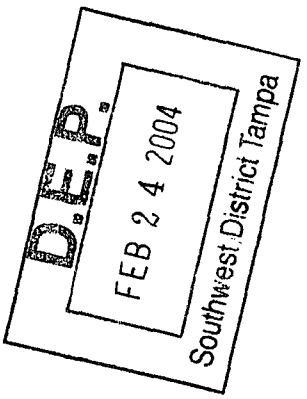

CONSTRUCTION PERMIT APPLICATION
CHARLOTTE PIPE AND FOUNDRY COMPANY
PLASTICS DIVISION
WILDWOOD, FLORIDA

PREPARED FOR:

CHARLOTTE PIPE AND FOUNDRY COMPANY
PLASTICS DIVISION
MONROE, NORTH CAROLINA

PREPARED BY:

AWARE ENVIRONMENTAL ® INC.
9305-J MONROE ROAD
CHARLOTTE, NORTH CAROLINA
AEI Job No. N188-53

February 2004

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SECTION 1.0
INTRODUCTION

Charlotte Pipe and Foundry Company, Plastics Division (CPFC) is requesting a Construction Permit for its Polyvinyl Chloride (PVC) pipe manufacturing facility. The facility is located in Wildwood, Florida (Figure 1) and currently operates under a Non-Title V Air Operating Permit (Permit No. 1190030-004-AO). The construction permit is being requested so that the facility may construct and install equipment that will enable the facility to increase its PVC pipe production, and to enable the facility to begin manufacturing Chlorinated Polyvinyl Chloride (CPVC) pipe. The facility plans to construct and install the following equipment:

- One (1) PVC extruder hopper receiver to feed one (1) PVC extruder;
- One (1) CPVC extruder hopper receiver to feed one (1) CPVC extruder; and
- One (1) CPVC compound storage silo.

Air emissions from the new equipment include fugitive VOC emissions from the pipe extrusion processes and PM/PM10 emissions from the material transfer stations and CPVC compound storage silo, which will be controlled by bagfilters and bin vent cartridge filters with minimum collection efficiencies of 99%. Fugitive VOC emissions from the pipe extrusion processes are expected to be minimal. The extruder hopper receivers as well as the extruders will be located inside facility buildings. The CPVC compound railcar vacuum unloader/storage silo will vent directly to the atmosphere.

SECTION 2.0
APPLICATION FOR AIR PERMIT – LONG FORM

APPLICATION FOR AIR PERMIT - NON-TITLE V SOURCE

See Instructions for Form No. 62-210.900(3)

I. APPLICATION INFORMATION

Identification of Facility

1. Facility Owner/Company Name: Charlotte Pipe and Foundry Company	
2. Site Name: Charlotte Pipe and Foundry Company – Plastics Division, Wildwood, Florida	
3. Facility Identification Number: 1190030 [ ] Unknown	
4. Facility Location: Street Address or Other Locator: County Road 124A City: Wildwood County: Sumter Zip Code: 34785	
5. Relocatable Facility? [ ] Yes [X] No	6. Existing Permitted Facility? [X] Yes [ ] No

Application Contact

1. Name and Title of Application Contact: James Neubauer, Scientist
2. Application Contact Mailing Address: Organization/Firm: Aware Environmental ® Inc. Street Address: 9305 Monroe Road Suite J City: Charlotte State: NC Zip Code: 28270
3. Application Contact Telephone Numbers: Telephone: (704) 815-1686 Fax: (704) 845-1759

Application Processing Information (DEP Use)

1. Date of Receipt of Application:	
2. Permit Number:	

Purpose of Application

Air Operation Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[ ] Initial non-Title V air operation permit for one or more existing, but previously unpermitted, emissions units.

[ ] Initial non-Title V air operation permit for one or more newly constructed or modified emissions units.

Current construction permit number: _____

[ ] Non-Title V air operation permit revision to address one or more newly constructed or modified emissions units.

Current construction permit number: _____

Operation permit number to be revised: _____

[ ] Initial non-Title V air operation permit under Rule 62-210.300(2)(b), F.A.C., for an existing facility seeking classification as a synthetic non-Title V source.

Current operation/construction permit number(s):

_____

[ ] Non-Title V air operation permit revision for a synthetic non-Title V source. Give reason for revision; e.g., to address one or more newly constructed or modified emissions units.

Operation permit number to be revised: _____

Reason for revision: _____

Air Construction Permit Application

This Application for Air Permit is submitted to obtain: (Check one)

[X] Air construction permit to construct or modify one or more emissions units.

[ ] Air construction permit to make federally enforceable an assumed restriction on the potential emissions of one or more existing, permitted emissions units.

[ ] Air construction permit for one or more existing, but unpermitted, emissions units.

Owner/Authorized Representative

1. Name and Title of Owner/Authorized Representative:
   Reese Sumrall, Jr.
2. Owner/Authorized Representative Mailing Address:
   Organization/Firm: Charlotte Pipe and Foundry Company – Plastics Division
   Street Address: 4210 Old Charlotte Highway
   City: Monroe State: NC Zip Code: 28110
3. Owner/Authorized Representative Telephone Numbers:
   Telephone: (704) 291-3211 Fax: (704) 348-6406
4. Owner/Authorized Representative Statement:

   I, the undersigned, am the owner or authorized representative of the facility addressed in this application. I hereby certify, based on information and belief formed after reasonable inquiry, that the statements made in this application are true, accurate and complete and that, to the best of my knowledge, any estimates of emissions reported in this application are based upon reasonable techniques for calculating emissions. The air pollutant emissions units and air pollution control equipment described in this application will be operated and maintained so as to comply with all applicable standards for control of air pollutant emissions found in the statutes of the State of Florida and rules of the Department of Environmental Protection and revisions thereof. I understand that a permit, if granted by the Department, cannot be transferred without authorization from the Department, and I will promptly notify the Department upon sale or legal transfer of any permitted emissions unit.*

   Signature 2/18/04 Date

* Attach letter of authorization if not currently on file.

Professional Engineer Certification

1. Professional Engineer Name: Edward C. Fiss, Jr.
   Registration Number: 40330
2. Professional Engineer Mailing Address:
   Organization/Firm: Aware Environmental ® Inc.
   Street Address: 9305 Monroe Road Suite J
   City: Charlotte State: NC Zip Code: 28270
3. Professional Engineer Telephone Numbers:
   Telephone: (704) 845-1697 Fax: (704) 845-1759

4. Professional Engineer Statement:

I, the undersigned, hereby certify, except as particularly noted herein, that:*

(1) To the best of my knowledge, there is reasonable assurance that the air pollutant emissions unit(s) and the air pollution control equipment described in this Application for Air Permit, when properly operated and maintained, will comply with all applicable standards for control of air pollutant emissions found in the Florida Statutes and rules of the Department of Environmental Protection; and

(2) To the best of my knowledge, any emission estimates reported or relied on in this application are true, accurate, and complete and are either based upon reasonable techniques available for calculating emissions or, for emission estimates of hazardous air pollutants not regulated for an emissions unit addressed in this application, based solely upon the materials, information and calculations submitted with this application.

If the purpose of this application is to obtain an air construction permit for one or more proposed new or modified emissions units (check here [X], if so), I further certify that the engineering features of each such emissions unit described in this application have been designed or examined by me or individuals under my direct supervision and found to be in conformity with sound engineering principles applicable to the control of emissions of the air pollutants characterized in this application.

If the purpose of this application is to obtain an initial air operation permit or operation permit revision for one or more newly constructed or modified emissions units (check here [ ], if so), I further certify that, with the exception of any changes detailed as part of this application, each such emissions unit has been constructed or modified in substantial accordance with the information given in the corresponding application for air construction permit and with all provisions contained in such permit.

Signature: _____ Date: 2/20/04

(seal)

Attach any exception to certification statement.

Scope of Application

Emissions Unit ID	Description of Emissions Unit	Permit Type	Processing Fee
004	One (1) extruder hopper receiver feeding one (1) PVC extruder.	AC1F	$250.00
007	One (1) CPVC compound storage silo.	AC1F	$250.00
008	One (1) extruder hopper receiver feeding one (1) CPVC extruder.	AC1F	$250.00

Application Processing Fee

Check one: [X] Attached - Amount: $ 750.00 [ ] Not Applicable

Construction/Modification Information

1. Description of Proposed Project or Alterations:

Charlotte Pipe and Foundry Company – Plastics Division has built a PVC pipe extrusion plant in Wildwood, Florida. The facility includes PVC compound handling systems and pipe extrusion equipment. The primary air pollutant from facility is particulate matter (PM) from the PVC raw material handling systems. Fugitive VOC emissions from the pipe extrusion process are anticipated to be minimal. The facility plans to construct and install additional pieces of equipment that will enable it to increase its PVC pipe production and also enable it to begin manufacturing CPVC pipe. The facility plans to construct and install one (1) extruder hopper receiver to feed one (1) PVC extruder, which will be added to Emission Unit Number 004 from the facility's current air operating permit (Permit No. 1190030-0040-AO). The facility also plans to construct a CPVC compound storage silo that is filled directly by a CPVC railcar vacuum unloader, which will receive the new Emission Unit Number 007. Finally CPFC plans to construct and install one (1) extruder hopper receiver to feed one (1) CPVC extruder, which will also receive the new Emission Unit Number 008.

2. Projected or Actual Date of Commencement of Construction: As soon as permit is issued.

3. Projected Date of Completion of Construction: Approximately two (2) months from commencement of construction.

Application Comment

NA

II. FACILITY INFORMATION

A. GENERAL FACILITY INFORMATION

Facility Location and Type

1. Facility UTM Coordinates: Zone: 17 East (km): 399.0 North (km): 3,197			
2. Facility Latitude/Longitude: Latitude (DD/MM/SS): 28/53/45 Longitude (DD/MM/SS): 82/02/00			
3. Governmental Facility Code: O	4. Facility Status Code: A	5. Facility Major Group SIC Code: 30	6. Facility SIC(s): 3084
7. Facility Comment (limit to 500 characters): This facility is located at County Road 124A, Wildwood, Florida, 34785. This facility is a PVC pipe extrusion facility.			

Facility Contact

1. Name and Title of Facility Contact: Reese Sumrall, Jr.
2. Facility Contact Mailing Address: Organization/Firm: Charlotte Pipe and Foundry Company – Plastics Division Street Address: 4210 Old Charlotte Highway City: Monroe State: NC Zip Code: 28110
3. Facility Contact Telephone Numbers: Telephone: (704) 291-3211 Fax: (704) 348-6406

Facility Regulatory Classifications

Check all that apply:

1. [ ] Small Business Stationary Source?	[X] Unknown
2. [ ] Synthetic Non-Title V Source?	
3. [ ] Synthetic Minor Source of Pollutants Other than HAPs?	
4. [ ] Synthetic Minor Source of HAPs?	
5. [ ] One or More Emissions Units Subject to NSPS?	
6. [ ] One or More Emission Units Subject to NESHAP Recordkeeping or Reporting?	
7. Facility Regulatory Classifications Comment (limit to 200 characters):	
This facility is a minor source of particulate matter.	

Rule Applicability Analysis

Florida Administrative Code.

B. FACILITY POLLUTANTS

List of Pollutants Emitted

1. Pollutant Emitted	2. Pollutant Classif.	3. Requested Emissions Cap lb/hour	tons/year	4. Basis for Emissions Cap	5. Pollutant Comment
PM	B	17.2	4.5	Rule and Other	Requested hourly emission cap is based on Rule 62-296-320 and the facility's pneumatic conveyor's max rate of 12.5 tons/hr (raw material). The annual emission cap is requested so that annual particulate emissions will be below five (5) tons per year.

C. FACILITY SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Area Map Showing Facility Location: [X] Attached, Document ID: Figure #1 [ ] Not Applicable [ ] Waiver Requested
2. Facility Plot Plan: [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
3. Process Flow Diagram(s): [X] Attached, Document ID: Figure #2 & #3 [ ] Not Applicable [ ] Waiver Requested
4. Precautions to Prevent Emissions of Unconfined Particulate Matter: [ ] Attached, Document ID:_____ [ ] Not Applicable [X] Waiver Requested
5. Supplemental Information for Construction Permit Application: [ ] Attached, Document ID:_____ [X] Not Applicable
6. Supplemental Requirements Comment: Not applicable to this facility.

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through G as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

One (1) extruder hopper receiver feeding one (1) PVC extruder.

3. Emissions Unit Identification Number: ID: 004 — [ ] No ID [ ] ID Unknown

4. Emissions Unit Status Code: C	5. Initial Startup Date: NA	6. Emissions Unit Major Group SIC Code: 30

6. Emissions Unit Comment: (Limit to 500 Characters)

This equipment is an addition to the Emission Unit Number 004 in the facility's current Air Operating Permit (Permit No. 1190030-004-AO). Please see Emission Source ID #35 (ES-35) on the attached Table #1. The primary air pollutant from this emission unit is particulate matter. This emission unit vents inside a facility building.

Emissions Unit Control Equipment

1. Control Equipment/Method Description (limit to 200 characters per device or method):

The air pollution control device is a bagfilter.

2. Control Device or Method Code(s): 018

Emissions Unit Details

1. Package Unit: NA (Not Applicable)
   Manufacturer: Model Number:
2. Generator Nameplate Rating: NA MW
3. Incinerator Information: NA
   Dwell Temperature: °F
   Dwell Time: seconds
   Incinerator Afterburner Temperature: °F

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate: NA mmBtu/hr
2. Maximum Incineration Rate: NA lb/hr tons/day
3. Maximum Process or Throughput Rate: 8,760,000 lbs/yr
4. Maximum Production Rate: NA
5. Requested Maximum Operating Schedule:
   24 hours/day 7 days/week
   52 weeks/year 8,760 hours/year
7. Operating Capacity/Schedule Comment (limit to 200 characters):

The maximum throughput rate of 8,760,000 lbs/yr corresponds to the hopper receiver that is planned to be installed to feed the new PVC extruder. The total maximum throughput rate for emissions unit ID #004 including ten (10) hopper receivers feeding the ten (10) extruders will remain 80,000,000 lbs/yr.

B. EMISSION POINT (STACK/VENT) INFORMATION

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? EP-23	2. Emission Point Type Code: 1

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):

These emission points vent inside a facility building.

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:

NA

5. Discharge Type Code: See the attached Table #2	6. Stack Height: See the attached Table #2	7. Exit Diameter: See the attached Table #2
8. Exit Temperature: See the attached Table #2	9. Actual Volumetric Flow Rate: See the attached Table #2	10. Water Vapor: NA

11. Maximum Dry Standard Flow Rate: NA dscfm	12. Nonstack Emission Point Height: See the attached Table #2

13. Emission Point UTM Coordinates: NA

Zone: East (km): North (km):

14. Emission Point Comment (limit to 200 characters):

This emission point is a vent. Please see the attached Figure #2 – Process Schematic Diagram.

C. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 0 of 0

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
NA		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

Segment Description and Rate: Segment 0 of 0

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
NA		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

Emissions Unit Information Section 1 **of** 3

Pollutant Detail Information Page 1 **of** 1

D. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION

Potential Emissions

1. Pollutant Emitted: PM		2. Pollutant Regulatory Code: EL
3. Primary Control Device Code: 018	4. Secondary Control Device Code: NA	5. Total Percent Efficiency of Control: 99%
6. Potential Emissions: 17.2 lb/hour 4.5 tons/year		7. Synthetically Limited? [ ] NA
8. Emission Factor: See Attachment A Reference:		9. Emissions Method Code: 4
10. Calculation of Emissions (limit to 600 characters): See Attachment A		
11. Pollutant Potential Emissions Comment (limit to 200 characters): See Attachment A		

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: RULE and OTHER (Maximum capacity)	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units: See Field 4	4. Equivalent Allowable Emissions: 17.2 lb/hour 4.5 tons/year
5. Method of Compliance (limit to 60 characters): PVC throughput and bagfilter control efficiency.	
Requested hourly emission cap is based on Rule 62-296-320 and the pneumatic conveyor's max rate of 12.5 tons/hr (raw material). The annual emission cap is requested so that annual particulate emissions will be below five (5) tons per year.	

E. VISIBLE EMISSIONS INFORMATION
(Only Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation 0 of 0

1. Visible Emissions Subtype: NA	2. Basis for Allowable Opacity: NA [ ] Rule [ ] Other
3. Requested Allowable Opacity: NA Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance: NA	
5. Visible Emissions Comment (limit to 200 characters): This emission unit vents inside a facility building and is therefore exempt from visible emissions compliance testing.	

F. CONTINUOUS MONITOR INFORMATION
(Only Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor 0 of 0

1. Parameter Code: NA	2. Pollutant(s): NA
3. CMS Requirement: NA	[ ] Rule [ ] Other
4. Monitor Information: NA Manufacturer: Model Number: Serial Number:	
5. Installation Date: NA	6. Performance Specification Test Date: NA
7. Continuous Monitor Comment (limit to 200 characters): NA	

G. EMISSIONS UNIT SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Process Flow Diagram [X] Attached, Document ID: Figure #2 [ ] Not Applicable [ ] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
3. Detailed Description of Control Equipment [X] Attached, Document ID: Table #1 [ ] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
7. Operation and Maintenance Plan [X] Attached, Document ID: Attachment D [ ] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [ ] Attached, Document ID:_____ [X] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: NA

APPLICATION FOR AIR III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through G as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

One (1) CPVC compound storage silo.

3. Emissions Unit Identification Number: ID: 007 — [ ] No ID [ ] ID Unknown

4. Emissions Unit Status Code: C	5. Initial Startup Date: NA	6. Emissions Unit Major Group SIC Code: 30

6. Emissions Unit Comment: (Limit to 500 Characters)

This Emission Unit represents one (1) CPVC compound storage silo that the facility plans to construct and install. The CPVC compound is filled directly to the storage silo by a railcar vacuum unloading system. Please see Emission Source ID #36 (ES-36) on the attached Table #1. The primary air pollutant from this emission unit is particulate matter. This emission unit vents directly to the atmosphere.

Emissions Unit Control Equipment

1. Control Equipment/Method Description (limit to 200 characters per device or method):

The air pollution control device is a bin vent-cartridge filter.

2. Control Device or Method Code(s): 018

Emissions Unit Details

1. Package Unit: NA (Not Applicable)
   Manufacturer: Model Number:
2. Generator Nameplate Rating: NA MW
3. Incinerator Information: NA
   Dwell Temperature: °F
   Dwell Time: seconds
   Incinerator Afterburner Temperature: °F

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate: NA mmBtu/hr
2. Maximum Incineration Rate: NA lb/hr tons/day
3. Maximum Process or Throughput Rate: 4,380,000 lbs/yr
4. Maximum Production Rate: NA
5. Requested Maximum Operating Schedule:
   24 hours/day 7 days/week
   52 weeks/year 8,760 hours/year
7. Operating Capacity/Schedule Comment (limit to 200 characters):

The maximum throughput rate of 4,380,000 lbs/yr corresponds to the new CPVC compound storage silo #1 that is planned to be constructed and installed.

B. EMISSION POINT (STACK/VENT) INFORMATION

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? EP-24	2. Emission Point Type Code: 1

3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point):

This CPVC storage silo will contain its own emission point that vents directly to the atmosphere.

4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common:

NA

5. Discharge Type Code: See the attached Table #2	6. Stack Height: See the attached Table #2	7. Exit Diameter: See the attached Table #2
8. Exit Temperature: See the attached Table #2	9. Actual Volumetric Flow Rate: See the attached Table #2	10. Water Vapor: NA

11. Maximum Dry Standard Flow Rate: NA dscfm	12. Nonstack Emission Point Height: See the attached Table #2

13. Emission Point UTM Coordinates: NA

Zone: East (km): North (km):

14. Emission Point Comment (limit to 200 characters):

This Emission Point is a vent. Please see the attached Figure #3 – Process Schematic Diagram.

C. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 0 of 0

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
NA		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

Segment Description and Rate: Segment 0 of 0

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
NA		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

Emissions Unit Information Section 2 **of** 3

Pollutant Detail Information Page 1 **of** 1

D. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION

Potential Emissions

1. Pollutant Emitted: PM		2. Pollutant Regulatory Code: EL
3. Primary Control Device Code: 018	4. Secondary Control Device Code: NA	5. Total Percent Efficiency of Control: 99%
6. Potential Emissions: 17.2 lb/hour 4.5 tons/year		7. Synthetically Limited? [ ] NA
8. Emission Factor: See Attachment A Reference:		9. Emissions Method Code: 4
10. Calculation of Emissions (limit to 600 characters): See Attachment A		
11. Pollutant Potential Emissions Comment (limit to 200 characters): See Attachment A		

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: RULE and OTHER (Maximum capacity)	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units: See Field 4	4. Equivalent Allowable Emissions: 17.2 lb/hour 4.5 tons/year
5. Method of Compliance (limit to 60 characters): CPVC throughput and bin vent cartridge filter control efficiency.	
6. Allowable Emissions Comment (Desc. of Operating Method) (limit to 200 characters): The hourly allowable emission limit is based on the maximum material handling capacity and Rule 62-296-320. The annual allowable emission limit is requested so that the emissions will be below five (5) tons per year.	

E. VISIBLE EMISSIONS INFORMATION
(Only Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation 1 of 1

1. Visible Emissions Subtype: VE5	2. Basis for Allowable Opacity: [X] Rule [ ] Other
3. Requested Allowable Opacity: Normal Conditions: 5 % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance: EPA Method 9	
5. Visible Emissions Comment (limit to 200 characters): Charlotte Pipe and Foundry Company – Plastics Division elects an alternative standard of 5 % opacity for the CPVC storage silo instead of particulate emissions compliance tests since the facility meets the conditions specified in Rule 62-29-620 of the F.A.C.	

F. CONTINUOUS MONITOR INFORMATION
(Only Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor 0 of 0

1. Parameter Code: NA	2. Pollutant(s): NA
3. CMS Requirement: NA	[ ] Rule [ ] Other
4. Monitor Information: NA Manufacturer: Model Number: Serial Number:	
5. Installation Date: NA	6. Performance Specification Test Date: NA
7. Continuous Monitor Comment (limit to 200 characters): NA	

G. EMISSIONS UNIT SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Process Flow Diagram [X] Attached, Document ID: Figure #3 [ ] Not Applicable [ ] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
3. Detailed Description of Control Equipment [X] Attached, Document ID: Table #1 [ ] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID: _____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
7. Operation and Maintenance Plan [X] Attached, Document ID: Attachment D[ ] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [ ] Attached, Document ID:_____ [X] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: NA

III. EMISSIONS UNIT INFORMATION

A separate Emissions Unit Information Section (including subsections A through G as required) must be completed for each emissions unit addressed in this Application for Air Permit. If submitting the application form in hard copy, indicate, in the space provided at the top of each page, the number of this Emissions Unit Information Section and the total number of Emissions Unit Information Sections submitted as part of this application.

A. GENERAL EMISSIONS UNIT INFORMATION

Emissions Unit Description and Status

1. Type of Emissions Unit Addressed in This Section: (Check one)

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, a single process or production unit, or activity, which produces one or more air pollutants and which has at least one definable emission point (stack or vent).

[X] This Emissions Unit Information Section addresses, as a single emissions unit, a group of process or production units and activities which has at least one definable emission point (stack or vent) but may also produce fugitive emissions.

[ ] This Emissions Unit Information Section addresses, as a single emissions unit, one or more process or production units and activities which produce fugitive emissions only.

2. Description of Emissions Unit Addressed in This Section (limit to 60 characters):

One (1) hopper receiver feeding one (1) CPVC extruder.

3. Emissions Unit Identification Number: ID: 008	[ ] No ID [ ] ID Unknown

4. Emissions Unit Status Code: C	5. Initial Startup Date: NA	6. Emissions Unit Major Group SIC Code: 30

6. Emissions Unit Comment: (Limit to 500 Characters)

This Emission Unit represents one (1) hopper receiver feeding one (1) CPVC extruder that the facility plans to construct and install. Please see Emission Source ID #37 (ES-37) on the attached Table #1. The primary air pollutant from this emission unit is particulate matter. This emission unit vents inside a facility building.

Emissions Unit Control Equipment

1. Control Equipment/Method Description (limit to 200 characters per device or method):

The air pollution control device is a bagfilter.

2. Control Device or Method Code(s): 018

Emissions Unit Details

1. Package Unit: NA (Not Applicable)
   Manufacturer: Model Number:
2. Generator Nameplate Rating: NA MW
3. Incinerator Information: NA
   Dwell Temperature: °F
   Dwell Time: seconds
   Incinerator Afterburner Temperature: °F

Emissions Unit Operating Capacity and Schedule

1. Maximum Heat Input Rate: NA mmBtu/hr
2. Maximum Incineration Rate: NA lb/hr tons/day
3. Maximum Process or Throughput Rate: 4,380,000 lbs/yr
4. Maximum Production Rate: NA
5. Requested Maximum Operating Schedule:
   24 hours/day 7 days/week
   52 weeks/year 8,760 hours/year
7. Operating Capacity/Schedule Comment (limit to 200 characters):

The maximum throughput rate of 4,380,000 lbs/yr corresponds to the hopper receiver that is planned to be installed to feed the new CPVC extruder.

B. EMISSION POINT (STACK/VENT) INFORMATION

Emission Point Description and Type

1. Identification of Point on Plot Plan or Flow Diagram? EP-25	2. Emission Point Type Code: 1	
3. Descriptions of Emission Points Comprising this Emissions Unit for VE Tracking (limit to 100 characters per point): This emission point vents inside a facility building.		
4. ID Numbers or Descriptions of Emission Units with this Emission Point in Common: NA		
5. Discharge Type Code: See the attached Table #2	6. Stack Height: See the attached Table #2	7. Exit Diameter: See the attached Table #2
8. Exit Temperature: See the attached Table #2	9. Actual Volumetric Flow Rate: See the attached Table #2	10. Water Vapor: NA
11. Maximum Dry Standard Flow Rate: NA dscfm	12. Nonstack Emission Point Height: See the attached Table #2	
13. Emission Point UTM Coordinates: NA Zone: East (km): North (km):		
14. Emission Point Comment (limit to 200 characters): This emission point is a vent. Please see the attached Figure #3 – Process Schematic Diagram.		

C. SEGMENT (PROCESS/FUEL) INFORMATION

Segment Description and Rate: Segment 0 of 0

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
NA		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

Segment Description and Rate: Segment 0 of 0

1. Segment Description (Process/Fuel Type) (limit to 500 characters):		
NA		
2. Source Classification Code (SCC):	3. SCC Units:	
4. Maximum Hourly Rate:	5. Maximum Annual Rate:	6. Estimated Annual Activity Factor:
7. Maximum % Sulfur:	8. Maximum % Ash:	9. Million Btu per SCC Unit:
10. Segment Comment (limit to 200 characters):		

D. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION

Potential Emissions

1. Pollutant Emitted: PM	2. Pollutant Regulatory Code: EL	
3. Primary Control Device Code: 018	4. Secondary Control Device Code: NA	5. Total Percent Efficiency of Control: 99%
6. Potential Emissions: 17.2 lb/hour 4.5 tons/year		7. Synthetically Limited? [ ] NA
8. Emission Factor: See Attachment A Reference:		9. Emissions Method Code: 4
10. Calculation of Emissions (limit to 600 characters): See Attachment A		
11. Pollutant Potential Emissions Comment (limit to 200 characters): See Attachment A		

Allowable Emissions Allowable Emissions 1 of 1

1. Basis for Allowable Emissions Code: RULE and OTHER (Maximum capacity)	2. Future Effective Date of Allowable Emissions: NA
3. Requested Allowable Emissions and Units: See Field 4	4. Equivalent Allowable Emissions: 17.2 lb/hour 4.5 tons/year
5. Method of Compliance (limit to 60 characters): CPVC throughput and bagfilter control efficiency.	
Requested hourly emission cap is based on Rule 62-296-320 and the pneumatic conveyor's max rate of 12.5 tons/hr (raw material). The annual emission cap is requested so that annual particulate emissions will be below five (5) tons per year.	

E. VISIBLE EMISSIONS INFORMATION
(Only Emissions Units Subject to a VE Limitation)

Visible Emissions Limitation: Visible Emissions Limitation 0 of 0

1. Visible Emissions Subtype: NA	2. Basis for Allowable Opacity: NA [ ] Rule [ ] Other
3. Requested Allowable Opacity: NA Normal Conditions: % Exceptional Conditions: % Maximum Period of Excess Opacity Allowed: min/hour	
4. Method of Compliance: NA	
5. Visible Emissions Comment (limit to 200 characters): This emission unit vents inside a facility building and is therefore exempt from visible emissions compliance testing.	

