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GENERAL ELECTRIC
PETERBOROUGH
ARMATURE DEPARTMENT #7

DEPARTMENT WIDE
RETROSPECTIVE EXPOSURE PROFILE

BINDER #1

BINDER #2 – APPENDICES ATTACHED

OHCOW FILE # G884

SUBMITTED TO:	***MARY COOK – OHCOW MANAGING DIRECTOR*** ***MAUREEN MULLEN - WSIB*** ***LESLIE PIEKARZ- OHCOW EXECUTIVE DIRECTOR*** ***NICK DE CARLO – CANADIAN AUTOWORKERS UNION*** ***DR. P. JUGNUNDAN - OHCOW PHYSICIAN*** ***DR. N. KERIN - OHCOW PHYSICIAN*** ***DR. R. WONG -OHCOW PHYSICIAN***
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DATE :	***JANUARY 30TH, 2006 FINAL EDITION***

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BINDER #1

1. ACKNOWLEDGEMENTS

The writer wishes to thank the Canadian Automobile Workers retirees/members for their patience, support, and guidance throughout the investigations and data collection, as well as preparation for this report. I commend their commitment and diligence in sharing the work experience and processes which they were involved in throughout the years. I would also like to thank John Ball and Don McConnell for their continued support and patience in assisting the writer with formulating this report. I would also like to thank Mary Ann Johnson for organizing the meetings and gathering the participants. The former GE employees played an integral role in data collection, meetings, and description of the workplace. The meetings involved hours of layout formulations, process descriptions, chemical analysis, and personal/group testimonies. Without their enthusiastic support, the contents and compilation of vital sections of this report would not have been possible. Some employees of the Armature Department both retired and currently employed, devoted up to 56 hours of their time for the completion of this report. I commend them on their commitment to occupational disease prevention, health and safety, to the success of this Intake Process and Retrospective Study, and to their support and hope for one another.

2. DISCLAIMER

It should be noted here that all processes described in Section 5. of this report were compiled by former and present General Electric Employees, and not by the OHCOW Staff. The OHCOW Hygienist recorded the processes and facilitated the discussion with regards to flow of material in and out of the department, layouts and illustration of processes. Some applied hygiene questions were posed in order to obtain further understanding of the processes where there was a requirement, such as the following:

- hazards identified in the areas of work
- key process specifications such as, temperature of ovens, solvents, engineering controls
- general working conditions, possible exposures
- use of personal protective equipment
- fumes, odours, types of smells identified
- dimensions of the equipment and machinery described

All the questions were posed to properly assess exposures in the various buildings and related processes. Furthermore, various documents have also been referenced or attached in the appendices herein to further provide evidence of the details given by the employees as well as evidence with regards to poor working conditions in the buildings, employee accidents, individual testimonies and general unsafe conditions and use of products in the GE Peterborough Facility, with a focus on Armature.

In supplement to the above mentioned documents, statements made by the employees and the processes described are validated in the Ministry of Labour Field Visit Reports that are cited in Section 7 of this report which validate, confirm and provide solid evidence of the testimonies given by the employees, description of the workplace and work conditions, and thus further provide evidence that exposures were more than likely incurred by working at this area at the General Electric Plant.

3. LETTER TO THE ADDRESSEES

Please note due to the vast amount of evidence, group testimonies, literature review and hygiene analysis presented herein, it is imperative that the report be read in it's entirety. The sections in this Retrospective Exposure Profile are not stand alone in nature and all depend on one another to fully comprehend the complex exposure review for the General Electric Employees, in the Armature Department.

In order to justly comprehend the vast nature of the exposure profiling, this report must be read in its entirely as every component is vital to the comprehension of the contents herein, and is recommended to be followed in succession i.e. Sections 1- though 11.

Please note the Retrospective Exposure Profile was completed as per the approved procedure (October 2002) of the Occupational Health Clinics for Ontario Workers, which follows the necessary guidelines for completion of Hygiene projects (procedure included on the following page). This REP must include both anecdotal and scientific information. Without the anecdotal information, the applied hygiene would not have been as successfully interpreted or analyzed.

ARMATURE

DEPARTMENT WIDE RETROSPECTIVE EXPOSURE PROFILE

4. INTRODUCTION:

Occupational Health Clinics for Ontario Workers (Toronto) was contacted by the CAW to conduct an Intake Clinic and a Department Wide Retrospective Exposure Profile in order to accompany claims that may be submitted to the Workplace Safety and Insurance Board. The following Department Wide Retrospective Exposure Profile is prepared from information gathered at the 2004 Intake Clinic and meetings held with workers and Union representatives as well as Document Reviews of Ministry of Labour Reports/Orders, Accident Reports, Union Letters and other General Electric Reports.

The OHCOW Hygienist met with former and presently employed Armature employees in 2004 on September 27th, October 18th, 25th, November 1st, 8th, 15th, 22nd and January 10th 2005, for collection of information on the processes and materials used and work conditions in the Armature department. The OHCOW Hygienist and other members of the CAW and GE Management went on a Tour of the location where Wire and Cable were situated in the past as well as the Armature Building, on December 8th, 2004. The buildings were divided according to their processes and will be described in this manner. The OHCOW Hygienist met with workers to characterize the following:

- processes, as per product flow and employee work card tasks
- exposure identification/description
- anecdotal information and testimonies
- accidents and incidents

The facility in Peterborough has been in existence for over 100 years. It covers approximately 21 acres. On April 20, 1891, the grand official opening of the plant was held. By the end of 1950, the local payroll numbered 4770 with an all time peak of 4980 in 1974 (McLaren, S. ed., 1991). Over 3000 chemicals were utilized in the plant.

5. WORK HISTORY AND PROCESS DESCRIPTION:

This document has been organized according to the various equipment and processes that were in existence in this department. The Layout and names of equipment/processes are defined as per the layouts in Appendix A, Plant Layout, and Appendix B through to I; you will find the armature layout as indicated by the appropriate decade. Building #5 was also part of this department. The layout and processes have changed over the years and a different layout has been prepared for the various decades past to present. All information provided in this section is from the employee accounts and intake clinic information received.

The Armature Department was responsible for building coils for motors and generators, stators, DC motors, armatures etc. Armatures are the rotating part of the motor. The building is 350 ft X 100 ft X 70 ft high. It also has a mezzanine, which covered only half of the building. It runs north to south and is open to the lower floor (balcony). See Appendix H – Armature Pictures Illustrating Large Dimensions. Due to large dimensions of the parts that were being built, some of the parts had to be carted by the armature railway to Building 8 or 10. The railway track covered 40 feet of the Armature building from north to south. Hence, the activities, processes, solvents and thus their toxic effects were brought forth into Building 8 and 10. Similarly the processes of building 8 and 10 would also affect the employees from armature as they would be exposed to any of the contaminants from the processes that were taking place in those respective buildings as well. This is not to be overlooked when attempting to define exposures. Furthermore, there was vacuum pressure impregnation of the electrical coils with either polyester or epoxy resins that took place within this building as well as building #10 and #8. It is imperative to note that armature is currently an existing department and some areas and processes, which will be mentioned here, are still in existence today.

The process of assembly winding was also conducted in Building 8 and Building 10 as well as at the Client site if need be. The parts that were assembled were transferred from department to department by the Armature Department's transfer cars on the railway tracks. Sometimes 2 cars were required to transfer finished products to various departments depending on the size. Building 10 handled large water wheel generator type equipment and Building 8 handled 30-40 tonnes equipment.

Please note, most processes will be outlined with brief descriptions or bullets for ease of comprehension. The descriptions of each process are numbered and follow their respective layout numbers. The descriptions are offered in numerical order or in the order of the process flow within the department, depending on the decade being discussed. (refer to Appendix B- I)

ARMATURE UPSTAIRS

Refer to the layout in Appendix B – each number on the layout refers to a process that may be discussed here. The map is not to scale. Be reminded that the layout for the upstairs armature is actually half the width (i.e. 40 feet Wide). Only those processes that are considered a priority from a health, hygiene, toxicology perspective will be mentioned.

The armature building is approximately 350 feet long and 100 feet wide. Thus, upstairs armature is only 40 feet wide. There is about 25 feet per bay. (See Appendix E for cross section of the building) The liftrucks that were operated in this building ran on propane gas.

The mezzanine floor is approximately 25 feet above the main floor. The entire height of armature is 70 feet. The crane runs at 30 feet high.

It is important to note that the armature location upstairs was quite hot and accumulated heavy fumes and vapours from the various processes. The fumes from the ovens and Vapour Pressure Impregnated (VPI) tanks downstairs, would rise and travel towards the higher levels of the building. Without proper make up air, or fresh air circulation, it is clear that the fumes and hot contaminated air would rise, and the employees located on the upper floor of the armature department were not only subject to the fumes from their own processes but also from the downstairs armature processes as well. In winter months, fumes may have been reasonably more prevalent, due to the negative pressure from limited exhausts on some of the equipment, lack of fresh air circulation within the building, and lack of forced fresh make up air. Only some windows were available for opening in this building. The proceeding sections will demonstrate how the large portable heater operations required all windows and doors to be shut, in order to achieve the desired oven temperatures.

In terms of housekeeping, air hoses were used often to brush off clothing, body parts, workstations and machinery. The floors were swept with brooms and the main aisles were swept with power sweepers. Pedestal fans were used for ventilation and for relief of heat. All these practices were detrimental, due to the fact that they dispersed the loose or frayed (asbestos and fiberglass) fibres from the various operations in this department, as well as fumes, vapours and other harmful dusts.

1. Shears Station:

This process was in place in the 1960's. Thereafter the process had changed. Three to four people worked in this area.

- 2 cutting machines were present in this area – each had long blades to cut the 8x5 foot blankets of insulation. One type of insulation was made with fiberglass materials known as NOMAX Mica. The other type of insulation was flexible asbestos board/blankets, as well as HAYSITE (the employees describe this material as hard fiberglass type material).
- The fibre boards were cut and prepared for the armature employees who required the sheets of insulation for the slotting processes (will be discussed later). This used to be completed near the cold room.
- There was no exhaust above the machinery in terms of capturing the fibres from the cutting operations.
- Fibres were free floating as per the employees, as they could be seen on employees clothing, floating in the air and on the equipment and surrounding areas as well.

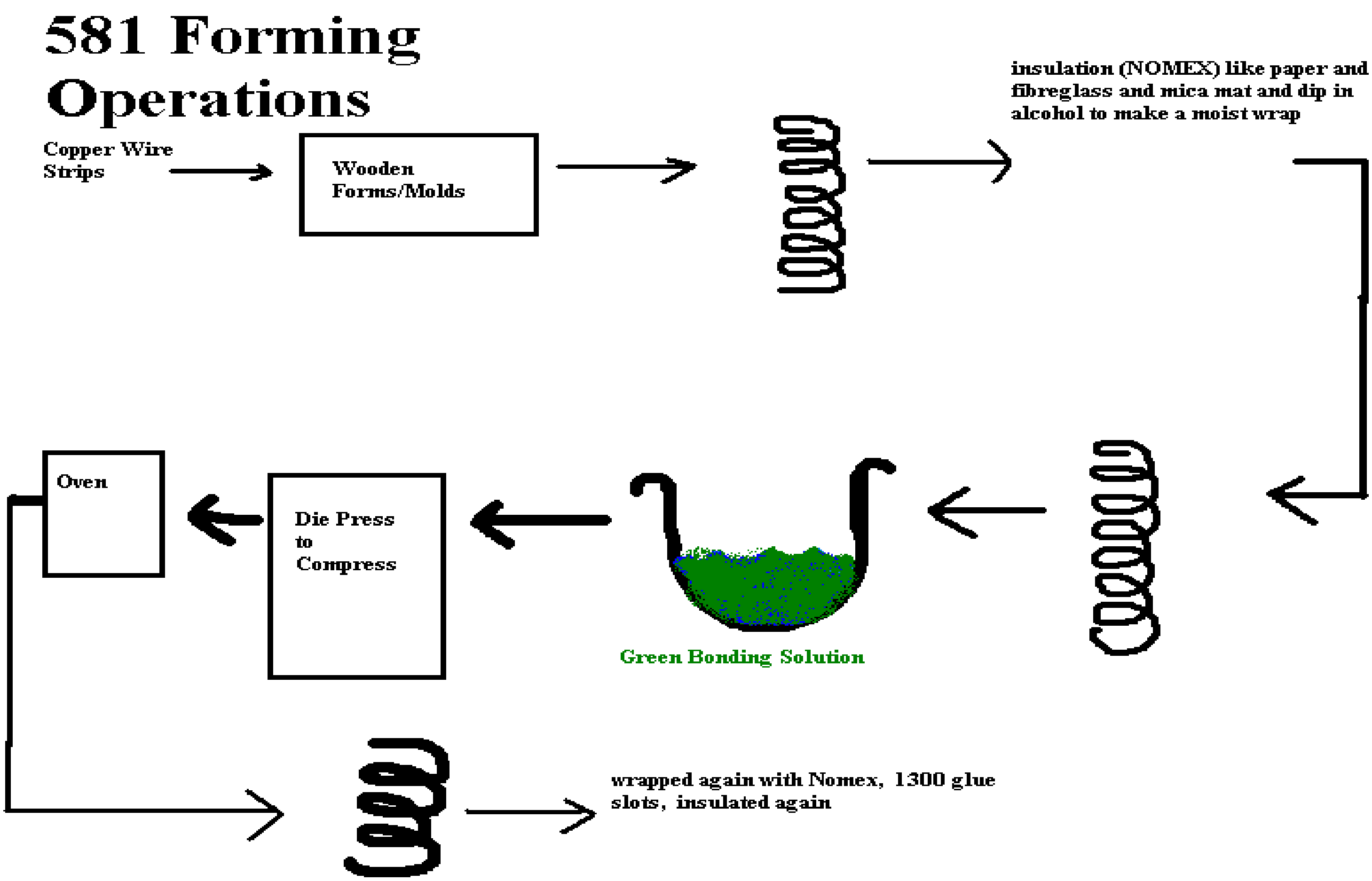
- Employees did wear aprons and smocks in this area. Employees did not wear any respiratory protection.
- All the areas had pedestal fans. The fibres dispersed into other areas of the building, as per the employees.

After the shears station was removed, Winding Lathes were installed in this area of the department. The machines were approximately 20 feet in length. Copper wire traveled through the machinery and was taped with insulation that was in the form of either MICA or Fiberglass. The wire was then wound onto a coil. Before the copper was insulated, silica was utilized to lubricate the wire so that the tape would run smoothly over the copper wire. Silica dust was generated by this process. Five coils were produced per shift. For the high voltage coils, silica was utilized in the late 1970's. Either the silica was in buckets or Tupperware containers and wire was drawn through the Tupperware contents (powder silica). Unless the plastic container was cracked, there was minimal silica in the area.

5. 581 Forming Machine (see Diagram 1 below):

- One employee was assigned to run the 581 Forming Machine.
- Diesel coils were formed and shaped by the hydraulic press, with long strips of copper
- This process was under piecework thus employees worked as quickly as possible.
- The process involved, taking fiberglass copper wired strips and forming the strips according to a wooden forms/molds. The wire was then insulated with NOMEX (fiberglass) and MICA Mat. These items were dipped in alcohol, known as a wood alcohol, in order to secure a firm and moist wrap. Isopropyl alcohol was also utilized, depending on the process requirements. The coil was then dipped in a green bonding solution, sent to the dye press to be compressed and then placed in an oven to be baked. At this time, the coil was wrapped once again with the NOMEX wrap. 1300 glue (GE assigned name) was added to the slots via paintbrush and the coil was insulated again.

Diagram #1:



The process flow diagram above shows how intricately the wires were insulated and wound with materials, bonded, sealed, and coated. The 581 forming process is not as involved as the other processes in the Armature Building however, it gives a clear example of how intricately the wires were coated and bound.

6. Punch Press for Diesel Leads:

- One employee was assigned to this operation, which was quite loud. The task required the employee to handle the large equipment, to flatten the copper leads in the part and cut pieces out. No protection was worn in this area. The punch press was manual and did not require heat.

7. 752 Coil Forming Machines:

- Flat wire was formed into a loop, and punch pressed into form. Insulation was then added to the copper wire. Silica, Mica, Fiberglass and scotch tape were utilized to insulate the wire (2-gauze fiberglass tape – with mica sandwiched in between the 2 layers of fiberglass) The wire was dipped in isopropyl alcohol as well. The wire was then fed into the taping machine, where fiberglass was wrapped on the wire again with Glyptol glue. The silica was in the form of a liquid/milky type form, used as a bonding material. Silica dust formation was minimal here, as per the employees.

- The taping machine did not have any exhaust ventilation over it. The employees state that often times the fibres would break off during the taping.
- The taping machine worked continuously for 8 hours per shift.
- The tape was cut into Rolls leaving raw edges on rolls so any loose fibres were free to be airborne.
- Due to the lack of engineering controls, the fibres were not contained at this station.

9. Dip Tank for Glass:

The Dip tank was 3-4 feet square. **Isonel 51** was the main content in the dip tank. It was an orange dye. 1500 thinner, also known as toluene, was added to the Isonel. The tank was an above ground tank, which was not heated. The tank also did not have any local exhaust ventilation. The function of this dip tank was to allow the fiberglass tape to be dipped and dyed with the GE preferred orange colour. The colour dye also added more texture to the tape as well. The tank did have a lid, however when it was not in use, the lid was always in the open position as per the employees. A Wire basket was available for the employees to place their tapes in the basket, and lower the basket into the tank contents. The basket would be left for dipping for about 20-30 minutes. The pulley was then lifted up and allowed to air dry and drip into the tank. The employees would retrieve their parts with their bare hands. No protection was worn.

The type of odour described here is an alcohol type odour. The dip tank contained an orange powder dye, which also included a resin, as per the employees. Employees stated that the vapours were not that heavy.

An employee that worked regularly with this dye, over time, began to develop orange roots and hair.

"…The employee was a natural blond who over time had orange colored hair due to her exposure to this dye. This employee was generally frail in terms of body density and structure. Her function was to dip the tape in the dip tank and let it sit to dry. When she would dip the tape, she would submerse her hands and arms into the dip tank as well. She would also be exposed to the dye solution on her hands, forearms and other parts as she would handle the tape in its wet state. The glass was allowed to sit in the dip tank for approximately 20-30 minutes. The dye would also stain her skin and nails." EMPLOYEE TESTIMONY

15. **Cut Off Machine and Stripper:**
    - This machine was 10-15 feet long and operated by one employee.
    - The main function was to cut the fiberglass covered copper wire.
    - Copper dust was formed when you stripped this material. (Not in excessive amounts, as per the employees).
    - Process involved loading a reel of copper wire, lead the wires through a set of rollers to have the wire come out straightened.
    - The ends of the wires were sent through a set of brushes, which would strip off the insulation off the ends of the wire, so that later this part of the copper wire could be brazed.
    - The copper wire was then cut to length.
    - There was no exhaust in this area.
    - Much of the copper wire was insulated with asbestos (either by the Armature processes or the wires/reels that came from the Wire and Cable department) – hence asbestos fibres would have been emitted through this process as well.

16. **Stripper: (as per above)**

- This machine was operated by one employee, for 8 hours. Copper wire was held and fed into the machine to strip off the insulation. Set of heavy brushes were put in place to strip off the insulation. Most leads had to be stripped off as well. This process generated numerous amounts of fibres.
- Ventilation had to be turned on
- Glass – Kapton glass – was a component of the insulated wire

17. **Flux, Tin and Lead Pot:**

- The lead pot was heated, to a temperature enough to take solid bars of lead and have them melt to liquid form (621 degrees Fahrenheit approximately). The lead pot was the size of a crock-pot.
- One operator was assigned to this operation.
- The leads of the copper wire were dipped into the lead pot. GY Wire (a type of wire) also was dipped into the lead pot and a tin pot.
- The wires were then put on a rack to allow the wires to cool
- There was ventilation on top of the pot, however, there was often splashing and bubbling of the liquid lead, and vapours would be emitted from the parts as well as the pot.
- If moisture was on the wire, there would be splashing as well, when the wire hit the liquid lead.
- The operators on this process were not given any personal protective equipment.

FLUX POT:
- The flux was brownish in color; it was a sticky glue-like substance,
- The purpose of the flux was to clean the copper so that the lead would adhere properly.
- The employees stated that the flux was likely to have muriatic acid in it as well.(Copper oxide)
- The flux was placed in a gallon sized pail

Summary of #17:

The bare copper wire was first cleaned by the flux, which was in a tank. The dipping of the wire into the flux and then lead pot was also for preparing the wires to have more adhesive properties for the insulators etc. The wire was then dipped into a heated pot, which contained liquid lead. When the fluxed wire hit the heated liquid lead, there would often times be splashing due to the chemical reaction as well as a significant chemical odour, (as the chemical reaction was strong enough to cause such an odour to develop). In order to alleviate the fumes from the lead pot and the chemical reaction of the flux with the lead and the copper, a pedestal fan was placed in this location, but was not operable at all times. One employee was actually assigned to this process; however other employees could also perform the tasks in this location for the materials they were working with.

19. Dip Tank in Floor:

The dip tank was sunken into the floor and it had a lid. It was fenced around for safety. One operator was assigned to the processes, which involved this dip tank. The tank was 4 feet square. Toluene and xylene were added to the tank to act as thinners. The tank contained epoxy varnish. MEK peroxide was also added to this tank to act as an accelerator. The tank was not heated. The parts were dipped, and then drip-dried over top the tank. The parts were then put into an oven. The entire area was full of fumes coming from the oven located adjacent to the tank as well as from the tank itself, and from the parts that were left hung to dry and cool off after being baked in the oven.

This dip tank was used for applying a varnish on the armatures or rotor type coils which all varied in size. They could be small sized coils to large 7-8 foot size coils as well. The coils were dipped in this tank, in order to seal the leads in the coil. The large coils were then placed on a conveyor and allowed to dry, before being taken to the ovens for the bake out. The room was large enough to hold enough coils that needed to be dried after they were dipped into the dip tank. The employees state that due to the dripping of the liquid varnish off the parts, varnish would often accumulate on the workplace floor. There was a heavy chemical odour from this tank as well as from the coils that were air-drying after being submersed in the tank. Although one employee was assigned to this process, the exposure to fumes and odours from the adjacent oven area and the air drying of parts over the dip tank itself, would have caused the employees in the adjacent sections of the department to incur exposures. Some employees had pedestal fans. These fans would cause the fumes to travel further to other areas of the department as well as into other employee's workplaces and thus their breathing space. Some employees sat beside the Dip tank area where coils were left to hang for drying purposes.

There was no exhaust for this operation.

18. Oven:

The oven was not properly ventilated.

> **"…The seals around the oven doors were not adequate and thus would not retain the fumes from the parts as they were being heated." EMPLOYEE TESTIMONY**

The employees could smell and see white smoke being emitted from the ovens. The oven was approximately 8-10 square feet in size. It was heated by an electric heater on the ceiling of the oven frame and parts were heated as air was forced down on them. The fumes were very heavy in these areas as per the employees. The parts would often be left in to dry/heat for approximately 1 hour or more.

The fumes that were being emitted in this area were the fumes from the varnishes that had been applied to the parts from the dip tanks, as well as lead and flux from the previous dip tank processes and the decomposition products from the oven operations.

The employees state that the fumes from the ovens would irritate the throat and nasal cavity when they would work in that area or adjacent areas. The odours were solvent type in nature. The employees state that their eyes would also be affected and would cause them to tear.

20, 32, 33. Taping Machines (an MOL Report provides evidence related to difficulties with this Taping Process – refer to Appendix K Document # 25):

- The taping machines involved mica mat, fiberglass, KAPTON (like scotch tape).
- All items from the forming operations were taped here.
- Five to six employees worked on the taping machines – there were 6 taping machines
- Due to the use of fibrous materials, many fibres were generated from this operation
- The glass MICA was dipped in alcohol to moisten it. The alcohol was available to employees in 5-gallon pails.
- Employees could not wear gloves on this operation, as they were then not able to handle the copper wire, or the tape. Barrier creams were introduced in the early 70's however, employees could not use the creams due to the fact that the cream would interfere with the application of the tape.

The alcohol in which the insulation was dipped consisted of: isopropyl alcohol, MEK, xylene or toluene. The employees state that their hands would turn white and burn on several occasions, due to the constant dipping of their hands in the 5-gallon pails. Some employees did have some breakouts on the skin as well. On Friday afternoons these alcohols were utilized to clean up the machines, for housekeeping purposes as well.

> **Each operator had a small can of alcohol about 8 inches in diameter with a lid to dip each roll before putting the roll on the machine.**

Employees state that on this job as well as other processes, employees would get covered in glue. MEK was utilized to take the glue off. The glue was quite sticky and hard to remove. Thus employees state that when using the MEK, they would rub vigorously to try to get the glue off their skin.

When working on DIESEL components, the employees stated they would dip their hands in alcohol all the time, in order to position the insulation. There were numerous dermatitis issues due to this.

Employees state that whenever they would go home to shower, often times, their skin would peel off the bottom of their feet and their hands, in large sheets/films. They attribute this to the solvent exposure in armature. (refer to Appendix K – Document #25).

21. Stator Coil Set up and Wrapper:

- The type of glue utilized for this operation was EC 1300 yellow glue. It was a 3M product, yellow in color and released a foul odour.
- The glue was applied by brush.
- MEK was utilized to remove any excess glue off hands and arms and any other areas of the body.

- Employees state that this area was also quite fibrous in that fibres could be seen floating in the air. It was quite dusty. They could see the fibres and dust shine like snow in the air.

24. Oven:

The purpose of the oven was to heat up coils to put into the dye press. The 761's Gy's and 581's were placed in this oven as well, in order to make the slots solid.

People would put their lunch on the oven for heating up. The GE facility was so large that going to the plant cafeteria was not feasible, as it would take too much time to get there and back to the Armature building. Hence employees ate at their workstations.

The oven was approximately 5x6 feet in dimension.

29. Pole Face Bar Press:

- A solid piece of copper was insulated with 5 layers of tape– they varied in size – hydro tape, terrylene tape, shrink Mylar, tedlar tape and permafill tape. All taping was done by hand. Varnish was also utilized for adhesive purposes. The varnish consisted of epoxy resin, which was milky white in color. It was brushed on and was quite sticky as per the employees.
- The copper wire was then put in a heated press, heated at 150 degrees Celsius.
- Fumes would be emitted, as the epoxy would be heated as well. The purpose of the process was to cure the tape onto the copper wire. The press was not exhausted out.

In order to clean the presses, which had accumulated epoxy varnish and other items on the equipment, MEK was utilized for cleaning purposes. Rags of MEK were wiped over the hot presses. Due to the temperatures of the press, fumes of MEK would also be emitted as the employees were cleaning, due to the reaction of heat with the MEK. The employees also state that a free coat type spray, like PAM, known as FREECOAT, was sprayed on the equipment to act as a non-stick release agent. This was a clear agent with MEK as an ingredient, as per the employees.

The employees were allowed to smoke at their workstation and they ate at their workstations, as stated earlier. Employees state in general, due to various cutting operations, such as cutting of fiberglass, asbestos or Mica, there were fibres all over the mezzanine levels of the armature department. Due to the fact that the upstairs level was like a balcony, the contaminants, whether they were fibres or fumes, were allowed to disperse to the other areas of the armature building as well.

Armature Department – 7
Floor Level
1960's

Refer to Appendix C for the processes discussed here. Each process has been assigned a number indicating it's location on the layout. Only those processes or locations that are deemed vital for discussion will be outlined and described here.

The number of shifts worked in this area depended on the workload. (job tasks could require that employees put in 12 -14 hour shifts, example, portable oven set up)

1. Sub Station

- 2-3 transformers were located in this area.
- the area was frequented by maintenance personnel
- it was a fenced off area

#10000 Royalene Degreaser:

- **The tank was ½ in ground and ½ above ground.**
- **It was 16 feet long, 4 feet wide and 6 feet deep**
- **The degreasing agent was ROYALENE (synonym – Trichloroethylene)**
- **The tank was heated to 200 degrees Fahrenheit**
- **The tank was heated with coils that were inbred in the tank (see Section #8 - Picture #6-Vapour Degreaser)**
- **There was no exhaust over top this tank**
- **Parts could also be lowered into the tank with a hoist or basket**
- **The idea of the cooling coils and heating coils was to have the vapours rise up and then condense and settle down**
- **Copper and steel components were placed in the tank for degreasing purposes**
- **Employees would monitor degreasing activities. As they would take the parts to the tank, they would wait alongside the tank as the parts were degreased, for approximately 10 -15 minutes (depending on the size and condition of the part).**
- **The employees state that anyone could degrease parts – there was no assigned employee to this task**
- **The employees state that the vapours would clear sinuses once employees would be in the vicinity of the tank**
- **Water Tank: this tank was the same size as the degreaser**
- **The water was heated and there was an exhaust over top the tank.**
- **The purpose of the water tank was for the copper brazed parts (from another process) to be dipped in.**

5. Copper Storage Area

- Any person using the wire came into this area and received their wire
- Reels from Wire and Cable were transported here for use
- Some of the reels consisted of insulated copper wire, some of which also contained asbestos, such as that from the carting operations.
- The employees wore cotton gloves.

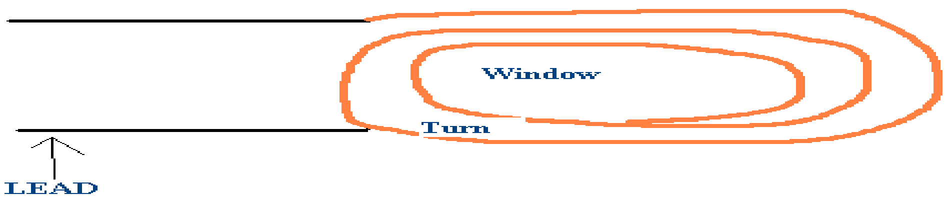
6. Copper Machine Lathe

- This lathe formed the copper wire into a flat plate, 2 inches wide by ½ inch thick.

7. Coil Winding Lathes

- One to two employees were assigned to each lathe (dry). They worked on a 2-3 shift bases. The copper wire was fed into the lathe, which acted as a tension device. The lathe rotated a number of times, and each time, a turn was formulated in the copper wire. There could be a number of turns, depending on the specs required. See Diagram 2 below for details on terminology. The lathe was a dry operating lathe – i.e. no machining fluids added etc.
- While the lathe is winding, mica or glass tape are also added automatically to the copper wire. With this process, fibres would float around. You could see if located against a window, fibres floating across the area, sparking like snow, as per the employees. There could have been asbestos present here as well. It all depended on the type of wire being worked on. If the wire came from Wire and Cable then the wire would have likely had asbestos in it.
- Asbestos fibres would also float around and be released.
- The employees did not wear any protection or breathing protection and there was no exhaust in this area.

Diagram #2. Definition of a "Turn." -copper wire shown here in orange:



Motorized sweepers were assigned to clean up the main aisle ways only. All other areas were cleaned by employees with brooms or other methods for sweeping purposes (air hoses). The fibres were frayed and you could not see them, unless against sunlight, floating in the air. Some fibres were seen accumulated on equipment or beneath machinery.

Employees state that sometimes fibres were noticeable on clothing, and at other times, it seemed that there were no fibres to be seen, but when wiping off machinery or skin or clothing, fibres could be see en mass, like dust bunnies coming off the skin and clothing. The employees did not have changing rooms. Thus they wore their street clothes to and from work, contaminated their cars, homes and potentially other members of their family, as well.

Employees were given SBS 30 and PLY 9, which were gels to relieve the itchiness caused by the fibres on their skin. Some employees had dermal infections or dermatitis. These lotions relieved employees from the skin reactions they were incurring while working with the fibres. Much time was allotted for employees to put this lotion on their skin.

8,9,10 – Tin Pot Operator/Stripper Flux:

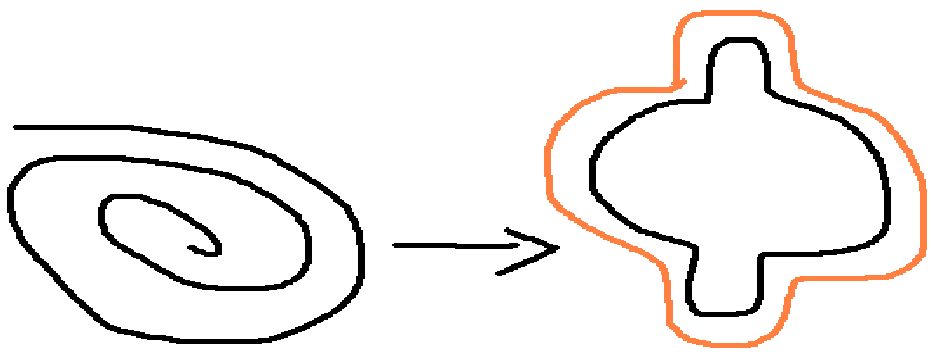
The operator who worked with this process wore a face shield, apron and asbestos gloves. The tin was heated to approximately 449 degrees Fahrenheit, so that it was in liquid form. The wire was mechanically stripped. There was an exhaust fan above the tin pot and it was exhausted out to the roof. The Flux consisted of a resin and alcohol. The purpose of the flux was to clean the copper wire so the tin would adhere to the copper. The lathe operators, who were located adjacent to this process, could smell the fumes coming from this process. The smell was described as being a sweet smell like sap off a pine tree. The resin must have contributed to this smell. The ventilation was on, but as per the employees, the ventilation did not work very well, as odours were heavy and were noticed to be coming off the tin pot and flux pot. The tin pot consisted of a ratio of 60/40 solder, 60 percent lead with 40 percent tin. Both bars of each would be added to the molten pot.

The employees had to wear asbestos gloves on this job, as the wires were too hot to handle. (The company, which supplied this product, was known as Castor).

12. Spreader (High Voltage Coils):

This process did not involve any application of liquid solvents or heated fumes. The process involved spreading the copper coils into a shape required for insertion into slots etc. See **Diagram #3** below. There were 2 spreader machines, 1 large and 1 small. The employees state, due to the forming/spreading activities, this process was a fibrous process, in that the fibres (asbestos fibres) would fray, and disperse.

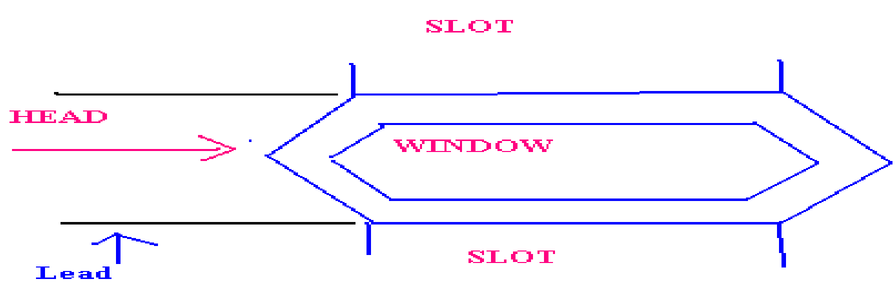
Diagram #3 - Spreader.



Speading of Copper Wire into Desired Shape

13. Coil Taping Area:

Diagram #4- Definitions of Slot, Lead, Window, and Head.
Approximately 30 people worked in this area over the three shifts. Due to the nature of the work here, these taper employees did have change rooms available to them. The coils were placed in clamps and leads were taped with mica tape. Depending on the voltage for which the coils were being prepared, that would determine the amount of mica tape required. For 12000 volts for example, 9 layers of mica tape were required. Each round of taping required painting with black varnish around each layer. The lead and the head would be taped with this tape and painted with the black varnish. See **Diagram #4** below. The black varnish was supplied in a 45-gallon drum and applied via brush.



Fiberglass cord was utilized to tighten the leads down and tighten it back into position. The coil air-dried. Employees had to feel the tightness of the tape on the wire; therefore they could not wear gloves. Employees would often dip their hands in the 1500 thinner, so they could tighten the fibreglass cords. Employees state they would often break out in blisters due to the exposure to toluene and their skin would dry out as well.

The coils were then taken to the compound tanks (number 14 on the layout).

In general due to the nature of the processes involved here, there would be accumulations of the black varnish, mica, as well as chalk or talc on the floor (which were utilized by employees, so that the tape would not stick to their hands). The employees state this was one of the dirtiest jobs in armature. The tapers had one hour for lunch. Some employees ate at their workstation. There were windows that were opened on occasion in this area. Fans were supplied in the summer.

Due to the number of people working in this area with the black asphalt varnish, the exposure to vapours were heavy in this area (See Section #8 - for further information with regards to this process).

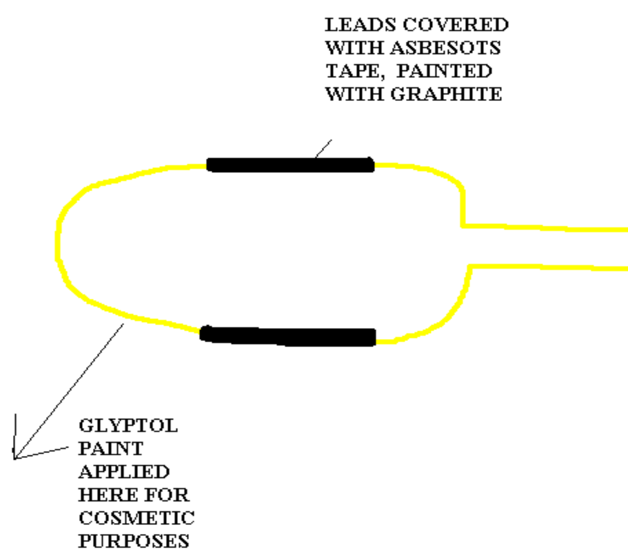
14. Compound Tanks :

There were 2 compound tanks in this area. Fifteen to twenty coils were inserted into the compound tanks at a time. Cardboards were fit on each slot side of the coil. The height of the tank was 6 feet tall, 25 feet deep and a diameter of 10 feet. The small tank was 8 feet in diameter and 12 feet long. Both tanks were pressure impregnated. The whole tank would fill up with asphalt. Once the lid was taken off the tank, the tray would be covered with asphalt, upon which the coils were placed. There was one tank operator per shift and 2 operators were assigned to put in and take out coils from the tanks.

The function of the compound tank was to have the asphalt harden the mica, fit it to size and heat it. The cardboard was removed from the coils; sacrifice tape would also be removed at this time. In general, the function of the sacrifice tape was to hold a part in position.

When the coils were taken out of the tank, they were cold. When the tank was opened, heavy fumes were emitted and it smelled of tar, for the whole day, as per the employees. The tray of coils that was inserted into the tanks would take anywhere from 3-4 hours to 24 hours (to pressurize).

Diagram 5: Taping of Leads:



Depending on the size, there was always one tank running at a time. The employees did wear aprons, but no gloves. They used their bare hands to take off the boards and sacrifice tape. They wore a facemask and cotton gloves for protection.

After this part of the process was completed, the asphalt-coated coil was then sent back to #13, Coil taping area.

The asbestos tape came in an inch wide reel, with loose fibres. The asbestos tape was held secured with the graphite paint. The rest of the wire was painted with red Glyptol paint. See Diagram 5.

15. Test Area

The test area consisted of high pot testing, turn testing, strand testing, and conductive measurement testing to name a few. High potential testing consisted of passing an electrical voltage through the wire. The testing process for large coils took approximately 60 tests. The small coils could take approximately 6 tests per coil. Ozone would be emitted by this process and employees state this would burn their sinuses. Armature employees on the upper floor state that they would also smell the fumes from the test areas. The high potential testing consisted of 30-40 000 volts. Turn testing tested the insulation on the wires. After the testing process, the copper wires would be sent to the winding assembly area, #16.

16. Assembly Winders (Section 16 on the layout – Appendix C):

Types of Coils and Equipment Assembled and the Associated Processes are discussed in this section – Section 16 – A- F:

This process of assembly winding was also conducted in Building 8 and Building 10 (and may have been conducted at the various Client sites). The parts that were assembled were transferred from department to department by the Armature Department's transfer cars on the railway tracks. Sometimes 2 cars were required to transfer finished products to various departments depending on the size. Building 10 handled large water wheel generator type equipment and Building 8 handled 30-40 tonne equipment. (See Appendix H – Picture of Large Dimension products)

The processes are similar for the various types of coils prepared in this area of the department. However, some of the processes required unique preparation activities. Only those activities will be described as the rest of the tasks for each product were similar to that of the Asphalt coils. Hence in order to refrain from repetition only the unique tasks are described here.

16A. Assembly Winders -Asphalt Coils:

Approximately 20-30 employees were assigned to this section of the department, located at the southwest corner of the building. Most of the coils that were utilized here came from the process sections of this department already discussed, i.e. section 1-15. Hence, all the copper wire that came from the previous sections of this department (floor level only) was covered with the **asphalt tar**. Asphalt coils are set up in a stator, which is the outer casing of a motor. The stator set up resembles the casing for a slide projector.

The coils are placed into the slots of the stator. In order to secure the coils into the slots, a number of items had to be wedged into each slot to ensure the coil was set and secure. Varnished pieces of asbestos were placed in each slot. The asbestos pieces were ½ inch- 1 inch wide and 36 inches in length. These pieces were prepared by the processes from the mezzanine level armature employees. The pieces were set on a cart and were already prepared for use. The Asbestos was held in tact by 1592 Asphalt Varnish. Another item that was placed within each slot was a "leatheroid" or thin cardboard piece. This cardboard had textile properties and came in various thicknesses. Furthermore, wedges, made of either maple or plywood, were also secured between each slot and coil to ensure that the coil was secure and tightly held in the stator slot. Finally, a varnished fiberglass cord was also lashed here to ensure the coil was secure. The cord was varnished to ensure the fibres would remain intact. The tape was not refrigerated.

The coils are connected in various locations one by one. The leads of each coil are connected via soldering. The solder material utilized is Rosin Core Solder. A mechanical clip is also utilized to ensure that the leads are married up. This process involved either 2 or 4 employees. The coils weighed varying amounts, depending on the size of the job, or stator. Some coils weigh 100 pounds or more, hence the need for more than one person for slotting the coils into the stator. The soldering was conducted by acetylene oxygen torch and copper wire. The next process was a 2-step process. The coil leads were then insulated with a tape that consisted of both glass (Fiberglass) or paper and Mica coated with asphalt varnish. The tape came to the employees already prefabricated. The tape was a GE Spec tape, called a glass tape or woven glass tape that was 1 1/4 inches wide (usually supplied by a U.S. supplier, some employees stated they recall the supplier name to be Cambric). The soldering operation did not have any local exhaust ventilation.

Only natural ventilation was relied upon, such as open doors and windows. It was mentioned by the employees that due to the black asphalt varnish, it was not a fibrous process to apply this tape on the coil leads. The tape was tightened around each coil by hand. The next step involved applying some more black varnish, asphalt varnish to the tape that was just wrapped on the coil leads to ensure security. The GE spec for the asphalt varnish was 1592 Asphalt Varnish. The tape was then wrapped around the coil leads once again and the process repeated. This process was repeated approximately **10 -15 times per pair of coil leads**. The employees would be covered with the black varnish, as they were unable to wear gloves for this process, as gloves would interfere with their securing of the tape after applying the varnish. Safety glasses were worn by some employees, but at this time they were not enforced. All in all, employees that wore prescription glasses were the only ones who had any form of eye protection at the time. Other employees did not necessarily wear any eye protection. Safety shoes were worn by some employees as well.

Each connection took about a half hour to solder and insulate with the tape. **As per Picture #1–Arm. Dept.GE Stator,** one can note the large dimensions of an actual stator; the diameter is approximately 46 feet! Hundreds of employees were working on this stator. With this type of stator, ladders were utilized to access the inner core. A stator of this size would take 2 – 3 months to complete in terms of the soldering and taping application **alone!** With regards to the individual coils, there could be two to four men working on one coil at a time. (refer to Appendix H and O for more illustrations of the large dimensions of parts that were handled in this department)

Picture #1 –Armature Department GE stator

The employees describe the work environment of applying the tape and varnish similar to that of a road tarring process. The smell of tar was quite heavy. After some time the employees stated that they would be immune to the smell and not notice it. However, upon arrival to the department, they would be overcome by the smell of the Asphalt tar. The employees confirmed that there was no local or general exhaust ventilation in this area. The building was full of fumes all the time due to the lack of proper ventilation for the various processes. Natural ventilation from windows and shipping doors would be the only type of fresh air to come into the department.

After this process was completed, the stator was prepared for shipment to Department 8 or 10 or to the Client.

Work Practice:

The employees stated that they would utilize 1500 Toluene to clean the accumulated tar off their hands after the taping operation. The toluene was available in a red canister, and they would dip their hands in and try to wipe off the tar. The toluene would be put on a rag, and the employees also wiped their facial areas as well to remove any tar. When the tar would have accumulated in heavy amounts, the employees stated that they would submerse their hands in the toluene canister for 5-10 minutes, trying to get the tar to come off their hands and forearms. The toluene would burn the employee hands after rigorous use of it. Moreover, whenever the employees had a cut or scratch on any body part, the toluene would cause them pain and stinging to the skin and wounded area. Hence the employees were not only inhaling the fumes from the toluene but were absorbing the toluene via uptake through the skin as well.

In terms of lunch breaks, employees stated they would eat their lunch right at the stator or nearby bench/ workstation, or wherever they could find a bench or table to place their lunch boxes.

16B. Assembly Winders - MCF Armature

The employees in the Assembly Winding Department were involved in the fabrication of the Multi Circuit Field Armature, (MCF Armature). This was also conducted in building 8 or 10 or at the Client site. The parts were transferred from building to building by the railway transfer carts. The copper wires for this set up came from the processes completed by the mezzanine levels employees. This copper wire was not covered with tar and was simply bare copper wire. These copper wires are secured into the armature. The armature is the rotating section of machinery and the part of a motor, which includes the main current-carrying winding.

Picture #2 Armature Department- Armature

The armatures that were assembled here were one to two feet in diameter to 5 feet in diameter (not as large as the stators). The coils were assembled into slots. This process could take from 2 days to 2 weeks to complete. In between each coil and slot, insulation had to be placed. Varnished asbestos pieces were placed in each slot. The size of the prefabricated asbestos pieces were 3-4 inches wide (thicker than the sheets prepared for the asphalt coils). In between the asbestos sheets, sheets of mica were also slotted in. The Mica sheets were 0.030 inches (30000th of an inch in width). The sheets of mica were varnished so that the pieces were not frail and fibres held in tact. The employees stated that this process was not excessively fibrous. Wedges were also placed in the slots to secure the coils. The wedges were plastic in nature and called Epon glass wedges. (Like a plastic divider)

19. Banding Lathe:

The next process was the Banding process. The banding machines were located adjacent to the Magnet Frame. See # 19 on the Armature Layout (Appendix C). The function of the banding lathe was to apply tape to the equipment in 300 or 525 (if no oven) pounds of tension. The department had both a large banding machine and a small one. Fiberglass tape with epoxy resin (used as an adhesive for the fibers to remain intact) was utilized for banding the parts together. The tape was called, Resi-Glass Cord. The banding operation was performed on order to secure the coils together.

Welding Area and Portable Equipment:

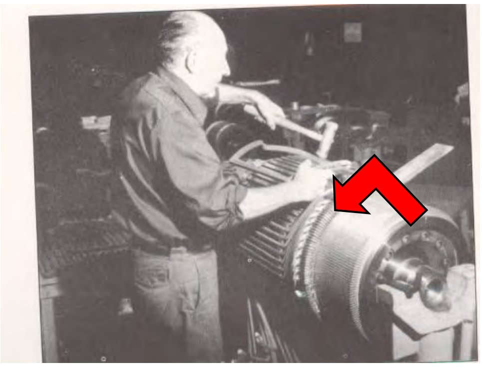
The next process involved TIG welding or brazing. The parts that required welding were the copper leads of the coils. The copper leads of each coil were welded to a series of insulated bars of the commutator riser. The commutator riser makes the electrical connection to the machine while it rotates.

TIG welding required:

- Copper to copper welding with no filler
- No gloves for protection, no ventilation, and no respiratory protection, (there was a hood present here)
- Engineer decided if there needed to be a change in process
- Varnish would be applied to the wire, therefore the varnish was also being welded. Thus there were fumes off the varnish as well during welding

Floor Level
1960's

16C. Assembly Winders - DC Armature
Picture #3- Arm. Dept. DC Armature



The red arrow indicates the location where the welding would take place. This process would take between three to four days or a couple of weeks, to complete. There would be either 2 or 4 employees doing the welding process.

The welding employees wore a helmet, gloves and at times a welding jacket. However, no respiratory equipment was utilized at this time. At times silver phosphorous welding was conducted for this process, and it gave off irritant fumes, as per the employees. At times, the engineer assigned to the job would indicate that silver phosphated (SIL PHOS) welding was required for certain jobs. TIG Welding was conducted by torch for certain jobs and Arc Welding for armatures, otherwise copper welding was conducted. There was no local exhaust ventilation for this process. The fumes would then rise to the upper floor of the armature department and the employees would be subject to those fumes (on the upper levels). The employees describe the smell as a dry copper type smell and a metallic taste was left in the mouth.

The welding was mostly TIG welding; TIG on copper. Due to the fact that this process was a lengthy process, the fumes and contaminants would accumulate at high levels, as this was a continuous process. Since welding operations were continuous for such large dimensioned parts that were being processed, there was no relief time from the welding fumes as there was also no ventilation or exhaust and thus clouds of welding fumes would accumulate and disperse throughout the adjacent areas and upper mezzanine levels.

#15 – High Potential Testing:

The next step involved high pot testing. Equipment from Section 15 (see Armature Department Layout Appendix C) would be brought in to conduct testing of the armature. Wherever the equipment was set up, the testing equipment would be transported to that location.

After the testing operation was completed, Permanent Banding was then conducted. The banding was conducted with Resi-Glass Tape.

The equipment was then ready to be taken to Building 8 or 10 for Resin/Varnish Coating, Baking/Curing and drying operations. As was already stated, this process was also conducted by the armature employees.

16D. Assembly Winders - MD- CD

This process was similar to the MCF Armature, as it was a smaller version. The (MD-CD parts came directly from the Assembly winding department. Bare copper was utilized for this process and thus not covered with Tar).

The process is the same as the MCF Armature process up to and including the Banding process. The leads of the copper wire were cut by the Lead cutting lathe (see #18 on the Armature Department Layout Appendix C). The Copper wire was then dipped in a Tin Solder pot (only the commutator part was dipped in the tin solder pot), which was electrically heated (approximately 500-600 Degrees Centigrade). The solder pot was located adjacent to the ovens (#21 Tin pot adjacent to three other tanks, refer to Armature Department Layout C). The solder pot is identified as 17A. There was no ventilation above this pot. All tanks had covers on them. A crane/Hoist was utilized to facilitate the process of hanging the copper wire above the pot and submersing the leads. The wires were submersed for approximately 10-15 minutes. Only the copper part of the wire was dipped into the solder tank. The wire was then taken out, wiped with a rag and set down to cool. The employees wore cotton gloves. The crane operators remained at this station for 10-15 minutes at a time if not longer.

The copper wires were then taken to #18 Lead cutting lathe for further finessing and smoothing of the wire. The CD was then tested and banded as per the processes discussed previously.

The CDs and MDs were then hung in the walk-in oven and allowed to cure for approximately 6 – 8 hours. While the CDs and MDs were still warm, they were dipped in the varnish tanks either 17C or 17D (one was larger than the other) tanks both had the same content – i.e. Varnish – 9700 or Isonel.

The CDs and MDs would then be dipped, cured, and cooled 2 -3 times in total.

It is imperative to note that every time a part was dipped it had to be baked as well and then hung to dry. This was a continuous cycle/process.

There were a lot of fumes emitted here, especially when parts were warm. The fumes would irritate and affect the eyes and nose.

When the warm parts were dipped the second or third time in a cycle, the warm resins coating the parts, which were still left uncured, would be emitted when being submersed in the dip tanks, and the chemical reaction of these uncured resins being dipped at warm temperatures into the dip tanks, would cause a chemical reaction and thus cause further irritation to the employees. The uncured by-products would also be trapped within the resins, when they were left to cure (usually only partial cure was obtained). The first cycle therefore caused less irritation in comparison with the second or third cycles, due to the increased temperatures.

Furthermore, due to the fact that the parts were not fully cured, the decomposition products would be trapped within the cooled resins and when the parts would be sanded, or grinding would take place to remove the icicles, these harmful contaminants would be released at that time. (See section #8 for further explanation of this)

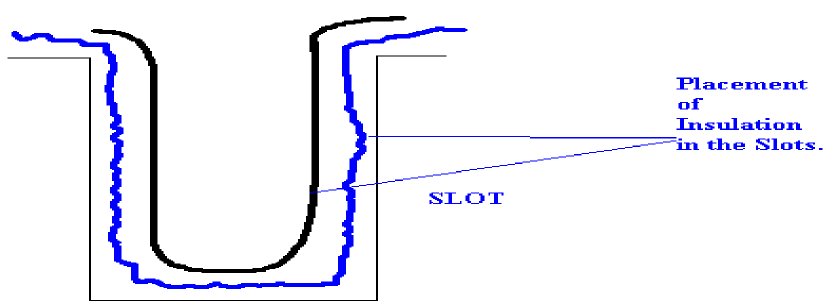
16 E: Assembly Winders - Turbine Rotor:
(started in the 1960's for GE)

The empty rotor shaft core i.e. the skeleton of the equipment was fabricated from the Machine shop – or from the client.

The whole component was made of steel. The employees of armature had to put liners in the slots upon arrival.

A) First a liner was put in the slots. The liner was either a mica liner or fiberglass liner, which both came to the employees already prepared and hardened. Mica was used for smaller sized slots and fiberglass for the larger slots (this was not a very heavy fibre producing process)
B) The sheets were put in a u-shaped manner into the slots. After this step, board and aluminum were added to ensure the insulation was secure and tight against the steel. **See Diagram #6 below**:

Diagram #6: Placement of Insulation in Turbine Rotor Slots:



C) At this stage, High Potential testing was conducted to test the insulation. Employees state high levels of ozone would be emitted during this testing operation. AC voltage was utilized for this part of the testing operation. The function of the High Potential Testing (High Pot Testing), was to ensure the insulation placed within the slots was well placed, secure in the slot and was strong enough to withhold the type/measure of electrical capacity the product was being fabricated for.
D) The employees state their sinuses would be affected by ozone.
E) The glastic material contained asbestos. This step would be repeated per turn (10 turns). See Diagram #2 for definition of a turn. Coils were placed in a slot with glastic fiberglass liner. Temporary clamps were put on and then clamped and heated. After cooling, high pot testing took place again. Temporary clamps were then taken off; steel wedges were put in place. **See Diagram #6.** Then after the clamps were taken off, a permanent wooden block was added. Large steel rings were heated to 600 degrees to expand them, and to have them shrunk onto the rotor. It took about 24 hours to heat up the oven, to 125-130 degrees. Finally a piece of insulation was added, then a steel wedge.

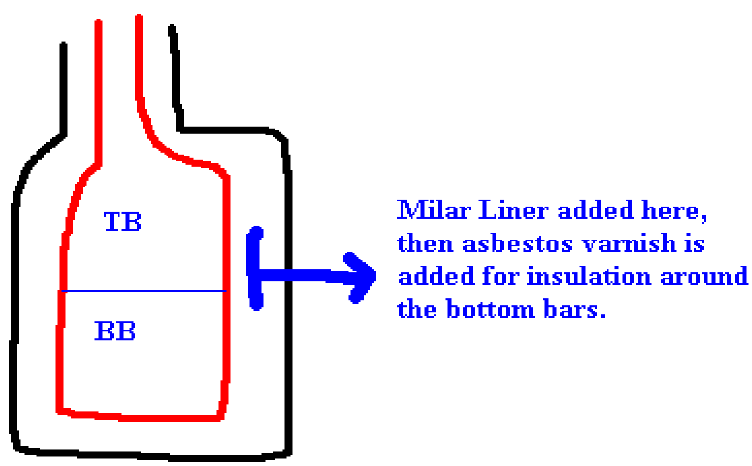
F) Individual wooden blocks fitted with a belt sander were added to make sure insulation was level.
G) This process alone took approximately 2-3 months to complete, with 2 men per shift on a 6-7 days/week.

The entire process is not demonstrated here. Heating of the equipment took 24 hours to heat to 125 -130 degrees C.

16 F: Assembly Winders - Induction Bar Rotor:

Induction rotors are a simplified rotor. The part consisted of bare copper wire that was delivered from the upstairs level of armature. The part was delivered with mica mat tape and glass tape insulation. The liner is Mylar or NOMEX or both. The liner is dipped in varnish, i.e. ISONEL varnish.

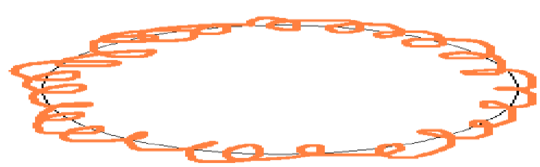
- push the clamps down, bend it to line to diagram, put in 1592 asbestos paper, (varnished asbestos between bars), in the arms for insulation – this is done all the way around (roll of asbestos – 36 inches wide with no fibres
- The insulation is an intricate process similar to the processes discussed previously, with the exception of some of the insulating materials mentioned above such as 1592 asbestos paper. See **Diagram #7 – Induction Bar Rotor below**.



- **Diagram #8- Forming and Bending**:

- The connections are then TIG welded or brazed, copper on copper or silphos welding (silphos welding was rare)
- A diagram of the end product of these individual connections is provided below - head on view :

Diagram # 9 – Head on view of Formed/Bent Wire:



- All coils are tied together with resi glass cord.
- Process then involved testing, banding, baking, curing and varnish dipping. As already described, assembly winding processes required that the baking and varnish dip cycles would be repeated 2-3 times at minimum.
- This part of the process took about 3-4 weeks to complete with 2 people.

All in all it is important to note that the handling of parts was very intricate and intimate and thus the proximity of exposure to asbestos and other contaminants and processes play a vital role in the exposures incurred by the employees.

21. Ovens (Section 21 on the layout – Appendix C)

The electric oven was divided into three sections. The oven was 15 feet deep and 10 feet high. The doors to the oven were over 10 feet wide. The first section on the west side of the oven was a “walk in” type set up, where employees could hang parts to be heated and let stand for a selected amount of time. The employees stated they would run in, place the part and run out as they would be overcome with the high temperatures and fumes in the oven. The temperature was set at 160 degrees C.

It is imperative to note that due to piece work activities, the oven doors were opened many times (when they should not have been), to place parts in the oven and retrieve parts as well (as smaller parts required shorter bake times). This would have compromised the exhaust and heating efficiency of the oven.

When the oven door would be opened, fumes would rush out. The parts would be set inside the oven for about 6-8 hours. The employees stated that the type of smell they experienced was that of burnt diesel /burnt varnish. At times the wooden wedges would actually catch fire in the ovens as well.

The other two sections of the oven were not walk in. They had trays upon which parts could be placed with the help of a liftruck and left to heat. After parts were heated, the trays would be pulled out and the parts retrieved. These sections were for larger parts that could not be hung on the track. There were exhaust ventilation pipes that ran alongside the side of the building wall where the oven was located and the fumes were released on the roof, outside of the building.

Portable Oven:

If the armatures were too big to be put into the stationary ovens, then this portable oven was utilized. This portable oven was only utilized in the open spaces available in the southwest corner of the armature department and the same armature department employees would also set this equipment up in building #8 and building #10 when the process called for it.

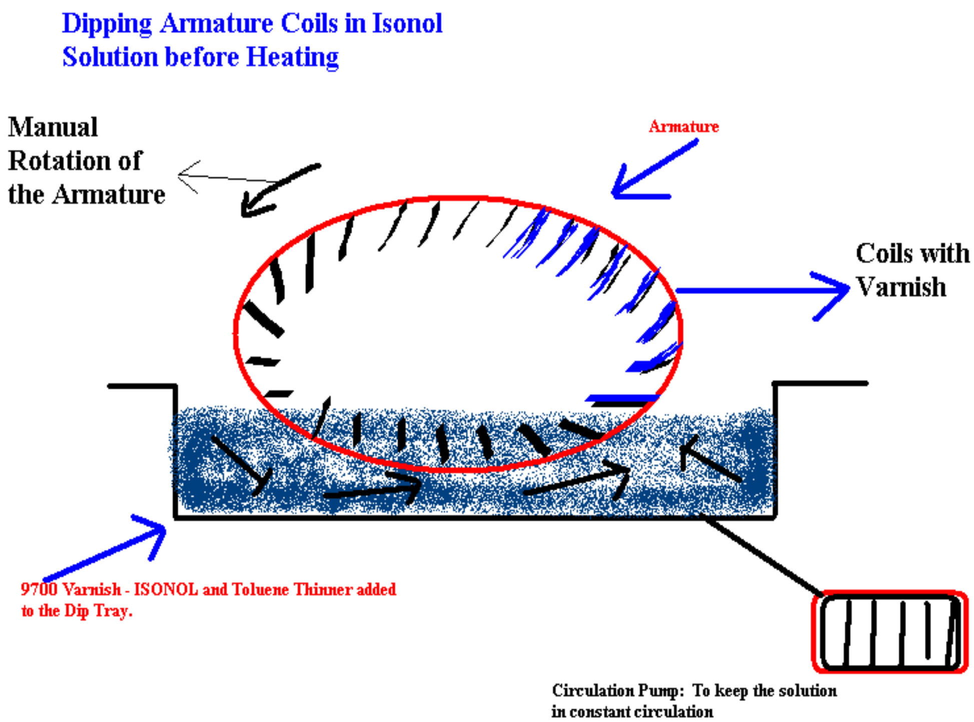
The portable oven was 20 feet by 20 feet by 15 feet in size. The oven was set up in an open area of the plant. The oven had four corner posts each with Calrod electric heaters. The items that required heating were covered with asbestos cloth. The asbestos cloth had a greasy feel to it, almost as if it had been dipped in oil. The asbestos would come to the department as a 36-inch roll with various diameters.

As per the employees, they stated that after you were done covering the equipment with the asbestos sheets, the employees looked as if they had just come back from a snow storm, they were covered in asbestos fibres from head to toe. Employees stated that they could see the asbestos fibres floating in the air, in their workspace and adjacent areas. EMPLOYEE TESTIMONIES

Portable Oven in place from approximately 1960-1980 as per the Employees. However further investigation of the MOL and GE documentation indicates that this oven was still in use in 1981 as well – (Refer to document #2 – Appendix K)

The armature coils were dipped into a drip tray, which was 6-7 feet square. The armature coils were dipped for purposes of varnishing the coils and sealing them into the armature. Each section was soaked for approximately 10 minutes to ensure that the coils were varnished and sealed. The armature was then rotated to allow the following sections to be dipped. Some of the armatures could be 25-30 tonnes in weight.

Diagram #10 – Armature Dipping in Isonel.



The solution in which the armature was dipped into was 9700 Varnish or ISONEL and Toluene Thinner. An electric pump was attached to the drip tray to ensure that the Isonel/Toluene solution remain in circulation. This varnish was not heated at this stage.

The drip tray was approximately one foot deep. It was lined with plastic liner, like that of a swimming pool. The employees applied the toluene thinner by 5-gallon safety cans. There was no ventilation over top the drip tray. The employees were subject to the fumes emitted by the reaction of toluene and Isonel mixture, which was circulating by an electric pump. There were approximately 150-180 gallons of varnish in the tray as well. The toluene thinner was added according to the specifications (there was a viscosity chart that the employees had to follow) the employees were given. Approximately 20 gallons of thinner was added to 150-180 gallons of Isonel Varnish. This part of the process would take approximately 10 minutes, i.e. to set up the drip tray.

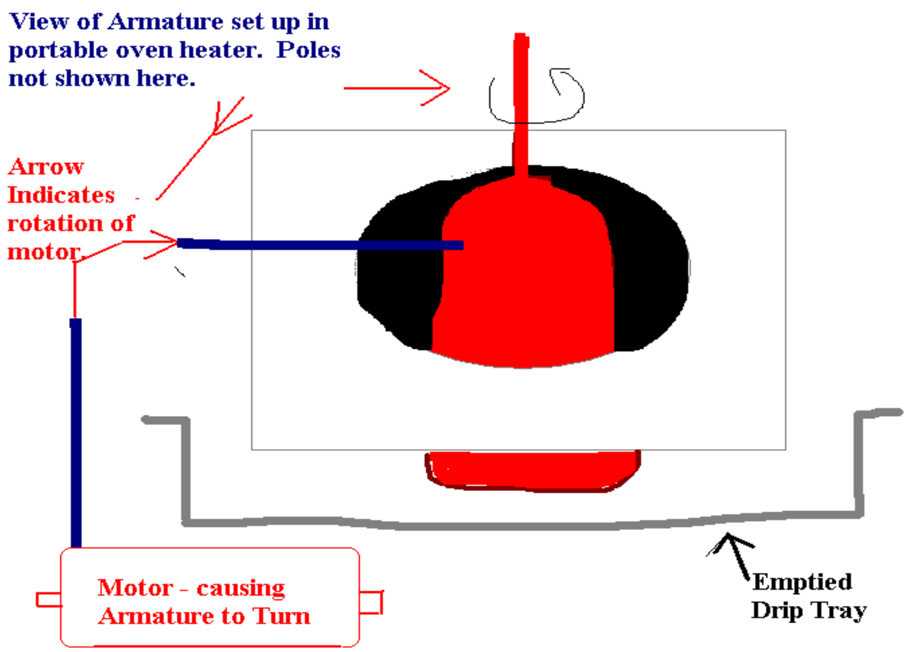
The employees stated that this process would emit a pungent varnish odour, and resembled the smell of diesel fumes. The employees would also incur watery eyes and irritation to the respiratory system. Two employees were required to prepare and launch this process. The Employees wore coveralls and rubber gloves due to the chemicals they were working with. **As the armature was rotated, varnish was applied manually with a varnish hose, to wet the parts of the coils that had been submersed, to ensure that no section of the armature was omitted.** A brush was also utilized to take off any excess varnish. This process took approximately 8 hours to complete, or more, depending on the size of the part.

After the varnish was applied, the portable oven was prepared for heating. The drip tray was emptied and placed under the oven casing, to capture any excess dripping of varnish from the armature. A motor was also attached to the armature, to ensure that it would be rotated during the heating process as well. **See Diagram #11(A)and (B) below. Diagram A has been formulated for ease of understanding the set up of the armature – however Diagram B is the actual set up as per process.**

Diagram #11 – Arm. Dept. Armature Set up in Portable Oven (A):

The portable oven rotation bar rotated every ½ hour to an hour to ensure that the entire part was soaked as required.

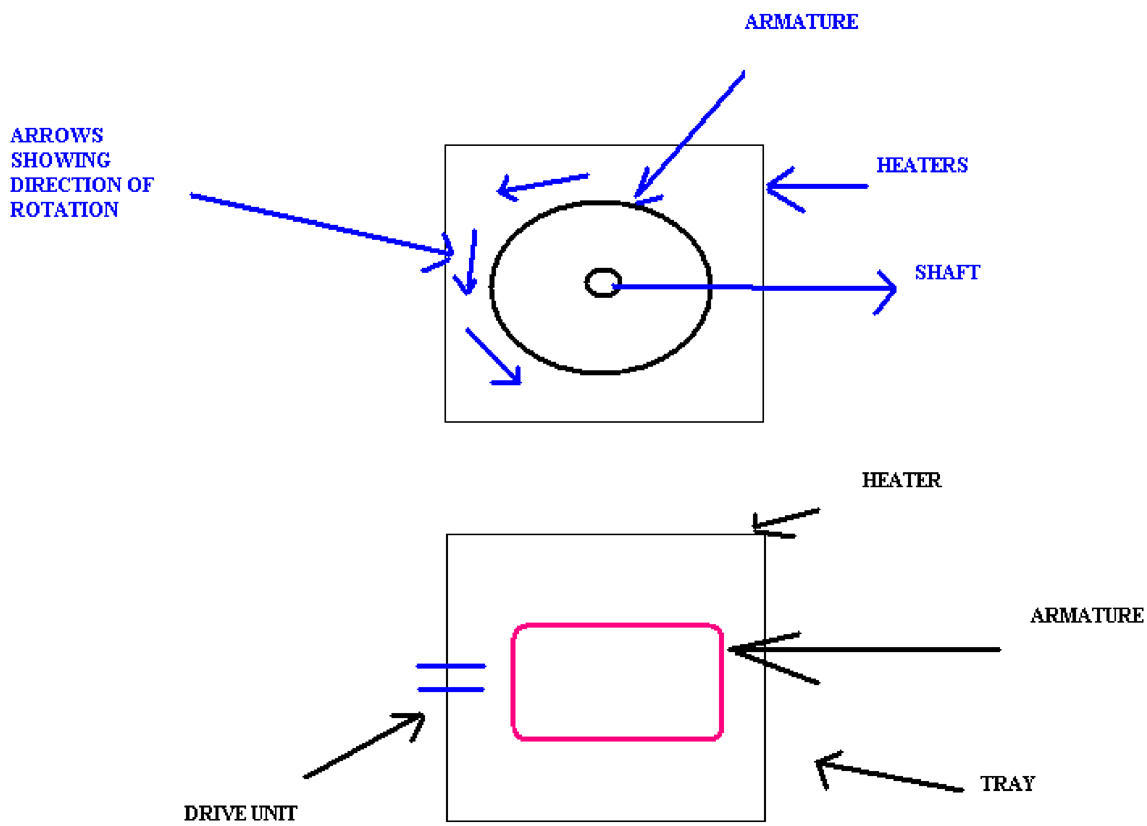
The employees then took the asbestos roll from the dolly. A bar was placed under the blanket and a crane operator would help facilitate the process. Scissors or a knife would be utilized to cut the blanket to the size of the equipment. All sides, top to bottom, were covered /skirted with asbestos blankets to absorb the heat.



The employees state that they did not wear any respiratory equipment, or other forms of PPE for protection again the asbestos or the varnish. They had their street clothes on and would go home with these clothes as well. The asbestos blanket would be draped over the equipment from left to right and back to front. A stepladder was utilized to get over the shaft and folded over the asbestos blanket away from the circular part of the armature. This was also a high fibre process as the blanket was being handled, folded over, and cut to length manipulated etc. Thus the employees were quite intimately interfacing with it and thus being exposed to high levels of asbestos fibres.

ACTUAL SET UP OF THE ARMATURE IN THE PORTABLE OVEN

Diagram #11 – Armature Set up in Portable Oven (B)



A wire was also secured over top the asbestos blankets to further secure the blankets to the part and ensure heat would stay within the enclosure.

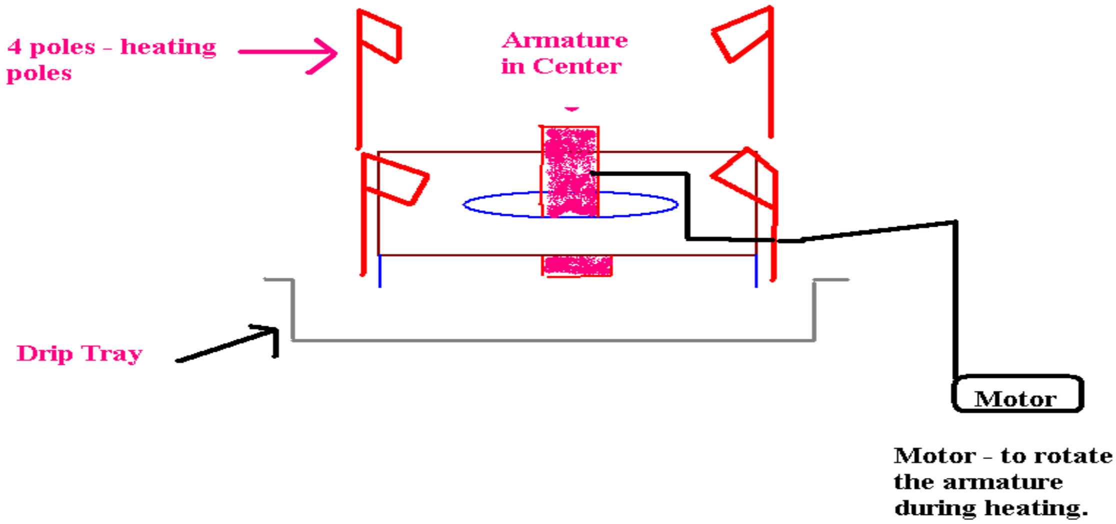
The blankets were 36 inches wide, no matter what the length. When the employees completed their tasks, they would fold up the blankets. About 15 to 20 blankets were used a year and reused thereafter.

After this decade, when safety became more stringent in companies, the employees would walk off the job due to the odours from the set up of the portable oven heaters as well as the set up of the Isonel/toluene drip tray.

This entire set up process would take a full shift to complete.

The heating process took some time to get the heater adjusted and stabilized. The required temperature for the heating/curing process was at least 150 degrees C for a minimum of 6 hours or more. Due to this, windows and doors had to remain shut during this process of heating, so as not to disturb the stabilization efforts of the portable heater and to maintain the temperatures at the desired level. The heating poles were 4 feet high. The actual portable heater was about 10 feet high in total. There were four on each corner. **See Diagram #12 below.**

Diagram #12 – Full View of Armature Portable Oven



After the heating had started, the employees would have to monitor and gauge the temperature of the equipment with the use of thermocouples. These gauges would be clipped on to the Armature wires and the temperature would be recorded. This step took place every half hour to monitor the equipment temperature. In order to get the reading, the employees would have to climb at the side of the equipment, move some of the asbestos blankets out of the way so they could climb in and take a reading. Due to the fumes, heat and asbestos fibres, the employees had to do this task very quickly. They would get covered with asbestos fibres due to the movement of the blankets and the crawling between the blankets to get the readings. The varnish had to be at 160 degrees C to ensure a proper cure for baking on the armature. There were 6-8 switches that were required to be turned on or off with regards to the temperature regulations for the portable heater, with a 20-30-degree range.

To stabilize the temperature of the armature it took approximately 12 to 24 hours of heating. After this time, when the heating had stabilized to the desired temperature, the armature was heated further for another 6-8 hours. After this was completed, the armature was allowed to cool with the removal of the asbestos sheets. As per the employees, this process is quite fibrous as the removal of the asbestos sheets caused the frayed, loosened fibres to free float. The employees would get the asbestos fibres on their skin and clothes. The armature was allowed to cool down so that the varnish fumes would dissipate.

This process was repeated 2-3 times. The armature was allowed to dry and cool down for approximately 2 shifts or 10-15 hours. The asbestos blankets were removed for cool down and replaced onto the parts for heat up processing. After the armature was cooled, the process was repeated once again. The armature coils were dipped in the Isonel/Toluene Varnish mixture and the armature was heated again. The armature was not removed from the oven set up. The Tray was removed, filled up and placed back beneath the oven set up. This process was repeated 2- 3 times, depending on the process requirement for the product and its related specifications. The employees state that when the armatures were heated up the second or third time, the fumes of the Isonel/toluene mixture were more evident, as there is more varnish being secured onto the armature at this point (the varnish thickens). The first time the armature was dipped it was at room temperature. The second or third time, the armature is cooled down to approximately 35 degrees Celsius, i.e. warm to touch. With this in mind, as the armature is dipped into the Isonel /toluene solution, the heat is reacting with the solvent mixture and thus causing more fumes to be emitted.

The employees re-used the asbestos sheets for other processes or equipment that required to be heated. The asbestos sheets were rarely discarded. An employee would climb up on top of the equipment and portable heater, fold the asbestos sheets and place them on a pallet to be reused. Often times, as per the employees, the blankets were thrown from the top parts of the equipment to the floor, again causing fibres to be dispersed into the work area. The employees state that at this stage, there were numerous fibres throughout their workspace and on their clothes, skin and hair.

The employees state that the general work conditions of the process consisted of exposure to asbestos fibres, heat and the fumes from the varnish mixture of Isonel and toluene thinner. Furthermore due to the fact that it was critical to attain proper temperatures for the oven, the natural ventilation in the plant, i.e. the doors and windows had to be shut closed, as this would hinder the heating process. Hence by shutting out the fresh air, the fumes and vapours from all the other processes, the dusts, fibres, etc, would also be trapped within the building. Hence a mass accumulated of all the contaminants in the building was attained and would remain within the building, thus exposing the employees (See Appendix U – documented Dates, Oct. 4, 1982 for further evidence and an MOL inspector testimony describing this environment).

The employees state that they wore their street clothes home, would place them in the general wash with all other clothes and would shower accordingly.

In terms of housekeeping, the employees state that at this time, there were Department Wide brooms/ sweeper operators, manual laborers who would be assigned to assist with clean up of work areas. Some employees utilized air hoses to wipe off asbestos fibres from their workstations, the equipment, as well as their own clothes, and bare skin. The employees state that they would eat their lunch right at the oven area or a bench nearby the oven. At times, they would work 12- 14 hours shifts if they were required to as well on this operation.

At this stage, the armature is prepared for either Testing, or shipping. The armature may be put on the tracks, and sent to another department or prepared for shipping to the client.

17. Tanks A, B, C, D (refer to Layout – Appendix C, 1960's)

The tanks were located in an open area on the plant floor. There was no ventilation or exhaust on any of the tanks. The tanks were utilized for 24 hours/day without exhaust. It should be noted that any employee could utilize the tanks. (Description in point form)

Tank A:

- Tank A consisted of tin solder.
- No lid
- Heated
- Less than 2 feet in diameter
- Height of 45 gallon drum
- Accessed by overhead crane operator or Jib Hoist

Tank B:

- Tank B consisted of pressure release varnish
- Lid present, when required, sealed/pressed
- Not heated
- 2.5 feet in diameter

Tank C:

- Tank C consisted of Isonel - 9752
- Lid present
- Not heated
- 3-4 feet deep
- dip parts with pendulum crane & Jib Hoist, assistance by crane operator

Tank D:

- Tank D consisted of Isonel –smaller tank
- Lid present
- Not heated
- Accessible by employees on floor level.

Crane operators would spend 10-20 minutes (average) above the tanks when transporting or setting a part to be dipped or retrieved from the tanks. With larger parts, it would take a longer time and thus crane operators would spend more time over the tanks.

22. 3 story high Storage Tank

The storage tank was for molten tar, as per the employees. However, the employees were not sure if the product was tar or asphalt. Asphalt is sometimes mistaken for coal tar products due to their similar appearances and applications in the industry. Through the investigation conducted here, and the limited information available, asphalt appears to be the main component in the processes involved in armature. (See Appendix Q – OHCOW's investigation on the composition of the Compound tanks).

MICA AREA
(point form description)

23. MICA Coil Processing:

- Strip off sacrifice tape and bake out from the processed coils
- The coils came out of compound tanks/coil taping process.
- 1 operator manning the tanks per all three shifts
- 2 operators in the stripping processes for 2 shifts only
- function was to strip off sacrifice tape/tar and then go back to coil taping process
- dirty /dusty job – the tape was brittle, gloves were worn as well as face shields (not all employees)
- employees utilized knives to strip the tape
- employees state that there were many operators who had difficulty breathing due to the dusty environment.

25. MICA AREA (See Diagram #13 below)

Asphalt mica tape (Mica tape with paper on both sides – black varnish -sticky

- 3 employees on one shift
- The room was approximately 30 feet Wide x60 Feet Long by 30 Feet high.
- Mica was brought in from boxes from India, they weighed approx. 150 pounds and the boxes were 3X4 feet. They were lifted off of the floor via a hoist.
- The mica was delivered in loose flakes (the size of corn flakes) and boxes were cut open.
- For larger boxes the lids were taken off at waist height. Needed to take pliers to pry lid off box. Had to spray to ward off bugs.
- The mica was hand fed into a hopper that was 2 feet square. This was done at waist height – employees state they were itchy all over their bodies due to this exposure.
- The hopper was 2 feet by 28 feet in length. The mica was thrown into the hopper and traveled up and over through the hopper into the shaker (cyclone type container) whose function was to shake the mica onto tape – sticky (see diagram #13 below - backing of tape was turned over so as to capture the flakes, while it traveled through the process
- As the machine ran, mica black varnish was also applied automatically onto the tape (same varnish known as asphalt tar varnish)
- There was a heating element at the end of the conveyor table, 6 inches off the top of the table – mid section, which enabled the flakes to adhere to the tape and form the tape.
- As the tape was run along and processed it was cut and wound onto a reel.

Employees state this area was very dusty and sticky with the varnish as well as flakes of mica everywhere. In term of housekeeping, the employees would sweep the mica off the floor, air hose the mica off equipment, thus cause the contaminants to disperse into several directions and other areas of the building. An apron was worn as protection, no respiratory protection - no ventilation or local exhaust in this area. The employees did rotate on the various tasks.

- The roll would then be moved to the slitter machine where the rolls were then sliced into 3.5-inch - 4 inch rolls of tape.
- They would put them in a 5-gallon steel pail sealed to keep the moisture in the tape.
- Then they go to inspection.
- There was a large steel tank in this area, which contained 1500 toluene. The purpose of this tank was to clean the equipment on the slitting machine. Tank is large 8ft by 4ft. It was ½ full at all times with a steel lid, however and as employees stated it was never sealed.
- There was a wire to hold the lid up on the tank.

- One roll would cut 50 rolls of tape. It looked like hockey tape.
- Cleaned hands with toluene thinner safety rags.
- Unloaded 2-3 boxes more than 100 –200 pounds or more.
- Conveyor table was about 24 feet long; it had to accommodate the weight of the hopper pipe - 15-18 ft high.

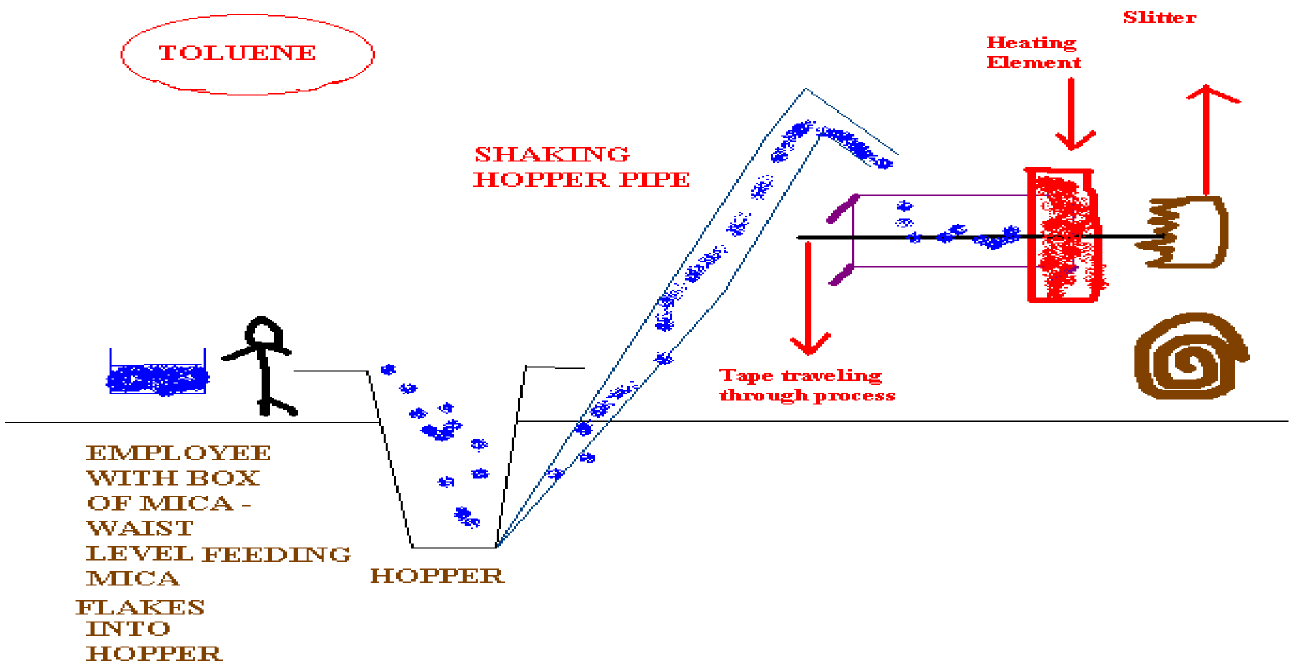
One employee who never smoked had died of cancer here and another incurred heart trouble (employee group testimony).

- Mica health concerns cause you to be itchy and coughing.
- Once the process started it had to be manned continuously. If the reel of tape was stopped, there was a fire hazard as the heating element would heat the tape so much that it would catch on fire – thus the flow would always have to be continued.
- In 67 or 68 there was fire of this sort.
- The element was red hot – at 300 -400 degrees C.

Refer to Appendix F for an illustration of location of this process in the department on the Armature Layout.

Employee stated this was one of the dirtiest jobs in the company. Due to the fact that there was so much varnish on the ground, employees' shoes, boots would have layers and layers of varnish underneath their soles and people would say to them. "You've grown so much taller in hours…due to the black resin and varnish on the bottom of your boots!" EMPLOYEE GROUP TESTIMONIES

Diagram #13- MICA AREA



At the end of the table, after the machine has passed over the tape and rolled onto a reel, the employees would then take the roll and set it on a slitter machine. The slitter was composed of 50 knives rotating. The tape was run through and cut. The width of the tape was 1- ¾ of an inch.

29. **(Hydroelectric Poles)** – electrical function of the motor which produces the current

Function is to have copper coil secured to the pole, insulated with mica, and then take the copper wires and attach them to a steel frame – this was then varnished, clamped, insulated and then baked:

- Pole Pieces of steel delivered to this department
- The piece was washed off with toluene. A rag was dipped into a bucket of toluene. The employees did not wear gloves for this process. The gloves that were provided by the employer would react with the toluene and swell up, hence the employees refrained from wearing them
- No respiratory equipment was provided
- The employees wore their street clothes for this process.
- The smallest steel piece would take approximately 30 minutes minimum for the toluene cleaning process. There was oil and dirt on the poles that had to be taken off.
- The employees state that the vapours of toluene were overwhelming in this area.
- The pole itself was also painted (3.5 inch brush) with black varnish/shellac –5-10 minutes to complete. The black shellac was like woodworking finisher, paint varnish, with high alcohol content.

- The paint had high alcohol content. It smelled sweeter than varnish.
- Mica sheets were then placed on hot plates. They were heated so as to easily form around the corners of the poles. The mica was 20 inches long and 12 inches wide.
- When Mica was heated, fumes would be given off- due to the fact that the mica was painted with a binder known as SHELLAC. The mica sheet was heated on a hot plate. The SHELLAC contained alcohol used as a thinner. The oven was heated to 160 degrees centigrade. The employee wore asbestos gloves when working with the heated mica sheets.
- This process was repeated at least 3 times (3 layers). The paint is over the mica sheets only. This process would take about 1 hour to complete.
- At this time, the pole would be clamped, with side plates made of steel.
- Then the pole was placed into oven #6 overnight.
- After 8 hours of baking, the employees would grind off any excess varnish. There was no dust capture in this area. There was a lot of dust in this location, due to the grinding operations.
- Mica dust would be flying everywhere
- Employees did wear a face shield, with cotton mask
- The grinding would take place in the ovens, where mica dusts, shellac would be grinded.
- It would take 10-15 minutes per pole to grind, depending on the size of the poles.
- Ovens were shut off, thus the exhaust was also shut off for the grinding process. Hence accumulation of dust occurred.
- Some poles were 6-8 feet in length
- Coils were placed over the pole via crane.
- No trichloroethylene in this location

Late 1960's and Mid 1970's – Refer to Layout in Appendix D
Refer to appendix G for a detailed explanation of location and processes on the Armature Floor Layout.

1. Copper Storage Area - same as before
2. Degreaser - same as before Royalene Degreaser
3. Grinding – This area was for smoothing off any excess copper – there was an exhaust system in place however it was not fully functional as per the employees. No protection was worn by the grinding employees. Any employee was able to come into the grinding area and grind materials. Copper rash and greening of the skin was common in this area. Minimum of 3 hours to a maximum of 8 hours for grinding operations. Copper dust, residue from solder such as silver and flux agents were also likely to be ground here as well. Only in the late 70's and 80's did canister respirators come into this area.
4. Wash:
   This was a hot water bath. The employees reacted to the hot water steaming. After the coils were grinded, they were then dipped in the Royalene tank for one hour. Then the parts were dipped in the hot water bath – and vapours would be emitted at this time. The employees state that the royalene would smoke, therefore it would irritate the respiratory tract of the employees.

5. PRESS:
   Compound press coils – same as before however, only 1/2 coil bar pressed.

6. Oven:
   The oven was 10x6 feet in size and it was exhausted to the roof. This was a gas oven, set at 120 degrees C minimum and 160 degrees C maximum. This temperature depended on the job.
   The oven was used to heat rotor coils, and poles for insulation. Carts would be loaded with the parts and rolled into the oven.

7. Test Area (same principle as before, with different voltage applied)
8. Sub Station -same as before
9. **Assembly Winders – copper leads: (Large DC's, stators and AC's)**
   - On the Stators, burning resin off the cable connections/copper leads – internal connections to external connection to make sure you have a good connection – Leads were burned if there was excess resin.
   - No exhaust, while burning leads
   - High fume content into the crane, blue smoke
   - Winding fumes , burnt resin – no exhaust
   - Had to heat copper up to burn excess resin, torch or brazing– couple of hours to do this. Blue smoke would be emitted due to burning of resin as well

   Late 80's an electronic precipitator/ smoke hog would be utilized for this process
     - could take all day to burn leads off
     - the smell was described by workers as burnt resin fumes
     - could take 30 minutes to 2 hours to complete this job
     - didn't matter where the crane was located – the smell was bad all the time in the crane due to heavy fumes

10. Banding Lathe:

- Purpose of the banding lathe was to put resi glass banding on the armature
- The resi glass would expand when the armature was heated up – which allowed for a tighter job
- When the armature was heated up, fumes would be released at this time (due to the fact that the insulated parts and other components, resins and thinners were also being dipped in the tanks) This cycle was repeated 2-3 times.
- Take out armature, put in banding lathe
- Electric iron rod – sealing/soldering or ironing out of the coils
- Cool down to 40-60 degrees C
- Then the parts were dipped into the Isonel tank – 10 – 15 minutes – till the bubbles would stop- then the part is taken out and drained over top of the tank – vapour is emitted at this time – for half hour and then – the part is placed in the oven.

11. VPI –(this tank came in late 1967 – 1968) After which 2 new VPI TANKS (see below) which are present today were installed.. The large VPI tank was put in the 1990's which was 7 feet deep and 3 feet above the ground. #1 Small tank is 100-inch diameter by 116 inches deep, #2 tank is 152-inch diameter by 154 inches deep. (Catalyzed epoxy resin 74023 = 4 feet above floor level.)

Stators that came in from another building would be dipped into the VPI tanks Fully immersed

- The VPI Tank had tributyl styrene thinner in the Tank – the resin was M6860 vendor # 74023 – this was in place late 70-80
- One employee incurred harsh rashes from this thinner and there was excess resin in baffles – which caused him to be exposed when handling the equipment
- After this reaction of the employee, this was then taken out and replaced with – Vinyl Toluene – added as thinner – till about 1994-95.

VPI tanks contained epoxy – 6860.- Not Heated VPI

The parts were dipped for 8 hours – under Vacuum Pressure Impregnation.

- The VPI tank was used more than any other process, 7 days per week – 24 hours 7 days a week
- It was used to saturate the coil with resin and to soak the insulation, tape, all the way down to the copper coil. Pressure was involved so as to impregnate the coil
- The process involved – closing the lid, drawing the vacuum to remove any moisture, then transfer of resin from the VPI storage in #12. The part was soaked for 4-6 hours, and then the epoxy was transferred back to the storage tank. The pressure was then released. The stator was then taken out. The lid is in up position. It would take 15-20 minutes to take the stator on/off the crane. Due to the residue of fumes and the lack of exhaust, fumes would be emitted when lid was in the open position. The stator and tank would emit heavy resin fumes, and employees eyes would water. They would break out in rashes and some employees would choke, as the fumes were quite heavy. The stator would be wiped dry with squeegee brushes to wipe off any excess resin.
- The dip operator would also incur heavy watery eyes as this operator would have to hook the stator to the crane and this could take some time to do. 15-20 minutes for this task.
- A stator could go for 2 or more VPI cycles depending on the specification.

Employees would incur rashes without contact with the VPI liquid. Some would incur rashes with the fumes themselves. The parts would then be placed in the ovens baked at 160 degrees C, 2-3 times in OVEN #17.

> It is important to note that some employees working in this area walking through the areas would react just by being exposed to the fumes; they would break out in rashes.
> EMPLOYEE TESTIMONY

- After items were placed in the oven the following would take place:
- If icicles developed, or other imperfections in the parts, the employees would have to buff off any excess resin off the stators, with a buffing wheel. Take off any icicles from the parts.
- Employees would then air hose the dust to clean the areas. Therefore epoxy dust would also be another contaminant in the areas.
- In general the VPI tank could be utilized for 24 hours, seven days a week, for various parts, and various numbers of cycles for each part.
- 2 operators were assigned to the VPI tanks per shift. There was a crane operator and tank operator.
- Leads were then brazed /air chiseled onto the stator windings.

11. The small VPI Tank
    - Take 1.5 hours to draw the vacuum
    - Flood job with the resin
    - Let sit at Atmospheric pressure for 1 hour at 85 pounds of pressure. Then the vacuum was released and the resin transferred back to the tank.
    - Storage tank 1971–– outside – baffles outside – when doors would be opened the fumes would crawl back inside the room and into work area.
    - Most fumes would come back into the plant, from the baffle area
    - The part would then go to the oven at 160 degrees C for 8 hours.

13. The Isonel 51 tank.

- This tank was for the purpose of coating on the coil or component with insulating varnish.
- Dip armature or interpole, let soak – till bubbles would form
- This tank was not heated and did have a lid. Xylene or toluene was added to act as thinners
- The parts would sit in the tank for about 3o minutes.
- 3 foot deep in the ground – ½ in tank and ½ out of tank
- The parts would be lifted up and left over the tank to drain for another half hour. Vapours would be released as per the employees.
- The parts were then put into the oven set at 160 degrees Celsius for 4-8 hours.
- Once the part was baked it was cooled to approximately 40-60 degrees Celsius and would be placed in the Isonel Dip tank again. Hence parts were warm when dipped in the Isonel, the second time which would create heat and vapour.

Some employees exposed to the Isonel would become tipsy and would go out for fresh air and be relieved.

- The Isonel air dried on its own if left out long enough. The parts were dipped and baked 2-3 times. (Armature usually required 2 dips and the poles required 1 dip – as per the specifications given)
- The leads were then cleaned via grinding operations or files to remove any Isonel icicles that may have formed during the drying process. The tank operators may have been involved with this process or cleaners that were assigned to this would be fully responsible for this task. From the 70's through to the 90's the cleaners were in place on the day shift only – their job code was Miscellaneous either 0807 or 0809 as per the employees. They would wear a cloth mask to protect from the dust that was generated through the grinding/filing icicles process.
- The oven was not perfectly sealed as smoke could be seen emitted from the seals and cracks. Fumes would be emitted off the oven and the parts were baked and left to cool. The fumes would be evident for half an hour to 1 hour as per employees, after the part came out of the oven.
- Oven cycles would take 4-8 hours for baking, once the desired temperature was reached. It would then take 6-8 hours to cool down.
- Parts were then dipped into the Isonel tank – ½ way till the bubbling stopped.
- Fumes smelt like resin or nail polish remover as per the employees.
- The OVEN #17 was VENTED TO ROOF TOP.
- Garage like doors were in place for access of parts into the oven.
- This was an electric oven set at 160 degrees C.
- The oven was used to bake parts that were either dipped in the Isonel tank or the VPI tank. Hence the type of fumes emitted varied.
- It would take 3-10 hours to fully cool down a part.
- There were ceiling fans put in place on the high ceiling of the Armature Building, to alleviate these oven fumes, in 1971. Upstairs employees would turn the fans on, as they were being subject to the fumes, as heat rises. However, due to the effect the fans had on bringing the fumes back down to the floor level, the floor level employees would ensure to keep the fans off. In addition, the fans were quite loud. The floor employees would turn off the fans because parts would not dry properly, Therefore employees were prone to shut the fans off. (See Appendix K – Document #15 – Joint Health and Safety Inspection report Dated 1987. This issue was ongoing and evidence that it was prevalent even in the late 1980's is given in this Inspection report."

  Feb. 13, 1987: Gallery Item #3 - #3 Oven on main floor generating heavy fumes. Since they were accumulating in the high ceiling area, workers upstairs turned on ceiling fans to find relief. Then workers on floor below were affected and in turn would switch fans off.

  This document indicated that the upper levels employees were exposed to the heavy fumes from the lower levels. The notes also indicate that often times the ovens were "overloaded" and would cause the fumes to be heavy from within the oven.
- employees on the mezzanine levels could smell the fumes and the fumes would stick to their clothing
- No doors were opened in the winter only in the summer months
- Smoke/haze – you could see particles in the air and you could see the residue on the windows – hard to clean

 # 1000. Xylene Tank: (still present in the 1974's)

- 32x12x8 in dimension, not heated and had a lid, 5-6 inches deep
- straight xylene tank
- purpose was to wash equipment, clean equipment
- take resin off chains and hooks
- employees would use rubber gloves to take parts or tools out of the tank
- There was a mesh tray available to dip the parts into the tank – however if some parts required further cleaning, employees would use scissors or knives and they would not wear gloves. 5-10 minutes per cleaning tasks. This would be done several times per shift. (like dish washing)
- Anything steel would be dipped into the tank to take the sticky residue off the parts – the parts were then set out to air dry for – 5 minutes – the smell was a solvent smell
- There was no exhaust ventilation in this area

- Some people cleaned the parts like they were washing dishes

99. Cleaning Area also known as the "SIN BIN"

The "Sin Bin" as employees had labeled one of the grinding stations in the Armature department, was a station where dusts were accumulated and employees exposed. The employees wore rags on their head to protect from the accumulation of dusts in their hair. The set up alone is hazardous to the health of employees and the employees in the adjacent areas, through exposure to escaping toxic dusts.

- dusty area as parts were grinded here with steel brushes to finesse the leads and take the resin off (looked like icicles)
- wire brush grinding was utilized
- this was a dirty area
- weld curtain enclosed the areas
- employee wore rags on head to protect from accumulation of dust in hair
- no exhaust present in this area

20. Cold Forming

The coil was formed, cut to length – had to be made hollow. It was formed then epoxied, painted and heated. Once this process was completed it was sent to #14 for further processing.

14. Coil Manufacturing (Bruce Generators)

Hydroelectric Coil Bar Forming – formed at the east end near the elevator

- many people worked here per shift
- after the coil was formed it went through a quality check by shooting pellets inside to make sure nothing was inside
- End headers were then put on the parts and insulated with epoxy tape
- After coil is formed it is insulated with epoxy class B tape (B: any material that must be heated and cooked) -Sticky job

- Employees would blister due to pulling on the tape, therefore they would use cotton gloves, with the fingers cut out – the parts were then sent to #15 area

#15 – Press:

- Hydraulic steam press used here (dry process)
- the parts were pressed (Put pressure on the part to integrate the copper and insulation) - Cure and mold part under pressure – C Press
- Pressure of 85 pounds PSI was allowed for one hour for the parts being saturated with the resin/ hence flood job and cover with resin
- the parts were then insulated with mica mat tape and sent to #18 compound tank
- Compound tanks (same activities as mentioned previously with the compound tanks)

All in all it took approximately 1 week to make a turbine bar which is ½ a coil, with 20 people on this operation, assembly line type operation
At this point – the part is in the armature

#16 FRIDGE: Storage for Epoxies – this came in during the mid 1970's:

- fridge, was a walk in freezer with no ventilation
- 30x40 height at 20 feet
- epoxy based materials were stored in this fridge, had to be stored at a certain temperature
- nothing in here below 4 degrees Celsius
- there were 2 doors on the fridge – could smell epoxies
- very high ceiling – 20 foot high ceiling
- before this – would store in storage cabinets in 60's
- one could stay in the fridge for some time, depending on the size of the parts being worked on

Cold Room: came in during 1973-1974 - Upstairs

- located where stores used to be
- Came in late 70's
- Before 1960's, had storage cabinets for epoxies
- Not vented, had 2 doors

#18 – The large tank was taken out at this time as it was not required.
Compound Tank -So then less contamination but still using the same materials
Storage tank stood 2 feet deep in asbestos (1977)
Refer to Appendix K Document #32 for document with regards to asbestos

#100 – Compound Tank

- One tank was taken out and replaced with an office in this location
- When the tank was taken out – there were problem with regards to asbestos – as asbestos had to be removed – (the tank was insulated with asbestos) -Storage tank was submersed 2 feet deep in asbestos. Refer to Document #32 – appendix K with regards to asbestos and the tank removal in 1977. Employees were asked to wipe down the tank with water as it was covered with asbestos fibres. After the tank was removed it was replaced with an office.

After the parts came out of the compound tank, paint finishing tape was applied around the radius of the coil. The part was then put through the test area, #7. It took approximately 1 week to make a turbine bar which is half a coil. Twenty people worked in this area. It was set up like an assembly line.

Crane Operator

Current employees in the Armature Department were called upon to give information with regards to crane activities. The crane operators have been on this job from the late 60's. They recount their duties as crane operators and talk about the VPI tanks as well.

At this time, the employee states the following. "I do not smell the harmful chemicals in the department, as I must have become immune to the smell, odours emitted by the chemicals. I haven't noticed the smell for years…everyone else that comes into the department does. Some employees would get a rash from the resin but they didn't know what was in the resin."

As crane operators, the employees turn stators, winders and parts all over the shop from one end to the other. He works in the cabin of the crane that measures 5x5 feet in size, made of a steel metal cage. It is not enclosed or ventilated. It is approximately 30 feet high. The tank operator is on the ground level and assists the crane operators with view , lifting and placing of parts. The hitcher/tank operator determines how to turn the job, weigh and balance etc. The tank operator secures the cables to the parts. The crane operator follows the signals given by the tank operator, via hand signals.

The speed of the crane could range to up to 5-6 mph.

The crane operator and the hitch/tank operators did not wear any protective equipment, while doing any of the tasks of this job. Crane operators would have to travel over the dip areas at least 3-4 times per day, if not more; it would be dependent on the size of the parts being handled. It would take 5 minutes to half hour to set parts for the crane, or take parts out of the tanks or ovens and place them back on the crane. Sometimes hours could be spent with regards to crane activities over tanks, portable ovens, exposure to fumes and vapours and fibres etc.

As soon as the tank operators or other employees would open the tank lid, the fumes would be overwhelming for the crane operator and would "stay with you for some time as there was no forced circulation of air or exhaust ventilation...and soak right into your clothing and pores. The smell stays with you like smoke stays on your clothes…some employees would break out in rashes immediately."

1980'S TO NOW: (SEE LAYOUT APPENDIX I)
DESCRIPTION OF EACH PROCESS IN POINT FORM

1 – Sub station
1a – test area
2 – Coil fabrication (part of Excitor Magframe):

- 1 person makes coils to put into the armature
- Go upstairs to tin the leads
- Can have 2 – 10 strands of Copper wire
- Wind enamel covered wire
- Tie each leg with string (cotton string)
- Leads are stripped and tinned (upstairs)
- Can have from 36-120 coils for armature
- Dacron tape is put on the nose and end head – depended on the job
- NOMEX insulation used in the slots
- If you run hand along NOMEX – you will blister
- Dry Job – after wires are wound, they are connected by brazing and soldering – with soldering iron , lead solder, (safety glasses worn on the job – fumes emitted from the resin)
- Process involves soldering, insulating, etc – this could take – 2-3 shifts – depends on the number of joints
- Rosin Core Solder was utilized
- Tie up with resi- glass cord
- Sent to banding lathe #4
- Then to #3 oven

#3 Oven:

- 160 degrees Celsius
- Vented out to the roof
- Cart goes into the heated/gas oven – 6x8 foot
- 3-4 hours to bake
- cure at 6-8 hours
- Test for minute – portable testing
- 2-3 times – high pot testing at 300 – 2750 volts
- after cool down , back into the VPI tank

VPI Tanks:

- not heated for small parts
- pressure tank with lid utilized for large parts
- #19 – storage for VPI

1980's to Now: (SEE LAYOUT APPENDIX I)

Crane Operators:

- assist with all processes
- on average 2-3 cycles for various parts as already illustrated and it could take – 6 hours per cycle
- bake at 160 degrees C between each cycle, when complete – send back to excitor area to clean machine surface with buffer – brush air down – 1 hour
- 1-2 employees – safety glasses and gloves – take one hour to clean – dusty operation.
- Then solder onto the circuit rings,
- Put Mica mat , 2- 3 layers and epoxy -Dacron Tape
- 6280 Epoxy then paint with 3M 6281
- In the joint insulate between each layer.
- Connect wrap resi glass on ends
- Air dry test and ship out

(2 cans A and B – mixed creme – brush on paint – skin reaction with this – not much odour – sometimes rubber gloves were worn on this job.
- Whole process takes a week – from start to shipment
For Magnetic frame instead of soldering operations, brazing operation took place, thus fumes of silphos

- Safety glasses worn

EXCITOR PROCESS
#4: Banding Lathe
#5 – Punch Press, Braze, clean. Insulate, press cold, press hot, test, cure clean, and put on pole, seal and ship

- The processes to put NOMEX insulation in between the copper strips – put them in the press
- Heat and cure
- Insulate them
- Then strip/braze and put them on the pole
- 1 week for pole 1 pole
- 12 people/shift –on 3 shifts

#6: Copper Strips:

- ¼ inch thick, 4 inch wide and 5 feet long approximately
- punch press, was utilized to flatten wire into shape, into the shape like a picture frame
- blank out corners, press flat and push together
- braze corners, clean with water (brazing could last all day and the process on average took 2 weeks to complete – copper dust everywhere in this area
- employees would rotate job, i.e. between brazing and cleaning operations.
- There were 10-12 people working here per shift.

- took about 8 hours – silphos or silver solder and flux – torch brazing here – the degreaser was eliminated
- grinders were air grinders – copper dust everywhere, when finessing the parts
- copper dust with silphos - the grinding process could last as long as 2 weeks
- wash parts with MEK or Acetone – wipe off with disposable towels – there was no degreaser at this time to take off the film from the copper dust of flux
- employees state many employees would be overcome with the MEK fumes and become intoxicated – 8 hours at this – some employees cleaned coils for the entire shift
- could complete 1 – 2 coils per day
- then set up to insulate with asbestos, quinorgo, quintax, today Nomax
- cut sheet to size, to insulate each turn
- coils will go on the pole
- shears operator at #26 – would be responsible to slit or shear the insulating material (asbestos etc)
- #26 – the slitter in this area was like a Guillotine
- wide open room in #26 area – 8 hours/day and employee was at this station doing this shearing job
- then take to the hydraulic press – to make square with 200 tonnes pressure
- then hook up leads to leads of coil
- Turn rectifiers on to bond everything at 135 degrees Celsius in press. 1 hour to complete this – let cool to 40 degrees C
- clean coil

Next step was to insulate the pole.

- To place Mica on poles had to first heat the plates on the heating pad, then wrap plates around pole – 2 different types of MICA plates which came from Switzerland

  Same area – Mica or Class B – M5680 – Epoxy and mica – sheet form
  Same as before 6820 and M7068B

After coil was placed on the pole, it was sent to the test areas.

#3 – was a gas oven, #7 was an electrical oven.
#20 – was a gas oven – then went to VPI system – in late 60's

#20 was actually #17 oven (previous layout)

#8 Winding Lathes:

- ROTOR POLE
- 5105 red epoxy poles piece insulated with copper coils – tension to pole
- usually one operator per lathe
- wet winding at this time
- 5/6 people per shift
- reel wire up and insulate with MICA Epon glass paint with red 5105 to bond together first layer of wire
- paint with red epoxy again, between each layer and paint with 5105
- lathe is rotating while this process is taking place, guiding wire through it and around poles
- Bake in #7 oven – electric oven – for 8 hours at 160 degrees C.
- 5105- warm to 50-60 degrees C to make spreadable and apply to parts– no ventilation
- then back to varnish tank #25 or apply varnish with brush, then take part to #20 oven
- fumes emitted here as per employees, the varnish that was applied was Isonel , and baked at 160 degrees C for 8 hours
- take side sticks off then apply red 5142 epoxy – 2 hours – air-dry epoxy- cosmetic , finessing touch up.
- toluene 1500 to clean up – each lathe had its own canister, tested, then parts went to varnish tank #25 – brush off then to large oven #20 – bake , then take out to test, then goes to another building
- toluene 1500 to clean up – again each lathe has own canister

#11 – 4 pole rotor – same as before – 2 man operation– no ventilation for this task
#25 – Isonel tank

  - people working here still eat in this location
  - dipped part - 10 minutes – Brush off excess resin and sent parts to Big Oven #20

#13 – similar to #14 areas in late 1960's and 1970's.(Vacuum Pressure Impregnation System- Winding Area) Refer to EMI 4320 for the detailed description of this process- APPENDIX P

- 2 shifts, 21-30 people working in this area
- low voltage coils were fabricated here
- 1-6 feet in length
- The coils were clean, or debris was vacuumed out with an air hose for preparation - debris was blown everywhere.
- wind coils into stator, air hose stator coils, clean, wind, connect, test, bake , put in VPI tank, Bake then VPI again (same cycle as previous processes)
- connect with solder – either 60/40 or 40/60 lead tin with rosin core (also Connect RTD's)
- then paint with resin flux, not acid flux, solder joints and then tape glass tape (made you itch, unbearable itchy)
- tape with mica mat glass
- test
- VPI

- oven
- Grinding took place in open area with air chisel, to take the icicles off the parts
- This was a dusty job, glasses and gloves were worn
- Then the leads were burned, brazed to ½ lead – this was conducted by the VPI winders, it took about ½ hour to complete just one lead
- In the early 80's smoke hogs were brought in to take relief form the fumes
- The job was dirty and the smell was heavy in this area as per the employees.

Asphalt coil winding: same process as before
(but different insulation in climate controlled)room – now epoxy versus mica exposure, Mylar mica mat impregnated with epoxy.

#17: Large Lathe

#18 Winding Area

- wind armature same as before see previous decade for details of this process already described.
- TIG brazing and TIG welding took place here. An exhaust was in place here; still lots of smoke
- PPE in the form of gloves, and jacket were worn at this time, no respiratory protection at this time
- 4 machines – 4 people on 3 shifts worked as welders, 10 people worked as winders
- No big parts- therefore portable welders' were not utilized heavily in this operation
- crane was upgraded as well during this time

#26 - shears station no exhaust here, sheets and rolls of any material were processed here

- 2-3 people -6 people per shift – only 2 shifts and 1-2 people worked on nights
- The materials were sheared to insulate or filling slots
- apron and gloves were worn but no respirators
- there were 2 machines and 1 slitter machine for items over a certain thickness
- there was a window and outside door – for ventilation, but this would cause fibres to disperse rather than be contained

- ➢ 2 machines and slitter machine , 2 shears, 1 slitter for anything over certain thickness
- ➢ band saw – to cut insulation as well

Cold Room:

- Clean area, climate controlled room for high voltage stator coils
- 15 people worked here per shift
- Same processes as previous
- Insulation changed here, epoxy versus mica matte impregnated with epoxy refer to EMI 4320 – Appendix P – Stator Winding
- Was cold so that people wouldn't get reactions from the epoxy

Explosion in Armature – 1971

In 1971, there was an explosion and fire at the Armature Building. One of the VPI tanks was overheated, red hot as per one of the employees, and exploded when it was doused with cold water by the firefighters. There was no fire here, only heavy masses of toxic fumes. Epoxy resin fumes were thick in the air. After the fire department left, the workers, armed with little more than rubber gloves were sent in to clean up the aftermath of the explosion. Fourteen firefighters who fought the fumes, died some years after this accident occurred, as per the employees. One person reports that the fumes were so toxic, trees defoliated for many blocks surrounding the building and that paint blistered off buildings and cars from as far as 2 miles away.

The explosion occurred at approximately 9:28 pm August 1, 1971. The plant was on summer shutdown mode and mostly maintenance employees were working at this time, on a Sunday afternoon. The VPI storage tank had a motorized pump in it that was utilized to cool the contents of the tank. The Motor had shut down due to a thunderstorm, which had cut the circuit to the pump. Hence, the solvent was being mixed but not cooled Hence, because the pump had shut down, the cooling effect for which it was working was no longer being administered to the contents in the tank. Hence the exothermic reaction was allowed to reach uncontrolled temperatures. The contents of the tank then reached a dangerous temperature and caused the lid of the tank to blow off. The fire department was called in and they put their fire hoses into the tank and from this action – fumes and gases were given off.

The building was quarantined by this time. The vapours and fumes had vaporized and then condensed like burned wood. People in the neighborhood who had their windows opened, thought their homes were on fire due to the smell of the chemicals and fumes everywhere.

As per the document in **Appendix J- Confidential information and Testimony of an Armature Winder**, (Notes that were formulated for a patient file -name had been omitted as well as other confidential data) the following is taken from the employee testimony:

" Paint peeled from the steel beams, every tree outside the department on Wolfe street lost it's leaves; paint came off cars parked nearby and paint peeled off houses as far away as Edgewater Blvd." EMPLOYEE TESTIMONY

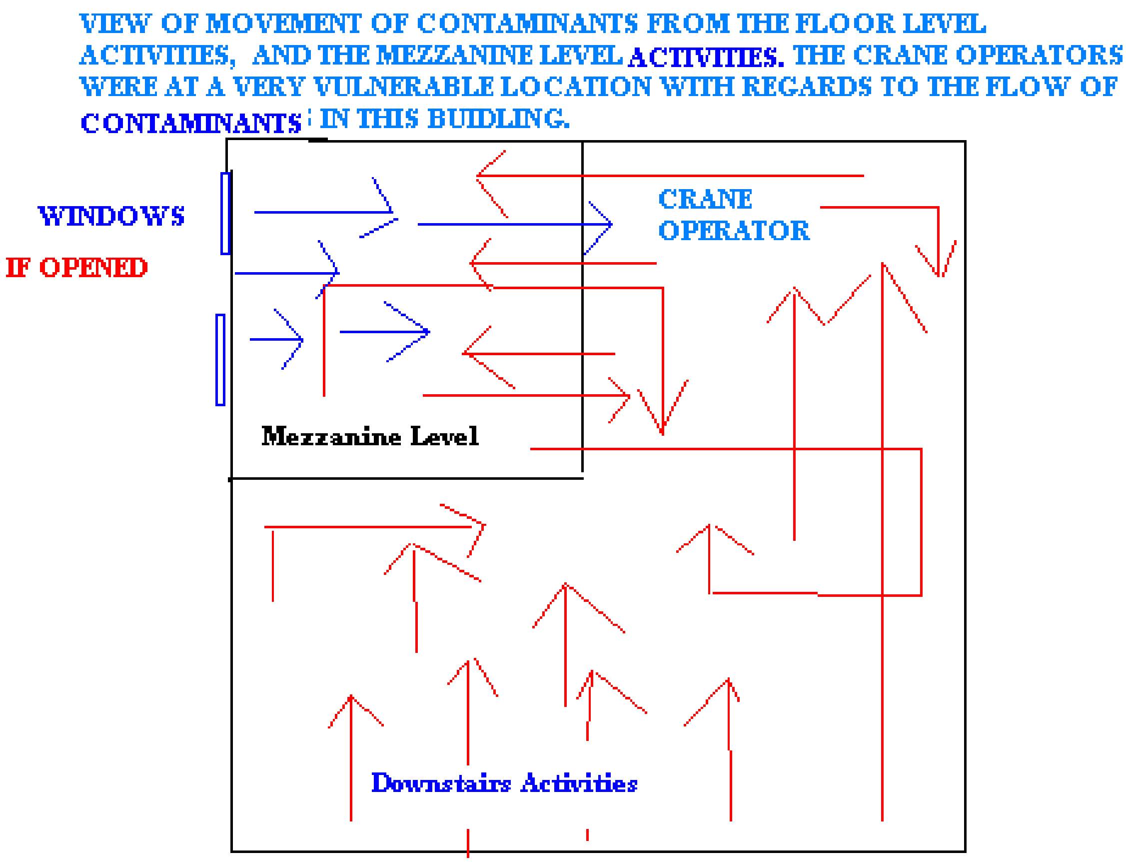
- Paint was literally lifted and hanging everywhere
- All material that had glass, glass tape on it or any open canisters were all discarded due to damage
- Some of the materials became so frail – such as the fiberglass tape – that upon touching the tape, it disintegrated

GENERAL AIR MOVEMENT IN THE ARMATURE BUILDING:

The employees state that at times you could not see the fibres on your clothing, however if you were to wipe your skin, you could see the fibres en mass at that time.
The employees state that when they would go home to shower, they would first shower or bath with cold water, so as to remove the fibres, and then with warm water, so that the fibres would not enter their pores and skin. EMPLOYEE TESTIMONY

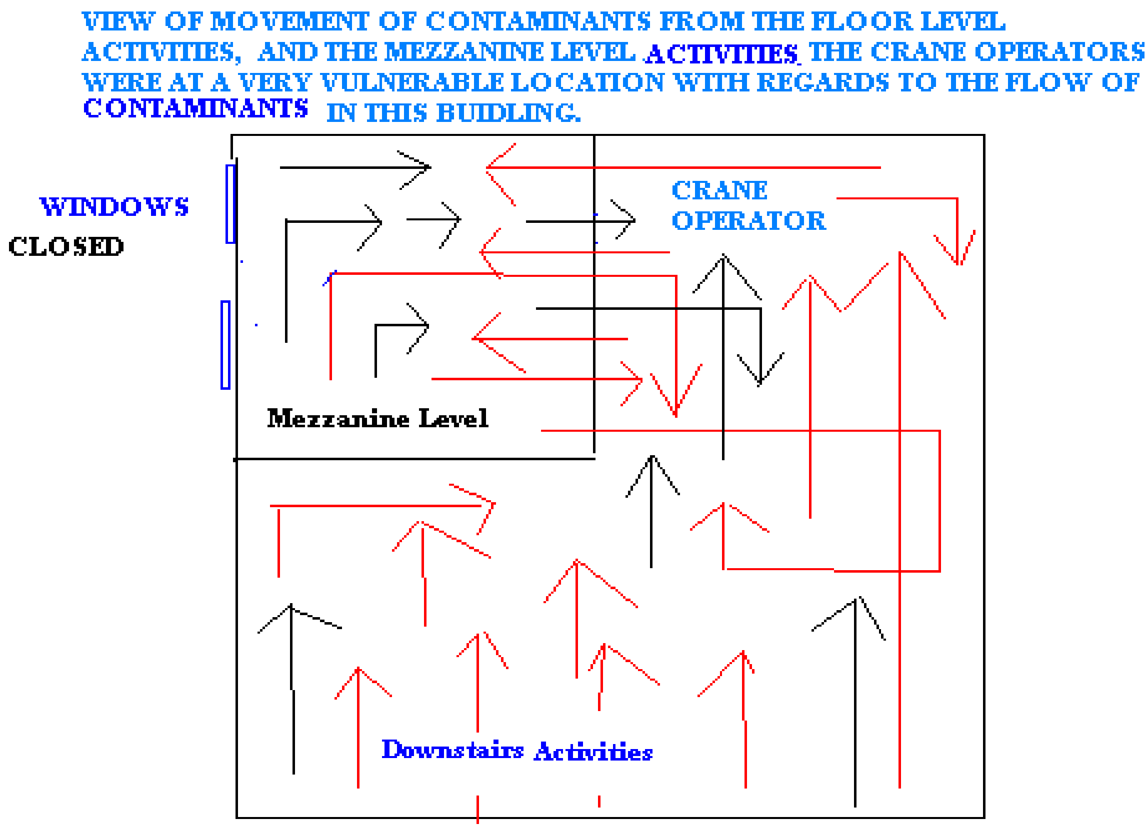
The activities on the ground level of armature such as the use of ovens, VPI tanks, asbestos blankets, other operations and general air movement in the plant, also contributed to the contamination of air on the mezzanine level as well. (see appendix U- Document dated December 1957).

DIAGRAM #14A – MOVEMENT OF CONTAMINANTS IN ARMATURE:



Cross Section of the Building. Arrows indicate flow of contaminants.

DIAGRAM #14B – MOVEMENT OF CONTAMINANTS IN ARMATURE



Cross Section of the Building. Arrows indicate flow of contaminants

As per the diagrams above, when the windows were opened, the contaminants would be pushed toward the lower levels of the armature building (depending on wind direction as well). The pedestal fans would also cause a similar pattern in terms of the flow of air. Moreover, when the windows were closed, the contaminants would be trapped within the building and would have nowhere to be released to the outdoors. All employees would be subject to the accumulation of the fumes, vapours, dusts and other contaminants, including the crane operators who would be subject to this accumulation of contaminants as well. The crane operators wore no protection and their cabins were also not ventilated.

Whenever air is exhausted from a building, regardless of the method, outdoor air must enter to take its place. A lack of replacement air creates a negative pressure condition, which increases the static pressure the exhaust fans must overcome, which in turn can cause reduction in exhaust volume from all fans (Plog, 1988).

The employees did not have any fresh air intake or make up air. The building was generally under negative pressure as there were activities that did have exhaust on them. However, the plant did not have any forced fresh make-up air. The only form of fresh air was through windows and garage doors. Some of the windows here were just for lighting purposes and could not be opened, while other windows were operable. Some of the processes required excess heat, so employees would refrain from having windows opened, thus containing the contaminants within the area and within the building. The employees also state that when the oven doors were opened or the lids on the VPI tanks from downstairs were opened, the fumes from the tank and parts would travel up to the mezzanine areas of the building and thus the employees on the balcony level would also incur the fumes from the tank and ovens and other operations.

The portable oven operations required that all sources of outside air be closed so that optimal oven temperatures could be attained. Hence this would cause all the contaminants in armature to be trapped in the building, causing a toxic vacuum of dusts, fibres, fumes, vapours, heat and other agents to accumulate in the building at higher levels than if some windows were left opened.

The ovens in general, on the ground level and the upper levels did not have proper seals. Thus fumes would escape and enter the various areas of the plant. Hot air rises and thus again, the employees on the upper level of armature, as well as the crane operators, were prone to the exposure to these fumes as well. The employees state that when the epoxies were being cured in the ovens, they could see smoke rising from the ovens. The employees state their eyes, nose and throat would be affected and they would incur burning sensations as well as headaches. Only after the inauguration of the Occupational Health and Safety Act, were the employees allowed to leave the areas, until the smoke or fumes dissipated. Before this time, employees had to stay at their workstations and continue working in the toxic environment.

The employees did have some pedestal fans at their workstation to seek refuge from heat and fibres, or fumes. However, this would not alleviate the presence of these contaminants. This would in fact disperse the contaminants to other areas and thus other employees. Moreover, the fans were generally just recirculating the already contaminated air. (**Refer to Appendix U – Document Dated March 2, 1979 – problems with the usage of Pedestal Fans)**

Some employees would break out with rashes and blistering on the skin from the epoxies and thinners. Some employees reacted so badly that they had open weeping sores from head to toe.

Employees state that they could see fibres, and dust sparkling in the sunlight beaming through the windows. There was also a haze that could be seen, not blue but smoky and gray in color.

The armature building itself had numerous ovens, tanks, pots and other processes that required local exhaust ventilation. With this in mind, due to the fact that there were exhausts in place for some devices and no fresh make up air, this causes a negative pressure environment, where air is taken out of the plant, but no new air is allowed into the plant, other than by open windows, if there are any.

Armature was located adjacent to the fractional department. Winds would cause the contaminants from fractional motors to be swept into the armature building. The fractional department was located adjacent to the armature department and was at about 30 feet in height. The fumes that would be exhausted out of the vents from the ovens, on the armature roof top, would be infiltrated into the fractional building, depending on wind direction, especially if a northern breeze. Neighbors on Park Street would also complain of fumes from the armature department as they would be subject to the fumes as well.

There was no ventilation in fractional motors, it was "one of the worst places to work, it was dirty and dingy and smelly." Fumes from stacks belching act of armature had the Ministry of Health come in. EMPLOYEE TESTIMONY

In **February, 1988 from Rob Baker – regarding – New VPI resin in Building 10 (Appendix U)**, a GE memo was circulated amongst management personnel discussing the plausibility of placing exhaust systems in either Building 10 or Building 7. However, as per the memo, the writer states:

"I am unable to predict at this time whether or not Building 10 would be less suitable for exhausting general shop air than Building 7. We don't have a good handle on air patterns off the property." MANAGEMENT TESTIMONY – APPENDIX U- February 1988

Also, this document further gives evidence of the presence of vinyl toluene in the processes carried out by Armature employees at this time, 1988.

6.0 CHEMICAL AND PROCESS ANALYSIS AND LITERATURE REVIEW

As the focus of this Department Wide Retrospective Exposure Profile is for Cancer and other Occupational Diseases in the Armature Department at GE, a number of chemicals utilized at GE over the years in question, have been researched and analyzed through the literature review as to their degree of hazard based on their utilization in the department. Other variables such as the lack of protection in the form of the three major Industrial Hygiene Controls, i.e. Engineering Controls, Administrative Controls and Personal Protection are also taken into account. Without these controls, the exposure to chemicals in all their forms (solids, liquids and gases) and their decomposition products when heated and their impact on human health is studied herein. Due to the number of dated processes, there were a number of chemicals that were utilized which have been discontinued today. Moreover a vast amount of research was required to be conducted from a historical as well as scientific perspective to analyze the use of chemicals over time such as benzene. Please note, the chemicals utilized in the GE plant over the decades did indeed contain harmful components which may not be present today due to vast amounts of research conducted by regulatory bodies over the years (e.g. American Congress of Governmental Industrial Hygienists).

Although a fully compiled database of Material Safety Data Sheets required for review of all the processes described by the employees was not available to OHCOW, there are several well-known chemicals that are found commonly in various processes. Due to the vast amount of research available for some processes, the processes are studied in some cases and in other areas, the individual chemicals are studied. Where adequate evidence and use of a chemical or its presence in the department is not made clear, the chemical has not been analyzed in this report. However, the detrimental effects of those chemicals that have not been analyzed herein should not be overlooked as potential contributors to the diseases and impairment incurred by the employees in this department. The benefit of studying the processes as a whole is that the research that is available enables one to study the synergistic, interactive effects of the chemicals as a whole process versus individual effect. This gives a more true or realistic value to the actual exposure in the department being studied.

Some MSDS sheets have been available to OHCOW and have been added to the Appendix M for your perusal. Some MSDS have been added to demonstrate the presence of the contaminant in the plant to provide evidence that the chemical was present.

COPPER:

Copper was a major component of the armature department. It was wound and wires were ground, sheared, formed and covered on poles and other parts of the armature's products being fabricated. With all these different types of processes, copper was seen in its many different forms throughout the department. The National Safety Council, 2004 states the following:

- Copper is insoluble in hot and cold water, soluble in nitric acid and hot sulfuric acid, very slightly soluble in hydrochloric acid and ammonium hydroxide (NSC, 2004).
- It is very slowly attacked by cold hydrochloric acid
- Health effects: irritation to the nasal mucous membranes, pharynx and eyes, chest pain, vomiting, nasal perforations and dermatitis
- Copper fumes and dust can irritate the upper respiratory tract, congestion of nasal mucous membranes, ulceration and perforation of the nasal septum, discoloration of the skin and pharyngeal congestion
- Fumes from the heating of metallic copper can cause upper respiratory irritation, chills, aching muscles, nausea, gastric pain and diarrhea. Acute poisoning from inhalation of copper containing dust has carried symptoms of heavy metal poisoning. Chronic exposure to copper can cause anemia.
- Occupational exposure to copper dust can lead to upper respiratory tract irritation and nausea, including a metallic taste in mouth (Whitman, 1962).
- The sweet taste experienced by workers is consistent with the onset of symptoms of metal fume fever. Factory workers exposed to copper dust and several other copper salts reported symptoms of eye, nose, throat irritation, anorexia and nausea (Askergren and Mellgren, 1975).
- Inhalation exposure to copper fumes, usually from welding or smelting operations, may result in metal fume fever. This condition results in headache, dryness of the mouth and throat, chills, fever and muscle aches (ATSDR, 1990; Seaton and Morgan, 1984).
- An unpublished letter regarding occupational exposure to copper fumes reported that levels of 0.02-0.4 mg/m3 copper did not cause complaints while exposure to 1.0-3.0 mg/m3 copper for shorter periods of time resulted in a sweet taste in the mouth but no nausea (Whitman, 1957).

Welding and grinding copper containing materials is of great importance here, as this process was carried out vigorously in the Armature Department. The welding of coils within the individual slots, coil leads, brazing and soldering, were all activities that contributed to the contaminants in the armature department and thus employee exposures.

As per ATSDR, 2004, " if you grind or weld copper metal, you may breathe high levels of copper dust and fumes." Due to the fact that employees ate, drank and smoked at their workstations, copper would not only be inhaled, but it would also be ingested as well. Copper can enter your body when you drink water or eat food or other substances that contain copper. Copper can also enter your body if you breathe air or dust containing copper. Long-term exposure to high doses can be harmful. Long-term exposure to copper dust can irritate your nose, mouth and eyes and cause headaches, dizziness, nausea and diarrhea. The occupational exposure limit for copper is 0.1 mg/m3 for copper fumes and 1.0 mg/m3 for copper dusts.

In terms of welding copper, Moreton, 1977 reviewed the following:

- Copper fume fever similar to metal fume fever from other heavy metals consists of upper respiratory tract irritation, metallic taste in the mouth, nausea and fever.
- The review states that arc welding fumes generate large amounts of copper fumes

What is of principal importance here is that the welding operations that take place can have toxic interactions with the contaminants already present in the air or in close proximity to the welding processes. As per the layout provided for 1960's (Appendix C), there was a welding section in this department as denoted by the north west corner of the layout. Furthermore, there was also a portable welding operation as well, as the large stators would require welding, and thus the employees would have to enter the armatures, and other circular parts, to weld the coils within slots as described in Section 5 of this report. As per Sjogren, B, 1988:

- Welding in atmospheres contaminated with halogenated hydrocarbons used as degreasing agents caused decomposition of these chemicals into hazardous byproducts. Disorders associated with welding exposures were pulmonary edema, chronic bronchitis, emphysema, pneumonia, asthma, welder's lung and metal fume fever
- Soldering and brazing involved the use of lead and tin in soft solders and copper and zinc in hard solders and were considered responsible for asthma among electronics workers.

Furthermore, due to the fact that part of the welding operations on the stators, and various armature windings already had epoxy coatings, with heat application, this would also cause the epoxies to react as well. This is supported by National Institute of Health, 2004: thermal degradation of coatings include: Bisphenol A and methacrylates (epoxy paints and primers), formaldehydes and aldehydes (all paints).

ISONEL 51:

An MSDS for this product has been retrieved from VON ROLL ISOLA company, care of Schenectady International Inc., one of the previous suppliers to GE Peterborough. The MSDS indicates that the major substances in this formulation include Xylene (mixed) and Mineral Spirits. Furthermore, the MSDS indicates that the material capable of release during processing is Formaldehyde. The MSDS is dated 1996. An older version was not available from GE members.

Moreover, documents were presented to OHCOW that have been included herein which demonstrate further that formaldehyde was a component of Isonel 51 and further indicates that IARC, NIOSH consider Isonel 51 to be a carcinogenic solvent due to it's ingredients (Appendix Q).

A briefing provided by Schenectady International states the following with regards to the uses and properties of ISONEL 51:

> *..Isonel 51 is a high –temperature modified polyester varnish for use in conventional dipping and bake applications. It is designed for thermally superior performance on stators, armatures, transformers and for-wound coils. Isonel 51 cures in two to eight hours at 300-400F, the actual cycle depending on oven efficiency and the weight and shape of the treated unit.*

The effects of xylene are discussed forthwith in the solvents section of this report. Mineral spirits and Formaldehyde are discussed as follows:

FORMALDEHYDE:

As per **IARC Monographs** – 2004 – the following data is pertinent to note with regards to Formaldehyde:

- Widely used in the production of resins that bind wood products, in plastics and coatings
- Low levels of formaldehyde have been encountered during the manufacture of man made vitreous fibres (MMVF), abrasives and rubber and formaldehyde production industries
- A very wide range of exposure levels have been observed in the production of resins and plastic products
- Nasopharyngeal cancer mortality was statistically significantly increased in a cohort study in the United States industrial workers exposures to formaldehyde and was also increased in 2 other US studies and Danish Cohort Studies
- 5 of 7 case –control studies found elevated risk for formaldehyde exposure
- The Working Group concluded that there is sufficient evidence in humans that formaldehyde causes nasopharyngeal cancer.
- A greater incidence of leukemia in 2 cohorts of US industrial workers and US garment workers was found recently, but not in a 3rd cohort of UK chemicals workers. The Working Group concluded that there is strong but not sufficient evidence for a causal association between leukemia and occupational exposure to formaldehyde.
- Formaldehyde is genotoxic in in-vitro models, animals and humans
- Cell proliferation increased substantially at formaldehyde concentrations higher than 6 ppm in rats

- The Working Group concluded that both genotoxicity and cytotoxicity have important roles in carcinogenesis of formaldehyde in nasal tissues.

