

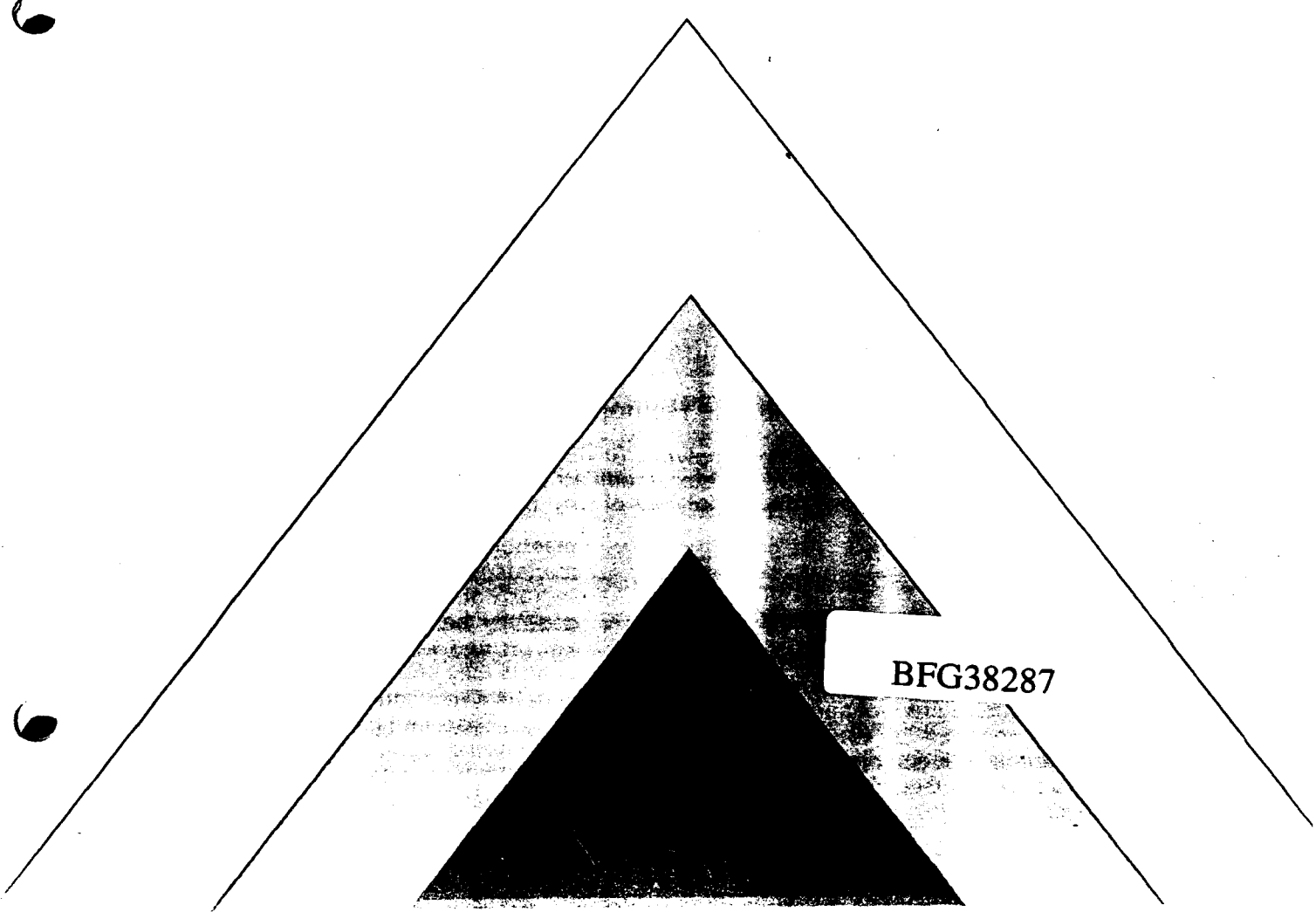
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BFGoodrich

Bulletin G-62
Second Edition
(Revised)

MATERIAL SAFETY DATA

Geon® Vinyl Resins,
Compounds



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ABOUT THIS BULLETIN

The data in this bulletin is applicable to all Geon® vinyl resins — general purpose type, Super EP type, dispersion resins, blending resins, powder coating resins — and to all grades of rigid, flexible and Geon® cellular vinyl compounds. This bulletin is not applicable to Geon® latexes nor to Geon® CPVC materials.