F. CONTINUOUS MONITOR INFORMATION
(Only Emissions Units Subject to Continuous Monitoring)

Continuous Monitoring System: Continuous Monitor 0 of 0

1. Parameter Code: NA	2. Pollutant(s): NA
3. CMS Requirement: NA	[ ] Rule [ ] Other
4. Monitor Information: NA Manufacturer: Model Number: Serial Number:	
5. Installation Date: NA	6. Performance Specification Test Date: NA
7. Continuous Monitor Comment (limit to 200 characters): NA	

G. EMISSIONS UNIT SUPPLEMENTAL INFORMATION

Supplemental Requirements

1. Process Flow Diagram [X] Attached, Document ID: Figure #3 [ ] Not Applicable [ ] Waiver Requested
2. Fuel Analysis or Specification [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
3. Detailed Description of Control Equipment [X] Attached, Document ID: Table #1 [ ] Not Applicable [ ] Waiver Requested
4. Description of Stack Sampling Facilities [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
5. Compliance Test Report [ ] Attached, Document ID:_____ [ ] Previously submitted, Date:_____ [X] Not Applicable
6. Procedures for Startup and Shutdown [ ] Attached, Document ID:_____ [X] Not Applicable [ ] Waiver Requested
7. Operation and Maintenance Plan [X] Attached, Document ID: Attachment D [ ] Not Applicable [ ] Waiver Requested
8. Supplemental Information for Construction Permit Application [ ] Attached, Document ID:_____ [X] Not Applicable
9. Other Information Required by Rule or Statute [ ] Attached, Document ID:_____ [X] Not Applicable
10. Supplemental Requirements Comment: NA

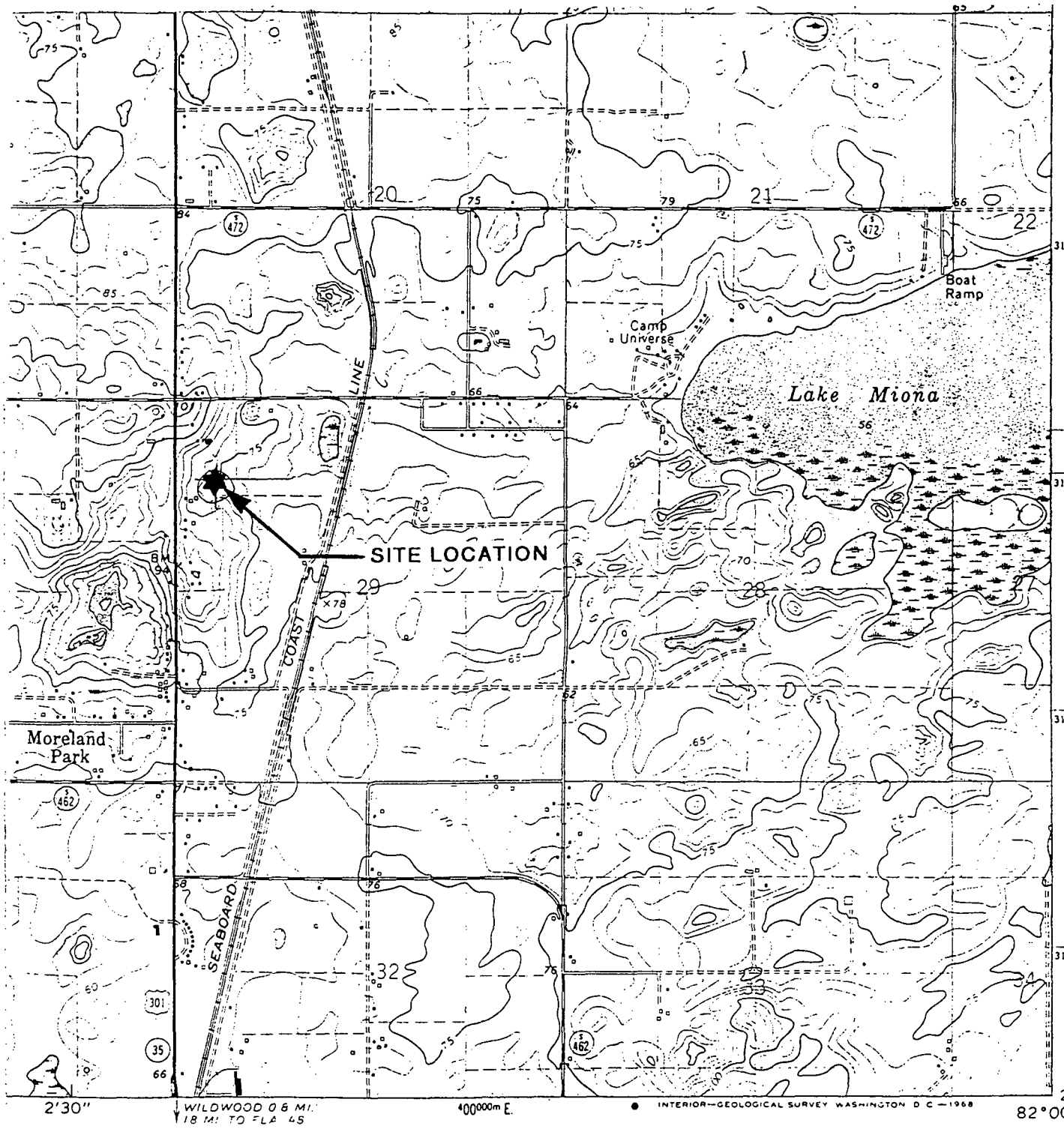
TABLES

TABLE 1
FACILITY EQUIPMENT INFORMATION

Emission Source Information					Control Device Information					Emission Point Information				
Emission Unit ID #	Emission Source ID #	Emission Source Description	Source Manufacturer	Source Capacity	Emission Point ID #	Control Device	Control Device Manufacturer	Minimum Control (%)	Filter Cloth Area	Exhaust Height	Exhaust Diameter	Exhaust Temp.	Volumetric Flow Rate	Exhaust Direction
001	ES-01	PVC Railcar Unloading	O.A Newton	417 lbs/min.	EP-01	Cartridge Filter	O.A. Newton	99	360 sq. Ft.	Ground Level	6 inches	Ambient	900 CFM	H
002	ES-02	PVC Storage Silo 2	Peabody-TecTank	4925 cu. Ft.	EP-02	Bin Vent (Cartridge)	O.A. Newton	99	270 sq. Ft.	64 ft.	1.93 sq. Ft.	Ambient	700 CFM	D
002	ES-03	PVC Storage Silo 3	Peabody-TecTank	4925 cu. Ft.	EP-03	Bin Vent (Cartridge)	O.A. Newton	99	270 sq. Ft.	64 ft.	1.93 sq. Ft.	Ambient	700 CFM	D
002	ES-04	PVC Storage Silo 4	Peabody-TecTank	4925 cu. Ft.	EP-04	Bin Vent (Cartridge)	O.A. Newton	99	270 sq. Ft.	64 ft.	1.93 sq. Ft.	Ambient	700 CFM	D
002	ES-05	PVC Storage Silo 5	Peabody-TecTank	4925 cu. Ft.	EP-05	Bin Vent (Cartridge)	O.A. Newton	99	270 sq. Ft.	64 ft.	1.93 sq. Ft.	Ambient	700 CFM	D
002	ES-06	PVC Storage Silo 6	Peabody-TecTank	4925 cu. Ft.	EP-06	Bin Vent (Cartridge)	O.A. Newton	99	270 sq. Ft.	64 ft.	1.93 sq. Ft.	Ambient	700 CFM	D
002	ES-07	PVC Resin Silo Silo 7	Peabody-TecTank	4925 cu. Ft.	EP-07	Bin Vent (Cartridge)	O.A. Newton	99	560 sq. Ft.	64 ft.	1.93 sq. Ft.	Ambient	700 CFM	D
004	ES-16	Extruder Hopper Receiver 1A	Universal Dynamics	6 cu. Ft.	EP-10	Bagfilter	Universal Dynamics	99	44.4 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-17	Extruder Hopper Receiver 1B	Universal Dynamics	6 cu. Ft.	EP-10	Bagfilter	Universal Dynamics	99	44.4 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-18	Extruder Hopper Receiver 2A	O.A Newton	2 cu. Ft.	EP-11	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-19	Extruder Hopper Receiver 2B	O.A Newton	2 cu. Ft.	EP-11	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-20	Extruder Hopper Receiver 3A	O.A Newton	2 cu. Ft.	EP-12	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-21	Extruder Hopper Receiver 3B	O.A Newton	2 cu. Ft.	EP-12	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-22	Extruder Hopper Receiver 4	O.A Newton	2 cu. Ft.	EP-13	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-23	Extruder Hopper Receiver 5	O.A Newton	2 cu. Ft.	EP-14	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-24	Extruder Hopper Receiver 6	O.A Newton	2 cu. Ft.	EP-15	Cartridge Filter	O.A Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
004	ES-35	Extruder Hopper Receiver 7	Universal Dynamics	6 cu. Ft.	EP-23	Bagfilter	Universal Dynamics	99	44.4 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
005	ES-25	Scrap Grinder Receiver	Rapid Granulator	1500 lbs/hr	EP-16	Bagfilter	Rapid Granulator	99	97.5 sq. Ft.	6.8 ft	NA	Ambient	2000 CFM	H
005	ES-26	Pulverizer Receiver	O.A Newton	2 cu. Ft.	EP-17	Cartridge Filter	O.A Newton	99	112.5 sq. Ft.	Ground Level	4 inches	Ambient	250 CFM	H
005	ES-27	Pulverized Material Hopper Receiver	New Herbold	80.5 cu. Ft.	EP-18	Baghouse Filter	Torit	99	483 sq. Ft.	16.5 ft	16 inches	Ambient	1550 CFM	V
005	ES-28	Day Bin 1	O.A Newton	120 cu Ft.	EP-17	Cartridge Filter	O.A. Newton	99	112.5 sq. Ft.	Ground Level	4 inches	Ambient	250 CFM	H
005	ES-29	Day Bin 2	O.A Newton	120 cu Ft.	EP-19	Cartridge Filter	O.A. Newton	99	112.5 sq. Ft.	Ground Level	4 inches	Ambient	250 CFM	H
005	ES-30	Day Bin 3	O.A Newton	120 cu Ft.	EP-20	Cartridge Filter	O.A. Newton	99	112.5 sq. Ft.	Ground Level	4 inches	Ambient	250 CFM	H
005	ES-31	Blender 1 Virgin Receiver	O.A Newton	5 cu. Ft.	EP-21	Cartridge Filter	O.A. Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
005	ES-32	Blender 1 Pulverized Receiver	O.A Newton	5 cu. Ft.	EP-21	Cartridge Filter	O.A. Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
005	ES-33	Blender 2 Virgin Receiver	O.A Newton	5 cu. Ft.	EP-22	Cartridge Filter	O.A. Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
005	ES-34	Blender 2 Pulverized Receiver	O.A Newton	5 cu. Ft.	EP-22	Cartridge Filter	O.A. Newton	99	135 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
006	ES-08	Compounder Resin Scale Hopper	O.A Newton	40 cu. Ft.	EP-08	Cartridge Filter	O.A. Newton	99	1781 sq. Ft.	7.5 ft	3.18 sq. ft.	Ambient	11,000 CFM	D
006	ES-09	Compounder Microingredient Receiver	O.A Newton	13 cu. Ft.	EP-09	Cartridge Filter	O.A. Newton	99	157.5 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
006	ES-10	Compounder CaCO3 Receiver	O.A Newton	13 cu. Ft.	EP-09	Cartridge Filter	O.A. Newton	99	157.5 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H
006	ES-11	Microingredient Units (7 units)	O.A Newton	2450 lbs.	EP-08	Cartridge Filter	O.A. Newton	99	1781 sq. Ft.	7.5 ft	3.18 sq. ft.	Ambient	11,000 CFM	D
006	ES-12	Compounder Hot Mixer	O.A Newton	32 cu. Ft.	EP-08	Cartridge Filter	O.A. Newton	99	1781 sq. Ft.	7.5 ft	3.18 sq. ft.	Ambient	11,000 CFM	D
006	ES-13	Double Batch Hopper	O.A Newton	40 cu. Ft.	EP-08	Cartridge Filter	O.A. Newton	99	1781 sq. Ft.	7.5 ft	3.18 sq. ft.	Ambient	11,000 CFM	D
006	ES-14	Compounder Cooler	O.A Newton	90 cu. Ft.	EP-08	Cartridge Filter	O.A. Newton	99	1781 sq. Ft.	7.5 ft	3.18 sq. ft.	Ambient	11,000 CFM	D
006	ES-15	Takeaway Hopper	O.A Newton	3000 lbs.	EP-08	Cartridge Filter	O.A. Newton	99	1781 sq. Ft.	7.5 ft	3.18 sq. ft.	Ambient	11,000 CFM	D
007	ES-36	CPVC Compound Storage Silo 1	Columbian-TecTank	4,590 cu. Ft.	EP-24	Cartridge Filter	Ultra	99	174 sq. Ft.	56 ft	6 inches	Ambient	600 CFM	D
008	ES-37	CPVC Extruder Hopper Receiver 8	Universal Dynamics	6 cu. Ft.	EP-25	Bagfilter	Universal Dynamics	99	44.4 sq. Ft.	Ground Level	4 inches	Ambient	420 CFM	H

**Highlighted information represents the new pieces of equipment covered in this permit application.

FIGURES



SCALE: 1:24000

1 1/2 0 1 MILE

1000 0 2000 4000 6000 8000 FEET

N

CHARLOTTE PIPE & FOUNDRY
WILDWOOD, FLORIDA

REFERENCE:
BASE MAP TAKEN FROM USGS QUADRANGLE MAP:
OXFORD, FLORIDA. DATED 1966.

FIGURE–1
SITE LOCATION MAP

AWARE ENVIRONMENTAL INC

AEI PROJECT No. N188–53

Figure 2 - Process Schematic Diagram (PVC)

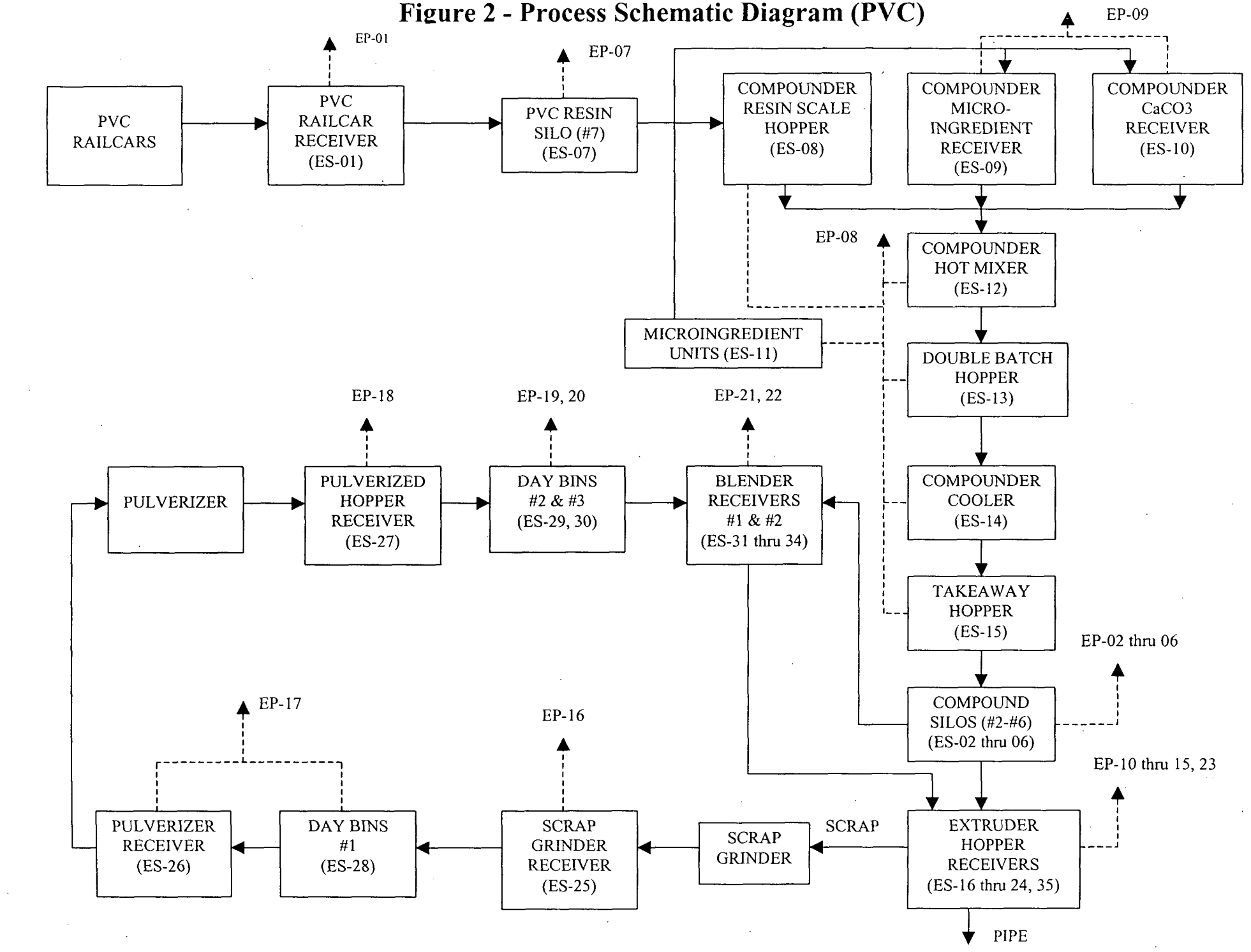
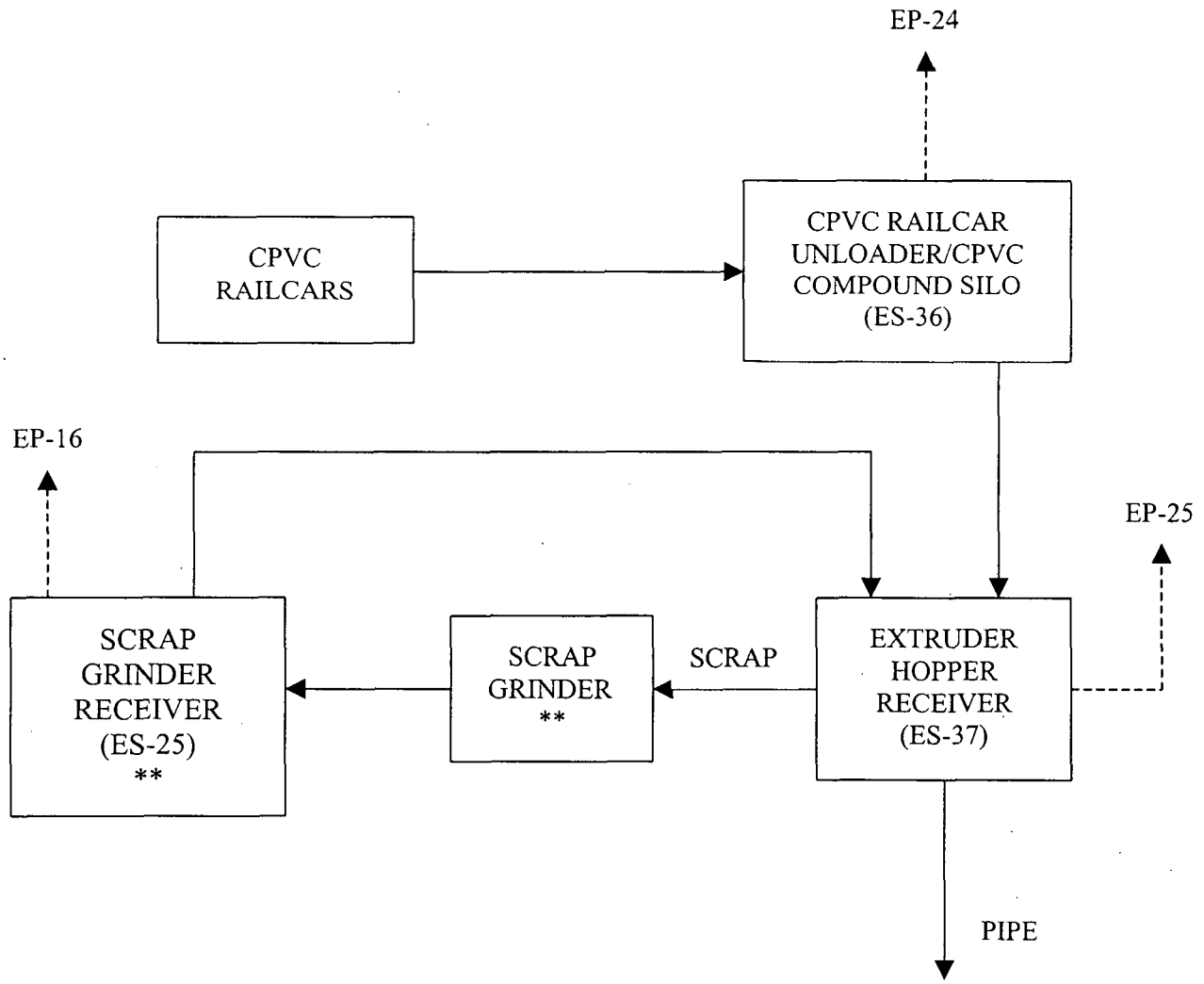


Figure 3 - Process Schematic Diagram (CPVC)



** The scrap grinder and scrap grinder receiver are permitted in the facility's current Air Operating Permit (Permit No. 1190030-004-AO).

ATTACHMENT A

EMISSION CALCULATIONS AND EMISSION FACTOR SELECTION

ATTACHMENT A
EMISSION CALCULATIONS AND EMISSION FACTOR SELECTION
Charlotte Pipe & Foundry Company
Wildwood, Florida

TABLE A-1 summarizes emissions from the proposed Charlotte Pipe and Foundry Company (CPFC) – Wildwood Facility. Emissions are calculated based on the processes described in **Section 1 – Process Description**. Emission factor selection is discussed below.

Taking a conservative approach, particulate matter emissions from CPFC's material transfer stations for extrusion and storage silos were modeled using uncontrolled particulate emission factors for concrete batching found in Table 11.12-2 of the USEPA's AP-42, *Compilation of Air Pollutant Emission Factors*. An emission factor of 0.72 lb/ton was chosen to model the PM emissions from unloading bulk material to the material transfer stations for extrusion and from the pneumatic conveyance of bulk materials to CPFC's storage silos. An emission factor of 0.46 lb/ton was chosen to model the PM10 emissions from unloading bulk material to the material transfer stations for extrusion and from the pneumatic conveyance of bulk materials to CPFC's storage silos.

Fugitive VOC emissions from CPFC's PVC pipe extrusion process were estimated using a residual vinyl chloride (VOC) concentration from the PVC resin of 0.35 ppm. The residual vinyl chloride concentration was supplied from a vendor certificate of analysis of a shipment of PVC resin received by CPFC.

Fugitive VOC emissions from CPFC's CPVC pipe extrusion process include chloroform and carbon tetrachloride. According to the MSDS for the CPVC compound, found in Attachment C of this application, less than 0.01% (<100 ppm) of residual chloroform and less than 0.005% (<50 ppm) of residual carbon tetrachloride may remain bound in CPVC resin. To take a conservative, worst case scenario approach, VOC emissions from CPVC pipe extrusion were estimated using a residual chloroform concentration from the CPVC compound of 100 ppm and a residual carbon tetrachloride concentration from the CPVC compound of 50 ppm. Actual residual chloroform and residual carbon tetrachloride concentrations are not expected to be this high.

Based on available information, CO emissions from CPFC's PVC pipe extrusion process are estimated to be negligible. CPFC operates its PVC pipe extrusion process below 200°C. According to the attached journal article, CO emissions from this process are believed to be at 0 ppm during the extrusion of PVC pipe at or below 200°C.

Supporting documentation for the emission factors used to estimate CPFC's emissions are attached for reference.

TABLE A-1
MATERIAL HANDLING EMISSIONS SUMMARY
PVC/CPVC HANDLING
Charlotte Pipe & Foundry - Plastics Division
Wildwood, Florida

TOTAL PARTICULATE MATTER (PM/PM10) EMISSIONS ESTIMATE

PROCESS	HOURS OF OPERATION ACTUAL (hr/yr)	HOURS OF OPERATION POTENTIAL (hr/yr)	MATERIAL THROUGHPUT POTENTIAL (lbs/yr)	CONTROL DEVICE	CONTROL EFFICIENCY	ESTIMATED PM UNCONTROLLED EMISSION FACTOR (lb/ton)	EMISSION ESTIMATES FOR PM BEFORE CONTROL POTENTIAL (ton/yr)	EMISSION ESTIMATES FOR PM AFTER CONTROL POTENTIAL (ton/yr)
PVC - Pipe Extrusion								
Hopper Receiver for Extrusion	8472	8760	8,760,000.00	Bagfilter	99.00%	0.72	1.577	0.016
CPVC - Pipe Extrusion								
Railcar Vacuum Unloader/Storage Silo	8472	8760	4,380,000.00	Bagfilter	99.00%	0.72	0.788	0.008
Hopper Receiver for Extrusion	8472	8760	4,380,000.00	Bagfilter	99.00%	0.72	0.788	0.008
TOTAL							**3.15**	**0.03**

PM-10 EMISSIONS ESTIMATE

PROCESS	HOURS OF OPERATION ACTUAL (hr/yr)	HOURS OF OPERATION POTENTIAL (hr/yr)	MATERIAL THROUGHPUT POTENTIAL (lbs/yr)	CONTROL DEVICE	CONTROL EFFICIENCY	ESTIMATED PM10 UNCONTROLLED EMISSION FACTOR (lb/ton)	EMISSION ESTIMATES FOR PM10 BEFORE CONTROL POTENTIAL (ton/yr)	EMISSION ESTIMATES FOR PM10 AFTER CONTROL POTENTIAL (ton/yr)
PVC - Pipe Extrusion								
Hopper Receiver for Extrusion	8472	8760	8,760,000.00	Bagfilter	99.00%	0.46	1.007	0.010
CPVC - Pipe Extrusion								
Railcar Vacuum Unloader/Storage Silo	8472	8760	4,380,000.00	Bagfilter	99.00%	0.46	0.504	0.005
Hopper Receiver for Extrusion	8472	8760	4,380,000.00	Bagfilter	99.00%	0.46	0.504	0.005
TOTAL							**2.01**	**0.02**

VOC EMISSION ESTIMATE (One (1) PVC Extruder, One (1) CPVC Extruder)

PVC - Pipe Extrusion		
Maximum material throughput:	8,760,000.00	lbs/yr
PVC vinyl chloride (VOC) residual:	0.35 ppm wt.	
Maximum vinyl chloride (VOC) emissions:	3.07	lbs/yr
CPVC - Pipe Extrusion		
Maximum material throughput:	4,380,000.00	lbs/yr
Chloroform (VOC) residual:	100.0 ppm wt.	
Maximum Chloroform (VOC) emissions:	438.00	lbs/yr
CPVC carbon tetrachloride (VOC) residual:	50.0 ppm wt.	
Maximum carbon tetrachloride (VOC) emissions:	219.00	lbs/yr
TOTAL VOC EMISSIONS	**660.07**	**lbs/yr**

11.12 CONCRETE BATCHING

11.12-1 Process Description [1-5]

Concrete is composed essentially of water, cement, sand (fine aggregate) and coarse aggregate. Coarse aggregate may consist of gravel, crushed stone or iron blast furnace slag. Some specialty aggregate products could be either heavyweight aggregate (of barite, magnetite, limonite, ilmenite, iron or steel) or lightweight aggregate (with sintered clay, shale, slate, diatomaceous shale, perlite, vermiculite, slag, pumice, cinders, or sintered fly ash). Supplementary cementing materials, also called mineral admixtures or pozzolan materials may be added to to make the concrete mixtures more economical, reduce permeability, increase strength, or influence other concrete properties. Typical examples are natural pozzolans, fly ash, ground granulated blast-furnace slag, and silica fume, which can be used individually with portland or blended cement or in different combinations. Chemical admixtures are usually liquid ingredients that are added to concrete to entrain air, reduce the water required to reach a required slump, retard or accelerate the setting rate, to make the concrete more flowable or other more specialized functions.

Approximately 75 percent of the U. S. concrete manufactured is produced at plants that store, convey, measure and discharge these constituents into trucks for transport to a job site. At most of these plants, sand, aggregate, cement and water are all gravity fed from the weigh hopper into the mixer trucks. The concrete is mixed on the way to the site where the concrete is to be poured. At some of these plants, the concrete may also be manufactured in a central mix drum and transferred to a transport truck. Most of the remaining concrete manufactured are products cast in a factory setting. Precast products range from concrete bricks and paving stones to bridge girders, structural components, and panels for cladding. Concrete masonry, another type of manufactured concrete, may be best known for its conventional 8 x 8 x 16-inch block. In a few cases, concrete is dry batched or prepared at a building construction site. Figure 11.12-1 is a generalized process diagram for concrete batching.

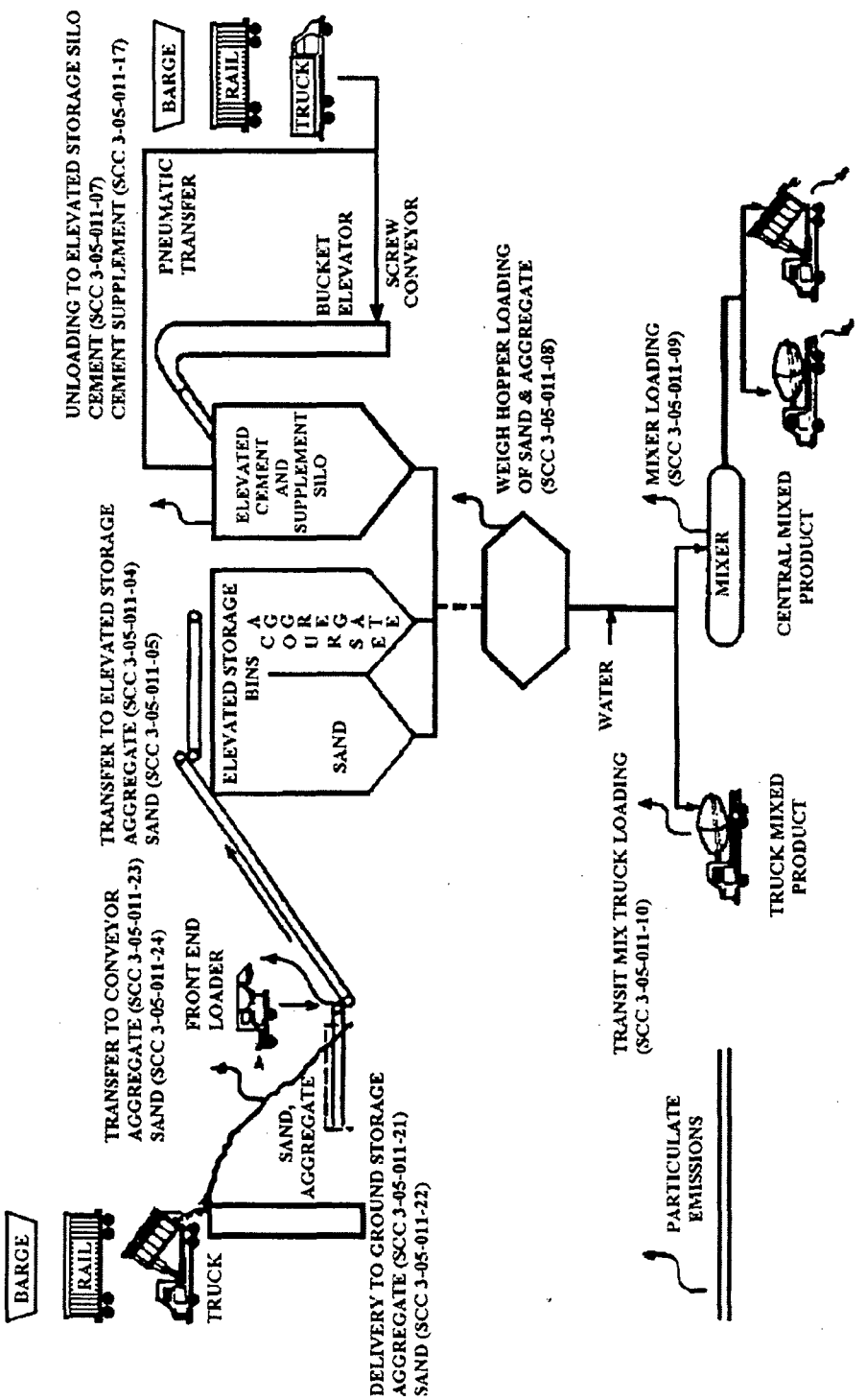
The raw materials can be delivered to a plant by rail, truck or barge. The cement is transferred to elevated storage silos pneumatically or by bucket elevator. The sand and coarse aggregate are transferred to elevated bins by front end loader, clam shell crane, belt conveyor, or bucket elevator. From these elevated bins, the constituents are fed by gravity or screw conveyor to weigh hoppers, which combine the proper amounts of each material.