From previous studies on Formaldehyde, the following was found:

- As per OSHA, 2002, formaldehyde is a potential human carcinogen. Airborne concentrations above 0.1 ppm can cause irritation of the eyes, nose and throat.
- Skin exposure causes various skin reactions including sensitization.
- exposure to formaldehyde gas can cause irritation of the eyes and respiratory tract, coughing, dry throat, tightening of the chest, headache and sensation of pressure in the head and palpitations of the heart
- exposure occurs primarily by inhaling formaldehyde gas or vapor from the air or by absorbing liquids containing formaldehyde through the skin (NCI, 2004)
- In 1987 the US EPA classified formaldehyde as a probable human carcinogen under conditions of unusually high or prolonged exposure. Since that time, some studies of industrial workers have suggested that formaldehyde exposure is associated with nasal cancer and nasopharyngeal cancer and possibly leukemia. (NCI, 2004)
- In June 2004, IARC reclassified formaldehyde as a known human carcinogen (IARC, 2004-June)
- Several NCI studies found professions with potential exposure to formaldehyde caused workers to be at an increased risk for leukemia and brain cancer compared with the general population. A study of 12,014 textile workers conducted by NIOSH, found an association between the duration of exposure to formaldehyde and leukemia deaths. However in a separate cohort study of 11,039 British industry workers, no association was found between cumulative formaldehyde exposure and leukemia deaths (NCI, 2004).
- exposure to 0.1 to 5 ppm causes irritation of the eyes, nose and throat
- Exposure to above 20 ppm can cause severe lacrimation, burning in the nose and throat and breathing becomes difficult.
- Chronic exposures can cause dermatitis and sensitization of the skin and respiratory tract.
- Formaldehyde is a sensitizing agent that can cause an immune system response upon initial exposure. It is a suspected human carcinogen that is linked to nasal cancer and lung cancer. Subsequent exposure may cause severe allergic reaction of the skin, eyes, and respiratory tract. (OSHA, 2002).

The MSDS from Schenectady company, indicates if HCL is in the plant then formaldehyde will react to form a carcinogen. (Appendix Q)

Formaldehyde can react with HCL to form BIS-CHLOROMETHYL ETHER, a carcinogen.

As per the MSDS in section Q, section 12B indicates Formaldehyde's incompatibilities. It states that Formaldehyde can react with HCL to form BIS- Chloromethyl Ether, a carcinogen. Muriatic Acid, HCL, was utilized in this department and is a common solvent utilized in many industrial settings. The presence of HCL in this department or its creation through chemical reactions with other solvents, is also plausible here, and thus the reaction with Formaldehyde cannot be overlooked.

As per ATSDR, bis-chloromethyl ether causes lung cancer and other tumors in people and animals. The Department of Health and Human Services (DHHS) has determined that bis-chloromethyl ether is a known human carcinogen. (taken directly from: ATSDR: http://www.atsdr.cdc.gov/tfacts128.html.

MINERAL SPIRITS:

- As per the MSDS that was provided by VON ROLL ISOLA, care of Schenectady , the following is listed with regards to exposure to minerals spirits:
  - May cause respiratory tract irritation
  - Lung irritant
  - May cause eye irritation, skin irritation, nervous system effects, blood chemistry changes and affects to the mucous membranes.

Of importance here is that although this agent was utilized for dipping or coating purposes, it was also later baked, cured and even sanded. There are other means by which exposures to the decomposition products in this material can occur.

SHELLAC:

Shellac's natural resin binder is produced by the lac insect. Shellac uses ethanol, an alcohol solvent made from corn. During application, vapours from the ethanol can irritate the eyes and respiratory tract system . It is pertinent to note here that some shellac can also be made with methanol, a powerful toxin also known as wood alcohol. (GreenHomeGuide GHC, 2005).

WOOD ALCOHOL – METHANOL:

Methanol was utilized as an agent to soak some of the items used for insulating the armature products. Hence, the effects of methanol must also be analyzed in this REP as it would have been a contributor to exposures incurred by the Armature employees.

Methanol and its properties and health effects are described below as per the sources listed:

As per the Office of the Environmental Health Hazard Assessment (OEHHA) 2003 the following information is taken directly to demonstrate the health effects of methanol exposure:

- Methanol is used as an industrial solvent; solvent for shellac and some paint and varnishes; a component of paint removers; lacquers and inks
- Methanol is readily absorbed following ingestion, inhalation or dermal exposure and the toxicity is the same regardless of the route of exposure.
- Methanol is a defatting agent causing skin to become dry and cracked. Signs of systemic poisoning may be delayed 8-36 hours after initial exposure.
- It can cause permanent damage to the optic nerve and central and peripheral nervous system with just a single acute exposure.
- Methanol can also have cumulative toxicity with repeated exposures.

A Material Safety Data Sheet obtained from Mallinckrodt Chemicals (MSDS No. M2015) Appendix T indicates the following with regards to Methanol:

- A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma death. A person may get better but then worse again up to 30 hours later.
- Decomposition products: CO, CO_2 and Formaldehyde.(this is supported by another MSDS provided in Appendix T from SPI Supplies Division – Structure Probe, Inc.

OHCOW 1997 – MSDS INFORMATION FROM GE
PREPARED BY Lou Ritlik: see attached tab

An important document which consists of a 1997 OHCOW investigation is provided here. The Industrial Hygienist (IH) had access to GE MSDS representative of that time and retrospective for select compounds that were utilized in the department and which are vital to the REP. Please refer to the tab for the review of chemicals present in the MSDS sheets and thus in the Armature department.

Memorandum from Lou Ritlik – Industrial Hygienist
To: Dr. Roland Wong - OHCOW
Date of Report: July 29, 1997

This memorandum addresses the review of material safety data sheets provided to OHCOW at this time for review. The writer describes the various chemicals and the means by which they could induce tumor initiators or tumor promoters.

The following chemicals are reviewed: Refer to the following Tab. The Author of the document was presented with MSDS that were available at that time in 1997, for review of the chemicals present at that time and retrospectively. As many MSDS were not made available today, this 1997 document is very pertinent and vital to this report.

The chemicals present in the MSDS investigation in 1997 were the following:

Dicumyl Peroxide (Insulating Varnish)
Methyl Ethyl Ketone Peroxide (see below for more information)
Pole of Peroxide in DNA Damage Caused by Asbestos
Triethylenetetramine
Chromic Acid
Styrene and Styrene Oxides

Supplemental Information has been investigated for some of the chemicals mentioned above:

TRIETHYLENETETRAMINE
Supplemental Information on TETA:
As per the ILO's ICSC (April 2005) card for TETA the following is stated:

- This substance decomposes on burning, producing toxic fumes including nitrogen oxides. This substance is a strong base and reacts violently with acid and is corrosive. Attacks metals such as aluminum, zinc, copper and its alloys.
- Symptoms of lung edema often do not become manifest until a few hours have passed and they are aggravated by physical effort.

- Repeated or long-term exposure may cause skin sensitization and or asthma.
- Hazardous decomposition products are carbon monoxide, carbon dioxide, and nitrous gases

Please note, as per the actual MSDS received by OHCOW from GE, hydrogen cyanide is also listed as a decomposition product of TETA. Appendix M

HYDROGEN CYANIDE:

As per the CDC, 2003, Hydrogen Cyanide irritates the eyes and respiratory tract. Cyanides poison the vital organs of the body, such as the lungs and heart, including areas of the brain that regulate proper functioning of those organs. Exposure may result in convulsions, unconsciousness and death. The vapours will be absorbed by the eyes. Other signs of exposure include:

- Headache, dizziness, confusion, nausea, shortness of breath, convulsions, vomiting, weakness, anxiety, irregular heartbeat, tightness in the chest.

As per the ATSDR, 2005 the following is stated with regards to Hydrogen Cyanide:

- Hydrogen cyanide is absorbed well by inhalation and can produce death within minutes
- Substantial absorption can occur through intact skin if vapour concentration is high or with direct contact with solution, especially at high ambient temperature and relative humidity
- Persons whose clothing or skin is contaminated with cyanide containing solution can secondarily contaminate emergency response personnel by direct contact or through off-gassing vapor.
- Hydrogen cyanide is highly toxic by all routes of exposure and may cause abrupt onset of profound central nervous system (CNS) damage, cardiovascular and respiratory effects, leading to death within minutes
- Hydrogen cyanide acts as a cellular asphyxiant. By binding to mitochondrial cytochrome oxidase, it prevents utilization of oxygen in cellular metabolism. The CNS and myocardium are particularly sensitive to the toxic effects of cyanide.

CHROMIC ACID (refer to Tab)

Chromic acid is a hexavalent form of chromium and has been classified as a carcinogen by the National Institute for Occupational Safety and Health (NIOSH) (NIOSH 1977). Chromic acid is also a powerful irritant, and repeated exposures can lead to respiratory and dermal sensitization reactions which are allergic reactions affecting either the skin or breathing (Proctor, 1988). As per NIOSH, 2005, routes of exposure with regards to chromic acid include, inhalation, ingestions, skin and/or eye contact. Symptoms of exposure include, irritation to the respiratory system, nasal septum perforation, liver, kidney damage, leukocytosis, leucopenia, eye injury, skin ulcer, sensitization dermatitis, potential occupational carcinogen. (refer to Tab for more information)

STYRENE AND STYRENE OXIDE:
Supplemental information on styrene:
Styrene, also known as vinyl benzene, has an irritant effect on mucous membranes and skin. Inhalation of high concentration may result in transitory CNS depression, with pre-narcotic symptoms. Chronic neurotoxic effects have been reported with repeated exposure to relatively high levels in the boat-construction industry. Contact allergy to styrene has been reported (Sjoborg et al., 1984). The metabolic transformation of styrene is characterized by its conversion to styrene 7,8- oxide by the mixed function oxidases and the cytochrome p-450 enzyme complex. Styrene 7,8-oxide is mutagenic in several prokaryotic and eukaryotic test systems. It has been shown to produce single strand breaks in DNA of various organic in mice (Solveig-Walles and Orsen, 1983). Chromosome aberrations and sister chromatid exchanges were reported to be significantly increased in several studies of styrene-exposed workers. (Xiao and Levin, 2000). It is important to note that a typical polyester resin contains 40-60% styrene (Government of Western Australia, 2003). Furthermore, as per the manner in which GE Armature employees applied some of the resins to the armatures, stators and other products that were fabricated in this department, i.e. Via hoses, roller brushes etc., the following is stated by the Government of Australia in terms of exposure:

The wet spray processes involved the application of styrene-based resin with spraying or by rollers an brushes. Large amounts of styrene vapour are given off during the application and curing states of these processes. As a result, employees will be exposed to excessive amounts of styrene unless adequate ventilation is provided.

- Styrene consists of a benzene ring with an ethylene group substitution
- Styrene is used as a solvent for synthetic rubber and resins, as a chemical intermediate and as a raw material in manufacturing polymerized synthetic plastic materials
- Main target organ for workers exposed to styrene is the central nervous system.

As per Hogstedt., B et al., 1979, chromosome aberrations caused by styrene exposure were studied:

- Workers manufacturing fiberglass-reinforced polyester resin boats were exposed to a number of solvents including styrene and MEK peroxide.
- Chromosomal aberrations were significantly more frequent in the workers than in the comparisons, with no correlation between exposure time and total number of aberrations.
- The authors concluded that the manufacture of polyester resin boats is associated with an increased frequency of chromosomal aberrations and possibly with cancer, as well as genotoxic effects on germ cells that would not appear until subsequent generations.

As per ACC-CHEM Laboratories, the following is stated about styrene:

- Major reactive solvent in a variety of uses for reinforced plastics manufacturing
- Exposure occurs by skin contact as well as inhalation of vapours and dusts
- Gastrointestinal symptoms can occur in addition to toxic hepatitis and peripheral neuropathy

As per Dillon Consulting Report for Working Safety with Casting Resins:

- Polyester resin contains styrene monomers (usually 30-60%) and a catalyst is added MEKP to accelerate the polymerization reaction.
- Primary hazardous chemicals and material included in these resin systems are styrene, MEK peroxide and fiberglass dust.
- If a worker is exposed to styrene over a long period of time, it can affect the CNS system, damage kidneys, liver, nerves, and the gallbladder.

Long-term exposure (3.2-10 years) to small quantities of styrene (1-10 ppm, whereas a person manufacturing polystyrene may receive 50-100 ppm over an 8 hour period) cause a wide spectrum of adverse health effects including neurotoxic, hematological (low platelet and hemoglobin values), cytogenic (chromosomal and cytogenic abnormalities) and carcinogenic effects. Neurotoxic effects include fatigue, nervousness, difficulty sleeping, poor performance on memory and stimuli response tests and nerve conduction velocity abnormalities. Other effects include low platelet and hemoglobin values, chromosomal and lymphatic abnormality at levels below 50 ppm (Polystyrene Production, 1996).

A 45 year old male exposed to styrene monomer vapours for five years developed a burning sensation in the lower portion of his feet and a feeling of walking on inflated balloons of cotton. Upon examination there was evidence of total demyelation. (Behari et al. 1986).

A study of neurotoxicity of toluene and styrene notes that these aromatic hydrocarbons have unsuspected long lasting neurological effects. The accumulation of these highly lipid soluble materials in the lipid- rich tissues of the brain, spinal cord and peripheral nerves was apparently correlated with acute or chronic functional impairment of the nervous system (O'Donoghue, JL., et al. 1985.)

TAB #1

ASBESTOS:

This section gives a preliminary review of asbestos, as well as asbestos carding operations. Due to the fact that the carding operations in Wire and Cable were not properly controlled, it was stated by many employees that the main aisle in this plant, i.e. Inside Works avenue, was a pathway along which contaminants traveled in and out of departments (see Appendix A), due to the narrow constriction and lack of ventilation in the various areas and lack of exhausts etc. Hence the fibres could have been transported to other areas of the building as well. Moreover, other processes specific to Armature will also be discussed here. In addition, due to the fact that some employees were transferred from armature to Wire and Cable, during Lay off periods, it is pertinent to include this operation of Wire and Cable in this section as well.

Backgrounder information - ASBESTOS CARDING – this section denoted in green on Asbestos is provided by Barry Lam of OHCOW .

Asbestos is a commercial term given to a group of six different, naturally occurring, fibrous minerals: amosite (brown), chrysotile (white), crocidolite (blue), and the fibrous varieties of tremolite, actinolite, and anthophyllite (gray). The latter three are also found in nonfibrous forms. Under pressure, the fiber bundles tend to split longitudinally forming long thin fibers with high length-to-width aspect ratios. These minerals have been used extensively in the past because of their high tensile strength, flexibility, chemical and physical durability and fire resistant properties.

In North America only amosite, chrysotile and crocidolite have industrial uses. Chrysotile makes up at least 95% of all natural fibers used in Canada. Crocidolite and amosite, which is imported from South Africa, make up the remaining 5%. Anthophyllite is used and mined in Finland only.

It is well established that occupational exposure to asbestos is associated with asbestosis (pulmonary fibrosis), increased risk of lung cancer, mesotheliomas of both pleural and peritoneal tissues, and pleural plaques. Several studies also showed an excess of gastrointestinal and laryngeal cancer in shipyard workers.

Despite the known health risks associated with workers in mines, from 1964 to 1973 world production of asbestos reached 4.8 million tonnes – Canada accounting for approximately 30% of that total. However, there does appear to be a steady decrease in production from 1979 to 1983. Asbestos was used for various industrial applications such as electrical and thermal insulation, brake linings, gaskets, and clutch facings; and as filler material in various consumer products like paper, paint, cement, and asphalt.

There are few studies that monitor the occupational exposure levels to asbestos. It is clear that past and present occupational exposure will have greatly changed over the years. This is a likely result of several factors such as improved engineering controls, sample collection, and sample analysis. As expected, workplace concentrations were very high before monitoring was first implemented around the 1930s. After recognizing the high dust concentrations, engineering controls were being implemented to reduce dust levels. However, not until after the 1970s, was there recognition and emphasis placed on the health risks associated with asbestos exposure. This is reflected in regulations adopted and the decline of asbestos production in some countries.

Activities resulting in occupational asbestos exposure can be divided into two broad categories. This first involves the production of asbestos through mining and milling. The second is the inclusion of industries that develop and manufacture asbestos containing products. The latter category can be further divided into: asbestos textile manufacturing, asbestos cement production, automotive parts manufacturing, construction and others.

Textile manufacturing is the dustiest of all the asbestos manufacturing processes. Chrysotile asbestos is almost used exclusively in the textile industry since they produce the longest fibers. Fiber preparation involves debagging, fiberizing, and blending. Opening bags of asbestos can be either manual or automatic. The dust emanating from these processes are difficult and costly to control. Asbestos fibers are then passed through a kollergang followed by a creighton opener or willow to further open and fluff the fibers. Once the fibers have been opened, blending the various types and grades of fibers is necessary to make the sheets more uniform. Depending on the process, organic fibers (e.g. rayon and cotton) may be added in the blending stage.

The blended fiber is then fed (either manually or blown) to the card for further processing. The carding process separates fiber bundles and aligns the fibers to produce uniform sheets or laps. The card operates by working, stripping, and brushing the asbestos fibers - similar to the processes in the wool industry. Mote knives and grid bars located underneath the card removes impurities and dusts. The carding process, along with asbestos preparation, generates the most dust into the working environment. To control asbestos exposure the carding process would have to be completely enclosed. Complete enclosures are costly and were likely not fully enclosed because of the need to continuously feed the card with asbestos from the hopper to make rovings (loosely formed yarn) that is later sent for further spinning and twisting to strengthen the yarn.

Nine textile plants in the USA were studied from 1964 to 1965 (**Table #1**). The sample collection method was on membrane filter.

Table #1. Mean dust concentrations by plant and operation in nine textile plants in the United States during 1964 to 1965 (Lynch & Ayer, 1966)

Operation	Fibers (f/cc)	Textile Plant 1	2	3	4	5	6	7	8	9
Fiber preparation	A	38.1	12.3	23.3	34.0	-	8.1	7.6	35.5	11.8
	B	15.0	10.0	13.3	18.3	-	3.0	4.5	17.0	2.6
Carding	A	18.1	13.6	20.6	32.9	-	6.0	17.2	28.2	8.3
	B	10.2	9.21	3.3	15.2	-	3.5	8.1	13.4	2.0
Spinning	A	9.6	4.1	20.2	29.8	-	5.1	24.8	20.8	7.4
	B	6.6	3.2	18.9	15.7	-	3.5	10.8	10.5	1.8
Twisting	A	9.3	6.9	15.8	51.4	-	4.8	25.9	16.7	3.1
	B	6.4	5.2	7.5	22.4	-	3.3	12.9	7.2	1.1
Winding	A	11.7	4.4	9.6	28.6	-	4.5	25.7	7.9	3.6
	B	7.5	3.9	8.9	17.5	-	3.2	11.7	2.7	1.3
Weaving	A	7.7	7.0	2.9	33.8	4.5	2.9	9.5	8.1	2.9
	B	4.8	3.1	2.3	17.8	3.9	2.2	5.7	3.0	1.5

Note: A = total fibers
B = fibers longer than 5 μm

In a different study (Dement et al., 1983), a chrysotile textile manufacturing plant in South Carolina was part of a retrospective cohort looking at mortality rates. From 1930 to 1975 this plant was under extensive study of dust control measures and occupational exposures by the U.S. Public Health Services. The authors state that the plant was progressive in the application of modern dust control measures that remained almost unchanged from 1940 to 1975. The study provides a detailed history of when and what engineering controls were implemented. Although the sampling technique was through an impinger, measuring fibers by millions of particles per cubic foot of air (mppcf), the authors have adjusted the values to reflect fibers per volume of air. **Table #2** was adapted from the journal article.

Table #2. Range of exposure estimates for a chrysotile textile plant from 1930 to 1975

Operation	Without controls fibers > 5 μm/cc	With controls fibers > 5 μm/cc
Fiber preparation	26.2 – 78.0	5.8 – 17.2
Carding	10.8 – 22.1	4.3 – 9.0
Spinning	4.8 – 8.2	4.8 – 6.7
Twisting	24.6 – 36.0	5.4 – 7.9
Winding	4.1 – 20.9	4.1 – 8.4
Weaving	5.3 – 30.6	1.4 – 8.2

A follow up study to the one conducted in South Carolina demonstrates an overall lung cancer for white males with at least 15 years of latency to have a SMR of 1.97 and an overall non-malignant respiratory disease of 3.11. The risk of lung cancer was found to increase in relation to cumulative exposure to chrysotile asbestos. For the entire cohort there was a risk of 2-3% for each fiber/cc-year. The authors recognize that mortality rates are not the ideal method of tracking non-malignant diseases.

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Intimate work with Asbestos insulated tape

(Appendix P: Engineering Manufacturing Instructions: 4320 – Stator Winding –gives a clear demonstration and evidence of how intimately the employees had to work with the various products for insulation into the stator slots as well as how detailed each job task was.

Asbestos Cutting operations for the slots and other miscellaneous insulating requirements for the Armature Department:

A study concerning exposure to asbestos during **bandsawing** of gasket material was completed by Fowler in May 2000. The following was reported (taken directly from the report):

- A simulation of bandsawing sheet asbestos gasket material was performed as part of a retrospective exposure evaluation
- The work was performed by bandsawing a chrysotile asbestos neoprene gasket sheet, purchased in 1996, with a 16 inch woodworking bandsaw inside a chamber.

- In contrast with findings from studies examining manual handling of gaskets, airborne asbestos concentrations from this operation were found to be well above current Occupational Safety and Health Administration permissible exposure limit (PEL) of 0.1 f/mL and the Ceiling PEL of 1.0 f/mL.
- Although some encapsulation effect of the neoprene matrix was seen on the particles in the airborne dust, unencapsulated individual fiber bundles were also seen.
- The author concludes that the airborne asbestos concentrations arising from this work were quite high and point to the need for careful observation of common sense precautions when manipulation of asbestos-containing materials are machined.

Results:

Personal air concentration of fibres greater than 5um during bandsawing were between 2.2 and 4.9f/mL by Phase Contrast Microscopy (PCM). The personal air concentration by Transmission Electron Microscopy (TEM) were higher at 22.2 – 49.3 f/mL for all asbestos fibres and 8.2-17.6f/mL for fibres greater than 5 um. Area sample results were: 0.75 – 2.3 f/mL by PCM and 5.7 -7.6 f/mL by TEM.

The study here involved a simulation in an isolation chamber. What needs to be noted here is that the years prior to ventilation and engineering controls being implemented on the bandsaw would have caused significant fibre production and thus exposure to the employees. The numbers reflected in the Fowler study, give an overview of what is expected when ventilation is involved. It can be extrapolated from this information, that without ventilation, the fibre concentrations would thus be much more significant.

Furthermore, a study by Longo et al. in 2002 found the following with regards to fibre release during the removal of asbestos containing gaskets: work practice simulation.

- Work practice studies were conducted involving the removal of asbestos-containing sheet gaskets from steam flanges. These studies were performed to determine the potential exposure levels to individuals who have worked with these types of materials in the past and may still work with these products today.
- The simulations show substantial asbestos fiber release using scraping, hand wire brushing, and power wire brushing techniques during the gasket removal process.
- The range of concentration was 2.1 to 31.0 fibres/cc greater than 5 micrometers when measured by Phase Contrast Microscopy (PCM). These results contrasted with the few reported results in the published literature where lower airborne asbestos levels were reported. In these studies, the airborne asbestos fiber levels measured in many of the samples exceeded all current and historical Occupational Safety and Health Administration (OSHA) excursion limits (15-30 minutes) and some previous permissible exposure limits (PEL) based on eight-hour time weighted average standard.
- The report further states that individuals who performed this type of work in the past may have been exposed to higher amounts of asbestos levels than previously suspected.

Compressed air hose usage and housekeeping:

The Coordinating Committee for Automotive Repair (CCAR) a non-profit government, industrial and educational group for the automotive service industry, estimates that using a compressed air hose to clean drum brakes can release up to 16 million asbestos fibres in the cubic meter of air around a mechanics face: Source: US EPA, Asbestos Action Program, 2005. CCAR, 2005). Even hitting a brake drum with a hammer can release over a million asbestos fibers.

Working in proximity to Asbestos Exposure:

Magnani et al., 2000 studied non-occupational exposure to asbestos and malignant pleural mesothelioma. The following was found in this study:

- A population –based case-control study was carried out in six areas from Italy, Spain and Switzerland
- Information was collected for 215 new histologically confirmed cases and 448 controls.
- In 53 cases and 232 controls without evidence of occupational exposure to asbestos, moderate or high probability of domestic exposure was associated with an increased risk adjusted by age and sex: odds ratio (OR) 4.81, 95 % confidence interval(CI) 1.8-13.1.
- These statistics correspond to three situations: cleaning asbestos contaminated clothes, handling asbestos material, and presence of asbestos materials susceptible to damage.
- Living between 2000 and 5000 meters from asbestos industries or within 500m of industries using asbestos could also be associated with an increased risk. It is suggested that low-dose exposure to asbestos at home or in the general environment carries a measurable risk of malignant pleural mesothelioma.

This would have been true of employees who worked directly with the asbestos blankets or were in the vicinity of the portable oven activities when the blankets were put on or off the equipment, as well as employees who worked with or in close proximity to the asbestos bandsawing operations; wire stripping, winding, cutting, welding, grinding operations.

World Health Organization (WHO) – Jan. 2005:

The WHO have studied the uses of asbestos worldwide and illustrate the potential exposure levels to asbestos through various machining methods that can assist in quantifying the exposures realized by a department handling asbestos impregnated materials. The following data are made available by WHO:

Typical Uses of Asbestos:

- **Boilers and heating vessels**
- **Cement pipe**
- **Clutch, brake, and transmission components**
- **Conduits for Electrical Wire**
- **Pipe covering**
- **Roofing Products**
- **Duct and Home Insulation**
- **Fire Protection Panels**
- **Furnace Insulating pads**
- **Pipe and Boiler Insulation**
- **Sheet vinyl or floor tiles**
- **Underlay for sheet flooring**

WHO states the following concerning Asbestos:

> **"Damage to asbestos-containing material can result in the release of small asbestos fibers that become airborne and are readily inhaled. These fibers can remain in the lungs for long periods and can cause serious lung disease."**

Exposure Levels:

The US Occupational Safety and Health Administration (OSHA) standard for asbestos in the workplace is set at 0.1 fibres/ml of air as the 8 hour Time Weighted Average.

The UK Health and Safety Executive have set their exposure limits in separate categories for both amphibole asbestos minerals and for chrysotile:

Amphibole: Short-term exposure is set at 0.6 f/ml averaged over any continuous 10 minutes
Long-term exposure limit is set at 0.2 fibres/ml averaged over any 4 hours

For Chrysotile, the short-term exposure limit is 0.9 fibres/ml averaged over any 10 minutes
Long Term exposure limit is 0.3 fibres/ml averaged over any 4 hours

Activities that can release fibres:

The WHO lists the following as activities, which will cause the release of asbestos fibres:

- Low-density materials such as asbestos containing thermal insulation for pipes and boilers, some wall or ceiling plasters and, some ceiling tiles are friable and can crumble under hand pressure. These materials can release high concentrations of fibres when damaged or disturbed e.g. during maintenance, renovations or demolition work.
- High density, hard materials in which asbestos fibres are embedded in a matrix, such as asbestos cement pipes and sheets. Floor tiles and ceiling materials are less likely to release fibres unless they are disturbed.
- **Sawing, drilling, crushing, scraping and sanding asbestos containing materials are particularly likely to release respirable fibres and dust.**
- **Small diameter fibres and particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling down.**

This last fact gives more leverage to the notion with regards to the fibres traveling through the Inside Works Avenue, contaminating various areas or various areas within the armature department alone. The housekeeping techniques would have distributed the fibres to other areas, and at a later time the fibres would settle, or be inhaled by employees (respirable), settle on employee's clothes, on machinery, and again be re-suspended when disturbed.

TABLE 3. (WHO, 2005): LIKELY FIBRE CONCENTRATIONS RESULTING FROM DIFFERENT KINDS OF WORK ON ASBESTOS CONTAINING MATERIALS.

Job	Likely fibre concentrations (fibres/mL)
Asbestos cement containing only chrysotile	
Machine sawing with exhaust ventilation (LEV)	Up to 2
Hand sawing asbestos cement with LEV	up to 1
Machine cutting asbestos cement without exhaust ventilation	up to 25
Asbestos insulating board (AIB) containing amosite asbestos	
Careful removal of whole AIB	up to 3
Breaking and ripping out AIB	5 to 20
Hand sawing AIB	5 to 10
Asbestos coating and lagging	
Well-conducted controlled wet stripping using manual tools (unless a dry patch is hit or lagging becomes detached)	up to 1
Well-conducted controlled wet stripping using power tools (unless a dry patch is hit or lagging becomes detached)	up to 10
Stripping pipe or vessel lagging - partially wetted or dry areas present	up to 100

As per the following reference collected from WHO, 2005

> **"Asbestos is a proven human carcinogen as per the International Agency for Research on Cancer (IARC Group 1). No safe level can be proposed for asbestos because a threshold is not known to exist.**

If no safe level can be proposed at this time with regards to asbestos, it is clear that engineering controls and personal protective equipment are the least measures that could be taken to try to prevent against exposure.

As with all Industrial Hygiene procedures, before any personal protective equipment is required to be worn by employees, proper engineering controls must be put in place to ensure that control of the contaminant is taking place at the source.

WHO, 2005 demonstrates the following as measures that should be taken when working with asbestos:

Where reasonably practical to do so:

- ***Enclose the work area and keep it under negative pressure***
- ***Use controlled wet removal methods (e.g. water injections, damping down the surface to be worked on)***
- ***Use a wrap-and- cut method or glove bag technique where appropriate***
- ***Use measures which control the fibres at source for instance, by using type H vacuuming equipment directly attached to tools but failing this, hand held by a second employee right next to the source emitting the fibres (known as shadow vacuuming).***
- ***YOU SHOULD REMEMBER THAT DRY REMOVAL PROCESSES ARE UNACCEPTABLE.***

It was mentioned by employees in the Armature department as well as many other employees during the course of the Intake Clinic and thereafter, as well as in the process section of this report, that dry sweeping by hand was a common method for housekeeping practices in this department as well as other areas of the plant. Furthermore, a powered electrical sweeper would travel along the main aisles of the department and the plant to sweep, thus distributing the fibres within the department was well as other areas of the plant and potentially outdoors.

Moreover, compressed air hoses were used commonly to clean up after work tasks were completed. These air hoses were either used to clean up the workstations, the fibres in any other underlying areas and the employees clothing and body parts as well. This action in and of itself distributes and moves fibres back up into the air space and thus causes even more fibre resurrection rather than removal.

Finally, the employees wore the same clothes to and from work. Given this point in and of itself, the employees would contaminate other areas of the department, the plant itself, the outdoor areas, their means of transportation and their homes and family members as well.

The **International Programme on Chemical Safety for Chrysotile Asbestos** reports a significant amount of data about exposure models, estimates of fibre release during various processes etc. Some of the data is provided directly from the report (IPCS, 1998).

- Workplace concentrations were very high when monitoring first began (in the 1930s).

Friction products

Skidmore & Dufficy (1983), based on simulated past conditions (**Table #4**), and McDonald et al. (1984) reported data on workplace exposures during friction product manufacturing. McDonald et al. (1984) reported that in the 1930s estimated average dust levels were 35-180 mpcm (1-5 mpcf) in 67% of analyzed locations, while in the 1960s average dust levels were below 7 mpcm (0.2 mpcf) at 38% of locations and below 18 mpcm (0.5 mpcf) at 67% of locations in which measurements were obtained.

Table #4. Average concentrations of chrysotile fibres (f/ml) longer > 5 µm from woven Asbestos products during various periods

	Pre-1931	1932-1950	1951-1969	1970-1979
Storage/distribution	&gt20	2-5	2-5	0.5-1
Preparation	&gt20	0-20	2-5	1-2
Impregnation/forming	&gt20	2-5	1-2	0.5-1
Grinding	&gt20	5-10	2-5	0.5-1
Drilling, boring	&gt20	2-5	1-2	1-2
Inspection	&gt20	2-5	1-2	0.5-1
Packing	&gt20	1-2	0.5-1	&lt0.5
Office/laboratory	10-20	&lt0.5	&lt0.5	&lt0.5

From the data in **Table #4** above, it is clear that the fibre concentrations over the years would have decreased from the original time they were first measured. As pre 1931 the levels could not be recorded or tabulated in this report, it is safe to estimate that the fibre levels would have been higher than those in the proceeding decades as stronger prevention and engineering controls methods were being implemented.

Skidmore & Dufficy (1983)

Kimura (1987) reported geometric mean fibre concentrations of 10.2-35.5 f/ml in 1970-1975, and 0.24-5.5 f/ml in 1984-1986 in spinning and grinding of friction products in Japan.

Likewise, the products that were being handled by the GE employees in armature ranged from asbestos boards, to copper coated wires to rolls of copper and asbestos covered wire reels to asbestos blankets for heating, asbestos gloves etc. The products being utilized were manipulated to different shapes, heated, handled by hand, dipped in resins and varnishes, bandsawed, twisted and turned in binding machines and handled on even more intimate levels with regards to placing asbestos wedges between slots of the armatures and stators etc. With all this in mind, being in the same department, the exposure levels would be additive in nature on a daily basis, given that all these process were conducted in the same vicinity. The air blowing, dry sweeping and lack of engineering controls would cause the fibres to disperse to different locations of the building and thus cause bystander exposure to occur as well.

A considerable number of reports have included airborne asbestos concentrations during maintenance and replacement of vehicle brakes. In the early period, poor or no engineering control measures were utilized, resulting in high total dust exposure, especially during grinding of brakes and compressed air blowing off dust, both operations of very short duration. Significantly, lower levels were measured when engineering controls were introduced. An overview of air concentrations measured during maintenance and replacement of asbestos-containing vehicle brakes is presented in **Table #5.**

Table #5. Asbestos air concentrations measured during maintenance and replacement of vehicle brakes

Mean concentration (f/ml)	Comment	Reference
3.8[a]	grinding truck brakes	Lorimer et al., 1976
15.9[a]	blowing off	Lorimer et al., 1976
3.8[a]	grinding	Rohl et al., 1976
16.0[a]	blowing off	Rohl et al., 1976
2.5[a]	dry brushing	Rohl et al., 1976
> 1[a]	17 of 19 operations	Menichini & Marconi, 1982
> 2[a]	11 of 19 operations	Menichini & Marconi, 1982
0.09[b]	fibres longer than 5 µm	Jahn et al., 1985
6.2[a]	blowing off, grinding	Jahn et al., 1985
0.03[b]	fibres longer than 5 µm	Elliehausen, 1985
0.06[b]		Ruhe & Lipscomb, 1985
< 0.5	TWA	Cheng & O'Kelly, 1986
0.13	maximum	Cheng & O'Kelly, 1986
4-5[a]	fibres longer than 5 µm, blowing off, grinding	Rodelsperger et al., 1986
5-10[a]	fibres longer than 5 µm, blowing off, grinding, trucks	Rodelsperger et al., 1986
< 0.05[b]		Kauppinen & Korhonen, 1987
0.01-0.2[b]	trucks and buses	Kauppinen & Korhonen, 1987
> 1[a]	blowing off	Kauppinen & Korhonen, 1987
< 0.004		Sheehy et al., 1987
< 0.004[b]		Godbey et al., 1987
0.09-0.12		Van Wagenen, 1987
0.046[b]		Cooper et al., 1988
0.03[b]	TWA < 0.002 f/ml	Moore, 1988

(Reference from this table can be found embedded in this Ipcs 1998 article and not provided in this report directly.)

[a] These results are mean personal samples obtained by PCOM; fibres ≥ 5 µm; these represent episodic releases and not time-weighted averages; operation specific.

[b] Mean personal air samples (8-h time-weighted average)

Exposure is dependent upon such factors as the extent of control, the nature of the material being manipulated and work practices.

ASBESTOS GLOVES:
Asbestos Blankets and Heating of Large Parts:

As per Bamber, H et al. 1970, controlled-atmosphere testing of the generation of airborne asbestos dusts from protective clothing made of asbestos fibers was conducted. Measured concentrations of fibers indicates that the threshold limit values for asbestos fibers might **be exceeded through wearing of asbestos protective clothing.**

In another study conducted by Samimi et al., 1981, Occupational exposure to asbestos fibers resulting from use of asbestos gloves was simulated. After 10 pairs of asbestos gloves were grouped into well worn and clean (4 pairs) well worn and lightly soiled (3 pairs) and well worn and heavily soiled (1 pair) and brand new (2 pairs) they were compared in an isolation chamber during a simulation - The following was noted:

- Mean Time Weighted Average (TWA) concentration ranged from 0.95 to 11.74 fibers/ cm3 in an isolation chamber. The minimum TWA concentration was 0.61 f/cm3 for well worn heavily soiled gloves and the maximum was 16.5 f/cm3 for well worn clean gloves.
- Well-worn clean gloves emitted significantly more fibers than did brand new gloves
- TWA concentrations of samples collected at the workplace ranged from 2.93 to 0.07 fibres per cm3 for breathing samples and 0.74 – 0.04 fibres for area samples. Five of seven breathing zone samples from the workplace exceeded the proposed TWA concentration limit of 0.1 asbestos fiber/cm3.
- Hand contamination was assessed and it was found that in 4 samples collected after touching a worktable, the values obtained were 9953 to 13108 fibres (greater than 5 micrometers)/cm2 of hand surface area
- Seven samples collected immediately after taking off gloves ranged from 741 to 3860 fibers/cm2.
- The authors strongly suggest an adoption of substitutes, and state that the use of asbestos gloves exposes the user to potentially hazardous concentrations of asbestos.

In another study conducted by Cherrie, JW et al, 2005, exposure and risks from workers wearing asbestos mitts was assessed. The author agrees that in the past, protective mittens made from chrysotile asbestos were commonly used in glass manufacturing and fibers were released from the asbestos mitts while they were being worn. However, in this study, the simulations were carried out specifically with the parameters of glass plant operations, and thus simulations of high localized convective airflows found in glass plants. Hence, although a very commendable study, this simulation is not applicable to employees wearing asbestos gloves in industrial processes with little to no ventilation.

According to the information provided in the process section of this report, asbestos gloves were worn for several processes in the armature department and thus this was another source of exposure.

MICA – CAS Number 12001-26-2: (see Appendix F – for layout of MICA area in Building #5 – 1970's to present)
(Some synonyms: biotite, margarite, muscovite)

Mica is a common mineral found in igneous rocks. It is used for a variety of materials including insulating of electrical components, as was conducted by GE. Mica is an often transparent, odorless solid that separates into flakes or thin sheets (New Jersey Department of Health and Senior Services (NJDHSS), 2002). NIOSH describes Mica (containing less than 1% quartz) as a colorless, odorless, flakes or sheets of hydrous silicates. This chemical affects the respiratory system, with symptoms of exposure including: irritation to the eyes, pneumoconiosis, cough, dyspnea, lassitude and weight loss (NIOSH Pocket Guide- Cas # 12001-26-2).

Information from a July 1976 product data sheet indicates (Appendix S) the mica was made with muscovite bonded with alkyd resins. Furthermore, from the processes section of this report, it was also indicated that shellac was also utilized as a bonding agent for the mica and other processes.

Mica was utilized in the armature department in many different forms: Mica segment plates, mica flakes, glass mica tape for windings. The mica had less than a percentage of crystalline silica in it. There are numerous research reports, which indicate that MICA alone can cause fibrosis in the lungs without the presence of silica. Furthermore, the machining of the mica would have also contributed to exposure as well.

The mica was either bonded with alkyd vinyl resin or shellac for segment plates.

Zinman, C. et al., 2002 cite a case report of possible mica pneumoconiosis and description of pathology in a man exposed for only 1-2 years, 35 years previously. Fibrosis in the presence of mica without evidence of silica was confirmed. This report indicated that mica exposure may result in mica pneumoconiosis.

The New Jersey Department of Health and Senior Services, 2002 indicate that repeated high exposure to the dust can irritate the lungs and may cause lung scarring (fibrosis). This causes an abnormal chest x-ray, cough and shortness of breath.

An MSDS from M-I Drilling Fluids UK Lt. for Mica indicates the following as pertinent information to be outlined herein (see Appendix R):

- MICA content in this 2003 MSDS is between 95-100% with 0-5 % Quartz, Crystalline Silica content. IARC Monographs, Vol. 68, 1997, conclude that there is sufficient evidence that inhaled crystalline silica in the form of quartz or crystobolite from occupational sources causes cancer in human, IARC Classifications Group 1. (Appendix R)

Some more Human Toxicity Excerpts:

ILO, 1971:

- Exposure of workers to MICA powder may cause irritation of the respiratory tract and after several years, nodular fibrotic pneumoconiosis that was long considered a form of silicosis but which may be due to pure MICA dust containing no free silica. Radiological appearance is often close to that of asbestosis.

Ruettner, Jr et al., 1972:

- Mica reduces intrapulmonary transportability compared to granular quartz particles. This results in a diffuse rather than a nodular type of pneumoconiotic fibrosis.

Pimenthel, JC et al., 1978:

- Hepatic and pulmonary granulomas were observed in 2 workers exposed to muscovite dust. Diffuse thickening of interaleveolar septa due to formation of reticulin and collagen fibres and proliferations of fibroblasts and histiocytes were seen.

Mackison, F.W. et al., 1981:

- In a study of 57 workers exposed to mica dust, 5 of 6 workers exposed more than 10 years to concentrations in excess of 25 million particles per cubic foot had pneumoconiosis. The most characteristic finding by chest x-ray was fine granulation of uneven density. The symptoms most frequently reported were chronic cough and dyspnea: complaints of weakness and weight loss were less frequent.

Mackison, F.W. et al, 1981:

- Exposure to mica dust over a period of years may cause scarring of the lungs.
- Pneumoconiosis had been observed in muscovite grinders. Two cases were reported. One after 6 years and the other after 8 years. Both had nodular opacities and in one, these nodules were as large as 1.5 cm diameter at postmortem. In addition, there was diffuse interstitial fibrosis and focal emphysema, but no pleural disease. Both had progressive respiratory impairment and mineralogical analysis revealed birefringent particles that consisted as much as 9% of the dry weight of the lung.

Rom, WN et al. 1992:

- A population of 57 workers involved in the grinding of quartz-free mica, 10 had chest radiographs consistent with pneumoconiosis. Symptoms of cough and dyspnea were related to the severity of lung involvement as determined by the chest radiograph. In another chest radiographic survey of mica miners and workers it was found that 11.4% of those exposed to pure mica had pneumoconiosis.

ACGIH, 1980:

- Mica workers in India with exposure corresponding to 18 years at 20 million particles per cubic foot showed mild pneumoconiosis as evidenced by reading of chest x-rays.

Skulberg, K et al., 1985:

- A total of 66 cases of mica pneumoconiosis in humans have been reported in case studies and in epidemiologic surveys. 26 of the cases indicate that pneumoconiosis may be caused by pure mica alone. In only six cases, the diagnosis was based on clinical examination, radiography and lung biopsy or autopsy results.
- Pure mica appears to be moderately toxic and may cause pneumoconiosis, although as per these authors, a causative relationship was difficult to demonstrate.
- The difficulty is due to long latency period, often-scarce symptoms and co-exposure to other types of dust such as quartz, feldspar and asbestos. Mica may occur in mixed dust pneumoconiosis.

LEAD:

- Carcinogenicity: None of the substances in this product are confirmed as human carcinogens at this time by NTP, IARC, or OSHA. IARC classifies lead and some lead compounds as 2B carcinogens to humans. ACGIH lists lead as "A3", (animal carcinogen with unknown relevance to humans).
- Most of the evidence on the relationship between lead exposure and cancer comes from 8 studies of workers with high levels of occupational exposure to inorganic lead. All 8 studies of highly exposed workers reported results for lung cancer, with 2 showing increased risks at least 50% higher than people not exposed. However, the results were highly dependent on one study where a 3-fold excess risk of lung cancer was found. Workers in the highest risk study had been possibly exposed to arsenic as well as lead in the early years of plant operation. Since arsenic is known to cause lung cancer, it is not clear whether the observed increase in lung cancer is due to lead, arsenic, or the combination of the two. More studies are being done to find out if lead or arsenic is responsible for the increase. Without the one highest risk study, all studies combined estimate the risk of workers exposed to lead at about 14% higher than unexposed persons. Moreover, these studies could not determine whether this increase was due to lead exposure or occurred because the lead-exposed workers tended to smoke more than the comparison groups (Steenland and Boffetta, 2000).
- Eating, drinking, and smoking should not be permitted in areas where solids or liquids containing lead compounds are handled, processed, or stored.
- Lead harms the peripheral nerves causing weakness and sensory disturbances
- Wrist weakness is a common symptom among persons with severe lead poisoning.
- Kidney damage, bone marrow damage, reproductive toxicity gastrointestinal difficulties and bone and joint pain are all related to exposure to lead and it's health effects as per the American Cancer Society: Lead;, 2005)

In terms of the emissions from the lead press, the following findings from OSHA demonstrate the various emission points, from which lead can be released in the workplace thus induce employee exposure: www.osha.gov

- Lead particulate may become airborne due to updrafts created by thermal rise from the surface of the refining kettle during preheating and cleaning.
- Lead fumes or particulate may be emitted from the surface of the molten lead during the transfer of lead to the kettle and from the kettle during melting, adding refining agents, and stirring of molten alloy. Lead emissions may occur while drossing lead kettles.

<u>Fumes from heated Lead Crock Pots:</u>

As per the National Institute for Occupational Safety and Health (NIOSH), human lead exposure occurs when dust and fumes are inhaled and when lead is ingested via lead contaminated hands, food, water, cigarettes and clothing. Lead entering the respiratory and digestive systems is released to the blood and distributed throughout the body. Furthermore, occupational lead exposures allowable under the current OSHA lead standards will not produce the more serious neurologic clinical symptoms, however lead exposure permissible under the OSHA standards may be harmful to the central nervous system. Several studies also report modest increases in blood pressure among workers exposed to concentrations of lead allowable under the OSHA lead standards. The International Agency for Research on Cancer (IARC, 2004) has designated lead as follows:

Inorganic lead compounds are *probably carcinogenic to humans (Group 2A)*.

Organic lead compounds are *not classifiable as to their carcinogenicity to humans (Group 3)*.

The American Conference of Governmental Industrial Hygienists (ACGIH, 1995) has designated lead as an animal carcinogen, indicating that lead has been shown to be carcinogenic in animals.

As per a Ministry of Labour report, dated May 7, 1968, it is indicated in the report that the contents of lead in the pot were not known and if there was more than the said amount of lead being utilized, then the exhaust systems were inadequate and required complete overhaul and improvement. Moreover, the inspector further indicates that housekeeping in the area was poor and the dross bucket "…looked as though it had never been cleaned out." (Appendix U).

Lai, J. et al. 1997 studied the relationship between ambient lead and blood lead among lead battery workers. It was shown that blood lead levels were higher in workers exposed to lead fumes that in workers exposed to lead dust. Both age and hygienic behavior were positively related to blood lead levels. Blood lead levels were affected more by hygienic behavior than by ambient lead levels. The authors conclude that the implementation of proper personal hygiene practices through workers' training may be more effective in lowering blood lead levels than the reduction of ambient lead levels through engineering controls. This study indicated that without proper safety practices in the form of engineering controls of safety behaviors and training, exposure to lead will be likely in the circulations of the work.

VINYL TOLUENE:

Taken from OSHA – Guideline for Vinyl Toluene:
Vinyl toluene is a combustible, colorless liquid with a strong, disagreeable odor (OSHA). Hazardous decomposition products include, toxic gases and vapours such as carbon monoxide and aromatic hydrocarbons. Exposure can occur via inhalation , eye or skin contact.

Effects on Animals: vinyl toluene is an eye, skin and mucous membrane irritant and central nervous system depressant in laboratory animals. Data also suggests that vinyl toluene has fetotoxic and teratogenic potential.

Effects on Humans: this chemical irritates the eyes, skin and mucous membranes in humans. Vinyl toluene induces sister chromatid exchanges and chromosomal aberrations in human lymphocytes in vitro (HSDB, 1986).

ROSIN CORE SOLDER:

Rosin Core Solder was utilized by many employees for the various processes in armature that required soldering. As per NIOSH, exposure to rosin core solder is through inhalation. Symptoms of exposure include, irritation to the eyes, nose, throat, upper respiratory system. Target Organs include: Eyes, respiratory system. **Cancer Site** [nasal cancer; thyroid gland tumors in animals (in presence of Formaldehyde, Acetaldehyde, or Malonaldehyde) taken directly from the NIOSH pocket guide to chemical hazards.]

ROYALENE
(synonym: Trichloroethylene)

Royalene was the trade name utilized for trichloroethylene (TCE), throughout the plant at GE. In the Armature department, royalene was utilized as a degreasing agent. The royalene (TCE) was described as being very toxic by the employees and the vapours were unbearable.

Generally speaking, Trichloroethylene is utilized as a metal degreaser, as a raw material to make other chemicals, as a cleaner in electronics manufacturing and for all sorts of general solvent purposes such as in paints, paint strippers and adhesives (Hazard Evaluation System and Information Service - HESIS, 1997). The TCE was utilized as a degreaser for the armatures and other parts. It was located at #10000 as indicated on the layout in appendix C. The TCE was heated to approximately 200 degrees Fahrenheit as per the employees and the degreasing process was carried out via the TCE vapours. The employee exposures would have been incurred via, dermal uptake and inhalation.

As per the HESIS, 1997 review:

- TCE enters your body when you breathe it's vapours in the air
- Absorption can occur through the skin, via lengthy skin contact, or if skin is cut or cracked
- Overexposure to TCE effects the central nervous system
- TCE causes cancer in mice and there is some evidence that it may also be a weak carcinogen in rats.
- HESIS states that TCE should be treated as a likely cause of human cancer.
- **HESIS also states that one should not rely upon sense of smell as a warning indicator that TCE is present. One's sense of smell becomes dulled after being around TCE for a short period of time. Measuring the amount of solvent in the air is the only reliable way to determine the exposure level.**
- Due to the fact that TCE vapours are heavier than air, they can settle into pockets and depressions (such as open Vats) and reach very dangerous concentrations.
- TCE quickly penetrates most ordinary clothing and can get trapped in gloves, boots and such exposure can cause burns and blistering.
- Extremely high concentrations of TCE or other chlorinated solvents can cause heart fibrillation, which can cause sudden death.

As stated by HESIS, TCE belongs to a large class of organic solvents, of which most share the same set of health effects, and some of which case specific effects. When two or more chemicals have similar health effects, ACGIH states that limits are to be lowered as the exposure then is a combined exposure. Usually when working with solvents, one solvent is not usually the only cause for exposure. Solvents are usually utilized in groups, where you may have TCE, Toluene, Xylene, Benzene, (as was the case here at GE) and many other solvents as exposure sources.

Most experts believe that repeated frequent overexposure to organic solvents in general over months or years can have long lasting and possibly permanent effects on the nervous system (HESIS, 1997).

The employees did not wear any personal protective equipment to protect from exposure to the vapors or possible skin contact. There would have been ample misting, and vapours due to the nature of the degreasing operations. Thus, dermal and respiratory uptake of this contaminant cannot be overlooked.

Published Paper Review on TCE by Wartenberg et al., 2000:

As per Wartenberg et al, 2000, the authors reviewed over 80 published papers and letters on the cancer epidemiology of people exposed to trichloroethylene.

"This literature of over 80 published articles on TCE's carcinogenicity to humans includes more than 20 reports on worker cohorts, more than 40 case-control studies, more than 62 cancer based studies and several commentaries and reviews."

The data by Wartenberg 2000 et al., is consistent with that of IARC and WEISS but suggests more strongly an association of TCE exposure with kidney and liver cancers and support Hodgkin's disease and non-Hodgkin's lymphoma. Moreover, there is support for an association between TCE exposure and Multiple Myeloma and prostate, laryngeal and colon cancers as well (Weiss, NS. 1996).

Evidence of excess cancer incidence among occupational cohorts with the most rigorous exposure assessment is found for: kidney cancer with a relative risk of 1.7, 95% confidence interval 1.1-2.7, liver cancer with a relative risk of 1.9 with a confidence interval of 1.0 -3.4 and non-Hodgkin's lymphoma with a relative risk of 0.5 with a confidence interval of 0.9 -2.3 as well as for cervical cancer, Hodgkin's disease and multiple myeloma. "The authors further state that it is often difficult to isolate one specific solvent as the cancer causing agent, as at most, solvents are usually found in groups in workplaces, rather than just one on its own."

As per the Agency for Toxic Substances and Disease Registry (ATSDR), 2004, the following data is given with regards to TCE exposures:

- Industrial grade trichloroethylene contains small amounts of stabilizers (0.1% by weight) such as Epichlorohydrin, which may increase the irritant effects
- At elevated temperatures, TCE may form more toxic compounds such as phosgene, a serious pulmonary irritant or dichloroacetylene, a neurotoxin.

As per the process section of this report, it was indicated that the temperature at which the Royalene was heated was approximately 200 degrees Fahrenheit.

- The recognition odor threshold for TCE is 110 ppm, which is slightly higher than the current OSHA PEL at 100 ppm – odour is thus an inadequate indication of hazardous concentrations.

Xiao and Levin (2000) report the following with regards to TCE exposure:

- CNS depression, with prenarcotic and narcotic symptoms as well as upper airway, mucous membrane and skin irritation
- Exposure to TCE vapour can lead to facial flushing known as degreaser's flush (Stewart et al., 1974).
- TCE has been reported as a hepatocarcinogen in experimental animals (mice but not rats). Kidney adenocarcinomas, testicular cell tumors, and possibly leukemia were found to be significantly increased in some experimental studies in rats(ATSDR, 1997).
- Data have accumulated which indicate that TCE may be carcinogenic in humans, including cancers of the stomach, liver, prostate and lympho-hematopoietic tissues (Anttila et al., 1995). Astocytic brain tumors have been reported to be associated with TCE exposure in the occupational setting (Heineman et al., 1994).
- **Despite the limited epidemiological evidence indicating carcinogenicity of TCE, the IARC had classified TCE in Group 2A (probably carcinogenic to humans). IARC 1995.**

SOLVENTS AND SOLVENT MIXTURES:

There were a multitude of solvents utilized in the various processes as already described, as well as thinning agents and cleaners. The following documents reflect on the use of solvents as mixtures and the inherent health effects associated with their use ranging from dermatological effects, to CNS damage and cancer.

Maier, H. et al., found the following in their 1997 report:

- A Case control study was reviewed which enrolled 369 patients with carcinomas of the upper aero digestive tract and 1476 randomized control subjects, the relative risk of head and neck cancer in patients exposed to paint, lacquer and varnish was analyzed.
- The relative risk (RR) of squamous cell cancer (after adjustment for possible alcohol and tobacco effects) was significantly increased for the larynx (RR = 2.3) and the oral cavity (RR = 3.6).
- The risk was not increased for the pharynx.
- The authors state that there is evidence that chronic exposure to paint, varnish and lacquer is a definite risk factor for cancer of the upper aero digestive tract. Further studies are required to confirm these findings, and to identify more precisely toxic substances encountered in the workplace.

Lynge et al. 1997 found the following with regards to exposures to solvents:

- There is evidence for increased risks of cancer following exposure to: trichloroethylene (for the liver and biliary tract and for non-Hodgkin's lymphomas); tetrachloroethylene (for the esophagus and cervix, although confounding by smoking and, alcohol, cannot be excluded, and non-Hodgkin's lymphoma); and carbon tetrachloride (lympho-hematopoietic malignancies).
- A causal association between exposure to benzene and an increased risk of leukemia is well-established, as well as a suggested risk of lung and nasopharynx cancer in a Chinese cohort.
- Occupation as a painter has consistently been associated with a 40 percent increased risk of lung cancer. (With the mixed exposures, however, it is not possible to identify the specific causative agent[s].)

Park et al., 1988 state the following:

- Deaths of 200 men and 75 women at an electronics fabrication facility were studied.
- Exposures at this facility included halogenated solvents, epoxy resins, and a variety of polymerizing systems.
- Excesses of pancreatic cancer were identified in both men and women. For the women, excesses of colon and ovarian cancer were also noted.

Xiao and Levin, 2000:

- Long term exposure to solvents had been reported to lead to chronic, irreversible brain damage, with intellectual impairment and decrements in performance, as well as mood disorders, demonstrated by neurobehavioral testing (Hanninen, 1986; Kishi et al, 1993).

- Cortical atrophy following long-term exposure has been described most convincingly following exposure to toluene (Rosenberg et al., 1988; Feldman and McKee, 1993).
- Paint manufacturing workers, chronically exposed to mixed solvents at levels less than the recommended threshold limit value (TLV) have been reported to exhibit poorer neurobehavioral performance and diminished digital sensitivity to vibration (Bleeker et al., 1991).
- Exposure to mixed solvents, such as among painters or lacquerers, has been shown to be associated with increased rates of adverse symptoms and electrophysiological evidence of peripheral nervous system abnormalities seen on nerve conduction testing and electromyography (Baker et al, 1985).
- Symptoms are more likely to appear with prolonged and repeated skin contact as commonly occurs among workers who use solvents for cleaning and degreasing or who wash their hands with solvents to remove glue, plastics or other materials from their skin (Lunberg et al., 1994).

This point is referenced here as this was a common occurrence at GE as the employees would use solvents to clean their skin from the use of glues or varnish or epoxies that had accumulated on their skin, forearms and face. Furthermore, this has been described in the process section of this report as well as the document review section in this report, which is forthcoming. An example of washing with solvents and then eating or lighting up a cigarette is also given in Section #8. An employee's finger had caught on fire, due to the use of the solvent for cleaning purposes, prior to lighting up a cigarette at the workstation. (Appendix U – Document Dated – August 21, 1981.)

With regards to solvents and solvent mixtures, it is pertinent to note that benzene has often been cited to be present in trace amounts in petroleum and aromatic solvents, e.g. toluene. With this in mind, solvents such as TCE, toluene or xylene that were utilized as thinning agents in various processes, as well as cleaning agents, for hands, forearms, and face (as stated by the employees), could have also contained trace amounts of benzene, as the literature indicates. As per OHCOW's fact sheet on Benzene exposure, any future epidemiological observations of cancer risks associated with xylene or toluene would have to take account of suspected effects of benzene impurities (see Appendix N– Fact Sheet on Benzene).

In 1980-1987 – IARC concluded that there was an excess risk of cancer among people in boot and shoe manufacturing (Scarpelli et al., 1993). The strongest evidence cited was for excess risks of nasal cancer and leukemia. On a general scale, this study reveals that some evidence for an excess risk of stomach, bladder and kidney cancer as well as multiple myeloma and non-Hodgkin's lymphoma was found among workers employed in jobs with the highest exposure to solvent. These findings were based on a small number in the cases studied. However with the exception of stomach and bladder cancer, the results were found only in a Florence Cohort. The authors suggest further studies in this area (HUA Fu et al, 1996).

Yu, I., et al., 2004:

The researches studied printing workers and their exposure to solvents. The researchers compared the number of neurological symptoms in exposed and non-exposed workers and how they related to level of exposure as defined by specific job title or by air sampling. The following solvents were included in this study, n-hexane, toluene, isopropyl alcohol and benzene and their effect on neurological and other symptoms. The researchers controlled for age, smoking, alcohol drinking, past exposure history, working hours and shift work. The researchers found that the exposure to solvent mixtures was significantly associated with the total number of neurological symptoms and with the prevalence of specific symptoms of the nervous system and mucous membrane irritation.

Petralia, S.A. et al., 1999 :

The researchers in this study examined the relationship between the risk of pre-menopausal breast cancer and occupational exposure to benzene and polycyclic aromatic hydrocarbons (PAH) and whether the reported relationship between PAH and breast cancer differed by tumor estrogen receptor (ER) status. It was found that risk increased with duration of exposure to benzene but not to PAHs. The findings suggest, " an association between risk and occupational exposure to benzene. The researchers state that caution should be taken in interpreting the data, as limiting factors such as low response rates and small numbers of exposed personnel could affect the results of the study.

Callender, 1995 studied a 31 year old black male engineer who developed severe chronic headache, dizziness, loss of balance, memory loss, fatigue, throat irritation due to exposure to MEK. His job consisted of testing properties of building materials resulting in daily exposure to MEK and fumes from burning fiberglass material. There may have been occasional exposure to peroxides and acetone. Significant central and peripheral nervous impairment was noted as well as nasosinal disturbances that were most likely related to repeated exposure to MEK while at work. A diagnosis was rendered of chronic toxic encephalopathy, peripheral polyneuropathy, vestibular dysfunction, and nasosinusitis.

LIQUID ASPHALT BONDING AGENT – SPEC 1028 COMPOUND TANKS, SPEC 1027 COILS:

The compound tanks and taping operations involved an asphalt varnish application. The actual MSDS were not made available to OHCOW for review however, as per the data in Appendix Q, an investigation was conducted to find the MSDS for SPEC, 1027 and 1028 in order to study the components of the black varnish and how they may have affected the work environment of the armature employees and their health and safety. The varnish was at one point fabricated by GE, Industrial Material Systems, and then was later sold to Von Roll Isola. (Current correspondence information is available in Appendix Q for the readers perusal) Furthermore, a more recent MSDS (not from GE) on a similar product containing Gilsonite, Asphalt and other solvents is included in Appendix R – for review of possible percent concentration of each ingredient.

The Liquid Asphalt varnish was composed of the following ingredients as per the Information obtained (other trace components are mentioned here, however could have been present as well – date of report is 1957):

- **Gilsonite**
- **Asphalt**
- **Toluene**

These are the main ingredients in the Asphalt Varnish products that were utilized at GE as per the data available as per 1957 criteria. Given this information, it is understood that:

GILSONITE:

Gilsonite, or North American Asphaltum is a natural, resinous hydrocarbon found in the Utah Basin in northeastern Utah. This natural asphalt is similar to a hard petroleum asphalt and is often called a natural asphalt, asphaltite, or asphaltum. Gilsonite is soluble in aromatic and aliphatic solvents, as well as petroleum asphalt. Due to its unique compatibility, gilsonite is frequently used to harden softer petroleum products. Gilsonite in mass is a shiny, black substance similar in appearance to the mineral obsidian. It is brittle and can be easily crushed into a dark brown powder.(taken directly from: http://www.zieglerchemcial.com/gilsonite.html.)

As per an MSDS that was collected containing these three components, it is indicated in the reactivity section of the data sheet that heating of this product may release hydrogen sulfide gas (H2S). (See Appendix R)

ASPHALT :

Asphalt is a complex mixture of paraffinic and aromatic hydrocarbons and heterocyclic compounds. Some polyaromatic hydrocarbons (PAH's) constituents are classified as human carcinogens. The complexity of the mixture provides considerable challenge to the development of an occupational exposure limit. **Asphalt based paints are used as protective coatings to prevent corrosion of metals, in lining irrigation canals, water reservoirs, in adhesives, in electrical laminates and wiring. (Law, 2005).**

As per DHHS-NIOSH, 2000 the following information is pertinent to note about Asphalt based paints and their effects on health:

- Asphalt based paints are specialized cutback (liquefied asphalt by addition of diluents) asphalt products that may contain a small amount of lampblack, aluminum flakes, or mineral pigments. These are used as protective coatings in waterproofing operations and in other similar applications (AI, 1990b). They may be applied at or near ambient temperatures by spraying or brushing. (As per the taping operations at GE, they were applied by brushing).
- The Gilsonite and Toluene constituents were utilized in this mixture to meet the desired performance specifications and serve a variety of functions as required by the process as per GE (Roberts et al., 1996)
- Petroleum distillates added to the asphalt can dry the skin, weaken the protective barriers of the skin and facilitates the entry of various contaminants into the body.
- Robinson et al., 1984, reported on the analysis of select polycyclic aromatic compounds (PAC's) in several asphalt based paints using gas chromatography- mass spectroscopy (GC/MS). Benz(a) anthracene, benzo(a)pyrene, benzo(e)pyrene, chrysene and phenanthrene were measured but only trace amount of phenanthrene <0.01% were detected.
- Conflicting results for 2 separate studies were obtained when raw roofing asphalts were applied to the skin of mice. Available data indicate that several formulations of asphalt based paints caused benign and malignant skin tumors in mice (Robinson et al., 1984; Bull et al, 1985) However these paints were not mutagenic in the Ames Salomonella Mutagenicity Assay either with or without metabolic activations (S-9). Several other asphalt based paints were positive in another type of genotoxicity assay i.e. DNA –adduct formulation, which is postulated to be 1 of the steps responsible for mutagenesis and carcinogenesis (Schoket et al., 1989a).

All in all DHHS-NIOSH indicated that the above mentioned studies and others that asphalt based paints in these studies are carconigenic (Robinson et al, 1984; Bull et al., 1985) and exert some genotoxicity (Robinson et al, 1984; Schoket et al, 198 a, b). NIOSH concludes that asphalt based paints are potential occupational carcinogens.

As indicated in the process section of this report, the compound tanks involved heating of the asphalt varnish and the taping operations involved applying the asphalt via brush. Hence, the asphalt was present in two states, as liquid at room temperature, vapour and fume. The burning of the leads, to remove the excess asphalt was required as well to finesse the pieces, and thus emitted fumes as well. (See appendix U for MOL investigation with regards to this process and fume accumulation and employee complaints).

As per DHHS-NIOSH, 2000 the following is stated with regards to Asphalt vapors and fumes:

- When asphalt products are heated, vapors are released: as these vapors cool, they condense. By definition, the condensate is asphalt fume. However due to the fact that the components in the vapor do not condense all at once, workers are exposed not only to asphalt fumes, but also to vapors. (Law, 2005).
- When liquid asphalt products are used at ambient temperature, workers are exposed to the liquid product and the vapors, but not the fumes. Workers may then be exposed through respiratory and

dermal contact. The petroleum distillate added to the asphalt products can dry the skin, weaken the protective barrier of the skin and thus facilitate the entry of various compounds into the body.
- Asphalt fumes generated at high temperatures are probably more likely to generate carcinogenic polycyclic aromatic hydrocarbons (PAHs) than fumes generated at lower temperatures.

Hence during the taping operations, this would have caused the employees to be exposed to the vapors of the black asphalt varnish.

Furthermore, DHHS-NIOSH 2000, explains the following with regards to the cooling of the liquid asphalt after applications:

- As liquid asphalt products harden form the outside surface in, the added diluents slowly evaporate from the outside surface, thus trapping part of the diluents inside the asphalt layer. If these asphalt products are heated even slightly, not only will the same compounds vaporize faster, but higher concentrations of the same compounds will vaporize along with other compounds that do not vaporize appreciably at ambient temperature.

Health Effects:

Zeglio, 1950 published observation of workers who insulated electrical cables and telegraph/telephone lines for a large Italian company:
- Workers exposed to fumes from tanks heated to 120 degrees Celsius complained of coughing and burning in their throats and chests and frequent hoarseness, headaches and nasal discharge
- Workers with longer lengths of employment tended to experience more instances of chronic nasal, pharyngeal and pulmonary symptoms.
- Among the 22 workers evaluated, physical examinations revealed 10 cases of rhinitis, 13 cases of oropharyngitis, 4 cases of laryngitis and 19 cases of bronchitis

It must be noted here that there are several limitations to this study, however, the investigation revealed that there are concerns related to exposure to asphalt fumes and thus their potential health effects.

The limitations as noted were:

- Small sample group
- Lack of comparison group
- Source and composition of the bitumen not elucidated and the potential for confounding exposure to coal tar
- And no measurements of worker exposures

The major route of occupational exposure to asphalt fumes (e.g., paving, roofing, and asphalt-based paints) is by inhalation; they may also be absorbed through the skin (National Toxicology Program, 2005)

(Following information taken from the OHCOW, Occupational Exposure Limits (OEL's) Submission documentation, 2004). Refer to URL: http://www.ohcow.on.ca.

The current Ontario time-weighted average exposure value (TWAEV) for asphalt fumes is set at 5 mg/m3 (total particulate). This can be compared to 0.5 mg/m3 (benzene-soluble fraction) time-weighted average (TWA) set by the American Conference of Governmental Industrial Hygienists (ACGIH). In year 2000, the ACGIH TWA was set at 5 mg/m3; however, it was reduced to 0.5 mg/m3 based on increases in mucous membrane and eye irritation found in studies.

Asphalt is sometimes mistaken for coal tar products due to their similar appearances and applications in the industry. They are, however, inherently quite different. Coal tar is produced through the pyrolysis of plant products; but mostly from coal. They are heavily loaded with PAHs and as a result of health hazard awareness, the use of tar products has been discontinued. Coal tar and coal tar pitch volatiles (CTPV) have been classified as a human carcinogen by the International Agency for Research on Cancer (IARC).

The compositions of asphalts and asphalt fumes and vapours vary depending on temperature, manufacturing process, presence of additives and modifiers, and work practices; it should be no surprise to learn that laboratory generated asphalt fumes that mimic asphalt fumes in the environment are difficult to produce. Asphalt based paints are used as protective coatings to prevent corrosion of metals, in lining irrigation canals, water reservoirs, in adhesives in electrical laminates and wiring. (Law, 2005).

Determining an OEL for asphalt emissions is exceedingly difficult considering the chemical complexity, various methods of application, route of exposure, method of sampling, and the health endpoint at which the limit is to prevent. This is aside from the above mentioned uncertainty of the presence of coal tar products. As per NIOSH, 2000, the chemical composition of vapors and fumes from asphalt products is variable and depends on the crude petroleum source, type of asphalt, temperature and extent of mixing during the manufacturing etc.

1) Many of the larger PAHs (4 to 6 carbon rings), which are considered more "harmful," in asphalt, are removed during the vacuum distillation process; however some types of bitumen will contain higher levels formed during cracking operations, are re-introduced to form different blends. Furthermore, in the early decades, refining would not be conducted as it is conducted today. Hence the possibility of more PAH's should not be overlooked. Without any hygiene data on this matter, from the workplace, it is difficult to access what types and amounts of contaminants were present in the fumes and vapours of the asphalt varnish, in Armature. Although benzopyrenes do not make up a large component in asphalt fumes, there are other polycyclic aromatic compounds such as benz[a]anthracenes that are listed as probable human carcinogens (IARC designation 2A); and methylated chrysenes, pyrenes, and fluoranthenes, which have chemical structures similar to known carcinogens.

2) The temperature at which the asphalt product is being used will affect the composition of emissions. Generally, roofing employs higher temperatures than road paving. As a rule of thumb, increasing temperatures generate more fumes. The compound tanks would have generated fumes when the tanks were opened after processing took place. The employees stated that the fumes were heavy.

3) When petroleum products are heated, vapors escape into the air that later condense to form fumes. Because this process does not occur instantaneously, workers are exposed to both asphalt vapors and fumes. In addition, dermal absorption can also occur. Currently, the methods used for sampling asphalt fumes (particulates) employ a membrane filter that is not useful in collecting vapors (gases). This will underestimate the overall exposure.

4) Acute effects of exposure to asphalt fumes show irritant symptoms of the serous membranes of the conjunctivae (eye irritation) and the mucous membranes of the upper respiratory tract. More recently, studies indicate that some workers involved in paving operations are experiencing lower respiratory effects (e.g. wheezing, coughing and shortness of breath) at 1.0 mg/m3 total particulates and 0.3 mg/m3 benzene-soluble particulates. Both these values are below the current OEL.

The major route of exposure to asphalt fumes is by inhalation, and they may be absorbed through the skin as well. (National Toxicology Program, 1997).

Data regarding the presence of carcinogens in asphalt fumes generated at United States (U.S.)worksites are limited. The occasional detection of B(a)P at worksites and the more frequent detection of B(a)P and other carcinogenic PAC's in laboratory-generated asphalt fumes indicate that under some conditions, known carcinogens are likely to be present. **Asphalt fumes generated at higher temperatures are more likely to generate carcinogenic PAH's and therefore are potentially more hazardous than fumes generated at lower temperatures**.

The exact chemical composition of asphalt depends on the chemical complexity of the original crude petroleum and the manufacturing processes. The proportions of the chemicals that constitute asphalt can vary because of significant differences in crude petroleum from various oil fields and even from various locations within the same oil field. Furthermore, data are limited regarding the presence of carcinogens in asphalt fumes generated at this U.S. worksite. The occasional detection of benzo(a)pyrene, B(a)P in asphalt fumes generated at worksites, as well as the more frequent generated asphalt fumes in laboratories indicate that under some conditions known carcinogens are likely to be present. Asphalt fumes generated at high temperatures are probably more likely to generate carcinogenic polycyclic aromatic hydrocarbons (PAHs) than fumes generated at lower temperatures.

Acute toxic effects on employees from exposure have been reported to include, irritant symptoms such as eye irritation, and nasal and throat irritation. Moreover, skin irritation, rashes, nausea, stomach pain, decreased appetite, headaches and fatigue were also symptoms that have been reported in workers working with asphalt fumes. Furthermore investigation of these nonspecific symptoms is required as per NIOSH.

A few studies reported an association between cancer at sites other than the lungs (e.g. bladder, kidneys, brain and liver) with occupations having potential exposure to asphalt. Since the interpretation of these findings is limited by the study and lack of good exposure data, no association can be made at this time. Further investigation is required.

The available data indicate that although not all asphalt based paint formulations may exert genotoxicty some are genotoxic and carcinogenic in animals. No published data examine the carcinogenic potential of asphalt based paints in humans, but NIOSH concludes that asphalt based paints are potential carcinogens.(NIOSH, 2000).

All in all, this NIOSH investigation concluded,

- Current data are considered insufficient for quantifying the acute and chronic health risks of exposure to asphalt, asphalt based paint or asphalt fumes and vapors. Additional studies of workers exposed to asphalt fumes, vapors and aerosols are needed to better characterize exposure and evaluate the risk of chronic disease, including lung cancer,
- The available data indicated that although not all asphalt based paint formulation may exert genotoxicity, some are genotoxic and carcinogenic in animals. No published data examine the carcinogenic potential of asphalt based paints in humans, but NIOSH concludes that asphalt based paints are potential occupational carcinogens.

All in all, further research needs to be conducted in this area of asphalt paint fumes and human health.

With the presence of other carcinogens in the workplace, it is difficult to determine if asphalt fumes are the culprit in the onset of disease, or if the other carcinogens, such as asbestos, benzene, are to blame.

As per the New Jersey Department of Health and Senior Services the following information is pertinent to note with regards to Asphalt fumes:

Acute health effects of exposure to asphalt fumes:

- Irritation to eyes, nose, throat and lungs
- Irritation of the skin
- Breathing the fumes can cause headache, dizziness and nausea

Chronic Health Effects:

- Asphalt fumes contain substances such as benzo(a)pyrene and Dibenz(a,h)anthracene that are known to cause cancer in humans.
- Long-term contact can cause skin pigment change which is made worse by sunlight exposure
- Very irritating substances may affect the lungs. It is not known whether asphalt fumes cause lung damage.

BENZENE:

Benzene is a designated substance in Ontario. It is known to cause the following health impairments due to chronic exposure such as (taken from OHCOW fact sheet of Benzene, See Appendix N – OHCOW Fact Sheet on Benzene)

- Leukemia
- Anemia
- Lymphoma
- Thrombocytopenia
- Leukopenia
- Chronically exposed workers have a 5-10 fold increase in developing leukemia, which develops after a latent period of 10-15 years.

Benzene is a known human carcinogen. Toxicity is manifested as myelotoxicity resulting in aplastic anemia and leukemia (Synder, et al., 1993).

Though Benzene exposure limits were established by various regulatory agencies, trace amounts can be found in various solvent mixtures such as toluene (appendix N – OHCOW Fact Sheet on Benzene). It has been stated repeatedly that employees dipped their hands in MEK, toluene, xylene (usually in 5 gallon pails) to wipe their hands, face, forearms, of workplace contaminants as well as cleaning equipment. Furthermore, many of the epoxies and other components in the department were also thinned with various solvents, which may have contained trace amount of benzene. Exposure to benzene may have been in the form of dermal as well as respiratory exposure. Furthermore, due to the fact that employees ate at their workstations, ingestion is another form of exposure that cannot be ruled out.

Benzene is an established human carcinogen. It was previously believed that benzene induced acute myelogenous leukemias only, but more recent studies have strongly suggested that other forms of leukemia and lymphomas may be caused by benzene exposure (Lundberg et al., 1994).

Benzene may pose a significant cancer risk at low exposure levels. Exposure to 1 ppm of benzene for 8 hours per day, 5 days per week for a working lifetime of 40 years has been estimated to increase the risk of leukemia by about 70% (Xiao and Levin, 2000). Given this information, the use of solvents in this department and the possible trace amounts in the various thinners that were utilized by the employees for the varnishes, epoxies, degreasers, mek, toluene, xylene etc, would contribute to this statistic and therefore further amplify the exposures of the employees in this department.

Benzene is a human leukemogen, and is among the known cancer causing agents, with the highest volume and broadest distribution (Verma et al., 1999). Infante stated that low level exposure (1 ppm) can cause chromosomal aberrations, which warrant an exposure limit below 1 ppm (Verma et al., 1999).

As per ACC-Chem Laboratories, exposure to benzene occurs primarily through inhalation of vapours, but it can be partially absorbed after skin contact as well. Primary toxic effect, particularly with long term exposures is on the haematological system.

TOLUENE:

Epidemiological studies have shown statistically significant increases in neurobehavioral effects in workers chronically exposed to organic solvents, which include:

- *Fatigue, irritability, memory impairment, personality or mood changes such as emotional instability, diminished impulse control and motivation, impaired intellectual function with decreased concentration ability, memory and learning ability. (Source: National Institute for Occupational Safety and Health (NIOSH), March 1987).*

Toluene is a clear, colorless liquid with an aromatic odour. Companies add toluene to aerosol spray paints, wall paints, lacquers, paint strippers, adhesives, printing ink, spot removers, cosmetics, perfumes and antifreeze. At room temperature, toluene is both volatile and flammable. The odour threshold for toluene in air is low at approximately, 80 parts per billion (ppb). Synonyms for toluene include toluol, methylbenzene, phenylmethane, and methacide (U.S Department of Health and Human Resources, ATSDR, February 2001). Short term exposure may lead to irritation of the eyes and respiratory tract. Long term exposure could lead to Central Nervous System Depression. Toluene, like many organic solvents, is a respiratory tract irritant. Toluene accumulates in adipose tissues, thus persons who are obese tend to retain more toluene than persons of normal weight. (U.S Department of Health and Human Resources, ATSDR, February 2001). It is important to note that signs and symptoms of toluene intoxification typically depend on intensity, duration and frequency of exposure.

- *Biological Fate:*

    a. Inhalation is the primary route of entry, however toluene can be absorbed through ingestion and dermal contact
    b. Peak blood concentration occurs 15 – 30 minutes after inhalation
    c. Rate of absorption after oral ingestion is slower than after inhalation
    d. Toluene has little water solubility and is distributed quickly to highly perfused tissues such as brain, liver and kidney
    e. Toluene's affinity for lipid-rich structures of nervous tissues results in central nervous system toxic effects within minutes.

- *Central Nervous System Effects:*

The principle effect of toluene exposure is CNS depression. Low to moderate levels from long term exposure can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and hearing loss. (U.S Department of Health and Human Resources, ATSDR, February 2001; Benignus, 1981).

    a. The nervous system is the most sensitive to effects of toluene.
    b. Chronically exposed workers have scored lower on tests of cognitive performance than did the unexposed controls.
    c. Toluene effects activity and sleep patterns, performance and learning, electrophysiological and central nervous system,

evaluation, synthesis of data, depression, incoordination, and excitatory effects (concentration dependant), (CCOHS: Health Effects of Toluene, Dec., 2003; Benignus, 1981). In acute cases toluene exposure may result in narcosis and in chronic cases exposure may result in ataxia, encephalopathy (Feldman, 1999).

In terms of acute exposure, several studies have examined the neuropsychiatric effects of acute exposure to toluene vapours. Cerebellar and CNS integrative dysfunction predominate. MRI results reveal a loss of gray- white matter contrast, diffuse supratentorial white matter high-signal lesional and low signal in the basal ganglia and midbrain, in the brains of neuropsychologically impaired toluene abusers. ((U.S Department of Health and Human Resources, ATSDR, February 2001; Benignus, 1981).

ACC-CHEM Laboratories:

- Until recently, commercial grades of toluene were frequently contaminated with benzene concentration of as much as 10-15%. About ¼ of toluene production is converted to benzene for industrial use and the remainder is used to produce solvents.

XYLENE

Xylene is a colorless liquid with a characteristic odour. The odour threshold in adults is 1 ppm. This solvent is most commonly used as a solvent and thinner for paints and varnishes, often in combination with other organic compounds and as a solvent in glues and printing inks. The most common uses and exposures are in the manufacture and application of paints, varnishes, printing inks. Xylene is also known as dimethyl benzene. Xylene's major target organ is the central nervous system (Beasley, 1992). Inhalation of xylene vapours in small amounts may cause headaches, euphoria, lightheaded feeling, dizziness, drowsiness or nausea. With more acute exposure, xylene may cause sleepiness, stumbling, irregular heartbeats, fainting, or even death. Xylene vapour is also mildly irritating to the skin, eyes and lungs. After serious exposure to xylene, symptoms may develop within a few days. Repeated exposure can cause permanent damage to the brain, heart, muscles and kidneys. (ATSDR – Xylene Patient Information, July 1995). Note: **The severity of symptoms is the best measure of the seriousness of exposure** (ATSDR – Xylene Patient Information, July 1995).

- *Biological Fate:*
  a. Inhalation is the common route of entry for several occupational groups.
  b. Skin absorption is not rapid but this is significant due to the frequency of manual work in various occupations.
  c. Xylene in adipose tissue is eliminated slowly due to its high fat/blood partition coefficient. Some accumulation does occur when exposure occurs at levels around 3.9 mmol/m3 for 5 consecutive days for 6 hours per day as per Rihimaki et al., 1979.

- *Central Nervous System Effects:*
  The principle affects of xylene are to the central nervous system. Xylene is a fat solvent that causes Central Nervous System dysfunction and destruction of other tissues.

  a. Local effects include dryness, irritation of the eyes, nose and throat, as well as nausea and anorexia.
  b. The most frequent effects related to the nervous systems are headaches, tiredness, irritability, and impaired performance in tests of simple reaction time, and short term memory. In addition: depression, insomnia, tremors, impaired concentration (CCOHS: Health Effects of Xylene, 2003).
  c. Xylene in high concentrations acts as a narcotic, inducing neuropsychological and neuropsychological dysfunction.
  d. Chronic exposure has been associated with: anemia, chest pain with ECG abnormalities, dyspnea, and CNS symptoms. (Langman, 1994)

ACC-Chem Laboratories state the following with regards to xylene:

- Commercial xylene is a mixture of 3 isomers and it is used in a variety of solvent application for glues, synthetic resins, rubber and paints
- Xylene is a CNS irritant and narcotic and causes performance impairment and cerebella dysfunction after acute exposures

RESEARCH STUDIES

Concomitant exposure to xylene and other solvents including toluene affect hematological parameters, liver size, liver enzymes, auditory memory, visual abstraction and vibration threshold in the toes. (Lingman, 1994). Organic solvents have been associated with peripheral neuropathy, and have been noted to be responsible for toxic neuropathies. In most situations of workplace exposures to concentrations below the TLV, some effects to the human body may occur, particularly with mixed substances (Beasley, 1992). Some individuals may incur eye, nose, and throat irritation, nausea, headache, irritability, lassitude impaired reaction times and impaired short term memory. Moderate exposures lead to dizziness, weakness, tremor, increasing confusion, and possible asymptomatic effects on renal function and hematological parameters.

- Chen and Uchida et al., (1994) note that the combined exposure to toluene and xylene causes an increase in symptoms associated with depression of the central nervous system and local irritation. The observed symptoms are similar to data retrieved on persons individually exposed to xylene or toluene. This suggests that the effects of the combined exposure to both solvents are additive.

- Dudek and Gralewicz et al., (1990) studied the effects of experimental exposure to toluene and xylene at 100 ppm (part per million) or their mixture of 50 ppm each, on the central nervous system. Nine psychological tests were used to measure the changes in the central nervous system function in the 10 volunteers aged 22 to 35. Exposure to xylene proved to cause the most adverse effect in the selected reaction time. Exposure to toluene affected the memory test performance.

- Neuropsychological findings in a non-clinical sample of workers exposed to solvents were studied by Reinvang et al., in 1994. Thirst –six workers were studied who had been exposed to organic solvents for more than 10 years. The workers and control groups were studied with a battery of neuropsychological tests and cognitive tests, where significant differences were observed for the Weschsler Adult Intelligence scale digit span and symbol digit substitution and on paired associate learning and continuous word recognition. The results indicate that long-term work-related exposure to organic solvents may have chronic toxic effects. (Reinvang et al.1994).

- Similarly, Cherry et al., (1985) studied two workforces of 44 men exposed to paint solvents and 52 men working with toluene were compared with age matched comparison groups of non-exposed workers. Scores on a series of performance tests were examined and it was found that the solvent exposed workers functioned less well than their comparison control group. It is very imperative to note that although the solvent exposed workers got lower scores than the solvent free control group, no evidence of impaired nerve conduction in the ulnar or median nerves were apparent. With this in mind, it is very important for medical practitioners to ensure their diagnosis take this into consideration, i.e. not all patients will show actual damage to the brain, nerves, neurological damages etc., but will show poor performance on neuropsychological tests .

- Likewise, Grasso et al, 1984, studied a number of Scandinavian reports, which claim that painters and workers in other trades in which prolonged occupational exposure to organic solvents may occur and develop a type of mental illness, which is described by impairments in memory, coordination and slow deterioration of personality. This conclusion is recognized as a cause of premature retirement and is classed as an occupational disease in certain countries. It is clear that a critical evaluation of the reliability of these methods in detecting minor deviations from normal and their ability to provide acceptable evidence of CNS damage or dysfunction has been proven to be acceptable in investigating personality, intelligence and memory loss in patients exposed to solvents. However, at present it is clearly stated that these test methods are not suitable for epidemiological studies due to the variability of response in normal individuals, which is ill defined. The same conclusion was arrived at with regards to the evaluation of electroencephalography, computerized axial tomography scanning and other physical examinations to the diagnosis of brain changes in groups of solvent exposed workers and non- exposed workers.

- Similarly, Linz et al., 1986, also conclude that neurologic examinations and laboratory screening tests showed no consistent pattern of abnormalities in solvent exposed industrial painters compared to the control group. However, in the evaluation of the psychological tests, short term memory deficits and signs of cognitive disturbances, clinically significant elevation of depression, hysteria and anxiety were detected in the painters versus the non-exposed control groups. Hence, it is very important that diagnosis of solvent exposed workers are carefully examined and thoroughly studied in terms of psychological tests, as the neurological exams and laboratory screening tests should not be relied upon solely without the supporting psychological tests. (Linz et al., 1986). Finally, volunteers that have been exposed to chronic low level exposures to xylene have also shown no signs in certain radiology tests, but have incurred the symptomology related to xylene exposure. Clinical neurological examination and electroencephalogram or brain wave test (EEG) in such subjects have generally been normal although Electroneuromyography (**ENMG**) has been affected, even at concentrations below the mixture TLV (Anshelm Olson, 1982; U.S Department of Health and Human Resources, ATSDR, February 2001).

- Chouaniere and Wild et al. (2002) have discovered that the neurotoxicity of long-term exposure to toluene is known at levels higher than 50 ppm and is suspected at lower levels. A cross sectional study was carried out in two printing plants on 129 workers who were exposed to low levels of toluene. One plant was exposed to 0-18 ppm toluene and the other plant was exposed to 2-27 ppm toluene. The workers were asked to fill out a questionnaire to measure the effects on their neurotoxic symptoms. Neurotoxic symptoms were not significantly correlated with current exposure. However, the conclusive statements made in this study state that low exposure levels to toluene were associated with decrements of memory test performances. Kamjima et al (2000) studied a patient who was a 54 year old man complaining of hyposmia, poor memory, lack of concentration and personality changes. The patient had worked 12 years at a manufacturing plant where he had to coat dashboard lines with xylene and potentially toluene as well. There was no local exhaust ventilation or personal protection that was worn by the employee. The patient was diagnosed with chronic solvent intoxication due to the chronology of symptoms, optic nerve atrophy, and the appearance and distribution of the Magnetic Resonance Imaging lesions.

- Kishi et al. (1993) studied the neurobehavioral changes resulting from chronic low level exposure to organic solvents in industrial painters. The painters were exposed to toluene and xylene and mineral spirits. The prevalence of depression, dizziness and unsteadiness was higher in painters than in the control group. Toluene exposure was significantly correlated with impaired performance on the Santa Ana test, another measure of psychomotor function, visual cognitive function and fatigue on the mood scale.

- In the 1997 World Health Organization, Environmental Criteria Program on chemical Safety for Xylene, it was found that subjective symptoms have been reported among workers exposed to solvent mixtures containing large amounts of xylene. Long term exposure to xylene is suspected to affect the nervous system adversely because chronic toxic encephalopathy and milder functional disturbances of the brain have sometimes been found among exposed painters and other workers. Furthermore, a neurotoxicity study, which involved animals, exposed for 3 months to 160 or 320 ppm xylene showed biochemical evidence of apparently irreversible adverse effect on the nerve cells of the brain even at the lower level. The Task Group considers these findings very important and recommended further confirmatory studies.

Hearing Loss

It has been determined that exposure to solvents also results in hearing loss in some employees, as per studies by Lataye et al, (2000) and Moshe et al. (2002). It is therefore important to bear in mind that noise effects can be exacerbated by non-acoustic agents. Combined effects of noise and solvent exceed the summation of the damage produced by each agent alone.

In one of the studies, an artist who painted large posters with different mixtures of organic solvents including toluene, xylene and methyl ethyl ketone, was diagnosed with having peripheral and central neuropathy including ototoxic hearing loss, as a result of unprotected exposure to organic solvents.

It is interesting to note that toluene may interact with some common medicines such as aspirin and acetaminophen to affect hearing as well. (Sherertz, P., 1998.)

In a recent study conducted by Herkov and Conger, neuropsychological and cognitive assessments were studied and an array of test methods for CNS damage was discussed. Herkov and Conger support neuropsychological testing as a “sensitive measure of cognitive functioning and brain injury.” Numerous test methods are described for various neuropsychological testing. They mention that due to the complexity of brain function and mechanisms for brain damage, there are few conditions that result in a well defined pattern of neuropsychological deficits. They go on to state that “brain injury regardless of the source, leads to impairment in a wide variety of cognitive deficits”.

METHYL ETHYL KETONE (MEK):

Methyl Ethyl Ketone was utilized on a regular basis by employees. It was stated repeatedly that employees would dip their hands into the MEK buckets so they could remove any paints or other chemicals from their hands as well as to remove nail polish for leisure purposes. MEK was also utilized to clean parts and equipment. Employees would dip rags into the buckets and thus be exposed to MEK via dermal uptake.

Alternkirch et al in 1979 studied the neurotoxicity of inhalation exposure to MEK. Rats were exposed for 15 weeks to vapor concentration of 10000 ppm MEK and other solvents such as n-hexane and MEK. The authors found and concluded that the addition of a small amount of MEK to n-hexane in a ratio of 1 to 9 parts, produced marked neurotoxicities, with a short onset time for morphological and clinical signs.

Welch et al. in 1991 studied a case of chronic neuropsychological and neurological impairment following acute exposure to a mixture of toluene and MEK. A 38 year old male laborer had spray painted a truck on 2 separate occasions in an enclosed unventilated 30 by 20 foot space. The paint contained toluene and MEK. Total exposure time was 24 hours. The painter, who wore only a thin fibre mask that covered his mouth and nose, experienced, nausea, headache, dizziness, wheezing and cough after each exposure. It was found that 2 years later, the motor memory and emotional deficits still persisted but stabilized. The authors concluded that the patient suffers from toxic encephalopathy with dementia and cerebellar ataxia resulting from acute exposure to toluene and MEK.

Effects of Methyl Ethyl Ketone, is a significant contributor to CNS Damage. As per the Canadian Centre for Occupational Health and Safety 1997, 3-5 minute exposure to methyl ethyl ketone (MEK) vapours produced slight nose and throat irritation at 100 ppm and definite nose and throat irritation at 350 ppm. Higher exposures are expected to cause central nervous system depression with symptoms such as headache, nausea, dizziness, drowsiness, and confusion. In terms of skin effects repeated or prolonged exposure can cause dermatitis and whitening of the skin (CCOHS: Methyl Ethyl Ketone, Dec, 1997)
Numerous case reports indicate that neurological effects resulting from high exposure to MEK in combination with other solvents is evident. Animal studies have confirmed synergism between MEK and various other solvents. Principle target organs include, the central nervous system, liver and lungs (CCOHS: Health Effects of Methyl Ethyl Ketone, Dec.1997).

METHYL ETHYL KETONE PEROXIDE:

- Organic peroxide
- Colorless, odorless liquid and a strong oxiding agent
- Used as a hardener and curing agent for plastics such as unsaturated polyester and fiberglass resins

Bates et al., 2001:

A 6 year old boy developed respiratory distress, metabolic acidosis; severe esophageal and gastric burns and a coagulopathy after ingestion of an unknown volume of methyl ethyl ketone peroxide in dimethyl phthalate. This case demonstrates the severe effect which this industrial chemical has on systemic and local point of contact with the gastrointestinal tract.

Anonymous, 1977:

- MEK peroxide is known to irritate the eyes and skin
- Chemical burns of the gastrointestinal tract as well as residual scarring and structure of the esophagus were noted in an individual surviving ingestion of 2 ounces of a 60% solution.

As per Dillon Consulting Report for Working Safety with Casting Resins:

- MEKP is known to be a strong irritant to the eyes, nose and throat. Long term exposure have liver and kidney damage. Eye contact can cause permanent blindness with a few drops and ingestion can be fatal.

Please refer to Tab#1 located at the start of Section #6. (information provided by the OHCOW, 1997).

Bisphenol A Diglycidyl Ether (DGEBPA): (see appendix M – MSDS L6277A Weeping Epoxy)

- Basic building block of epoxy resins
- This building block is made by reacting Epichlorohydrin and Bisphenol A (CCOHS, 2004).
- Epoxy resins based on glycidyl ethers are used in protective coating, solvent-less coating, coal tar pitch modified coatings and many others.
- Repeated skin contact can cause allergic skin sensitization in some individuals. Once a person is sensitized, contact with even a small amount causes outbreaks of dermatitis.
- Of all possible polymer combinations, the dimmer has the greatest potential for skin sensitization
- As per National Institute of Health disease associated with this agent is contact dermatitis allergic. (July, 2004).
- Skin irritation and rashes, muscle and joint disorders and central nervous system and respiratory disturbances have been reported in workers exposed to DGEBPA-based epoxy resins, as well as several other potentially harmful chemicals at the same time, Tomizawa, T., 1977).
- Numerous cases of allergic skin reaction have been reported in people occupationally exposed to DGEBPA based epoxy resins. Low-molecular weight resins which contain a high percentage of pure DGEBPA appear to be the true sensitizers (CCOHS – Cheminfo, 2004).

- Incomplete combustion may produce phenolics and possibly also aldehydes, acids and other unidentified toxic organic compounds (Dow Chemical Company, 2004)
- **It is stated on the MSDS sheet that it is necessary to: "…avoid breathing vapors from oven heating or curing when heated to decomposition toxic fumes emitted. No smoking or eating in area of use". (Refer to Appendix K – Document #11- gives more information with regards to the hazards of uncured and cured DGEBA and toxic fumes). It is stated in this document that when this product is heated to very high temperature, toxic vapours would be given off that could be very hazardous. For this reason, the curing process should happen in an enclosed and exhausted space.**

EPOXY RESINS, ENAMELING, VARNISH POTS/HEATED ENAMEL POTS

- As per IARC , **VOL.**: 47 (1989) (p. 329) occupational exposure grouping for a painter is listed under *Group 1: The agent (mixture) is carcinogenic to humans. The exposure circumstance entails exposures that are carcinogenic to humans.*

Because the employees in the Armature department worked with enamels, lacquers and varnishes, the following data and pertinent information is applicable to the workers in the armature department. The information is taken directly from the document cited:

- Thousands of chemical compounds are used in paint products as pigments, extenders, binders, solvents and additives
- Painters are commonly exposed via inhalation to solvents and other volatile paint components
- Dermal contact is the other major source of exposure
- Painters may be exposed to the chemical agents that they or their coworkers use.
- Painters are commonly exposed to solvents, petroleum solvents, toluene, xylene, ketones, alcohols, esters and glycol ethers.
- Benzene was used as a paint solvent in the past but is currently found only in small amounts in some petroleum solvent based paints.
- **IARC indicated that of 3 large cohort studies of painters and collections of national statistics, 20% of all cancers were above the national average and lung cancers were at 40% above the national average.**
- The available evidence on the prevalence of smoking in painters indicated that an excess risk for lung cancer of this magnitude cannot be explained by smoking alone.
- There were also small excesses of esophageous, stomach and bladder cancer as well as leukemia and cancers of the buccal cavity and larynx.

As per the Department of Health Services, 2005 (DHS California), the following is stated with regards to Epoxy Resin Systems:

- Common effects of overexposure to the chemicals used in epoxy resins systems are eye, nose and skin irritation, skin allergies and asthma.
- Finished or hardened epoxy products are practically non-toxic unless they are cut, **sanded or burned**
- The systems are made of epoxy resin and curing agents
- It is exposure to the **uncured resin** components that can be harmful
- Some of the epoxy resins utilized at GE were of the Class A and B type where the resin and curing agent had to be mixed prior to application. Single component systems are stated to be safer as per DHS, as the hazardous chemicals are already partly combined into less toxic polymers (DHS, 2005).
- Epichlorohydrin was a primary component of epoxy resins at least 68% as per NSC, (Epichlorohydrin chemical backgrounder) 2005.
- There are numerous additives that can affect human health in epoxy resins such as curing agents, aliphatic and aromatic amines, diluents, organic solvents and fillers. In order to correctly assess exposures one must look at all the ingredients in the epoxy resin systems, their individual toxicity as well as the additive effects of these ingredients with other toxins in the process and workplace.

- As per DHS, older epoxy resins caused skin cancer in laboratory animals. This may have been the case due to the presence of Epichlorohydrin.
- 2 solvents sometimes found in epoxy resins systems, 2-ethoxyethanol and 2 methoxyethanol cause birth defects in laboratory animals and reduced sperm counts in men. Some glycidyl ethers also damage the testes and cause birth defects in test animals.

Health Effects:

Lung: vapors and spray mists can irritate lungs
Some people can become allergic to curing agents, even dust from sanding or grinding the hardened plastics

Skin: epoxy resins can cause skin irritation as well as sensitization

Eyes/Nose/throat: most epoxy resin system chemicals and their vapours can irritate
eyes, nose and throat. Some individuals can develop headaches and thus irritation (all taken from Department of Health Services, California DHS, 2005)

Nervous System: solvents inhaled or absorbed through the skin can affect the brain as well. Overexposure can lead to nausea, dizziness, slurred speech, confusion and loss of consciousness.

Engineering Controls and Exposure:

It is known through employee interviews and statements, that engineering controls were not present, insufficient or not operative. It is stated by many research reports that certain controls need to be in place to prevent exposure. The exposures, the symptoms, the occupational diseases, along with the lack of controls, the lack of personal protective equipment, the lack of education and administrative controls in terms of personal hygiene, all lead to evidence that exposure would have been incurred to these and other contaminants.

At GE the exposure to epoxy resins would have occurred though inhalation, skin contact, misting, due to the methods in which they were handled, oven fumes and uncured components from the ovens as well. Furthermore dusts from the uncured parts covered with the resin would be another primary source of exposure to epoxy resins, as the parts were often sanded/grinded after being drip dried or baked in the ovens. The "icicles" had to be removed and this is another source of exposure.

Furthermore, many of the solvents and dip tanks which contained epoxy were without lids. As per DHS, 2005, containers and vats of epoxy resins and solvents should be tightly covered to prevent evaporation.

Engineering controls as per DHS, 2005:

- **Do not sand or grind hardened epoxies that contain asbestos fiberglass or silica fillers, as these substances can cause severe lung disease if you breathe their dusts.**

It is known that the epoxies and parts did contain these materials as some of the slots, the sidings in the slots and the wedges were made of asbestos and fiberglass, as well as mica. Hence as the parts were indeed sanded and grinded in unventilated areas, without proper protective equipment, exposures would be incurred.

- **Containers and vats of epoxy resins and solvents should be tightly covered to prevent evaporation.**

As per the process section of this report, it is clear that the containers and tanks containing the solvents and epoxy resins, and varnishes were not covered. When parts were being removed from the VPI tanks, it was clear that the vapours emitted from the parts would have accumulated in the workplace air as well. The parts, due to their large dimensions, took time to be released from the vessels and the ovens, hence without proper ventilation and engineering controls, exposure to those vapours and fumes would have been incurred by all employees, including crane operators and employees on the mezzanine floor.

- **Local exhaust ventilation system is the most effective type of ventilation control.**

As stated in this report, these systems were not in place for most of the decades the department had been in operation, including confirmation from the 1996 report of OHCOW (Appendix L).

- **Heating epoxies during curing or any other process can cause chemicals to evaporate (turn into gas) more quickly. The higher the temperature, the greater the amount of chemical released into the air you breathe. Be sure that adequate ventilation is used when epoxies must be heated or when the curing reaction generates heat.**

In many MOL reports and the statements made by the employees describing the processes in Armature, it was reported the oven seals would often fail and thus not contain the gases coming off the heating epoxy resins in the ovens. Moreover, after the parts were heated/baked, they were taken out of the oven and allowed to dry, be dipped again and the process would continue for several cycles. Throughout this process there was no form of exhaust ventilation present to contain the off gassing from the parts, or the vapours from within the ovens. None of the processes were isolated or enclosed to reduce exposures.

- **When engineering controls cannot sufficiently reduce exposures, a respirator must be worn and a respiratory protection program must be developed.**
- **Protective clothing should also be provided to protect against skin exposure and accidental splashing into the eyes or face etc.**

As per the **MOL report dated June 22, 1973, from L. Bithel** (Appendix U), one example of personal protective equipment provided to employees due to the occurrence of dermatitis in women on the mezzanine floor applying tape, was only in the year, 1973. The years prior to this recommendation, the employees continued to work with unsafe and hazardous conditions.

" …a dermatitis problem appeared recently in this building where, in an open mezzanine area, girls wrap glass tape, which has previously been soaked for 24 hours in aliphatic epoxide/toluene, around copper coils of various types and sizes. Leather gloves were used on the left hand at one machine for tightening up the tapes, but at some operations, gloves were not worn. The epoxy mixture changed formulation recently consisting of cycle aliphatic epoxide, Bisphenol A and octylene glycol."

In order to alleviate the dermatitis issues, management offered Latex gloves. It should be noted that this PPE change was only allotted for the employees in this section of the mezzanine only.

The New Zealand Dermatological Society Incorporated, 2005, states the following with regards to epoxy resins:

- Common two part epoxy resins systems contain epoxy resin, catalysts/curing agents and diluents and/or or other additives. Any of these chemicals on their own may cause irritant and or allergic contact reactions.
- Uncured epoxy resins, hardener and diluents are powerful irritants and potent sensitizers.
- Hardeners and diluents are more volatile than resin and may cause allergic reactions from breathing in fumes. As per The Society of the Plastics Industry, 2001, this fact is supported and they state that glycidyl ethers vaporize more readily than the epoxy resin material and therefore have an increased potential for inhalation exposure. These diluents are also likely to be much stronger sensitizers than the epoxy resins.
- **Cured epoxy resins are seldom a problem but it has been found that measurable amounts of uncured reagents may remain in the cured resin after 1 week**.

CANCER:

As per DHS, 2005, older epoxy resins caused skin cancer in laboratory animals. Epichlorohydrin is the contaminant that is stated to have been the probable cause, as it is a probable human carcinogen. Most new epoxy resins today contain less Epichlorohydrin. Furthermore, Diaminodiphenyl sulfone (DDS) a curing agent in some epoxy resins is carcinogenic in laboratory animals. Most other components of epoxy resin systems have not been adequately tested to determine if they cause cancer.

In terms of Reproductive Effects, DHS states that the various diluents and solvents in epoxy systems may affect reproduction. Two solvents found in epoxy resin systems such as 2-ethoxyethanol and 2-methoxyethanol cause birth defects in laboratory animals and reduced sperm counts in men.

Finally it is imperative to note that heating epoxies during curing or any other process can cause chemicals to evaporate, with higher temperatures releasing more gases (DHS, 2005).
As per Solvay Chemical, 2004:

- Epichlorohydrin is a chemical intermediate used primarily in the manufacture of epoxy resins and synthetic glycerol. It is also used in the production of Epichlorohydrin elastomers, polyamide-Epichlorohydrin resins, water treatment chemicals, and a variety of glycidyl derivatives.

Spectrum Laboratories state the following pertinent information on their MSDS, 2005:

- Marked nose & eye irritation occur only above 100 ppm.
- Epichlorohydrin effects on the skin, eyes, and respiratory tract may be delayed for several hours.
- Epichlorohydrin causes dermatitis.
- Inhalation of Epichlorohydrin causes irritation of the eyes and throat.
- Epichlorohydrin may be released to the atmosphere and in wastewater during its production and use in epoxy resins, glycerin manufacture, as a chemical intermediate in the manufacture of other chemicals, and other uses

Borgstedt, H. and Hine, H describe the following chemistry related aspects of epoxies that are pertinent to mention here to comprehend the toxicity of epoxies and their properties during the various processes in which the employees at GE had to manage the use of the epoxies. (See Appendix W for reference material provided by Borgstedt and Hine). Taken directly from the reference:

- The toxicity and the irritancy of the curing mixture depend on the degree to which curing has progressed
- The toxicity and irritancy of the initial uncured mixture are comparable to those of the individual components, where the fully cured resin is less toxic. However, if the cured resin is subject to dust producing operations, like filing, sanding or drilling, irritation and sensitization may be realized by the operators, especially to the upper respiratory tract.
- **Adequate ventilation is required for the safe handling of the materials during processing**
- The authors quote that there was an "incidence of severe respiratory irritation and mild nephrotoxicity in six laborers who had removed epoxy resin concrete with air hammers." Although the specific offending agent could not be identified, xylene was strongly implicated here.
- The authors quote another study where seborrheic dermatitis was observed in 14 female workers in an electrical equipment plant. The resin was handled repeatedly without protective measures, and the resin –coated assemblies were heated. The cases mostly occurred within a radius of about 10 yards of the work stations where the resins were heat-cured without ventilation and problems also occurred in workers who did not directly handle the materials. Hence it was concluded here that the exposure occurred through vapor exposures. The authors also note that the workers with the seborrheic skin changes were particularly prone to develop pathological skin changes as well.

Furthermore, clinical examinations of 50 workers exposed to varnishes through spray painting operations showed that 70% had ocular pains, 20% had signs of chronic bronchitis and 30 % had moderately positive colloidal seraloability proofs (Spagna et al, 1972). The authors concluded that the high percentage of acetate in the mixtures caused the workers' complaints.

Rosenstock et al, in 1986 found the following concerning exposures to epoxy resins and other additives.

- Epoxy resins appear in high performance paints, adhesives, and coating
- The hardeners used are potent skin and respiratory tract sensitizers leading to contact dermatitis, hay fever and asthma.
- Neutral and synthetic rubber exposures are associated with cancer, skin disease and chemical intoxications resulting from organic sulfur compounds and lead exposure.

Cragle et al, in 1992 investigated the relationship between bladder cancer and other illnesses and epoxy resins.

- The exposed workers studied had experience working with benzene, chromium, radiation trichloroethylene and other chemicals as opposed to the references.
- Statistically significant increases in dizziness, insomnia, numbness or tingling in limbs, rashes and bladder cancer were seen among the exposed workers.
- All of the workers with bladder cancer were current or former smokers and had exposure to epoxy resins.

In another study conducted in 1963, (anonymous authors), it is clearly stated that exposure to wet or uncured resins and the chemicals used to thin, strengthen or harden the epoxy mixture may be particularly hazardous to health.

The National Occupational Health and Safety Commission (NOHSC) of Australia state the following with regards to epoxy resins – 1998:

- Most of the uncured resins are the reaction products of two chemicals, epichlorohydrin and diphenylolpropane
- Acid anhydrides, polyamides and alkyanolamides are less irritating or sensitizing than the aliphatic amines. However due to problems in curing, hardness and flexibility, amines are sometimes added to correct these problems and obtain the right chemical mixture for quality purposes
- NOHSC state, "it seldom happens that the hardener is given its true chemical name on the label, but is usually described as for example, Hardener 3867. It is pertinent to remember that a complete safe resin and hardener had not yet been invented.
- Most liquid amines are volatile and have a pungent odour. Chemically they are highly reactive, being strongly alkaline and soluble in water. Workers who are exposed to these chemicals and who perspire freely are therefore especially susceptible to dermatitis. The risk of dermatitis occurrence is therefore higher in hot weather than in cold weather.

However temperature in the plant is more of importance here than is the weather outdoors. As there was inadequate ventilation in this facility, hot or cold was dependant on the processes at hand and not on the weather.

NOHSC goes further and gives some primary examples of individuals exposed to epoxy resins and the health effects. Taken directly from the document cited (1998):

1. The manager of a brush company developed a rash on the face and eyelids from "fumes: after using epoxy resin experimentally for one day.

2. An employee manufacturing epoxy resin suffered a chemical burn with blistering following an accidental splash; dermatitis subsequently developed.
3. Two employees using epoxy resins in the manufacture of golf club heads developed dermatitis after a few weeks. Previously in the fishing rods department, three men has also been affected by a different hardener.
4. Two men used epoxy resin to glue glass sheets to aluminum sheeting. Both were affected, one man becoming so sensitive that he could no longer enter the room where this process was carried out.
5. Dermatitis of the face occurred due to wiping the sweat from the forehead with the back of a contaminated hand: similarly the genitalia were affected as a result of going to the toilet without first washing hands.

Furthermore it is pertinent to note that primary irritation can occur from direct skin contact with either the resin, the hardener, the mixture or from exposure to the fumes. Sensitization can occur after a few hours , or years through skin contact with either the resin or the hardener or the fumes.

NOSHC states the following about effects to certain body systems:

- Asthma-like reactions to the inhalation of fumes and dust from sawing cured resin have been reported. The cause is the fumes from the uncombined hardener being released from air bubbles set in the cured resin. Upper respiratory irritation has also occurred from inhaling dust and vapours during the removal of epoxy resin concrete.

In terms of workspace and engineering controls the following is recommended by this Australian governmental body, NOSHC, 1988, most of which were not part of the GE structure for its employees:

- Work with epoxy resins should be carried out in an un-congested area of the factory and under conditions of good ventilation. (This was not the case on the upper floor or the lower main floor of the armature department. There was no ventilation provided in any of the areas ranging from the upper floor, to the VPI tanks and the 4 tanks side by side one another over the decades – please refer to the Layouts in the Appendices A-I, to view the workspace in close proximity of all processes to one another).
- In terms of fume controls, NOHSC state that some workers can develop a rash after a very short exposure to the fumes. For small articles, local exhaust systems are recommended for employees. With regards to large articles, as was mostly the case in armature, NOHSC suggests that installation of extensive or elaborate fume control in the areas of the factory should be specially allocated to this type of work load. In some processes they state that it may be advantageous to have the operation totally enclosed and worked by remote control, eliminating possible fume escape.

As per the processes described in Section 5 of this report, it is clear that the above mentioned engineering controls were not part of the work area of the Armature employees at GE. Given these recommendations it is clear that exposure was incurred, due to the nature of the chemicals of these solvents and due to the lack of proper personal protective equipment, lack of proper safety procedures in handling the epoxy systems and other solvents for that matter, lack of proper personal hygiene and education and lack of proper engineering controls.

Without proper personal protective equipment, proper management of the systems utilizing these agents, i.e. the ovens, exhausts etc., the employees would have been exposed to the wet and uncured products of the resins and thus would incur the exposures to their by-products as well as the by-products of the thinners and additives that formed the mixture as a whole. It is clear from the literature and research provided herein and available on epoxy resins, that ample exhaust ventilation should be applied wherein there is the use of epoxy resins systems.

Bray, P., 1999 clearly states that the components in epoxy resin systems include, hardeners, diluents, epoxy acrylates, Epichlorohydrin, and Bisphenol A.
Jolanki et al., 1986

- Over a 10 year period (1974-1983) 1082 cases of occupational skin disease were diagnosed
- Epoxy products caused 71 cases of allergic contact dermatitis, 3 cases of irritant contact dermatitis and 1 contact uticaria.
- All but 3 of the 71 patients with allergic contact dermatitis had contact allergy to Bisphenol A-type epoxy resins.

The authors of this study clearly state that, “Although solid epoxy resins have been considered to be safe from an allergic point of view, 6 cases of allergic contact dermatitis and 3 cases of irritant contact dermatitis were caused by solid epoxy resins.

Bourne, L. et al., 1959:

The authors researched the occupational injuries resulting from exposure to epoxy resins and amine curing agents. This reference is taken, though dated, due to the fact that this reference was available at the time of the existence of the armature department at GE and thus knowledge on epoxy resin systems and their detrimental health effects were also well known within the safety community on a whole (decades ago).

- Exposure to resin/amine systems may cause dermatitis, mucous membrane inflammation, skin allergies, respiratory distress, liver dysfunction or visual disturbances.
- Production of a completely nontoxic resin/amine system is not possible, minimum toxicity is a function of both minimum system component volatility and minimum solubility in skin secretions
- Risk of individual sensitization to resin /amine system components is proportional to integrated exposure.

In this research abstract some obvious engineering controls were recommended here. These controls were not evident in the oven area for the upstairs armature location nor for the downstairs location with regards to ovens, proper ventilation or proper enclosures etc.

- Hot processes should be enclosed (with a special unit if possible)
- The prohibition of smoking or eating at work should be strictly governed
- curing processes should take place in well ventilated chambers with restricted access
- The immediate reporting of all cases of skin contact or injury, the onsite presence of good washing facilities and the thorough cleansing of hands.

Haz Map – Information from the National Institute of Health – July 2004.

- Epoxy resins are associated with occupational asthma and contact dermatitis, allergic dermatitis
- Occupational asthma reported in electronics industry and in paint and glue workers
- Allergic contact dermatitis reported in construction workers, shoemakers, electronics workers, mechanics, printers and textile workers
- "Patients who develop skin allergy to epoxy resins are allergic to the monomers (such as epichlorohydrin and Bisphenol A in about 90% of the cases and to the hardener in the remaining cases."

Anonymous, 1963:
Health hazards associated with the production and industrial use of epoxy resins were reviewed.

- Wet or uncured resins and the chemicals used to thin, strengthen or harden the epoxy mixture may be particularly hazardous to health
- Liquid resins may produce severe eye irritation or dermatitis
- The sensitizing effects of recurrent exposure to epoxies may cause skin disease
- Dermatitis is the ailment that most frequently affects workers who handle epoxy resins and the chemicals used in their manufacture.
- Respiratory and other troubles may result from breathing the vapors, fumes or dusts of various materials used in the process.

Cohen, S. R., 1974:

- Supports the notion that the improper handling of epoxies can lead to a cause effect relationship where symptoms described by workers who handle epoxy resins and exposure to the solvents even below accepted standards can be realized and exposures incurred

Park, R., Silverstein, M et al., 1986.

Excess cancer deaths at an electronics and electromechanical manufacturing facility for aircraft and missile applications prompted a mortality study. Exposures included machining and grinding operations, similar to those described in the Armature department of GE, armature construction, and various assembly operations. Chemical exposures included: Halogenated solvents, cutting fluids, solder fluxes, epoxy resins, cyanoacrylate resins and acrylonitire based resins. From 1965 to 1979 there were 30 deaths from cancer among female workers alone, where 15.5 deaths was the expected value. From 1970 to 1979 there were an excess of deaths to pancreatic cancer in men and women and of colon, stomach and ovarian cancer in women. Exposure to epoxy like materials may have some relationship to the colon cancer among the women and pancreatic cancer in the men.

Jolanki, R. et al., 1996 studied occupational dermatoses from exposure to epoxy resin compounds in a ski factory.

Of 22 workers, occupational allergic contact dermatitis was found in 8 individuals. Six were sensitive to epoxy resins compounds, i.e. epoxy resins, hardeners or diluents, 1 to cobalt in glass-fiber reinforcement and 1 to formaldehyde in a urea –formaldehyde glue and lacquer. Four workers had irritant contact dermatitis from epoxy resin compounds, lacquers, sanding dusts or glass-fibre dust. Three had contact allergy from a new sensitizer, diethyleneglycol diglycidyl ether in a reactive diluent. Immediate transfer of workers sensitized to epoxy resins from epoxy exposure prevents aggravation of their dermatitis.

The ILO, 1995 also makes the following statement concerning resins (epoxies, curing agents, plastics)

- Most contain many poisonous ingredients such as solvents, dyes, stabilizers, fillers, plasticizers, catalysts and monomer residue
- Epoxy resins are normally cured with a phenol compound, and polyesters are cured with a peroxide compound
- Uncured epoxy resins or monomers are very toxic and penetrate the skin and lungs rapidly
- Dust created by shaping, cutting and drilling can be harmful
- Resins can produce a wide variety of highly toxic vapours and gases when heated or burned. Fires caused by burning plastic are sometimes very difficult to control.

Fillers (as per the International Labour Organization – 1985 – taken directly from the source)

Fillers are powders or tiny fibres added to resins to give bulk, strength and form. They are durable and some resist heat, fire and electricity. Asbestos and chromates cause cancer, and fiberglass can cause serious lung problems if breathed in over a period of time. These substances can also be highly irritating to the skin and eyes. They are easily released as harmful dusts when resin products are shaped, sawn or drilled. Avoid breathing and direct contact.

As per The Society of Plastics Industry, 2001: inhalation exposure to fillers such as crystalline silica or fiberglass may result in delayed lung injury.

Examples relevant to GE Armature processes: asbestos, quartz, silica, fiberglass.

The 1971 Explosion:

Taken directly from the Examiner Article and an Employee Testimony (Appendix J – Dated August 1971)

> **"..a chemical reaction in a 2000 gallon VPI pressurized tank cause for a cloud of offensive gas to be emitted …a toxic cloud hovered over the city. When the firefighters came in and poured water on the overheated resin, the tank then exploded and it was a miracle that no one was killed. The smell was putrid. …paint peeled from the steel beams; every tree outside the department on Wolfe street lost it's leaves; paint peeled off houses as far away as Edgewater blvd."**

Products mentioned as per June 11, 1979 document – authored by Ed Hunt – UE Health and Safety Representative– SOLVENTLESS EPOXY VARNISH:

1. Boron Trifluoride Mono Ethylamine
2. Shell Epoxy 826 or Ciba 6005
3. 3M Cardolite NC 513

The author of this report stated the following:

> ***The fire itself would have given off large amounts of these toxic fumes, but that is not to say that our members who had long exposures working in this areas would not show the same health effect as those who were immediately involved with the 1971 fire. …This chemical Boron Trifluoride Mono Ethylamine can certainly be the reason behind the health effects suffered by our member and others as a result of that 1971 fire. (See Appendix K – Document #26.)***

- **It is stated on the MSDS sheet for thixotrophic epoxy sealant - that it is necessary to: "…avoid breathing vapors from oven heating or curing when heated to decomposition toxic fumes emitted. No smoking or eating in area of use. (Refer to Appendix K Document #11 document dated July 17, 1989 – which gives more information with regards to the hazards of uncured and cured DGEBA and toxic fumes. It is stated in this document that when this product is heated to very high temperature, toxic vapours would be given off that could be very hazardous. For this reason, the curing process should happen in an enclosed and exhausted space.**
- **Furthermore, although not clear if the weeping epoxy was present in this fire, it would have been present in other areas such as storage areas. The weeping epoxy MSDS sheet clearly indicates that there are unusual fire and explosion hazards, "Toxic fumes and vapours emitted when heated to decomposition. Butyl Glycidyl ether may be vaporized and hydrogen chloride gas released upon combustion." (See appendix M)**
- **In another MSDS for Hardener for Mexotropic Epoxy Sealant (M-6290-A) of the chemical family Polyamidoamine – it is clearly stated on the MSDS that toxic fumes are emitted when decomposition temperatures are reached. The TLV as per the MSDS is 1 ppm and indicated that when heated or misted, inhalation hazards can occur. Furthermore, it clearly indicated that the chemical should be utilized in a well ventilated area. Avoid skin contact or breathing in vapours. No smoking or eating in areas of use. See Appendix M.**

- **Furthermore there were thinners added to the varnishes as well – for example amongst them toluene, xylene, MEK or MEK peroxide. As per the MSDS for MEK Peroxide, the following is stated: "*…..If Self Accelerating Decomposition Temperature is reached, may release toxic and flammable gases and burst into flames. In fire condition, SADT is approximately 70 Degrees C. Animal studies have shown that MEK peroxide to be tumorigenic. (See appendix M for MSDS).*"**

Given the information above, in general most of the epoxies and the components used to mixed with these resins, such as the curing agents, hardeners etc, are very well described in the MSDS sheets and clearly indicate of the necessary precautions to be taken as well. Heating of the products release vapours that should have been controlled via engineering controls. Furthermore, excessive heating would have emitted toxic vapours that should have been avoided at all costs. Given this information and the fact that the fumes in Armature were not properly handled, exposure to these toxic vapours would have been incurred by the employees and thus occupational health disease would have also been realized as per the evidence.

As per www.mrfibreglass.com, the following is stated with regards to the uncontrolled curing and burning of epoxy and the hazards associated with this process.

- The chemical reaction that cures mixed epoxy is exothermic or heat generating
- If left to cure in a contained mass, such as in a mixing pot, it can generate enough heat to melt plastic, burn your skin or ignite surrounding combustible materials.
- The larger or thicker the epoxy mass the more heat is generated. For example, a 100-gram mass of mixed epoxy can reach 400 degrees Fahrenheit.
- Mixed resin and hardener become hot and frothy as they thermally decompose, generating toxic vapour. These include: Carbon monoxide, oxides of nitrogen, ammonia, possibly some aldehydes and other vapours.
- **Cured epoxy can emit similar vapours if you heat it too much.**

(appendix J has further information from an employee testimony with regards to the Explosion in 1971)

Fibreglass-Reinforced Plastics

Minamoto, K. et al., 2002:

- Patch tests were carried out on 29 workers involved in fibre-reinforced plastics manufacturing in order to investigate the causes of their skin problems.
- Of 22 workers who reported experiencing skin problems, 4 showed reactions to methyl ethyl ketone peroxide, and 2 showed reactions to unsaturated polyester based resin, one to styrene and one to formaldehyde.
- Seven cases were diagnosed as allergic contact dermatitis due to chemicals, three as irritant contact dermatitis due to chemicals and three as dermatitis due to mechanical irritation from glass fibre or dust. Eighteen of the 29 subjects including 2 workers without a history of skin problems were sensitized to at least one chemical.

As per Dillon Consulting Report for Working Safety with Casting Resins:

- Fiberglass is a chemical inert material, however it can cause skin and eye irritation and the inhalation of fibres may irritate the upper respiratory tract. It is not yet known whether there is an increased risk of lung cancer in humans exposed to fiberglass fibres, however the Workers Compensation Board of British Columbia has classified synthetic mineral fibres as a possible human carcinogen.

PHENOLS:

Phenols are used in the manufacture of epoxy and other phenolic resins and as a solvent for petroleum refining. Phenol originated from coal tar or as a degradation product of benzene. Synthetic phenol is made by fusing sodium benzenesulfonate with NaOH or by heating monochlorobenzene with aqueous NaOH under high pressure(Windholz, 1983). The main use of phenol is as a feedstock for phenolics resins, Bisphenol A and caprolactum. It is used in the manufacture of many products including insulation materials, adhesives, lacquers, paint, etc (IARC, 1989).

Short term effects of exposure to phenol include respiratory irritation, headaches and burning eyes. Chronic effects of high exposure included weakness, muscle pain and anorexia, weight loss and fatigue; following dermal exposure included liver damage, diarrhea, dark urine and red blood cell destruction. Skin exposure to a relatively small amount of concentrated phenol has resulted in the death of humans. (ATSDR, 2004).

Phenol can be absorbed through the mucous membranes of the human eye (WHO, 1994). It's cellular uptake is both rapid and passive due to its lipophilic character, and signs of systemic toxicity develop soon after exposure. Phenol's main target organs are the liver and kidney. It may also effect the respiratory and cardiovascular systems.

Merliss, 1972 described muscle pain and weakness of unknown etiology, enlarged liver and elevated serum enzymes (LDH, GOT, GPT) characteristic of liver damage in an individual with intermittent inhalation and dermal exposure to phenol, cresol and xylenol. Baj et al., 1994, examined twenty-two office workers exposed for six months via inhalation to a commercial product containing formaldehyde, phenol and chlorohydrocarbons. At the end of the six month period, the indoor air of the workers contained 1300 ug/m3 of formaldehyde and 800 ug/m3 of phenol The eight workers with the highest concentration of phenol in their urine had decreased erythrocyte and T-helper lymphocyte numbers and increased numbers of eosinophils and monocytes compared to controls. The multiple chemical exposure of this study prevented the author from concluding that these effects are attributable to phenol exposure alone. However, in relation to the exposures and contaminants at GE, this study can be applied as the chemicals studied here were similar to those released over time at the GE plant as well as during the explosion in 1971.

EPICHLOROHYDRIN:

Epichlorohydrin is used in the production of various synthetic materials, including epoxy resins, wet strength resins for the paper industry and water treatment resins. There is widespread use of Epichlorohydrin as a stabilizer (National Sciences Library, 2005)

- About 90% of commercial epoxy resins are prepared by reacting epichlorohydrin with 4,4 isopropylidenedipehenol to obtain a molecule of a desired chain length and molecular weight, (Mathias, C., 1981).
- Epichlorohydrin is classified as a substance that may reasonably be anticipated to be a carcinogen according to US Department of Health and Human Service.
- It is also classified as a carcinogen by the EPA's Toxic Release Inventory (TRI).
- It can produce temporary sterility
- Acute poisoning may lead to respiratory paralysis
- Chronic poisoning may lead to kidney damage

IARC, 1999 has reviewed the carcinogenicity of Epichlorohydrin both in humans and in experimental animals:

Animal Studies:

In rats, papillomas and carcinomas of the fore stomach were induced following oral administration of epichlorohydrin. In an inhalation study, papillomas and carcinomas of the nasal cavity were found. IARC defines epichlorohydrin as the following: Group 2A: The agent (mixture) is probably carcinogenic to humans. The exposure circumstance entails exposures that are probably carcinogenic to humans.

The exposure standards working group is of the view that there is strong evidence from the appropriate animal studies to prove a strong presumption that human exposure to Epichlorohydrin may result in the development of cancer. Epichlorohydrin is classified as a Category 2 Carcinogen, by the Australian Government, NOHSC, 2005).

NIOSH CURRENT INTELLIGENCE BULLETIN 30 OCT. 1978 STATES THE FOLLOWING;

- The National Institute for Occupational Safety and Health (NIOSH) recommends Epichlorohydrin be handled in the workplace as if it were a human carcinogen.
- This recommendation is based primarily on two recent studies: a long term epidemiologic study showing significant increase in respiratory cancer deaths of exposed workers, and an inhalation study showing an increase in nasal carcinomas in rats. In addition, cytogenic studies of human peripheral lymphocytes have shown a highly significant increase in chromosome abnormalities in exposed workers.
- A statistically significant ($p<.05$) increase in deaths due to respiratory cancer has been observed in a long-term epidemiologic study conducted on workers exposed to Epichlorohydrin at two facilities of

the Shell Chemical Company. There were 864 workers identified as having been occupationally exposed to Epichlorohydrin for 6 months or more

- For men estimated to have had moderate to heavy exposure who were followed for 15 years or more, observed deaths were also greater than those expected for the categories of all cancers, leukemia, and suicide, although those differences were not statistically significant. Information was not available for most workers on smoking history, or the extent of exposure to other chemicals.
- In ongoing inhalation studies, rats exposed to Epichlorohydrin have shown a statistically significant increase in nasal cancer ($p < .05$).
- Pending further evaluation of its carcinogenic potential NIOSH believes it would be prudent to minimize occupational exposure to Epichlorohydrin.

The Environmental Protection Agency states the following with regards to the classification and health effects of Epichlorohydrin (EPA, 2004):

- EPA has classified epichlorohydrin as a Group B2 probable human carcinogen.
- Epichlorohydrin may be released to the ambient air during its production and use (EPA, 2005)
- An increased incidence of tumors of the nasal cavity has been observed in rats exposed to epichlorohydrin by inhalation (EPA, 1985).
- EPA states that acute short term exposure to epichlorohydrin in the workplace has caused irritation to the eyes, respiratory tract and skin of workers. At high levels of exposure, nausea, vomiting, cough, labored inflammation of the lung, pulmonary edema and renal lesions may be observed in humans (EPA, 1999; 2005).
- An increased incidence of lung cancer mortality (not statistically significant was reported in one study of workers exposed to Epichlorohydrin (EPA, 2005)
- Chronic occupational exposure of humans to epichlorohydrin in air is associated with high levels of respiratory tract illness and hematological effects (EPA, 2005).

Case Study – Health Hazard Evaluation Report – by NIOSH – 1997:
RE: exposures to resins in a manufacturing company utilizing polyester resins:

NIOSH was approached by employees from the manufacturing company (which manufactures a variety of home decorative items by curing polyester resin in preformed molds) who were concerned about health effects possibly associated with exposure in the resin and finishing departments. The workers had symptoms documented as follows:

1. Chronic cough, burning eyes, severe headaches, and nausea from exposure to airborne contaminants from liquid resin, acetone, stains, lacquers, and sanding dust
2. Skin irritation and burns to the hands and arms from dermal exposure to liquid resin and acetone

Air monitoring was conducted during the manufacturing activities for VOC's, styrene, Stoddard solvent, MEKP, as well as respirable dust and total dust. Personal breathing zone samples were collected when workers were mixing and pouring liquid resins revealed that full shift exposure concentrations to styrene ranged from 15 to 46 parts per million. Some exposures exceeded the ACGIH TLV at 20 ppm and the NIOSH REL of 50 ppm. The short term breathing zone samples for styrene exposure during resin mixing exceeded the ACGIH and NIOSH STEL of 40 ppm and 100 ppm respectively.

It is pertinent to note that at the time of this investigation, manufacturing production was reduced because of the seasonal nature of the company's product line., Workers exposure to styrene vapour will likely increase during the time of the year when the company experiences higher production demands.

It was found that there were ventilation deficiencies with both the local and general exhaust ventilation systems provided for the pouring tables and the mix room. The use of paint booths for dust control was inefficient and only marginally effective in controlling personal breathing zone exposure levels.

Furthermore, although PPE was provided, it was concluded that it was not efficient enough in protecting the workers from the contaminants. More appropriate glove material was required to prevent permeation of the solvents onto the skin of employees.

This in the case of the GE Armature building, given the fact that there was little to no exhaust ventilation for most processes and given that employees seldom wore gloves or respirators in the decades preceding the 1980's and even the 1970's the exposures to the multitudes of solvents during mixing, pouring, application of the resins to the stators and other Armature parts, is evident. Furthermore, the other simultaneous exposures to fumes and vapours from other activities in close proximity to one another would have also contributed to the exposure incurred by the employees in this department.

As per the case study given here. The styrene levels were found to be higher than the ACGIH TLV for example. It must be made clear here that the armature department utilized multitudes of chemicals. Thus the TLVs for the combined effects of exposure would have to be taken into account. Thus overexposure is inevitable to the solvents in the armature department.

"…..**some hazardous substances may act in combination with other workplace exposures, medications, or personal habits of the worker to produce health effects even if occupational exposures are controlled below the limits set by the evaluation criteria. Synergistic and additive effects may not be considered by a chemical – specific evaluation criterion. Furthermore, many substances are appreciably absorbed by direct skin contact potentially increasing the overall exposure and biologic response beyond that expected from inhalation alone. Finally evaluation criterion may change over time as new information on the toxic effects of an agent become available. Because of these reasons it is prudent for an employer to maintain workers exposures well below the established occupational health criteria. " NIOSH, 2000.**

As per the statement above, it is clear that when we study chemicals and their exposures to human and animals, the TLVs overtime change, as we become more and more educated on the health effects of those chemicals/processes. Similarly, as for asbestos and formaldehyde for example, decades ago little was known as to what their health effects were, and today, more and more stringent restrictions are placed on their use in the workplaces and the TLVs that are assigned to them.

WELDING:

There were various types of welding processes that took place within this department as already described in section 5 of this report. welding, brazing, soldering, cutting.

IARC classifies welding fumes in Group 2B – i.e. welding fumes are possibly carcinogenic to humans.

Welding fume is defined as particulate emissions intrinsic to the various welding processes (IARC, 1990).

The health effects of welding exposures are difficult to list due to the fact that the fumes may contain so many different substances that are known to be harmful. The individual components of welding smoke can affect just about any part of the body, including the lungs, heart, kidneys and central nervous system.

Metal fume fever is the most frequently observed acute respiratory illness of welders and may occur during and after welding duties (Antonini, 2003). Martin et al. 1997 reported that oxides of copper, magnesium, tin, or cadmium in welding fumes may cause metal fume fever. The most frequent cancer reported among welders had been of the respiratory system (IARC 1990).

Various conditions in the workplace will effect the variation of welding fume exposure (Wallace et al. 2002).

- Welding in well ventilated areas disperses fumes whereas welding in confined spaces with poor ventilation will result in higher exposure levels
- Work method is another variable – the distance from the source of the emissions and the welder's breathing zone in relation to the fume emitted are important determinants of exposure as well .The welding position which is either flat, vertical, horizontal or overhead and the proximity of the welder to the fume plume affect exposure (Lucas, 2004).
- Welders are highly exposed during the intermittent arcing period. There should be little exposure between the arcing periods, however, they may be influenced by the presence of other welders in the vicinity, effectiveness of control measures and general ventilation.
- Personal protective equipment is required when engineering controls are not suitable or cannot be provided.

