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ENGINEERING DEPARTMENT  
UNION CARBIDE CHEMICALS DIVISION

(COMPOSITE)  
DESIGN REPORT

PART VII - REVISIONS TO RETURN GAS PURIFICATION SYSTEM

POLYETHYLENE UNIT - PLANT 510

PROJECT 64-12

930-6546

File "A"

PORT LAVACA, TEXAS

DECEMBER 10, 1964

017389

DESIGN REPORT  
HIGH PRESSURE POLYETHYLENE EXPANSION  
SEADRIFT PLANT  
PROJECT 64-12

PART VII - REVISIONS TO RETURN GAS PURIFICATION SYSTEM  
930-6546

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Seadrift, Texas

December 10, 1964

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Design Report

High Pressure Polyethylene Expansion

Project 64-12

Seadrift Plant

Part VII - Revisions to Return Gas Purification System

930-6546

Foreword

This design report contains flow diagram SK-80507 and the specifications for equipment, instruments, piping, valves, and insulation for the additions and revisions necessary to the Return Gas Purification System at the No. 1 olefin plant to support the High Pressure Polyethylene Expansion, Project 64-12, at Seadrift.

The revisions to the Return Gas Purification System consist of re-traying the bottom section of the No. 1 oil column with higher capacity valve trays; the redistribution of the present heat transfer surface between the various services to achieve maximum utilization of the existing surface; the conversion, where necessary, of the tube side flow pattern of the heat exchangers from parallel to series flow to increase the overall heat transfer coefficient, the paralleling and/or replacement of existing lines to reduce line pressure drop; and the installation of a new in-line centrifugal pump to replace the high maintenance cost electric-motor-driven reciprocating pump.

The expansion of polyethylene will impose an additional propane refrigeration load of about 700 BHP on the existing refrigeration system. This additional horsepower is present in the drives of the compressors but to make this horsepower available would require revisions to the present refrigeration system to balance the refrigeration loads. About 400 BHP will be obtained at a very nominal cost by relining the two first-stage cylinders on the #12 Worthington reciprocating compressor to adapt it for 25# propane service. To obtain the other 300 horsepower would require some rather extensive revisions which did not appear economically attractive. The 300 BHP load will be absorbed by the present refrigeration system. This added load may reduce the capacity of the No. 1 olefin unit but any reduction in capacity is expected to be of a minor nature. The relining of #12 compressor will be done on the plant working budget and will not be a part of Project 64-12.

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Equipment List

Flow Diagram SK-80507

6546E-701 - FRACTIONATING TRAYS (Not shown on Flow Diagram)

One (1) set of 44, No. 10 gauge, carbon steel valve trays for installation in bottom section of existing 72" ID No. 1 oil column, item 6092E-901. Plant 510 Engineering to direct purchase.

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6546E-702 - FLOW ELEMENT (Existing)

One (1) orifice run existing, re-installed in line P-701 for measurement of Poly "A" return gas flow. Connect to existing instrument 6034E-142D.

6546E-703 through -704 - NOT USED

6546E-705 - CENTRIFUGAL PUMP

Proposed:

|       |           |
|-------|-----------|
| Pump  | 6006-1450 |
| Motor | 6218-1949 |

One (1) 1 1/2" in-line Sanyne pump suitable for operation at -40°C temperature. Plant 510 Engineering to direct purchase.

6546E-705A - LIQUID LEVEL CONTROLLER

One (1) instrument system to record and control liquid level in pump suction tank 24" P-705 by means of a motor valve in the tank vent line 1 1/2" P-705; to sound an alarm for either a high or a low level; and to also shutdown pump at a lower level than the low level alarm in the tank. See instrument specifications SK-510-6546E-705A.

One (1) instrument system to record the flow and pressure of the vent flow from pump suction tank 24" P-705. See instrument specifications SK-510-6546E-705A.

6546E-705A-1 - LIQUID LEVEL RECORDER

6546E-705A-2 - LIQUID LEVEL TRANSMITTER

6546E-705A-3 - CONTROL VALVE

6546E-705A-4 - PRESSURE SWITCH

6546E-705A-5 - PRESSURE SWITCH

6546E-705A-6 - FLOW & PRESSURE RECORDER

6546E-705A-7 - ORIFICE RUN

6546E-705A-8 - ORIFICE PLATE

6546E-705A-9 - FLOW TRANSMITTER

6546E-705A-10 - PRESSURE TRANSMITTER

6546E-705A-11 - ALARM LIGHT

6546E-705A-12 - ALARM LIGHT

6546E-705A-13 - PRESSURE SWITCH

6546E-705B - LOW LEVEL SHUTDOWN SYSTEM

One (1) electrical system to shutdown pump, item 6546E-705, by interrupting electrical power supply to pump when tank level reaches a predetermined low point. Shutdown actuated by Item 6546E-705A-13.

See instrument specification SK-510-6546E-705A.

6546E-705D - PRESSURE GAUGE

For specifications see schedule, page 8.

6546E-705E - PRESSURE GAUGE

For specifications see schedule, page 8.

6546E-705F - PRESSURE GAUGE

For specifications see schedule, page 8.

6546E-705G - SAFETY VALVE

For specifications see schedule, page 9.

6546E-705H - SAFETY VALVE

For specifications see schedule, page 9.

6546E-705I - SAFETY VALVE

For specifications see schedule, page 9.

6546E-705J - PUMP SUCTION SCREEN (Not Shown on Flow Diagram)

One (1) PCL-R/FF temporary strainer for use with 3" 300 Lb. ASA RF flanges in accordance with UCCC Standard P-97. Install in line P-705 at suction nozzle of pump, item 6546E-705. Length of cone shall be 9 1/4". All material type 304 stainless steel. Cone shall be 24 gauge perforated sheet with 3/64" diameter holes, 131 per square inch.

Line List

Flow Diagram SK-80507

| <u>Number</u> | <u>From</u>    | <u>To</u>                          | <u>Size</u>           | <u>Material<br/>Handled</u> | <u>Specifications</u> |
|---------------|----------------|------------------------------------|-----------------------|-----------------------------|-----------------------|
| P-701         | 4" 6034P-130   | 4" 6034P-130                       | 4", 6", 8"            | H-C Gas                     | 56                    |
| P-702         | 6092E-904      | 6034E-111                          | 6"                    | H-C Gas                     | 156                   |
| P-703         | 6034E-111      | 4" 6092P-908                       | 6", 4"                | H-C Gas                     | 156                   |
| P-704         | 4" 6034P-142   | 3" 6034P-142                       | 4", 3"                | H-C Liquid                  | 155                   |
| P-705         | No Line Number | 6546E-705 &<br>1 1/2"<br>6036P-227 | 3", 4", 24"<br>1 1/2" | H-C Liquid                  | 155A ←                |
| P-706         | 6546E-705      | P-705 and 3"<br>6030P-424          | 3"                    | H-C Liquid                  | 155                   |
| P-707         | P-705          | Air                                | 1/2"                  | H-C Vapor                   | 155A, 155, 25         |
| P-708         |                | AIR                                | 1"                    | AIR                         | 155A                  |

Pressure Gauge Schedule

Flow Diagram SK-80507

| <u>Item No.</u>           | <u>Location</u> | Ashcroft <sup>(1)</sup><br><u>Figure No.</u> | <u>Range - PSI</u> |
|---------------------------|-----------------|----------------------------------------------|--------------------|
| 6546E-705D                | P-705           | 1279A                                        | 0-1000             |
| 6546E-705E <sup>(2)</sup> | P-705           | 1279A                                        | 0-1000             |
| 6546E-705F <sup>(2)</sup> | P-706           | 1279A                                        | 0-1000             |

(1) Furnish Ashcroft Duragauge or equivalent, with 4 1/2" white dial and 1/4" NPT lower back connection.

(2) Install with pressure snubber.

Safety Valve Schedule

Flow Diagram SK-80507

| <u>Item No.</u> | <u>Location</u> | <u>Size</u> | Crosby <sup>(1)</sup><br><u>Series</u> | <u>Set</u><br><u>Pressure, PSI</u> | <u>Connections</u><br><u>Inlet    Outlet</u> |
|-----------------|-----------------|-------------|----------------------------------------|------------------------------------|----------------------------------------------|
| 6546E-705G      | P-705           | 1" x 1 1/2" | JMB-s                                  | 590                                | Screwed                                      |
| 6546E-705H      | P-706           | 1/2" x 3/4" | JMB-s                                  | 590                                | Screwed                                      |
| 6546E-705I      | P-706           | 1/2" x 3/4" | JMB-s                                  | 645                                | Screwed                                      |

(1) Crosby-Ashton, Type A, or equivalent, suitable for operation at temperature and pressure indicated by series number.