The data in this bulletin is limited to the safe handling and use of the PVC polymer itself and to PVC based compounds we manufacture. It does not include information on the suitability of PVC for any particular application nor discuss any precautions that may be necessary during product use in service.

The format used to report material safety data information is essentially similar to the U.S. Department of Labor Form OSHA 20 modified to facilitate description of our materials.

USER'S RESPONSIBILITIES

A bulletin such as this cannot be expected to cover all possible individual situations. In addition, the conditions under which our products are processed and used are beyond our control. The products described herein can be hazardous if not processed properly. As the user of Geon® vinyls has the responsibility to provide a safe workplace, all aspects of an individual operation should be examined to determine if or where precautions, in addition to those described herein, are required. Any health hazard and safety information contained herein should be passed on to your customers or employees, as the case may be. BFGoodrich must

rely on the user of Geon® vinyls to utilize the information we have supplied to develop work practice guidelines and employee instructional programs for the individual operation.

DISCLAIMER OF LIABILITY

As the conditions or methods of use are beyond our control, we do not assume any responsibility and expressly disclaim any liability for any use of this material. Information contained herein is believed to be true and accurate but all statements or suggestions are made without any warranty, express or implied, regarding accuracy of the information, the hazards connected with the use of the material or the results to be obtained from the use thereof.

GENERAL INFORMATION

This bulletin has been prepared to provide guidelines and appropriate precautions to assist our customers in the safe handling and use of Geon® vinyl resins and compounds. BFGoodrich recommends that, before use, safety personnel and employees handling Geon® vinyls read and understand the information and precautions presented herein.

During processing or post-processing operations involving heat sufficient to cause mass melting, the sum total of the compounding ingredients present may emit vapors and odors irritating to the respiratory tract, eyes and skin. BFGoodrich recommends that Geon® vinyls always be used under well-ventilated conditions to avoid significant employee exposure.

SECTION I

Manufacturer's Name	The BFGoodrich Company, Chemical Group
Address	6100 Oak Tree Boulevard, Cleveland, OH 44131
Telephone Number	(216) 447-6000
Trademark	Geon® Vinyls
Chemical Name	Poly (vinyl chloride), PVC
Formula	$(CH_2 CHCl)_n$
Chemical Family	Vinyl Chloride Homopolymer (With the following exceptions):
	Geon® 135: Copolymer of vinyl chloride/vinyl acetate
	Geon® 137: Carboxy-modified vinyl chloride polymer
	Geon® 138: Copolymer of vinyl chloride/vinyl ester

SECTION II

HAZARDOUS INGREDIENTS

PVC resins contain small but detectable amounts of residual vinyl chloride monomer (VCM), a cancer-suspect agent. Extensive product and process improvements have resulted in the reduction of residual vinyl chloride monomer to a very low level in prime grades of major Geon® vinyl resins (See Table 1 and read Section V).

Other ingredients, such as stabilizers, lubricants,

plasticizers, and pigments are added with resin to manufacture PVC compounds. The sum total of all ingredients will emit vapors during processing. All possible health effects of these vapors are not known and individual sensitivities will vary. Exposure may produce acute health effects in some sensitive individuals. The effects relate primarily to eye, nose, and throat irritation. Efficient ventilation should be provided (read Section VIII) to prevent significant employee exposure. BFGoodrich recommends that these materials be used under well-ventilated conditions to avoid breathing these vapors.

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Solvents

No organic solvents are used in the manufacture of Geon® vinyl resins. Organic solvents may be used in the manufacture of stabilizers and other ingredients, and therefore, be detectable in small amounts in PVC compound.

Carcinogenic Chemicals

See Table III.

Heavy Metals

- A) Resin: No lead, mercury, other heavy metals or heavy metal compounds are used in the manufacture of Geon® vinyl resins. These materials are ubiquitous and trace quantities may be found in the environment.
- B) Compound: Geon® vinyl compounds contain heavy metal stabilizers generally in amounts less than 5%. These may include organometallics such as tin, lead, cadmium, barium and zinc and metallic salts such as basic lead carbonate and basic lead sulfate.

