

Interoffice Communication

To M. L. Ashby
From P. D. Despres
Date January 12, 1984
Subject REISSUE OF THERMAL RELIEF VALVE DISCHARGE CONTAINMENT DESIGN

The original issue of the final design for RV discharge containment on January 11, 1984 contained two erroneous specifications Worklist item number 8 and note 1 in Figures 2 and 4 specified the removal of a segment of tubing between the nitrogen supply and the sample bomb eductors. This specification has been removed; the nitrogen is the motive fluid for the eductor, which is used to clear the sample lines when taking vinyl chloride samples. Please discard the old final issue and replace it with the attached.


P. D. Despres
Process Engineer

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cc: RAC-JWW-MLA(4)-MCM-JRH(4)-RB-PLF-DLD-SRA-PE
PFF-MGH-JCL

CWH 000002091



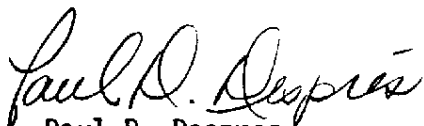
Interoffice Communication

To M. L. Ashby
From P. D. Despres
Date January 11, 1984
Subject Thermal Relief Valve Discharge Containment
Design No. 1983-400-1283-PDD
FINAL Design

Sixteen relief valves protecting process piping and equipment in vinyl chloride service in the tank farm area now discharge directly to the atmosphere (see attached Figures 1 and 3). Overpressure in these systems is due almost exclusively to thermal expansion of liquid vinyl chloride in blocked-in sections of piping or equipment. The attached final design provides for containment of the discharges of these sixteen relief valves by piping their discharge lines into the closed loop sampling system vent line which ties directly into the tank farm vent line to the incinerator. This containment system will eliminate the possibility of a vinyl chloride discharge to the atmosphere from these sixteen RVs.

The tank farm vent line will not have to be shutdown for tie-ins to be made; an existing 1" thread-o-let and ½" thread-o-let on the vent header will be the points of connection.

This project should be completed with funding from Miscellaneous Projects Under \$15,000. By copy of this final design to J. R. Holcomb, a cost estimate is requested. Please contact me if there are any questions or comments.


Paul D. Despres
Process Engineer

Approved


D.L. Davis
Sr. Process Engineer

kf

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CWH 000002092

Discussion

Relief valve discharges in the tank farm area are very rare. Overpressure by the process equipment, such as pumps, is not possible in this section of the plant. Relief valve discharges have occurred in the past, however, and have been found to be caused by thermal expansion of the vinyl chloride in an enclosed, liquid filled system. A system must be completely liquid filled or contain a non-condensable gas before thermal expansion can develop sufficient pressure for an RV discharge at 285 psi. The statistical probability of these conditions occurring is low and indicates the rarity of thermal RV discharges.

Figures 1 and 3 indicate the 2 areas in the tank farm where the 16 RVs are located. The valves themselves are listed in the attached Table 1 with their service descriptions and specifications. There will be two tie-in points to the vent line to the incinerator. The 9 valves indicated in Figure 1 will tie-in to the existing 1½" vent line now servicing the closed loop sampling system in the P-401 and T-401 area. The 7 RVs indicated in Figure 3 will be tied in to the existing ½" thread-o-let on the 3" railcar vent header in the pipe rack at the southwest corner of the T-411C dike. Thermal releases characteristically discharge very small quantities of vinyl chloride, so upsetting the incinerator will not be a problem with a direct tie-in to the vent header. The largest system will discharge less than 1 lb. of vinyl chloride due to thermal expansion at 30°C. Ten RVs on the vent recovery system now discharge directly to the incinerator vent line and have not caused a problem in the past.

These 16 RVs are not fire-sized; they were designed to relieve liquid overpressure in the pipelines. The discharge lines will all be 1" pipe, matching the relief valve discharge connections. Pressure drop through the 1" pipe is not a consideration for thermal discharges due to the small amount of VCM released. Likewise, the small pipe will provide an appropriate restriction to help limit flow and reseal the RV in the event that an RV sticks open.