11.12-2 Emissions and Controls [6-8]

Particulate matter, consisting primarily of cement and pozzolan dust but including some aggregate and sand dust emissions, is the primary pollutant of concern. In addition, there are emissions of metals that are associated with this particulate matter. All but one of the emission points are fugitive in nature. The only point sources are the transfer of cement and pozzolan material to silos, and these are usually vented to a fabric filter or "sock". Fugitive sources include the transfer of sand and aggregate, truck loading, mixer loading, vehicle traffic, and wind erosion from sand and aggregate storage piles. The amount of fugitive emissions generated during the transfer of sand and aggregate depends primarily on the surface moisture content of these materials. The extent of fugitive emission control varies widely from plant to plant. Particulate emission factors for concrete batching are given in Tables 11.12-1 and 11.12-2. Particulate emission factors per yard of concrete for an average batch formulation at a typical facility are given in Tables 11.12-3 and 11.12-4. Metals emission factors for concrete batching are given in Tables 11.12-5 and 11.12-6.

Types of controls used may include water sprays, enclosures, hoods, curtains, shrouds, movable and telescoping chutes, and the like. A major source of potential emissions, the movement of heavy trucks over unpaved or dusty surfaces in and around the plant, can be controlled by good maintenance and wetting of the road surface.

Predictive equations that allow for emission factor adjustment based on plant specific conditions are given in Chapter 13. Whenever plant specific data are available, they should be used in lieu of the fugitive emission factors presented in Table 11.12-1 through 11.12-4.



. Figure 11.12-1. Typical Concrete Batching Process.

TABLE 11.12-1 (METRIC UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING	Total PM	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING
Aggregate transfer [b] (3-05-011-04, -21, 23)	0.0035	D	0.0017	D	ND		ND	
Sand transfer [b] (3-05-011-05, -22, -24)	0.0011	D	0.00051	D	ND		ND	
Cement unloading to elevated storage silo (pneumatic) [c] (3-05-011-07)	0.36	E	0.23	E	0.00050	D	0.00017	D
Cement supplement unloading to elevated storage silo (pneumatic) [d] (3-05-011-17)	1.57	E	0.65	E	0.0045	D	0.0024	E
Weigh hopper loading [e] (3-05-011-08)	0.0026	D	0.0013	D	ND		ND	
Mixer loading (central mix) [f] (3-05-011-09)	0.11	E	0.039	E	0.0056	E	0.0019	E
Truck loading (truck mix) [g] (3-05-011-10)	0.31	D	0.075	D	0.10	D	0.025	D
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data.

[a] All emission factors are in kg of pollutant per Mg of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 846 kg course aggregate, 648 kg sand, 223 kg cement and 33 kg cement supplement. Approximately 75 liters of water was added to this solid material to produce 1826 kg of concrete.

[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42, Section 13.2.2, with $k_{PM-10} = .35$, $k_{PM} = .74$, U = 10 mph, $M_{aggregate} = 1.77\%$, and $M_{sand} = 4.17\%$. The moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.

[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11 and 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average $yard^3$ of concrete. The unit for these emission factors is kg of pollutant per Mg of aggregate and sand.

[f] Reference 9. The emission factor units are kg of pollutant per Mg of cement and cement supplement. Emission factors were developed from a typical central mix operation. The average estimate of the percent of emissions captured during each test run is 94%.

[g] Reference 9 and 10. The emission factor units are kg of pollutant per Mg of cement and cement supplement. Emission factors were developed from two typical truck mix loading operations. Based upon visual observations of every loading operation during the two test programs, the average capture efficiency during the testing was 71%.

TABLE 11.12-2 (ENGLISH UNITS)
EMISSION FACTORS FOR CONCRETE BATCHING [a]

Source (SCC)	Uncontrolled				Controlled			
	Total PM	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING	Total PM	EMISSION FACTOR RATING	Total PM-10	EMISSION FACTOR RATING
Aggregate transfer [b] (3-05-011-04, 21, 23)	0.0069	D	0.0033	D	ND		ND	
Sand transfer [b] (3-05-011-05, 22, 24)	0.0021	D	0.00099	D	ND		ND	
* Cement unloading to elevated storage silo (pneumatic) [c] (3-05-011-07)	0.72	E	0.46	E	0.00099	D	0.00034	D
Cement supplement unloading to elevated storage silo (pneumatic) [d] (3-05-011-17)	3.14	E	1.10	E	0.0089	D	0.0049	E
Weigh hopper loading [e] (3-05-011-08)	0.0051	D	0.0024	D	ND		ND	
Mixer loading (central mix) [f] (3-05-011-09)	0.22	E	0.078	E	0.011	E	0.0038	E
Truck loading (truck mix) [g] (3-05-011-10)	0.61	D	0.15	D	0.21	D	0.051	D
Vehicle traffic (paved roads)	See AP-42 Section 13.2.1							
Vehicle traffic (unpaved roads)	See AP-42 Section 13.2.2							
Wind erosion from aggregate and sand storage piles	See AP-42 Section 13.2.5							

ND = No data.

[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. Loaded material includes course aggregate, sand, cement, cement supplement and the surface moisture associated with these materials. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.

[b] Reference 9 and 10. Emission factors are based upon an equation from AP-42 Section 13.2.2, with $k_{PM-10} = .35$, $k_{PM} = .74$, U = 10 mph, $M_{aggregate} = 1.77\%$, and $M_{sand} = 4.17\%$. The moisture contents of the materials ($M_{aggregate}$ and M_{sand}) are the averages of the values obtained from Reference 9 and Reference 10.

[c] The uncontrolled PM & PM-10 emission factors were developed from Reference 9. The controlled emission factor for PM was developed from References 9, 10, 11 & 12. The controlled emission factor for PM-10 was developed from References 9 and 10.

[d] The controlled PM emission factor was developed from Reference 10 and Reference 12, whereas the controlled PM-10 emission factor was developed from only Reference 10.

[e] Emission factors were developed by using the Aggregate and Sand Transfer Emission Factors in conjunction with the ratio of aggregate and sand used in an average $yard^3$ of concrete. The unit for these emission factors is lb of pollutant per ton of aggregate and sand.

[f] Reference 9. The unit for the emission factors are lb of pollutant per ton of cement and cement supplement. Emission factors were developed from a typical central mix operation. The average of the estimates of the percent of emissions captured during each test run is 94%.

[g] Reference 9 and 10. The emission factor units are lb of pollutant per ton of cement and cement supplement. Emission factors were developed from two typical truck mix loading operations. Based upon visual observations of every loading operation during the two test programs, the average capture efficiency during the testing was 71%.

TABLE 11.12-3 (ENGLISH UNITS)
PLANT WIDE EMISSION FACTORS PER YARD OF TRUCK MIX CONCRETE [a]

	Uncontrolled		Controlled	
	PM (lb/yd^3)	PM-10 (lb/yd^3)	PM (lb/yd^3)	PM-10 (lb/yd^3)
Aggregate delivery to ground storage (3-05-011-21)	0.0064	0.0031	0.0064	0.0031
Sand delivery to ground storage (3-05-011-22)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to conveyor (3-05-011-23)	0.0064	0.0031	0.0064	0.0031
Sand transfer to conveyor (3-05-011-24)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to elevated storage (3-05-011-04)	0.0064	0.0031	0.0064	0.0031
Sand transfer to elevated storage (3-05-011-05)	0.0015	0.0007	0.0015	0.0007
Cement delivery to Silo (3-05-011-07 controlled)	0.0002	0.0001	0.0002	0.0001
Cement supplement delivery to Silo (3-05-011-17 controlled)	0.0003	0.0002	0.0003	0.0002
Weigh hopper loading (3-05-011-08)	0.0079	0.0038	0.0079	0.0038
Truck mix loading (3-05-011-10)	0.17	0.042	0.058	0.014
Total Facility (3-05-011-01)	0.20	0.058	0.090	0.030

TABLE 11.12-4 (ENGLISH UNITS)
PLANT WIDE EMISSION FACTORS PER YARD OF CENTRAL MIX CONCRETE [a]

	Uncontrolled		Controlled	
	PM (lb/yd^3)	PM-10 (lb/yd^3)	PM (lb/yd^3)	PM-10 (lb/yd^3)
Aggregate delivery to ground storage (3-05-011-21)	0.0064	0.0031	0.0064	0.0031
Sand delivery to ground storage (3-05-011-22)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to conveyor (3-05-011-23)	0.0064	0.0031	0.0064	0.0031
Sand transfer to conveyor (3-05-011-24)	0.0015	0.0007	0.0015	0.0007
Aggregate transfer to elevated storage (3-05-011-04)	0.0064	0.0031	0.0064	0.0031
Sand transfer to elevated storage (3-05-011-05)	0.0015	0.0007	0.0015	0.0007
Cement delivery to Silo (3-05-011-07 controlled)	0.0002	0.0001	0.0002	0.0001
Cement supplement delivery to Silo (3-05-011-17 controlled)	0.0003	0.0002	0.0003	0.0002
Weigh hopper loading (3-05-011-08)	0.0079	0.0038	0.0079	0.0038
Central mix loading (3-05-011-09)	0.063	0.022	0.0031	0.0011
Total Facility (3-05-011-01)	0.095	0.037	0.036	0.017

[a] Total facility emissions do not include road dust and wind blown dust. Based upon emission factors presented in Table 11.12-2 and the following composition of one yard of concrete

Coarse Aggregate	1865. pounds
Sand	1428. pounds
Cement	491. pounds
Cement Supplement	73. pounds
Water	20. gallons

TABLE 11.12-5 (METRIC UNITS)
CONCRETE BATCH PLANT METAL EMISSION FACTORS [a]

	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Phosphorus	Selenium	EMISSION FACTOR RATING
Cement Silo Filling [b] (SCC 3-05-011-07)	8.38e-07	8.97e-09	1.17e-07	1.26e-07	3.68e-07	1.01e-04	8.83e-06	5.88e-05	ND	E
w/ Fabric Filter	2.12e-09	2.43e-10	2.43e-10	1.45e-08	5.46e-09	5.87e-08	2.09e-08	ND	ND	E
Cement Supplement Silo Filling [c] (SCC 3-05-011-17)	ND	ND	ND	ND	ND	ND	ND	ND	ND	E
w/ Fabric Filter	5.02e-07	4.52e-08	9.92e-09	6.10e-07	2.60e-07	1.28e-07	1.14e-06	1.77e-06	3.62e-08	E
Central Mix Batching [e] (SCC 3-05-011-09)	1.16e-07	ND	5.92e-09	7.11e-07	1.91e-07	3.06e-05	1.64e-06	1.01e-05	ND	E
w/ Fabric Filter	9.35e-09	ND	3.55e-10	6.34e-08	1.83e-08	1.89e-06	1.24e-07	6.04e-07	ND	E
Truck Loading [g] (SCC 3-05-011-10)	1.52e-06	1.22e-07	1.71e-08	5.71e-06	1.81e-06	3.06e-05	5.99e-06	1.92e-05	1.31e-06	E
w/ Fabric Filter	5.80e-07	5.18e-08	4.53e-09	2.05e-06	7.67e-07	1.04e-05	2.39e-06	6.16e-06	5.64e-08	E

ND = No data.

[a] All emission factors are in kg of pollutant per Mg of material loaded unless noted otherwise. The average solid material composition of concrete batches presented in references 9 and 10 was 846 kg course aggregate, 648 kg sand, 223 kg cement and 33 kg cement supplement. Approximately 75 liters of water was added to this solid material to produce 1826 kg of concrete.

[b] The uncontrolled emission factors were developed from Reference 8. The controlled emission factors were developed from Reference 9 and 10. Although controlled emissions of phosphorous compounds were below detection, it is reasonable to assume that the effectiveness is comparable to the average effectiveness (98%) for the other metals.

[c] Reference 10.

[d] Reference 9. The emission factor units are kg of pollutant per Mg of cement and cement supplement. Emission factors were developed from a typical central mix operation. The average estimate of the percent of emissions captured during each test run is 94%.

[e] Reference 9 and 10. The emission factor units are kg of pollutant per Mg of cement and cement supplement. Emission factors were developed from two typical truck mix loading operations. Based upon visual observations of every loading operation during the two test programs, the average capture efficiency during the testing was 71%.

TABLE 11.12-6 (ENGLISH UNITS)
CONCRETE BATCH PLANT METAL EMISSION FACTORS [a]

	Arsenic	Beryllium	Cadmium	Chromium	Lead	Manganese	Nickel	Phosphorus	Selenium	EMISSION FACTOR RATING
Cement Silo Filling [b]										
(SCC 3-05-011-07)	1.68e-06	1.79e-08	2.34e-07	2.52e-07	7.36e-07	2.02e-04	1.76e-05	1.18e-05	ND	E
w/ Fabric Filter	4.24e-09	4.86e-10	4.86e-10	2.90e-08	1.09e-08	1.17e-07	4.18e-08	ND	ND	E
Cement Supplement Silo Filling [c]										
(SCC 3-05-011-17)	ND	ND	ND	ND	ND	ND	ND	ND	ND	E
w/ Fabric Filter	1.00e-06	9.04e-08	1.98e-08	1.22e-06	5.20e-07	2.56e-07	2.28e-06	3.54e-06	7.24e-08	E
Central Mix Batching [d]										
(SCC 3-05-011-09)	2.32e-07	ND	1.18e-08	1.42e-06	3.82e-07	6.12e-05	3.28e-06	2.02e-05	ND	E
w/ Fabric Filter	1.87e-08	ND	7.10e-10	1.27e-07	3.66e-08	3.78e-06	2.48e-07	1.20e-06	ND	E
Truck Loading [e]										
(SCC 3-05-011-10)	3.04e-06	2.44e-07	3.42e-08	1.14e-05	3.62e-06	6.12e-05	1.19e-05	3.84e-05	2.62e-06	E
w/ Fabric Filter	1.16e-06	1.04e-07	9.06e-09	4.10e-06	1.53e-06	2.08e-05	4.78e-06	1.23e-05	1.13e-07	E

ND = No data.

[a] All emission factors are in lb of pollutant per ton of material loaded unless noted otherwise. The average material composition of concrete batches presented in references 9 and 10 was 1865 lbs course aggregate, 1428 lbs sand, 491 lbs cement and 73 lbs cement supplement. Approximately 20 gallons of water was added to this solid material to produce 4024 lbs (one cubic yard) of concrete.

[b] The uncontrolled emission factors were developed from Reference 8. The controlled emission factors were developed from Reference 9 and 10. Although controlled emissions of phosphorous compounds were below detection, it is reasonable to assume that the effectiveness is comparable to the average effectiveness (98%) for the other metals.

[c] Reference 10.

[d] Reference 9. The unit for the emission factors are lb of pollutant per ton of cement and cement supplement. Emission factors were developed from a typical central mix operation. The average of the estimates of the percent of emissions captured during each test run is 94%.

[e] Reference 9 and 10. The emission factor units are lb of pollutant per ton of cement and cement supplement. Emission factors were developed from two typical truck mix loading operations. Based upon visual observations of every loading operation during the two test programs, the average capture efficiency during the testing was 71%.

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Review Paper
see specific reference

SPECIAL REPORT

Volatile Emissions During Thermoplastics Processing—A Review

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ABSTRACT

Types and amounts of volatiles emitted during thermoplastics processing depend upon the chemical structure of the material and the choice of processing conditions. The identification of volatiles and the development of analytical techniques for measuring their concentration in the workplace are of paramount importance to establish or revise threshold limit values that would minimize exposure to hazardous chemical substances and lead to corrective action. In this review, information related to the types of volatiles emanating from injection molding machines and extruders as well as analytical methods for their measurement was collected, analyzed, and tabulated. Emphasis was placed on the four major commodity plastics, viz., polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), and polystyrene (PS). Although the main emphasis is on emissions during processing, related literature under simulated conditions is also mentioned.

Background

More than 65% of all thermoplastic products produced in the U.S. are processed by two major processing operations: extrusion and injection molding. As the plastics processing industry has grown to its present size there has been an increasing interest on the part of government agencies that have regulatory responsibilities. The Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) have been concerned with a number of potential problems related to emissions in the plastics processing industry whereas the Food and Drug Administration (FDA) is mostly concerned with the suitability of plastics products for food and drug packaging and consumer usage.

Plastics processing operations produce air emissions, waste water, and solid waste resulting from both polymers and additives. The emissions into the air consist of both volatiles and particulates at levels that can be as high as 5% of the actual ton-

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TABLE I
Extrusion Point Source Emissions*

	Storage, Blending, and Grinding	Extruder	Sheet Finishing Rolls	Pelletizing, Cutting, and Trimming
Particulates				
Polymer	×			×
Additives	×			×
Volatiles				
Monomer		×	×	
Moisture		×		
Additives		×		
Solvent		×		
Decomposition products		×		

* Adapted from Ref. 2, p. 144.

nage of resins processed annually in the U.S.[1] With respect to the principal thermoplastics processing operations, all steps of extrusion and injection molding have the potential to release particulates and/or volatiles. Tables I and II summarize the sources and types of air emissions in extrusion and injection molding operations, respectively.[2]

Types and amounts of volatile organic compounds (VOCs) emitted during thermoplastics processing would obviously depend upon a variety of material related factors such as type of resin and its degree of dryness, residual monomer content, degree of stabilization, and presence of additives. Processing conditions, in particular residence time and temperature, are most important as well as equipment variables (screw design, venting). Depending on the processing plant capacity to emit VOCs, plants in metropolitan U.S. areas are soon to face strict "Clean Air Act" rules particularly as related to smog-creating emissions. Emissions beyond threshold levels may require special permits and pollution control methods. Industry has already begun studies to calculate emission rates for many resins and data are available to processors that need them when applying for permits. For example, studies on ABS (acrylonitrile–butadiene–styrene polymer) indicate 180 μg of VOC emissions per gram of resin with ethyl benzene being the major component.[3] Resin manufacturers have begun providing such data in their product documentation.

Volatiles are usually emitted during extrusion and injection from heated cylinders and molds and may consist of residual monomers, moisture, solvents, decomposition products of thermoplastic resins and their additives, or even the actual additives if high processing temperatures are used. Workers in processing plants may be exposed to a variety of hazardous chemical substances and volatiles which may not be regulated at the present time. The highest processing temperatures reached by the normal extrusion/injection molding

TABLE II
Injection Molding Point Source Emissions*

	Hopper	Heating/Injection System	Mold	Trimmer	Grinder
Particulates					
Polymer	×			×	×
Additives	×			×	×
Volatiles					
Monomer		×	×		
Additives		×	×		
Decomposition products		×	×		

* Adapted from Ref. 2, p. 279.

of most thermoplastics are, in principle, well below their decomposition temperature at which volatiles begin to form. However, for some resins, decomposition products may be formed at the high end of processing temperatures; for example, HF for some fluoroplastics processed at 330°C, acetaldehyde for polyesters processed at about 300°C, carbon oxides, ammonia and water for some nylons processed at about 310°C, HCl for PVC processed above 210°C.[2] Indeed, resin manufacturers may conduct tests at temperatures slightly above the maximum recommended melt temperature to determine level of volatiles (worst case scenario); such experiments for a particular grade of nylon-66 indicated that CO levels fell well below the permissible exposure limit not only during molding but also during purging.[4]

With respect to additives, it is possible that certain antioxidants and UV stabilizers such as 2,6-di-tert-butyl-4-methyl phenol (BHT), tris-nonylphenyl phosphite, and 2-hydroxy-4-octoxybenzophenone may volatilize at processing temperatures exceeding 265°C. Other air emissions from additives could include low molecular weight plasticizers that tend to volatilize at fairly low processing temperatures and chemical blowing agents which produce mixtures of gases that may contain N_2, CO, CO_2, NH_3, etc.[5]

The identification of volatiles and the development of analytical techniques for measuring their concentration in the workplace are of paramount importance to establish or revise threshold limit values that would minimize overexposure and lead to corrective action. In this review, resulting from a comprehensive, on-line search of the U.S. and worldwide literature, information related to the types and measurement of volatiles emanating from injection molding machines and extruders during thermoplastics processing was collected and tabulated. Emphasis was placed on the four major commodity plastics, viz., polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), and polystyrene (PS). Although the emphasis is on emissions during processing, related literature under simulated conditions is also mentioned.

TABLE III
Volatiles Emanating During Processing of PE (Polyethylene)

Plastic	Volatile Products		Conditions/Remarks	Ref. #
LDPE	acetaldehyde	formic acid	Unstabilized PE	6
	formaldehyde	acetic acid		
	propanal	propionic acid	Thermal oxidation in air at	
	acrolein	acrylic acid	264–289°C in a tube for	
	butanal	butyric acid	4 min	
	pentanal	cyclopropane		
	acetone	furan		
	2-butanone	THF		
	2-pentanone	iso-butanal		
	isovaleric acid	methyl vinyl ketone		
	hydroxyvaleric acid	valerolactone		
	crotonic acid	butyrolactone		
	caproic acid	water		
LDPE	carbon monoxide (30 ppm,[a] 70 ppm[b])		113-mm extruder	7
	formaldehyde (0.7 ppm,[a] 1.1 ppm[b])			
	acrolein (0.02 ppm,[a] 0.1 ppm[b])			
LDPE	carbon monoxide (0.0 ppm,[c] 1.0 ppm[d])		extruder coater (paper coating)	
PE–peroxide	methane		(PE + 2% dicumyl peroxide	8
	phenyl acetate		in a sealed ampule	
	α,α-dimethylbenzyl alcohol		under N_2 at 140°C)	
PE	carbon monoxide		Blending, molding, compression	9

Die temperature [a]220°C; [b]290°C; [c]295–300°C; [d]318–320°C

TABLE IV
Volatiles Emanating During Processing of PP (Polypropylene)

Plastic	Volatile Products		Conditions/Remarks	Ref. #
i-PP	Acetaldehyde Formaldehyde α-Methyl acrolein Acetone 2-Butanone 2-Pentanone Methylcyclopropyl ketone Acetyl acetone 1-Hydroxy-2-propanone	Formic acid Acetic acid Water 2-Methyl(2-propen-1-ol) 2,5-Dimethyl furan Methyl formate	Unstabilized PP, thermal oxidation in air at 220–280°C in a tube for 2 min	6
PP	Carbon monoxide (30 ppm) Formaldehyde (0.2 ppm) Acrolein (<0.01 ppm)		Extruder (film making), die temp. = 220°C	7

Discussion/Remarks

TYPES OF VOLATILES

Polyolefins

Tables III and IV summarize available information on the types of volatiles emitted during actual and simulated processing of PE and PP, respectively. The tables emphasize that a large variety of hazardous chemicals may be formed depending on stabilization levels and processing conditions. Specific information on evolution of carbon monoxide from various polymers, including polyolefins, is given in Tables V and VI. Laboratory conditions for evolution of aldehydes and their corresponding concentrations from polyolefins are summarized in Table VII.

PVC

Table VIII gives available information on the types of volatiles emitted during actual and simulated processing of PVC. Volatiles may consist of additives and their decomposition products as well as the degradation products of the resin. Typical concentrations of volatiles (HCl, plasticizer, and its decomposition product) are shown in Table IX, not only for extrusion and injection molding, but also other manufacturing processes. Specific information on evolution of carbon monoxide from various polymers, including PVC, can be found in Tables V and VI.

TABLE V
Evolution of Carbon Monoxide in the Upper Part of the Processing Temperature Range (ppm) [Ref. 7]

Polymer	200°C	250°C	260°C	270°C	280°C	290°C	300°C	310°C	320°C	330°C	340°C	350°C	400°C
LD Polyethylene	0	50	50	50	70	120	210	390	800	3000	5000	5400	2500
HD Polyethylene	20	30	50	50	60	90	100	100	100	150	130	50	12000
EVA (4% VA)	0	100	100	120	160	180	410	800	5000	6000	7000	6000	2500
Polypropylene	20	90	100	150	250	410	550	700	950	1100	1100	800	150
PVC	0	40	50	100	100	100	100	110	110	110	120	120	120
Polystyrene	0	10	20	20	20	30	30	40	40	50	70	100	800
PMMA	0	0	0	0	10	40	70	80	80	100	100	90	30
Polycarbonate	0	0	0	0	0	0	0	0	0	20	20	20	240
PET	0	0	0	40	50	80	100	120	150	190	230	300	1600
Nylon 6.6	20	20	30	30	30	30	50	50	70	70	80	200	1400
ABS	0	0	0	0	0	0	0	20	20	30	30	30	120
Wood (fir)	0	120	250	500	2000	3800	4600	5000	2700	1300	150	150	400

TABLE VI
Carbon Monoxide Evolution in the Melting and Processing Temperature Range of Various Plastics [Ref. 7]

Material	Tm (°C)	Tg (°C)	Compression Molding (°C)	Injection Molding (°C)	Extrusion (°C)	Onset of CO Evolution (°C)	CO can reach 500 ppm (°C)
LD Polyethylene	110–130	—	135–180	150–315	150–340	220	315
HD Polyethylene	120–140	—	150–230	150–315	150–340	200	375
EVA (4% VA)	90	—	90–150	120–220	150–220	220	305
Polypropylene	176	—	170–235	205–290	220–310	200	290
PVC	—	75–105	140–220	165–195	150–210	240	>450
Polystyrene	—	100	130–205	165–260	190–255	240	380
PMMA	—	90–105	150–220	165–260	205–260	280	never
Polycarbonate	—	150	150–325	250–345	230–290	330	410
PET	258	—	—	290–315	230–320	280	375
Nylon 6,6	265	—	—	270–325	270–330	200	355
ABS	—	88–120	165–235	195–275	200–235	310	420

The processing temperatures were obtained from the *Modern Plastics Encyclopedia*, 1978.

Polystyrene

Table X summarizes available information on the types of volatiles emitted during actual and simulated processing of PS. Table XI contains an analysis of the various hydrocarbons formed above an extruder die. Specific information on evolution of carbon monoxide from PS, along with other polymers, can be found in Tables V and VI.

ANALYTICAL METHODS

Table XII lists analytical methods that have been used to measure volatiles emanating during processing of PE, PP, PVC, and PS. A wide variety of chemical as well as instrumental methods have been utilized to identify/quantify volatile components. Instrumental methods include:

- Gas chromatography (GC)/mass spectroscopy (MS) with multiple-ion detector (MID);
- GC with FID (flame ionization detector), flame-photometric detector, or ECD (electron capture detector);
- Head-space GC;
- Pyrolyzer-GC/MS;
- Time-of-flight MS (TOFMS);
- High pressure liquid chromatography;
- Infrared spectroscopy;

TABLE VII
Evolution of Aldehydes from Heated Polyolefins in Air [Ref. 7]

	Formaldehyde (TLV 3.0 mg/m³ or 2.0 ppm)											
	170°C		200°C		240°C		280°C		320°C		360°C	
LDPE	0.1	(0.1)	0.3	(0.2)	0.5	(0.4)	1.9	(1.5)	0.7	(0.6)	0.6	(0.5)
HDPE	—	—	0.3	(0.2)	0.5	(0.4)	0.6	(0.5)	0.5	(0.4)	0.6	(0.5)
PP	—	—	0.7	(0.6)	1.6	(1.3)	1.5	(1.2)	0.7	(0.6)	0.6	(0.5)
	Acrolein (TLV 0.25 mg/m³ or 0.1 ppm)											
	170°C		200°C		240°C		280°C		320°C		360°C	
LDPE	None detected at these temps.						1.0	(0.4)	1.9	(0.8)	12.8	(5.5)
HDPE	—	—	0.4	(0.2)	0.6	(0.3)	3.6	(1.5)	4.4	(1.9)	4.6	(2.0)
PP	—	—	0.1	(0.04)	0.1	(0.04)	0.2	(0.1)	0.6	(0.3)	1.7	(0.7)

The concentrations are in mg/m³ for 10 g polymer averaged over 50 min. The equivalent in parts per million appears in parentheses. All tests were carried out with a 5 g sample in an unstirred shallow well in a heated steel plate.

