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		Date MARCH 18, 1994
Project Title/Work Order Operability Test Procedure for 241-U Compressed Air System and Heat Pump		EDT No. 605333
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W. W. Jenkins	S2-24	X			
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AUG 31 1994 ENGINEERING DATA TRANSMITTAL

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1	1	Cog. Eng. RD Freeman	<i>RD Freeman</i>	3/9/94	S2-24	JH Wicks	<i>JH Wicks</i>	26 APR 94	T4-07	1	1	
1	1	Cog. Mgr. WW Jenkins	<i>WW Jenkins</i>	8/30/94	S2-24	JA Tuck	<i>JA Tuck</i>	15 MAR 94	S2-24	1	1	
1	1	QA JJ Verderber	<i>JJ Verderber</i>	3/9/94	S1-57	DE Reber	<i>DE Reber</i>	4/19/94	T4-08	1	2	
		Safety N/A				SS Tank Cog. <i>MR Koch</i>	<i>MR Koch</i>	3/9/94	S1-57	1	1	
		Env. N/A				Air Sys. Cog. <i>WG Brown</i>	<i>WG Brown</i>	3/9/94	R1-49	1	1	
1	1	JA Crawford	<i>JA Crawford</i>	3/9/94								
1		GJ Rust	<i>GJ Rust</i>	4/2/94								

18. Signature of EDT Originator <i>RD Freeman</i> 3/9/94	19. Authorized Representative for Receiving Organization <i>WW Jenkins</i> 8/30/94	20. Cognizant/Project Engineer's Manager <i>WW Jenkins</i> 8/30/94	21. DOE APPROVAL (if required) Ltr. No. <input type="checkbox"/> Approved <input type="checkbox"/> Approved w/comments <input type="checkbox"/> Disapproved w/comments
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RELEASE AUTHORIZATION

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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

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WHC Information Release Administration Specialist:

Jamara Kohn for Chris Willingham
C. Willingham

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08-31-94

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SUPPORTING DOCUMENT		1. Total Pages 33	
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APPROVED FOR PUBLIC RELEASE <i>CU 8/31/94</i>			
7. Abstract This Operational Test Procedure (OTP) is designed to allow a functional test of the operating parameters of the upgraded 241-U-701 Compressed Air and HVAC Systems. This OTP will be used as a final function check for the entire upgraded air system and HVAC system. Upon completion and sign off of the OTP the systems will be turned over to Operations.			
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9. Impact Level Q			

**Operability Test Procedure for
241-U Compressed Air System and Heat Pump**

March 18, 1994

**H. C. Martin
R. D. Freeman**

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I TEST PLAN

1.1 SYSTEM DESCRIPTION

The 241-U-701 compressed air system supplies instrument quality compressed air (per ISA standards) to Tank Farm 241-U. The supply piping to the 241-U Tank Farm is not included in the modification. The word "system" as used in this document refers only to the equipment and piping external to the 241-U Tank Farm compressed air supply piping. Prior to upgrade efforts, the existing compressed air system was in need of major modifications. Modifications to the 241-U-701 compressed air system include the following:

- 1.1.1 15 HP Reciprocating Air Compressor, Ingersoll-Rand Model 10T3NLM-E15
- 1.1.2 Air dryer, Hankinson, Model DH-45
- 1.1.3 Miscellaneous system equipment and piping (valves, filters, etc.) to meet the design.

A newly installed heat pump allows the compressor to operate within an enclosed relatively dust free atmosphere and keeps the compressor room within a standard acceptable temperature range, which makes possible efficient compressor operation, reduces maintenance, and maximizes compressor operating life.

The heat pump system includes the following components:

- 1.1.3.1 Heat pump, Bard Mfg. Co., Model WH601
- 1.1.3.2 Thermostat

1.2 TEST SCOPE

This document is an Operability Test Procedure (OTP) which will further verify (in addition to the Acceptance Test Procedure) that the 241-U-701 compressed air system and heat pump operate within their intended design parameters. The activities defined in this OTP will be performed to ensure the performance of the new compressed air system will be adequate, reliable and efficient. Completion of this OTP and sign off of the OTP Acceptance of Test Results (Attachment 3) is necessary for turnover of the compressed air system from Engineering to Operations.