Furthermore, as per the Manitoba Labour Workplace Safety and Health June 2000:

- **Humidity can also effect the amount of fume generated, the amount of fume generated increased due to absorption of fluxes.**

As per the National Occupational Health and Safety Commission, 1990 and Carter, 2004 state the following with regards to Welding and degreasers:

- **Ultraviolet rays given off by welding can react with chlorinated hydrocarbon solvents, such as trichloroethylene, methylene chloride and Perchlorethylene to form phosgene gas. Even a very small amount of phosgene may be deadly although early symptoms of exposure usually take 5-6 hours to appear. Irritation of the respiratory tract and/or serious lung damage may occur. Arc welding should never be performed within 200 feet of degreasing equipment or solvents.**

- **Long-Term Health Effects:**
  - **Studies of welders, flame cutters and burners have shown that welders have an increased risk of lung cancer, and possibly cancer of the larynx (voice box) and urinary tract.**
  - **Welders may also experience a variety of chronic respiratory lung problems including bronchitis, asthma, pneumonia, emphysema, pneumoconiosis, decreased lung capacity, silicosis and siderosis, ulcers, gastritis, as well as reproductive risks.**
  - **Welders who perform welding or cutting on surfaces covered with asbestos insulation are at a risk of asbestosis, lung cancer, mesothelioma and other asbestos related diseases.**

Mydin and Semple, 2005 concluded in a recent study with regards to validation of a model to estimate welding fume: there is increasing evidence of an association between welding activity and chronic diseases such as neurological disease, lung cancers and reproductive effects.

A report provided by Gary Liss of the Ontario Ministry of Labour in 1996 was reviewed. The following information taken from the report is pertinent to mention here:

- The welding environment is very complex with the presence of numerous gases and particulate components. These constituents of welding fumes and gases can be classified into those intrinsic and those outside or extraneous to the process (e.g. bystander exposure to asbestos)
- Liss also states that there is now more evidence for acute short term changes in pulmonary function among welders that appears to be associated with higher exposure to absence of ventilation systems.
- Some but not all studies continue to demonstrate an increased prevalence of symptoms among welders compared to controls. While non- smokers were affected in some studies, there was some evidence for an interaction with someone with greater effects seen among smokers.
- Most of the studies reported in 1984 and thereafter are consistent in that they continue to document a moderate 30-40 % increase in lung cancer risk among welders, however the findings are not consistent.

Liss concluded in his 1996 report: "there continues to be evidence that prolonged exposure to welding fumes and gases that existed under past and perhaps current conditions may be associated with both acute and chronic health problems in welders. Several of these associations represent outcomes for which evidence had not been present in 1985." Liss concluded that because welders compose at present an important proportion of the workforce and may suffer inordinately from certain relatively common conditions such as pneumonia, and possibly lung cancer and other diseases as well as conditions specific to welding, such as MFF and acute cross shift pulmonary reactions, this should be considered an important health problem.

In a Danish study of never-smoking welders, (Lyngenbo, O et al., 1989), the following was observed:

74 high exposed welders and 31 age matched electricians were examined. None had ever smoked or been exposed to known noxious agents to the lungs. A significant difference was found between the welders and the control group in vital capacity, total lung capacity, forced expiratory volume in one second, peak

expiratory flow rate. The lungs of welders were physiologically 10-15 years older than those of the control group. 30% of welders had a well defined respiratory disease.

Furthermore, as per CCOHS, 2001 the following are also pertinent factors which effect health in terms of exposures to welding fumes. Often times the parts in armature that were welded, soldered, or brazed, were coated already with either epoxy resins, vapours, insulation such as asbestos or fibreglass, or other solvents (solvents utilized to clean or prepare the part for welding, or cleaned with alcohols prior to being machined). As per CCOHS:

- Vapours or fumes can come from coatings and residues on metal being welded. Some ingredients in coating can have toxic effects. These include:
  - Metal working fluids such as oils and rust inhibitors
  - Cadmium plating
  - Vapours from paints and solvents
  - Lead- oxide primer paints
  - Some plastic coatings
  - Epoxies.

CCOHS recommends the removal of coatings prior to welding. However the processes in armature were not such that the epoxies, varnishes, solvents, asbestos etc, could be removed prior to welding. This would not have been possible. Hence exposure to the toxic effects of welding on coated parts would be incurred by employees. If coatings are not removed, the following thermal breakdown of coatings in the form of gases are released:

- Polyurethane coatings produce hydrogen cyanide, formaldehyde, carbon dioxide, carbon monoxide, oxides of nitrogen and isocyanate vapours
- Epoxy coating can produce carbon dioxide and carbon monoxide
- Vinyl paints can produce hydrogen chloride

Welding gases are produced from welding and cutting processes which include:

- Carbon dioxide from decomposition of fluxes
- Carbon monoxide from the breakdown of carbon dioxide shielding gas in arc welding
- Hydrogen chloride and phosgene produced by the reaction between ultraviolet light and the vapours from chlorinated hydrocarbon degreasing solvents such as TCE.

The International Labour Office, 1998 lists the following as long term health effects in welders:

- Respiratory tract infections
- Pneumoconiosis

- Liver, nasal, sinonasal, stomach and lung cancers
- Respiratory disease from high concentrations of carbon dioxide and related oxygen deficient atmospheres

Furthermore, as per the Manitoba Labour Workplace Safety and Health June 2000 (taken directly from the report):

Of the gases emitted, ozone is also emitted during welding and is classified as pulmonary irritation and can cause pulmonary edema. In addition, nitrogen oxides are formed from the heating of atmospheric oxygen and nitrogen. The oxide usually consists of nitrogen dioxide and nitric oxide. Nitrogen dioxide is irritating to the eyes, nose and throat at low concentrations (10-20 ppm) and at higher concentrations results in pulmonary edema. Furthermore, hydrogen chloride and phosgene are produced by the reaction between ultraviolet light and vapours from chlorinated hydrocarbon degreasing solvents. Both of these gases irritate and can damage the respiratory system.

As per IARC, 1990, the following is stated with regards to welding and welding of stainless steel materials, which did take place here at GE.

- Fumes from the welding of stainless-steel and other alloys contain nickel compounds and chromium{VI} and {III}. Welders who weld painted mild steel can also be exposed to a range of organic compounds produced by pyrolysis. Welders, especially in shipyards, may also be exposed to asbestos dust.
- Welding fumes are retained in the lungs.
- Elevated concentrations of chromium and nickel are seen in blood and urine, primarily in manual metal arc stainless-steel welders.
- Airway irritation and metal fume fever are the commonest acute effects of welding fumes.
- 10 out of 12 case-control studies showed an association between lung cancer and exposure or employment as a welder. (IARC, 1990).
- Highest exposures to chromium {VI} may occur during chromate production, welding, chrome pigment manufacture, etc.

As per Behrman, 1997, welders are exposed to a wide range of metals and non-metals with varying and sometimes additive toxic effects. The following exposures must be taken into account when assessing exposures in the GE Armature employees.

Taken from Behrman, 1997: Table #6: Welders and Exposures

EXPOSURE	SOURCE	ACUTE EFFECTS	CHRONIC EFFECTS
Iron oxide	Steel welding	Metal fume fever (MFF)	Siderosis
Zinc oxide	Galvanized steel	MFF	Bronchitis, dermatisis
Chromate	Stainless steel welding	Bronchitis, mucosal irritation	Carcinogenesis
Cadmium	Solder, welding rods	Pneumonitis, renal failure	Renal, liver dysfunction
Lead	Brazing, soldering, welding	CNS toxicity, Renal failure, gastroenteritis	CNS Toxicity, anemia, Neuropathy
Asbestos	Product being welded	Asbestosis	Lung cancer, mesothelioma

As per DHS, 1992, the following is stated with regards to Hexavalent Chromium.

- Hexavalent chromium causes lung cancer in humans. The EPA and ATSDR indicate that the risk of lung cancer to exposed workers is extremely high.
- Hexavalent chromium can irritate the nose, throat and lungs. Repeated or prolonged exposure can damage the mucous membranes of the nasal passages and cause ulcers to form. It is also very irritating to the skin. Ulcers can form as well as sensitization.
- Welding on stainless steel without adequate control measures can lead to exposure at least several times above the legal exposure limit.

High Potential Testing:

This process also caused emissions of ozone. The employees on the mezzanine levels indicate that during high potential testing, the fumes from the processes below would rise and irritate their nose, throat and eyes.

OZONE:

As per the New Jersey Department of Health and Senior Services Hazardous Substance Fact Sheet, the following is pertinent to note with regards to ozone.

- OSHA exposure limit is 0.1 ppm for an 8 hour work shift
- Breathing ozone can irritate the nose and throat – as well as irritate the lungs causing coughing and/shortness of breath. Higher exposures can cause a build-up of fluid in the lungs
- Repeated exposures may cause lung damage. Ozone may cause mutation in the cells – i.e. genetic changes.
- As per CCOHS, severe or permanent lung injury or death could result from even a very short term exposure to relatively low concentrations.
- **A small number of studies examining long term occupational exposures to ozone have reported headache, irritation of the nose and throat, chest constriction and lung congestion in exposed workers. Human population studies indicate the people living in communities with high background ozone levels have experienced a greater decrease in lung function over 5 years than people living in communities with lower background levels**.(CCOHS, 1998.)
- **More importantly as per CCOHS, 1998** – ozone exposures may influence clearance of other hazardous substances from the lung. Individuals with asthma were reported to be sensitized to the effect of the other irritants when pre-exposed to 0.12 ppm ozone for 1 hour. **Animal studies have shown that rats exposed to ozone prior to an exposure to asbestos had significantly more asbestos in their lungs one month later than animals not exposed to ozone.**

FIBREGLASS:

Fibreglass has been reviewed by many independent researchers and regulatory bodies for over 15 years. The concept of fibreglass and its capability to harm human health remains unsolved as there are thousands of employees who have worked with some form of fiberglass or presently working with fiberglass and have incurred occupational diseases that may be attributed to their exposure to fiberglass or fiberglass reinforced products.

A. DEFINITION AND CLASSIFICATION:

The definition of fiberglass in and of itself is confusing, as different regulatory bodies have varying definitions, some of which are clearly defined, others which overlap within those definitions. Comparisons between standards or regulations become confusing and trying to identify compliance becomes a challenge when the classifications are not clearly defined (Siemiatycki, J et al, 2004; OHS, 2001). Most of the categories include a broad range of fibre types, with different physical and chemical properties, and indeed some of the characteristics overlap between categories (OSH, 2001).

Many manufacturing sites, which OHCOW is currently servicing, have exhibited signs of health deterioration with regards to the respiratory system and an association with fiberglass and fibreglass reinforced plastics.

Several clients who have used and are using fibreglass as a primary or secondary component in the equipment they fabricate, state that there are a number of methods utilized in which fiberglass is actually manufactured, coated, sealed etc. Fibreglass sheets, pieces, boards, components can be coated with resins that contain benzene, silica and other harmful ingredients that are worth mentioning here and are definitely contributors to ill health amongst our workers. Fibreglass reinforced plastics are coated with resins which contain polyester, or epoxies or both can prove to be hazardous to human health, especially if the fibres are respirable or inhalable to some degree (Government of South Australia, GS8, 2000). **Fibres may act as carriers of chemical carcinogens to the target organ (taken from IARC, 1996).**

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OCCUPATIONAL ASTHMA:

Occupational Asthma has been noted to be common amongst a variety of contaminants discussed, i.e. such as epoxy dust, styrene, TETA, welding fumes. Occupational asthma cannot be overlooked when assessing exposures incurred by the employees of the armature department.

In summary, as per the National Library of Medicine – Haz Map, 2003 information relating to Occupational Exposure to Hazardous Agents, the following is stated with regards to Chemicals contributing to Occupational Asthma:

- Workers handling shellac – due to the presence of ethylenediamine
- Workers handling or using epoxy adhesives, and resins, due to the presence of pryomellitic dianhydrise, tetrachlorophthalic anhydride, trimellitic anhydride
- Workers using rosin core solder (as indicated in section 5 of this report)
- Workers exposed to styrene
- Workers exposed to Urea formaldehyde

Hence although already mentioned in the various chemical analysis herein Occupational Asthma is one of the many diseases that should not be overlooked in the diagnosis of the employees that worked in this department.

7.0 DOCUMENT REVIEW

Some select Material Safety Data Sheets have been made available to OHCOW for review. The data sheets clearly indicate the precautions that were necessary to ensure that impaired health will not result from the use of the product. These are included here for the reason of proof of existence and reference for the reader.

L6277 – Weeping Solvent (Appendix M) Contains – 60-100% Bisphenol A Diglycidyl Ether and 10-30 % Butyl Glycidyl Ether

The precautions with regards to use of this product indicate the sensitization can occur through contact or inhalation. Prolonged or repeated contact may cause dermatitis and some individuals may become sensitized. Furthermore, the hazardous decomposition products are also listed which include ketones, chlorinated hydrocarbons and unidentified organics.

Various other Material Safety Data sheets are available for the reader's perusal as well (however they have not all been listed here – refer to the Appendix – M).

A Patient File:

In addition to information already provided here as evidence, another document, related to a Patient's record (former GE employee) has been included in the following tab. Although the patient information is not included, the additional information with regards to the employees' specific workplace exposures and a literature review is provided here. This patient worked in Building 10, which was one of the areas in which the armature employees worked as well, and the data herein is relevant to the armature employees. This information further illustrates and provides evidence that Isonel 51 contained formaldehyde. Moreover, it further investigates the relation of exposure to organic solvents and lymphoma's and Hodgkin's disease. Please see tab attached.

Tab #2

RESIN APPLICATION:

Appendix K Document # 1:
Field Visit Report (FVR)
From: R.Fliegl, P.Eng
Date of Report: July 4, 1974
GE Contact: Mr. Dan Abel - Specialist, Safety

This report gives a very detailed view on some of the unsafe applications of solvent to the stator parts in the armature department. Although stated in this Field Visit Report that the process was no longer going to be implemented, there is no follow up report that indicates that this process ceased. The MOL inspector does not indicate that a follow up visit will be made to ensure that the process was indeed terminated, nor does this inspector put in any recommendations or orders to cease the processes that were taking place. The process is well-described in the report and available to view in the Appendix K.

"…the stators are up to 15' in diameter and up to 3' wide. The method of coating involved lying the stator on blocks within a large diameter drip tray then pumping the reduced polymer through a hose onto the copper coils. In order to carry out the operations the workman stands inside the stator and directs the output of the hose. The operation takes approximately 1 hour per day and is carried out for three successive days for each stator. Consumption of the polyester resins is about 1 – 2 gallons per application."

Here is an excerpt of the seriousness of the issue at hand and the unsafe conditions in which employees were to work when coating the large parts. Although the process might have been terminated on the date of the visit, retrospectively, the exposures incurred cannot be overlooked at this time, concerning the exposures which may have resulted due to these types of unsafe procedures. Comments made by the inspector were as follows:

> **"….the method of coating the large stators tends to place the operators in the midst of potentially high levels of solvent concentrations. Although exposure is for a very short period, such levels could be hazardous to health."**

As per www.mrfibreglass.com, a producer of epoxy resins and writer for the safety guidelines in the use of these type of products, the following is stated with regards to some of the processes that had been taking place as per the previous MOL report above.

- Spraying increases the amount of hazardous volatile components released from the epoxy
- Using solvents to thin the epoxy for spraying add to the health and safety risks
- As epoxy leaves the nozzle, it is reduced to tiny droplets which can be inhaled and cause extensive damage to the lungs and other health problems, such as skin sensitization and allergic reactions.

Although a hose or brush were utilized for application of the varnished to the large parts, the misting and splashing effects could have been realized from these tasks as well.

Another form of evidence about application of varnish to the parts produced in Armature is given below. In this example, the armature employees are occupying Building # 10.

Appendix K Document # 2:
Union Handwritten Notes
Date of Report: February 25, 1981 at 2200 hrs.

This document provides evidence of exposure to varnish, improper ventilation, improper PPE, reactions to skin and eyes after 20 minutes of exposure, large surface areas (therefore larger amounts of evaporation of the contaminants into the environment). In point form taken directly from the notes:

- **Large armature being flooded inside oven in #10 Building**
- **Xylol thinners used to thin Isonel varnish**
- **Two people work inside oven enclosure as a rule**
- **At this time, chemical cartridge masks are worn but not good enough since both employees complaining of skin reactions and visible swollen eyes after 20 minutes of exposure**
- **Probably styrene fumes given off when flooding reached part when varnish begins to kick over (activated to make it safe)**
- **Large area of evaporation involved with large fan under armature, pumps to move liquid Isonel and large surface area of armature all tend to create severe problem**

This process refers to the portable oven operations that have been described in the process section of the report, which utilized the asbestos blankets. In this document, there is evidence that the varnish is applied, or flooded onto the parts in an open oven, without proper ventilation. The varnish vapours are released as the surface areas of the parts are large and the application takes time.

The first document of evidence in Appendix K (Document #1) shows evidence that the MOL stated in 1974 that the method of application of the varnish to the stators would be stopped. However, as per Document #2 – which is a 1981 document, 7 years later, it is clear that the process was never discontinued.

Referenced below is another document which provides evidence with regards to mishandling of epoxies in the workplace which can also lead to over exposure to epoxies and their components.

Appendix K Document # 3
Union Handwritten Notes
Date of Report: February 24, 1981 (day before)

RE: EPOXY 5918 (POLYESTER)

Relevant evidence from the document is recorded herein in bullet form:

- 42 kits were scheduled to go into big oven when proper ventilation would take care of fumes
- This was supposed to be done between 4:30 pm and 8:00 am on February 23, 1981 but for some reason they were not put in the large oven but rather in the small north oven, which had no ventilation. The oven was loaded at 0600 hours on February 24, 1981.

- The fumes of styrene were so strong that people in the area refused to work until the air was cleaned up.

Another example of products being written off and being reused in the plant is given in the document provided below – please refer to the appendix K for details in this document:

Appendix K – Document #4 -Dated – March 29, 1988. Rob Baker, Plant Engineering. – please note the M6860 Epoxy referred to contained Tertiary Butyl Styrene (TBS) to enhance viscosity.

Appendix K -Document #5 -Dated: January 13, 1988 – RE: VPI Resin and Vinyl Toluene – this document refers to the consideration of an new resin – A50A469 which contains 13 % vinyl toluene. As per the document, it indicates that the management of this resin would be far more intense than the current resins in use. A Plant in Schenectady was visited where this resin was utilized and employees were complaining of fumes, the smell and headaches all the way to heart related symptoms.

Appendix K Document # 6:
Union Handwritten Notes – Re: Medical conditions of employee on Mezzanine floor working with Epoxy and fiberglass
Date of Report: October 29, 1979.

Employee suffering from reactions to epoxy and fiberglass. Eyes are swollen shut and whitish pimples developing all over skin.

Appendix K Document # 7:
Union Handwritten Notes – Re: Mercury spill in Armature
Date of Report: November 1, 1979.

This report indicates that employees were exposed to Mercury during a rupture of a gauge near #2 VPI Tank. The Mercury spill was not handled immediately and employees in the area were being exposed to the mercury at the time.

Another example of mishandling of epoxies and solvents in armature:

Appendix K Document # 8
Union Notes: Accident Report
Date of Report: June 5, 1981

Accident details are listed as per below:

- Employee was utilizing epoxy melting pot
- Was using 1500 toluol thinner in regular job application
- Soaked rag was in his hands
- Attempted to wipe excess epoxy off the outside of the melting pot

- Holes above the switch on the side of the pot are open to red hot elements
- Vapours ignited burning both hands and forearms

Appendix K Document # 9
Letter Dated March 10, 1986
From: Materials and Technical Systems Department

This report is written with regards to potential health and environmental hazards associated by the use of resins contaminating tertiary butyl-styrene and vinyl toluene in the VPI process in Building #7: This document alone demonstrates the different activities with the VPI tanks where possible exposure to resin could be incurred by armature employees. The document is written by officials of the Materials and Technical Systems department and thus should have held much weight for Armature management at the time.

The summary is as follows:

1- employee exposure to reactive diluent vapours such as vinyl toluene and tertiary butyl styrene may occur in the building during the following operations/at the following times:
  - **when resin is present in the process tanks and lids are opened**
  - **during removal of stators from the tank and set up in the curing vat**
  - **while stators remain on the curing tray prior to transfer to ovens**
  - **during manual touch-up of stators on the curing tray**
  - **during maintenance or cleaning of process tanks, storage tanks or pipes linking these tanks**
  - **when removing bungs from drums containing resins, or reactive diluent in pure form.**

The list continues, however the document is incomplete, as the remainder of the document was not made available to OHCOW. However the amount of information present here is paramount in the evidence and justification required to assure that the points and analysis made in this REP are substantiated with this document in terms of exposure to the resins at different points of handling the materials that would be submersed in the tanks, or taken out etc.

This document takes away any doubt that exposure would only occur at one or no point in the process. Exposure to solvents, their decomposition products, their fillers, diluents, would have been incurred in each and every plausible step or manipulation in the system when dealing with these processes whether it be heating, baking, dipping, curing, hung to dry, to be grinded, or sanded etc.

Appendix K Document # 10:
Meeting Minutes Those present – W. Broadworth et al.
Date of Report: August 14, 1986

This document outlines clearly the historical use of TBS

> **"…we have been using A50A311 VPI Resin since approximately 1974. In September 1974, 7% Tertiary Butyl Styrene (TBS) was added to the resin to reduce the resin viscosity. This addition has been approved by Corporate Health and Safety….Development work is underway on two candidate VPI resins that might replace the current material. Both resins contain significant amounts of Vinyl Toluene.**

Appendix K Document # 11
Re: Epoxy L-5105 and L-7067
From: Kim Perrotta – H&S National Representative
Date of Report: July 17, 1989

This report brings to light some very pertinent issues with regards to mishandling of epoxies in the plant as well as evidence with regards to the presence of silica as a filler, and Boron tri-fluoride mono-ethyl-amine.

It is pertinent to note here that in this letter, the writer indicated that the paste is uncured when first used, and hardens because of the curing agent, upon heating.

Given the process and procedure information we have with regards to the application of resin to the part, either through dipping or application through hoses, close proximity to the resins has already been established. Employees were exposed to the resins, and their vapours, as well, and through dermal contact, either through spills, splashes, or handling. Furthermore the employees were exposed to the decomposition products as well when the resins, the curing agents, the fillers were heated, to their fumes, as well as fumes from the welding operations, and the epoxy dusts, due to grinding and sanding activities. All of the various stages would have contributed to the detrimental health effects of exposure to these various forms of epoxy from start to finish.

The author of this report, a National Health and Safety Representative, stated the following:

> *"…under normal circumstances, these products should not present hazards by inhalation because the chemicals involved are not very volatile. If they are being mixed with some kind of solvent, that changes things. A number of solvents used with epoxies present serious health concerns, so please let me know if these products are being mixed with something not listed on the MSDS…..when I checked with one researcher he said that the Silica did not appear to present exposure problems to workers who used or worked on these products (i.e. he did not think that a worker would be at risk from silica when sanding a part covered with cured epoxy paste."*

However, today we know that this could pose health risks for employees who work with silica and machining of silica containing products, as well as machining of the epoxies.

Given the information from above it is clear that the epoxies were thinned with 1500 toluol and many other solvents as per the vast amount of evidence provided here.

It is pertinent to note, that not only are the resins being heated in the ovens, but all the other ingredients, such as the fillers, the hardeners, the curing agents, the solvents that are added to thin the agents, fibreglass, asbestos, etc are also being heated. All of these agents together would give off fumes and their individual decomposition products, which in most cases were toxic as per the MSDS sheets. Again, their cumulative effects on human health and synergistic effects must be investigated as well as their individual levels of exposure.

Appendix K Document # 28
Meeting Minutes – UE-CGE
Date of Report: May 20, 1980
RE: Miscellaneous health and safety related concerns regarding misuse of toxic chemicals and others

- employee was working for 2 hours on armature bars using 1500 thinner in large quantities
- was rapidly losing ability to function, losing memory, reported to hospital
- the EEG that day showed abnormalities
- the attending specialist/physician stated that there was no other physical cause that could be found and attributed the health condition to toluene.
- This document also makes reference to Asbestos – and the unknown status of asbestos in the plant at this time – note – 1980.
- Asbestos gloves still being used in the plant at this time (new samples were being sought)
- Trichloroethylene still being utilized – a new substitute was being sought

Appendix K Document # 29
Management Letter
Date of Report: April 23, 1987
RE: Materials Cured in New Oven

This document gives evidence of the contents of resins utilized in the VPI tanks during this time period, i.e. 1987. Tertiary Butyl Styrene and Vinyl Toluene were still present in the resin mixtures. Please refer to the document for further information.

ASBESTOS:

Appendix K Document # 12
Monthly Inspections Armature Building
From: J.Ball and Don Adams
Date of Report: February 28, 1983
GE Contact: Mr. R.K Osbourne – Manager Armature Shop Operations – Industrial Apparatus Department

This letter was addressed to the manager of the Armature department with regards to requested action on some of the items that were brought forth by the JHSC representatives with regards to:

Bay 221 – Asbestos from pipes over main door was loose and bricks had fallen from top portion of the wall. This was roped off and was in process of being repaired.

The reason for this document to be included here is to demonstrate that asbestos was a problem in the building even at this time of the decade, i.e. 1983.

Appendix K Document # 13
Monthly Inspection – Joint Health and Safety Committee
Date of Report: November 25, 1985

Upstairs armature items brought forth to the attention of the Managers in charge:

Bay 220 – Asbestos lagging on steam pipes breaking up
Downstairs Armature
Bay 212 – Tracks and oven floor are partly filled with liquid epoxy. Slip hazard and possible fire hazard.
Asbestos – Building 5 – Quintex 7059 sheet – cut and stored – Glastic 5989B Sheet - Although not clear as to what the codes are in reference to here, this is evidence that asbestos composed insulating materials were still being utilized in this department for insulating armature units and were still being machined and cut for processes in the department by the employees. Many fibres were being produced here and accumulating, as per the information already provided in Section 5 of this report. There were no engineering controls in this area as well.

Appendix K Document # 14
Letter from the Joint Health and Safety Committee
Date of Report: October 28, 1981

Committee members write to the Manager of Armature with regards to 16 Items that were noted on a workplace inspection. One of the items that was brought forth to the attention of the manager was:

- Item #9: Bay 212 – elevated storage area. There are some sheet asbestos cloth stored here. All asbestos material should be out of the plant at this time.

This evidence indicates that asbestos was still in the department at this period of time. Furthermore, the other evidence sited in this section of the report, further illustrates that asbestos containing products were still utilized at this time as well as asbestos insulation for the building as well, was visible and deteriorating within the building.

Appendix K Document # 15
January Inspections – Joint Health and Safety Committee
Date of Report: February 13, 1987

Indication that asbestos was still present in the Armature Building – as item on page 2 indicates:

Bay 206 – Asbestos lagging torn and frayed on pipes behind drills.

Appendix K Document # 16
Field Visit Report (FVR)
From: J. Toth – P Eng
Date of Report: December 22, 1976
GE Contact: Mr. AK Faggetter – Specialist, Safety, Employee and Community Relations

This FVR clearly states that at this time in 1976 significant exposure to asbestos does exist in the Armature Department. Recommendations to increase ventilation on band saws were made as well and one direction was suggested.

The operation that is referred to in this FVR is with regards to the band saws that were utilized to cut asbestos boards to 1 inch wide strips. The area where this was conducted was in a location fully open to the plant. Each of the three band saws was locally exhausted (1976). Directions issued were to ensure adequate local mechanical exhaust be provided to the band saws.

Appendix K Document # 17
Armature JHSC Monthly Tour
By: John Ball, Lorne Read
Date of Report: March 19th, 1987

This document is cited in this report as evidence that asbestos related issues were still being dealt with at this time and date, i.e. March 19th, 1987. Quintex, a form of insulation in the Armature department parts manufacturing, was machined and cut and it contained asbestos. The JHSC suggested that sampling be conducted to verify that asbestos was not being released during machining/ cutting of this encapsulated product. The Joint Health and Safety Committee requested the following with regards to the Quintex cutting operations:
"…Quintex cutting job be sampled to see if any asbestos is released from the encapsulated form…"

Appendix K Document # 18
Union Handwritten Notes
Date of Report: March 5th, 1987

This report is provided here as evidence that asbestos containing parts were still being processed by GE employees. Although this report indicates that the parts, were actually sent away for asbestos removal etc, it gives an indication/example that there may have been more instances where parts with oiled asbestos sheets or other parts that were once fabricated in the past by GE employees were still being handled during this date and time, and thus exposures to the dusts or other remnants of asbestos in the form of fibres or dust on the parts to be manipulated was plausible.

The points to outline are recorded here in bullet form:

- Concerns raised by area steward about an armature coil brought in for repair
- Oiled asbestos sheet was used as an insulation later on this unit built by CGE in the 1960 time slot
- Unit was sent to Toronto facility for removal of the asbestos sheet
- Material remaining consists of mainly varnish with possible particles of asbestos
- Many hazards of varnish, copper and asbestos dusts must be controlled by zero- discharge vacuum and use of present ventilated room where copper is ordinarily processed.

This examples indicates that exposure to asbestos would have continued over the years when parts were requested to be processed for repair purposes.

Appendix K Document # 30
Field Visit Report
Date of Report: August 13, 1980
RE: Toluene Vapor

Although this FVR deals with concerns that employees raised due to a co-worker who became overwhelmed by the toluene vapors, this document gives evidence that indeed old large electric motors and/or generators were being rebuilt in this department. The department in question is Department #10, and this is applicable to the armature employees as well, as they worked in proximity to these activities.

It clearly states in the FVR that the employees had to remove all the old insulation, within the part, with the application of toluene. In doing so, the insulation would have also consisted of asbestos sheets, and asbestos insulated wire, and thus employees would be exposed to the fibres as the parts were being handled. Moreover, the employees were nevertheless also exposed to the toluene vapors as well.

Appendix K Document # 32
UE-CGE Safety Committee Special Meeting
Date of Report: June 17, 1977
RE: Asbestos

This document gives some more information on the asbestos related issues that were being experienced during removal of the compound tank as per section 5 of this report. Employees were concerned that as the compound tank was being removed from Building #5, the asbestos fibres which were 2 feet deep, where the tank was located, would crawl into Building 7 work area (via wind). The tank was cleaned with wet sponges to ensure that no fibres would further contaminate the area. There is concern over how this process was handled in the plant.

TRICHLOROETHYLENE

Appendix K Document #19
Medical Letter from Dr. William D Blastorah – M.D.
Date of Report: December 17th 1979

This doctor's letter indicates and confirms exposure to trichloroethylene and it's fumes. The patient was suffering from
"…increasingly severe gastro-intestinal and other disturbances since the recent summer. Investigation failed to reveal any surgical basis for his complaints although originally his symptoms suggested this. A few days ago it came to my attention that his job entailed his using and inhaling fumes from a cleaning solvent through most of his working day. I was informed this solvent was trichloroethylene."

Further, the doctor writes,
" I did not suggest or state and do not believe that any pre-existing condition was aggravated in this case. Rather his symptoms are primarily due to his working with the chemical in question…Neither did I state that this worker or other personnel should not work on the degreaser equipment – but rather that they should not inhale or be exposed to the fumes in question."

The doctor confirms in this report that the employee's condition in this case was due to exposure to the TCE fumes.

Appendix K Document # 20
Letter to Dr. S.L. Rutledge
From: John H. Ball- UE Safety Representative
Date of Report: June 1, 1981

This report refers to numerous employees suffering from exposure to trichloroethylene and its effects on their health. The patient in the case mentioned by Dr. Blastorah, was at first discharged by the company because the company felt the employee's condition was due to mental illness and an abuse problem with alcohol. Fortunately, the letter written by the doctor enabled the patient to be re-instated to the workplace.

Mr. Ball indicates, "our experience with this chemical (trichloroethylene) in Canadian General Electric is a long and bitter history of discomfort, illness and even death….it is most difficult to get proof that is positive on most problems of this sort but at one point the then current manager of Health and Safety here, admitted to me that they (CGE) were aware of an employee, Lindsay Tetlock who had died of exposure to trichloroethylene compounded by alcohol intake."

This letter further details that Mr. Ball was in the process of fighting a grievance against poor working conditions including the degreaser tank, a welding station (where Mr. Ball worked) and other related problems.

Of the people that worked beside Mr. Ball, one had since died of lung cancer, one has emphysema, one has had three bypass operations of the heart and Mr. Ball himself was warned to leave the job or that he too would incur emphysema or something worse.

The letter goes on further to indicate that " the company did ventilate one degreaser but only after 12 years of struggle and numerous work refusals to work under legislation – Bill 70….if we are to force installation of ventilation on this second tank we need back-up proof or even strong suspicion that there is over-exposure."

Appendix K Document # 21
Peterborough Examiner Article – on Trichloroethylene
Date of Report: June 3, 1981

This report further provided evidence that trichloroethylene was utilized at CGE and that employees were getting effected by exposures to the vapours. Moreover, the article further implies that employees had to fight to get proper engineering controls in place in order to avoid exposure.

If it takes 12 years to get proper engineering controls in place, exposure without engineering controls, in an Open Vapour tank with heated Trichloroethylene is more than probable.

Appendix K Document # 22
Letter from Occupational Health Clinics Doctors, Marie L Roy and Michael Wills and Registered Nurse, H. Hutchinson.
Addressed to: Mr. John Ball
Date of Report: November 29, 1990

This letter confirms the presence of some major toxic chemicals in the Armature Department, retrospectively when this letter was written by the then, OHCOW Executive Director, in 1990. The following relevant statements are made:

- For the last 20 years, one of the Armature employees has been exposed to various chemicals including amines, chromic acid, epoxy varnishes and resins, polyester resins, styrene, organic solvents, t-butyl perbenzoate and methyl ethyl ketone peroxide.
- The patient in question had skin tumors that have been diagnosed as symmetrical lipomatosis by a dermatologist of the Wellesley hospital. This may be attributed to the exposure to MEK peroxide as it causes skin tumors in animals.
- Another employee that was seen at OHCOW (also from the armature department), had been diagnosed with lung cancer and died.
- This note also indicates other deaths arising from the armature department – one being a woman who died of leukemia, and another man in his late 40's died of colon cancer, 2 additional cases of leukemia (deceased workers) and two lymphatic cancers (deceased workers).

As per the most recent information obtained in 2005 from the GE employees it is stated that the patient in question died of cancer shortly after he retired from GE in 2000 or 2001. This employee was an armature winder. The employee was covered with lumps (lymph node swellings) that eventually turned malignant.

Appendix K Document # 23
From: Occupational Health Branch – W.R. Waddell, M.D.
Date of Report: April 27, 1981
Re: Field Visit Report – regarding Trichloroethylene

This report is a field visit report regarding concerns over exposure to trichloroethylene. An employee incurred health effects due to exposure to this chemical. One suggestion is made in this visit and one order was issued as well.

Although this incident was reviewed in building #8, it was stated as per the process section of this document that there were many tasks that were performed in Building number 8 which were similar to those in Building Number 7.

The visit refers to the degreasing operations, where there was a tank sized 6 X 8 X 10 feet and utilized Royalene (trichloroethylene) as the degreasing agent. One operator and a helper operated the equipment while 10 other employees worked in the general area.

One of the measurements taken reached 100 ppm of Trichloroethylene solvent vapour. No exhaust ventilation was being utilized at the time, and degreasing activities were taking place.

The MOL suggestions and order indicated a need to improve the ventilation for this process and minimize the exposure to vapours at this process, "efforts should be made to protect the vapour blanket in the degreaser from drafts which can cause spillage of vapour into the ambient air."

This report is another piece of evidence with regards to the fact that engineering controls were not present, or not in optimal condition to protect workers from exposure to toxic solvents.

TOLUENE:

Appendix K Document # 30 (as already shown)
From: Occupational Health Branch – Field Visit Report - W.R. Waddell, M.D.
Date of Report: August 13, 1980
Re: Toluene Vapour

This report provides evidence that toluene was utilized by the armature employees. This particular report is referring to an employee, whose job title was Armature Winder. The employee was overcome by exposure to toluene vapours, and incurred neurological illness as per the Ministry Report.

The task involved was stated in the report as follows:

> "Employee was washing turbine bars with 1500 thinner when his vision became blurred and out of focus. His vision was blurred, speech was impaired and he was mentally confused."

The MOL report describes the process as follows:

- This incident occurred in Building #10 where there is only natural ventilation through door and windows. Local exhaust ventilation is not provided at this particular site of the building, where the incident occurred.
- Large electric motors and or generators are rebuilt. Old insulation is removed from the stator colors by repeated hand wiping with pads saturated with toluene.
- The recommendation that was offered by the MOL inspector was that all workers even observers should wear respiratory protection when toluene is used at this work station. No orders were issued.

EPOXY RESINS:

Appendix K Document # 25
From: Ministry of Health – Environmental Health Services Branch
Date of Report: July 13, 1973
Re: Exposure to fiberglass, epoxy and solvent

The issue was concerning exposure to epoxy resins on the mezzanine floor. Three different tapes are described as being used, which further confirms the statements and process description given by the GE employees as per the earlier sections of this report.

The tapes included: 1. Fiberglass tape impregnated with epoxy
2. Fiberglass, mica and epoxy
3. terylene tape (soaked in toluene prior to use)

The employees were expected to hand wind the armatures with any of these tapes. Dermatitis incurrence were increasing and the company had then decided to start a program with regards to protective clothing and protective cream. The employees were to wear cotton gloves inside the protective gloves. There is no mention of what type of gloves the employees were to wear.

As per the New Zealand Dermatological Society Incorporated, 2005, to reduce exposure use special gloves (nitrile rubber or nitrile butatoluene gloves) to protect hands. Rubber gloves do not help as resin penetrates through the gloves in 30 seconds. Vinyl and neoprene rubber are not totally protective.

THE EXPLOSION AT ARMATURE IN 1971
AUGUST 1, 1971

Appendix K Document # 26
From: Ed Hunt- UE Safety Representative
Date of Report: June 11, 1979
Re: Solvent-less Epoxy Varnish

This letter includes research conducted on three components that were used to make the Solvent-less Epoxy Varnish which ignited during the 1971 Fire.

"The Chemical Boron Trifluoride Mono Ethylamine can certainly be the reason behind the health effects suffered by our members and others as a result of that 1971 fire."

No Date : Proof testimony from Sharon Armstrong – helped clean up after the explosion – suffered from RE-occurring throat infections and loss of voice.

Appendix K Document # 27
From: Mr. L Bithel, P.Eng
Date of Report: September 10, 1971
Re: Field Visits Report Part 1 – RE: 1971 - Explosion

This Ministry of Labour document offers some more information with regards to the sequence of events which occurred during the explosion of the contents in the VPI tank in 1971.

Here is some pertinent information taken from the report:

- Tank containing epoxy resin overheated
- Company requested a visit to discuss the steps which had been taken and to advise on any further steps required to avoid any significant exposure.
- The steps already taken were adequate to avoid significant exposure during the evolution stage of the reaction
- The final step required would be the cleaning up of the phenolic liquids which has been vaporized during the reaction and then condensed on steelwork, tables etc.
- The tank involved in the incident was the epoxy premix tank located towards the centre of the building but not underneath the upper floor (see appendix K for all other details.)

There are some pertinent points that are mentioned in this MOL document that are of concern. Firstly as per the MOL document the following was noted:

- The high temperature of the tank together with the flashing of the water directed into the tank resulted in

- A) the expulsion of some epoxy material which finally solidified – there was a fair amount on the tank side and on the floor nearest to the manhole cover and there were minor amounts scattered around, even on the upper floor
- B) the vaporization of materials which later condensed - this was very noticeable on the upper floor, where liquid had collected on plastic sheets placed over tables and metal parts – paint had also been stripped from steelwork and wood
- C)The liquid around the tank appeared to be phenolic and precaution would be required during the cleaning up, particularly against skin absorption.

The points of concern with such a large expulsion of taking off of epoxy materials is with regards to the MOL comments on the following and their conclusions:

- …..the steps taken by the company with the assistance of the Peterborough Fire Department were effective in dealing with the situation and in preventing any significant exposure. The remaining steps requiring action at the time of the visit were cleaning up the solids, including cleaning out the holding tank, which would not involve any significant exposures and cleaning up the liquid material throughout the areas, which could involved exposure to phenolic materials with a possibility of skin absorption.

With such massive amounts of epoxy "taking off" it is difficult to determine how clean up procedures would not have caused over exposures in this type of explosion, within a building of this size. It is clear from the data we have collected on epoxy resins, that most of them emit toxic gases upon decomposition temperatures. In the case of an explosion or overheating, this would guarantee release of those toxic decomposition products. Without any proper ventilation within the building, how could such a vast expulsion and thus emission of fumes be contained throughout the building?

With such a vast number of solvents and other materials utilized in this department it would be obvious that many solvents ignited and thus were brought further to react with such bursts of heat in their proximity and thus numerous solvents, fumes, gases and their decomposition products would be in the entire building and as per the article below, affected the adjacent areas in the city as well.

In an article in the Peterborough Paper(Appendix J) – it was stated that a "2000 gallon resin tank is believed to be responsible for a cloud of offensive gas that hung over the city Sunday night and Monday morning. Complaints about the irritating gas were received from all corners of the city!"

As per an employee account, see Appendix J the following is also stated with regards to this explosion;

There was extensive damage to work areas in armature, paint peeled from the steel beams, every tree outside the department on Wolfe St lost its leave; paint came off cars parked nearby and paint peeled off houses as far away as Edgewater Blvd. An electrician that was called to attend to duties within the tank died one year later of leukemia. Peterborough fire department lost 4 firefighters within 1 year of the fire from cancer. As the confidential information indicates, this statement is not known for certain however, after interviewing the

Fire Department, there indicated that many of the firemen who fought that particular fire at GE were unable to continue working in their jobs as firemen. The firemen were off work on compensation.

If the adjacent areas in the city were so heavily effected by this explosion, how could the department, in which this explosion occurred, be a safe place to work, without a thorough clean out of all the contents and other materials that may have been contaminated with the explosion. Without proper ventilation in the department, it is difficult to ascertain how fumes and vapours were properly expelled from the department.

The OHCOW Risk Mapping Project conducted by OHCOW hygienists in 1995:

This report gives a view of the conditions of the workplace during 1995. It was not a retrospective analysis of workplace processes and conditions, but rather a current view of the workplace at the time, and how to ameliorate the conditions at that time and thereafter.

Although not appendixed in this report, a copy of the relevant pages are included in Appendix L. The entire report 1996 can be made available upon request.

All in all with regards to armature, the contaminants at this point in time were still the following:

Epoxies, toluene, Isonel, epoxy dust, MEK, diesel exhaust, tin pot, varnishes, aerosol release agents, etc. All in all this indicates that although the exposure may have been minimized over the years theoretically due to more stringent safety guidelines and the Occupational Health and Safety Act, things were not cleaned up as they could have been and non-conformances still existed and thus exposures would have continued.

The employees were exposed to several contaminants in the workplace. Even when the OHCOW risk mapping investigation took place, there was evidence of exposure to similar contaminants as those in decades past. If engineering controls were a struggle to implement, it is without doubt that exposures would have continued over the years. As per the 1981 example already discussed below:

This document demonstrates how it was a struggle to implement changes or proper engineering controls with regards to the Degreasers for example. The degreasers had to be exhausted with proper engineering designs, however, the employees had to wait 12 years before this could be attained.

Appendix K Document # 20
Letter to Dr. S.L. Rutledge
From: John H. Ball- UE Safety Representative
Date of Report: June 1, 1981

The letter goes on further to indicate that " the company did ventilate one degreaser but only after 12 years of struggle and numerous work refusals to work under legislation – Bill 70….if we are to force installation of ventilation on this second tank we need back-up proof or even strong suspicion that there is over-exposure."

8. ANALYSIS OF DATA – APPLIED HYGIENE PERSPECTIVE

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8. ANALYSIS OF DATA – APPLIED HYGIENE PERSPECTIVE

1. (A) NATURE OF THE WORK:

There were numerous chemical substances and processes of which some were or contained carcinogens directly or indirectly (decomposition products) that proliferate or contribute to the onset of occupational disease. Furthermore, the following factors also support the proliferation and onset of occupational disease in the Armature Department. (Refer to appendix H for pictures demonstrating the large dimensions of parts).

- Large dimensions of parts/products that were fabricated in the armature department
- Large dimensions equate to higher volumes of solvent use, higher levels of fumes and vapours, and thus higher levels of exposures
- Insulation pieces may have been small in size, however the quantity of parts required to be machined and the proximity to exposure and machining of the insulation pieces containing fibres, asbestos fibres, and epoxies, contribute to exposures incurred as well.
- Due to the large dimensions of parts, the duration of exposure is also increased due to the length of time spent on fabricating the parts, working the individual processes (as has already been explained and demonstrated in section 5 of this report – i.e. diameters of parts ranging to 46 feet, taking 3-4 weeks to complete a welding job or an insulation job alone
- Intricate design and requirements for insulation in the interior of the large parts was all completed by hand. The intimate work required to machine the parts, joining the individual pieces together via soldering and welding, and the type of workmanship involved in insulating an individual slot in a stator for example required intimate work with insulation pieces and welding of the copper wires. Hence along with the large dimensions of each product fabricated in this department, the large dimensions carried intricate interior insulation requirements and thus a complex form of exposures was incurred.
- Due to the large dimensions of parts, some engineering controls were not suitable for containing the fumes or vapors from the processes in which the parts were machined, dipped in solvents, heated, welded etc.
- Due to the intricate designs within the large parts, the interiors which were insulated and joined, slotted were conducted by hand, and thus even engineering controls for those processes were either not available or not deemed required as the exposure to contaminants was either not obvious or not deemed enough to cause disease.
- The congestion of all the processes in this department would also lead to higher exposures as well; (refer to Appendix G, H and O).
- Increased chemical reactions with regards to the synergistic effects and additive effects of chemicals would be realized in this work environment.

Nature of the work process and close proximity to the contaminants.

To further bombard the exposures that the employees incurred, the actual work practices, whether they be in the form of general operating procedures or the intricate nature of the proximity of the worker to the source of the contaminants, were also a means by which employees' exposure was enhanced and lead to health impairment. Several examples include working in close proximity to the molten lead pots, the stripping of asbestos covered wires, the crane operators being directly exposed to the seeping fumes and vapours from the

VPI tanks, the degreasers, the dip tanks, the ovens, and the bandsawing operations as well as the varnish application and compound tanks, to name a few. The parts fabricated were so large in dimension that it took months to complete individual tasks! Example as previously given in the preceding sections, a 46 diameter stator took 2-3 months to complete for the coil, asphalt varnish application and soldering alone! Hundreds of employees were working on parts of large dimensions such as stators. Ladders were utilized to access the inner core. With regards to the individual coils, you could have 2 men or 4 men working on one coil at a time.

Hence the following variables are pertinent in the formula for considering exposures to contaminants in this building:

Proximity to the source of exposure
Duration of exposure
Lack of personal protective equipment
Lack of engineering controls
Lack of forced fresh air
Large supply of each solvent, alcohol, resin utilized, due to the large dimensions of parts fabricated
Longer exposure times due to variable overtime hours
Ignorance of the precautions noted on the MSDS sheets
Lack of safety training
Lack of safe working procedures
Eating at the workstation
Heat/humidity in the building
Poor housekeeping practices

In terms of quantification of exposure and the ability to provide evidence in a retrospective nature is further enhanced here with the supportive robust literature reviews and MOL and GE Documentation. The lack of proper engineering controls as well as safety practices and education all support and contribute to the formula for the onset and proliferation of occupational disease incurred by the GE Armature employees, as well as the following analysis:

1.B) PRESENCE OF CARCINOGENS

Numerous carcinogens were present in the Armature department, namely asbestos, formaldehyde, benzene and other potentially tumor causing agents, as per the evidence already presented such as:

- Styrene, chromic acid, MEKP, TETA, dicumyl peroxide: tumor initiators and promoters
- TCE, asphalt fumes, welding fumes, Epichlorohydrin, Formaldehyde, and the various other decomposition products and by-products that have been previously discussed.

The fact that carcinogens are present in the workplace are alone factors in the onset and realization of Occupational Disease.

Furthermore, these carcinogens were in place in vast amounts from the start of this departments' operations to the very recent years. With asbestos alone for example, asbestos insulation for coils was still being utilized in the 1980's. The insulation was still being bandsawed, and slitted in 1985. The parts were still being grinded and sanded, thus causing exposures to asbestos in many different forms. Asbestos insulation pieces utilized for insulating the actual building, that were frayed and hanging from insulation pipes were noted on several JHSC monthly inspections and documented proof of this fact is dated 1987 (see previous sections). Repair of asbestos containing parts, such as stators and generators, as has already been mentioned, was another serious form of exposure to asbestos that must not be overlooked. This continued in the 1980's. It is not certain, as to when this process of repairing old parts ceased, as there were no documents available that indicated when this process ceased, if at all.

In addition to information already provided here as evidence, another document, related to a Patient's record (former GE employee) has been included in Section 7 – Tab2. Although the patient information is not included, the additional information with regards to the employee's specific workplace exposures and a literature review is provided here. This patient worked in Building 10, which was one of the areas in which the armature employees worked as well, and the data herein is relevant to the armature employees. This information further illustrates and provides evidence that Isonel 51 did indeed contain formaldehyde. Moreover, it further investigates the relation of exposure to organic solvents and lymphoma and Hodgkin's disease.

Taken directly from CDC: http://www.cdc.gov/niosh/topics/organsolv/:

> ***Organic solvents are carbon-based solvents (i.e., they contain carbon in their molecular structure). Millions of U.S. workers are exposed to organic solvents that are used in such products as paints, varnishes, lacquers, adhesives, glues, and degreasing/cleaning agents, and in the production of dyes, polymers, plastics, textiles, printing inks, agricultural products, and pharmaceuticals.***
>
> ***Many organic solvents are recognized by NIOSH as carcinogens (e.g., benzene, carbon tetrachloride, trichloroethylene), reproductive hazards (e.g., 2-ethoxyethanol, 2-methoxyethanol, methyl chloride), and neurotoxins (e.g., n-hexane, tetrachloroethylene, toluene). Many different classes of chemicals can be used as organic solvents, including aliphatic hydrocarbons, aromatic hydrocarbons, amines, esters, ethers, ketones, and nitrated or chlorinated hydrocarbons.***

Many of these solvents have been in use in the Armature Department for several decades and their detrimental effects on human health would have also been realized by the employees. The manner in which these solvents were utilized during processing and the fact that there was no PPE or engineering controls, would further amplify exposures.

2. OHCOW 1995 RISK MAPPING:

The Occupational Health Clinics for Ontario Workers conducted a Risk Mapping report/exercise in 1995. There are numerous hazards that have already been mentioned in this report that were still prevalent even in 1995. Given this fact alone, it can be stated if the workplace conditions and toxic contaminants were still of great concern at this point in time, retrospectively they would have been successively poorer conditions. See the Appendix L for the list of prioritized hazards in armature in 1995, as per the employees at that time, with the assistance of OHCOW Occupational Hygienists. This fact in and of itself must not be overlooked in the assessment of the health of the employees of the Armature department. Retrospectively this document alone indicates that the workplace conditions remained poor and of great concern as engineering controls were not in place or not operable and the hazards were not eliminated or substituted even in **1995.**

As evidence has already been provided in the previous sections, it is clear that Due Diligence was not practiced by the employer, as it took a lengthy time to get engineering controls in place for the degreaser in the example below.

> **…"the company did ventilate one degreaser but only after 12 years of struggle and numerous work refusals to work under legislation – Bill 70….if we are to force installation of ventilation on this second tank we need back-up proof or even strong suspicion that there is over-exposure."**

Appendix K Document # 21
Peterborough Examiner Article – on Trichloroethylene
Date of Report: June 3, 1981

This report further provided evidence that trichloroethylene was utilized at CGE and that employees were getting effected by exposures to the vapours. Moreover, the article further implies that employees had to fight to get proper engineering controls in place in order to avoid exposure.

If it takes 12 years to get proper engineering controls in place, exposure without engineering controls, in an Open Vapour tank with heated Trichloroethylene is more than probable.

3. UPSTAIRS MEZZANINE ACTIVITIES:

Employees state in general, due to various cutting operations, such as cutting of fiberglass, asbestos or Mica boards, there were fibres all over the mezzanine levels of the armature department. There were no proper engineering controls implemented to contain the fibres. Due to the fact that the upstairs level was like a balcony, the contaminants, whether they were fibres, fumes, or vapours were allowed to disperse to the other areas of the armature building as well, and vice versa.

Contaminants – Fumes and Vapours: (applies to all areas of Armature)

It is important to note that the armature location upstairs was quite hot and accumulated heavy fumes and vapours from the various processes including those from the lower level operations. The fumes from the ovens and Vapour Pressure Impregnated (VPI) tanks downstairs, would rise and travel towards the higher levels of the building. Without proper make up air, or fresh air circulation, it is comprehensible that the fumes and hot contaminated air would rise, and thus employees on the upstairs armature department were not only subject to the fumes from their own processes but also from the downstairs armature processes as well. Evidence of fumes coming from the lower levels of the building traveling to the mezzanine floor has already been given in this REP through the Ministry of Labour reports previously cited in Section 7.

In winter months, fumes may have been reasonably more prevalent, with negative pressure due to various exhausts on some of the equipment and a lack of fresh air circulation within the building and no make up air. Some windows were available for opening in this building, but mostly were not operable, and were for lighting purposes only. Likewise with the Portable Oven, as stated earlier, in order to maintain and achieve the oven temperature, all doors and windows had to be shut. Hence the contaminants generated in the building were trapped inside, and would accumulate as there was no fresh air into the building and no exhaust systems to contain the contaminants.

The activities downstairs were also major contributors to fumes and vapours that would travel to the mezzanine levels. To mention a few operations, the taping operations and the compound tanks would emit vast amounts of asphalt varnish fumes and vapors. The winding operations also involved the application of 1592 asphalt varnish. Soldering of the coils within the various forms of products built in the assembly winding area, could take 2-3 weeks to 2-3 months. Hence build up of welding fumes from these operations alone would have had a major impact on health. Burning of the excess tar from the asphalt coated parts also generated fumes as per the mezzanine level employees (evidence of which has already been cited in section 7 of this report).

4. AIR CIRCULATION IN THE PLANT:

Due to the lack of forced fresh air into the building by mechanical means and due to the lack of proper exhausts on any of the machinery or solvent pots, if any, a negative pressure environment was created in the armature building. With the vast amounts of activities and volumes of solvents and fumes being emitted from the various processes, this ventilation deficiency was a major contributor to ill health as a stand-alone precursor to Occupational Disease within the building.

As stated earlier, the layout of the building was such that half the length of the building was occupied on the upper level and the total lower half of the building was occupied with work areas. This set up restrained the airflow, if any, in a more confined area thus creating a heavy cloud of contaminants in the air **(Refer to Diagram #14)**

Whenever air is exhausted from a building, regardless of the method, outdoor air must enter to take its place. A lack of replacement air creates a negative pressure condition, which increases the static pressure the exhaust fans must overcome, which in turn can cause reduction in exhaust volume from all fans (Plog, 1988).

It is clear that the contaminants were allowed to accumulate within each building and disperse. The buildings were generally in a negative pressure environment, creating a vacuum type environment, where the contaminants were formulated within each building, some were exhausted out of the plant, and others were not. The fumes and contaminants had nowhere to be released other than within the building. There were few windows that were available to be opened in some of the buildings; however, most were only for purposes of allowing daylight to enter the building. Most windows were not present for the purposes of air flow or natural ventilation. There are plenty of windows, at the height of the building, and some skylight type windows on the ceiling, however, most are in place for “lighting” purposes. This was confirmed by the Writer at the December 7th, 2004 Plant Tour, with GE management representatives and GE Union representatives.

Due to the fact that the ventilation was poor, the exposure to solvents, fumes and other contaminants such as the mixture of the vapours and fumes would also be inevitable as proven by the research and documented evidence referenced herein. The fact that there was a lack of an exhaust system in place for some major processes and some exhaust systems in place for process such as the ovens and various other processes, which were used from time to time, lend the already compromised ventilation in the building to a more negative pressure environment. If and when the exhaust systems were in operation, and with the lack of manual input of fresh make-up air, this creates a slightly negative pressure environment. There was no fresh air to dilute the fumes and other contaminants, and the air was heavily polluted. The summer months would lend more fresh air into the plant versus the winter months in general.

Some employees used personal fans to alleviate their exposure to heat or fumes. But without proper building ventilation and exhaust systems, the fans would not only disperse the contaminants into other employees’ work zones, but any settled asbestos fibres or other fine fibres, and/or dusts and fumes would be re-dispersed into the environment. The air that the fans would be circulating would be the same polluted air and would not be providing any benefit to the employees.

With regards to fibreglass, although health effects of the fibres are not clearly understood or defined to date, these fibres may act as carriers of chemical carcinogens to the target organs (IARC, 1996).

The crane activities would have caused some of the contaminants to move or flow from one area to another, North and South, thus moving the body of air/fumes from one area to another, north to south and vice versa. However, without any proper ventilation, make up air or fresh air, perhaps more in the summer months versus the winter, the contaminants would just accumulate and the employees would be subject to them. **Winter exposures could potentially be higher as natural ventilation supplied by open doors and windows is decreased.**

In addition, the portable oven required shutting of all windows. Thus all contaminants were locked into the work environment of the employees, creating a vacuum effect, where all contaminants were locked in the building and had no where to be expelled out of the building (refer to Diagram #14). Forklift and pedestrian activity as well as pedestal fans may have moved contaminants from one place to another, thus redistributing settled dusts and fibres into the workplace air.

5. LACK OF PROPER ENGINEERING CONTROLS:

Much of the machinery on the mezzanine levels did not have exhaust systems in place to capture fibres, dusts, fumes, vapours. Moreover, the dipping tanks, the taping operations, the shears station, as well as the stripping of insulation by the heavy brushes, welding and soldering, grinding, would have generated many contaminants in the forms of fibres, frayed fibres, dusts, vapours etc. These operations required local exhaust ventilation to at least minimize dispersal of the contaminants into underlying areas. However, this was not the case, as per the employee accounts and the GE documentation and MOL evidence provided here. With the lack of proper engineering controls, it is evident that exposure to these contaminants is expected. The employee accounts, the MOL and GE documents, support this statement as well. The material safety data sheets and the types of contaminants that the employees were working with, all indicate that these hazardous substances needed to be controlled and were not. Proper Personal Protective Equipment was not supplied to the employees so that they could protect themselves from the contaminants. Likewise, where PPE was offered, the processes did not allow for use of the PPE as it affected the quality and ability of the employees from doing their job (e.g. taping operations). It must be noted here, that due to lack of controls, the contaminants generated upstairs, would also travel to the lower levels of armature and affect those employees as well, and vice versa. Without proper personal protective equipment, the chances of uptake of contaminants into the body are largely enhanced.

With the vast amount of solvents being utilized in their many forms as solid, liquids, gases, the numerous processes which involved stripping, heating, hot pressing, sanding, grinding, welding, it would be diligent for the employer to ensure that proper engineering controls be in place. However, the Armature department as well as many other departments at GE relied upon natural ventilation for all these toxic processes. With this in mind, it is imperative to note that the manufacturers instructions on the MSDS sheet studied here were not followed as many of them required proper local exhaust ventilation, proper PPE and proper training and handling of the materials. Relying on natural ventilation alone would not suffice for the multitude of chemicals and carcinogens utilized in this department and thus, exposure to the solvents, the fumes, the fibres, their by-products and decomposition products is more than **guaranteed.**

If engineering controls are put in place to capture fumes or vapours but they are not being utilized, or are malfunctioning, then the employees would most likely be exposed to those contaminants, their by-products and their vapours/fumes/dusts etc.

Although some processes did have some exhaust systems in place, it was stated numerous times that the exhausts were ineffective, not turned on, or constantly malfunctioning (such as the oven seals which were not in proper form, over the years – See Appendix U)

Furthermore, often times, due to the fact that oven doors were constantly opened and closed, this would have impaired the efficiency with which the exhaust would have been working.

6. LACK OF TRAINING:

Lack of proper training on the handling of solvents, their by – products, PPE, safety protocols, would also cause employees to incur exposures as already stated. The use of pedestal fans, the improper cleaning of hands, the improper use of solvents, the consumption of food in the work areas and placement of lunches on ovens heating copper coils covered with epoxies, the lack of change rooms for work clothes and street clothes, would all relate to the fact that the employees were not properly trained on the hazards they were working with. Furthermore, the fact that employees ate at their workstations would also cause employees to be exposed to contaminants through ingestion as well. The MSDS clearly indicate that eating and smoking in the vicinity of the solvents be prohibited.

Use of Pedestal Fans:

Employees would utilize pedestal fans to relieve or dissipate the fumes within the air around the processes they were working with or seek relief from high temperatures. In utilizing the pedestal fans, employees would only disperse the fibres, fumes, vapours into adjacent processes and thus cause contaminants to be dispersed to other areas. The fans may have assisted them in the time they were working, however, the usage of fans was not optimal as it only dispersed the contaminants to other areas, including the lower level armature area. (as the mezzanine was an open balcony).

Appendix U – Document: March 2, 1979 – gives an example of how an employee was overcome by fumes due to the improper use of the pedestal fans at the workstation.

Eating on the Job:

The employees ate on the job as was stated by all employees. Some employees heated their food by resting their containers on top of exhaust vents or oven tops. It is inevitable and not debatable that employees were not only subject to contaminants via inhalation and dermal uptake but also through ingestion due to these activities. Furthermore, as smoking was permitted within the workplace, ingestion of contaminants also took place via this practice as well.

Due to the nature of their work, several machines required constant operation and supervision, as the operations were not such that they could be shut down for breaks etc. Thus the employees were less inclined to take lunches in the cafeteria that was too far from their work station to begin with, and thus employees were less inclined to eat anywhere other than their workstation amongst all the contaminants. Furthermore, the employees were less inclined to wash their hands prior to eating for these same reasons.

Due to the speed and intensity with which certain parts were produced and handled, there was not much time for change of gloves or respiratory equipment, cleansing of hands etc. It was stated at several meetings and at the intake clinic that lunch bags, boxes were located at benches close to the work stations and some employees even ate in the near vicinity of their work areas versus the cafeteria.

Personal Protective Equipment:

The employees were not given respiratory equipment, for a majority of the processes, that would protect them from the fumes or other solvent vapours that were emitted from the processes which would also increase their chances of exposure to contaminants.

Likewise, wherever PPE was offered, often times, it was not sufficient to protect against the contaminants, such as the wrong gloves for the type of resins, or alcohols being interfaced with. It is always imperative to follow the manufacture's recommendation for the type of glove or ask the glove supplier for the correct type of glove to wear for the processes at hand. Moreover, there were no measures by which employees could take street clothes and change into work clothes and vice versa at the start and end of shifts. With the carcinogens and other toxic chemicals being worked with in this department, it is evident that the contaminants were allowed to be transported to various personal belongings, such as their automobiles, homes, family members, food etc.

Eating, drinking, and smoking should have been prohibited where toxic chemicals or various contaminants are handled or stored. With cancer causing agents and other toxic chemicals, these are some of the steps that are to be taken to protect from exposure to these toxins. However, there were no policies in place that disallowed employees to carry these actions. The employees did eat at their workstations, they smoked at their workstations, they did not often go to the bathrooms to wash their hands. Often times, hands were cleansed with alcohols as they were often covered with resins or lacquers, epoxies etc. As per the report given earlier, an employee cleaned his hands with alcohol and burned his thumb when lighting a cigarette. (Appendix U-Aug. 21, 1981).

Employees handled toxic chemicals with their bare hands and were subject to fumes and vapours.

Heat:

Heat is a major contaminant that causes health impairment that should not be overlooked with regards to exposures incurred by the GE employees through the years. Without proper ventilation, without proper use of exhaust systems and without proper safety precautions, the employees had been exposed to high temperatures and were heat exerted based on processes and practices discussed herein. In addition, the heavy equipment and parts that had to be handled (the copper reels which had to be placed on and off equipment required much physical exertion on the part of the employees). Furthermore, with heat and perspiration, the uptake of chemicals would have been increased as well. Dermatitis issues would be prevalent in the summer as well as the winter months, due to the fact that the doors and windows were required to be shut down, and the portable oven and other operations generated much heat, fumes and vapours. (Part #8 – Solvents in the proceeding section will discuss issues around heat, further).

Air Hoses and Housekeeping:

Not only did the employees eat on the job, but their method of clean up would have also disturbed the settled contaminants thus causing them to be exposed to settled contaminants that were present in their workspace. Air hoses were utilized to clean off machinery, work stations and body parts, (the latter is a practice that should never occur).

Often times it was mentioned that the employees would sweep their work stations after the shift was over. In areas such as the winding machines, stripping machines, bandsawing, dry sweeping would re-disperse the settled fibres into the air and cause the fibres to become airborne, and thus allow for more chances of exposures.

The fact that fibres and dust had to be blown off clothes and skin is an indication that exhaust systems were not working efficiently or that the work environment was contaminated. Engineering controls were either malfunctioning or non-existent. This practice occurred throughout the department. This is another indication that it was inevitable that employees were exposed to these contaminants.

The motorized sweepers were required to clean the main aisle ways in the department, and this process would have disturbed the settled fibres and vapours as well.

Health and Safety at GE and the Right to Know:

With the initiation of the Occupational Health and Safety Act, awareness of health and safety issues and hazards was slowly increasing. However prior to the Act and years after the Act as well, there were numerous chemicals that the employees worked with as well, for which the employees did not know what the contents of the chemicals were, how to protect themselves from disease and illness or even know what type of precautions to take with regards to handling the chemicals and engineering controls etc. As has been demonstrated in this report, there have been numerous chemicals that have been utilized over the years, without protection, without proper engineering controls, that would indeed render disease and illness to be apparent (especially due to the manner in which the chemicals were being utilized, i.e. hand dipping, face wiping, washing hands with solvents, heating of solvents to molten temperatures without proper exhaust systems , asbestos fibres, using air hoses to clean off clothing and body parts etc). Employees were given work cards on process requirement for the various operations they had to operate, however there was no indication of the hazards on the job, how to protect themselves from the hazards, let alone Material Safety Data sheets for various chemicals that were utilized. The employees and supervisors were often told, due to the fact that "this product is a GE formulated product, and it is patented, no data sheet is available for these chemicals" being used.

It is important to stress that even after the initiation of the Occupational Health and Safety Act; things did not change immediately within the workplace. The evidence is further solidified by the Ministry of Labour reports, the dates of those reports and the October 1982 reports presented by the United Electrical, Radio and Machine Workers of America Union to the Ontario New Democratic Party Caucus Task Force (appendix V). The results of those reports, in the form of replies from Dr. Cohen for example, indicate a lack of education or awareness of occupational health hazards and disease producing agents in the workplace. Dr. Cohen, the company doctor, indicates that he was not aware of epoxies or solvents causing nerve damage. This is a clear indication that the Doctor was not "aware" of Occupational Health hazards in the workplace, and thus the employees were not only misguided but misrepresented and misdiagnosed. Education of workers and management awareness of safety hazards would have taken ample time before serious changes were made to the conditions in the workplace.

Regardless of the Threshold Limit values, the levels have changed for various suspect and confirmed carcinogens over the years. Levels that may have been considered safe years ago, have now been discovered to be unsafe and thus limits brought down even more. Exposures were inevitably incurred during the start of the GE plant and during the initiation of the Occupational Health and Safety Act as well and thereafter based on all of the testimonies, literature reviews, and other evidence provided herein.

From a Due Diligence perspective, the employer had failed in complying with Section 25 2(d) of the Act which clearly states that the employer shall acquaint a worker or person in authority over workers with any hazard in the workplace and in the handling, storage, use, disposal and transport of any article, device, equipment or a biological, chemical, or physical agent. This further illustrates that conditions must have been far more detrimental in the previous years of the company's existence, i.e. prior to the Act. The fact that Material Safety Data sheets or information with regards to contents of chemicals in the various products being used was unavailable, leads to the fact that employees were working with chemicals that were harmful to their health and they were not being kept informed of the harmful effects of those chemicals and how to protect themselves against those effects.

7. USE OF SOLVENTS AND HAND DIPPING OPERATIONS:

As per the processes described by the employees, exposure to solvents by dermal exposure was foreseeable as they were constantly dipping their hands in solvents to either submerse insulated materials, to clean off their hands, to remove epoxy resins from their skin. This process alone would have caused employees to be exposed to solvents and incur uptake through their skin directly.

For example, the Pole Face Bar Press operation required that the employees varnish the copper parts by hand. They were then required to put the parts in a heat press when the epoxied parts would be pressed to form. This operation was not exhausted out. Given this fact, the employees would be exposed to the fumes generated by the off-gassing of the parts during this operation. This operation was said to be quite sticky with the accumulation of epoxy varnish on the machinery and the various exposed body parts of the employees. Again the employees utilized MEK or other alcohols to clean their body parts as well as the equipment.

Many of the varnishes that were utilized, namely asphalt varnish were quite stubborn and sticky to get off the machinery and body parts, including the face. Hence employees would rub the solvents vigorously into their skin to get the varnishes off. Hence, they were stripping off the protective barriers off their skin as well, thus causing it to be more vulnerable to the uptake of harmful contaminants.

The employees stated that they would utilize 1500 Toluene to clean the accumulated tar off their hands after the taping operation. The toluene was available in a red canister, and they would dip their hands in and try to wipe off the tar. The toluene would be put on a rag and then the body parts contaminated, and would be wiped with the soaked rag. When the tar would have accumulated in heavy amounts, the employees stated that they would submerse their hands in the toluene canister for 5-10 minutes. The toluene would burn the employees' hands after rigorous use of it. Moreover, whenever the employees had a cut or scratch on their hands, the toluene would cause them pain and stinging to the skin and wounded area. Hence the employees were not only inhaling the fumes from the toluene but were absorbing the toluene via skin uptake as well. Other tasks, involving taping operations, asphalt varnish, mica, hydroelectric poles, and upstairs mezzanine processes (such as taping operations) required the employees to employ the alcohols to remove the contaminants from their skin or machinery.

Furthermore, in the operations involving the Hydroelectric poles, the poles themselves had to be wiped with toluene to prepare for further processing. This task took at minimum 30 minutes for a wipe down to take place. Instances where employees were overcome by toluene vapours occurred on numerous occasions, (amongst other contaminants).

It is known that many solvents and thinners contained percentages of benzene in their formulation. This source of exposure cannot be overlooked when reviewing solvents, thinners and other agents in the workplace that may have contained benzene in their composition.

BENZENE

- ***Leukemia is often associated with exposure to benzene, which was a widely used solvent in the rubber industry and currently is found as an impurity in other solvent mixtures such as varsol and naphtha (WPIRG, 1982).***

Not only is the literature evidence enough with regards to having benzene as an ingredient in some of the thinning agents, degreasers, and other solvents, the Hygiene report of October 1987, mentioned in section 7 of this report, indicates that benzene was found in the environment, upon sampling.

8. Solvent Exposure (in conjunction with part #6 – Lack of Training – HEAT)

Exposure to solvents has been demonstrated and evidence provided, throughout the report. These is no doubt that exposure had occurred, through the means that solvents were utilized, mishandled and exposure to their vapours and fumes, lack of proper or suitable PPE, lack of engineering controls, lack of fresh air to dilute the solvents, lack of air circulation, improper usage or placement of pedestal fans, use of air hoses etc., all contributed to the uptake of solvents by the employees of the armature department over the decades.

Furthermore, the parts in armature that were fabricated were extremely large and thus the application of solvents and the vast surface areas that required to be submerged or flooded with varnishes and epoxies would also contribute to the amount of solvents the employees would be exposed to. Likewise, although the parts were immense in size, the intricacy with which the individual insulation parts were handled or insulation components were made, also contributed to the employees' exposures, as the exposures were intimate in nature, i.e. in close proximity to asbestos fibres, fiberglass, silica dust, both from an inhalation standpoint as well as dermal exposure. Most glass tape for example that was wound on various components as explained earlier, was applied with intricate steps that the employees at times could not wear gloves, as this would hinder their ability to do their job, and would also hinder the quality of work that was being conducted for the armatures and other parts. Moreover the tapes were often dipped in solvents prior to application, to ensure fibres were in tack during taping operations.

Furthermore it is pertinent to note here that the products were being constantly, dipped, heated/baked and then allowed to cure. This cycle would be repeated many times as per section 5 of this report in order to get a well epoxied and cured final product. With the repetition of this cycle, it is pertinent to note that once the epoxies were cured and re-heated, their decomposition products were noted to be heavier in terms of exposure, as the employees indicated that the fumes and vapours were stronger during the second and third cycles. This is of great importance to this report, as this indicates that exposures were indeed inevitable and would be more and more robust, as the cycles were repeated. As per Dillon Consulting Report for Working Safety with Casting Resins, heating finished casting work may decompose to generate toxic gases such as hydrogen cyanide (polyurethane) and styrene oxides.

Symptomology and exposure to Solvents/ same target organs:

- Repeated exposure to organic solvents may result in the gradual development of persistent symptoms such as headache, fatigue, irritability, memory impairment, depression, emotional instability, sleep disturbance, alcohol intolerance etc. Further exposure can lead to chronic toxic encephalopathy, characterized by memory disturbances, impaired psychomotor function, impaired verbal abilities and disturbances of mood. Some symptoms may persist even after exposure had ceased (Olsen and Sabroe, 1980).

Heat, Winter, and Summer Exposures:

The prevalence of symptoms and disease would be higher in the winter than the summer as per the study below.

As **per Xiao and Levin, 2000:**

- Higher solvent volatility, with generation of significant airborne concentration of vapor, large surfaces from which evaporation may take place, lack of appropriate enclosure and/or exhaust ventilation systems and relatively high temperature of the work environment may all contribute to increase uptake of solvents by inhalation
- Physical activity may be an important determinant of solvent uptake through inhalation as enhanced levels of physical activity have been associated with uptake rates increased by one to three times their baseline (**Astrand et al., 1972**). Furthermore, uptake is influenced by level and duration of exposure, workload and the specific physicochemical features of each solvent as well as by work practices and the use of protective equipment (**Xiao and Levin, 2000).**
- Exposure may be relative as the rate of solvent uptake through the skin varies among workers due to the variation in skin thickness, skin perfusion and presence of cuts or abrasions of the skin. Increased solvent absorption can occur when solvents are trapped between wet clothing and skin (Cohr, 1986).

Minamoto et al. 2002, conducted 2 surveys one in the winter and the other in the summer to examine the skin problems of all manual workers from 11 small to medium sized fibre glass reinforced plastics factories in Kyushu, Japan. The workers exposures included, unsaturated polyester resin including styrene, hardeners such as MEK peroxide, glass fibre and dust including shortened glass fiber and plastic particles. Fifty-eight percent of workers surveyed reported having skin problems. It is interesting to note that the workers in factories where dust generating and lamination processes were separate, were less likely to have a history of skin problems than those where the 2 processes were in the same building. The prevalence of dermatitis was higher in the winter, at 23.3 % in the summer and 13.4 % in the winter.

In armature, even though the summer months brought forth higher temperatures, along with the accumulation of heat from the processes in the department, such as the ovens, compounding tanks, VPI tanks and the curing of parts, exposure to heat would have been incurred all year long. This exposure would be high in the winter months as well, especially with the portable oven operations, where it was required that all windows and doors be shut.

As these are all preventative measures to take while working with most solvents and in particular, lead, it is suitable to state here, that because it was known that lead was utilized in the workspace in the armature building by the employees, it was known that it was heated without any local exhaust ventilation or any personal protective equipment, parts that were coated with lead and flux were then either air dried or baked in the adjacent ovens, it can be stated that lead was indeed part of the employees' work environment and that absorption or exposure to the employees was more than likely as the preventative measures as listed above were not implemented.

Also as stated in the earlier sections of this report, in Section 5 and 7, the method of application of some of the solvents such as the resin application for large stators, armatures etc, are indicative of hazardous exposures to solvents, their vapours, and exposure through dermal uptake as well.

9. COMBINED EFFECTS OF EXPOSURES TO SOLVENTS AFFECTING THE SAME TARGET ORGANS:

It is well known that the armature department utilized multitudes of chemicals. Hence the TLV's for the combined effects of exposure would have to be taken into account. Thus overexposure is inevitable to the solvents in the armature department, as solvents were often looked at in isolation of one another, when conducting hygiene sampling. Although upon sampling, each individual solvent may be within it's TLV, however, on numerous occasions the solvents were not far from approaching the TLV (example in Appendix U TLV for copper dust approached 1977- however difficult to ascertain the conditions – as there are pages missing from this report). With this in mind, and the fact that combined effects of like solvents are additive, overexposure and exceeding the TLV would have been more than likely in Armature.

- There are numerous additives that can affect human health in epoxy resins such as curing agents, aliphatic and aromatic amines, diluents, organic solvents and fillers. In order to correctly assess exposures one must look at all the ingredients in the epoxy resin systems, their individual toxicity as well as the additive effects of these ingredients with other toxins in the process and workplace.

As per NIOSH 2000:

- ***some hazardous substances may act in combination with other workplace exposures, medications, or personal habits of the worker to produce health effects even if occupational exposures are controlled below the limits set by the evaluation criteria. Synergistic and additive effects may not be considered by a chemical – specific evaluation criterion. Furthermore, many substances are appreciably absorbed by direct skin contact potentially increasing the overall exposure and biologic response beyond that expected from inhalation alone. Finally evaluation criterion may change over time as new information on the toxic effects of an agent become available. Because of these reasons it is prudent for an employer to maintain workers exposures well below the established occupational health criteria. (NIOSH HETA REPORT 2000)***

As this is a retrospective study, it cannot be stated that the solvents, their decomposition products, the vapours, fumes were never above the TLV's. The hygiene sampling (as per the documentation reviewed) does not indicate that the additive effects of like solvents have been taken into account when reviewing their TLV's.

It is pertinent to state that prior to certain time periods, solvents were indeed mishandled, (according to the knowledge we have today), and levels to which the employees were exposed were higher than what we allow today. Moreover, given the case studies and other literature reviews in this report, there are many examples that indicate even with some form of engineering controls and adequate PPE, exposures still occurred in some workplaces. Given this information, and comparing it to the Armature department, knowing that in most instances PPE was not sufficient or even present for certain job tasks even in more recent time periods, and not provided in previous decades, and given the fact that engineering controls were not operable, not present, not efficient, or not maintained, would further enhance the levels of contaminants emitted into the environment. Thus exposures would be incurred by the employees of the armature department.
Employees often worked overtime hours as the parts would require continual manning of the operations, hence the TLV's at the point would be lower than what would normally be calculated. This

may have been overlooked in terms of consideration by any of the hygiene data that was documented for these employees over the last decades.

For example, Dianova, A.V. et al. 1976 studied the synergistic effects of Mica Dust and resins. They found that inhalation of phlogopite, muscovite, shellac and alkyd resins separately, caused discrete pneumoconiosis; combined inhalation of mica dust and resin produced an inhibiting effect of the shellac and alkyd resin on the course of the pneumoconiosis produced by the mica, with significant potentiation of the toxic and sensitizing effects. A threshold limit value of 2 mg/m3 is recommended for simultaneous concentrations of these dusts.

Exposure to Solvent Mixtures/Carcinogens:

- The toxic effects of exposures to mixtures of organic solvents may be influenced by interactive effects among the component agent – the activity of each compound either enhancing or diminishing the toxic effects of others in the mixture (Baker et al., 1985).

It is pertinent to note that although very little hygiene data was available to OHCOW for review, it was clear that most of the sampling indicated that usually, solvents were within the range expected at the time, with regards to TLV's etc. However, no cumulative or additive exposures were taken into account when analyzing the data. Especially when most solvents are targeting the same organ groups in the human body, though they may be within the TLV levels individually, their cumulative effects could be very detrimental to human health as was the case in Armature. The hundreds of chemicals that have been utilized here and in their many forms as liquid gases and their associated decomposition products as well. The processes of dipping, baking curing lead to multitudes of exposures due to the lack of efficient engineering controls which further contributed to the illnesses realized by the Armature employees.

- As per Xiao and Levin 2000, in workers who experienced multiple exposure to solvents, overestimation or underestimation of the risk associated with exposure may readily occur unless the metabolic consequence of the interaction are understood for the specific agents.
- The Alcohols, acetone, methyl ethyl ketone, trichloroethylene, benzene, toluene, styrene, xylene, were amongst only some of the toxic chemicals that were present in the armature department. Most organic solvents share the same basic set of health effects, though some solvents also cause specific effects of their own (DHS, 2005).
- The ACGIH suggests the following practical approach:

"…**when two or more hazardous substances, which act upon the same organ system, are present, their combined effect rather than that of either individually should be given primary consideration. In the absence of information to the contrary, the effects of the different hazards should be considered as additive (Alessio, 1996).**

An example of how data has been misinterpreted and thus exposures continued for Armature Employees:

For example, in another Ministry of Labour Field Visit Report dated October 7, 1982 (Appendix U), the visit was made again with regards to fumes. Fumes were once again escaping from the drying ovens in

armature. Complaints with regards to irritation, nausea, disagreeable odor have been reported from the employees working on the platform near the ovens.

Once again it is mentioned that mechanical ventilation is present however there appears to be numerous leaks.

The MOL officer indicated the following at the time of the visit, which perhaps today would be rebutted due to ongoing research and Scientific knowledge/expertise:

- **The fume release during the drying or curing of painted parts contain a large variety of partial oxidation products generated by thermal decomposition of the resin, solvents and additives present in the paint. In general no significant health hazard is posed by these contaminants as they are being released at low concentration levels, however they have objectionable odor and some can be irritants.**

This statement alone can be rebutted at many levels. If the material safety data sheets were reviewed, as they have been in this report, many hazardous decomposition products are emitted when the solvents, resins, additives, fillers and other chemicals are heated. The MSDS clearly indicate that toxic fumes will be released. Given the fact that the fumes were escaping from the ovens on many occasions through the years, their combined additive or synergistic effect had to be applied to truly recognize that exposures may have been in excess of the TLV's allowable at the time or for sure today. The MSDS at that time also clearly indicate the measures that required to be taken in the event of heating of the products in question or mishandling, decomposition, engineering controls required, PPE etc. Given this information, more could have been done to protect the employees even in the time in question and the years prior, as the MSDS were quite detailed and informative.

To say that the results obtained by the hygiene reports were well below the TLV'S and there was nothing to worry about, was not appropriate given the mixture and multitudes of chemicals that were

Furthermore, it was stated by the MOL official that often time, fumes are leaked out of the ovens when they are overloaded. Overloading usually occurred with increased production. MOL TESTIMONY

being heated and manipulated in the various processes.

Because there were so many chemicals in the department that essentially effect the same systems in the body or the same target organs, and due to the additive consideration of their combined presence, it can be stated that overexposure occurred in the employees of the armature department as their systems were constantly bombarded with the same or similar solvents that target their bodies in similar ways, and thus cause for illness, such as in the skin, brain, respiratory tract, nasal area etc. Furthermore there were many solvents and exposure in many forms to several solvents in their various states, i.e. solid, liquid, gas.

10. BYSTANDER EXPOSURE:

Furthermore, "bystander" exposure from the activities of coworkers is another source of exposure for the armature employees. **An assessment of the presence and adequacy of ventilation, inquiries about enclosure of solvent related processes and the use of hoods or other specialized ventilation and specialty equipment should be made. Temperature conditions also contribute to the reaction to solvents and other contaminants in the work place (Xiao and Levin, 2000).** As per the authors, this fact applies throughout the armature department as most of the work processes and the associated effluents or fumes emitted from the processes would be dispersed into various areas, due to the lack of proper engineering controls. Thus the employees were affected on the mezzanine levels by the operations occurring on the floor levels and vice versa. Likewise, the crane operators were also affected by the activities throughout the Armature building, as they were exposed to the fumes, fibres and dusts that would be emitted from processes on the mezzanine levels as well as those contaminants from the floor levels as well.

As per Diagram #14, the crane operators had no escape from the accumulation of contaminants in the building. There were bombarded by the contaminants coming from the mezzanine levels as well as those rising from the lower armature levels as well.

Due to the fact that the mezzanine level had many different processes, the various contaminates that were generated by these processes would disperse into the adjacent areas, and floor levels, thus potential for exposure to other employees in the department would be inevitable. Furthermore, due to the lack of exhaust and proper ventilation in the building in general, the contaminants had no escape route and would remain in the underlying areas. Once again, the usage of pedestal fans would only move the contaminants from one area to another, and would not remove the contaminants from the building. Likewise the close proximity of the various machinery, ovens and operations, would also imply that additive exposures to the various solvents would be incurred as well as exposure to the fibres. Bystander effect cannot be overruled due to the employees working in close proximity to the processes would be exposed to the contaminants as well.

Crane and Forklift Drivers:

Due to the fact that the crane operations were located adjacent to the mezzanine floor, the crane operators would be exposed to the contaminants from the mezzanine floor as well as the lower level armature operations. Again, due to the fact that the contaminants had nowhere to escape, the crane operators would be exposed to the fumes, vapours, fibres, epoxy dusts, copper dusts as well as the employees working in close proximity to those operations. It can be stated that through the operations/tasks that the crane operators were involved in and the lack of PPE, lack of engineering controls within the crane cabin, and the fact that only natural ventilation was available if at all in this building, the crane operators would have been highly exposed to the mixtures of fumes, vapours, decomposition products, fibres and dusts that were being emitted from the various operations. Furthermore, the winter months would have been worse for the crane operators as well as the other employees, due to the fact that the portable oven operations required that no natural ventilation was allowed into the facility, i.e. no open doors or garage doors, in order to attain the desired oven temperatures.

It could take anywhere form 30 minutes to 2 hours to complete a job in which crane operators were required for assistance. Example: the assembly winding operators who were involved in torch brazing tasks, to burn off the excess resin. This task alone could take a full shift or 2 to burn off excess resin. Hence higher fume accumulations would be incurred and higher lengths of exposure.

It should be noted that the crane operators had forklift duties as well. Henceforth not only did they have exposure to the contaminants and fumes that were emitted from the various processes but they also had hands on exposure to the contaminants as they had to place contents on pallets for delivery, and worked in close proximity to the various processes and incurred exposure to those processes at the floor level as well. The employees also worked as hitch operators, where they had to assist with hooking up the parts to the crane, for dipping and baking operations. The crane operators would also be exposed to the fumes and vapours emitted by the various processes as those fumes and vapours would rise and bounce off the ceiling and travel with nowhere to escape. Without any protection or ventilation in the crane cabin, the operators would be exposed to those fumes and vapours in the plant air.

11. PROCESSES AND EXPOSURES:

a) WELDING:

There was no local exhaust ventilation for this process. The fumes would then rise to the upper floor of the armature department and the employees would be subject to those fumes (on the upper levels). The employees describe the smell as a dry copper type smell. The welding was mostly TIG welding; TIG on copper, thus the taste was also copper like. Due to the fact that this process was a lengthy process, the fumes and contaminants would accumulate at high levels, as this was a continuous process. No relief in terms of ventilation or exhaust was provided and thus clouds of welding fumes would accumulate and disperse throughout the adjacent areas and upper mezzanine levels. Furthermore, the welding operations produced much ozone and fumes from the heated epoxy resins, fumes, paints, asbestos fibres etc.

Due to the fact that parts were so large and immense, the individual process themselves would take lengthy periods of time to be completed, i.e. welding, winding, shearing etc. Hence, there was no relief time in terms of time weighted average exposures, to fumes and the various other contaminants, as the processes were drawn out for lengthy periods. Thus with lengthy processes, the contaminants would accumulate in heavy amounts. This applied to all applications.

No relief in terms of ventilation or exhaust was provided and thus clouds of welding fumes would accumulate and disperse throughout the adjacent areas and upper mezzanine levels. "A purple haze could be seen hovering over mid range in the armature department." Employee Testimonies.

Along with this, as mentioned earlier, there were degreasers, solvent dip tanks and other contaminants, in the vicinity of the welding operations. Some of the welding operations were portable and some were required to be located within the actual parts, i.e. within the armatures or stators, to solder coils together etc (as per section 5 of this report)

Welding in conditions where there are solvents and contaminants that would cause toxic reaction with the weld processes were also realized in Armature. Due to the fact that the welding operations took place in congested areas, with accumulation of fumes, vapors, dusts and fibres and heat, reactions with the welding operations were inevitable. Welding occurred near the TCE tanks and dip tanks, thus causing reactions. . Given this information, a problem was actually documented in the following Document:

October 2, 1979- From AK Faggetter with regards to Royalene (Appendix U) and another example is found in Appendix U – document dated March 5, 1979.

"If the lid on this degreaser is raised immediately after the wash cycle is shut down a heavy concentration of TCE escapes into the air. This finds its way to the 16A aluminum weld area and gives trouble with HCL generation."

CCOHS recommends the removal of coatings prior to welding. However the processes in armature were not such that the epoxies, varnishes, solvents, asbestos etc, could be removed prior to welding. This would not have been possible. Hence exposure to the toxic effects of welding on coated parts would be incurred by employees. In general if coatings are not removed, the following thermal breakdown of coatings in the form of gases are released:

- Polyurethane coatings produce hydrogen cyanide, formaldehyde, carbon dioxide, carbon monoxide, oxides of nitrogen and isocyanate vapours
- Epoxy coating can produce carbon dioxide and carbon monoxide
- Vinyl paints can produce hydrogen chloride

Welding and grinding of steel products must not be overlooked when assessing exposures in the Armature department. The employees were without proper protection and thus would have incurred exposures to welding fumes, which would have consisted of harmful toxins including Hexavalent Chromium. The harmful effects of exposure to this carcinogen have already been discussed in the previous sections of this report.

b) HYDROELECTRIC POLES:

Each task was a lengthy task and thus exposures would be incurred taking into account the length of time exposed to the various contaminants, and the method of exposure as well, the frequency of exposure etc. For example:

- Toluene rags utilized to clean the poles (approximately 30 minutes to complete)
- Gloves could not be worn as they were not the proper ones to be worn, and they reacted with the toluene
- Mica plates were heated, which allowed for emission of decomposition products and implied that the plates would be more malleable and thus frail
- Asbestos gloves were worn on this job due to heat
- Grinding of the parts was conducted, hence there was mica dust accumulation and there were no exhaust systems in place.

c)ASPHALT VARNISH USAGE – COMPOUND TANKS

The employees were exposed to the fumes from the asphalt, gilsonite, toluene compilation without proper engineering controls or personal protective equipment. Based on the facts as per the knowledge we have on asphalt and the possible presence of carcinogens in the asphalt fumes and the armature environment as a whole, this process in and of itself cannot be overlooked when reviewing the possible precursors for the onset of occupational disease in the armature employees.

Furthermore, parts were also heated to remove excess asphalt from the coils, and the employees would complain that this process would also contribute to the accumulation of fumes and thus incurrence of irritability (as the symptoms presented themselves)

As per the following Plant Visit Report dated December 10, 1957, the following is confirmed in this report: (see appendix U)

- ***"Coils that have been asphalt coated are wound with cloth tape in another section. Excess asphalt at the corners of the coils are burned off using a heated iron. This operation causes heavy smoke and Fumes to be given off that go up to the mezzanine floor. Several complaints have been registered by people working on this upper floor, to eye irritation, nose throat and chest soreness, and a feeling of tiredness at the end of the day. After seeing the fumes, I would believe they could be irritating." MOL INSPECTOR TESTIMONY***

Given the above excerpt from the Plant Visit Report, it is clear that the inspector was aware that the fume accumulation was heavy and that the complaints that were noted by the employees were of legitimate concern. As per section 5 of this report, it was stateed that approximately 30 people worked in the taping area, where asphalt varnish was applied. This number of employees applying the varnish and conducting the taping operations would further enhance the quantity of vapours released. Moreover, in other applications such as soldering the leads of the asphalt coils, in order to complete each connection, varnish had to be applied to each lead. This process could take up to 30 minutes to complete one coil alone!

The procedure where tar is burned, from the corner of formed coils, prior to taping gives off considerable fume. Normally these breakdown products are detrimental to health and it is quite conceivable that they could cause eye and throat irritation of persons working nearby. – Appendix U. (Date of report – December 18, 1957)

Mr. H.M Nelson on December 18, 1957:

Furthermore, engineering controls, such as ventilation at the source, the compound tanks and their ventilation system, were not adequately described to OHCOW. However, given the fact that employees indicate the work conditions were poor, and describe the actual tasks involved, as well as the odours that they experienced with this process, it is likely that engineering controls were not sufficient to protect employees from exposure to the asphalt for fume and vapours emitted from these processes.

Compound Tanks and Exposure to Asphalt Fumes:

Both compound tanks were pressure impregnated tanks. The employees stated that upon opening the door to the tanks, there would be odors of heavy fumes from the insides of the vessel. The coils were cold once they were taken out of the tanks; however, the employees explained that the tank smelled of tar for the whole day. The tray of coils would take from 3-4 hours to 24 hours to pressurize. Because there were 2 tanks, it was confirmed that one tank would always be running when the other was being loaded or unloaded. Employees were not protected from respiratory exposure to the fumes. They also did not wear hand protection. Thus, handling of the parts could have also contributed to some exposure via dermal uptake as well.

Employees have stated when the tanks were opened the tar like smell would be overwhelming and would lurk in the department for the extent of the day if not longer. If one tank was opened, the other was in operation. Hence the tar smell would be constant within the department due to the constant operations of the tanks and opening of the tank lids.

In the taping areas, there would have been exposure to the vapours and dermal exposure as well. The length of exposure also played a role in the exposure equation. Application of asphalt varnish to coils could take 2 – 3 months to complete. This is only one task in the stator building process. There were many uses for the asphalt varnish, including, hydroelectric pole preparations as well as the Assembly Winding operations.

Employees described the work of applying tape and varnish similar to that of road tar processes and the smell of tar was quite heavy. "The building was constantly full of these fumes as well as all other contaminants and fumes." Employee Testimonies.

With the asphalt varnish operations, constant hand dipping and wiping of parts and body parts in 1500 toluene were quite frequent. The asphalt varnish was sticky and hard to rub off. As already stated, the 1500 toluene that was utilized to clean off body parts could have also contained benzene.

d) Ovens and Fumes

It was stated by numerous employees and testimonies recorded and processes reports given in this report, that the ovens would not encapsulate the fumes from the parts that were being baked with epoxies on them. The fumes would escape from the oven door cracks on the mezzanine floor as well as fumes that would be coming from the lower floor and rise up to the mezzanine levels. As well exhaust systems if present over the years were not operable, too noisy and shut down or not present at all. For example employees experienced irritation of the throat and nasal areas while working in close proximity to Oven #18 on the mezzanine floor. This irritation could have been caused by the release of formaldehyde from the heating of the Isonel coated parts or the release of epichlorohydrin as well.

It is significant to note, that not only are the insulations and resins being heated in the ovens, but so are all the other ingredients, such as the fillers, the hardeners, the curing agents, the solvents that are added to thin the agents, etc. All of these agents together would have given off fumes and their individual decomposition products, which in most cases were toxic as per the MSDS sheets presented to OHCOW and the applicable research documents. Again their cumulative effects on human health and synergistic effects must be taken into account as well as their individual levels of exposure. As per OSHA Technical Manual on Polymer Matrix Materials, "the hazard information for all products used in the process must be considered when evaluating potential exposures. Deviations from the manufacturer's recommendations may result in unsafe processes and thus exposure to employees as well as serious reactivity." Furthermore when trying to sample for a particular contaminant it is vital to note what all the other ingredients are in the area, that might defer the sample from being taken, from a chemical and hygiene point of view.

EVIDENCE (Appendix U – in chronological order):

1. January 24, 1980 Grievance #79-89 Group Armature –:

This letter gives further evidence of problems with regards to fumes escaping from the VPI ovens and rising to the gallery levels and thus causing employees on the gallery levels to be exposed. As demonstrated in this report, there have been numerous concerns raised about the fumes seeping out of oven seals, and concerns with regards to fumes rising from the VPI ovens to the upper gallery levels.

2. January 15, 1980 – AM – Union Notes on Fumes and Smoke
3. January 16, 1980 – AM – Union Notes on Fumes and Smoke
4. February 14, 1980 – Union Notes on Fumes and Smoke

Union Notes indicate that the fume issues remain on a continuous basis and employees were constantly being exposed to fumes from the baking operations.

5. February 1982 – Union Notes with regards to Incident with Fumes from September 15, 1981 – through to January 29 , 1982.

Union notes indicate that employees were incurring exposures to fumes from the VPI tanks as per the dates listed above. As per the testimonies and description of conflicts experienced by the employees of Armature, as indicated in the process section of this report, the employees on the mezzanine levels were given fans at a period in time, however due to loud noise and the re-introduction of the fumes to the employees on the ground levels, the ground level armature employees would shut the fans off entirely. Hence the mezzanine levels employees would continue to be exposed to the fumes from the ovens.(appendix K Document #15)

6. October 4, 1982 Fumes from Heat Curing of Epoxy Resin:
Ontario Ministry of Labour – Occupational Health Visits
By: R.W. Dickey.

This report clearly indicates the deficiencies that are apparent on one of the ovens in the Armature department, in 1982. There were 2 external roof fans for escaping smoke in this particular year.

The inspector quotes, "During the first hour smoke escapes around the door seals (they are continuously being replaced). If the oven is overloaded or a breakdown in exhaust, the smoke escapes into the work area. Company policy if fumes bothered the worker can leave the area. It rises and affect the workers on the upper gallery."

This document indicates that the testimonies of the workers which already described the issue with regards to fumes seeping out of oven seals etc, was indeed the case, up to and including 1995, which indicates that exposure to epoxy fumes and other solvents was incurred as far as this date as the evidence here demonstrates.

It is paramount to recall here from Section 5 of this report, that some of the ovens were "walk in" ovens, where employees would be required to walk into the heating oven to hang small parts and then leave the oven area. This would no doubt cause the employees to be exposed to the decomposition products and off gassing of the resins and epoxies from the baking of parts. Moreover, the employees did not wear any protection when entering the ovens, and thus were most vulnerable to the exposures that were inevitable therein.

7. February 18, 1985: Health and Safety Committee Letter
From John Ball and Larry T Ball

This letter was addressed to the management of the Armature department with regards to requests for follow up on items that were noted from a Feb. 18, 1985 inspection conducted by the JHSC.

Two items of importance that are pertinent to note are listed as follows:

Bay 213 – Oven #3 – Holes in East side allow fumes to escape during baking operation.

Bay 213 – Hygiene sinks are being used to dump epoxy and solvents. Employees should be informed of the hazards associated with solvents and the purpose of these hygiene sinks.

These two examples from which 14 were listed for the inspection for this month.
8. October 8, 1985: Safety Items from Inspection this month:

Frekote 33 releasing agent give off fumes on Maxi Press – and suggest organic vapour respirator

9. February 5, 1986 – Union Notes with regards to Mezzanine level employees exposed to Fumes from Ovens:

Operators were having issues concerning Fumes from the VPI ovens escaping and entering their workspace. The downstairs level employees have left their workstation and went to the adjacent Building #5 for relief from the fumes. Furthermore, a blue color smoke was seen evident in this area. As per the notes, it was noted that the oven ventilation system was "out of commission" for more than a week's time.

10. February 13, 1987 Evidence:
January Inspection Report: Dated
By: Ken Miller, Ed Rowe, John Ball (Appendix K – Document #15)

3. *Gallery: Tin Pot exhaust system at west end very noisy. Operators probably leaving it off because of noise levels*
4. *Oven at west end needs repair to gaskets around doors. Leaking fumes badly.*
5. *#3 Oven on main floor generating heavy fumes (and accumulating to ceiling levels)*

It should be made clear here that indeed the employees were exposed to uncured epoxy resins as is made evident in the MOL report dates, October 16th and 20th , 1969 (Appendix U). Samples of epoxy paint and catalyst were processed and found that the paint contained uncured epoxy resin, pigment and solvent. The catalyst consists of an epoxy resin modified with amine and solvents.

Time Line:
From 1980 to 1987 still having problems with fumes. Hence exposures would be reflected in this timeline as well. Prior to this there would have been more exposure to the fumes. Again there was often overload of parts into the ovens, this would then disallow for proper encapsulation and containment of the fumes and thus the fumes would escape into the worker's environment.

The constant opening and closing of oven doors would also minimize the efficiency of the exhaust systems on the ovens and thus this would also contribute to the exposures incurred by the employees as well.

Exposure to fumes and decomposition products would be enhanced by employees who were involved in the "walk in" oven operations.

As per NOSHC, 1988:

- In terms of fume controls, NOHSC state that some workers can develop a rash after a very short exposure to the fumes. For small articles, local exhaust systems are recommended for employees. With regards to large articles, as was mostly the case in armature, NOHSC suggests that installation of extensive or elaborate fume control in the areas of the factory should be specially allocated to this type of work load. In some processes they state that it may be advantageous to have the operation totally enclosed and worked by remote control, eliminating possible fume escape.

e) Vapour Pressure Impregnated Tanks and open Solvent Dip Tanks (Appendix U):

EVIDENCE with regards to EPOXIES AND SOLVENT EXPOSURE AND POOR HYGIENE PRACTICES:

August 1981 – Letter from Management with regards to high incident and accident rates in Armature during 1981.

Six accidents reported in the document that related to rashes and exposure to epoxies. The relevance of this document is the importance to note that operators were still eating or smoking on the job without washing hands after handling epoxies or solvents at the workplace, and employees were still incurring rashes at this time period, i.e. 1981.

Accident - April – rash on arms
May, Rash from using fiberglass
June rash and general health problems while working with epoxy
June – burnt hands while cleaning a heating pot with thinners
June – rash on hands.
July – Lit cigarette after washing hands in ALCOHOL and burnt thumb

November 17, 1981 – Union Notes on the use of epoxy – exposure to wrists and forearms and epoxy and mica dust exposure:

These notes are very detailed with regards to the misuse of epoxy, the health effects incurred by the employees in armature, the grinding of poles and exposure to epoxy dust and mica. This document is provided herein as further evidence with regards to exposure to raw epoxy and the health effects incurred therein.

Taken directly from the union notes:
POLE WINDING AREA – EAST END OF BUILDING #7:

1. "…Found 1 gallon cans being used as ready to use pots and besides being extremely wasteful these pots let the operators wrist and forearms contact the epoxy. When asked why the low heating pots are not being used, the answer seems to be that it is too much trouble to transfer from the gallon can to the pot".

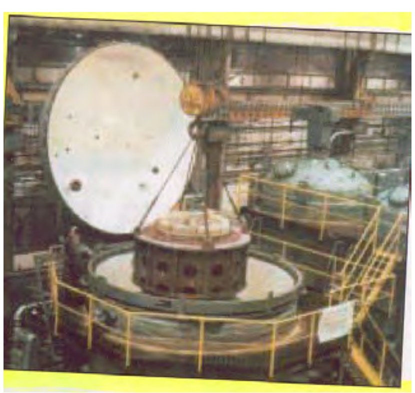
2. Hygiene station on N.E. wall in sadly maintained conditions. Raw epoxy pots in immediate area and proper materials not present.
3. Lack of adequate instruction and follow up enforcement by Supervisor is evident.
4. Are adjacent to where poles are being ground and dressed (epoxy is very poorly ventilated. Epoxy dust and Mica are covering large areas.
5. People are still washing their hands and arms in solvents.

f) Portable Heater and Resin Application and Vapour Pressure Impregnated Tanks

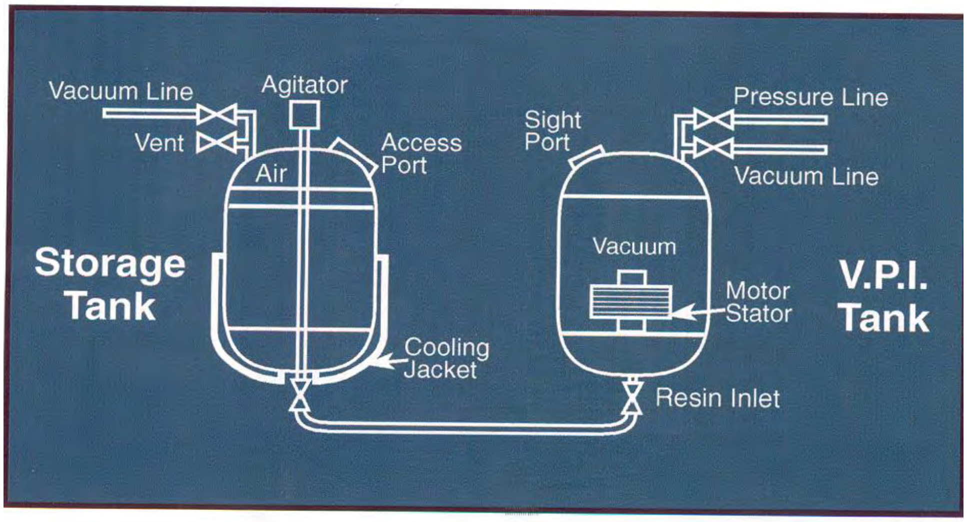
The importance to note here is that due to the large parts that were being fabricated, some parts were not able to fit within the VPI tanks. This method of coating the armature products was to mimic the same application of the VPI tanks via this manual mode. The portable oven processes were utilized for parts that were large in dimension and would not fit into the ovens available. The application of the varnish thus had to be conducted by hand as the parts could not fit into the VPI tanks. The application of the varnish was conducted by hose or brush, for which evidence has already been provided. Another important factor with regards to this oven was the use of the asbestos blankets. The blankets were cut with scissors to custom fit and secure the products to be heated. This cutting process would have generated fibres as would have the securing and handling tasks involving the blankets. Finally if the asbestos blankets were not fit tightly onto the parts, totally encapsulating them, then upon heating, fumes would have been emitted from this portable process as well. Furthermore, once the parts were cooled to 35 degrees C after being heated (not fully cured at times) they were then dipped or Isonel was applied by hose or brush once again. Uncured product would thus be trapped in the varnished parts, and once dipped and partially cured again and again, more and more uncured product would be trapped in the varnished products. As this is not recommended by the manufacturers of epoxies, when the parts were grinded or sanded, these trapped uncured by-products would then be released in the form of toxic dusts and thus employees would be exposed at this time as well.

As per Dillon Consulting Report for Working Safety with Casting Resins:

- relying on natural ventilation alone is not effective in reducing exposure to high concentrations of vapors. Given the size of some of the armature products that were being manufactured, the vapour emissions were heavy and thus exposures inevitable.
- Mixing resin products and lay-up work must be performed inside a booth or using other ventilation methods away from heat sources. The air above an open container of polyester resin (within 2 feet) can emit as much as 60-100 ppm of styrene vapours.
- Areas should be vented while pieces cure, since pieces will be emitting vapours. Pieces dried days before can still emit low levels of vapours if they are large pieces. Allow enough time for pieces to cure fully!



As can be seen in Picture #4 – the part is being lowered into the VPI tank via a crane. There is no epoxy in the tank at present, in order to allow the part to rest in the tank. Once the system is ready, the tank lid closes shut and is sealed. The resin located in the storage container (refer to Picture #5 below) is then allowed to be released into the tank for application to the armature, stator etc. By this method the parts are fully submersed and integrity of wetting the entire surface is more accurately attained versus manual methods that were utilized with the large Armature parts.



Reference: Picture(#4-#5) taken from: John C. Dolph Company, www.dolphs.com.

This method of impregnating electrical apparatus with insulating varnish is quite common as it can provide an adequate insulation with a few VPI cycles. Further cycles fill smaller surface openings to ensure the entire apparatus is impregnated to it's entirety.

However, with the larger parts, manual methods were utilized where the employees would stand within the parts, such as stators and apply the varnish via a hose. MOL Evidence of this has been given in previous sections of this report.

As per the OSHA Technical Manual on Polymer Matrix Materials – the following information is pertinent to note here:

- the potential for respiratory exposure is increased when the resin mixture is applied by spraying or when curing temperatures are high enough to volatilize the resin mixture. The potential for dermal exposure is typically much greater than respiratory exposure when working with epoxies.

In an MSDS for Hardener for Mexotropic Epoxy Sealant (appendix M - M-6290-A) of the chemical family Polyamidoamine – it is clearly stated on the MSDS that toxic fumes are emitted when decomposition temperatures are reached. The TLV as per the MSDS is 1 ppm and indicated that when heated or misted, inhalation hazards can occur. Furthermore, it clearly indicated that: the chemical should be utilized in a well ventilated area, Avoid skin contact or breathing in vapours, No smoking or eating in areas of use. (See Appendix M). With the information on this MSDS alone, it can be stated that the manufacturer's instructions were not followed as ventilation was not provided. Furthermore, it is not clear what year this product was used, as it was supplied by the Plant itself, as the MSDS indicates.

Portable Oven:

The length of time it took to properly enclose the large parts required to be heated required much time and commitment by the employees: the employees on the floor levels as well as the crane operators. As this would take time, the manipulation of the asbestos blankets would also be a source of exposure to the asbestos fibres as they would indeed be more friable and malleable with continued use, manipulation, cutting and heating. It took a full shift to set up the portable heater, which equated to a full shift of exposure to the Isonel vapours and the asbestos fibres from the asbestos blankets. As per the evidence given here for the use of asbestos gloves, the same would be applicable to the generation of fibres for the use or reuse of the asbestos blankets as well. It is also important to keep in mind that due to the fact that this portable oven was set in the middle of the building, with no local exhaust ventilation and no oven door seals, (and the asbestos blankets, which were the only form of insulation), the escaping of fumes generated from this process would be inevitable.

It was stated that approximately 15-20 rolls of blankets were used/year.

In addition, it would take time for the oven to reach a temperature of 150 degrees Celsius. It took approximately 6 hours if not longer to reach 150 degrees Celsius, after which it took 12-24 hours to stabilize the armature or the other parts to be baked at 150 degrees Celsius. Then 6-8 hours of actual heating at this temperature were required. Hence it was quite a lengthy process. All doors had to be shut as well as windows so that the desired temperature could be attained and maintained. Given this fact, not only were the fumes trapped within the building, but also all the fumes, and vapours from the other processes as well, creating a vacuum type environment: ozone, welding fumes, shellac, copper dust, epoxy dust, asbestos fibres, tar/asphalt fumes from the taping operations etc.

Employees would then have to go within the portable oven apparatus and take readings every ½ hour to ensure the temperature was at a desired level.

Employees stated that when heating after the 2nd or 3rd time, more fumes would be evident as there was more and more varnish applied to the parts after the second or third cycle.

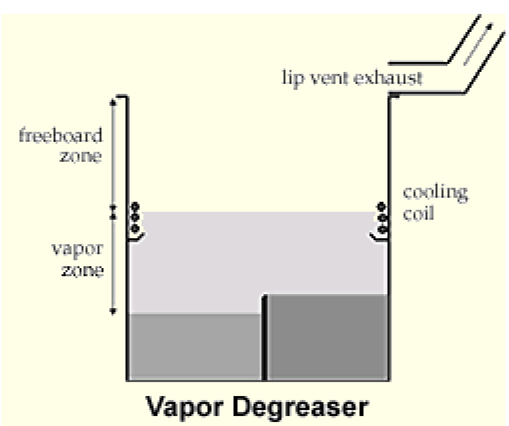
Finally the employees ate at their workstations, thus causing for further contamination of their food as well as ingestions of contaminants from their work area.

G) DEGREASING ACTIVITIES:

The most common form of metal degreasing is with trichloroethylene (TCE) as a vapour degreaser. Vapour degreasing utilizes the cleaning action of the solvent in its vapour state, usually through an open top vapour cleaner (OTVC) as described by the employees in Section 5 of this Report. Exposure to the vapours can occur mainly through inhalation and skin contact (Department of Heath and Aging NICNAS, Australia (DHA – NICNAS, 2004).

The process of utilizing open vat vapour degreasing is a common process, as per Picture # 6 below. However, there are measures that need to be taken in order to ensure that exposure to the vapours of the degreasing solvent are not being evaporated into the breathing zone of the employees in the near vicinity of the degreaser or the indoor air environment as a whole. The following points illustrate how exposure to the vapours could be incurred as per the University of Minnesota (U of M) – Minnesota Technical Assistance Program:

- The film of solvent remaining on parts when they exit the degreaser is defined as drag out. Drag out losses are generally three to eight times greater than diffusions losses. (U of M: Minnesota Technical Assistance Program, 2002)
- Solvent emissions are reduced by 60% when parts are taken from the vapour zone when they are only moist compared to dripping with solvent.
- If parts are immediately removed from the degreaser, the residual liquid film will quickly evaporate into unsaturated air and be lost.
- **The velocity of vapor moving around large parts is high, creating more turbulence and increasing the chance of concentrated vapor being carried high into the degreaser or out of the unit. Keep part loads small to help prevent solvent loss.**
- When the degreaser is idling diffusion losses tend to be highest. It is best to keep an idling degreaser covered.



As per DHA – NICNAS, 2004, The following is stated with regards to TCE:

- TCE is absorbed via inhalation, dermal and oral routes with the most significant uptake being through inhalation of the vapour
- The critical effect on repeated exposure is kidney toxicity
- There is a concern during vapour degreasing as workers may be exposed to high vapour concentration for prolonged periods
- Use of TCE in cold cleaning is of concern as workers may be exposed to the vapours as well as absorption of liquid through the skin, through misting or accidental splashing, spills and through handling of parts that have been dipped and taken out without PPE.

A Ministry of Labour report dated ***May 19, 1981 (Appendix U)***, illustrates that an order was given to the company with regards to a Degreasing Tank in Building 8 which was also utilized for Armature. The order given reads as follows:

"Adequate ventilation or other means shall be provided at the degreaser to reduce the fumes from escaping at all times, to maintain below the TLV of 100 ppm. (Noted at time, lip exhausts not operating)."

This document of evidence supports Section #5 of this report with regards to what was explained by the GE employees and the fact that vapors did escape the degreasing tanks and that they were exposed to TCE. Their exposure was legitimate and incurred by the toxic substances that they worked in close proximity to.

Three years prior to this document, a problem was noted with regards to a degreaser in Building #8. Area personnel were complaining of smell and fumes. One employee was rushed to the hospital to due the fact that they were overcome by the TCE fumes. It was noted that the lip exhaust ventilation was not being used on this degreaser and thus exposure to fumes was incurring to the employees and the employees in the near vicinity of the degreaser. This document was prepared by the Safety Analyst, R.E. Fowler – addressed to the Areas Supervisors, LD Read. (Appendix U)

March 5, 1979 – Mr. Read replied to this request –(Appendix U) stating that exhaust on the degreaser was not necessarily required.

- ***An exhaust will not prevent fume problems caused by some types of misuse such as using nylon or rope slings in the tank, removing jobs before they are properly drained, etc***
- ***It can cause excessive loss of degreaser fluid through drag out of vapour***
- ***The installation cost is considerable.***

These statements were made by the area supervisor and demonstrate how safety was not considered a priority in the case of the company and in the benefit of the employees. It is clear that working with such a toxic chemical, in the vapour state, with the emission of fumes, that exhaust ventilation was indeed a requirement, as well as training of the employees on the job, how to properly handle parts, when to take the parts out, educating employees on the "drag out" and how to protect themselves from exposure to the fumes or dermal uptake. Finally the supervisor concludes in this document:

- ***I do not believe an exhaust system is justified in this instance. I would like to know if it is to be the policy of the safety unit to requires lip exhausts on all vapors degreasers. It if is, please make it known so Manufacturing Engineering can budget accordingly.***

This response gives evidence of 2 major items that are pertinent to note here. 1. Cost was a factor here instead of safety of the employees. 2. It is a clear indication and evidence that most vapour degreasers in the Plant did not have proper lip exhausts on their degreasers. Hence exposures to TCE fumes can be stated to have been incurred by employee's plant wide, as fumes control was not present and it is evident that training was not adequate.

h) Decomposition Products and Health Effects:

As has already been demonstrated, not only were the solvents that were utilized toxic and harmful to health, but their decomposition products were also toxic and fatal to human health. For example, TETA an epoxy hardener was utilized in armature. It's decomposition products include, hydrogen cyanide as well as carbon monoxide, carbon dioxide and nitrogen oxides. Isonel 51 decomposition products include formaldehyde. Many of the products utilized in armature have very toxic decomposition products and thus heating of these products as well as the presence of these products during the 1971 explosion would have caused off-gassing and emission of the by-products as well during this incident. Moreover, welding processes would have caused the coatings and other solvents, varnishes, lacquers to react as well.

As per many data already presented here as well as DHS 1989:

> " heating epoxies during curing or any other process can cause chemicals to evaporate more quickly. The higher the temperature, the greater the amount of chemical released into the air. Use the lowest possible curing temperature, avoid heating epoxies unnecessarily and be sure that adequate ventilation is used when epoxies must be heated or when the curing reaction generates heat."

Given the information as per above as well as the vital data available on the MSDS for the various solvents, epoxies and their ingredients, the engineering controls were clearly not in effect and moreover, during the 1971 Explosion, these decomposition products would have been immersed into the air of the entire department, as well as the outside air and surrounding properties, as indicated in the various evidence documents provided herein.

Furthermore, as per the MSDS in section Q, section 12B indicates Formaldehyde's incompatibilities. It states that Formaldehyde can react with HCL to form Bis- Chloromethyl Ether, a carcinogen. Muriatic Acid, HCL, was utilized in this department and is a common solvent utilized in many industrial settings. The presence of HCL in this department or its creation through chemical reactions with other solvents, is also plausible here, and thus the reaction with Formaldehyde cannot be overlooked.

When the 1971 Explosion occurred, the vapors would have accumulated and settled in low lying areas as well causing further exposures to employees. Ex. HESIS, 1996:

> TCE vapors are heavier than air, hence they can settle into pockets and depressions such as open Vats and reach very dangerous concentrations.

i) MICA:

The processes which included the use of MICA were namely, coil winding lathes, use of glass tape for winding, spreaders, mica processing operations and hydroelectric pole insulation as well, where the mica sheets were heated and grinded. With regards to the winding and spreading operations, the mica, the asbestos, and the glass tape was being formed and stretched as well and in doing so, would have caused the tape to fray (and any loose fibres to be immersed into the air). Asbestos fibres were also present here, as there were reels of copper wire that were taken from the Wire and Cable department that were also being winded or spread as well. Furthermore, some of the glass tape also included asbestos fibres as well. There was no exhaust ventilation or personal protective equipment that would have protected the workers from the hazards of exposure to mica and mica dust. Furthermore, the mica impregnated sheets also had alcohol, mek and toluene mix as an integral ingredient and thus the employees would have been exposed to those solvents as well when handling the mica and processing it.

As per the New Jersey Department of Health and Senior Services (2002) fact sheet on Mica, the following is recommended:

- Where possible enclose the operation and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.

- Wear protective clothing and wash thoroughly at the end of the workshift.

As per the information provided here and the MOL documentation, this was not part of the job description, not was it enforced, nor was education given with regards to washing of hands after the use of mica, nor was proper PPE given to anyone coming in contact with this product. The employees utilized their hands and had no respiratory equipment to protect them against exposure. Thus without proper controls, exposures would have been likely to have been incurred.

- Do not eat, smoke, or drink where Mica is handled, processed or stored since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics smoking or utilizing the toilet.
- Wash thoroughly at the end of the work shift.
- Post hazard and warning information in the work area….communicate all information on the health and safety hazards of Mica to potentially exposed workers.

Proper training with regards to the hazards of the product, right to information was limited, as some MSDS were not attainable by employees, and posting of signage was not conducted by the employer to ensure employees followed the necessary means to protect themselves from this contaminant.

There were no postings and due to the lack of MSDS made available to the employees, they were not able to educate themselves as to how to protect themselves from this substance.

- Workers whose clothing has been contaminated by Mica should change into clean clothing promptly.

This practice was not in effect at GE. Thus workers would have taken the contaminants home as with other contaminants in this plant.

- Do not take contaminated work clothes home, family members could be exposed.
- Do not eat smoke or drink where Mica is handled, processed or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, applying cosmetics, smoking or using the toilet.

Given the information above, it is well known as per section 5 of this report that the employees did eat at their work stations. Given the fact that there was no exhaust ventilation or proper housekeeping processes or proper training with regards cleansing of hands and contaminated clothing, the employees would have been exposed to this chemical as well as their food would have been contained as well as they ate at their workstations.

Furthermore, the insulation of the hydroelectric poles also required the mica segment plates to be utilized. The plates were heated and then placed on the ends of the poles. What is pertinent to note here is that when the mica plates were placed, after placement, they would be grinded to ensure smoothness , thus the emission of dusts would have been incurred at this point in this process. There was no exhaust system in place nor was there any respiratory protection made available to the employees. Heating of the plates would have caused decomposition products to be emitted.

The housekeeping procedures for all these processes included dry sweeping with a broom and utilized air hoses to remove fibres from machinery and from body parts as well as clothing. This practice would have alone contributed to the re-dispersal of already settled fibres. Furthermore, the electrical sweeping process in the main aisles would have also contributed to dispersing the setting fibres and other fibres in the areas.

The employees were given SBS30 and PLY 9 to relieve their itchy skin from exposure to the fibres. Although this was a diligent practice by the employer, more engineering controls were required rather than the supply of creams to relieve the exposed workers.

As per a document sent to the attention of **Mr. Jeff Godfrey of the Ministry of Labour, April 14, 1983**, the following information is pertinent to note here: (Appendix S).

- Reports of concerns with regards to dust generated in building #8 at the commutator-turning lathe.
- Production has been since reduced (this indicating that any further work in the area or sampling for dusts would not be representative of the already incurred exposures at this time and retrospectively)
- "…mica on its own can cause a form of dermatitis, in fact it has affected the lathe operator recently."
- The costs and equipment required to correct the ventilation deficiencies are minimal
- **Since mica does contain a percentage of silica, this can of course cause more serious problems such as lung and respiratory system damage**

A month prior to this document being sent, on **April 11, 1983 – a letter from L.T. Ball** indicated that due to the sampling results, no further action was required to alleviate any problems with regards to dusts in the area.

It must be noted here, that due to the fact that production was greatly reduced, the results from the sampling were not reflective of the results that would have been obtained had the sampling been conducted the year (s) prior when the dust levels were higher as per the employees. Hence the results obtained in this report are not representative of what the employees were being exposed to retrospectively speaking. It was stated that "production had been greatly reduced." With this information, it can be stated that with the sample results obtained, the results that would have been obtained prior would have been at or above the TLV. The results obtained at this time were 1.05 mg/m3 in the operator's breathing zone and the area sample showed 0.74 mg/m3. The TLV at the time for MICA was 3.0 mg/m3 respirable mass.

In a report one month prior to these sampling results, the following results were obtained for mica dust levels.

Report – March 31, 1983 – from L.T. Ball – to Ross Perin: (Appendix S)

Two air measurements were taken in Building #8 for mica dust. It is not clear here whether the sampling was for mica dust or for total dust. One sample was taken at the lathe and another at a test area. Both samples were below the TLV which was 10.0 mg/m3. Hence given that this sample was seemingly taken for total dust and not mica dust specifically, there is a false sense that the TLV was greatly not being approached by the results obtained, when in fact it was not being compared to the correct items that were required to be sampled for. The TLV for Mica as per ACGIH is 3 mg/m3 (respirable fraction).

A letter with signatures on this report was then resubmitted by the employees indicating that they were concerned with the specifics of mica dust.

J) MACHINING OF EPOXY COATED PARTS AND EXPOSURE TO DUSTS:

Exposure to epoxy dusts would be inevitable as all major large parts had excess accumulation of epoxy and thus required to be grinded. The parts would be left to hang to dry and cure, and in doing so any excess epoxy would gravitate and form icicles. These are the defects that would have to be ground or sanded off the large parts – See Picture #7 below. Without any proper personal protective equipment or engineering controls, exposure to toxic epoxy dust is expected. As per DHS, 1989, it is stated that it is not recommended to sand or grind hardened epoxies that contain, asbestos, fiberglass or silica fillers as these substances can cause severe lung disease if you breathe their dusts.

Picture #7: Manufactured Part taken out of VPI Tank – Note: Formation of icicles.

Furthermore, exposure during transfer of parts from VPI open Tank to grinding stations or areas to dry, to cure, or travel to and from the oven would also cause exposure to vapours from the tank and the parts themselves as they are drying off and releasing vapors.

The ovens often had seals that would malfunction and would allow the fumes from the baked parts to escape into the work place air and employees would incur exposures. Evidence of this has already been provided in the previous and current sections of this Report.

Evidence that the engineering controls were not suitable or not operable and were in constant non-conformance has also been provided in numerous sections of this report.

If in the more recent years there was evidence of exposure to dusts and fumes, and there were issues with regards to the engineering controls, then it can be stated the years preceding would been more hazardous with regards to exposures to these toxic solvents.

The following information has been collected from a Manufacturer and end user of epoxy products. Please note the following with regards to epoxies and their use. Taken directly from the document (Health Effects from Overexposure to Epoxy – 2004, www.mrfibreglass.com)

- The risk of exposure to resin, hardener and mixed epoxy is greatest when they are liquid.
- As epoxy cures the chemical ingredients react to form a non-hazardous solid
- Exposure by inhaling epoxy vapours is unlikely, because epoxy products evaporate slowly, however the risk increases when ventilation is inadequate or when the products are heated.

These facts are relevant to the exposures incurred in Armature. Often times parts were taken out of the ovens even before they were fully cured and often times ovens were full to over capacity thus causing exposure to heavy fumes and vapors as well.

As supported by The Society of Plastic Industry, 2001 : they state the protection of epoxy resin system workers form the 2 major health hazards they face, skin contact and inhalation of vapors, consists chiefly of three major work place controls:

Adequate ventilation, proper personal protective equipment and clothing, good housekeeping.

With this information alone, we know that these controls were not provided thus due to the manner in which these products were handled, the lack of training and the lack of due diligence on the part of the employer, exposure to the contaminants of epoxy resins is likely to be guaranteed.

There was no adequate ventilation with regards to epoxy tanks, VPI tanks, proper oven seals, etc. Hence, ventilation was not adequate and thus the presence of epoxy in the air is inevitable. Furthermore, the epoxies were indeed heated, cured, baked, dipped, heated, baked, cured over and over again, repeatedly for the same parts, for several cycles. Hence, the process was not complete until sequences of dipping and heating were continuously implemented. The methods that were utilized in terms of handling the epoxies would have contributed to the exposures incurred by the employees in this department. Furthermore, the vast dimensions of the parts handled in armature would also contribute to exposure incurred to epoxies, as such large parts were not enclosed or ventilated properly to exhaust out any decomposition products or off gassing of curing epoxy vapours from the heated parts.

- Ingestion of epoxy is rare, but it can happen when resin, hardener or mixed epoxy contaminated food, beverages or eating surfaces. The Society of Plastic Industry, 2001

Due to the fact that most employees ate at their workstations, smoked at these stations, and drank beverages at the stations as well, ingestion of epoxies and other contaminants in this department cannot be overruled. This route of exposure would also have contributed to the exposures the employees incurred in this department.

- Sanding partially cured epoxy produces airborne dust, which increases your risk of exposure by skin contact, inhaling or ingesting. Although epoxy is firm enough to sand within 2 hours, it may not cure completely for up to two weeks. Until then the dust can contain unreacted hazardous components. Furthermore, partially cured epoxy sanding dust if allowed to settle on the skin can also lead to contact dermatitis. In addition, when you inhale the uncured epoxy dust particles, they can become trapped in the mucous lining of the respiratory system and can cause severe respiratory irritation or allergies. The Society of Plastic Industry, 2001

Due to the fact that there were asbestos insulated wires, asbestos slots, fibreglass slots, silica fillers etc, grinding of these materials would have caused the respiration of these dusts into the lungs as well and cause the onset of disease.

Furthermore, OSHA Technical Manual on Polymer Matrix Materials state the following with regards to sanding, grinding epoxied apparatus:

- Dusts may be generated in several ways in advanced composite processes. The most common dust generating processes are machining and finishing cured parts and in repair of damaged parts. Much of the dust generated in these processes can be very fine and should be considered respirable. Studies of some graphite –epoxy finishing operations found respiration fractions ranging from 25%-100%.

As was made evident earlier in this report, as per analysis of paint from an epoxy coated part, it was shown that the part contained uncured epoxy resin. With this information, it is further made clear that indeed parts with uncured epoxy resins were sanded and employees were exposed to epoxy vapours and their decomposition products as well. (appendix U- October 20, 1969).

- One may become sensitized to epoxy after many exposures or just one. It could take ten days of exposure, a month or even years.
- Allergic reactions to epoxy can result in irritated skin or respiratory problems. Inhaling concentrated epoxy vapours if done frequently or for long periods, can irritate your respiratory tract.
- At room temperature, epoxy vapours are unlikely to be highly concentrated. If an employee is already sensitized to the epoxy, then exposure to low concentrations can trigger an allergic reaction. At warmer temperatures and in unventilated spaces, the epoxy vapour levels increase. This would be the case in the armature department as there was no air circulation within the department and little to no functioning exhaust systems in the plant.
- Mixed resin and hardener become hot and frothy as they thermally decompose, generating toxic vapors. These include Carbon monoxide, oxides of nitrogen, ammonia, and some aldehydes. Cured epoxy can emit similar vapors if you heat it too much. Due to the fact that the sequence of processes involved with the large parts in this department involved, dipping, baking curing grinding, dipping baking curing grinding, constantly, there would have been emissions of these toxic vapours during the several stages of processing the equipment.

Also as has already been cited here, the employees were exposed to uncured epoxy resins as well, as can be conceivable which such large parts that were being handled in this department and controlling exposures to such vast use of solvents, epoxies and multitudes of other chemicals was not possible at all times. However, this does not change the fact that indeed exposures were incurred and thus occupational disease and illnesses would be conceivable.

Likewise, the following facts are paramount to note with regards to working with cured or finished plastics as per Dillon Consulting Report for Working Safety with Casting Resins:

- Allow enough time for pieces to cure fully prior to finishing the piece. It is very important that curing times are followed since there will be off gassing of hazardous components of the resin while the chemical reaction is still occurring

As is known from the process section of this report and the document review provided, it is clear that this indeed did occur, and that parts were not cured fully before they were machined. This would be inevitable with the massive sizes of the parts that were being handled.

- Processing such as gluing, cutting, sanding, burning and melting of finished plastics can generate toxic vapours and gases and if the temperature is high enough the product can decompose and release it's original hazardous components – also the part may release any unreacted monomers and decomposition products.

To further create an even more hazardous condition, the employees utilized compressed air hoses to clean off body parts, clothing and machinery, to rid themselves of the toxic epoxy dusts. This would have caused dispersal of epoxy dusts into the various areas and this would have caused bystander exposures as well.

Copper Dust:

Grinding of copper wire and other parts took place heavily in the 1960-1970's. An exhaust system was in place but it was not fully functional. A grinding task would take (see #6 – Appendix I) anywhere from 3-8 hours. The employees did not wear any protective equipment, however in the late 1970's canister respirators were introduced for this job task.

k) Asbestos:

It is indisputable that exposure to asbestos has been incurred in the armature department. There were numerous processes in Armature which utilized or machined asbestos for Armature products, such as:

- Shears/copper stripped machinery where copper wire was stripped of any insulation (near the leads area)
- Taping Machines
- Bandsawing Asbestos Boards
- Winding /Forming Machines
- Grinding, Sanding, Welding Operations
- Asbestos Gloves
- Insulation for Building Pipes and other areas
- Asbestos Blankets for Portable Oven
- Repair of products fabricated by GE, from Clients

Over the decades asbestos was utilized in many products, processes and it was present in the building's insulation as well. On several occasions, frayed, deteriorated asbestos insulation was found by JHSC Inspections, to have been visibly hanging off pipes in various areas. In 1981 it was indicated that all asbestos should have been out of the plant, however, in 1987 there were issues with regards to hanging and deterioration of asbestos off pipes.

Furthermore, there was continued use of asbestos, up to and including the late 1980's (although documentation for later years is not available, it cannot be stated whether or not asbestos was present in the working processes of the employees in the 1990's). Document #33 provides an approximate time on when asbestos insulation was removed in the building, however it does not give details as to where or what type of insulated materials had asbestos removed: ex. Pipes, boilers, walls, ceiling, machinery. Likewise, insulation for coils appears to have been purged in 1992. However no information with regards to the various repair activities that took place, where large generators, or stators, would be brought back from the Clients, is available, which indicates when this process was purged in this building. As with other processes the repair activities would generate many asbestos exposures due to the fact that the dismantling of parts, insulating coils, welding, stripping etc., would all release asbestos fibers.

With regards to bandsawing of asbestos sheets, an MOL inspector had directed the employer to install engineering controls as there were none present (whether this was done or not is not confirmed). However this clearly indicated that years prior to this MOL inspector's visit, there would have been exposures to asbestos fibers during this process alone. In fact bandsawing processes continued in Building #5 area, up to and including 1987 (documentation for later years is not available – refer to Appendix K – Document #18, #30, #17). This asbestos from the Building #5 operation was utilized to insulate each turn in the coils, for application to the Poles (refer to Section #5 – 1980's processes). Much dust was generated in this building as there were no engineering controls to contain the release of the fibers. The process involved both shears and slitting operations. The slitter operated similar to a guillotine.(Document #13-Appendix K).

Transfer of employees from Armature to Wire and Cable:.

It is pertinent to note that between 1957 to 1960 many employees from armature were transferred to Wire and Cable and vice versa during the lay off periods to cover the various duties in both departments. Hence exposures to both departments and their solvents and other contaminants therein have to be taken into account when considering exposures and diseases incurred. Those employees have to be closely studied from a medical and hygiene perspective as their exposures would be obvious in their health records, testimonies and current health status.

Asbestos Gloves and Blankets:

Furthermore, the use of asbestos gloves had been demonstrated here through the literature reviews as another source of exposure to asbestos fibers. Thus exposure to the asbestos blankets would be of greater concern as the employees indicated repeatedly that the fibers could be seen floating everywhere when the blankets were utilized with the portable heater. Not only were the blankets put in place, they were also cut to size to ensure they covered the apparatus fully. The cutting operations would have also released fibers.

Machining of Asbestos:

Winding and tubing lathes would have also caused asbestos exposure to be incurred due to the manipulation of the insulated copper wires into various shapes. In winding the copper wire, or stripping insulated wires, there would have been exposure to fibers, especially without any PPE and engineering controls. (Appendix J-Testimony of an Armature Winder). Grinding operations and welding operations would have also contributed to exposure to asbestos fibers. What is of importance to note here once again is the vast dimensions of the parts, thus the length of exposure is increased and the volumes of contaminants that are present in the building would also increase due to their requirement for the parts being fabricated – example – asbestos insulation boards for the slots in the armature coils, for which some parts were 46 feet in diameter and took months to insulate, months to solder the coils together, etc. The spreader operations would have also caused fibers to be frayed and be dispersed in the work environment, as well as the taping operations.