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List of Equipment to Be Insulated

Flow Diagram SK-80507

| <u>Item No.</u> | <u>Temperature, °C</u> | <u>Location</u> | <u>Remarks</u>                                 |
|-----------------|------------------------|-----------------|------------------------------------------------|
| 6546E-705       | -19                    | Outside         | Pump only, do not<br>insulate pump gear<br>box |

List of Lines to Be Insulated

Flow Diagram SK-80507

| <u>Line No.</u> | <u>Size</u>            | <u>Temperature, °C</u> | <u>Location</u> | <u>Remarks</u> |
|-----------------|------------------------|------------------------|-----------------|----------------|
| P-702           | 6"                     | +5                     | Outside         | -              |
| P-703           | 6", 4"                 | +5                     | Outside         | -              |
| P-704           | 4", 3"                 | -15                    | Outside         | -              |
| P-705           | 3", 4", 24",<br>1 1/2" | -19                    | Outside         | -              |
| P-706           | 3"                     | -19                    |                 |                |



# GENERAL

Specification 25 has screwed piping in 1/2" to 3/4" size.  
 Specification 25-A has screwed piping in 1/2" to 2" size.

When these specifications are to be used for vacuum service, add the suffix letter "V", i.e. Specification 25-V; 25-A-V. This specification ("V") furnishes alloy bolting for increased gasket loading.

Construction shall equal or exceed requirements of the American Standard Code for Pressure Piping, ASA B31.3, Petroleum Refinery Piping.

## PRESSURE-TEMPERATURE RATINGS

### SPECIFICATION 25

| <u>SIZE</u>        |           |     |     |     |     |     |     |     |     | <u>HYDROSTATIC</u> |
|--------------------|-----------|-----|-----|-----|-----|-----|-----|-----|-----|--------------------|
|                    |           |     |     |     |     |     |     |     |     | <u>TEST PRESS</u>  |
| Temp, °C:          | 0 to 38   | 66  | 93  | 121 | 149 | 177 | 204 | 232 | 260 |                    |
| Temp, °F:          | 32 to 100 | 150 | 200 | 250 | 300 | 350 | 400 | 450 | 500 |                    |
| Max pressure, psi: |           |     |     |     |     |     |     |     |     |                    |
| Thru 14"           | 275       | 255 | 240 | 225 | 210 | 195 | 180 | 165 | 150 | 425                |
| 16"                | 250       | 245 | 235 | 225 | 210 | 195 | 180 | 165 | 150 | 375                |
| 18"                | 220       | 215 | 210 | 205 | 200 | 195 | 180 | 165 | 150 | 330                |
| 20"                | 195       | 190 | 185 | 180 | 175 | 175 | 170 | 165 | 150 | 290                |
| 24"                | 160       | 160 | 155 | 150 | 145 | 145 | 140 | 135 | 130 | 240                |

Pressure-temperature ratings are based on 0.030 corrosion allowance and unreinforced branch connections.

### SPECIFICATION 25-A

Maximum pressure: 150 psi  
 Temperature range: 0°C to 260°C (32°F to 500°F)  
 Hydrostatic test pressure: 300 psi

## PIPING

| Item                | Size, incl.   | Specification                                                                                           |
|---------------------|---------------|---------------------------------------------------------------------------------------------------------|
| <u>Construction</u> | 1/2" to 3/4"  | Screwed (1)                                                                                             |
|                     | 1" to 2"      | Spec. 25: Butt-welded and flanged.                                                                      |
|                     | 2-1/2" to 24" | Spec. 25-A: Screwed (1).<br>Butt-welded and flanged. Backing rings shall not be used for welded joints. |

# VALVE AND PIPING SPECIFICATION

UNION CARBIDE CORPORATION  
CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
SOUTH CHARLESTON, WEST VIRGINIA

NUMBER 25; 25-A

DATE 9-1-64  
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|                                              |                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|----------------------------------------------|---------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Pipe</u>                                  | 1/2" to 1-1/2"<br>2" to 24"                                                     | Steel, butt-welded: ASTM A53.<br>Steel, seamless: ASTM A53, Grade B, made by the open-hearth, electric furnace or basic oxygen process.                                                                                                                                                                                                                                                                                                                                                     |
| Thickness                                    | 1/2" to 2-1/2"<br>3" to 4"<br>6"<br>8"<br>10"<br>12"<br>14" to 24"              | Schedule 40.<br>Spec. 25: Schedule 40.<br>Spec. 25A: .156" wall.<br>Spec. 25: Schedule 40.<br>Spec. 25A: .188" wall.<br>Spec. 25: Schedule 20.<br>Spec. 25A: .188" wall.<br>Spec. 25: Schedule 20.<br>Spec. 25A: .203" wall.<br>Schedule 20.<br>Schedule 10.                                                                                                                                                                                                                                |
| <u>Pipe Nipples</u>                          | 1/2" to 3/4"<br>1"<br>1-1/4" to 2"                                              | Schedule 80 - Butt-welded.<br>Spec. 25A: Schedule 80, butt-welded.<br>Spec. 25A: Schedule 40, butt-welded.                                                                                                                                                                                                                                                                                                                                                                                  |
| <u>Elbows,<br/>Straight and<br/>Reducing</u> | 1/2" to 3/4"<br>1" to 2"<br><br>2-1/2" to 24"                                   | Forged steel, screwed.<br>Spec. 25: Steel, butt-welding, seamless or seam-welded: ASTM A234 WPB or WPBW. Long Radius. Elbows, straight, may be bent to a minimum radius of six pipe diameters as follows:<br>1" to 1-1/2": May be shop or field bent.<br>2": Shall be shop bent.<br>Spec. 25-A: Forged steel, screwed.<br>Steel, butt-welding, seamless or seam-welded: ASTM A234 WPB or WPBW. Long Radius. Elbows, straight, shall be shop bent to a minimum radius of six pipe diameters. |
| Thickness(2)                                 | 1/2" to 3/4"<br>1" to 2"<br>2-1/2" to 3"<br>4"<br>6"<br>8" to 12"<br>14" to 24" | 2000 lb (min).<br>Spec. 25: Standard Weight. •<br>Spec. 25A: 2000 lb (min).<br>Standard Weight.<br>Spec. 25: Standard Weight.<br>Spec. 25A: .188" wall.<br>Spec. 25: Standard Weight.<br>Spec. 25A: .219" wall.<br>Schedule 20.<br>Schedule 10.                                                                                                                                                                                                                                             |