The RVs on F-401 and F-402 (RV-413 and RV-414, respectively) will be re-located from the top head of the filter to the side to aid in clearing and changing the filters. A bypass line will be installed around the RVs to be used for clearing the dryers of vinyl chloride for opening. The vent line that presently ties back into the closed loop sampling vent from the N₂ supply line will be removed and the filters will be vented to the incinerator through the RV bypass (see Figures 2 and 4).

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TABLE 1. VCM RELIEF VALVES TO BE CONTAINED

R V NO.	R V SET PRESSURE	DISCH. LINE SIZE	LOCATION - SERVICE
AREA 1: T-401, P-401 (SEE FIGURE 1)			
321	285	1	P-401 discharge to F-401
327	285	1	P-401 suction line
328	285	1	P-401 discharge, F-401 outlet
329	285	1	T-401 header
330	285	1	P-401 suction line
331	285	1	T-401 header
343	285	1	P-401 discharge to rerun
413	190	1	F-401
640	285	1	F-403
AREA 2: T-411 C, P-411 (SEE FIGURE 2)			
319	285	1	Under T-411 C
322	285	1	P-411 discharge header
323	285	1	F-402 outlet to railcar loading
324	285	1	F-402 outlet to tank farm
325	285	1	F-402 outlet header
326	285	1	P-411 suction header
414	190	1	F-402

CWH 000002094

PDD

RCM-193-400-1253-PDD

12/6/83

Environmental Impact Statement

This project will eliminate discharges of vinyl chloride to the atmosphere from sixteen relief valves in the tank farm area that protect pipelines and equipment from liquid thermal expansion. The discharge lines from the RVs will be routed to the VCM vent incinerator.

Energy Impact Statement

This project will have no effect on plant energy consumption. The Process Design Energy Checklist was not applicable and was not completed for this design.

Safety and Health Impact Statement

This project will eliminate potential vinyl chloride exposure from RV discharges from sixteen RVs in vinyl chloride service in the tank farm area. The Process Design Safety Checklist has been completed and was included in the Review Design.

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WORK LIST

Refer to Figure 1 for Items 1 through 4.

1. Relocate RV-413 to the 1½" connection on the side of F-401 (see Figure 2). Run line 1"-HE-1-N-A2-1 from RV-413 on F-401 and RV-328 to the 1" tee in the 1½" vent line for the closed loop sampling system. A section of the existing 3/4" closed loop sampling vent line will be removed and the remaining section tied back into line 1"-HE-1 (see Note 3, Figure 1). Tie in RVs -330, -327, -343 to line 1"-HE-1. Include a 1" block valve and pipe union at each RV. At F-401, include a 1½" x 3/4" concentric reducer and a 3/4" block valve between the filter and RV-413, and a 1" pipe union and 1" block valve downstream of the RV (refer to Figure 2). Include a bypass around RV-413 with a 3/4" block valve, concentric 1" x 3/4" reducer and a 1" pipe union. Include a 3/4" bleeder in the line and backweld all threaded connections.
2. Run line 1"-HE-2-N-A2-1 from RV-321 and tie in to line 1"-HE-1. Install a pipe union and 1" block valve at the RV tie-in and backweld the threaded connections. Car seal open the valve.
3. Run line 1"-HE-3-N-A2-1 from RV-329 and PV-331 and tie in to line 1"-HE-1. Install a pipe union and 1" block valve at each RV tie-in and backweld the threaded connections. Car seal open the valves.
4. Run line 1"-HE-4-N-A2-1 from RV-640 on F-403 to line 1"-HE-1. Install a pipe union and 1" block valve at the RV and backweld all threaded connections. Car seal open the valve. Include a 3/4" bleed valve in the line by RV-640. Remove the existing 3/8" priming line from the P-415 discharge and run a ½" priming line from P-415 to line 1"-HE-4. Include a block valve in the line.
5. Tie in the 3/4" closed loop sampling system vent line to line 1"-HE-1-N-A2-1.

Refer to the attached Figure 3 for Items 6 through 10.