Not only does the machining of parts containing asbestos contribute to exposure, but the lack of proper engineering controls, training and personal protective equipment all contribute to exposure to asbestos. Due to the large dimensions of the parts fabricated in this building, the volumes of products such as asbestos sheets would have contributed to exposure as well. Welding and stripping of copper wires insulated with asbestos would have caused exposures as well. The cutting machines, (shears stations), winding lathes, banding machines, and other handling operations, grinding, machining and welding of parts containing asbestos, would be likely sources of exposure to asbestos fibers, and the dispersal of the fibers, due to lack of engineering controls and methods of containment and housekeeping.

As per WHO, 2005:

- **Sawing, drilling, crushing, scraping and sanding asbestos containing materials are particularly likely to release respirable fibers and dust.**
- **Small diameter fibers and particles may remain suspended in the air for a long time and be carried long distances by wind or water before settling down.**

Housekeeping:

Furthermore, the intricate use of asbestos in insulation operations and other processes and maintenance operations also lend to exposure to asbestos at different levels. Housekeeping evidence, in terms of sweeping and use of air hoses, testimonies provided by the employees, the Ministry of Labour and the JHSC, and the literature review provided here are all evidence of the exposure to asbestos that the employees were subject to. If the employees were sweeping asbestos fibers off the floor and using air hoses to blow off fibers from the machinery, their clothes and skin, exposure is inevitable.

This practice would have been an essential contributor to disease in the workplace as well as all the other variables mentioned in this report. Furthermore, there was never any proper dust control with these operations as is evident from the reports and the levels of free silica in these areas would have also caused ample exposures to be incurred and the onset of disease. Free silica and other dusts and toxic products in the workplace cannot be ruled out as significant contributors to the onset of disease in the GE workplace.

Repair of Armature Parts from Clients such as Generators and Stators:

It is also imperative to note, the employees in Building 10 were also involved in the repair/rebuilding of large generators or motors. In conducting repairs, they were required to remove all the old insulation from stator coils, for example. It clearly states in the FVR (appendix k – Document #30) that the employees had to remove the old insulation, with the application of toluene. In doing so, the insulation would have also consisted of asbestos sheets, and asbestos insulated wire, and thus employees would be exposed to the fibers as the parts were being handled. Moreover, the employees were nevertheless also exposed to the toluene vapors as well. The toluene was utilized, as a wet method to clean the parts and contain the asbestos fibers so that they would not remain loose. Exposure to fibers would be high with these processes, as the fibers would have been frayed, dislodged from original placement and form, in the products being repaired.

Activities within the Building:

Furthermore, the liftrucks, crane and pedestrian activities would naturally disperse the settled or floating fibers into other areas of the plant and aisle ways as they would disperse the fibers from the contaminated operations, into other areas adjacent to these processes and the main aisle way of the plant running east to west (Inside Works Avenue). This can also be stated to have occurred with the fumes, vapours and dusts in various other processes not only in building 7, but all the other adjacent departments as well.

The main walk way which cut across the entire facility from east to west, allows one to walk from the east end of the plant, i.e. building 26 through till the west end of the plant till, Building #8, without going outdoors. Due to the fact that there was no proper ventilation in this plant as a whole, this aisle way acted as a major ARTERY transporting the various contaminants, fumes, dust, vapours, asbestos fibers to the other buildings from wire and cable and vice versa. Hence contaminants from building 7 would travel to building 26 and vice versa. The aisle way acted as a tunnel in which these contaminants traveled. When pedestrians or forklift traffic or crane movements would cause the air in the plant to be moved or disturbed, it would cause this air to move in and out of this main aisle way. (See Appendix A)

An employee stated the following with regards to the main plant aisle way, "the main aisle way was like a vacuum….the activities from asbestos carding for example would cloud the main aisle way and transport the fibers to the various areas of the plant at GE and I worked in BUILDING 16, which is not close to that activity at all. When I had to travel through the aisle way just looking down the aisle way it appeared as if a snowstorm was coming through, all the fibers accumulated in that tunnel and were distributed in the various entrances to the other buildings, as the doorways to those buildings acted as receiving grounds for these contaminants!" EMPLOYEE TESTIMONIES.

12. OTHER INFORMATION – LACK OF MSDS SHEETS:

Due to the fact that relevant MSDS sheets were not made available to employees over the decades in question, or to OHCOW, for this investigation, it is difficult to ascertain the elimination or confirmation of the presence of certain products. It is not clear if other carcinogenic products were utilized in the solvents other than what is has been investigated through the data presented to OHCOW and through the literature reviews. For example, it is not certain if Meta-phenylenediamine was utilized in this department. This product is an aromatic amine that could also be a component in epoxy resin systems and is known to cause contact dermatitis and kidney and bladder cancer (OSHA Technical Manual on Polymer Matrix Materials). However because no solid evidence was available and due to the fact that limited GE MSDS and other documentation was available for review, it cannot be stated whether this product and/or many others were or were not present in this department.

This fact needs to be taken into consideration when assessing exposures in workers of this Plant. Lack of information for investigations taking place today does not equate to a lack of exposures.

13. Document Review/ Ministry of Labour Evidence:

The review of some documents that were presented to OHCOW clearly indicates that due to the many inefficiencies with the engineering controls, there were exposures that were being incurred by the employees at the time the investigation (Field Visit) took place. If conditions were poor at the time of the investigation, it can be stated that conditions would have been more severe years prior.

The Ministry of Labour reports provide ample evidence of the poor work conditions in this facility and further validate that exposures were incurred as the housekeeping was poor, the engineering controls were non-existent in some areas, and inefficient in others, the company had poor maintenance practices, poor awareness with regards to asbestos and other solvents and carcinogens and their toxicity to human health etc. Noncompliance to directions and recommendations given by the Ministry is evident in the review of these reports and not only is there a fault of the GE Management but also of the MOL for not following up on their orders or directives given to the GE management.

Document prepared by the United Electrical, Radio and Machine Workers of America – Presented to the Ontario New Democratic Party Caucus Task Force October 5, 1982 – this document provides evidence with regards to employees concerns and work conditions, which were brought forth to the governing bodies - Please refer to Appendix V.

14. Literature Review and All Evidence Provided Herein:

With the evidence from the epidemiological studies and medical reviews presented, it is clear that most of the conditions in this work place would have resulted in the onset of disease for a majority of the workers in the Armature Department at General Electric. This is further compounded by evidence not only from the employees' testimonies but also direct and factual data presented by the Ministry of Labour, indicating non-conformances with the law and poor engineering controls. The medical research and epidemiological studies link many of the cancers and other life impairing illnesses in the workplace to those realized by the General Electric Employees and continue to be confirmed to date. The process information is further supported by the literature reviews provided herein, from IARC and other governing agencies, as evidence of exposure based on handling of the solvents, being exposed to these contaminants in their various states, either room temperature or molten temperatures and synergistic effects, and their other general use in the Armature Department.

15. The 1971 Explosion:

Most of the resins and other chemicals in the department would have emitted toxic fumes during the explosion in 1971. The information on epoxies that has been provided here denotes that the decomposition products are toxic and thus would have been emitted in large quantities during the explosion. The off-gassing of parts that would have been contaminated with the fumes and vapours would have remained for much time after the explosion. If the streets and trees around the plant were affected and paint was peeling off cars outside of the plant. how could conditions inside the plant be even remotely safe? If the conditions from an occurrence inside a building are really effected and damaged outside, kilometers away from the incident, how could the conditions in the plant be safe to work in?

The release of toxic gases and carcinogens as mentioned already in previous sections of this report would have been incurred: formaldehyde, styrene, benzene, phenols, carbon monoxide, carbon dioxide, nitrogen oxides, hydrogen chloride, hydrogen cyanide.

Epoxy related fires should be extinguished with dry chemical, foam or CO2. However, as per the evidence presented herein, the fire department had added water to the epoxy and thus an explosion occurred thereafter.

Furthermore, as per MSDS reviewed (actual or generic it is stated in numerous data sheets with regards to Reactivity Data: epoxy resins and epoxy resins hardeners react with each other producing heat. They should not be mixed with each other under uncontrolled conditions or in large masses as the ensuing exothermic may result in heat and smoke resulting in hazardous decomposition products) See Appendix R – Generic MSDS for Epoxy Polymer Mix. This data sheds light on what occurred during the 1971 overheating of the VPI tanks. The fireman came in to dissipate the heat and added water to the tank, thus causing an explosion.

Appendix J – Testimony of an Armature Winder: gives more information with regards to the fire, with a testimony of the explosion in 1971. Please refer to the appendix for further information.

Many of the chemicals were incompatible with one another. As per the MSDS in Appendix Q – Isonel 51, which was utilized in large quantities throughout the decades, in this department, the formaldehyde present in the solvent reacts with HCL to form a carcinogen, BIS-chloromethyl ether. With this high mixture of chemicals present in this department, by-products and other incompatible products would be even greater when the explosion occurred. Some product/parts in the plant disintegrated upon touch, other examples of paint peeling off the walls, (as was evident even now, as observed on the December 7th 2004 tour), and paint peeling off cars kilometers away, all prove how toxic this chemical reaction was and how detrimental it was to the employees, the products inside the plant as well as the neighboring areas outside the plant.

9. CONCLUSIONS:

The multitudes of chemicals and processes, including carcinogens, in their various forms, that were utilized in the Armature department have been demonstrated here to harm the health of employees working in this department. Furthermore, the size of the parts being fabricated, would also dictate the volumes of chemicals that would be required, and thus more production of contaminants, more time required to machine and process the parts, which are all directly related to the frequency and duration of exposure. The constant dipping, baking, curing of these products and the exposure to the many forms, solids, liquids gases and their decomposition products have been demonstrated here to be of paramount importance when trying to assess and establish exposures. One process alone cannot be looked at as stand alone, as the processes all occurred in a building namely Building 7 -5, 8 and 10 for armature employees. Most buildings at GE were similar in that they all relied on natural ventilation. Hence the above statement, applies to all buildings, as all the processes within the buildings were close to one another, contaminants were heavy and accumulated, (as there was no forced make-up air) and thus bystander exposures to several contaminants from several processes were incurred by employees. Nevertheless, without proper ventilation, exhaust controls, exposure to these solvents is inevitable.

"Culprits for disease are often attempted to be singled out when trying to establish exposures. However exposure rarely occurs in isolation. Solvents are usually found in groups in workplaces, i.e. simultaneous exposures, rather than just one solvent on it's own. (Wartenberg, 2000)."

It has been demonstrated here and made clear that a majority of the solvents have similar target organs or body systems such as the Central Nervous System, Respiratory Tract, Gastrointestinal System, the skin and many more. Most solvents that were utilized have similar target organs and thus, exposures to these solvents must be calculated in combined effect ratios rather than singular exposures. Furthermore, taking into account overtime work, would largely reduce the accepted TLV levels and have not been observed to have been taken into account as per the evidence presented to OHCOW.

Some hazardous substances may act in combination with other workplace exposures, medications , or personal habits of the workers to produce health effects even if occupational exposures are controlled below the limits set by evaluation criteria. Synergistic and additive effects may not be considered by a chemical-specific evaluation, which has been the case as per the evidence presented to OHCOW. Furthermore, many substances are appreciably absorbed by direct skin contact potentially increasing the overall exposure and biologic response beyond that expected from inhalation alone. Many of the TLV's have changed over time, as new information on the toxic effects of an agent become available. Hence it is prudent for all employers to maintain worker exposure well below the established occupational health criteria. (NIOSH, 2000).

Hygiene Data was not made available, either due to lack of documentation available or very limited or absent during the early decades of the plant operations. Thus assigning quantitative measures of exposure to individual job activities was not deemed appropriate at this time. It was not realistic and potentially misleading to create seemingly precise exposure data (assigning time weighted average exposures to jobs) for jobs in occupational settings, which span over and above 4 decades. Moreover, concerning the usage of Asbestos in this department, due to the unique protocols carried, levels obtained through literature reviews in other workplace settings were not comparable with the work processes in the Armature Department.

Assigning a classification scheme for the usage of the chemicals as a surrogate for actual exposures as per the Marano study of 2000, (where an exposure assessment for aircraft manufacturing workers was conducted), would be the most appropriate with the numerous types of processes and chemicals involved in the Armature department. In the Marano study, chemical usage as a surrogate for actual exposures was utilized along with conducting an analysis by categories of years potentially exposed. This approach was required because of the absence of any direct quantitative measure of actual exposure levels experienced by the workers in various jobs held prior to 1980. Marano et al., 2000 state:

> **"We believed that it would be inappropriate and perhaps misleading to make guesses as to the levels of exposure (e.g. ppm) during the 1930's through the 1970's for specific jobs….on the other hand, we are quite certain about the fact of exposure….that employees were routinely exposed to the chemicals due to the known components of the products utilized in the early years."**

Similarly, it can be stated that the employees who have worked in the Armature Department as per the decades studied herein and years prior, were exposed to the chemicals that have been studied and to other unknown chemicals for which there is no data at this time (chemicals which were mentioned by the employees, but for which there was no documented proof in the form of MSDS sheets or chemical information from GE that would allow OHCOW to make relevant confirmation of existence in the department). The certainty lies in the known components in the chemicals utilized for the various processes and their decomposition products.

If an epidemiological study were to be conducted for the General Electric employees of Armature, and a classification scheme applied such as that in the Marano study, with three categories, routine usage, intermittent usage and minimal to no usage, an approximated 99% of all Armature employees would be classified (as per the author) under the routine usage classification. Furthermore, it has to be stated here that due to the close proximity of the various processes in this department, bystander exposures must be taken into account as well. Because the ovens, solvents dip tanks, VPI tanks, bandsawing operations, welding operations, degreasing operations, dry sweeping operations and all other processes were used on a daily basis, and the deficient engineering controls, bystander exposures would also be considered "routine" exposures to those employees who were not directly involved with the chemicals in question.

The Retrospective Exposure Profile supports the contention that there was a high level of asbestos exposure and other chemicals in the Armature Department. The procedures carried out throughout the decades were complex, chemicals formulations were unique to the General Electric protocols (MSDS not available for all chemicals formulated by GE) and the dynamics of the building construction and ventilation all lead to the complexities described in the Report. Considerable occupational exposures to 35 chemicals were reviewed and 15 processes were critically analyzed, along with evidence supported by several Ministry of Labour Field Visit Report. Of the 35 chemicals utilized, 15 are Carcinogens (some possibly carcinogenic) as per the International Agency for Research on Cancer (IARC).

Finally it should be noted here that the statements made by the employees and the processes described are validated in the Ministry of Labour Field Visit Reports that are cited in Sections 7 & 8 of this report which validate, confirm and provide solid evidence of the testimonies given by the employees, description of the workplace and work conditions, and thus further provide evidence that exposures were more than likely to have contributed if not fully incurred by working in this area at the General Electric Plant.

In all evidence provided in the form of the medical, scientific literature reviews and Ministry of Labour and General Electric company records:

- Due Diligence was not a practiced in all aspects of management processes and health and safety at this workplace. All the documents and testimonies presented here as evidence demonstrate that the employer did not properly train the employees on the use and care of personal protective equipment, did not disclose information on the products the employees were utilizing or how to protect themselves against those products, did not provide suitable ventilation within the plants or suitable engineering controls for the various equipment that was present in the plant etc.

- As per the critical analysis of the processes, literature review and background information on the various chemicals and processes that were utilized in the Armature Department of General Electric, it is clear that employees were most likely exposed to these contaminants, to their by-products and to the reactive products that are formulated when these products are mixed together or their reactions to heat and simultaneous exposure to other products/processes. Furthermore, due to the lack of suitable personal protective equipment and engineering controls and lack of proper health and safety management with regards to administrative controls, eating at the work station, air hose usage, poor housekeeping practices, lack of proper washing instructions, usage of equipment in the absence of proper engineering controls, the nature of the ventilation in the plant, and the fact that there was a significant amount of cancer causing agents plant wide and their careless use, there is enough evidence to link the work relatedness of the employees' debilitating diseases to the unsafe work environment, materials, processes and procedures they were required to participate in as employees of GE.

- Poor ventilation in the plant, the lack of operable windows was not suitable to release plant air to the outside environment, and Inside Works Avenue, the main aisle way acting as a transporter of contaminants throughout the GE plant all contribute to the health impairments that have been and are being incurred by the former and current GE employees to date.

- Chemicals that were present in the patented formulas of GE cannot be ruled out as causative agents in the development of illness and disease in the employees of the Armature department at GE. The MSDS were not available for review in totality by OHCOW as they were not made available to employees or union members alike. The elimination or confirmation of **other** toxic agents and/or carcinogens, not mentioned in this REP, for this Department cannot be justified here without further evidence. However, through the investigation conducted herein, the literature reviews, MSDS sheets, Ministry reports, GE documentation, manufacturer's data (epoxy resins for example), the presence of many toxic agents and carcinogens have already been confirmed to be present in the Armature processes.

It was a pleasure working with all parties involved in this Retrospective Exposure Profile. I thank all parties who participated in it's formulation and completion.

On behalf of Occupational Health Clinics for Ontario Workers,

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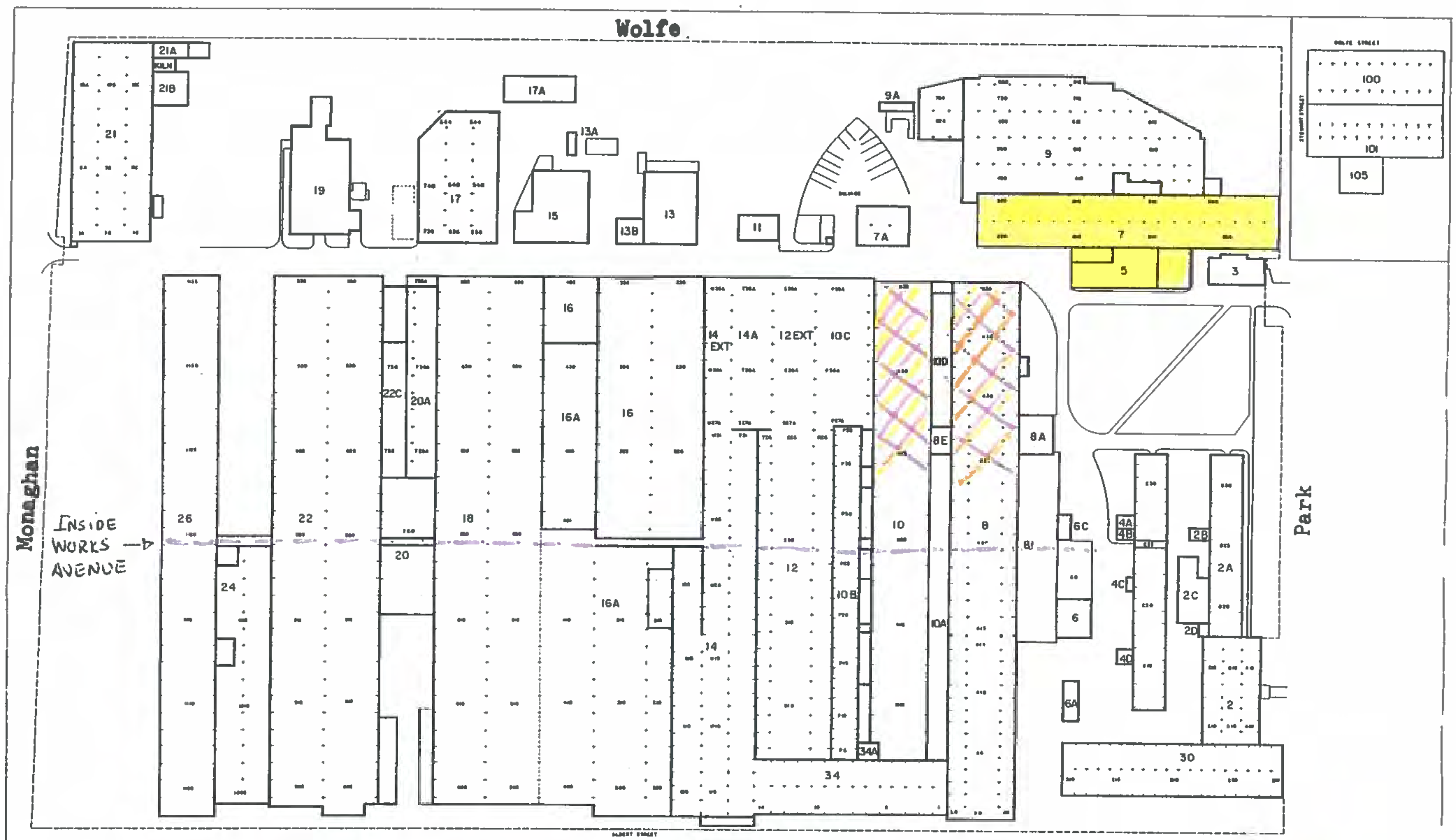
APPENDIX A-W IS LOCATED IN BINDER #2

BINDER #2

APPENDICES – BINDER #2

A) PLANT WIDE LAYOUT
B) ARMATURE UPSTAIRS LAYOUT
C) 1960'S LAYOUT FOR DOWNSTAIRS ARMATURE
D) LATE 1960'S EARLY 1970'S LAYOUT DOWNSTAIRS
E) ARMATURE BUILDING CROSS SECTION
F) MICA AREA ON ARMATURE LAYOUT
G) ARMATURE EQUIPMENT AND PROCESSES – BLACK AND WHITE PHOTO A) BEFORE THE 1970'S, B) AFTER 1970'S
H) ARMATURE PICTURES–ILLUSTRATING LARGE DIMENSIONS OF PARTS
I) 1980'S TO PRESENT LAYOUT
J) CONFIDENTIAL INFORMATION – TESTIMONY OF ARMATURE WINDER
K) MINISTRY OF LABOUR REPORTS FOR DOCUMENT REVIEW
L) OHCOW RISK MAPPING 1995
M) SELECT MSDS SHEETS FROM GE MADE AVAILABLE TO OHCOW
N) OHCOW – BENZENE FACT SHEET
O) PICTURES OF ARMATURE AND ARMATURE PARTS/PROCESSES
P) ENGINEERING MANUFACTURING INSTRUCTIONS: #4320-STATOR WINDING
Q) ISONEL 51 AND ASPHALT VARNISH -INFORMATION AND CORRESPONDENCE
R) GENERIC MICA, ASPHALT VARNISH, AND RESIN MSDS SHEETS
S) GE MICA PRODUCT DATA SHEET
T) GENERIC METHANOL MSDS (2)
U) GE DOCUMENTS – REFERENCED IN ANALYSIS SECTION 8.
V) UNITED ELECTRICAL RADIO AND MACHINE WORKERS OF AMERICA –OCTOBER 5, 1982 DOCUMENT TO THE NDP CAUCUS TASK FORCE
W) REFERENCE MATERIAL PROVIDED BY BORGSTEDT AND HINE

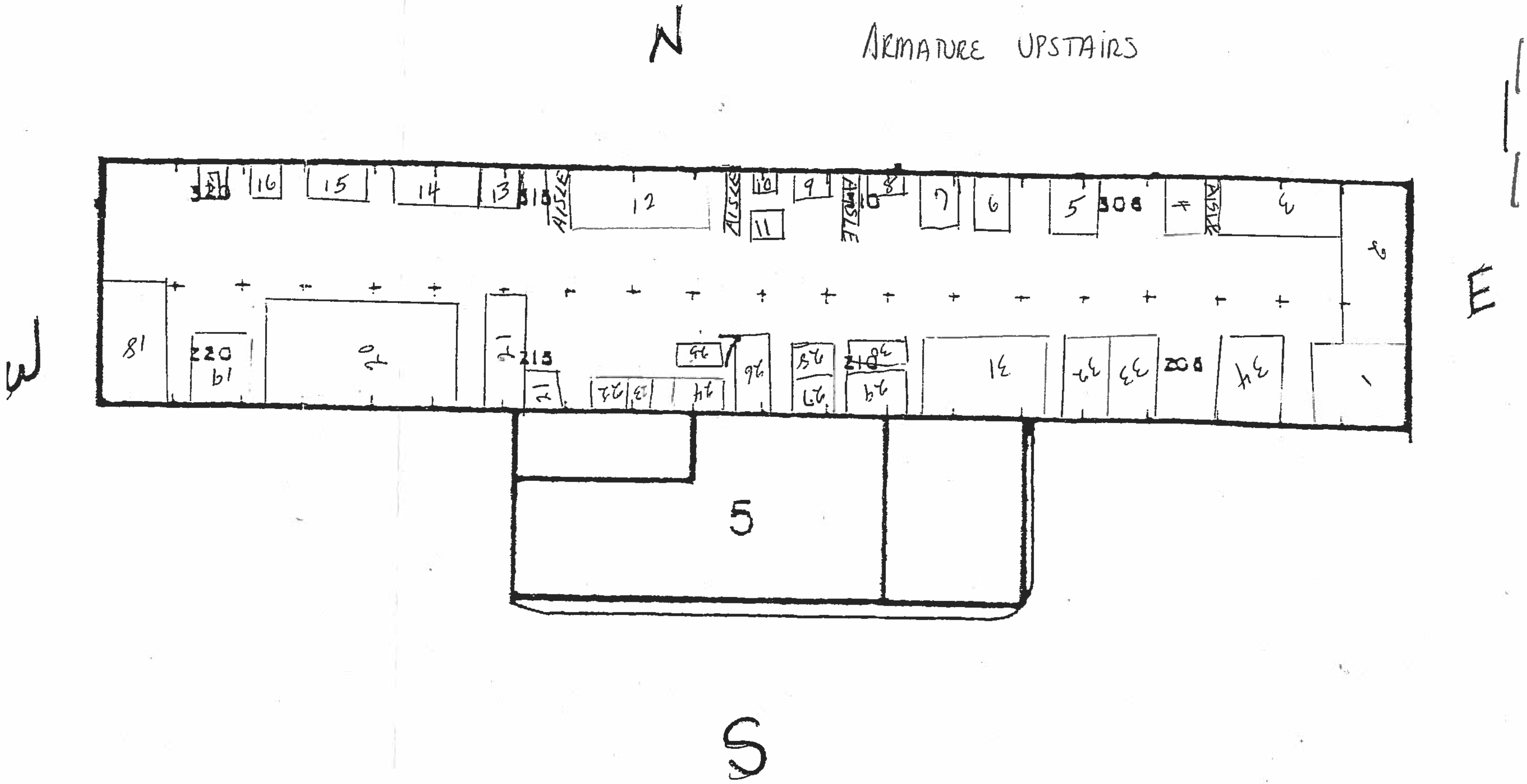


No. 2 MAIN OFFICE
No. 2A CONSTRUCTION
SWGR. ENG. & MARKETING
No. 3 RELATIONS
No. 4 CAPACITORS
No. 5 COIL IMPREGNATING
No. 6 GARAGE
No. 6B TRANSPORTATION
No. 6C HOSPITAL
No. 7 ARMATURE
No. 7A SALVAGE
No. 8 MACHINE SHOP
No. 8A PLANT ENG.
No. 81 BAR STOCK STORES
No. 8A PURCHASING, INST. LAB.
No. 9 F.H.P. MOTORS

No. 10 GENERATOR ASSEMBLY
No. 10B BABBIT SHOP
No. 11 FIRE HALL
No. 12 PUNCH PRESS
No. 13 STEAM PLANT
No. 13B COMPRESSOR BUILDING
No. 14 STRUCTURAL STEEL
No. 14A -do-
No. 14 2nd, 3rd FLOORS G.P. CONTROL
No. 15 PAINT SHOP
No. 16 SWITCHGEAR
No. 16A TRANSPORTATION EQUIIPMENT, TOOL ROOM
No. 17 N.M. MACHINE SHOP
No. 18 INDUCTION MOTORS MAINTENANCE

No. 20 WIRE, CEMA & I.P.C. OFFICE
No. 20A COMPUTERS & SCOPS
No. 21 APD OFFICE, LAB
No. 22 WIRE & CABLE
No. 24 FORMEX
No. 26 WIRE & CABLE
No. 30 APP. SHIPPING, RECEIVING, WAREHOUSE, RECTIFIERS, COMMUNICATIONS, EMPLOYEE STRS., STATIONERY
No. 34 STEEL CUTTING
No. 34 2nd FLOOR G.P. CONTROL
No. 100 APP. ENG. LAB
APP. ENG. PERSONNEL
No. 101 APPARATUS MARKETING, I.P.S. ADV. & SALES PROM.

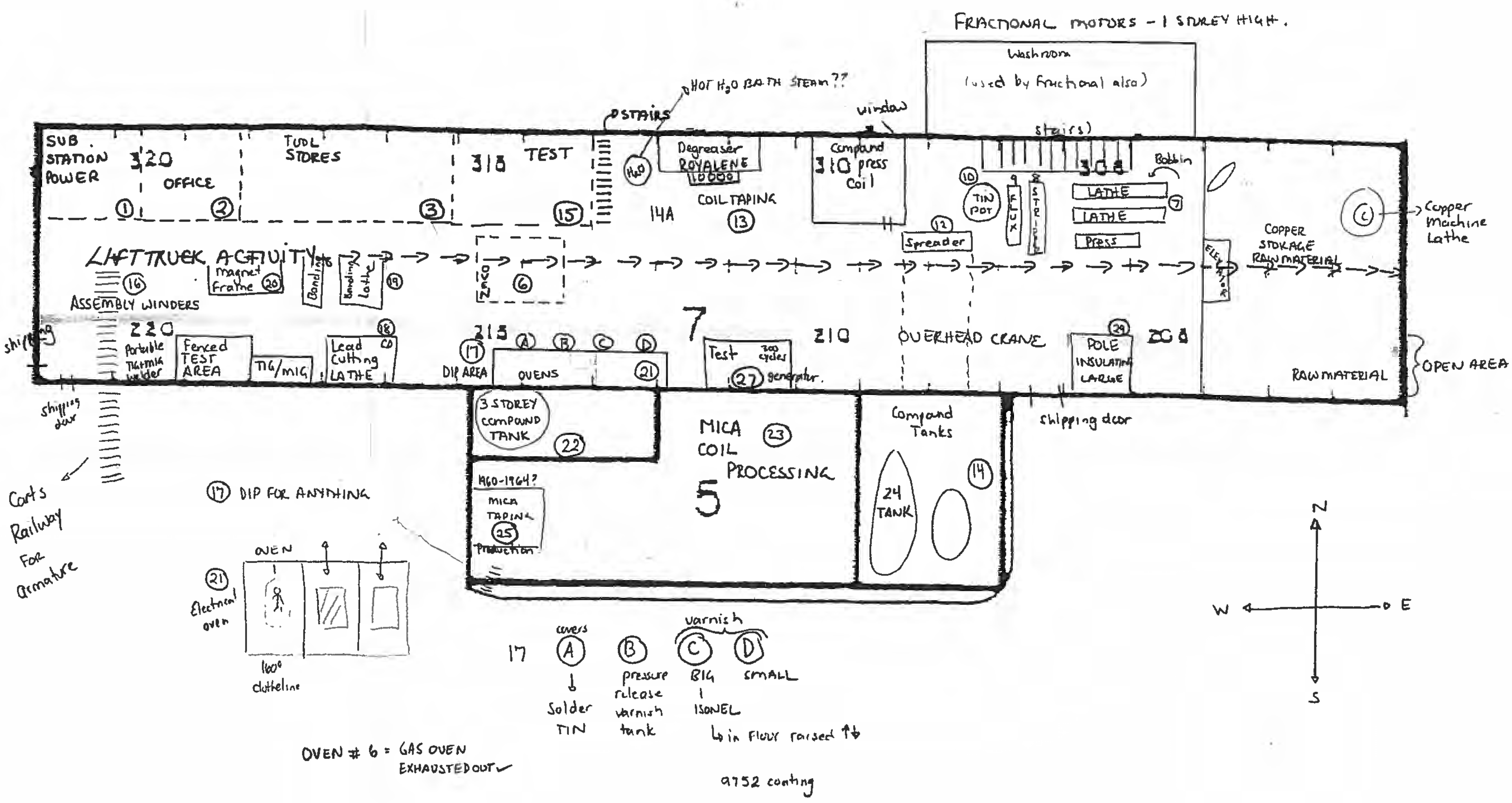
LEGEND
= ARMATURE DEPT.
= DEPT 8 or 10 shared Armature SPACE
= INSIDE WORKS



N
ARMATURE UPSTAIRS
W
E
S
16
15
14
13
AISLE
12
AISLE
10
9
11
AISLE
8
7
6
5
308
AISLE
220
215
208
5

APPENDIX B

ARMATURE DOWNSTAIRS
1960'S



[redacted]

January 31, 2005

[redacted]

[redacted]

[redacted]

Place of Employment: Canadian General Electric, Peterborough

A work history found among my father's effects is enclosed. It dates from 1941 to 1976 and has additions on it in his own handwriting. A work history dated 1976 to 1984 (or retirement) has been requested from GE Canada but has not yet been received.

[redacted] started to work at C.G.E. on 2.5.1941 but left to enlist in the armed services 7.8.42. However, he was denied due to rheumatism in his shoulder and an inability to carry a rifle. He returned to work at GE on 11.1.43. According to family records he retired on November 1, 1984 at the age of 62 years and 7 months. For the first years, [redacted] worked in the Diesel Dept. as a coil former winder and also in Induction Motors. The liners that he worked with were made from mica dust and silica.

Later on, [redacted] passed his trade papers as an armature winder. For the last 30-35 years of his career at the C.G.E. he worked in the Armature Department as an armature winder. He worked with asbestos daily at this job. The air near his work station was filled with a white dust and white particles. His nose and eyes ran constantly while working as evidenced by [redacted] when he

1976-1984

[redacted]

would walk by [redacted]s work station. [redacted] wore glasses. I do not know if he wore a breathing mask.

In the 1960's (date unknown) there was a fire in the area where armature tape was made. My father was working on armatures at that time.

On Sunday, August 1, 1971 at 9:28 p.m. Peterborough Fire Department was sent to a fire at building # 7, corner of Park and Wolfe St. It was in the armature department. According to the Peterborough Fire Department, (personal interview with Margaret, Chief's Secretary, January 6, 2005), the fire was a big fire for this city (see newspaper clipping, attached). It was caused by an overheated 2000 gallon kettle which contained resin which was used to make materials which coated the armature windings. I believe [redacted] worked the night shift that evening as he came home earlier than expected and told my mother that they were unable to work due to the fire, the damage it caused to the building and the fumes. I think [redacted] took 1 ½ days off work due to this event.

[redacted]. He worked in armature department for many years with my father and he knew him well. K. was there the night of the August 1, 1971 fire. He indicated that there was extensive damage to the work area. Paint peeled from the steel beams; every tree outside the department on Wolfe St. lost its leaves; paint came off cars parked nearby and paint peeled off houses as far away as Edgewater Blvd. At the time, the electrician L. Thorington went down into the tank while Mr. Riel Sr. sat on the top of the tank. L. Thorington died 1 year later from leukemia. K. said that [redacted] was present at the time of the fire.

I spoke to I.M. (name withheld by me), a former C.G.E. worker who worked in the armature department. He was present at the time of the fire. He said that a V.P.I. tank – a pressurized tank caught fire and when the firemen came in and poured water on it, the tank then exploded and it was a miracle that no one was killed. The smell was putrid. Ken Logan was the supervisor at the time. He gave the men rubber gloves and asked them to clean it up. The men refused and went home. I. M. took two 1 or 2 weeks off work at this time. Apparently, according to I.M. the Peterbough Fire Department lost 4 firefighters within 1 year of the fire from cancer. This may be a local rumour, as in my interview with the Fire Department, they were not aware of these deaths but did indicate that many of the firemen who fought that particular fire at the C.G.E. were unable to continue working in their jobs as firemen. The files of these men are stored at City Hall and can be accessed by the Fire Department's request (Margaret, Chief's Secretary). These firemen went off work on Workman's Compensation.

[redacted] was also exposed to fumes, vapours and gases from materials used to make resins to coat the armatures during the big fire of August 1, 1971. He was also exposed to welding fumes, chemical fumes, fiberglass, silica, mica dust, aluminum, chromium, copper, nickel, zinc, paint, varnish, degreasers. He tended the oven, treated items with varnish and paint. As well he did dipping and baking, insulating and soldering.

His upper limb use was repetitive. There was high noise, vibration and solid particles of white specks floating in the air.

Throughout the working years, [redacted] health deteriorated, starting at about age 40. His illness appeared to progress after the fire of 1971. Every year he would suffer 4 to 6 bouts of heavy coughing complete with copious amounts of phlegm (clear, white or yellow). He would be off work anywhere from 1 to 3 weeks with these ailments which would be labeled as colds or bronchitis or pneumonia. He had pains in his lungs and shortness of breath. He was not paid for his sick days at this job. To my knowledge (hearsay from my dad and mom) he was diagnosed over the years with: chronic bronchitis, asthma, fibrosis, emphesema, chronic

[redacted]

obstructive lung disease and congestive heart failure. He was on 3 puffers, prednisone, oxygen, blood pressure medication and slow K. There could have been more medications.

[redacted] was a smoker, like most of the other employees at the C.G.E. He tried to quit on many occasions without success until he finally quit smoking for good in December 1994.

In December, 1994 [redacted] was hospitalized at St. Joseph's Hospital here in Peterborough and told that due to COPD and congestive heart failure he would not live long. It took quite awhile for him to recover. Although we did think we would lose him, he recovered enough to be sent home and was considered, "a miracle man" by the nurses who cared for him. He had been bedridden so long that he suffered from drop foot upon his release. He was placed on oxygen.

Shortly after my father came home, my mother became terminally ill. Although my father was ill and on oxygen he cared for my mother at home as best he could, through her two year journey into death. She died in April 1997.

[redacted] was unable to enjoy his retirement years due to his illness and being chained to an oxygen tank. He had many medical expenses. He had to change his hobbies to new sedentary hobbies that could be done at home, in order to adjust to his disability. When medical personnel (Victoria Order of Nurses) came to the home, I heard the words, "asbestosis" and "two tumours beginning with the letter M." Chest x-rays, blood work, respiratory therapy, nursing and doctoring was done in the home for a long period of time.

To accommodate his illness, [redacted] had many extra expenses such as:

Traveling oxygen tank
Hospital bed and tray -- sheets, blankets, linens
Commode, raised toilet seat, raised bath seat

[redacted]

Walker, braces, cane, electric chopper, sleep apnea device, craft and hobby supplies, van – for high seat, handicapped sticker fees

[redacted] was on oxygen for 5 years. It was 85% covered by C.G.E. He paid about $150 to 200 per month out of his own pocket for his oxygen.

[redacted] was the father of 8 children. If we had not been able or willing to help out, he would have been required to pay for the following services to maintain himself and his wife in his own home:

A housecleaner
A bill payer
A personal shopper
Lawn cutter
Gardener
Personal health care aide
Someone to put garbage out

In March 1999 [redacted] was hospitalized at Peterborough Regional Health Centre. Initially the diagnosis was pneumonia but later on [redacted], family physician said it was the progression of his COPD illness. It was a painful, extremely uncomfortable death. Reg Tapp died on April 26, 1999.

I feel that part of my father's illness was work related due to exposure to workplace hazardous materials including exposure to asbestos over a long period of time, due to exposure to silica and mica dust and due to exposure of practically every chemical known to man in his work at GE. I feel that the fire of August 1, 1971 was significant in affecting his health and that it should be investigated further. I feel that [redacted] (now deceased) should have received some monies from W.S.I.B. for years and years of pain and intense suffering, for extra expenses associated with his disability and for the loss of what should have been the enjoyment of his short retirement years.

. . AND TIPPING CANOES

PLENTY OF LAUGHS

at a sharp curve on County Road 18 just east of Bridgenorth early this morning.

Driver of the truck, Howard James McGinn, of Coe Hill, was not injured.

Provincial police in Peterborough are also investigating a single-car accident Monday afternoon that caused an estimated $1,200 damage.

The accident occurred on the 19th line of Dummer Township in Norwood. Driver Wilbur R. Archer, 16, of RR 1, Norwood, received a cut to his right eye in the mishap.

Firemen Spend 12 Hours At CGE

A chemical reaction in a 2,000 gallon resin tank at Canadian General Electric Ltd. is believed responsible for a cloud of offensive gas that hung over the city Sunday night and Monday morning.

Fireman were called to the plant at 9:28 p.m. Sunday when a refrigeration unit used to cool a resin tank broke down and the resin began to harden giving off gas and heat.

Fireman stayed until 9.43 Monday morning pumping water on the tank to keep it cool.

Complaints about the irritating gas were received from all corners of the city.

Platoon chief Fred Ray, who supervised the night's operations said that the six fireman used 61 air-tanks for breathing over the night. There were no injuries.

No estimates of damage were available, but a CGE spokesman said it would be "extensive."

Alarm Box

SUNDAY

12:25 p.m.: 145 Stewart St., lockout.

9:28 p.m.: Canadian General Electric, 107 Park St., gas fumes.

10:42 p.m.: 380 Mark St., fire in free house.

MONDAY

9:05 p.m.: 367 Rogers St., car fire.

After 43 Years Service

At 6:10 p.m. Saturday, William Hunt started up his General Motors diesel bus and left the downtown terminal heading north on the George St. run.

About 55 minutes later he turned off the same bus, collected his change purse and ticket stubs and closed the doors on a bus driving career that has spanned 43 years.

Mr. Hunt retired Saturday and took with him the longest continuous bus - driving record in Peterborough history.

In 1928, the year after they took the last of the trolley cars off the streets, Mr. Hunt began driving buses on what passed for streets in those days.

WILL MISS IT

Since then he has driven "millions of miles," and he "can't remember being off sick one day."

"I've been on the streets my whole life," he says, "all I worked inside you could put in your eye."

What keeps a ma bus for 43 years non thing in particular, in general, I'm bour it."

At 70 years he ha most of his cont "with the exception few," but he has m good friends on his day run and "I thar that."

Peterborough, the changed "a lot" he for the people. "I dor thing different."

Despite retirement says he'll still "be before 5 a.m. and ma nice to know I don't l up."

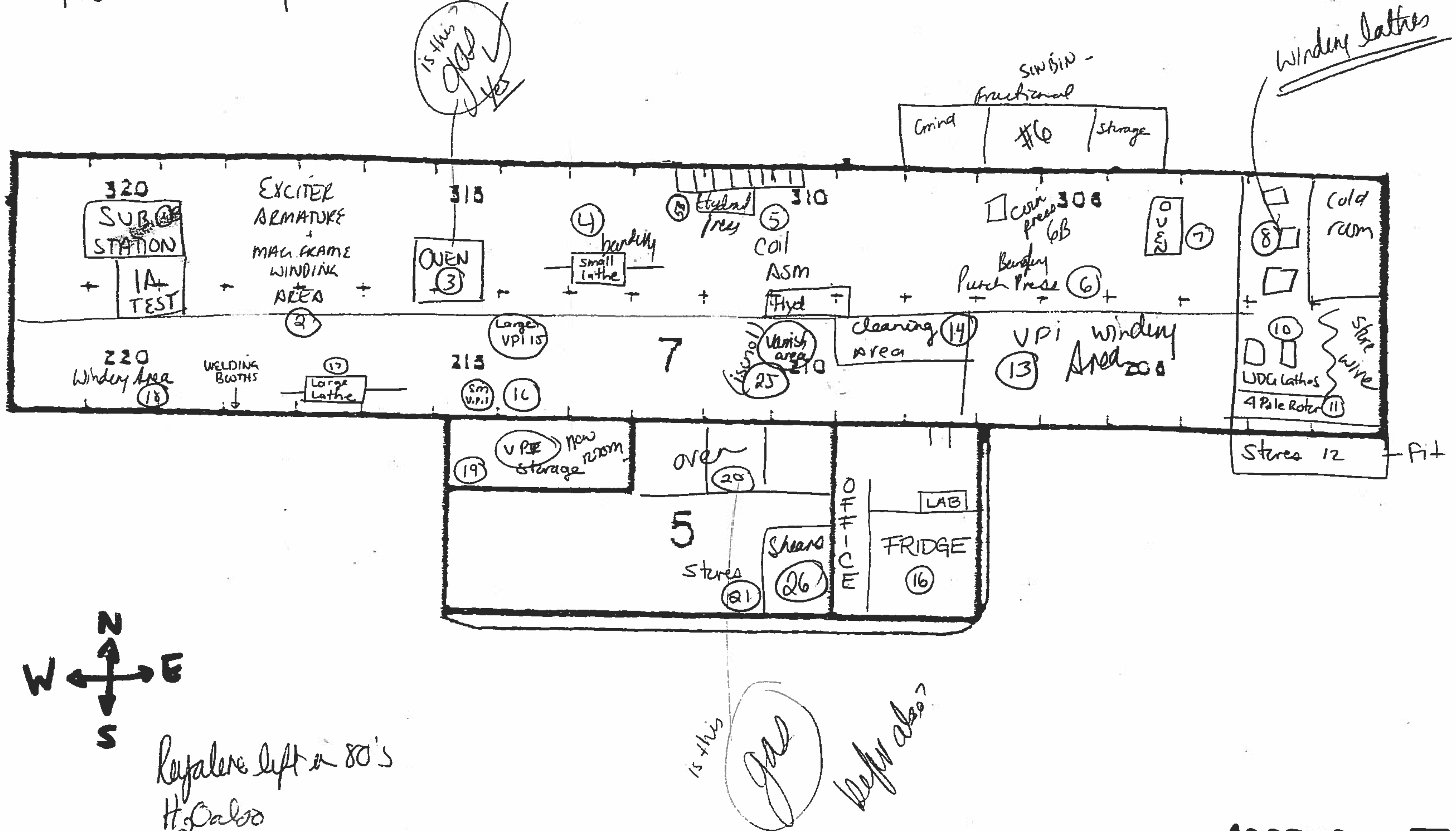
At an age where automobile is conside complishment, he ha plans.

"I intend to start r cycle."

Just watch out George St. buses Mr

WILLIAM HUNT STARTS HIS LAST RI

1980's — Today



Rayalene left in 80's H_2O also

APPENDIX I

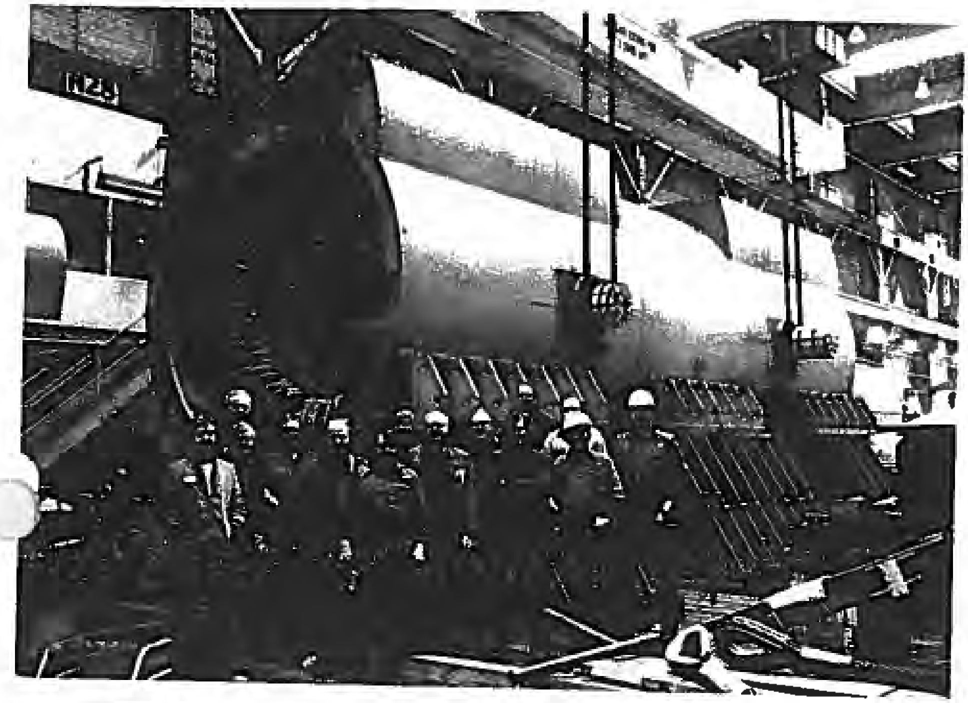
20 oven gas oven → when put put in VPI late mid to late 60-70's

Compound tank 1977 → took out 1977 due to asbestos everywhere

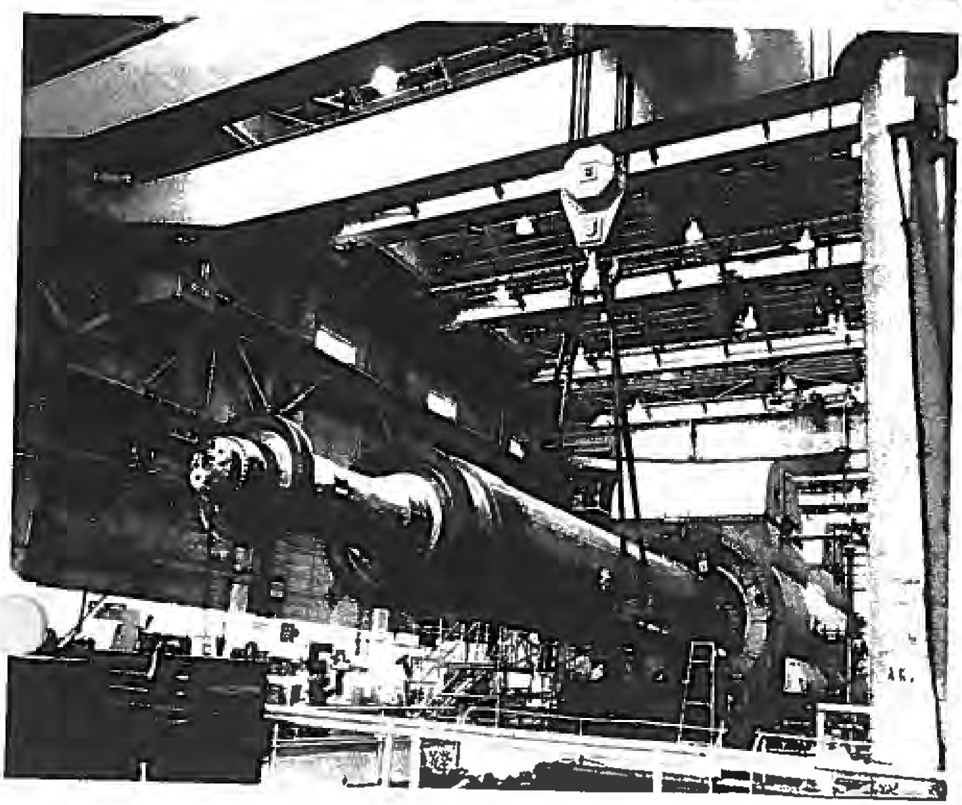
1980's LAYOUT
TO
PRESENT

I

...ing south down the Machine Shop, this photo shows the busy and congested place that Building 8 was for many years. ...ing 10 was constructed to relieve this condition and provide for the larger generator and motor sizes being designed.



The Bruce-B generator weighs over a million pounds and is the largest we have ever built. It's our first machine with dome coolers mounted on top to contain the hydrogen coolant gas. Here are some of the fellows who helped build it.



At Peterborough, a dramatic view of the rotor being moved into the stator. This rotor weighs 365,000 lbs. The shaft itself is made of solid forged steel. Only a couple of forges in the world are capable of producing it

Looking south down the Machine Shop, this photo shows the busy and congested place that Building 8 was for many years. Building 10 was constructed to relieve this condition and provide for the larger generator and motor sizes being designed.

SHEET #2 ARMATURE #7 BLDG. AFTER 1970 TO PRESENT

BY JOHN BAL.

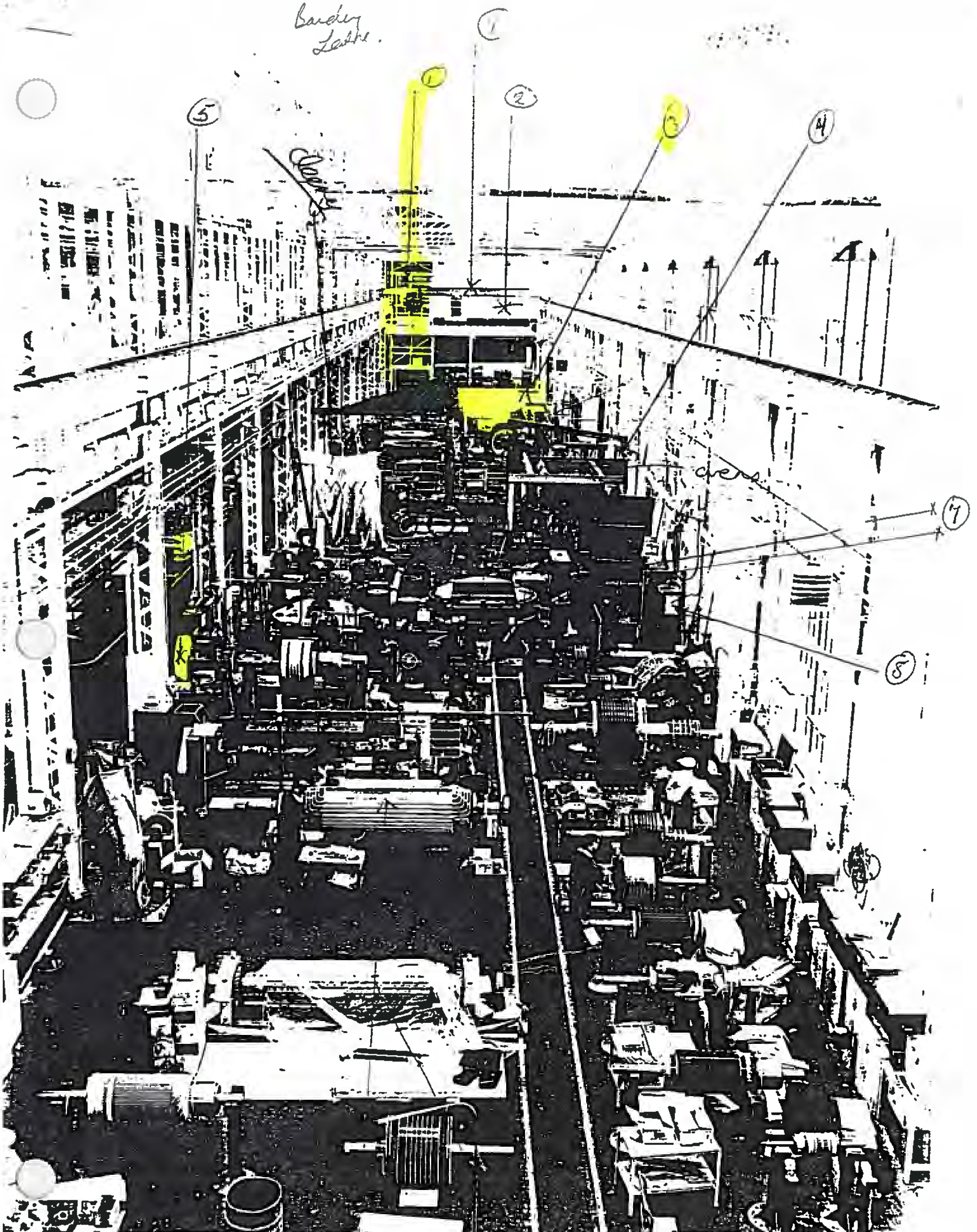
(1) OPEN ELEVATOR TO 2ND FLOOR COLD ROOM + MEZZANINE
(2) LIMIT OF CRANE BAY (BLDG CONTINUES FURTHER EAST UNDER MEZZANINE ALSO.
(3) SHIPPING DOOR FACING SOUTH + AISLE INTO BLDG.
(4) OVENS FOR BAKING EPOXIES ETC. NOW OUT OF BUILDING BUT DOORS OPENING INTO #7 BLDG. AND LEAKING MAJOR AMOUNTS OF FUME INTO #7 BLDG. AS WELL AS HEAT.
(5) ONE OF MANY TURNING LATHES FOR ROTATING ARMATURES, ROTORS AS THE ARE WOUND.
(6) LARGE ROTOR IN WINDING PROCESS
(7) (10) TWO V.P.I. TANKS APPROX 15' DIA 15'-20 FEET DEEP VAPOUR/PRESSURE/IMPREGNATION. STEEL VESSELS ABOUT 4" THICK. SET DOWN IN PITS. ONE EXPLODED IN 1971.

(8) WELDING AREA. USUALLY TIG WELD OF COPPER CONNECTION
(9) SMALL BRIDGE CRANE. PENDANT OPERATED.
NOTE PICTURE WAS OBVIOUSLY TAKEN FROM BRIDGE OF OPERATOR CONTROLLED (IN GONDOLA) CRANE.

NOTE

NOT SHOWN TO THE WEST OF THIS PICTURE IS AN AREA WHERE VERY LARGE ARMATURES WERE WOUND. WELDERS FROM #8 + 10 WERE OFTEN BROUGHT IN TO WELD TEMPORARY SET-UPS TO TURN THESE HUGE UNITS FOR WINDINGS. AND THEN LATER TO "ARC AIR" ASSEMBLY FOR REMOVAL. THIS WAS ONE OF MY JOBS OVER A NUMBER OF YEARS. IT MEANT WELDING THROUGH EPOXY SPILLS AND WAS RATHER DANGEROUS BECAUSE OF LARGE QUANTITIES OF SOLVENTS ALL AROUND. FIRES WERE FREQUENT

Sheet #2



goes into DC

CD Armatur

© Turbine Roter

100 Induction Bar Rotor AC

SHEET #2
AFTER 1970 ATTACK

SHEET 1 ARMATURE #7 BLDG. ABOUT 1970 OR BEFORE

NOTE AREA SHOWN IS APPROX. ½ WIDTH OF BLDG. 7 LEFT TO RIGHT.

BY JOHN BALL

1. MAGNET FRAME (A TYPE OF MOTOR STATOR)
2. AISLE / WOOD BRICK FLOORING THROUGHOUT MOST OF BLDG.
3. ARMATURE - IRON LAMINATIONS WITH SLOTS FOR WINDINGS
4. EXHAUST HOOD FOR WELDING AREA. (MOSTLY T.I.G.)
5. JIB HOIST - SWINGS 180° FOR LOCAL LIFTING.
6. T.S. STATOR. THE OUTER CASING OF A PARTICULAR TYPE MOTOR
7. CRANE TRACKS. BAY NUMBERS ON BEAMS (BAY = 25' APPROX)
8. WOUND COILS READY TO GO IN STATORS
9. OPEN WINDOWS (NO GLASS EVER) ONTO MEZZANINE 2ND FLOOR
10. WINDOWS (FACING SOUTH OUTDOORS) CAN BE PARTIALLY OPENED
11. BAKING OVENS LOCATION. BEFORE MOVING BACK TO THE RIGHT IN AN ADDED ON AREA.
12. SHIPPING DOOR. USED FOR VENTILATION IN WARM WEATHER.
13 C.D. STATORS BEING WOUND. VARIOUS 100 - 250 - 300 HP.

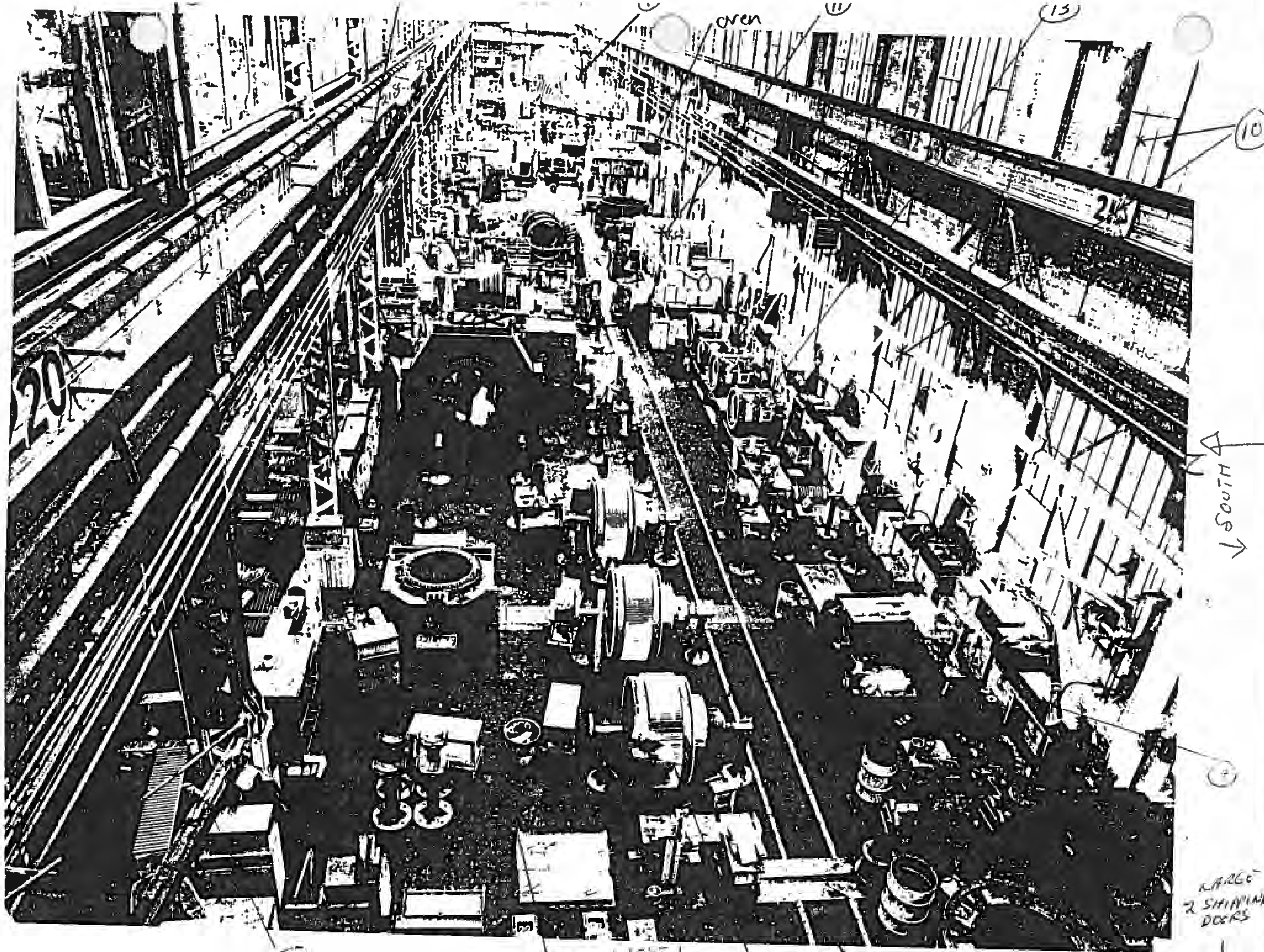
NOTES

(1) AT #6 FOR EXAMPLE, LEADS WOULD BE SOLDERED OR BRAZED & THEN FINISH TAPING/TYING/VARNISH/EPOXY/ ETC. AFTER COILS ARE IN PLACE & WEDGED

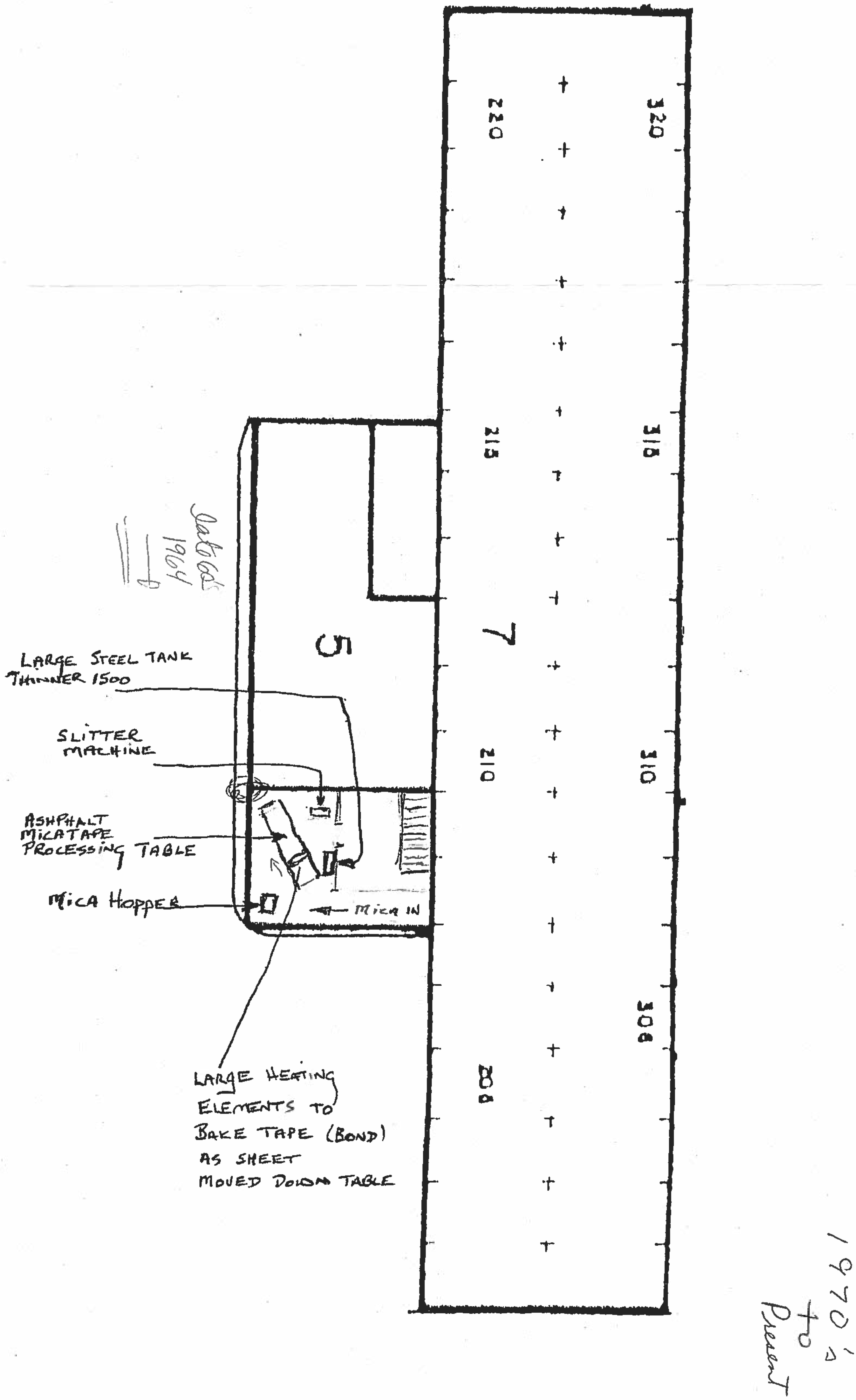
(2) OPEN CANS OF SOLVENTS, GLUES, VARNISH AT EVERY MACHINE. RESIDUE & SCRAP GOES INTO OPEN 45 GAL DRUMS IN SIGHT.

(3) WORKERS KEPT THEIR CLOTHES & THEIR LUNCHES AT WORK STATION AND USUALLY ATE BESIDE THEIR JOB.

(4) LATER ON CANDY/CIGARETTE/COFFEE/ ETC VENDING MACHINES WERE LOCATED UNDER CRANE TRACK ON LEFT SIDE ABOUT BAY 217 THESE WERE NOT ENCLOSED THEN OR NOW.



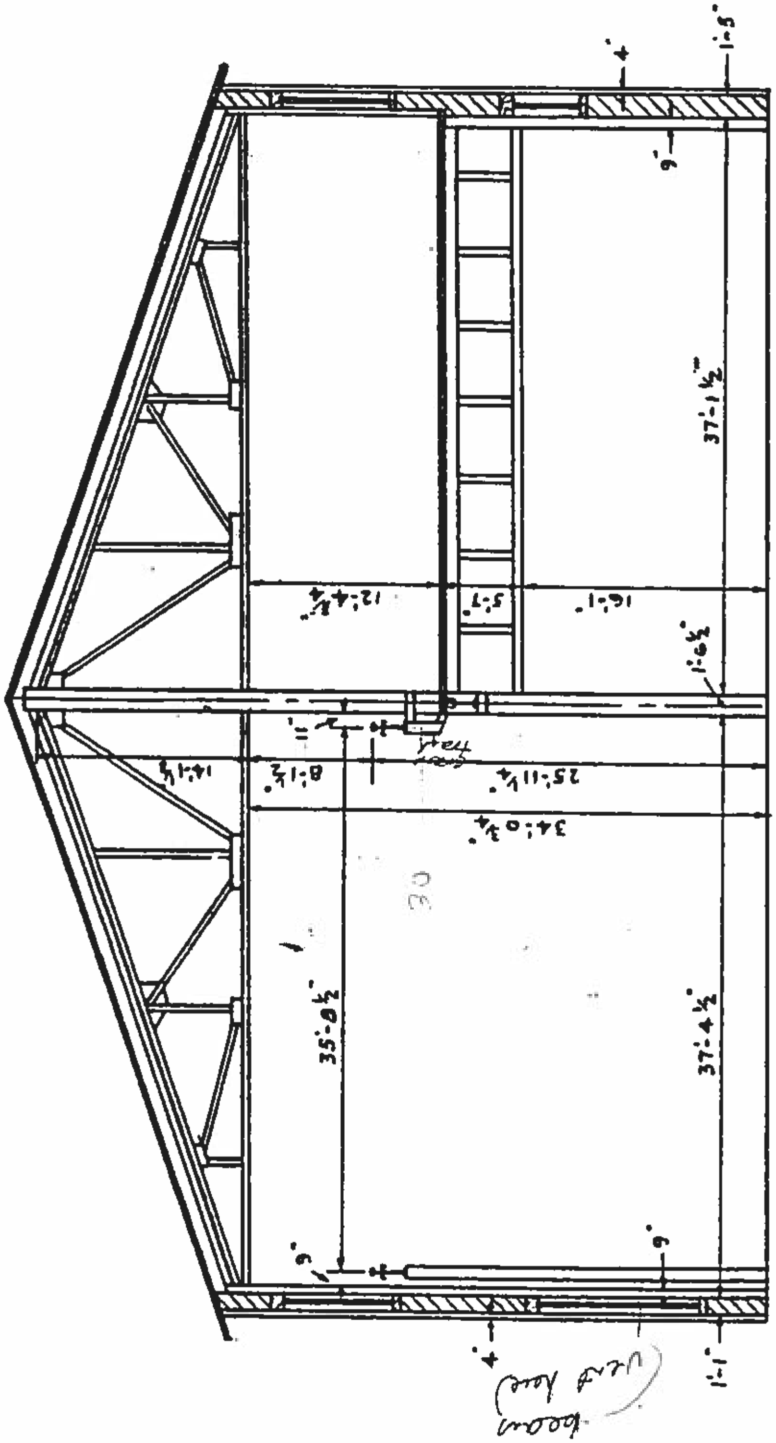
FLOOR. SHEET #1 1970 APPROX.


LARGE STEEL TANK
THINNER 1500
SLITTER MACHINE
ASHPHALT MICATAPE PROCESSING TABLE
MICA HOPPER
MICA IN
LARGE HEATING ELEMENTS TO BAKE TAPE (BOND) AS SHEET MOVED DOWN TABLE
5
7
320
220
315
215
310
210
308
208
late 60's
1964
1970's to Present

NOV 3 2004

PETERBORO WORKS - BUILDING DATA

BLDG. NO. 7.

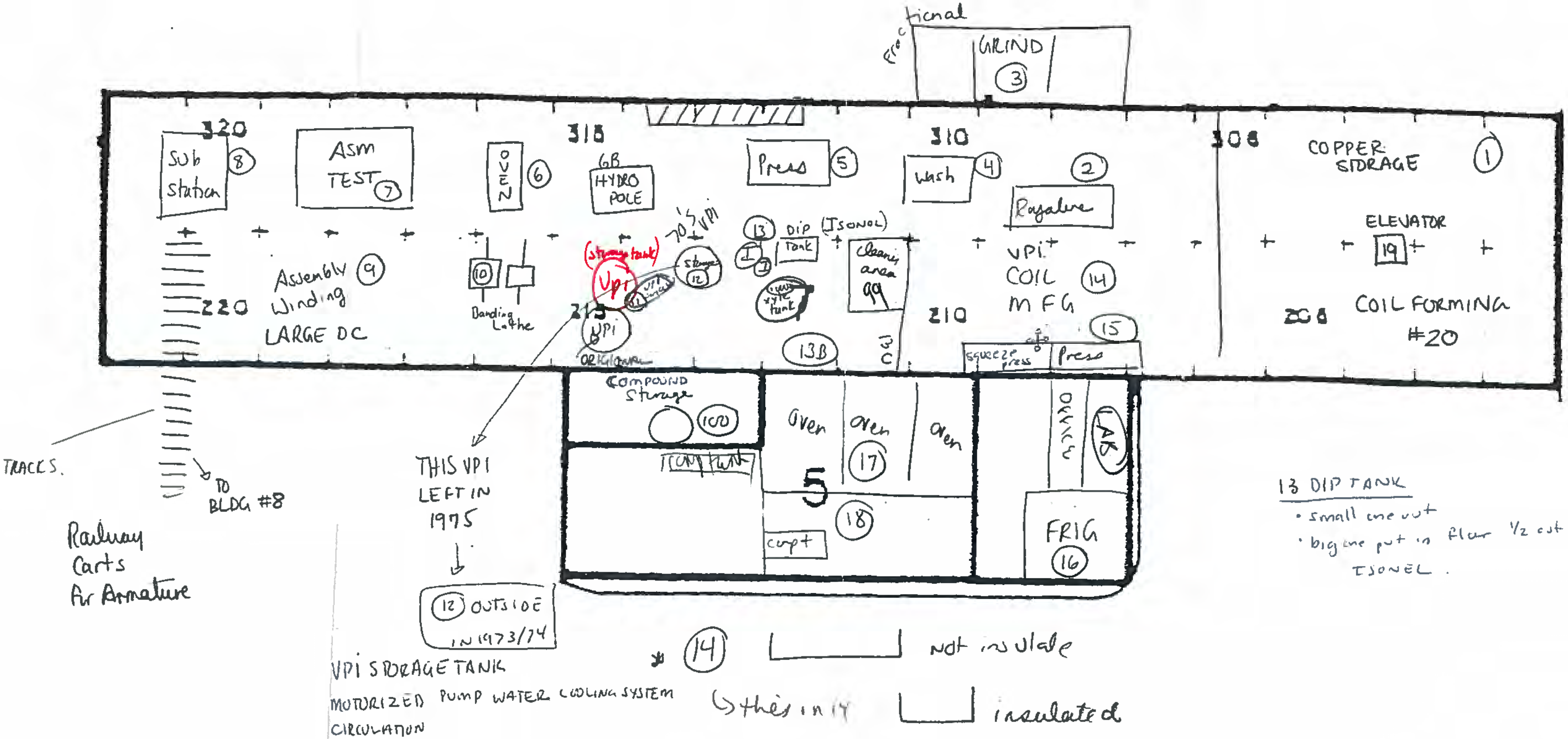


TYPICAL CROSS SECTION
(LOOKING WEST)

NUMBER	PAGE
5-705	1 OF 1

late 1960's → 70's

ARMATURE DOWNSTAIRS



1971 Explosion · Storage # 12 exploded
∴ put 12 out + put in a bigger
tank storage out tank.

NOV. 8

APPENDIX D

#33

[illegible]al	Department	Process	Bldg	Date Removed
Asbestos	Wire & Cable	Braiders/ Carding	22	1978
	Plant wide - insulation removal	Plant facilities		1977- 1994
	Paint Shop	Asbestos filler for various paints	15	Approximately 1979
	Diesel/Transportation	Insulation for coils	16 South	1992
	PC&C	wiremen- Insulation on wire	16	Approximately 1980
	Plant wide	Welding- Blankets/gloves		1978 - 1980
Silica	Low Voltage Control(LVC)/ PC&C	Fuses manufacturing	34/2 16	1991 projection - 1999
Lead	Babbitt shop/Bearing Cell	Bearings---replaced with tin	10B	1994 - 1995
Tin/Lead	Induction Motors	Tinning leads	18 South	??
		solder lead leads on coils	18 South	1995
	Diesel/Transportation	solder/ braze contacts	16 South	1992
	Drive Systems	Circuit cards	20	1991
	Wire & Cable	Lead Jackets over large cables	22	1980 -1981
	Relays	Tinning leads	30 Basement	1986
	General Purpose Motors (GPM)	Solder leads	9	1991
	Capacitor	Brazing	4C	1986
MOCA	PC&C	Component manufacturing	30/3 16	 1996
Benzene	Diesel/Transportation	Cleaning (wipe down)	16A	1992
Cadmium	Plating	Brazing	23	1991
	Diesel/Transportation	Brazing	16 South	1992
Chrome, Nickel, Silver	Plating	Plating	23	1991
Arsenic	Tool Room	Case hardening	16A North	Approximately 1993
Nickel (23%)	Tank shop	Welding	14 North	1982
Isocyanate (MDI)	Induction Motors	Instafoam	18 South	1994
	Drive systems	Instafoam	20 & 22	1991
Trichloroethylene	Plant Wide	Vapour Degreasing	07,08,12, 14,22,23	Approximately 1988

32?

ARMATURE (F)

M I N U T E S

UE-CGE SAFETY COMMITTEE

SPECIAL MEETING
17 JUNE 1977

PRESENT: Teena Flood, Bruce Harris, John Ball, Jim Munro, Ken Faggetter

ABSENT: Andy Fowler

Meeting opened 1530 hours.

Ken called a special meeting to let the Committee know the latest information on the asbestos pollution problems in #5 Bldg. Armature.

Samplers carried by Lloyd Hutchison indicated a very high fibre count so the area was immediately closed off. This was Thursday, 16 June 1977.

A wall was built Thursday evening enclosing the affected area to prevent spill-out into Bldg. #7. Then a second wall was built to contain the tanks at the west end of #5 where the worst fibre build-up occurred.

Samples taken in Bldg. #7 were negative and hopefully the measures taken will prevent any further spread.

A tent has been erected on the lawn and crews will be employed over the week-end to remove all stores, vacuum them with zero discharge absolute filter machines and then the articles will be wiped down with wet sponges, placed in the tent pending thorough cleaning of #5 Bldg.

Persons doing this operation will be wearing protective clothing and masks.

Ken tells us that a Company doctor from Schenectady says that short term exposure is not particularly dangerous but continuous exposure should be limited at all costs.

Frank Watts of Ministry of Labour will be here Monday to check on the pre-cautions being taken.

Meeting adjourned 1600 hours.

Asbest

J. Ball
Secretary
UE-CGE Safety Committee

23 June 1977

cc: ET Williams. W Woodbeck. BH Martin

Ministry of
Labour

I.H.S.B. File No.

Occupational Health Branch

FIELD VISIT REPORT

#30

Date: August 13, 1980

From: W.R. Waddell, M.D.

mailed Sept 29/80/gb

Plant: Canadian General Electric Company Limited	Requested by: O.H.B.
Address: 107 Park Street North Peterborough, Ontario K9J 7B5	Date of Request: July 3, 1980
Contacts: Mr. K. Faggetter, Safety Manager Mrs. J. Mather, Plant Nurse Mr. G. Kluge, Plant Worker	Accompanied by:
	Date of Visit: August 12, 1980
Hazard: Toluene vapour	Copies to: Dr. P.L. Pelmear Mr. G.S. Rajhans Mr. J. McNair (3) Mr. K. Faggetter

Abstract: This visit was made to assess the possible occupational cause of a neurological illness in one employee of this company. Possible exposure to toluene vapour was confirmed.

One recommendation is made.

No orders are suggested to be issued.

No further action by the Occupational Health Branch is requested.

* * *

As the incident occurred about bays 26 to 29 in building #10, this area was thoroughly inspected.

Comments

1. This work station is in an open area of a large building which measures about 800 feet by 150 feet by 26 feet. The ventilation of building 10 occurs naturally through doors and windows. Local mechanical exhaust ventilation is applied at various sites in the building but not at this work station.

2. At this work station, large electric motors and/or generators are rebuilt. In this process, old insulation is removed from the Stator coils by repeated hand wiping with pads saturated with toluene. The odour of toluene vapour is said to be quite strong in the general area when this procedure is carried out.

3. The workers involved with insulation removal wear respiratory protection and impermeable gloves during the procedure. The respirators used are a MSA Comfo II ½ masks fitted with cartridges approved for use with organic vapours. These were seen to be in good condition.

4. The solvent was seen to be kept in safety cans in a cupboard at the work site.

5. Toluene is a central nervous system depressant which can be absorbed by inhalation and/or through the skin. The Threshold Limit Value for toluene accepted by the Province of Ontario is 100 ppm. No air test for toluene vapour was done as it was not being used at the time of the visit.

RECOMMENDATIONS

1. All workers (even observers) should wear respiratory protection when toluene is used at this work station.

No orders are suggested to be issued.

W.R. Waddell, M.D.
Medical Consultant
Occupational Health Medical Service

WRW/gb

55

Re Materials Cured in New Oven

23 April 1987

cc ~~R. Rehder~~
~~K. Logan~~ Bldg 7
F. MacDonald
F. Ronca
F. McMullen

R. Baker
Plant Engineering

This is intended to give an indication of the types and quantities of materials to be cured in the new oven so that the afterburners can be properly sized.

* VPI Resin

This is the major material to be processed. I would estimate that 65 % of all oven cycles will be for AC stators and thus involve the M6860 resin (or its future replacement).

The quantity of material involved will depend on the number and size of the stators in the load. On a worse case basis , say two medium large stators on their first run, there could be 20 gallons of VPI resin contained in the winding and on the frame. To be conservative, we should assume all of this material may give off its volatile content .

The current resin contains about 3% of Tertiary Butyl Styrene. The proposed new resin will contain 25% vinyl tolulene but will be more reactive and thus at least 50% of the diluent should be reacted and contained within the insulation.

* Isonel 51

We use this material on DC armatures. Approximately 10 % of all oven cycles will involve this resin.

Some armatures are very large and might contain 12 gallons of resin which is all near the surface and will volatilize. Most of the armatures are much smaller and would contain only 1-2 gallons each.

This material contains up to 50% solvents (Xylol).

* M9637

This material is also used primairily on DC armatures but it is also used on some rotor coils . This material might account for approximately 5% of all oven cycles.

Four to six gallons of resin may be present in an oven load.

The material contains up to 55% solvent (Toluol).

Other Cycles

Approximately 20 % of all oven cycles give off only minor amounts (relative to the materials referred to above) of solvents or other contaminants.

Each AC stator is given a prebake to drive off moisture and cure glaskyd and any other B-staged material such as glass roving ties and the turn insulation on the endheads of the coils.

DC armatures get several in-process bakes to cure temporary and permanent bands.

WC Broadworth

W. C. Broadworth
Insulation Systems

UNITED ELECTRICAL, RADIO & MACHINE WORKERS OF AMERICA
LOCAL 524
203 REID ST., PETERBOROUGH, ONT. K9J 3P7
TELEPHONE (705) 742-3491

MINUTES

UE-CGE SAFETY COMMITTEE

20 MAY 1980

PRESENT: Teena Flood, Jack Doris, Larry Ball, Bruce Harris, Jack Legros, John Ball.

NEW BUSINESS

20-5-80-1 **MISUSE OF TOXIC MATERIALS**

On Wednesday, May 7, 1980 about 4:00 p.m. Linden Jackson of Armature started feeling ill and confused. He had been working for approximately two hours on Armature bars, using 1500 thinners in large quantities. (Toluene - Methylbenzene) *

Since he was rapidly losing his ability to function, he reported to Plant Nursing Station shortly thereafter.

A high blood pressure reading plus other symptons resulted in his removal by taxi to Peterborough Medical Centre to see his personal physician. On arrival at that place he was immediately transferred to Civic Hospital Emergency.

At this time Linden's problem was severe enough that his memory was failing him.

The following morning at 8:10 a.m. John Ball was told of Linden's problem. Linden's co-workers suspected chemical involvement.

John Ball then called Joyce Mathers at Plant Surgery and asked that Linden's doctor be notified immediately of the chemical being used.

Later that day Linden's attending Specialist, Dr. Tovitch, told Mrs. Jackson that in his opinion there was no other physical cause that he could find and that in all probabilities the toluene thinners caused the problem.

An EEG taken that day indicated some abnormalities, since then a second EEG has shown improvement.

This incident punctuates very strongly the extreme need for a thorough education in use and safety precautions where chemicals are in use in the plant.

The following points should be noted.

Approximately 1:30 p.m., Wednesday, May 7, 1980, John Ball was called to this job site to check into the use of this chemical. Acetone had been removed because of severe fire hazard. Toluene (1500 thinners) had been substituted.

It was John Ball's suggestion that the workers wear chemical masks when working. The three workers who were present at the time agreed and did so during the whole operation.

Linden Jackson arrived on the job after this instruction was given and for some reason Linden did not wear a mask. His sense of smell is very poor and this could have lulled his concern.

There are no laid down procedures in evidence regarding the use of these chemicals. Although it is very obvious now that these instructions are sorely needed.

ACTION

This committee has agreed to the following courses of action as a minimum:

1. To call Bruce Martin to ask that an educational program be implemented to acquaint all supervision with hazards and safeguards to follow when these materials are used in their areas.

2. Begin an educational series to ensure that all people required to use these chemicals know and use all safety equipment and all proper procedures.

3. That all persons working near or on these dangerous substances be made aware of the warning symptoms of over-exposure and the proper action to take in case of an accident.

4. Ask Bruce Martin for a firm date upon which this course of action will be implemented.

20-5-80-2 EXHAUST STACK FUMES - ARMATURE

Recently installed exhaust stacks on south side of Armature are creating heavy smoke and acrid fumes in the whole east of the plant area including inside buildings now that warm weather is here.

Jack Legros was asked to have a course of action defined for this committee by this May 20 meeting.

Jack has talked with other locations in USA and Canada who use the same or similar compounds (M-68-60). His findings were that there is no hazard involved. UE members asked for a written report of this information. This was not forthcoming.

Jack also relates there is a $20,000.00 Par in the works but there is confusion as to whether it has been signed or not. This money is to do the following:

1. Prepare an appraisal of the environmental impact of the discharge from the ovens (while baking M-68-60) on neighbouring and CGE activities.

2. Evaluate discharge with regard to existing or pending air quality regulations.

3. Recommend whether oven discharge should or should not be controlled.

In this regard we have a completion date of August 31, 1980 but this is not realistic because the PAR is not even finalized as yet.

We wonder at the sensibilities of this approach. Ken Faggetter should have the data on the by-products of heating etc.

He should be able to conduct tests to determine the concentration and from these a simple reply "hazard" or "no hazard" will result in either corrective action or a communication to all affected personnel that the fumes are harmless even if they are unpleasant.

This course of action could save months of time and probably a considerable amount of money too.

20-5-80-3 SAFETY INSTRUCTION BOOKLETS

This committee feels there is a definite need for a booklet outlining general Safety Rules and Precautions across the plant.

Individual Safety Orientation is fine but often people are travelling across the plant for various reasons, Specific hazards can be encountered in many places. All workers should be aware of these before they enter the plant.

ACTION

We will take this on as a project. One line warnings etc can be collected and joined in a hand-out booklet both for new hires and other employees.

Appendix K - #28
May 20, 1980
Safety Committee Meeting
Minutes

20-5-80-4 **LEAD POT - PUNCH PRESS**

A lead pot used in the Short Run Area for tinning of braided copper leads is not properly ventilated.

Teena requires a MSDS sheet on the Lead, Alcohol and Resin used in this operation.

ACTION Ken Faggetter is asked to supply those MSDS to UE members as per Section 8 (6) (d) (1) of the Occupational Health and Safety Act 1978.

TOXIC MATERIALS

30-1-80-1 **MICA AND COPPER DUEST 16A**

Hold on for verification of solution. Teena and Jack Legros.

30-1-80-4 **ASBESTOS IN PLANT**

Results were to be in our hands by May 15. This has not been honoured in fact we have no word from Ken Faggetter on a number of concerns he is supposed to be acting on.

Larry Ball was directed by Roland Hosein to organize a clean-up of these buildings involved in asbestos contamination.

Larry says it is not his responsibility and that Ken should be looking after it.

20-12-79-1 **ASBESTOS DUST #16 DIESEL**

Engineering has promised a substitution by July 1980.

14-6-79-3 **NON METALLIC MACHINE SHOP**

Although Bruce Martin remarked months ago that all asbestos was going out of this area, the problem is still there. Ventilation is still not up to par and clean-ups have been less than satisfactory.

16-11-78-8 **ASBESTOS GLOVE REPLACEMENTS**

Larry now has samples of Thermo Best gloves from Cleveland Ohio ("A" Best Products)

Preliminary testing indicates they are very good.

30-1-80-5 **AIR CONTAMINANTS BUILDING #12 SOUTH**

This welding job is being relocated to Building #22. The trichloroethylene degreaser is also being sent there too. Jack Legros assures us that the degreaser will be at opposite end of the area.

30-1-80-6 **TRICHLOROETHYLENE SUBSTITUTE**

Still looking for a non contaminating detergent.

ACTION Check with Toronto CGE locations. We understand trichloroethylene was banned from Davenport over ten years ago. They must have an alternate cleaning system.

16-11-78-3 **NOXIOUS FUMES #16 and 16A BUILDING**

Roland Hosein says we need a continuous monitoring system. He feels that ozone is not likely problem although we know it often exceeds the TLV by a good degree.

He suspects VPI tanks and trichloroethylene are at the root of part of the problem.

15-6-78-3 **TUNGSTEN THORIUM**

Still no movement from Ken Faggetter.

15-6-78-3 **BABBITT SHOP CLEAN UP**

ACTION Ken Faggetter will be approached to do checks for lead contamination in area

Note Even though it was originally agreed that a complete clean-up would be done in this filthy area this has been slowly watered down until now. We have to prove a specific contamination before the general clean up will be considered.

25-11-77-1 **POWDER PAINT DUST**

The latest word is that equipment is being sent from England by water transportation.

At least the excuses for long delays are varied and sometimes even original

22-11-79-3 NOISE AND DUST #14 GALLERY

A memo from local negotiations, December 19, 1969, refers to a PAR to cover cost of closing in the area.

It is not clear as yet if this PAR included the whole gallery but it is our understanding at present that this was the intent.

ACTION Ken Faggetter to enquire with Andy Fowler why the job was halted with only part of the gallery enclosed.

5-4-79-2 FUME HAZARD SPOT WELDERS #14 BUILDING

A letter to Jack Legros from W. Fruist dated 21 April 1980 names the type of oils used as preservatives on different forms of steel sheets and coils.

This is fine but what we require is Material Safety Data Sheets on the following:

From Algoma Steel	Blended Quaker Blatchford 1 part Ferrocate 5684-K6-M2 5 parts straight mineral oil
From Dafasco	Quaker Ferrocate 5685 Imperial Oil Coating EE47F
Stelco	Imperial Esso 337 Rust Bon Imperial Esso 390 Rust Bon

ACTION Ken Faggetter to procure copies as soon as possible and forward some to UE committee members as per previous mentioned section of Occupational He lth and Safety Act 1978.

8-4-80-1 UE REQUESTS MSDS FORMS

UE still requires MSDS on Triethane/Marinite/Haysite

8-4-80-5 ASBESTOS PAPER CEMA MOTORS

No information from Gerry Downie as yet.

8-4-80-7 ASBESTOS WIRE DRIVE SYSTEMS

Still no decision on 600V wire as yet.

FIRE PROTECTION

30-1-80-2 CAFETERIA FIRE HAZARDS

ACTION Larry to see Art Dainton for written reply.

8-4-80-11 FIRE ACCESS LADDER BUILDING #5

No completion date from Fred MacDonald

8-4-80-9 FIRE EXIT EMERGENCY LIGHTING

The wiring is now installed. Off now.

8-4-80-8 FIRE EXTINGUISHER TRAINING

Training routine now in place. Off now.

HEARING CONSERVATION

14-9-77-3 WIEDEMANN PRESSES

Hold for results of CEMA Motors tests.

23-2-79-9 GALION CRANE NOISE LEVEL

Still no action from Ken Murduff

23-11-79-9 #15 STRANDER WIRE AND CABLE

Bruce wants a letter sent from this committee to ask intent and a completion date.

ACTION Larry will write this letter.

CRANES

22-11-79-11 TRAVELLING CRANES

Signs are still not up in place.

20-12-79-2 STACKER CRANE BLIND SPOT

No information from Paul Kyselka as yet.

13-3-80-1 RADIO CONTROL CRANE 10C

Nothing done as yet.

24-4-80-1 NEAR MISS 10C CRANES

A letter from Fred MacDonald May 8, 1980 and a letter from Brian O'Brien dated May 9, 1980 has assured us that this situation is now well in hand. Off now.

MATERIAL HANDLING

22-11-79-2 INTERPOLE STRAPS ARMATURE

A correction. Emil Hawara is still on this job. The work is simply not coming through right.

22-11-79-3 MATERIAL HANDLING #8 NE GALLERY

Hold for completion of intended projects.

EDUCATION

8-11-79-7 JOB TRAINING IN PLANT

Jack Legros feels that this should form a part of our activities.

7-9-78-1 STATISTICAL ACCIDENT ANALYSIS

It is our understanding that information for Wire & Cable is now available. We expect action on most phases shortly.

15-6-79-8 FORK TRUCK DRIVER TRAINING

April 28 is date for first course to be taught.

MISCELLANEOUS

26-2-80-1 ILLEGAL PARKING PLANT HOSPITAL

Jack Legros has a letter from Art Dainton suggesting three actions that might alleviate the problem -

26-2-80-1 ILLEGAL PARKING PLANT HOSPITAL (Continued)

1. Caution lights over either end of Hospital area.

2. Warning tickets placed on offending vehicles.

3. Vehicles to wait a Bld #21 until cleared for access to unloading or loading area.

24-4-80-4 COMMITTEE GOALS

Since UE committee members have been instructed by the Union Executive to carry on with safety work and leave negotiations to those responsible, management has been notified that UE committee members are not prepared to discuss this issue further. We know and understand their role. Strive towards a healthier, safer place to work in, whatever action that goal may require.

NEXT MEETING

TUESDAY, JUNE 3, 1980 AT 1:00 p.m.

J. Ball
Secretary
UE/CGE Safety Committee

Copies to: P. How, W. Woodbeck, Ed Hunt, R.Dickey, Dr. D. D. Curtis, Dr. J. W. Cowell, R. D. Maguire,

Sim:A

P
FILE

UNITED ELECTRICAL, RADIO & MACHINE WORKERS OF AMERICA
LOCAL 524
203 REID ST., PETERBOROUGH, ONT. K9J 3P7
TELEPHONE (705) 742-3491

#10 BLDG.
FITTING/TEST FLOOR

Minutes of Meeting

This is a copy of the minutes prepared in respect to the UE/CGE Safety committee meeting of May 20, 1980.

When first sent to Jack Legros, as Chairman, for corrections or ommissions, he refused to have them typed and distributed.

We, as a Committee went over these Minutes again and changes were made where Jack indicated, but the main context of the document remained as it was originally written, since it was a factual report of business that was discussed at that meeting.

This present format of the minutes was again rejected in total, by Jack Legros.

UE Executive was called in on June 3 meeting to try to help resolve the issue, but to no avail.

Since there has been considerable problem in getting in contact with CGE either on grievences or through Joint Executive meeting it was decided to process the minutes and get them to the responsible people who have the Authority to move quickly on these very serious issues, namely 20-5-80-1 and 20-5-80-2.

We understand that these two entries are the primarily unacceptable items in Jack Legros estimation.

John Ball
Secretary
UE/CGE Safety Committee.

G

I.S.B. File No. 336-00005-0008

E.H.S. File No. 2H-25

ONTARIO DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES BRANCH

365 - 4066

OCCUPATIONAL HEALTH SERVICE

SEP 13 1971

FIELD VISIT REPORT

PART 1

Memorandum to:
Dr. V. L. Tidey
Chief, Occupational Health Service

Date: September 10, 1971

From: Mr. L. Bithel, P. Eng.

Plant: Canadian General Electric Co. Ltd.

Address: 107 Park Street North,
Peterborough, Ontario.

Contacts: Mr. D.W. Abel, Specialist-Safety
Mr. G. Hansen, Safety Analyst
Mr. F.C. Dohaney, Materials Manager
Mr. M.M. Uloth, Insulation System Manager
Mr. V.R. Mulhall, Chief Chemist
Mr. L. Mahon, Insulation Chemist.
(Mr. S.R. Adamson, Vice President & General Manager Industrial Apparatus Dept.)

Requested by: Company

Accompanied by: Mr. R.W. Dickey, I.S.B.

Date of Visit: August 4, 1971

Copies to: Mr. J. McNair (3)
Mr. S.R. Adamson

Abstract:

Following an incident in which a tank containing epoxy resin was overheated, the company requested a visit to discuss the steps which had been taken and to advise on any further steps required to avoid any significant exposure. The steps already taken were adequate to avoid significant exposure during the evolution stage of the reaction. The final step required would be the cleaning up of phenolic liquids which had been vapourized during the reaction and then condensed on steelwork, tables etc. Adequate precautions against skin absorption were required and two directions and one recommendation were issued at the time of the visit. These are repeated at the end of the report.

The company requested assistance following an incident in Building 7, when a batch of epoxy resin overheated and the reaction became uncontrollable, resulting in the evolution of fumes and liquid material.

Building 7 is used, amongst other things, for the vacuum-pressure impregnation of electrical coils with either polyester or epoxy resin. The building is 350 ft. x 100 ft. x 70 ft. high, with an upper floor 350 ft. x 40 ft. wide extending across from one side. The tank involved in the incident was the epoxy premix tank, located towards the centre of the building but not underneath the upper floor. It is a stirred pressure of 2000 gallons capacity with refrigeration coils to control the temperature of the contents. Prior to the three weeks annual vacation which began on July 11, the premix tank was filled with epoxy resin including 600lb. of boron trifluoride-monoethylamine complex, which is a catalyst. The tank contents were maintained at 12°C by circulating water at 8°C through the cooling system, and this should have prevented any further reaction as the catalyst does not become active until the temperature reaches 90°C.

However, the temperature started to rise during the last weekend of the vacation (July 31st) and on Sunday August 1 at 4:00 p.m. the water in the cooling system began to steam and then the tank started to fume. There had been a power failure earlier on Sunday, and the cooling system was not operating. However the stirrer (7.5 KW) remained operating. The Peterborough Fire Department was called in and the firemen, using Scott Air-Paks, were of great assistance in the operation to control the reaction. The tank manhole cover had been removed, which probably prevented a pressure build-up in the tank, and at one time the firemen directed water into the tanks but the temperature of the contents was too high and the water flashed and blew out. Some control of the temperature was finally achieved by filling the sump around the tank with flowing water. At the time of inspection, the centre of the tank contents were still hot (about 130°C) and no work will be carried out in the tank until the temperature at the centre is below 100°C.

The high temperature (400°-500°C) in the tank, together with the flashing off of the water directed into the tank resulted in:- (a) the expulsion of some epoxy material which finally solidified - there was a fair amount on the tank side and on the floor nearest to the manhole cover, and there were minor amounts scattered around, even on the upper floor, (b) the vapourization of material which later condensed - this was very noticeable on the upper floor, where liquid had collected on plastic sheets placed over tables and metal parts - paint had also been stripped from steelwork and wood. The solid material would be no hazard, although the large amount by the tank may be difficult to chip away. The liquid however appeared to be phenolic and precautions would be required during the cleaning up, particularly against skin absorption.

COMMENTS:-

1) By the time of the visit the company and the fire department had taken adequate steps to control the reaction and to reduce any vapour concentrations in the building. Using the Drager equipment, phenols and aldehydes could not be detected. An exhaust duct had been installed at the open cover of the holding tank, and it was working effectively. A test of the air inside the tank showed 5 ppm phenols, and aldehydes were not detected.

2) Tests carried out by the company on the gases from the tank, using infra-red techniques, demonstrated the presence of carbon monoxide, methane, cresols, metal cyclopentadiene and a trace of formaldehyde. These are typical decomposition products of the epoxy materials in the tank.

3) Tests were made on the upper floor, and no phenol was detected in the general air, but 2 ppm was detected close to the surface of the dark liquid which had condensed on the plastic table covers.

4) Conditions within the plant were good at the time of the visit, but the clean-up required will be fairly extensive. The main safety consideration would be the avoidance of absorption of the phenolic compounds through the skin, as the vapour pressure is certainly too low to allow concentrations to reach the threshold limit value.

5) The reason for the reaction "taking off" is not yet known, but the power failure may have been partly responsible by causing withdrawal of the refrigeration system. It is rather surprising that the stirring system kept operating (or at least re-started) while the refrigeration system remained shut down. However, it was stated that there had been a slow rise in temperature for about 4 days prior to the incident, so perhaps something else was also involved. Holding the mix, including the catalyst, over the three weeks vacation period could also be part of the reason.

CONCLUSIONS:-

The reason for the reaction in the premix vessel "taking off" is not fully understood. However the steps taken by the company, with the assistance of the Peterborough Fire Department, were effective in dealing with the situation and in preventing any significant exposure. The only remaining steps requiring action at the time of the visit were (a) cleaning up the solids (including cleaning out the holding tank), which would not involve any significant exposure, and (b) cleaning up the liquid material throughout the area, which could involve exposure to phenolic materials, with a possibility of skin absorption. At the time of the visit, the cleaning operation was discussed with the company, and the Industrial Safety Officer, Mr. R. Dickey, issued the directions, which are given below.

DIRECTIONS (already issued):-

1) During the cleaning-up process, gloves and other protection shall be worn to prevent absorption through the skin.

2) All used cleaning cloths shall be stored in closed containers and then disposed of safely (by burning or other means).

RECOMMENDATION:-

1) Employees shall be encouraged to practice good personal hygiene during the clean-up period.

Bithel

L. Bithel, P. Eng.

LB/cap

PUBLIC HEALTH DIVISION

ONTARIO

DEPARTMENT OF HEALTH

ENVIRONMENTAL HEALTH SERVICES BRANCH
ONE ST.CLAIR AVENUE WEST
TORONTO 7, ONTARIO

Telephone:
365-4066
Area Code:
416

September 13, 1971

Mr. S.R. Adamson,
Vice President & General Manager,
Industrial Apparatus Department,
Canadian General Electric Co. Ltd.,
107 Park Street North,
PETERBOROUGH, Ontario.

Dear Mr. Adamson,

Enclosed is a copy of the Field Visit Report prepared by Mr. L. Bithel, following a visit to your plant on August 4, 1971. The directions suggested at the end of the report are for issue to you by the Department of Labour's Industrial Safety Officer.

Yours sincerely,

H.M. Nelson

H. M. Nelson, P.Eng.,
Officer-in-Charge,
Engineering Section.

Enc. Report

HMN/vr

EPOXY VARNISH
CEC
E

United Electrical, Radio and Machine Workers of America
Affiliated to the Canadian Labour Congress

10 CODECO COURT, DON MILLS, ONTARIO M3A 1A2 / 447-5196

Ouvriers Unis de l'Electricité, Radio et de la Machinerie d'Amérique
Affilié au Congrès des Travailleurs du Canada

C. S JACKSON, President • WM. WOODBECK, Vice-President • OSVALDO NUNEZ, Vice-President for Quebec
VAL BJARNASON, Secretary-Treasurer • ART JENKYN, Director of Organization

June 11, 1979

Mr. Pete How, Business Agent,
UE Local 524,
203 Reid Street
Peterborough, Ontario
K9J 3P7

Dear Pete: Re: Solventless Epoxy Varnish

Please find enclosed a copy of my research concerning one of the three components that were used to make Solventless Epoxy Varnish.

SEE CHEMICAL DOCKET AS WELL

This chemical BORON TRIFLUORIDE MONO ETHYLAMINE* can certainly be the reason behind the health effects suffered by our members and others as a result of that 1971 fire.

The fire itself would give off large amounts of these toxic fumes, but that is not to say that our members who had long exposures working in this area would not show the same health effects as those who were immediately involved with the 1971 fire.

Therefore it is quite important that we involve ourselves with all aspects of the WCB investigation of this fire; and further that we compile a production history of the use of "Solventless Epoxy Varnish" which would include documentation of all workers who were exposed to its manufacture.

I am enclosing a copy of "How to Look at a Workplace" which I put together from the OFL Program for your guidance. Also our Safety committee who have completed this program will have a good idea on what is necessary to put together a production history study.

I have not traced down the other two components of "Solventless Epoxy Varnish," -- (1) Shell Epoxy 826 or Ciba 6005; (2) 3M cardolite NC 513; but I felt the research on "Boron Trifluoride Monoethylamine" was important enough to send it to your local immediately.

Fraternally,

Ed Hunt

Ed Hunt
UE Health & Safety Rep.

EH-js
encls.

c.c. - Wm. Woodbeck, UE Vice-President

UE LOCAL 524, PETERBOROUGH

(Armature Department)

BORON TRIFLUORIDE MONO ETHYL AMINE -- BF_3-$C_2H_5NH_2$ is a white to pale tan flakes. Specific gravity is 1.38, melting point 88-90^{oC}. Soluble in furfuryl alcohol, polyglycol, acetone, Releases Boron Trifluoride(1) above 110^{oC}. Combustible. It has a HIGHLY TOXIC HAZARD RATING, and a moderate fire risk rating.

It is used as an elevated temperature cure for epoxy resins.

(1) BORON TRIFLUORIDE; BF_3; is a colorless gas; 2.3 times as dense as air; melting point -126.8^{oC}; boiling point -101^{oC}; does not support combustion; soluble in cold water; hydrolyzes in hot water; soluble in concentrated sulfuric acid; decomposes in alcohol.

It is TOXIC by inhalation; corrosive to skin and tissue; has a tolerance in air of 1 part per million.

ETHANOLAMINE (GENEARIC NAME) NIOSH

MONO ETHYL AMINE is the legal label name for Ethyl Amine

ETHYL AMINE also known as aminoethane; $CH_3CH_2NH_2$; is a colorless, volatile liquid (or gas); ammonia odor; strong alkaline reaction; boiling point 16.6^{oC}; freezing point -81.2^{oC}.

It is derived from ethyl chloride and alcoholic ammonia under heat and pressure.

Hazard: flammable, dangerous fire risk. TOXIC, strong irritant. Tolerance

Appendix K-25

I.S.B. File No.
O.H.S. File No. 4F - 71

MINISTRY OF HEALTH
ENVIRONMENTAL HEALTH SERVICES BRANCH
365-4066

Ontario

OCCUPATIONAL HEALTH S[illegible]
JUL [illegible] 19[illegible]

FIELD VISIT REPORT
PART 1

Memorandum to:
Dr. V. L. Tidey
Chief, Occupational Health Service

Date: July 13, 1973

From: Dr. G. Debow

Plant: Canadian General Electric Company	Requested by: Company
Address: PETERBOROUGH, Ontario.	Accompanied by:
	Date of Visit: June 26, 1973
Contracts: Mr. Dan Abel, Safety Specialist.	Copies to: Mr. J. McNair(3) Mr. D. Abel (1)

Abstract: This visit was made to assess working conditions in a part of the plant where dermatitis was occurring. The workers are exposed to fiberglass, epoxy and solvent. A recommendation and a direction are suggested.

&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&&

The area in question is in the armature section of the large motor and generator department. This is in building #7. The area where the problem is occurring is on the mezzanine floor of building #7. The work consists of wrapping armature with tape. This is done by females and three different tapes are used. Samples were taken for analysis. One tape is a fiberglass tape impregnated with an epoxy and another tape is fiberglass, mica and epoxy. There is also a terylene tape used. The tape may be soaked in toluene before being used. The tape may be machine wound, however, the problem is occurring where the tape is hand wound.

At the beginning the company did not use stringent measures as they were told that the epoxy was "mild." Since the dermatitis has occurred the company has started a strict program of protective clothing, a protective cream and a personal hygiene program. This program has improved the situation.

2. VLT
2. file

2/.....

COMMENTS

1. Since the company has been more stringent in epoxy handling, the problem with dermatitis has lessened.

2. The employees have been following the regimen set out by the company concerning personal hygiene and barrier cream application.

3. The temperature in the area can be over 90°F. 32°C Because of this, the company is considering placing the workers in a temperature controlled area. The area where they work now can only be air conditioned at great expense.

4. It is possible that cotton gloves worn inside the protective gloves would reduce the amount of sweat present. The cotton gloves should be changed and laundered frequently.

RECOMMENDATION

Employees should be encouraged to practise good personal hygiene.

DIRECTION to be issued

Protective clothing shall be provided and worn by the employees exposed to epoxy resins.

G. Debow

G. Debow, M.D.

GD:jt

Telephone Memo

Date: Jan 21/73

Person: Dan Abel

Organization: CGE

Address: Peterborough

Tel. No.:

Message: Dan Abel called to report 7 cases of dermatitis in an area where epoxy resin is used. He would like a visit to be made to help resolve the problem.

Tony—
This one got to
my desk by mistake.
I'm just completed a
visit including a look at
an area where employees were
getting dermatitis from epoxies.
I would check with Dan if I
were you to make sure this visit
the same area.
Hugh

Action: 4F-77

D. B. Abbott

21 Jan 73

Signature [illegible]

ONTARIO DEPARTMENT OF HEALTH
OCCUPATIONAL HEALTH LABORATORIES TEL: 965-7925
360 CHRISTIE STREET, TORONTO 4, ONT.

RE: EPOXY RESIN AND IMPREGNATED TAPES FROM CANADIAN GENERAL ELECTRIC, PETERBORO, SUBMITTED BY DR. DEBOW.

REPORT NO: 15,468
DATE: JULY 4, 1973
COPIES TO: DR. V. TIDEY
DR. G. DEBOW

FROM: D. ARAI

1) THE RESIN WAS AN EPOXY RESIN, SIMILAR TO "EPOXIDE 201", AND WAS NOT COMPLETELY CURED.

2) THE WHITE TAPE CONSISTED OF A FIBER-GLASS FABRIC COATED WITH AN INCOMPLETELY CURED EPOXY RESIN SIMILAR TO SAMPLE #1 ABOVE.

3) THE YELLOW TAPE CONSISTED OF A MICA LAYER BETWEEN TWO SHEETS OF FIBER-GLASS FABRIC HELD TOGETHER WITH AN EPOXY RESIN CONSISTING OF A PHENOL-FORMALDEHYDE POLYMER ETHERIFIED WITH GLYCIDAL GROUPS, SIMILAR TO "EPOXOLATED NOVOLAC". THE RESIN WAS NOT COMPLETELY CURED.

ANALYSIS BY D. Arai
D. ARAI

DA/JS

PUBLIC HEALTH DIVISION

Telephone:
965 - 4066

Area Code:
416

ONTARIO

MINISTRY OF HEALTH

ENVIRONMENTAL HEALTH SERVICES BRANCH
ONE ST.CLAIR AVENUE WEST
TORONTO 7, ONTARIO

M4V 1K8

July 18, 1973

M~~r~~. Dan Abel,
Safety Specialist,
Canadian General Electric Company,
107 Park Road, North,
PETERBOROUGH, Ontario.

Dear Mr. Abel:

Enclosed is a copy of the Field Visit Report prepared by Dr. G. Debow, following a visit to your plant on June 26, 1973. The Direction suggested at the end of the report is for issue to you by the Ministry of Labour's Industrial Safety Officer.

Yours sincerely,

G. A. Sinclair, M.D., F.R.C.P.(C),
Officer-in-Charge,
Medical Section.

GAS:jt
Encl. Report

Ontario
Ministry of
Labour

O H B File No.
I H S B File No.

Occupational Health Branch

FIELD VISIT REPORT

K #23

Date: April 27, 1981

From: W. R. Waddell, M.D.

Plant: Canadian General Electric Co. Ltd.

Address: 107 Park Street, North,
PETERBOROUGH, Ontario.
K9J 7B5.

Contacts: Mr. E. Hatherly, Machining Section Foreman
Mr. C. Card, Grinder

Hazard: Trichloroethylene

Requested by: O.H.B.

Date of Request: February 25, 1981

Accompanied by:

Date of Visit: April 9, 1981

Copies to: Dr. P. Pelmear (O.H.B.)
Mr. J. McNair (I.H.S.B.) (3)
Mr. S. Bell (O.H.B.)
Mr. R. C. Bergey

Abstract: This visit was made to assess the possible occupational cause of an illness in one employee of this company. Possible exposure to trichloroethylene vapours was confirmed.

One suggestion is made.

One order is suggested to be issued.

No further action by the Occupational Health Branch is requested.

This incident occurred near a vapour degreaser in building #8.

Comments

1. The degreaser is located on the west side of Bay K18. It measures 6 x 8 x 10 feet and uses trichloroethylene ("Royalene") as the degreasing agent. One operator and a helper operate the equipment. Another 10 employees work in the general area.

2. The cooling coils of the degreaser appeared to function well. A lip exhaust was seen to be present around the entire perimeter of the top of the degreaser. This did not function as it was not connected to any system local mechanical exhaust ventilation.

3. Degreasing was in progress at the time of the visit. Good work practices were observed. The parts to be treated were slowly lowered into the vapour phase. Some parts required spraying with trichloroethylene in addition to vapour degreasing. The cleaned parts were slowly lifted from the vapour phase. No residual trichloroethylene liquid was present on or in the finished work.

4. At the time of the visit, the air in the area of the degreaser was clear. Occasionally, the odour of solvent was detectable. Using appropriate Drager tubes, 3 air tests for trichloroethylene were done. At two locations only a trace of trichloroethylene was indicated. At the third location, 100 ppm was indicated.

5. Trichloroethylene is a central nervous system depressant and a mild irritant of respiratory tract; injury to the cardio-vascular system, the gastrointestinal system, the liver and kidneys has also been observed. In Ontario, the accepted TLV-TWA for trichloroethylene is 100 ppm (ACGIH 1980).

Suggestion

1. To minimize trichloroethylene exposure by inhalation, the ventilation in the area of the degreaser should be improved. Efforts should be made to protect the vapour blanket in the degreaser from drafts which can cause spillage of vapour into the ambient air.

Accordingly, under the authority of Regulation 145 of the Occupational Health and Safety Act, 1978, the following order is suggested to be issued: -

> All measures necessary to prevent exposure to any toxic substance by inhalation shall be taken and without limiting the generality of the foregoing, where any toxic substance is used, adequate ventilation shall be provided.

No further action by the Occupational Health Branch is requested.

W. R. Waddell, M.D.
Medical Consultant
Occupational Health Medical Service

WRW/pc

Ontario
Ministry of
Labour

Report from Dr Warrell

Degreasing. Trichlorethylene

(F)

April 30, 1981.

Canadian General Electric Co. Ltd.,
107 Park Street, North,
PETERBOROUGH, Ontario.
K9J 7B5.

Att: Mr. R. C. Bergey

Dear Sir:

Please find enclosed a copy of the Field Visit Report.

Yours truly,

G. Debow

G. Debow, M.D., D.I.H.
Senior Medical Consultant
Occupational Health Medical Service
Occupational Health Branch
400 University Avenue, 7th Floor
Toronto, Ontario
M7A 1T7

Telephone: 416/965-3610

Encl.

Occupational Health
Clinic for Ontario
Workers (Toronto) Inc.

Centre de sante
des travailleurs(ses)
de l'Ontario (Toronto) inc.

29 November 1990

Mr. John Ball, Union Representative
United Electrical Radio and Machine Workers of Canada Local 524
203 Reid Street
Peterborough, Ontario
K9J 3P7

Dear Mr. Ball:

This letter is written to clarify the wishes of the United Electrical, Radio and Machine Workers, Local 524 for further involvement with OHCOW (Toronto) Inc. regarding the case of workers in the Armature Department, Canadian General Electric (CGE), Peterborough. For the last 20 years, one of the Armature Department workers, Mr. Gerhard Kluge, has been exposed to various chemicals including amines, chromic acid, epoxy varnishes and resins, polyester resins, styrene, organic solvents, t-butyl perbenzoate and methyl ethyl ketone (MEK) peroxide. As you have previously been informed, Mr. Kluge's skin tumours have been diagnosed as "symmetrical lipomatosis" (multiple benign tumours of fatty tissue) by a dermatologist Dr. B. Fisher of the Wellesley Hospital. We know that at least one of the agents to which Mr. Kluge was exposed, ie. MEK peroxide, causes skin tumours in animals. Mr. Kluge's case has been submitted to the Workers' Compensation Board with supporting documentation in order to establish a link between his exposure to workplace chemicals and his multiple lipomas.

In a handwritten submission dated September 15, 1990 you have indicated to OHCOW (Toronto) Inc. that another CGE Armature Department worker, Mr. Michael Gregg, may also have been affected by workplace chemicals. Mr. Gregg was a 41-year-old man who died in 1989 of lung cancer. Mr. Gregg had worked since leaving school beside Mr. Kluge in the Armature Department at CGE, and he had been a smoker of a pack of cigarettes a day for twenty years. Although we have a pathology report and some of the treating physicians' notes on Mr. Gregg, these reports indicate that the cell type of Mr. Gregg's lung cancer was not definitely determined. Your note dated September 15, 1990 also indicated that among the workers in the Armature Department, a woman of Mr. Gregg's age died of leukemia, and another man in his late 40s died of colon cancer. In another sentence in the same note, you have referred to four other deceased workers, including two additional cases of leukemia and two of lymphatic cancer.

On October 26, 1990, we had a telephone conversation during which you stated that, besides the above workers, there are still two other workers in the Armature Department who have tumours on their skin similar to Mr. Kluge's tumours. If the last 2 cases of skin tumours are confirmed as being of similar pathological type as Mr. Kluge's tumours, this would almost certainly be significant, since multiple lipomatosis is a relatively rare condition. During our telephone conversation, you stated that you would refer these workers to our Clinic for evaluation. At that time, I requested you to send us a list of all chemicals to which workers have been exposed in the Armature Department at CGE over the years, so that we could be sure that we have all the appropriate Material Safety Data Sheets (MSDSs) with which to conduct literature searches.

On November 2, 1990, we received your handwritten submission dated October 28, 1990 along with the Material Safety Data Sheet on MEK peroxide and a few other chemicals, but we did not receive a complete list of chemicals. In your November 2 submission, you indicated that there had been an explosion and major release of toxic chemicals at CGE in 1971, which you believe caused continuing contamination in the Armature Department. You have also referred to the fact that the Peterborough Firefighters were involved in this chemical release.

It is always hard to judge if a single isolated illness (like that of Mr. Gregg) is related to a workplace exposure. If, along with Mr. Kluge's case, we can obtain further information including complete pathology reports on all the workers' cases, particularly the skin tumour cases, and the complete list of chemicals to which all the workers were exposed over the years, there is the possibility of submitting a group claim to the WCB. Further medical and epidemiological investigations of these tumour cases can then also proceed. A worksite visit to the Armature Department would also strengthen the report which we may be able to write.

For all these reasons, we encourage you to refer the surviving affected workers and the complete list of chemicals ever used in the Armature Department to OHCOW (Toronto) Inc. We further urge your Union to call OHCOW (Toronto) Inc. to set up a time when you could meet with our staff to further discuss OHCOW (Toronto) Inc.'s involvement. We look forward to hearing from you.

Yours sincerely,

Marie L. Roy

Michael Wills

Harriet Hutchinson

Marie L. Roy
M.D., Ph.D., FRCPC

Michael Wills
M.D., CCFP, CCBOM, FRCPC

Harriet Hutchinson
R.N., CCOHN

jc

cc: Mr. John Van Beek, Executive Director OHCOW (Toronto) Inc.
Clinic Staff
Mr. Gerhard Kluge

JUNE 3/81

(E)

Note I was questioned by Dr Curtis re this report. [illegible] was present.
Several days later I was called to a meeting with Jim Cooley, Ralph Goudy Bruce Martin to be read the riot act.
Martin feels that I could be sued under some obscure law about Embarrassing your Employer. Perhaps there is a law also that says an Employer should not sicken or kill an employee through misuse of dangerous chemicals.

CGE union claims chemical a hazard

3 JUNE 3/81
P.M. PET EXAM.

Employees at Canadian General Electric are being tested for concentrations of a chemical which some fear causes cancer and other serious health problems, says a member of the plant's health and safety committee.

John Ball said four or five men who work in areas where a cleaning solvent containing Trichlorethylene is used are being examined. One man has been found to have traces of the chemical in his system, he said.

Bruce Martin, manager of employee and community relations for the plant, refused to confirm the testings.

He said the provincial occupational health and safety act requires that such information be kept confidential, and Ball is violating the act by discussing it with The Examiner.

NOTE THIS IS A CURIOUS REMARK BY BRUCE MARTIN, NOT ONLY HAD I INVOLVED [DR] CURTIS SEVERAL WEEKS BEFORE, BUT AS [W]ELL, DR CURTIS HAD AGREED TO DO URINE [SA]MPLING ON WORKERS IN THE TANK AREA [BEC]AUSE OF THE HEALTH CONCERNS. SEVERAL WORKERS AGREED TO THE TESTING [PR]OCEDURE WHICH COVERED A PERIOD OF [D]AYS. ONE MAN, (WHO WAS, COINCIDENTALLY) PRIVATE PATIENT OF DR CURTIS SHOWED [H]IGH" HYDROCARBON CONTENT "IN HIS URINE [S]AMPLES. THIS MAN WAS THE ONE WHO [ORIGIN]ALLY PROMPTED THE ACTION BY MYSELF. HE WAS SUFFERING SEVERE DISTRESS, [AF]TER THE TANK WAS REPAIRED AND [P]ROPERLY VENTED, HE HIMSELF CANCELLED AN [IN]TENDED SURGERY AND AT LAST CONTACT [H]IS [SYMP]TOMS HAD DISAPPEARED.

A spokesman for the ministry of labor in Toronto says the confidentiality requirement applies only if tests are requested by the ministry.

NOTE ✱ "He hasn't even had the courtesy to speak to our plant medical consultant, Dr. Don Curtis, who is in the plant every day," said Martin.

Ball said employees with health problems usually attributed to Trichlorethylene are being tested. He said the committee is trying to gather evidence to prove to management the chemical is a health hazard, so a ventilation system will be added to a tank where it is used as a degreasing agent.

He said after 12 years of fighting, the company ventilated a similar tank where Trichlorethylene (in a vapor form) is used.

"We're getting to the point now that if the company doesn't put in a ventilation system we will go to the department of labor asking the operation be shut down. We don't want to do that because it means our jobs, but something has to be done.

"It's a good cleaning agent and it can be used safely. And using it safely is what we're looking for," said Ball.

Because Trichlorethylene is used at CGE in a vapor state, Ball said the "greatest danger" of it being inhaled is posed. He said it is believed to cause problems with the liver, lungs, central nervous system, the cardio vascular system and causes headaches and nausea.

Ball said the company doesn't recognize the chemical as a health hazard.

Martin said CGE has worked with ministry of labor officials to plan improvements to the ventilation systems around the five tanks in the plant where the chemical is used. He said ministry doctors are "satisfied there is no immediate danger to any of our employees".

"It's like any other chemical — if it's not ventilated properly, it can be a problem for the employee — but it's not identified as one of the designated hazardous chemicals under the health and safety act."

Martin said ventilation was improved near one tank during last year's shutdown, and a second project is due to start soon. Each project costs the company about $25,000, he said.

Trent University chemistry professor Stewart Brown confirmed Trichlorethylene is a potential hazard, but said its effects on the health of workers would depend on the degree of exposure.

"They are working with a potentially dangerous substance," said Brown. "It looks as if their concern is well-founded. But like any poison, the effects are very much dependent on the dose, something that is not always taken into account in stories about toxic

Trichlorethylene (F)

UNITED ELECTRICAL, RADIO & MACHINE WORKERS OF AMERICA

LOCAL 524

PETERBOROUGH, ONTARIO — TELEPHONE AREA CODE 705-742-3491

June 1, 1981

Dr. S. L. Rutledge
327 Charlotte Street
Peterborough, Ontario

Dear Sir:

Enclosed you will find some assorted information on the chemical "trichlorethylene". Among the enclosures is a letter written by Doctor Blastorah concerning a similar case we dealt with in another factory.

The young man concerned had actually been discharged by this company because of what the company felt were problems relating both to a mental condition and a less than choice, life style, i.e. drug abuse, etc. Thanks to Dr. Blastorah's kind concern and involvement the man was also re-instated on his job with full recompense.

The reference in Dr. Blastorah's letter to the use of this chemical as a anasthetic is certainly valid. On August 11, 1957, I was with my wife during the birth of our first son in Halifax, Nova Scota. The pain suppressor I saw in the delivery room and which she was using was "trilene" or "twilight sleep". The "genearic' name on the label was "trichlorethylene". I was working in the Chemical Stores at Shearwater Navel Air Station at that time and was quite familiar with that particular chemical.

Our family doctor of that time told me later that the "trilene" had been removed from use shortly after because of toxic side effects including suspected carcinogenic capabilities. Our experience with this chemical in Canadian General Electric is a long and bitter history of discomfort, illness and even death.

It is most difficult to get proof that is positive on most problems of this sort but at one point the then currant manager of Health & safety here, admitted to me that they (C.G.E. management) were aware that an employee, Lindsay Tetlock had died of exposure to trichlorethylene compounded by alcohol intake.

......2/

On the "Ontario Department of Health" chemical data sheet enclosed you will see margin notes about Lindsay, made by me in 1970. Lindsay was alive then but ailing obviously. As a chief steward I was fighting a grievance against poor working conditions including the degreaser tank, a welding station (where I worked) and other related problems.

I told management at several hearings that Lindsay was sick and he seemed to get some respite by hanging his head into the vapour. It was thought later that he may have been suffering some addiction to this chemical as well. I was told that I was a hypochondriac and to forget it.

Approximately one year later Lindsay was removed very quietly from that job and was dead within three months. Cause of death, "Acute Anoxia" with massive liver damage. This was from the autopsy report viewed by a non medical person and related to me.

Of the other people who worked beside me, one has since died of lung cancer, one has emphysema, one has had three bypass operations on his heart and I was warned by my doctor to leave that job or I would have emphysema or something worse. There are many others with adverse effects but this may give you an idea of our deep concern.

The company did properly ventilate one degreaser but only after 12 years of struggle and numerous refusals to work under legislation - Bill 70.

If we are to force installation of ventilation on this second tank we need back-up proof or even strong suspicion that there is over-exposure.

At the moment we are being troubled by high installation costs and also the "100 PPM" guideline set by the Department of Health in their "Directive". (See enclosures) Where welding and heating is concerned as in Cliff's area, even 5 PPM is far too high.

......3/

If you need further information, I would be pleased to assist in any way possible.

I can be contacted in two ways:

Call - 743-1331, Odyssey Unit #277
7:30 a.m. to 6:15 p.m.

OR

U.E. Local 524
203 Reid Street
Peterborough, Ontario
742-3491
9:00 a.m. to 5:00 p.m.

Yours truly,

John H. Ball

John H. Ball
UE Safety Representative
Local 524

JHB/gv
encls.

App K #19

334 CHARLOTTE STREET

TELEPHONE RI 2-6141

WILLIAM D. BLASTORAH, M.D.

SURGEON

PETERBOROUGH, ONTARIO

December 17, 1979

R E P R I N T

Re: -----------------

Dear ---------------:

Further to our telephone conversation of Friday, Dec. 13, 1979, and in response to a copy of a note delivered by the above, please let me say the following.

This worker has had increasingly severe gastro-intestinal and other disturbances since the recent summer. Investigation failed to reveal any surgical basis for his complaints, although originally his symptons suggesed this.

A few days ago it came to my attention that his job entailed his using and inhaling fumes from a cleaning solvent through most of his working day. I was informed this solvent was trichloroethylene.

I was aware of dangers from this chemical and since this occurence have made inquiries from appropriate sources as to these dangers. I feel justified in stating that his symptoms are due to inhalation of these vapours at his place of work and that he should not continue his exposure to same. If indeed the vapours are those of trichloroethylene, as they appear to be, I must be more emphatic. I further would suggest that other personnel should not inhale these vapours on a continuing basis.

In this regard I have spoken with Dr. E. L. Magee-a highly qualified anaesthesiologist in Peterborough. He is quite familiar with this agent and supports the above premise. He stated he would be happy to speak with you on this matter.

I also feel that I should clarify some points in the note over your signature referred to above.

I did not suggest or state and do not believe that any pre-existing condition was aggravated in this case. Rather--his symptoms are primarily due to his working with the chemical in question.

Neither did I state that this worker or other personnel should not work on the degreaser equipment--but rather--that they should not inhale or be exposed to the fumes in question. As you I am sure realize, this is not quite the same thing.

As you stated, trichloroethylene is the substance formerly used as an anaesthetic agent commonly known as trilene. I understand on good authority that there is some evidence that it is carcinogenic.

I am sure that you have the health and welfare of your employees uppermost on your mind and that you will pursue this problem through the Workmen's Compensation Board and/or the various health agencies set up to investigate and control working conditions. Assuming this, I have not instigated any investigation, except by talking to you, my patient, and several of my local colleagues conversant with such problems.

I would be most happy to hear from you regarding what has been done to rectify an unfortunate situation.

Yours truly,

ARMATURE (F)

HEALTH & SAFETY COMMITTEE

UE

CGE

March 19th., 1987
PBO. Safety Unit

ARMATURE JHSC MONTHLY TOUR
Inspection by: John Ball, Lorne Read

1) Armature bunks (small ones) are in poor repair, request that mew wood blocks be supplied

2) Vpi Tanks------suggest grounding link cable on end of pole used to hook up cables in VPI tank, instead of shrink tubing as insulating link.

3) Bay 212-----hardwood block under stator is badly cracked.

4) Stores------suggest that Quintex cutting job be sampled to see if any asbestos is realeased from encapsulated form.

5) Copper Stores------blue racks still not welded. This will go to the Ministry of Labour if not corrected before next inspection. It has been on the inspection report for several months.

6) Bay 206-----winding mandrel north side, wood platform unsafe under.

7) Bay 211------cleaning room cupboard, broken bottle should be cleaned out.

8) Upstairs Unit 619------fire exit blocked west end.

cc: R. Hays
J. Crowther
F. MacDonald (K. Logan, L. Collins)
R. McLean
J. Ball
L. Read
L. Ball

Ministry of Health

Ontario

Appendix K-16

I.S.B. File No. :
O.H.P.B. File No. : 7J-55

OCCUPATIONAL HEALTH PROTECTION BRANCH

FIELD VISIT REPORT

Date: December 22, 1976

From: J. Toth, P.Eng.

Plant: Canadian General Electric Limited	Requested by: O.C.D.S.
Address: 107 Park Street North Peterborough, Ontario	Accompanied by: Mr. F.E. Watts, O.S.B.
	Date of Visit: November 24, 1976
Contacts: Mr. A.K. Faggetter - Specialist - Safety, Employee & Community Relations	Copies to: Dr. V.L. Tidey Mr. K. Cleverdon (3) Dr. J.J. Vingilis Mr. S. Morton Mr. A.K. Faggetter
Hazard: Asbestos Dust (in Armature Dept and Carding/Braiding)	

Abstract: A visit was made to investigate the occupational exposure to asbestos in the Armature Department and in the Carding - Braiding sections of the above mentioned company. Significant exposure to asbestos does exist in the Armature Department. Recommendations are made and one direction is suggested.

* * *

In the Armature Department three bans saws on 2 shifts/day are used by 7 persons about 2-3 hours/day for cutting of asbestos boards to 1" wide strips.

The area in question is (60' x 30' x 30' high) in a corner of a building and fully open to the plant. Each of the three band saws is locally exhausted and the recirculated air is filtered in a Torit type dust collector. The total exhaust capacity connected to the saws was in the range of 600-800 cfm. Capture velocity at the saws was about 200-250 fpm. Respirable dust, using a CGA Technology Division, Respirable Dust Monitor, Model No. RDM 101-1 was measured up to 0.52 mg/m^3 of air during the asbestos board cutting. The operator used an approved respirator.

The carding - braiding and twisting sections were previously visited and described by Dr. M. Cohen in her report dated November 20, 1975.

The braiding machines (2) are enclosed in a 3' x 9' x 6' wide booth and are exhausted at a rate of about 600 cfm.

One carding machine is enclosed in a 12' x 8' x 8' high booth and exhausted at a rate of about 1200 cfm.

One small carding machine is fully enclosed and air velocity was about 150-200 fpm (about 300-400 cfm) into the enclosure.

The twisting machine is fully enclosed and exhausted. Air velocity into the enclosure was about 400 fpm.

The respirable dust in the carding - braiding - twisting area was less than 0.1 mg/m^3.

Comments

1. In the Armature Department the band saws are not adequately exhausted.

A bench type booth (with downdraft grille or perforated table) about 3' x 6' wide, exhausted through a sealed box under the grille to capture the coarse dust, appears to give an adequate control. This and other solutions were discussed with Mr. K.A. Faggetter.

2. The carding - braiding - twisting section appears to be adequately exhausted.

3. At the request of Mr. K. A. Faggetter, a list of approved respirators is attached.

Recommendations

1. It is suggested, that an exhausted booth be designed and built above the band saws in such a way, that no dust could reach the breathing zone of the operators. Air flow at the booth face should be at least 200 fpm and transport velocity in the duct should be not less than 3500 fpm.

An Engineering Data Sheet No. 2-8 for "Open face Paint Spray Booths" is attached.

2. The Industrial Safety Act prescribes, that a ventilation system should be arranged so that exhausted contaminants could not re-enter the area from which they were exhausted.

A copy of "Recirculation of Air from Industrial Exhaust System" (Industrial Ventilation, a Manual of Recommended Practice, 14th Edition, page 7-17) is attached.

3. Air sampling is suggested. It should be carried out after the changes made in the present exhaust system at the band saws.