017405

**VALVE AND PIPING SPECIFICATION**

UNION CARBIDE CORPORATION  
CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
SOUTH CHARLESTON, WEST VIRGINIA

**NUMBER 25; 25-A**

**DATE** 9-1-64  
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|                            |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|----------------------------|-------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Reducers,</u>           |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u>Caps</u>                | 1/2" to 3/4"<br>1" to 2"                  | Forged steel, screwed.<br><u>Spec. 25:</u> Steel, butt-welding, seamless or seam-welded:<br>ASTM A234 WPB or WPBW. 2" reducer may be shop<br>swaged without reducing wall thickness.<br><u>Spec. 25-A:</u> Forged steel, screwed.<br>Steel, butt-welding, seamless or seam-welded:<br>ASTM A234 WPB or WPBW. Reducers may be shop<br>swaged without reducing wall thickness.<br>2000 lb (min).<br><u>Spec. 25:</u> Standard Weight.<br><u>Spec. 25-A:</u> 2000 lb (min).<br>Standard Weight. |
| Thickness(2)               | 1/2" to 3/4"<br>1" to 2"<br>2-1/2" to 24" |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u>Branch Connections,</u> |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u>Full Size and</u>       |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u>Reducing</u>            | 1/2" to 3/4"<br>1" to 2"<br>2-1/2" to 24" | Forged steel, screwed tee: 2000 lb (min).<br><u>Spec. 25:</u> Shop fabricated without added reinforcement.<br><u>Spec. 25-A:</u> Forged steel, screwed tee: 2000 lb (min).<br>Shop fabricated without added reinforcement.                                                                                                                                                                                                                                                                   |
| <u>Couplings Welded</u>    |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u>Into Line</u>           | 1/2" to 1"<br>(cplg size)                 | Forged steel couplings, "Thredolets" or "Elbolets";<br>3000 lb (min).                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <u>Flanges</u>             |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| (Including                 |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Reducing)                  | 1/2" to 3/4"<br>1" to 2"<br>2-1/2" to 24" | Forged steel, screwed: ASA 150 lb.<br><u>Spec. 25:</u> Forged steel slip-on: ASA 150 lb (3)<br><u>Spec. 25-A:</u> Forged steel, screwed: ASA 150 lb.<br>Forged steel slip-on: ASA 150 lb (3)                                                                                                                                                                                                                                                                                                 |
| Facing                     | 1/2" to 24"                               | Manufacturer's standard (4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <u>Flanges,</u>            |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <u>Blind</u>               | 1/2" to 24"                               | Forged steel: ASA 150 lb.                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Facing                     | 1/2" to 24"                               | Manufacturer's standard (4)                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| <u>Unions</u>              | 1/2" to 2"                                | Forged steel, screwed, "Petro" or approved equal:<br>3000 lb (min).                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <u>Pipe Plugs</u>          | 1/2" to 2"                                | Steel.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <u>Gaskets</u>             |                                           | Compressed asbestos: U. S. Rubber 4899 or approved<br>equal; 1/16" thick.                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <u>Dope</u>                |                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Threads                    |                                           | Teflon tape: "Permacel" 412 or approved equal.                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Gaskets                    |                                           | For temp 32°F to 350°F - Cup grease.<br>For temp 350°F to 500°F - Graphite and oil.                                                                                                                                                                                                                                                                                                                                                                                                          |
| <u>Bolts and Nuts</u>      |                                           | <u>Spec. 25; 25-A:</u> Regular square head bolts;<br>heavy hex nuts: ASTM A307, Grade B.                                                                                                                                                                                                                                                                                                                                                                                                     |
| <u>Bolts and Nuts for</u>  |                                           | Alloy steel stud bolts: ASTM A193, Grade B7 or                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <u>Vacuum Service</u>      |                                           | B14; hex nuts: ASTM A194, Grade 2 or 2H.                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

017406

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

**NUMBER 25; 25A**  
**DATE 9-1-64**

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**VALVES - Specification 25 and 25A**

Materials for valves listed below are either forged or cast steel (dependent on size and manufacturer) with 11-1/2 - 13% chrome steel trim.

| Service                                 | Size, incl.   | Screwed | Carbide Number |         |
|-----------------------------------------|---------------|---------|----------------|---------|
|                                         |               |         | Flanged        | Welding |
| <b><u>SHUTOFF</u></b>                   |               |         |                |         |
| <b><u>Specification 25</u></b>          | 1/2" to 3/4"  | GA-1133 | -              | -       |
|                                         | 1" to 2"      | -       | GA-1148(5)     | GA-1255 |
| <b><u>Specification 25A</u></b>         | 1/2" to 2"    | GA-1117 | -              | -       |
| <b><u>Specifications 25 and 25A</u></b> | 2-1/2"        | -       | GA-59          | GA-1202 |
|                                         | 3" to 12"     | -       | GA-1174(5)     | GA-1202 |
|                                         | 14" to 24"    | -       | GA-59          | GA-1202 |
| <b><u>CONTROL</u></b>                   |               |         |                |         |
| <b><u>Specification 25</u></b>          | 1/2" to 3/4"  | GL-1132 | -              | -       |
|                                         | 1" to 2"      | -       | GL-1151        | GL-1256 |
| <b><u>Specification 25A</u></b>         | 1/2" to 2"    | GL-167  | -              | -       |
| <b><u>Specifications 25 and 25A</u></b> | 2-1/2" to 10" | -       | GL-143         | GL-1203 |
| <b><u>CHECK</u></b>                     |               |         |                |         |
| <b><u>Specification 25</u></b>          | 1/2" to 3/4"  | CK-1197 | -              | -       |
|                                         | 1" to 2"      | -       | CK-1154        | CK-1204 |
| <b><u>Specification 25A</u></b>         | 1/2" to 2"    | CK-1197 | -              | -       |
| <b><u>Specifications 25 and 25A</u></b> | 2-1/2" to 8"  | -       | CK-203         | CK-1205 |

- Notes:** (1) Couplings in screwed piping to have tapered threads.  
(2) When the ID of a butt-welding fitting is smaller than the ID of the adjoining pipe by more than 1/8", the fitting ID shall be taper machined 1:4 to match the pipe ID.  
(3) Lap-joint type may be used where required to facilitate erection; stub ends shall be steel, butt-welding, seamless ASTM A234 WPB with wall thickness the same as specified for elbows.  
(4) Flat-face flanges with full-face gaskets shall be used to mate with cast iron equipment flanges (MSS SP-46, Fig. 2).  
(5) Reduced-port valve. Do not use with safety valve in vapor relief service or where port reduction is of significance. Use GA-1198 instead of GA-1148; use GA-59 instead of GA-1174.

017407

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

**NUMBER** 56: 56A  
**DATE** 9-1-64  
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**GENERAL**

|                   | <u>Maximum Pressure</u> | <u>Hydrostatic Test</u> | <u>Pneumatic Test</u> |
|-------------------|-------------------------|-------------------------|-----------------------|
| Specification 56  | 1050 psi                | 2175 psi (1)            | 1050 psi              |
| Specification 56A | 750 psi                 | 1650 psi (2)            | 750 psi               |

Temperature Range: 0°C to 260°C (32°F to 500°F)

**PIPING**

| Item                                 | Size, incl.               | Specification                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                        |
|--------------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Construction (3)</u>              | 1/2" to 3/4"<br>1" to 12" | Socket-welded and flanged except valves.<br>Butt-welded and flanged except branch connections to 1" and 1-1/4" lines.                                                                                                                                               |                                                                                                                                                                                                                                                                                                        |
| <u>Fabrication</u>                   | 1/2" to 12"               | To equal or exceed the fabrication requirements of the Petroleum Refinery Piping Code, ASA B31.3, latest edition, except as amended or added to herein. Backing rings are not desired, but if used must be of the consumable type.                                  |                                                                                                                                                                                                                                                                                                        |
| <u>Corrosion Allowance</u>           |                           | Pressure-temperature ratings allow for 0.065" corrosion.                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                        |
| <u>Inspection</u>                    |                           | All piping shall be visually inspected by the Purchaser's inspector who shall also view Fabricator's routine quality control radiographs and witness tests on shop fabricated piping.                                                                               |                                                                                                                                                                                                                                                                                                        |
| <u>Testing, Pre-erection</u>         |                           | All welded piping shall be hydrostatically tested with clean, oil-free water. Field fabricated or field completed piping may be tested after erection if more convenient. The test pressure shall be in accordance with the table shown under "General."            |                                                                                                                                                                                                                                                                                                        |
| <u>Testing, Post-erection</u>        |                           | The entire piping system shall be given a pneumatic test (inert gas preferred) not exceeding the pressure shown in table under "General." All joints shall be painted with a foam or bubble-producing medium and inspected for leaks while under the test pressure. |                                                                                                                                                                                                                                                                                                        |
| <u>Pipe (4)</u>                      | Material                  | 1/2" to 12"                                                                                                                                                                                                                                                         | Steel, seamless API 5L, Grade B; open-hearth, electric furnace or basic oxygen process(5).                                                                                                                                                                                                             |
|                                      | Thickness                 | 1/2" to 12"                                                                                                                                                                                                                                                         | Schedule 80.                                                                                                                                                                                                                                                                                           |
| <u>Elbows, Straight and Reducing</u> | Type                      | 1/2" to 3/4"<br>1" to 12"                                                                                                                                                                                                                                           | Forged steel socket-welding: ASTM A105, Grade II.<br>Steel, butt-welding, seamless or seam-welded, ASTM A234 WPB or WPBW. Long Radius.<br>Note: Straight pipe elbows may be bent to a minimum radius of six pipe diameters.<br>1/2" to 1-1/2": May be shop or field bent.<br>2" to 12": Shop bent only |
|                                      | Thickness                 | 1/2" to 3/4"<br>1" to 8"<br>10" to 12"                                                                                                                                                                                                                              | 3000 lb (min).<br>Extra Strong.<br>Schedule 80.                                                                                                                                                                                                                                                        |