TABLE VIII
Volatiles Emanating During Processing of PVC (Polyvinyl Chloride)

Volatile Products	Conditions/Remarks	Ref.
Hydrogen chloride (170 ppm) Benzene (~2 ppm)	Using TG at 205°C (no HCl detected in moving furnace. HCl evolution time dependent at set temp.)	7
Free alcohol Mercaptoester } (of stabilizer)	Clear PVC odor during extrusion	10
Phthalic anhydride	GC-ECD (electron capture detector)	11
Chloroethylene Benzene Chloromethylbenezene Dioxolanes	pyrolyzer–GC/MS at 150–200°C for 5–20 min	12
Paraffinic hydrocarbons Naphthenic hydrocarbons Olefinic hydrocarbons Alkyl benzenes Chlorine HCl HCN C_2H_3Cl	Boot manufacture from PVC, emissions begin at 150–170°C	13, 14
Plasticizers	Lab oven tests for plasticizer type, temp., etc.	15
Residual catalysts and their decomposition products, solvents, thermal degradation products, mixtures of antioxidants, and monomer impurities	PVC processing	16
DOP (dioctyl phthalate) (<200°C) (plasticizer) DOP HCl acrolein benzene 2-ethylhexanol } at >200°C	Pilot plant at 180–230°C, 3 domestic PVC granulates for cables	17
Dioctyl phthalate (0.03–0.1 g/kg) benzene toluene } trace xylene HCl VC monomer } practically absent	Plasticized PVC—for electric cables	18
Dichloroethane	Emissions from PVC plant	19
HCl DOP (dioctyl phthalate) Phthalic anhydride	Extrusion (150–200°C) Injection molding (180–190°C) Calenderng (130–200°C) Hot embossing (~180°C) Thermoforming (120–130°C) Compression molding (150°C) Compounding, etc. (120°C)	20
Vinyl chloride DOP (dioctyl phthalate)	General list of volatiles from plastics and rubbers (by RAPRA)	21

TABLE IX
Concentrations of Impurities in Workplace Air in the PVC Processing Industry [Ref. 20]

Processing Method	Hydrogen Chloride ($mg\ m^{-3}$)	DOP ($mg\ m^{-3}$)	PA ($\mu g\ m^{-3}$)	Processing Temperature (°C)	Amount of Plasticizer (%)
Extrusion	0.15 ± 0.06 (6)	0.05 ± 0.03 (4)	—[a]	150–200	2.4
Extrusion	0.09 ± 0.10 (3)	0.3 ± 0.2 (5)	0.3 ± 0.5 (16)	150–195	nk
Calendering	0.15 ± 0.03 (6)	0.5 ± 0.5 (7)	0.2 ± 0.1 (8)	130–200	6.5–15
Hot embossing	0.03 ± 0.02 (2)	0.05 ± 0.02 (5)	—[a]	~180	nk
Welding	0.3 ± 0.02 (3)	0.3 ± 0.05 (4)	5.0 ± 2.0 (4)	400 (at lamp)	nk
Injection molding	0.05 ± 0.00 (2)	0.02 ± 0.01 (2)	<0.02 (2)	180–190	nk
Compounding	—[a]	0.02 ± 0.01 (5)	—[a]	120	20
Thermoforming	—[a]	0.02 ± 0.02 (2)	0.1 ± 0.05 (2)	120–130	nk
High-frequency welding	<0.03 (2)	±0.02	—[a]	nk	nk
Spread coating	—[a]	—[b]	1.2 ± 0.2 (4)	160–205	35 (DINP)
Blow molding	0.05 ± 0.02 (2)	—[c]	—[c]	150–190	—
Compression molding	0.04 ± 0.01 (2)	—[c]	—[c]	150	—

The results are given as the mean ± SD (number of samples).
[a] Not measured.
[b] Di-isononylphthalate (DINP) plasticizer.
[c] Unplasticized PVC.
DOP: dioctyl phthalate.
nk: Not known.
PA: phthalic anhydride.

TABLE X
Volatiles Emanating During Processing of PS (Polystyrene)

Volatile Products	Conditions/Remarks	Ref. #
Benzene (<1 ppm) Styrene (<50 ppm)	TG at 260°C	7
Styrene Carbon monoxide	Blending, molding	9
Styrene Benzene Ethyl benzene Toluene Carbon monoxide	Injection molding at 200–300°C for 0.5–5 min	22
Benzene Toluene Ethylbenzene Propylbenezene Isopropylbenzene Styrene Phenyl acetate α-Methylstyrene Benzaldehyde H_2S SO_2 } (>250°C)	Food grade PS 200–280°C	23
Styrene, ethylbenzene, benzene, xylenes, toluene, nonaromatics C_4–C_5, hydrocarbons C_9 +	Air above die during extrusion of PS containing 0.18% styene	24

TABLE XI
Analysis of the Air above the Die During PS Extrusion[a] [Ref. 24]

Component	Relative Concentration (%)	Concentration in Air (ppm)
Styrene	24.5	4.27
Ethylbenzene	16.9	2.66
Benzene	1.8	0.32
Xylenes	2.4	0.42
Toluene	0.06	0.11
Nonaromatics C_4–C_8[b]	3.8	0.67
Hydrocarbons C_9–[b]	50.6	8.86
Total	100.0	17.32

[a] Polystyrene containing 0.18% styrene.
[b] These were presumably evolved from the additive present.

- Colorimetry;
- Polarography.

Advances in gas and liquid chromatography and the availability of new detectors and packing materials combined with computerized data acquisition and statistical analysis methods have made these complex analyses faster and easier.

COMMENTS ON REFERENCES LISTED IN TABLES III–XII

Polyolefins/PS/Miscellaneous

During thermal oxidation of unstabilized LDPE in air at 264–289°C for 4 min in a tube, 44 compounds representing hydrocarbons, alcohols, aldehydes, ketones, acids, cyclic ethers, and esters were identified using GC/MS (gas chromatography/mass spectrometry) equipped with MID.[6] In case of unstabilized PP under similar conditions at 220–280°C for 2 min in air, 23 products were identified.[6] Water was found to be the main product of thermal oxidation of PP, while organic volatiles constitute about 3% of the amount of water.

Above 200°C and in air, a wide range of plastics like PE, PP, PVC, PS, etc., evolve carbon monoxide.[7] Polyolefins also evolve formaldehyde and acrolein. Tests in the vicinity of four different extruders have confirmed small (below threshold) quantities of these volatiles, which can be controlled easily using adequate ventilation.

Krynska et al.[25] heated the plastics viz., PE, PP, PC (polycarbonate), and PA (polyamide) in an autoclave, collected the products of decomposition, and analyzed by GC, spectrophotometry, and colorimetry. The evolution of monomers and CO,[9] during the processing (blending, molding, compression, etc.) of granular PE, PS, or powder phenolics can be reduced by carefully controlling the temperatures of these operations.

Mal'tseva et al.[23] have analyzed hydrocarbon volatiles from food grade PS at processing temperature 200–280°C by GC with H-flame ionization detector and sulfur compounds by GC with flame-photometric ionization detector. At 200°C, H_2S and SO_2 are practically absent, while at >250°C their amount increases.

Shaposhnikov et al.[26] have described the use of chemical, polarographic, spectrophotometric, and chromatographic methods for analysis of volatile products escaping into the atmosphere during the processing of PP, PVC, and ABS. The degassing of PE, PS, PVC, polyamides, poly(styrene/acrylonitrile) (SAN), and polycarbonates in driers and extruders operated in vacuo has been discussed by Czabon et al.[29] The driers were located ahead of the extruder.

Darivakis et al.[30] have studied release rates of condensables and total volatiles (by gravimetry) from rapid devolatilization (100°C/s) of PE and PS samples of different particle size. No identification of volatiles has been reported.

Seymour et al.[24] have reported that tests for the presence of styrene monomer show that emissions during plant extrusion and injection molding of PS are negligible and readily handled by fume-removal equipment. No styrene monomer was detected during the injection molding of commercial PS. They observed that there is some loss of the

TABLE XII
Analytical Methods Used for the Measurement of Volatiles Emanating During Processing of PE, PP, PVC, and PS

Plastic	Analytical Method	Conditions/Remarks	Ref. #
LDPE i-PP	GC/MS	Separation on silanized glass columns. MS with MID (multiple-ion detector)	6
PE, PP PVC, PS	Nondispersive IR gas analysis Colorimetric Drager tubes HPLC	IR for CO and CO_2 Colorimetry for aldehydes	7
PE, PP	GC, spectrophotometry, colorimetry	Heated in an autoclave	25
PE	GC	PE + 2% dicumyl peroxide in a sealed ampule under N_2 at 140°C	8
PP, PVC	Polarography, spectrophotometry, chromatography, chemical methods	Processing	26
PS	GC	4 columns of varying polarity, processing	27
PS, SAN	Chromatography, colorimetry	Injection molding at 200–300°C for 0.5–5 min	22
PS	GC-H-FID GC-flamephotometric ionization detector	For hydrocarbons For sulfur compounds	23
PVC	GC-ECD (Electron Capture Detector)	Dust, vapor, fume of phthalic anhydride collected on a porous adsorbent combined with filter sampling	11
PVC	Pyrolyzer—GC/MS	150–200°C for 5–20 min	12
PVC	GLC–FID/MS	150–170°C up to 400°C, boot manufacture from PVC	13, 14
PVC	Lab oven with air convection	Plasticizers type, temp., etc.	15
PVC	GC/MS	Gaseous products isolation in dynamic system; also, products absorbed in charcoal tubes and desorbed with CS_2	16
Plasticized PVC	GC-FID	Plant emissions passed through 3 bubblers containing DMF, followed by GC-FID, with 15% neopentyl glycol succinate on Chromosorb W at 50°C and 7.5 mL N/min	19
Plasticized PVC	For HCl: Cl^- electrode DOP: LC, reversed phase C-18 column, UV detector at 230 nm Phthalic anhydride: GC-ECD at 320°C, fused silica capillary column	Sampling: For HCl: collected into impingers containing 15 mL absorption liquid (KNO_3 + $Pb(NO_3)_2$) DOP: collected into Florisil adsorption tubes and eluted with acetonitrile Phthalic anhydride: drawing air through Tenax tubes, then desorbing with methyl-t-butylether	20
PS	Adsorption on charcoal/desorption by CS_2; GC	Air above extruder die or injection mold cavity was passed through charcoal, adsorbate was desorbed by CS_2 and analysis by GC	24
Automotive plastics (interior)	Head-space GC	Crushed sample in a closed head-space sample tube (1 g/10 mL tube volume) heated at 120°C for 5 h, followed by GC-FID	28

volatiles contained in PS during injection molding and extrusion, the loss being related to the magnitude of the initial volatile content of PS. Concentrations of styrene up to ~5 ppm were present in the air directly above the extruder die. A complete analysis of the air is given in Table XI. No styrene was detected at the cutter, along the side of the sheet during extrusion, at the ceiling level above the extruder, nor in the office adjacent to the plant.

Willoughby[31] has mentioned that there are well-established analytical procedures for determining the airborne concentrations of most of the hazardous materials commonly incorporated into rubbers and plastics, e.g., use of single beam IR spectroscopy for styrene, vinyl chloride, chloroprene, and solvent vapors. Gas chromatography has been utilized for the determination of airborne vinyl chloride and beta-naphthylamine (an antioxidant) and for various monomers when dissolved in their polymers. UV spectroscopy has been used for the determination of polycyclic aromatics and optical microscopy for the determination of asbestos.

Schmidt and Lubmann-Geier[29] have described a head-space GC with FID for collecting and analyzing volatiles from the plastics used in the interiors of cars. Grotheer and Smith[31] have developed an apparatus for the characterization of the volatile constituents of polymeric materials. The diffusion rates of volatiles in a vacuum were determined for an ethylene/vinyl acetate/vinyl alcohol terpolymer by using time-of-flight MS. By utilizing ASTM E595-77, the condensable and noncondensable volatile content was determined. Infrared and mass spectroscopy of the condensed material from the terpolymer indicated the presence of phenyl stearate, which is apparently a reaction product of stearic acid (plasticizer) and phenol [released from the DuPont cross-linking agent Hylene MP (phenol endcapped 4,4'-methylene bis(phenyl isocyanate))].

Additional information related to the emissions from polyolefins/polystyrene under processing conditions can be found in References 32–35. General additional information can be found in References 36–39.

PVC

Shirokov et al.[13,14] reported that clinical tests on the cardiovascular and nervous systems of workers exposed to ~1 year in the manufacture of boots from PVC showed a tendency for hypotonia and decreased pulse pressure. Above 150–170°C, they have reported the emissions of paraffinic, naphthenic, and olefinic hydrocarbons, alkylbenzenes, Cl_2, HCl, HCN, and C_2H_3Cl, as determined by GC/MS.

Usmani[1] has described laboratory and pilot-plant methods for obtaining data on the kinds and amounts of chemicals emitted during PVC processing. Various techniques available for sampling different types of leaks which would then be run through a GC/MS system include: (a) the dilution or flow-through sampling method; (b) packed porous polymer tube samples: and (c) passive dosimeters. Poppe[15] developed a technique for the study of volatile loss of plasticizers during PVC plastisol processing, which consisted of a laboratory oven with considerable air convection. The influence of plasticizer type, temperature, etc., can be studied using this method.

Gaseous products, liberated during processing of PVC, were isolated in a dynamic system, separated, and identified by GC/MS.[16] The liberated gaseous products consisted of residual catalysts, their decomposition products, solvents, products of thermal decomposition of PVC, and mixtures of antioxidants and monomer impurities.

Pilot plant studies on three PVC granulate samples used for cables showed emission of only plasticizer dioctyl phthalate (DOP) at <200°C; however, between 200 and 230°C, the air pollutants besides plasticizer were: HCl, acrolein, benzene, and 2-ethylhexanol.[17] During the processing of plasticized PVC used for cables, the plasticizer DOP was found to be 0.03–0.1 g/kg of PVC, along with traces of benzene, toluene, and xylene, while HCl and vinyl chloride monomer were practically absent.[18]

Gas emissions from a plasticized PVC processing plant were passed at 0.5 L/min through three bubblers containing dimethyl formamide (DMF). After 10–100 min, all organic components were identified and determined in a GC-FID, with 15% neopentyl glycol succinate on Chromosorb W at 50°C and 7.5 mL N_2/min. The major component was dichloroethane.[19]

Vainiotalo and Pfaffli[20] have reported emissions from 12 PVC plants, at which 11 different processing methods, viz., extrusion, calendering, hot embossing, welding, injection molding, compounding, thermoforming, high frequency welding, spread coating, blow molding, and compression molding, were in use. The concentrations of impurities detected, viz., HCl, DOP, and phthalic anhydride (decomposition product of the plasticizer

DOP) in the workplace air of these plants are given in Table IX, and were far below the hygienic standards. Sampling and analysis methods for these three impurities have been described in detail.

Additional information related to the emissions from PVC under processing conditions can also be found in References 34, and 40.

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ATTACHMENT B

MSDS FOR PVC RESIN

OXYVINYLS™

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MSDS NUMBER : M40722 ISSUE DATE : 09-11-01

PRODUCT NAME : OXYVINYLS(TM) PVC HOMOPOLYMER RESIN (PRIME GRADES)

Manufacturer's Name and Address : Oxy Vinyls, LP
5005 LBJ Freeway, LB30
Dallas, TX 75380 (Telephone) 972-720-7000

24 HOUR EMERGENCY TELEPHONE : 1-800-733-3665 OR 972-404-3228

TO REQUEST AN MSDS : 1-800-699-4970

CUSTOMER SERVICE : 1-877-699-8465

PRODUCT USE : Vinyl Fabrication

CHEMICAL NAME : Ethene, chloro-, homopolymer

CHEMICAL FORMULA : (C2H3Cl)n

SYNONYMS/COMMON NAMES : Polyvinyl chloride

2. COMPOSITION/INFORMATION ON INGREDIENTS

CAS NUMBER / NAME
9002-86-2 Ethene, chloro-, homopolymer

EXPOSURE LIMITS	PERCENTAGE	
PEL: Not Established	VOL	ND
TLV: Not Established	WT	99.9
PELZ2:Not Established		

COMMON NAMES:
Polyvinyl chloride

Listed On(List Legend Below):
00 19 22 23

- -

LIST LEGEND

00 TSCA INVENTORY	19 PA REQUIREMENT- 3% OR GREATER
22 CANADIAN DOMESTIC SUB LIST	23 NJ REQUIREMENT- 1% OR GREATER

3. HAZARDS IDENTIFICATION

********** EMERGENCY OVERVIEW **********

* FUMES PRODUCED IN PROCESSING MAY IRRITATE THE EYES AND RESPIRATORY TRACT

* White powder or granules

****

POTENTIAL HEALTH EFFECTS

ROUTES OF ENTRY:

Inhalation, Ingestion.

TARGET ORGANS:

None known.

IRRITANCY:

Fumes produced in processing may irritate the eyes and respiratory tract.

SENSITIZING CAPABILITY:

None known.

REPRODUCTIVE EFFECTS:

None known.

CANCER INFORMATION:

Contains a carcinogen below the reportable 0.1% by weight value.

SHORT-TERM EXPOSURE (ACUTE)

INHALATION:

Fumes produced in processing may irritate the eyes and respiratory tract

EYES:

Fumes produced in processing may irritate the eyes and respiratory tract

SKIN:

None known.

INGESTION:

Not a likely route of exposure.

REPEATED EXPOSURE (CHRONIC)

May be irritating.

3. HAZARDS IDENTIFICATION (Continued)

SYNERGISTIC MATERIALS:

None known.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:

None known.

4. FIRST AID MEASURES

EYES:

Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN:

Wash thoroughly with soap and water after handling.

INHALATION:

Remove to fresh air if safe to transport. Otherwise attempt to provide fresh air by ventilation. If breathing is difficult, have a trained person administer oxygen. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY (911 or emergency transport services).

INGESTION:

Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. Give large quantities of water. (If available, give several glasses of milk.) If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

NOTES TO PHYSICIAN:

No specialized procedures. Treat for clinical symptoms.

5. FIRE FIGHTING MEASURES

Flash Point: 391°C (736°F)

Method: ASTM D1929

Autoignition Temperature: 454°C (849°F)

5. FIRE FIGHTING MEASURES (Continued)

FLAMMABLE LIMITS IN AIR, BY % VOLUME

Upper: Not determined
Lower: Not determined

EXTINGUISHING MEDIA:

Water is most effective. ABC dry chemical, AFFF and protein type air foams are also effective.

FIRE FIGHTING PROCEDURES:

Keep unauthorized personnel removed and upwind. Wear NIOSH/MSHA approved positive pressure self-contained breathing apparatus and full protective clothing.

FIRE AND EXPLOSION HAZARD:

This product is nonflammable and nonexplosive under normal conditions of use. At high temperatures this product can decompose to give off hydrochloric acid and gas.

The minimum ignition energy for explosion of resin dust is much higher than that of natural materials such as corn starch and flour and also exceeds those of other plastic materials. Care should be taken in addressing ignition sources in working and handling areas.

Smoke generated when resin burns is within the narrow limits of toxicity of smoke from all commonly used materials. The primary toxic combustion products are carbon monoxide and hydrogen chloride. Carbon monoxide is an asphyxiant generated by all natural and synthetic organic materials from incomplete combustion and is the principal toxicant in fire atmospheres. The doses of carbon monoxide and hydrogen chloride needed to cause lethality are very similar. Resin combustion products include many other compounds, such as carbon dioxide and water from complete combustion, but do not include phosgene, acrolein, or vinyl chloride.

SENSITIVITY TO MECHANICAL IMPACT:

Not applicable.

SENSITIVITY TO STATIC DISCHARGE:

Electrostatic charge may build up during handling. Grounding of equipment is recommended.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS:

Evacuate unnecessary personnel and eliminate all sources of ignition.

ENVIRONMENTAL PRECAUTIONS:

Contain spill with dike to prevent entry into sewers or waterways.

6. ACCIDENTAL RELEASE MEASURES (Continued)

TCLP: This product or others of similar composition, in the as shipped condition, have been tested and found to be not hazardous using the USEPA's Toxicity Characteristic Leaching Procedure (TCLP - 40 CFR 261, Appendix II). Any physical or chemical modification of this product may change the TCLP test results.

METHODS FOR CLEANING UP:

Sweep or vacuum spills. To minimize dust, vacuum cleaning is preferred.

7. HANDLING AND STORAGE

HANDLING:

Use good housekeeping practices. As with handling of all powdered materials, accumulations of the product should be removed from settling areas such as rafters, roofs, building columns, and ductwork to eliminate any secondary potential dust explosion or fire hazards.

Use with adequate ventilation.

SPECIAL MIXING AND HANDLING INSTRUCTIONS:

Normal Melt Processing: Virtually all thermoplastic materials will emit fumes and/or vapors when heated to processing temperatures. The concentration and composition of these vapors will depend upon variables such as specific compound formulation and processing method and temperature. Always use the product under well ventilated conditions and avoid breathing process vapors. For personal hygiene, wash thoroughly after handling resin, especially before eating, smoking, or using toilet facilities. Do not store or consume food in processing areas.

Cleanup: Cleanup following normal melt processing should be performed under well ventilated conditions. Compound based upon vinyl resin may be held at process temperatures for a short time without significant thermal degradation. However, it should be recognized that exposure to either elevated temperature or excessive heat history (time) will result in decomposition. (As a general rule, degradation begins to occur after about one (1) hour at 177°C (350°F), about ten (10) minutes at 204°C (400°F), and within five (5) minutes at 232°C (450°F). Equipment should not be shut down for extended time periods with the product in it, or decomposition and possible corrosion of unprotected metal may result. If dies and screws are not cleaned manually, then compound should be purged from processing equipment prior to shutdown using special vinyl purge compound or a compatible thermoplastic such as general purpose ABS. (Do not use flame retarded or halogen containing grades for this purpose.)

STORAGE:

Store in a cool, dry, ventilated area away from heat, sparks and flame.

The resin by itself will not support combustion, however, materials such as wooden pallets, paper bags, cardboard boxes, and other combustibles can provide sufficient fuel to cause the product to burn.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING CONTROLS:

Handle product in a well ventilated area.

If product is handled in an open system, the use of process enclosures, local exhaust ventilation, and/or other engineering controls should be considered to control airborne levels to below recommended exposure limits, or below acceptable levels where there are no limits.

PERSONAL PROTECTION

RESPIRATORY:

For conditions of use where exposure to dust or mist is apparent, a NIOSH approved half-face respirator may be worn.

A respiratory protection program that meets 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed whenever workplace conditions warrant use of a respirator.

EYE/FACE:

Wear safety glasses with side shields (ANSI Z87.1).

SKIN:

Wear protective gloves such as leather, canvas or cotton to minimize skin contact.

OTHER:

Emergency shower and eyewash facility should be in close proximity (ANSI Z358.1).

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: White powder or granules

Odor Threshold: Not determined

Specific Gravity (Water=1): 1.4

Vapor Pressure: Not determined

Vapor Density (Air=1): Not applicable

Density: 1.4

Evaporation Rate: Not determined

% Volatiles by Wt: Not determined

Boiling Point: Not determined

Freezing Point: Not determined

Melting Point: Not determined

9. PHYSICAL AND CHEMICAL PROPERTIES (Continued)

Solubility in Water (% by wt.): Negligible

pH: Not applicable

Octanol/Water Partition Coefficient: Not determined

Thermal Decomposition Temperature: 1hr.@177°C; 10min.@204°C; 5min.@232

Other: Not applicable

VOC (% by wt;g/l): Not applicable

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY:

__X__ STABLE _____ UNSTABLE

REACTS WITH:

_____ AIR	_____ OXIDIZERS	_____ METALS
_____ WATER	_____ ACIDS	_____ OTHER
_____ HEAT	_____ ALKALIS	__X__ NONE

HAZARDOUS POLYMERIZATION:

_____ OCCURS __X__ WILL NOT OCCUR

COMMENTS:

Avoid heat, sparks and open flames.

HAZARDOUS DECOMPOSITION PRODUCTS:

Hydrogen chloride, carbon monoxide, carbon dioxide, and very small amounts of benzene and aromatic and aliphatic hydrocarbons.

Revised

11. TOXICOLOGICAL INFORMATION

09002-86-20 Ethene, chloro-, homopolymer (PVC) (non-respirable). This substance is practically non-toxic by the oral route. It is unlikely to cause skin irritation. Eye irritation may occur from the mechanical action of lodged particles.

For further information call or write the address shown on page 1 of the MSDS.

12. ECOLOGICAL INFORMATION

9002-86-2 Ethene, chloro-, homopolymer

TOXICITY: No data available. This material is believed to be non-toxic to aquatic life.

PERSISTENCE: No data available. This material is believed to be likely to persist in the environment.

BIOACCUMULATION: No data available. This material is believed to be unlikely to bioaccumulate.

For further information call or write the address shown on page 1 of the MSDS.

13. DISPOSAL CONSIDERATIONS

Dispose of all waste and contaminated equipment in accordance with all applicable federal, state and local health and environmental regulations.

14. TRANSPORT INFORMATION

DOT INFORMATION: Not Regulated

Revised

15. REGULATORY INFORMATION

U.S. FEDERAL REGULATIONS:

OSHA Standard 29 CFR 1910.1200 requires that information be provided to employees regarding the hazards of chemicals by means of a hazard communication program including labeling, material safety data sheets, training and access to written records. We request that you, and it is your legal duty to, make all information in this Material Safety Data Sheet available to your employees.

This product contains a toxic chemical or chemicals subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR 372. See Section 2, List Legend 02.

TSCA:

All components of this product that are required to be on the TSCA inventory are listed on the inventory.

SARA/TITLE III HAZARD CATEGORIES:

If the word "YES" appears next to any category, this product may be reportable by you under the requirements of 40 CFR 370. Please consult those regulations for details.

15. REGULATORY INFORMATION (Continued)

Immediate(Acute) Health:	NO	Reactive Hazard	NO
Delayed(Chronic) Health:	NO	Sudden Release of Pressure	NO
Fire Hazard:	NO		

HMIS HAZARD RATINGS:

HEALTH HAZARD: 0 FIRE HAZARD: 1 REACTIVITY: 0

STATE REGULATIONS:

State of California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):
WARNING: This product contains a chemical known to the State of California to cause cancer.

See Section 2. COMPOSITION/INFORMATION ON INGREDIENTS list legend for applicable state regulation.

INTERNATIONAL REGULATIONS:

Consult the regulations of the importing country.

CANADA:

WHMIS Hazard Class: NOT CLASSIFIED

16. OTHER INFORMATION

For additional non-emergency health, safety or environmental information telephone (972) 404-2076 or write to:

Oxy Vinyls, LP
5005 LBJ Freeway, LB30
Dallas, Texas 75380

16. OTHER INFORMATION (Continued)

MSDS LEGEND:

ACGIH = American Conference of Governmental Industrial Hygienists

CAS = Chemical Abstracts Service Registry Number

CEILING = Ceiling Limit (15 Minutes)

CEL = Corporate Exposure Limit

OSHA = Occupational Safety and Health Administration

PEL = Permissible Exposure Limit (OSHA)

STEL = Short Term Exposure Limit (15 Minutes)

TDG = Transportation of Dangerous Goods (Canada)

TLV = Threshold Limit Value (ACGIH)

TWA = Time Weighted Average (8 Hours)

WHMIS = Worker Hazardous Materials Information System (Canada)
* = See Section 3 Hazards Identification - Repeated Exposure(Chronic) Information

IMPORTANT: The information presented herein, while not guaranteed, was prepared by competent technical personnel and is true and accurate to the best of our knowledge. NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR PURPOSE, OR OF ANY OTHER KIND, EXPRESS OR IMPLIED, IS MADE REGARDING PERFORMANCE, STABILITY OR OTHERWISE. This information is not intended to be all-inclusive as to the manner and conditions of use, handling and storage. Other factors may involve other or additional safety or performance considerations. While our technical personnel will be happy to respond to questions regarding safe handling and use procedures, safe handling and use remains the responsibility of the customer. No suggestions for use are intended as, and nothing herein shall be construed as a recommendation to infringe any existing patents or violate any federal, state or local laws, rules, regulations or ordinances.

This Material Safety Data Sheet (MSDS) covers the following materials:

- OXYVINYLS(TM) PVC HOMOPOLYMER RESIN (PRIME GRADES)
- OXYVINYLS(TM) 225M
- OXYVINYLS(TM) 1267
- OXYVINYLS(TM) 1467
- OXYVINYLS(TM) F5
- OXYVINYLS(TM) 30FG
- OXYVINYLS(TM) 185F
- OXYVINYLS(TM) 185
- OXYVINYLS(TM) 190F
- OXYVINYLS(TM) 195F
- OXYVINYLS(TM) 200F
- OXYVINYLS(TM) 200
- OXYVINYLS(TM) 216
- OXYVINYLS(TM) 220E
- OXYVINYLS(TM) 220F
- OXYVINYLS(TM) 222A
- OXYVINYLS(TM) 222E
- OXYVINYLS(TM) 222S

16. OTHER INFORMATION (Continued)

- OXYVINYLS(TM) 222
- OXYVINYLS(TM) 224T
- OXYVINYLS(TM) 225
- OXYVINYLS(TM) 225A
- OXYVINYLS(TM) 225E
- OXYVINYLS(TM) 225F
- OXYVINYLS(TM) 225G
- OXYVINYLS(TM) 225P
- OXYVINYLS(TM) 226FEP
- OXYVINYLS(TM) 226F
- OXYVINYLS(TM) 230
- OXYVINYLS(TM) 230F
- OXYVINYLS(TM) 240F
- OXYVINYLS(TM) 240
- OXYVINYLS(TM) 250F
- OXYVINYLS(TM) 255F
- OXYVINYLS(TM) 280
- OXYVINYLS(TM) 310
- OXYVINYLS(TM) 355
- OXYVINYLS(TM) 450F
- OXYVINYLS(TM) 455FG
- OXYVINYLS(TM) 455FH
- OXYVINYLS(TM) 455F
- OXYVINYLS(TM) 470R
- OXYVINYLS(TM) 500F

17. WARNING LABEL INFORMATION

SIGNAL WORD:

CAUTION

HAZARD WARNINGS:

FUMES PRODUCED IN PROCESSING MAY IRRITATE THE EYES AND RESPIRATORY TRACT

PRECAUTIONS:

Avoid breathing dust, vapors or mist.