Directions to be Issued

1. Adequate local mechanical exhaust shall be provided to the band saws.

J. Toth

J. Tóth, P.Eng.

JT:lm
Att.

15 Overlea Boulevard, 5th Floor
Toronto, Ontario
M4H 1A9

416/ 965-4066

December 23, 1976

Mr. A.K. Faggetter
Specialist-Safety, Employee & Community Relations
Canadian General Electric Limited
107 Park Street North
PETERBOROUGH, Ontario

Dear Mr. Faggetter:

Enclosed is a copy of the Field Visit Report prepared by Mr. J. Toth, P.Eng., following a visit to your plant on November 24, 1976.

Yours truly,

H M Nelson

H.M. Nelson, Chief
Occupational Health Engineering

HMN:lm
Encl.

ARMATURE

(F)

HEALTH & SAFETY COMMITTEE

UE CGE

UE/CGE JOINT HEALTH & SAFETY COMMITTEE MEETING

JANUARY INSPECTIONS- ARMATURE
BY KEN MILLER, ED ROWE, JOHN BALL

February 13, 1987

cc: L. Collins
N. Logan
J. Ball
J. Crowther
E. Rowe

Unit #16		Blue rack at east end still not welded after damage by lift truck.
Gallery	1.	Tin pot exhaust system at west end very noisy. Operators probably leaving it off because of noise levels.
	2.	Oven at west end needs repair to gaskets around doors. Leaking fumes badly.
	3.	#3 Oven on main floor generating heavy fumes. Since they were accumulating in the high ceiling area, workers upstairs turned on ceiling fans to find relief. Then worksers on floor below were affected and in turn would swtich fans off.
	4.	752 Diesel coil formes - ungarded pinch points.
Bay 321		Grit blast cabinet in very poor condition. Should be repaired before further use.
Bay 316		Extension cord to pedestal fan has open conduit box on floor.
Bay 316		Tool #221626 Open drive belt foot pedal.
Bay 217		Fan on hot plate not drawing at all.

ARM.

<u>Stores area north wall</u>	Aluminum ladder has one broken rung.
<u>Stores Area north wall</u>	Coolant recovery system leaking badly.
<u>Bay 206</u>	Asbestos bagging torn and frayed on pipes behind grills. *
<u>Bay 206</u>	Housekeeping around band saw conjested and dangerous.
<u>Shears Area</u>	Need proper storage rack for spare shear blades. Package of two blades weigh 140 lbs.
<u>Shears</u>	Clamp can come down on operator's fingers. No guard to stop this from ocurring. Refer to Ministry Inspector.

ARMATURE F

Canadian General Electric

SUBJECT: UE/CGE Health & Safety Committee

COPIES: J Ball
R Bergey
R Hays
J Legros

PETERBOROUGH
October 28, 1981

R. K. Osborne
Manager Armature Shop Operations
Manufacturing Section
Industrial Apparatus Department

On the 26th of October 1981, John Ball and Jack Legros, representing the UE/CGE joint Health and Safety Committee, made an inspection of buildings #5 and 7. No serious hazards were observed and the upstairs of Bldg. #7 was particularly clean and uncluttered. The following conditions, primarily maintenance items, were noted and the committee would appreciate your comments on the actions to be taken in this regard.

1. Bay 321 upstairs. Wooden ladder is unsafe and should be replaced. Steel ladder to elevated storage area is loose from its moorings and needs repair.
2. Bay 319 upstairs. Emergency light not functioning properly. Probably needs battery replacement.
3. Bay 315 - fan on column is positioned low enough to warrant a mesh guard.
4. Cable rack extreme east end downstairs - loose part needs bolting or welding.
5. Bay 206 - single spindle drill. The committee would like to see the off/on switch of this machine in a more accessible position, say, the front of the spindle column.
6. Bay 206 - 2 spindle drill. Quite dirty and the tool posts improperly adjusted. Hazard to operators.
7. TL# 221044 2 spindle brush. Guard needs repair or replacement.
8. Bay 211 north side. Two storage rooms are jam packed with loosely piled tools and equipment. Material must be examined to eliminate scrap and piled properly to eliminate hazard.
9. Bay 212 elevated storage area. There is some sheet asbestos cloth stored here. All asbestos material should be out of the plant by this time.
10. Bay 218 sanding machine. Severely frayed power cord on motor.
11. Bay 220 pedestal grinder outside maintenance area. Tool posts improperly positioned.
12. TL# 191848 TIG welder. Operators complained of unsafe condition presented when this mechanism was crane lifted about the shop. Specifically, the fear of the gas bottles falling from machine. Shop should be reminded that bottles are not to be crane lifted even as part of a machine. Also lifting bail to be checked to ensure machine is in proper balance upon crane lifting.

13. Stores area - storekeeper complains of new lift truck presenting hazard of fouling beam of building trying to load high racks. Safety guard may be lowered 6 inches or racks repositioned.

John Ball
Jack Legros
U.E.-C.G.E. Joint
Health and Safety Committee

pev

HEALTH & SAFETY COMMITTEE

(F)

November 25/85.

MONTHLY INSPECTION
ARMATURE

10:20 a.m.

UPSTAIRS - BLDG #7: Attention - Dave Davidson
Wayne Broadworth

- Bay 220- Hemp rope on block and tackle over isonal varnish tank is badly freyed.
- Bay 220 - North Wall Flammable locker does not have proper ventilation at bottom to dispense accumulated vapors.
- Bay 220- North Side Asbestos lagging on steam pipes breaking up.
- Bay 209-North Pane of glass broken (3).
- Cold Room-South Wall Oxy-acet bottles not properly secured.
- Cold Room-Work Platforms (Green South Wall) One needs safety rail - one set of steps needed- presently using two-wire reels.
- Cold Room - Emergency lighting east wall inoperative (again).
- East Wall-North End Elect. cord box in bad repair.

DOWNSTAIRS - BLDG #7 Attention - W. Broadworth
Ken Logan

- Fire exit from tank room partially blocked outside.
- Bay 215- Liquid in bottom of pit. Evaporation and fire hazard.
- Bay 212- Tracks and oven floor are partly filled with liquid epoxy. Slip hazard and possible fire hazard.
- Bay 5- 2nd Floor Stores Area - Five gallon cans of varnish stored- Fire Hazard.
- Asbestos-Bldg 5 - Quintex 7059 Sheet - cut and stored- 010;015;030 sheets. CLASTIC 5989B sheet-.015/.020 (Fibres when cut)
- Bay 208- Cycloblast TL 238031 Safety glass broken.

E-1

(F)

HEALTH & SAFETY COMMITTEE

UE/CGE HEALTH & SAFETY COMMITTEE

MONTHLY INSPECTION

ARMATURE BUILDING

FEBRUARY 28, 1983

Mr. R.K. Osborne
Manager Armature Shop Operations
Industrial Apparatus Department

On February 4/83 John Ball and Don Adams representing Health and Safety Committee made an inspection of the Armature Building. You are to be commented on the area as it was very evident that considerable effort had been put into safety items since our last tour. The following items were noted and the committee would appreciate your comments.

Main Floor

Bay 221 - Asbestos from pipes over main door was loose and bricks had fallen from top portion of the wall. This was ropped off and was in process of being repaired.

Bay 220 - The test area cage had a railing on the bottom of the sliding gate broken.

con't on page 2

HEALTH & SAFETY COMMITTEE

Bay 220 - Plates (5 ft. long) were stored vertically against fence and could easily be knocked over. South side, inside tank room there was electrical box with a transformer and relay which was exposed. The cover was there but it would not stay closed.

Bay 219 - North side - There was a cover off 110 volt receptical. It is located just below the shift break sign.

Second Floor

Cold Room - Emergency lighting is still missing.

J. Ball /aa

John Ball
UE/CGE Health & Safety Committee

D. Adams

Don Adams
Manager Shop Operations

:dh

Tim G
cc

RESEARCH
UE
UNITED ELECTRICAL, RADIO AND MACHINE WORKERS OF CANADA (UE)
TRAVAILLEURS UNIS DE L'ELECTRICITE, RADIO ET MACHINERIE DU CANADA (TUE)

FACTS ~~SHEET~~ ON EPOXY

aug 8/89

July 17, 1989

TO: H&S Representatives, Local 524 - GE Peterborough

FROM: Kim Perrotta, H&S National Representative

RE: Epoxy - L-5105 and L-7067
(L-5918)

There are four possible components to an epoxy -- the resin, the hardener or curing agent, the filler and the solvent or diluent.

In the two epoxy products you have asked me about, the resin is the Diglycidyl Ether Bisphenol A epoxy (known as DGEBA resin for short). The Boron Trifluoride complex (which I believe is Boron Tri-flouride Mono-ethyl-amine) is the curing agent and Silica is the filler. In this case, the paste is uncured when first used and hardens, because of the curing agent, upon heating.

When the product is uncured, the DGEBA resin is hazardous. There is evidence which indicates that it causes skin cancer. Some people have suggested that the resin itself does not cause cancer, but rather a trace contaminant, * Epichlorohydrin, causes it. Apparently, earlier products had greater traces of Epichlorohydrin (which is clearly a cancer causing agent) than products today, so suppliers maintain that skin cancer is not a concern today. This has yet to be proven.

Uncured DGEBA resin also produces skin rashes upon contact and can produce allergic skin rashes so that even a little contact causes a bad rash. Apparently, a "sensitized" person can develop a rash from contact with a freshly cured product which may still have some unreacted resin in it. Given that sensitization could cost someone his/her job, all efforts must be taken to prevent skin contact with the resin.

When heated (to very high temperatures), toxic vapours would be given off that could be very hazardous. For this reason, the curing process should happen in an enclosed and exhausted space. (I am assuming that this is the case.)

NOTE ONE CASE OF SKIN CANCER VERIFIED WITH ONE ARMATURE WINDER OF LONG SERVICE INDIVIDUAL AVOIDS SUN AND ALWAYS HAS.

.../2

Under normal circumstances, these products should not present hazards by inhalation because the chemicals involved are not very volatile. If they are being mixed with some kind of solvent, that changes things. A number of the solvents used with epoxies present serious health concerns, so please let me know if these products are being mixed with something not listed on the MSDS.

When I checked with one researcher, he said that the Silica did not appear to present exposure problems to workers who used or worked on these products (ie. he did not think that a worker would be at risk from Silica when sanding a part covered with cured epoxy paste).

The researcher I spoke to was the same person who asked us a while back if we had a large population of epoxy exposed workers he could study for skin cancer. We never did get back to him with estimated numbers of workers for the Peterborough plant. He was very interested when I suggested that we might have a skin cancer case. He suggested that we check the following things out:

1. Does this worker actually have direct contact with the epoxy?

2. Has he worked with it for a fairly long period of time?

3. Is the site of his skin cancer on a portion of his skin that is exposed to the epoxy?

If one of you could check on this (discreetly and with respect for this fellow's privacy) and get back to me, we may be able to assist him with a compensation claim, while also possibly identifying an area of serious concern for workers in general.

I have enclosed a copy of a factsheet on epoxies that was prepared by a group in the United States. It provides a good (although somewhat dated) overview of concerns on epoxies.

cc. J. Gooley
B. Woodbeck

(51)

14 August 1986

Re Safety issues concerning VPI resins

Those present:
R. Bergey
L. Ball
W. Broadworth

cc R. Rehder
F. McMullan
P. Kyselka
E. Rowe
K. Logan } Bldg 7
P. Ronca

A meeting was held on Aug 14, 1986 to review those action items agreed upon at a meeting called by E. Rowe on Apr 21, 1986 concerning the recommendations from John Murphy (Corporate Health and Safety).

The history of this situation is as follows:

- we have been using A50A311 VPI resin since approximately 1974. In Sept 1984, 7% Tertiary Butyl Styrene (TBS) was added to the resin to reduce the resin viscosity. This addition had been approved by Corporate Health and Safety.

-Development work is underway on two candidate VPI resins that might replace the current material. Both resins contain significant amounts of Vinyl Tolulene. John Murphy of Corporate Health and Safety was called in for advice on handling the diluents and as a result of this visit a number of recommendations were made concerning the TBS currently being used.

_ A FAR is being prepared for a new oven and a decision on whether scrubbers/afterburners etc are required must be made.

Action Items:

1.0 Recommendation 4.1.1 - Air Sampling
The Safety Unit will take air samples as soon as possible at the following locations:

- at the front of the tank as a large stator is being lifted from the tank.
- at the front of the tank as pure TBS is being added
-at the gallery level when the tank is being unloaded
- at the gallery level when the oven cycle has been started and smoke is being produced at the maximun level

Action L. Ball. R. Bergey

2.0 Recommendation 4.1.5 - External Air Pollution
Air sampling at the stack was recommended. This test was conducted in approximately 1978 before the TBS was added. The sample holes are already in place. Repeating the tests is recommended.

Action P. Kyselka

Note -This data is required to allow a decision to be made on the scrubbers for the new oven.

3.0 Recommendations 4.1.2,4.1.3 -Operator protective equipment

52

The recommended chemical type gloves and goggles are available in the plant . The Safety Unit recommend a proper eye wash station be installed at the sink.

Action K.Logan

4.0 Recommendation 4.1.6,4.1.9 -Facility improvements
Ventilation of the pit and covering of vacuum system breather is recommended. Action F. McMullan

WC Broadworth

W.C. Broadworth
Insulation Systems

endix K-9

28

Canadian General Electric

MATERIALS AND
TECHNICAL SYSTEMS
DEPARTMENT

940 LANSDOWNE AVENUE, TORONTO, ONTARIO M6H 3Z4

K Logan
cc R Rehder
L Chun
L Kohn
P Ronca
E Rowe
R Bergey

~~13 Mar 86~~
wcb

March 10, 1986

Mr. W.C. Broadworth
Supervisor - Insulation Systems
Unit 613
Canadian General Electric Co. Ltd.
107 Park Street North
Peterborough, Ontario
K9J 7B5

Dear Mr. Broadworth:

Following my conversations with Mr. Lloyd Chun and Dr. Roland Hosein, I have provided you with this revised report pertaining to the potential health and environmental hazards presented by the use of resins containing tertiary butyl-styrene and vinyl toluene (also known as methyl styrene) in the Vacuum Pressure Impregnation process in Building 7, Peterborough.

1.0 Summary of Potential Hazards Associated with Stator Resin Impregnation and Curing

1.1 Employee exposure to reactive diluent vapours (that is tertiary butyl-styrene and vinyl toluene) may occur in the building during the following operations/at the following times:

(i) when resin is present in the process tanks and lids are opened,

(ii) during the removal of stators from the tank and set-up in the curing tray,

(iii) while stators remain on the curing tray prior to transfer to ovens,

(iv) during manual touch-up of stators on the curing tray,

(v) when resin remains in the dyke below the curing tray,

(vi) during maintenance or cleaning of process tanks, storage tanks, or pipes linking these tanks,

(vii) when removing bungs from drums containing the resin, or reactive diluent in pure form.

Continued . . .

(18)

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4321

SUBJECT

Cleaning of Wound Stator After V.P.I. Treatment

SECTION— 11
PART— 2
PAGE— 1
CONT'D on PG.—

Scope: This E.M.I. covers the manufacturing procedure to be followed, for the final clean-up of wound stator after the V.P.I. treatment.

Requirements: To establish a procedure to ensure a relatively clean and smooth finish of wound stator prior to the final assembly and painting operations.

Procedure:

1. Cleaning of Stator Bore

(a) Clean stator bore by filing with a flexible body file to remove epoxy runs and drops. Varnish build-up on stator bore must be kept to a minimum.

(b) Check air ducts to ensure minimum blockage by epoxy varnish - all ducts must be at least 85% open.

2. Cleaning of Stator Frame

(a) On open type frames, the frame and back of core are to be given a minimum clean-up with a flexible body file to ensure a reasonable appearance.

(b) On closed frames wire brush the exterior surface of frame to remove epoxy runs and drops. It is not necessary to grind to bare metal as long as the surface is smooth to receive final painting.

(c) Clean all epoxy varnish and silicone rubber from mounting surface of feet and from feet hold-down bolt holes, spot faces and spigots with a wire brush and paint scraper.

(d) Vacuum clean the complete stator to remove all epoxy dust and silicone rubber.

(e) ZZ Tape a sheet of polyethlene to each end of wound stator to prevent the entry of foreign material into the winding during the transfer to and storage in the assembly area.

ROUTE
EMI-4000
ec 1.
Part
19& 41

*—Revision
Z—Addition

Prepared By	Section and Unit	Type Name	Signature
Len Foster	L.M. & G. 149	Prod. Engineering S.L. Thomas	S.L. Thomas
Date Issued: Jan. 15/69	Supersedes Issue Dated: Jan. 31/68	Manuf. Eng. J.A. McGovarin	J.A. McGovarin
		Quality Control R.J. Hackwood	R.J. Hackwood

(19)

1#TO:KEN E LOGAN (PBRO) 88-08-25 13:19 RECD:88-08-26 13
R.00015 FR:ROB BAKER RE:NEW VPI RESIN SAFETY REQUIRE 46L 880

TO: WAYNE C BROADWORTH (PBRO)
P F NEUMAN (PBRO)
LORNE D READ (PBRO)
CC: KEN E LOGAN (PBRO)
J A MACDONALD (PBRO)
BOB H REHDER (PBRO)
PIERO V RONCA (PBRO)
ED J ROWE (PBRO)
FROM: ROB BAKER 88-08-25 13:19
RE: NEW VPI RESIN SAFETY REQUIRE

Some comments on your letter of August 22/88:

1 The storage tank should be protected on all sides adjacent to manufacturing areas with fire walls. If possible, the tank room should be on an exterior plant surface as it is now.

2 I believe the FM requirement for an emergency underground tank in case of fire is only applicable when the burning liquids are not contained. This would be the case in a paint storage area, for example, but I don't think that it would apply here.

3 Does the Schenectady tank have a vacuum rating?

4 LD Read is working on an alternate method of providing paint and solvents to the plant than a central storage building. Check with him about storing drums of VT centrally.

5 It is true that there is still a slight odour off the new #3 Oven. Since we have received approval for the new oven and the incinerator for #1 and #2 ovens, the MOE has stated an intention to require an additional 1/4 second retention time in the fume incinerator. We will have to comply with this when the units are moved. This might be enough to eliminate the odour. The new regs also will be based on total emissions rather than on rate of emission.

6 Based on past experience, I doubt that higher stacks are going to help the odour problem. A high apartment building is less than a kilometre downstream of the stack.

7 Significant improvements of the vapour capture equipment for the Stokes pumps will be required for Bldg 10.

8 CO2 has limitations for fire fighting in an open area. We should have help from equipment suppliers or a consultant when it comes time to design these.

(20')

sulation Systems
nit 613

Re: VPI Resin

cc P. Jones

5 July 1988

Fred MacDonald
Armature

The following lots of resin are released for use:

HF414	8 barrels
HF412	2 barrels
HC411	2 barrels
B409	1 barrel

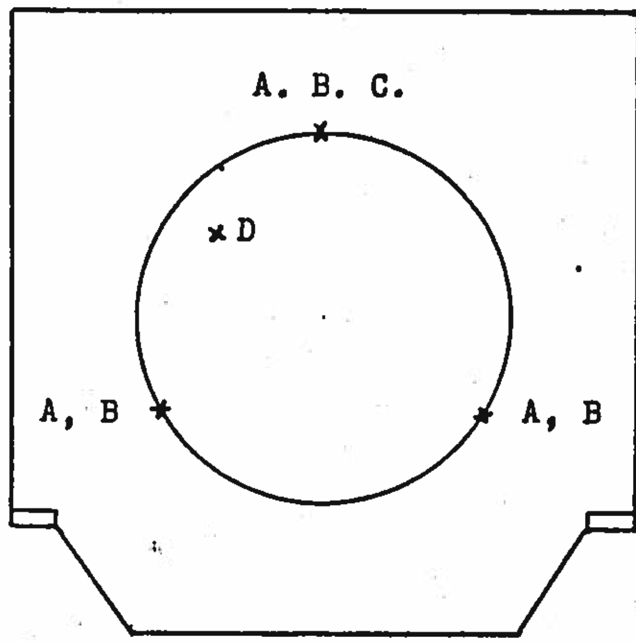
The remaining 20 barrels are still quarantined because of high gel times.

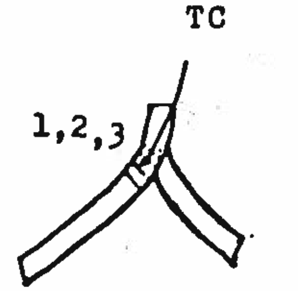
WCB

W. Broadworth

SECTION: LARGE MOTOR AND GENERATOR

TITLE - LOCATION OF THERMOCOUPLES FOR BAKING STATOR WINDINGS PER SPEC. #30272.





1. Small Amount Of Duxseal
2. 1/2 Lap Teflon
3. 1/2 Lap Mylar

T.C.#	T.C. LOCATION	
1	"A" - On Coil Nose - Connection End	Secure to Coil Arms as Shown Above.
2	"A" - On Coil Nose - Connection End	
3	"A" - On Coil Nose - Connection End	
4	"B" - On Coil Nose - Opp. Connection End	
5	"B" - On Coil Nose - Opp. Connection End.	
6	"B" - On Coil Nose - Opp. Connection End.	
7	"C" - In Air Duct At Core	
8	"D" - Suspend in Bore to Measure Air Temperature	

SHEET NO. 1. OF

REVISIONS					ISSUED BY / DATE	
1		3		6	N.R.Selkirk 12-10-73	SK-142-010.
2		4		7	APPROVED BY / DATE	
		5		8		

APP 3232A

(22)

CANADIAN GENERAL ELECTRIC COMPANY LIMITED • METHODS MANUAL

MAINTENANCE DEPARTMENT - 992

1. AIR DRYER

   (A) 4-WAY VALVE OPERATOR TO BE GREASED ONCE A MONTH.

   (B) DESICCANT TO BE CHANGED (1) ONCE PER YEAR.

   (C) CLEAN OR REPLACE FILTERS ONCE (1) A MONTH.

   (D) CHECK THE NORMAL REACTIVATION AIR FLOW GAUGE IS INDICATING AT THE YELLOW LINE.

2. HYDRAULIC SYSTEM

   (A) CHECK OIL LEVEL ONCE (1) PER WEEK.
   RECORD ON PUNCH CARD.

3. TRANSFER LINES

   (A) CLEAN BASKET STRAINERS - EVERY TWO WEEKS.

4. LID

   (A) CHECK LINE-UP OF THE LID - EVERY THREE MONTHS

5. 'O' RINGS

   (A) REPLACE AS REQUIRED.

6. OIL MIST SEPERATORS

   (A) CHECK AND CLEAN MONTHLY - REPLACE FILTERS EVERY SIX MONTHS.

REVISIONS				ISSUED BY	DATE	
1	[illegible] 71	4	7	F. J. McMULLEN	9 Mar. 76	MI-145-A-27
2	[illegible] Mar. 76	5	8	APPROVED BY [illegible]	DATE [illegible]	
		3	6			

(22)

PROCESS INSTRUCTION

PI 5 0 4 1 INSTR No	SECTION	PART	SHEET No 0 0 0 1

TITLE
ARMATURE OPERATION

SECTION
VPI SYSTEM

PART
PROCESS TO OBTAIN RESIN SAMPLE

ISS No | IDENT
CONT ON SHEET ______

The ideal time to obtain a resin sample is while transferring the resin to the treat tank. This will require only opening the valve on the side of the storage tank and filling the container.

However, if it is critical a sample be taken and it cannot be obtained as above, then it will be necessary to operate the system manually.

To operate manually, turn the key switch on the front of the panel to Maintenance. On the toggle switch board inside the panel, turn storage tank pressure switch on (UP). Only put enough pressure into tank to allow the resin to flow when the valve on the side of the storage tank is opened. After sample has been taken, close pressure valve and switch on the"STORAGE TANK DEPRESSURE" switch.

When tank is at or close to atmospheric pressure, the system may be switched to automatic. Be sure all switches on board inside panel are in the off position. Turn keyed switch to automatic and turn main disconnect "OFF" then "ON".

ROUTE

APP 4204 12/72

ISSUED BY	UNIT	DATE ISSUED	SUPERSEDES
P. Trudell	613	11 October 1983	NEW

Jan 20/82

(24)

OPERATION OF V.P.I. TANKS

1. SELECT PROGRAM 1-2-or 3 ON TANK 1 OR 2 OR BOTH.

2. TURN "SYSTEM LOCK" TO AUTO.

3. PUSH PROGRAM START BUTTON ON TANK 1 OR 2 OR BOTH.

4. MEASURE THE VACUUM LEVEL IN M.M. WITH THE GAUGE. RECORD AND SIGN ON THE RUN PRINTOUT AFTER 25 MIN.

5. WHEN THE BELL RINGS, TRANSFER VARNISH TO TREAT TANK.

   TANK 1 MINIMUM 2 MINUTES TRANSFER
   TANK 2 MINIMUM 5 MINUTES TRANSFER

6. WHEN TRANSFER COMPLETE, TWIST THE CONTINUE TANK 1 OR TANK 2.

7.* WHEN THE BELL RINGS, TRANSFER VARNISH FROM TREAT TANK TO STORAGE TANK. REPEAT - TWIST THE CONTINUE TANK 1 OR TANK 2.

8. WHEN BELL RINGS FOR END OF CYCLE, PUSH ACKNOWLEDGE. HYDRAULIC PUMP CAN NOW BE OPERATED. PUMP WILL ONLY BE ALLOWED TO COME ON AT THE END OF A CYCLE, IF THERE IS NO PRESSURE OR VACUUM IN THE TANK.

   UNLOCK THE LID)
   RAISE THE LID)
   REMOVE THE PRODUCT)
   TO START PUMP PUSH ANY ONE OF "LID RAISE","LID LOWER","LID LOCK", OR "UNLOCK LID".

   IF LID IS ALL THE WAY UP OR ALL THE WAY DOWN THE HYDRAULIC PUMP WILL TURN OFF AFTER TWO MINUTES. TO RESTART, PUSH ONE OF THE 4 BUTTONS.

* YOU CAN HOLD THE CYCLE AT THIS TIME BY NOT ACTIVATING THE TRANSFER VALVE. YOU CAN SELECT A NEW PROGRAM PART WAY THROUGH A CYCLE. THE OLD PROGRAM WILL STAY IN OPERATION UNTIL THE CYCLE HAS ENDED.

IF THERE IS A POWER FAILURE, TURN OFF (THEN ON) MAIN DISCONNECT, THEN PUSH ONE OF THE START BUTTONS IMMEDIATELY, THEN THE RESET BUTTON.

OPERATION OF V.P.I. TANKS

1. SELECT PROGRAM 1-2-or 3 ON TANK 1 OR 2 OR BOTH.

2. TURN "SYSTEM LOCK" TO AUTO.

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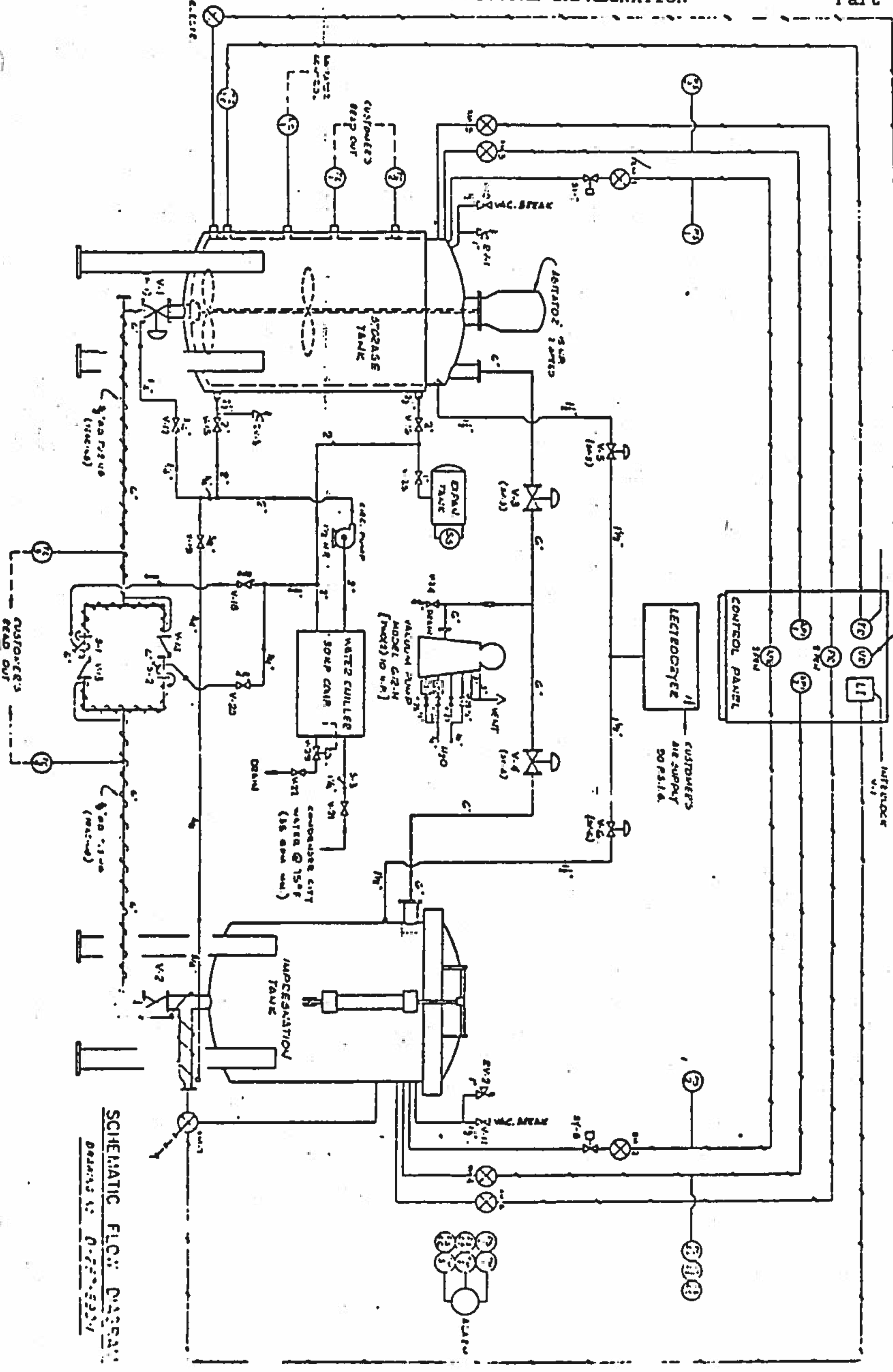
IF THERE IS A POWER FAILURE, TURN OFF (THEN ON) MAIN DISCONNECT, THEN PUSH ONE OF THE START BUTTONS IMMEDIATELY, THEN THE RESET BUTTON.

ENGINEERING MANUFACTURING INSTRUCTIONS —
VARNISH TREATMENT OF OPEN SLOT
AC STATORS BY VACUUM PRESSURE IMPREGNATION

Cont'd on
Page 10



SCHEMATIC FLOW DIAGRAM

(27)

Canadian General Electric

SUBJECT: VPI Cycles

COPIES: E. Rowe
R. Osborne
A. Archer

Peterborough, 11 October 1984

K.E. Logan
Foreman - Units 616/617/618
Armature Operations

The Tertiary Butyl Styrene has been added to the storage tank and viscosity is now 980 cps.

Please disregard all EEI's issued to extend the VPI cycles and heat the stators. Please revert to the original specifications for VPI cycles.

Please continue to run sample coils with all stators until further notice. Please attach the aluminum side plates to all high voltage sample coils.

WCB

W.C. Broadworth
Supervisor - Insulation Systems & Shop Support
Armature Operations

ec:

19-37

G430

(Accident?
Armature
(Lou Clarke) (F)

Friday June 5, 1981

EFO W/S Bay 206 North

Lou was using epoxy melting pot. He was using 1500 Toluol thinners in regular job application. He had a soaked rag in his hands.

He attempted to wipe excess epoxy off the outside of the melting pot. Holes above the switch on the side of the pot are open to red hot elements. The vapours ignited burning both hands & forearms. He is expected to be off work for a week.

Tom MacDonald night foreman. Operator beside Lou asked for a Safety Rep to be called. Bill , guard on duty arrived and took away the melt pot to Security Office.

Apparently another pot of this type is in Stores for use. Safety Office knew nothing of this accident on Monday morning.

Suggestion Fire Blankets should be in area in case of burning clothing.

Bay 215 Press north side. Manilla rope in eye on pull out badly frayed.

Bay 217 Mica dust from grinding over wide area. Proper

Doug Spence going to make sure that other unit will not be used.

42-44-45-48-53-255
273-336

Compounds 57 59 255

~~Tuesday~~ Thursday November 8 1979 Mercury Spill Armature.
(about midnight)

Using McCloud guage, vacuum pressure indicator

John Liberty may know how much mercury in guage.
Don MacDonald says going to use chemical absorbent.
Checking vacuum in #2 VPI tank.
On vacuum first, then to atmospheric, then to pressure when guage blew up showering mercury over area.

November 7/79
Mercury still laying around area and probably a good deal down in pit.
I was not informed at time of spill ~~not~~ nor was I informed at any later time.

Note. Paul Jones estimates about two pints of mercury.

Unit charts were not working so mercury system was on to check out problem. Apparently operator did not shut valve off in proper sequence.

Caution Pit is partly filled with liquid. Have to check it out.

triple distilled Mercury used in guage

Pete Trudell was in charge of clean up. doesn't know how much volume of mercury in guage.

Tony MacNeil was operator on shift. Should know the routine

416-441-1939 Mary Marshall feels that anyone going into pit should be fully equipped to reduce any contact. She is going to get back to me to-day.
Could be epichlorhydrin

~~X~~ Mercury X will transform to Mercury Sulphide

Dec 14 1979 Talked to Jim Mums & Ken Logan & Tony Ball. Mercury still in area. Arthur worked at it. Tony says its Ken Haggetts baby.

October 22 1980
1400

~~Cheryl~~ Sherron
Tanaka Chemko

Dave Davidson.
Foreman

Armature
Glass tape Allergy

Age 35 years
Seniority. Oct 29, 1977

~~Cheryl~~ Sherron has small white rough projections which develop into itchy & sore pimples. She notices that when out of the fibre glass area the condition subsides.

Her Doctor feels that it is probably job related. She is going to have allergy tests done before going into a request for job transfer.

October 24/80 ~~Cheryl~~ Sherron worked on Hydro job yesterday and to-day reported to Surgery

~~Cheryl's~~ Sherron Doctor, David Hogue has recommended she see Dr Curtis. They are working co-operatively.

Dr Hogues wants her to have the materials she is working with.

October 27/80 Sherron has an appointment with Dr Curtis at 0900 Ch. of Surgery

October 27/80 0815 Brought a letter from David Hogue requesting that she be removed from this job because of the allergy to Epoxy and fibre glass.

She says that there are some allergies in her family and her children did have some minor problems.

Back here on Sept 16 1980 from lay off. Has been in Armature three times now and this is the first time she has had problems. Eyes are swollen shut face affected and hands.

Tom Bluett has request in for Sherron in Dispatch 2nd week in December until middle of January.

Dr Curtis agrees that she should have complete allergy survey to try to pinpoint ~~causative~~ causative material. Dr Ryan specialist.

Sherron is to apply for WCB Benefits as of retroactive date when problem first occurred.

Dr Curtis agrees it would be sensible to check Armature to see if new products have come in lately

Re VPI Resin with Vinyl Tolulene

cc J. Crowther
L. Read

13 Jan 1988

R. H. Rehder
P. Ronca
E. Rowe
[redacted]
F. MacDonald

While I was in Schenectady, I had an opportunity to talk to various shop personnel about their experience with the A50A469 resin . This resin contains a nominal 13% vinyl tolulene.

The opinion was universal that the vinyl tolulene caused significant problems on the shop floor. Personnel in the area complained about the fumes, the smell and a variety of ailments from headaches to heart attack symptoms.

They suggested that we should consider a separate building for the VPI tanks if we were to use such a resin. Should we keep Bldg 7 ?

The whole VPI system had been electrically grounded to prevent sparks. A copper jumper wire was placed across every joint in every piping system exposed to the resin or its vapours.

An explosive release line had been placed in the tank exhaust system with a rupture disc to prevent venting in normal operation.The tank was fitted with a purging system with a blower to force ventilate the tank before it is opened. A lip exhaust, strategically placed floor vents , and an enclosed and ventilated drain booth were also in place. Problems had been experienced with exhaust fumes that re-entered the building through open windows etc.

A vacuum control system had been installed to limit the vacuum to 3 mm Hg. This was done with valves on the exhaust from the vacuum pump and a double redundant sensor system. They were concerned about the possibility of explosions and boiling off the Vinyl Tolulene if lower vacuums were allowed. We currently work to 2 mm while other companies such as Siemens use vacuum's at lower levels (.12 mm). I think optimum vacuum levels are critical to achieving efficient resin impregnation on high voltage insulation systems. (Schenectady only went to 6.6 kv.) This concern will probably be less relevant with the non-mylar VPI system and the lower resin viscosity.

In any event, we should be facing into the shop situation with respect to Vinyl Tolulene . The resin we are considering has a 25% vinyl tolulene content and thus the problems will be more severe than those referred to above. We must resolve the

(73)

question as to whether the technical and economic advantages justify the necessary safety considerations and the inevitable background odours. The attached Exhibit 1 summarizes the pros and cons.

Would you please attend a meeting at 2:30 PM on Tuesday , January 26 to review the above. The meeting will be in the 613 Conference Room , 2A-2nd.

WB

W. C. Broadworth
Insulation Systems

Comparison of UPI Resins

Technical Properties

	A50A311	A50A485
Viscosity @ 25°C	1100 cps	470 cps
Gel Time @ 171°C (min)	20-55	8.0
Heat Deflection Temperature (°C)	105	122
% DF @ 170°C	2.0	1.0
Thermal Stability - 5% Weight Loss (°C)	158	173
Temperature Class	F	F-H
Tank Life Stability	Good	Excellent
Fire / Explosive Hazard	No	Yes

Economic Considerations

Resin cost
1987 volume = 169 barrels × 500 lb/barrel

	A50A311		A50A485
- Per lb	\$6.40		\$5.40 est.
- Total 1987 volume	\$540,800	\$84,500	\$456,300

Also - Reduced Tank Time
- Possibly Reduced Energy Cost due to Cure Cycle

UCB
Jan 13 /88

Re : New VPI Resin

(75)

* NOTE REMAR ON THE PAGES.

Background :- problems with existing '311 resin
- high cost - $6.30 /lb
- high viscosity
- some compatability problems

- '469 resin developed first & used by Schenectady (13% V.T.)
  - not used here because of poor tank stability
  - implemented in Schenectady in 1984
    - problems with smell etc led to extra funds being req'd for ventilation, enclosed drain booth etc

'485 Resin Invented by Markowitz
- low viscosity 470 cps
- 16% mat'l savings
- good tank stability
- good temperature capability
- rapid gel → less resin run out
- compatable with more insulating materials

- Development work now underway in Eng. Lab.

* **Problems**
- odour - 25% Vinyl Tolulene (now used in 702 polyester-TE)
- may be explosive risk in tank
- Environmental concern outside plant due to smell & styrene exposure
- Vinyl tolulene will probably soon be a designated material
  - may require medical monitoring of employees
  - need good ventilation

* **Issues**
- Will the afterburners protect the residents of Albert Str.?
- What about fumes from tank exhaust & Bldg ventilation system? (afterburner?)
- What can be done to minimize problems inside the Building? — Stay in Bldg 7 - much farther to fence
  — segregate the end of Bldg 10

WCB 28 Jan 88

(66)

NOTE + REMARKS.

29 Mar 1988

cc K Logan
W Broadworth
T Hulsman

Rob Baker
Plant Engineering

We have 16 drums (about 700 Imp gallons) of M6860 epoxy resin in storage at the Armature that aren't suitable for production, and which we want to have disposed. The material is packaged in standard weight drums, and has been treated with TBS (tertiary butyl styrene) to try to control its viscosity. I am not sure of the percent content of TBS, but Wayne Broadworth can probably tell you. This material was removed from the old tank filling baffles in 1987, or before.

Will you please find out what it will cost us to dispose of this material. The material cost was written off in 1987.

Fred MacDonald
Armature

Feb 24 1981
Armature
Epoxy 5918

Ron Blair
Called in
0900

Epoxy that has gone over shelf life on site was returned to plant.
Before epoxy can be scrapped it has to be picked and (activated in order to make it safe

42 kits were scheduled to go into big oven where proper ventilation would take care of fumes.

They were supposed to be done between 4:30 PM and 8:00 AM Feb 23 81 but for some reason they were not put in the large oven but rather in the small north oven where no ventilation is available. The oven was loaded at 0600 Feb 24/81.
The fumes of styrene was so strong that people in area refused to work until the air cleared up.

Talked to Paul Jones. He says that about 200 more kits are ready to be activated now. But rules were stringent as to where and when the job was to be done. But instructions were not followed.

Cec Mumford is bringing the kits in through his stores. He says about $5,000 kits are to be returned eventually.

Cec started to accelerate compound by mixing in area north of stores

1120 AM Jim Munro says that they are not going to accept any more from Power Generation.
Only the amount now in stores will be disposed of

CGE

Confidential. For Internal use only.

ENGINEERING LABORATORY
TEST REPORT

Date— 80 12 09

Subject— L-5918 (5) Polyester

Object of Investigation— Gel Time Determination for Materials Returned From Site.

Test No. 5G-34-35

Batch Number	Gel Time @24°C	Manufacturing Date
922 (New Catalyst)	395 minutes	78 06 22
922 (Old Catalyst)	385 minutes	
928 (New Catalyst)	300 minutes	78 07 12
928 (Old Catalyst)	300 minutes	
941 (New Catalyst)	420 minutes	78 10 13
941 (Old Catalyst)	410 minutes	
944 (New Catalyst)	410 minutes	78 10 25
944 (Old Catalyst)	410 minutes	
951 (New Catalyst)	310 minutes	78 11 29
951 (Old Catalyst)	300 minutes	
954 (New Catalyst)	265 minutes	78 12 01
954 (Old Catalyst)	255 minutes	

cc: J.A. Munro - Unit 614
~~J.F. Brown - Unit 614~~
G.P. Jones - Unit 613
J.L. Chun - Unit 613
P.V. Ronca - Unit 752
P.R. Ouimet - Unit 752

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
PETERBOROUGH PLANT

App 3288-8/77

Tested by— Gordon Young

Report

ENGINEERING LABORATORY
TEST REPORT

Date— 80 12 09

Subject— L-5918 (5) Polyester

Object of Investigation— Gel Time Determination for Materials Returned From Site.

Test No 5G-34-35

Batch Numbers	Gel Time @24°C	Manufacturing Date
961 (New Catalyst)	330 minutes	79 02 09
961 (Old Catalyst)	338 minutes	
962 (New Catalyst)	375 minutes	79 03 03
962 (Old Catalyst)	360 minutes	
965 (New Catalyst)	338 minutes	79 03 20
965 (Old Catalyst)	332 minutes	
969 (New Catalyst)	335 minutes	79 04 03
969 (Old Catalyst)	330 minutes	
970 (New Catalyst)	330 minutes	79 04 16
970 (Old Catalyst)	330 minutes	
974 (New Catalyst)	330 minutes	79 04 23
974 (Old Catalyst)	320 minutes	

Conclusions—

1. Batches 928, 951, 954, 961, 965, 969, 970 & 974 can be used as 5 hour - gel time material.
2. Batches 922, 941, 944 & 962 are not recommended to be used as 5 hour - gel time material.

Tested by— Gordon Young

Report Approved by—

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
PETERBOROUGH PLANT

App 3288-8/77

Frank Blakely
616 Area Steward
Apprentice in 618 also
Foreman Ken Fagan

Feb-25. 1981 2200
Armature #10 Bldg
(F)

Frank says that large armatures are being flooded inside the oven in #10 Bldg.

Xylol Thinners used to thin Isonel Varnish. Two people are required to work inside oven enclosure as a rule.

Although they wore chemical cartridge masks this is not good enough since both complained of dry heaves after working on job for 20 minutes. Considerable eye discomfort was also evident and in fact Frank's eyes were still red and inflamed this evening.

Next flooding operation is approx. six weeks away in the oven.

The Bruce Generator on the horizontal rolls will have to be flooded also but this will take place near shut down.

Probably Styrene fumes given off when flooding reaches point where Varnish begins to kick-over.

Large area of evaporation involved with large fans under armature, pumps to move liquid Isonel and large surface area of armature all tend to create severe problem.

NIOSH GUIDE

Styrene $C_6H_5CH=CH_2$ Phenylethylene, Vinylbenzene Cinnamene, Styrene monomer.
100 PPM REL.
Will attack CNS, resp. system, lungs, eyes, skin.
Route Inh, ing. Contact

April 9 1981 Frank reports that crew on day shift dipped on armature three times and were complaining of symptoms again. Frank is on night shift now.
A second armature is now ready for dip as well.

April 10 1981 Spoke with Earl , he says it will be about two weeks before next armature is ready for Flood Dip.

Aug 25 1981
Armature
(#10 Bldg)

Foreman Ken Fagan

1225 Operator Pat Johnston says unit was flood dipped on midnight
Aug 25/81 shift Tues AM this week. And then subsequent (2) dips since then each one on a shift other than days.
Fagan gives the excuse that he didn't know the night shift operator was coming back from illness on Monday midnight.

Now Pat is complaining of headache + nausea. Dave Routley complained of difficulty breathing in area outside flood dip operation and he had no idea of what was being done. He says he wasn't aware of any new or strange odours.
This armature is now finished, and next one may start on weekend or Monday AM latest.

August 31/81 1030AM Another Unit has been flood dipped over the weekend.
Sept 3/81 Spoke with Ken Fagan (not personally) and he says they'll
0800 be putting an armature up for bake to-day at 0800.
This is strange because I am sure the one in the oven is done and no others are ready for flood dip as yet.
0915 Phone call to say that operation has been postponed. Didn't get call personally so I still don't know what the hell is up.

Sunday Sept 6/81 0730 Job was supposed to start yesterday but H&VE
Mark Scott called to say it was held up until 0700 Sun Sept 6.
operator This seems odd since the armature appeared to be ready to go on Friday about 1500.

0810 Filling tray with Isonel varnish thinned with Xylol
No ventilation (1st tube) (Xylol) reading 150 PPM on Toluene tube.
Bottom of tray Reading taken at surface of varnish
covered. (2nd tube) 80 PPM. at surface of tray holding varnish.
doors open (3rd tube) At breathing zone - no reading.
and roof off

Note Since Xylene can interfere with Toluene Tubes we
Start flood are not sure that we are getting Toluene only.
0855 Toluene Tube #4 No reading at breathing zone.
0900 Tube #5. Trace at operator breathing.

Page 3
Armature
Flood Dip
(#10 Bldg
Oven)

Tube #6 Breathing Zone 9.05 15 PPM

Mark Scott says that fumes haven't bothered him. He has operated unit about 3 times now. He feels that the roof off helps considerably.

925 Tube #7 " 45 PPM at operators face on West side.

:35 Tube #8 15 PPM at breathing zone.

:40 Tube #9 10 PPM One foot from face at breathing zone

:43 Tube #10 10 PPM One foot from ~~face~~ at breathing zone.

Note Should check to see if Isonel name might indicate Isocyanates in the Varnish

Tues Sept 9/81 Am suffering from severe chest pains in left lower lung region. When I cough the pain is intense. Also had severe nasal congestion beginning Sunday afternoon after doing test samples. The non productive cough (no phlegm) started Sunday evening and is progressively worsening.

Tues Sept 22/81 Jim Funk called to say he had been talking with Schenectady makers of Isonel. They will send an MSDS. They claim there is no MDI or TDI in their product, They do warn however that magnet-wire varnish does have ~~[illegible]~~ isocyanates

most organic solvents; volatile with steam. Insoluble in water.
Hazard: Moderately toxic by ingestion.
Use: Medicine.
Available also as the isometheptene tartrate, the hydrochloride, and the mucate.

alpha-isomethylionone (gamma-methylionone) $C_{14}H_{22}O$.
Properties: Slightly yellow liquid; sp. gr. 0.925–0.929 (25/25°C); refractive index (20°C) 1.5000–1.5010; flash point 217°F (TCC). Soluble in 5 parts of 70% alcohol. Combustible; low toxicity. A synthetic product.
Uses: Floral perfumes, particularly of a violet character; flavoring.

isomorphism. The state in which two or more compounds that form crystals of similar shape have similar chemical properties and can usually be represented by analogous formulas, e.g., Ag_2S and Cu_2S.

"Isomate."[520] Trademark for isocyanate foam systems. Available as non-burning, pour-in-place froth, or spray foams.

isoniazid (N-isonicotinyl hydrazine; INAH; isonicotinic acid hydrazide) $C_5H_4NCONHNH_2$.
Properties: Colorless or white crystals; odorless; affected by air and light; m.p. 170–173°C; sparingly soluble in alcohol, slightly soluble in benzene and ether; freely soluble in water. Solutions practically neutral to litmus.
Derivation: From gamma-picoline.
Grade: U.S.P.
Use: Medicine.

isonicotinic acid $\overline{CHCHNCHCHC}COOH$. Pyridine-4-carboxylic acid.
Properties: White, practically odorless powder; m.p. 314–317°C (sealed capillary), slightly soluble in water; pH of saturated aqueous solution at 20° 3.6.
Containers: Fiber drums.
Use: Synthesis of isoniazid and similar substances.

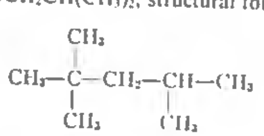
isonipecaine hydrochloride. See meperidine hydrochloride.

"Isonol C100."[520] An aromatic reinforcing polyol. $C_6H_5N[CH_2CH(CH_3)OH]_2$
Properties: Amber liquid. Viscosity (50°C) 1000 cps (max.); sp. gr. (23°C) 1.055. Water content 0.05%. Combustible.
Uses: Ingredient of polyurethane foams, coatings, sealants, and elastomers; intermediate in organic synthesis.

ONGL
???

isononyl alcohol $C_8H_{17}CH_2OH$. A higher alcohol developed in early 1968; used as a basis of plasticizers such as diisononyl adipate. Combustible.

isooctane (2,2,4-trimethylpentane). Molecular formula $(CH_3)_3CCH_2CH(CH_3)_2$; structural formula:



A branched-chain hydrocarbon.
Properties: Colorless liquid; sp. gr. 0.6919 (20/4/°C); f.p. −107.4°C; b.p. 99.2°C; refractive index (n 20/D) 1.3914; flash point 10°F. Insoluble in water, slightly soluble in alcohol and ether. Autoignition temp. 784°F.
Grades: Technical; pure; research; spectrophotometric.
Containers: 5-, 54-gal drums; tanks.
Hazard: Flammable, dangerous fire risk. Moderately toxic by ingestion and inhalation. Explosive limits in air 1.1 to 6%.
Uses: Organic synthesis; solvent; motor fuel; used with normal heptane to prepare standard mixtures to determine anti-knock property of gasoline. See octane number.
Shipping regulations: (Rail) Red label. (Air) Flammable Liquid label.

isooctene C_8H_{16}. Mixture of isomers.
Properties: Colorless liquid; boiling range 190–200°F; bromine number 137; sp. gr. 0.726 (60/60°F). Flash point below 20°F.
Hazard: Flammable, dangerous fire risk.
Shipping regulations: (Rail) Red label. (Air) Flammable Liquid label.

isooctyl adipate $(C_8H_{17}OOCCH_2CH_2-)_2$. Plasticizer providing low-temperature stability. Used in calendering film, sheeting, vinyl dispersions, extrusions.

isooctyl alcohol (isooctanol). General term applied to any isomer of the formula $C_7H_{15}CH_2OH$ in which the eight carbon atoms form a branched chain. Usually refers to a mixture of isomers made by the Oxo process. A selected C_7 hydrocarbon fraction is reacted with hydrogen and carbon monoxide in the presence of a catalyst at pressures up to 3000 psi. The crude alcohol is recovered and purified.
Properties: Clear liquid. Distillation range 182–195°C; wt/gal 6.95 lb; sp. gr. (20/20°C) 0.832; flash point (Tag open cup) 180°F. Combustible. Low toxicity.
Containers: 55-gal drums, tank cars.
Uses: Ingredient of plasticizers; intermediate for nonionic detergents and surfactants; synthetic drying oils, cutting and lubricating oils, hydraulic fluids; resin solvent; emulsifier; antifoaming agent, intermediate for introducing the isooctyl group into other compounds.

Upjohn Co
Manufacturers

isooctyl isodecyl phthalate $C_8H_{17}OOCC_6H_4COOC_{10}H_{21}$.
Properties: Clear liquid; sp. gr. (20/20°C), 0.976; flash point 445°F; combustible; low toxicity; mild odor.
Grade: Technical.
Containers: Drums; tank trucks; tank cars.
Use: Plasticizer.

isooctyl palmitate $C_8H_{17}OOCC_{15}H_{31}$.
Properties: Clear liquid, sp. gr. 0.863 (20°); acidity 0.2% max (palmitic); moisture 0.05% max; m.p. 6–9°C; b.p. 228°C (5 mm). Soluble in most organic solvents. Combustible; low toxicity.
Uses: Secondary plasticizer for synthetic resins; extrusion aid and plasticizer.

isooctylphenoxypolyoxyethylene ethanol isooctylphenylpolyethylene glycol ether) $(CH_3)_3CCH_2C(CH_3)_2C_6H_4O(CH_2)_2O(C_2H_4O)_7C_2H_4OH$.
Properties: Slightly viscous pale amber-colored liquid; oily musty odor, m.p. 2–5°C; b.p. 150°C (initial) at 1 micron; density 1.06 g/ml (20°C). Combustible; low toxicity.
Use: Surface-active agent.

isooctylphenylpolyethylene glycol ether. See isooctylphenoxypolyoxyethylene ethanol.

O.H.P.B. File No.: 5B-83

Ontario

MINISTRY OF HEALTH

OCCUPATIONAL HEALTH PROTECTION BRANCH

FIELD VISIT REPORT

Date: July 4, 1974

From: R. Fliegl, P. Eng.

Plant:	Canadian General Electric Company	Requested by:	O.H.P.B.
Address:	107 Park Street North Peterborough, Ontario	Accompanied by:	Mr. F. Watts, I.S.B.
		Date of Visit:	June 19, 1974
Contacts:	Mr. Dan Abel - Safety Specialist Mr. Munson - Manager of ~~Armature~~ Shop Operations	Copies to:	Dr. V.L. Tidey (1) Mr. J. McNair (3) Mr. Dan Abel (1)
Hazard:	Resin Application		

Abstract: A visit was made to assess conditions in the stator coating area of the armature department. No coating operations were observed during the visit. The company has discontinued this method of coating the electrical coils of large stators. No directions are suggested.

&&&&&&&&&&&&&&&&&&&&&&&&&&&&

Within the armature department the stators of large electrical motors are wound with coils of current carrying wire. As insulation, the coils are coated with a polyester material and then the stators are baked in a large sealed oven. The stators are up to 15' in diameter and up to 3' wide. The method of coating involves lying the stator on blocks within a large diameter drip tray, then pumping the reduced polymer through a hose onto the copper coils. In order to carry out the operation the workman stands inside the stator and directs the output of the hose. The operation normally takes about 1 hour per day and is carried out for three successive days for each stator. There are about 4 or 6 stators done in this way each year. (Smaller stators are immersed in a dip tank.) The company supplies the workman with boots, gloves, and an apron. The polymer used is a General Electric Polyester Resin No. 9522 thinned by an aliphatic - aromatic hydrocarbon solvent mixture. Consumption is estimated to be about 1 to 2 gallons per application.

2/...

During the visit the operation was not being carried out however, the work area was examined. The coating operation was found to be carried out in a large open plant area at bays No. 212 and 213 of armature building No. 7. The company indicated that they were aware of the hazards involved in the operation and this method of coating large stators has been temporarily discontinued. Plans are now being carried out to utilize a pre-coated copper wire in large diameter stators.

COMMENTS:

1. The method of coating the large stators tends to place the operator in the midst of potentially high levels of solvent concentrations. Although exposure is for a very short period, such levels could be hazardous to health.

2. It would seem that the company has recognized the hazard involved in this method of coating large stators and has taken steps to discontinue the operation.

DIRECTIONS:

No directions are suggested.

RF:gb

Rudy Fliegl

R. Fliegl, P. Eng.

DIRECTOR
OCCUPATIONAL HEALTH
JUL 4 1974
PROTECTION BRANCH

Community Health Standards Division,
5th Floor, 15 Overlea Boulevard,
Toronto, Ontario M4H 1A9.

416/965-4066

July 5, 1974.

Mr. D. Abel,
Safety Specialist,
Canadian General Electric Company,
107 Park Street North,
PETERBOROUGH, ONTARIO.

Dear Mr. Abel:

Enclosed is a copy of the Field Visit Report prepared by Mr. R. Fliegl following a visit to your plant on June 19, 1974.

Yours truly,

H. M. Nelson, P.Eng.,
Occupational Health Engineering.

HMN/bc
encl.

APPENDIX K

Document Number and Description

1. RESIN APPLICATION – FIELD VISIT REPORT……………………………..………JULY 4, 1974
2. UNION NOTES – XYLENE THINNERS…………………………………...………FEB. 25, 1981
3. UNION NOTES- EPOXY 5918-SHELVED……………………………...…...……..FEB. 24, 1981
4. PLANT ENGINEERING MEMO – EPOXY DRUMS……………………….....….MAR. 29, 1988
5. MANAGEMENT LETTER – RE: VPI RESIN WITH VINYL TOLUENE……..….JAN.13, 1988
6. UNION NOTES – ARMATURE GLASS TAPE ALLERGY……………….…....OCT. 29, 1979
7. UNION NOTES – MERCURY SPILL………………………………….....………..NOV. 1, 1979
8. UNION NOTES – ARMATURE ACCIDENT……………………………………..JUN 5, 1981
9. MATERIAL AND TECHNICAL SYSTEMS DEPARTMENT – MANAGEMENT MEMO AND EMI #4321 (VPI TANKS)……………..……………………………………………..MAR 10, 1986
10. MANAGEMENT MEMO- RE: SAFETY ISSUES CONCERNING VPI RESINS. -…..…...AUG 14, 1986
11. LETTER FROM HEALTH AND SAFETY NATIONAL REP………….....……JULY 17, 1989
12. MONTHLY INSPECTION…………………………………………….....………...FEB. 28, 1983
13. MONTHLY INSPECTION……………………………………………….....….....NOV. 25, 1985
14. MONTHLY INSPECTION……………………………………………….....……..OCT. 28, 1981
15. JANUARY INSPECTION…………………………………………………...…...…FEB. 13, 1987
16. FIELD VISIT REPORT – ASBESTOS DUST…………………………….....……DEC. 22, 1976
17. ARMATURE JHSC TOUR…………………………………………….....………MAR. 19, 1987
18. UNION NOTES………………………………………………………………......….MAR. 5, 1987
19. LETTER FROM DR. BLASTORAH RE: GE EMPLOYEE……………………..DEC.17, 1979
20. LETTER FROM J.BALL……………………………………………………...…..JUNE 1, 1981
21. NEWSPAPER ARTICLE – EXAMINER……………………………………….JUNE 3, 1981
22. OHCOW LETTER TO J.BALL RE: PATIENT MR. KLUGE…………….....….NOV.29, 1998
23. FIELD VISIT REPORT – TCE……………………………………………….APRIL 27, 1981

25. FIELD VISIT REPORT – TAPING OPERATIONS ON MEZZANINE FLOOR …………JULY 13, 1973
26. SOLVENTLESS EPOXY VARNISH MEMO…………………………….....….JULY 11, 1979
27. FIELD VISIT REPORT – RE: EXPLOSION…………………………….....….SEPT. 10, 1971
28. MEETING MINUTES: RE: MISUSE OF TOXIC MATERIALS……………….MAY 20, 1980
29. MEMO RE: MATERIALS CURED IN NEW OVEN…………………………APRIL 23, 1987
30. FIELD VISIT REPORT – TOLUENE VAPOUR……………………………...AUG. 13, 1980

32. SAFETY COMMITTEE MEETING MINUTES………………………………...JUNE 17, 1977

33. ASBESTOS AND OTHER CONTAMINANTS CHART (date products no longer used)..date not indicated

EPOXY (E)

sent to Y. Hoag

Chapter 12

TOXICITY, HAZARDS, AND SAFE HANDLING

Harold H. Borgstedt
University of Rochester
School of Medicine and Dentistry
Rochester, New York
and
Charles H. Hine
University of California
San Francisco Medical Center
San Francisco, California

low irritating and sensitizing potential of the latter.

D. Toxicity of the Curing Mixture

During the curing process of the working mixture the reactive groups of the resins and the hardeners are progressively consumed. Hence the toxicity and irritancy of the curing mixture depend on the degree to which curing has progressed. The toxicity and irritancy of the initial uncured mixture are comparable to those of the individual components, whereas the almost fully cured resin will be much less toxic. No cases of systemic intoxication after percutaneous exposure to cured resin have been reported.

The curing process is often exothermic which may lead to considerable self-heating of the curing mixture. This may cause thermal burns or combined thermal-chemical burns, especially if the mixture contained highly caustic liquid-amine hardeners. Self-heating or external heating may also lead to the generation of vapors of volatile low-molecular-weight epoxy resins, especially of the reactive diluents, or volatile amines. Both of these may show the toxicity and irritancy discussed under the individual components. Accordingly adequate ventilation is a necessary prerequisite to the safe handling of these materials during processing.

E. Toxicity of the Fully Cured Resins

The fully cured resins are practically inert substances with no significant degree of toxicity if no unreacted components are present. Bourne et al. [1] showed that heat treatment markedly reduced surface pH and the number of bubbles in the finished product. This is an indication of lowered residual amine content and hence reduced irritancy. Mixtures allowed to cold-cure under conditions of high atmospheric humidity gave the highest pH values.

The fully cured resins may contain up to 1% of unreacted amine hardeners [1]. This amount is insufficient to cause systemic toxicity but may lead to irritation and sensitization, especially of the respiratory tract, when finished epoxy resins are subjected to dust-producing operations like filing, sanding, or drilling. Joyner and Pegues [45] reported the incidence of severe respiratory irritation and mild nephrotoxicity in six laborers who had removed epoxy resin-concrete with air hammers. Although they could not positively identify the offending agent, xylene, a known thermodecomposition product of epoxy resins, was strongly implicated. This hypothesis seems highly unlikely, however. It is hard to accept that the concrete-breaking operation supplied sufficient energy to decompose the resin and more particularly to give toxic levels of xylene. Dust may have been the carrier of the irritating agent because there were no further problems when the workers used dust respirators.

Skin irritation may also occur when devices manufactured from epoxy resins are left in contact with the skin for long periods of time. A case of severe dermatitis in an amputation stump has been reported [1] after contact with a prosthesis patched with an epoxy resin. The prosthesis caused no further problems after the patch was recured at 80°C for 3 days, which presumably removed traces of unreacted hardener by further chemical reaction.

By thermodecomposition of a cured bisphenol A type of resin, Leong and McFarland [46] produced vapors that were fairly toxic to rats on inhalation. The predominant cause of death was pulmonary edema. The authors stated that pyrolysis products may be a potential hazard to workers in industry. The combustion products of epoxy resins, on the other hand, were found to be nontoxic. Thrune [47], concerned with the possibility of toxic vapors arising from smoldering combustion of halogenated epoxy formulations, found only the easily noticed halogens and hydrogen halides but no phosgene or other unusual or highly toxic substances.

III. INDUSTRIAL HAZARDS

Recorded industrial experiences with epoxy resins during the last 3 decades have delineated which of the toxic effects of these compounds are likely to lead to significant health problems and which are not. The most important problems are the following:

1. The irritation of surface tissues by components of the uncured resin system.
2. The sensitization of surface tissues. It must be emphasized here that the pathological reactions of the skin are not an expression of systemic toxicity, but a local response, caused by local contact with irritating agents.
3. Depression of the blood-forming organs (bone marrow). ✓
4. Central-nervous-system depression.
5. Carcinogenicity ✓

✓ :TE

Although effects 3 through 5 are of much less widespread occurrence, they are potentially so dangerous that they must be taken into account.

only the uncured epo[illegible] latter three effects; evidence of systemic intoxication caused by amine hardeners has been sporadic and insignificant. The fully cured resins have virtually no systemic toxicity.

A. Skin Irritation

1. Incidence

Pathological skin disorders (dermatoses) have been observed in many industries. In electrical, electronic, and metal-bonding operations the incidence of dermatoses has been rather high [48. 49] whereas in lacquer and paint factories it has been much less common, presumably because the operators were more accustomed to handling and protecting themselves from hazardous chemicals [50]. The epoxy resins are not unusual in this respect; the introduction of almost every new plastic has initially lead to outbreaks of skin problems in the affected industrial workers [51]. Early experiences with these materials probably give the best estimate of the inherent hazards because protective measures had not matured to the present level. The first problems were reported only a short time after large-scale industrial production of the epoxy-resin system components had begun in about 1947.

Dernehl [32] saw 14 cases of dermatitis among 46 exposed workers (an incidence of 34%) in a plant manufacturing ethylenediamine. The cases varied in severity; three workers had to be transferred, others were able to continue work at the amines unit. The cases requiring transfer occurred after 1 year or less, but of five workers exposed for over 3 years, four developed skin changes. Dernehl quotes from the first recorded incidence of skin irritation and blistering by ethylenediamine [52]. The incidence of dermatoses among the workers during the hot months (in Texas) was twice that during the cool months.

Welcker [53] observed development of seborrheic dermatitis in 14 female workers in an electrical equipment plant. The resin mixture was handled repeatedly without protective measures, and the resin-coated assemblies were heated. Since the cases mostly occurred within a radius of about 10 yards of the work stations where the resins were heat-cured without ventilation and problems also occurred in workers who did not directly handle the materials, Welcker concluded that most of the irritations were due to vapor exposures. He observed that workers with seborrheic skin were particularly prone to develop pathological skin changes. In this study the incidence was markedly higher in winter, probably because of lack of ventilation.

Pletscher et al. [54] studied 20 workers exposed to both resins and hardeners. The workers were pouring, dispensing, and spraying the materials without any protection. Pletscher et al. divided them into three groups: six workers never exhibited skin changes; eight workers showed intermittent mild or moderate skin changes without loss of time; six workers showed severe skin changes leading to loss of time or transfer to other jobs. The severity of the skin changes did not depend on the duration of exposure so much as on what Pletscher calls "endogenous factors": a proneness to develop allergic reactions of the skin. Most of the workers sensitive to epoxy resins and hardeners were also sensitive to such materials as formalin and floor wax. Improvement of handling techniques reduced or prevented the occurrence of skin symptoms, even in a number of previously sensitized individuals.

In 1957 Grandjean [55, 56] investigated the incidence of dermatoses in 11 factories manufacturing electrical equipment. The operations were mixing of the resins, manual or mechanical pouring, casting and removal of excess uncured resin from work pieces by wiping or later, when hardened, by tooled removal. The workbenches as well as the tools, clothes, and hands of the operators were found to be contaminated. Organic solvents were employed for removing materials from the skin. Under these circumstances the incidence of dermatoses classified as "slight" was 21% and of "severe" dermatoses 22%, for a total incidence of 43%. Contact with liquid resins or their components was responsible for this incidence. Amine vapors were sampled at the work stations and invariably found to be below the limits of measurement (0.15 μg/l of air).

Malten [57], in 1956, observed an incidence of about 10% among workers in an aircraft factory. Bourne et al. [1] inspected numerous factories in Great Britain and found the rates of incidence to vary from 20 to 100%. They relate a personal communication by Reynard, who estimated the incidence of signs of dermatitis in workers in an automobile-body plant to be near 100%. Similar rates of incidence in various industries have been reported by Bourne et al. [1, 58-60] and numerous other workers [48, 54, 61-70]. In most cases it is not clear which components of the resin systems caused the trouble.

These rather high rates of incidence reflect early industrial experiences, not, generally, present ones. Two factors mainly contributed to the decrease: much better technical safety precautions of the kind to be discussed later and the development of much safer hardeners, such as the alkanolamines, amine salts, and amine adducts.

2. Symptomatology

Because the symptoms of surface-tissue irritation caused by epoxy compounds, hardeners, and the curing mixture are very similar, they can be considered together. Furthermore, in the usual industrial exposures, it is generally not possible to separate the effects of the individual components because all of them are handled at the same time by most workers.

Contact with liquid materials leads to the rapid development of more or less sharply localized lesions in the affected areas, mostly over the hands and the arms. The severity of the l sions depends on the nature of the material, the duration of exposure, the means employed to remove the materials, and endogenous factors.

The mildest cases of contact dermatitis show erythema, swelling, and often pruritus, which may be intolerable. In more severe cases there is early vesiculation, weeping of the moist lesions, and, later, crusting and scaling, punctate erythema, and folliculitis. Scratching of pruritic areas often leads to excoriations. In the most severe cases there may even be outright, more or less deep, necrosis and exfoliative dermatitis. The nail beds are particular danger zones because complete removal of the offending agents may be difficult or impossible. Serious paronychias have been observed [1]. Bourne et al. [1, 59] described two cases in males where resin material was transferred, while urinating, from the barrier cream-protected hands to the, of course unprotected, genitals with "unfortunate results." THREE new CIUS

Direct splashes of liquid materials in the eyes cause, depending on the material and the amount involved, conjunctivitis and pain, and in severe cases corneal damage. The "halo effect" and the inability to focus described by some affected persons is due to corneal edema, usually caused by amine hardeners.

Grandjean [56] distinguishes two stages of irritation. The initial stage, which may last from a few days to several months, is characterized by erythematous itching patches, located predominantly on the face and the upper extremities. Recovery takes 2 to 3 weeks and is accompanied by scaling. Cessation of work is usually not necessary. The sites of eruptions in the second stage, which follows the first if contact is continued or resumed, are the same. The lesions are papulovesicular and severely pruritic. This leads to scratching, breakdown of the vesicles, X

excoriations--in short, a wet eczema. Work must be discontinued if this stage is reached. Healing occurs over several weeks, with scaling. Patch tests show sensitivity to resins, amines, or both in so many cases that the secondary lesions should mostly be considered as sensitivity reactions rather than signs of primary irritation.

Individual differences in the sensitivity of the skin have been described [1]. Some workers tolerated resin or amine splashes on the skin without ill effects; others showed minimal reactions on the first few contacts and were then able to tolerate further exposures without ill effects. It is not clear whether this is due to immunological processes or to mechanical toughening of the skin. This effect, however, appears to be less common with the components of epoxy-resin systems than with other industrial chemicals. It was noted very early [53] that it is often difficult or impossible to separate the skin changes caused by primary irritation from those caused by sensitization. Sometimes the time course of the occurence of the dermatoses after exposure will provide the necessary clues, but often the superimposition of direct irritation on sensitivity reactions or vice versa makes a clear-cut diagnosis impossible.

X

If heat is evolved or applied during the curing process, exposure to vapors leads to harmful effects on the skin and the respiratory tract. The amines are generally considered to be the worst offenders, but, since heat is generated by or applied to the complete resin mix only, the epoxy compounds, especially the monomeric reactive diluents, may also cause or at least contribute to irritation. Welcker [53] already observed that although hands, arms, and the neck may be involved, the face is most consistently and most severely affected. In Morris' experience [44, 71] the central third of the face (nose, adjacent portions of the cheeks, upper lids, and, especially, the eyelids) was most commonly affected. Savitt [70] also emphasized the particular sensitivity of the eyelids. In more severe exposures the eyes themselves may be affected, and conjunctivitis may develop.

Care must be taken in the diagnosis of the dermatoses to exclude those caused by other factors, such as other chemicals used in manufacturing, cleaning agents (including certain soaps containing phenol [7]), and fungal infections.

Aromatic amine hardeners or liquid mixtures containing them may stain the skin yellow or brown.

Some of the solid organic acids or anhydride-type hardeners may sublime from the curing mixture when heat is applied. The vapors may permeate nonprotective clothing, and the materials may sublime and persist, thereby occasionally causing dermatitis of unexposed (i.e., clothed) body areas [44, 72].

Neoplastic skin changes have not been observed in humans, but the results of the animal experiments discussed earlier should be remembered because of the potential seriousness of this hazard.

B R I E F

Presented To

Ontario New Democratic Party Caucus Task Force

On

Occupational Health and Safety

Medical Surviellance

And

Workplace Monitoring

By The

United Electrical, Radio and Machine Workers
of America

October 5, 1982

This delegation of U.E. members from Peterborough are here to put forward problems encountered with the Occupational Health and Safety Act, as far as monitoring the workplace and investigating health problems of workers.

The company where we work, Canadian General Electric, has a company doctor to monitor workers who come in contact with hazardous substances. These workers are told that they have to submit to medical monitoring by the company doctor if they work with hazardous substances. This company monitoring is a complete medical, over and above medicals done by the workers own physician. These medical reports are not kept completely confidential, as the company safety unit (composed of management personnel) have access to these medical reports.

policy issue

In the case of Cadmium workers who have had high levels of Cadmium in their blood. The company has provided ventilation in all silver soldering jobs, where the Cadmium problem originated. The workers were put on a monitoring system where they submit to continous blood tests for traces of Cadmium, instead of the workplace being monitored. Since the company had put ventilation into operation they assumed the problem of Cadmium was cleared up. One worker still had high Cadmium levels in his blood. This worker was the only operator in this particular silver soldering area, so there was no other worker to compare him to. Since this problem the economic situation has lead to a work shortage in this area and the job has been shutdown.

The Joint Committee has not received any reports on continuous monitoring of these areas, other than the initial tests to substantiate the fact that the workers were being exposed to Cadmium. The committee was involved in the initial setup of testing by the Department of Labour Health Branch. This testing was done after the ventilation system was installed.

In the case of Asbestos workers, medical monitoring was being done on workers and not continous monitoring of the workplace. Again the workers were compelled to submit to complete medicals by the company doctor instead of being given a list of test to have done for Asbestos and sent to their own family physician.

In the case of four workers who worked with cutting oils, the workplace was not monitored. Material Safety Data Sheets on the cutting oil is very vague and gives no real chemical information. But the four workers have broken out with serious skin rashes, some worse than others. They contacted their own physician who sent them to the only skin specialist in Peterborough, who by chance, works in the same clinic as the company doctor. The company doctor along with the skin specialist have concluded that these workers have a hereditary skin disease - all four are different diseases according to the skin specialist.

The cases I have mentioned were brought to the attention of the union members of the committee by the workers involved because they became frustrated and felt that the job was causing their illness. These incidents are not classified as accidents and reported to the Joint Committee. All accidents and incidents reported to the Plant Hospital should be sent to the Joint Committee and the Union members of the committee should be afforded the opportunity to investigate <u>all</u> accidents and incidents. We have questioned 'why' we have to receive permission from the Company's Safety Unit before being allowed to investigate any problem?

As for Designated Substances, workers are again submitted to complete medicals by the company doctor not their own family physician. This is an infringement of a worker's right to medical examination by a doctor of his own choice. Inspectors have interpreted sec. 7-2 (d) (e) of the Regulations on Designated Substances, to mean a company doctor not worker's family doctor.

As for monitoring the workplace, the committee has no input as to what kind of monitoring is to be done on Designated Substances. The committee is informed of test after they are taken by the company's Safety Unit. The company's Accident Prevention Specialist does this testing. This specialist has little to no experience in workplace monitoring and received only a few days training on how to calibrate and use the monitoring equipment.

These cases are to show you the frustration that is encountered by a Health and Safety Committee member representing workers in a large multinational corporation. The company has a complete advisary attitude towards union members on the committee.

The executive of the union along with the Safety Committee members representing the workers have taken our difficulties to the Ministry of Labour. This meeting consisted of area manager, Ernie Chapman and his manager, Jim Nelson. Both agreed there was a problem in the operating of the committee but nothing has been done to correct the problems.

The Act has to be changed in many ways to protect the workers of Ontario.

Material Safety Data Sheets on toxic chemicals have to be more explicit, as to chemicals used in their compounts.

The workers have to be given back their rights, to medical examinations by a doctor of their choice.

With the Act and Regulations as they now stand, companies are trying to set up a perfect work force with the help of a company doctor. These doctors are paid completely by the company.

If a worker becomes ill after a number of years on a job he is removed from the job with no further checks of the workplace. Evidence of this was when a worker had Larynigitis which cleared up when he was off the job (CO^2 welding). This worker's own physician concluded that the fumes from the welding caused his problem. So the company doctor had him removed from his job. This worker tried to file a compensation claim through the Plant Medical Services but the Manager of the Plant Safety Unit stopped the claim. The union is now handling the case of the worker.

Medical monitoring is being substituted for workplace monitoring. Workers are still being used as guinea pigs to detect workplace chemical hazards.

We would like to see legislation changed which would force companies to give the workers complete chemical information on hazardous materials.

Workers should have the right to medical examinations by a doctor of their choice where Designated Substances are concerned. These doctors would then send a report to the company stating whether a worker is fit for employment, fit with limitations, or unfit and the amount of toxic chemicals found in the worker's body, if this be the problem.

Joint Committees must be allowed to investigate all accidents and illnesses without any restrictions being placed upon the committee members representing the workers.

This Act was initiated to protect the workers of Ontario. It is being lost in the Political Football Field with Government and Big Businesses - again the worker is coming up on the dirty end of the stick.

We are told repeatedly by the Department of Labour inspectors that under the 'Internal Responsibility System' our committee is expected to search out, identify and obtain corrective action on any problem in the workplace. These inspectors feel that they need only do a cursory inspection once every six months or so and all other problems will be resolved through committee action.

Although this arrangement looks fine on paper, in real life it is something short of preposterous. As example of how dangerous this sort of program can be, I will give you two instances.

1. In mid 1979, I reported a problem of skin rash among workers on a particular machine using 'Steel Kut Oil'. I was very concerned over the long term risks. At that time I had only limited data on the substance in use, but it is considered carcinogenic and this I reported to the committee.

   Out of that meeting a letter was sent to our Head Nurse to ask that anyone reporting a skin problem from that area be referred to the company doctor immediately.

   We later removed this issue from the minutes under the supposition that the problem was now under expert surveillance.

   Approximately six weeks ago I was doing work on another problem when I ran across a man who is seriously ill from a rash contacted on that job in question. He had lost a months work over his condition although there was no compensation claim involved. Now, over a year later he is still suffering considerably although he has been off that particular job for several months and his condition is slowly improving.

I now have record of five men who have had reactions to the chemical involved. Actually, everyone who I have found to work on it has had a problem, more or less severe.

This man who was severely affected was treated at Plant Surgery several times but never referred to the plant doctor. When I directed him to the plant doctor, the response there, was a refusal to consider any chemical involvement. So much for 'internal responsibility'.

I have called in the Department of Labour and the Department of Health. I also have arranged for compensation claims to be filed through our Union Office.

Incidentally, the symptons this one man is showing are the classic ones that are the forerunner to skin cancer. This could have been avoided if we as union representatives had at least equal authority to our opposites on the committee.

'Internal Responsibility System' is an unworkable premise under the present legislation.

2. <u>May 20, 1980</u> - I reported an incident at a regular meeting where a worker was seriously poisoned by Toluene solvent fumes. This happened about two hours after I had procured respirator kits for men on the day shift on that job. Even though supervision knew of the extreme concern I had over the job in question, no one bothered to ensure the second shift was wearing respirators.

A brother to the stricken man had died of a stroke several months earlier and so when this worker began feeling similar symptons he panicked and that panic probably saved his health and possibly his life as well. He was off the job and in "Emergency" at Civic Hospital within the hour.

At our next meeting I recounted this accident and made several recommendations to prevent a re-occurrence. These were agreed to by all six people at the meeting.

The company chairman refused to have the minutes typed or distributed.

At the following meeting he identified the passages, that in his estimation, were inadmissable. These I changed to his direction even though I felt it was not necessary.

I rewrote nine pages of minutes and once again he stopped publication of those minutes. They were never allowed to be distributed. I had them typed by the union but when I offered a copy to the Department of Labour inspector, he never accepted them either and refused to comment on the issue at any time.

To this date there have been little or no changes in the handling and use of solvents in our workplace.

In August 1982, I again raised this issue because two workers have suspected nerve damage to their hands, possible from using solvent to wash their hands.

From that meeting a letter was written in bulletin form by members of management and sent to the head of Safety for authorization. That bulletin was reported missing at the September meeting.

From the research I now have on hand I am very concerned that we may be looking at a problem that is far greater and more serious than most people suspect. Management's seeming reluctance to deal squarely with the issue might be more than carelessness or a careless attitude.

Solvents such as Toluene often have benzene as a contaminent, and so should be treated as a possible carcinogen

During the five years of our committee only two or three items have been forwarded by management. All of these (perhaps three) came from the company hygienist who resigned and left the company shortly after his submissions.

It is obvious to union representatives that we have to do the job by oursolves. Only by searching out the problems and securing the facts and then, more or less threatening the company, can we be sure of getting rectification on many problems.

This sort of constant warfare is too trying on the individuals concerned. We need more and better legislation with equal authority vested in union representatives as well.

Ministry of Labour

Toronto, Ontai[illegible] M7A 1T7.

Telephone: (416) 965-3211

March 15, 1983.

Dr. W. R. Paul,
Manager,
Occupational Health,
Canadian General Electric,
1420 Dupont Street,
TORONTO, ONTARIO.
M6H 2B2

Dear Bill:

Re: C.G.E., Peterborough

Please find attached copies of two briefs presented to the Ontario NDP Task Force in October 1982 by the United Electrical, Radio and Machine Workers of America.

They were referred to Mr. John Turner, MPP for Peterborough by Miss Jill Jones, Treasurer, U.E. Local 524, 527 and 540 on January 14th, 1983, with a request for a written response by the appropriate Minister. The Minister of Labour advised Miss Jones on February 16th that he would respond when he had fully reviewed the subject matter.

The concerns seem to apply to the C.G.E., Peterborough plant and most of the responses will need input from you and C.G.E. staff. Also attached are a series of questions raised by a member of Dr. Robinson's staff.

It would be appreciated if you would review these documents and as soon as it is convenient contact Dr. Debow of this Branch so that he and Dr. Waddell, the Occupational Health Branch field Consultant, may meet you and any other persons to prepare a response for use by the Assistant Deputy Minister and Minister.

Your help and cooperation will be very much appreciated.

With kind regards,

Yours sincerely,

Peter L. Pelmear, MD, FFOM, CCBOM,
Director,
Occupational Health Branch.

Mtg arranged for April 13 c̄ Drs Debow & Waddell [illegible]

PLP/bc
Attach. [illegible]

c.c. Dr. G. Debow
Dr. W. Waddell

March 11, 1983

MEMORANDUM TO: Dr. P. Pelmear
Director
Occupational Health Branch

FROM: Leona Lang
Executive Assistant
Occupational Health & Safety Division

RE: CGE Peterborough

Please review the attached briefs on Medical Surveillance and Workplace Monitoring (Brief # 1) and the IRS (Brief #2) and provide the answers for the following questions. I have been asked to prepare a response for the Minister. A reply would be appreciated as soon as possible.

Brief #1: Medical Surveillance and Workplace Monitoring

(1) Are there any control programs in place in this company? for what substances? Do the terms of the program(s) require a medical by the company doctor? Was the health and safety committee involved in setting up the control programs and agree to the choice of doctor for medical surveillance? Do the workers have the right to a medical by a personal physician in the case of (a) regulated substances (b) other toxic substances (ex. cadmium?) What is the company's policy with respect to the choice of physician for medical monitoring?

(2) Cadmium (page 1)

- During what period did the company conduct silver soldering?
- Was the operation shut down? When? In all parts of the plant?

- When were the workers put on continuous monitoring for cadmium?

- What did monitoring include? Was monitoring done by the company and the Ministry of Labour?

- How many workers had blood levels, when?

- There was air sampling for cadmium done by Occupational Health Branch on March 24, 1982 in the coil winding department in Bay 13. Was this the first time this was done? Was there any continuous or follow-up monitoring?

- Has Occupational Health Branch ever investigated a cadmium problem previous to March 24, 1982?

- Why did it take until September 24, 1982, (6 months later) for the Occupational Health Branch report to be completed?

- When was ventilation installed (for cadmium)? Where? Was it effective in lowering cadmium levels in blood? If not — why not? If yes — how effective?

- Do workers wear respirators for cadmuim operations? - (before and after the incident)

- Did a worker still have high cadmium levels in his blood after the ventilation was installed? What level and when determined? How is he now? What were air cadmium levels before and after ventilation?

-Was there any monitoring on other workers done after the high blood level was obtained after the ventilation was installed? if not - why not?
if yes, when?

(3) Asbestos (Page 2)

- Did Occupational Health and Safety Branch do any bulk samples or Air Quality Assessments for asbestos — when? results? What areas?

- What is the nature of the asbestos work done? Before? Now?

- How many workers had to have complete medicals for asbestos? By Who? When? Any positive results?

(4) Cutting Oils (Page 2, Brief #1) (Page 1-2, Brief # 2)

- When did the operation using cutting oils commence and when did rashes start appearing? How many are/were exposed to cutting oils. How many had rashes?

- Did the company physician ever see any of the workers with skin rashes? Is it true that the man who was severely affected was treated at Plant Surgery but never referred to the plant doctor? If not why not? Is he still employed? What is his condition now? Does the company doctor have any medical records on the 5 cases of skin rashes? (Page 2 Brief #2) Are the symptoms displayed in this one case a forerunner to skin cancer?

- The Occupational Health Branch investigated for a skin rash claim on March 17, 1981 — no orders suggested —no further action —why? (If workers had reported this problem to company since 1979?) — (this information is needed to answer the question as to why the workplace was not monitored)

- The Occupational Health Branch investigation of September 14, 1982, resulted in advice to the Occupational Health Branch re cutting oils — and the company agreed to change the cutting oil. Has the company changed the oil? —has this been verified by Occupational Health Branch or Industrial Health and Safety Branch?

- Can you provide information on the workers who have hereditary skin rashes? Can we prove these rashes are not occupationally related? (I presume this information cannot be released in any subsequent response I prepare?)

- What are the chemical components of Steel Kut Oil? Is it carcinogenic?

(5) Monitoring

I understand there are no provisions under the designated substances regulations for health and safety committee input regarding the kind of monitoring to take place or worker rep accompanyment during monitoring by the company (is this correct?)

In the case of sampling and testing by Occupational Health Branch — can we confirm that worker reps accompany the hygienist?

Can we confirm who does the monitoring for the company? Does the company Accident Prevention Specialist do the monitoring and what are his/her qualifications?

In order to answer the allegation that medical monitoring is substituting workplace monitoring it would be helpful to have a brief outline on all sampling done by Occupational Health Branch in past 5 years-for what? Any way we can determine what kinds/frequency of monitoring done by the company?

(6) Welding Fumes (Page 4)

- Has Occupational Health Branch done any investigations for welding fumes? What areas? When? results?

- Is there proper ventilation for welding? Is it in use? Did Occupational Health Branch ever suggest orders for ventilation for welding. Do welders wear respirators? Is it necessary ? or does ventilation clear the fumes. Did this particular worker wear a respirator prior to his laryngitis? Are they available if needed?

- Any information available on the Manager of the plant safety unit stopping a WCB claim for welding fumes? (p. 5) - if not, can we obtain this information? What is the conditin of the patient now?

- Did the company doctor remove him from the job? When? For what reason? Was he given another job?

- Frequency of monitoring by company for welding.

Brief # 2 Internal Responsibility System

Toluene (or toluol) (page 3) I've seen it spelled both ways - which is corrrect? Are they two different substances? What is toluene used for? Is it still in use? When discontinued?

When was the worker allegedly "poisoned"? Was he hospitalized? How is he now?

Was his illness attributed to toluene?

Has there ever been air sampling for toluene? When? Results?

Is it a possible carcinogen? (benzene?) (Page 4)

Are there any other solvents in use in this workplace -how are they handled? (page 4, Brief #2)

Any information on two workers with nerve damage to hands from washing hands with solvents? Are rubber gloves and respirators routinely used when workers use toluene and during the use of other solvents?

Leona Lang

Leona Lang

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

107 PARK STREET NORTH, PETERBOROUGH, ONTARIO, K9J 7B5 — TEL: (705) 748-8486

March 23, 1983.

Peter L. Pelmear, MD,FFOM,CCBOM,
Director,
Occupational Health Branch, Ont. Ministry of Labour,
Occupational Health and Safety Division,
400 University Avenue, 7th Floor,
Toronto, Ontario.
M7A 1T7.

Dear Dr. Pelmear,

I received a copy of your letter to Dr. Bill Paul the Corporate Medical Director of GE. We appreciate you sharing the copy of the two briefs presented by the United Electrical Radio and Machine Workers of America in October 1982. During October and November we certainly had lots of indications in Plant Medical Services that in fact some briefs had been prepared and presented but this is the first opportunity I have had to see and review the actual material presented by the UE.

When Dr. Waddell called me about a week ago indicating that there would be some material table on the floor concerning confidentiality in Peterborough, I wrote an immediate reply and that reply still stands.

I would like to stress to you that I came to CGE about five years ago new to occupational medicine but well seasoned in dealing and working with medical care delivery systems. I have been heavily involved in all organizational levels of medicine and spent a large part of my time as "Chief of Staff" of Peterborough Civic Hospital. My initial presentation to GE was on the confidentiality of medical materials. Because of our large nursing staff here at GE Peterborough we have spent a lot of time here internally discussing confidentiality.

In addition, long before I came on the scene, CGE Peterborough was committed to a good level of Plant Medical Services delivery and monitoring. They have had detailed monitoring programs in place for beryllium and uranium for about twenty years. They have also had lead and mercury under surveillance for a number of years prior to 1978. The company has provided when the work force was suitable, 24 hour a day seven day a week nursing coverage with immediate doctor availability. Dr. Thompson, an internist, Dr. Dalton, an internist and Dr. Cyril MacIsaac are three community doctors who have had input into CGE prior to my arrival here.

....2/

13.4.83

Canadian General Electric

continued.......

Dr. Trossman has done beryllium and uranium examinations for approximately ten years for CGE.

There's a few important points that should be made here:

1) The employee in fact does have the option for any designated or non-designated substance where examination is required to go to his family doctor and have this examination done. In fact our receptionist here will set up the appointments for the employees to have this done. We would have, at peak working time, approximately 400 people under surveillance for beryllium and uranium plus 120 for cadmium, 10 to 15 for lead, some 20 in the Plating department where there are problems with inhaled products and some 40 to 45 welders. Approximately 1/3 of these people will see Dr. Trossman for their medical. Approximately 1/3 will come here to Plant Medical Services and will be seen by myself. The remaining 1/3 go to their own family doctors for their medicals.

2) We have set up a full release of information series of forms and we use these diligently. We are quite prepared to share with the family doctor, with the employee, or with the employee and a union person if they come together, any of the information or material we collect. I am sure history will document here, that this is in fact correct. My committment to any employee partaking of either the paramedical or the medical surveillance in the CGE is to contact him directly if anything is abnormal or out of line. I have endeavored to do this 100% of the time.

3) One of the points that I have held to and I think will probably be justified and I am sure this causes some concern within the working force of CGE is that paramedical services of surveillance will be done through Plant Medical Services. There is both a quality of care and a cost factor to this, To give you an example we have three large laboratory units in the city of Peterborough. All three units have to send material outside to places such as London Lab to get some of the work done. The normal readings, the method of reporting and the alerting of abnormal readings are all handled differently by each institution. My committment to CGE is where possible to use Ministry of Labour services such as for urine leads, urine berylliums etc. For the rest of the services we need some direct input into the provision and the quality of care. As indicated in #2 we are quite prepared to share these with the employee, with the employee plus a union representative or on signed release of information to the employee's family doctor or if he wishes, directly to the union.

....3/

ontinued....

4) Running through these two briefs seems to be the theme that union people have not been involved. I would like to stress to you as I did in the confidentiality that in fact I feel they have been heavily involved. I have met with the UE executive in entirety two times a year over the last three years. There has been no management attending these meetings. I have outlined to them my goals and objectives for the year that I have presented to management and have had their input. In addition to this as each designated substance or each substance such as cadmium that has caused us concern, I have met with the health & safety people and have given them all the information I have. I make copies of any reports that I have that I am working on and I have also given them all the background material that I have access to. The peculiar thing is that they have done the same for me. I think it is fair to say that if it hadn't been for one of the health & safety workers the cadmium may have gone unnoticed for another 6 or 8 months. In that instance I am very proud of the way Plant Medical Services and the Health & Safety group reacted in the City of Peterborough. I think in fact we have demonstrated some leadership and to stress again that the Health & Safety people from UE were heavily involved in that.

5) In the second paragraph of the initial presentation it is implied that medical records are not kept confidential and the company's safety unit have access to those medical reports. This is not true. Safety people have no access to medical records.

6) There is a running theme through the report that the quality of monitoring done by some of the Health & Safety committee is not adequate. It is true that we had a hygienist here until about two years ago. I would like to stress to you that I have direct access to an industrial hygienist through corporate GE with a Dr. Roly Hoseine. He has with him additional staff that we have called in here from time to time to help us. Dr. Hoseine has been liberal with his time and extremely wise with his advise. While we have missed having a hygienist here in the last couple of years management has indicated, and I have supported the fact the type of person that comes in here that is a hygienist is very critical. The right person has not been available to this time. The past two years we have had lots of input from Dr. Hoseine and Larry Ball has done an exceptionally fine job in terms of the air monitoring. I would support the quality and the integrity of his work.

4/.....

continued.........

With these six basic points in place let me try and address the questions you have asked. I will not repeat the above information.

From brief #1 - point #1: We have control programs for beryllium, uranium, lead, mercury, noise, trichlorethlyene, cadmium, plating, epoxies, asbestos and to a small extent, welders. Medical delivery system is outlined in the above items. The Health & Safety Committee has been heavily involved in setting up any new control programs. The employee has the rights as listed in the points above.

Cadmium: Silver soldering is an on-going process when within the CGE Plant. We found a silver solderer about two years ago who developed pneumonitis which we were able to track down and relate to cadmium in the solder. Appropriate air sampling was done, urine sampling done, blood sampling done, masks supplied, work site re-arranged and on-going monitoring. In this particular instance we continue to see the worker on this job regularly for urines and yearly for blood and physical examination. This gentleman has elected to come to Plant Medical Services for his medical. The operation was not shut down. On tracking through the use of silver solder, we found some 8 to 10 places in CGE where silver solder is used. The heavy users of silver were put on a urine, blood monitoring and yearly physical examination and those people in the surrounding area were surveyed with urines. We continue to monitor these work sites. We occasionally from time to time have mild rises in urine cadmium at which time the safety representative and myself will go to the work site and try and determine the cause. Monitoring includes cadmium levels at the work site, cadmium urines and bloods in the worker and physical examination. From time to time approximately 20 workers would have had blood levels done. The work done in March 24/82 was to confirm the follow ups and problems we were having. There has been intensive follow up in monitoring. The occupational health branch through Dr. Waddell has been notified of our handling of cadmium. I cannot explain to you why it took the Occupational Health Branch about six months to complete the report. The initial episode was handled and worked on within the first two weeks. I can assure you that we continue to run into spots where cadmium is being used and having to set up new parts of the program. I would like to stress to you that the company has made a committment to try and remove the cadmium silver soldering if possible. They have spent a lot of time and expense in the last year experimenting with solder without cadmium. Ventilation has been upgraded, I would indicate in some areas, a great expense, and has been extremely affective in lowering cadmium levels in the blood. Workers do wear respirators for cadmium operation. This was not so, prior to the incident or should I say rather it was not enforced prior to the incident but certainly is now. *

5/......

continued.......

We have one worker, and I have shared this with Dr. Waddell from the time we got into this, who continues to run high urine and high blood. The Ministry of Labour came in and did some comparative samples to be sure there is no obvious problem in the vicinity. This gentleman is an extremely good employee who does not smoke, eat, or drink in his work site and handles himself very well. We are unable to explain the cadmium in his blood and urine. In addition to this following three weeks of holiday time at Christmas, his urine and blood cadmium were higher than they were before. Following up on this we had his house reviewed and family, with their consent, all sampled for cadmium. In addition to this I have shared all this information with this gentleman's family doctor and with the family doctor, negociated to have Dr. D. Boyle, an independant internist who deals in endocrinology, see this gentleman. I have shared all the information we have on cadmium and we meet with this gentleman on a regular basis and he continues under intensive monitoring. All this material has been shared with Dr. Waddell. The on-going monitoring is intensive until we are sure the bloods return to a normal level and the urines are within normal level. As with other monitoring as we start to get acceptable values then the surveillance time is spread out. The majority of people involved in cadmium at the present time are having urine test done about once every three months. If in fact their urine is up then they are brought back for a repeat urine and blood.

Asbestos: Asbestos was under surveillance at the time I came to Plant Medical Services. A lot of asbestos used to be used & the committment was to remove all asbestos from the work place. My understanding is there is a very minimal amount of board asbestos available at the present time. There is one brand of wire that has some asbestos in the insulation. In addition to this we have a large number of pipes that are covered with asbestos. We have done medicals chest x-rays, and pulmonary functions on those people exposed in any way to asbestos. This included minor things like using asbestos aprons and asbestos gloves. To my understanding there was one gentleman with chronic obstructive lung disease who was contesting the fact that he was turned down as not having asbestosis.

Cutting Oils: This is an extremely interesting problem and in fact was all documented with Dr. Waddell. Although the union indicates many cases there were in fact three cases presented here. All three were seen after discussion with the family doctor by Dr. Ryan. It is my understanding that the diagnosis in the first gentleman was vitiligo. The diagnosis in the second gentleman was systemic lupus. The third gentleman while he did not have a rash when he came to see me he certainly gave a history of a oil conpatible rash on his groin. This had settled down completely. You should understand that these gentlemen were seen here, were seen by their family doctor, and then were seen by by Dr. Ryan.

6/.....

continued.......

Dr. Ryan is a dermatologist who practices in the same building as I do and I can see while their may be some concern from the union point of view of collusion but in fact Dr. Ryan was agreed to by the family doctors of the employees involved. I realize through employees coming to Plant Medical Services in fact this problem had not been cleared up. I invited the three Health & Safety workers from the UE to discuss it. I tried to outline for them the reasons for my stand and the support that Dr. Ryan was giving and also support from the three family doctors. I offered them any independant outside opinion that they would like to get. They were not prepared to indicate an outside expert source. It is my understanding that they have referred this on to Workmen's Compensation and I cannot tell you the outcome of it. I will have to check on the chemical components of still cut oil to see if it is carcinogenic. My recollection is that there were some warnings about the use of the oil and because of this the oil was changed approximately a year ago.

Monitoring: As indicated in the preamble, members of the Health & Safety committee have a direct input into the medical monitoring. From the time a substance is identified, they have all the input that I can give them. It is my understanding that sampling and testing by the Occupational Health Branch worker representatives accompany the Safety people. I would like to stress that medical monitoring only supports work site monitoring only supports work site monitoring. The air sampling for beryllium, trichlorethlyene, asbestos, cadmium etc. all play a part in our program.

Welding Fumes: (Fumes from products with vinyl chloride and trichlorethlyene drifting through the welding arc have had extensive follow up here.)
The worker who indicated respiratory problems was never pinned down as a Workmen's Compensation type of incident. The ear, nose & throat doctor said that because of circumstantial evidence he probably should be removed from his job.

A brief explanation of company doctor removing anyone from job. It has been an agreed to policy that where limitations are given to Plant Medical Services either from the family physician, a specialist referral, workmen's compensation etc. that these recommendations will be discussed with the employee plus a union representative and I will do my best to explain to him what will happen if these recommendations are in fact implimented. Once there is agreement among the employee, the union representative and myself in terms of what they will mean then these are written down ~~and are~~ a particular of his medical chart indicating that these are limitations. On this basis alone the employee is transferred out. My feeling is in this case the doctor in charge continued.....

of the case was relectant to say this was related to welding fumes. I presume this is why it was not put through as Workmen's Compensation but would look to the Workmen's Compensation people in the building to answer that. The surveillance of welding at CGE in Peterborough varies from very intense in some areas to hardly any at all. It is one of our objectives in the year 1983 to bring all welders under surveillance. This is going to take us a little time to get in place. It will be in line with the inclusion of chromium etc. in the use of 11 new substances suggested for regulation.

Brief #2:

The allegedly poisoned worker in toluene (Lynden Jackson) was taken to St. Joseph's Hospital. I was allerted within a few minutes of this happening and called the family doctor and the neurologist in charge of the case. It is my understanding that this gentleman had finished his shift and in fact was taken to the hospital within the five or ten minutes of his quiting time. His illness was not attributed to toluene. It was attributed to small vessel disease. There are a lot of solvents including trichlorethlyene used in the work place. We have spent a lot of time dealing with these. We have sent out brochures to employees requesting that they use the standard cleaning agents rather than the solvents. We have done a lot of in-service education with first line managers. We have reviewed all the cleaning agents within the Plant to make sure they are capable of doing the work they are supposed to do. I have no information on nerve damage from washing hands with solvents. There is no doubt that they are defatted and a lot of time much more suseptable to epoxy and other rashes. Where necessary gloves are available for solvent workers and certainly respirators are supplied for people who have to work with toluene.

I want to thank you for the opportunity of replying to these two briefs. Any other information I can obtain for you I would be more than happy to.

Yours sincerely,

Dr. D. D. Curtis,
Consultant,
Plant Medical Services.

DC/bam

Ontario Ministry of Labour

Memorandum

To: Dr. P. Pelmear,
Director,
Occupational Health Branch,
Toronto.

Date: 1983 April 22

From: Dr. W. R. Waddell, M.D.,
Medical Consultant,
Occupational Health Branch,
Kingston.

File:

APR 26 1983
DIRECTOR
OCCUPATIONAL
HEALTH BRANCH

Re: C.G.E. Peterborough

On 83/04/13, a meeting was held at C.G.E. - 1420 Dupont Street in Toronto to address the concerns raised by the U.E. about C.G.E. Peterborough in briefs presented to the Ontario N.D.P. Task Force on Occupational Health & Safety on 82/10/05.

Present at this meeting were: -

Dr. G. Debow, O.H.B. Toronto
Dr. W. Waddell, O.H.B. Kingston
Dr. W. Paul, Corporate Physician - C.G.E. Toronto
Mr. R. Hosein, Corporate Hygienist - C.G.E. Toronto
Dr. D. Curtis, Plant Physician - C.G.E. Peterborough
Mr. R. Bergey, Occupational Health & Safety Manager - C.G.E. Peterborough
Mr. L. Ball, Safety Analyst - C.G.E. Peterborough

Page #1, item (1)

Most of the points raised in this paragraph are covered in Dr. Curtis' letter of 83/03/23 (copy enclosed). In the 4½ years that I have dealt with this company, I have found that they monitor both the workers and the workplace. Such monitoring is done as needed depending on their assessment of the hazard. I am aware that programs exist for lead, mercury, asbestos, beryllium, uranium, cadmium, trichloroethylene, MOCA, silica and wood dust. As outlined in Dr. Curtis' letter, the company is flexible in terms of the choice of a physician by the workers.

Page #1, item (2) Cadmium

See Dr. Curtis' comments on pages 4 and 5 of his letter.

To my knowledge, C.G.E. Peterborough has conducted silver soldering for decades. The matter came to my attention during a visit on 81/04/09 (see O.H.B. File #41781CMOW - copy enclosed).

The operation was not shut down. The provision of local mechanical exhaust ventilation at all silver soldering operations throughout the plant was suggested with an appropriate order. It is my understanding, that this order was issued and complied with by the company within a short time of its issuance. Cadmium exposed workers were examined for evidence of cadmium toxicity within several months of the time of my visit of 81/04/09. I think the monitoring included a medical examination to include the determination of blood cadmium and urine cadmium levels. The necessary specimens were taken under the supervision of the plant medical department. The actual determinations were done using both private laboratories and the Occupational Health Laboratory. More than 100 workers had cadmium levels determined in the course of this screening procedure.

I also addressed cadmium exposure in this plant during a visit of 82/01/27 (see O.H.B. File #46782AMOI - copy enclosed). E. Stefov addressed cadmium exposure in the plant on 82/03/16 (O.H.B. File #13582CEAA - copy enclosed). O.H.B. did an Exposure Assessment for cadmium in the plant on 82/05/17 (E.A.R. #34082CAOB - copy enclosed). C.G.E. hired a private contractor to do an Air Quality Assessment for cadmium at one work station in the plant in November 1981 (see comment #5 O.H.B. File #46782AMOI). I have no knowledge of previous O.H.B. Air Quality Assessments for cadmium in this plant but my records only go back 4½ years. I am not aware that the company has done any continuous or follow up monitoring. I am not aware that O.H.B. has ever investigated a cadmium problem previous to 81/04/09. I do not understand the meaning of the first question at the top of page 2 of Ms. Lang's questionnaire. My first visit to the plant re cadmium was on 81/04/09 and the report of that visit is dated 81/04/15. Similarly, my visit of 82/01/27 is dated 82/02/01 and E. Stefov's visit of 82/03/16 is dated 82/03/19. The Air Quality Assessment of 82/05/17 is dated 82/06/09.

As stated above, mechanical exhaust ventilation was installed at all silver soldering stations within the plant shortly after the cadmium problem became evident in April 1981. As cadmium has a half life in the body of about 10 years, it is unrealistic to expect the installation of ventilation to lower blood cadmium levels in a short time. In fact, blood cadmium levels are not a particularly good indicator of recent cadmium exposure and the question would better be addressed to urine cadmium levels. In any case, it will be some time before elevated cadmium levels return to normal.

When I examined the first work station involving cadmium on 81/04/09, the worker involved had only just been supplied with respiratory protection. Previous to this, he had worn no respiratory protection. Subsequent to this he did wear respiratory protection as did one other cadmium exposed worker whose urine cadmium was found to be elevated.

I do not believe that the initial worker of the visit of 81/04/09 ever did have an elevated blood or urine cadmium level. One worker at another silver soldering station, was found to have an elevation of both blood and urine cadmium. The actual results of this testing are considered medically confidential. The remainder of the questions in this particular sub-paragraph are addressed in either Dr. Curtis' letter or my own Field Visit reports. The patient was well when his high urine and blood cadmium levels were found and that to my knowledge, he remains well to this day.

The next sub-paragraph has also been addressed in previous comments and/or documentation.

Asbestos

The asbestos hazard was assessed by O.H.B. personnel on a number of occasions in the past 4½ years (see O.H.B. File #14079DEAA; 21179EEAB-M; 12479GMOB; O.H.L. #17583; 01880BEOB-M and 29782DMOW - copies enclosed). Both Bulk Samples and Air Quality Assessments for asbestos were done as per the attachments. The nature of the asbestos work done is also described in the attachments. At the present time, the only asbestos in the plant is present in the form of old pipe lagging. I believe that 400 workers have had medicals for asbestos by Dr. Curtis within the past several years. I am aware of only 1 case of asbestosis at C.G.E. Peterborough.

* not here

Cutting Oils

See O.H.B. File #09079EMOG; 18179EEOB-M; 36681AMOW; 18782IXAA; O.H.L. #19663 - copies enclosed. To my knowledge, the company has used cutting oils for decades. There is some controversy about when the rashes appeared. Dozens of men would have been exposed to cutting oils at various locations throughout the plant. For the plant in general, I have no idea how many have had rashes. Dermatitis, is of course, extremely common in oil exposed individuals. The specific incident mentioned in the brief involves visit #18782IXAA. Three workers were said to definitely have a dermatitis. Two of these dermatitides were not occupational in orgin.

I believe the company physician did see the workers' skin rashes. The remainder of this sub-paragraph is addressed in Dr. Curtis's submission. It is my understanding that the worker who did develop a definite cutting oil dermatitis is well and working at the present time. I do not believe that

Dr. Curtis felt that this man's dermatitis appeared to be pre-cancerous.

No orders were suggested with regard to the skin rash concern of March 1981 (#36681AMOW) because no definite cause for the dermatitis could be identified and the use of the coolant appeared to be within acceptable practices of industrial hygiene.

It is my belief that in fact the cutting oil incident #18782IXAA resulted in the oil being changed within a few days of the time of the visit. This has not been verified by the Occupational Health Branch and I cannot speak for the Industrial Health & Safety Branch. I was told by Dr. Curtis on the telephone that the company had changed the oil.

The workers with the "hereditary skin rashes" were not present at the time of the visit. One was said to have vitiligo and the other is said to have systemic lupus erythematosus. I do not believe that these diseases can be occupationally related to cutting oil.

The safety data sheet for Steel Kut Oil is attached. It does not mention carcinogenic properties. In general, it is wise to minimize skin contact with oils because of the carcinogenic properties of some.

Monitoring

The first subsection under monitoring would better be addressed by the Legal Branch or the I.H.S.B. For the past year I have requested that our A.Q.A. technician make a Union contact while making a plant visit such that some input into the testing procedure might be made. Mr. L. Ball, makes it a practice to have a Union Rep with him when he does short term Drager tube testing.

Subsection 3 - Mr. Ball does the Air Quality Assessment for C.G.E. Peterborough. He has a background of some length in the safety field. He has received a one week training session in C.G.E. - Toronto. He works under the direct supervision of the corporate hygienist, Mr. R. Hosein and it is Mr. Hosein's belief that Mr. Ball's work is accurate and reproducable.

Subsection 4 - This question is so broad as to defy a simple answer. The Occupational Health Branch has done a variety of air sampling in the plant over the past 5 years (the attachments represent only some of the work which has been done). The kind and frequency of the testing done by the company is governed by their perceived needs. The question of medical monitoring vs workplace monitoring is subject to endless debate. Because toxic agents can enter the body via inhalation, ingestion and skin absorption, it should be obvious that monitoring the workplace air cannot completely replace medical monitoring now or ever.

Welding Fumes

See O.H.B. File #00979AEAA; 18079BEAB; 29082HMOW and 18982KAOB - copies enclosed.

The Occupational Health Branch has investigated welding fumes - see attachments.

There is proper ventilation for welding. Sometimes the workers do not use it. To my knowledge, the Occupational Health Branch has not suggested orders re ventilation for welding. The welders do not wear respirators. It is not necessary. The particular worker did not wear a respirator prior to his laryngitis. Respirators are available.

Mr. Bergey denies having stopped any claim for compensation for welding fume. Such claims for compensation are initiated by the family physician and have nothing to do with Mr. Bergey. I believe that the patient is fit at the present time.

As noted in my Field Visit report, the patient went back to his old welding job.

I do not know the frequency of the monitoring by the company for welding fume.

Toluene

See O.H.B. File #05880GMOW. Both toluene and toluol are correct. They are the same substance. Toluene is used for many purposes, most often as a solvent. It is still in use.

The worker was exposed to toluene fumes on 80/05/07. He was hospitalized. I do not know his present condition.

His illness was not directly attributable to toluene.

No air sampling for toluene was done. The operation involved in this incident is very intermittent. If proper work practices are followed, toluene exposure would be minimal.

Toluene can contain trace amounts of benzene. Benzene is suspect of carcinogenic potential for man.

Many other solvents are in use in this workplace. They are handled according to the hazard controls outlined in their respective safety data sheets.

The last sub-paragraph involves health complaints which are unknown to me or to the plant physician. Impermeable protective clothing and respirators are worn when required as a hazard control as outlined in the appropriate safety data sheets.

W. R. Waddell, M.D.,
Medical Consultant,
Occupational Health Branch.

WRW/pc

Encl.

Ministry of
Labour

Telephone: (416) 965-3211

March 15, 1983.

Dr. W. R. Paul,
Manager,
Occupational Health,
Canadian General Electric,
1420 Dupont Street,
TORONTO, ONTARIO.
M6H 2B2

Dear Bill: Re: C.G.E., Peterborough

Please find attached copies of two briefs presented to the Ontario NDP Task Force in October 1982 by the United Electrical, Radio and Machine Workers of America.

They were referred to Mr. John Turner, MPP for Peterborough by Miss Jill Jones, Treasurer, U.E. Local 524, 527 and 540 on January 14th, 1983, with a request for a written response by the appropriate Minister. The Minister of Labour advised Miss Jones on February 16th that he would respond when he had fully reviewed the subject matter.

The concerns seem to apply to the C.G.E., Peterborough plant and most of the responses will need input from you and C.G.E. staff. Also attached are a series of questions raised by a member of Dr. Robinson's staff.

It would be appreciated if you would review these documents and as soon as it is convenient contact Dr. Debow of this Branch so that he and Dr. Waddell, the Occupational Health Branch field Consultant, may meet you and any other persons to prepare a response for use by the Assistant Deputy Minister and Minister.

Your help and cooperation will be very much appreciated.

With kind regards,

Yours sincerely,

Peter L. Pelmear, MD, FFOM, CCBOM,
Director,
Occupational Health Branch.

PLP/bc
Attach.

c.c. Dr. G. Debow
Dr. W. Waddell

21.3.83

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

107 PARK STREET NORTH, PETERBOROUGH, ONTARIO, K9J 7B5 — TEL: (705) 748-8486

March 11, 1983.

Dr. W. R. Waddell,
Ministry of Labour,
400 University Avenue,
Toronto, Ontario.
M7A 1T7.

c.c. Bob Bergey
Bruce Martin
Jim Gooley

Dear Dr. Waddell,

Thank you for your phone call the 10th of March 1983. I am deeply disappointed in the UE letter to the minister re: confidentiality in Peterborough.

As I indicated to you on the phone and have stressed through our Plant Medical Services, confidentiality to me is critical.

Plant Medical Services in Peterborough is a self contained unit. The only keys for Plant Medical Services are with Joyce Mather, Head Nurse, and myself. The only time there is access to Plant Medical Services is when there is a nurse or myself here. Security does not have a key to Plant Medical Services. In addition to this we have our records located in the nurses's office. This door is locked when we go out of the building. The locking of the medical records has been a standard procedure from the day I arrived here. When we realized that we would have to leave some charts out such as charts on the receptionist's desk for work the next day, we change the locking systems so there is no access to this building unless there is nurse supervision.

Joyce Mather and I have been meeting twice a year with the full executive of the UE, without any management people present. During these meetings over the last three years I have tabled with them for discussion, the paper on confidentiality which reflects my approach to relationships here at CGE Peterborough. In addition to this we have explained to the union how we are approaching attempting to maintain confidentiality.

The most disturbing part about your phone information, Dr. Waddell, is that I have never been questioned at these meetings about our confidentiality or how we are handling ourselves.

..../2

28.3.83

Rec'd Mar. 28/83 C

continued.......

About a year ago we brought all personnel files down to Plant Medical Services and retrieved all medical information that was in them. I can recall being questioned probably two or three times in the last year, particularly by union representatives who are going out with employees being bumped on 1310 about confidentiality but my understanding the explanations being received have always been satisfactory and in fact are not causing any universal grief.

I am disappointed that the UE have elected to use this approach rather than come directly with their concerns. We are more than happy to meet with any of them to talk about individual cases and to try and rectify things. I assure you that if there is a leak of information from here I want to know about it and it will be stopped. I also want to assure you that I have no knowledge of information of "leaks" from Plant Medical Services to management.

As I indicated to you on the phone I would be interested in seeing a copy of the letter UE wrote to the Minister. I did not receive a copy. I would also be interested in a copy of the minister's reply.

I hope the above information is some help to you. Thanking you again I remain,

yours sincerely,

Dr. D. D. Curtis,
Consultant,
Plant Medical Services.

DDC/bam

February 16, 1983

Ms. Jill Jones
Treasurer - Local 540, 527, 524
United Electrical, Radio & Machine Workers
Of Ontario
203 Reid Street
Peterborough, Ontario
K9J 3P7

Dear Ms. Jones:

The Honourable Claude Bennett, Minister of Municipal Affairs and Housing, has forwarded three briefs to my attention, through the Honourable John Turner's Peterborough constituency office.

As all three briefs fall within my Ministry's jurisdiction, I will be responsible for responding to you directly.

I will, however, ask you for the time that is necessary to respond accordingly. The task is large, but be assured that I will be pleased to answer your briefs after considerable thought and review.

Very sincerely,

R. H. Ramsay
Minister

cc: The Honourable Claude Bennett
The Honourable John Turner

OCCUPATIONAL HEALTH AND SAFETY DIVISION
FEB 17 1983
ASSISTANT DEPUTY MINISTER
FILE No. 8302T705

ONTARIO
MINISTRY OF LABOUR
INDUSTRIAL HEALTH & SAFETY BRANCH
FEB 21 1983
OCCUPATIONAL HEALTH & SAFETY DIVISION

B/F Feb 28

Dr Robinson for action on 2 briefs — Medical Surveillance - Internal Responsibility.

cc Minister Secret

Ontario

Office of the Minister

Ministry of Municipal Affairs and Housing

Hearst Block
Queen's Park
Toronto, Ontario
M7A 2K5
416/965-6456

February 9, 1983

The Honourable Russell H. Ramsay
Minister
Ministry of Labour
14th Floor
400 University Avenue
Toronto, Ontario
M7A 1T7

Dear Russ:

I am enclosing three briefs which were submitted to the Speaker's constituency office following an Availability Day in Peterborough. As the only Minister present, the briefs were sent to me but, since they are within the purview of your Ministry, I am forwarding them to you for response.

Yours sincerely,

Claude

Claude F. Bennett
Minister

Enclosure

cc: John M. Turner, M.P.P.
Peterborough
Speaker
Legislative Assembly

MINISTRY OF LABOUR
RECEIVED
FEB 15 1983
OFFICE OF THE MINISTER
FILE CODE

UNITED ELECTRICAL, RADIO & MACHINE WORKERS OF AMERICA
LOCAL 524 LOCAL 527 LOCAL 540
203 REID STREET PETERBOROUGH ONTARIO TELEPHONE AREA CODE 705-742-3491

Jan 14/83

Mr John M. Turner, M.P.P

re - public meeting held on Jan 14/83

It was unfortunate that we where unable to arrange a time to voice the concerns and issues of our U.E. members. Hopefully there will be another such meeting in the near future where by we will have the opportunity to voice these concerns.

We have left three briefs which we hope you will forward to the appropriate minister concerned.

We would appreciate a written responce from these ministers with regards to their feelings ~~and~~ on these matters of great importance to our members.

Sincerely yours

Jil Jones

Treasurer
UE Local 524
453

DEPARTMENT OF HEALTH
-DIVISION OF INDUSTRIAL HYGIENE-

Plant Visit Report

Memorandum to:
Dr. J.G. Cunningham,
Director.

Date: December 19, 1957

From: H. M. Nelson

Plant: Canadian General Electric	Requested by: Mr. Tom Lister, Safety Superintendent.
Address: Park Street, Peterborough, Ontario.	Accompanied by:
No. Employees: M.- F.- Total	Date of Visit: December 10, 1957
Hazard: Nitrate salt bath, asphalt, tar	Contacts: Mr. Lister

Company to be notified by:

Bring Forward: Take no Action:

Copies to: Dr. Bulmer

In the building examined about 100 ft. x 350 ft. x 25 ft. high with an open mezzanine floor about 40 ft. x 350 ft. at about 15 ft. above ground floor, large industrial motors and generators are built. Because of the type of operations, there is no flow of materials, so individual operations were studied.

Some operations not considered hazardous were lacquer dipping in a small tank using a toluene solvent, solder melting on armatures, asphalt curing in a ventilated oven and a tar dipping operation.

In the annealing area of the plant, copper bars formed into coils are first degreased by immersion in a standard trichlorethylene degreaser about 3 ft. x 6 ft. x 5 ft. deep, then soaked in a sodium nitrate-nitrite bath about 5 ft. x 8 ft. at 750 ° F. and finally quenched in water for cooling. One or two loads of coils are treated in this way per 8 hour shift. The tanks are separated by about 8 ft. each with the salt bath between the other two.

The degreaser is covered when not being used and appeared to be functioning normally. The salt tank is opened only for loading and unloading, the area around the bath is kept reasonably clean, and the operator is very careful lowering the charge into the bath. The salt container is emptied once every six months for inspection and cleaning. When the bars are quenched, clouds of steam are given off that go to the roof and then roll along the roof to parts of the mezzanine floor.

At the present the company is planning an exhaust to capture the steam from the quench just as it reaches the roof. This is considered a good move.

It was suggested that at least 15 minutes be allowed between degreasing of parts and placing in the salt bath, to ensure complete drying.

Coils that have been asphalt coated are wound with cloth tape in another section. Excess asphalt at the corners of the coils is burned off using a heated iron. This operation causes heavy smoke and fumes to be given off that go up to the mezzanine floor. Several complaints have been registered, by people working on this upper floor, to eye irritation, nose, throat and chest soreness, and a feeling of tiredness at the end of the day. The workers affected feel their source of trouble is the burning below them. After seeing the fumes I would believe they could be irritating. //

It was suggested that a local exhaust system be designed for the burning area. It was felt that an exhaust header be set up with a flexible lead for each bench adjustable for the type of work handled. With this set up most of the fumes could be captured but work would not be hampered. If six inch leads exhausted at 100 cfm were used it should be possible to keep the area cleared.

HMN/mam

H.M. Nelson
H. M. Nelson.

)ll.

Parliament Buildings,
Toronto 2, Ontario,
December 18, 1957.

Mr. T. Lister,
c/o Canadian General Electric,
Park Street,
Peterborough, Ontario.

Dear Mr. Lister:

On my visit to your plant December 10, several operations were examined and discussed. The annealing operation was considered to be satisfactory with little obvious opportunity for oxides of nitrogen escaping into the air. Again, it can be stressed that organic materials coming in contact with the nitrate-nitrite salt bath could have serious consequences. It would seem advisable, that after degreasing, parts be allowed to air dry for not less than 15 minutes before being immersed in the salt bath. Your idea to install an exhaust fan for capturing steam from the quench tank is considered good, and such a move is to be encouraged.

The procedure where tar is burned, from the corner of formed coils, prior to taping gives off considerable fume. Normally these breakdown products are detrimental to health and it is quite concievable that they could cause eye and throat irritation of persons working nearby. It is suggested that these fumes be removed from the air at the source of generation. A local exhaust system would seem to be the easiest method to carry this out. Such a system would require flexibility to cover the operation without being in the way. at least one exhaust inlet per bench and sufficient capacity to control the fumes. Sufficient capacity would be dependent on the type of system designed.

One other point questioned was the possibility of lead exposure at the position where solder is melted on armatures. Exposure appears to be low, but I would suggest you contact Miss Greer your plant nurse to see if stippled cell counts have ever been done on the men exposed. If not, you could suggest she send in blood smears from these persons to our laboratory. Miss Greer is quite familiar with the routine as she sends in slides regularly.

If you have any further questions, feel free to contact this Division at any time.

Yours truly,

H. M. Nelson,
Chemical Engineer,
Division of Industrial Hygiene.

HMN/mam

OCCUPATIONAL HEALTH
MAY 8 1968
En

ONTARIO DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH BRANCH

FIELD VISIT REPORT
PART I

Memorandum to:
Dr. E. Mastromatteo, ✓
Chief, Occupational Health Service

Date: May 7, 1968.

From: H.M. Nelson

Plant:	Canadian General Electric Co.Ltd.	Requested by:	Company
Address:	PETERBOROUGH, Ontario.	Accompanied by:	Dr. V.L. Tidey, EHB Dr. D.R. Parliament, EHB Mr. R. Dickey, ISB
		Date of Visit:	March 26, 1968.
Contacts:	Mr. D. Able, Safety Superintendent Mr. C. Durant, Manager of Fuel & Feed Channels Mr. E. Gregson, Facilities Engineering APD.	Copies to:	Dr. V.L. Tidey Dr. D.R. Parliament Mr. G.F. Robbins (3)

Abstract: This visit was made to review use of beryllium, uranium, lead, and mercury in various areas. This report will deal with only areas where lead is involved and one where mercury is involved. Dr. Tidey has prepared a report dated April 23, 1968 covering most of the areas. This report will act as an adjunct to his report.

*****

Building 22 - Wire and Cable

In the operation examined here, lead is extruded around electrical cable. It is a fairly standard operation. Lead is melted in an elevated pot 36 in. dia. The molten lead flows to the extrusion press by gravity. Some slitting of lead sheathing is done with the product remelted. In general though lead pigs are used.

The lead pot is covered with 2 openings in the cover. They are 18 in. x 9 in. and 12 in. x 5 in. Both have air flows into them of about 150 fpm or 230 cfm.

Comments

1. Housekeeping in the area is poor. Thick layers of dust were noted on the control cabinet, and lead plates (about 1 in. square) were strewn around the floor.

...2

Canadian General Electric Co. Ltd
Peterborough, Ontario

Comments (Cont'd)

2. On the pot operating platform (8 ft above floor level) there were 3 overfilled dross buckets.

3. Several paper cups were noted in the area, and remains of food such as orange skins were seen in the scrap drums.

Direction to be Issued (In addition to those suggested by Dr. Tidey)

1. Dross buckets are not to be overfilled. The level of dross should never exceed 2 or 3 inches below the lip of the container.

Recommendation

1. Local exhaust should be applied to the drossing operation.

Building #22 - Babbit Shop

There are eight lead melting units where various babbit materials are handled. The units are as follows:

1. A 9 ft x 5 in. lead trough with a similar sized fluxing bath. 40% tin and 60% lead is handled with a slot 9 ft x 3 in. located between the two pots. Exhaust rate is 2200 fpm for a volume of 4950 cfm.

2. 3 small 18 in. dia. gas fired units for handling 80 - 88% lead material. No exhaust is provided except for combustion products.

3. 3 -30 in. dia. pots mounted on an elevated platform handling 80 - 88% lead. Each fitted with slot exhaust of 1½ in. x 24 in. with only half of each exposed. Air flow rate at each pot about 4000 fpm for 550 cfm.

4. A 36 in. x 8 in. pot for handling 60% tin, 40% lead is fitted with a slot 36 in. x 1½ in. exhausted at 1200 fpm for a capacity of 450 cfm.

...3

<u>Canadian General Electric Co. Ltd</u>
<u>Peterborough, Ontario</u>

The total area involved is about 100 ft x 40 ft x 30 ft high. The exhaust in the area represents about 4 air changes per hour.

<u>Comments</u>

1. Housekeeping in the area is not good. It was also noted that smoking is carried out in the area.

2. In general the exhaust rates could be considered low. Melting temperatures though are low, and so perhaps not much hazard exists. Air sampling will have to be carried out to determine degree of exposure.

<u>Building #7 - Armature Unit</u>

One melting pot of a total of 5 or 6 was examined. It is 12 in. dia. and fitted with an 8 in. x 1½ in. slot exhausted at 200 fpm for a capacity of 17 cfm. Armature leads are buffed after dipping in the pot. The buffing, a flux holder and dross container are fitted with exhaust hoods, but there was no definite indication of airflow. At first we were told the pot contains 60% tin and 40% lead. Later this was "hedged on", because routine laboratory analysis of baths showed mostly tin with only traces of lead. It was felt that we did not know the actual contents of the pots and as it was then about 5.30 p.m., the people who knew had left.

<u>Comments</u>

1. Housekeeping in the area was poor. The dross bucket looked as though it had never been cleaned out. There were bits of splashed metal around.

2. Because of the extent of the operation, if no lead is used in the pot then no health hazard should occur. However, if lead is actually used then the exhaust systems are inadequate and require complete overhaul and improvement.

<u>Capacity Treat Area</u>

Electrolytic capacitors manufactured by the company are mounted in tins which are then filled with pyranol using vacuum chests.

<u>Canadian General Electric Co. Ltd</u>
<u>Peterborough, Ontario</u>

There are a total of 16 chests fitted with local exhaust slots having a total of 11,250 cfm air movement. The room is about 60 ft x 50 ft x 35 ft high. Some further exhaust is located at pyranol handling tanks, so that the total air movement is about 15,000 cfm or about 8 air changes per hour. There is an air make-up unit in the room.

Behind each chest is a glass manometer for measuring vacuum. It is possible for a gauge to break spilling mercury on the floor. Because of cracks in the floor some of this mercury may be trapped there and possibly vaporize.

<u>Comments</u>

1. Because of the high rate of air exchange the chance of significant mercury exposure is very remote. However, air sampling has been requested.

H.M. Nelson

H.M. Nelson,
Occupational Health Service,
Environmental Health Branch.

HMN:jej

October 20, 1969.

Canadian General Electric Company,
PETERBOROUGH,
ONTARIO.

Att'n: Mr. Dan Abel,
Assistant Safety Supervisor

Dear Sirs:

The samples of epoxy paint and catalyst that you gave to Mr. S. Morton on a recent air sampling visit, have been processed by our laboratory. The paint contained uncured epoxy resin, pigment and solvent. The catalyst consisted of an epoxy resin modified with amine and solvents.

Appropriate precautions should be taken inthe handling of the products to ensure that employees are not exposed to a health hazard.

Enclosed are three papers which you may find helpful.

1. Information re: Control of Hazards of Epoxy-Resin Systems. Ontario Department of Health.

2. Handling Precautions for Epoxy Resins
Technical Bulletin #T1-100, 15 January 1964
The Epoxylite Corporation.

3. Skin Disorders from Epoxy Systems
Technical Service Notes #89
Ciba Products Company.

Yours sincerely,

G. A. Sinclair, M.D., C.R.C.P.(C),
Officer-in-Charge,
Industrial Health Section.

GAS/bc
Encls. (3)

ONTARIO DEPARTMENT OF HEALTH
OCCUPATIONAL HEALTH LABORATORIES TEL: 365-2201
360 CHRISTIE STREET, TORONTO 4, ONT.

RE: EPOXY PAINT AND CATALYST USED BY CANADIAN GENERAL ELECTRIC, PETERBOROUGH, ONTARIO. REQUESTED BY COMPANY.

REPORT NO: 13,811
DATE: OCT. 16, 1969
COPIES TO: DR. TIDEY

FROM: H. WALL

THIS SAMPLE WAS GIVEN TO MR. S. MORTON BY DA~~VID~~n ABEL, ASST. SAFETY SUPERVISOR, C.G.E. ON A RECENT AIR SAMPLING VISIT. NO REPORT ON THESE SAMPLES HAS BEEN SENT TO THE COMPANY.

PAINT

SOLVENT (27% OF SAMPLE): MIXTURE OF TOLUENE, XYLENE, ETHYL CELLOSOLVE, AND AN UNIDENTIFIED KETONE.
DISSOLVED MATTER (73% OF SAMPLE): UNCURED EPOXY RESIN AND PIGMENT.

CATALYST

SOLVENT (83% OF SAMPLE): MIXTURE OF NORMAL BUTYL ALCOHOL, TOLUENE, AND XYLENE.
DISSOLVED MATTER (17% OF SAMPLE): EPOXY RESIN MODIFIED WITH AMINE.

ANALYSIS BY H Wall
H. WALL

HW/JG

OCCUPATIONAL HEALTH
OCT 17 1969

I.S.B. File No. 336-00005-0008
O.H.S. File No. 4E-85
4E-89

Ontario

MINISTRY OF HEALTH
ENVIRONMENTAL HEALTH SERVICES BRANCH
365-4066

OCCUPATIONAL HEALTH SERVICE
JUN 26 1973

FIELD VISIT REPORT
PART 1

Memorandum to:
Dr. V. L. Tidey
Chief, Occupational Health Service

Date: June 22,1973

From: L. Bithel, P. Eng.

Plant: Canadian General Electric Co. Ltd.

Address: 107 Park Street North
Peterborough, Ontario

Requested by: Company

Accompanied by: Mr. R. Dickey, I.S.B.

Date of Visit: June 7,1973

Contracts:

Mr. Dan Abel, Safety Specialist
Mr. Glen Hansen, Safety Specialist
Mr. Ken Faggetter, Superintendent, Shop Operations
Mr. Ed Ayrheart, Shop Foreman, Magnet Wire
Mr. Jim Dearing, Manufacturing Engineering Technician

Copies to:

Mr. J. McNair (3)
Mr. D. Abel
Mr. H. Wall

Abstract: This visit was made to assess exposure to mercury, lead and epoxies. A potentially significant exposure to mercury was found in the Wire and Cable Division, chiefly due to poor housekeeping. At the lead extrusion process, most of the recently issued directions have been complied with. At the coil wrapping area, a dermatitis problem due to epoxy or solvent has been cleared up by the company's actions. Three directions and two recommendations are made to control the mercury exposure.

* * * * * * *

Three areas of this plant were seen during this visit, involving three different exposures.

1. Wire and Cable Division - Wire testing

In one part of this building, the insulation on fine copper wires is tested for breaks or imperfections by passing the wire continuously through a small pool of mercury and measuring and recording the electrical resistivity. This is in accordance with the NEMA

Dr. VLT
Dr. Hi...

specification for this type of wire. One room (F room, Building 22) contains 8 machines. Eight spools of wire are positioned at one end of the machine, and the wires from the spools are run individually through pools of mercury (about ½" x ¼") contained in a trough by felt pads. The wires continue to the far end of the machine where they are rewound on spools. A lot of mercury globules were visible on the base of the machine and on the very rough wood block floor.

In the next room (east room) there were three machines, with fewer visible mercury globules. In another adjacent room (Building 24) there were 4 more machines (51) and some large mercury globules were noticed under the end of one machine.

Using a J/W mercury sniffer, the following measurements of mercury vapour concentrations were obtained:

LOCATION		MERCURY VAPOUR (milligrams/cubic metre)
1.	F room, at breathing level	up to 0.075
2.	F room, at machine base	up to 0.9
3.	F room, at floor level	up to 0.8
4.	East room, at breathing level	0.025 - 0.04
5.	Building 24, at breathing level at floor level	0.04 - 0.05 0.1 - 0.2

The consumption of mercury is 30-40 pounds per year.

2. <u>Wire and Cable Division - Lead</u>

This area was inspected by G. S. Rajhans on February 15,1973, and his report dated March 1,1973 suggested several directions involving improved local exhaust, plus the standard directions for housekeeping, personal hygiene etc. Since that visit all ducts have been repaired, the fan operation has been improved, an exhaust hood (10" x 16') has been placed above the outlet extruder head, and covers have been supplied for the dross buckets.