017408

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|                                                          |                         |                                     |                                                                                                                                                                                                                                                                                                                                                   |
|----------------------------------------------------------|-------------------------|-------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Reducers</u>                                          | Type                    | 3/4"<br>1" to 12"                   | Forged steel socket-welding: ASTM A105, Grade II.<br>Steel, butt-welding, seamless or seam-welded.<br>ASTM A234 WPB or WPBW; or shop swaged<br>from pipe without reducing wall thickness and<br>without welding.                                                                                                                                  |
|                                                          | Thickness               | 3/4" to 12"                         | Same as elbows, except for swaged pipe type.                                                                                                                                                                                                                                                                                                      |
| <u>Flanges</u>                                           | Type                    | 1/2" to 3/4"<br>1" to 12"           | Forged steel socket-welding: ASTM A105, Grade II.<br>Steel, butt-welding seamless, ASTM A234 WPB.                                                                                                                                                                                                                                                 |
|                                                          | Thickness               | 1/2" to 12"                         | Same as elbows.                                                                                                                                                                                                                                                                                                                                   |
| <u>Branch Connections,<br/>All Size and<br/>Reducing</u> | Type                    | 1/2" to 1-1/4"<br><br>1-1/2" to 12" | Forged steel socket-welding tee: ASTM A105,<br>Grade II: 3000 lb (min).<br>Shop fabricated. Reinforcing when required<br>shall be 100%.                                                                                                                                                                                                           |
|                                                          | Branch<br>Reinforcement | 1-1/2" to 12"                       | Reinforce 90° branch connections in accordance<br>with this table and Engineering Standard P-177.<br><u>Spec. 56</u><br>3-1/2" x 1-1/4", 1-1/2" and 2"<br>4" x 1-1/4" and larger 8" x 1-1/4" and larger<br>5" x 1-1/4" and larger 10" x 1-1/4" and larger<br>6" x 1-1/4" and larger 12" x 1-1/4" and larger<br><u>Spec. 56A</u><br>None required. |
| <u>Flanges, All</u>                                      | Material<br>Facing      | 1/2" to 12"                         | Forged carbon steel, ASTM A105, Grade I.<br>1/4" raised smooth plane face, 125 microinch (AA)<br>surface finish.                                                                                                                                                                                                                                  |
| <u>Flanges</u>                                           | Type                    | 1/2" to 3/4"<br>1" to 12"           | ASA 600 lb socket-welding, bored to match pipe.<br>ASA 600 lb welding neck, bored to match pipe.                                                                                                                                                                                                                                                  |
| <u>Flanges,<br/>Reducing</u>                             | Type (6)(7)             | 3/4" to 12"                         | ASA 600 lb slip-on type.                                                                                                                                                                                                                                                                                                                          |
| <u>Flanges,<br/>Red.</u>                                 | Type                    | 1/2" to 12"                         | ASA 600 lb.                                                                                                                                                                                                                                                                                                                                       |
| <u>Flanges,<br/>Riffler</u>                              | Type                    | 2" to 12"                           | ASA 600 lb welding neck bored to match pipe.                                                                                                                                                                                                                                                                                                      |
| <u>Flanges, Welded</u>                                   | Lines(8)(9) Type        | 1" max                              | Forged carbon steel, "Socoklets" and "Weldolets"<br>(same as branch connection pipe schedule);<br>"Thredolets" and "Elbolets": 3000 lb (min).                                                                                                                                                                                                     |
| <u>Gaskets</u>                                           | Pipe Threads<br>Gaskets |                                     | "Flexitallic" Style CG or approved equal; Type 304<br>stainless steel with asbestos filler.<br>Teflon tape. "Permacel" 412 or approved equal.<br>None.                                                                                                                                                                                            |
| <u>Bolts Studs and Nuts</u>                              |                         |                                     | Alloy steel, Carbide Spec. PVM-100, Class 1.                                                                                                                                                                                                                                                                                                      |

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

**NUMBER** 56; 56A  
**DATE** 9-1-64

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**VALVES**

| <b>Service</b>                                 | <b>Size, incl.</b> | <b>Carbide Number</b>                              | <b>Material Body</b> | <b>Type of Ends</b> |
|------------------------------------------------|--------------------|----------------------------------------------------|----------------------|---------------------|
| <u>Shutoff</u>                                 |                    |                                                    |                      |                     |
| <u>Gate</u>                                    | 1/2" to 3/4"       | GA-1117                                            | FS                   | Screwed             |
|                                                | 1" to 2"           | GA-1150(10)                                        | FS                   | Flanged(12)         |
|                                                | 2-1/2" to 12"      | GA-79                                              | CS                   | Flanged(12)         |
| <u>Control</u>                                 |                    |                                                    |                      |                     |
| <u>Globe</u>                                   | 1/4"               | GL-115                                             | FS                   | Screwed             |
|                                                | 1/2" to 3/4"       | GL-171                                             | FS                   | Screwed             |
|                                                | 1" to 2"           | GL-1153                                            | FS                   | Flanged(12)         |
|                                                | 2-1/2" to 12"      | GL-124                                             | CS                   | Flanged(12)         |
| <u>Check</u>                                   |                    |                                                    |                      |                     |
| <u>Ball</u>                                    | 1/2" to 3/4"       | CK-208                                             | FS                   | Screwed             |
| <u>Piston</u>                                  | 1/2" to 3/4"       | CK-1197                                            | FS                   | Screwed             |
|                                                | 1" to 2"           | CK-1156                                            | FS                   | Flanged(12)         |
| <u>Swing</u>                                   | 2-1/2" to 12"      | CK-262                                             | CS                   | Flanged(12)         |
| <u>Excess Flow</u>                             | 2" to 6"           | CK-1196(11)                                        | FS                   | Flanged(12)         |
| <u>Emergency</u>                               |                    |                                                    |                      |                     |
| <u>Blowdown</u>                                | 1/2" to 6"         | CK-1055                                            | FS                   | Flanged(12)         |
| <u>Gage Glass</u>                              |                    |                                                    |                      |                     |
| <u>Flat (reflex)</u>                           | 3/4" x 1/2"        | GC-623                                             | FS                   | Screwed             |
| <u>Valve Stem Packing</u><br>(for replacement) | 1/4" up            | John Crane Company's Style 1871 or approved equal. |                      |                     |

- Notes:**
- (1) Hydrostatic test based on limitations of flanges and valves at 100°F in the non-corroded condition.
  - (2) Hydrostatic test based on limitations of branch connections at 100°F in the non-corroded condition.
  - (3) To maintain structural strength, it is recommended that no process line be less than 1-1/2" size. For sample lines, instrument leads, and other small lines, a shutoff valve shall be installed at the connection to the process line. The first shutoff valve and the connecting nipple must not be less than 1/2" size. If valve and/or process line outlet is screwed, the connecting nipple shall be Type 304 stainless steel. Outlet end of threaded fittings on process lines shall match the nipple size.
  - (4) Pipe sizes 1-1/4", 2-1/2", and 3-1/2" and 5" are not to be used except for minimum length required to match purchased equipment.
  - (5) When specified grade of material is unavailable, seamless ASTM A106, Grade B pipe may be substituted.

017410

VALVE AND PIPING SPECIFICATION  
UNION CARBIDE CORPORATION  
CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
SOUTH CHARLESTON, WEST VIRGINIA

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- (6) To be front and back welded.
- (7) Butt-welding or socket-welding reducers preferred.
- (8) No connection shall be made to the heel of an elbow except to permit the installation of a temperature sensing element. When such a connection is required, an "Elbolet", 3000 lb minimum shall be used.
- (9) When "Sokolets" or "Weldolets" are used in shop fabricated pipe sections, a 6" long nipple, threaded at outlet end, shall be attached. The threaded end shall be capped to prevent damage during shipment.
- (10) Reduced-port valve, substitute GA-79 under full-nozzle safety valves or where port-reduction is of significance due to the additional pressure drop.
- (11) Excess flow check valve shall be installed inverted (stem down) with the flow such that it tends to move the disk toward the seat, i. e. close the valve.
- (12) Flange facing to be 1/4" raised smooth plane face, 125 microinch(AA) surface finish.