Plasticizer

Geon® vinyl flexible (plasticized) compounds will contain polymeric, monomeric or mixed ester plasticizer in amounts generally between 20%-50%. These materials are volatile when heated, and will contribute to the sum total of the vapors released during processing.

Pigments

Geon® vinyl compounds may contain commonly available pigments based on lead, iron oxide, carbon black, chromium, ultramarines, titanium dioxide, mercadmiums, phthalocyanines, molybdates, quinacridones and other organic or inorganic materials. In cube compound, these pigments are typically bound-up in our manufacturing process and are not expected to create any hazard in handling or processing. In powder compounds, because of potential dusty conditions, respiratory protection may be required. If conditions exist where dust is possible, the employee should be provided with a suitable NIOSH approved respirator. (See Section VIII. See Table III).

SECTION III

PHYSICAL DATA

(Typical data,
not specifications)

Specific Gravity (H₂O = 1.0).

Resin: 1.40.

Compound: See Product Data Sheet.

Solubility in Water — Slight.

Particle Size

Resin: See Table II

Compound: Cubes measuring approximately 3/16-inch per side; or powder. Particle size of powder compound varies due to compounding ingredients.

Appearance and Odor

Resin: White powder, practically odorless or bland odor.

Compound: Pigmented or unpigmented cubical granules or powder, slight odor.

SECTION IV

FIRE AND EXPLOSION HAZARD DATA

Extinguishing Media

Water is most effective. ABC dry powder and protein type air foams are also effective. Geon® vinyls would be considered "ordinary combustibles" (NFPA defined Class A). Carbon dioxide is not generally recommended for use on Class A fires as a lack of cooling capacity may result in reignition.

Special Fire Fighting Procedure

Self-contained breathing apparatus should be used for fires in which PVC becomes involved. Personnel not having suitable respiratory protection should leave the area to prevent significant exposure to toxic combustion gases.

Decomposition Products

- A) When forced to burn, PVC combustion products will mainly be carbon monoxide, carbon dioxide, hydrogen chloride and smoke. Other gases, including aromatics and aliphatics, are present in small amounts. Geon® 135 will also contribute minor amounts of acetic acid as gas and smoke.

Inhalation of, or overexposure to, PVC combustion products and primarily hydrogen chloride will cause irritation of the respiratory tract, eyes and skin. Depending on the severity of exposure, physiological response to inhalation will be coughing, pain, inflammation, edema, and desquamation in the upper respiratory tract. When burned, PVC will have a detectable pungent odor.

The combustion products of PVC, like those from most other natural and synthetic materials, must be considered toxic. Like most conventional materials including wood, paper and cotton, the major hazard is carbon monoxide. Carbon monoxide acts as an asphyxiant while hydrogen chloride is highly irritating.

- B) Under abnormal processing conditions (including equipment malfunctions or plug-up) decomposition of PVC compound may occur in an extruder, injection molding machine, or other processing equipment, resulting in a characteristic whitish smoke which will contain hydrogen chloride and vapors from metallic stabilizers and other ingredients. Inhalation will result in irritation of the respiratory tract, eyes and skin resulting in coughing, pain, and inflammation. Employees involved in removing decomposing materials should be provided with suitable air supplied respirators. Decomposing compound should be removed to a well ventilated area, preferably outdoors, and thoroughly soaked with water. Stand safely back while dousing since water contacting the hot decomposing compound may result in a explosion-like burst of steam.

Refer to **Cumulative Supplement June 1977 NIOSH Certified Equipment**, NIOSH #77-195, for a listing of NIOSH approved respirators. It can be

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obtained, no charge, from

Publications Dissemination, DTS
NIOSH
4676 Columbia Parkway
Cincinnati, Ohio 45226

- C) During typical break-down and clean-up of equipment after processing, PVC compound may be held at processing temperature for a short period. While this should not result in significant decomposition, it should be understood that the combined vapors from all ingredients will be present. PVC compound cannot be held static in processing equipment under high heat or at processing temperature for extended periods of time. Decomposition will occur. During equipment clean-up operations, avoid inhalation of fumes. Local exhaust ventilation should be provided to prevent significant employee exposure.
- D) Post-processing operations at your workplace or at your customer's workplace involving heat sufficient to result in polymer breakdown emitting smoke and fumes should always be conducted in a manner to avoid inhalation of fumes. Local exhaust ventilation should be provided to prevent significant employee exposure.