During this visit, no air flow through the hood on the extruder was detected, while the air velocity through a 13½" x 13½" door opening above the lead pot was measured at 320 feet per minute (f.p.m.). With this door closed, the air velocity into the pot through the opening (21½" x 8½") where the scrap lead conveyor enters was measured at 450 fpm. There was considerable dross and metal on the working platform around the top of the pot, but housekeeping elsewhere was fair.

3. <u>Building 7 – Epoxy Resin</u>

A dermatitis problem appeared recently in this building where, in a fairly bright and open mezzanine area, girls wrap glass tape, which has previously been soaked for 24 hours in aliphatic epoxide/toluene, around copper coils of various types and sizes. Leather gloves were worn on the left hand at one machine for tightening up the tapes, but at some operations (e.g. cleaning the "irons") gloves were not worn.

The epoxy mixture used was changed recently to a formulation consisting of cyclo aliphatic epoxide 97%, bis-phenol A 1% and 2% octylene glycol. This is mixed with an equal quantity of toluene before use. Since the incidents occurred, the personal hygiene measures have been improved, and new types of thin latex gloves have been obtained.

<u>Comments:</u>

1. There does appear to be a significant mercury exposure in the wire and cable division, particularly in F room, as the threshold limit value for mercury (0.05 mg/cu.m.) is approached or exceeded, but the recent urine analyses indicate little or no absorption of mercury. The high vapour concentrations would appear to be due mainly to the large amount of spilled mercury in the areas, and if this mercury can be eliminated, a large reduction in mercury vapour should occur.

2. Steps to be taken to eliminate this source of vapour would include:

   (a) Pick up all large globules with paper, or with a suction device having a small nozzle, a mercury trap, a vacuum pump and a discharge going to the outside.

   (b) Chemical conversion of the fine droplets by applying a suitable solution to convert the mercury to mercuric sulphide. Solutions could contain sodium thio sulphate ("hypo"), or a mixture of slaked lime and flowers of sulphur, or calcium polysulphide.

(c) A general improvement in housekeeping, which would require an improvement in the floor surface (which is presently of wood blocks). Cracks should be filled in, and floor surfaces should be smoothed as much as possible, either by sanding, filling with epoxy etc. or by replacing the blocks. The final surface should be covered by a suitable finish (epoxy paint, etc. as is presently used in some areas) which would give a smooth surface permitting spilled mercury to be readily picked up or converted.

(d) Consideration should be given to placing trays, having upturned edges, under the mercury troughs to catch any spills.

(e) Skin contact should be avoided.

(f) Some machine bases were seen to have a gap between the floor and the base. This gap should be filled up (after cleaning up or converting any mercury within the base) to prevent mercury droplets running underneath the machine.

(g) Similarly any furniture in the area, such as lockers, benches etc. should either have their bases sealed to the floor, or be placed on legs so that the floor below them can be cleaned.

3. At present urine samples are submitted once or twice a year. This should be increased to 4 times per year.

4. Some literature on mercury is enclosed with this report.

5. There has been a marked improvement in conditions at the lead area, but there should be further improvement in housekeeping in the lead pot area. In addition, there was no measurable air flow at the hood above the outlet extruder head, probably because of insufficient suction at the point of connection of its duct to the hood above the lead pot. This suction could only be increased by installing a slide valve or other restriction immediately below the duct connection, so as to reduce the air flow through the lead pot. This may not be satisfactory. Connecting the duct closer to either of the two fans available would require a considerable increase in the length of the small (3" dia.) duct, which would also increase the resistance to air flow. Perhaps the easiest solution would be to instal a small fan just for this hood. The capacity need only be 200-300 cfm, and the fan discharge could go to the main discharge.

6. The dermatitis episode appears to be clearing up due to the measures taken by the company. It would appear that the cause was a slackening of personal hygiene measures following the introduction of a "safe" epoxy formulation, but it is not certain whether the epoxy or the solvent was the cause. There have been no cases of sensitization up to the present.

Conclusions:

An immediate improvement in housekeeping is required in the mercury handling area, and personal hygiene measures should be enforced.

Directions to be Issued:

1. Housekeeping in the mercury handling areas shall be maintained at a high level.

2. No eating, drinking, or smoking shall be permitted in the mercury areas.

3. A urine sample shall be submitted from each worker in the area every 3 months, to the Occupational Health Laboratories, 360 Christie Street, Toronto.

Recommendations:

1. Employees should be encouraged to practise good personal hygiene. This should include washing before eating, drinking, smoking or using washroom facilities.

2. A further visit should be made during the winter when the above directions have been complied with, to evaluate the contribution of the mercury troughs to the mercury-in-air levels, and to determine if further controls are required.

LB:sl

L. Bithel, P. Eng.

PUBLIC HEALTH DIVISION

ONTARIO

MINISTRY OF HEALTH

ENVIRONMENTAL HEALTH SERVICES BRANCH
ONE ST.CLAIR AVENUE WEST
TORONTO 7, ONTARIO
M4V 1K8

Telephone:
965 - 4066

Area Code:
416

July 6, 1973

Mr. D. Abel,
Safety Specialist,
Canadian General Electric Co. Ltd.,
107 Park Street, North,
PETERBOROUGH, Ontario.

Dear Mr. Abel:

Enclosed is a copy of the Field Visit Report prepared by Mr. L. Bithel, following a visit to your plant on June 7, 1973. The Directions suggested at the end of the report are for issue to you by the Ministry of Labour's Industrial Safety Officer.

Yours sincerely,

H. M. Nelson, P.Eng.,
Officer-in-Charge,
Health Engineering Section.

HMN:jt
Encl. Report

Ministry of Health

Ontario

I.S.B. File No. :
O.H.P.B File No. :
A.Q.A. #103

OCCUPATIONAL HEALTH PROTECTION BRANCH

FIELD VISIT REPORT

416/965-4066

Date: February 4, 1976

From: M. Polny

Plant:	Canadian General Electric Co.
Address:	Oakville, Ontario
Contacts:	Mr. M. Reeve Mr. William McArthur
zard:	Mercury
Requested by:	Routine Survey
Accompanied by:	
Date of Visit:	January 22, 1976
Copies to:	Dr. M. Fitch (3) ISB (3) Mr. S. Morton (2) Mr. M. Reeve

No. & Location Machine Shop	Mercury mg/m^3 of air
1. Tapping mercury from taps, in hood, left side	<0.01
2. Tapping mercury from taps, in hood, right side	<0.01
3. Tapping mercury from taps, in hood, behind operator	<0.01
4. By sink	<0.01
5. By work bench	<0.01
6. Filling pumps, by hood	0.01
7. Central area in crib	0.04
8. Background, outside crib	<0.01

Analysis: Mrs. S. Doomernik

Threshold Limit Value (TLV) 0.05 mg/m^3 of air.

M. Polny

MP:df

ARMATURE

Confidential. For internal use only.

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
PETERBOROUGH PLANT

ENGINEERING LABORATORY
TEST REPORT

Date— December 16, 1977

Subject—

Copper Dust - Armature Dept.

Object of Investigation—

To Determine Concentration of Copper Dust in Air

Test No X11-99

Sample	Concentration
16 Dec. 1977	
Personal Sample during grinding	0.80 mg/m^3
TLV (copper)	1.0 mg/m^3 (page 13)

Conclusion—

cc: K Faggetter - Safety
R. Fowler - Safety

App 3288-8/77

Tested by— J.L. Chun

Report Approved by— V.R. Mulhall

TRICLORETHYLENE

E

PETERBOROUGH, 2 March 1979

L.D. Read
Supervisor - Advance
Manufacturing Engineering
I.A.D.

On 6 February 1979 a problem developed with the degreaser in Bldg. 8, bay K19. Area personnel were complaining of the smell and fumes. One employee went to the Plant Hospital complaining of nausea caused by the fumes.

Investigation revealed that an employee, in an effort to divert the fumes from his work station, had placed a large pedestal fan in such a way that it was causing a turbulence within the degreaser and was actually aggravating the problem. Removal of the fan relieved the problem but reports from area personnel and supervision say that fumes from this degreaser are a frequent problem.

The degreaser is equipped with a "lip-exhaust duct" which is not being used. If it were connected to an exhaust duct that would exhaust the fumes to the outside of the building it would greatly assist in eliminating the problem.

Would you please arrange to have the lip-exhaust utilized to exhaust escaping fumes outside the building.

R.E. Fowler
Safety Analyst
Employee & Community Relations

:am

cc: J Ball, RM MacLellan, GW Gimblett, AK Faggetter

F/R TRICL.

TRICLORETHYLENE

(F)

CANADIAN GENERAL ELECTRIC

SUBJECT: Vapour Degreaser
Bldg. 8 Bay K19

COPIES: JG Legros
K Faggetter
T Cuffe

R. E. FOWLER MAR - 6 REC'D

PETERBOROUGH
March 5, 1979

R. Fowler
Safety Unit

In reply to your letter of March 2, 1979 concerning this degreaser:

We have had complaints of fumes from this degreaser 2 or 3 times over the last couple of years and in each case it was traced to improper use of the facility. Instruction of the operator on proper degreasing procedures in each case overcame the problem.

I have the following concerns about installing an exhaust system on this facility as you requested:

a) An exhaust will not prevent fume problems caused by some types of misuse such as using nylon or rope slings in the tank, removing jobs before they are properly drained, etc.

b) It can cause excessive loss of degreaser fluid through dragout of vapour.

c) The installation cost is considerable.

Certainly there are places where an exhaust is justified such as near ovens or welding stations where very low concentrations of vapour can cause problems due to the adjacent processes. However, we do not have this problem in Bldg. #8 and I question taking action as long as fume concentrations are below recognized TLV's.

I believe it is important that operators follow proper operating procedures whether there is an exhaust system or not.

In conclusion, I do not believe an exhaust system is justified in this instance. However, I would like to know if it is to be the policy of the Safety Unit to request lip exhausts on all vapour degreasers. If it is, please make it known so Manufacturing Engineering can budget accordingly.

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I await your reply before taking action on your request.

Lorne Read

Lorne Read - Supervisor
Advance Manufacturing Engineering
Industrial Apparatus Department

pev

TRICLOROETHYLENE

PETERBOROUGH, 2 March 1979

L.D. Read
Supervisor - Advance
Manufacturing Engineering
I.A.D.

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R.E. Fowler
Safety Analyst
Employee & Community Relations

:am

cc: J Ball, RM MacLellan, GW Gimblett, AK Faggetter

F/R TRICL.
TRICLORETHYLENE
F

CANADIAN GENERAL ELECTRIC

SUBJECT: Vapour Degreaser
Bldg. 8 Bay K19

COPIES: JG Legros
K Faggetter
T Cuffe

R. E. FOWLER MAR - 6 REC'D

PETERBOROUGH
March 5, 1979

R. Fowler
Safety Unit

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c) The installation cost is considerable.

Certainly there are places where an exhaust is justified such as near ovens or welding stations where very low concentrations of vapour can cause problems due to the adjacent processes. However, we do not have this problem in Bldg. #8 and I question taking action as long as fume concentrations are below recognized TLV's.

I believe it is important that operators follow proper operating procedures whether there is an exhaust system or not.

In conclusion, I do not believe an exhaust system is justified in this instance. However, I would like to know if it is to be the policy of the Safety Unit to request lip exhausts on all vapour degreasers. If it is, please make it known so Manufacturing Engineering can budget accordingly.

........2

I await your reply before taking action on your request.

Lorne Read - Supervisor
Advance Manufacturing Engineering
Industrial Apparatus Department

pev

EPOXY VARNISH CEC

E

United Electrical, Radio and Machine Workers of America
Affiliated to the Canadian Labour Congress

10 CODECO COURT, DON MILLS, ONTARIO M3A 1A2 / 447-5196

Ouvriers Unis de l'Electricité, Radio et de la Machinerie d'Amérique
Affilié au Congrès des Travailleurs du Canada

C. S JACKSON, President • WM. WOODBECK, Vice-President • OSVALDO NÚNEZ, Vice-President for Quebec
VAL BJARNASON, Secretary-Treasurer • ART JENKYN, Director of Organization

June 11, 1979

Mr. Pete How, Business Agent,
UE Local 524,
203 Reid Street
Peterborough, Ontario
K9J 3P7

Dear Pete: Re: Solventless Epoxy Varnish

Please find enclosed a copy of my research concerning one of the three components that were used to make Solventless Epoxy Varnish.

This chemical BORON TRIFLUORIDE MONO ETHYLAMINE* can certainly be the reason behind the health effects suffered by our members and others as a result of that 1971 fire.

*SEE CHEMICAL DOCKET AS WELL

The fire itself would give off large amounts of these toxic fumes, but that is not to say that our members who had long exposures working in this area would not show the same health effects as those who were immediately involved with the 1971 fire.

Therefore it is quite important that we involve ourselves with all aspects of the WCB investigation of this fire; and further that we compile a production history of the use of "Solventless Epoxy Varnish" which would include documentation of all workers who were exposed to its manufacture.

I am enclosing a copy of "How to Look at a Workplace" which I put together from the OFL Program for your guidance. Also our Safety committee who have completed this program will have a good idea on what is necessary to put together a production history study.

I have not traced down the other two components of "Solventless Epoxy Varnish," -- (1) Shell Epoxy 826 or Ciba 6005; (2) 3M cardolite NC 513; but I felt the research on "Boron Trifluoride Monoethylamine" was important enough to send it to your local immediately.

Fraternally,

Ed Hunt

Ed Hunt
UE Health & Safety Rep.

EH-js
encls.

c.c. - Wm. Woodbeck, UE Vice-President

UE LOCAL 524, PETERBOROUGH

(Armature Department)

BORON TRIFLUORIDE MONO ETHYL AMINE -- $BF_3-C_2H_5NH_2$ is a white to pale tan flakes. Specific gravity is 1.38, melting point 88-90°C. Soluble in furfuryl alcohol, polyglycol, acetone, Releases Boron Trifluoride(1) above 110°C. Combustible. It has a HIGHLY TOXIC HAZARD RATING, and a moderate fire risk rating.

It is used as an elevated temperature cure for epoxy resins.

(1) BORON TRIFLUORIDE; BF_3; is a colorless gas; 2.3 times as dense as air; melting point -126.8°C; boiling point -101°C; does not support combustion; soluble in cold water; hydrolyzes in hot water; soluble in concentrated sulfuric acid; decomposes in alcohol.

It is TOXIC by inhalation; corrosive to skin and tissue; has a tolerance in air of 1 part per million.

ETHANOLAMINE (GENEARIC NAME) NIOSH

MONO ETHYL AMINE is the legal label name for Ethyl Amine

ETHYL AMINE also known as aminoethane; $CH_3CH_2NH_2$; is a colorless, volatile liquid (or gas); ammonia odor; strong alkaline reaction; boiling point 16.6°C; freezing point -81.2°C.

It is derived from ethyl chloride and alcoholic ammonia under heat and pressure.

Hazard: flammable, dangerous fire risk. TOXIC, strong irritant. Tolerance

TRICLORETHYLENE (F)

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

SAFETY UNIT

SUBJECT: Royalene Degreaser (Cold)

PETERBOROUGH, 2 October 1979

T.J. Mather
General Foreman
Induction Motors

This will confirm our conversation on 27 September 1979 re the above degreaser.

If the lid on this degreaser is raised immediately after the wash cycle is shut down a heavy concentration of trichlorethylene escapes to the air. This finds its way to the 16A aluminum weld area and gives trouble with HCL generation.

By leaving the lid closed for 5 minutes after the machine is shut down its exhaust system clears out the vapour.

It is my understanding you will place a sign on the machine giving operating instructions to provide this 5 minute delay at all times when the degreasor is used.

AK Faggetter/am

A.K. Faggetter
Industrial Hygienist
Occupational Health & Safety

:am

cc: BH Martin, RA Whiteside, LJ Collins
UE-CGE Safety Committee

Canadian General Electric

Copy

ARMATURE

Howara,

CORPORATE
EMPLOYEE RELATIONS

1420 DUPONT STREET, TORONTO, ONTARIO M6H 2B2 - TEL: (416) 534-6511

January 24, 1980

JAN 2 8 1980

Mr. J. Gooley
Sec. Grievance Panel
Local 524,
U.E.R. & M.W.A.
203 Reid Street
Peterborough, Ont.

Re: Grievance #79-89 Group Armature

Dear Mr. Gooley:

On December 11, 1979, Mr. Denham and I met with your panel to discuss the following grievance:

> We the undersigned claim that we are being forced to work under unsafe and hazardous working conditions. We wish this matter taken up as a grievance under the terms of the union agreement with the view to having these conditions corrected immediately.

This was a rehearing at the request of your panel.

At the hearing, your panel stated that fumes escaping from the V.P.I. ovens are still creating a problem on the gallery. Your panel cited the following as an example. On December 4, 1979, gallery employees left the area because of fumes. Contractors, who had been working on oven #4 left the plant at 9:00 a.m. leaving an eight foot section out of the ventilating system. After lunch a member of your panel, Mr. J. Ball, who is also a member of the Joint Occupational Health and Safety Committee, approached Foreman J. Berwick, Foreman K. Logan and Manager J. Munro and inquired into the state of the oven. In each case, Mr. Ball stated, he was informed that the oven was off. Mr. Ball then went to the oven himself and found it was on. Mr. Ball then contacted Employee Relations Manager, B. Martin, who together with Mr. Logan, Mr. K. Faggetter and Mr. Ball approached the oven operator and confirmed that the oven was on.

Your panel claims management knew the oven was on and purposely attempted to subvert the Safety Committee.

We have investigated the claim raised by your panel and are of the opinion that some relevant points have been neglected.

... 2

Canadian General Electric

At the beginning of the shift in question, the operator of oven #4, in the presence of Mr. Berwick and Mr. Munro was instructed by Mr. Logan to shut the oven down until the contractors had finished their work. He did so; consequently, when members of management were approached by Mr. Ball concerning the oven, they answered in good faith that it was off.

When members of Local Management and Mr. Ball approached the operator of oven #4 in the afternoon, the operator reported the following in their presence: he had turned the oven on in the morning after the contracts had left, thinking they were finished. He did so on his own, without instructions from anyone.

The contractors returned late in the afternoon of the same day and finished their work. We are of the opinion that the incident arose due to poor communication and could have been avoided. Management was not aware the oven was on, there was no attempt to subvert the safety committee and thus we do not see a violation of the Collective Agreement as alleged.

Yours truly,

Christopher D. Ross

C.D. Ross
President's Designate.

cc: CLeal
PHow
Grievors

copy

MAY-19-1981 F18 bldg (F)

Ontario Ministry of Labour — Occupational Health and Safety Division — Industrial Health and Safety Branch

400 University Ave, Toronto, Ontario M7A 1T7, Tel 965-4125

Degreaser TRICHLOROETHYLENE

FILE NUMBER: 336 0000 - ...

PLEASE QUOTE FILE NUMBER ON ALL ... OR CORRESPONDENCE

EMPLOYER: Canadian General Electric Co Ltd

REG 13

MAILING ADDRESS: 107 Park St N — CITY: Peterborough — POSTAL CODE: K9J 7B5

LOCATION OF PREMISES:

MANAGEMENT NAME: M. Gordon — STANDARD GEOGRAPHICAL CLASSIFICATION: 35 15 14 1 04 — TRIGGER: — OUT STD: — T/G: T — DR: 413 — TELEPHONE NO: 705 742 77..

OWNER OF PREMISES: Canadian General Electric Co Ltd — COMM/REP: 4 6 — UNION: 160 — LOCAL: 005..

OWNER MAILING ADDRESS: 214 King St W. — CITY: Toronto — POSTAL CODE: M5H 1K7 — PROV. STA: ONT

ACTIVITY OF EMPLOYER - COMPLETE WHEN SIC NUMBER TO BE CHANGED OR FOR NEW EMPLOYER

SEND COPY TO. CSB ☐ HEALTH ☐ ☐ ☐ ☐

KEYPUNCH DATA (4 FILE NUMBER 15)	INSPECTOR NUMBER	INSPECTION DATE DAY	MONTH	YEAR	F E D.	INSP. CODE	CYCLE	NUMBER OF EMPLOYEES 29 PRODUCTION 33 34 ADMIN
336000050008	430	19	05	81	2	5	06	0 1765 000 5..

39 T/G NEW DURATION 45 NEW MANAGEMENT 64 65 NEW TELEPHONE NO

NOTES

FOR FURTHER INFORMATION CONTACT REGIONAL MANAGER INDUSTRIAL HEALTH & SAFETY BRANCH ... SHEPPARD AVE. EAST SUITE 215 WILLOWDALE, ONTARIO M2N 5X5 TELEPHONE (416) 224-1606

TAKE NOTICE THAT YOU ARE REQUIRED UNDER THE OCCUPATIONAL HEALTH & SAFETY ACT, 1978 TO POST A COPY OF THIS REPORT IN A CONSPICUOUS PLACE.

Internal Responsibility System
Self Assessment

Follow-up of Occupational Health Report April 27/81

Contacts Mr. R. Bergey, Safety Manager
Mr. J. Ball, Area Safety Member
for United Electrical, Radio and Machine
Workers of America, Local 524

The degreaser in Bld E has been my unresolved concern now that this order has been issued I will wait to see if it is resolved.

REPORT RECEIVED BY [signature]

INSPECTOR [signature] R. H. Dixley

Ontario Ministry of Labour — Occupational Health and Safety Division

Industrial Health and Safety Branch

400 University Ave
Toronto, Ontario
M7A 1T7
Tel: 965-4125

PAGE NO. ____ OF ____

INSPECTION DATE (DAY / MONTH / YEAR): 19 05 51

FILE NUMBER — SIC: 336 — REG. NO.: 00005 — DIV: 0005

TO: ORDERS TO EMPLOYER

EMPLOYER: CANADIAN GENERAL ELECTRIC CO. LTD

ADDRESS: 107 PARK ST. N. PETERBOROUGH

Take notice that you are required to comply with the following orders under
☒ The Occupational Health and Safety Act, 1978 ☐ Canada Labour Code Part IV

Please notify the Branch by letter upon completion

ORDER NUMBER	E OR O	I / A / R	ACT OR REGULATION SECTION	
				EVALUATION
				BLD 5, BAY K15
00656	E	I	14(5)	ALL MEASURES NECESSARY TO PREVENT EXPOSURE TO ANY TOXIC SUBSTANCE BY INHALATION SHALL BE TAKEN AND WITHOUT LIMITING THE GENERALITY OF THE FOREGOING, WHERE ANY TOXIC SUBSTANCE IS USED OR PRODUCED, ADEQUATE VENTILATION SHALL BE PROVIDED
				1 ADEQUATE VENTILATION OR OTHER MEANS SHALL BE PROVIDED AT THE DEGREASER TO REDUCE THE FUMES FROM ESCAPING AT ALL TIMES, TO MAINTAIN BELOW THE TLV OF 100 PPM.
				(NOTED AT TIME, LIP EXHAUST NOT OPERATING)

REPORT RECEIVED BY: [signature]

INSPECTOR: [signature]

Smoke & fumes
Annealing

Jan 15 1980 AM

Fumes & smoke were heavy again. Exhaust fan was not turned on. People went to Surgery.

John Ball was at SSFC and thereby turned problem over to Bruce Harris via Odyssey.

Jan 16 1980 AM

Fumes bad again. This time it apparently was traced back to open windows blowing fumes back into building.

Feb 14 1980

Fumes bad again in AM. Checked out oven switch. It was padlocked all right but switch can be off anyhow. Not sure what caused the fumes though. Ken Togan got mouthy again because I was in his area. Took Terry over to see the whole thing. Jack Berwick says he'll have better seals installed on the upstairs oven doors.

Canadian General Electric

ARMATURE
F

SUBJECT: Safety

COPIES: R.H. Hays
file

Peterborough, 21 August 1981

Messrs: W. Broadworth
R. Crooks
D. Davidson
K. Logan
J. Munro
[redacted]

The safety performance of Armature during 1981 is alarming to say the least, and totally unacceptable. To date July, there have been 10 medical and 14 lost time accidents - more than the total number of accidents during 1980.

A review of these accidents (appendix A) indicates major causes to be:

1. Lack of safety consciousness by both employees and supervision.

2. Improper lifting practices.

3. Lack of adherence to hygiene procedures.

4. Poor housekeeping.

It is management's responsibility to provide a safe work environment, provide adequate safety protection devices and enforce safety rules and regulations. It is the employee's responsibility to work safely within this environment using safety devices provided and following safety practices established.

The Business is serious about both supervision and employees accepting these responsibilities. It is obvious that we have not been successful in communicating this message through traditional vehicles such as Safety Committees and communication. A much tougher approach is now necessary.

The following action items will be implemented immediately to improve the safety performance of Armature:

1. AFR's will be plotted and posted in each unit so that all employees are fully aware of their performance.

2. A communication letter will be issued by the MSD to employees on a monthly basis (ie appendix B).

3. Communication between supervisors and employees on safety will be increased.

4. Observed unsafe actions (ie safety glasses, lifting procedures, horseplay etc.) will be delt with through documented disciplinary actions.

5. Disciplinary action will be taken where accidents have resulted from unsafe practices or carelessness.

6. At the first indication - either implied or observed - that an employee is having physical difficulties in performing the job, the employee will be removed from the job and Safety will be contacted to evaluate the physical requirements of the job.

7. At the first indication of dermatitis, an employee will be removed from the job and not allowed to return.

8. Safety Committees will be directed to place greater emphasis on housekeeping and developing safety consciousness amongst employees.

9. Safety has been a key measurement of supervision performance. It will receive added weighting in performance reviews during the next period. AFR targets for 1981 were set for each unit early in the year (ref. KOP #A815). Performance will be measured to these targets. Targets for 1982 will reflect a further improvement over the 1981 targets.

Would you please attend a meeting on Tuesday, August 25 at 3:00 pm to review your specific plans for supporting the above.

R.K. Osborne
Manager - Armature Operations
Industrial Apparatus Department

cc:

APPENDIX B

5-2-1

Canadian General Electric

SUBJECT: Safety

COPIES:

Peterborough, 7 August 1981

To: All Armature Employees

Our safety record in Armature is alarming, and I felt that you should be made fully aware of the situation.

Accident Frequency Rate is defined as the number of accidents for every 200,000 hours worked, and approximates the number of accidents for every hundred employees in a one year period.

Our performance during 1980 and the first two quarters of this year is as follows:

Accident Frequency Rates

	1980 Year	1981 1st Q	1981 2nd Q
Unit 616/618	17.5	10.7	15.7
Unit 617	34.4	0.0	70.2
Unit 619	13.8	26.8	61.5
Total Armature	17.4	13.9	47.5

These numbers compare to a current Peterborough Plant average of 12.4.

At our current rate, half of us would have an accident each year and 2 out of 3 accidents would result in lost time.

We must reduce the level of accidents in Armature. I would ask the Area Safety Committees to continue their efforts in identifying safety hazards in the work place. I would also ask all employees to be continually conscious of safety in carrying out their duties - working in a safe manner and using safety equipment supplied.

R.K. Osborne
Manager - Armature Operations
Industrial Apparatus Department

ec:

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

ORGANIZATION AND POLICY GUIDE

DEPT: - PETERBOROUGH PLANT SUBJECT: - WEARING OF EYE PROTECTION	TAB R.I.	NUMBER 3-1-21

PREPARED BY	DATE ISSUED	SUPERSEDES ISSUE DATED	PAGE
Safety Unit	81-04-03	71-02-05	1 of 1

INSTRUCTION

1. SCOPE:

It is recognized that certain operations within the Plant are hazardous to the eyes. As a consequence, the Company has established an eye protection program and will provide eye protection in accordance with the instructions relative to same. It should be the objective of the foreman to obtain the compliance of the employee with this program by education rather than by disciplinary measures.

2. PROCEDURE:

2.1 If a foreman observes that an employee is not participating in the eye protection program, the foreman should approach the employee and explain why eye protection is necessary and ascertain from the employee the reason for not participating.

2.2 After having been assured that the employee has been issued the proper type of eye protection, that the fit is correct and that the employee has a proper understanding of the need for eye protection, the foreman finds that the employee is still not participating, the employee should be warned that disciplinary action will be taken if protection requirements are ignored.

2.3 If, following the oral warning, the foreman observes that the employee is still not participating in the eye protection program, the foreman should have a further interview with the employee and confirm this by use of interview record form #G740, clearly outlining that any further failure on the part of the employee to observe the requirements of the eye protection program will result in a suspension being incurred.

2.4 If the employee still persists in ignoring the eye protection requirements for the employee's occupation, the foreman should suspend the employee and confirm by use of a second interview card. Upon the employee returning to work the foreman should interview the employee prior to commencing work to determine if the employee's attitude has changed. If not, the employee should be inform him that the wearing of safety glasses in all Manufacturing areas is a condition of employment. A foreman should refer to Section 17 (1) (b) of the O.H.S.A. 1978 "A worker shall use or wear the equipment, protective devices or clothing that his employer requires to be used or worn'.

Manager - Employee & Community Relations

Complete Revision

Distribution: List # 2
List # 4 less Scarborough
List #12 - Tab 1
R.S.Hood

Document 3816B/0240B

APPENDIX A

MONTH	UNIT	MA	LT	DESCRIPTION OF ACCIDENT
January	-	-	-	-
February	619	X		Tripped over hand truck while carrying a coil.
	619	X		Bumped hand on metal stand.
	619	X		Sore shoulder from lifting coils.
March	616		X	Slipped and fell on floor.
April	619		X	Caught finger in hydraulic press.
	619		X	Soreness in arms from forming coils - hammering.
	619	X		Struck hand on a truck.
	619	X		Thumb struck while taping coils.
	619	X		Rash on arms.
	619		X	Hammer slipped and struck hand.
May NICK	617	X		Kink in neck and shoulders while moving copper.
	618		X	Rash from using fibreglass tape.
GENE	617		X	Sore shoulder from lifting coil off pallet onto work bench.
HOPPE	617		X	Pain in back while lifting brazing fixture onto table.
June	614	X		Slipped and cut chin on box.
	617	X		Hit hand with a hammer.
	618	X		Rash and general health problems while working with epoxy.
?	617		X	Sore back while putting a pole on winding lathe.
	614		X	Slipped and fell, striking fingers.
	619		X	Went over on ankle while stepping off a platform.
Lou.	617		X	Burnt hands while cleaning a heating pot with thinners.
	619		X	Rash on hands.

MONTH	UNIT	MA	LT	DESCRIPTION OF ACCIDENT
July	618		X	Lit cigarette after washing hands in alcohol and burnt thumb.
	616		X	Tripped on stand and fell on knee.

Employee File

PETERBOROUGH,

TO:

Several discussions have been held with you regarding the matter of wearing approved eye protection in Manufacturing areas. To date your co-operation in this matter has been less than satisfactory.

This letter is to inform you of your obligations under the Occupational Health and Safety Act, 1978 and Regulations for Industrial Establishments. Part III Section 17(1) (a) and (b) state:

"A Worker shall

(a) Work in compliance with the provisions of this Act and the regulations;

(b) Use or wear the equipment, protective devices or clothing that his employer requires to be used or worn;"

Part III Section 17(2) (a) (b) state:

"No Worker shall

(a) Remove or make ineffective any protective device required by the regulations or by his employer, without providing an adequate temporary protective device and when the need for removing or making ineffective the protective device has ceased, the protective device shall be replaced immediately.

(b) Use or operate any equipment, machine, device or thing or work in a manner that may endanger himself or any other worker;

It is expected that based on the above you will wear approved eye protection as required in your work area.

The obligations of a supervisor are outlined in Part III Section 16(1) (a) and (b) which state:

"A supervisor shall ensure that a worker,

(a) Works in the manner and with the protective devices, measures and procedures required by this Act and the regulations; and

13 January 1981

(Part III Section 16(1) (a) and (b) Cont'd)

(b) Uses or wears the equipment, protective devices or clothing that his employer requires to be used or worn.

Based on the above section of the Occupational Health and Safety Act, 1978 and Regulations for Industrial Establishments and on my responsibility therein should you persist in not wearing approved eye protection I will have no alternative but to advise you that there is no available work for you which does not involve the wearing of eye protection and to advise you to remain at home until you decide to wear the required protective devices required by your occupation.

Armature
~~Nov. 17 1981~~ (F)
(Epoxy)

0815

Dave Lucano - Got Epoxy rash seven years ago. Says about 15 people came down with rash in period of two weeks. Dave was went off job (pole winding) at that time and had no further problem until very recently.
He helped another man on a job with epoxy and shortly thereafter took a severe allergy. To-day he is Surgery with his right eye badly swollen and stiff eye red & severely irritated. (Transferred to C.H. Dec. 4/81)

Dr Curtis Larry Ball, Ken Fuggetty, John Ball toured pole winding area in East end of Bldg #7.

① Found 1 gallon cans being used as ready use pots and besides being extremely wasteful these pots let the operators wrist & forearm contact the Epoxy. When asked why the low heating pots are not being used, the answer seems to be that it is too much trouble to transfer from the gallon can to the pot.

② Hygiene station on N.E wall in sadly maintained condition. Raw epoxy pots in immediate area and proper materials not present.

③ Lack of adequate instruction & follow-up enforcement by Supervisors is evident.

④ Area adjacent where poles are being ground & dressed (epoxy) is very poorly ventilated. Epoxy dust & (mica) is covering a large area.

⑤ People are still washing their hands and arms in solvents.
T.L.V. hand cleaner is on the hygiene rack but the dispenser is in bad shape and container is probably epoxy contaminated.

Armature Upstairs
Feb 1 1982

E

0915

Reported by Steward Bonnie Morley that fumes are still coming up on Balcony.
Sept 15 1981, Sept 18 1981, Jan 7 1982, Jan 29/82

Fumes were bad on these days. Bonnie was told by Ken Fagan that an extra load was in the oven on Friday and this caused the problem.
The smoke is mainly coming out around the oven doors.
The men on the ~~platform~~ mezzanine turn on the ventilators and this clears the upper air ~~but~~ then the men on the floor turn the fans off again.

Problem seems to emanate from #1 & 2 mostly. The unit with the front ventilation seems to give almost no problem.

Note A possible solution may be to incorporate a curtain across the opening to contain the fumes escaping from the oven doors.

Dave Davidson threw me out of his area and got rather snooty about it too. I asked him how come he hadn't allowed the people in the area to contact Safety Committee.

Spoke with Ken Fagan, he was reasonable although he at first questioned my presence. We talked over the problem and I asked that he should let me in on the problem when it occurred so I could see the scope of it all for myself.

Ontario Ministry of Labour

Industrial Health & Safety Branch

Request for Occupational Health Visits

DATE	PRIORITY REQUESTED	
October 4, 1982	YES ☒	NO ☐

COMPANY FILE NO.	UNION LOCAL	UNION COMPLAINT NO.
0336-00005-0008	599 IUE	Yes

Employer Information:

NAME OF EMPLOYER: Canadian General Electric Co. Ltd. Ind. Apparatus Div. 'A'

ADDRESS OF EMPLOYER: 107 Park St. N., Peterborough K9J 7B5? 076 82JEAA

TELEPHONE NUMBER	SERVICE REQUIRED	NUMBER OF EMPLOYEES
705-748-8486	HYGIENE ☒ MEDICAL ☒	880

COMPANY CONTACT	POSITION HELD
Mr. L. Ball 748-7570	Safety Specialist

EMPLOYEE REPRESENTATIVE	POSITION HELD
Mr. G. Mansell	IUE Committee Member

Hazard Report:

TYPE OF HAZARD: Fumes from heat curing of epoxy resin

DETAILS

This union represents office, laboratory and nuclear workers. Their people sometimes work in vicinity of the ovens.

Electrical stators are dipped in epoxy and then placed in ovens to cure. Load takes 12 - 16 hours. Ovens (3) 18' X 18' X 15' with internal slot exhausts. Two external roof fans for escaping smoke.

During the first hour smoke escapes around the door seals (they are continuously being replaced). If the oven is overloaded or a breakdown in exhaust, the smoke escapes into the work area. Co. policy, if bothered the worker can leave the area. It rises and affects the workers on the upper gallery.

In 1980 extra exhausting was installed and a private survey was made on the inside and outside of building. (See the report)

The union committee stated they are not satisfied and want Occupational Health to make tests.

NOTE: Please contact firm to ensure when and time a load will go in oven. Also contact members of both unions during visit.

YEAR	1982
REGION	13
NO.	

R.W. Dickey
INDUSTRIAL SAFETY OFFICER

C. Leigh
MANAGER

J. Nelson
ADMINISTRATOR

One ? Hygiene Report

C . . . .

Copy To O.H.B.

S-2-1

Canadian General Electric

SUBJECT: Report on Industrial Hygiene Survey
Conducted at C.G.E. Peterborough
October 20/21, 1980.

COPIES: HR Hosein
B Bergey
L Chun
K Faggetter
F MacDonald
R Osborne
F McMullen

To: Mr. Lorne Read, Peterborough.

CONFIDENTIAL

Health, Safety and Environment Section
Corporate Human Resources Operation
December 17, 1980.

A survey was conducted at C.G.E. Peterborough to determine the composition and quantity of materials emitted from oven #2 during the curing of the epoxy resin on a large stator. Several complaints have arisen from those within building #7 as well as many outside who have had to walk through a "courtyard" contaminated with smoke and an irritating odour which occured as a result of downdraft air currents carrying the emissions from the smokestack (of the oven) into this area.

RESULTS

Table 1 - Contaminant Concentrations

Possible Structure	Tube Number	Quantity in Tube (µg)	Volume Sampled (l)	Volume Sampled (m^3)	Concentration (mg/m^3)	TLV-Th (mg/m
nzene	1	0.7	20.4	0.020	0.035	30
luene	1	0.5	20.4	0.020	0.025	375
nzene	2	6.6	23.1	0.023	0.287	30
luene	2	6.0	23.1	0.023	0.261	375
hane	3	5.0	23.0	0.023	0.217	Simple Asphyxi
nzene X	3	0.4	23.0	0.023	0.017	30
lene	3	0.1	23.0	0.023	0.004	435
esol	3	0.1	23.0	0.023	0.004	22
imethyl benzene	3	0.1	23.0	0.023	0.004	125
etylene	4	30	26.5	0.027	1.11	Simple Asphyxi

Table 1 Cont.d

Possible Structure		Tube Number	Quantity in Tube (µg)	Volume Sampled (1)	Volume Sampled (m^3)	Concentration (mg/m^3)	TLV-TW (mg/m^3
bon dioxide	grouped together as possible anylite	4	100	26.5	0.027	3.70	9000 Simple Asphyx
pane		4					
maldehyde		4					3.0
yl Alcohol		4					-
uene		4	80	26.5	0.027	2.96	375
nol		4	54	26.5	0.027	2.00	19
tane	grouped together as possible anylite	4	30	26.5	0.027	1.11	1600
'entenoic Acid		4					-
aldehyde		4					-
lohexanol		4					200
ethyl Phenol (Cresol)		4	20	26.5	0.027	0.741	22
tylene		6	14	45	0.045	0.31	Simple Asphyxiar
pionaldehyde		6	200	45	0.045	4.44	-
uene		6	74	45	0.045	1.64	375
ydroxy Phenol (hydroquinone)		6	27	45	0.045	0.60	2
bon Dioxide		8	150	45	0.045	3.33	9000
pane		8					Simple Asphyxiar
tyaldehyde		8					180
uene		8	85	45	0.045	1.89	375
ene		8	20	45	0.045	0.44	435

NOTE: 1) Only those materials indicating a measureable "quantity in tube" are indicated above (as per Peninsula Tables (Appendix 1)).

2) Tenax tubes 6 and 8 were obtained October 8, 1980 to determine the feasibility of using Tenax tubes as an adsorbing medium.

3) See Appendix 2 for position of samplers.

NOTE: 4) Tube 4 has two groups of 4 chemicals where each group may be a possible anylite. Tube 8 has one group of 3 chemicals which may also be a possible anylite. Due to the inability of the mass spectrometer to differentiate which of these chemicals is the actual anylite, it is difficult to allow comparisons between them and the TLV to be made.

The six Tenax tubes submitted to Peninsula Chemical Analysis Limited (tubes 1-4 taken at a 100 ml/min flow rate the night of October 20/21, 1980, and the tubes 6-8 taken at a 1.5 l/min flow rate October 8, 1980) were analyzed using a mass spectrometer. Tubes 6 and 8 were taken primarily to determine the feasibility of using Tenax as an adsorbing medium for the unknown contaminants being released during the curing of the resin (M6860) of stators (October 20/21, 1980, stator 505-1054). Tubes 1-4 should be looked at most closely since the lower flow rate allows a greater time period for the tenax to adsorb the contaminants.

According to Dr. R.J. Smythe (Director of Peninsula Chemical Analysis Limited) the mass spectrometer technique is a qualitative rather than a quantitative technique thereby indicating that the concentrations of contaiminants are approximate only. As can be seen in the results section, the contaminant concentrations are much less than the TLV-TWA. These concentrations exist within the oven during the cure and indicate that concentrations outside of the oven (i.e. within building 7) are significantly less since minimal release through the oven occurs. It is therefore possible to indicate that contaminants emfnating from the curing resin are of such low cencentration outside the oven in the work environment of building 7 as to not pose a hazard to health.

The mass spectrometer data indicates that thermal decomposition is probably not a major problem in this study since a large proportion of the recognizable organi
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Since the smell is bothersome to those walking outsi
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To determine the concentration of the contaminant be
outside environment, calculations based on the concentratio
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system depressants, but the levels are too low to be of toxicologic significance.

The many other chemicals detected in the air sample were too low to quantify, but the toxicologic properties will be primarily central nervous system depression and irritation of the eyes and respiratory tract.

RECOMMENDATIONS

1. Maintain a slight negative pressure within the ovens to minimize the leakage within the plant.

2. Check frequently the integrity of the gaskets, door jams and seams and replace these as necessary to minimize leakage.

3. Check frequently the fan blades, motors and belts to ensure they are in proper working order.

4. If possible, increase the capacity of the exhaust fan to dissipate the emission higher above the building roofs. This can be done in concert with the use of higher stacks.

P.A. Gray:ll

Tube One

m/e	Possible Structure	Approximate quantity in tube
50	Aromatic fragment	
51	" "	
52	" "	
63	" "	
65	" "	
67	Dienes	
69	Thiophenes or alkene/cycloalkene fragment	
77	Benzene fragment	
78	Benzene	0.7 micrograms
79	Aromatic fragment	
80	Cn H_2n-4 ie. C_6H_8	
81	Diene fragment	
91	Toluene fragment	
92	Toluene	0.5 micrograms
115	Trimethyl Substituted Benzene fragment	

Tube Two

m/e	Possible Structure	Approximate quantity in tu
26	acetylene or aromatic fragment	
27	C_2H_3	
29	C_2H_5 or CHO	
37	Unknown C_3H	
38	Aromatic fragment	
39	Aromatic, C_3H_3	
41	C_3H_5	
42	CH_2CO unsaturated acetates diketones and cyclic ketones	
50	Aromatic fragment	
51	" "	
52	" "	
54	Aromatic fragment	
56	$C_nH_{2n}CO$ (as m/e =42)	
63	Aromatic fragment	
65	" "	
66	Aromatic fragment or C_nH_{2n-4}	
67	Dienes, alkynes, cycloalkenes C_nH_{2n-3}	
68	Aromatic fragment	
69	C_nH_{2n-4} or thiophenes	
77	Benzene fragment	
78	Benzene	6.6 micrograms
79	Aromatic fragment	
80	C_nH_{2n-4}	
81	C_nH_{2n-3}, C_nH_{2n-10}	
91	Toluene fragment	
92	Toluene	6 micrograms
95	see m/e 81, furylalkyl, polyunsaturated alcohols, cyclic alcohols and others	

Tube Three

m/e	Possible Structure	Approximate quantity in tu
26	acetylene or aromatic fragment	
27	CnH_2n-1	
30	Ethane	5 micrograms
36	Unknown orgin	
37	Unknown C_3H	
38	Aromatic fragment	
39	Aromatic, C_3H_3	
40	C_3H_4	
41	CnH_2n-1, ie C_3H_5	
42	CnH_2nCO, unsaturated acetates, diketones and cyclic keytones	
50	Aromatic fragment	
51	" "	
53	" "	
55	C_4H_7 or CH_2CHCO	
63	Aromatic fragment	
65	" "	
67	Dienes, Alkynes and cycloalkenes, CnH_2n-3	
77	Benzene fragment	
78	Benzene	0.4 micrograms
79	Aromatic fragment	
81	CnH_2n-3, CnH_2-10 fragment	
91	Toluene - xylene fragment	
95	See m/e 81, Furylalkyl, polyunsaturated alcohols and ethers	
106	Xylene	0.1 micrograms
108	Cresol	0.1 micrograms
116	Trimethyl benzene	0.1 micrograms

Tube Four

m/e	Possible structure	Approximate quantity in tu
26	acetylene	30 micrograms
27	C_2H_3 ie. C_nH_{2n-1}	
37	unknown C_3H	
38	C_3H_2 from aromatic fragmentation	
39	C_3H_3 " " "	
41	C_nH_{2n-1} fragment	
42	$C_nH_{2n}CO$ unsaturated acetates, diketones and cyclic ketones	
43	C_nH_{2n-1} fragment	
44	CO_2, C_3H_8, CH_3-CHO, vinyl alcohol	100 micrograms
53	C_4H_5	
55	C_4H_7, CH_2=CHC=O	
57	C_nH_{2n-1}	
58	CH_3-CH_2-CHO	
67	C_5H_7	
69	C_5H_9, CH_3CH=CHC=O	
77	Benzene fragment C_6H_5	
79	Aromatic fragment	
80	C_nH_{2n-4} ie. C_6H_8	
81	furylalkyl fragment, polyunsaturated alcohol etc.	
82	$C4H_2O_2$, C_5H_6O or C_6H_{10}	
83	C_nH_{2n-1} from alkenes and cycloalkenes	
85	C_nH_{2n-1} or C_nH_{2n+1} CO	
91	Toluene fragment	
92	Toluene	80 micrograms
94	Phenol	54 "
95	see m/e =81	
97	C_7H_{13} ie. C_nH_{2n-1}	
100	C_7H_{16}, $C_5H_8O_2$, $C_6H_{12}O$, cyclohexanol	30 micrograms
[illegible]	[illegible]	20 "

Tube Six

m/e	Possible structure	Approximate quantity in tube
26	acetylene	14 micrograms
27	$Cn-H_2n-1$	
37	unknown C_3H	
38	aromatic fragment	
39	C_3H_3 aromatic fragment	
41	CnH_2n-1	
42	C_2H_2CO from unsaturated acetates, diketones etc.	
53	C_4H_5	
55	C_4H_7 or $CH_2=CH_2C=O$	
57	CnH_2n-1	
58	CH_3-CH_2-CHO propionaldehyde	200 micrograms
59	$CnH_2n+1\ O$, $CnH_2n-1\ O_2$	
67	C_5H_7	
69	C_5H_9, $CH_3CH=CHC=O$	
77	Benzene fragment	
79	Aromatic fragment	
80	CnH_2n-4 ie C_6H_8	
81	furylalkyl fragment, polyunsaturated alcohol	
91	toluene fragment	
92	toluene	.74 micrograms
110	dihydroxyphenol (hydroquinone)	27 "

Tube Eight

m/e	Possible structure	Approximate quantity in tube
39	C_3H_3 aromatic fragment	
40	C_4H_4 " "	
44	CO_2 propane acetyaldehyde	150 micrograms
91	toluene fragment	
92	toluene	85 micrograms
105	xylene fragment	
106	xylene	20 micrograms

APPENDIX 2

Position of Samplers (i.e. when facing oven #2)

Tube #1 - left front port

Tube #2 - right front port

Tube #3 - right rear port (samples directly the effluent going out of chimney)

Tube #4 - left rear port

PENINSULA CHEMICAL ANALYSIS
LIMITED

October 23, 1980

Project No. 6531

Canadian General Electric
Company Limited,
107 Park Street North,
Peterborough, Ontario.

Attention: Mr. Lloyd Chun

Dear Mr. Chun:

Enclosed please find the mass spectra generated by the samples submitted to our laboratory on October 9, 1980. The spectra have been run at two different gain levels to increase sensitivity and to achieve unambiguous mass counts.

The spectra all indicate the absence of any appreciable quantities of gases other than water, oxygen and nitrogen. (m/e = 28 for nitrogen and the doubly charged species at 14; similarly, oxygen at 32 has a doubly charged species at 16)

The spectra were obtained with our Hitachi RMU6-E mass spectrometer at 70 ev ionizing voltage. The instrument manufacturer claims a "detectability" of 0.05 ppm under favourable conditions, however, we have found that 1 - 2 ppm for atmospheric gas samples under favourable conditions is much more realistic.

The aqueous condensate obtained during the sampling experiments (mass spectra #7) again contains no appreciable quantities of organic material.

These preliminary investigations indicate that organic vapours and gases generated during the operation of Canadian General Electric's furnace system will probably require concentration on adsorbent such as tenax.

We trust that this is the information you require, but should you have any further queries concerning this report, please do not hesitate to contact this office.

Yours very truly,
PENINSULA CHEMICAL ANALYSIS LIMITED

Smythe

Richard J. Smythe, Ph. D.

RJS/brl
encl.

: These samples + analysis were conducted prior to the use of Tenax tubes, the results showing the need for an adsorbent such as Tenax.

BOX 810 NIAGARA FALLS ONT. L2E6V6 LAB. 8407 STANLEY AVE. UNIT 10.

416-356-7667

Ministry of Labour | du Travail de l'Ontario | Health Branch | de la santé au travail

Rapport de la visite sur les lieux de travail

M-573

Date: September 29, 1982	From/De: J. Toth, P. Eng.	
I.H.S.B. File No./Dossier D.S.S.I. Nº: 336-005-008	I.H.S.B. Region No./Region D.S.S.I. Nº:	O.H.B. File No./Dossier D.S.T. Nº: 18782IXAA

Plant/Usine: Canadian General Electric

Date of Request/Date de la demande: September 14, 1982

Address/Adresse:
107 Park St. N.
Peterborough, Ontario

Requested by/Demande par: IHSB

RECEIVED CENTRAL REGISTRY OCT 7 1982

OCT 13 1982 OCCUPATIONAL HEALTH BRANCH

Accompanied by/Accompagné par: Dr. W. Waddell, OHB

Contacts/Personnes contactees:
Mr. L. Ball, Safety Analyst
Mr. J. Ball, Health and Safety Committee Representative

Date of Visit/Date de la visite: September 27, 1982

Copies to/Copies à:
Mr. J. Nelson (5)
OHB Head Office
OHB Field Office

Hazard/Risque: Cutting oil mist and decomposition products

Abstract/Sommaire des résultats

A visit was made to investigate the ventilation in the Herbert turret lathe area.

No local or general ventilation is provided at the lathe and exposure to oil droplets and decomposition products such as sulphur dioxide, phosgene etc. is possible.

Advice to the employer is made.

***

The company was previously visited by members of this Branch and has been adequately described in numerous reports.

This visit was concerned with workers' exposure to cutting oil mist and cutting oil decomposition products.

Comments

1. In the Building 8I, Bay 15 in an area of about 30' x 60' x 60' high two Herbert turret lathes are operated. On these lathes mostly thread cutting is made on brass, bronze, stainless and mild steel workpieces. In the last 20 years a cutting oil, under the trade name of Steel Kut supplied by APCO Industries Co. Ltd. 10 Industrial St. Toronto has been used. This cutting oil is a mineral oil (96%) containing 3% of sulphur and 0.75% of chlorine.

   In the last 3 years several lathe operators got skin rashes, which is suspected to have been caused by the use of the cutting oil.

2. About 4 gallons of cutting oil used on each lathe per week. The cutting oil is dripping from a 1/2" pipe onto the workpiece, collected with the chips on a pan located under the lathe, filtered and recirculated. It appears that only one part of the 4 gallons is absorbed on the surface of the chips, most of it is lost in the form of droplets, thrown out by the centrifugal force, and by thermal decomposition on the hot chips. No local exhaust is provided at the lathes and no roof or wall fans are installed in this area.

   Occasionally some of the operators are using respirators (3M, No. 8710) but when it is soaked with oil, they claim, breathing through it is impossible.

3. At the time of this visit the amount of oil mist, generated at one of the operating lathe was not significant. The amount of decomposition product was not excessive, either. However, it was reported that 4-5 flare ups per month occur from the hot chips which generate irritating smoke.

   The shirt of the operator was spread with oil droplets and apparently oil was spread on his face and his trousers, as well.

   Because of the nature of the job no flush guards can be used. However, local exhaust or a portable exhaust located at the operator's work station could reduce exposure to oil mist and thermal decomposition products.

4. The sulphur and chlorine is bonded in the aliphatic chain of the oil and at higher temperature when decomposed it may generate sulphur dioxide and phosgene. No components, which could generate nitrosoamines are present in the Steel Kut. This information was supplied by the manufacturer, APCO Industries Co. Ltd.

Advice to the Management

1. At the Herbert turret lathes local exhaust and/or a portable fan should be used to reduce the workers' exposure to oil mist and decomposition products.

2. Consideration should be given to replace the cutting oil (Steel Kut from APCO) with a less toxic one.

3. The workers should be provided with personal protective equipment such as aprons, gloves.

:mp

J. Toth

J. Toth, P. Eng.

SS

Ministry of Labour | du Travail de l'Ontario | Health Branch | de la santé au travail | Rapport de la visite sur les lieux de travail

M-674

Date November 4, 1982	From/De E. V. Stefov, P. Eng.	
I.H.S.B. File No./Dossier D.S.S.I. Nº 0336-00005-0008	I.H.S.B. Region No./Region D.S.S.I. Nº 13	O.H.B. File No./Dossier D.S.T. Nº 07682JEAA
Plant/Usine Canadian General Electric Co. Ltd.	Date of Request/Date de la demande October 7, 1982	
Address/Adresse 107 Park St. N., Peterborough, Ontario K9J 7B5	Requested by/Demande par IHSB	
Contacts/Personnes contactees Mr. L. Ball, Health and Safety Representative Mr. Paul Jones, IUE Representative	Accompanied by/Accompagné par Mr. R. W. Dickey, IHSB	
	Date of Visit/Date de la visite October 25, 1982	
Hazard/Risque Fumes	Copies to/Copies à Mr. J. Nelson (5) OHB Central File OHB Toronto/East File Dr. W. Waddell	

RECEIVED
CENTRAL REGISTER
NOV 16 1982
OCCUPATIONAL HEALTH BRANCH

Abstract/Sommaire des résultats

This visit was made as a result of the Union's concern about employee exposure to fumes escaping from the drying ovens. Complaints of irritation, nausea, disagreeable odor have been reported from the employees working on the platform near the ovens.

Mechanical ventilation is provided inside and outside the ovens. A small leak was found during the visit.

The management has indeed assessed the situation and has conducted intensive testing of all the contaminants released.

No significant health hazard was found.

Advice to the employer is made.

***

Comments

1. Complaints of irritation, odor and nausea have been made by the workers employed at the platform located above and across the (3) drying ovens.

   These complaints occur intermittently whenever some fume escapes from the upper end of the ovens.

2. The fumes released during the drying or curing of painted parts contain a large variety of partial oxidation products generated by thermal decomposition of the resin, solvents and additives present in the paint.

   In general no significant health hazard is posed by these contaminants as they are being released at low concentration levels, however they have objectional odor and some may be irritants, i.e. aldehydes.

3. The company has investigated the situation and has undertaken a comprehensive study in order to identify and monitor the exposure levels.

   The study was presented to me during the visit. The results of this study revealed very low concentrations. Attached find a copy of this study.

4. During the visit however, a small leak was detected at one of the ovens. A small amount of fume could be seen escaping from the upper end of the oven.

   The ovens are relatively large 18' x 18' x 15' and are provided with mechanical exhaust, a roof exhaust and a slot exhaust at the floor level. Adequate inflows were measured at the front opening of the ovens.

   No measurements could be made at the upper end.

   Additional exhaust fans are being provided on the wall to remove the fumes which escape.

5. The slot exhaust inside the oven may be working against the roof exhaust if slot velocities are high.

   Most of the hot fume and vapor released within the oven accummulate at the upper end as hot fumes rise up, hence the floor slot exhaust may not be removing any fume.

   It seems to be worthwhile that the engineering department look into this situation.

6. In order to prevent leakage from the ovens it was suggested during the visit that the upper end be partially enclosed with moveable or permanent curtains.

   This suggestion was well taken by the company.

7. To minimize any leaks the oven should not be overloaded.

   Apparently the main cause of such sporadic leaks is the overloading of the ovens when increased production.

Advice to the Employer

1. The upper end of the drying ovens should be partially enclosed or provided with curtains to prevent fume leakage and increase airflows through the front oven opening.

2. The ovens should not be overloaded with painted parts as this increases the amount of fume release within the oven, hence leakage occurs.

:mp

Evelyn V. Stefov

E. V. Stefov, P. Eng.

Canadian General Electric

Copy to ...

SUBJECT: Report on Industrial Hygiene Survey
Conducted at C.G.E. Peterborough
October 20/21, 1980.

COPIES: HR Hosein
B Bergey
L Chun
K Faggetter
F MacDonald
R Osborne
F McMullen

To: Mr. Lorne Read, Peterborough.

CONFIDENTIAL

Health, Safety and Environment Section
Corporate Human Resources Operation
December 17, 1980.

A survey was conducted at C.G.E. Peterborough to determine the composition and quantity of materials emitted from oven #2 during the curing of the epoxy resin on a large stator. Several complaints have arisen from those within building #7 as well as many outside who have had to walk through a "courtyard" contaminated with smoke and an irritating odour which occured as a result of downdraft air currents carrying the emissions from the smokestack (of the oven) into this area.

RESULTS

Table 1 - Contaminant Concentrations

Possible Structure	Tube Number	Quantity in Tube (µg)	Volume Sampled (l)	Volume Sampled (m^3)	Concentration (mg/m^3)	TL (m
nzene	1	0.7	20.4	0.020	0.035	:
luene	1	0.5	20.4	0.020	0.025	3:
nzene	2	6.6	23.1	0.023	0.287	:
luene	2	6.0	23.1	0.023	0.261	3:
hane	3	5.0	23.0	0.023	0.217	Simp: Asph
nzene X	3	0.4	23.0	0.023	0.017	:
lene	3	0.1	23.0	0.023	0.004	4:
esol	3	0.1	23.0	0.023	0.004	:
imethyl benzene	3	0.1	23.0	0.023	0.004	1:
etylene	4	30	26.5	0.027	1.11	Simp: Asph

Table 1 Cont.d

Possible Structure	Tube Number	Quantity in Tube (μg)	Volume Sampled (l)	Volume Sampled (m^3)	Concentration (mg/m^3)	TL (m
rbon dioxide / opane / rmaldehyde / nyl Alcohol — grouped together as possible anylite	4 / 4 / 4 / 4	100	26.5	0.027	3.70	9 Simpl As
luene	4	80	26.5	0.027	2.96	
enol	4	54	26.5	0.027	2.00	
ptane / Pentenoic Acid / xaldehyde / :lohexanol — grouped together as possible anylite	4 / 4 / 4 / 4	30	26.5	0.027	1.11	1
methyl Phenol (Cresol)	4	20	26.5	0.027	0.741	
etylene	6	14	45	0.045	0.31	Simpl Asphy
opionaldehyde	6	200	45	0.045	4.44	
uene	6	74	45	0.045	1.64	
hydroxy Phenol (hydroquinone)	6	27	45	0.045	0.60	
rbon Dioxide / opane / etyaldehyde	8 / 8 / 8	150	45	0.045	3.33	9 Simp Asph
luene	8	85	45	0.045	1.89	
lene	8	20	45	0.045	0.44	

NOTE: 1) Only those materials indicating a measureable "quantity in tube" are indicated above (as per Peninsula Tables (Appendix 1)).

2) Tenax tubes 6 and 8 were obtained October 8, 1980 to determine the feasibility of using Tenax tubes as an adsorbing medium.

3) See Appendix 2 for position of samplers.

NOTE: 4) Tube 4 has two groups of 4 chemicals where each group may be a possible anylite. Tube 8 has one group of 3 chemicals which may also be a possible anylite. Due to the inability of the mass spectrometer to differentiate which of these chemicals is the actual anylite, it is difficult to allow comparisons between them and the TLV to be made.

The six Tenax tubes submitted to Peninsula Chemical Analysis Limited (tubes 1-4 taken at a 100 ml/min flow rate the night of October 20/21, 1980, and the tubes 6-8 taken at a 1.5 l/min flow rate October 8, 1980) were analyzed using a mass spectrometer. Tubes 6 and 8 were taken primarily to determine the feasibility of using Tenax as an adsorbing medium for the unknown contaminants being released during the curing of the resin (M6860) of stators (October 20/21, 1980, stator 505-1054). Tubes 1-4 should be looked at most closely since the lowe flow rate allows a greater time period for the tenax to adsorb the contaminants.

According to Dr. R.J. Smythe (Director of Peninsula Chemical Analysis Limit the mass spectrometer technique is a qualitative rather than a quantitative technique thereby indicating that the concentrations of contaiminants are approximate only. As can be seen in the results section, the contaminant concentrations are much less than the TLV-TWA. These concentrations exist within the oven during the cure and indicate that concentrations outside of the oven (i.e. within building 7) are significantly less since minimal release through the oven occurs. It is therefore possible to indicate that contaminants eminating from the curing resin are of such low cencentration outside the oven in the work environment of building 7 as to not pose a hazard to health.

The mass spectrometer data indicates that thermal decomposition is probabl not a major problem in this study since a large proportion of the recognizable or present appear to be stable aromatic compounds and low molecular weight species, according to Dr. R.J. Smythe.

Since the smell is bothersome to those walking outside in the courtyard, changes to the system should be made to remove this problem.

To determine the concentration of the contaminant being emitted into the outside environment, calculations based on the concentrations shown (i.e. within the oven) and the exhaust system flow rate are required. Based on the very low levels within the oven, it is hardly likely that emissions from the stack will be outside of the regulated limits.

The irritating odour reported by those within the building and those walking through the courtyard may be due to the cresol, formaldehyde, hexaldehyde acetaldehyde, propionaldehyde and phenol. These chemicals are known irritants to the eyes and respiratory tract, but the levels expected outside the oven and in t courtyard will not pose a health risk. The other chemicals are central nervous system depressants, but the levels are too low to be of toxicologic significance.

The many other chemicals detected in the air sample were too low to quantify, but the toxicologic properties will be primarily central nervous system depression and irritation of the eyes and respiratory tract.

RECOMMENDATIONS

1. Maintain a slight negative pressure within the ovens to minimize the leakage within the plant.

2. Check frequently the integrity of the gaskets, door jams and seams and replace these as necessary to minimize leakage.

3. Check frequently the fan blades, motors and belts to ensure they are in proper working order.

4. If possible, increase the capacity of the exhaust fan to dissipate the emiss higher above the building roofs. This can be done in concert with the use of higher stacks.

P.A. Gray:ll

m/e	Possible Structure	Approximate quantity in t
50	Aromatic fragment	
51	" "	
52	" "	
63	" "	
65	" "	
67	Dienes	
69	Thiophenes or alkene/cycloalkene fragment	
77	Benzene fragment	
78	Benzene	0.7 micrograms
79	Aromatic fragment	
80	Cn H_2n-4 ie. C_6H_8	
81	Diene fragment	
91	Toluene fragment	
92	Toluene	0.5 micrograms
115	Trimethyl Substituted Benzene fragment	

m/e	Possible Structure	Approximate quantity in
26	acetylene or aromatic fragment	
27	C_2H_3	
29	C_2H_5 or CHO	
37	Unknown C_3H	
38	Aromatic fragment	
39	Aromatic, C_3H_3	
41	C_3H_5	
42	CH_2CO unsaturated acetates diketones and cyclic ketones	
50	Aromatic fragment	
51	" "	
52	" "	
54	Aromatic fragment	
56	CnH_2nCO (as m/e =42)	
63	Aromatic fragment	
65	" "	
66	Aromatic fragment or CnH_2n-4	
67	Dienes, alkynes, cycloalkenes CnH_2n-3	
68	Aromatic fragment	
69	CnH_2n-4 or thiophenes	
77	Benzene fragment	
78	Benzene	6.6 microgra
79	Aromatic fragment	
80	CnH_2n-4	
81	CnH_2n-3, CnH_2n-10	
91	Toluene fragment	
92	Toluene	6 micrograms
95	see m/e 81, furylalkyl, polyunsaturated alcohols, cyclic alcohols and others	

m/e	Possible Structure	Approximate quantity i
26	acetylene or aromatic fragment	
27	CnH_2n-1	
30	Ethane	5 micrograms
36	Unknown orgin	
37	Unknown C_3H	
38	Aromatic fragment	
39	Aromatic, C_3H_3	
40	C_3H_4	
41	CnH_2n-1, ie C_3H_5	
42	CnH_2nCO, unsaturated acetates, diketones and cyclic keytones	
50	Aromatic fragment	
51	" "	
53	" "	
55	C_4H_7 or CH_2CHCO	
63	Aromatic fragment	
65	" "	
67	Dienes, Alkynes and cycloalkenes, CnH_2n-3	
77	Benzene fragment	
78	Benzene	0.4 micrograms
79	Aromatic fragment	
81	CnH_2n-3, CnH_2-10 fragment	
91	Toluene - xylene fragment	
95	See m/e 81, Furylalkyl, polyunsaturated alcohols and ethers	
106	Xylene	0.1 micrograms
108	Cresol	0.1 micrograms
116	Trimethyl benzene	0.1 micrograms

m/e	Possible structure	Approximate quantity in
26	acetylene	30 micrograms
27	C_2H_3 ie. CnH_2n-1	
37	unknown C_3H	
38	C_3H_2 from aromatic fragmentation	
39	C_3H_3 " " "	
41	CnH_2n-1 fragment	
42	CnH_2nCO unsaturated acetates, diketones and cyclic ketones	
43	CnH_2n-1 fragment	
44	CO_2, C_3H_8, CH_3-CHO, vinyl alcohol	100 micrograms
53	C_4H_5	
55	C_4H_7, CH_2=CHC=O	
57	CnH_2n-1	
58	CH_3-CH_2-CHO	
67	C_5H_7	
69	C_5H_9, CH_3CH=CHC=O	
77	Benzene fragment C_6H_5	
79	Aromatic fragment	
80	CnH_2n-4 ie. C_6H_8	
81	furylalkyl fragment, polyunsaturated alcohol etc.	
82	$C4H_2O_2$, C_5H_6O or C_6H_{10}	
83	CnH_2n-1 from alkenes and cycloalkenes	
85	CnH_2n-1 or CnH_2n+1 CO	
91	Toluene fragment	
92	Toluene	80 micrograms
94	Phenol	54 "
95	see m/e =81	
97	C_7H_{13} ie. CnH_2n-1	
100	C_7H_{16}, $C_5H_8O_2$, $C_6H_{12}O$, cyclohexanol	30 micrograms
118	Dimethyl phenol (cresol)	20 "

Tube Six

m/e	Possible structure	Approximate quantity in tub
26	acetylene	14 micrograms
27	Cn-H_2n-1	
37	unknown C_3H	
38	aromatic fragment	
39	C_3H_3 aromatic fragment	
41	CnH_2n-1	
42	C_2H_2CO from unsaturated acetates, diketones etc.	
53	C_4H_5	
55	C_4H_7 or CH_2=CH_2C=O	
57	CnH_2n-1	
58	CH_3-CH_2-CHO propionaldehyde	200 micrograms
59	CnH_2n+1 O, CnH_2n-1 O_2	
67	C_5H_7	
69	C_5H_9, CH_3CH=CHC=O	
77	Benzene fragment	
79	Aromatic fragment	
80	CnH_2n-4 ie C_6H_8	
81	furylalkyl fragment, polyunsaturated alcohol	
91	toluene fragment	
92	toluene	74 micrograms
110	dihydroxyphenol (hydroquinone)	27 "

Tube Eight

m/e	Possible structure	Approximate quantity in tube
39	C_3H_3 aromatic fragment	
40	C_4H_4 " "	
44	CO_2 propane acetyaldehyde	150 micrograms
91	toluene fragment	
92	toluene	85 micrograms
105	xylene fragment	
106	xylene	20 micrograms

APPENDIX 2

Position of Samplers (i.e. when facing oven #2)

Tube #1 - left front port

Tube #2 - right front port

Tube #3 - right rear port (samples directly the effluent going out of chimney)

Tube #4 - left rear port

LIMITED

October 23, 1980

Project No. 6531

Canadian General Electric
Company Limited,
107 Park Street North,
Peterborough, Ontario.

Attention: Mr. Lloyd Chun

Dear Mr. Chun:

Enclosed please find the mass spectra generated by the samples submitted to our laboratory on October 9, 1980. The spectra have been run at two different gain levels to increase sensitivity and to achieve unambiguous mass counts.

The spectra all indicate the absence of any appreciable quantities of gases other than water, oxygen and nitrogen. (m/e = 28 for nitrogen and the doubly charged species at 14; similarly, oxygen at 32 has a doubly charged species at 16)

The spectra were obtained with our Hitachi RMU6-E mass spectrometer at 70 ev ionizing voltage. The instrument manufacturer claims a "detectability" of 0.05 ppm under favourable conditions, however, we have found that 1 - 2 ppm for atmospheric gas samples under favourable conditions is much more realistic.

The aqueous condensate obtained during the sampling experiments (mass spectra #7) again contains no appreciable quantities of organic material.

These preliminary investigations indicate that organic vapours and gases generated during the operation of Canadian General Electric's furnace system will probably <u>require concentration on adsorbent such as tenax.</u>

We trust that this is the information you require, but should you have any further queries concerning this report, please do not hesitate to contact this office.

Yours very truly,
PENINSULA CHEMICAL ANALYSIS LIMITED

Smythe

Richard J. Smythe, Ph. D.

RJS/brl
encl.

OTE: These samples & analysis were conducted prior to the use of Tenax tubes, the results showing the need for an adsorbent such as Tenax.

.BOX 810 NIAGARA FALLS ONT. L2E6V6 LAB. 6407 STANLEY AVE. UNIT 10.
416-356-7667

ARMATURE

HEALTH & SAFETY COMMITTEE

c.c. John Ball

Messrs: Ed Rowe
Ken Logan
Dave Davidson

On February 18, 1985 John Ball and Larry Ball representing the UE/CGE Joint Health and Safety Committee conducted an inspection of Building #5-7 and 7 2nd floor. The following items were observed as unsafe conditions. Your immediate attention to correct the following items would be appreciated. If you have any questions relative to these items please contact me at Local 7570.

BAY 214 Clean Room - Pull rope on conveyer at east end is frayed and not securely spliced.

BAY 209 Nylon straps are being used in the degreaser. These ropes should be scrapped. Degreaser operators should be advised that nylon straps should not be used in degreasing operation - Only chains should be used in future.

BAY 208 Crane under gallery east end - is used to lift rotors. This crane is rated for 6000 lbs. The rotors are 5500 lbs. (approximately) plus shaft. This rotor has to be jogged when placing rotor in fixture. The employees are concerned with overloading when jogging occurs. (Bernie Covert to follow-up)

BAY 208 Crane under gallery (west) - operators complained of crane making a grinding noise when travelling east and west. (Bernie Covert to follow-up)

BAY 206 Nylon straps on center pillar are frayed and should be scrapped.

BAY 206 Band Saw - Electric cables lying on the floor in front of saw where operators stand. This could cause a tripping hazard.

BAY 213 Oven # 3 - Holes in East side allow fumes to escape during baking operation.

BAY 213 Hygiene sinks are being used to dump epoxy and solvents. Employees should be informed of the hazards associated with solvents and the purpose of these hygiene sinks.

BAY 215 South Emergency Exit - snow buildup outside exit and materials outside could prevent easy access in case of emergency. (This item is complete Feb.19-85)

Outside corner of building 7 & 5 - V.P.I. exhaust system is leaking fluid on ground. This could get into storm sewer system.

BAY 217. Jammed by ice and cannot be opened, material also stored outside door. (Completed Feb.19-1985)

BAY 217 & 218 Welding spots on floor should be ground - tripping hazard.

D.Davidson Upper gallery Bay 217 - G.T.A. spreader. This machine originally had two palm buttons. A foot pedal has now been installed. The foot pedal is not guarded by a toe cap.
The two palm buttons should be put back into service - the present setup could cause the operators hands to be trapped if foot pedal was accidently tripped. (completed)

BAY 217 Coil stripper - guard on left side of stripper is broken and not properly secured. T.L. 142-152.

Grit blast at west end needs repair large dust buildup in area.

BAY 310 Grinder #241903 - Belt pully under table should be guarded.

North exit in cold room has a buildup of ice outside door and on stairs - (Completed Feb.19/85).

Lift truck forks are too short when lifting copper reels - this causes damage to the pallets - Extension forks should be made available when lifting and transporting copper reels.

L.T. Ball /aml
Larry T. Ball
UE/CGE Joint Health &
Safety Committee

J. Ball /aml
John Ball
UE/CGE Joint Health &
Safety Committee

ARMATURE
E

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

107 PARK STREET NORTH, PETERBOROUGH, ONTARIO, K9J 7B5 — TEL: (705) 748-7964

OCCUPATIONAL HEALTH AND SAFETY UNIT

8 October 1985

Armature Bldg.7
Messrs: E. Rowe
D. Davidson
W. Broadworth

An inspection of your area was conducted jointly by the UE/CGE Health & Safety Committee on Sept.23/85. The following safety items were noted. Would you please refer to the following items and arrange to have them corrected.

- Frekote 33 releasing agent give off fumes on Maxi Press - & suggest organic vapour respirator.

K. Logan

- Bay 213 north - rotor coil press enclosure - drive chain guard needs repair.
- Bay 209 north - two punch presses not properly guarded.

c.c. J. Ball - 642
U.E. Comm. member

aml/

L.T. Ball

L.T. Ball - Specialist
Accident Prevention
Occupational Health & Safety

Feb. 5 1986
Armature
#7 Upstairs

(F

0820

Sebours operator.

Call from Louise Ryan regarding heavy oven fumes. The oven ventilation system has been out of commission for approximately one week now.

At 0630 the area was full of blue smoke. Operators from lower part of building were in #5 Bldg to get clear of smoke.

Ed Rowe, Leo Collins, Ken Logan. They are aware that oven has been out of commission for some time. I asked how come they were operating without fans going.
Ken answered that no one is prepared to go on the roof to fix the fan right now. I suggested that salt on the ice would cure the problem. Also that the condition created in here was far from safe also. Larry Ball showed up about 0845.

Saw Don Nichols operator on ovens. Advised him that ovens are not to be operated without fans working. Also told him that the obligation is also his to refuse to operate an unsafe machine or system at any time.

Ken Logan was present while I spoke to Don. I also reminded Ken that he would also be liable if the oven was operated in an unsafe condition and someone was injured or made ill by it.

Larry + Ed Rowe went to see Paul Kupsella to enquire about the state of repairs scheduled for the fan units on the roof. Their excuse was that the roofs were unsafe. In fact the crane man bucket can be used to do the work in all likelihood anyhow.

1*TO:KEN E LOGAN (PBRO) 88-02-01 10:57 RECD:88-02-01 11:03
03 .5 FR:ROB BAKER RE:NEW VPI RESIN - BLDG 10 31L 880202

TO: WAYNE C BROADWORTH (PBRO)
CC: H ROLAND HOSEIN (MEAD)
BILL J LEGGE (PBRO)
KEN E LOGAN (PBRO)
J A MACDONALD (PBRO)
LORNE D READ (PBRO)
BOB H REHDER (PBRO)
PIERO V RONCA (PBRO)
ED J ROWE (PBRO)
ROM: ROB BAKER $\boxed{\text{88-02-01}}$ 10:57
RE: NEW VPI RESIN - BLDG 10

confirm our discussion this morning about the environmental aspects the new resin:

I am unable to predict at this time whether or not Bldg 10 would be less suitable for exhausting general shop air than Bldg 7. We don't have a good handle on air patterns off the property.

In order to evaluate the problem in Bldg 10 (or Bldg 7) we will need a layout of the process and where exhaust will be required. We will have to make an estimate of the air volumes and then try and decide ow best to treat them. I expect that exhaust rates could be quite n (greater than 20,000 cfm) which also brings up the problem of make-up air.

I don't know what treatment methods will work. The Lab are going to have to help out with this, perhaps with a small scale model and a determination of the mass flow of the vinyl toluene and a relative "odour index". It is possible with very low odour that straight dilution would be permitted.

81

MAY 19 1981   FIB bldg

Degreaser
TRICHLOROETHYLENE

Ontario Ministry of Labour — Occupational Health and Safety Division — Industrial Health and Safety Branch, 400 University Ave, Toronto, Ontario M7A 1T7, Tel. 965-4125

FILE NUMBER: 336 0000-

PLEASE QUOTE FILE NUMBER ON ALL CORRESPONDENCE

Copy

EMPLOYER: Canadian General Electric Co Ltd

REG: 13

MAILING ADDRESS: 107 Park St N

CITY: Peterborough

POSTAL CODE: K9J 7B5

LOCATION OF PREMISES:

MANAGEMENT NAME: M. Gordon

STANDARD GEOGRAPHICAL CLASSIFICATION: 35 15 14 1 04

TRIGGER:

OUT STD:

T/G: 1

DR: 413

TELEPHONE NO: 705 742 77

OWNER OF PREMISES: Canadian General Electric Co Ltd

COMM/REP: 6

UNION: 160

LOC: 005

OWNER MAILING ADDRESS: 214 King St W.

CITY: Toronto

POSTAL CODE: M5H 1K7

PROV: Ont

ACTIVITY OF EMPLOYER - COMPLETE WHEN SIC NUMBER TO BE CHANGED OR FOR NEW EMPLOYER

SEND COPY TO   CSB ☐   HEALTH ☐ ☐ ☐ ☐

KEYPUNCH DATA / FILE NUMBER	INSPECTOR NUMBER	INSPECTION DATE DAY	MONTH	YEAR	FED	INSP. CODE	CYCLE	NUMBER OF EMPLOYEES
336000050008	430	19	05	81	2	5	06	0 1765 0005

39 T/G NEW DURATION 45 NEW MANAGEMENT 64 65 NEW TELEPHONE NO

NOTES

FOR FURTHER INFORMATION
CONTACT REGIONAL MANAGER
INDUSTRIAL HEALTH & SAFETY BRANCH
... SHEPPARD AVE. EAST
SUITE 216
WILLOWDALE, ONTARIO M2N 5X5
TELEPHONE (416) 224-1606

TAKE NOTICE THAT YOU ARE REQUIRED UNDER THE OCCUPATIONAL HEALTH & SAFETY ACT, 1978 TO POST A COPY OF THIS REPORT IN A CONSPICUOUS PLACE.

Internal Responsibility System
Self Assessment

Follow-up of Occupational Health Report April 27/81

Contacts: Mr B Bergey, Safety Manager
Mr J. Baile, Area Safety Member
for United Electrical, Radio and Machine
Workers of America, Local 524

The degreaser in Bld 8 has been my unresolved concern. Now that this order has been issued I will wait to see if it is resolved.

REPORT RECEIVED BY

INSPECTOR

Ontario Ministry of Labour — Occupational Health and Safety Division

Industrial Health and Safety Branch

400 University Ave
Toronto, Ontario
M7A 1T7
Tel 965-4125

PAGE NO ____ OF ____

INSPECTION DATE		
DAY	MONTH	YEAR
19	05	51

FILE NUMBER		
SIC	REG. NO.	DIV.
336	00005	0008

TO: ORDERS TO EMPLOYER

EMPLOYER: CANADIAN GENERAL ELECTRIC CO LTD

ADDRESS: 107 PARK ST. N. PETERBOROUGH

Take notice that you are required to comply with the following orders under
☒ The Occupational Health and Safety Act, 1978 ☐ Canada Labour Code Part IV

Please notify the Branch by letter upon completion

ORDER NUMBER	E OR O	I/A	I/R	ACT OR REGULATION SECTION	
					EVALUATION
					BLD 5, BAY K18
00656	E	I		145	ALL MEASURES NECESSARY TO PREVENT EXPOSURE TO ANY TOXIC SUBSTANCE BY INHALATION SHALL BE TAKEN AND WITHOUT LIMITING THE GENERALITY OF THE FOREGOING WHERE ANY TOXIC SUBSTANCE IS USED OR PRODUCED, ADEQUATE VENTILATION SHALL BE PROVIDED
					(1) ADEQUATE VENTILATION OR OTHER MEANS SHALL BE PROVIDED AT THE DEGREASER TO REDUCE THE FUMES FROM ESCAPING AT ALL TIMES, TO MAINTAIN BELOW THE TLV OF 100 PPM.
					(NOTED AT TIME, LIP EXHAUST NOT OPERATING)

REPORT RECEIVED BY: [signature]

INSPECTOR: [signature]

SPI Supplies Division
Structure Probe, Inc.
P.O. Box 656 West Chester, PA 19381-0656 USA
***Phone:** 1-(610)-436-5400 **Fax:** 1-(610)-436-5755*
***E-mail:** spi3spi@2spi.com*
WWW: http://www.2spi.com
Manufacturer's CAGE: 1P573

Material Safety Data Sheet

SPI #02523-AA and 02523-AB Methyl alcohol

Section 1: Identification


```
Date Effective..........  July 14, 2003
                          (most recent revision)

Chemical Name/Synonyms... Methanol

Emergencies
Contacting CHEMTREC:

24 Hour Emergency Use Only #'s...
Worldwide phone: 1-(703)-527-3887
Worldwide FAX:   1-(703)-741-6090
Toll-free phone: 1-(800)-424-9300 USA only

Product or Trade Name.... SPI #02523-AA and 02523-AB Methyl alcohol

Synonyms................  Carbinol; Methyl Alcohol; Methyl hydroxide;
                          Monohydroxymethane; Pyroxylic spirit; Wood alcohol;
                          Wood naptha; Wood spirit; Monohydroxymethane;
                          Methyl hydrate.
```

Hazardous Material Information System USA			National Fire Protection Association USA
	Health	1	
	Fire Hazard	3	
	Reactivity	0	
	Personal Protection		

NFPA Rating: (estimated) Health: 1; Flammability: 3; Instability: 0

Section 2 Composition

Component Name	CAS #	Percent	EINECS/ELINCS
Methyl alcohol	67-56-1	>99.0	200-659-6

Section 3: Hazard Identification

Emergency overview:

Appearance:

Clear, colorless liquid. Flash Point: 11°C (52°F).
Poison! Cannot be made non-poisonous. Causes eye and skin irritation. May be absorbed through intact skin. This substance has caused adverse reproductive and fetal effects in animals.

Danger! Flammable liquid and vapor. Harmful if inhaled. May be fatal or cause blindness if swallowed. May cause central nervous system depression. Causes respiratory tract irritation. May cause liver, kidney and heart damage.

Target Organs:
Kidneys, heart, central nervous system, liver, eyes.

Potential Health Effects

Eye: Produces irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. May cause painful sensitization to light.

Skin: Causes moderate skin irritation. May be absorbed through the skin in harmful amounts. Prolonged and/or repeated contact may cause defatting of the skin and dermatitis.

Ingestion: May be fatal or cause blindness if swallowed. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause systemic toxicity with acidosis. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause cardiopulmonary system effects.

Inhalation: Harmful if inhaled. May cause adverse central nervous system effects including headache, convulsions, and possible death. May cause visual impairment and possible permanent blindness. Causes irritation of the mucous membrane.

Chronic: Prolonged or repeated skin contact may cause dermatitis. Chronic inhalation and ingestion may cause effects similar to those of acute inhalation and ingestion. Chronic exposure may cause reproductive disorders and teratogenic effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause liver, kidney, and heart damage.

Section 4: First Aid Measures

Eyes:
Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.

Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately. Induce vomiting by giving one teaspoon of Syrup of Ipecac.

Inhalation:
Get medical aid immediately. Remove from exposure to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth-to- mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.

Notes to Physician: Effects may be delayed. Ethanol may inhibit methanol metabolism.

Section 5: Fire Fighting Measures

General Information:
Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Flammable Liquid:
Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May be ignited by heat, sparks, and flame.

Extinguishing Media:
For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Do NOT use straight streams of water.

Flash Point: 11°C (52°F).

Autoignition Temperature: 464°C (867.20°F)
Explosion Limits, Lower: 6.0 vol %

Upper: 36.00 vol %

Section 6: Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then ; in suitable container. Use water spray to disperse the gas/vapor. Remove all sources o: ignition. Provide ventilation. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7: Handling and Storage

Handling:
Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Gr(and bond containers when transferring material. Avoid contact with eyes, skin, and clotl Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.

Storage:
Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a dry, well-ventilated area away from incompatible substances. It should be in a designat("Flammables-area". Keep containers tightly closed. Do not store in aluminum or lead containers.

Section 8: Exposure Controls and Personal Protection

Engineering Controls:
Use explosion-proof ventilation equipment. Facilities storing or utilizing this materia: should be equipped with an eyewash facility and a safety shower. Use adequate general o: local exhaust ventilation to keep airborne concentrations below the permissible exposure limits. Use only under a chemical fume hood.

Exposure Limits:

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Methanol	200 ppm TWA; 250 ppm STEL; skin - potential for	200 ppm TWA; 260 mg/m3 TWA 6000 ppm	200 ppm TWA; 260 mg/m3 TWA

cutaneous absorption IDLH

OSHA Vacated PELs: Methanol: 200 ppm TWA; 260 mg/m3 TWA; 250 ppm STEL; 325 mg/m3 STEL

Personal Protective Equipment
Eyes: Wear chemical goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR §1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workpl conditions warrant a respirator's use.

Section 9: Physical and Chemical Properties

Physical State: Liquid
Appearance: Clear, colorless

Odor: Alcohol-like - weak odor
pH: Not available.
Vapor Pressure: 128 mm Hg @ 20°C
Vapor Density: 1.11 (Air=1)
Evaporation Rate: 5.2 (Ether=1)
Viscosity: 0.55 cP 20°C

Boiling Point: 64.7°C @ 760.00mm Hg
Freezing/Melting Point: -98°C
Decomposition Temperature: Not available.
Solubility: miscible
Specific Gravity/Density: .7910g/cm^3

Molecular Formula: CH_4O
Molecular Weight: 32.04

Section 10: Stability and Reactivity

Chemical Stability:
Stable under normal temperatures and pressures.

Conditions to Avoid:
High temperatures, ignition sources.

Incompatibilities with Other Materials:
Strong oxidizing agents, strong acids, isocyanates, aliphatic amines, caustics (e.g. ammonia, ammonium hydroxide, calcium hydroxide, potassium hydroxide, sodium hydroxide).

Hazardous Decomposition Products:
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide, formaldehyde.

Hazardous Polymerization:
Will not occur.

Section 11: Toxicological Information

RTECS#: PC1400000
CAS# 67-56-1:
LD_{50}/LC_{50}:
CAS# 67-56-1:

Draize test, rabbit, eye: 40 mg Moderate;
Draize test, rabbit, eye: 100 mg/24H Moderate;
Draize test, rabbit, skin: 20 mg/24H Moderate;
Inhalation, rat: LC_{50} = 64000 ppm/4H;
Oral, mouse: LD_{50} = 7300 mg/kg;
Oral, rabbit: LD_{50} = 14200 mg/kg;
Oral, rat: LD_{50} = 5628 mg/kg;
Skin, rabbit: LD_{50} = 15800 mg/kg

Carcinogenicity:
CAS# 67-56-1: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

Epidemiology: No data available.
Teratogenicity: Effects on Newborn: Behaviorial, Oral, rat: TDL_o=7500 mg/kg (female 17-19 days after conception).

Effects on Embryo or Fetus:
Fetotoxicity, Inhalation, rat: TCL_o=10000 ppm/7H (female 7-15 days after conception).

Specific Developmental Abnormalities:

Cardiovascular, Musculoskeletal, Urogenital, Inhalation, rat: TCL_o=20000 ppm/7H (7-14 days after conception).

Reproductive Effects:
Paternal Effects:
Spermatogenesis: Intraperitoneal, mouse TDL_o=5 g/kg (male 5 days pre-mating).
Fertility: Oral, rat: TDL_o =35295 mg/kg (female 1-15 days after conception).
Paternal Effects: Testes, Epididymis, Sperm duct: Oral, rat: TDL_o = 200 ppm/20H (male 78 weeks pre-mating).

Neurotoxicity: ACGIH cites neuropathy, vision and CNS under TLV basis.
Mutagenicity:
DNA inhibition: Human Lymphocyte = 300 mmol/L.
DNA damage: Oral, rat = 10 umol/kg.
Mutation in microorganisms: Mouse Lymphocyte = 7900mg/L.
Cytogenetic analysis: Oral, mouse = 1 gm/kg.

Other Studies: No data available.

Section 12: Ecological Information

Ecotoxicity:

Fish: Fathead Minnow: 29.4 g/L; 96 Hr; LC50 (unspecified)
Goldfish: 250 ppm; 11 Hr; resulted in death

Rainbow trout: 8000 mg/L; 48 Hr; LC50 (unspecified)
Rainbow trout: LC50 = 13-68 mg/L; 96 Hr.; 12°C .
Fathead Minnow: LC50 = 29400 mg/L; 96 Hr.; 25°C, pH 7.63
Rainbow trout: LC50 = 8000 mg/L; 48 Hr.;
Unspecified ria:
Phytobacterium phosphoreum: EC50 = 51,000-320,000 mg/L; 30 minutes; Microtox test No data available.

Environmental: Dangerous to aquatic life in high concentrations. Aquatic toxicity rating: TLm 96>1000 ppm. May be dangerous if it enters water intakes. Methyl alcohol is expected to biodegrade in soil and water very rapidly. This product will show high soil mobility and will be degraded from the ambient atmosphere by the reaction with photochemically produced hyroxyl radicals with an estimated half-life of 17.8 days. Bioconcentration factor for fish (golden ide) < 10. Based on a log Kow of -0.77, the BCF value for methanol can be estimated to be 0.2.

Physical: No information available.

Other: No information available.

Section 13: Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in

40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.
RCRA U-Series: CAS# 67-56-1: waste number U154; (Ignitable waste).

Section 14: Transport Information

	US DOT	IATA	RID/ADR	IMO	Canada TDG

Shipping Name:	METHANOL	METHANOL
Hazard Class:	3	3(6.1)
UN Number:	UN1230	UN1230
Packing Group:	II	II
Additional Info:		FLASHPOINT 11°C (52°F)

Section 15: Regulatory Information

US Federal Regulations

TSCA
CAS# 67-56-1 is listed on the TSCA inventory.

Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
CAS# 67-56-1: final RQ = 5000 pounds (2270 kg)

Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes
CAS # 67-56-1: acute, flammable.

Section 313
This material contains Methanol (CAS# 67-56-1, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and **40 CFR Part 373**.

Clean Air Act:
CAS# 67-56-1 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by

OSHA.

States (USA):
CAS# 67-56-1 can be found on the following state right to know lists:

California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives Hazard Symbols:
T F

Risk Phrases:
R 11 Highly flammable.
R 23/24/25 Toxic by inhalation, in contact with skin and if swallowed.
R 39/23/24/25 Toxic : danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.

Safety Phrases:

S 16 Keep away from sources of ignition - No smoking.
S 36/37 Wear suitable protective clothing and gloves.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 7 Keep container tightly closed.

WGK (Water Danger/Protection)
CAS# 67-56-1: 1
Canada - DSL/NDSL
CAS# 67-56-1 is listed on Canada's DSL List.
Canada - WHMIS

This product has a WHMIS classification of B2, D1A, D2B.

Canadian Ingredient Disclosure List
CAS# 67-56-1 is listed on the Canadian Ingredient Disclosure List.

Exposure Limits Around the World:
CAS# 67-56-1: OEL-ARAB Republic of Egypt:TWA 200 ppm (260 mg/m3);Skin OEL-AUSTRALIA:TWA 200 ppm (260 mg/m3);STEL 250 ppm;Skin OEL-BELGIUM:TWA 200 ppm (262 mg/m3);STEL 250 ppm;Skin OEL-CZECHOSLOVAKIA:TWA 100 mg/m3;STEL 500 mg/m3 OEL-DENMARK:TWA 200 ppm (260 mg/m3);Skin OEL-FINLAND:TWA 200 ppm (260 mg/m3);STEL 250 ppm;Skin OEL-FRANCE:TWA 200 ppm (260 mg/m3);STEL 1000 ppm (1300 mg/m3) OEL-GERMANY:TWA 200 ppm (260 mg/m3);Skin OEL-HUNGARY:TWA 50 mg/m3;STEL 100 mg/m3;Skin JAN9 OEL-JAPAN:TWA 200 ppm (260 mg/m3);Skin OEL-THE NETHERLANDS:TWA 200 ppm (260 mg/m3);Skin OEL-THE PHILIPPINES:TWA 200 ppm (260 mg/m3) OEL-POLAND:TWA 100 mg/m3 OEL-RUSSIA:TWA 200 ppm;STEL 5 mg/m3;Skin OEL-SWEDEN:TWA 200 ppm (250 mg/m3);STEL 250 ppm (350 mg/m3);Skin OEL-SWITZERLAND:TWA 200 ppm (260 mg/m3);STEL 400 ppm;Skin OEL-THAILAND:TWA 200 ppm (260 mg/m3) OEL-TURKEY:TWA 200 ppm (260 mg/m3) OEL-UNITED KINGDOM:TWA 200 ppm (260 mg/m3);STEL 250 ppm;Skin OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

California Prop. 65:

Proposition 65 requires manufacturers or distributors of consumer products into the State of California to provide a warning statement if the product contains ingredients for which the State has found to cause cancer, birth defects or other reproductive harm. If this product contains an ingredient listed by the State of California to cause cancer or reproductive toxicity, it will be listed below:

None

Section 16: Other Information

Disclaimer of Liability:

Caution! Do not use SPI Supplies products or materials in applications involving implantation within the body; direct or indirect contact with the blood pathway; contact with bone, tissue, tissue fluid, or blood; or prolonged contact with mucous membranes. Products offered by SPI Supplies are not designed or manufactured for use in implantation in the human body or in contact with internal body fluids or tissues. SPI Supplies will not provide to customers making devices for such applications any notice, certification, or information necessary for such medical device use required by US FDA (Food and Drug Administration) regulation or any other statute. SPI Supplies and Structure Probe, Inc. make no representation, promise, express warranty or implied warranty concerning the suitability of these materials for use in implantation in the human body or in contact with internal body tissues of fluids.

****

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ON-LINE To Ask a Question or Make a Comment

ON-LINE To Place an Order or Request a Quote

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Return to:

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- SPI Supplies Catalog Table of Contents
- SPI Supplies Home Page

Worldwide Distributors, Representatives, and Agents

MSDS Number: M2015 * * * * * *Effective Date: 08/10/04* * * * * * *Supercedes: 11/12/01*

MSDS *Material Safety Data Sheet*

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response in Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 703-527-3887

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS J.T.Baker

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

METHYL ALCOHOL

1. Product Identification

Synonyms: Wood alcohol; methanol; carbinol
CAS No.: 67-56-1
Molecular Weight: 32.04
Chemical Formula: CH_3OH
Product Codes:
J.T. Baker: 5217, 5370, 5595, 5794, 5811, 5842, 5869, 9049, 9063, 9065, 9066, 9067, 9069, 9070, 9071, 9073, 9075, 9076, 9077, 9091, 9093, 9096, 9097, 9098, 9263, 9822, 9830, V654
Mallinckrodt: 3004, 3006, 3016, 3017, 3018, 3024, 3041, 3701, 4295, 5160, 8814, H080, H488, H603, H985, V079, V571

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Methyl Alcohol	67-56-1	100%	Yes

3. Hazards Identification

Emergency Overview

POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 1 - Slight

Contact Rating: 3 - Severe (Life)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Once absorbed into the body, it is very slowly eliminated. Symptoms of overexposure may include headache, drowsiness, nausea, vomiting, blurred vision, blindness, coma, and death. A person may get better but then worse again up to 30 hours later.
Ingestion:
Toxic. Symptoms parallel inhalation. Can intoxicate and cause blindness. Usual fatal dose: 100-125 milliliters.
Skin Contact:
Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure.
Eye Contact:
Irritant. Continued exposure may cause eye lesions.
Chronic Exposure:
Marked impairment of vision has been reported. Repeated or prolonged exposure may cause skin irritation.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.
Ingestion:
Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
Skin Contact:
Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 12C (54F) CC
Autoignition temperature: 464C (867F)
Flammable limits in air % by volume:
lel: 6.0; uel: 36
Flammable Liquid and Vapor!
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Moderate explosion hazard and dangerous fire hazard when exposed to heat, sparks or flames. Sensitive to static discharge.
Fire Extinguishing Media:
Use alcohol foam, dry chemical or carbon dioxide. (Water may be ineffective.)

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Use water spray to blanket fire, cool fire exposed containers, and to flush non-ignited spills or vapors away from fire. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

J. T. Baker SOLUSORB® solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
For Methyl Alcohol:
- OSHA Permissible Exposure Limit (PEL):
200 ppm (TWA)
- ACGIH Threshold Limit Value (TLV):
200 ppm (TWA), 250 ppm (STEL) skin

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-facepiece respirator, airlined hood, or full-facepiece self-contained breathing apparatus. Breathing air quality must meet the requirements of the OSHA respiratory protection standard (29CFR1910.134). This substance has poor warning properties.

Skin Protection:
Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed

in areas of unusual exposure.
Eye Protection:
Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Miscible in water.
Specific Gravity:
0.8
pH:
No information found.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
64.5C (147F)
Melting Point:
-98C (-144F)
Vapor Density (Air=1):
1.1
Vapor Pressure (mm Hg):
97 @ 20C (68F)
Evaporation Rate (BuAc=1):
5.9

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.
Hazardous Decomposition Products:
May form carbon dioxide, carbon monoxide, and formaldehyde when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizing agents such as nitrates, perchlorates or sulfuric acid. Will attack some forms of plastics, rubber, and coatings. May react with metallic aluminum and generate hydrogen gas.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Methyl Alcohol (Methanol) Oral rat LD50: 5628 mg/kg; inhalation rat LC50: 64000 ppm/4H; skin rabbit LD50: 15800 mg/kg; Irritation data-standard Draize test: skin, rabbit: 20mg/24 hr. Moderate; eye, rabbit: 100 mg/24 hr. Moderate. Investigated as a mutagen, reproductive effector.

```
--------\Cancer Lists\------------------------------------------------------
                                         ---NTP Carcinogen---
Ingredient                               Known    Anticipated    IARC Category
------------------------------------     -----    -----------    -------------
```

Methyl Alcohol (67-56-1)	No	No	None

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into the water, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into the air, this material is expected to exist in the aerosol phase with a short half-life. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into air, this material is expected to have a half-life between 10 and 30 days. When released into the air, this material is expected to be readily removed from the atmosphere by wet deposition.
Environmental Toxicity:
This material is expected to be slightly toxic to aquatic life.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: METHANOL
Hazard Class: 3
UN/NA: UN1230
Packing Group: II
Information reported for product/size: 358LB

International (Water, I.M.O.)

Proper Shipping Name: METHANOL
Hazard Class: 3, 6.1
UN/NA: UN1230
Packing Group: II
Information reported for product/size: 358LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Methyl Alcohol (67-56-1)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.

```
Methyl Alcohol (67-56-1)                    Yes   Yes   No    Yes

--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
-----------------------------------------  ---   -----   ----  --------------
Methyl Alcohol (67-56-1)                   No    No      Yes        No

--------\Federal, State & International Regulations - Part 2\----------------
                                                     -RCRA-    -TSCA-
Ingredient                                 CERCLA    261.33     8(d)
-----------------------------------------  ------    ------    ------
Methyl Alcohol (67-56-1)                   5000      U154       No


Chemical Weapons Convention:  No     TSCA 12(b):  No     CDTA:  No
SARA 311/312:  Acute: Yes      Chronic: Yes   Fire: Yes Pressure: No
Reactivity: No          (Pure / Liquid)
```

Australian Hazchem Code: 2PE
Poison Schedule: S6
WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

---

16. Other Information

NFPA Ratings: Health: **1** Flammability: **3** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! VAPOR HARMFUL. MAY BE FATAL OR CAUSE BLINDNESS IF SWALLOWED. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. CANNOT BE MADE NONPOISONOUS. FLAMMABLE LIQUID AND VAPOR. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM AND LIVER.
Label Precautions:
Avoid breathing vapor.
Avoid contact with eyes, skin and clothing.
Wash thoroughly after handling.
Keep container closed.
Use only with adequate ventilation.
Keep away from heat, sparks and flame.
Label First Aid:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.
Product Use:
Laboratory Reagent.
Revision Information:
No Changes.
Disclaimer:
****

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****

Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

POLYESTER
VINYL

SEE PHTHALIC ANHYDRIDE ALSO PAGE 184

PRODUCT DATA

Effective July 15, 1976
Supersedes July 1, 1974 Issue

ROLAND HASKIN

1631 & 1636 SEGMENT PLATE

1631 is built-up mica insulation made with muscovite mica splittings bonded with an alkyd-vinly resin. 1636 is made with mica splittings sandwiched between mica paper. 1631 offers excellent stability, greater than is available with shellac-bonded mica. 1636 offers lower cost. Both are fully cured products that may be punched or cut to any desired shape or size with ease and have excellent hot-crush resistance.

SUGGESTED USES

1631 and 1636 are suggested for 155°C applications for commutator segments, spacers, washers and other flat areas where a rigid insulation is required.

PRODUCT DETAILS

	1631	1636
Binder	alkyd-vinyl	alkyd-vinyl
Binder content - % max	5%	9%
Density - pounds per cubic inch	0.092	0.085
Thickness tolerances (ASTMD-374C)—sanded—inches average	±0.001	±0.005
inches individual	±0.002	±0.001

PERFORMANCE PROPERTIES

	1631	1636
Temperature class	155°C	155°C
Dielectric strength (ASTM D 352-56T)		
Short time, 2-inch electrodes in air - vpm avg.		
≤ .030" thick	650	650
> .030" thick	550	550
Stability - slip and ooze at 20,000 psi, 240°C	nil	nil
Compressibility, cold, 3,000 psi	< 2%	< 4%
Punchability	excellent	excellent
Arc resistanc, seconds	150-250	150-250

AVAILABLE FORM

1631 is available in punched parts or 37 inch by 39 inch sheets, while 1636 sheet size is 36 inch by 38 inch. Both are available in thickness ranging from 0.020 to 0.065 inch.

ORDERING INSTRUCTIONS

Address all orders or requests for technical information to your nearest General Electric Insulating Materials Distributor or Field Sales Office, or to Insulating Materials, General Electric Company, 1 Campbell Road, Schenectady, New York 12306.

...ne
Phone
VanAllen
Hist.File

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME General Electric Company, Insulating Materials Prod. Section	EMERGENCY TELEPHONE NO. (518) 385-3357
ADDRESS (Number, Street, City, State, and ZIP Code) 1 Campbell Road, Schenectady, New York 12345	
CHEMICAL NAME AND SYNONYMS Polyester Bonded Electrical Insulation	TRADE NAME AND SYNONYMS 1631 Laminated Flake Mica Board
CHEMICAL FAMILY Polyester Bonded Flake Mica	FORMULA Modified Polyester

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Alcohol, MEK, Toluene Mixture	< 5	200 ppm

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	NA	SPECIFIC GRAVITY (H_2O=1)	NA
VAPOR PRESSURE (mm Hg.)	NA	PERCENT, VOLATILE BY VOLUME (%)	< .5
VAPOR DENSITY (AIR=1)	NA	EVAPORATION RATE (______ =1)	NA
SOLUBILITY IN WATER	NA		
APPEARANCE AND ODOR	Gray solid laminate. Odor mild to odorless.		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) NA	FLAMMABLE LIMITS	NA	Lel	Uel

EXTINGUISHING MEDIA
Water, foam or dry chemical.

SPECIAL FIRE FIGHTING PROCEDURES
None

UNUSUAL FIRE AND EXPLOSION HAZARDS
Avoid open flames.

SECTION V - HEALTH HAZARD DATA

SHOLD LIMIT VALUE <.5% 200 ppm See Section II (Alcohol, MEK, Toluene)

S OF OVEREXPOSURE
ssive inhalation of high concentration may cause conditions such as headaches
drowsiness, or vomiting. If swallowed, could cause drunkiness or systematic illness.

ERGENCY AND FIRST AID PROCEDURES
overcome, remove from area immediately, call physician. If breathimg is irregular or
opped, administer oxygen or resuscitation. For eye irritation, wash with plain
ter.

SECTION VI - REACTIVITY DATA

ABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	Avoid open flame.

COMPATABILITY *(Materials to avoid)*

ZARDOUS DECOMPOSITION PRODUCTS

ZARDOUS YMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

P... TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
? returned to original container.

STE DISPOSAL METHOD
r local sanitary regulations. The material is a solid laminate. May be shredded,
opped up, or pulverized and buried.

SECTION VIII - SPECIAL PROTECTION INFORMATION

SPIRATORY PROTECTION *(Specify type)*
one

NTILATION		
	LOCAL EXHAUST Normal	SPECIAL
	MECHANICAL *(General)*	OTHER Avoid open flame

OTECTIVE GLOVES	Yes	EYE PROTECTION	Recommended

HER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

CAUTIONS TO BE TAKEN IN HANDLING AND STORING
lake Mica may cuase mild skin irritation. Wash with soap and water.

PRECAUTIONS
material is not temperature sensitive. Avoid open flame. Avoid sharp edges
o prevent cuts and abrasions.

BIBLIOGRAPHY

Klauder, J. V., L. Shelanski, and K. Gabriel. 1955. Industrial uses of fluorine and oxalic acid. AMA Arch. Ind. Health 12:412.

PHTHALIC ANHYDRIDE

DESCRIPTION

$C_8H_4O_3$, phthalic anhydride, is moderately flammable, white, lustrous, solid, with needle-like crystals.

SYNONYMS

Phthalic acid anhydride, benzene-o-dicarboxylic acid anhydride, phthalandione.

POTENTIAL OCCUPATIONAL EXPOSURES

Phthalic anhydride is used in the manufacture of phthaleins, benzoic acid, alkyd and polyester resins, synthetic indigo, and phthalic acid, which is used as a plasticizer for vinyl resins. To a lesser extent, it is used in the production of alizarin dye, anthranilic acid, anthraquinone, diethyl phthalate, dimethyl phthalate, erythrosin, isophthalic acid, methyl aniline, phenolphthalein, phthalamide, sulfathalidine, and terephthalic acid. It has also found use in pesticides and herbicides, as well as perfumes.

A partial list of occupations in which exposure may occur includes:

Alizarin dye makers	Mylar plastic makers
Alkyd resin makers	Organic chemical synthesizers
Automobile finish makers	Phthalein makers
Cellulose acetate plasticizer makers	Resin makers
Dacron fiber makers	Vat dye makers
Erythrosin makers	Vinyl plasticizer makers
Insecticide makers	

PERMISSIBLE EXPOSURE LIMITS

The Federal standard is 2 ppm (12 mg/m³).

ROUTE OF ENTRY

Inhalation of dust, fume, or vapor.

HARMFUL EFFECTS

Local—

Phthalic anhydride, in the form of a dust, fume, or vapor, is a potent irritant of the eyes, skin, and respiratory tract. The irritant effects are worse on moist surfaces. Conjunctivitis and skin erythema, burning, and contact dermatitis may occur. If the chemical is held in contact with the skin, as under clothes or shoes, skin burns may develop. Hypersensitivity may develop in some individuals. Inhalation of the dust or vapors may cause coughing, sneezing, and a bloody nasal discharge. Impurities, naphthoquinone, as well as maleic anhydride, may also contribute to eye, skin, and pulmonary irritation.

Systemic—

Repeated exposure may result in bronchitis, emphysema, allergic asthma, urticaria, and chronic eye irritation.

MEDICAL SURVEILLANCE

Emphasis should be given to a history of skin or pulmonary allergy, and preplacement and periodic examinations should evaluate the skin, eye, and lungs, as well as liver and kidney functions. The hydrolysis product, phthalic acid, is rapidly excreted in the urine, although this has not been used in biological monitoring. Diagnostic patch testing may be helpful in evaluating skin allergy.

SPECIAL TESTS

None in common use.

PERSONAL PROTECTIVE METHODS

Proper ventilation, rubber gloves, protective clothing, head coverings, and goggles are recommended when repeated or prolonged contact is possible. Respiratory protection may be needed in dusty areas or where fumes or vapors are present.

BIBLIOGRAPHY

Ghezzi, I., and P. Scott. 1965. Clinical contribution on the pathology induced by phthalic and maleic anhydride. Med. Lav. 56:746.

Merlevede, E., and J. Elskens. 1957. The toxicity of phthalic anhydride, maleic anhydride, and the phthalates. Arch. Belg. Med. Soc. 15:445.

ALDEHYDES AND KETONES

Aldehydes and ketones are aliphatic or aromatic organic compounds which contain the carbonyl group, C=O.

The aldehydes, R−CH=O, are used primarily as chemical feedstock because of their relatively high reactivity. They are volatile, colorless liquids, with the exception of formaldehyde, which is a gas, and can exhibit additional hazard due to its flammability. Typically, these compounds are strongly irritating to the skin, eyes, and respiratory tract. Acute exposure may result in pulmonary injuries such as edema, bronchitis, and bronchopneumonia. Skin and pulmonary sensitization may develop in some individuals and result in contact dermatitis and, more rarely, asthmatic attacks. After hypersensitivity develops, individuals may develop symptoms due to other aldehydes. For this reason, medical surveillance and industrial hygiene practices are of importance.

Ketones are characterized by the structure R-O-R. They are similar in their chemical and toxicological properties, and all are flammable, colorless liquids with a pungent odor similar to acetone. They are used as industrial solvents and raw materials or as intermediates in chemical synthesis. Prolonged exposure is usually precluded by the intense irritation of the eyes and respiratory tract.

SP

MINUTES

SPECIAL MEETING

August 26, 1980
Roland Hosein

UE

I.U.E.

CGE

Present: Teena Flood, John Loucks, Paul Jones, Don Dunn, Don Nelson Bruce Harris, Frank Mills, Terry Ball, John Ball, Paul Gray (Corporate), Roland Hosein.

Roland says they are setting up programs of control on PCB, degreasers, welding.

Figures that welding could be one of the prime problems. Says that air line breathing systems are being looked at to utilize some safety.

Noise levels will be mapped in all plants, taking checks now and then a further check six months later to guage success.

Hazardous material identification system, Sept. 18, working draft on this coming up.

Carcinogens, will be preparing a guideline on this subject hopefully by early next year.

Govt.standards for females specifically will be looked at and revised if necessary.

Want to change from reacting to problems to being prepared for problems before they actually come on the floor.

Working on PCB in Burlington now. Says no one there is exposed to PCB now under stringent controls.

Degreasers draft in October. Cutting fluids in November.

Roland says they don't want to interfere with plants who have programs under way.

In February a company-wide hygiene survey will be conducted by Corporate Office people.

AUDIO: John Loucks says that his hearing test has been done but a bad reading has been indicated. John has asked for further discussion but has had no further contact on it.

Roland says that there is no cause in law that says we will be allowed to be part of testing in plant. But he says that it certainly can be negotiated.

CGE may be going to a lower TLV on some chemicals. We (company) have expertise to engineer these chemicals and may even overkill certain things but will possibly be leading government by optimum controls.

Fibre glass -- has done research. At high doses can give asbestos-like reactions. Nothing on lung obvious but he feels should protect with nuisance dust respirator until we are sure that latency period is not just longer than asbestos.

He figures we should work to 50% of TLV where possible.

Roland says a Corporate Lab has been discussed. Pet. Lab was brought into focus. Some doors have been opened there. Figures that there will be movement on this before very long too.

MSDS: Usually three weeks wait for Hosein. By the new law, companies are required to supply these if products are to be sold and used in Ontario.

Copies to: P.How, Wm. Woodbeck, Ed Hunt, B.H. Martin, Dr. D.D. Curtis, Dr. J.W. Cowell, R.D. Maguire, A.K. Faggetter, J.G. Legros, J.A. Doris, L.T. Ball

PRODUCT DATA

BUILT-UP MICA
1631, 1636
Segment Plate

PD-201 F

Effective July 15, 1976
Supersedes July 1, 1974 Issue

1631 & 1636 SEGMENT PLATE

1631 is built-up mica insulation made with muscovite mica splittings bonded with an alkyd-vinly resin. 1636 is made with mica splittings sandwiched between mica paper. 1631 offers excellent stability, greater than is available with shellac-bonded mica. 1636 offers lower cost. Both are fully cured products that may be punched or cut to any desired shape or size with ease and have excellent hot-crush resistance.

SUGGESTED USES

1631 and 1636 are suggested for 155°C applications for commutator segments, spacers, washers and other flat areas where a rigid insulation is required.

PRODUCT DETAILS

	1631	1636
Binder	alkyd-vinyl	alkyd-vinyl
Binder content - % max	5%	9%
Density - pounds per cubic inch	0.092	0.085
Thickness tolerances (ASTMD-374C)—sanded—inches average	±0.001	±0.005
inches individual	±0.002	±0.001

PERFORMANCE PROPERTIES

	1631	1636
Temperature class	155°C	155°C
Dielectric strength (ASTM D 352-56T)		
Short time, 2-inch electrodes in air - vpm avg.		
$\lessapprox$ .030" thick	650	650
> .030" thick	550	550
Stability - slip and ooze at 20,000 psi, 240°C	nil	nil
Compressibility, cold, 3,000 psi	< 2%	< 4%
Punchability	excellent	excellent
Arc resistanc, seconds	150-250	150-250

AVAILABLE FORM

1631 is available in punched parts or 37 inch by 39 inch sheets, while 1636 sheet size is 36 inch by 38 inch. Both are available in thickness ranging from 0.020 to 0.065 inch.

ORDERING INSTRUCTIONS

Address all orders or requests for technical information to your nearest General Electric Insulating Materials Distributor or Field Sales Office, or to Insulating Materials, General Electric Company, 1 Campbell Road, Schenectady, New York 12306.

GENERAL ELECTRIC

: ~~JJ Keane~~
~~SH~~ Shane
RN VanAllen
Hist.File

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME General Electric Company, Insulating Materials Prod. Section	EMERGENCY TELEPHONE NO. (518) 385-3357
ADDRESS (Number, Street, City, State, and ZIP Code) 1 Campbell Road, Schenectady, New York 12345	
CHEMICAL NAME AND SYNONYMS Polyester Bonded Electrical Insulation	TRADE NAME AND SYNONYMS 1631 Laminated Flake Mica Board
CHEMICAL FAMILY Polyester Bonded Flake Mica	FORMULA Modified Polyester

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Alcohol, MEK, Toluene Mixture	< 5	200 ppm

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	NA	SPECIFIC GRAVITY (H_2O=1)	NA
VAPOR PRESSURE (mm Hg.)	NA	PERCENT, VOLATILE BY VOLUME (%)	< .5
VAPOR DENSITY (AIR=1)	NA	EVAPORATION RATE (________ =1)	NA
SOLUBILITY IN WATER	NA		
APPEARANCE AND ODOR	Gray solid laminate. Odor mild to odorless.		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	NA	FLAMMABLE LIMITS	NA	Lel	Uel

EXTINGUISHING MEDIA
Water, foam or dry chemical.

SPECIAL FIRE FIGHTING PROCEDURES
None

UNUSUAL FIRE AND EXPLOSION HAZARDS
Avoid open flames.

SECTION V - HEALTH HAZARD DATA

HRESHOLD LIMIT VALUE
2.5% 200 ppm See Section II (Alcohol, MEK, Toluene)

S OF OVEREXPOSURE
cessive inhalation of high concentration may cause conditions such as headaches drowsiness, or vomiting. If swallowed, could cause drunkiness or systematic illness.

MERGENCY AND FIRST AID PROCEDURES
overcome, remove from area immediately, call physician. If breathimg is irregular or topped, administer oxygen or resuscitation. For eye irritation, wash with plain ater.

SECTION VI - REACTIVITY DATA

TABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Avoid open flame.

ICOMPATABILITY *(Materials to avoid)*

AZARDOUS DECOMPOSITION PRODUCTS

AZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

TEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
e returned to original container.

ASTE DISPOSAL METHOD
er local sanitary regulations. The material is a solid laminate. May be shredded, hopped up, or pulverized and buried.

SECTION VIII - SPECIAL PROTECTION INFORMATION

ESPIRATORY PROTECTION *(Specify type)*
lone

ENTILATION	LOCAL EXHAUST Normal	SPECIAL
	MECHANICAL *(General)*	OTHER Avoid open flame

ROTECTIVE GLOVES Yes	EYE PROTECTION Recommended

THER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

RECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Flake Mica may cuase mild skin irritation. Wash with soap and water.

THER PRECAUTIONS
material is not temperature sensitive. Avoid open flame. Avoid sharp edges to prevent cuts and abrasions.

MICA (F)

UNITED ELECTRICAL, RADIO & MACHINE WORKERS OF AMERICA

LOCAL 524 LOCAL 527 LOCAL 540

203 REID STREET PETERBOROUGH ONTARIO TELEPHONE AREA CODE 705 742 3491

April 14, 1983

Mr. Jeff Godfrey
Ministry of Labour
47 Sheppard Avenue East (216)
Willowdale, Ontario

Dear Sir:

During your regular tour of Inspection on December 12, 1982, I reported a concern regarding dust generated at Bay K-30 Building #8, Commutator turning lathe.

At that point in time I had not considered the dust to be an unresolved problem. Since several months have elapsed and the situation has not changed for the better, even though production has been greatly reduced, I would request your renewed attention.

I have enclosed a document that has been signed by twenty (20) persons who are required to work in this area.

The ventilation deficiences that allow this dust pollution are both simple and easy to correct, and I am sure, can be implemented at minimal cost. The actual health hazards inherent in this particular type of dust are not too certain, but mica, on its own can cause a form of dermatitis, in fact it has affected the lathe operator recently.

Since mica does contain a percentage of silica, this can of course cause more serious problems such as lung and respiratory system damage.

The efforts of management to record a dangerous level really has no sense in this instance. The equipment to control and probably eliminate almost all dust, is already in place. It merely needs modication.

2/.........

Mr. Jeff Godfrey
Ministry of Labour
April 14, 1983
Page 2

We are asking that the company be advised to change work practices and install whatever additional ducting or capture hoods that are necessary to eliminate the potential hazard as soon as possible.

Yours sincerely,

John H. Ball
Health & Safety Committee
U.E. Local 524

JHB/gv
encls.

c.c. - Mr. R. Bergey, Manager
Occupational Health & Safety
Canadian General Electric Co. Limited

MICA (F)

april 12 1983
Peterborough Ont.

Mr Jeff Godfrey
Ministry of Labour
47 Sheppard Ave East (216)
Willowdale Ontario M2N 5X5

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Since Mica does contain a percentage of silica This can of course cause more serious problems such as lung & respiratory system damage.

The feeling is, why work in a questionable atmosphere when exposure could easily be reduced to near zero.

The efforts of management to record a dangerous level really has no sense in this instance.

The equipment to control + probably eliminate almost all dust, is already in place. It merely needs modification

We are asking that the Company be advised to change work practices and install whatever additional ducting or capture hoods that are necessary to eliminate this potential hazard as soon as possible

Your's sincerely,
John H. Ball
VE Health + Safety

cc R.C. Bergey
Mgr Occupational Health & Safety
Can Gen Electric.

MICA

E

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

107 PARK STREET NORTH, PETERBOROUGH, ONTARIO, K9J 7B5 — TEL: (705) 748-7964

OCCUPATIONAL HEALTH AND SAFETY UNIT

c.c. Paul Rommell-Unit 643
Bob Bergey -Unit 809
Bruce Harris-Unit 937
John Ball -Unit 642

11 April 1983

Ross Perrin
Main Test
Unit #912

On April 6/83 air samples were collected during machining of CTY Collectors and 761 Bushings to determine the amount of respirable dust generated from this operation.

The #1 sample was collected from the operators breathing zone. The result was 1.05 mg/m^3 or 35% of the T.L.V.

Sample #2 was collected from between the columns in Bay K29, Building #8 Main Test. This sample was .74mg/m^3 or 23% of the T.L.V.

The T.L.V. for Mica is 3.0 mg/m^3 respirable mass therefore no action is recommended at this time.

L. T. Ball/JET

L. T. Ball
Specialist- Accident Prevention
Occupational Health and Safety

LTB/jet

SP

Canadian General Electric

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CANADIAN GENERAL ELECTRIC COMPANY LIMITED

APP 4792 1/83

MICA DUST

Canadian General Electric

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SECTION

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B. Bergey -Unit 809

31 March 1983

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Main Test
Bldg.#8

On March 26/83 two air measurements were taken in the Main Test Bldg. #8 Bay K30 for mica dust. These pumps were left in the area for 6 hours.

One pump was placed between the two columns at the back of the lathe. This filter collected 1.89 mg/m^3 of air. The other pump was placed on the test bench. This filter collected 1.34 mg/m^3 of air. The T.L.V. for dust is ~~10~~.0 mg/m^3 therefore these tests are well below the T.L.V.

6.0 LB

If more tests are required I can be reached at local 7570.

L T Ball
L. T. Ball
Specialist- Accident Prevention
Occupational Health and Safety

LTB/jet

MICA DUST (F)

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

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Occupational Health and Safety

LTB/jet

3P

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

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WE ARE NOT CONCERNED ABOUT DUST LEVELS WE'RE CONCERNED ABOUT SPECIFIC PARTICLES IN THE DUST

If more tests are required I can be reached at local 7570.

L.T. Ball

L. T. Ball
Specialist- Accident Prevention
Occupational Health and Safety

LTB/jet

WE ARE ALSO CONCERNED ABOUT WHAT LEVEL THE ABOVE GENTLEMAN HAS IN HIS OFFICE

Don Elliott, Donald Bell, Andy Pirie, Bill Crompton, Martin Aackaher, Wayne Rowlett, S Lancashire, C. Burnie, Ed Ilnet, W Gibson, J O'Rourke, W. Crawford, G O'Rourke, E McGlynn, Jim Richards, Bill Massey, Paul Conway, Keith Aylmage, Bill Stillman, N.T. McGrath

MICA (E)

Canadian General Electric

EMPLOYEE AND
COMMUNITY RELATIONS
SECTION

107 PARK STREET NORTH, PETERBOROUGH, ONTARIO, K9J 7B5 — TEL. (705) 748-7984

OCCUPATIONAL HEALTH AND SAFETY UNIT

c.c. P. Rommel - Unit 621
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B. Harris - Unit 937
B. Bergey - Unit 809

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Andy Pirie
Bill Crompton
Walter Cocklaher
Ed Shiel
Jim Richards
Wayne Howlett
S. Lancashire
W. Gibson
C. Burns
H. O'Keeffe
Bill Murray
Paul Conway
W. Crawford
Keith Dalmage
G. O'Rourke
Bill Stillman
E. McGlynn
M. J. McGrath

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LTB/jet

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S Lancashire W Gibson Bill Manny
C. Burnie J O'Rourke Paul Conway
W. Crawford Keith Ashmage
G O'Rourke Bill Stillman
E McGlynn W.T. McGrath

SAFETY DATA SHEET
MICA

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

PRODUCT NAME: MICA

APPLICATIONS: Lost circulation material.

SUPPLIER:
M-I Drilling Fluids UK Ltd,
Pocra Quay,
Footdee,
Aberdeen. AB11 5DQ
Tel: 44 (0)1224 - 584336
Fax: 44 (0)1224 - 576119

EMERGENCY TELEPHONES: 001 281 561 1600 (USA)

2. COMPOSITION/INFORMATION ON INGREDIENTS

NAME / CAS No.:	EINECS Nr.:	CLASSIFICATION	CONTENT
MICA 12001-26-2		- Not classified.	95-100 %
QUARTZ, CRYSTALLINE SILICA 14808-60-7	238-876-4	-	0-5 %

The Full Text for all R-Phrases are Displayed in Section 16

GROSS FORMULA: Naturally occuring mineral

COMPOSITION COMMENTS: This product contains a small quantity of quartz, crystalline silica.

3. HAZARDS IDENTIFICATION

This product contains a small quantity of quartz. IARC Monographs, Vol 68, 1997, concludes that there is sufficient evidence that inhaled crystalline silica in the form of quartz or crystobalite from occupational sources causes cancer in humans. IARC classification Group 1.

4. FIRST AID MEASURES

INHALATION: Move the exposed person to fresh air at once. Get medical attention if any discomfort continues.

INGESTION: First aid is not normally required. Rinse mouth thoroughly. Drink plenty of water.

SKIN:	Wash skin thoroughly with soap and water. Remove contaminated clothing. Get medical attention if any discomfort continues.
EYES:	Promptly wash eyes with plenty of water while lifting the eye lids. Get medical attention if any discomfort continues.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA:	This material is not flammable. Use extinguishing media appropriate for surrounding fire.
SPECIAL FIRE FIGHTING PROCEDURES:	No specific fire fighting procedure given.
UNUSUAL FIRE & EXPLOSION HAZARDS:	No unusual fire or explosion hazards noted.
HAZARDOUS COMBUSTION PRODUCTS:	Not relevant.

6. ACCIDENTAL RELEASE MEASURES

SPILL CLEANUP METHODS:	Shovel into dry containers. Cover and move the containers. Flush the area with water. Avoid generation and spreading of dust. Wear necessary protective equipment.

7. HANDLING AND STORAGE

USAGE PRECAUTIONS:	Avoid handling which leads to dust formation. Provide good ventilation. Mechanical ventilation or local exhaust ventilation may be required.
STORAGE PRECAUTIONS:	Store at moderate temperatures in dry, well ventilated area.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

INGREDIENT NAME:	CAS No.:	STD	LT EXP 8 Hrs	ST EXP 15 Min
QUARTZ, CRYSTALLINE SILICA	14808-60-7	MEL	0.3 mg/m3	
MICA	12001-26-2		0.8 mg/m3	No std.

INGREDIENT COMMENTS: MEL = Maximum Exposure Limit. * OSHA PELs for Mineral Dusts containing crystalline silica are 10 mg/m3 / (%SiO2+2) for quartz and 1/2 the calculated quartz value for cristobalite and tridymite. NUI = Nuisance Dust. OES TWA 4mg/m3 respirable dust, 10mg/m3 total dust.

PROTECTIVE EQUIPMENT:

VENTILATION:	Provide adequate general and local exhaust ventilation.
RESPIRATORS:	Respiratory protection must be used if air concentration exceeds acceptable level. Dust filter P3 (for especially fine dust/powder).

PROTECTIVE GLOVES:	No specific hand protection noted, but gloves may still be advisable. For prolonged or repeated skin contact use suitable protective gloves. Rubber or plastic.
EYE PROTECTION:	Wear dust resistant safety goggles where there is danger of eye contact.
OTHER PROTECTION:	Wear appropriate clothing to prevent repeated or prolonged skin contact. Provide eyewash station.

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE:	Powder, dust.		
COLOUR:	Varying. Grey. to Silver.		
ODOUR/TASTE:	Odourless or no characteristic odour.		
MELT./FREEZ. POINT (°C, interval):	1300		
DENSITY/SPECIFIC GRAVITY (g/ml):	2.6 - 2.9	**Temperature (°C):**	20
pH-VALUE, DILUTED SOLUTION:	9.0	**Concentration %M:**	10%
SOLUBILITY DESCRIPTION:	Insoluble in water.		

10. STABILITY AND REACTIVITY

STABILITY:	Normally stable.
CONDITIONS TO AVOID:	Not known.
MATERIALS TO AVOID:	No incompatible groups noted.
HAZARDOUS DECOMP. PRODUCTS:	Not relevant.

11. TOXICOLOGICAL INFORMATION

INHALATION:	Dust may irritate respiratory system or lungs. Harmful: danger of serious damage to health by prolonged exposure through inhalation.
INGESTION:	May cause discomfort if swallowed.
SKIN:	Powder may irritate skin.
EYES:	Particles in the eyes may cause irritation and smarting.
HEALTH WARNINGS:	This product contains small quantities of quartz. Prolonged inhalation of high concentrations may damage respiratory system. Because of quantity and composition, the health hazard is small.

12. ECOLOGICAL INFORMATION

ECOLOGICAL INFORMATION:	Not regarded as dangerous for the environment. Contact M-I's Environmental Affairs Department for ecological information. This material is a naturally occurring mineral. OSPAR have defined this chemical as PLONOR.

13. DISPOSAL CONSIDERATIONS

DISPOSAL METHODS:	Recover and reclaim or recycle, if practical. Dispose of on site landfill area. Dispose of in accordance with Local Authority requirements.

14. TRANSPORT INFORMATION

ROAD TRANSPORT NOTES:	Not Classified
RAIL TRANSPORT NOTES:	Not Classified.
SEA TRANSPORT NOTES:	Not Classified.
AIR TRANSPORT NOTES:	Not Classified.

15. REGULATORY INFORMATION

RISK PHRASES:	Not classified.
SAFETY PHRASES:	S-22 Do not breathe dust. S-38 In case of insufficient ventilation, wear suitable respiratory equipment.
UK REGULATORY REFERENCES:	The Control of Substances Hazardous to Health Regulations 1988. Chemicals (Hazard Information & Packaging) Regulations 1993. IARC Monographs, Vol.68, 1997.

16. OTHER INFORMATION

USER NOTES:	HMIS Health - 1 HMIS Flammability - 0 HMIS Physical Hazard - 0 E - Safety glasses, Gloves, Dust Respirator
INFORMATION SOURCES:	Material Safety Data Sheet, Misc. manufacturers. Sax's Dangerous Properties of Industrial Materials, 9th ed., Lewis, R.J. Sr., (ed.), VNR, New York, New York, (1997).
ISSUED BY:	Sarah Glover
REVISION DATE:	25-04-03
REV. No./REPL. SDS GENERATED:	1
PRINTING DATE:	2003-04-25
R-PHRASES (Full Text):	Not classified.
DISCLAIMER:	MSDS furnished independent of product sale. While every effort has been made to accurately describe this product, some of the data are obtained from sources beyond our direct supervision. We cannot make any assertions as to its reliability or completeness; therefore, user may rely on it only at user's risk. We have made no effort to censor or conceal deleterious aspects of this product. Since we cannot anticipate or control the conditions under which this information and product may be used, we make no guarantee that the precautions we have suggested will be adequate for all individuals and/or situations. It is the obligation of each user of this product to comply with the requirements of all applicable laws regarding use and disposal of this product. Additional information will be furnished upon request to assist the user; however, no warranty, either expressed or implied, nor liability of any nature with respect to this product or to the data herein is made or incurred hereunder.

MATERIAL SAFETY DATA SHEET

System Three Resins, Inc. 3500 W. Valley Hwy N, Suite 105 Auburn, Washington 98001

SECTION I - PRODUCT IDENTIFICATION

Product Name: **Silvertip® Laminating Resin Part A**
MSDS Number: 0900A
Product Type: Epoxy Polymer Mixture
24-Hr. Emergency Phone:
CHEMTREC: 1-800-424-9300

Date of Prep: August 1, 2003
Information: 253-333-8118
Prepared By: J. Bartlett

Hazard Ratings:
Health 2
Fire 1
Reactivity 0

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

INGREDIENT	WT%	CAS NUMBER	OSHA PEL	ACGIH TLV
Diglycidyl Ether of Bisphenol A	70-80%	25068-38-6	none established	none established
Benzyl Alcohol	10-15%	100-51-6	none established	none established
Alkylglycidyl Ether	10-15%	17557-23-2	none established	none established

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Range: not applicable
Vapor Density: Heavier than Air
Evaporation Rate: Slower than Ether
Appearance and Odor: Clear thick liquid with little or no odor.

Specific Gravity: 1.1-1.3
Material V.O.C.: None
Water Solubility: Negligible

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: > 300°F
Method: Pensky-Martens Closed Cup
Flammable Limits in Air By Volume - Lower: N/A Upper: N/A
Extinguishing Media: Foam, Carbon Dioxide, Dry Chemical, Water Fog

Special Firefighting Procedures: When fighting chemical fires wear full protective equipment with self-contained breathing apparatus. Water spray may be used to cool fire-exposed containers. Toxic fumes may be evolved when this substance is burned.

SECTION V - REACTIVITY DATA

Stability: Stable.
Hazardous Polymerization: Will not occur.
Incompatibility: Strong oxidizing agents, Lewis and mineral acids.

Hazardous Decomposition Products: Oxides of carbon, aldehydes, acids

Conditions to Avoid: Epoxy resins and epoxy resin hardeners react with each other producing heat. They should not be mixed with each other under uncontrolled conditions or in large mass as the ensuing exotherm may result in heat and smoke resulting in hazardous decomposition products.

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:
Acute: Slightly irritating to skin, moderately irritating to eyes. Odor may irritate nose, throat and respiratory tract of some persons.
Chronic: May cause skin sensitization from prolonged and repeated contact.
Carcinogenicity: Early studies with DGEBPA have been negative. The IARC concluded in 1988 that DGEBPA was not classifiable as a carcinogen.

EMERGENCY AND FIRST AID PROCEDURES:

Eyes: Flush with water for 15 minutes holding eyelids open. Seek medical attention.

Skin: Remove contaminated clothing and shoes and wipe excess off skin. Flush skin with water. Follow by washing in soap and water. If irritation occurs, seek medical attention. Do not reuse clothing until cleaned. Contaminated leather articles (shoes) cannot be decontaminated and should be destroyed.

Inhalation: Remove victim to fresh air and provide oxygen if breathing is difficult. Give artificial respiration if not breathing. Get medical attention.

Ingestion: Do not give liquids if victim is unconscious or very drowsy. Otherwise, give no more than 2 glasses of water and induce vomiting by giving 2 tablespoons syrup of ipecac (1 tablespoon and 1 glass of water for child). If ipecac is unavailable, give 2 glasses of water and induce vomiting by touching finger to back of throat. Keep head below hips while vomiting. Get medical attention.