1.2.1 Organizational Responsibilities

The OTP shall be performed by Tank Farms Facility Operations and the required support personnel. Facility Systems (FS) is responsible for resolving any test exceptions (with approval of QA and the applicable WHC Cognizant Engineer(s)), and FS is

responsible for assuring the completion of any needed modifications, repair/rework of the system prior to turnover. Facility Systems is also responsible for obtaining all signatures on the Acceptance of Test Results and sending a copy of the signed off Acceptance sheet to each of the signees. Facility Systems will also ensure that the Preventive Maintenance Procedures and Operations Procedures are issued and in place before the OTP is accepted by Operations.

Facility Operations will provide a Test Director (TD) who is responsible for ensuring the OTP is performed in accordance with this document. The Test Director is the single person in charge during the performance of this test and is responsible for determining when this test is in progress. The Test Director's duties include coordinating and overseeing the performance of the test, witnessing and signing for the completion of each indicated step, contacting the appropriate personnel to verify hold points, recording exceptions, and assisting in the resolution of test exceptions.

Quality Control (QC) hold points identified in the OTP must be witnessed and signed off by Westinghouse Hanford Company (WHC) QC personnel.

WHC Quality Assurance (QA) shall review and approve exception resolutions when considered appropriate by the Test Director and shall sign the OTP Acceptance Sheet.

The Air Systems Cognizant Engineer will be responsible for supporting the Test Director during the OTP.

The Single Shell Tank (Facility) Cognizant Engineer will be responsible for supporting the Test Director during the OTP. Shall also provide an in depth review of the system operation and upon satisfactory completion of this OTP, sign the OTP acceptance sheet in Attachment 3.

The Tank Farms Cognizant Engineers and Managers responsible for acceptance of this OTP include:

- 1.2.1.1 Air Systems Cognizant Engineer
- 1.2.1.2 Electrical Systems Cognizant Engineer
- 1.2.1.3 Single Shell Tank (Facility) Cognizant Engineer
- 1.2.1.4 Facility Systems Manager
- 1.2.1.5 West Tank Farms Operations Manager

Note:

Throughout this document, the term "Cognizant Engineer" shall be understood to include Cognizant Engineer designees, except on the OTP Acceptance of Test Results sheet (Attachment 3) which shall be signed by the respective Cognizant Engineer.

The Cognizant Engineer(s) shall provide technical guidance to the Test Director as necessary in the resolution of test exceptions. The Facility Systems Engineer is responsible for obtaining the resolution of exceptions, is authorized to make red-line changes to the procedure, and must sign the OTP Acceptance Sheet after all exceptions are resolved. The Facility Systems Engineer shall prepare and issue the Operability Test Report (OTR). The Single Shell Tank and Air Systems Cognizant Engineer is responsible for providing an in depth review of the system operation and upon satisfactory completion of this OTP, sign the OTP acceptance sheet in Attachment 3.

1.3 TEST OBJECTIVES

The objectives of this OTP are to allow Tank Farms Operations to become familiar with the operating parameters of the 241-U-701 Instrument Quality Compressed Air System, and complete the required OTP documentation. This OTP will be used as a final function check for the entire upgraded air system and to demonstrate the systems capability to support the daily operation of the U Tank Farm. The results of the OTP will be recorded in the following format.

1.3.1 Data Recording

Throughout the OTP, spaces are provided so the test performers can initial to signify successful completion of the required steps. On some steps, spaces are provided for QC witness or verification. Data Sheets are provided in Section 4.1 for recording required information during the OTP. Each recorder shall initial the designated column of any table used during the OTP, and print and sign their name on one of the lines below the table.

1.3.2 Exception Sheets

Any exception (deviation from expected results) encountered during the OTP will be recorded on an OTP Exception sheet (Attachment 4, make additional sheets as needed), and the exception number shall be noted next to the applicable procedure step. Upon the discovery of an exception, the Test Director, with input from the Facility Systems Engineer, determines whether to continue the OTP. The system carries a safety class and approval designator of 3Q. The Test

Director and the appropriate Cognizant Engineer will be responsible for maintaining the safety class and approval designator of the system by having WHC QA involved at the appropriate time for the resolution of the test exceptions. The OTP shall not continue without resolving and/or repairing a deficient or malfunctioning item unless the Test Director determines that the nonconformance does not endanger personnel or equipment. Resolutions or any exceptions may include troubleshooting and repair instructions. Every exception to the OTP must be approved by the Facility Systems engineer and the Test Director. WHC QA shall review and approve all exceptions. At the discretion of the Test Director, QA review and approval of exceptions may occur either at the time the resolution is written or when the QA Engineer reviews the test results.