Avoid contact with eyes, skin and clothing.

Avoid generation of dust.

Keep container tightly closed and properly labeled.

Use with adequate ventilation.

Wash thoroughly after handling.

17. WARNING LABEL INFORMATION (Continued)

FIRST AID

EYES:

Immediately flush eyes with a directed stream of water for at least 15 minutes, forcibly holding eyelids apart to ensure complete irrigation of all eye and lid tissues. Washing eyes within several seconds is essential to achieve maximum effectiveness. GET MEDICAL ATTENTION IMMEDIATELY.

SKIN:

Wash thoroughly with soap and water after handling.

INHALATION:

Remove to fresh air if safe to transport. Otherwise attempt to provide fresh air by ventilation. If breathing is difficult, have a trained person administer oxygen. If respiration or pulse has stopped, have a trained person administer Basic Life Support (Cardio-Pulmonary Resuscitation/Automatic External Defibrillator) and CALL FOR EMERGENCY SERVICES IMMEDIATELY (911 or emergency transport services).

INGESTION:

Never give anything by mouth to an unconscious person. If swallowed, do not induce vomiting. Give large quantities of water. (If available, give several glasses of milk.) If vomiting occurs spontaneously, keep airway clear and give more water. GET MEDICAL ATTENTION IMMEDIATELY.

IN CASE OF SPILL OR LEAK:

Sweep or vacuum spills and place in containers for recovery or disposal.

FIRE:

Use carbon dioxide, dry chemical, water or other agent suitable for surrounding fire. Decomposition in an open flame may yield hydrogen chloride gas.

HANDLING AND STORAGE:

Store in a clean, dry, well ventilated area away from heat.

DISPOSAL:

Dispose of in accordance with federal, state and local regulations.

INFORMATION REQUIRED BY FEDERAL, STATE OR LOCAL REGULATIONS:

This Product Contains:

CAS#	NAME
9002-86-2	Ethene, chloro-, homopolymer

HMIS RATING: HEALTH 0 FLAMMABILITY 1 REACTIVITY 0

17. WARNING LABEL INFORMATION (Continued)

LABEL NUMBER: 0201M40722

For Industrial Use Only

ATTACHMENT C

MSDS FOR CPVC COMPOUND

TempRite CPVC
Material Safety Data Sheet
BFGoodrich

TempRite® CPVC POWDER COMPOUND

U.S. DOT: Not regulated

MSDS Number: 96394
Issue date: August, 1996
Supersedes: MSDS 93003 (1/93)

SECTION I

Manufacturer
The BFGoodrich Company
Specialty Polymers & Chemicals Div.
9911 Brecksville Road
Cleveland, OH 44141-3247
Telephone: 1-800-331-1144

Transportation Emergency Telephone
CHEMTREC: (800) 424-9300

Chemical Name/Synonyms
Mixture of chlorinated poly(chloroethene) and process/performance additives* such as processing aid, heat stabilizers, impact modifiers, lubricants, and pigments.

TSCA Status
Components are listed in EPA Inventory.
CAS Number: mixture.

* Specific chemical identity withheld as a trade secret (29CFR1910.1200(i)).

SECTION II - HAZARDOUS INGREDIENTS/IDENTITY INFORMATION

- Product contains the following chemical(s) subject to the reporting requirements (i.e., at or above de minimus amount) of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40CFR372: None known.
- Products contain or may contain the materials listed below.

Ingredient Name	CAS No.	Percent[1]	ACGIH TLV-TWA	OSHA PEL (U.S.A.)
· CPVC Resin	68648-82-8	>80%	PNOC 10 mg/m³	None established[2]
· Organotin compound (as Sn)	7440-31-5	<5%	TLV 0.1 mg/m³ skin STEL 0.2 mg/m³ skin	0.1 mg/m³ skin
· Titanium dioxide[3]	13463-67-7	<5%	TLV 10 mg/m³	5 mg/m³ total dust
· Carbon Black[4]	1333-86-4	<1%	3.5 mg/m³	3.5 mg/m³

1 Typical amount - not a specification.
2 As a guide, use 10 mg/m³ (5 mg/m³ respirable dust).
3 Some products (typically identified as "Natural") may contain <1% titanium dioxide, and perhaps none.
4 Some products may contain carbon black, while other products do not. IARC has reclassified carbon black as category 2B carcinogen (known animal carcinogen, possible human carcinogen).

Notes: - ACGIH TLV-TWA: Threshold Limit Value - Time Weighted Average for concentration of the chemical substance in the ambient workplace air for a normal 8-hour workday, 40-hour workweek, to which nearly all workers may be repeatedly exposed without adverse effect. American Conference of Governmental Industrial Hygienists, 1995/1996 Edition.
- PEL: OSHA Permissible Exposure Limit, 8-hour TWA, 29CFR1910.1000.
- PNOC: Particles Not Otherwise Classified (ACGIH).
- STEL: Short Term Exposure Limit, 15-minute TWA.
- The "skin" notation calls attention to the skin as an additional significant route of absorption of the listed chemical.

SECTION III - PHYSICAL/CHEMICAL CHARACTERISTICS (Typical data, not specifications)

Solubility in Water	Melt Processing Temp.	Specific Gravity (H_2O=1)
Insoluble	Typically >390°F (>200°C)	1.5-1.6

Other	Appearance and Odor
Characteristics such as boiling point, vapor pressure, vapor density, and evaporation rate are not applicable to this product.	Pigmented or unpigmented powder. Practically odorless.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash-Ignition Temp.	Self-Ignition Temp.	Flammable Limits in Air
~900°F (~482°C)*	Not determined	See Unusual Fire and Explosion Hazards

* Estimated result. Not specifically determined for every product.
- Flash-ignition temperature is 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 is 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.

Extinguishing Media
Water, ABC dry chemical, AFFF, and protein type air foams. CPVC compounds are "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 Firefighting Procedure
Wear self-contained breathing apparatus (SCBA) equipped with a full facepiece and operated in a pressure-demand mode or other positive-pressure mode and protective clothing. Personnel not having suitable respiratory protection must leave the area to prevent significant exposure to toxic gases from combustion, burning, or decomposition. In an enclosed or poorly ventilated area, wear SCBA during cleanup immediately after a fire as well as during the attack phase of firefighting operations.

Unusual Fire and Explosion Hazards
- Non-CPVC mixture components may burn with intense heat.
- Irritating or toxic substances will be emitted upon combustion, burning, or decomposition. Smoke from burning CPVC will be very irritating.
- Run off water from firefighting may have corrosive effects.
- Hydrogen chloride, a combustion product of CPVC, has a corrosive effect on many metals. Affected equipment surfaces and unprotected structural elements of buildings should be washed with a detergent based water solution to remove corrosive deposits as soon as possible after depositions have occurred.
- Because this product is a powder, airborne dust may occur. Dust explosion severity experiments show that typical CPVC-based powder compounds do not propagate dust explosions when subjected to a

12,000 volt AC electrical discharge at dust cloud concentrations up to 2.0 oz./ft^3. A "secondary" dust explosion potential may exist. That is, a dust explosion of some other more sensitive material could cause CPVC-based powder that has settled on overhead surfaces, etc., to be dispersed into the propagating flame-front generated by the exploding product. In general, dust is a static charge generator which may be ignited by electrostatic discharge, electrical arcs, sparks, welding torches, cigarettes, open flame, or other significant heat sources. Although the risk of a dust explosion is low, as a precaution implement safety measures to eliminate hazard potential such as:

- Bond, ground and properly vent containers, conveyors, dust control devices and other transfer equipment. Prohibit flow of powder or dust through non-conductive ducts, vacuum hoses or pipes, etc.; only use grounded, electrically conductive transfer lines when pneumatically conveying product.
- Prevent accumulation of dust (e.g., well-ventilated conditions, promptly vacuuming spills, cleaning overhead horizontal surfaces, etc.). Eliminate ignition sources such as sparks or static buildup (e.g. humidification).
- Pouring product from its container may cause an electrostatic buildup which may be discharged as a spark. A spark can be an ignition source for solvent vapor/air mixtures. If you add this product to any combustible/flammable material, ensure appropriate safe handling practices such as provision for inerting flammable vapors and measures such as those cited above.
- A properly engineered explosion suppression system must be considered. See standards such as the National Fire Protection Association NFPA 654, "Standard for the Prevention of Dust Explosions in the Plastics Industry"; NFPA 69, "Explosion Prevention Systems"; NFPA 68, "Explosion Venting Protection"; NFPA 77, "Static Electricity" and other standards as the need exists.

SECTION V - REACTIVITY DATA

Stability	Hazardous Polymerization
Stable	Will not occur

Hazardous Decomposition Products (e.g., combustion, overheating, etc.)
Not determined. Thermal decomposition or pyrolysis may emit CO, CO_2, hydrogen chloride, organotins, hydrocarbons.

Potential Decomposition Product	ACGIH TLV-TWA/C/STEL	OSHA PEL/C
- Carbon monoxide	TLV 25 ppm	PEL 35 ppm; C 200 ppm
- Hydrogen chloride	C 5 ppm	C 5 ppm
- Organotin cmpd. (as Sn)	TLV 0.1 mg/m^3 skin STEL 0.2 mg/m^3 skin	0.1 mg/m^3 skin

Note: "C" Means Ceiling Limit.

Melt Processing Emissions (e.g., extrusion, molding, etc.)
Potential melt processing emissions have not been fully determined. Volatiles (fumes, vapors and odors) from start up before processing, melt processing, and equipment break down/cleanup after melt processing are expected to be the primary hazard in an occupational setting. Trace amounts of organic tin compounds (less than 0.1 mg/m^3) may be present in the ambient workplace atmosphere from melt processing. Trace amounts of carbon tetrachloride and chloroform are possible (see Appendix). If decomposition occurs in processing equipment due to hang up or stagnation, hydrogen chloride is generated. Conduct any operation emitting fumes or vapors under well-ventilated conditions.

Incompatibility (conditions/materials to avoid)

- Avoid overheating.
- Avoid contact with acetal, acetal copolymers and amine containing materials during processing. If processed together, these materials may be mutually destructive and degrade rapidly. Prevent cross contamination of feedstocks. Thoroughly purge and mechanically clean processing equipment to prevent

these materials from coming in contact with each other. Refer to technical service reports for specific equipment and procedural recommendations.

SECTION VI - HEALTH HAZARD DATA

NO TOXICITY STUDIES HAVE BEEN CONDUCTED ON THIS PRODUCT. Information presented is our best judgement based on the components of the mixture. As with all chemicals for which test data are limited or do not exist, caution must be exercised through the prudent use of protective equipment and handling procedures to minimize exposure. AVOID EYE AND SKIN CONTACT. AVOID INHALATION. DO NOT INGEST, TASTE, OR SWALLOW. USE UNDER WELL-VENTILATED CONDITIONS. WEAR EYE PROTECTION AND PROTECTIVE GLOVES. WASH THOROUGHLY AFTER HANDLING. KEEP CONTAINER CLOSED WHEN NOT IN USE.

Acute and Chronic Health Effects

- Because this product is a powder, dust exposure may occur in an occupational setting. Mixture components can exhibit the following:
  - Eye contact: Contains components which may cause immediate or delayed eye irritation. The onset of irritation may not occur until several hours after exposure.
  - Skin contact: Contains components which may cause effects such as reddening, swelling, irritation, and dermatitis. The onset of symptoms may not occur until several hours after exposure. Organotins can be absorbed through the skin causing effects such as reddening, swelling, irritation, and ataxia (inability to coordinate body or muscular movements), hypersensitivity, and shaking.
  - Inhalation: Contains components which may cause effects such as irritation of the nose, throat, respiratory tract and lungs. May cause respiratory tract discomfort, nausea, headache, dizziness, lung damage, vomiting, dry throat, and abdominal pain.
  - Ingestion: Contains components which may cause effects such as depression, eye and nasal discharge, stomach and intestinal irritation, and diarrhea.
  - For carbon black (which may be a component of these powder compounds), no serious health effects have been established in man. Inflammation, lung fibrosis, and lung tumors have been observed in animals at levels which overload lung clearance mechanisms. Carbon black contains varying amounts of polynuclear aromatic compounds (PNA's) which have been found to cause cancer in animals. Solvent extracts of carbon black are carcinogenic to the skin of mice. It is classified by IARC to be a known animal carcinogen and a possible human carcinogen (Group 2B).
- Molten product causes skin burns.
- At elevated temperatures (e.g., processing temperature), this product may emit fumes and vapors that are irritating to the respiratory tract, eyes and/or skin of sensitive people. The concentration and composition of vapors will depend upon variables such as processing method and temperature. The potential for acute and/or chronic health effects will depend on the effectiveness of exhaust ventilation provided to the process area.
- Symptoms such as (but not limited to) coughing, tearing, and irritation must be regarded as potentially hazardous and measures taken to avoid exposure.
- Decomposition or combustion products cause irritation, possibly severe, to the eyes, respiratory tract, and skin. From any decomposing or burning material, overexposure may cause serious injury or may even cause death.

NOTE: Hydrogen chloride is detectable by its sharp pungent odor in concentrations as low as 1-5 ppm. Low concentrations (below 50 ppm) are not harmful in short-term exposures but do provide excellent warning properties by causing coughing or irritation. Because the protective response is so strong, humans rarely submit to damaging concentrations – instead, there is an unmistakable urge to leave the area. Repeated or prolonged exposure to high concentrations can cause eye and respiratory damage.

Target Organs	Routes of Entry
Eyes, skin, respiratory system, lungs.	Inhaling process vapors. Inhaling dust.

Carcinogenicity
Mixture components: Not listed by NTP, or OSHA. IARC has reclassified carbon black, a component of some Temprite® Powder Compounds, as category 2B carcinogen (known animal carcinogen, possible human carcinogen).

Medical Conditions Aggravated by Exposure
Preexisting skin and/or respiratory disorders or diseases may be aggravated. In persons with asthma, impaired pulmonary function or other types of chronic obstructive respiratory diseases (e.g., bronchitis, emphysema, bronchial hyperreactivity), skin allergies, eczema, etc., processing fumes or vapors may cause exacerbation of symptoms.

Emergency and First Aid Procedure
If irritation or other symptoms as noted above occur or persist from any route of exposure, remove the affected individual from the area; see a physician / get medical attention.
- Eye Contact: Treat as any foreign particulate matter in the eye.
- Skin Contact: For contact with powder (dust), wash the affected area with plenty of soap and water. If molten polymer contacts skin, cool the skin rapidly with water or ice. See a physician for removal of any adhering material and treatment of burn.
- Vapor Inhalation (melt processing vapors or decomposition products): Remove the affected individual to fresh air. Provide protection before allowing reentry.
- Dust Inhalation: Remove the affected individual to fresh air. Provide protection before allowing reentry.
- Ingestion: Rinse mouth with water. Drink plenty of water to cause dilution in the stomach. Induce vomiting by sticking finger down throat or by giving Syrup of Ipecac. Call a physician at once. Never give anything by mouth to an unconscious person.

SECTION VII - PRECAUTIONS FOR SAFE HANDLING AND STORAGE

Steps to be taken in case material is released or spilled
Place into a container for reuse or disposal. Do not sweep or flush product into sewers or waterways. Use care to avoid dust generation. See Section VIII on control measures for appropriate personal protection equipment.

Waste Disposal Method
Incinerate or landfill waste in a properly permitted facility in accordance with federal, state and local regulations. Although this product is not defined or designated as hazardous by current provisions of the Federal (EPA) Resource Conservation and Recovery Act (RCRA, 40CFR261), recognize that in appropriate dust/air ratio, dust cloud in air has explosion potential. Land disposal should be in closed containers. Federal, state and local regulations where the waste material is generated, treated, and/or disposed of must be examined to verify the appropriate waste classification.

Precautions to be taken in handling and storage
- General Considerations. Conduct any operation emitting fumes or vapors under well-ventilated conditions. Ensure well-ventilated conditions by methods such as local mechanical exhaust ventilation, as necessary, during equipment start up and during operations such as hot melt processing (extruding, molding, etc.), cutting, regrinding, heat welding, soldering, and break down and cleanup of equipment after melt processing; and/or any other melt processing or pre/post-processing operation involving heat sufficient to result in fumes or vapors, or in product breakdown. Avoid continued, prolonged, and/or repeated breathing of fumes or vapors. Do not inhale, ingest, taste, swallow, or chew this product. Wash thoroughly after processing, especially before eating, smoking or using toilet facilities. Do not store or consume food in processing areas. Do not use processing equipment to heat food.
- Equipment Start Up/Cleanup. Equipment start up and break down/cleanup following normal melt processing always must be performed under well-ventilated conditions. CPVC compound may be held at process temperatures for a short time without significant decomposition. However, recognize that CPVC compounds are designed for continuous processing and that exposure to either prolonged elevated

temperature or excessive heat history (time) will result in decomposition. Melt processing equipment must not be shut down for extended periods of time with compound in it or decomposition will occur leading to irritating and/or toxic emissions as well as to possible corrosion of unprotected metal from HCl. For equipment shutdown at melt temperatures (typically ≥390-440°F [≥200-225°C]), we recommend the use of a purge compound such as acrylic or general purpose ABS (do not use flame-retarded or halogen-containing grades). In case of a power loss or other mishap, dismantling of the die assembly should begin immediately.

Special note: During equipment start up and when dismantling melt processing equipment, compound near, at, or above its normal processing temperature must never be allowed to accumulate in thick masses on the floor or elsewhere. The mass will be begin to thermally decompose and to swell due to internal gassing of the molten product which will emit fumes and vapors that are irritating to the respiratory tract, eyes and/or skin. Gassing may cause the mass to explode, especially if its surface is hardened with water. Molten waste should be collected as strands or flattened to 2 inches or less, and quenched in a drum of cold water. Decomposing product must be removed to a well-ventilated area, preferably outdoors.

- Processing fume condensate, which may include toxic contaminants from additives, may be combustible and should be removed periodically from exhaust hoods, ductwork and other surfaces. Impervious gloves should be worn during cleanup operations to prevent skin contact.
- Static electric buildup and discharge may occur when conveying, transferring or pouring product. The spark produced may be sufficient to ignite vapors of flammable liquids such as solvents used in adhesive preparation. Always transfer product by means which avoid static buildup. Avoid pouring product directly from its container into combustible or flammable material.
- Sprinklered warehouse areas are recommended. CPVC by itself typically will not support combustion but other combustible contents (e.g. wooden pallets, cardboard boxes, etc.) can provide sufficient fuel and heat to force CPVC and CPVC-based compounds to burn.

SECTION VIII - CONTROL MEASURES

Ventilation

Always provide well-ventilated conditions in operations such as extrusion, molding, cutting, sawing, machining, regrinding, heat welding, thermoforming, and any other processing or pre/post-processing operation involving heat sufficient to result in polymer breakdown and/or fumes or vapors. Volatiles from melt processing operations must not be discharged into unventilated or poorly ventilated work areas. The continuous supply of fresh air to the workplace and, when necessary, the continuous removal of volatiles through exhaust hoods will provide well-ventilated conditions for most operations. Ventilation must be adequate to maintain the ambient workplace atmosphere below exposure limits listed in Section II and V and to draw dust, fumes, vapors or smoke away from workers to prevent routine inhalation. Ventilation guidelines/techniques may be found in publications such as Industrial Ventilation American Conference of Governmental Industrial Hygienists, 6500 Glenway Avenue, Bldg. D-7, Cincinnati, OH 45211-4438 U.S.A.

Respiratory Protection

- Not normally necessary when well-ventilated conditions are provided.
- Abnormal conditions such as equipment malfunction, improper equipment, improper processing procedures, hang up, or stagnation of product during processing may cause decomposition. If general dilution or local exhaust ventilation is not adequate to avoid inhalation of fumes or vapors during setup/start up, processing, and equipment tear-down/cleanup, then exposed employees must be provided with suitable air supplied respirators approved by NIOSH/MSHA such as an airline respirator or positive pressure self-contained breathing apparatus.
- Routine inhalation of dust of any kind should be avoided. If dust inhalation cannot be avoided, wear a dust respirator approved by NIOSH/MSHA. Exercise care when dumping bags or otherwise transferring powder, sweeping, mixing or doing other tasks which can create dust.
- Respiratory protection, such as a NIOSH/MSHA approved positive pressure self-contained breathing

apparatus, is necessary to prevent inhalation of decomposition or combustion gasses.

Protective Equipment
- Safety glasses or goggles suitable for keeping dust out of the eyes.
- Protective gloves to avoid skin contact with product and for handling hot material during processing.
- Wear long sleeve shirt and trousers and other equipment as needed to avoid skin contact.

SECTION IX - TRANSPORTATION

Domestic Transportation (U.S.A.)
Not regulated.

International Transportation
- By airplane or truck: Not regulated.
- By vessel (water): Not regulated

SECTION X - HAZARD CLASSIFICATIONS/REGULATORY INFORMATION

Federal Regulations (U.S.A.)
- SARA Title III (40CFR311/312) Hazard Category: Acute (immediate) Health Hazard; Chronic (delayed) Health Hazard.
- SARA Title III Section 313 Toxic Chemical Substance(s) present at or above de minimus concentrations: None known.

State Regulations (U.S.A.)
While we do not specifically analyze these products, or the raw materials used in their manufacture, for substances on various state hazardous substances lists, to the best of our knowledge no such substances are present, or known to be present at reportable concentrations, except those specifically listed below:
- California Proposition 65 "substances known to the State of California to cause cancer, birth defects or other reproductive harm:" Carbon tetrachloride <50 ppm; chloroform <100 ppm.
- Massachusetts Substance List*: Chloroform >1 ppm; carbon tetrachloride >1 ppm.
- New Jersey Workplace Hazardous Substance List*: Chlorinated poly(chloroethene) (CAS 68648-82-8), organotin compound, modifier, lubricant, titanium dioxide (CAS 13463-67-7).
- Pennsylvania Right to Know Act*: Chlorinated poly(chloroethene), organotin compound, modifier, lubricant, titanium dioxide.
- * Unless specifically identified, chemical identity of non-CPVC components are confidential business information (trade secret) and are being withheld as permitted by 29CFR1910.1200.

International Regulations
- Canadian Controlled Products classification (WHMIS): Class D, Division 2B, for products without carbon black; Class D, Division 2A, for products which contain carbon black.
- Canadian Ingredient Disclosure List (WHMIS-IDL): Tin compound, n.o.s. >1%.
- Canadian Domestic Substances List (DSL): Mixture components are listed.
- European Economic Community hazard classification: Not regulated.
- European Economic Community EINECS: Monomers for CPVC resin are listed.

Hazard Rating Systems

NFPA 704*		HMIS**		Key: 0 = Insignificant;
Health:	2	Health:	1	1 = Slight; 2 = Moderate;
Flammability:	1	Flammability:	1	3 = High; 4 = Extreme;
Reactivity:	0	Reactivity:	0	B = Eye protection, gloves.
Special:	—	Personal Protection:	B	

* National Fire Protection Association rating identifies the severity of hazards of material during a fire emergency (i.e., "on fire").
** Hazardous Materials Identification System (National Paint and Coatings Association) rating applies to product "as packaged" (i.e., ambient temp.).

APPENDIX. Less than 0.01% (<100 ppm) of residual chloroform (CAS 67-66-3) and less than 0.005% (<50 ppm) of residual carbon tetrachloride (CAS 56-23-5) may remain bound in CPVC resin. The American Conference of Governmental Industrial Hygienists identifies each of these chemicals as cancer suspect agents (A2). The OSHA Permissible Exposure Limit (8-hour time-weighted average) to these substances is 2 ppm for chloroform and 5 ppm for carbon tetrachloride. The presence of these residual chemicals in TempRite® CPVC is not expected to create a hazard. In a well-ventilated workplace, the potential concentration of chloroform or carbon tetrachloride will be well below established threshold limit values. Monitoring of BFGoodrich CPVC production facilities show chloroform levels to be below 0.00003% (<0.3 ppm) and carbon tetrachloride levels to be below 0.00005% (<0.5 ppm) in the workplace air. BFGoodrich production workers are not required to wear special respiratory protection.

USER'S RESPONSIBILITY

This bulletin cannot cover all possible situations which the user may experience during processing. Each aspect of your operation should be examined to determine if, or where, additional precautions may be necessary. All health and safety information contained in this bulletin should be provided to your employees or customers. It is your responsibility to use this information to develop appropriate work practice guidelines and employee instructional programs for your 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 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. Compliance with all applicable federal, state and local laws and regulations remains the responsibility of the user.

LABEL INFORMATION

PRODUCT: CPVC COMPOUND *.

* **TEMPRITE®, BLAZEMASTER®, FLOWGUARD®, or any other new name, for any package.**

No health hazards are expected during normal handling and processing of CPVC resin by itself and cube/pellet compounds under well-ventilated conditions. CPVC compound contains organotin components. From powder compound, organotins may be absorbed through the skin causing irritation or other effects. Avoid prolonged or repeated skin contact with powdered compound by wearing cloves. CPVC resin and powder compounds may generate static electricity which can ignite combustible gases/vapors. Powdered compound, cutting and regrinding operations also may create dust. If dust inhalation can not be avoided, wear a dust respirator approved by NIOSH/MSHA.

CAUTION! Fumes from heated compound may cause irritation of the eyes, skin, nose and throat. Overheating or decomposition creates vapors or smoke containing eye, respiratory tract and skin irritants, primarily hydrogen chloride. Well-ventilated conditions are necessary to eliminate hazard risk. Wear approved NIOSH/MSHA air-supplied respirator if ventilation is not adequate.

FIRST AID: If irritation occurs of persists from any route of exposure, remove the affected individual from the area. Call a physician.

Before using this product, read Material Safety Data bulletin for additional important information.

WITHIN THE U.S.A., IN CASE OF TRANSPORTATION EMERGENCY: CALL CHEMTREC: (800) 424-9300.

The BFGoodrich Company, Specialty Chemicals, 9911 Brecksville Road, Cleveland, OH 44141-3247.
Telephone: (800) 331-1144.

ATTACHMENT D

OPERATION AND MAINTENANCE PLAN

O. A. NEWTON

Material Control Systems Group

REVERSE PULSE FILTERS

Operating Instructions

RECEIVING YOUR UNIT

Prior to accepting shipment, care must be taken to inspect all equipment received both for proper count and damage. Any and all irregularities must be noted on carrier's copy of the shipping receipt to assist in settling any claims for damage or shortages. All equipment is shipped F.O.B. Point of Origin, whether on a prepaid or collect basis.

ANY CLAIM FOR DAMAGE IN TRANSIT OR SHORTAGES MUST BE BROUGHT AGAINST THE CARRIER BY THE PURCHASER.

INSPECTION OF UNIT

Housing: Particular attention should be paid to the sheet metal housing of your collector. Unit should be inspected for dents and cracks or rips. Dented housing may seriously affect the structural integrity of the unit. Unit should be checked against the certified drawings for correctness and the manufacturer notified immediately. No corrections may be made without authority of the manufacturer.

Components: A count should be made of all pieces received, and this should be verified against the carrier's manifest. Boxes should be inspected for rough handling which may have resulted in hidden damage.

SETTING UP YOUR UNIT

Housing: Lifting lugs are normally provided for your convenience in handling the dust collector. If these cannot be used, proper care must be taken to assure safe moving and precautions taken to prevent damage to the housing or components.

Electrical: A 120 V. 60 cycle power wiring circuit must be connected to the filter's timer. The timer must be wired according to timer instruction sheet enclosed. Check solenoid wiring and program jumper. Program jumper must be installed in #3 position for (3) solenoid filters, #4 position for (4) solenoid filters and so on. Set "on" time at minimum setting of 50 milliseconds. Set "off" time at approximately 10 seconds. Refer to timer sheet attached. Then follow standard start up instructions.

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Compressed Air: All compressed air piping leading to the collector must be purged prior to hooking up to the distribution header located on the unit. 90 - 100 PSIG of clean, dry air is required for your unit to operate properly. It is recommended that a shut-off valve, a pressure regulator, and an inline filter should be installed immediately upstream from the distribution header.

If excessive moisture is present an after cooler and dessicant dryer is strongly recommended.

Assembling bags and cages into housing: Please refer to individual instruction sheet for filter assembly.

Doors: Hold-downs on doors should only be hand tightened. Excessive pressure can distort the door panel itself resulting in leakage.

Auxiliary Equipment: All auxiliary equipment must be installed according to manufacturer's specifications and interlocked with the entire system as needed. Direction of rotation of each items should be checked prior to start up to entire system.

START UP INSTRUCTIONS

Check air pressure available, verify 90 - 100 PSIG.

Apply current to timer and make sure the timer is cycling.

Allow unit to run under normal conveying conditions for at least 48 hours, after initial installation of bags. This will allow bags to reach their maximum operating efficiency. During initial start up there may be some minor product carry over until the bags reach maximum operating efficiency.

After 48 hours inspect the bags, bag clamps and note conveying conditions. If the product is caked on the bags or being carried through the bags or conveying rates are low, see trouble shooting section. The bags should be inspected monthly and replaced if holes or wearing are observed.

TROUBLE SHOOTING

1.) Low conveying rates due to excessive high pressure on pressure conveying systems or high vacuum on vacuum conveying systems.

   A.) Check air pressure in header.
   B.) Check timer to see if it is functioning properly. Decrease "off" time to a minimum of 3 seconds and repeat instructions described under the "Start up Instructions".
   C.) Check solenoid valves to see if they are operating properly.
   D.) Check for loose wiring.