Medical Conditions Generally Aggravated by Exposure: Other than skin sensitization which appears to be permanent, epoxy resin does not appear to cause long term health effects. Nor, does it appear to aggravate other medical conditions.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

If Material is Spilled: Avoid contact with material. Persons not wearing appropriate protective equipment should leave the area of the spill until cleanup is complete. Stop spill at source, dike area to prevent spreading, pump liquid to salvage tank or drum. Remaining liquid may be taken up on clay, diatomaceous earth, sawdust, or other absorbent, and shoveled into disposal containers.

Waste Disposal Method: Waste is not hazardous by RCRA criteria (40 CFR 261). Place in an appropriate disposal facility in compliance with local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Respiratory Protection: Normally none is required when adequate ventilation is provided. In the absence of proper environmental control NIOSH approved respiratory is required. For emergencies, a self-contained breathing apparatus or full-faced respirator is recommended.

Ventilation: Provide adequate ventilation in work areas. Confine material in sealed containers when not in use.

Hand Protection: Always wear impervious gloves, neoprene, vinyl or rubber.

Eye Protection: Splash proof goggles or safety spectacles with side shields are recommended. Always wear eye protection when sanding cured epoxy resins to avoid dust in eyes.

Other Protective Equipment: Wear clean, body-covering clothing to avoid skin contact.

SECTION IX - TRANSPORTATION REQUIREMENTS

Department of Transportation Classification: Not Hazardous

D.O.T. Proper Shipping Name: Not Regulated

Other Requirements:
This product contains no toxic chemicals subject to the report requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (EPRCA) and of 40 CFR 372.

SYSTEMTHREE MATERIAL SAFETY DATA SHEET

System Three Resins, Inc. 3500 W. Valley Hwy N. Suite 105 Auburn, Washington 98001

SECTION I - PRODUCT IDENTIFICATION

Product Name: **Silvertip® Fast Hardener Part B**
MSDS Number: 0900B
Product Type: Amine Polymer Mixture
24-Hr. Emergency Phone:
CHEMTREC: 1-800-424-9300

Date of Prep: August 1, 2003
Information: 253-333-8118
Prepared By: J. Bartlett

Hazard Ratings:
Health 3
Fire 1
Reactivity 0

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

INGREDIENT	WT%	CAS NUMBER	OSHA PEL	ACGIH TLV
Aliphatic Amines	60-70%	(Mixture is a trade secret)	none established	
Alkyl Phenols	15-20%	(Mixture is a trade secret)	none established	
Benzyl Alcohol	15-20%	100-51-6	none established	
Aromatic Amine	5-10%	14-77-55-0	0.1 mg/m^3	none established

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS

Boiling Range: not applicable
Vapor Density: Heavier than Air
Evaporation Rate: Slower than Ether
Appearance and Odor: Clear thick liquid with ammonia-like odor.

Specific Gravity: 0.9-1.0
Material V.O.C.: None
Water Solubility: Negligible

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point: > 300°F
Method: Pensky-Martens Closed Cup
Flammable Limits in Air By Volume - Lower: N/A Upper: N/A
Extinguishing Media: Foam, Carbon Dioxide, Dry Chemical, Water Fog

Special Firefighting Procedures: When fighting chemical fires wear full protective equipment with self-contained breathing apparatus. Water spray may be used to cool fire-exposed containers. Toxic fumes may be evolved when this substance is burned.

SECTION V - REACTIVITY DATA

Stability: Stable.
Hazardous Polymerization: Will not occur.
Incompatibility: Strong oxidizing agents, Lewis and mineral acids.

Hazardous Decomposition Products: Oxides of carbon and nitrogen, aldehydes, acids

Conditions to Avoid: Epoxy resins and epoxy resin hardeners react with each other producing heat. They should not be mixed with each other under uncontrolled conditions or in large mass as the ensuing exotherm may result in heat and smoke resulting in hazardous decomposition products.

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:
Acute: Slightly irritating to skin, moderately irritating to eyes. Odor may irritate nose, throat and respiratory tract of some persons.
Chronic: May cause skin sensitization from prolonged and repeated contact.
Carcinogenicity: Early studies with DGEBPA have been negative. The IARC concluded in 1988 that DGEBPA was not classifiable as a carcinogen.

EMERGENCY AND FIRST AID PROCEDURES:

Eyes: Flush thoroughly with water for at least 15 minutes. Get immediate medical attention.

Skin: Remove contaminated clothing and flood area with water. Wash affected skin with soap and water. Wash clothing before reuse. Discard shoes. Get medical attention if redness, soreness, or blistering occur or persist.

Inhalation: Remove to fresh air. Administer oxygen if necessary. Get medical attention if breathing is difficult or cough develops.

Ingestion: DO NOT INDUCE VOMITING. Vomiting will cause further damage to throat or respiratory tract. Dilute by giving water or milk to drink if victim is conscious. GET IMMEDIATE MEDICAL ATTENTION.

Medical Conditions Generally Aggravated by Exposure: This material may be a strong skin sensitizer in certain susceptible persons. Once sensitized, most persons are unable to work around amine cured epoxy resins without an allergic reaction. Sensitized persons are not known to have other health problems as a result of sensitization.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND USE

If Material is Spilled: Avoid contact with material. Persons not wearing appropriate protective equipment should leave the area of the spill until cleanup is complete. Stop spill at source, dike area to prevent spreading, pump liquid to salvage tank or drum. Remaining liquid may be taken up on clay, diatomaceous earth, sawdust, or other absorbent, and shoveled into disposal containers.

Waste Disposal Method: Waste is not hazardous by RCRA criteria (40 CFR 261). Place in an appropriate disposal facility in compliance with local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

Respiratory Protection: Normally none is required when adequate ventilation is provided. In the absence of proper environmental control NIOSH approved respiratory is required. For emergencies, a self-contained breathing apparatus or full-faced respirator is recommended.

Ventilation: Provide adequate ventilation in work areas. Confine material in sealed containers when not in use.

Hand Protection: Always wear impervious gloves, neoprene, vinyl or rubber.

Eye Protection: Splash proof goggles or safety spectacles with side shields are recommended. Always wear eye protection when sanding cured epoxy resins to avoid dust in eyes.

Other Protective Equipment: Wear clean, body-covering clothing to avoid skin contact.

SECTION IX - TRANSPORTATION REQUIREMENTS

Department of Transportation Classification:

One gallon or less: ORM-D
More than one gallon: AMINES, LIQUID, CORROSIVE, N.O.S., (ETHYLENE AMINE), 8, UN2735, PG II, ERG NO. 153

SARA Title III:
This product contains no toxic chemicals subject to the report requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (EPRCA) and of 40 CFR 372.

Seaboard Asphalt Products Company

MATERIAL SAFETY DATA SHEET

SEABOARD ASPHALT PRODUCTS COMPANY
3601 FAIRFIELD ROAD
BALTIMORE, MARYLAND 21226
(410) 355-0330 OR FAX (410) 355-5864

CHEMTREC
EMERGENCY
(SPILL, FIRE, EXPOSURE)
DAY OR NIGHT
800-424-9300

SECTION I. PRODUCT IDENTIFICATION

PRODUCT CODE: LN-11
PRODUCT NAME: Equinox Asphalt Gilsonite Driveway Sealer

SECTION II. INGREDIENT INFORMATION

	%	CAS	TLV
Asphalt	65-75	8052-42-4	5 mg/m^3
Mineral Spirits (Stoddard)	25-35	64741-41-9	100 ppm
Gilsonite	19-23	NA	5 mg/m^3

This product does not contain any materials listed by OSHA, NTP, or IARC as carcinogens.

SECTION III. HEALTH HAZARD INFORMATION

CAUTION! HEATING MAY RELEASE HYDROGEN SULFIDE GAS (H_2S)

EYE CONTACT: The cool material will cause minor eye irritation. However, thermal burns may result form contact with the hot material. The degree of the injury will depend on the amount of material that gets into the eye and the speed and thoroughness of the first aid treatment. Signs and symptoms may include, pain, tears, swelling, redness and blurred vision. This hazard evaluation is based on the data from similar materials.

SKIN CONTACT: The cool material will cause minor skin irritation. However, thermal burns may result from contact with the hot material. The degree of the injury will depend on the amount of material that gets on the skin and the speed and thoroughness of the first aid treatment. Signs and symptoms may include: pain, discoloration and swelling. This hazard evaluation is based on data from similar materials.
The systemic toxicity of this substance has not been determined. However, it should be practically non-toxic to internal organs if it gets into the skin.

INHALATION: Fumes from the hot material can be unpleasant and may produce nausea and irritation of the upper respiratory tract. If inhaled, this substance is considered practically non-toxic to internal organs. This substance contains sulfur compounds which may form hydrogen sulfide. the rotten eggs odor of hydrogen sulfide is unreliable as an indicator of concentration. Signs and symptoms of over exposure to hydrogen sulfide include respiratory tract irritation, headaches, dizziness, nausea, gastrointestinal disturbances, coughing, a sensation of dryness and pain in the nose, throat and chest, confusion and unconsciousness. Hydrogen sulfide concentrations of 1000 -2000 ppm can be extremely hazardous. This hazard evaluation is based on data from similar materials.

INGESTION: This is an unlikely route of entry, however if swallowed, this substance is considered practically non-toxic.

ADDITIONAL HEALTH DATA COMMENT: Studies in which mice were exposed to a variety of whole asphalts did not result in any increased cancer rate; mice exposed to asphalts diluted with hydrocarbon solvents had increased incidence of certain types of cancer. Brief or intermittent skin contact with this asphalt product is not expected to produce any delayed effects. While normal handling of this product is not likely to cause cancer in humans, skin contact and breathing of mists or vapors should be reduced to a minimum.

FIRST AID: EYE CONTACT: Flush eyes, including under eyelids, with running water for at least fifteen minutes. Get medical attention. SKIN CONTACT: If the hot, melted material gets on the skin, quickly cool in water. See a doctor for extensive burns. DO NOT try to peel the solidified material form the skin or use solvents or thinners to dissolve it. The use of vegetable oil or mineral oil is recommended for removal of this material from the skin. Flush exposed area with water while removing contaminated clothing. Get medical attention if irritation persists. INHALATION: If there are signs or symptoms of hydrogen sulfide exposure(respiratory tract irritation, headache, dizziness, nausea, gastrointestinal disturbances, coughing, a sensations of dryness or pain in the nose, throat and chest, confusion and unconsciousness), move the person to fresh air. If breathing has stopped, apply artificial respiration. Call a doctor. Note to physician: In addition to the use of 100% oxygen and supportive care, suggested treatment for hydrogen sulfide poisoning includes the use of nitrites. This is based on the similar mechanisms of toxicity between hydrogen sulfide and hydrogen cyanide. The nitrite-induced methemoglobin is thought to bind the toxic hydrosulfide ion. Initial inhalation of amyl nitrite pearls for 15 to 30 seconds if each minute should be initiated until 10 ml of a 3% solution of sodium nitrite can be administered intravenously at 2.5 to 5 ml per minute. While the efficacy of nitrites in hydrogen sulfide poisoning has not been unequivocally demonstrated, their use is recommended as part of the treatment regimen. Hyperbaric oxygen therapy has been used for cyanide poisoning with some success and may be of benefit in hydrogen sulfide poisoning if other measures are ineffective. INGESTION: Unlikely, if occurs give person milk or water. Keep head below the waist. Contact a physician or Poison Control Center. Never give anything by mouth to a person who is unconscious or having convulsions.

NFPA RATING: HEALTH - 1 FIRE - 2 REACTIVITY - 0

SECTION IV. FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD: : ~ 110 °F Tag open cup
UPPER EXPLOSIVE LIMIT: Not Available
LOWER EXPLOSIVE LIMIT: Not Available

EXTINGUISHING MEDIA: Water, carbon dioxide and dry chemical. Use water spray to cool fire-exposed containers. A fine water mist may be used to smother fire or to disperse vapors. Do not use a solid stream of water since the stream will scatter and spread the fire. Fire fighters must wear self-contained breathing apparatus and full protective clothing when fighting fires involving this material.

SECTION V. REACTIVITY DATA

CAUTION! HEATING MAY RELEASE HYDROGEN SULFIDE GAS (H_2S)

This material is stable in closed containers at room temperature under normal storage and handling conditions. It does not polymerize. It is incompatible with strong oxidizing agents. Decomposition products can include carbon monoxide, carbon dioxide, and water vapor.

SECTION VI. PHYSICAL DATA

BOILING POINT: ~ 650 °F
APPEARANCE AND ODOR: Black liquid with organic odor

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURE

Notify safety personnel of large spills or leaks. Clean-up personnel need protection against liquid contact and vapor inhalation. Absorb small spills and collect liquid, if feasible, or absorb with vermiculite or sand. Do not flush to sewer or stream.
Dispose of liquid waste via licensed waste disposal company. Follow Federal, State and Local regulation.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Wear impervious gloves and safety glasses to prevent contact with the skin and eyes. If repeated or prolonged contact with liquid is likely, wear protective clothing including boots, apron, and faceshield or splash goggles. Remove contaminated clothing immediately and do not reuse until it has been properly laundered.
Eye wash stations and safety showers should be available in use and handling areas.
Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store in closed containers in a cool, dry, well-ventilated area away from oxidizers, heat and open flame.
Protect container from physical damage.

Date Prepared: 11/09/90
Revision: 0

Appendix Q

MAR 31/05

Dear Sonia

RE Armature Varnish in '60's

It was called Liquid Asphalt Bonding Agent. SPEC 1028 Compound tanks
SPEC 1027 Coils

It was made by General Electric Industrial Material Systems. It was sold later to Vonrollisola (VRI)
I tried to get data sheets from lab but they could not find them. This also contained 1500 Thinner.

Yours truly
Don McConnell

ATTN: Sonia Lal

Material Safety Data Sheet

ISONEL 51

PERCENT VOLATILE (BY WEIGHT).... 50 %

Section IV: Fire and Explosion Hazard of Product

CONDITIONS OF FLAMMABILITY...... Flammable liquid, can form explosive vapours with air above flash point in confined spaces.

MEANS OF EXTINCTION............. CO_2, dry chemical, foam, water fog. Wear full protective clothing with supplied air source.

FLASHPOINT AND METHOD OF DETERMINATION.................. 31.1°C (TCC)
UPPER EXPLOSION LIMIT(% BY VOL). 7.0 % (based on xylene)
LOWER EXPLOSION LIMIT(% BY VOL). 1.0 % (based on xylene)
AUTO-IGNITION TEMPERATURE....... 243°C
FLAMMABILITY CLASSIFICATION..... Flammable liquid, can form explosive vapours with air above flash point in confined spaces.

HAZARDOUS COMBUSTION PRODUCTS... CO, CO_2, toxic fumes.
EXPLOSION DATA.................. Flammable liquid, can form explosive vapours with air above flash point in confined spaces. Containers may rupture when exposed to direct flame or heat.
SENSITIVITY TO STATIC DISCHARGE. Not available

Section V: Reactivity Data

CHEMICAL STABILITY.............. Stable
INCOMPATIBLE MATERIALS.......... Oxidizing agents
CONDITIONS OF REACTIVITY........ HAZARDOUS POLYMERIZATION: Will not occur.
HAZARDOUS DECOMPOSITION PRODUCTS CO, CO_2, toxic fumes.

Section VI: Toxicological Properties of Product

ROUTES OF ENTRY
SKIN CONTACT.................. Direct contact with vapour, mist or liquid may cause defatting, drying and cracking of the skin. Prolonged and repeated contact may cause dermatitis.

SKIN ABSORPTION............... Not readily absorbed, probably has the same effects as for inhalation.

EYE........................... Liquid: is a severe irritant; may cause corneal burns and conjunctivitis. Vapour: is an irritant: may cause corneal damage and photohobia. (light sensitivity)

Material Safety Data Sheet

ISONEL 51

INHALATION.................... May cause irritation of eyes, nose, throat, respiratory tract and CNS depression.(headache, dizziness, drowsiness, nausea, vomiting, abdominol pain, and incoordination). Severe overexposure may lead to coma and possible death.

INGESTION..................... May cause irritation and burning of the mouth and throat, abdominal pain, and CNS depression.

ACUTE OVEREXPOSURE EFFECTS...... See: ROUTES OF ENTRY (above).

CHRONIC OVEREXPOSURE EFFECTS.... Frequent or prolonged contact may irritate the skin and cause dermatitis. Organs affected: eye, nose, throat, lungs, respiratory system.

EXPOSURE LIMITS (TLV-TWA)....... 100 ppm (xylene)
100 ppm (mineral spirits)

IRRITANCY OF PRODUCT............ Eye irritant

SENSITIZATION TO MATERIAL....... Not available

CARCINOGENIC EFFECTS............ The ingredients of this product are not listed as carcinogens by NTP, (National Toxicology Program), not regulated as carcinogenby OSHA, (Occupational Safety And Health Administration), and have not been evaluated by IARC or ACGIH.

TERATOGENIC EFFECTS............. Not available

REPRODUCTIVE EFFECTS............ Not available

MUTAGENIC EFFECTS............... Not available

TOXICOLOGICALLY SYNERGISTIC PRODUCTS........................ Not available

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Section VII: Preventive Measures

PERSONAL PROTECTIVE EQUIPMENT... RESPIRATORY PROTECTION: NIOSH/MSHA approved full face piece chemical cartridge respirator with organic vapor cartridges. A full facepiece supplied-air respirator (SAR) or self-contained (SCBA) for higher or unknown concentrations.

EYE: Safety glasses/goggles or face shield.

OTHER: Gloves, clothing, boots of NBR, acrylonitrile or coated with Viton or PVA to prevent skin exposure.

Material Safety Data Sheet

ISONEL 51

SPECIFIC ENGINEERING CONTROLS...	Local exhaust ventilation is recommended to maintain vapour or dust levels below cited TLV or explosion limits. Use explosion proof equipment. Do not reroute vented gases from a curing/reaction process back into the work area.
LEAK AND SPILL PROCEDURES.......	Stop source of spill and remove ignition sources. Ventilate area of the spill. Use explosion proof equipment and tools. Wear adequate protective clothing and a respirator. Absorb with clay, sand or other absorbent material. Collect and place in a covered, identified container for reclamation or disposal. Restrict access to the area until the cleanup is complete. Prevent from entering sewers or water courses.
WASTE DISPOSAL..................	Dispose of by controlled incineration or in designated landfill sites in accordance with local, provincial, and federal regulations.
HANDLING PROCEDURES.............	Keep container closed when not in use. Drums should be grounded when being emptied.
STORAGE REQUIREMENTS............	Store in a cool, dry, well-ventilated area. Keep away from heat,strong oxidizers, and ignition sources. Keep containers closed when not in use. Use proper grounding procedures.
SPECIAL SHIPPING INFORMATION....	TDG CLASS: PAINT/CLASS 3/UN1263/PGIII.

Section VIII: First Aid Measures

Material Safety Data Sheet

ISONEL 51

SPECIFIC FIRST AID PROCEDURES... INHALATION: Remove contamination source or move victim to fresh air.If breathing has stopped,properly trained personnel should begin artificial respiration or CPR immediately.Immediately obtain medical attention.

SKIN: Wash the skin with water.If the material penetrates the protective clothing, remove the clothing and flush the skin with water.If there are any signs of skin sensitization,irritation,or chemical burns get prompt medical attention.

EYE: Immediately,flush the eye(s) with gently flowing water for 20 minutes,by the clock holding eyelid(s) open.Obtain medical attention.

INGESTION: Have victim drink 10 ounces of water to dilute material in the stomach.DO NOT INDUCE VOMITING.Immediately,obtain medical attention. Never give anything by mouth to an unconscious person.

Section IX: Preparation Date of Material Safety Data Sheet

PREPARED BY...................... Health, Safety & Environmental Department
PHONE NUMBER OF PREPARER........ (416) 757-5136 WRONG#
DATE PREPARED................... August 1994

*

Ad Reference #

160903

ISONEL® 51-66HF INSULATING VARNISH

Description:
ISONEL® 51-66HF INSULATING VARNISH is a high temperature, modified polyester varnish supplied in a high flash point, "Rule 66" (non-photochemically reactive) solvent system. A flash point of 130°F (55°C) and the "Rule 66" solvent system allow compliance with OSHA standards for dip tank safety as well as with many air quality regulations.[1] Designed for conventional dip and bake application, **ISONEL® 51-66HF** cures to a clear, tough film. It offers an economical alternative to silicone varnishes for U.L. Class 200 and Class 220 protection.

ISONEL® 51-66HF is certified as meeting the requirements of Military Specification MIL-I- 24092, Grade CB, Composition II, Class 180.

Recommended Uses:
ISONEL® 51-66HF is designed for thermally superior performance on stators, armatures, transformers and form-wound coils. It can also be used as a flexible impregnant for woven insulation materials and served wire.

Physical Properties:

Viscosity at 77°F (25°C)	
Zahn #4 (seconds)	45-75
Centipoises	650-1050
Specific Gravity at 77°F (25°C)	0.920 - 0.940
Solids Content, %	46-50
Flash Point (ASTM D 56-70, °F/°C)	130/55
Viscosity Reducer	XV-930

Cure Cycle:
ISONEL® 51-66HF cures in two (2) to eight (8) hours at 300-400°F (149-204°C), the actual cycle depending on oven efficiency and the weight and shape of the treated unit.

Cured Film Properties (Varnish cured 2 hours at 400°F [204°C]):

Electrical - Dielectric Strength (ASTM D-115) on copper	
Dry	3700 volts/mil
Wet	2500 volts/mil
Mechanical - Helical Coil Bond Strength (ASTM D-259 on MW-35)	
77°F (25°C)	21.0 pounds
302°F (150°C)	1.0 pounds

Weight Loss (ASTM D 2756-68)	
48 Hrs. @ 392°F (200°C)	8.3%
96 Hrs. @ 392°F (200°C)	11.6%

U.L. 1446 Thermal Endurance (°C based on 20,000 hour intercept):

	Twisted Pair	Helical Coil
MW-16	220	240
MW-30	200	220
MW-35	200	220
MW-76	180	220

[1] - Consult your local, state and federal agencies to verify this point in your particular area.

®

ISONEL 51 Insulating Varnish

DESCRIPTION

ISONEL 51 is a high-temperature, modified polyester varnish for use in conventi and bake applications. ISONEL 51 cures to a clear, tough film and offers an ecc alternative to sillicone varnishes for U.L. Class 200 and Class 220 protection.

ISONEL 51 is certified as meeting the requirement of military specification MIL Grade CB, Composition I, Class 180.

RECOMMENDED USES

ISONEL 51 is designed for thermally superior performance on stators, armatures, tranformers and form-wound coils.

PHYSICAL PROPERTIES

Viscosity at 77F (25 C)	
Zahn #2 (seconds)	70-100
Centipoises	150-250
Specific Gravity at 77F (25 C)	0.945-0.965
Solids Content, %	48-52
Flash Point (ASTM D 56-70, F/C)	86/30
Viscosity Reducer	Xylol

CURE CYCLE

ISONEL 51 cures in two to eight hours at 300-400F (149-204 C), the actual cycle depending on oven efficiency and the weight and shape of the treated unit.

CURED FILM PROPERTIES (Varnish cured 2 hrs at 400F[204 C])

Electrical - Dielectric Strength (ASTM D 115) on copper

Dry - 4400 Volts/Mil

Wet - 3500 Volts/Mil

Mechanical - Helical Coil Bond Strength (ASTM D 2519 on MW-35)

77F (25 C) - 21.5 Pounds (9.8kg)

302F (150 C) - 1.3 Pounds (0.6kg)

U.L. 1446 THERMAL ENDURANCE (C based on 20000 hour intercept)

	Twisted Pair	Helical Coil
MW-16	220	240
MW-24#	180	220
MW-30	200	220
MW-35	200	220
Curved Electrode ASTM D 1923) 180 C	--	--

ISONEL 51 is also available in a Rule 66, high-flash solvent system; ISONEL 51-

ISONEL 51 is made under U.S. Patent 3523820 and corresponding international equ

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If you have questions or comments, Please contact to market@pleo.com

To Main Page | Back to Varnish Page | To SCI Main Page

06/14/05

Schentedy: 1-518-347-4200

Perform Annette Lewis 1-518-347-4460

Appendix Q

vonRoll ISOLA

Fax

Von Roll Isola USA, Inc.

One West Campbell Road
Schenectady, NY 12306

Phone +1 518 344 7100
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www.vonroll-isola.com

To: Sonia Lal

Telephone: 416-449-0009 ext 225
Fax: 416-449-7772

From: Donna Mellon, Environmental Compliance
Telephone: 518-344-7140
Fax: 518-344-7297
Email: donna.mellon@vonroll-isola.com

Subject: Old GE Formulations

Date: September 9, 2005 7:25 PM

Number of pages 20 **(including cover sheet)**

Attached is the MSDS information that I have on file for:

- Isonel 51
- 06M6401, which I believe to be the raw material code for 1207.
- I have no MSDS information on file for 1208

—Health →
→ MSDS

If I can be of further assistance, please let me know.

Donna

Calling Glyptal

Bill Hoge : covering for Chemist :

1:33 - Donna Mellon

PD George ← 1-314-621-5700 *
Altana?

1:37 - TODD

MATERIAL SAFETY DATA SHEET FOR: ISONEL 51

SECTION I - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

HAZARD RATINGS :	HMIS	NFPA
H	2	2
F	3	3
R	0	0
PP	B	

MANUFACTURER'S NAME : SCHENECTADY INTERNATIONAL, INC.
STREET ADDRESS : P.O. BOX 1046
CITY, STATE, ZIP CODE : SCHENECTADY, NEW YORK 12301
EMERGENCY TELEPHONE NO. : (518) 370-4200

Safety Specialist

DOT RESPONSE GUIDE NUMBER: 26
FIRE FIGHTERS GUIDE NO : A-95

TRADE NAME : ISONEL 51
CHEMICAL NAME/CLASS: MODIFIED ALKYD SOLUTION
NIOSH NO : N/A
TSCA : THIS PRODUCT OR ITS CONSTITUENTS ARE LISTED ON TSCA INVENTORY.
TRADE SECRET : THIS MATERIAL IS NOT CONSIDERED TO REPRESENT CONFIDENTIAL BUSINESS INFORMATION TO SII.
LAST REVIEW DATE/BY: 05/16/96 JCY

SECTION II (A) - HAZARDOUS SUBSTANCES (29 CFR 1910.1200)

HAZARDOUS SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
XYLENE	1330-20-7	NO	20.0000-30.0000	8@20	100
MINERAL SPIRITS	64742-47-8	NO	20.0000-30.0000	<1 @ 20	100

SECTION II (B) - MATERIALS CAPABLE OF RELEASE DURING PROCESSING

THE FOLLOWING SUBSTANCES MAY BE CAPABLE OF BEING RELEASED DURING STORAGE, HANDLING, AND/OR PROCESSING AND MAY NOT BE REFLECTED IN THIS MSDS' SECTION II (A). SCHENECTADY INTERNATIONAL, INC. DOES NOT CONSIDER THEM TO REPRESENT A PHYSICAL OR HEALTH HAZARD DURING NORMAL OPERATIONS. HOWEVER, THE USER OF THIS MATERIAL HAS THE RESPONSIBILITY TO PROVIDE A SAFE WORK PLACE AND, THUS, THEY MUST REVIEW THEIR OPERATIONS AND DEVELOP APPROPRIATE WORK PRACTICE GUIDELINES AND EMPLOYEE PROTECTION AND INSTRUCTIONAL PROGRAMS.

SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
FORMALDEHYDE	50-00-0	NO	> 50 PPB	1.3@20	100

CONDITIONS TO AVOID:
DURING A CURING/REACTION PROCESS, TOXIC BYPRODUCTS MAY BE EMITTED. DO NOT REROUTE VENTED GASES BACK INTO WORK AREA.

SECTION II (C) - NON-HAZARDOUS SUBSTANCES (29 CFR 1910.1200)

THE FOLLOWING SUBSTANCES ARE PRESENT IN THIS MATERIAL BUT ARE NOT CONSIDERED BY SCHENECTADY INTERNATIONAL, INC. TO PRESENT PHYSICAL OR HEALTH HAZARDS PER 29 CFR 1910.1200.

HAZARDOUS SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
NOT APPLICABLE					

SECTION III (A) - HAZARDS IDENTIFICATION FOR MATERIALS IN SECTION II (A)

XYLENE

ANSI SIGNAL WORD FOR THIS MATERIAL IS: DANGER

RISKS:
PHYSICAL DANGERS : FLAMMABLE.
HEALTH WARNINGS : MAY CAUSE RESPIRATORY TRACT IRRITATION. LUNG IRRITANT. MAY BE A TERATOGEN. MAY AFFECT THE LIVER.

SECTION III (A) - HAZARDS IDENTIFICATION FOR MATERIALS IN SECTION II (A) (CONTINUED)

MAY AFFECT THE KIDNEYS.

HEALTH CAUTIONS : MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. MAY CAUSE NERVOUS SYSTEM EFFECTS. MAY CAUSE BLOOD CHEMISTRY CHANGES. MAY AFFECT MUCOUS MEMBRANES.

TO WORK SAFELY WITH THIS MATERIAL:

KEEP AWAY FROM HEAT, SPARKS AND FLAME. AVOID CONTACT WITH EYES, SKIN OR CLOTHING.
AVOID BREATHING MATERIALS' VAPOR, DUST OR FUMES. KEEP CONTAINER CLOSED. USE WITH ADEQUATE VENTILATION.

MINERAL SPIRITS

ANSI SIGNAL WORD FOR THIS MATERIAL IS: WARNING

RISKS:

PHYSICAL CAUTIONS: COMBUSTIBLE.

HEALTH WARNINGS : MAY CAUSE RESPIRATORY TRACT IRRITATION. LUNG IRRITANT.

HEALTH CAUTIONS : MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. MAY CAUSE NERVOUS SYSTEM EFFECTS. MAY CAUSE BLOOD CHEMISTRY CHANGES. MAY AFFECT MUCOUS MEMBRANES.

TO WORK SAFELY WITH THIS MATERIAL:

KEEP AWAY FROM HEAT, SPARKS AND FLAME. AVOID CONTACT WITH EYES, SKIN OR CLOTHING.
AVOID BREATHING MATERIALS' VAPOR, DUST OR FUMES. KEEP CONTAINER CLOSED. USE WITH ADEQUATE VENTILATION.

SECTION III (B) - HAZARDS IDENTIFICATION FOR MATERIALS IN SECTION II (B)

FORMALDEHYDE

ANSI SIGNAL WORD FOR THIS MATERIAL IS: DANGER

RISKS:

PHYSICAL CAUTIONS: COMBUSTIBLE.

HEALTH DANGERS : CAUSES EYE BURNS. CAUSES SKIN BURNS. POTENTIAL CANCER HAZARD.

HEALTH WARNINGS : HARMFUL IF ABSORBED THROUGH SKIN. HARMFUL IF INHALED. LUNG IRRITANT. HAS TESTED POSITIVE AS A MUTAGEN. MAY AFFECT THE LIVER. MAY AFFECT THE KIDNEYS. SENSITIZER. MAY CAUSE RESPIRATORY SENSITIZATION.

HEALTH CAUTIONS : MAY CAUSE NERVOUS SYSTEM EFFECTS. MAY CAUSE BLOOD CHEMISTRY CHANGES. MAY AFFECT MUCOUS MEMBRANES. MAY CAUSE ALLERGIC REACTION.

SECTION III (C) - HAZARDS IDENTIFICATION FOR MATERIALS IN SECTION II (C)

NOT APPLICABLE

SECTION IV - EMERGENCY FIRST AID PROCEDURES

RESCUE

IF A PERSON IS INVOLVED IN A HAZARDOUS EXPOSURE SITUATION, MOVE THE AFFECTED PERSON FROM THE AREA. IF THE PERSON IS "OVERCOME"", IMMEDIATELY CONTACT MEDICAL AUTHORITIES AND IMPLEMENT APPROPRIATE EMERGENCY RESCUE PROCEDURES. DO NOT BECOME A CASUALTY--FOLLOW THE FACILITY'S EMERGENCY PROCEDURES AND UTILIZE PERSONAL PROTECTIVE EQUIPMENT AS NECESSARY. FOLLOW OTHER FIRST AID PROCEDURES DEPENDING UPON THE TYPE AND EXTENT OF EXPOSURE.

SECTION IV - EMERGENCY FIRST AID PROCEDURES

EMERGENCY FIRST AID

IN THE EVENT OF AN EMERGENCY, OR AN UNEXPECTED ACUTE OVEREXPOSURE TO THE MATERIAL, THE NTIS RECOMMENDS INSTITUTING APPLICABLE FIRST AID PROCEDURES AND IMMEDIATELY SENDING FOR PROPER MEDICAL ASSISTANCE. THE "EMERGENCY CARE FOR HAZARDOUS MATERIALS" BOOK AND/OR NTIS SUGGEST THE FOLLOWING "BASIC" TREATMENT GUIDELINES FOR ADULT PATIENTS FOR MATERIALS IN THE NOTED DOT CLASSIFICATION USING GOOD, APPROPRIATE EMS PROTOCOLS.

SYMPTOMS

CARDIOVASCULAR :	CARDIAC ARRHYTHMIAS; TACHYCARDIA; AND HYPOTENSION MAY BE PRESENT.
CNS :	CNS DEPRESSION TO COMA. CONFUSION, DISORIENTATION, HEADACHE, DROWSINESS, WEAKNESS, AND SEIZURES MAY BE PRESENT.
EYE :	CHEMICAL CONJUNCTIVITIS.
GASTROINTESTINAL:	MUCOUS MEMBRANE PAIN AND IRRITATION; NAUSEA; VOMITING; AND DIARRHEA.
LIFE :	CNS DEPRESSION MAY LEAD TO RESPIRATORY ARREST. CONVULSIONS, CARDIAC ARRHYTHMIAS, AND PULMONARY EDEMA MAY ALSO BE FOUND.
RESPIRATORY :	UPPER RESPIRATORY TRACT IRRITATION POSSIBLY INCLUDING A BURNING SENSATION IN THE CHEST. DYSPNEA, TACHYPNEA, AND RALES MAY PROGRESS RAPIDLY TO MASSIVE PULMONARY EDEMA.
SKIN :	IRRITATION; DERMATITIS, AND CYANOSIS OF THE EXTREMITIES.

TREATMENT

ANTIDOTE :	INFORMATION NOT AVAILABLE.
CNS :	MONITOR FOR SHOCK AND TREAT IF NECESSARY. MONITOR FOR SHOCK; ANTICIPATE SEIZURES; AND TREAT THEM IF NECESSARY.
EYE :	FLUSH EYES IMMEDIATELY FOR AS LONG AS 15 MINUTES WITH LARGE AMOUNTS OF WATER, OR NORMAL SALINE SOLUTION, LIFTING THE LOWER AND UPPER LIDS OCCASIONALLY OR, IF APPROPRIATE, USE EYE IRRIGATION LENS. IF THERE ARE ANY SIGNS OF EYE IRRITATION OR CHEMICAL BURNS, OBTAIN PROMPT MEDICAL ATTENTION.
GASTROINTESTINAL:	ADMINISTER 4 TO 8 OUNCES OF WATER FOR DILUTION IF PRODUCT WAS INGESTED AND THE PATIENT CAN SWALLOW, HAS A GOOD GAG REFLEX, AND NO DROOLING. DO NOT USE EMETICS. NEVER GIVE ANYTHING TO AN UNCONSCIOUS PERSON.
RESPIRATORY :	MOVE THE PATIENT TO FRESH AIR AT ONCE; ASSIST VENTILATION AS NEEDED; AND ADMINISTER OXYGEN, IF NECESSARY, BY NON-REBREATHER MASK AT 6-12

SECTION IV - EMERGENCY FIRST AID PROCEDURES

LITERS PER MINUTE. IF BREATHING HAS STOPPED, PERFORM ARTIFICIAL RESPIRATION. KEEP THE AFFECTED PERSON WARM, AND AT REST, WHILE OBTAINING MEDICAL ATTENTION. MONITOR FOR PULMONARY EDEMA AND TREAT AS NECESSARY.

SKIN : GENTLY BLOT, WITH ABSORBENT MATERIAL, ANY EXCESS LIQUIDS THAT ARE PRESENT. RINSE THE PATIENT WITH WATER, REMOVE CONTAMINATED CLOTHING, AND WASH THE PATIENT WITH A SURFACTANT LIKE TINCTURE OF GREEN SOAP AND LARGE QUANTITIES OF WATER FOR AS LONG AS 15 MINUTES. IF THERE ARE ANY SIGNS OF SKIN SENSITIZATION, IRRITATION, OR CHEMICAL BURNS, OBTAIN PROMPT MEDICAL ATTENTION.

SECTION V - FIRE/EXPLOSION HAZARD DATA

FLASH POINT: 88 F AUTO IGNITION TEMP.: N/A REFRIGERATE: NO

EXTINGUISHING MEDIA: CO2,DRY,FOAM,FOG

PROCEDURES: EXCLUDE AIR; TREAT LIKE A GASOLINE OR OIL FIRE. WEAR FULL PROTECTIVE CLOTHING WITH SUPPLIED AIR SOURCE.

UNUSUAL HAZARDS: WHEN HEATED TO DECOMPOSITION IT MAY EMIT TOXIC FUMES.

FLAMMABLE LIMITS IN AIR:

SUBSTANCE(S)	%LEL	%UEL
XYLENE	1.0	7.0
MINERAL SPIRITS	1.0	7.0
FORMALDEHYDE	7.0	73.0

SECTION VI-ACCIDENTAL RELEASE PROCEDURES

FOLLOW FACILITY/COMPANY'S EMERGENCY PLANS.

STOP SOURCE OF SPILL AND REMOVE ALL IGNITION SOURCES.

VENTILATE AREA OF SPILL.

CONTAIN THE SPILL AND PREVENT THE MATERIAL FROM OBTAINING ACCESS TO ANY CONFINED SPACES, PUBLIC SEWERS, OR WATERWAYS.

COLLECT THE MATERIAL USING ABSORBENTS, NON-SPARKING TOOLS, EXPLOSION PROOF VACUUMS, OR OTHER EQUIPMENT REQUIRED BY THE SIZE OF THE SPILL.

DECONTAMINATE THE AREA, COLLECTING ANY CLEANING AND RINSING MEDIA FOR PROPER RECLAMATION OR DISPOSAL.

DETERMINE APPROPRIATE COURSE OF ACTION FOR THE COLLECTED MATERIAL.

CONTACT THE APPROPRIATE AUTHORITIES AND DISPOSE ACCORDING TO GOVERNMENTAL REGULATIONS.

SECTION VII - HANDLING AND STORAGE

PROTECT CONTAINER FROM PHYSICAL ABUSE.

SECTION VII - HANDLING AND STORAGE

KEEP CONTAINER TIGHTLY CLOSED.

STORE IN A COOL, DRY, WELL-VENTILATED FLAMMABLE STORAGE AREA AWAY FROM IGNITION SOURCES INCLUDING STATIC ELECTRICITY.

BOND AND GROUND CONTAINERS WHEN TRANSFERRING LIQUID.

KEEP SEPARATE FROM INCOMPATIBLES.

SINCE EMPTIED CONTAINERS MAY RETAIN MATERIAL RESIDUE, FOLLOW LABEL WARNINGS EVEN AFTER CONTAINER IS EMPTY. DO NOT CUT, PUNCTURE, OR WELD ON OR NEAR THIS CONTAINER.

SECTION VIII - PERSONAL PROTECTION

EYE : TYPE TO BE DETERMINED BY A QUALIFIED PERSON. WHEN SPLASH HAZARDS ARE PRESENT, CHEMICAL GOGGLES ARE RECOMMENDED. FOR POTENTIALLY SEVERE EXPOSURES, THE ADDITION OF A FACE SHIELD IS RECOMMENDED.

GLOVES : SELECT THOSE IMPERVIOUS TO THE CITED SOLVENTS OR OTHER HAZARDOUS SUBSTANCES.

[illegible]IENIC : WEAR APPROPRIATE CLEAN, PROTECTIVE CLOTHING AND KEEP CONTACT (BODY) AREAS CLEAN.

VENTILATION : MAINTAIN VAPOR LEVELS BELOW CITED TLV OR EXPLOSION LIMITS FOR MENTIONED HAZARDOUS MATERIALS.

OTHER : "RESPIRATOR SELECTION"

THE NIOSH POCKET GUIDE (6/90) PRESENTS CLASSES OF RESPIRATOR PROTECTION SUITABLE FOR GIVEN AIR CONCENTRATION, OR EXPOSURE LEVELS. THE LISTED CONCENTRATIONS AND ONE RESPIRATOR EXAMPLE ARE PROVIDED AS FOLLOWS PLEASE CONSULT THIS, OR OTHER APPROPRIATE, REFERENCE FOR ADDITIONAL RESPIRATORS WHICH MAY BE SUITABLE.

REF.	LEVEL	RESPIRATOR
NIOSH	1000 PPM	ANY CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE(S).
	1500 PPM	ANY SUPPLIED-AIR RESPIRATOR.
	3750 PPM	ANY SUPPLIED AIR RESPIRATOR OPERATED IN A CONTINUOUS-FLOW MODE.
	5000 PPM	ANY AIR-PIURIFYING, FULL-FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE, FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.
	EMERGENCY	ANY SELF-CONTAINED BREATHING

SECTION VIII - PERSONAL PROTECTION

	APPARATUS THAT HAS A FULL FACE-PIECE AND IS OPERATED IN A PRESSURE DEMAND OR OTHER POSITIVE-PRESSURE MODE.
ESCAPE	ANY AIR-PURIFYING, FULL FACEPIECE RESPIRATOR (GAS MASK) WITH A CHIN-STYLE, FRONT- OR BACK-MOUNTED ORGANIC VAPOR CANISTER.

SECTION IX - PHYSICAL DATA

FORM (@25'C) : CLEAR AMBER LIQUID WITH HYDROCARBON ODOR

BOILING POINT	: 300-320 F	MELTING POINT:	N.A.	ODOR THRESHOLD (PPM)	: NOT AVAILABLE
SPECIFIC GRAVITY	: .945-.975	LBS./GAL.	: 7.9-8.1	% WT. SOLIDS	: 48.0-52.0
PH	: NOT APPLICABLE	WATER SOL.	: NO	COEF. WATER/OIL DIST (G/ML)	: NOT AVAILABLE
EVAPORATION RATE	: < ETHER	VAPOR DENSITY:	> AIR	VOLATILE ORGANIC COMPOUND (LBS./GAL.):	4.00

SECTION X - REACTIVITY DATA

GENERAL STABILITY @25'C	: STABLE
HAZARDOUS POLYMERIZATION	: WILL NOT OCCUR
HAZARDOUS DECOMPOSITION PRODUCTS	: ON THERMAL DECOMPOSITION IT MAY EMIT TOXIC FUMES, INCLUDING CO AND/OR CO2.
CONDITIONS TO AVOID	: AVOID ANY HEAT, SPARKS OR STATIC ELECTRICITY.
CONDITIONS WHICH MAY CAUSE INSTABILITY:	AVOID STRONG OXIDANTS.

SECTION XI - HEALTH HAZARD DATA

THIS MATERIAL, OR A CONSTITUENT, IS CONSIDERED TO BE A CARCINOGEN BY:

ORGANIZATION	CLASSIFICATION
NTP	B: CARCINOGENICITY REASONABLE ANTICIPATED
IARC	GROUP 2A: PROBABLY CARCINOGENIC TO HUMANS WITH EVIDENCE OF CARCINOGENICITY TO ANIMALS
OSHA	YES
OTHER	YES

A REVIEW OF AVAILABLE DATA INDICATES ANY PREEXISTING ABNORMAL CONDITIONS WITH THE LISTED TARGET ORGANS MAY BE AGGRAVATED BY EXPOSURE TO THIS MATERIAL.

ORGANS AFFECTED: SKIN, EYE, NOSE, THROAT, LUNGS, LIVER, KIDNEYS, BLOOD, CENTRAL NERVOUS SYSTEM, RESPIRATORY SYSTEM, GI TRACT

ROUTE OF ENTRY : CONTACT, EYES, INGESTION, INHALATION, ABSORPTION

THE HAZARDS PRESENTED ARE THOSE FOR THE HAZARDOUS SUBSTANCES PRESENTED IN SECTION II (A) UNLESS OTHERWISE NOTED.

XYLENE

EXPOSURE VALUES:

	PPM:	MG/M3:		PPM:	MG/M3:		PPM:	MG/M3:		PPM:	MG/M3:
OSHA PEL	100	435	ACGIH TLV	100	435	NIOSH TWA	100	N/A	VENDOR TWA	N/A	N/A

SECTION XI - HEALTH HAZARD DATA

OSHA STEL	150	655	ACGIH STEL	150	655	NIOSH STEL	N/A	N/A	VENDOR STEL	N/A	N/A
OSHA CEILING	N/A	N/A	ACGIH CEILING	N/A	N/A	NIOSH CEILING	200	N/A	VENDOR CEILING	N/A	N/A

IDLH 10000 N/A

ACUTE HAZARDS

GENERAL

XYLENE IS A MONOCYCLIC AROMATIC HYDROCARBON WHILE XYLENE CAN EXIST IN THREE ISOMERIC FORMS, ORTHO, META, AND PARA. THE COMMERCIAL GRADE OF XYLENE IS PREDOMINATELY A MIXTURE OF ALL THREE ISOMERS AND ETHYL-BENZENE. THE APPROXIMATE PERCENTAGES (NIOSH, 1986) ARE: O-XYLENE (9.1%), M-XYLENE (60.2%), P-XYLENE (13.6%), AND ETHYL BENZENE (17.0%). THE CAS REGISTRY NOS. ARE: XYLENE (MIXED), #1330-20-7; O-XYLENE, #95-47-6; M-XYLENE, #108-38-3;P-XYLENE,#106-42-3; AND ETHYLBENZENE, #100-41-4.

OTHER AROMATIC MATERIALS NOTED BY NIOSH WHICH MAY BE PRESENT IN XYLENES MIXED) AT LOW CONCENTRATION LEVELS ARE: TOLUENE, #108-88-3;, TRI-METHYLBENZENE, #2551-13-7; PHENOL, #108-95-2; THROPHENE, #110-02-1; AND PYRIDINE, 110-86-1.

TOXICITY, CARCINOGENESIS, AND IRRITATION STUDIES HAVE BEEN CONDUCTED ON XYLENES (MIXED) AND THE SUBSEQUENT HEALTH EFFECT DATA PRESENTED REFLECT SUCH STUDIES. THUS WHILE SOME OF THE XYLENES (MIXED) CONSTITUENTS HAVE A SEPARATE PEL/TLV/REL VALUE, THE ONES PRESENTED FOR XYLENES ARE THOSE ACCEPTED BY OSHA FOR XYLENES (MIXED).
SYNONYMS FOR XYLENE ARE P-ORTHO-XYLENE, 1,2 DIMETHYLE-BENZENE; META-XYLENE, 1,3-DIMETHYL-BENZENE; PARA-XYLENE; 1,4-DIMEHTYL-BENZENE

XYLENE IS INCOMPATIBLE WITH STRONG OXIDIZERS

ABSORPTION

THIS MATERIAL CAUSES DIZZINESS, EXCITEMENT, DROWSINESS, STAGGERING GAIT, AND INCOHERENCE.

RTECS REPORTS A DERMAL LD50 OF GREATER THAN 1700 MG/KG OF THIS MATERIAL WAS ADMINISTERED TO RABBITS. THIS VALUE REPRESENTS A SLIGHT ABSORPTION HEALTH HAZARD.

CARCINOGENICITY

A NATIONAL TECHNICAL INFORMATION SERVICE (NTIS) REPORT (9/84) INDICATES THAT XYLENE HAS BEEN APPROPRIATELY DESIGNATED AS A GROUP D-NOT CLASSIFIED CHEMICAL. ALL PRESENTED DATA INDICATES XYLENES ARE NOT MUTA-GENIC IN THE TEST SUBJECTS.

THE SAME NTIS REPORT REVIEWED TERATOGENICITY AND PRESENTS DATA THAT XYLENES AND P-XYLENE HAVE TERATOGENIC POTENTIAL AS INDICATED BY FETAL SKELETAL ABNORMALITIES.

A VENDOR STATES THIS MATERIAL CAUSES SLIGHT FETOTOXICITY AT DOSES WHICH ARE MATERNALLY TOXIC.

CONTACT

THIS MATERIAL CAUSES DERMATITIS.

RTECS REPORTS A 100% DOSAGE OF THIS MATERIAL WAS ADMINISTERED TO THE SKIN OF RABBITS IN A STANDARD DRAIZE TEST. THE REACTION TO THIS MATERIAL WAS MODERATE.

SECTION XI - HEALTH HAZARD DATA

RTECS REPORTS A 500 MG DOSE OF THIS MATERIAL WAS ADMININSTERED TO THE SKIN OF RABBITS FOR 24 HOURS IN A STANDARD DRAIZE TEST. THE REACTION TO THIS MATERIAL WAS MODERATE.

EYE

THIS MATERIAL CAUSES IRRITATION AND CORNEAL VACUOLIZATION.

RTECS REPORTS A 87 MG DOSE OF THIS MATERIAL WAS ADMINISTERED TO THE EYES OF RABBITS. THE REACTION TO THIS MATERIAL WAS MILD.

RTECS REPORTS A 5 MG DOSE OF THIS MATERIAL WAS ADMINISTERED TO THE EYES OF RABBITS FOR 24 HOURS IN A STANDARD DRAIZE TEST. THE REACTION TO THIS MATERIAL WAS SEVERE.

INGESTION

THIS MATERIAL CAUSES ANOREXIA, NAUSEA, VOMITING, AND ABDOMINAL PAIN; ALSO IRRITATES NOSE AND THROAT.

RTECS REPORTS AN ORAL LD50 OF 4300 MG/KG OF THIS MATERIAL WAS ADMINISTERED TO RATS. TOXIC EFFECTS NOTED INCLUDE CHANGES IN THE LIVER, KIDNEYS, URETER, AND/OR BLADDER. THIS VALUE REPPRESENTS A SLIGHT INGESTION HEALTH HAZARD.

INHALATION

THIS MATERIAL CAUSES DIZZINESS, EXCITEMENT, DROWSINESS, INCOHERENCE, AND STAGGERING GAIT; ALSO IRRITATES EYES, NOSE AND THROAT.

RTECS REPORTS AN INHALATION LC50 OF 5000 PPM OF THIS MATERIAL WAS ADMINISTERED TO RATS FOR 24 HOURS. THIS VALUE REPRESENTS A SLIGHT INHALATION HEALTH HAZARD.

:HRONIC HAZARDS

:ONTACT

REPEATED OR PROLONGED EXPOSURE TO XYLENE MAY CAUSE A SKIN RASH.

:YE

REPEATED EXPOSURE OF THE EYES TO HIGH CONCENTRATIONS OF XYLENE VAPOR MAY CAUSE REVERSIBLE EYE DAMAGE.

MINERAL SPIRITS

:XPOSURE VALUES:

	PPM:	MG/M3:		PPM:	MG/M3:		PPM:	MG/M3:		PPM:	MG/M3:
ISHA PEL	500	2000	ACGIH TLV	N/A	N/A	NIOSH TWA	N/A	350	VENDOR TWA	N/A	N/A
'SHA STEL	N/A	N/A	ACGIH STEL	N/A	N/A	NIOSH STEL	N/A	N/A	VENDOR STEL	N/A	N/A
'SHA CEILING	N/A	N/A	ACGIH CEILING	N/A	N/A	NIOSH CEILING	N/A	1800	VENDOR CEILING	N/A	N/A
DLH	10000	N/A									

CUTE HAZARDS

ENERAL

THIS MATERIAL IS A CLEAR LIQUID WITH A CHARACTERISTIC ODOR. A SYNONYM IS HYDROCARBON MIXTURE.

THE CAS REGISTRY NUMBER IS 64742-47-8.

SECTION XI - HEALTH HAZARD DATA

THE COMMERCIAL MATERIAL IS A HYDROCARBON MIXTURE AND IS NOTED BY A VENDOR TO CONTAIN >95% "STODDARD SOLVENT" (CAS REGISTRY #: 8052-41-3) AND <5% OF UNIDENTIFIED AROMATIC MATERIALS.

THIS MATERIAL IS INCOMPATIBLE WITH STRONG OXIDIZING AGENTS, STRONG ACIDS OR BASES, AND SELECTED AMINES.
THIS MATERIAL HAS A CAS REGISTRY NUMBER OF 64742-47-8, AND IT'S COMMON NAME IS EXXSOL D 110. IT IS A CLEAR, COLORLESS LIQUID.

CARCINOGENICITY

REPROTEXT STATES SOME RELATED FRACTIONS HAVE CAUSED CANCER IN ANIMALS.

SOME RELATED FRACTIONS HAVE BEEN ASSOCIATED WITH BIRTH DEFECTS AND MENSTRUAL PROBLEMS IN HUMANS.

REPROTEXT STATES SIMILAR PETROLEUM DISTILLATE FRACTIONS HAVE CAUSED KIDNEY DAMAGE IN MALE RATS.

:ONTACT

THIS MATERIAL CAN CAUSE DRY, CRACKED SKIN AND SKIN IRRITATION.
THIS MATERIAL IS CONSIDERED TO BE OF LOW TOXICITY BY THE ROUTE OF SKIN CONTACT.

FREQUENT OR PROLONGED CONTACT MAY IRRITATE AND CAUSE DERMATITIS.

SKIN CONTACT MAY AGGRAVATE AN EXISTING DERMATITIS CONDITION.

REPROTEXT STATES THIS MATERIAL IS EXPECTED TO BE A SKIN IRRITANT BASED ON PROPERTIES IF SIMILAR SUBSTANCES.
REPROTEXT STATES REPEATED CONTACT WITH THE SKIN MAY PRODUCE A DEFATTING DERMATITIS WITH DRYNESS AND CRACKING. IF THIS PRODUCT CONTAINS SIG-NIFICANT AMOUNTS OF N-HEXANE XREF, IT MAY DAMAGE THE PERIPHERAL NERVES, PRODUCING NUMBNESS AND TINGLING IN THE EXTREMITIES.

REPROTEXT STATES PERSONS WITH SKIN CONDITIONS MAY BE MORE SENSITIVE WHEN EXPOSED TO THIS MATERIAL.

:YE

THIS MATERIAL CAN CAUSE EYE IRRITATION WITH STINGING, TEARING, AND REDNESS.
THIS MATERIAL IS SLIGHLTY IRRITATING, BUT DOES NOT INJURE EYE TISSUE.

REPROTEXT STATES THIS MATERIAL IS EXPECTED TO BE AN EYE IRRITANT BASED ON PROPERTIES OF SIMILAR SUBSTANCES.

REPROTEXT STATES PERSONS WITH EYE CONDITIONS MAY BE MORE SENSITIVE WHEN EXPOSED TO THIS MATERIAL.

NGESTION

THIS MATERIAL MAY CAUSE GASTROINTESTINAL TRACT IRRITATION, NAUSEA, AND NERVOUS SYSTEM DEPRESSION.
THIS MATERIAL IS CONSIDERED TO EXHIBIT MINIMAL TOXICITY THROUGH THE ROUTE OF INGESTION.

SMALL AMOUNTS OF THIS PRODUCT ASPIRATED INTO THE RESPIRATORY SYSTEM DURING INGESTION OR VOMITING MAY CAUSE MILD TO SEVER PULMONARY INJURY, POSSIBLY PROGRESSING TO DEATH.

SECTION XI - HEALTH HAZARD DATA

...ALATION

THIS MATERIAL CAN CAUSE NOSE AND THROAT IRRITATION, DIZZINESS, HEADACHE, AND DROWSINESS.
HIGH VAPOR OR AEROSOL CONCENTRATIONS (GREATER THAN APPROX. 700 PPM, ATTAINABLE AT ELEVATED TEMPERATURES WELL ABOVE AMBIENT) ARE IRRITATING TO THE EYES AND THE RESPIRATORY TRACT, AND MAY CAUSE HEADACHES, DIZZINES DIZZINESS, ANESTHESIA, DROWSINESS, UNCONSCIOUSNESS, OR OTHER CENTRAL NERVOUS SYSTEM EFFECTS, INCLUDING DEATH.

REPROTEXT STATES THIS PRODUCT IS EXPECTED TO BE A RESPIRATORY IRRITANT AND CNS DEPRESSANT BASED ON PROPERTIES FROM SIMILAR SUBSTANCES. SYMPTOMS OF CNS DEPRESSION INCLUDE NAUSEA, HEADACHE, WEAKNESS, DIZZINESS, LOSS OF COORDINATION AND JUDGEMENT, AND COMA AND DEATH FROM RESPIRATORY PARALYSIS.

REPROTEXT STATES PERSONS WITH RESPIRATORY AND/OR NEUROLOGICAL CONDITIONS MAY BE MORE SENSITIVE WHEN EXPOSED TO THIS MATERIAL.

REPROTEXT STATES PERSONS EXPOSED TO OTHER PETRLEUM PRODUCTS, OR TO OTHER CNS DEPRESSANTS, MAY BE MORE SENSITIVE WHEN EXPOSED TO THIS MATERIAL.

SECTION XII (A) - ECOLOGICAL INFORMATION

XYLENE

E HAZARDS

THIS MATERIAL MAY PHOTOCHEMICALLY DEGRADE BY REACTION WITH HYDROXYL RADICALS (HALF-LIFE 1-18 HOURS) WHEN RELEASED INTO THE ATMOSPHERE.

THE DOMINANT REMOVAL PROCESS OF XYLENE IN WATER IS VOLATILIZATION.

XYLENES ARE MODERATELY MOBILE IN SOIL AND MAY LEACH INTO GROUNDWATER WHERE THEY ARE KNOWN TO PERSIST FOR SEVERAL YEARS.

BIOCONCENTRATION IS TO EXPECTED TO BE A SIGNIFICANT PROCESS WITH XYLENE.

SECTION XII (B) - INCOMPATIBILITY INFORMATION

FORMALDEHYDE

GENERAL

THIS MATERIAL IS INCOMPATIBILE WITH STRONG OXIDIZING AGENTS, CAUSTICS, STRONG ALKALIES, ISOCYANATES, ANHYDRIDES, OXIDES, AND INORGANIC ACIDS.

FORMALDEHYDE REACTS WITH NITROGEN DIOXIDE; NITROMETHANE; PERCHLORIC ACID AND ANILINE; OR PEROXYFORMIC ACID TO FORM EXPLOSIVE COMPOUNDS.

FORMALDEHYDE CAN REACT WITH HYDROCHLORIC ACID TO FORM BIS-CHLOROMETHYL ETHER, A CARCINOGEN.

FORMALDEHYDE SOLUTIONS MAY SELF-POLYMERIZE TO FORM PARAFORMALDEHYDE

SECTION XII (B) - INCOMPATIBILITY INFORMATION

WHICH PRECIPITATES FROM THE SOLUTION. OXYGEN, FROM THE AIR, CAN OXIDIZE FORMALDEHYDE TO FORMIC ACID, A CORROSIVE MATERIAL, ESPECIALLY WHEN HEATED.

SECTION XII (C) - SYNERGISTIC EFFECTS

NOT AVAILABLE

SECTION XIII - DISPOSAL CONDITIONS

THIS MATERIAL WILL BE A RCRA HAZARDOUS WASTE IF DISPOSED AS RECEIVED. HOWEVER, SUBSEQUENT USE OF THIS MATERIAL MAY REQUIRE A REASSESSMENT OF ANY WASTES GENERATED TO DETERMINE THEIR LEGAL STATUS.

RQ VALUES OF SUBSTANCES LISTED IN SECTION II (A) AND (B), AS 100%:

SUBSTANCE(S)	DOT RQ	EPA RQ
XYLENE	100	100
MINERAL SPIRITS	100	100
FORMALDEHYDE	100	100

THE CALCULATED DOT RQ OF THIS MATERIAL, AS SHIPPED, IS: 100 LBS.

THE RCRA HAZARDOUS WASTE CODES APPLICABLE TO THIS MATERIAL, IF DISPOSED AS RECEIVED, ARE:

CODE	NAME	DOT RQ	EPA RQ
D001	WASTE FLAMMABLE MATERIAL WITH A FLASH POINT <140 F	100	100

SECTION XIV - TRANSPORT INFORMATION

THE US DOT REQUIRES THE FOLLOWING INFORMATION WHEN THIS MATERIAL IS SO TRANSPORTED PER TITLE 49 OF THE CFR.

	UN/NA NUMBER	: UN 1866
	DOT HAZARD CLASS	: CLASS 3,
NON-BULK	DOT PRIMARY LABEL	: FLAMMABLE LIQUID LABEL/PLACARD PRIMARY RISK CLASS NUMBER 3
	DOT PRIMARY PLACARD	: FLAMMABLE LIQUID LABEL/PLACARD PRIMARY RISK CLASS NUMBER 3
	DOT PROPER SHIPPING NAME:	RESIN SOLUTION III, SHIPPED IN THE U.S. UNDER 171.12A

	UN/NA NUMBER	: UN 1866
PRIMARY LABEL	DOT HAZARD CLASS	: CLASS 3 (9.2),
BULK	DOT PRIMARY LABEL	: FLAMMABLE LIQUID LABEL/PLACARD PRIMARY RI
CONTAINERS	DOT PRIMARY PLACARD	: FLAMMABLE PLACARD WITH ID NUMBER PRINTED ON IT CLASS NUMBER 3
	DOT PROPER SHIPPING NAME:	RESIN SOLUTION (XYLENE), III, RQ (XYLENE)

INTERNATIONAL REGULATIONS REQUIRE THE FOLLOWING INFORMATION WHEN THIS MATERIAL IS TRANSPORTED BY WATER.

	UN/NA NUMBER	: UN1866,
	HAZARD CLASS	: CLASS 3.3,
NON-BULK	PRIMARY LABEL	: FLAMMABLE LIQUID LABEL/PLACARD PRIMARY RISK CLASS NUMBER 3
	PROPER SHIPPING NAME	: RESIN SOLUTION, P.G. III, RQ (XYLENE), DESCRIBED IN ACCORDANCE WITH

SECTION XIV - TRANSPORT INFORMATION

SECTION XV - REGULATORY INFORMATION

PRODUCT USE: N/A

1. SUPERFUND AMENDMENTS & REAUTHORIZATION ACT OF 1986

SECTION 302 -- EXTREMELY HAZARDOUS SUBSTANCES

THE FOLLOWING SUBSTANCES IN THIS MATERIAL MAY REQUIRE SOME NOTIFICATION TO APPROPRIATE AUTHORITIES IF THE TOTAL AMOUNT OF SUCH MATERIAL IN YOUR POSSESSION EVER EXCEEDS THE 'PLANNING VALUES'.

HAZARDOUS SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
FORMALDEHYDE	50-00-0	NO	> 50 PPB	1.3@20	100

SECTION 304 - EMERGENCY NOTIFICATION

THE FOLLOWING SUBSTANCES IN THIS MATERIAL MAY REQUIRE SOME NOTIFICATION TO APPROPRIATE AUTHORITIES IF THE TOTAL AMOUNT OF SUCH MATERIAL RELEASED TO THE ENVIRONMENT EVER EXCEEDS A REGULATED THRESHOLD.

HAZARDOUS SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
XYLENE	1330-20-7	NO	20.0000-30.0000	8@20	100
MALDEHYDE	50-00-0	NO	> 50 PPB	1.3@20	100

SECTIONS 311/312--MSDS & EMERGENCY AND HAZARDOUS CHEMICAL INVENTORY FORM

THIS MATERIAL MAY BE APPLICABLE TO THESE REGULATIONS AND MAY REQUIRE APPROPRIATE GOVERNMENTAL REPORTS IF THE TOTAL AMOUNT OF THIS MATERIAL AND/OR ANY OF THE CONSTITUENTS LISTED IN YOUR POSSESSION EVER EXCEED THE REGULATORY THRESHOLD VALUES.

HAZARDOUS SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
XYLENE	1330-20-7	NO	20.0000-30.0000	8@20	100
FORMALDEHYDE	50-00-0	NO	> 50 PPB	1.3@20	100

THE APPROPRIATE HAZARD CLASSES FOR THIS MATERIAL ARE:

HEALTH HAZARDS	PHYSICAL HAZARDS
ACUTE	FIRE
CHRONIC	

SECTION 313--TOXIC RELEASE

THE FOLLOWING SUBSTANCE(S) ARE SUBJECT TO THE REPORTING REQUIREMENTS OF SECTION 313 OF TITLE III OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 AND 40 CFR PART 372. THESE SUBSTANCES MAY NOT BE REFLECTED IN THIS MSDS' SECTION II OR XI.

SUBSTANCE(S) WITH CAS NUMBERS	CAS NO.	TRADE SECRET	WEIGHT RANGE	VAPOR PRESSURE MM HG @C	DOT RQ
XYLENE	1330-20-7	NO	20.0000-30.0000	8@20	100

2. STATE'S RIGHT-TO-KNOW LAWS

SECTION XV - REGULATORY INFORMATION

.RAL STATES HAVE ENACTED STATUTES REQUIRING CERTAIN INFORMATION BE AVAILABLE ON MSDS AND/OR LABELS IN ADDITION TO THAT REQUIRED BY 29 CFR 1910.1200. THE FOLLOWING REFLECT SCHENECTADY INTERNATIONAL, INC. BEST AVAILABLE INFORMATION OF WHICH SUBSTANCES MAY BE PRESENT IN THIS MATERIAL AND, THEREFORE, APPLICABLE TO THE GIVEN STATE. CHEMICAL NAMES ARE TRUNCATED TO 125 CHARACTERS.

CALIFORNIA--PROPOSITION 65--"SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER".

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE COMMON NAME : FORMALDEHYDE	50-00-0	NO	

CALIFORNIA--"SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM".

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE COMMON NAME : FORMALDEHYDE	50-00-0	NO	

IASSACHUSETTS--RIGHT-TO-KNOW--EXTREMELY HAZARDOUS SUBSTANCES.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE COMMON NAME : FORMALDEHYDE	50-00-0	NO	

IASSACHUSSETTS--RIGHT-TO-KNOW--HAZARDOUS SUBSTANCES.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: XYLENE COMMON NAME : XYLENE	1330-20-7	NO	
CHEMICAL NAME: FORMALDEHYDE OMMON NAME : FORMALDEHYDE	50-00-0	NO	

IEW JERSEY--WORKPLACE HAZARDOUS SUBSTANCE LIST.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: XYLENE COMMON NAME : XYLENE	1330-20-7	NO	
CHEMICAL NAME: FORMALDEHYDE COMMON NAME : FORMALDEHYDE	50-00-0	NO	

IEW JERSEY--RIGHT-TO-KNOW--ENVIRONMENTALLY HAZARDOUS SUBSTANCES.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE COMMON NAME : FORMALDEHYDE	50-00-0	NO	

ENNSYLVANIA--RIGHT-TO-KNOW--SPECIAL HAZARDS.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: XYLENE COMMON NAME : XYLENE	1330-20-7	NO	
CHEMICAL NAME: FORMALDEHYDE COMMON NAME : FORMALDEHYDE	50-00-0	NO	

ENNSYLVANIA--RIGHT-TO-KNOW--HAZARDOUS SUBSTANCES.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE MMON NAME : FORMALDEHYDE	50-00-0	NO	

3. INTERNATIONAL CONCERNS

SECTION XV - REGULATORY INFORMATION

FOLLOWING REPRESENT CERTAIN APPLICABLE INTERNATIONAL STATUTES/REGULATIONS.

:ANADA--CONTROLLED PRODUCTS REGULATION (WHMIS). THIS MATERIAL IS KNOWN TO BE APPLICABLE TO THIS REGULATION.

WHMIS DESIGNATION(S): B2 : FLAMMABLE.
B3 : COMBUSTIBLE.
D1B: MAY BE A TERATOGEN. LUNG IRRITANT.
D2B: MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION.

:ANADA--INGREDIENT DISCLOSURE LIST.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE			
COMMON NAME : FORMALDEHYDE	50-00-0	NO	

:UROPEAN ECONOMIC COMMUNITY (EINICS).

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE			
COMMON NAME : FORMALDEHYDE	50-00-0	NO	

IONG KONG.

SUBSTANCE(S)	CAS NO.	TRADE SECRET	ID NO.
CHEMICAL NAME: FORMALDEHYDE			
COMMON NAME : FORMALDEHYDE	50-00-0	NO	

SECTION XVI - OTHER

HE HEALTH AND SAFETY EFFECTS INFORMATION PRESENTED IS THAT AVAILABLE TO SCHENECTADY INTERNATIONAL, INC. (SII) AS OF THE DATE 'UBLISHED. SII MAKES NO REPRESENTATION OF THE INFORMATION'S COMPLETENESS OR ACCURACY. SII EXPECTS THOSE PERSONS, RECEIVING 'HIS MSDS, WILL EXERCISE THEIR INDEPENDENT JUDGEMENT OR CONSULT WITH A COMPETENT HEALTH/SAFETY PROFESSIONAL IN DETERMINING 'HIS MATERIAL'S APPROPRIATENESS FOR A SPECIFIC USE AND TYPE OF PERSONAL PROTECTION EQUIPMENT DEEMED NECESSARY FOR THE GIVEN ISE AND THE AVAILABLE ENGINEERING CONTROLS.

'/A = NOT AVAILABLE // N.A. = NOT APPLICABLE // N.D. = NOT DETERMINED
DATE PRINTED 03/31/97
'EIGHT RANGES EXPRESSED AS PERCENTAGES UNLESS OTHERWISE INDICATED. RQ EXPRESSED IN POUNDS.

Appendix Q   1207

MATERIAL SAFETY DATA SHEET

PAGE: 1
06M6401

MANUFACTURED BY:
INSULATING MATERIALS INCORPORATED
1 CAMPBELL ROAD
SCHENECTADY, NEW YORK 12306

EMERGENCY TELEPHONE:
DAILY 8AM-5PM (518) 385-0172
24HRS (518) 395-3310
REVISED: 6/06/86
PREPARER:A L DRAKE

***** I PRODUCT IDENTIFICATION *****

PRODUCT IDENTIFICATION: 06M6401   CHEMICAL FAMILY:OLEORESINOUS INSULATING SOL'N
CHEMICAL NAME: OLEORESINOUS INSULATING VARNISH   FORMULA: MIXTURE

***** II PRODUCT COMPONENTS *****

PRODUCT COMPOSITION	APPROX. %	ACGIH TLV	OSHA PEL	UNITS	CAS REG NO.
A. HAZARDOUS					
ASPHALT-GILSONITE-LINSEED OIL POLY	< 40%	NF	NF	NA	68551-37-1
TOLUENE	< 70%	100	200	PPM	108-88-3* toluene
B. NON-HAZARDOUS					

***** III PHYSICAL DATA ******

**PRODUCT INFORMATION
BOILING POINT : NF (F) NF (C)
VAPOR PRESSURE(20 C): NF MM HG
VAPOR DENSITY(AIR=1): NF
FREEZING POINT : NF (F) NF (C)
MELTING POINT : NF (F) NF (C)
PHYSICAL STATE : LIQUID
ODOR : MILD PETROLEUM
COLOR : BLACK
SOLUBILITY IN WATER(20 C):NF
SOLUBILITY IN ORGANIC SOLVENT:NF
(STATE SOLVENT)

% VOLATILE BY VOLUME:68
EVAPORATION RATE :>1
(BUTYL ACETATE=1
SPECIFIC GRAVITY :.897
(WATER=1)
DENSITY :NF KG/M3
ACIDITY/ALKALINITY :NF MEG/G
PH :NF

ASPHALT-GILSONITE-LINSEED OIL POLY
BOILING POINT: NF (F) NF (C)
VAPOR PRESSURE: (20 C) NF MM HG
VAPOR DENSITY: (AIR=1) NF

MATERIAL SAFETY DATA SHEET

TOLUENE
BOILING POINT: 231 (F) 111 (C)
VAPOR PRESSURE: (20 C) 22 MM HG
VAPOR DENSITY: (AIR=1) 3.2

***** IV FIRE AND EXPLOSION DATA *****

FLASH POINT: 48 (F) 9 (C) BY PMCC IGNITION TEMP:NF (F)NF (C)
FLAMMABLE LIMITS IN AIR(%): LOWER 1.2 UPPER 7.1
EXTINGUISHING MEDIA:
CARBON DIOXIDE
DRY CHEMICAL
FOAM
WATER MIST
SPECIAL FIREFIGHTING PROCEDURES:
EXTREMELY FLAMMABLE.
POSITIVE PRESSURE, SELF-CONTAINED BREATHING APPARATUS
EVACUATE AREA AND FIGHT FIRE FROM A SAFE DISTANCE.
TOXIC VAPORS ARE EMITTED IN A FIRE CONDITION.
CONTAINERS CAN BUILD UP PRESSURE IF EXPOSED TO HEAT (FIRE).

***** V REACTIVITY DATA *****

STABILITY:
X STABLE UNSTABLE
HAZARDOUS:
POLYMERIZATION WILL NOT OCCUR
HAZARDOUS DECOMPOSITION PRODUCTS:
CARBON MONOXIDE.
CARBON DIOXIDE.
TOXIC FUMES.
INCOMPATIBILITY (MATERIALS TO AVOID):
CONTACT WITH OXIDIZING AGENTS.
CONDITIONS TO AVOID:
KEEP AWAY FROM HEAT,SPARKS AND OPEN FLAME.

***** VI HEALTH HAZARD DATA *****

ACUTE SIGNS/EFFECTS OF OVEREXPOSURE:
INGESTION:
CAUSES VOMITING,NAUSEA,AND DIARRHEA
IRRITATION OF THE MOUTH, THROAT, AND STOMACH
ASPIRATION CAN BE A HAZARD IF THIS MATERIAL IS SWALLOWED.
SKIN CONTACT:
MAY CAUSE MODERATE SKIN IRRITATION.
WILL CAUSE SKIN DEFATTING.
INHALATION:
EXCESSIVE INHALATION CAUSES HEADACHE,DIZZINESS,NAUSEA AND INCOORDINATION.
CAUSES IRRITATION OF THE MOUTH,NOSE,AND THROAT.
CAN CAUSE UNCONSCIOUSNESS IF INHALED.
EYE CONTACT:

MATERIAL SAFETY DATA SHEET

MAY CAUSE SEVERE EYE IRRITATION.
CAUSES REDNESS AND TEARING.
CAUSES BLURRED VISION.

MEDICAL CONDITIONS AGGRAVATED:
RESPIRATORY
LIVER, KIDNEY
DERMAL AILMENTS.
CENTRAL NERVOUS SYSTEM DISORDERS.
GASTROINTESTINAL DISORDERS.
EYE AILMENTS.

*

OTHER:
HAZARDS APPLY TO THE COMPONENT TOLUENE.

CHRONIC EFFECTS OF OVEREXPOSURE:
DERMATITIS.
RESPIRATORY AILMENTS.
CENTRAL NERVOUS SYSTEM DAMAGE.
LIVER AND KIDNEY DAMAGE.
THIS PRODUCT CONTAINS A COMPONENT THAT IS A SUSPECTED MUTAGEN.
THIS PRODUCT CONTAINS A COMPONENT THAT IS A SUSPECTED TERATOGEN.
EYE DAMAGE.

* Dies
Say

EMERGENCY AND FIRST AID PROCEDURES:

INGESTION:
IF SWALLOWED DO NOT INDUCE VOMITING, GIVE LARGE QUANTITIES OF WATER TO DRINK AND GET MEDICAL ATTENTION, NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

SKIN:
REMOVE CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE.
WASH WITH SOAP AND WATER.
GET MEDICAL ATTENTION IF IRRITATION PERSISTS.

INHALATION:
IF INHALED, REMOVE TO FRESH AIR, IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION, PREFERABLY MOUTH-TO MOUTH. IF BREATHING IS DIFFICULT GIVE OXYGEN. GET MEDICAL ATTENTION.

EYES:
IN CASE OF CONTACT, IMMEDIATELY FLUSH EYES WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES AND GET MEDICAL ATTENTION.

NOTE TO PHYSICIAN:
MONITOR FOR 24 HRS., OBSERVE AND SUPPORT LIVER FUNCTION.
ASPIRATION MAY CAUSE SEVERE LUNG DAMAGE. EVACUATE STOMACH IN A WAY WHICH AVOIDS ASPIRATION.

MATERIAL SAFETY DATA SHEET

TOXICITY: ASPHALT-GILSONITE-LINSEED OIL POLY
ACUTE ORAL LD50: NF MG/KG
ACUTE DERMAL LD50: NF MG/KG
ACUTE INHALATION LC50: NF
OTHER: NONE.

AMES TEST: UNKNOWN

TOXICITY: TOLUENE
ACUTE ORAL LD50: 5,000 (RAT) MG/KG
ACUTE DERMAL LD50: 14,000 (RBT) MG/KG
ACUTE INHALATION LC50: LCLO 4,000PPM/4H RAT
OTHER: EYE AND SKIN IRRITANT.
AMES TEST: UNKNOWN
PRINCIPAL ROUTES OF EXPOSURE:
ORAL.
DERMAL - SKIN.
EYES.
INHALATION.
ABSORPTION THROUGH SKIN.
THIS PRODUCT OR ONE OF ITS INGREDIENTS PRESENT 0.1% OR MORE IS NOT LISTED AS A CARCINOGEN OR SUSPECTED CARCINOGEN BY NTP, IARC, OR OSHA.
PRODUCTS/INGREDIENTS:
THIS SPACE RESERVED FOR SPECIAL USE.

***** VII SPECIAL PROTECTIVE EQUIPMENT *****

RESPIRATORY PROTECTION:
USE IN A WELL VENTILATED AREA.
USE APPROVED NIOSH RESPIRATORY PROTECTION IF TLV EXCEEDED.....
OR OVER EXPOSURE IS LIKELY.
PROTECTIVE GLOVES:
POLYVINYL ALCOHOL GLOVES.
EYE AND FACE PROTECTION:
MONOGOGGLES.
FACE SHIELD.
OTHER PROTECTIVE EQUIPMENT:
RUBBER APRON.
WEAR CLEAN, BODY-COVERING CLOTHING.
VENTILATION:
USE ONLY IN WELL VENTILATED AREA.
MECHANICAL VENTILATION.

*** VIII SPILL, LEAK AND DISPOSAL PROCEDURES ***

ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
WIPE, SCRAPE OR SOAK UP IN AN INERT MATERIAL AND PUT IN A CONTAINER FOR DISPOSAL.

MATERIAL SAFETY DATA SHEET

WEAR PROPER PROTECTIVE EQUIPMENT AS SPECIFIED IN THE PROTECTIVE EQUIPMENT SECTION.
REMOVE SOURCES OF IGNITION.
WARN OTHER WORKERS OF SPILL.
INCREASE AREA VENTILATION.
PERSON NOT TRAINED SHOULD EVACUATE AREA.

DISPOSAL METHOD:
DISPOSAL SHOULD BE MADE IN ACCORDANCE WITH FEDERAL, STATE AND LOCAL REGULATIONS.

***** IX SPECIAL PRECAUTIONS *****

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
USE GROUND STRAP.
STORE UPRIGHT IN A COOL PLACE BELOW 30'C (85'F).
AVOID BREATHING VAPORS, IF EXPOSED TO HIGH VAPOR CONCENTRATION, LEAVE AREA AT ONCE.
AVOID CONTACT WITH SKIN AND EYES.
USE ONLY IN A WELL VENTILATED AREA.
DANGER! EXTREMELY FLAMMABLE.
KEEP CONTAINER CLOSED WHEN NOT IN USE TO PREVENT CONTACT WITH ACIDIC, BASIC OR OXIDIZING MATERIALS.
KEEP AWAY FROM FOOD AND SMOKING MATERIALS.
WASH HANDS BEFORE EATING AND SMOKING.

ENGINEERING CONTROLS:
EXHAUST VENTILATION
EYEWASH STATIONS.
USE IN A WELL VENTILATED AREA.

** X SHIPPING AND REGULATORY CLASSIFICATION DATA **

DOT SHIPPING NAME:	RESIN SOLUTION
DOT HAZARD CLASS:	FLAMMABLE LIQUID
DOT LABEL(S):	FLAMMABLE
UN/NA NUMBER:	UN1866
PLACARDS:	NA
EXPORT:	NA
EPA HAZARD WASTE:	D001
OSHA HAZARD CLASS:	IRRITANT
CPSC CLASSIFICATION:	--
TRANSPORTATION CLASS:	IMO 3.2 PG 3105
	RID (OCTI) --
	ADR (ECE) --
	RAR (IATA) 3,II

NFPA/HMIS CLASSIFICATION: FLAMMABILITY 3 , REACTIVITY 0 , HEALTH 2

ADDITIONAL INFORMATION:
THESE DATA ARE OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS A PRODUCT SPECIFICATION. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, IS MADE. THE RECOMMENDED HANDLING PROCEDURES ARE

MATERIAL SAFETY DATA SHEET

BELIEVED TO BE GENERALLY APPLICABLE. HOWEVER, EACH USER SHOULD REVIEW THESE RECOMMENDATIONS IN THE SPECIFIC CONTENT OF THE INTENDED USE..

....

THIS PRODUCT CONTAINS A SUBSTANCE(S) THAT IS (ARE) ON THE LIST OF TOXIC CHEMICALS SUBJECT TO SECTION 313 OF THE SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA). THIS SUBSTANCE MAY BE SUBJECT TO AN ANNUAL SUBMISSION OF A TOXIC CHEMICAL RELEASE FORM. SUCH SUBSTANCE IF PRESENT AT LESS THAN ONE PERCENT, IS NOT LISTED UNDER PRODUCT COMPOSITION IN SECTION II..

C = CEILING LIMIT	NEGL = NEGLIGIBLE
EST= ESTIMATED	NF = NONE FOUND
NA = NOT APPLICABLE	UNKN = UNKNOWN
NE = NONE ESTABLISHED	REC = RECOMMENDED
ND = NONE DETERMINED	V = RECOMM. BY VENDOR
BY-PRODUCT = REACTION BY-	SKN = SKIN
PRODUCT, TSCA INVENTORY	TS = TRADE SECRET
STATUS NOT REQUIRED UNDER	R = RECOMMENDED
40 CFR PART 720.30(H-2)	MST = MIST

....

vonRoll ISOLA

Fax

To: Sonia Lal

Telephone: 416-449-0009 Ext 225
Fax: 416-449-7772

From: Donna Mellon, Environmental Compliance
Telephone: 518-344-7140
Fax: 518-344-7297
Email: donna.mellon@vonroll-isola.com

Von Roll Isola USA, Inc.

One West Campbell Road
Schenectady, NY 12306

Phone +1 518 344 7100
Fax +1 518 344 7297
www.vonroll-isola.com

Subject: **1027 - 1028**

Date: September 12, 2005 2:34 PM

Number of pages 12 **(including cover sheet)**

Sonia,

I have copied the pertinent formulation information from the file. It appears that later the materials were manufactured for GE by Schenectady International (then Schenectady Chemical) but I don't know for sure under what Schenectady Chemical part numbers.

It appears that the 1208A, B and C designations I have in the files are just slightly different formulations of 1208.

These appear to be Asphalt materials 6098 and 6094 *
I included the discussion on the RMC 6260 composition of Gilsonite. *

We don't work with Asphalt materials here so I don't have a feel for coal tar vs asphalt sources. We don't seem to have MSDSs on these material as the may have been dropped before the MSDSs were created.

If I can be of further assistance, let me know.

Sincerely,
Donna
D

1027

PROCESS INSTRUCTIONS

1027

ISSUE NO 20

REASON Supersedes issue 19 of 11/12/65
2. Relabel RMC 6401
Batch Card Reference Issue 20 of 4/1/71

EQUIPMENT

DATE 4/1/71

ISSUED BY N. Kaplan

PAGE 1 OF 1

I. Safety Materials

This material contains

RMC	Materials	Standing Instruction
448	448 Oil (contains linseed oil)	001-534
6098	Hi Melt Asphalt	001-514
6260	Gilsonite Selects	001-514
6366	Blown Linseed Oil	001-534
6647	Toluene	001-505

II. Product Description

The product is a pitch-like base consisting of Oil-Gilsonite and Asphalt dissolved in Toluene.

III. Process Description

This product is RMC 6401 relabeled.

IV. Process Procedure

1. Check batch card and determine how many drums are to be relabeled.

2. Cover up all identifying marks on the drum.

3. Restencil 1027, Batch #_______, gross and tare weights and add a #1 warning label.

N. Kaplan 4/1/71

NK:ev [illegible] 4/5/71

N. Kaplan
Production Engineer

RMC 6401

File

Subject: RMC 6401

Schenectady, August 6, 1970

Mr. S. C. Manuel
Riverview #14

RMC NUMBER AND G. E. NAME

RMC 6401, #2 Varnish

DESCRIPTION

RMC 6401 defines a 30% solution of an oil modified asphalt, gilsonite pitch like resin in toluene.

USE

Flexible insulation intermediate and repacked as IMD 1027.

SUPPLIER

Schenectady Chemical
Schenectady, New York

maybe
RMC - 6401

HAZARDS

Contact with the skin may cause mild irritation which passes away as soon as the material is removed. Avoid prolonged breathing of the fumes, and be careful not to enter a confined space where the material is present.

REFERENCE

EI for 1027 Black Adhesive, Issue 17, Dated 1/18/60.
Batch card for 1027 Black Adhesive, Issue 13, Dated 11/12/65.

GHG:ev

G. H. Gelvin

6098

General Electric Co.
Insulating Materials Dept.
Raw Material Quality Instruction

RMC No: 6098 (D50JM39)
Description: Hi Melt Asphalt
Issue No: 1
Date: 8/27/69

I SAFETY HAZARD

If skin contact is made, wash affected area with soap and water. Refer to Raw Material Hazard 001-514.

II APPROVED SUPPLIERS

Robertson Co.

III INSPECTION PROCEDURE

A. Assure that the shipment is from an approved supplier.

B. Sampling: A representative eight ounce sample will be taken from each lot of material received.

C. Testing

TEST	FREQUENCY	METHOD	SPECIFICATION
Softening Point	2/lot	*	185.0 - 192.0

*Ball and ring in glycerine bath. Five degree per minute rate of rise. Heat ring and force into pitch.

D. Certification: A certificate of test is not required.

E. Retain a four ounce sample.

IV DISPOSITION

Refer to general procedure for release of raw materials.

G. H. Gelvin G.H. Gelvin
Quality Control Engineer
Varnish and Wire Enamel

GHG:ev

FROM : FAX NO. : Sep. 12 2005 02:38PM P5

6098

H. H. ROBERTSON COMPANY

AMBRIDGE, PENNSYLVANIA 15003

January 3, 1969

6098

Mr. S. C. Manuel, Manager-Purchasing
General Electric Company
Chemical and Medical Division
Insulating Materials Department
One Campbell Road
Schenectady, New York 12306

Dear Mr. Manuel:

We have your letter of December 24, referring to our RB-4008, which we supply against your Specification D50JM39. A Technical Data Sheet is attached for RB-4008 for your reference.

You have asked whether or not we can supply the compound with a Softening Point of 185° to ~~195~~°C. (365°-378°F.) 192°

We can supply a compound in the Softening Point range that you require and it will be of the same family as RB-4008. This would not be a standard product with us, however, but would have to be made on order for you alone. In order to prepare for this, we are requesting that the latest issue of your specification D50JM39 be sent on to us so that we can recheck on properties other than Softening Point so the specification will be met in its entirety.

Very truly yours,

H. H. ROBERTSON COMPANY

Glenn J. Earle, General Manager
Technical Products Department

GJE:lds
Attachment

FROM :

FAX NO. :

Sep. 12 2005 02:39PM P6

6260

AMERICAN GILSONITE COMPANY
134 WEST BROADWAY
SALT LAKE CITY 1, UTAH

February 28, 1958

AME 6100
and 6260

General Electric Company
Building 65, Room 101
69 River Road
Schenectady, New York

Phil –
For your files
Jack

Attention: ~~Mr. P. W. Ham~~ J M Witzel

Gentlemen:

We are pleased to send you information from our Technical Department in reply to your request of November 27, 1957. The questions asked more or less fell in the \$64,000.00 class, so our reply is a little delayed.

The material is our Gilsonite Selects, your Code 6260, Specification D50 JM 42.

"The exact composition of the components in Gilsonite is not known due to the complexity of the mixture. It is essentially a mixture of polynuclear materials containing only a trace amount of unsaturated or paraffinic molecules. The polynuclear molecules are composed of various aromatic, naphthenic and heterocyclic ring systems. The C/H ratio of Gilsonite is about 1/1.8.

"Certain oil fractions of Gilsonite (6-8%) have been more carefully studied. They contain 30-40% aromatics and 60-70% naphthenic materials. It should be emphasized that these represent the lowest molecular weight fractions of Gilsonite (200-400), and due to the method of isolation, none of the nitrogen, sulfur or oxygen bearing molecules were present.

"Nitrogen is present to the extent of 2.5% giving a C/N ratio of approximately 40/1. Most of this nitrogen is incorporated in five and six membered ring systems as tertiary or pyrrolic nitrogen, which ring systems exist in most of the polynuclear molecules. The average molecular weight of Gilsonite molecules is about 2000 with many of the molecules much larger than this.

FROM : FAX NO. : Sep. 12 2005 02:39PM P7

1028C

PROCESS INSTRUCTIONS

1028C

ISSUE NO 4

REASON 1. Supersedes issue 3 of 4/22/69
2. Relabel RMC 6405
Batch Card Reference issue 4 of 4/1/71

EQUIPMENT

DATE 4/1/71

ISSUED BY N. Kaplan

PAGE 1 OF 1

I. Safety
Materials

This material contains

RMC	Materials	Standing Instructions
448	448 Oil (contains linseed oil)	001-534
6582	Manganese Resinate	001-568
6094	Blown Asphalt B	001-514
6098	High Melting Asphalt	001-514
6647	Toluene	001-505

II. Product
Description

The product is a toluene solution of a drier and an oil modified asphaltic resinous pitch-like base.

Use

The product is used for electrical insulation.

III. Process
Description

This product is RMC 6405 relabeled.

IV. Process
Procedure

1. Check batch card and determine how many drums are to be relabeled.
2. Cover up all identifying marks on the drum.
3. Restencil 1028C, Batch #________, gross and tare weights and add a #1 warning label.

4/5/71

NK:ev

N. Kaplan 4/1/71

N. Kaplan
Production Engineer

File RMC 6405

Subject: RMC 6405

Schenectady, July 29, 1970

Mr. S. C. Manuel
Riverview #14

RMC NUMBER AND G. E. DESIGNATION

RMC 6405, #4 Varnish

DESCRIPTION

RMC 6405 defines a 50% solution of a catalyzed, oil modified asphalt resin in toluene.

USE

Repacked as IMD cat no. 1028-C.

SUPPLIER (tentative)

Schenectady Chemical
Schenectady, New York

HAZARDS

Contact with the skin may cause mild irritation which passes away as soon as the material is removed. Avoid prolonged breathing of the fumes, and be careful not to enter a confined space where the material is present.

REFERENCE

EI for 1028-C Black Varnish, Issue 1, Dated 2/8/60
Batch Card for 1028-C, Issue 2, Dated 9/30/65.

GHG:ev

G. H. Gelvin

FROM : FAX NO. : Sep. 12 2005 02:39PM P9

1028A

ENGINEERING INSTRUCTION & BATCH CARD

RET. SAMPLE IN BOX

BATCH NO

PRODUCT NO. 1028-A BLACK VARNISH DATE

ISSUE NO. 11 OF 9/19/56

POT NO.

TEST NAME	ATM	STORAGE DRUMS SPECIFICATION	LOAD FINAL TEST DATA
VISCOSITY	66_.4	800 - 1700	
SOFTENING POINT, °C BASE	640.2	120 - 125	
Dry, AIR	595.1	2 hrs max.	
WEIGHT/GAL., LBS. 25C	655.3	7.84-7.92	
Pounds per gal approx			7.90
		MATERIAL ADDED	

YIELD		REMARKS	PROCESS DATA	HOURS
THEORETICAL		Supersedes issue 10 of 10/4/55		
GALLONS		Revised to 640.2 TEST METHOD AND WGT/GAL	HOURS AT HEAT	
ACTUAL	88%			
POUNDS			GRINDING TIME	

CDC-843-A (8-54)

BATCH RECORD—MATERIAL USED—MILL BASE OR RESIN

PRODUCT NO. 1028-A BLACK VARNISH ISSUE NO. 11 OF 9/19/56 BATCH NO.

EQUIPMENT TYPE: EQUIP. NO.: FLASH POINT: 20-80F

BATCH SIZE: TARIFF COM. CODE NO.: COST CENTER: 003

LOAD DATE: FOREMAN:

MATR'L NO.	% COMP.	MATERIAL NAME	POUNDS/FORMULA	REF. OR LOT NO.	ADDITIONS	RMC
		PART ONE:-				
	6.81	448 OIL LINSEED	115 lbs.			448
D5E21B	0.24	MANGANESE RESINATE B	4 lbs.			6582
		PART TWO:-				
D5D1B	35.50	BLOWN ASPHALT B	600 lbs.			6094
	16.00	M 098	270 lbs.			6098

9-18

BATCH RECORD—MATERIALS USED—MIX OFF

BATCH NO.

PRODUCT NO. 1028-A BLACK VARNISH LBS./GAL.

ISSUE NO. 11 OF 9/19/56 FOREMAN FINAL DATE

MATR'L NO.	% COMP.	MATERIAL NAME	POUNDS/FORMULA	REF. OR LOT NO.	ADDITIONS	RMC
D5B11A	41.45	TOLUENE A	700 lbs.			5647
	100.00		1689 lbs.			

1028B

H D Letteron
1/7/44

ENGINEERING INSTRUCTIONS

NO. 1027-1 PASTING VARNISH ISSUE NO. 4

JANUARY 3, 1944

Revised to use 1028 Varnish base and toluol as in the test run called for on S245.

COMPOSITION

Base	%	%	Batch
✓ No. 214 Asphalt. D5D1B	60.0	15.000	600 lbs.
✓ No. 292 Asphalt. D5D3	27.0	6.750	270 "
No. 448 Oil.	11.5	2 875	115 "
No. 194 Resinate	1.5	.375	15 "
	100.0	25,000	1000 lbs.
Thinner			
✓ Toluol, D5B11.	100.0	75.0	3000 lbs.
		(total)	4000 lbs.

Weight per gallon : 7.45 lbs.

Estimated yield : 450 gallons.

H. A. Letteron

RESIN & INSULATION MAT'LS. ENG. DIV.

HAL:EDL

6094

GENERAL ELECTRIC

D50JM38-S1

CHEMICAL MATERIALS DEPARTMENT
SPECIFICATION
BLOWN ASPHALT

Supersedes D5D1-S6

G-E Material D50JM38 identifies an air-blown asphalt as follows:

6092 D50JM38A - 140 C softening point
6094 D50JM38B - 145 C softening point ←

PROPERTIES:

	D50JM38A	D50JM38B
Softening point, deg C	135-145	143-152
Flash point, deg C, min	218	282
Solubility in carbon tetrachloride, %, min	99	-
Penetration at 25 C, 100 C, 100 g for 5 sec, 0.1 mm	18-24	2.0 max
Loss on heating, %, max	0.5	-
Ash, %, max	-	0.2

REFEREE METHODS:

Sampling	ASTM D140
Softening point	ASTM D36
Flash point	Part C, G-E E12C7
Penetration	ASTM D5
Loss on heating	ASTM D6
Ash	ASTM D555

CERTIFICATE OF TEST:

When requested on purchase order or otherwise, the manufacturer shall submit promptly to the laboratory of the purchaser at the point of delivery a certificate of test in triplicate showing that the material conforms to this specification. This certificate shall contain the G-E designation and the purchase order number so that the certificate may be identified with the shipment.

PACKING AND MARKING:

Material D50JM38A shall be shipped in steel drums.

Material D50JM38B shall be shipped in bags, so as to prevent loss of material in transit. All shipments shall meet ICC and carriers' regulations.

Each container shall be legibly marked with the purchase order number, the manufacturer's name, and the G-E designation.

June 17, 1957

6094

Chemical
Materials
Department

SUPPLIES AND EQUIPMENT
DATA FOR ORDERING
G-E MATERIAL D50JM38 - BLOWN ASPHALT

D50JM38

June 17, 1957*

G-E Material D50JM38 identifies an air-blown asphalt, as follows:

G-E designation	Description	Previous designation
D50JM38A	140 C softening point	G-E M 5162
D50JM38B	145 C softening point	

The Departmental purchasing unit should furnish suppliers with copies of specification D50JM38-S1 which supersedes D5D1-S6.

Orders for this material should specify:

Material name - Blown asphalt
Designation - G-E Material D50JM38 (add proper suffix)
Specification - D50JM38-S1
Quantity

The approved sources of supply for G-E Material D50JM38 are:

G-E designation	Supplier	Supplier's designation
D50JM38A 6092	H. H. Robertson Co 2407 Farmer's Bank Bldg Pittsburgh 22, Pa.	2717
	The Philip Carey Mfg Co Wayne Ave at Cooper Cincinnati 15, Ohio	No. 30 asphalt
	Witco Chemical Co Pioneer Asphalt Div 25 E Wacker Dr Chicago 1, Ill.	PA 602
D50JM38B 6094	H. H. Robertson Co	RB 2901
	Witco Chemical Co Pioneer Asphalt Div	PA 555

*Supersedes D5D1 dated January 27, 1954

(17)

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4321

CANADIAN GENERAL ELECTRIC COMPANY LIMITED — FOR USE OF CGE EMPLOYEES ONLY

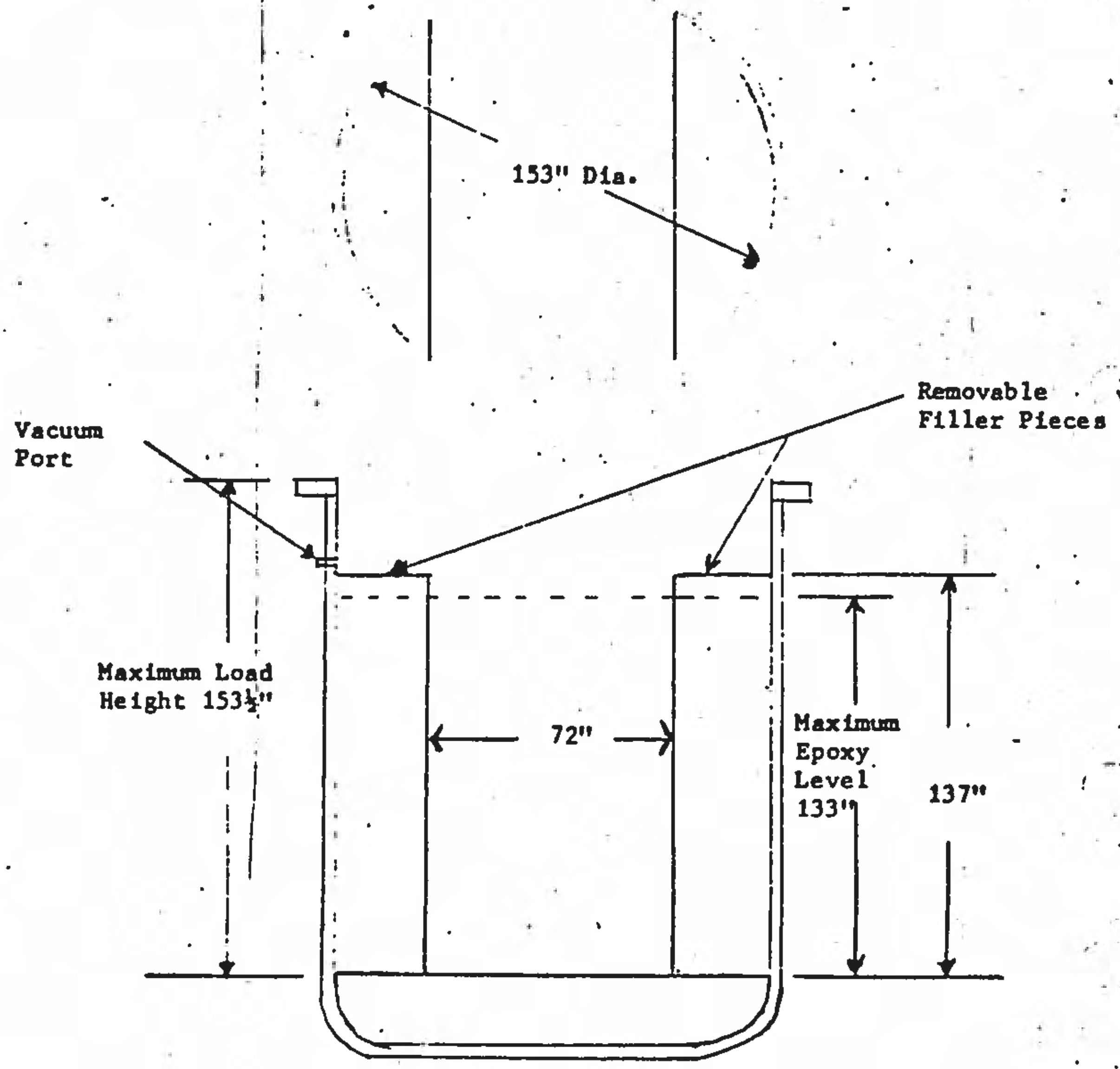
SUBJECT: VARNISH TREATMENT OF OPEN SLOT AC STATORS BY VACUUM PRESSURE IMPREGNATION (V.P.I.)

SECTION — 10
PART — 2
PAGE — 11
CONT'D on PG. — 12

Large Vacuum Pressure Impregnation Treating Tank Dimensions

Located in 618 Unit - Building #7

Maximum Load - 40 Ton (not including epoxy).



Drawing is not to scale.

ROUTE
4000
Sec 1
Pt 19
41

Prepared By	Section and Unit	Type Names	Signatures
F.J. McMullen	I.A.D. - 144	Prod. Engineering J.R. Dorsey	[signature]
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.G. Legros	[signature] 3/25/86
8 Mar 76		Quality Control H. Marksfield	[signature]
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab. A.R. Hailey	[signature]

* Received Nov. 8th, 2004 *

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

SUBJECT

STATOR WINDING - A.C. MACHINES
BELOW 7000 VOLTS

SECTION—0
PART— 1
PAGE— 1
CONT'D on PG.—

ROUTE
EMI-4000 Sec. 0
Pt. 41

Prepared By	Section and Unit	Type Names	Signatures
Eng. Admin.	Large Gen. 751	Prod. Engineering	
Date issued	Supersedes Issue Dated	Manuf. Eng.	
19 Apr. 1968	New	Quality Control	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

M- 1-66

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT: Stator Coil Bracing

SECTION— 1
PART—
PAGE—
CONT'D on PG.—

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

INDEX

ROUTE
EMI - 4000 Section 1
Pts. 2,3,4 and 6 and 4

Revision Edition

1222DM 6-65

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued: 30 Sept. 1966	Supersedes Issue Dated: 27 Dec. 1963	Manuf. Eng. J.A.McGovarin	
		Quality Control R.J.Hackwood	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

SUBJECT

Stator Coil Bracing

SECTION— 1
PART— 2
PAGE— 1
CONT'D on PG.–

1. SCOPE

This E.M.I. covers the standard coil bracing procedure to be followed on op
slot induction motors and AC machines.

2. REQUIREMENTS

To provide a method of coil bracing to insure a uniform and tightly lashed machine.

3. SPECIFICATIONS

Z The type of coil bracing and materials used will be specified on stator winding drawing and insulation specification 26936.

4. PROCEDURE

4.1 Location of Support Ring

4.1.2 The armature winder when fitting the machine for support rings use drawing dimensions as a guide only.

4.1.3 Locate Support Ring 1.1 $\pm$ .1" Axially inward from Coil loop to center of the ring, unless superseded by specific drawing instructions.

4.1.4 Ring measurements shall be taken from the stator flange to the side of the bare ring and from the inside diameter of stator co to the inside of bare ring allowing for ring insulation plus th necessary drop in coil per stator winding data drawing. The ob is to position ring so that coils will rest against it, as ins in slots.

4.1.5 When through ties are used the ring will be located further in wards stator core so that ties are straight & in a radial dire

Z 4.2 Separator Between Coils and Support Ring

4.2.1 Textolite separator strip will be made per insulation spec 26936 C or E

4.2.2 Textolite separator strips will be taped to support ring in th places as the machine is being wound.

4.2.3 The separator strips will be joined by butt lapping and over t with AQ23C4A2.

ROUTE
EMI - 4000 Section 1
Pts. 2,3,4 6 and 41

...evision
ΔZ-Addition

Prepared By	Section and Unit
Len Foster	I.M. & T.E. 145 Process Eng'g.
Date Issued	Supersedes Issue Dated
Oct. 12, 1966	Dec. 27, 1963

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	S.L.Thomas	
Manuf. Eng.	J.A.McGovarin	
Quality Control	R.J.Hackwood	
Eng'g Lab		

PW 1222DM 6-65

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

4. PROCEDURE

4.2 Separator Between Coils and Support Ring

Z 4.2.4 The armature winder is to check at regular intervals to insure that separator is conforming with the angle formed by coil arm and not bearing on the edge of coil.

4.2.5 Epoxy - Dacron felt mylar Bracing pad will be made per insulati spec 26936 Sec. G and MI 1452-005.

4.3 Taped Blocks

4.3.1 Blocks will be standard 1 inch in width and the same depth as c

4.3.2 Operator who sets up machine will fit a span of coils & positic blocks per stator winding bracing drawing & make a gauge recorc this position.

4.3.3 The operator who tapes on blocks will use this gauge to maintai uniformity in positioning blocks on coils.

4.3.4 The operator when winding machine will add extra tape to block: per insulation specification #26936 to maintain tightness of winding combined with uniformity of coil position.

4.4 "C" Ring Blocks

4.4.1 The armature winder, when fitting machine for location of supp rings, will also determine the quantity, height and thickness "C" blocks.

Z 4.4.2 Blocks will be the "H" dimension shown on sketch, Page 7, part

4.4.3 "C" Ring blocks must be a press fit against coil sides to achi required uniformity and tightness of winding.

4.5 Self Locking Coil Blocks

Z 4.5.1 Blocks will be the "H" dimension shown on Sketch, Page 7, Part

Z 4.5.2 Self Locking coil blocks must be a press fit against coil side achieve required uniformity and tightness of winding.

ZZ 4.5.3 Blocks are to consist of not more than 2 pieces, held together lengthwise by tape.

ROUTE
EMI - 4000 Section 1
Pts. 2,3,4, 6 and 41

Revision
ZZ--Addition

Prepared By	Section and Unit
Len Foster	I.M. & T.E. 145 Process Eng'g.
Date Issued	Supersedes Issue Dated
Oct. 12, 1966	Dec. 27, 1963

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	S.L.Thomas	
Manuf. Eng.	J.A.McGovarin	
Quality Control	R.J.Hackwood	

CANADIAN GENERAL ELECTRIC COMPANY LIMIT

FOR USE OF CGE EMPLOYEES ONLY

4. PROCEDURE (Cont'd)

4.6 Lashing Coils in Pairs to Support Ring Using "C" Ring Blocks

4.6.1 Insert coil in slot per EMI-4322, Section 4.

4.6.2 Lash coil to support ring with a continuous tie using two strands hand, one turn around coil and locked on the under side of support means of crossover cinch, refer to photographs 1 and 2, Page 9.

4.6.3 Insert ring block directly over support ring between this coil and preceding coil, refer to photograph 3, Page 10.

4.6.4 Lash coils in pairs to support ring with required number of turns per insulation specification #26936.

4.6.5 The second last turn is to be locked on the underside of support r by means of a crossover cinch, refer to photograph 6, Page 11.

Z 4.6.6 The first & last turns are to be pulled tight by a tension bar or mallet; see sketch, Page 8.

4.6.7 The loose ends of the lashing material is inserted into the slot c the tension bar and then rotated until the slack has been taken up

4.6.8 Leverage is then applied to the underside of support ring to pull lashing tight, refer to photograph 7, Page 12.

Z 4.7 Lashing Bottom Arms of Coils Using Self Locking Blocks

4.7.1 Insert and position coil block between the two coil arms per Stato Coil Bracing drawing, refer to photograph 1, Page 14.

4.7.2 Lash coils in pairs with required number of turns per insulation specification #26936,; refer to photograph 2, Page 14.

Z 4.7.3 The second turn is to be locked on the under side of coil arms by a crossover cinch; refer to photograph 3, Page 15.

Z 4.7.4 The last turn is locked across the top width of coil arm by a cros over cinch; refer to photographs 5 and 6, Page 16, and then is pulled down the side of coil arm and pulled tight by a tensioning bar; refer to photograph 7, Page 17.

ROUTE
EMI - 4000 Section 1
Pts. 2,3,4, 6 and 41

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

4. PROCEDURE (Cont'd)

Z 4.8 Lashing Top Arms of Coils Using Self Locking Coil Blocks

4.8.1 Insert and position coil block between the two coil arms per Stat Bracing drawing, refer to photograph 1, Page 18.

4.8.2 Lash coils in pairs with required number of turns per insulation specification #26936, refer to photograph 2, Page 18.

Z 4.8.3 The second turn is to be locked on the underside of coil arms by crossover cinch, refer to photograph 3, Page 19.

Z 4.8.4 The last turn is locked across the top width of coil arm by a cr over cinch, refer to photographs 5,6,7, Pages 20 and 21.

Z 4.8.5 The last turn is to be pulled tight by tensioning bar, refer to photograph 8, Page 21.

Z 4.9 Lashing Individual Coils to Support Ring with Lock on Ring

4.9.1 Insert coil in slot per EMI-4322, Section 4.

4.9.2 Lash coil to support ring with continuous tie, two strands in ha per insulation specification #26936.

Z 4.9.3 The first turn around coil is locked on the under side of suppor ring by a crossover cinch, refer to photographs 1 and 2, Page 22

4.9.4 The last turn around coil and support ring is locked through the preceding turns and then continued over the support ring, refer photographs 4 and 7, Pages 23 to 25.

Z 4.9.5 The first and last turns are to be pulled tight by tensioning ba or mallet, refer to photograph 2, Page 22.

4.10 Lashing Coils in Pairs to Support Rings Using Rect. Blocks & Chain Tie

4.10.1 Insert coil in slot per EMI-4322, Section 4.

4.10.2 Lash coil to support ring with continuous tie two strands in har and one turn around coil and locked on the underside of support by a crossover cinch, refer to photograph 1, Page 26.

4.10.3 Insert rectangular block directly over support ring between thi coil and preceding coil.

4.10.4 All tie blocks must be a press fit.

ROUTE
EMI-4000 Section 1
Pts. 2,3,4 6 and 41

·Revision
ZZ-Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued: Oct. 13, 1966	Supersedes Issue Dated: Dec. 27, 1963	Manuf. Eng. J.A.McGovarin	
		Quality Control R.J.Hackwood	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

4. PROCEDURE (Cont'd)

Z 4.10.5 Lash coils in pairs to support ring with required number of turns per insulation specification #26936, refer to photograph 2, Page 26

4.10.6 Secure rectangular block by crossover tie, refer to photograph 4, Page 27.

Z 4.10.7 The first and last turns are to be pulled tight by tensioning bar or mallet. Refer to Photographs 3 & 5, Pages 27 & 28.

4.11 Chain Lashing Top Arms of Coils Using Rectangular Blocks

4.11.1 Insert and position tie block between the two coil arms per stator coil bracing drawing, refer to Photograph 1, Page 29.

4.11.2 Tie block must be a press fit.

Z 4.11.3 Lash coils in pairs with required number of turns per insulation specification #26936, refer to Photographs 2,3,4, Pages 29 & 30.

Z 4.11.4 Secure tie block by crossover cinch, refer to Photographs 5&6, Page

Z 4.11.5 Pull the last turn TIGHT with tensioning bar or mallet, refer to Photograph 6, Page 31.

4.12 Chain Lashing Bottom Arms of Coils Using Rectangular Blocks

4.12.1 Insert and position tie block between the two coil arms per stator coil bracing drawing, also refer to Photograph 1, Page 32.

4.12.2 Tie block must be a press fit.

4.12.3 Lash coils in pairs with required number of turns per insulation specification #26936, also refer to Photographs 2&3, Pages 32 & 33

4.12.4 Secure tie block by crossover cinch, refer to photographs 5&6,Pg.

Z 4.12.5 Pull the last turn tight with tensioning bar or mallet, refer to Photograph 4, Page 33.

ROUTE
EMI-4000
Section 1
Pts. 2,3,4, 6 and 41

Z—Revision
ZZ—Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued: Oct. 13, 1966	Supersedes Issue Dated: Dec. 27, 1963	Manuf. Eng. J.A.McGovarin	
		Quality Control R.J.Hackwood	

SIGNATURES REQUIRED AS SHOWN

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT

STATOR COIL BRACING

SECTION— 1
PART— 2
PAGE— 6
CONT'D on PG.—

ZZ 4.13 <u>Lashing Individual Coils to Support Ring with "Lock" on Coil Arm</u>

4.13.1 Insert Coil in slot per EMI - 4322, Section 4.

4.13.2 Lash coil to support ring with continuous tie, two strands in hand per insulation specification #26936, refer to photographs 2&3, Page and 37.

4.13.3 The second turn around bottom coil arm is locked across the top wid of coil arm by means of a crossover cinch, refer to photographs 4 a Pages 37 and 38.

4.13.4 The last turn around bottom coil arm is locked across the top width coil arm by means of a crossover cinch, refer to photographs 6,7, & Pages 38 and 39.

4.13,5 The last turn is to be pulled tight by a mallet or tensioning bar, refer to photograph 9, Page 40.

ROUTE
EMI - 4000 Section 1
Pts. 2,3,4, 6 and 41

-Revision
ZZ--Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A.McGovarin	- 11
Oct. 13, 1966	Dec. 27, 1963	Quality Control R.J.Hackwood	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

PW 1222DM 6-63

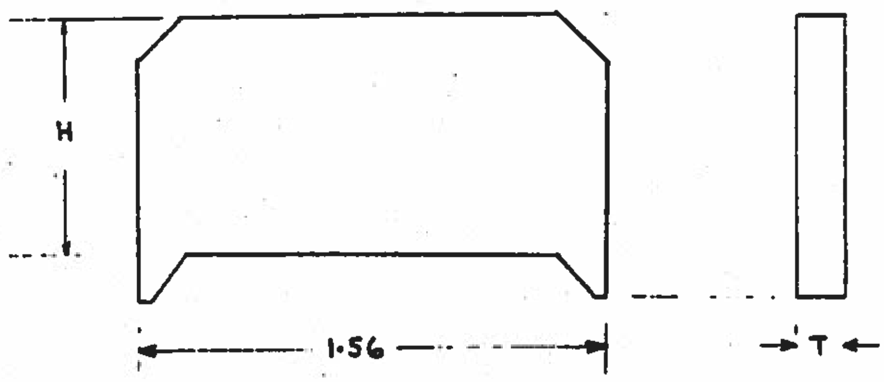
CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

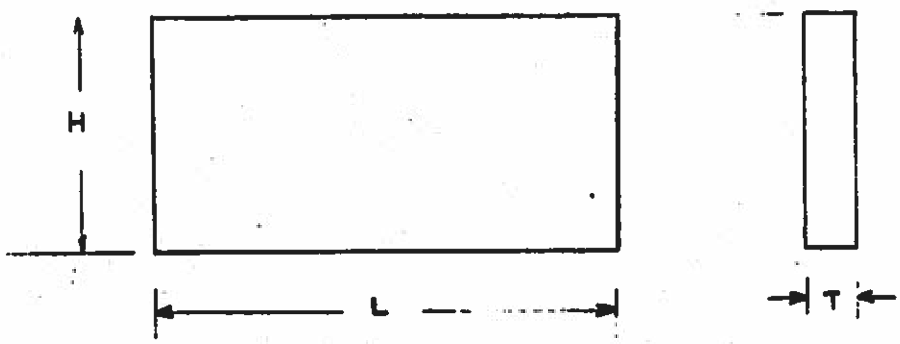
ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT	
STATOR COIL BRACING	SECTION— 1 PART— 2 PAGE— 7 CONT'D ON PG. - 8

PART 1



PART 2



"H" = INSULATED COIL HEIGHT — .10

"L" = (SLOT PITCH AT BORE X 1.33) — .4

"T" = DETERMINED AT SET-UP

ROUTE
EMI-4000 Section 1
Pts. 2,3,4, 6 and 41

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	Motor and Generator 141 Process Eng'g	Prod. Engineering J.L. McKeever	
Date Issued	Supersedes Issue Dated	Manuf. Eng. A.L. Malby	
27 December 1963	NEW	Quality Control W.N. Baldry	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

FW 1322OM

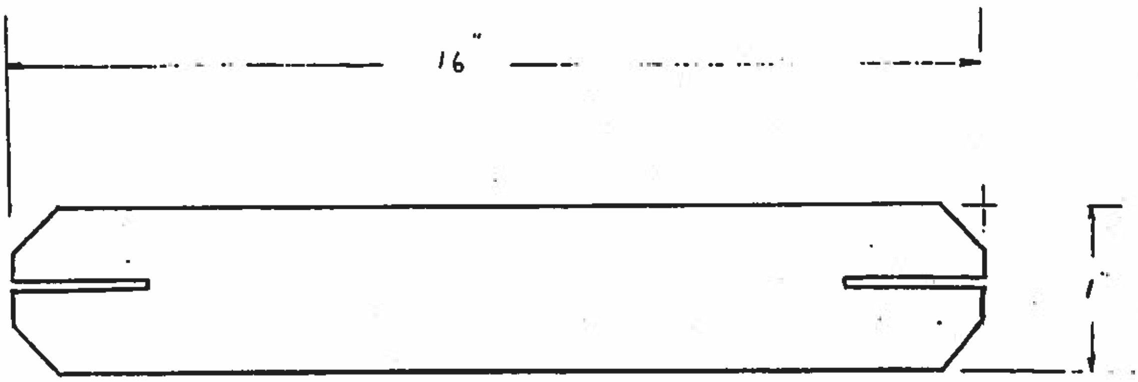
ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

SUBJECT

STATOR COIL BRACING

SECTION— 1
PART— 2
PAGE— 3
CONT'D ON PG. -



NOTE:

To avoid possible damage to insulation when tightening lashing, use a protective pad of 1/2" rubber approximately 4" square between coil and tensioning bar

ROUTE
EMI-4000 Section 1
Pts. 2,3,4, 6 and 41

Revision
Addition

Prepared By	Section and Unit
Len Foster	Motor and Generator 141 Process Eng'g
Date issued	Supersedes Issue Dated
27 December 1963	NEW

SIGNATURES REQUIRED AS SHOWN

Type Frames	Signatures
Prod. Engineering	J.L.McKeever
Manuf. Eng.	A.L. Malby
Quality Control	W.N. Baldry
Eng'g. Lab.	

PW1700M

CANADIAN GENERAL ELECTRIC COMPANY . . ITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT: STATOR COIL BRACING

SECTION—
PART—
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CONT'D ON PG.

LASHING ... TO SUPPORT ... BLOCKS

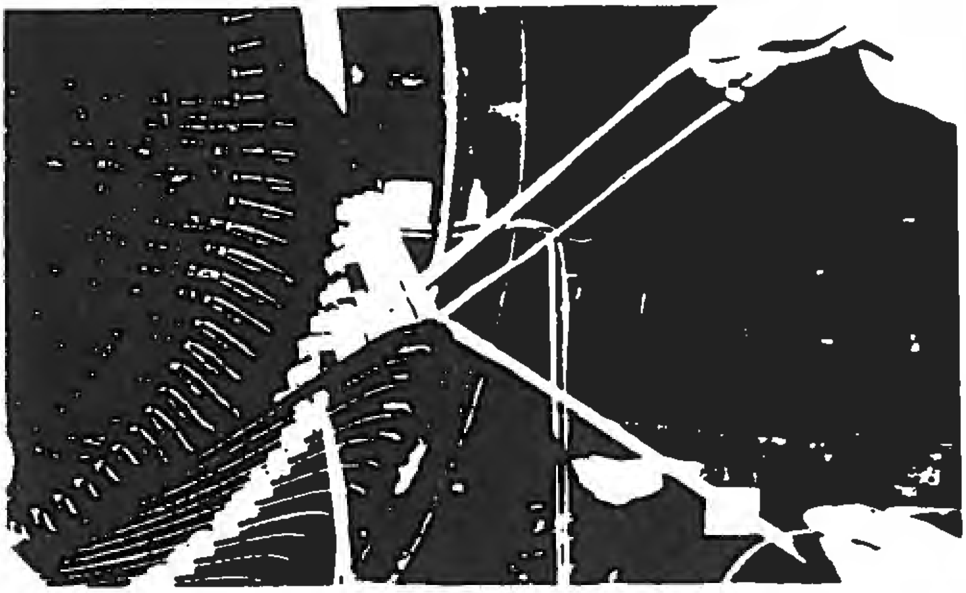

PHOTO #1

ITEM 4.c.2.

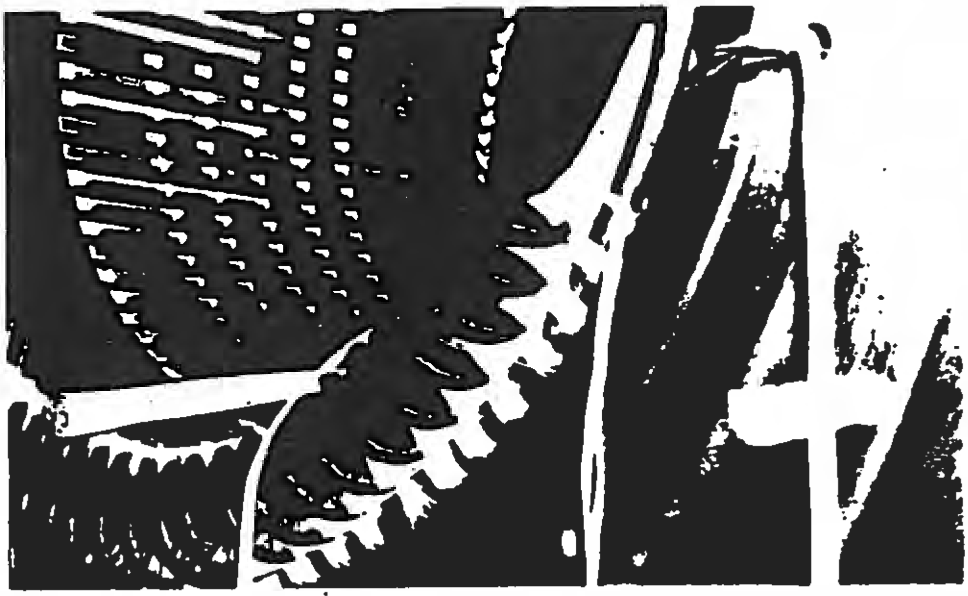

PHOTO #2

ITEM 4.c.2

LASHING COILS TO SUPPORT RING USING "C" BLOCK

ROUTE

Prepared By	Section and Unit
Len Foster	Motor and Generator ... Process Eng'g.
Date Issued	Supersedes Issue Dated
2_ December ...	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Maloy	
Quality Control	N.N. Baldry	
Eng'g. Lab.		

— Revision Edition

PW 1222DM HSP

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No.

SUBJECT

STATOR COIL BRACING

SECTION—
PART—
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LASHING COILS TO SUPPORT RING USING "C" BLOCKS

PHOTO #

ITEM

PHOTO #

ITEM .c.

LASHING COILS TO SUPPORT RING USING "C" BLOCKS

ROUTE

MI-

Section
Pts. 2, 3,
and

Revision
Edition

Prepared By	Section and Unit		Type Names	Signatures
Len ... ter	Motor and Generator ... Process Eng'g.	Prod. Engineering	J.L. McKeever	
Date Issued	Superseded Issue Dated	Manuf. Eng.	A.L. Malby	A.L.M.
... 19..	NEW	Quality Control	M.N. Balury	M.N.B.
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.		

PW1222DM

ENGINEERING MANUFACTURING INSTRUCTIONS — No. [illegible]

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

SUBJECT: STATOR COIL BRACING

SECTION— [illegible]
PART— [illegible]
PAGE— [illegible]
CONT'D ON PG.

LASHING COILS TO SUPPORT RING USING "C" BLOCKS

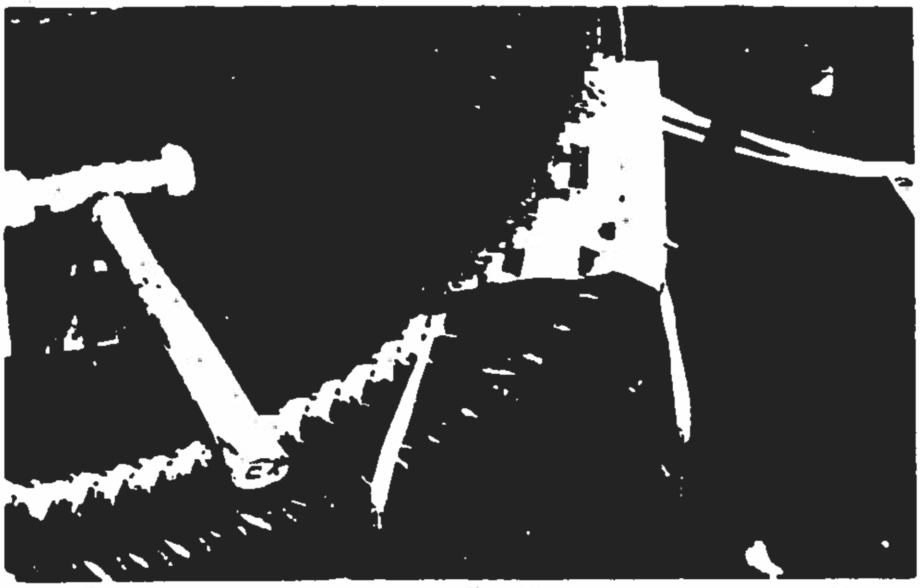

PHOTO #5

ITEM [illegible]

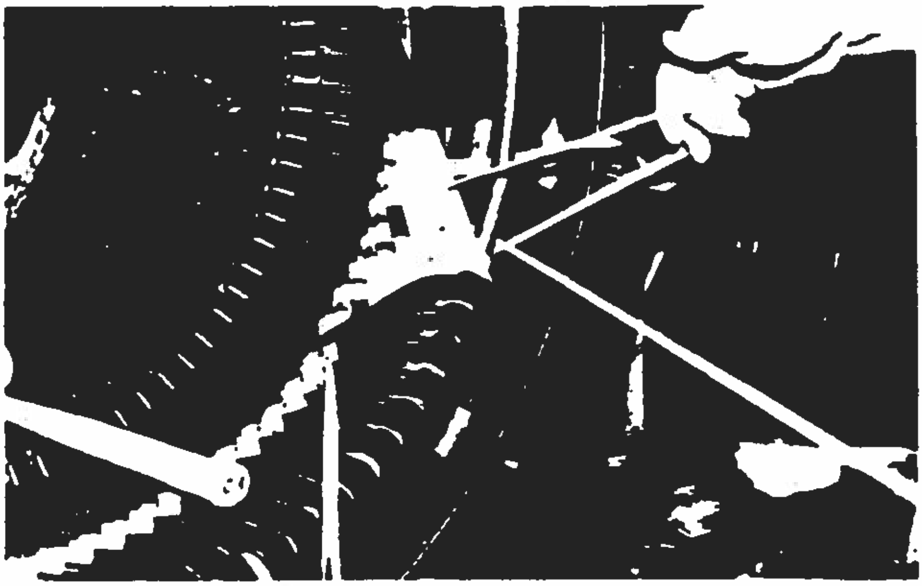

PHOTO #[illegible]

ITEM 4.2.3

LASHING COILS TO SUPPORT RING USING "C" BLOCKS

ROUTE

MI-4000
Section 1
Pts. 2,3,4,
5 and 21

Prepared By	Section and Unit
Len Foster	Motor and Generator 141 Process Eng'g.
Date Issued	**Supersedes Issue Dated**
27 December 1965	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J. L. McKeever	
Manuf. Eng.	A. L. Malby	A.L.M.
Quality Control	W. N. Baldry	W.N.B.
Eng'g. Lab.		

ENGINEERING MANUFACTURING INSTRUCTIONS — No.

SUBJECT STATOR COIL BRACING

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CANADIAN GENERAL ELECTRIC COMPANY
FOR USE OF CGE EMPLOYEES ONLY

LASHING COILS TO SUPPORT RING USING "C" BLOCKS

PHOTO #7

ITEM 4.6.2

PHOTO #8

ITEM 4.6

LASHING COILS TO SUPPORT RING USING "C" BLOCKS

ROUTE
EMI-4000
Section 1
Pts.2,3,4,
6 and 41

Prepared By	Section and Unit
Len. Foster	Motor and Generator, L.L. Process Eng'g
Date Issued	Supersedes Issue Dated
27 December 19	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Malby	
Quality Control	W.N. Baldry	
Eng'g. Lab.		

PW1222DM

ENGINEERING MANUFACTURING INSTRUCTIONS — No.

SUBJECT STATOR COIL BRACING

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CONT'D ON PG.

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

LASHING COILS TO SUPPORT RING USING "C" BLOCKS

PHOTO #

ROUTE
MI-4000
Section 1
Pts. 2,3,4,
6 and 41

Revision Edition

Prepared By	Section and Unit
Len Foster	Motor and Generator 141 Process Eng'g
Date Issued	Supersedes Issue Dated
27 December 1963	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Malby	A.L.M.
Quality Control	W.N. Baldry	W.N.B.
Eng'g. Lab.		

PW1222086

CONT'D on PG.— 15

Lashing Bottom Arms of Coils Using Self Locking Coil Blocks

Photo #1

Item 4.7.1

Photo #2

Item 4.7.2

Lashing Bottom Arms of Coils Using Self Locking Blocks

ROUTE

MI 4000
Sec. 1
Pts. 2,3,4
and 41

--Revision
Z--Addition

Prepared By	Section and Unit
Len Foster	I.M. & T.E. 145 Process Eng'g.
Date Issued	Supersedes Issue Dated
13 Oct. 1966	27 Dec. 1963

	Type Names	Signatures
Prod. Engineering	S.L.Thomas	
Manuf. Eng.	J.A.McGovarin	J.A.McG. 11 Nov 66
Quality Control	R.J.Hackwood	R.J.Hackwood

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT

Stator Coil Bracing

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CONT'D on PG.— 16

Lashing Bottom Arms of Coils Using Self Locking Coil Blocks

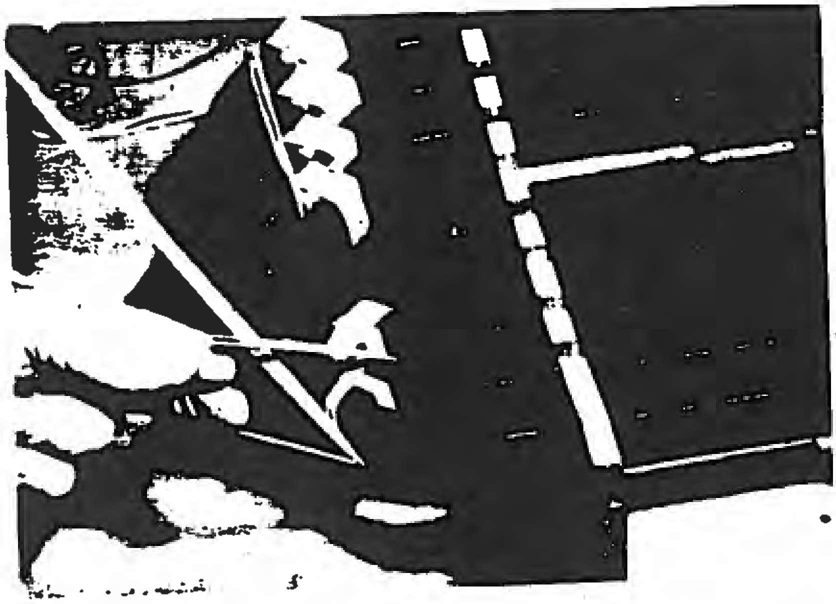

Photo #3

Item 4.7.3

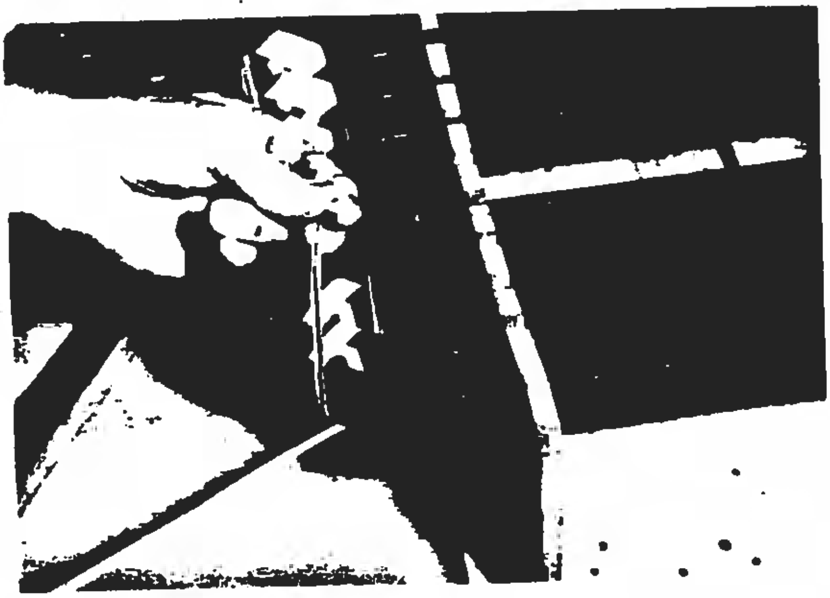

Photo #4

Item 4.7.2

Lashing Bottom Arms of Coils Using Self Locking Coil Blocks

ROUTE

EMI 4000
Section 1
Pts. 2,3,4,
6 and 41

Prepared By	Section and Unit
Len Foster	I.M. & T.E. 145 Process Eng'g.
Date Issued	Supersedes Issue Dated
13 Oct. 1966	27 Dec. 1963

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	S.L.Thomas	
Manuf. Eng.	J.A.McGovarin	
Quality Control	R.J.Hackwood	
Eng'g. Lab.		