1.3.3 Procedure Modification

If the OTP requires modification due to unforeseen circumstances, the Facility Systems Engineer may red-line the OTP Record Copy. The engineer making the procedure modification and the Test Director must initial and date any red-line changes. Procedure modifications may include working steps out of sequence. If the modification is lengthy the change may be described on an OTP Exception Sheet and have WHC QA concurrence.

1.3.4 OTP Execution Sheet

Upon completion of the test the Test Director shall check the applicable space on the OTP Execution Sheet (Section 4.2) which indicate whether the OTP has been performed "with exception" or "without exception". The appropriate personnel shall print their names, sign and date the OTP Execution Sheet in the spaces provided.

1.3.5 Acceptance of Test Results

After the OTP Execution Sheet is completed, and all the exceptions have been resolved, the signatures for Acceptance of Test Results (Attachment 3) must be obtained on the OTP Acceptance Sheet.

1.3.6 Acceptance for Use

When the West Tank Farms Operations Manager verifies that the OTP has been completed, the manager shall sign in the spaces provided on the Acceptance of Test Results Sheet, accepting the 241-U-701 Instrument Quality Compressed Air System "for

use". Preventive Maintenance and Operating Procedures should be released and available at this time.

1.3.7 Operability Test Report

A copy of the completed test shall be forwarded to the Air Systems Cognizant Engineer and Facility Systems Engineer. This data will be used to prepare the Operability Test Report (WHC-SD-WM-OTR-151). The Record Copy of the OTP will be placed in the WHC Work Package. The Air Systems Cognizant Engineer will be responsible for obtaining all signatures on the Acceptance of Test Results and returning a signed off copy back to each individual on the list.

1.3.8 Acceptance for Beneficial Use (ABU)

The ABU was not funded for FY 94. The ABU will be completed by the Facility Systems Engineer with a tentative completion date of November 4, 1994.

1.4 REFERENCES

The following references were used or created during the design of the 241-U-701 Instrument Quality Compressed Air System.

1.4.1 Drawings

H-2-36380, Sheet 1, Rev. 2
H-2-36381, Sheet 1, Rev. 2
H-2-73682, Sheet 1, Rev. 6
H-2-73692, Sheet 1, Rev. 2 & Sheet 2, Rev. 1

1.4.2 ECNs

198245 (Basic mechanical & electrical design)
198255 (Original slab - superseded by 196637)
196637 (New slab - supersedes 198255 entirely)
196668 (Electrical changes)
198342 (Corrections, adds sheet metal interior to bldg & ground plate beneath slab - superseded by 603448)
603448 (Same as 198342 except more corrections & replaces interior with sheetrock - supercedes 198342 entirely)
606148 (Corrections to 198245 and 196637)

1.4.3 Vendor Information (CVI 22526)

Ingersoll-Rand Form SCD-421, May 1988, Instruction Manual
Ingersoll-Rand Form SCD-491-A, Aug 1988, Parts List
Hankinson Model DH-45, Description, Installation, Operation & Maintenance, Testing, & Repair Parts Manual

Hankinson Compressed Air Filter Manual
Bard Mfg Co. Heat Pump Model WH601, Owners Manual & Replacement Parts Manual
Parkline Inc. (Metal Bldg) Erection Drawings & Instructions

1.4.4 WHC Controlled Documentation

WHC-IP-0842, Waste Tanks Administration, Section 5.9.1, REV 1, 'Lockout/Tagout'

WHC-CM-6-1, Standard Engineering Practices, EP-4.2, Testing Practices

WHC-SD-WM-ATP-066, Acceptance Test Procedure for 241-U Instrument Air Compressor & Heat Pump

2 TEST EXECUTION SECTION

Before starting the OTP, personnel conducting the test shall become familiar with the equipment and controls. The Test Director must ensure that protective guards are in place before starting any equipment, and personnel remain clear of all moving parts. Eye protection is required when closing breakers, venting air from any part of the system, and performing maintenance tasks. Hearing protection is required in the vicinity of the air compressor and air dryer while they are operating.

Note:

Any person associated with this OTP who observes a condition which could ENDANGER the SAFETY of PERSONNEL, must stop the test and notify the Test Director IMMEDIATELY.