Unusual Fire and Explosion Hazards

The potential dust explosion hazard of PVC has been evaluated by BFGoodrich using the Hartmann Vertical Tube Apparatus developed by the Bureau of Mines. In this test, resin is fluidized in a vertical tube using a stream of air. Ignition is accomplished using a high voltage alternating current spark applied across brass terminals. Research has also been reported by the National Fire Protection Association (NFPA) based on equations using data from a battery of tests.

PVC Resin: - Geon® vinyl resins representing fine particle size (2 Microns: Geon® 121), medium particle size (75 Microns: Geon® 141(140 x 31) and large particle size (130 Microns: Geon® 103EPF76) neither ignited nor exploded in a test range of 0.1-2.0 gm/liter concentration using standard conditions of test. Fluidization becomes difficult at and above the 2.0 gm/liter level making it impractical to test at greater volumes.

- The NFPA (Fire Protection Handbook, 14th Edition, pg. 3-112) shows "fine" particle size homopolymer PVC resin to have a low order of risk:

Explosibility Index	0.1 (Weak)
Ignition Sensitivity	0.1 (Weak)
Explosion Severity	<0.1 (Weak)

- These data indicate that typical homopolymer PVC resin has a very low order of explosion risk. As a precaution, it is prudent to employ standard safety measures used in handling finely divided organic powders.

PVC Compound: - **Cube Compound**, because of large particle size, does not represent an explosion hazard.

- **Powder Compound**, because of fine particle size fillers and additives or liquids added to the PVC resin, may have increased dust explosion potential. Because of the wide variety of possible ingredient combinations, operations using plasticized or unplasticized powder compounds should be evaluated as the individual situation exists.

- The NFPA (Fire Protection Handbook, 14th Ed., pg. 3-112) reports the following for a PVC (67%)/DOP (33%) mixture:

Explosibility Index	2.9 (Strong)
Ignition Sensitivity	3.6 (Strong)
Explosion Severity	0.8 (Moderate)

- Implement precautions to control or eliminate likely sources of ignition, such as static build-up. Maintain good housekeeping, notably, ventilation, to prevent accumulation of potentially explosive dust concentrations. Properly maintain and operate dust control devices.

Ignition Characteristics (ASTM D-1929)

PVC resin has a flash-ignition temperature of about 391°C (735°F) and a self-ignition temperature of about 454°C (850°F). Because PVC polymer contains chlorine in the molecule, these materials are difficult to ignite and burn slowly. Like all organic materials, PVC is combustible and can be forced to burn by continuous application of intense heat. Like all combustible materials, protect from open flame and maintain proper clearance when using portable heat devices, etc. Safely store flammable liquids away from PVC.

Flash Ignition Temperature: The lowest initial temperature of air passing around the specimen at which sufficient combustible gas is evolved to be ignited by a small external pilot flame.

Self-Ignition Temperature: The lowest initial temperature of air passing around the specimen at which, in the absence of an ignition source, ignition occurs of itself, as indicated by an explosion, flame or sustained glow.

SECTION V

HEALTH HAZARD DATA

Threshold Limit Value
None established.

Effects of Overexposure

Processing vapors may produce acute health effects in some individuals. The effects relate primar-

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ily to eye, nose and throat irritation. Individuals with bronchial asthma and other types of chronic obstructive respiratory disease may develop bronchospasm if exposure is prolonged.

Emergency and First Aid Procedures

If irritation persists, remove affected individual from the area. Call a physician. Provide protection before re-entry. If overexposure occurs, leave the area.

Skin Sensitization.

Human patch tests conducted with numerous Geon® vinyl resins indicate these materials have a low order of toxicity and do not cause skin sensitization.