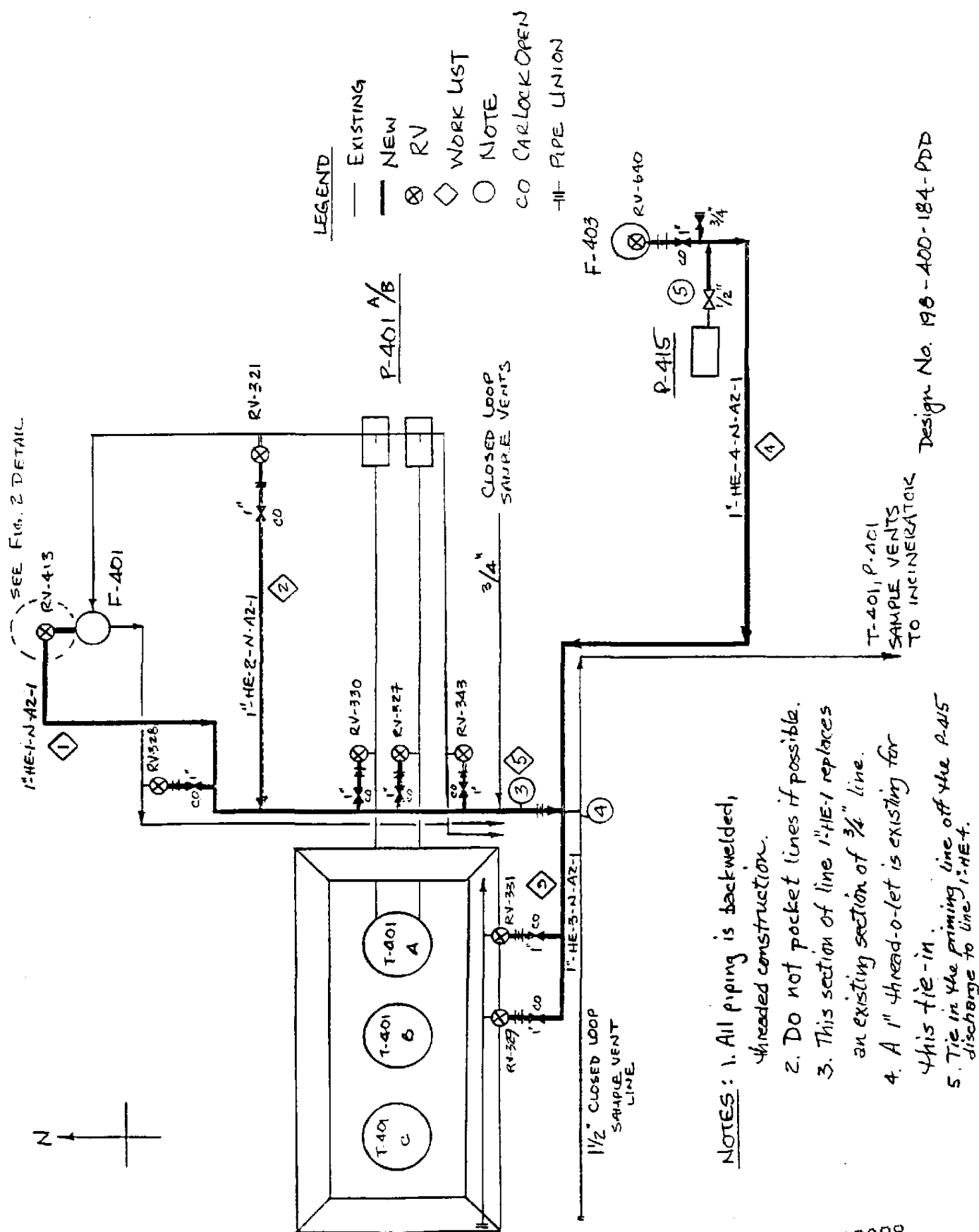
6. Run line 1"-HE-5-N-A2-1 from RV-319 on the rework line under T-411C to the ½" thread-o-let on the 3" vent line from T-411C at the SW corner of the tank dike. Install a pipe union and 1" block valve at the RV tie-in and backweld all threaded fittings. Car seal the valve open. Include 1 3/4" bleed valve by the RV and a 1 x ½" concentric reducer at the thread-o-let.
7. Run line 1"-HE-6-N-A2-1 from RV-322 on the P-411 discharge header and RV-326 on the suction header and tie in to line 1"-HE-5. Install unions and 1" block valves at the RV tie-ins and backweld all threaded connections. Car seal the valves open. Include a 3/4" bleed valve by RV-322.