**VALVE AND PIPING SPECIFICATION**  
 UNION CARBIDE CORPORATION  
 CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
 SOUTH CHARLESTON, WEST VIRGINIA

**NUMBER** 155; 155A  
**DATE** 9-1-64

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**GENERAL**

|                    | <u>Maximum Pressure</u> | <u>Hydrostatic Test</u> | <u>Pneumatic Test</u> |
|--------------------|-------------------------|-------------------------|-----------------------|
| Specification 155  | 645 psi                 | 1100 psi                | 645 psi               |
| Specification 155A | 590 psi                 | 1100 psi                | 590 psi               |

Temperature Range: Minus 40°C to 204°C (Minus 40°F to 400°F)

**PIPING**

| <u>Item</u>                   | <u>Size, incl.</u>        | <u>Specification</u>                                                                                                                                                                                                                                                                                          |
|-------------------------------|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Construction (1)</u>       | 1/2" to 3/4"<br>1" to 12" | Socket-welded and flanged except valves.<br>Butt-welded and flanged except branch connections to 1" and 1-1/4" lines.                                                                                                                                                                                         |
| <u>Fabrication</u>            | 1/2" to 12"               | To equal or exceed the fabrication requirements of UCCOD Specification PPF-L1121 and to Petroleum Refinery Piping Code, ASA B31.3, latest edition, except as amended or added to herein. Backing rings are not desired, but if used must be of the consumable type.                                           |
| <u>Corrosion Allowance</u>    |                           | Pressure-temperature ratings allow for 0.065" corrosion.                                                                                                                                                                                                                                                      |
| <u>Heat Treatment</u>         |                           | All welded joints shall be stress relieved in accordance with the requirements of UCCOD Specification PPF-L1121.                                                                                                                                                                                              |
| <u>Inspection</u>             |                           | All piping shall be visually inspected by the Purchaser's inspector who shall also view Fabricator's routine quality control radiographs and witness tests on shop fabricated piping.                                                                                                                         |
| <u>Testing, Pre-erection</u>  |                           | All welded piping shall be hydrostatically tested with clean, oil-free water. Field fabricated or field completed piping may be tested after erection if more convenient. The test pressure shall be 1100 psi and is based on limitations of steel valves and flanges at 100°F in the non-corroded condition. |
| <u>Testing, Post-erection</u> |                           | The entire piping system shall be given a pneumatic test (inert gas preferred) not exceeding the pressure shown in table under "General." All joints shall be painted with a foam or bubble-producing medium and inspected for leaks while under the test pressure.                                           |
| <u>Pipe (2)</u>               | <u>Material</u>           | 1/2" to 1-1/4"                                                                                                                                                                                                                                                                                                |
|                               |                           | 1-1/2" to 12"                                                                                                                                                                                                                                                                                                 |
|                               | <u>Thickness</u>          | 1/2" to 6"                                                                                                                                                                                                                                                                                                    |
|                               |                           | 8" to 12"                                                                                                                                                                                                                                                                                                     |
|                               |                           | Austenitic stainless steel, seamless, Type 304L(3)(4).<br>Silicon-killed, aluminum-finished steel, seamless(5)(6).<br>Schedule 80.<br>Schedule 60. (When Schedule 60 is unavailable, Schedule 80 may be used.)                                                                                                |

017412

# VALVE AND PIPING SPECIFICATION

UNION CARBIDE CORPORATION  
CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
SOUTH CHARLESTON, WEST VIRGINIA

NUMBER 155; 155A

DATE 9-1-64

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|                                                                                 |                         |                                                |                                                                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------------|-------------------------|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Elbows,</u><br><u>Straight and</u><br><u>Reducing</u>                        | Type                    | 1/2" to 3/4"                                   | Forged austenitic stainless steel, Type 304L,<br>socket-welding.                                                                                                                                                                                                       |
|                                                                                 |                         | 1" to 1-1/4"                                   | Austenitic stainless steel, seamless, Type 304L,<br>butt-welding. Long Radius.                                                                                                                                                                                         |
|                                                                                 |                         | 1-1/2" to 12"                                  | Silicon-killed, aluminum-finished steel, seamless,<br>butt-welding. Long Radius(5).                                                                                                                                                                                    |
|                                                                                 | Thickness(7)            | 1/2" to 3/4"<br>1" to 10"<br>12"               | 3000 lb (min).<br>Extra Strong.<br>Schedule 80.                                                                                                                                                                                                                        |
| <u>Reducers</u>                                                                 | Type                    | 3/4"                                           | Forged austenitic stainless steel, Type 304L,<br>socket-welding.                                                                                                                                                                                                       |
|                                                                                 |                         | 1" to 1-1/4"                                   | Austenitic stainless steel, seamless, Type 304L,<br>butt-welding.                                                                                                                                                                                                      |
|                                                                                 |                         | 1-1/2" to 12"                                  | Silicon-killed, aluminum-finished steel, seamless,<br>butt-welding; or shop swaged from pipe without<br>reducing wall thickness and without welding(5).                                                                                                                |
|                                                                                 | Thickness(7)            | 3/4" to 12"                                    | Same as elbows, except for swaged pipe type.                                                                                                                                                                                                                           |
| <u>Caps</u>                                                                     | Type                    | 1/2" to 3/4"                                   | Forged austenitic stainless steel, Type 304L,<br>socket-welding.                                                                                                                                                                                                       |
|                                                                                 |                         | 1" to 1-1/4"                                   | Austenitic stainless steel, seamless, Type 304L,<br>butt-welding.                                                                                                                                                                                                      |
|                                                                                 |                         | 1-1/2" to 12"                                  | Silicon-killed, aluminum-finished steel, seamless,<br>butt-welding(5).                                                                                                                                                                                                 |
|                                                                                 | Thickness(7)            | 1/2" to 12"                                    | Same as elbows.                                                                                                                                                                                                                                                        |
| <u>Branch</u><br><u>Connections,</u><br><u>Full Size and</u><br><u>Reducing</u> | Type                    | 1/2" to 1-1/4"                                 | Forged austenitic stainless steel, Type 304L,<br>socket-welding tee, 3000 lb (min).                                                                                                                                                                                    |
|                                                                                 |                         | 1-1/2" to 12"                                  | Shop fabricated. Reinforcing when required shall<br>be 100%.                                                                                                                                                                                                           |
|                                                                                 | Branch<br>Reinforcement | 1-1/2" to 12"                                  | Reinforce 90° branch connections in accordance<br>with this table and Engineering Standard P-177(8).<br><u>Spec. 155</u><br>8" x 1-1/4", 1-1/2", 2", and 8"<br>10" x 1-1/4", 1-1/2", 2", 8", and 10"<br>12" x 1-1/4" and larger<br><u>Spec. 155A</u><br>None required. |
|                                                                                 |                         |                                                |                                                                                                                                                                                                                                                                        |
| <u>Flanges, All</u>                                                             | Material                | 1/2" to 1-1/4"<br>1-1/2" to 12"                | Forged austenitic stainless steel, Type 304L.<br>Forged silicon-killed, aluminum-finished steel(5).                                                                                                                                                                    |
|                                                                                 | Facing                  | 1/2" to 12"                                    | <u>Manufacturer's standard.</u>                                                                                                                                                                                                                                        |
|                                                                                 |                         |                                                |                                                                                                                                                                                                                                                                        |
| <u>Flanges</u>                                                                  | Type                    | 1/2" to 3/4"<br>1" to 6" and 10"<br>8" and 12" | ASA 300 lb socket-welding, bored to match pipe.<br>ASA 300 lb welding neck, bored to match pipe.<br>ASA 300 lb welding neck, bored to match<br>Schedule 80 pipe.                                                                                                       |
|                                                                                 |                         |                                                |                                                                                                                                                                                                                                                                        |
|                                                                                 |                         |                                                |                                                                                                                                                                                                                                                                        |
|                                                                                 |                         |                                                |                                                                                                                                                                                                                                                                        |
| <u>Slip-on</u><br><u>Flanges,</u><br><u>Reducing</u>                            | Type(9)(10)             | 3/4" to 12"                                    | ASA 300 lb slip-on type.                                                                                                                                                                                                                                               |
| <u>Slip-on</u><br><u>Flanges,</u><br><u>Standard</u>                            | Type                    | 1/2" to 12"                                    | ASA 300 lb.                                                                                                                                                                                                                                                            |