The majority of this OTP will be conducted while the air system is pressurized, making appropriate precautions mandatory. Operating compressors shall not be left unattended until the Air Systems Cognizant Engineer has confirmed that all controls and safety devices for each compressor are working properly. If the OTP is suspended and the compressed air system shut down, place the valves in the PRETEST VALVE LINEUP condition (see valve table page 14). Also isolate equipment and controls, where required for personnel safety or equipment protection, in accordance with WHC-IP-0842, Waste Tanks Administration, Section 5.9.1, REV 0, 'Lockout/Tagout'.

The pre-test and post-test maintenance work could involve the handling of items such as Stoddard solvent and turbine oil. If required, the Test Director must ensure that all applicable Material Safety Data Sheets (MSDSs) are at the test site, and that all required personnel read and comply with the MSDSs. Excess and waste chemicals must be properly stored or disposed of.

TEST DIRECTOR _____

DATE _____

2.1 EQUIPMENT REQUIRED

Operations shall supply all test equipment unless otherwise noted. M & TE (measurement and test equipment) shall have a valid calibration stamp attached that indicates a calibration traceable to the National Institute of Standards and Technology.

2.1.1 Volt-ohm meter, portable, (0 to 600V AC).

MAKE/MODEL: _____ S\N: _____ CAL. DATE: _____ QC _____ / _____

2.1.2 Clamp-on Ammeter (0-100 Amp AC scale)

MAKE/MODEL: _____ S\N: _____ CAL. DATE: _____ QC _____ / _____

2.1.3 Torque Wrench (0-100 Ft. Lbs. scale)

MAKE/MODEL: _____ S\N: _____ CAL. DATE: _____ QC _____ / _____

2.1.4 (3 qts min.) of 500 SSU, Lubricating oil
(Stores # 0012-1380-040).

QC _____ / _____

2.1.5 Hazardous Material Spill Kit for liquids.

2.1.6 Pipe fittings and hose

2.1.6.1 (2) 3/8" NPT Nipple

2.1.6.2 (1) 3/8" NPT Elbow

2.1.6.3 (1) 3/8" x 1" NPT Bell Reducer

2.1.6.4 (1) 25' - 1" air hose with fittings as required
to mate with female 1" NPT pipe fitting.

If any of the above fittings are to be left in place after the OTP and become a part of the system, they will require the appropriate WHC QA requirements.

2.1.7 (2) Thermometers (0-100°F)

2.1.8 Personal protective equipment

2.1.8.1 Ear Plugs

2.1.8.2 Eye Protection

2.1.8.3 Gloves

2.1.9 Ingersoll-Rand Type-30 Instruction Manual
Hankison International - Desiccant Air Dryer Catalog

2.2 LOCK AND TAG

Applicable crafts personnel will perform the following steps, and the Test Director shall initial and date the space provided. Additional spaces are provided where necessary for Cognizant Engineer and WHC QC Inspector initials. Locks and tags shall be applied and/or removed in accordance with WHC-IP-0842 "Waste Tank Project Administration", Section 5.9 "Lockout/Tagout".

NOTE:
ALL COMPONENT LABELS IN THIS PROCEDURE ARE CONTAINED IN (PARENTHESIS). IN THE FIELD ALL COMPONENT LABELS ARE PRECEDED BY 241-U-701-. eg. (PI-1) = 241-U-701-PI-1

- 2.2.1 Verify **DANGER** tag has been installed on the following breaker and it is placed in the "OFF" position.

Compartment C4 of "241-U-271 MCC # 1" labeled "241-U-701 COMPRESSOR BUILDING" _____/_____

- 2.2.2 Verify **CAUTION** tags "Equipment to be operated by test personnel only." have been installed on the following disconnect switches and they are placed in the "OFF" position.

2.2.2.1 Main Disconnect Switch (DS-1). _____/_____

2.2.2.2 Air Compressor Disconnect Switch (DS-3). _____/_____

2.2.2.3 Mini Power Center (MPC-1) main breaker. _____/_____

2.2.2.4 Heat Pump Disconnect Switch (DS-2). _____/_____

- 2.2.3 Set all equipment controls to the "OFF" position.