CWH 000002096

8. Run line 1"-HE-7-N-A2-1 from RV-414 and RV-325 on F-402 and F-402 outlet line and tie in to line 1"-HE-5. Include a 1" pipe union and block valve on RV-325. Relocate RV-414 to the 1" vent line on the side of F-402 (refer to Figure 4). Include a 1 x 3/4" concentric reducer and block valve upstream of the RV and a 1" pipe union and block valve downstream. Car seal open the valves. Include a 1" bypass valve around the RV. Backweld all threaded connections.
9. Run line 1"-HE-8-N-A2-1 from RVs -323 and -324 and tie in to line 1"-HE-5. Include 1" pipe unions and block valves at the RV tie-ins and backweld the threaded connections. Car seal open the valves.
10. Tie in the 3/4" closed loop sampling system vent line to line 1"-HE-5-N-A2-1.

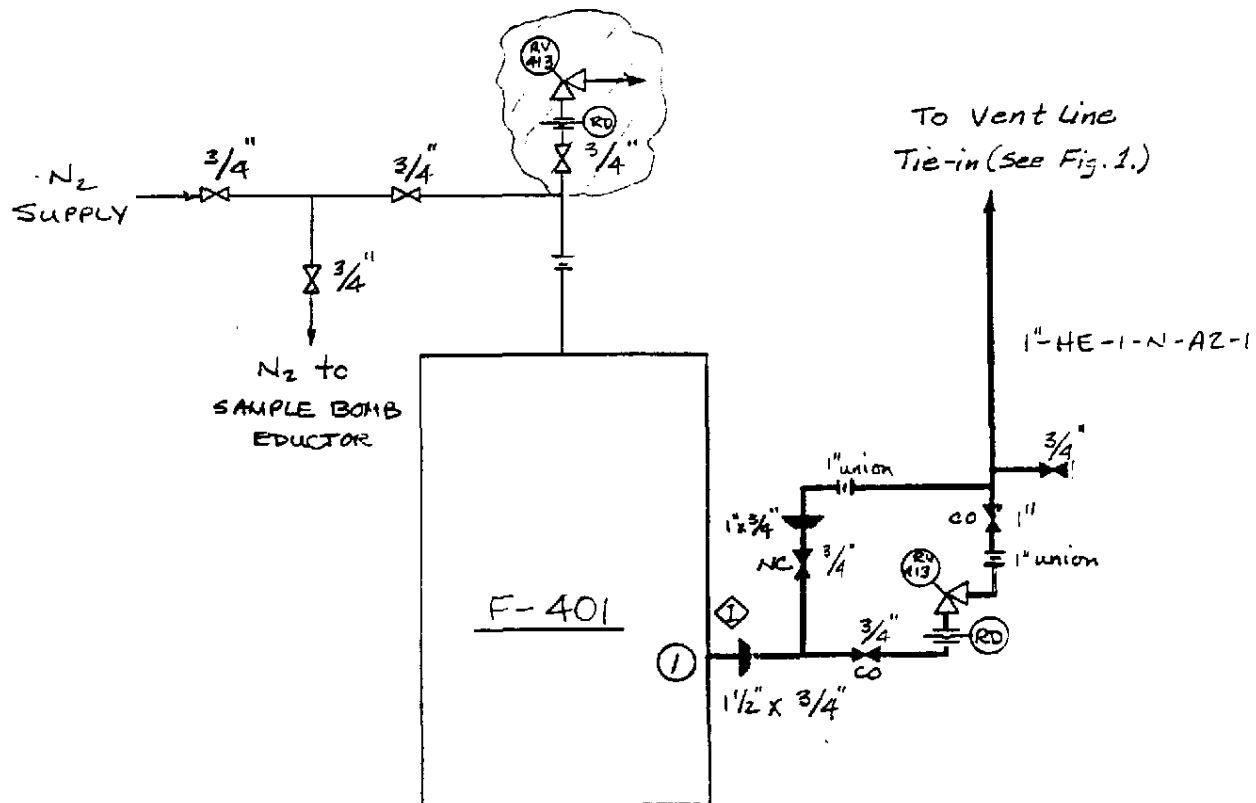
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FIGURE 1. RELIEF VALVE DISCHARGE CONTAINMENT SYSTEM



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FIGURE 2. F-401 VCM FILTER RV PIPING



NOTES: 1. There is an unused 1 1/2" stub-out existing.