017413

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

**NUMBER** 155; 155A  
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|                                                                         |                         |           |                                                                                                                                                                            |
|-------------------------------------------------------------------------|-------------------------|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Flanges,</u><br><u>Orifice</u>                                       | Type                    | 2" to 12" | ASA 300 lb welding neck, bored to match pipe.                                                                                                                              |
| <u>Fittings, Welded Type</u><br>Into Lines(11)(12)(13)<br>1-1/2" to 12" |                         | 1" max    | Forged austenitic stainless steel, Type 304L;<br>"Sockolets" and "Weldolets" (same as branch<br>connection pipe schedule); "Thredolets" and<br>"Elbolets" : 3000 lb (min). |
| <u>Gaskets</u>                                                          |                         |           | Spiralwound, "Flexitallic" Style CG or approved<br>equal, Type 304 stainless steel with asbestos<br>filler.                                                                |
| <u>Dope</u>                                                             | Pipe Threads<br>Gaskets |           | Teflon tape, "Permacel" 412 or approved equal.<br>None.                                                                                                                    |
| <u>Bolt Studs and Nuts</u>                                              |                         |           | Alloy steel, Carbide Spec. PVM-100, Class II.                                                                                                                              |

**VALVES**

| Service                                        | Size, incl.               | Carbide<br>Number                                     | Material<br>Body | Type of<br>Ends    |
|------------------------------------------------|---------------------------|-------------------------------------------------------|------------------|--------------------|
| <u>Shut off</u>                                |                           |                                                       |                  |                    |
| <u>Gate</u>                                    | 1/2" to 3/4"<br>1" to 12" | GA-1137A<br>GA-902                                    | 18-8<br>3.5 Ni   | Screwed<br>Flanged |
| <u>Control</u>                                 |                           |                                                       |                  |                    |
| <u>Globe</u>                                   | 1/2" to 3/4"<br>1" to 12" | GL-1164<br>GL-909                                     | 18-8<br>3.5 Ni   | Screwed<br>Flanged |
| <u>Check</u>                                   |                           |                                                       |                  |                    |
| <u>Piston</u><br><u>Swing</u>                  | 1/2" to 3/4"<br>1" to 12" | CK-1065<br>CK-916                                     | 18-8<br>3.5 Ni   | Screwed<br>Flanged |
| <u>Excess Flow</u>                             | 2" to 6"                  | CK-1053(14)                                           | 3.5 Ni           | Flanged(600 psi)   |
| <u>Emergency</u><br><u>Blowdown</u>            | 1/2" to 6"                | CK-1056                                               | 3.5 Ni           | Flanged(600 psi)   |
| <u>Gage Glass</u>                              |                           |                                                       |                  |                    |
| <u>Flat (reflex)</u>                           | 3/4" x 1/2"               | GC-624                                                | 18-8 SMO         | Screwed            |
| <u>Valve Stem Packing</u><br>(for replacement) | 1/2" up                   | John Crane Company's Style 1871<br>or approved equal. |                  |                    |

017414

## VALVE AND PIPING SPECIFICATION

UNION CARBIDE CORPORATION  
CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
SOUTH CHARLESTON, WEST VIRGINIA

NUMBER 155: 155A

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- Notes:
- (1) To maintain structural strength, it is recommended that no process line be less than 1-1/2" size. For sample lines, instrument leads, and other small lines, a shutoff valve shall be installed at the connection to the process line. This first shutoff valve and the connecting nipple must not be less than 1/2" size. Outlet end of threaded fittings on process lines shall match the nipple size.
  - (2) Pipe sizes 1-1/4", 2-1/2", 3-1/2", and 5" are not to be used except for minimum length required to match purchased equipment.
  - (3) All austenitic stainless steel shall conform to the designated grade from PVM-300.
  - (4) Nipples threaded on both ends may be furnished to Type 304.
  - (5) Silicon-killed, aluminum-finished steel to be in accordance with Carbide Specification PVM-102. When the specified grade of material is unavailable, Cr-Cu-Ni-Al steel in accordance with PVM-103 may be used as a substitute.
  - (6) Seamless pipe to PVM-102 is seldom available in sizes above 10" IPS. When large diameter pipe of this material must be furnished, the pipe may be rolled from PVM-102 plate and the longitudinal weld seam made in accordance with Carbide Specification PVW-103.
  - (7) When the ID of a butt-welding fitting is smaller than the ID of the adjoining pipe by more than 1/8", the fitting ID shall be taper-machined at a 30° maximum angle to match the pipe ID.
  - (8) Locate all branch connections in welded run pipe 180° from longitudinal seam.
  - (9) Butt-welding or socket-welding reducers preferred.
  - (10) To be front and back welded.
  - (11) No connection shall be made to the heel of an elbow except to permit the installation of a temperature sensing element. When such a connection is required, an "Elbolet", 3000 lb minimum shall be used.
  - (12) Cross-qualification of welders and procedures required for joining the particular dissimilar materials.
  - (13) When "Sokolets" or "Weldolets" are used in shop fabricated pipe sections, a 6" long nipple, threaded at outlet end, shall be attached. The threaded end shall be capped to prevent damage during shipment.
  - (14) Excess flow check valve shall be installed inverted (stem down) with the flow such that tends to move the disk toward the seat, i.e. close the valve.

017415

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

**NUMBER** 150; 150A  
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**GENERAL**

|                    | <u>Maximum Pressure</u> | <u>Hydrostatic Test</u> | <u>Pneumatic Test</u> |
|--------------------|-------------------------|-------------------------|-----------------------|
| Specification 156  | 1050 psi                | 2175 psi(1)             | 1050 psi              |
| Specification 156A | 845 psi                 | 1950 psi(2)             | 845 psi               |

Temperature Range: Minus 40°C to 204°C (Minus 40°F to 400°F)

**PIPING**

| Item                          | Size, incl.               | Specification                                                                                                                                                                                                                                                        |
|-------------------------------|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Construction (3)</u>       | 1/2" to 3/4"<br>1" to 6"  | Socket-welded and flanged except valves.<br>Butt-welded and flanged except branch connections to 1" and 1-1/4" lines.                                                                                                                                                |
| <u>Fabrication</u>            | 1/2" to 6"                | To equal or exceed fabrication requirements of UCCOD Specification PPF-L1121 and to Petroleum Refinery Piping Code, ASA B31.3, latest edition, except as amended or added to herein. Backing rings are not desired, but if used must be of the consumable type.      |
| <u>Corrosion Allowance</u>    |                           | Pressure-temperature ratings allow for 0.065" corrosion.                                                                                                                                                                                                             |
| <u>Heat Treatment</u>         |                           | All welded joints shall be stress relieved in accordance with the requirements of UCCOD Specification PPF-L1121.                                                                                                                                                     |
| <u>Inspection</u>             |                           | All piping shall be visually inspected by the Purchaser's inspector who shall also view Fabricator's routine quality control radiographs and witness tests on shop fabricated piping.                                                                                |
| <u>Testing, Pre-erection</u>  |                           | All welded piping shall be hydrostatically tested with clean, oil-free water. Field fabricated or field completed piping may be tested after erection if more convenient. The test pressure shall be in accordance with the table shown under "General."             |
| <u>Testing, Post-erection</u> |                           | The entire piping system shall be given a pneumatic test (inert gas preferred) not exceeding the pressures shown in table under "General." All joints shall be painted with a foam or bubble-producing medium and inspected for leaks while under the test pressure. |
| <u>Pipe (4)</u>               | Material<br><br>Thickness | 1/2" to 1-1/4"<br>1-1/2" to 6"<br>1/2" to 6"                                                                                                                                                                                                                         |
|                               |                           | Austenitic stainless steel, seamless, Type 304L(5)(6).<br>Silicon-killed, aluminum-finished steel, seamless(7).<br>Schedule 80.                                                                                                                                      |