E.) Check for moisture or oil in air lines. Check to see if upper part of filter bags are damp or caked up. Install "after cooler" following the compressor and automatic moisture drains on receiver, and provide moisture traps or dessicant type dryer at collector if moisture is present.

F.) Check dew point of dust laden air. If unit is at or below dew point it may be necessary to pre-heat collector with hot, dry gas before start-up and/or to insulate collector. If heavy moisture condenses on the bags at shut-down then the collector must be purged with hot, dry gas before final shut-down.

G.) Check if bags are "skin" tight on cages. Bags must be free on cage for proper "flex". Bags which have been cleaned or washed may shrink and must be checked for a "loose" fit. Check hopper for overloading.

1.) Check dust discharge mechanism for proper operation and capacity. Correct if necessary.

2.) Check for material bridging across hopper or sticking to hopper. Coat hopper with Epoxy or Teflon type coating or add a sufficient size rapper or vibrator to keep hopper clear.

2.) High Product Carry Over.

A.) Allow unit to run at least 48 to 96 hours after initial installation of bags before performing checks. This running time allows bags to reach their operating efficiency and dusting may stop.

B.) Check filter bags for holes and wearing, replace if necessary.

C.) Check bag installation.

3.) Poor Bag Life.

A.) Check for moisture and dew point in unit. High moisture will cause certain filter materials to shrink and shorten bag life.

B.) If localized abrasion of bags is observed an impingement baffle may be required.

C.) Check for corrosion on cages. "Rough" surfaces will cause excess bag wear. Plastic coated or 304 Stainless Steel cages are available.

If you are experiencing any difficulties not covered by the above instructions, contact your O. A. Newton Salesman.

TIMER INSTRUCTIONS

Please refer to the individual instruction sheet for timer operation.

TIMER TROUBLE SHOOTING

1.) Check for mechanical damage.
2.) Check wiring of both power and solenoid valves.
3.) If indicator light is not on, check power input.
4.) Check fuse, replace if blown.
5.) Check program jumper. Program jumper should be in #3 position for 3 solenoid units and #4 position for 4 solenoid units and so on.
6.) Refer to timer instructions for further data.

INITIAL SETTING OF TIMER

1.) Set "On" time at minimum setting of 50 milliseconds.
2.) Set "Off" time at approximately 10 seconds. Then follow standard start up instructions.

O. A. NEWTON

Pleat Plus
Cartridges

PLEAT PLUS FILTERS FOR BAGHOUSES

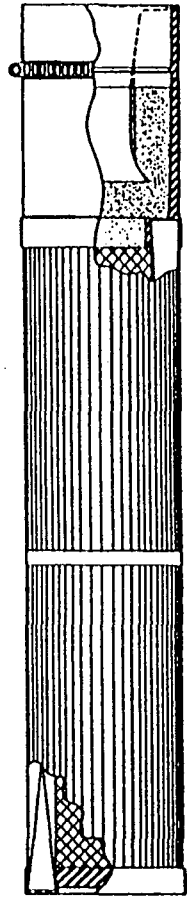
DESIGNED FOR 5.75" BOTTOM LOAD BAGS

TDC PLEAT PLUS CARTRIDGES OFFER:

- More efficient filtration compared with felt
- Increased media area provides lower restriction
- Reduced maintenance costs due to easier changeouts
- No cages required with pleated filters
- Longer filter life
- Improved air flow capacity
- Superior dust release
- Washability
- One piece installation (excluding clamp)

SPECIFICATIONS:

- High strength, 100% spun bond polyester media
- Continuous 200° F operating temperature
- Variable pleat height and pleat count
- Urethane or metal components
- Excellent efficiency
- Food grade construction
- Custom designs available
- Non-shedding, continuous-fiber construction
- Polyurethane top and bottom construction
- Galvanized metal inner core (304 SS or plastic optional)



MEDIA OPTIONS:

- SB—100% spun bond polyester
- SBME—Metalized media/ground wire for static dissipation
- SBTB—Media immersed in PTFE bath to create a hydro/oleo phobic coating (resistance to oil, water & dirt)
- SBPTFE—PTFE membrane on outer surface for ultra high efficiency, moisture resistance and ease of dust release

STANDARD SIZES* & MEDIA AREAS

Media Length	Over-All Length	30 Pleats	45 Pleats
36"	43.705"	15.0 ft²	22.5 ft²

* 1" pleat height

Note: All specifications are nominal and are subject to change without notice.

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O. A. NEWTON

INSTALLATION OF BOTTOM LOAD PLEAT PLUS™ FILTERS

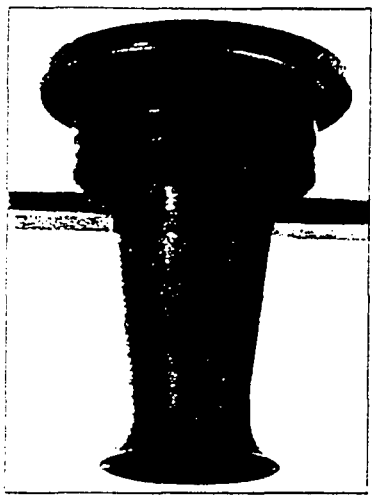

Figure 1

Figure 2

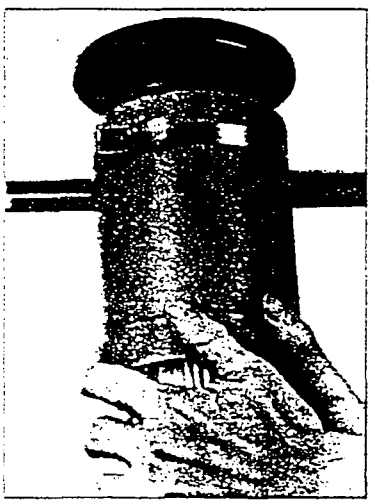

Figure 3

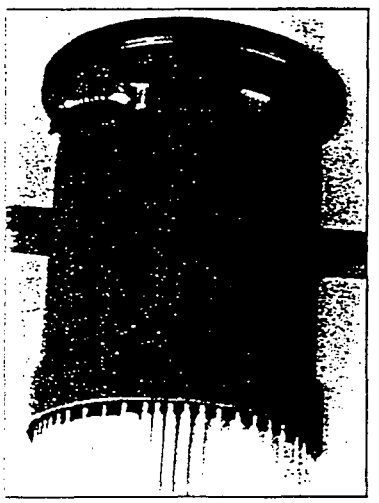

Figure 4

Venturi (Figure 1) or bag cup should be clean and in good repair.

Position a new clamp in the channel located near the top of the molded open end of the filter. Tighten until the clamp stays in place but is not compressing the filter top. (Figure 2

Carefully push the open end onto the venturi, or bag cup, and slide the filter up until the internal bead snaps into the venturi, or bag cup, groove. (Figure 3)

Make sure the top is mounted evenly, all the way around. Gently pull down on the filter to assure the bead is firmly in the groove. Check to see that filters are hanging straight and are not touching another filter or sidewall.

Position the clamp toward the top of the clamp channel and tighten into place. Do not overtighten. The clamp should be tight enough to prevent the filter from turning when twisted, but not so tight that the band segments cut into the molded top. 10-14 inch pounds torque recommended. (Figure 4)

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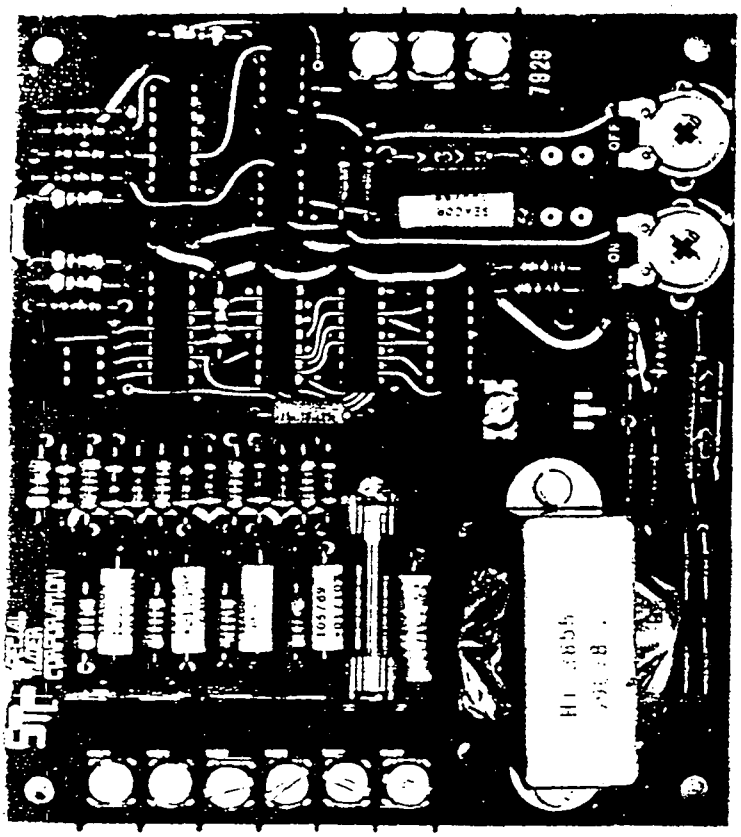
SEQUENCE PROGRAMMER #7929
FOR DUST COLLECTORS

SOLID STATE LOW COST



SEQUENCE:

1. No. 1 on, then No. 2 on, and so on to the last selected output, then back to No. 1, and continuing.
2. On times and off times are adjustable.
3. To extend on or off time ranges, add the proper capacitor to terms A, B & C. (+) to term B for on. (+) to term A for off and (–) to term C for both.

16VDC CAPACITOR SIZE FOR TIME RANGE

SYM	TIME RANGE	REF.
1	16 - 600 Milliseconds	.1
2	30 Milliseconds to 1.2 Seconds	.2
3	.1 - 6 Seconds	1
4	.2 - 12 Seconds	2.2
5	.3 - 20 Seconds	3.3
6	1 - 60 Seconds	10
7	2 Seconds to 2 Minutes	22
8	15 Seconds to 10 Minutes	100
9	.5 - 20 Minutes	220
10	1 - 45 Minutes	470
11	1 Minute 1.5 Hours 250	470
12	1 Minute to 8 Hours 1 M	470

RELIABLE, COMPACT, LOW COST

Here's 100% solid state reliability that features integrated circuitry and measures just 5-1/2" x 4-7/8" x 1-1/2". Available in enclosures such as moistureproof or explosionproof.

ADJUSTABLE SIGNAL INTERVALS

Signals are adjustable from 1/50 second to 8 hours. Special modifications for long timing ranges and models with complex sequences are also available. LED indication is provided for each output, and for power on indication.

STOP FUNCTION (Pressure Switch Sensing)

The sequence may be stopped at any position, on or off, restarting at that position for set time.

SELECTING PROPER PROGRAM

The gold jumper on the component side of the Control is for selecting the number of outputs. It is inserted in a small socket. To reduce the number of output positions, remove this jumper by pulling lightly until it retracts from the socket. Reinsert into the proper socket position (each hole closer to the fixed end reduces the output quantity by one) corresponding to the number of outputs desired.

INSTALLATION

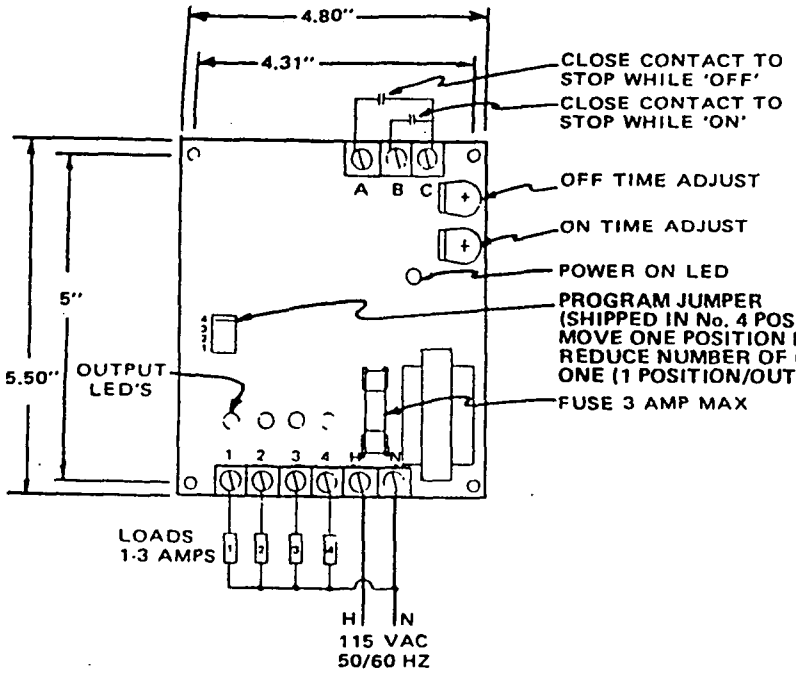
1. Mount the control or enclosure in any convenient location. Direction of the control does not effect its performance.
2. Connect 115 V 50/60 Cycle supply to terminal H & N. Neutral to N, High to H.
3. Connect one wire of each load to terminals 1 thru 4 as required. The remaining wire (common) is to be connected to terminal N.
4. Output rating is 3 amps at 115 VAC, maximum.

PROGRAM UP TO 4 FUNCTIONS!

Up to 4 outputs can be provided on the Special Timer Corporation Sequence Programmer, enabling you to program any sequence of up to 4.

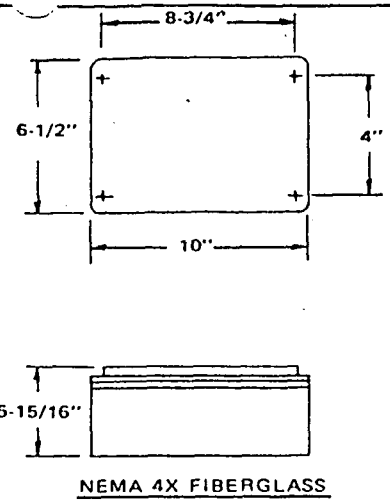
STC SPECIAL TIMER CORPORATION

P.O. BOX 1000 DAYTON, MINN. 55327 PHONE 612/441-4320

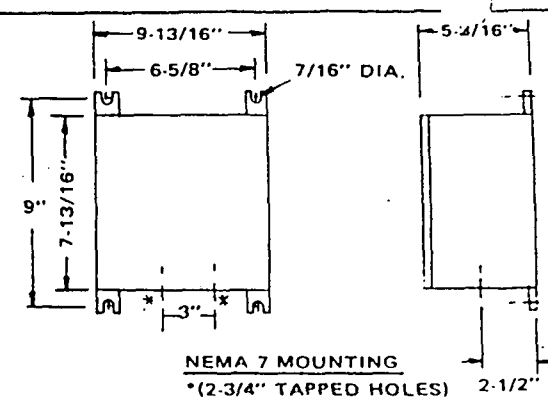


SEQUENCE:

1) No. 1 ON THEN OFF, THEN No. 2 AND SO ON TO LAST SELECTED OUTPUT THEN BACK TO No. 1 AND CONTINUING, EACH OUTPUT IDENTICAL.
2) ON TIME AND OFF TIME ARE INDEPENDENTLY ADJUSTABLE
3) FOR AVAILABLE TIME RANGES SEE TABLE AT RIGHT



NEMA 4X FIBERGLASS

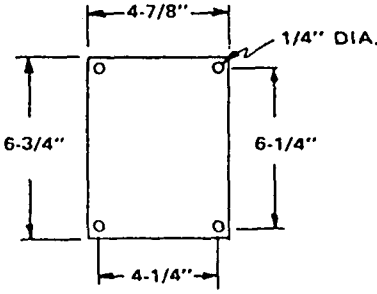


NEMA 7 MOUNTING
*(2-3/4" TAPPED HOLES)

TO ORDER/SELECT PART NUMBER 7929 - 1 - 7 - NEMA 4
SELECT FROM TABLE BELOW { – ON TIME RANGE, – OFF TIME RANGE, – ENCLOSURE IF REQUIRED }

NOTE: VARIATIONS OF TIME RANGES MAY BE SPECIFIED AS WELL AS LONGER TIMES. SPECIAL VOLTAGES, OR NUMBER OF OUTPUTS.

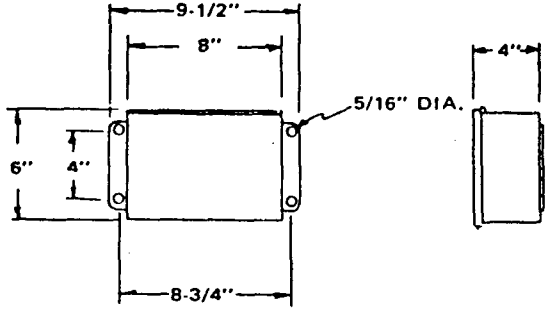
TIME RANGE MAY BE INCREASED BY ADDING CAPACITANCE FROM TERMINAL C TO TERM A OR B. C IS NEGATIVE (–) LEAD OF CAPACITOR.



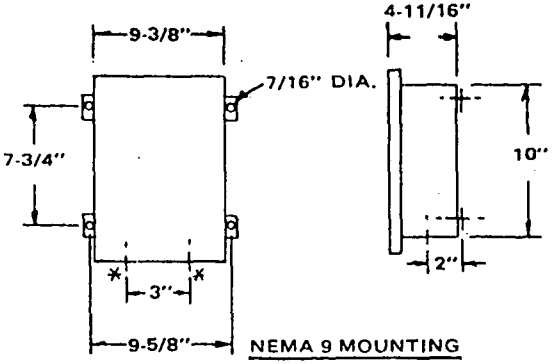
FLAT PANEL MOUNTING

16VDC CAPACITOR SIZE FOR TIME RANGE

SYM	TIME RANGE		REF.
1	16 - 600 Milliseconds		.1
2	30 Milliseconds to 1.2 Seconds		.2
3	.1 - 6 Seconds		1
4	.2 - 12 Seconds		2.2
5	.3 - 20 Seconds		3.3
6	1 - 60 Seconds		10
7	2 Seconds to 2 Minutes		22
8	15 Seconds to 10 Minutes		100
9	.5 - 20 Minutes		220
10	1 - 45 Minutes		470
11	1 Minute 1.5 Hours	250	470
12	1 Minute to 8 Hours	1 M	470



NEMA 4 & 12



NEMA 9 MOUNTING
*(2-3/4" TAPPED HOLES)

SPECIAL TIMER CORPORATION

SCALE: 1 | APPROVED BY: [illegible] 4/24/80 | DRAWN BY: BM
DATE: 4/16/80

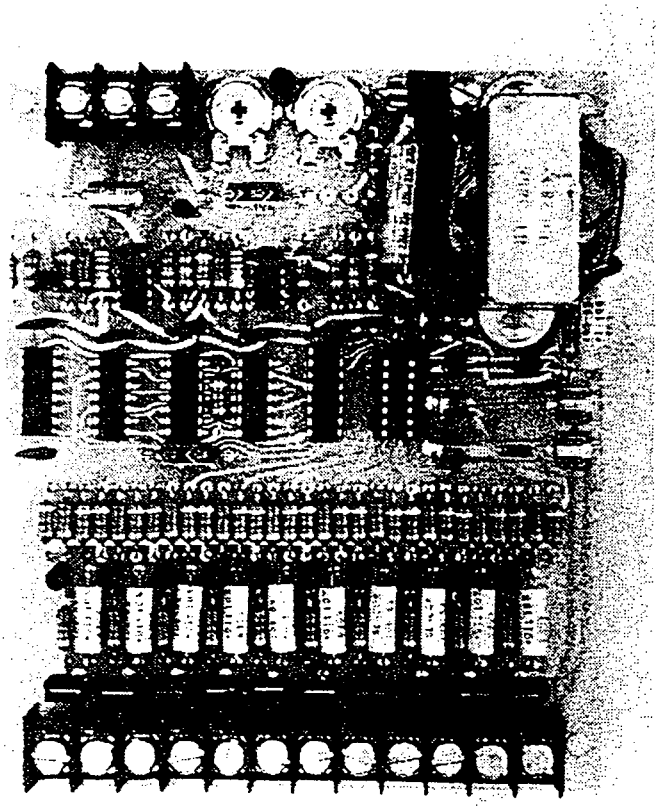
1 TO 4 OUTPUT SEQUENCER

FIELD CONNECTION DIAGRAM 7929

SEQUENCE PROGRAMMER #7937

FOR DUST COLLECTORS

SOLID STATE LOW COST



SEQUENCE:

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2. On times and off times are adjustable.
3. To extend on or off time ranges, add the proper capacitor to terms A, B & C. (+) to term B for on. (+) to term A for off and (–) to term C for both.

16VDC CAPACITOR SIZE FOR TIME RANGE

SYM	TIME RANGE	REF.
1	16 - 600 Milliseconds	.1
2	30 Milliseconds to 1.2 Seconds	.2
3	.1 - 6 Seconds	1
4	.2 - 12 Seconds	2.2
5	.3 - 20 Seconds	3.3
6	1 - 60 Seconds	10
7	2 Seconds to 2 Minutes	22
8	15 Seconds to 10 Minutes	100
9	.5 - 20 Minutes	220
10	1 - 45 Minutes	470
11	1 Minute 1.5 Hours 250	470
12	1 Minute to 8 Hours 1 M	470

RELIABLE, COMPACT, LOW COST

Here's 100% solid state reliability that features integrated circuitry and measures just 6-1/4" x 5-3/8" x 1-1/2". Ask about enclosures such as moistureproof or explosionproof.

ADJUSTABLE SIGNAL INTERVALS

Signals are adjustable from 1/50 second to 120 seconds, signals (intervals) can range to over eight hours. Special modifications for long timing ranges and models with complex sequences are also available. LED indication is provided for each output, and for power on indication.

STOP FUNCTION (Pressure Switch Sensing)

The sequence may be stopped at any position, on or off, restarting at that position for set time.

SELECTING PROPER PROGRAM

The gold jumper on the component side of the Control is for selecting the number of outputs. It is inserted in a small socket. To reduce the number of output positions, remove this jumper by pulling lightly until it retracts from the socket. Reinsert into the proper socket position (each hole closer to the fixed end reduces the output quantity by one) corresponding to the number of outputs desired.

INSTALLATION

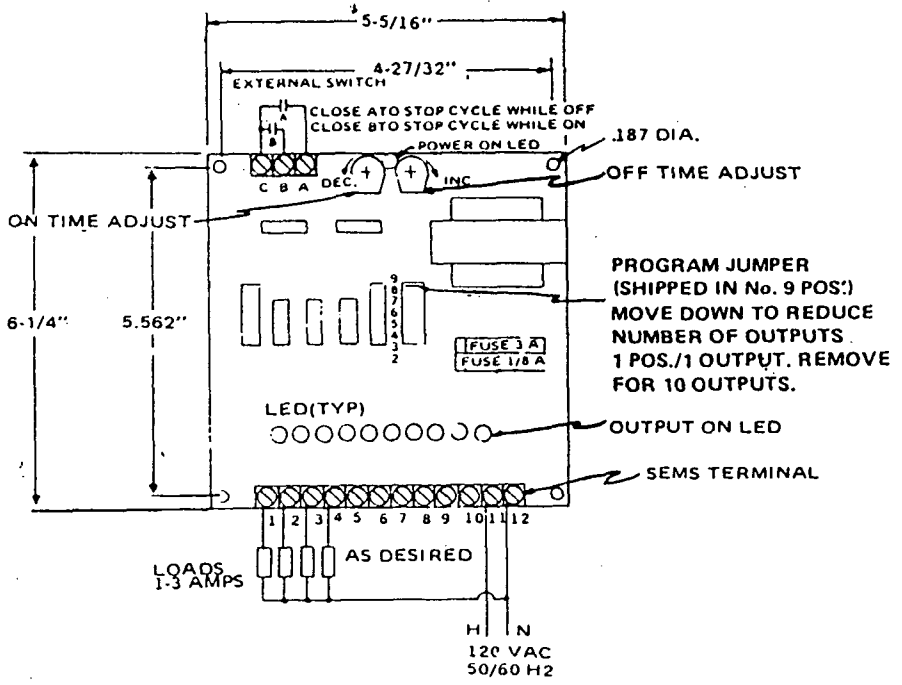
1. Mount the control or enclosure in any convenient location. Direction of the control does not effect its performance.
2. Connect 115 V 50/60 Cycle supply to terminal 11 & 12. Neutral to 12, High to 11.
3. Connect one wire of each load to terminals 1 thru 10 as required. The remaining wire (common) is to be connected to terminal 12.
4. Output rating is 3 amps at 115 VAC.

PROGRAM UP TO 10 FUNCTIONS!

Up to 10 outputs can be provided on the Special Timer Corporation Sequence Programmer, enabling you to program any sequence of up to 10.

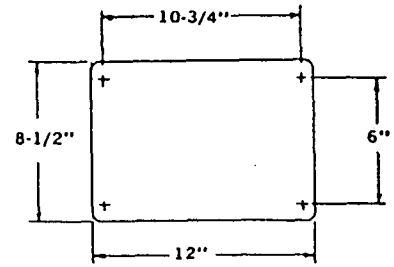
STC SPECIAL TIMER CORPORATION

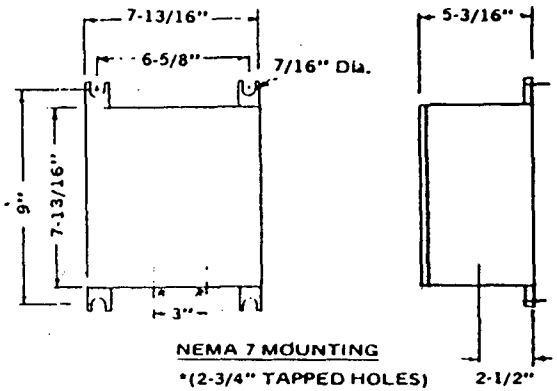
P.O. BOX 1000 DAYTON, MINN. 55327 PHONE 612/441-4320



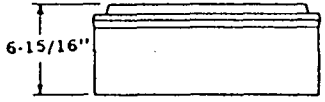
SEQUENCE:

1) No. 1 ON THEN No. 2 AND SO ON TO LAST SELECTED OUTPUT THEN BACK TO No. 1 AND CONTINUING, EACH OUTPUT IDENTICAL
2) ON TIME AND OFF TIME ARE INDEPENDENTLY ADJUSTABLE
3) FOR AVAILABLE TIMES SEE TABLE AT RIGHT AND DWG. 770409





NEMA 7 MOUNTING
*(2-3/4" TAPPED HOLES)

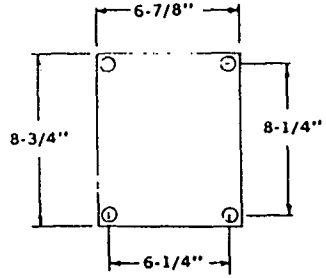


NEMA 4X MOUNTING
FIBERGLASS

TO ORDER SPECIFY—PART NUMBER 7937-1 - 6 NEMA
SELECT FROM TABLE BELOW
—ON TIME RANGE
—OFF TIME RANGE
—ENCLOSURE (If Required)

NOTE: VARIATIONS OF TIME RANGES MAY BE SPECIFIED AS WELL AS LONGER TIMES. SPECIAL VOLTAGES, OR NUMBER OF OUTPUTS.

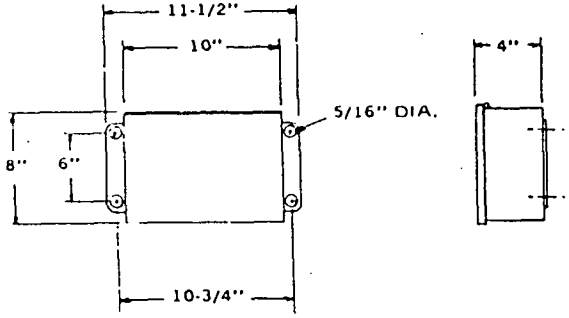
TIME RANGE MAY BE INCREASED BY ADDING CAPACITANCE FROM TERMINAL C TO TERM A OR B, C IS NEGATIVE (–) LEAD OF CAPACITOR.



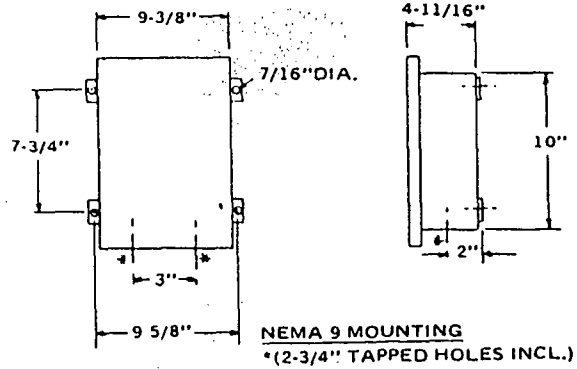
FLAT PANEL MOUNTING

16VDC CAPACITOR SIZE FOR TIME RANGE

SYM	TIME RANGE	REF.
1	16 - 600 Milliseconds	.1
2	30 Milliseconds to 1.2 Seconds	.2
3	.1 - 6 Seconds	1
4	.2 - 12 Seconds	2.2
5	.3 - 20 Seconds	3.3
6	1 - 60 Seconds	10
7	2 Seconds to 2 Minutes	22
8	15 Seconds to 10 Minutes	100
9	.5 - 20 Minutes	220
10	1 - 45 Minutes	470
11	1 Minute 1.5 Hours 250	470
12	1 Minute to 8 Hours 1 M	470



NEMA 4 & 12 M UNTING



NEMA 9 MOUNTING
*(2-3/4" TAPPED HOLES INCL.)