Z -Revision Edition

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT

Stator Coil Bracing

SECTION— 1
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CONT'D on PG.—17

Lashing Bottom Arms of Coils Using Self Locking Coil Blocks

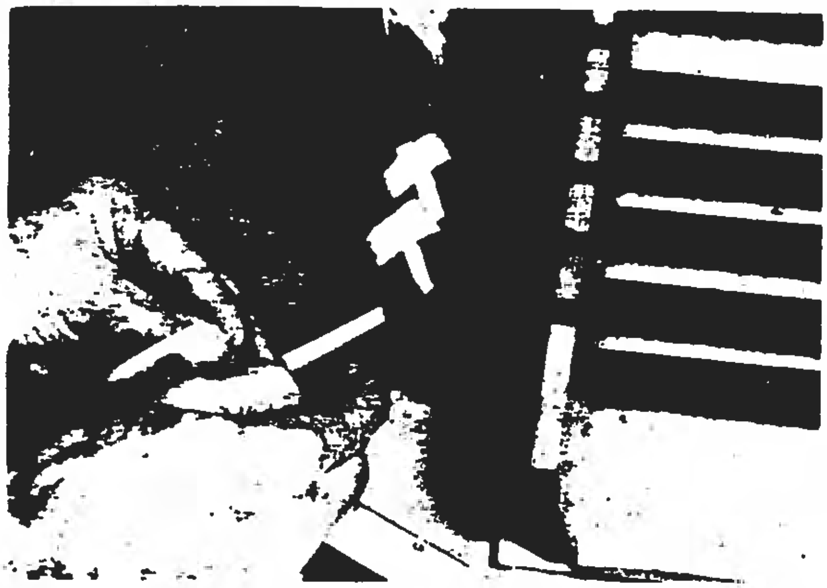

Photo #5

Item 4.7.4

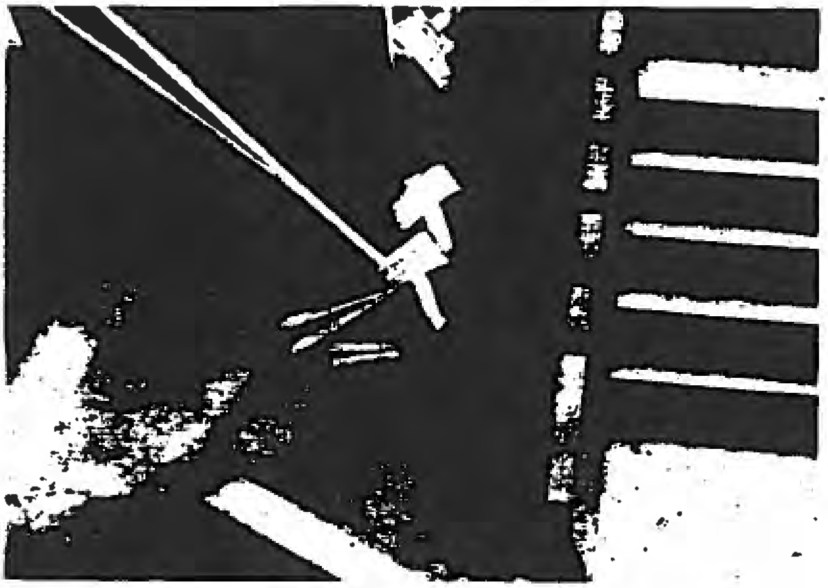

Photo #6

Item 4.7.4

Lashing Bottom Arms of Coils Using Self Locking Coil Blocks

ROUTE

EMI - 4000
Sec. 1
Pts. 2,3,4,
5 and 41

Revision
Addition

Prepared By	Section and Unit
Len Foster	I.M. & T.E. 145 Process Eng'g.
Date Issued: 13 Oct. 1966	Supersedes Issue Dated: 27 Dec. 1963

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	S.L.Thomas	
Manuf. Eng.	J.A.McGovarin	J. Shots - 11 Nov 66
Quality Control	R.J.Hackwood	

NADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT

Stator Coil Bracing

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CONT'D on PG.— 18

Lashing Bottom Arms of Coils Using Self Locking Coil Blocks

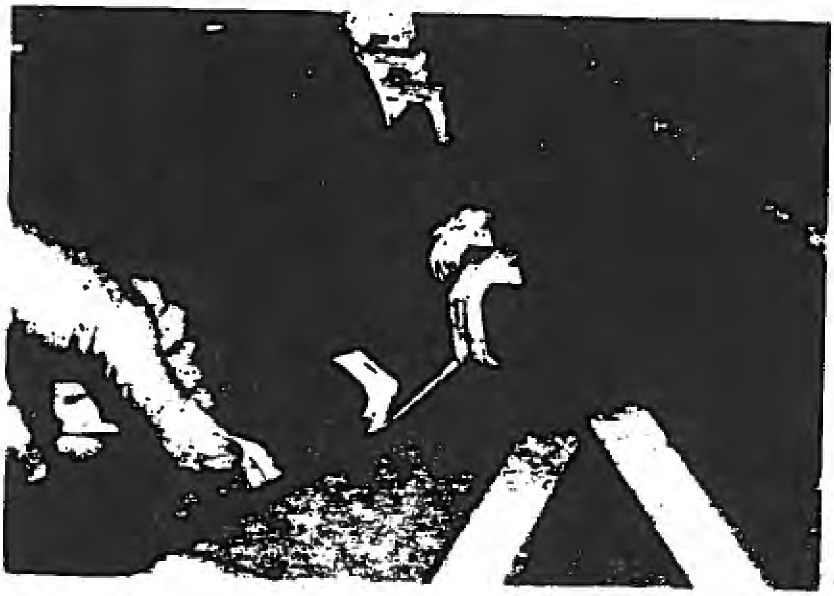

Photo #7

Item 4.7.4

ROUTE

EMI 4000
Sec. 1
Pts. 2,3,4
5 and 41

Revision
Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	145 Process Eng'g I.M. & T.E.	Prod. Engineering S.L. Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A.McGovarin	1 Nov 66
13 Oct. 1966	27 Dec. 1963	Quality C... R.J.Hackwood	

CONT'D on PG.— 19

Lashing Top Arms of Coils Using Self Locking Coil Blocks

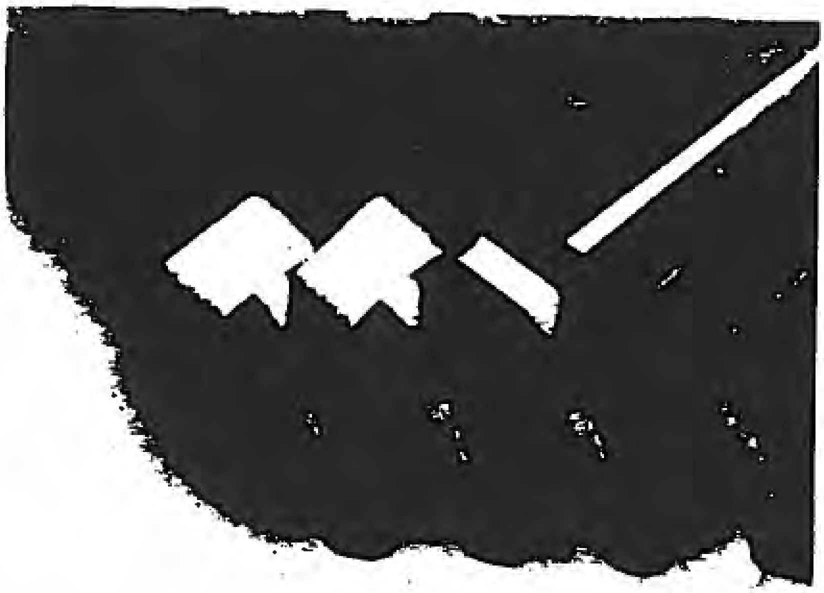

Photo #1

Item 4.8.1

Photo #2

Item 4.8.2

Lashing Top Arms of Coils Using Self Locking Blocks

ROUTE
MI 4000
Sec. 1
Pts. 2,3,4,6
and 41

Revision Addition	Prepared By	Section and Unit	Type Names	Signatures
	Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L. Thomas	
	Date Issued 13 Oct. 1966	Supersedes Issue Dated 27 Dec. 1963	Manuf. Eng. J.A.McGovarin	11 Nov 66
			Quality Control R.J.Hackwood	

NADIAN GENERAL ELECTRIC COMPANY LIMIT

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

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Stator Coil Bracing	SECTION— 1 PART— 2 PAGE— 19 CONT'D on PG.—20

Lashing Top Arms of Coils Using Self Locking Coil Blocks

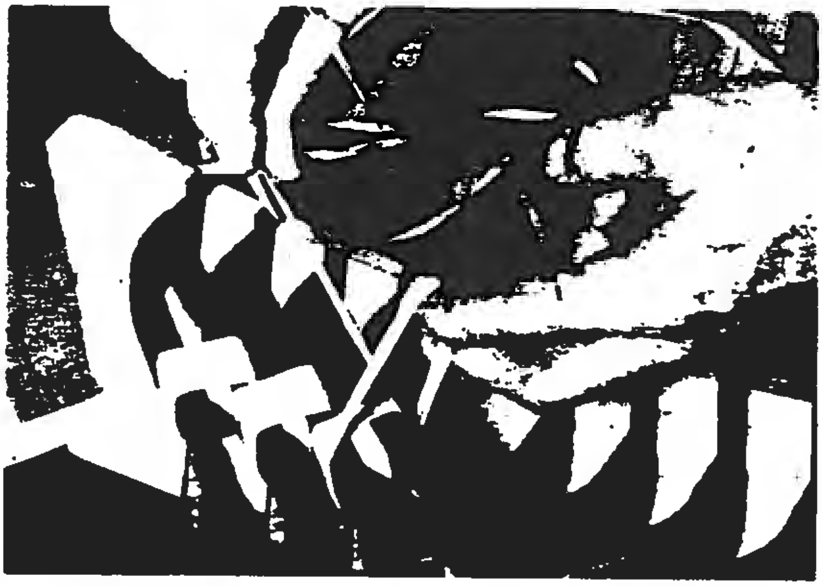

Photo #3

Item 4.8.3

Photo #4

Item 4.8.2

Lashing Top Arms of Coils Using Self Locking Coil Blocks

ROUTE

EMI 4000
Sec. 1
Pts.2,3,4,
and 41

Revision
Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A.McGovarin	4 Nov.66
13 Oct. 1966	27 Dec. 1963	Quality Control R.J.Hackwood	

Lashing Top Arms of Coils Using Self Locking Coil Blocks

Photo #5

Item 4.8.4

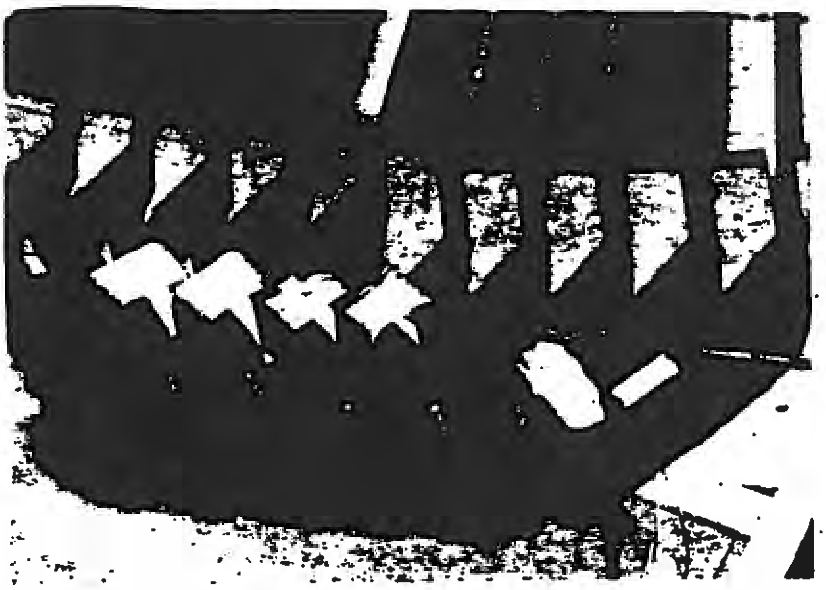

Photo #6

Item 4.8.4

Lashing Top Arms of Coils Using Self Locking Blocks

ROUTE

EMI 4000
~~Sec. 1~~
Pts. 2,3,4,
6 and 41

R—Revision
Z—Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A.McGovarin	4 Nov 66
13 Oct. 1966	27 Dec. 1963	Quality Control R.J.Hackwood	

Lashing Top Arms of Coils Using Self Locking Coil Blocks

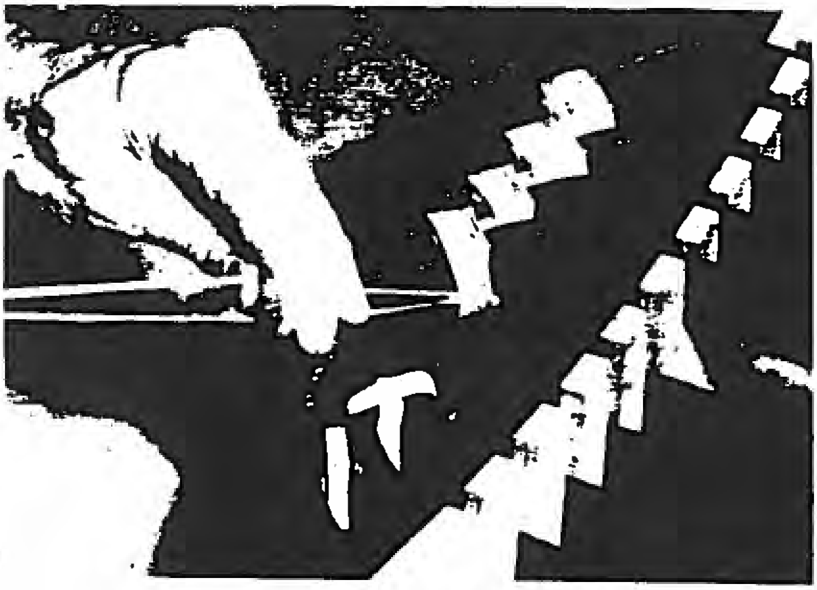

Photo #7

Item 4.8.4

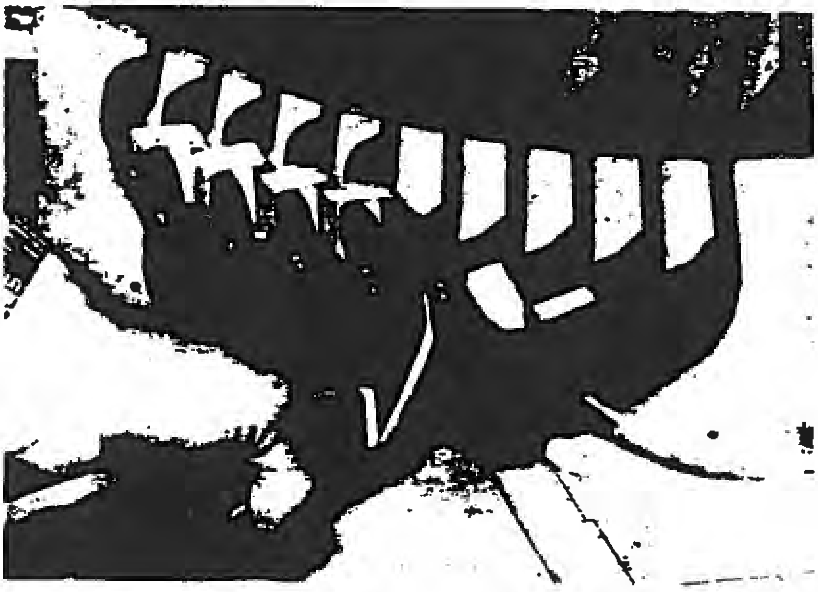

Photo #8

Item 4.8.5

Lashing Top Arms of Coils Using Self Locking Coil Blocks

ROUTE
EMI 4000
Sec. 1
Pts. 2,3,4
6 and 41

*--Rev. Z--Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued 13 Oct. 1966	Supersedes Issue Dated 27 Dec. 1963	Manuf. Eng. J.A.McGovarin	
		Quality Control R.J.Hackwood	

ENGINEERING MANUFACTURING INSTRUCTIONS — No. _32_

CANADIAN GENERAL ELECTRIC COMPANY ... MITED

FOR USE OF CGE EMPLOYEES ONLY

SUBJECT: STATOR COIL BRACING

SECTION— 1
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LASHING INDIVIDUAL COILS TO SUPPORT RING

PHOTO #1

ITEM 4.9.3

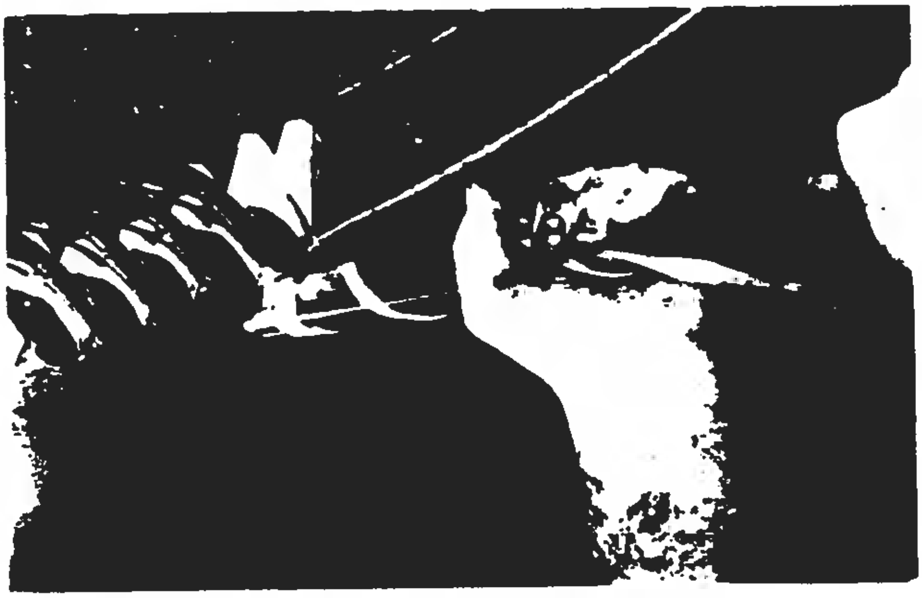

PHOTO #2

ITEM 4.9

LASHING INDIVIDUAL COILS TO SUPPORT RING

ROUTE
MI-4000
ection 1
ts. 2,3,..,
c and 4_

Prepared By	Section and Unit
Len Foster	Motor & Generator 1.1 Process Eng'g
Date Issued	Supersedes Issue Dated
2_ December 1963	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Malby	A.L.M.
Quality Control	W.N. Baldry	W.N.B.
Eng'g. Lab.		

PW 1222GM

ENGINEERING MANUFACTURING INSTRUCTIONS — No.

SUBJECT

STATCR COIL BRACING

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PART—
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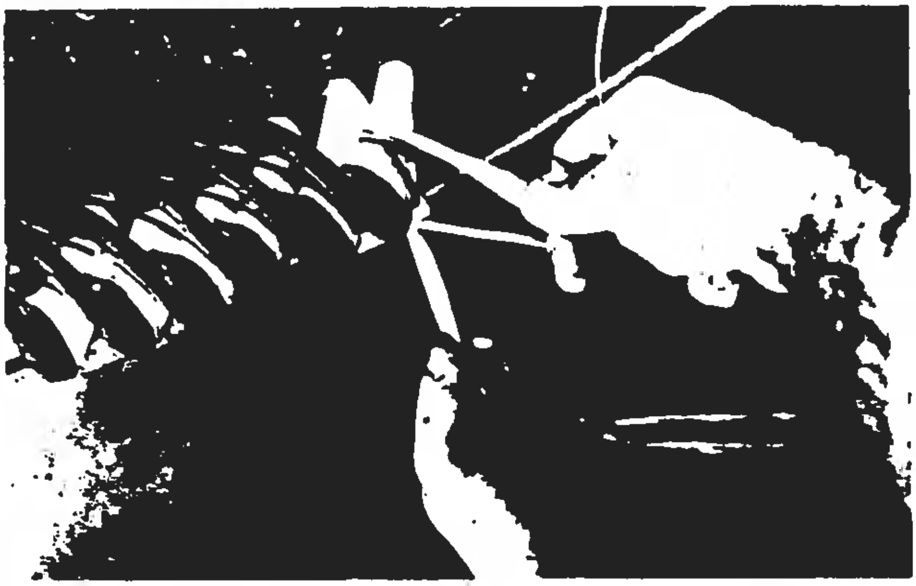
CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

LASHING INDIVIDUAL COILS TO SUPPORT RING



PHOTC #3

ITEM 4.9

PHOTC #4

ITEM 4.9.4

LASHING INDIVIDUAL COILS TO SUPPORT RING

ROUTE

MI-400C
ection 1
ts. 2,3,-,
6 and 41

Prepared By	Section and Unit
Len Foster	Motor & Generator 141 Process Eng'g
Date Issued	Supersedes Issue Dated
27 December 1963	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L.McKeever	
Manuf. Eng.	A.L. Malby	A.L.M.
Quality Control	W.N. Balury	W.N.B.
Eng'g. Lab.		

ENGINEERING MANUFACTURING INSTRUCTIONS — No. -32-

SUBJECT: STATOR COIL BRACING

SECTION—
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LASHING INDIVIDUAL COILS TO SUPPORT RING

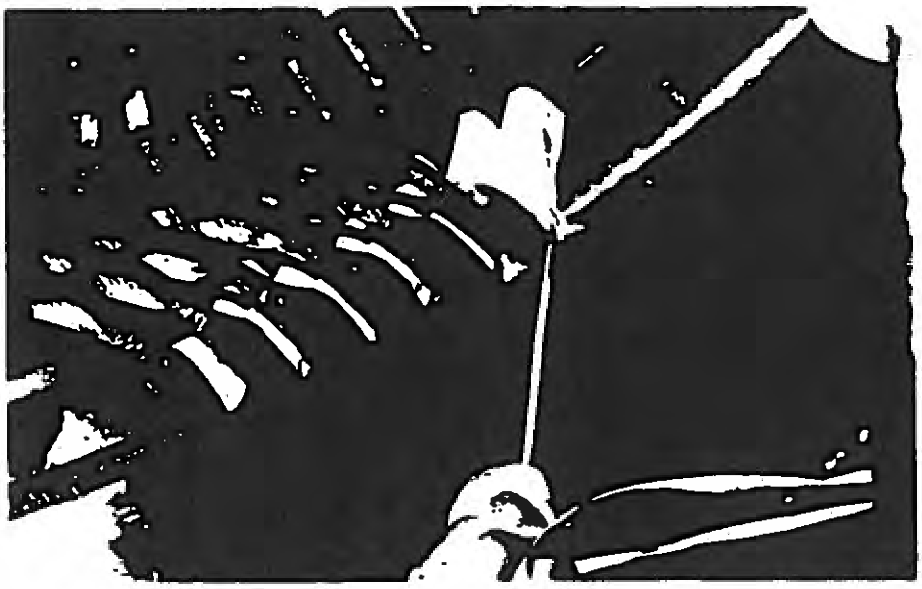

PHOTO #5

ITEM 4.9.4

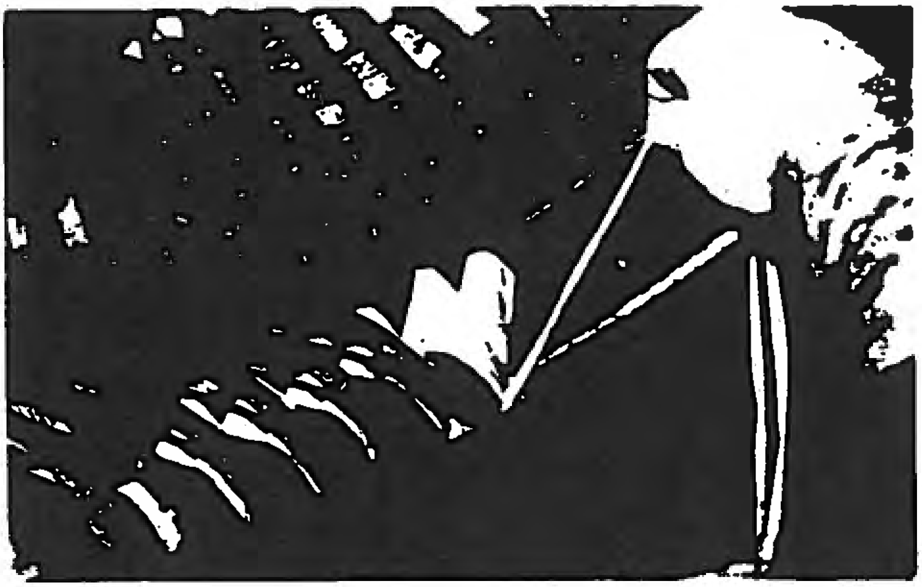

PHOTO #6

ITEM 4.9.4

LASHING INDIVIDUAL COILS TO SUPPORT RING

ROUTE
I-4000
ction 1
s. 2,3,4,
5 and 41

Prepared By	Section and Unit
Len Foster	Motor & Generator ... Process Eng'g
Date Issued	**Supersedes Issue Dated**
27 December 1963	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J. L. McKeever	
Manuf. Eng.	A. L. Malby	
Quality Control	W. N. Balury	9.2.13.
Eng'g. Lab.		

ENGINEERING MANUFACTURING INSTRUCTIONS — No. -32-

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

SUBJECT

STATOR COIL BRACING

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LASHING INDIVIDUAL COILS TO SUPPORT RING

PHOTO #7

ITEM 4.9..

ROUTE
I-4000
ction 1
s. 2,3,4,
5 and 41

Revision
tion

Prepared By	Section and Unit
Len Foster	Motor & Generator ... Process Eng'g
Date Issued	Supersedes Issue Dated
27 December 196?	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	Aluck
Manuf. Eng.	A.L. Malby	A.L.M.
Quality Control	W.N. Baldry	W.N.B.
Eng'g. Lab.		

22D00

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS

No. 320

SUBJECT: STATOR COIL BRACING

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PAGE—
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LASHING COILS IN PAIRS TO SUPPORT RING USING RECT. BLOCKS

PHOTO #1

ITEM 4.10.2

PHOTO #2

ITEM 4.10.3

LASHING COILS IN PAIRS TO SUPPORT RING USING RECT. BLOCKS

ROUTE

I4000
ction 1
s. 2,3,4,
5 and 41

Prepared By	Section and Unit
Len Foster	Motor and Generator 141 Process Eng'g
Date Issued	**Supersedes Issue Dated**
27 December 1963	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Malby	
Quality Control	W.N. Baldry	M.N.B.
Eng'g. Lab.		

CANADIAN GENERAL ELECTRIC COMPANY ...MITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. ..320

SUBJECT

STATOR COIL BRACING

SECTION—
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CONT'D ON PG.

LASHING COILS IN PAIRS TO SUPPORT RING USING RECT. BLOCKS

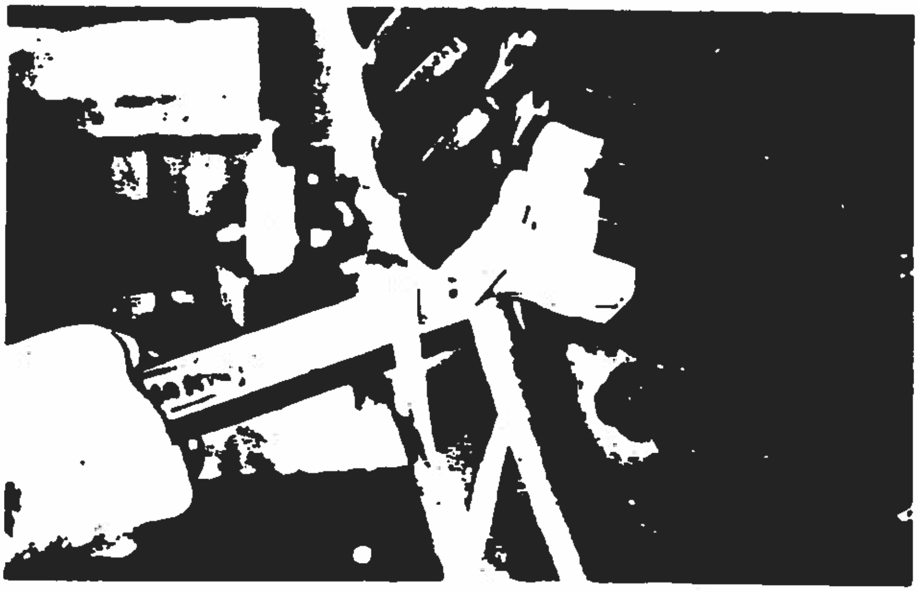

PHOTO #3

ITEM 4.10.5

PHOTO #4

ITEM 4.10.6

LASHING COILS IN PAIRS TO SUPPORT RING USING RECT. BLOCKS

ROUTE

...I-4000
...ection 1
...s. 2,3,4,
6 and 41

Prepared By	Section and Unit
Len Foster	Motor and Generator, Process Eng'g
Date Issued	**Supersedes Issue Dated**
27 December 196.	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Malby	
Quality Control	W.N. Baldry	
Eng'g. Lab.		

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS

— No.

SUBJECT

STATOR COIL BRACING

SECTION—
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CONT'D ON PG.

LASHING COILS IN PAIRS TO SUPPORT RING USING RECT. BLOCKS

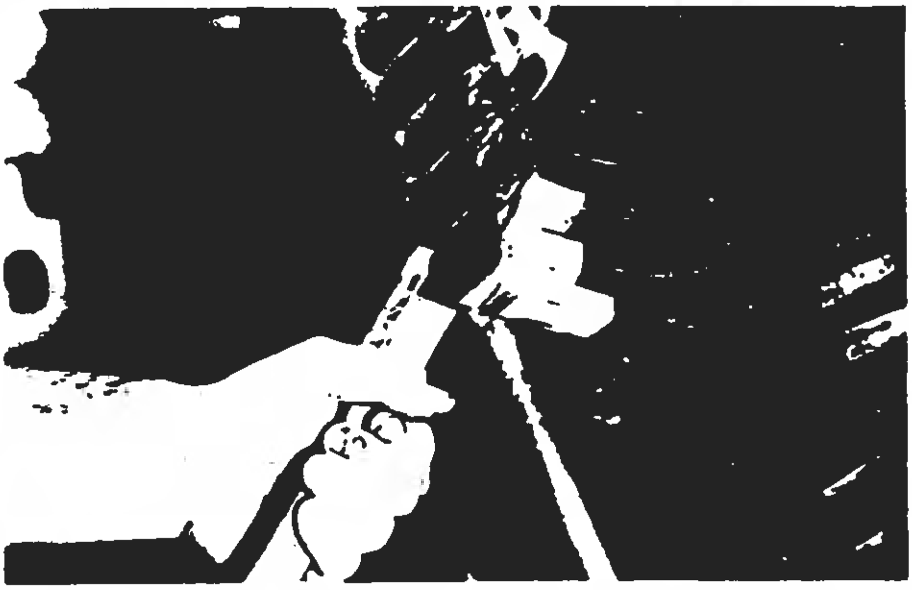

PHOTO #5

ITEM 4.10

PHOTO #6

ITEM 4.10

LASHING COILS IN PAIRS TO SUPPORT RING USING RECT. BLOCKS

ROUTE

EMI-.OC
Section 1

Pts. 2,3,4,
5 and 41

Prepared By	Section and Unit
Len Foster	Motor & Generator 1.1 Process Eng'g
Date Issued	Supersedes Issue Dated
27 December 19.3	NEW

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	J.L. McKeever	
Manuf. Eng.	A.L. Malby	
Quality Control	W.N. Balary	
Eng'g. Lab.		

ENGINEERING MANUFACTURING INSTRUCTIONS — No. [illegible]

SUBJECT: STATOR COIL BRACING

SECTION— 1
PART— 2
PAGE—
CONT'D ON PG.

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

CHAIN LASHING TOP ARMS USING RECT. BLOCKS

PHOTO #1

ITEM [illegible].11.[illegible]

PHOTO #2

ITEM [illegible].11.[illegible]

CHAIN LASHING TOP ARMS USING RECT. BLOCKS

ROUTE
[illegible]1-4000
Section 1
[illegible]ts. 2,3,[illegible],
[illegible] and [illegible]1

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	Motor and Generator [illegible] Process Eng'g	Prod. Engineering J.L. McKeever	[signature]
Date Issued	Supersedes Issue Dated	Manuf. Eng. A.L. Malby	[signature]
27 December 19[illegible]	NEW	Quality Control W.N. Baldry	9.2.[illegible]
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

Revision Edition

PW1222DM

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No.

SUBJECT

STATOR COIL BRACING

SECTION— 1
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CONT'D ON PG.

CHAIN LASHING TOP ARMS USING RECT. BLOCKS

PHOTO #3

ITEM 4.11.

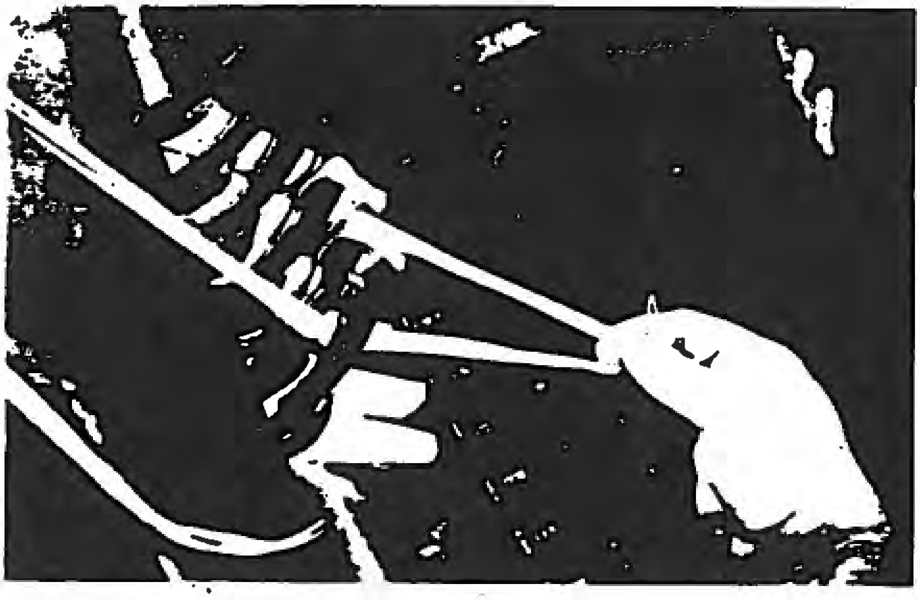

PHOTO #4

ITEM 4.1.3

CHAIN LASHING TOP ARMS USING RECT. BLOCKS

ROUTE

EMI-4000
Section 1
Pts. 2,3,4,
and 41

Prepared By: Len Foster	Section and Unit: Motor & Generator 442 Process Eng'g	Type Names	Signatures
Date Issued: 27 December 1963	Supersedes Issue Dated: NEW	Prod. Engineering J.L. McKeever	
		Manuf. Eng. A.L. Malby	
SIGNATURES REQUIRED AS SHOWN		Quality Control W.N. Baldry	
		Eng'g. Lab.	

CANADIAN GENERAL ELECTRIC COMPANY ...MITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. .32.

SUBJECT: STATOR COIL BRACING

SECTION— 1
PART— 2
PAGE—
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CHAIN LASHING TOP ARMS USING RECT. BLOCKS

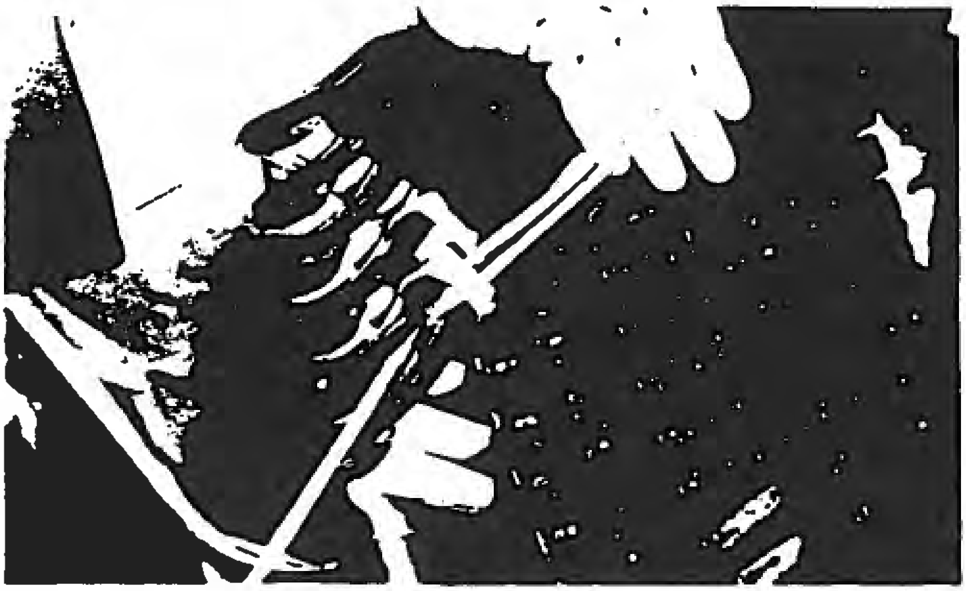

PHOTO #5

ITEM 4.11.4

PHOTO #6

ITEM 4.11.5

CHAIN LASHING TOP ARMS USING RECT. BLOCKS

ROUTE

EMI-4000 Section 1

Pts. 2,3,4, 5 and 41

Revision Edition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	Motor and Generator LGI Process Eng'g	Prod. Engineering J.L.McKeever	
Date Issued: 27 December 1963	Supersedes Issue Dated: NEW	Manuf. Eng. A.L. Malby	
		Quality Control W.N. Balgry	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

W 1222D

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS

No.

SUBJECT: STATOR COIL BRACING

SECTION—
PART—
PAGE—
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CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

PHOTO #1

ITEM 4.12.1

PHOTO #2

ITEM 4.12.

CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

ROUTE
MI-4000
ection 1
ts.2,3,-,
and 41

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	Motor and Generator Process Eng'g	Prod. Engineering J.L. McKeever	
Date Issued	Supersedes Issue Dated	Manuf. Eng. A.L. Malby	
27 December 19	NEW	Quality Control W.N. Baldry	
SIGNATURES REQUIRED AS SHOWN		Eng'g Lab.	

ENGINEERING MANUFACTURING INSTRUCTIONS — No.

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

SUBJECT: STATOR COIL BRACING

SECTION—
PART—
PAGE—
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CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

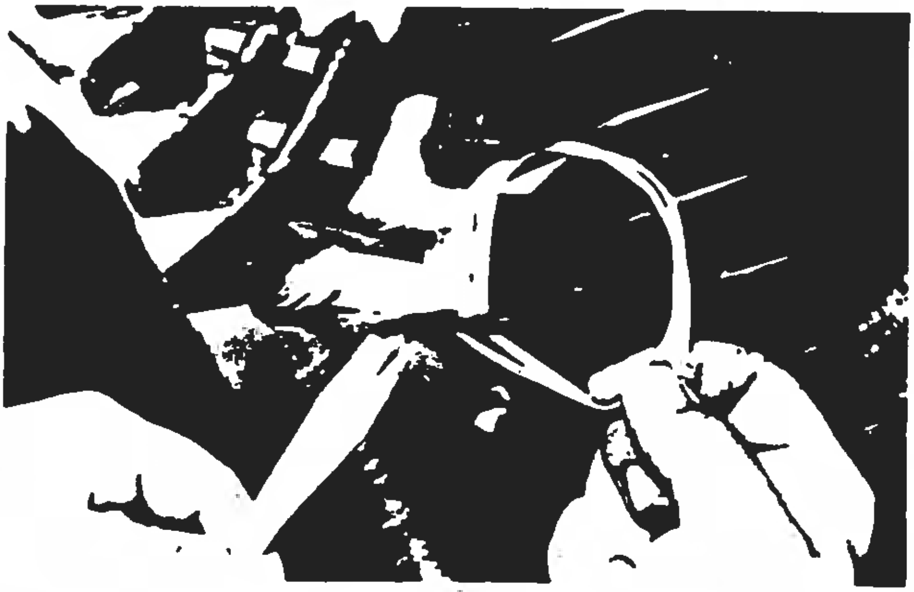

PHOTO #3

ITEM 4.12.3

PHOTO #4

ITEM 4.12.3

CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

ROUTE
EMI-4000
Section 1
Pts,2,3,4.
5 and 41

Revision
Edition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	Motor &Generator 111 Process Eng'g	Prod. Engineering J.L. McKeaver	
Date Issued	Supersedes Issue Dated	Manuf. Eng. A.L. Malby	
27 December 1983	NEW	Quality Control W.M. Balury	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT

STATOR COIL BRACING

SECTION— 1
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PAGE—
CONT'D ON PG.

CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

PHOTO #5

ITEM 4.12.4

PHOTO #6

ITEM 4.12.4

CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

ROUTE
EMI-4000
Section 1
Pts.2,3,4,
. and 41

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	Motor and Generator 141 Process Eng'g	Prod. Engineering J.L. McKeever	[signature]
Date Issued: 27 December 1963	Supersedes Issue Dated: NEW	Manuf. Eng. A.L. Malby	
		Quality Control W.N. Balary	G.T.B.
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

ENGINEERING MANUFACTURING INSTRUCTIONS — No. -320

SUBJECT: STATOR COIL BRACING

SECTION— 1
PART— 2
PAGE— -
CONT'D ON PG. -

CANADIAN GENERAL ELECTRIC COMPANY LIMITED
FOR USE OF CGE EMPLOYEES ONLY

CHAIN LASHING BOTTOM ARMS USING RECT. BLOCKS

PHOTO #-

ITEM 4.12.-

ROUTE
EMI-4000
Section 1
Pts. 2,3,
4,6, 41

Revision Letter

Prepared By	Section and Unit
Len Foster	Motor & Generator L&l Process Eng'g
Date Issued	Supersedes Issue Dated
27 December 1963	NEW

SIGNATURES REQUIRED AS SHOWN →

	Type Names	Signatures
Prod. Engineering	J. L. McKeever	
Manuf. Eng.	A. L. Malby	
Quality Control	W. N. Baldry	
Eng'g. Lab.		

W1222084 hsp

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT

Stator Coil Bracing

SECTION— 1
PART— 2
PAGE— 36
CONT'D on PG.— 3'

Lashing Individual Coils to Support Ring with "Lock On" Coil Arm

Photo #1

Item 4.13

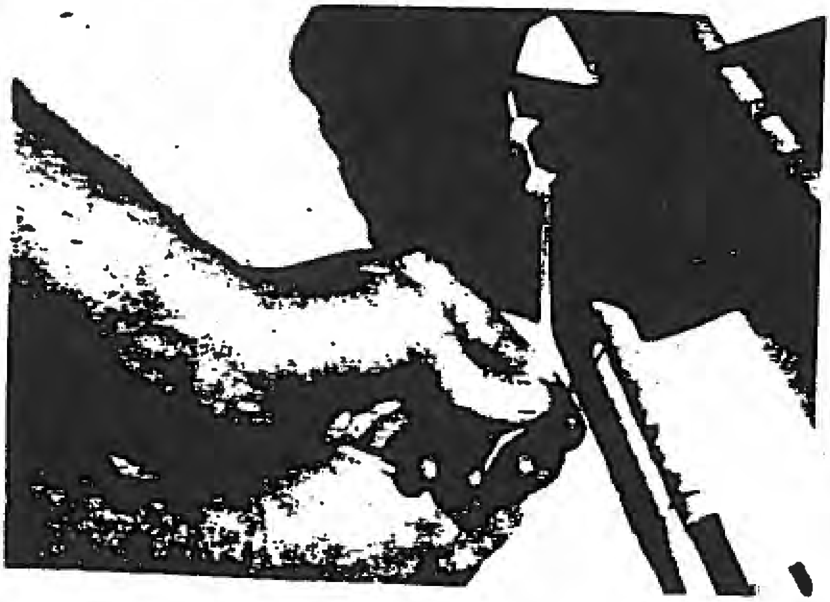

Photo #2

Item 4.13.2

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

ROUTE
EMI 4000
Sec. 1
Ps. 2,3,4,
~~and 41~~

Revise. Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued 13 Oct. 1966	Supersedes Issue Dated 27 Dec. 1963	Manuf. Eng. J.A.McGovarin	
		Quality Control R.J.Hackwood	

SIGNATURES REQUIRED AS SHOWN

CANADIAN GENERAL ELECTRIC COMPANY LIMIT

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT

Stator Coil Bracing

SECTION— 1
PART— 2
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CONT'D on PG.—38

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

Photo #3

Item 4.13.2

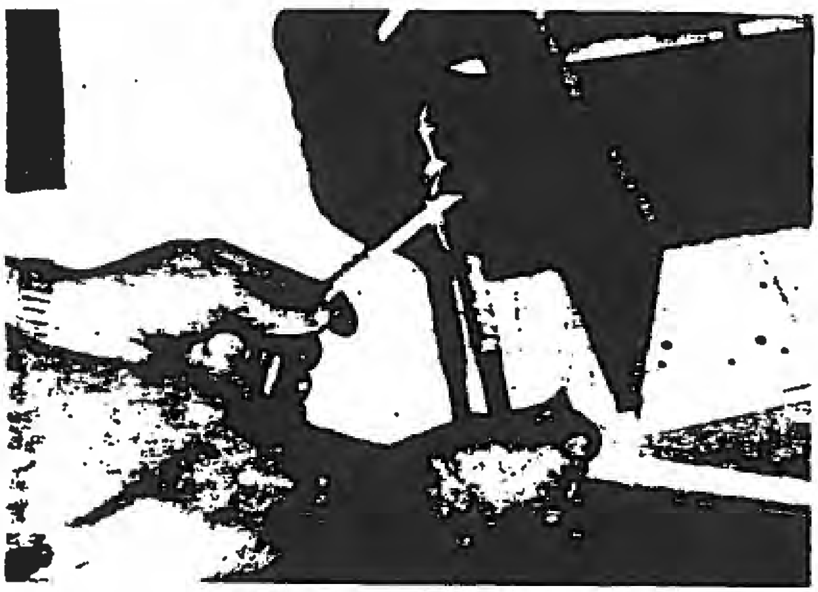

Photo #4

Item 4.13.3

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

ROUTE

EMI 4000
Sec. 1
Pts. 2,3,4
6 and 41

--Revision
Z--Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A.McGovarin	
13 Oct. 1966	27 Dec. 1963	Quality Control R.J.Hackwood	

ANADIAN GENERAL ELECTRIC COMPANY LIMI...
FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT

Stator Coil Bracing

SECTION— 1
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CONT'D on PG.— 39

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

Photo #5

Item 4.13.3

Photo #6

Item 4.13.4

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

ROUTE
MI 4000
Sec. 1
Pts. 2,3,4
and 41

-Rev.
-Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g	Prod. Engineering S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A.McGovarin	11 Nov 66
13 Oct. 1966	27 Dec. 1963	Quality Control R.J.Hackwood	

SIGNATURES REQUIRED AS SHOWN

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Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

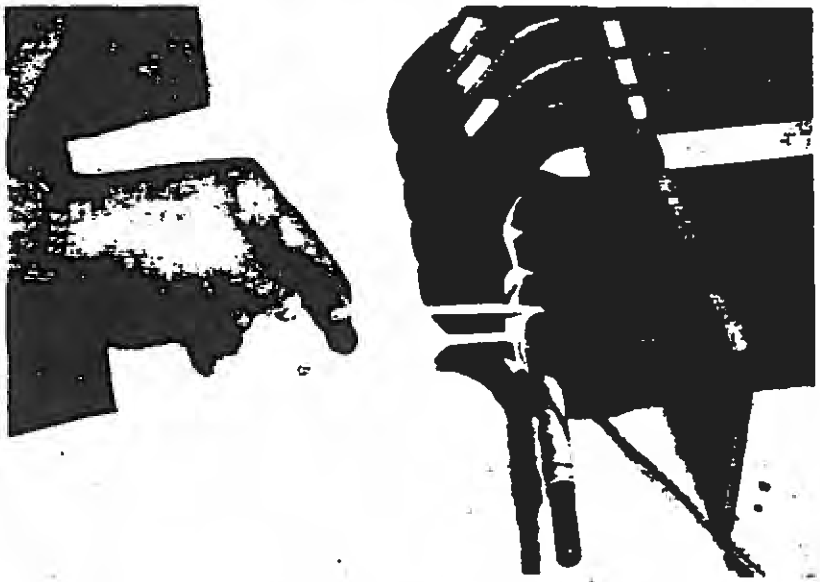


Photo #7

Item 4.13.4

Photo #8

Item 4.13.4

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

ROUTE
EMI 4000
Sec. 1
Pts. 2,3,4
and 41

Addition

Prepared By	Section and Unit	Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g	Prod. Engineering S.L.Thomas	
Date Issued: 13 Oct. 1966	Supersedes Issue Dated: 27 Dec. 1963	Manuf. Eng. J.A.McGovarin	
		Quality Control R.J.Hackwood	

SIGNATURES REQUIRED AS SHOWN

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT

Stator Coil Bracing

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

Photo #9

Item 4.13.5

Photo #10

Item 4.13

Lashing Individual Coils to Support Ring with "Lock" on Coil Arm

ROUTE
EMI 4000
Sec. 1
Pts. 2,3,4
and 41

Prepared By	Section and Unit		Type Names	Signatures
Len Foster	I.M. & T.E. 145 Process Eng'g.	Prod. Engineering	S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng.	J.A.McGovarin	[signature] 11 Nov 66
13 Oct. 1966	27 Dec. 1963	Quality Control	R.J.Hackwood	

SIGNATURES REQUIRED AS SHOWN

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT

GENERAL RULES FOR TYING CONNECTIONS

SECTION— 2
PART— 2
PAGE— 1
CONT'D on PG.—

1. SCOPE

This E.M.I. covers the general rules for tying connections on open slot induction motors and AC machines.

2. REQUIREMENTS

To provide a method of tying connections to insure a uniform and compact connection bundle.

3. PROCEDURE

3.1 Tying Adjacent Pole Machines

3.1.1 Before tying, all pole connections should be located in their respective smooth arc around the circumference of the machine.

3.1.2 All ties shall be made with a double thickness of specified lashing material per insulation specification #26936.

3.1.3 All ties shall be made by means of a continuous tie. Refer to photos on Page 3 & 4 Photo A.B.C.D.

3.1.4 Ties shall be lashed on each end of the pole jumper to the series lead. The distance between ties not to exceed four (4) inches.

3.1.5 For polyseal, specials and heavy duty machines, lash connection bundle to each series lead.

3.1.6 Tie all top mounted circuit rings as a group to every third or fourth series lead as in 3.1.3.

3.1.7 Tie all side mounted circuit rings as a group to every finish or outside lead with a continuous tie per insulation spec. #26936.

3.1.8 Pull ALL ties tight after each turn.

3.2 Tying Alternate Pole Machines

3.2.1 Repeat items 3.1.1, 3.1.2 and 3.1.3 under tying adjacent pole machines.

3.2.2 Lash every second pole jumper at the elbow to a series lead but if the distance between ties exceeds four (4) inches, tie each jumper to a series lead.

ROUTE
... - 600 Sectional
Pts. 2,3,4, 6 and 41

Prepared By	Section and Unit
Jim Fitzpatrick	146 Process Eng'g.
Date Issued	Supersedes Issue Dated
13 Nov/67	

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	S.L. Thomas	
Manuf. Eng.	J.A. McGovarin	
Quality Control	B.J. Hackwood	
Eng'g. Lab.		

W 1121

3. PROCEDURE (cont'd)

3.2.3. For polyseal, specials and heavy duty machines, lash connection bundle to each series lead.

3.2.4 Tie all top mounted circuit rings as a group to every third or fourth series lead as in 3.1.3 Tying Adjacent Pole Machines.

3.2.5 Tie all side mounted circuit rings as a group to every finish or outside lead with continuous tie per insulation spec. #26936.

3.2.6 Pull ALL ties TIGHT after each turn.

3.3 Tying Cable to Connection Bundle

3.311 All cable leads shall be tied where they join connection bundle pe insulation specification #26936 and sketch on page 3. part B.

3.3.2 Cables shall be tied together per insulation specification #26936 if the distance between connection bundle and the point where they enter stator frame exceeds four (4) inches. Refer to sketch on page 3 part A.

ROUTE

EMI-4000
Section 1
Pts 2,3,4,
5 and 41

Prepared By	Section and Unit	Type Names	Signatures
J. Fitzpatrick	146 Process Eng'g	Prod. Engineering S.L.Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. J.A. McGovarin	
[illegible]/57		Quality Control B.J. Hackwood	
SIGNATURES REQUIRED AS SHOWN		Eng'g. Lab.	

W 1222

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

SUBJECT
General Rules for Tying Connections

SECTION— 2
PART— 2
PAGE— 3
CONT'D on PG.—

Photo A

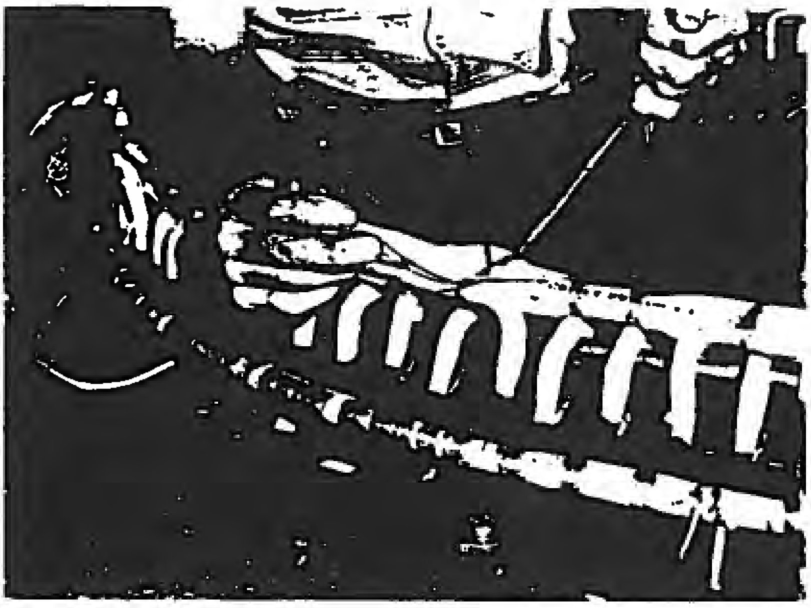


Photo B

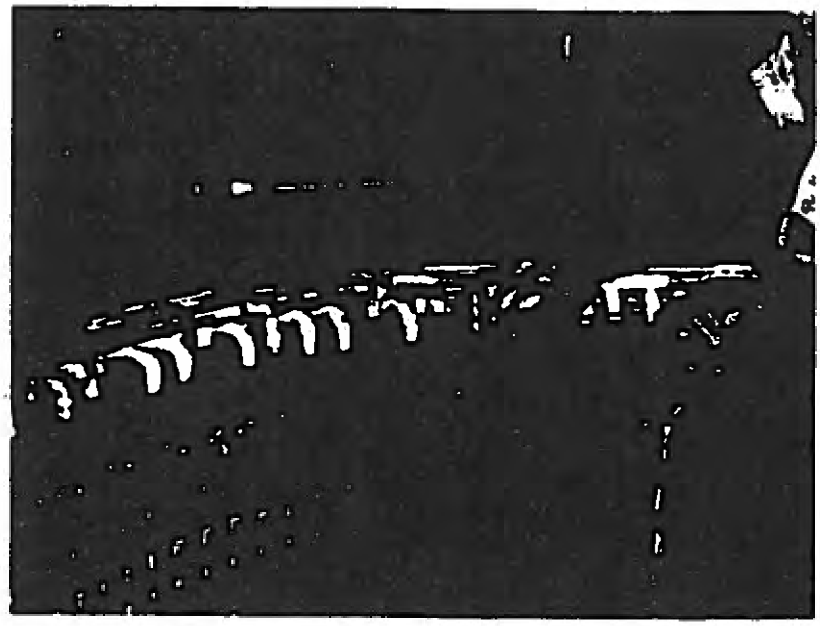
ROUTE
EMI 4000 Section 1
Pts 2,3,4, 6 and 41

Prepared By	Section and Unit
J. Fitzpatrick	
Date Issued	**Supersedes Issue Dated**
13 Nov/67	

SIGNATURES REQUIRED AS SHOWN

	Type Names	Signatures
Prod. Engineering	S.L. Thomas	
Manuf. Eng.	J.A. McGovarin	
Quality Control	B.J. Hackwood	
Eng'g Lab		

C.



D.

ROUTE
EMI 4000
Sectional
Pts 2,3,4,
6 and 11

Prepared By J. Fitzpatrick | Section and Unit
Date Issued 13 November/67 | Supersedes Issue Dated

SIGNATURES REQUIRED AS SHOWN

Type Names		Signatures
Prod. Engineering	S.L. Thomas	
Manuf. Eng.	J.A. McGovarin	
Quality Control	B.J. Hackwood	

ENGINEERING MANUFACTURING INSTRUCTIONS — No. 4320

SUBJECT
Baking Instructions for Varnished AC Stators which cannot be Oven Baked

SECTION— 3
PART— 1
PAGE— 1
CONT'D on PG.— 2

This EMI covers the general baking procedure for varnished AC stators which are physically too large for any of our permanent ovens.

A. Procedure:

1. The number of varnish floods and bake temperature will be specified on the applicable Insulation Specification.

2. Thermocouples should be located in the following areas to monitor the temperature rise of the stator:

   a) At least 4 inside the bore on the core.

   b) At least 2 on the back of the core opposite any 2 which have been located on the inside of the bore.

   c) At least 4 on either the connection bundle or the opposite end of the winding depending on which are closer to the heaters.

3. The winding RTD's (when present) must also be connected up. It is these which determine when the winding has reached the starting temperature of the baking cycle. If RTD's are not present use an average of all the thermocouples.

4. Place sufficient calrod heaters around and in the machine to heat the frame. Cover this setup with a suitable cover to reta the heat. For the first 2-3 hours of preheat an opening shoul be left in the top of the housing to let volatiles escape.

   - All heaters must be continuously controllable.

5. Start heat up by turning on the heaters. Ensure that the following conditions are met during heat up and bakes.

   a) Maximum temperature differential between any RTD and thermocouple must not exceed 15°C.

   b) Rate of rise must not exceed 20°C/hour.

   c) Any thermocouple or RTD must not exceed the actual bake temperature by 10% at any time.

ROUTE
MI 4000
ec.0
t. 41

Prepared By	Section and Unit	Type Names	Signature
T. van Vliet	Ind.1. Mach.Eng'g.	Prod. Engineering SL Thomas	
Date Issued	Supersedes Issue Dated	Manuf. Eng. JA McGovarin	
9 Jan. 1968	New	Quality Control RJ Hackwood	

Revision
Z-Addition

ENGINEERING MANUFACTURING INSTRUCTIONS —No. 4320

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

FOR USE OF CGE EMPLOYEES ONLY

SUBJECT

Baking Instructions for Varnished AC Stators which cannot be Oven Baked

SECTION— 3
PART— 1
PAGE— 2
CONT'D on PG.—

A.

6. If required, DC current may be applied to the winding after the frame has reached a minumum temperature of 90-100°C. Do not apply more than 25% of rated stator current to the winding.

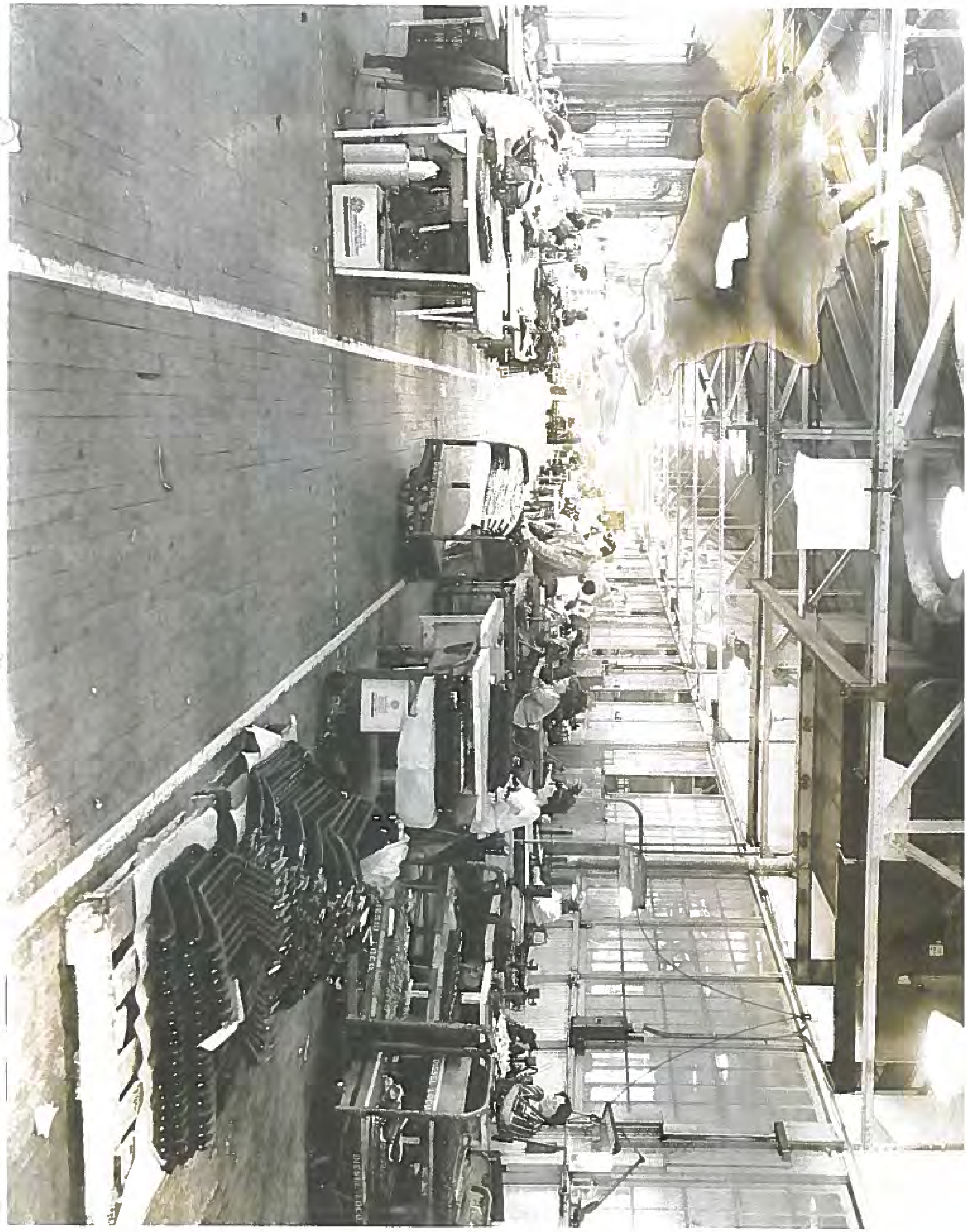
7. The bake cycle can start when the average RTD or thermocouples reading is 90% of the baking temperature specified in the insulation specification.

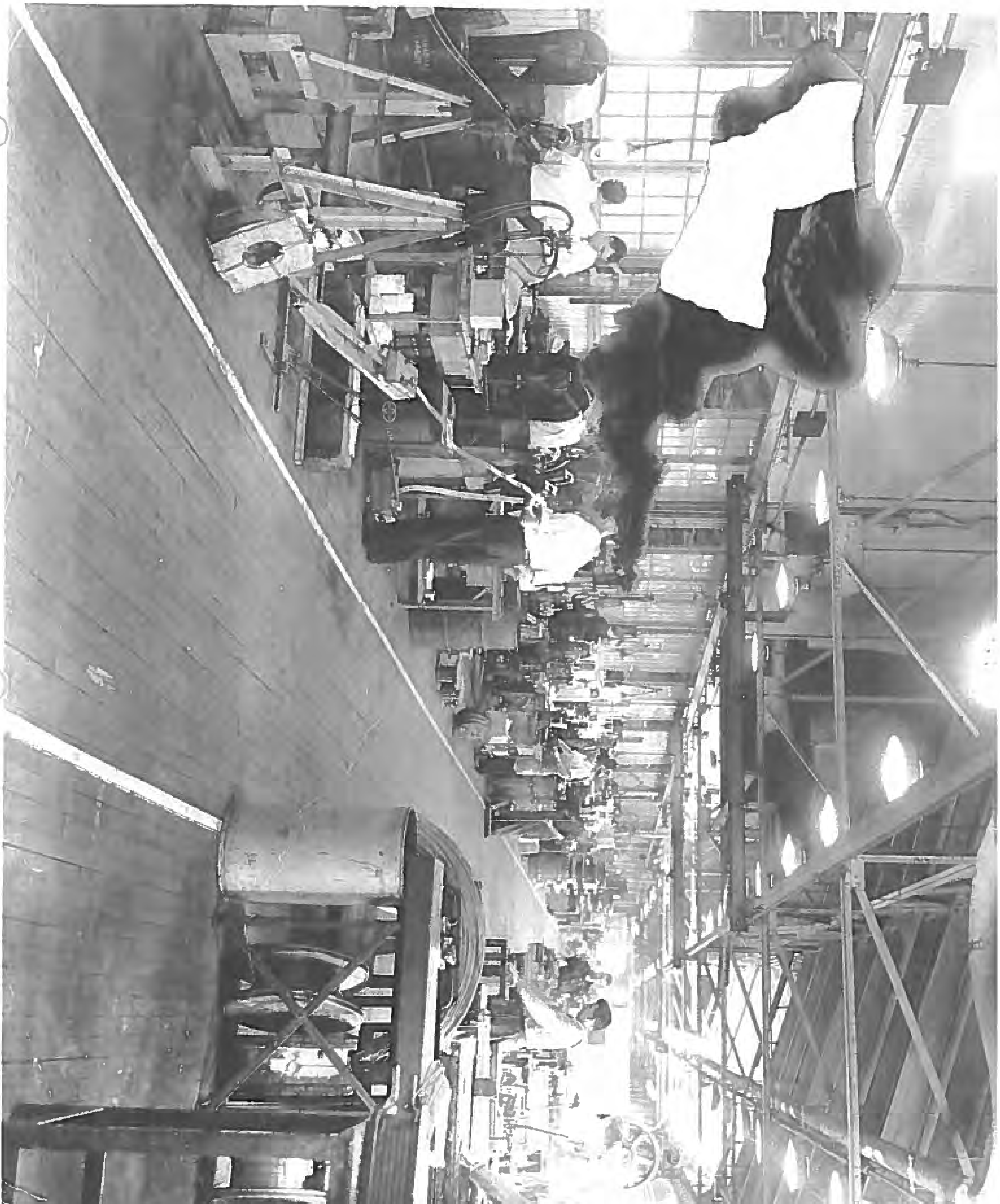
8. After the bake cycle has been completed allow the frame to cool to room temperature.

ROUTE
MI 4000
Sec. 0
Pt. 41

Prepared By	Section and Unit
T. van Vliet	Ind'l.Mach.Eng'g.
Date Issued	Supersedes Issue Dated
9-Jan. 1968	New

	Type Names	Signatures
Prod. Engineering	SL Thomas	
Manuf. Eng.	JA McGovarin	
Quality Control	RJ Hackwood	





Occupational Health Clinics for Ontario Workers Inc.
Centres de santé des travailleurs (ses) de l'Ontario Inc.

Toronto Clinic
970 Lawrence Ave. W. Suite #110
Toronto, ON M6A 3B6
Tel: 416-449-0009 or 1-888-596-3800
Fax: 416-449-7772
E-mail: toronto@ohcow.on.ca
www.ohcow.on.ca

BENZENE

What is benzene?

- a hydrocarbon which appears as a clear, colourless liquid
- highly flammable, giving off flammable vapours that are almost 3 times heavier than air
- may exist as a liquid or vapour at normal temperatures and pressures
- occurs naturally in the environment mainly as a result of automobile exhaust and cigarette smoke, so everyone is exposed to some degree

What are the uses of benzene?

- used as a solvent in the synthetic rubber industry and in the processing of paints
- use in industry has declined considerably but often present in trace quantities in petroleum and aromatic solvents (eg. toluene)
- minor component (less than 2.5%) of gasoline sold in Canada

How is benzene absorbed into the body?

- main route of exposure occurs through breathing vapours and mists
- liquid benzene is absorbed by swallowing or absorption through skin
- will also attack fatty layer of skin and continuous contact will lead to dermatitis
- minor ingestion may occur through contamination of food, drink, chewing gum or cigarettes brought into the work area or eating with contaminated hands
- absorbed benzene tends to move to fatty tissues and builds up in the bone marrow and central nervous system
- persons under 18 should be protected from exposure since they have a lower resistance to bone marrow poisons
- pregnant women and nursing mothers should not be exposed and special precautions are necessary where women of childbearing age are exposed

What are the health effects of benzene?

Benzene is a designated substance in Ontario and if it is suspected to be used in the workplace, an assessment must be carried out to determine the need for a control program.

- the Ontario benzene regulation requires that a worker's time-weighted average exposure (TWA) be reduced to the lowest practical level with the objective of a TWA concentration of no more than 1 ppm (3.2 mg/m^3)

- the Ontario benzene regulation states that the TWA concentration in the workplace shall not exceed 15 ppm or 48 mg/m^3

- the United States Occupational Safety & Health Administration (OSHA) recommends an 8-hour TWA of 1 ppm and a short-term limit (STEL) of 5 ppm; an action level of 0.5 ppm was established to encourage lower exposures for employees

- the American Conference of Governmental Industrial Hygienists has recommended lowering the TWA to 0.1 ppm (0.3 mg/m^3)

What should you do if you are exposed to benzene in the workplace?

- contact the worker representative on the joint health and safety committee

- determine whether or not a workplace assessment has been conducted and whether or not there is a control program for benzene in place

- If you are concerned about your exposure to benzene see a doctor

- call the Occupational Health Clinic for Ontario Workers in your area for assistance with hygiene and medical evaluations

Material Safety Data Sheet

964. Cec.

Section I - PRODUCT IDENTIFICATION

Product name: L-6277 A

Synonym: Weeping epoxy

Product use: Epoxy Adhesive
Chemical family: Epoxy resin

Typical kit size:
Quart pint 1/2 pt

Supplier: GE Canada
Address: 107 Park St. N.
Peterborough, Ont.
K9J 7B5

24 Hr Emergency Phone:
(416)-858-5108

Telephone #: (705)-748-7722

Inventory number:

Section II - HAZARDOUS INGREDIENTS

Ingredients	CAS #	%	Hazard Data
Diglycidyl ether / Bisphenol A epoxy	25068-38-6	60-100	LD50(rat,oral) 9,000 mg/kg
Butyl glycidyl ether	2426-08-6	10-30	LD50 (rat, oral) 2,560 mg/kg

Section III - PHYSICAL DATA

Boiling point: NAv

Specific gravity: 1.14

Vapour pressure (mm Hg): 1

Evaporation rate: NAv

Vapor density (Air=1): 4.5

Solubility in water: Slightly

Volatiles,%: 000

Freezing point: NAv

pH: NAp

Auto-ignition temperature: NAv

Coefficient of water/oil distribution: NAv

Appearance and odour:

* Amber coloured, clear viscous liquid.

Odour threshold: NAv ppm

Section IV - FIRE OR EXPLOSION HAZARD

Flash point (Method): 73 (DEG C) (PMCC) LEL: NAv UEL: NAv

Extinguishing media: Carbon Dioxide, Dry Chemical, Water Fog, Foam

Special fire fighting instructions:

* Wear adequate respiratory protection. Avoid smoke inhalation. Water may be ineffective except as a fog.

Unusual fire and explosion hazards:

* Toxic fumes and vapours emitted when heated to decomposition. Butyl glycidyl ether may be vapourized and hydrogen chloride gas released upon combustion.

Section V - REACTIVITY DATA

Stability: Stable   Incompatibility: Strong acids,bases,amines,mercaptan

Hazardous decomposition products:

* On pyrolysis aldehydes, ketones, chlorinated hydrocarbons and unidentified organics

Hazardous Polymerization: Will not occur

Section VI - TOXICOLOGICAL PROPERTIES

Exposure limit: 25 ppm

Inhalation:

* Sensitization can occur through contact or inhalation. Prolonged exposure can cause headache, nausea, dizziness.

Skin:

* Prolonged or repeated contact may cause dermatitis and some individuals may become sensitized.

Eyes:

* Moderately irritating.

Ingestion:

* Irritating

Chronic effects:

* Sensitization can occur through contact or inhalation. Butyl glycidyl ether is a bacterial mutagen but is not mutatgenic in mammalian tests.

Section VII - FIRST AID MEASURES

Inhalation:

* Remove to fresh air. If breathing has stopped, restart and get medical attention.

Skin:

* Wash with soap and water. Wash contaminated clothing before re-use. If irritation persists or a rash develops, get medical attention.

Eyes:

* Flush with water for at least 15 minutes - get medical aid.

Ingestion:

* Do not induce vomiting. Get medical aid immediately.

Section VIII - PREVENTATIVE MEASURES

Respiratory protection:

* Emergencies - approved organic canister or air pack

Ventilation:

* Local exhaust

Protective clothing:

* Neoprene rubber gloves, protective apron and long sleeves.

Eye protection:

* Chemical Safety goggles or face shield.

Other protective equipment:

* Barrier creams, safety shower, eye wash station.

Spill, leak or release:

* Use inert absorbent solid to soak up material, remove to a sealed container. Wear adequate respiratory protection, avoid skin contact.

Waste disposal:

* Small quantities may be cured in ratio with part B to an inert solid routine disposal. Use licensed disposal Co. and meet all Federal, Provincial, and Municipal regulations.

Section IX - SPECIAL PRECAUTIONS

Storage and handling conditions:

* Store in cool, well ventilated area in closed container. Avoid direct contact. Encourage good housekeeping and personal hygiene.

Comment:

* Avoid breathing vapours from oven heating or curing. When heated to decomposition toxic vapours are emitted. No smoking or eating in area of use. Barrier creams can help reduce contact.

Section X - PREPARATION INFORMATION

NAv - information not available at the time of preparation
NAp - not applicable

Prepared by: T.L. Sayer, Ph.D. Telephone #: (705)-748-7728

Preparation date: Last review date: 01/19/89

Version: 1.10

448 GE CANADA

Cec

Material Safety Data Sheet

grey epoxy/* fill hole

stick some mixed (A+B) Drushed

Section I - PRODUCT IDENTIFICATION

Product name: L-5142 B — Synonym: Epoxy Hardener

Product use: Epoxy Kit — Typical kit size: <50 mL

Chemical family: Aliphatic polyamine

Supplier: GE Canada
Address: 107 Park St. N.
Peterborough, Ont.
K9J 7B5

24 Hr Emergency Phone: (416)-858-5108

Telephone #: (705)-748-7722 — Inventory number:

Section II - HAZARDOUS INGREDIENTS

Ingredients	CAS #	%	Hazard Data
Triethylenetetramine	112-24-3	~100	LD50 (rat, oral) 4340 mg/kg LD50 (rabbit, skin) 820 mg/kg

Section III - PHYSICAL DATA

Boiling point: 277 (DEG C) — Specific gravity: 0.979

Vapour pressure (mm Hg): < 0.01 — Evaporation rate: 0.001 (nBuAcetate=1)

Vapor density (Air=1): 5.0 — Solubility in water: 100 % by wt.

Volatiles,%: 100 — Freezing point: -3 DEG C

pH: NAp — Auto-ignition temperature: 338 DEG C

Coefficient of water/oil distribution: NAv

Appearance and odour:

* Pale yellow liquid with a mild ammonia type odour.

Odour threshold: NAv ppm

Section IV - FIRE OR EXPLOSION HAZARD

Flash point (Method): 135 (DEG C) (PMCC) LEL: 1.00 UEL: 6.50

Extinguishing media: Carbon dioxide or dry chemical.

Special fire fighting instructions:

* Fire fighters use self-contained breathing apparatus and full protective clothing for fires involving large quantities.

Unusual fire and explosion hazards:

* May produce a floating fire hazard.

Section V - REACTIVITY DATA

Stability: Stable   Incompatibility: Oxidizers, acids, aldehydes, ketones

Hazardous decomposition products:

* carbon monoxide, carbon dioxide, nitrogen oxides, hydrogen cyanide

Hazardous Polymerization: Will not occur

Section VI - TOXICOLOGICAL PROPERTIES

Exposure limit:

Inhalation:

* Vapours are irritating and may cause sensitization resulting in asthma-like symptoms in certain individuals.

Skin:

* Causes chemical burns. Repeated exposure may result in absorption of harmful amounts of material and may result in sensitization.

Eyes:

* Can result in severe burns and corneal injury.

Ingestion:

* Moderately toxic. Acute overexposure may result in burns to the mouth & throat, abdominal pain, nausea, vomiting and diarrhea.

Chronic effects:

* Repeated contact or inhalation may cause sensitization or aggravate an existing dermatitis, asthma, & inflammatory or fibrotic pulmonary disease

Section VII - FIRST AID MEASURES

Inhalation:

* Remove victim to fresh air. Assist breathing with oxygen if necessary, Get medical attention.

Skin:

* Immediately flush with water and wash with soap and water. Promptly remove contaminated clothing. Get medical attention if irritation persists or if a large area is involved.

Eyes:

* IMMEDIATELY flush eyes for at least 15 min, including under the eyelids. Get medical attention promptly.

Ingestion:

* Give three glasses of milk or water to dilute the material. Do not induce vomiting. Call a physician at once.

Section VIII - PREVENTATIVE MEASURES

Respiratory protection:

* Organic canister or self-contained apparatus for emergencies.

Ventilation:

* Local exhaust

Protective clothing:

* Butyl gloves, long sleeves, aprons. Wash contaminated clothing.

Eye protection:

* Safety glasses with side shields or chemical goggles.

Other protective equipment:

* Barrier creams may provide additional protection.

Spill, leak or release:

* Cover small quantities with sodium carbonate or sodium bisulfate. Scrape up for disposal by a licensed operator.

Waste disposal:

* Can be reacted in small quantities with ratio amounts of L-5142 A to form solid for landfill. Liquid can be incinerated at a licensed site.

Section IX - SPECIAL PRECAUTIONS

Storage and handling conditions:

* Store in a cool well ventilated area in sealed containers. Keep away from sources of ignition & heat. Keep working areas clean with disposable coverings. Follow good hygienic practices.

Comment:

* This material has exhibited evidence for weak mutagenic activity in in-vitro test systems but did not exhibit carcinogenic potential in life-time mouse skin painting studies. Prevention of skin contact is of the utmost importance. Once sensitized, no practical TLV exists.

Section X - PREPARATION INFORMATION

NAv - information not available at the time of preparation
NAp - not applicable

Prepared by: T.L. Sayer, PhD

Telephone #: (705)-748-7728

Preparation date: 04/14/82

Last review date: 01/19/89

Version: 1.10

Larry Ball C-1

Occupational Safety and Health Administration Epoxy

OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

V.P.I. Bldg 16 Transportation Equipment

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME: General Electric Co., Insulating Materials Prod. Section	EMERGENCY TELEPHONE NO.: (518) 385-3357
ADDRESS (Number, Street, City, State, and ZIP Code): 1 Campbell Road, Schenectady, New York 12345	
CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS: 702 Permafil
CHEMICAL FAMILY: Unsaturated Polyester	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE Unsaturated Polyester	70		METALLIC COATINGS		
SOLVENTS Vinyl Toluene	30	100 ppm	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES Quinone	Tr	.1 ppm	OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	334	SPECIFIC GRAVITY (H_2O=1)	1.02
VAPOR PRESSURE (mm Hg.)	1.1	PERCENT, VOLATILE BY VOLUME (%)	< 5%
VAPOR DENSITY (AIR=1)	4.1	EVAPORATION RATE (butyl acetate	< 1
SOLUBILITY IN WATER	nil		
APPEARANCE AND ODOR	Clear amber liquid - pungent odor		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
115°F Pensky Martens		8%	11%

EXTINGUISHING MEDIA
Foam, Carbon Dioxide, Dry chemical, Water, Fog.

SPECIAL FIRE FIGHTING PROCEDURES
Self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Dense smoke. Hazardous polymerization.

(Continued on reverse side)

Form OSHA-20

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
Not established.

EFFECTS OF OVEREXPOSURE
Skin and eye irritation.

EMERGENCY AND FIRST AID PROCEDURES
Eyes: Flush with water 15 minutes. Call physician.
Skin: Wash with soap and water.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE	X	Temp. above 65°C(150°F). Materials listed below.
	STABLE		

INCOMPATABILITY *(Materials to avoid)* Copper, brass, lead, strong oxidizing or reducing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Acetophenone, methane, alcohols, methylstyrene. Burning liberates CO, CO_2, and smoke.

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR	X	See above.
	WILL NOT OCCUR		

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Salvage in steel drums. Absorb excess with clean sand andburn in remote location.

WASTE DISPOSAL METHOD
~~Burn in small amounts in open shallow pan. Do not incinerate containers.~~

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
Not applicable.

VENTILATION		
	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)* X	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Chemical resistant	Safety glasses

OTHER PROTECTIVE EQUIPMENT
Not applicable

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Warning: May decompose violently when overheated. Keep away from sources of heat.

OTHER PRECAUTIONS
Store below 125°F out of direct sunlight. Melt only in water bath of 55°C (131°F) max.

[redacted]

EPOXY M5910

CANADIAN GENERAL ELECTRIC COMPANY LIMITED

SPECIFICATION

M5910-S3

SOLVENTLESS EPOXY VARNISH

29 February 1972

SUPERSEDES M5910-S2

M5910 identifies a solventless epoxy varnish.

PROPERTIES:

Total solids, percent	100
Viscosity, centipoises, max.	
Fresh, 25 C (1)	1100
Gel time, 135°C, minutes	26-36
Volatility (2), at 38 C, mm Hg, max.	0.5
Heat distortion temperature (3), deg. C	55 ± 10
Tan δ, max. (4)	0.30
Water content, %, max.	0.15

(1) It is desired that this viscosity be kept as low as possible.
(2) The vapor pressure of any component.
(3) Sample to be cured 3 hours at 150 C.
(4) At 10 volts per mil, material thickness 45 ± 5 mils, as measured at 100 C after sample cure of 24 hours at 150 C.

ANUFACTURE:

Material M5910 shall consist of an epoxy mixture and hardener, as follows:

Shell epoxy 826 or ciba 6005	71 pts. by wt.
3M cardolite NC 513	29 pts. by wt.
Boron trifluoride monoethylamine (1)	3 pts. by wt.

(1) Only approved supplier: Harshaw Chemical Company.

The above mixture shall not contain reactive diluents having high volatility or toxicity characteristics, such as butyl glycidyl ether. The varnish shall be supplied free from metallic and other particulate impurities.

Material should be manufactured and shipped immediately so that storage is avoided.

REFEREE METHODS:

Solids content	ASTM D115
Viscosity	ASTM D115
Gel time	GE Test Method E 12C50
Tan δ	ASTM D150
Volatility	ASTM D323
Heat distortion test	ASTM D648

ED. THIS IS THE CHEMICAL INVOLVED IN 1971 EXPLOSION IN ARMATURE
- CONFIDENTIAL DOCUMENT

FACTORY TRIAL APPROVAL:

Final approval of material to this specification will be based on factory trial. After final approval, no changes shall be made in the composition of material furnished to this specification without prior knowledge and approval of the purchaser.

When material has been approved, the supplier and purchaser shall agree on an infrared spectrophotometric curve. All batches of material shall be evaluated against this curve before shipment.

CERTIFICATE OF TEST:

When requested on the purchase order or otherwise, the manufacturer shall submit promptly to the purchaser at the point of delivery, a certificate of test in triplicate showing that the material conforms to this specification. This certificate shall contain the CGE designation, batch number, date of manufacturing and the purchase order number so that the certificate may be identified with the shipment.

PACKING AND MARKING:

Unless otherwise specified, material shall be supplied in standard commercial containers to meet ICC and carriers' regulations.

Each container shall be legibly marked with the purchase order number, manufacurer's name, batch or lot number, date of manufacturing, the CGE designation, and the following note: "STORE IN SHADED AND COOL PLACES."

AMINOETHYL PIPERAZINE AMINE MIXTURE EPOXY E

PRODUCT DATA

UNISORB MACHINERY INSTALLATION SYSTEMS

V-100 EPOXY GROUT

TOUGH AND DURABLE • EASILY FLOWS INTO PLACE • FAST CURING • MINIMAL MATERIAL USAGE

GENERAL INFORMATION

Unisorb V-100 Epoxy Grout is a two-component, 100% solids, filled epoxy system that cures rapidly at normal room temperatures setting up a tough, durable impact and vibration resisting grout which eliminates the chronic problem of regrouting common to many installations It is a new and proven method of grouting, regrouting, and anchoring hard-to-hold heavy machinery.

Unisorb V-100 Grout can be used to grout shears, lathes, punches, presses, grinding machines, machine tools, compressors, pumps, engines, generators, motors, crushers, grinding mill bases, truck and track scales, column bases, sole plates, rails, hoist bases, canning machinery, etc.

IMPORTANT ADVANTAGES

1. **PERMANENCE** — ***Eliminates need for periodic regrouting. Saves down time, labor and lost production . . . resistance to oils, greases, acids, alkalies and solvents is much greater than that of cementitious materials . . . tensile and flexural strengths are at least 15 times that of concrete, compression strength is about 5 times that of concrete.***
2. **EASY, FLOW-INTO-PLACE INSTALLATION** — ***Flows into spaces under machines of ½" or less and fills completely before solidifying.***
3. **FAST CURE** — ***At 77° F., a ½" thickness will set up for use in 6 hours.***
4. **MINIMUM MATERIAL USAGE** — ***Use ¼" to ¾" of Unisorb V-100 Grout — no minimum thickness restriction.***
5. **SMOOTHER MACHINE OPERATION** — ***Unisorb V-100 Grout survives impact and vibration as well as reinforced rubber materials and will not delaminate under the most severe shock loads.***
6. **REGROUTS AND REBUILDS FOUNDATIONS** — ***No need to move equipment or break connections. Just raise equipment ½" to ¾" and grout with Unisorb V-100 Grout. Repairs damaged foundations with minimum time delay and labor costs.***

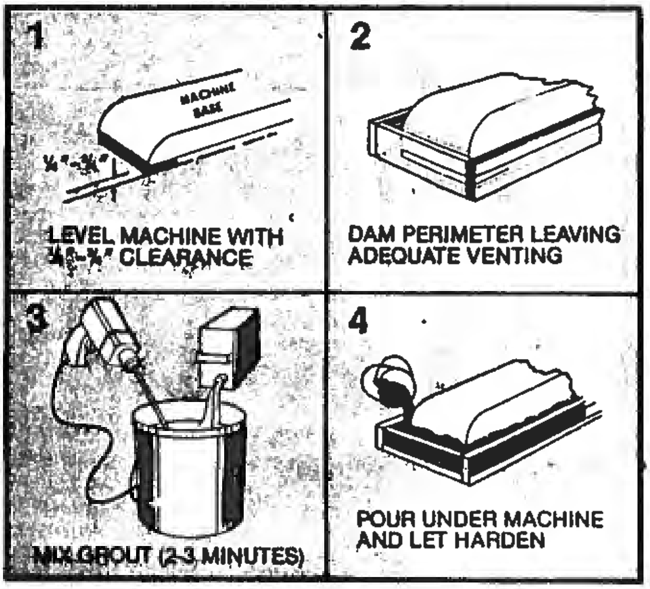
SUGGESTIONS FOR USING UNISORB V-100 GROUT

PRECAUTIONS

Epoxy resins may sensitize certain personnel. When using resins, wear plastic or rubber gloves, and/or coat exposed skin with protective cream. Avoid inhaling fumes and keep area well ventilated. Wash skin and clothes with soap and water only. If resin splashes in eyes, flush immediately with running water for at least 15 minutes. Do not burn cured material without adequate ventilation and respiration equipment. Seller makes no warranty and user assumes all risks with respect to the use of this product.

APPLICATION TECHNIQUES FOR GROUTING

BASE PREPARATION — For best economy and optimum installation, leave approximately ½" of space between machine base and foundation. Be careful to remove loose or weak concrete from foundation surfaces and to clean machine base if adhesion is desired. Concrete foundation must be firm, although Unisorb V-100 Grout will flow into cracks as small as .002" and strengthen entire structure. If foundation is metal, sand to roughen surfaces and wipe solvent for best adhesion.



Dam the grout area if it is not already recessed. Use 2 x 4's to enable resin to build at least a 2" head. Apply one to two polished coatings of a good paste wax to the side of a 2 x 4 that contacts the resin. Then, liberally apply a $\frac{1}{64}$" to $\frac{1}{32}$" unpolished wax coating on these sides. Place caulking compound or ribbon putty on the floor side and abutting ends of 2 x 4's. ***Be certain that joints of dam are well sealed.*** Anchor forms in place.

RESIN PREPARATION — Store material between 70° F. and 80° F. ***Do not mix until ready to pour.***

Pot life at 77° F. is 15 minutes. This can be extended slightly, if necessary, by swirling mixture to delay heat build-up in center of mass.

When ready to pour, premix resin portion (deep gold colored liquid) for one or two minutes with stirrer in power drill to assure uniform filler distribution. ***Note: Stirrer blade must be able to touch bottom of pail. Do not use stirrer with hindrance under blade.***

While stirring thoroughly mixed resin, pour in hardener. To prevent splashing, pour in a steady stream about 6" high. Mixing time should be about two minutes. Run stirrer around pail perimeter, up and down, and hold at a slight angle until you note uniform color and an absence of streaks.

POURING MIXED RESIN — ***Always pour from one spot to prevent air inclusions under the machine.*** When resin has penetrated to other side of base, move pour spot along same side of base to where resin has stopped. ***Pour until resin is at least ½" up side of base.*** When resin has filled to bottom of opposite and adjacent sides of base, it is acceptable to fill in sides by pouring around base perimeter.

REMOVING FORMS — If temperature has been maintained at 77° F. during entire pouring procedure, it is possible to remove forms within 6 to 8 hours. After removing anchoring devices, a sharp rap should be enough to separate forms from the Unisorb grout base. Bolts can then be checked for tightness and the machine placed in operation.

RESIN AND HARDENER STORAGE — If partial cans are used, be certain to close covers tightly after measuring out. Shelf life is indefinite, if instructions are followed.

YIELD
One pound of Unisorb V-100 Grout will fill 16½ cubic inches, set up.

OTHER APPLICATIONS

GROUT ANCHOR BOLTS — Drill hole to a depth 10 to 15 times the bolt diameter. Use a hex-head bolt. Make hole diameter about ½" larger than bolt diameter. To set anchor bolt quickly, fill hole about one-third of depth with Unisorb V-100 Grout. Preheat bolt to about 150° F. and put in place. Bolt will set permanently in less than one hour. If heat is not used V-100 will set in six to eight hours.

LAY PERFECTLY LEVEL BASES — No transit required . . . just dam the area to be covered and pour in Unisorb V-100 Grout. It will self-level before setting, then set harder than concrete to a tough, corrosion-resistant base.

MAKE JACKING PADS QUICKLY — Fill in area with clean, sharp crushed stone, scrap metal or other clean filler to reduce cost. Use at least ½" thickness of Unisorb V-100 Grout.

REINFORCE BEARING SLEEVES AND MACHINE PARTS — Instead of enlarging worn bearing support areas and putting in oversize bearings, fill in behind new bearings with Unisorb V-100 Grout.

GROUT FULCRUM PEDESTALS ON TRUCK AND TRACK SCALES — Unisorb V-100 Grout resists shock loading and chemical corrosion — reduces need to regrout, with attendant costs of recalibrating and recertifying.

ADHERE NEW CONCRETE TO OLD — The bond between Unisorb V-100 Grout and concrete is stronger than concrete-to-concrete. Use it as an adhesive film between concretes. (Not recommended for applications to wet concrete.)

PATCH FLOORS — Extend Unisorb V-100 Grout with clean fillers, such as pea gravel or crushed stone. Spread clean sand or grit over wet resin surfaces to prevent slipping. Color can be darkened by addition of a small amount of carbon.

PHYSICAL PROPERTIES

Color	Dark Yellow Orange
Working Time, 77° F.	15 Minutes
Gel Time, 77° F.	30 Minutes (1/2" depth)
Viscosity, 77° F.	6000 cps
Linear Shrinkage	0.0013 in./in.
Expansion Coefficient	0.000020 in./in./F.°
Compressive Strength (ASTM D-695)	9,000 PSI (6-hour cure)
	15,250 PSI (3-day cure)
	16,800 PSI (7-day cure)
Compression Modulus	0.63 x10^6 (6-hour cure)
	0.86 x10^6 (3-day cure)
	1.10 x10^6 (7-day cure)
Tensile Strength (ASTM D-638)	4260 PSI
Tensile Modulus	1.13 x10^6
Tensile Elongation	.057%
Flexural Strength (ASTM D-790)	6800 PSI
Flexural Modulus	1.26 x10

UNISORB MACHINERY INSTALLATION SYSTEMS
Box 1000, Jackson, Michigan 49204
(517) 764-6060 Telex TWX 810-253-1912 MISUNISORB JKN

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#532

CANADIAN GENERAL ELECTRIC

ENGINEERING LABORATORY

PETERBOROUGH

MATERIAL SAFETY DATA SHEET

SECTION I

Supplier's NAME: Canadian General Electric Co. Ltd.	EMERGENCY TELEPHONE NO.: 705-748-7728
ADDRESS (Number, Street, City, State, and ZIP Code): 107 Park St. N. Peterborough, Ontario K9J 7B5	
CHEMICAL NAME AND SYNONYMS: Hardener for Mexotropic Epoxy Sealant (M-6290A)	TRADE NAME AND SYNONYMS: M-6290B
CHEMICAL FAMILY: Polyamidoamine	FORMULA

SECTION II HAZARDOUS INGREDIENTS

	%	TLV (UNITS)	SPECIES	LD50 ORAL	LD50 DERMAL
Polyamidoamine	>96	*			
Mineral Filler	< 4	**			
Polar Additive	< 1				
* Contains no more than 5%					
Diethylenetriamine and 5%		1 ppm			
Nonylphenol					
** No inhalation hazard considered					
when fillers coated with liquid hardener					

SECTION III PHYSICAL DATA

BOILING POINT (°F.)		SPECIFIC GRAVITY (H_2O=1)	1.04
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%)	0
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____ =1)	
SOLUBILITY IN WATER	Very Low		
APPEARANCE AND ODOR: Thixotropic clear amber coloured paste with "amine" odour.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): 201°C	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA: CO2, dry chemicals, foam.

SPECIAL FIRE FIGHTING PROCEDURES: Firefighters should use self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Toxic fumes emitted when decomposition temperature reached.

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE 1 ppm (When heated or misted, inhalation hazards can occur).

EFFECTS OF OVEREXPOSURE
Prolonged or repeated skin contact is irritating, can produce dermatitis and possible an allergic response. Contact may damage eyes.

EMERGENCY AND FIRST AID PROCEDURES
Wash exposed skin area immediately with soap and water. Remove and wash contaminated clothing. Flush eyes with plenty of running water for 15 minutes. Get prompt medical assistance.

SECTION VI REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	Combustible liquid avoid heat and ignition sources.

INCOMPATABILITY (Materials to avoid)
Avoid contact with acidic materials and strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Toxic fumes emitted from thermal degradation.

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	Do not heat above 60 °C before adding to Part A

When added to Resin (M-6290B) system undergoes moderately exothermic reaction at room temperature depending on total mass.

SECTION VII · SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Ventilate area. Avoid skin contact or breathing vapours. Scrape up and clean up residues with inert absorbent material; remove to plastic-lined covered container.

WASTE DISPOSAL METHOD
Scrap material can be added to Resin component (M-6290A) in correct ratio to produce inert solid for routine disposal or dispose of wast through licensed waste disposal Company.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
In confined areas or for emergencies - air supplied or self-contained respirators.

VENTILATION	LOCAL EXHAUST	SPECIAL
	Preferable	
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Impervious gloves	Chemical Safety goggles or face shield

OTHER PROTECTIVE EQUIPMENT
Long sleeved clothing aprons. Safety shower, eye bath.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Store in cool, dry well ventilated areas in closed containers. Avoid skin contact. Avoid breathing of vapour.

OTHER PRECAUTIONS
Wash thoroughly after handling with soap and water. No smoking or eating in area of use.

Cec

#43

CANADIAN GENERAL ELECTRIC

ENGINEERING LABORATORY

PETERBOROUGH

MATERIAL SAFETY DATA SHEET

SECTION I

SUPPLIER'S NAME Canadian General Electric Co. Ltd.	EMERGENCY TELEPHONE NO. 705-748-7728
ADDRESS (Number, Street, City, State, and ZIP Code) 107 Park St. N. Peterborough Ontario K9J 7B5	
CHEMICAL NAME AND SYNONYMS Thixotropic Epoxy Sealant	TRADE NAME AND SYNONYMS M-6290A
CHEMICAL FAMILY Epoxy Resin	FORMULA

SECTION II HAZARDOUS INGREDIENTS

	%	TLV (UNITS)	SPECIES	ORAL LD50	DERMAL
DGEBA type Epoxy Resin	<95	NA			
Mineral Filler	< 5	*			
* no inhalation hazard considered when fillers coated with Epoxy Resin.					

SECTION III PHYSICAL DATA

BOILING POINT (°F.)		SPECIFIC GRAVITY (H_2O=1)	1.15
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%)	0
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (______ =1)	
SOLUBILITY IN WATER	Very Low		
APPEARANCE AND ODOR	Thixotropic clear white paste with slight odour.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) ~ 204°C	FLAMMABLE LIMITS	Lel	Uel
EXTINGUISHING MEDIA CO2, dry chemical, foam			
SPECIAL FIRE FIGHTING PROCEDURES Wear adequate respiratory protection.			
UNUSUAL FIRE AND EXPLOSION HAZARDS Toxic fumes emitted when heated to decomposition.			

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

EFFECTS OF OVEREXPOSURE
Moderately irritating to shkin and eyes. Prolonged contact can cause cracking of the skin, dermatitis and sensitization.

EMERGENCY AND FIRST AID PROCEDURES
Wash contaminated skin thoroughly with mild soap and water. Flush eyes with water for at least 15 minutes. Get medical aid.

SECTION VI REACTIVITY DATA

STABILITY			
	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	Can polymerize slowly when heated above 100°C.

INCOMPATABILITY (Materials to avoid)
Do not mix with strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Highly toxic fumes emitted when heated to decomposition.

HAZARDOUS POLYMERIZATION			
	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	Do no heat before adding curing agent.

With addition of hardener (M-6290B) Resin cures with moderate exotherm at room temperature depending on total mass.

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Scrape material into container. Clean up residues with inert absorbent solid. Avoid skin contact.

WASTE DISPOSAL METHOD
Mix scrap material with curing agent (M-6290B) in Correct ration to produce inert solid for routine disposal or dispose of through licensed waste disposal Company.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
Emergency or non-routine use - Approved organic canister mask or air pack.

VENTILATION		
	LOCAL EXHAUST Preferable	SPECIAL
	MECHANICAL (General) Acceptable	OTHER

PROTECTIVE GLOVES Neoprene Rubber

EYE PROTECTION Chemical Safety goggles or face shield

OTHER PROTECTIVE EQUIPMENT
Barrier creams, aprons. Safety shower, eye bath.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Store in cool, well ventilated area, in closed container. Avoid direct contact. Encourage good housekeeping.

OTHER PRECAUTIONS
Avoid breathing vapous from oven heating or curing when heated to decomposition toxic fumes emitted. No smoking or eating in area of use.

GE CANADA

Material Safety Data Sheet

563 Cec pg

Section I - PRODUCT IDENTIFICATION

Product name: L-5918 C

Synonym: MEK peroxide solution

Product use: Polyester Kit
Chemical family: Organic peroxide

Typical kit size: <50 mL

Supplier: GE Canada
Address: 107 Park St. N.
Peterborough, Ont.
K9J 7B5

24 Hr Emergency Phone: (416)-858-5108

Telephone #: (705)-748-7722

Inventory number:

Section II - HAZARDOUS INGREDIENTS

Ingredients	CAS #	%	Hazard Data
Methyl ethyl ketone peroxide	1338-23-4	30-60	TDLo (human, oral) 480 mg/kg
Dimethyl phthalate	131-11-3	30-60	LD50 (rat, oral) 484 mg/kg
Proprietary Solvent	NAv	10-30	LD50 (rat, interper) 3.38 g/kg
			NAv

Section III - PHYSICAL DATA

Boiling point: NAv

Specific gravity: ~1.08

Vapour pressure (mm Hg): NAv

Evaporation rate: NAv

Vapor density (Air=1): 6.7

Solubility in water: Negligible

Volatiles,%: NAv

Freezing point: NAv

pH: NAp

Auto-ignition temperature: NAv

Coefficient of water/oil distribution: NAv

Appearance and odour:

* Clear, blue to colourless oily liquid with ketone-like odour.

Odour threshold: NAv ppm

Section IV - FIRE OR EXPLOSION HAZARD

Flash point (Method): 58 (DEG C) (TCC) LEL: NAv UEL: NAv

Extinguishing media: Water, Fog, Foam, Carbon Dioxide, Dry Chemical

Special fire fighting instructions:

* Burns vigorously, may be difficult to extinguish. Cool fire exposed containers.

Unusual fire and explosion hazards:

* If SADT (Self Accelerating Decomposition Temp) reached, may release toxic and flammable gases and burst into flames. In fire conditions, SADT is approximately 70 C.

Section V - REACTIVITY DATA

Stability: Unstable   Incompatibility: Acid, oxidizing material, acetone

Hazardous decomposition products:

* Toxic and flammable gases released at SADT

Hazardous Polymerization: Will not occur

Section VI - TOXICOLOGICAL PROPERTIES

Exposure limit: 0.2 ppm

Inhalation:

* Extremely irritating to mucous membranes

Skin:

* Extremely irritating - may be absorbed.

Eyes:

* Corrosive and extremely irritating. Contact may cause permanent blindness.

Ingestion:

* Very corrosive-may be fatal.

Chronic effects:

* Fatal if ingested. Eye contact may cause permanent blindness. Animal studies have shown MEK peroxide to be tumorogenic.

Section VII - FIRST AID MEASURES

Inhalation:

* Remove to fresh air. Contact a physician.

Skin:

* Wash affected area promptly with plenty of soap and water. If irritation persists, see a physcian.

Eyes:

* IMMEDIATELY wash with copious quantities of water for at least 15 min. Contact a physician. (Delays greater than 5 seconds may result in serious and permanent eye damage.)

Ingestion:

* Take large amounts of milk or water and immediately contact a physician. Do not induce vomiting

Section VIII - PREVENTATIVE MEASURES

Respiratory protection:

* Approved canister or air-pack should be available for emergency use.

Ventilation:

* General ventilation

Protective clothing:

* Rubber gloves, apron.

Eye protection:

* Monogoggles

Other protective equipment:

* Safety shower and eyewash station

Spill, leak or release:

* Absorb with inert, non combustible absorbant (vermiculite, sand), clean with non-sparking tools, store in plastic. Scrub area thoroughly with soap and water.

Waste disposal:

* Use licensed disposal company and follow all Federal, Provincial and local regulations. Scrap may be cured with resin in small quantities f disposal in an approved landfill.

Section IX - SPECIAL PRECAUTIONS

Storage and handling conditions:

* Store in clean, cool, separated, fire-resistant facility. Area must be free of ignition and heat sources, direct sunlight, combustibles oxidizing and reducing agents and well ventilated. No smoking area.

Comment:

* Store in original shipping container. Maintain cleanliness. Transfer only required amounts to work area. Allow only trained personnel to handle peroxides.

Section X - PREPARATION INFORMATION

NAv - information not available at the time of preparation
NAp - not applicable

Prepared by: T.L. Sayer, Ph.D.

Telephone #: (705)-748-7728

Preparation date: 04/05/84

Last review date: 12/19/88

Version: 1.00

- 8204

Canadian General Electric 749 449

MATERIAL SAFETY DATA SHEET

SECTION 1

Product: Glass Filled Epoxy Adhesive	CGE No. L-5142A
Manufacturer's Name: Canadian General Electric Co. Ltd. — Address: 107 Park St. N., Peterborough, Ont.	Phone No. (705)748-7728
Trade Name: Epoxy Resin and Filler — Synonyms:	

SECTION 2 — HAZARDOUS INGREDIENTS — TYPICAL VALUES

MATERIAL	WT %	TLV	MATERIAL	WT %	TLV
Bisphenol A Type Epoxy	~60	None Est			
Inert Inorganic Fillers	~40	-			

SECTION 3 — PHYSICAL DATA

Boiling Point (°C)	Solubility in water Insol
Vapour Pressure (mm Hg)	Specific Gravity (H_2O = 1)
Vapour Density (air = 1)	% Volatile by weight 0
Appearance and Odour Thick, heavy, grey paste	

SECTION 4 — FIRE AND EXPLOSION HAZARD DATA

Flash Point (and method used) 249 °C T.O.C., T.C.C., C.O.C.	Flammable Limits (STP in air)-Vol.% Lower Upper

Extinguishing Media: ☒ Water Fog ☐ Foam ☐ Alcohol Foam ☒ CO_2 ☒ Dry Chemical ☐ Other

Special Fire Fighting Protection Equipment and Hazards: Wear adequate respiratory protection, emits toxic fumes when heated to decomposition.

SECTION 5 — REACTIVITY DATA

Stability: Unstable ☐ Stable ☒	Conditions to avoid:

INCOMPATIBILITY — Materials to avoid: ☐ Water ☐ Acid ☐ Base ☐ Corrosive ☐ Oxidizing Material ☐ Other

Hazardous Decomposition Products: Emits highly toxic fumes when heated to decomposition.

HAZARDOUS POLYMERIZATION: May Occur ☐ Will Not Occur ☒	Conditions to avoid: Heating resin before addition of hardener.

SECTION 6 — SPILL OR LEAK PROCEDURES

...al is released or spilled: Scrape up spilled material and place in suitable ...solid absorbent to remove traces. Avoid skin contact.

...ll quantities may be cured and disposed of in an approved ...f through licensed waste disposal company.

449
CEO

SECTION 7 — HEALTH HAZARD DATA

ye Contact Material is strongly alkaline and can cause severe burns.

Skin Contact or Absorption Material is strongly alkaline and can cause severe burns. Sensitization will occur with repeated exposure. Levels of less than 1 PPM may cause allergic response in sensitized persons.

Inhalation May cause intense burning of upper respiratory tract. Repeated sensitization of respiratory tract may cause Asthma-like symptoms. May cause nausea and vomiting.

Ingestion Strongly alkaline - cause vomiting and burns to mouth and throat.

FIRST AID PROCEDURE

EYES AND SKIN: Wash eyes, including under lids, for at least 15 min. Get medical attention promptly. Wash skin immediately with soap and water.

INHALATION: Remove victim to fresh air. Keep warm and at rest. Get medical attention.

GESTION: Give 3 glasses of water or milk. Get medical attention.

CAUTION: Once sensitized, there is no practical TLV.

SECTION 8 — SPECIAL PROTECTION INFORMATION

entilation To meet TLV requirements, mechanical acceptable but local exhaust preferred.

espiratory Protection Fresh air mask in confined areas.

otective Clothing Butyl or neoprene gloves, long sleeved work clothing, and aprons. ntaminated clothing must be washed before re-use.

E OTECTION ☐ Not normally necessary ☐ Safety glasses without side shields ☐ Safety glasses with side shields ☒ Chemical worker's goggles

☐ Gas tight goggles or equivalent ☐ Other

SECTION 9 — SPECIAL PRECAUTIONS

cautions to be taken in handling and storing: Store in dry, cool, well ventilated areas away from ition sources.. Store away from acids and strong bases. Protect containers from age.

er precautions: Areas of use should be kept clean with kraft paper table covers, dispose when soiled into plastic bag lined container. An eye wash and safety shower should available in use areas. No smoking or eating in areas of use.

SECTION 10 — HAZARD RATING *(FOR CGE USE)*

LTH	FIRE	CONTACT	REACTIVITY
	2	4	2

u by: T.L. Sayer, Ph.D

82 04 14

Title:

Address: 107 Park St. N., Peterborough

Cec

SHELL CANADA CODE
647-200

#138

SHELL CANADA CHEMICAL COMPANY
MATERIAL SAFETY DATA SHEET

MANUFACTURER/SUPPLIER'S NAME: SHELL CANADA CHEMICAL COMPANY
ADDRESS: 75 Wynford Drive
Don Mills, Ontario
M3C 2Z4

POISON CONTROL CENTRE
TORONTO: 416-598-5900
QUEBEC CITY: 418-656-8090

CANUTEC
24 HOUR EMERGENCY TELEPHONE
(613) 996-6666

EMERGENCY TELEPHONE NUMBER
SHELL: 403-232-2220 (BUS. HRS.)
AT ALL OTHER TIMES: 403-228-1334

923920

SECTION I PRODUCT IDENTIFICATION

TRADE NAME: TOLUENE

CHEMICAL SYNONYMS
Methylbenzene
Toluol

FORMULA
$C_6H_5CH_3$

PRODUCT USE
Solvent

WHMIS CLASS AND DESCRIPTION
Class B2 Flammable Liquid
Class D2B Other Toxic Effects - Skin Irritant

TRANSPORTATION (TDG)
SHIPPING NAME: TOLUENE
UN NUMBER: 1294
CLASS DESCRIPTION:
Class 3.2 Flammable Liquid : II
Class 9.2 Hazardous to the Environment :

NOTE: For specific label text see SECTION XIII

SECTION II INGREDIENTS

NO. COMPOSITION	CAS NUMBER	PERCENTAGE
CONTROLLED INGREDIENTS		
P TOLUENE	108-88-3	100 % VOLUME
1 XYLENE	1330-20-7	0.1 - 1.0 % VOLUME
NON CONTROLLED INGREDIENTS		

LEGEND: P=PRODUCT NO.=INGREDIENT CBI=CONFIDENTIAL BUSINESS INFORMATION

SECTION III TOXICOLOGICAL PROPERTIES

ACUTE TOXICITY DATA

NO SPCS	ORAL LD 50	DERMAL LD 50	INHALATION LC 50	HRS
P Rat	5000.0 mg/kg		8000.0 ppm	4
Rabbit		14000.0 mg/kg		
1 Rat	4300.0 mg/kg		6350.0 ppm	4
Rabbit		3950.0 mg/kg		

LEGEND: P=PRODUCT NO.=INGREDIENT * - SATURATED AIR

SECTION III TOXICOLOGICAL PROPERTIES - Continued

OTHER TOXICITY DATA
Inhalation is the primary route of exposure although absorption may occur through skin contact or following accidental ingestion.
This product is expected to be irritating to skin but is not predicted to be a skin sensitizer.
Toxicity tests carried out for chronic effects and mutagenicity have been negative.
Data is insufficient to further classify according to WHMIS criteria.

SECTION IV SUPPLEMENTAL HEALTH INFORMATION

SUPPLEMENTAL HEALTH INFORMATION
May be irritating to skin and eyes. Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Vapours are moderately irritating to the eyes and respiratory passages. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, and central nervous system depression. The liquid is highly toxic when taken into the lungs, causing severe chemical pneumonitis.

SECTION V EMERGENCY AND FIRST AID PROCEDURES

EYES
Flush eyes with water for at least 15 minutes.
INHALATION
Remove victim from further exposure and restore breathing, if required. Obtain medical attention.
INGESTION
Do not induce vomiting. Obtain medical attention immediately.
SKIN
Wash contaminated skin with mild soap and water. If irritation occurs and persists, obtain medical attention.
NOTES TO PHYSICIAN
The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

SECTION VI EMPLOYEE PROTECTION

EYES AND FACE
Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.
SKIN (HANDS, ARMS AND BODY)
Impervious gloves (viton, nitrile, PVC) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn.
RESPIRATORY
If exposure exceeds occupational exposure limits, wear a NIOSH- approved respirator. Proper equipment includes an approved combination organic vapour/ particulate filter chemical cartridge respirator for low concentrations, or an atmosphere-supplied,positive pressure demand,self-contained or airline breathing apparatus for high concentrations.
EXPOSURE INFORMATION
Toluene: 100 ppm, 375 mg/m3 (TLV/TWA) ACGIH 88/89

SECTION VII ENGINEERING CONTROLS

GENERAL
Highly recommended for all indoor situations to control fugitive emissions. Electrical and mechanical equipment should be explosion-proof.
LOCAL
Also recommended where mechanical ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit.
MAKE-UP AIR
Should always be supplied to balance air exhausted (either generally or locally).

SECTION VIII PREVENTATIVE MEASURES

STORAGE AND HANDLING
Flammable. Store in a cool, dry, well ventilated area, away from heat and ignition sources. Avoid breathing vapours and prolonged or repeated contact with skin. Launder contaminated clothing prior to reuse. Use good personal hygiene.
SPILL AND LEAK PROCEDURES
Issue warning "Flammable". Eliminate all ignition sources. Isolate hazard area and restrict access. Try to work up wind of spill. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours; contain runoff. For large spills remove by mechanical means and place in containers. Absorb residue or small spills with absorbent material and remove to non-leaking containers for disposal. Flush area with water to remove trace residue. Dispose of recovered material as noted below. Notify appropriate environmental agency(ies).

SECTION VIII PREVENTATIVE MEASURES - Continued

WASTE DISPOSAL METHODS
Reclaim or dispose of at a licenced waste disposal company. Incinerate with approval of environmental authority. Landfill absorbed material in a government approved site.

SECTION IX PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT (deg C):	111
FREEZING POINT (deg C):	-95
DENSITY (kg/m3 @ deg C):	860.00 - 870.00 @ 15
VAPOUR DENSITY (AIR=1) (mg/m3):	3.1
VAPOUR PRESSURE (mmHg @ deg C):	> 22.0 @ 20
SPECIFIC GRAVITY (H2O=1):	0.86600
LEVEL:	Not Available
MOLECULAR WEIGHT (g):	92.13
VISCOSITY (cSt @ deg C):	Not Available
EVAPORATION RATE (nBuAc=1):	2.24
PARTITION COEFFICIENT (KOW):	2.69
WATER SOLUBILITY:	Slight

OTHER SOLVENT: Soluble in most organic solvents eg. ether, alcohol, benzene

PHYSICAL STATE
Mobile Liquid Aromatic Hydrocarbon
ODOUR AND APPEARANCE
Colourless

AVERAGE ODOUR THRESHOLD Not Available

Cec

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305

Phone: (518) 385-4085 DIAL COMM 8*235-4085

MATERIALS · INFORMATION · SERVICES

No. 1061

EXXON AROMATIC 100
Revision B

Date May 1980

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: EXXON AROMATIC 100 (Trade name) (Formerly SOLVESSO 100)
OTHER DESIGNATIONS: High Solvency Aromatic Naphtha, GE Material D5B30D
DESCRIPTION: An aromatic hydrocarbon solvent mixture with a TCC flash point above 100 F.
MANUFACTURER: Exxon Company, U.S.A. PO Box 2180 Houston, Texas 77001 — Emergency Telephone: (713) 221-3424

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Typical Compositon of Solvent:		
Alkylated Benzenes (mainly C_8 to C_{10}*) ------------	> 96	8-hr TWA 50 ppm**
Saturated Hydrocarbons ----------------------------	< 4	

*Exact composition varies from lot to lot. Levels of typical low molecular weight components:

Benzene ------------ 0.004%
Toluene ------------ 0.004%
Ethylbenzene -------- 0.29%

**Recommended by supplier (8/79).

SECTION III. PHYSICAL DATA

Boiling point at 1 atm, deg F ----	311-344	Specific gravity, 60/60 F ------	0.87
Vapor pressure @ 25 C, mm Hg -----	<10	Percent volatile --------------	100
Vapor density (Air=1) ------------	4.1	Evaporation rate (BuAc=1) ------	0.2
Solubility in water --------	Negligible		

Appearance & Odor: Water-white liquid with an aromatic hydrocarbon odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
(TCC) 107 F	Approx. 800 F	% by Volume	0.9	6.0

Extinguishing Media: Foam, dry chemical, CO_2, water spray, or fog. Use water spray to cool fire-exposed containers.
This combustible liquid is a fire and explosion hazard when heated.
Vapors can flow along surfaces to distant ignition sources and flash back.
Use air-supplied breathing equipment for enclosed areas in a fire situation.

SECTION V. REACTIVITY DATA

This material is stable under normal storage and usage. Hazardous polymerization will not occur.
This combustible liquid (OSHA Classification II) is incompatible with strong oxidizing agents; on burning in air, black smoke and toxic fumes and gases, including oxides of carbon and nitrogen, are produced.

GENERAL ELECTRIC

NO. 1061

SECTION VI. HEALTH HAZARD INFORMATION	TLV 50 ppm (See Section II)

Inhalation of high vapor concentrations may have results ranging from mild depression to convulsions and loss of consciousness. Concentrations of 100-200 ppm may cause dizziness, nausea, and headache. Prolonged or repeated skin contact is irritating and will cause defatting and dermatitis. Eye contact may cause burning and irritation. Aspiration can be a hazard if this material is swallowed.

FIRST AID:

Skin Contact: Remove contaminated clothing promptly, and wash skin with soap and water. Replace lost skin oils with medically approved lotions and creams.

Eye Contact: Flush eyes with lots of running water for 15 minutes. Get medical help if irritation persists.

Inhalation: Remove victim to fresh air. Restore and/or support breathing as required (oxygen administration by trained personnel may be indicated).

Ingestion: Do not induce vomiting! Call a physician. Give white mineral oil or edible oil.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel. Remove all ignition sources. Provide adequate ventilation. Contain and recover free liquid. Use vermiculite, sand, etc. to absorb residues or small spill; scrape up with nonsparking tools and place in a covered metal container.

DISPOSAL: Absorbed material may be burned in an open pit, away from buildings and people. Prevent liquid from entering sewers or water course. Scrap liquid may also be atomized in an approved incinerator. Large amounts of waste liquid may be reprocessed for use or disposed of via a licensed solvent disposal company. Scrap liquid can be diluted with fuel oil for incineration in boiler.

Follow Federal, State and Local regulations. Report spills that may enter waterways, sewers, etc.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide efficient general and exhaust ventilation (explosion-proof) to meet TLV requirements; 100 lfm face velocity for exhaust hoods. Use respirators with organic solvent-type canisters for short periods of nonroutine work or emergency at 50-2000 ppm and self-contained or air-supplied breathing apparatus for higher or unknown vapor concentrations.

Buna-N rubber gloves and aprons should be worn to prevent contact of solvent with the skin. Safety glasses or goggles and/or face shield should be used for eye protection, depending on conditions of use.

Eyewash stations should be readily accessible in solvent use areas.

Ventilation should be suitable to prevent collection of these dense vapors in low lying areas or sumps.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store containers in a clean, cool, well-ventilated, low fire-risk area, away from oxidizing agents and ignition sources. Ground and electrically interconnect metal containers when dispensing. Use safety cans for small amounts of solvent. Use nonsparking tools near solvent areas.

Prevent skin contact; remove solvent-contaminated clothing promptly and launder before re-use. Avoid breathing of vapor. Prevent ingestion. Use with adequate ventilation.

Follow good hygienic practice. Wash thoroughly with soap and water after using this material.

DATA SOURCE(S) CODE: 1

APPROVALS: MIS CRD	J. M. Nielsen
Industrial Hygiene and Safety	DW 5-16-80
MEDICAL REVIEW:	3 June 1980

GENERAL ELECTRIC

Cec

MATERIAL SAFETY DATA SHEET

CORPORATE RESEARCH & DEVELOPMENT

SCHENECTADY, N. Y. 12305

Phone: (518) 385-4085 DIAL COMM 8*235-4085

MATERIALS · INFORMATION · SERVICES

No. 1061 A

EXXON AROMATIC 150
Revision A

Date May 1980

SECTION I. MATERIAL IDENTIFICATION

MATERIAL NAME: EXXON AROMATIC 150 (formerly SOLVESSO 150)

DESCRIPTION: A narrow cut aromatic hydrocarbon mixture with a TCC flash point of about 150 F

OTHER DESIGNATIONS: High solvency Aromatic Naphtha, GE Material D5B30F

MANUFACTURER: EXXON Company USA
PO Box 2180
Houston, TX 77001

Tel: Day (713) 221-3424 Evening (713) 668-7024 or 622-1422

SECTION II. INGREDIENTS AND HAZARDS

SECTION II. INGREDIENTS AND HAZARDS	%	HAZARD DATA
Typical Composition of Solvent:		
Alkylated benzenes (C_9 and higher)*	>96	8-hr TWA 100 ppm***
Saturated hydrocarbons (C_8 and higher)**	< 4	

*Benzene content < 0.01%

**C_7 Saturated hydrocarbons < 0.1%

***TLV recommended by the supplier (8/79).

SECTION III. PHYSICAL DATA

Boiling pt at 1 atm, deg F	360-410	Specific gravity (60/60 F)	0.90
Vapor press, at 25 C, mm Hg	<10	Volatiles, %	ca 100
Vapor density (Air = 1)	4.8	Evaporation rate (nBuAc=1)	0.04
Water solubility	negligible		

Appearance & Odor: Water white liquid with a mild, aromatic hydrocarbon odor.

SECTION IV. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air % by volume	LOWER	UPPER
>140 F (TCC)	Approx 800 F		0.8	6.0

Extinguishing Media: Foam, dry chemical CO_2 water spray, or fog. Use a water spray to cool fire-exposed containers.

It is a fire and explosion hazard when heated.

Vapors can flow along surfaces to distant ignition sources and flash back.

Use self-contained breathing equipment for enclosed areas in a fire situation.

SECTION V. REACTIVITY DATA

This material is stable under normal storage and usage. Hazardous polymerization will not occur.

This combustible liquid (OSHA Classification IIIA) is incompatible with strong oxidizing agents; on burning in air black smoke and toxic fumes and gases, including oxides and carbon and nitrogen, are produced.

GENERAL ELECTRIC

No. 1061 A

SECTION VI. HEALTH HAZARD INFORMATION	TLV 100 ppm

Inhalation of high vapor concentrations may have results ranging from mild depression to convulsions and loss of consciousness. Concentrations of 100-200 ppm may cause dizziness, nausea, and headache. Prolonged or repeated skin contact is irritating and will cause defatting and dermatitis. Eye contact may cause burning and irritation. Aspiration can be a hazard if this material is swallowed.

FIRST AID:

Skin contact: Remove contaminated clothing promptly, and wash skin with soap and water. Replace lost skin oils with medically approved lotions and creams.

Eye contact: Flush eyes with lots of running water for 15 minutes. Get medical help if irritation persists.

Inhalation: Remove victim to fresh air. Restore and/or support breathing as required. (Oxygen administration by trained personnel may be indicated.) Get medical help.

Ingestion: Do not induce vomiting! Call a physician. Give white mineral oil or edible oil.

SECTION VII. SPILL, LEAK, AND DISPOSAL PROCEDURES

Notify safety personnel. Remove all ignition sources. Provide adequate ventilation. Contain and recover free liquid. Use vermiculite, sand, etc. to absorb residue or small spill; scrape up with nonsparking tools and place in a covered metal container. Prevent liquid from entering sewer or watercourse.

DISPOSAL: Absorbed material may be burned in an open pit, away from buildings and people. Scrap liquid may also be atomized into an approved incinerator. Large amounts of waste liquid may be reprocessed for use or disposed of via a licensed solvent disposal company. Scrap liquid can be diluted with fuel oil for incineration in boiler.

Follow Federal, State and Local regulations. Report spills thay may enter waterways, sewers, etc.

SECTION VIII. SPECIAL PROTECTION INFORMATION

Provide efficient general and exhaust ventilation (explosion proof) to meet TLV requirements; 100 lfm face velocity for exhaust hoods. Use respirators with organic solvent-type canisters for short periods of nonroutine work or emergency at 100-2000 ppm and self-contained or air-supplied breathing apparatus for higher or unknown vapor concentrations.

Buna-N rubber gloves and aprons should be worn to prevent contact of solvent with the skin. Safety glasses or goggles and/or face shield should be used for eye protection, depending on conditions of use. Eyewash stations should be readily accessible in solvent use areas.

Ventilation should be suitable to prevent collection of these dense vapors in low lying areas or sumps.

SECTION IX. SPECIAL PRECAUTIONS AND COMMENTS

Store containers in a clean, cool, well-ventilated low fire-risk area, away from oxidizing agents and ignition sources. Ground and electrically interconnect metal containers when dispensing. Use safety cans for small amounts of solvent. Use non-sparking tools near solvent areas.

Prevent skin contact; remove solvent-contaminated clothing promptly and launder before reuse. Avoid breathing of vapor. Prevent ingestion. Use with adequate ventilation.

Follow good hygienic practice. Wash thoroughly with soap and water after using this material.

DATA SOURCE(S) CODE: 1

APPROVALS:	MIS CRD	J. McNielan
Industrial Hygiene and Safety		DHW 5-16-80
MEDICAL REVIEW:	3 June 1980	

GENERAL ELECTRIC

RISK MAPS

ARMATURE

- ❒ pole
- ❒ stator
- ❒ stator coils, bars, equalizers, etc.
- ❒ rotor
- ❒ VPI

ARMATURE

WHAT HAZARDS/OPERATIONS ARE OF CONCERN TO YOU?

- mica (cold room area - dusty, silica contamination (?))
- epoxy (have workers with skin sensitization)
- odours (?)
- VPI (skin)
- thinners (MEK, xylene)
- glue
- acetone
- brazing fumes
- smoke (VPI residue) –> decomposition products
- solder and flux
- ozone (electrical)
- noise (grinding)
- heat and cold
- ergonomics (repetitive motion)

ARMATURE POLES

Incoming Materials

- store ☐ ✔
- wash (toluene) ○ ✗
- ergonomics ☐ ✔

→

Winding
(insulate)

- mica sheet ☐ ✔
- 5105 epoxy ○ ✗
- ergonomics ☐ ✔
- dust ☐ ✔
- solder Δ →
- brazing ☐ ✔

↓

Bake

- 5142 epoxy Δ ✔
- ergonomics ☐ ✔
- epoxy dust Δ ✗
- heat ☐ ✔
- aerosol release agent Δ ✗ →

←

Test

- handling (ergonomics) ☐ ✔
- hipot ☐ ✔

KEY:				
	○	High hazard	✔	Controls working
	Δ	Moderate hazard	✗	Controls not working
	☐	Low hazard	→	Improve controls

ARMATURE
STATOR

Raw Material

- dust (metal, welding, bead, storage dust) ○ →
- chemical (MEK, acetone) ○ →

→

Assemble

- fibreglass
- 1300 glue
- slot liner (repetition)

→

Winding

- muscular strain (arm, shoulder) ○ →
- hammering ○ →
- pushing/pulling ○ →
- weight ○ →
- glass tape (rashes/dipped in chemical) ○ →

Brazing

- repetitive ○ →
- chemicals ○ →
- minor injuries ○ ✗

Brazing Cables

- repetitive ○ →
- muscle strain (weight) ○ →
- MEK, epoxy ○ →

Building

- cold ○
- heat ○

Cold Room

- cold ○ →
- silica ○ (?)

KEY:				
	○	High hazard	✔	Controls working
	△	Moderate hazard	✗	Controls not working
	□	Low hazard	→	Improve controls

…RMATURE
STATOR COILS, BARS, EQUALIZERS, ETC.

Copper & Insulating Tapes

- lift truck △ →
- manual lifting △ ✔

→

Winding & Cutting

- repetitive ○ ✔
- respiratory (insulation) △ ✗

⇄

Press Form & Spread

- heat □ ✔
- epoxies ○ →
- noise □ ✔
- heavy △ ✔
- chemicals ○ →
- repetitive ○ ✔

⇄

Insulate

- repetitive ○ ✔
- heavy △ ✔
- semi-cured tapes ○ →
- dust ○ →
- epoxies (mica) ○ →
- machine vibration □ ✔
- chemicals ○ →

↓

Dip & Bake

- varnishes ○ →
- heat cycle
- fumes △ →
- smoke △ →
- chemicals· △ →

←

Test

- electrical △ ✔
- heavy △ ✔
- noise △ ✔
- ozone △ ✔
- repetitive △ ✔

←

Ship & Pack

- heavy △ ✔
- repetitive △ ✔
- noise △ ✔
- lift truck △ →
- limited space △ →

KEY:

○	High hazard	✔	Controls working
△	Moderate hazard	✗	Controls not working
□	Low hazard	→	Improve controls

ARMATURE ROTORS

Punch Copper
- machine Δ ✓
- dirt □ ✓
- ergonomics ○ →

Braze
- solder ○ ✓
- flux ○ ✓
- lead Δ ✓
- heat Δ ✓
- ergonomics □ ✓

Clean & Grind
- dust □ ✗
- acetone/MEK □ ✗
- noise □ ✗

Assembly
- brazing solder ○ ✓
- dust ○ ✓
- flux ○ ✓
- epoxy ○ ✓
- ergo Δ

Clearing & Insulating
- dust ○ →
- epoxy insulations ○ →
- epoxy liquid ○ →
- acetone ○ →
- hammering Δ →
- lifting Δ →
- repetitive Δ →
- heat Δ ✓

Final Assembly
- epoxy ○ ✓
- RTV ○ ✓
- ergonomics Δ ✓

Bake & Test
- heat □ ✓

KEY:

○	High hazard	✓	Controls working
Δ	Moderate hazard	✗	Controls not working
□	Low hazard	→	Improve controls

ARMATURE

VPI TANKS & CRANES

Oven
- heat
- fumes
- noise
- epoxy

O ✗ ←→ ✔ □

→

Tank 1-2
- epoxy
- thinner
- fumes
- muscle strain

O ✗ ←→ ✔ □

→

Oven
- heat
- fumes
- noise

O ✗ ←→ ✔ □

→

Clean
- dust O →
- tap fluid O →
- grinding dust O →
- muscle strain O →
- chips O →

Oven
- heat
- fumes
- epoxy
- noise

O ✗ ←→ □ ✔

→

Isonal Tank

(All others, eg. poles, arms)
- fumes
- thinner

O ✗ ←→ □ ✔

→

Oven
- heat
- fumes
- noise

O ✗ ←→ □

→

Clean
- dust O →
- grinding dust O →
- straw on body O →

(Isolated Room)

Wash Tank
- thinner O →

Cranes
- fumes O →
- noise O →
- dust O →
- mist O →
- strain O →
- heat O →
- stress O →

KEY:
- O High hazard
- Δ Moderate hazard
- □ Low hazard
- ✔ Controls working
- ✗ Controls not working
- → Improve control

ARMATURE

Summary of Prioritized Hazards by Department		
Department	**Hazards**	**Needed Control**
Pole	❶ wash (toluene) ❷ 5105 epoxy ❸ solder fumes ❹ epoxy dust ❺ aerosol release agent	❶ enforce use of gloves/education ❷ enforce use of gloves and barrier cream/education ❸ a) ventilation (*smog hog*) b) substitute lead solder ❹ a) ventilation b) enforce use of respirator ❺ ventilation (replace equipment)
Stator	❶ repetitive motion ❷ heavy lifting ❸ standing ❹ awkward positions	❶ tool design/tool availability/modernize tools ❷ overhead cranes/lifting devices ❸ anti-fatigue mat/sit-stand stool ❹ winding tables/platforms/scaffolding
Stator Coils, Bars & Equalizer	❶ epoxies ❷ varnishes ❸ freekote/MEK/toluene/oxylene/isonel calflo/Paratherm/red silicone rubber ❹ tin pot (80% tin, 20% silver) ❺ fumes & smoke (diesel exhaust) from locomotive parked under building in tunnel ❻ lift truck ❼ repetitive work	❶ increased local exhaust ventilation ❷ education ❸ a) supply personal protective equipment b) proper storage ❹ improve ventilation ❺ review operating procedure (does locomotive idle for long period of time unnecessarily) ❻ a) replace when needed b) maintain regularly ❼ a) adjustable taping stands & tables supply properly designed tools b) exercise c) lighting

ARMATURE

SUMMARY OF PRIORITIZED HAZARDS BY DEPARTMENT

Department	Hazards	Needed Control
Pole	❶ wash (toluene) ❷ 5105 epoxy ❸ solder fumes ❹ epoxy dust ❺ aerosol release agent	❶ enforce use of gloves/education ❷ enforce use of gloves and barrier cream/education ❸ a) ventilation *(smog hog)* b) substitute lead solder ❹ a) ventilation b) enforce use of respirator ❺ ventilation (replace equipment)
Stator	❶ repetitive motion ❷ heavy lifting ❸ standing ❹ awkward positions	❶ tool design/tool availability/modernize tools ❷ overhead cranes/lifting devices ❸ anti-fatigue mat/sit-stand stool ❹ winding tables/platforms/scaffolding
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SUMMARY OF PRIORITIZED HAZARDS BY DEPARTMENT

Department	Hazards	Needed Control
Rotor	❶ cleaners (acetone, MEK) ❷ grinding/cleaning ❸ ergonomics ❹ fugitive emissions (from VPI)	❶ a) education b) personal protective equipment (gloves, respirator) ❷ improve ventilation (different hood or stronger suction) ❸ scissor tables would help when working from different heights ❹ improve VPI tank ventilation [general housekeeping needs to be improved]
VPI Tanks & Cranes	❶ cleaning ❷ oven emissions/tanks ❸ thinner (wash tank) ❹ cranes	❶ proper equipment ❷ preventive maintenance on ovens, VPI tanks & isonal tank ❸ substitute with water-based compound ❹ training/storage/organization