2.2.3.1 All the breakers in the Mini Power Center (MPC-1). _____/_____

2.2.3.2 Instrument Air Compressor Control Switch (HS-1). _____/_____

2.2.3.3 Instrument Air Dryer Control (HS-2). _____/_____

2.2.3.4 Heat pump thermostat controls. _____/_____

2.3 POWER SUPPLY VERIFICATION

This section supplies power to the 241-U-701 Compressor Building from "241-U-271 MCC # 1" located in the 241-U-271 Control Room.

- 2.3.1 Request Operations to remove the "DANGER" tag from "241-U-701 COMPRESSOR BUILDING" breaker located in compartment C4 of 241-U-271 MCC # 1. _____/_____
- 2.3.2 Ensure Operations has removed the "DANGER" tag from "241-U-701 COMPRESSOR BUILDING" breaker located in compartment C4 of 241-U-271 MCC # 1. _____/_____
- 2.3.3 Set the "241-U-701 COMPRESSOR BUILDING" breaker located in compartment C4 of 241-U-271 MCC # 1 to the "ON" position. _____/_____

WARNING
THE NEXT STEP IS PERFORMED ON ENERGIZED EQUIPMENT.

- 2.3.4 Verify 480 volt power is supplied to the 241-U-701 Compressor Building at the Main Disconnect Switch (DS-1) with the Volt-Ohm meter (phase to phase). _____/_____
- 2.3.5 Set Main Disconnect Switch (DS-1) to the "ON" position. _____/_____
- 2.3.6 Set Mini Power Center (MPC-1) Main breaker to the "ON" position. _____/_____
- 2.3.7 Set Mini Power Center (MPC-1) breaker # 4 "LIGHTING" to the "ON" position and verify indoor lights work by switching them on. _____/_____

WARNING
THE NEXT STEP IS PERFORMED ON ENERGIZED EQUIPMENT.

- 2.3.8 Set Mini Power Center (MPC-1) breaker # 3 "RCPTCLS" to the "ON" position and verify 120 volt power at ALL of the receptacles with the volt-ohm meter. _____/_____

- 2.3.9 Set Mini Power Center (MPC-1) breaker # 5 "LIGHTING OUTSIDE" to the "ON" position and verify outdoor lights work by switching them "ON" then "OFF". _____/_____

2.4 PREPARATION FOR HEAT PUMP START-UP TEST

This section prepares the heat pump for start-up and operation.

- 2.4.1 Check the heat pump (AHU-1) thoroughly to assure that there are no loose parts and the machine has not been tampered with since it was installed. _____/_____
- 2.4.2 Verify that the Heat Pump air filter is clean and in place. _____/_____
- 2.4.3 Verify that condenser fan and indoor blower turn free without rubbing and that they are tight on the shafts. _____/_____

2.5 POWER TESTS OF HEAT PUMP EQUIPMENT

The following steps verify the proper power supply to the Heat Pump.

- 2.5.1 Verify that Heat Pump Thermostat controls are "OFF". _____/_____
- 2.5.2 Set Heat Pump Disconnect Switch (DS-2) to the "ON" position. _____/_____
- 2.5.3 Place a thermometer inside 241-U-701 in a location that permits a free flow of room air over the thermometer. _____/_____
- 2.5.4 Place a thermometer outside of 241-U-701 in a location free from direct sunlight. _____/_____
- 2.5.5 Set system to HEAT, set thermostat above ambient temperature, set fan switch to AUTO. Let the system run for two minutes and verify that hot air is discharging from the supply air register. _____/_____
- 2.5.6 Set fan switch to OFF, set system to COOL, set thermostat below ambient temperature, set fan switch to AUTO. Let the system run for two minutes and verify that cool air is discharging from the supply air register. _____/_____
- 2.5.7 Set thermostat to desired temperature (75°F), set fan switch to auto, and set system to heat or cool as required. Heat pump should begin to operate. _____/_____

NOTE:
DURING THE REMAINDER OF TEST KEEP DOORS TO 241-U-701 CLOSED (OR NEARLY CLOSED) WHENEVER POSSIBLE!!

2.6 COMPRESSED AIR SYSTEM STATUS VERIFICATION

QC Hold

2.6.1 Verify that the following instruments have been calibrated. Complete the following tables:

NOTE:
ALL READINGS, REQUESTED BY THIS PROCEDURE, WHICH ARE NOT TAKEN FROM CALIBRATED INSTRUMENTS ARE FOR INFORMATION ONLY.