Vinyl Chloride Monomer (VCM)

By a process called polymerization, vinyl chloride monomer, which is a gas at ordinary temperature and pressure, is converted into polyvinyl chloride (PVC) resin, which is a white powder. A small number of workers exposed for many years to large amounts of VCM gas developed a rare cancer of the liver called angiosarcoma. All confirmed VCM related cases have been among workers in plants that either manufacture VCM or convert VCM into PVC. OSHA has implemented regulations which also apply to PVC because small amounts of residual VCM remain in resins or compounds and potentially may be released into the workplace atmosphere during storage or processing.

VCM Monitoring Requirements

Current OSHA regulations require all facilities where PVC is processed (including blends of PVC with other polymers) or fabricated (with heat sufficient to cause mass melting*) shall be monitored to determine concentrations of ambient VCM in the workplace atmosphere. These regulations require that no employee may be exposed to VCM concentrations greater than 1.0 ppm (part per million by volume) averaged over any eight hour period or 5.0 ppm averaged over any period not exceeding 15 minutes. The action level is 0.5 ppm averaged over any eight hour work day.

Monitoring may be discontinued for any employee only when at least two consecutive determinations, made not less than five working days apart, show exposures for that employee at or below the action level. REFERTO OSHA REGULATIONS (INCLUDING 1910.1017) FOR COMPLETE DETAILS.

Since small quantities of VCM do remain in PVC resin, we recommend that periodic monitoring programs be conducted. If you choose to have monitoring conducted by an independent laboratory, we suggest that the laboratory be one accredited by the American Industrial Hygiene Association.

*"Mass melting" occurs when the entire structure is heated so that the physical integrity and form of the input material is lost.

Places where VCM May Concentrate

With the low level of residual VCM in today's resins and by following the guidelines provided in this bulletin, it is highly unlikely under normal circumstances that anyone engaged in handling or pro-

cessing Geon® vinyls will be exposed to ambient VCM concentrations above the OSHA "action level."

There are, however, conditions under which VCM may accumulate to measurable amounts in the workplace atmosphere. Since VCM is volatile, it is released from the resin gradually in storage and more rapidly under heat from further processing. Open, handle, and use PVC resin and compound under well-ventilated conditions to avoid significant employee exposure.

Areas where VCM might concentrate are:

- 1) Closed containers such as bulk railcars, bulk trucks, storage tanks, and drums. Vent the air space above the resin or compound and monitor for VCM; or, provide suitable respiratory protection prior to exposure of personnel (See OSHA 1910.1017).
- 2) Storage areas for bagged or boxed PVC and places where incoming resins and compounds are unloaded, where packages are first opened, and where material is first melted. Provide suitable ventilation.
- 3) Processing areas such as compound preparation; extruding, curing, or coating operations, and other areas where heat is being applied. Provide suitable ventilation.

VCM at levels below 260 ppm reportedly cannot be detected by odor. Suitable test equipment and methods must be used.

Low VCM Content of Geon® Vinyls

BFGoodrich has implemented continuing technical efforts to reduce the level of VCM in the work atmosphere, the environment, and in PVC resin. Extensive product and process improvements have resulted in General Purpose, EP-type, Dispersion and Mass Polymerized Blending resins with extremely low levels of residual VCM. Residual VCM in major types of Geon® vinyl resins are presented in Table 1.

Studies in PVC processing and fabricating plants have shown exposures to be below the "action level." With current resins, in combination with ventilation and work practice programs, it should be possible for a typical processing plant not to have to regulate the area. Compliance with OSHA regulations requires that a program of initial monitoring be implemented (See OSHA 1910.1017). BFGoodrich recommends that periodic monitoring be conducted thereafter.

Progress has also been made in reducing residual VCM in suspension grade blending and paste resins. Because of the unique characteristics of blending and paste resins, there is greater technical difficulty in stripping residual VCM without damaging the polymer. Residual VCM in suspension grade blending and paste resins may result in detectable quantities of ambient VCM above the action level in storage and processing areas of the resin user's plant. The user should monitor personnel periodically and implement ventilation and work practice programs to prevent significant employee exposure and to comply with OSHA regulation 1910.1017.