LEGEND

-  EXISTING
 NEW
 NOTE
 WORK LIST
 PIPE UNION
 CAR LOCK OPEN
 REMOVE / RELOCATE

PDD

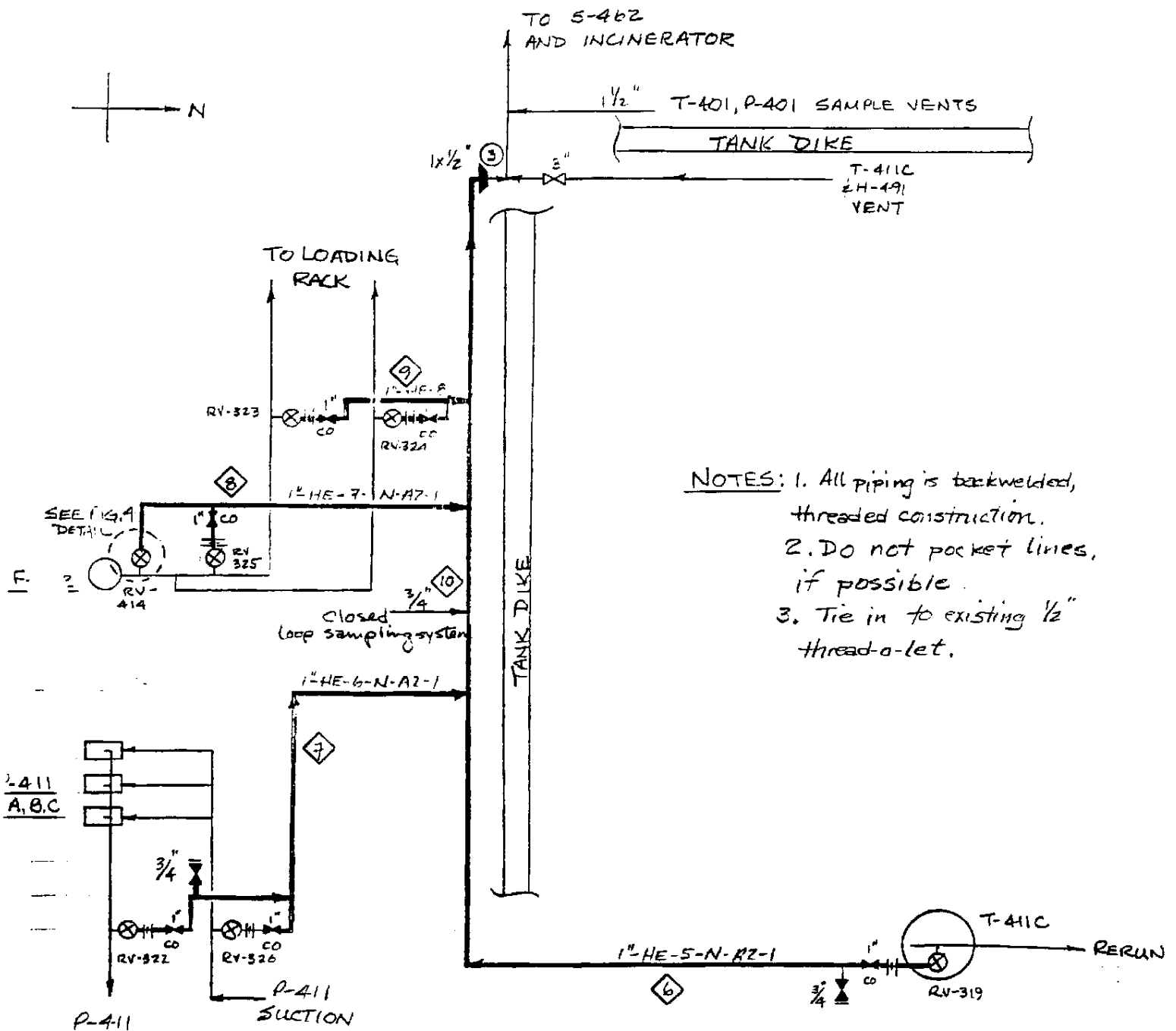
Design No. 198-400-184-PDD

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CWH 000002100

FIGURE 3. RELIEF VALVE DISCHARGE CONTAINMENT SYSTEM



- NOTES: 1. All piping is backwelded,
threaded construction.
2. Do not pocket lines,
if possible.
3. Tie in to existing 1/2"
thread-o-let.