SPECIAL TIMER CORPORATION

SEQUENCE PROGRAMMER

FIELD CONN. DIAGRAM

793709

ASCO
JOUCOMATIC
Form No. V6950

GB CE

GENERAL INSTALLATION AND MAINTENANCE INSTRUCTIONS

Note: These General Installation and Maintenance Instructions must be read in conjunction with the Instruction Sheet for the specific product.

INSTALLATION

ASCO/JOUCOMATIC components are intended to be used only within the technical characteristics as specified on the nameplate. Changes to the equipment are only allowed after consulting the manufacturer or its representative. Before installation depressurize the piping system and clean internally.
The equipment may be mounted in any position if not otherwise indicated on the product by means of an arrow.
The flow direction and pipe connection of valves are indicated on the body.

The pipe connections have to be in accordance with the size indicated on the nameplate and fitted accordingly.
Caution:
- Reducing the connections may cause improper operation or malfunctioning.
- For the protection of the equipment install a strainer or filter suitable for the service involved in the inlet side as close to the product as possible.
- If tape, paste, spray or a similar lubricant is used when tightening, avoid particles entering the system.
- Use proper tools and locate wrenches as close as possible to the connection point.
- To avoid damage to the equipment, DO NOT OVERTIGHTEN pipe connections.
- Do not use valve or solenoid as a lever.
- The pipe connections should not apply any force, torque or strain to the product.

ELECTRICAL CONNECTION

In case of electrical connections, they are only to be made by trained personnel and have to be in accordance with the local regulations and standards.
Caution:
- Turn off electrical power supply and de-energize the electrical circuit and voltage carrying parts before starting work.
- All electrical screw terminals must be properly tightened according to the standards before putting into service.
- Dependent upon the voltage electrical components must be provided with an earth connection and satisfy local regulations and standards

The equipment can have one of the following electrical terminals:
- Spade plug connections according to ISO-4400 or 3 x DIN-46244 (when correctly installed this connection provides IP-65 protection).
- Embedded screw terminals in metal enclosure with "Pg" cable gland.
- Spade terminals (AMP type).
- Flying leads or cables.

PUTTING INTO SERVICE

Before pressurizing the system, first carry-out an electrical test. In case of solenoid valves, energize the coil a few times and notice a metal click signifying the solenoid operation.

SERVICE

Most of the solenoid valves are equipped with coils for continuous duty service. To prevent the possibility of personal or property damage do not touch the solenoid which can become hot under normal operation conditions.

SOUND EMISSION

The emission of sound depends on the application, medium and nature of the equipment used. The exact determination of the sound level can only be carried out by the user having the valve installed in his system.

MAINTENANCE

Maintenance of ASCO/JOUCOMATIC products is dependent on service conditions. Periodic cleaning is recommended, the timing of which will depend on the media and service conditions. During servicing, components should be examined for excessive wear. A complete set of internal parts is available as a spare parts or rebuild kit. If a problem occurs during installation/maintenance or in case of doubt please contact ASCO/JOUCOMATIC or authorised representatives.

A separate Declaration of Incorporation relating to EEC-Directive 89/392/EEC Annex II B is available on request. Please provide product identification number and serial numbers of products concerned.
This product complies with the essential requirements of the EMC-Directive 89/336/EEC and amendments. A separate Declaration of Conformity is available on request. Please provide product identification number and serial numbers of the products concerned.

FR CE

INSTRUCTIONS GÉNÉRALES D'INSTALLATION ET D'ENTRETIEN

Note : Ces instructions générales d'installation et d'entretien complètent la notice spécifique du produit.

MONTAGE

Les composants ASCO/JOUCOMATIC sont conçus pour les domaines de fonctionnement indiqués sur la plaque signalétique ou la documentation. Aucune modification ne peut être réalisée sur le matériel sans l'accord préalable du fabricant ou de son représentant. Avant de procéder au montage, dépressuriser les canalisations et effectuer un nettoyage interne.
A moins qu'une flèche ou la notice n'indique un sens de montage spécifique de la tête magnétique, le produit peut être monté dans n'importe quelle position.
Le sens de circulation du fluide est indiqué par repères sur le corps et dans la documentation.

La dimension des tuyauteries doit correspondre au raccordement indiqué sur le corps, l'étiquette ou la notice.
Attention :
- Une restriction des tuyauteries peut entraîner des dysfonctionnements.
- Afin de protéger le matériel, installer une crépine ou un filtre adéquat en amont, aussi près que possible du produit.
- En cas d'utilisation de ruban, pâte, aérosol ou autre lubrifiant lors du serrage, veiller à ce qu'aucun corps étranger ne pénètre dans le circuit.
- Utiliser un outillage approprié et placer les clés aussi près que possible du point de raccordement.
- Afin d'éviter toute détérioration, NE PAS TROP SERRER les raccords des tuyauteries.
- Ne pas se servir de la vanne ou de la tête magnétique comme d'un levier.
- Les tubes de raccordement ne devront exercer aucun effort, couple ou contrainte sur le produit.

RACCORDEMENT ÉLECTRIQUE

Le raccordement électrique doit être réalisé par un personnel qualifié et selon les normes et règlements locaux.
Attention :
- Avant toute intervention, couper l'alimentation électrique pour mettre hors tension les composants.
- Toutes les bornes à vis doivent être serrées correctement avant la mise en service.
- Selon la tension, les composants électriques doivent être mis à la terre conformément aux normes et règlements locaux.

Selon les cas, le raccordement électrique s'effectue par :
- Connecteur débrochable ISO4400 ou 3 x DIN46244 avec degré de protection IP65 lorsque le raccordement est correctement effectué.
- Bornes à vis solidaires du bobinage, sous boîtier métallique avec presse-étoupe "Pg - -".
- Cosses (type AMP).
- Fils ou câbles solidaires de la bobine.

MISE EN SERVICE

Avant de mettre le circuit sous pression, effectuer un essai électrique. Dans le cas d'une électrovanne, mettre la bobine sous tension plusieurs fois et écouter le "clic" métallique qui signale le fonctionnement de la tête magnétique.

FONCTIONNEMENT

La plupart des électrovannes comportent des bobinages prévus pour mise sous tension permanente. Pour éviter toute brûlure, ne pas toucher la tête magnétique qui, en fonctionnement normal et en permanence sous tension, peut atteindre une température élevée.

BRUIT DE FONCTIONNEMENT

Le bruit de fonctionnement varie selon l'utilisation, le fluide et le type de matériel employé. L'utilisateur ne pourra déterminer avec précision le niveau sonore émis qu'après avoir monté le composant sur l'installation.

ENTRETIEN

L'entretien nécessaire aux produits ASCO/JOUCOMATIC varie avec leurs conditions d'utilisation. Il est souhaitable de procéder à un nettoyage périodique dont l'intervalle varie suivant la nature du fluide, les conditions de fonctionnement et le milieu ambiant. Lors de l'intervention, les composants doivent être examinés pour détecter toute usure excessive. Un ensemble de pièces internes est proposé en pièces de rechange pour procéder à la réfection. En cas de problème lors du montage/entretien ou en cas de doute, veuillez contacter ASCO/JOUCOMATIC ou ses représentants officiels.

Conformément à la directive CEE 89/392/CEE Annexe II B, une Déclaration d'Incorporation peut être fournie sur demande. Veuillez nous indiquer le numéro d'accusé de réception (AR) et les références ou codes des produits concernés.
Ce produit est conforme aux exigences essentielles de la Directive 89/336/CEE sur la Compatibilité Electromagnétique, et amendements. Une déclaration de conformité peut être fournie sur simple demande. Veuillez nous indiquer le numéro d'accusé de réception (AR) ainsi que les numéros de série des produits concernés.

DE CE

ALLGEMEINE BETRIEBSANLEITUNG

ACHTUNG: Diese Allgemeine Betriebsanleitung gilt in Zusammenhang mit der jeweiligen Betriebsanleitung für die speziellen Produkte.

EINBAU

Die ASCO/JOUCOMATIC-Komponenten dürfen nur innerhalb der auf den Typenschildern angegebenen Daten eingesetzt werden. Veränderungen an den Produkten sind nur nach Rücksprache mit ASCO/JOUCOMATIC zulässig.
Vor dem Einbau der Ventile muß das Rohrleitungssystem drucklos geschaltet und innen gereinigt werden.
Die Einbaulage der Produkte ist generell beliebig. **Ausnahme:** Die mit einem Pfeil gekennzeichneten Produkte müssen entsprechend der Pfeilrichtung montiert werden.
Die Durchflußrichtung und der Eingang von Ventilen sind gekennzeichnet.

Die Rohranschlüsse sollten entsprechend den Größenangaben auf den Typenschildern mit handelsüblichen Verschraubungen durchgeführt werden. **Dabei ist folgendes zu beachten:**
- Eine Reduzierung der Anschlüsse kann zu Leistungs- und Funktionsminderungen führen.
- Zum Schutz der Ventile sollten Schmutzfänger oder Filter so dicht wie möglich in den Ventileingang integriert werden.
- Bei Abdichtung am Gewinde ist darauf zu achten, daß kein Dichtungsmaterial in die Rohrleitung oder das Ventil gelangt.
- Zur Montage darf nur geeignetes Werkzeug verwendet werden.
- Konische Verschraubungen sind sorgfältig anzuziehen. Es ist darauf zu achten, daß beim Anziehen das Gehäuse nicht beschädigt wird.
- Spule und Führungsrohr von Ventilen dürfen nicht als Gegenhalter benutzt werden.
- Die Rohrleitungsanschlüsse sollen fluchten und dürfen keine Spannungen auf das Ventil übertragen.

ELEKTRISCHER ANSCHLUß

Der elektrische Anschluß ist von Fachpersonal entsprechend den geltenden VDE- und CEE-Richtlinien auszuführen. **Es ist besonders auf folgendes zu achten:**
- Vor Beginn der Arbeiten ist sicherzustellen, daß alle elektrischen Leitungen und Netzteile spannungslos geschaltet sind.
- Alle Anschlußklemmen sind nach Beendigung der Arbeiten vorschriftsmäßig entsprechend den geltenden Regeln anzuziehen.
- Je nach Spannungsbereich muß das Ventil nach den geltenden Regeln einen Schutzleiteranschluß erhalten.

Der Magnetantrieb kann je nach Bauart folgende Anschlüsse haben:
- Anschluß für Gerätesteckdose nach DIN 43650 Form A/ISO 4400 oder 3x DIN 46244 (durch ordnungsgemäße Montage der Gerätesteckdose wird Schutzklasse IP 65 erreicht).
- Anschlüsse innerhalb eines Blechgehäuses mittels Schraubklemmen. Kabeleinführung ins Gehäuse mit PG-Verschraubung.
- Offene Spulen mit Flachsteckern (AMP-Fahnen) oder mit eingegossenen Kabelenden.

INBETRIEBNAHME

Vor Druckbeaufschlagung des Produktes sollte eine elektrische Funktionsprüfung erfolgen:
Bei Ventilen Spannung an der Magnetspule mehrmals ein- und ausschalten. Es muß ein Klicken zu hören sein.

BETRIEB

Die meisten Ventile sind mit Spulen für Dauerbetrieb ausgerüstet. Zur Vermeidung von Personen- und Sachschäden sollte jede Berührung mit dem Ventil vermieden werden, da die Magnetspule bei längerem Betrieb sehr heiß werden kann.

GERÄUSCHEMISSION

Diese hängt sehr stark vom Anwendungsfall, den Betriebsdaten und dem Medium, mit denen das Produkt beaufschlagt wird, ab. Eine Aussage über die Geräuschemission des Produktes muß deshalb von demjenigen getroffen werden, der das Produkt innerhalb einer Maschine in Betrieb nimmt.

WARTUNG

Die Wartung hängt von den Einsatzbedingungen ab. In entsprechenden Zeitabständen muß das Produkt geöffnet und gereinigt werden. Für die Überholung der ASCO/JOUCOMATIC-Produkte können Ersatzteilsätze geliefert werden. Treten Schwierigkeiten bei Einbau, Betrieb oder Wartung auf, sowie bei Unklarheiten, ist mit ASCO/JOUCOMATIC Rücksprache zu halten.

(ASCO/JOUCOMATIC Produkte sind entsprechend der EG-Richtlinie 89/392/EWG gefertigt.

Eine separate Herstellererklärung im Sinne der Richtlinie 89/392/EWG Anhang IIB ist auf Anfrage erhältlich. Geben Sie bitte für die Produkte die Nummer der Auftragsbestätigung und die Seriennummer an.
Das Produkt erfüllt die wesentlichen Anforderungen der EMC-Richtlinie 89/336/EWG und der entsprechenden Änderungen. Eine separate Konformitätserklärung ist auf Anfrage erhältlich. Bitte geben Sie die Auftragsbestätigungsnummer und die Seriennummern der betreffenden Produkte an.

AUTOMATIC SWITCH CO.
50-60 Hanover Road
Florham Park, New Jersey 07932
Tel. (201) 966-2000
Fax (201) 966-2628

AUTOMATIC SWITCH CO.
1561 Columbia Highway
Aiken, South Carolina 29801
Tel. (803) 641-9200
Fax (803) 641-9290

ANGAR SCIENTIFIC
54 Horsehill Road
Cedar Knolls, New Jersey 07927
Tel. (201) 538-3700
Fax (201) 538-5937

ASCO
JOUCOMATIC
Form No. V6950

ES CE

INSTRUCCIONES GENERALES DE INSTALACION Y MANTENIMIENTO

Nota: Estas Instrucciones Generales de Instalación y Mantenimiento deben considerarse en conjunción con la Hoja de Instrucciones de cada producto.

INSTALACION

Los componentes ASCO/JOUCOMATIC sólo deben utilizarse dentro de las especificaciones técnicas que se especifican en su placa de características o catálogo. Los cambios en el equipo sólo estarán permitidos después de consultar al fabricante o a su representante. Antes de la instalación despresurice el sistema de tuberías y limpie internamente.
El equipo puede utilizarse en cualquier posición si no estuviera indicado lo contrario sobre el mismo mediante una flecha o en el catálogo.
En el cuerpo o en el catálogo se indican el sentido del fluido y la conexión de las válvulas a la tubería.

Las conexiones a la tubería deben corresponder al tamaño indicado en la placa de características la etiqueta o el catálogo y ajustarse adecuadamente.
Precaución:

- La reducción de las conexiones puede causar operaciones incorrectas o defectos de funcionamiento.
- Para la protección del equipo se debe instalar, en la parte de la entrada y tan cerca como sea posible del producto, un filtro adecuado.
- Si se utilizara cinta, pasta, spray u otros lubricantes en el ajuste, se debe evitar que entren partículas en el producto.
- Se debe utilizar las herramientas adecuadas y colocar llaves inglesas lo mas cerca posible del punto de conexión.
- Para evitar daños al equipo, NO FORZAR las conexiones a la tubería.
- No utilizar la válvula o el solenoide como palanca.
- Las conexiones a la tubería no producirán ninguna fuerza, par o tensión sobre el producto.

CONEXION ELECTRICA

Las conexiones eléctricas serán realizadas por personal cualificado y deberán adaptarse a las normas y regulaciones locales.
Precaución:

- Antes de comenzar el trabajo, desconecte el suministro de energía eléctrica y desenergice el circuito eléctrico y los elementos portadores de tensión.
- Todos los terminales eléctricos deben estar apretados adecuadamente según normas antes de su puesta en servicio.
- Según el voltaje, los componentes eléctricos deben disponer de una conexión a tierra y satisfacer las normas y regulaciones locales.

El equipo puede tener uno de los siguientes terminales eléctricos:

- Conexiones desenchufables según ISO 4400 o 3 x DIN-46244 (cuando se instala correctamente esta conexión proporciona una protección IP-65).
- Terminales de tornillo con carcasa metálica con entrada de cable de conexión roscada "PG".
- Conector desenchufable (tipo AMP).
- Salida de cables.

PUESTA EN MARCHA

Se debe efectuar una prueba eléctrica antes de someter a presión el sistema. En el caso de las válvulas solenoides, se debe energizar varias veces la bobina y comprobar que se produce un sonido metálico que indica el funcionamiento del solenoide.

SERVICIO

La mayor parte de las válvulas solenoides se suministran con bobinas para un servicio continuo. Con el fin de evitar la posibilidad de daños personales o materiales no se debe tocar el solenoide, ya que puede haberse calentado en condiciones normales de trabajo.

EMISION DE RUIDOS

La emisión de ruidos depende de la aplicación, medio y naturaleza del equipo utilizado. Una determinación exacta del nivel de ruido sólamente se puede llevar a cabo por el usuario que disponga la válvula instalada en su sistema.

MANTENIMIENTO

El mantenimiento de los productos ASCO/JOUCOMATIC depende de las condiciones de servicio. Se recomienda una limpieza periódica, dependiendo de las condiciones del medio y del servicio. Durante el servicio, los componentes deben ser examinados por si hubieran desgastes excesivos. Se dispone de un juego completo de partes internas como recambio o kit de montaje. Si ocurriera un problema durante la instalación/mantenimiento o en caso de duda contactar con ASCO/JOUCOMATIC o representantes autorizados.

Se dispone, por separado y bajo demanda, de una Declaración de Incorporación conforme a la Directiva CEE 89/392/EEC Anexo II B. Rogamos que nos faciliten los códigos y números de acepta-ción de pedido correspondientes.
Este producto cumple con los requisitos esenciales de la Directiva EMC 89/336/CEE y sus correspondientes modifi-caciones. Si lo desea, podemos facilitarle una Declaración de Conformidad por separado. Rogamos faciliten el número de confirmación de pedido y los números de serie de los respectivos productos.

IT CE

ISTRUZIONI DI INSTALLAZIONE E DI MANUTENZIONE GENERALE

Nota: Queste istruzioni devono essere lette in congiunzione con il manuale specifico del prodotto.

INSTALLAZIONE

Le elettrovalvole devono essere utilizzate esclusivamente rispettando le caratteristiche tecniche specificate sulla targhetta. Variazioni sulle valvole o sui piloti sono possibili solo dopo aver consultato il costruttore o i suoi rappresentanti. Prima dell'installa-zione depressurizzare i tubi e pulire internamente.
Le elettrovalvole possono essere montate in tutte le posizioni. Diversamente, una freccia posta sulla valvola indica che deve essere montata in posizione verticale e diritta.
La direzione del flusso e' indicata sul corpo della valvola per mezzo di una freccia oppure con l'etichetta "IN", "1", "A", o "P".

I raccordi devono essere conformi alla misura indicata sulla targhetta apposta.
Attenzione:

- Ridurre i raccordi puo' causare operazioni sbalgliate o malfunzionamento.
- Per proteggere il componente installare,il più vicino possibile al lato ingresso, un filtro adatto al servizio.
- Se si usano nastro, pasta, spray o lubrificanti simili durante il serraggio, evitare che delle particelle entrino nel corpo della valvola.
- Usare un'attrezzatura appropriate e utilizzare le chiavi solo sul corpo della valvola.
- Per evitare danni al corpo della valvola, NON SERRARE ECCESSIVAMENTE i tubi.
- Non usare la valvola o il pilota come una leva.
- I raccordi non devono esercitare pressione, torsione o sollecitazione sull'elettrovalvola.

ALLACCIAMENTO ELETTRICO

L'allacciamento elettrico deve essere effetuato esclusivamente dal personale specializzato e deve essere conforme alle Norme locali.
Attensione:

- Prima di mettere in funzione togliere l'alimentazione elettrica, diseccitare il circuito elettrico e le parti sotto tensione.
- I morsetti elettrici devono essere correttamente avvitati, secondo le Norme, prima della messa in servizio.
- Le elettrovalvole devone essere provviste di morsetti di terra a seconda della tensione e delle Norme di sicurezza locali.

I piloti possono avere una delle seguenti caratteristiche elettrice:

- Connettore ISO-4400 o 3 x DIN-46244 (se installato correttamente e' IP-65).
- Morsettena racchiusa in custodia metallica. Entrata cavi con pressacavi tipo "PG".
- Bobina con attacchi FASTON (tipo AMP).
- Bobine con fili o cavo.

MESSA IN FUNZIONE

Prima di dare pressione alla valvoa, eseguire un test elettrico. Eccitare la bobina diverse volte fino a notare uno scatto metallico che dimostra il funzionamento del pilota.

SERVIZIO

Molte elettrovalvole sono provviste di bobine per funzionamento continuo. Per prevenire la possibilita' di danneggiare cose o persone, non toccare il pilota.
La custodia della bobina o del pilota puo' scaldarsi anche in normali condizioni di funzionamento.

EMISSIONE SUONI

L'emissione di suoni dipende dall'applicazione e dal tipo di elettrovalvola. L'utente puo' stabilire esattamente il livello del suono solo dopo aver installato la valvola sul suo impianto.

MANUTENZIONE

Generalmente questi componenti non necessitano spesso di manutenzione. Comunque, in alcuni casi e' necessario fare attenzione a depositi o ad eccessiva usura. Questi componenti devono essere puliti periodicamente, il tempo che intercorre tra una pulizia e l'altra varia a seconda delle condizioni di funzionamento. Il ciclo di durata dei componenti dipende dalle condizioni di funzionamento. Incaso di usura e' disponibile un set completo di parti interne per per la revisione.
Se si incontrano problemi durante l'installazione e la manutenzione o se si hanno dei dubbi, consultare ASCO/JOUCOMATIC o i suoi rappresentanti.

L'utente puo'richiedere al costruttore una dichiarazione sepa-rate riguardante le Direttive EEC 89/392/EEC e 91/368/EEC (vedere allegato II B) fornendo il numero di serie e il riferimento dell'ordine relativo.
Il presente prodotto è conforme alle esigenze essenziali della Direttiva EMC 89/336/CEE ed agli emendamenti. Una Dichiarazione di Conformità separata può essere ottenuta su richiesta. Si prega di fornire il numero della conferma dell'ordinativo ed i numeri di serie dei relativi prodotti.

NL CE

ALGEMENE INSTALLATIE- EN ONDERHOUDSINSTRUKTIES

N.B.: Deze algemene instruktles t.a.v. installatie en onderhoud moeten in acht worden genomen tezamen met de specifieke voorschriften van het produkt.

INSTALLATIE

ASCO/JOUCOMATIC produkten mogen uitsluitend toegepast worden binnen de op de naamplaat aangegeven specificaties. Wijzigingen, zowel elektrisch als mechanisch, zijn alleen toegestaan na overleg met de fabrikant of haar vertegenwoordiger. Voor het inbouwen dient het leidingssysteem drukloos gemaakt te worden en inwendig gereinigd.
De positie van de afsluiter is naar keuze te bepalen, behalve in die gevallen waarbij het tegendeel door pijlen wordt aangegeven. De doorstroomrichting wordt bij afsluiters aangegeven op het afsluiterhuis.

De pijpaansluiting moet overeenkomstig de naamplaatgegevens plaatsvinden.
Hierbij moet men letten op:

- Een reductie van de aansluitingen kan tot prestatie- en funktie-stoornis leiden.
- Ter bescherming van de interne delen wordt een filter in het leidingnet aanbevolen.
- Bij het gebruik van draadafdichtingspasta of tape mogen er geen deeltjes in het leidingwerk geraken.
- Men dient uitsluitend geschikt gereedschap voor de montage te gebruiken.
- Bij konische/tapse koppelingen moet met een zodanig koppel worden gewerkt dat het produkt niet wordt beschadigd.
- Het produkt, de behuizing of de spoel mag niet als hefboom worden gebruikt.
- De pijpaansluitingen mogen geen krachten of momenten op het produkt overdragen.

ELEKTRISCHE AANSLUITING

In geval van elektrische aansluiting dient dit door vakkundig perso-neel te worden uitgevoerd volgens de door de plaatselijke overheid bepaalde richtlijnen.
Men dient in het bijzonder te letten op:

- Voordat men aan het werk begint moeten alle spannings-voerende delen spanningsloos worden gemaakt.
- Alle aansluitklemmen moeten na het beëindigen van het werk volgens de juiste normen worden aangedraaid.
- Al naar gelang het spanningsbereik, moet het produkt volgens de geldende normen van een aarding worden voorzien.

Het produkt kan de volgende aansluitingen hebben:

- Stekeraansluiting volgens ISO-4400 of 3x DIN-46244 (bij juiste montage wordt de dichtheidsklasse IP-65 verkregen).
- Aansluiting binnen in het metalen huis d.m.v. schroefaansluiting. De kabeldoorvoer heeft een "PG" aansluiting.
- Spoelen met platte steker (AMP type).
- Losse of aangegoten kabels

IN GEBRUIK STELLEN

Voordat de druk aangesloten wordt dient een elektrische test te worden uitgevoerd. Ingeval van magneetafsluiters, legt men meerdere malen spanning op de spoel aan waarbij een duidelijk "klikken" hoorbaar moet zijn bij juist funktioneren.

GEBRUIK

De meeste magneetafsluiters zijn uitgevoerd met spoelen voor continu gebruik. Omdat persoonlijke of zakelijke schade kan ontstaan bij aanraking dient men dit te vermijden, daar bij langdurige inschakeling de spoel of het spoelhuis heet kan worden.

GELUIDSEMISSIE

Dit hangt sterk af van de toepassing en het gebruikte medium. De bepaling van het geluidsniveau kan pas uitgevoerd worden nadat het ventiel is ingebouwd.

ONDERHOUD

Het onderhoud aan de afsluiters is afhankelijk van de bedrijfs-omstandigheden.
In bepaalde gevallen moet men bedacht zijn op media welke sterke vervuiling binnen in het produkt kunnen veroorzaken.
Men dient dan regelmatig inspecties uit te voeren door de afsluiter te openen en te reinigen. Indien ongewone slijtage optreedt dan zijn reserve onderdelensets beschikbaar om een inwendige revisie uit te voeren.
Ingeval problemen of onduidelijkheden tijdens montage, gebruik of onderhoud optreden dan dient men zich tot ASCO of haar vertegenwoordiger te wenden.

Een aparte fabrikanten verklaring van inbouw, in de zin van EU-richtlijn 89/392/EEG aanhangsel IIB kan door de klanter na opgave van orderbevestigingsnummer en serienummer verkregen worden.
Dit produkt voldoet aan de fundamentele voorschriften van EMC-richtlijn 89/336/EEG en de bijbehorende wijzigingen. Een afzonderlijke verklaring van overeenstemming is op verzoek verkrijgbaar. Vermeld s.u.b. het nummer van de opdrachtbevestiging en de serienummers van de betreffende produkten.

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Fraccionamiento Bosques de las Lomas
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INSTALLATION AND MAINTENANCE INSTRUCTIONS

REMOTE PILOT OPERATED 2-WAY VALVES

BULLETIN **8353**

Kit No. 96-875

Form No. V-5162 R5

DESCRIPTION

Bulletin 8353 is a 2-way diaphragm type air valve designed for remote pilot operation. Valves have an angle type aluminum body with a 1/8 N.P.T. connection in the valve bonnet for connection to the ASCO remote pilot valve. Valves are designed for multi-unit installations with separately mounted ASCO pilot valves.

OPERATION

When remote pilot valve opens, pressure above the diaphragm is released allowing main line pressure to act against the underside of the diaphragm, opening the main valve orifice. When pilot valve closes, main line pressure bleeds to the top of the diaphragm and closes the main orifice.

INSTALLATION

Check valve bonnet for correct catalog number, pressure and service.

POSITIONING

Valve may be mounted in any position.

PIPING/TUBING

Connect piping to valve according to markings on valve body. Apply pipe compound sparingly to male pipe threads only; if applied to valve threads, it may enter the valve and cause operational difficulty. Pipe strain should be avoided by proper support and alignment of piping. When tightening pipe, do not use valve as a lever. Wrenches applied to valve body or piping are to be located as close as possible to connection point. The remote ASCO pilot valve should be mounted as close as possible to the main valve. For correct ASCO pilot valve, consult factory. For proper operation of valve, a specific pilot valve must be utilized. Connecting tubing lengths of ten feet or less have little effect on the pulse response. Installations with over ten feet of tubing must be tested under actual operating conditions. Tubing with 1/4 O.D. is recommended for all installations.

CAUTION: To avoid damage to the valve body, DO NOT OVER-TIGHTEN PIPE CONNECTIONS. If teflon tape, paste, spray or similar lubricant is used, use extra care due to reduced friction.

IMPORTANT: For the protection of the valve, install a strainer or filter suitable for the service involved in the inlet side as close to the valve as possible. Periodic cleaning is required, depending on the service conditions. See Bulletins 8600, 8601 and 8602 for strainers.

MAINTENANCE

WARNING: Depressurize valve and bleed air from header before making repairs. It is necessary only to remove the tubing from the remote pilot valve.

CLEANING

A periodic cleaning of all valves is desirable. The time between cleaning will vary, depending upon media and service conditions. In general, sluggish valve operation or excessive leakage or noise will indicate that cleaning is required.

PREVENTIVE MAINTENANCE

1. Keep the medium flowing through the valve as free from dirt and foreign material as possible.
2. While in service, operate valve at least once a month to insure proper opening and closing.
3. Periodic inspection (depending on media and service conditions) of internal valve parts for damage or excessive wear is recommended. Thoroughly clean all parts. Replace any parts that are worn or damaged.

IMPROPER OPERATION

1. Incorrect Pressure: Check valve pressure. Pressure to valve must be within 5-125 psi.
2. Excessive Leakage: Disassemble valve and clean all parts. Replace parts that are worn or damaged with a complete Spare Parts Kit for best results.
3. Failure to Open or Close:
   A. If diaphragm valve stays open, bleed hole may be clogged. If diaphragm valve stays closed, diaphragm may be torn. Disassemble valve and clean or replace diaphragm assembly.
   B. Failure of the remote pilot solenoid valve can also cause the diaphragm valve to stay closed or open. Inspect remote pilot solenoid valve for proper opening and closing.