017416

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

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|                                                   |                      |                                |                                                                                                                                                   |
|---------------------------------------------------|----------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Elbows, Straight and Reducing</u>              | Type                 | 1/2" to 3/4"                   | Forged austenitic stainless steel. Type 304L, socket-welding.                                                                                     |
|                                                   |                      | 1" to 1-1/4"                   | Austenitic stainless steel, seamless. Type 304L, butt-welding. Long Radius.                                                                       |
|                                                   |                      | 1-1/2" to 6"                   | Silicon-killed, aluminum-finished steel, seamless, butt-welding. Long Radius(7).                                                                  |
|                                                   | Thickness(8)         | 1/2" to 3/4"<br>1" to 6"       | 3000 lb (min).<br>Extra Strong.                                                                                                                   |
| <u>Reducers</u>                                   | Type                 | 3/4"                           | Forged austenitic stainless steel, Type 304L, socket-welding.                                                                                     |
|                                                   |                      | 1" to 1-1/4"                   | Austenitic stainless steel, seamless, Type 304L, butt-welding.                                                                                    |
|                                                   |                      | 1-1/2" to 6"                   | Silicon-killed, aluminum-finished steel, seamless, butt-welding; or shop swaged from pipe without reducing wall thickness and without welding(7). |
|                                                   | Thickness(8)         | 3/4" to 6"                     | Same as elbows except for swaged pipe type.                                                                                                       |
| <u>Caps</u>                                       | Type                 | 1/2" to 3/4"                   | Forged austenitic stainless steel, Type 304L, socket-welding.                                                                                     |
|                                                   |                      | 1" to 1-1/4"                   | Austenitic stainless steel, seamless, Type 304L, butt-welding.                                                                                    |
|                                                   |                      | 1-1/2" to 6"                   | Silicon-killed, aluminum-finished steel, seamless, butt-welding (7).                                                                              |
|                                                   | Thickness(8)         | 1/2" to 6"                     | Same as elbows.                                                                                                                                   |
| <u>Branch Connections, Full Size and Reducing</u> | Type                 | 1/2" to 1-1/4"                 | Forged austenitic stainless steel, Type 304L, socket-welding tee: 3000 lb (min).                                                                  |
|                                                   |                      | 1-1/2" to 6"                   | Shop fabricated. Reinforcing when required shall be 100%.                                                                                         |
|                                                   | Branch Reinforcement | 1-1/2" to 6"                   | Reinforce 90° branch connections in accordance with this table and Engineering Standard P-177.                                                    |
|                                                   |                      |                                | <u>Spec. 156</u>                                                                                                                                  |
|                                                   |                      |                                | 3-1/2" x 1-1/4", 1-1/2" and 2"                                                                                                                    |
|                                                   |                      |                                | 4" x 1-1/4" and larger<br>5" x 1-1/4" and larger<br>6" x 1-1/4" and larger                                                                        |
| <u>Flanges, All</u>                               |                      |                                | <u>Spec. 156A</u>                                                                                                                                 |
|                                                   |                      |                                | None required.                                                                                                                                    |
|                                                   | Material             | 1/2" to 1-1/4"<br>1-1/2" to 6" | Forged austenitic stainless steel, Type 304L.                                                                                                     |
|                                                   | Facing               | 1/2" to 6"                     | Forged silicon-killed, aluminum-finished steel(7).<br>1/4" raised smooth plane face, 125 microinch (AA) surface finish.                           |
| <u>Flanges</u>                                    | Type                 | 1/2" to 3/4"<br>1" to 6"       | ASA 600 lb socket-welding, bored to match pipe.<br>ASA 600 lb welding neck, bored to match pipe.                                                  |
| <u>Flanges, Reducing</u>                          | Type(9)(10)          | 3/4" to 6"                     | ASA 600 lb slip-on type.                                                                                                                          |
| <u>Flanges, Blind</u>                             | Type                 | 1/2" to 6"                     | ASA 600 lb.                                                                                                                                       |

**017417**

**VALVE AND PIPING SPECIFICATION**  
**UNION CARBIDE CORPORATION**  
**CHEMICALS DIVISION - ENGINEERING DEPARTMENT**  
**SOUTH CHARLESTON, WEST VIRGINIA**

**NUMBER** 150; 150A  
**DATE** 9-1-64

**PAGE** 3 **OF** 4

|                                                                             |                         |          |                                                                                                                                                                          |
|-----------------------------------------------------------------------------|-------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <u>Flanges,</u><br><u>Orifice</u>                                           | Type                    | 2" to 6" | ASA 600 lb welding neck, bored to match pipe.                                                                                                                            |
| <u>Fittings, Welded Type</u><br><u>Into Lines(11)(12)(13)</u><br>1/2" to 6" |                         | 1" max   | Forged austenitic stainless steel, Type 304L;<br>"Sockolets" and "Weldolets" (same as branch<br>connection pipe schedule); "Thedolets" and<br>"Elbolets": 3000 lb (min). |
| <u>Gaskets</u>                                                              |                         |          | Spiralwound, "Flexitallic" Style CG or approved<br>equal, Type 304 stainless steel with asbestos<br>filler.                                                              |
| <u>Dope</u>                                                                 | Pipe Threads<br>Gaskets |          | Teflon tape, "Permacel" 412 or approved equal.<br>None.                                                                                                                  |
| <u>Bolt Studs and Nuts</u>                                                  |                         |          | Alloy steel, Carbide Spec. PVM-100, Class II.                                                                                                                            |

**VALVES**

| <u>Service</u>                                       | <u>Size, incl.</u>       | <u>Carbide<br/>Number</u>                             | <u>Material<br/>Body</u> | <u>Type of<br/>Ends</u> |
|------------------------------------------------------|--------------------------|-------------------------------------------------------|--------------------------|-------------------------|
| <u>Shutoff</u><br><u>Gate</u>                        | 1/2" to 3/4"<br>1" to 6" | GA-1137A<br>GA-1058                                   | 18-8<br>3.5 Ni           | Screwed<br>Flanged      |
| <u>Control</u><br><u>Globe</u>                       | 1/2" to 3/4"<br>1" to 6" | GL-1164<br>GL-1059                                    | 18-8<br>3.5 Ni           | Screwed<br>Flanged      |
| <u>Check</u><br><u>Piston</u><br><u>Swing</u>        | 1/2" to 3/4"<br>1" to 6" | CK-1065<br>CK-1060                                    | 18-8<br>3.5 Ni           | Screwed<br>Flanged      |
| <u>Excess Flow</u>                                   | 2" to 6"                 | CK-1053(14)                                           | 3.5 Ni                   | Flanged                 |
| <u>Emergency</u><br><u>Slowdown</u>                  | 1/2" to 6"               | CK-1056                                               | 3.5 Ni                   | Flanged                 |
| <u>Gage Glass</u><br><u>Flat (reflex)</u>            | 3/4" x 1/2"              | GC-624                                                | 18-8 SMO                 | Screwed                 |
| <u>Valve Stem Packing</u><br><u>for replacement)</u> | 1/2" up                  | John Crane Company's Style 1871<br>or approved equal. |                          |                         |