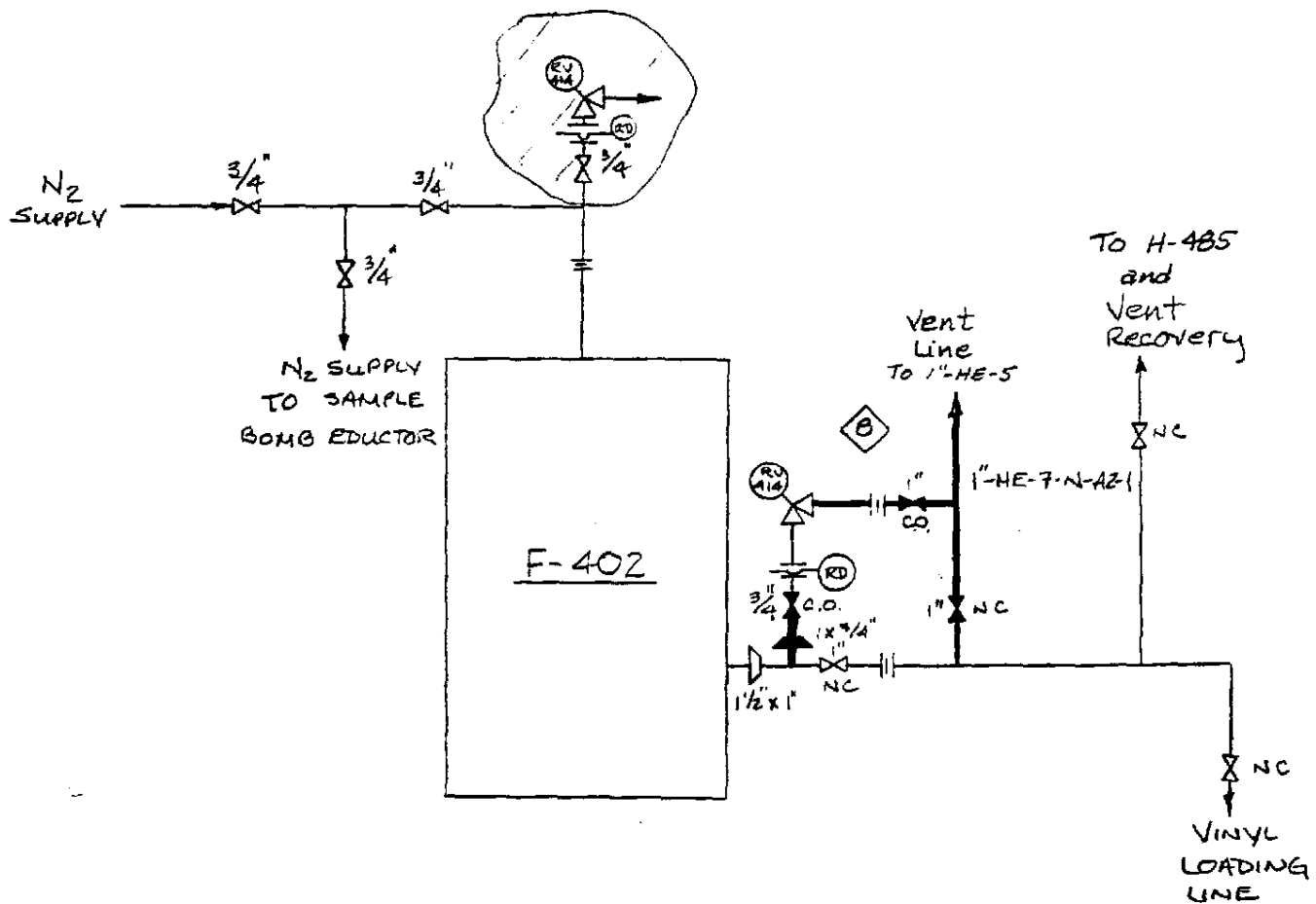
LEGEND

- EXISTING — NEW
- ⊗ RV ⊕ PIPE UNION
- > WORK LIST ○ NOTE
- CO CAR LOCK OPEN

Design No. 198-400-184-PDD

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FIGURE 4. F-402 VCM FILTER RV PIPING