VALVE DISASSEMBLY AND REASSEMBLY (Refer to Figures 1 & 2)

Depressurize valve and bleed air from headers before making repairs. Remove tubing connection from remote pilot valve. Proceed in the following manner:

1. Remove bonnet screws, valve bonnet, diaphragm spring and diaphragm assembly. If the valve you are disassembling contains a square cut gasket or a step spacer as shown in the sectioned view, Figure 2, the square cut gasket or step spacer need not be replaced unless damaged. If a replacement is required, order by the numbers indicated in Figure 2.
2. Diaphragm assembly is now accessible for cleaning or replacement. Replace diaphragm assembly if worn or damaged.
3. Reassemble in reverse order of disassembly paying careful attention to exploded view provided for identification and placement of parts.
4. Replace diaphragm assembly, (for ease of assembly, the tab may be located in any position) diaphragm spring, valve bonnet and bonnet screws. Torque bonnet screws in a crisscross manner to 10 - 11 foot-pounds.
5. Replace tubing connection from remote pilot valve.
6. After maintenance, operate the valve a few times to be sure of proper opening and closing.

SPARE PARTS KITS

Spare Parts Kits are available for ASCO valves.
Parts marked with an asterisk (*) are supplied in Spare Parts Kit.

ORDERING INFORMATION FOR SPARE PARTS KITS

When Ordering Spare Parts Kits,
Specify Valve Catalog Number and Serial Number.
Order Kit No. 96-875

For Square Cut Gasket, Order
Part No. 88-224-228A

For Step Spacer, Order
Part No. 93-834-1

Form No. V-5162R5 PRINTED IN U.S.A. 1977 Automatic Switch Co.

ASCO Valves
FLORHAM PARK, NEW JERSEY 07932

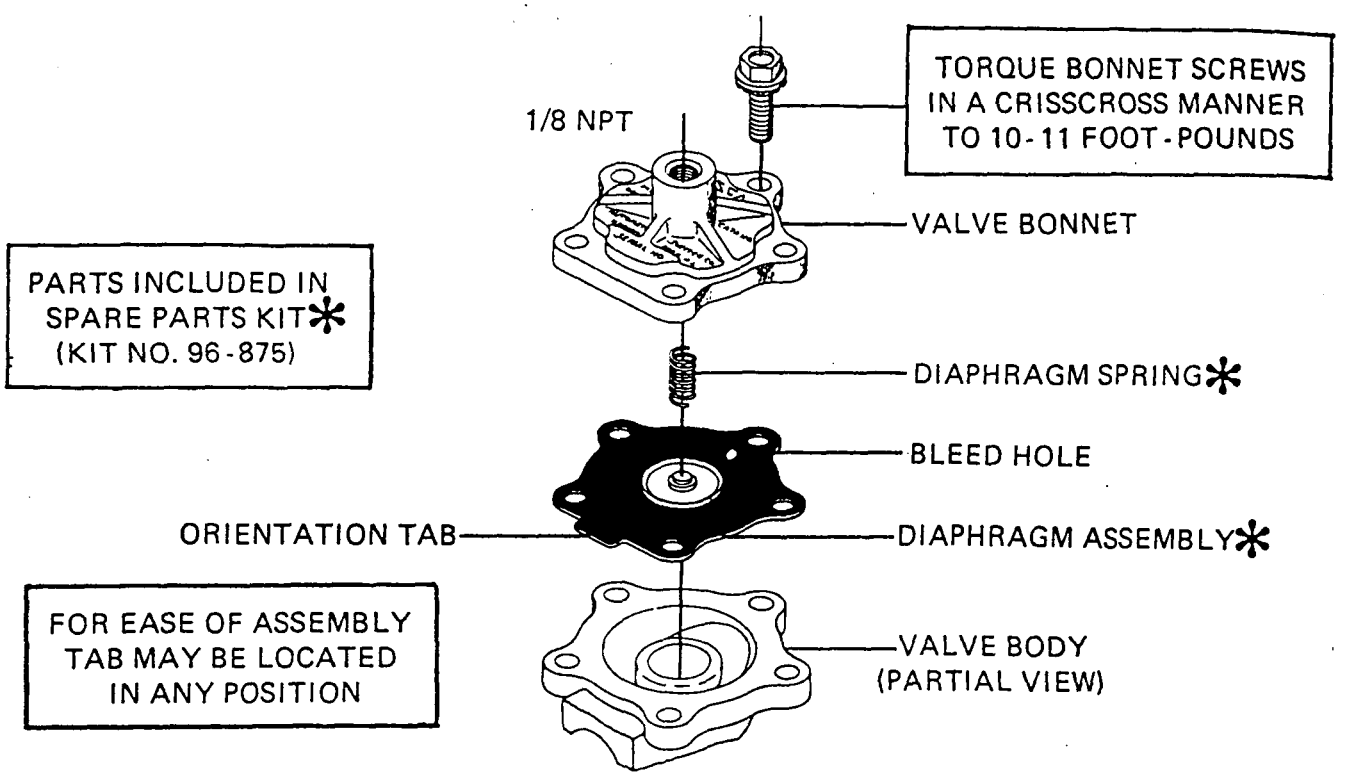

Figure 1. Bulletin 8353

IMPORTANT

THE SQUARE CUT GASKET AND STEP SPACER SHOWN BELOW ARE USED IN OLD STYLE VALVES ONLY. THEY ARE NOT SUPPLIED IN SPARE PARTS KITS, BUT IF REQUIRED, THEY MAY BE ORDERED INDIVIDUALLY BY PART NUMBER.

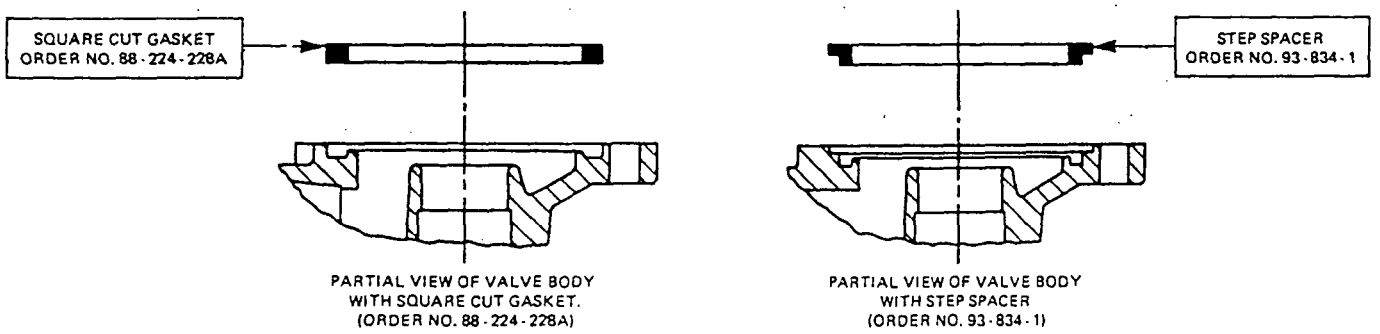

Figure 2. Bulletin 8353
Partial Views Showing Square Cut Gasket and Step Spacer used in Older Style Valves.

ASCO Valves
Automatic Switch Co. FLORHAM PARK, NEW JERSEY 07932 Form No. V-5162R5 PRINTED IN U.S.A. 1977

Installation & Maintenance Instructions

2-WAY DIRECT-ACTING SOLENOID VALVES
NORMALLY OPEN OR NORMALLY CLOSED OPERATION
BRASS OR STAINLESS STEEL CONSTRUCTION – 1/8", 1/4", OR 3/8" NPT

SERIES
8262
8263

Form No.V5256R8

IMPORTANT: See separate solenoid installation and maintenance instructions for information on: Wiring, Solenoid Temperature, Causes of Improper Operation, and Coil or Solenoid Replacement.

DESCRIPTION

Series 8262 and 8263 valves are 2-way direct-acting general service solenoid valves. Valves bodies are of rugged brass or stainless steel. Series 8262 or 8263 valves may be provided with a general purpose or explosionproof solenoid enclosure. Series 8262 and 8263 valves with suffix "P" in the catalog number are designed for dry inert gas and non-lubricated air service.

OPERATION

Normally Open: Valve is open when solenoid is de-energized; closed when is energized.

Normally Closed: Valve is closed when solenoid is de-energized; open when energized.

IMPORTANT: No minimum operating pressure required.

Manual Operation

Manual operator allows manual operation when desired or during an electrical power outage. Depending upon basic valve construction, three types of manual operators are available:

Push Type Manual Operator

To engage push type manual operator, push stem at base of valve body upward as far as possible. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, release stem. Manual operator will return to original position.

Screw Type Manual Operator

To engage screw type manual operator, rotate stem at base of the valve body clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage, rotate stem counterclockwise until it hits a stop.

⚠ **CAUTION: For valve to operate electrically, manual operator stem must be fully rotated counterclockwise.**

Stem/Lever Type Manual Operator

To engage manual operator, turn stem/lever clockwise until it hits a stop. Valve will now be in the same position as when the solenoid is energized. To disengage manual operator, turn stem/lever counterclockwise until it hits a stop.

⚠ **CAUTION: For valve to operate electrically, manual operator stem/lever must be fully rotated counterclockwise.**

Flow Metering Devices

Valves with suffix "M" in catalog number are provided with a metering device for flow control. Turn stem to right to reduce flow; left to increase flow.

INSTALLATION

Check nameplate for correct catalog number, pressure, voltage, frequency, and service. Never apply incompatible fluids or exceed pressure rating of the valve. Installation and valve maintenance to be performed by qualified personnel.

Note: Inlet port will either be marked "I" or "IN". Outlet port will be marked "2" or "OUT".

Future Service Considerations.

Provision should be made for performing seat leakage, external leakage, and operational tests on the valve with a nonhazardous,noncombustible fluid after disassembly and reassembly.

Temperature Limitations

For maximum valve ambient and fluid temperatures, refer to charts below. Check catalog number, coil prefix, suffix, and watt rating on nameplate to determine the maximum temperatures.

Wattage	Catalog Number Coil Prefix	Coil Class	Max. Ambient Temp. °F	Max. Fluid Temp. °F
6, 10.5, 12.4	none, DA or S	A	77	180
6,10.5 12.4	DF, FT or SF	F	125	180
6,10.5, 12.4	HT	H	140	180
9,10.7	none, DP or SP	F	77	180
9.7	none, FT or HT	A, F or H	77	120
11.2	none, FT or HT	A, F or H	77	150
16.7	none, DP or SP	F	77	200
17.1	none, KP SP or SD	F	125	180
17.1	HB, KB SS or SV	H	140	180

Catalog Nos.8262B200 and 8262 C200 AC construction only and Catalog Nos.8262B214 and 8262 D200 AC and DC construction are limited to 140°F fluid temperature.

Valves with Suffix V or W that are designed for AC service and normally closed operation are for use with No. 2 and 4 fuel oil service. These valves have the same maximum temperatures per the above table except Suffix W valves are limited to a maximum fluid temperature of 140°F.

Listed below are valves with Suffix V in the catalog number that are acceptable for higher temperatures.

Catalog Number Coil Prefix	Max. Ambient Temp.°F	Max. Fluid Temp.°F
FT8262, HB8262 FT8263, HB8263 8262G, 8263G	125	250*
HT or HB 8262G HT or HB 8263G	140	250

*The only exception is the 8262G and 8263G series (Class F coil) at 50 Hertz rated 11.1 and 17.1 watts are limited to 210°F fluid temperature.

Positioning

This valve is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub-assembly area.

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Disassembly and Reassembly of Stem er Type Manual Operator (Refer to Figure 3)

NOTE: There are two stem/lever manual operator constructions. They are identified by the location of the core spring as *internal* or *external* spring construction.

1. Unscrew solenoid base sub–assembly from manual operator body.
2. Unscrew manual operator body from valve body. Then remove body gasket and stem retainer.
3. Slip stem/spacer sub–assembly with stem gasket from manual operator body. Remove core assembly with core spring from center of manual operator body.
4. All parts are now accessible for cleaning or replacement. Lubricate gaskets per *Valve Reassembly* step 2.
5. Position core as ly with core spring into base of manual operator body. hen install stem/spacer sub–assembly into manual operator body to engage with core assembly.
6. Reinstall stem retainer on body and stem/spacer sub–assembly.

IMPORTANT: The spacer on the stem/spacer sub–assembly must be *inside* of the stem retainer for *internal* spring construction and *outside* the stem retainer for *external* spring construction.

7. Replace body gasket and install manual operator assembly in valve body. Torque manual operator body to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].
8. Replace solenoid base gasket and solenoid base sub–assembly. Torque solenoid base sub–assembly to 175 ± 25 in–lbs [19,8 ± 2,8 Nm].
9. Check manual operator for proper operation. Turn stem clockwise and counterclockwise; stem should turn freely without binding.

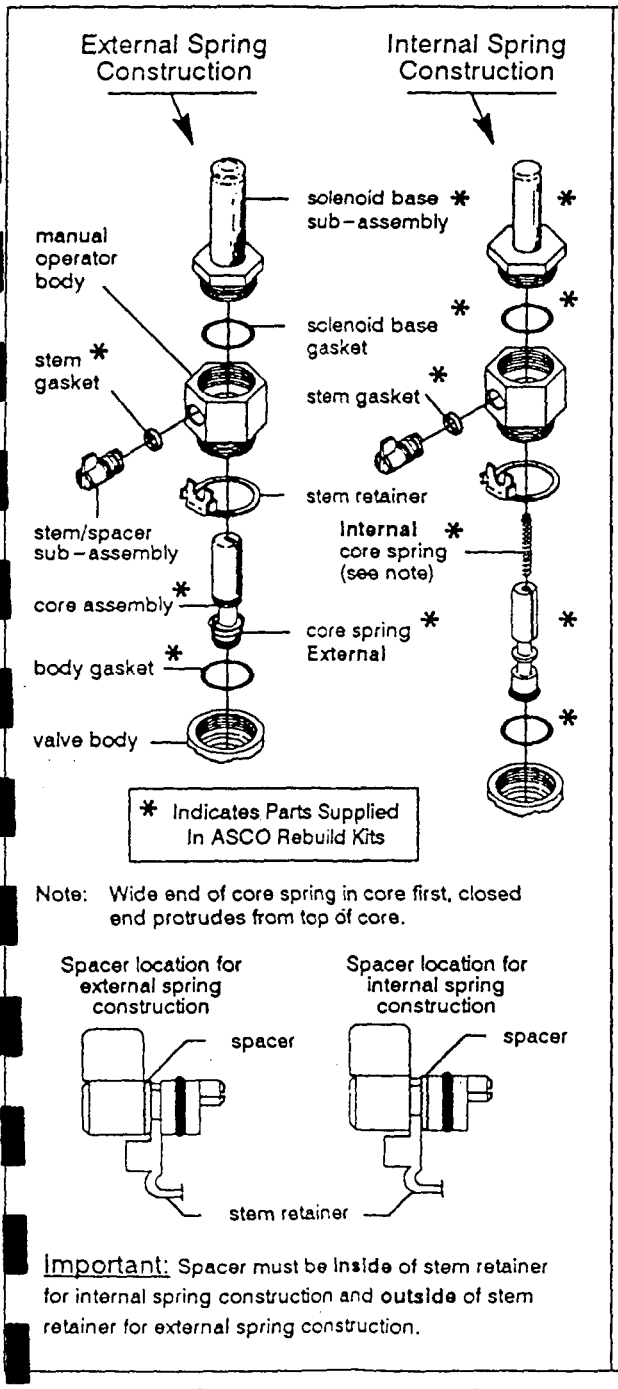

Figure 3. Stem/lever type manual operators

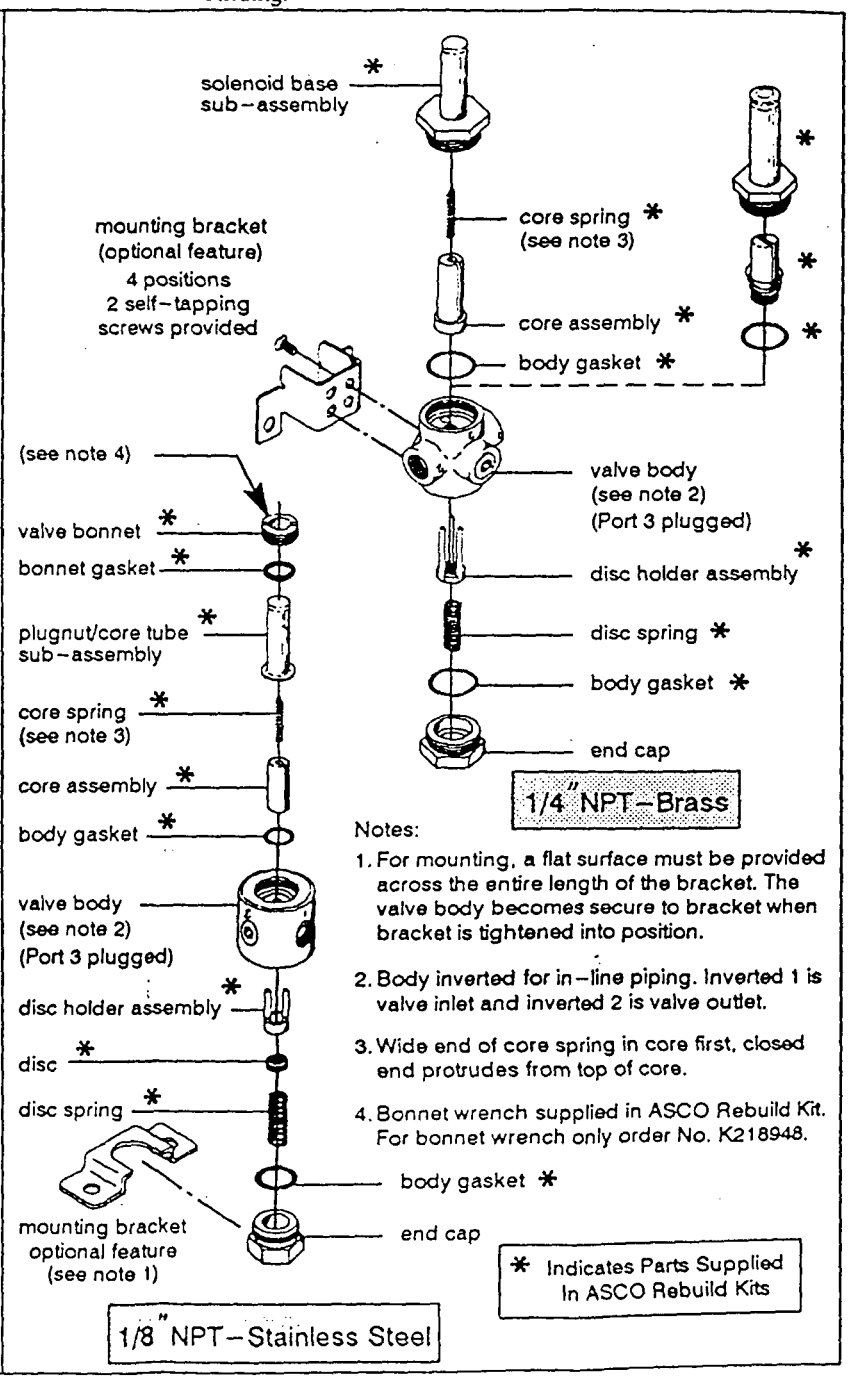

Figure 4. Series 8262, normally open construction.

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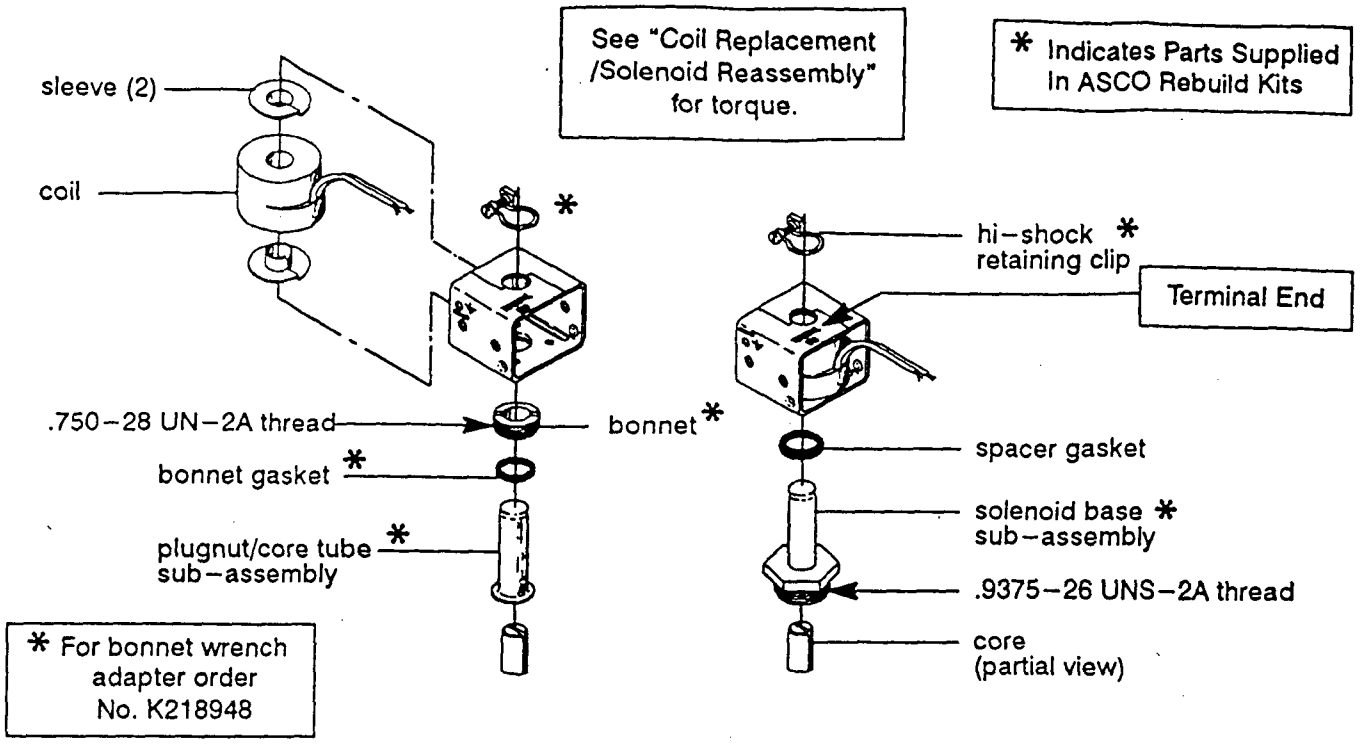

Figure 5. Series U8016 hi–shock clip construction – open–frame solenoid with leaded coil.

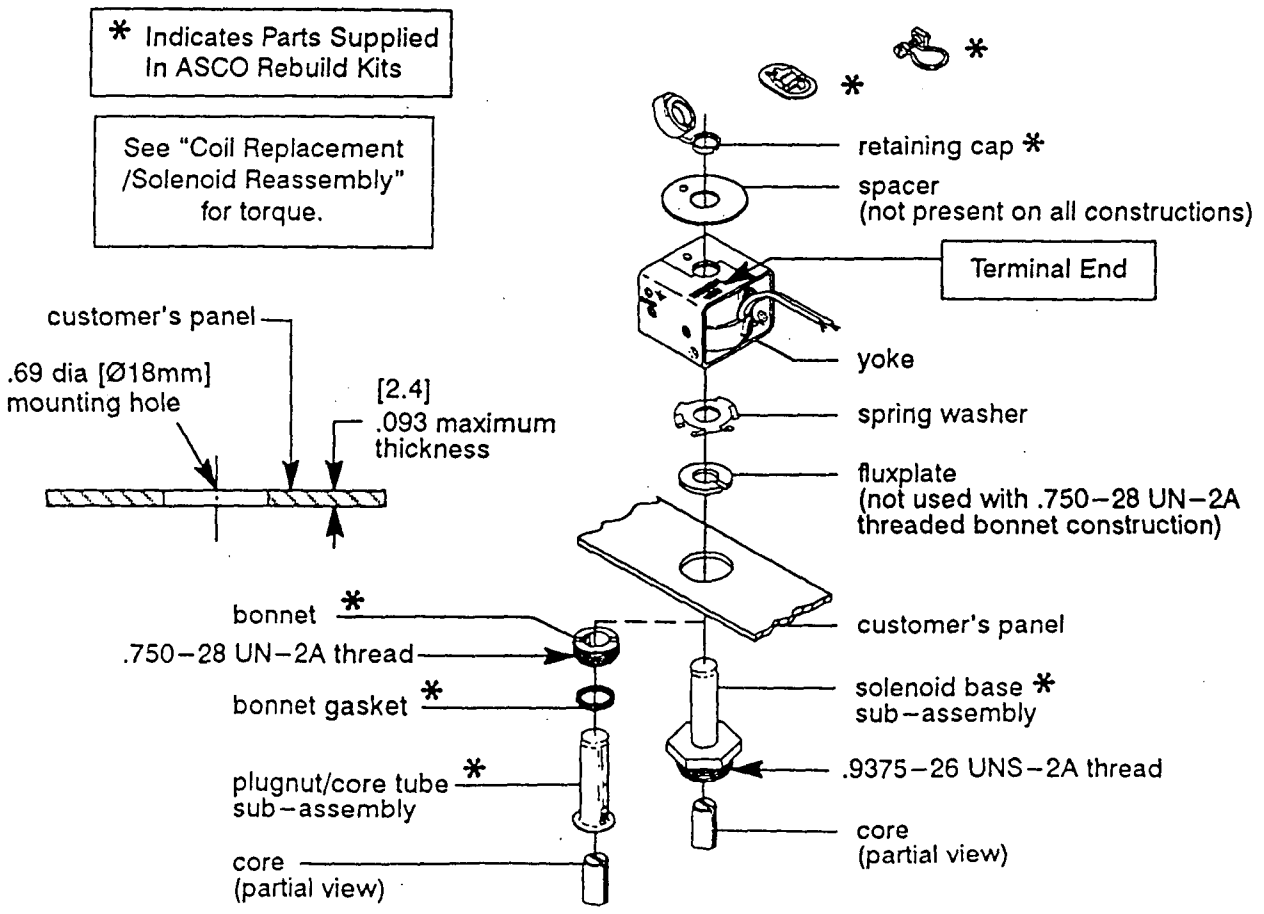

Figure 6. Series U8016 open–frame panel mount solenoid with leaded coil.

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Installation & Maintenance Instructions

OPEN–FRAME SOLENOIDS

SERIES U8016 US8016

Form No.V6917

NOTICE: See separate valve installation and maintenance instructions for information on: Operation, Positioning, Mounting, Piping, Strainer or Filter Requirements, Flow Controls, Cleaning, Preventive Maintenance, Causes of Improper Operation, Disassembly and Reassembly of Basic Valve.

DESCRIPTION

Series U8016 are open–frame, pull type solenoid operators. When installed just as a solenoid and not attached to an ASCO valve, the core has a 0.250–28 UNF–2B tapped hole with 0.38 minimum full thread.

Series US8016 open–frame solenoid operators are the same as Series U8016 except they are provided with spade terminal coils.

OPERATION

When the solenoid is energized, the core is drawn into the solenoid base sub–assembly.

IMPORTANT: When the solenoid is de–energized, the initial return force for the core, whether developed by spring, pressure or weight, must exert a minimum force to overcome residual magnetism created by the solenoid. Minimum return force for AC construction is 11 ounces; 5 ounces for DC construction.

INSTALLATION

Check nameplate for correct catalog number, voltage, frequency, wattage and service.

⚠ CAUTION: To protect the solenoid valve or operator, install a strainer or filter, suitable for the service involved in the inlet side as close to the valve or operator as possible. Clean periodically depending on service conditions. See ASCO Series 8600, 8601 and 8602 for strainers.

⚠ WARNING: To prevent the possibility of electrical shock from the accessibility of live parts, install the open–frame solenoid in an enclosure.

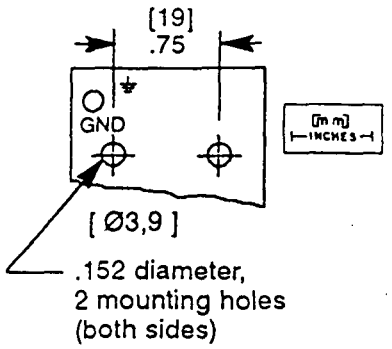
Positioning

This solenoid is designed to perform properly when mounted in any position. However, for optimum life and performance, the solenoid should be mounted vertically and upright to reduce the possibility of foreign matter accumulating in the solenoid base sub–assembly area.

If open–frame solenoid is supplied on an ASCO valve, check basic valve instructions for positioning.

Mounting

Refer to Figure 1 (below) for mounting.



⚠ CAUTION: Be sure mounting screws do not penetrate yoke far enough to damage coil.

Figure 1. Yoke mounting dimension (partial view).

Wiring

Wiring must comply with local codes and the National Electrical Code. Coils are provided with lead wires or 1/4" spade terminals. The solenoid yoke is provided with a hole for a grounding screw, see Figure 2. Grounding screw not supplied with solenoid. To facilitate wiring, the solenoid may be rotated 360° by removing the retaining cap, clip or hi–shock clip.

⚠ CAUTION: When metal retaining clip disengages, it will spring upward.

Rotate solenoid enclosure to desired position. Then replace retaining cap, clip or hi–shock clip before operating. Be sure hi–shock retaining clip seat in circular groove around side wall of solenoid base sub–assembly. Tighten retaining clip securely so that the retaining clip ends meet.

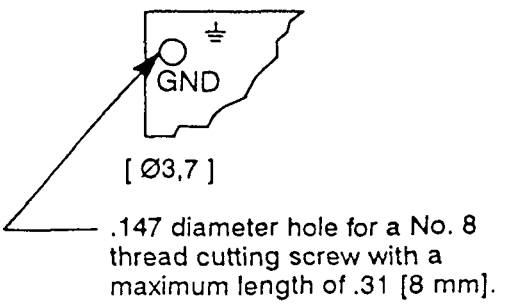


Figure 2. Hole for grounding screw (partial view).