017418

## VALVE AND PIPING SPECIFICATION

UNION CARBIDE CORPORATION  
CHEMICALS DIVISION - ENGINEERING DEPARTMENT  
SOUTH CHARLESTON, WEST VIRGINIA

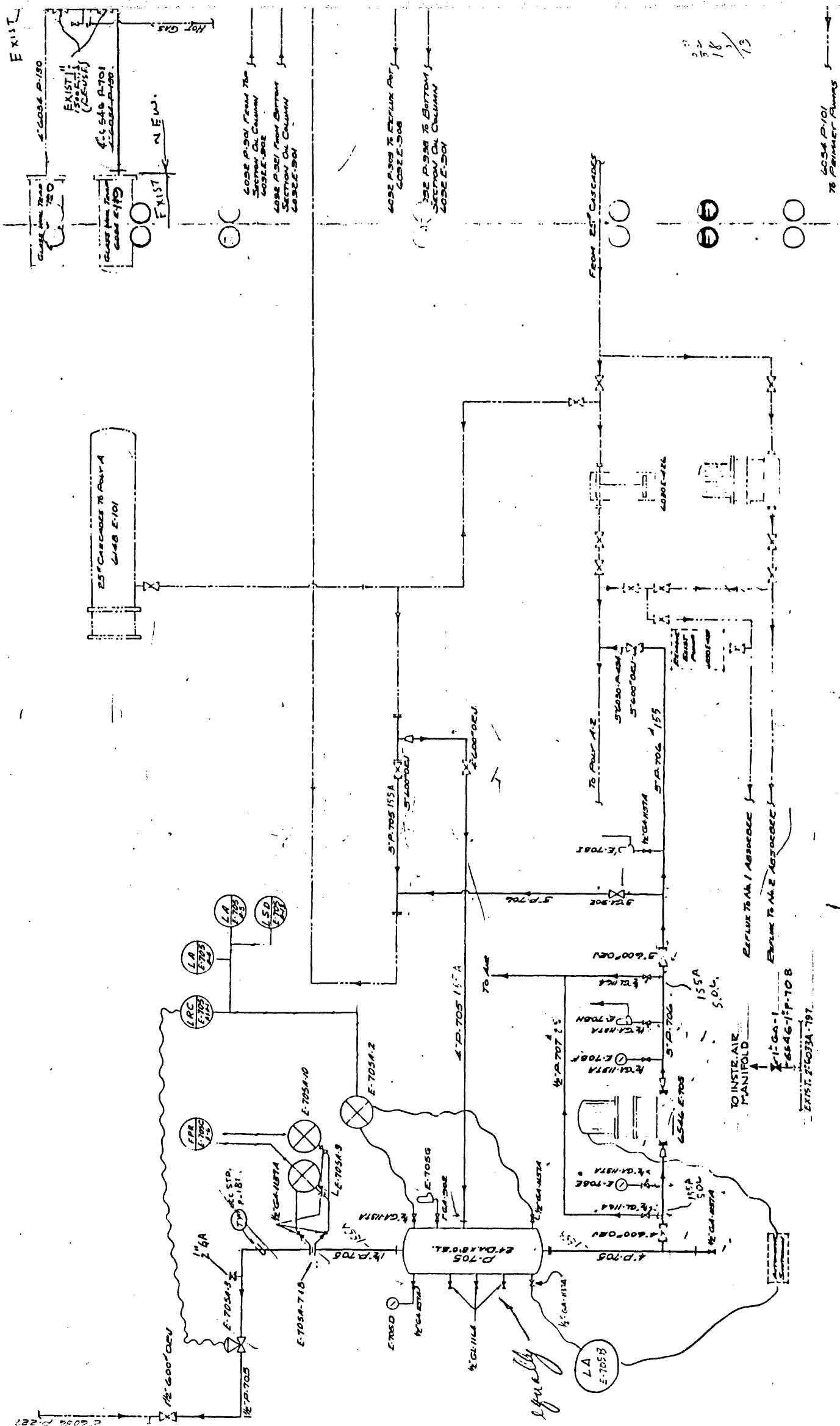
NUMBER 150. 150A

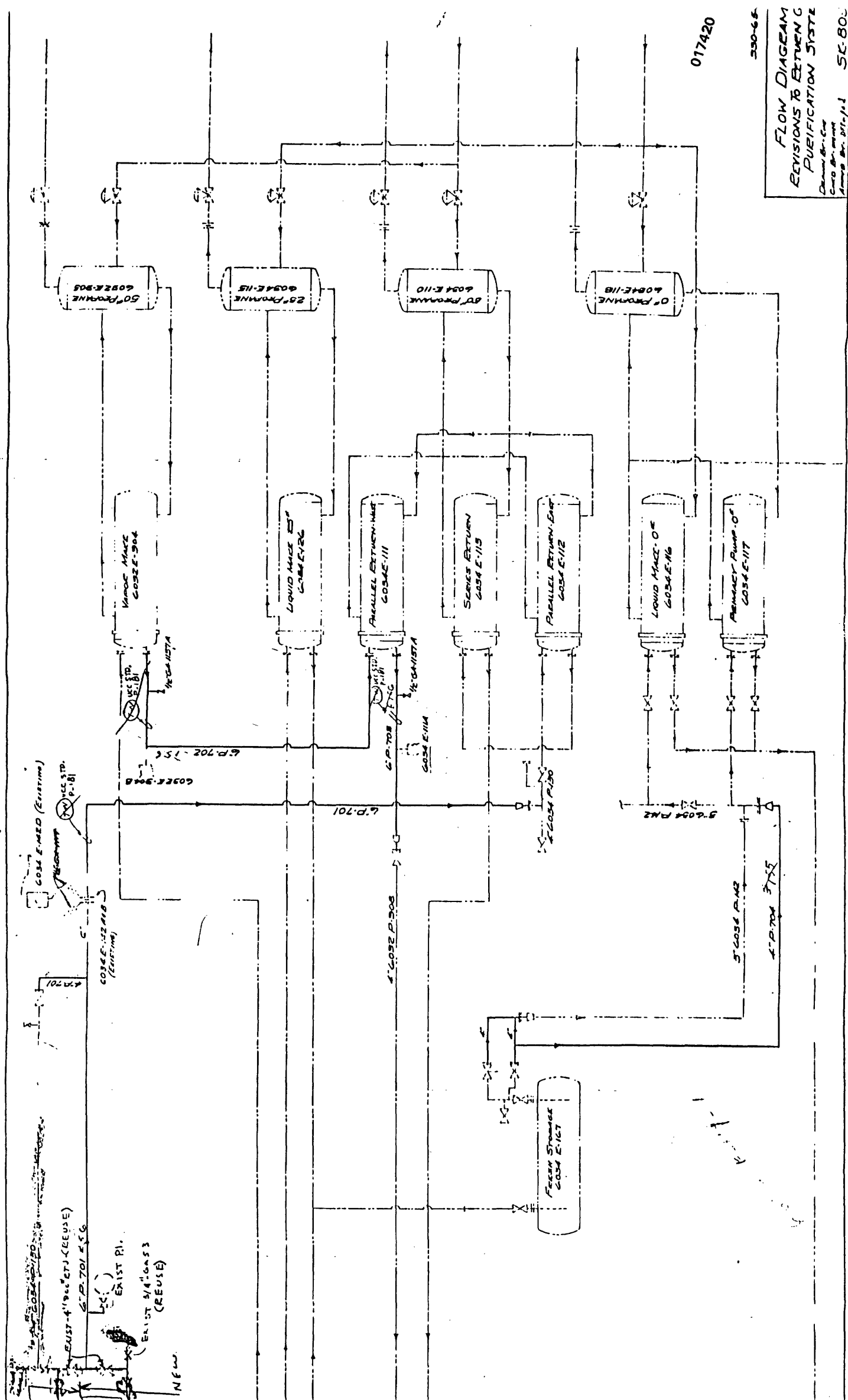
DATE 9-1-64

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- Notes:
- (1) Hydrostatic test based on limitations of flanges and valves at 100°F in the non-corroded condition.
  - (2) Hydrostatic test based on limitations of branch connections at 100°F in the non-corroded condition.
  - (3) To maintain structural strength, it is recommended that no process line be less than 1-1/2" size. For sample lines, instrument leads, and other small lines, a shutoff valve shall be installed at the connection to the process line. The first shutoff valve and the connecting nipple must not be less than 1/2" size. Outlet end of threaded fittings on process lines shall match the nipple size.
  - (4) Pipe sizes 1-1/4", 2-1/2", 3-1/2", and 5" are not to be used except for minimum length required to match purchased equipment.
  - (5) Nipples threaded on both ends may be furnished to Type 304.
  - (6) All austenitic stainless steel shall conform to the designated grade from PVM-300.
  - (7) Silicon-killed, aluminum-finished steel to be in accordance with Carbide Specification PVM-102. When the specified grade of material is unavailable, Cr-Cu-Ni-Al steel in accordance with PVM-103 may be used as a substitute.
  - (8) When the ID of a butt-welding fitting is smaller than the ID of the adjoining pipe by more than 1/8", the fitting ID shall be taper-machined at a 30° maximum angle to match the pipe ID.
  - (9) Butt-welding or socket-welding reducers preferred.
  - (10) To be front and back welded.
  - (11) No connection shall be made to the heel of an elbow except to permit the installation of a temperature sensing element. When such a connection is required, an "Elbolet", 3000 lb minimum shall be used.
  - (12) Cross-qualification of welders and procedures required for joining the particular dissimilar materials.
  - (13) When "Sokolets" or "Weldolets" are used in shop fabricated pipe sections, a 6" long nipple threaded at outlet end, shall be attached. The threaded end shall be capped to prevent damage during shipment.
  - (14) Excess flow check valve shall be installed inverted (stem down) with the flow such that it tends to move the disk toward the seat, i. e. close the valve.

017419





W.C. 930-6546

List of Lines to Be Insulated

Flow Diagram SK-80507

| <u>Line No.</u> | <u>Size</u>               | <u>Temperature, °C</u> | <u>Location</u> | <u>Remarks</u>                                              |
|-----------------|---------------------------|------------------------|-----------------|-------------------------------------------------------------|
| P-702           | 6"                        | +5 - 41°F              | Outside 10-L    | - - 2"                                                      |
| P-703           | 6", 4"                    | +5 41°F                | Outside 10-L    | - - 2"                                                      |
| P-704           | 4", 3"                    | -15 +5°F               | Outside 10-L    | - 4" IPS - 3'<br>- 3" IPS - 2 1/2"                          |
| P-705           | 3", 4", 2 1/2",<br>1 1/2" | -19 - 4°F              | Outside 10-L    | - 1 1/2" IPS - 2 1/2'<br>- 3" IPS - 3'<br>- 2 1/2" IPS - 4" |
| P-706           | 3"                        | -19 - 4°F              | 10-L            | 3"                                                          |

017421