LEGEND

— EXISTING

— NEW

◇ WORK LIST

—||— PIPE UNION

CO CAR LOCK OPEN

⊞ REMOVE / RELOCATE

PDD

Design No. 198-400-184-PDD

1/5/84

CWH 000002102

To: M. L. Ashby

From: V. M. Fisher & S. C. Racca
Date: August 24, 1984

Subject: TANK FARM VENT BLOWER (BL-412 A&B)
MODIFICATIONS
DESIGN NO. 204-400-884-VMF/SCR

VISTA

interoffice
communication

The attached class "A" design provides for modifying the Tank Farm Vent Blowers BL-412 A&B and spare to handle higher wet vent header pressures. Also included are revisions to the existing instrumentation and piping. The modifications will protect the blowers from surging and will decrease the probability of bypassing the tank farm vent to atmosphere.

This design should be implemented before the "Incinerator Bypass Reduction - High Vent Pressure" project (see "Incinerator Bypass Reduction", V. M. Fisher to M. L. Ashby, March 15, 1984) is fully operational. After this project is started up the maximum wet vent header pressure at PT-902 (the pressure transmitter for the Wet Vent Header Pressure Bypass Controller, PRC-902) will be increased from 90 inches WC to 110 inches W.C.

The eductor now installed in place of the spare blower will be removed and stored in the warehouse. Based on nitrogen and electrical prices, operating the eductor rather than the blowers would cost \$33,000 extra per year. In the future, the eductor will be installed temporarily if both spare blowers are down for maintenance.

The blower modifications is the better and less costly alternative, using existing equipment, to handling the higher wet vent header pressures. Currently, PED is evaluating long term alternatives to compressing the tank farm vents.

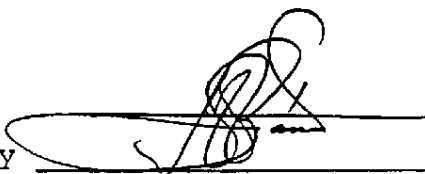
Currently, one fully modified blower package (with a 20 hp motor), one new check valve, and all instrumentation with the exception of the specified pressure gauges on the blower discharges have been installed. Also the spare blower has been modified and is stored in the warehouse. Work list items which remain are modifying and installing the other blower package, installing the other check valve, two pressure gauges, and cooling water outlet piping for the recycle cooler, and setting RV-533 at 4 inches W.C. and TSH-491 at 200°F.

CWH 000002103

Virgil M. Fisher
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Stephen C. Racca
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Approved By


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cc: RAC-PEM-RB-MLA(4)-MCM-JRH(4)-SRA-PLF-DLD-PE-PFF

CWH 000002104

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Safety Checklist
Operating Procedure
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CWH 000002105

DESIGN BASIS

TANK FARM VENT BLOWER MODIFICATIONS VCM PLANT

The "Incinerator Bypass Reduction" design (Design No. 194-900-983-VMF to M. L. Ashby from V. M. Fisher, March 15, 1984) when completely operational will increase the vent header pressure from 90 to 110 inches W.C. Raising the maximum allowable wet and dry vent header pressures will reduce the possibility of bypassing the incinerator to atmosphere. Considering line and equipment losses at a wet vent rate of 47,080 SCFH and a tank farm vent rate of 200 SCFM the maximum back pressure on the Tank Farm Vent Blowers BL-412A/B will be 131 inches W.C. To handle the wet vent header's increased pressure the blowers must be modified.