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SECTION VI

REACTIVITY DATA

Stability — Stable.

Decomposition Products — See Section IV.

Hazardous Polymerization — Will Not Occur.

Incompatibility

Avoid contact of PVC resin or compound with acetal or acetal copolymers and with amine-containing materials during processing. At processing conditions these materials are mutually destructive and involve rapid degradation of the products. Thoroughly purge and mechanically clean processing equipment to avoid even trace quantities of these materials from coming in contact with each other. Prevent cross contamination of feedstocks.

SECTION VII

SPILL OR LEAK PROCEDURES

Steps to be taken in case material is released or spilled

Sweep, shovel, or vacuum into containers for reuse or disposal. If conditions occur where dust is possible, employees should be supplied with NIOSH approved respirator. (See Section VIII).

Waste Disposal Method

Landfill or incineration in accordance with federal, state, or local regulations. If incinerated, be aware that corrosive hydrogen chloride is generated. Geon® vinyl resins and compounds are not defined or designated as hazardous for waste disposal purposes under the current provisions of the Resource Conservation and Recovery Act. (40CFR261)

SECTION VIII

SPECIAL PROTECTION

Ventilation

Exhaust ventilation designed to pull vapors away from workers should be installed at all mixing operations, the hot end and feed area of processing equipment and at cut-off equipment. Ventilation should always be used to prevent routine inhalation of smoke, fumes or vapors from processing or other operations. Other operations to consider include regrind operations, thermoforming, heat sealing, soldering, and curing.

We suggest that you obtain a copy of the **NIOSH Recommended Industrial Ventilation Guidelines**, GPO #017-033-00136-7. It can be obtained from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. There is a fee for this publication (\$3.90 as of September, 1980).

Respiratory Protection — Dust

OSHA 1910.1000(e) requires wearing of approved respirator or implementing appropriate engineering controls if airborne concentrations of dust particles exceed 15 mg/m³ of total dust, or 5 mg/m³ of respir-

able dust. Health authorities recognize respirable dust to be particles 10 microns or smaller in size. Typical particle size for suspension and mass PVC resins is 130-150 microns; blending resins 40-80 microns. Dispersion resins have an average particle size below 10 microns.

Note: While there is no evidence of a substantial risk to health, a British study found a small decrease in breathing capacity for workers who smoked and were exposed to PVC dust. This decrease was about one-seventh of that caused by normal aging and about equal to that expected with a one-pack-a-day cigarette smoker. There was no significant decrease from inhalation of PVC dust by non-smokers. These findings indicate that it is prudent to minimize PVC dust exposure as much as possible.

Other Protection Information

- 1) PVC resin must be compounded with other ingredients. If you purchase PVC resin, the other ingredients you select for compounding purposes may require special consideration, especially respiratory protection. You must determine to your own satisfaction that your techniques, processes and additives comply with applicable regulations. As we cannot be responsible for materials or operations outside of our direct control, contact your additive supplier for information regarding specific compounding ingredients you select.
- 2) Safety glasses are recommended for all industrial workplaces. Special protective gloves and clothing are not normally required. Wear gloves when handling hot PVC.

SECTION IX

SPECIAL PRECAUTIONS

- 1) Vapors emitted during processing may condense on exhaust hoods, ductwork or other surfaces. Avoid skin contact with condensate during clean-up operations. Condensate may contain contaminants which may be toxic. Rubber gloves should be worn when cleaning condensate from exhaust hoods and other surfaces.
- 2) Observe good rules of personal industrial hygiene. Wash hands prior to eating, smoking, or using toilet facilities. Do not store or consume food in processing areas. Do not use processing equipment to heat food.
- 3) The process of regrinding PVC scrap for re-extrusion or waste disposal generally results in substantial heat. Cool regrind before placing it in containers. The excellent insulating quality of PVC will prevent heat in the center of a container from escaping, potentially resulting in slow thermal decomposition of the material. This may not only render the product unsatisfactory for further processing but also result in fumes and vapors from all ingredients being released into the workplace atmosphere which can cause irritation of the respiratory tract, eyes and skin.
- 4) Remove PVC resin or compound from walkways and floors to prevent slippery footing.

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