Burner ring assembly modifications, included in the Liquid Seal Flame Arrestor Project, eliminated the wet vent header burner ring and combined the wet and dry vents in the dry vent burner. The dry vent burner was sized to handle 64,000 SCFH with a 12 inch W.C. pressure drop. By combining the wet and dry vents, the pressure drop through the dry vent burner increased to approximately 36 inches W.C. raising the vent header pressures at design flow the same amount. To compensate for the increased pressure drop through the dry vent burner, the setpoint for the dry and wet vent header pressure controllers (PRC-901 and PRC-902, respectively) had to be increased from the original setting of 65 inches W.C. to prevent bypassing the incinerator at design flows.

The blowers were originally designed for an inlet vent rate of 200 SCFM and a wet vent header pressure of 65 inches W.C. By design, the existing blowers' maximum pressure rise is 72 inches W.C. When the header pressure rises above the blower discharge pressure, decreasing blower throughput, surging becomes a problem. Surging may cause bearing failure resulting in rubbing and severe damage to the blower internals. Currently, this is a repeated maintenance problem for BL-412A/B.

To eliminate the surge problem resulting from the increased wet vent header pressure, BL-412A/B and spare will be modified to increase the discharge pressure. The existing Paxton Blowers can be converted from a model CB-95 to a model CB 96 for 300 to 500 SCFM at 140 to 126 inches W.C. pressure rise. The modifications will include: changing the belt guards, belts, the motor pulleys (changing from two-groove to three-groove and increasing the diameter from 5.6 in. to 8.0 in.), the blower pulleys (changing from two-groove to three-groove and increasing the diameter from 4.2 in. to 5.3 in.), and the impellers, machining the casing covers, increasing the oil reservoirs capacity, and increasing the motors from 7.5 hp to 20 hp. The modified blowers will operate at 5300 RPM, an increase from 4700 RPM. The price for

modifying two blowers is \$4,050 each (FOB Santa Monica, CA). Modifying the spare will cost less since all that is required is changing the impeller and the blower pulley, and machining the casing cover.

The modified blower will be operated at a minimum flow of 300 SCFM ($\approx$ 15% above the surge point of 250 SCFM). Based on actual data, the existing recycle loop system would have an estimated pressure drop of 177 inches W.C. at 300 SCFM (Recycle Cooler = 44 inches W.C., check valve = 43 inches W.C., piping = 35 inches W.C., and PCV-491 at 90° (or 100%) open = 55 inches W.C) which exceeds the blower's discharge pressure. To reduce this pressure drop new check valves, having a pressure drop of approximately 2 inches W.C. at 300 SCFM will be installed. (The check valves prevent blower damage due to backward rotation.)

Recycle Cooler H-412, a water cooled monel, multi-tube exchanger, is provided in the recycle line to prevent overheating the blower. A recent cleaning of the cooler increased the cooling water flow rate from 2.5 gpm to 7.5 gpm. An evaluation of actual data indicates that this cooler will be adequate to maintain the increased recycle flow below 120°F at the outlet of H-412.

The minimum flow through the blower will be maintained 15% over surge by using the blower motor amperage to control recycle control valve ICV-412. The blower performance curve exhibits a rapid loss in pressure head with flows over 300 SCFM. To keep the discharge pressure high even at maximum vent rates, amperage control rather than a constant flow recycle loop will be used to maintain the flow through the blower. The new controller IRC-412 will control at 12.5 amps to maintain a minimum of 300 SCFM flow through the blower. To warn of an impending surge condition a low amp alarm IAL-412 will be activated at 12 amps. A high amp alarm IAH-412, activated at 22.9 amps will warn of an impending blower motor tripout. Each blower will be equipped with a low amp shutdown to prevent surge damage. The shutdowns, ISDL-412 A or B, will be activated at 11.5 amps. All alarms will be located in the main control room and when activated will have an audible buzzer and annunciator panel light.

Control Valve PCV-491A will have a 3-way solenoid installed on the pneumatic signal line to the valve's diaphragm actuator. The solenoid will close PCV-491A to isolate the tank farm blower system from the wet vent header whenever the operating blower shuts down. Should the eductor be in use, hand switch HS-412 will energize the solenoid to allow normal operation of PCV-491A.

A high pressure alarm PAH-481 will be tied into transmitter PT-481 which senses the pressure in S-412. When the pressure reaches 2 inches W.C. an audible buzzer and an annunciator light will be activated in the main control room. To monitor the pressure in S-412 a recorder, PR-481, will also be installed in the main control room.