INSTRUMENT	CALIBRATION DATE	CALIBRATION DUE	VERIFIED BY
LP instr. air pressure indicator, 241-U-701-PI-7			
LP instr. air pressure indicator, 241-U-701-PI-8			

2.6.2 Verify the following disconnect switches are OFF and caution tagged.

- 2.6.2.1 Air Compressor Disconnect Switch (DS-3)
OFF ____/____
- 2.6.2.2 Mini Power Center (MPC-1), breaker #1 AIR DRYER & DRAINS
OFF ____/____

2.6.3 Verify all equipment controls are set to the OFF position.

Instrument Air Compressor Control Switch (HS-1)

OFF ____/____

POWER SWITCH on the Air Dryer Console

OFF ____/____

- 2.6.4 Compressed Air System has been visually inspected to make sure there are no loose parts and the equipment has not been obviously tampered with since the installation and ATP. _____/_____
- 2.6.5 Compressed Air System layout is acceptable to Facility Operations in regard to maintainability and ease of operation. _____/_____
- 2.6.6 Attach the 1" hose to valve (V-2) and run it outside. Anchor the exterior end of the hose to prevent it from whipping and blowing on personnel or contaminated areas. _____/_____
- 2.6.7 Check frame oil level and, if necessary, add oil in accordance with page 11 of Ingersoll-Rand Form SCD-421, Instruction Manual. _____/_____
- 2.6.8 Prime the receiver condensate trap (TRAP-1) using instructions on page 23 of Ingersoll-Rand Form SCD-421, Instruction Manual. _____/_____
- 2.6.9 Verify that the compressor auxiliary valve is engaged for constant speed control regulation. The lockout knobs on the auxiliary valve should be turned counterclockwise until fully open. See instructions on page 10 of Ingersoll-Rand Form SCD-421, Instruction Manual. _____/_____
- 2.6.10 Set valves to the positions shown in the following table, initialing each space.

Note:

Location of components & instruments may be found on the Flow Diagram on pages 7 & 8 of ECN 198245 and Attachments 1 and 2 of the OTP.

PRETEST VALVE LINEUP

(V-1)	OPEN		(EV-13)	CLOSED		(V-25)	CLOSED	
(V-2)	CLOSED		(EV-14)	CLOSED		(EV-26)	OPEN	
(V-3)	CLOSED		(V-15)	OPEN		(V-27)	OPEN	
(V-4)	CLOSED		(V-16)	OPEN		(V-28)	CLOSED	
(V-5)	CLOSED		(V-17)	CLOSED		(V-29)	OPEN	
(V-6)	CLOSED		(V-18)	OPEN		(V-30)	CLOSED	
(V-7)	OPEN		(V-19)	CLOSED		(V-35)	THROTL'D	
(V-8)	OPEN		(V-20)	OPEN				
(V-9)	CLOSED		(V-21)	OPEN				
(V-10)	CLOSED		(V-22)	OPEN				
(V-11)	OPEN		(V-23)	CLOSED				
(V-12)	CLOSED		(V-24)	CLOSED				

3 OTP EXECUTION

NOTE:

If Sections 3.1 or 3.2 are suspended at any time, follow the direction given in Section 3.3 of this document.

3.1 COMPRESSED AIR SYSTEM START-UP

- 3.1.1 Request approval from West Area Tank Farm Operations Shift Supervisor/Manager of the Compressed Air System test and coordinate events with Operations.

WARNING:

BEFORE ENERGIZING THE COMPRESSOR BREAKERS, ALL PERSONNEL IN THE COMPRESSOR BUILDING MUST PUT ON PERSONAL EYE AND EAR PROTECTION. POST SIGNS OUTSIDE OF THE BUILDING FOR EYE AND EAR PROTECTION DURING THE TEST.

3.1.2 Set the following disconnect switches to the "ON" position.

3.1.2.1 Air Compressor Disconnect Switch (DS-3)
ON ____/____

3.1.2.2 Mini Power Center (MPC-1), breaker #1 AIR DRYER &
DRAINS ON ____/____

3.1.3 Turn "ON" the air compressor with switch (HS-1).
ON ____/____

CAUTION:
SHUT THE COMPRESSOR(S) DOWN IF THERE IS ANY UNUSUAL NOISE OR VIBRATION.

3.1.4 Check the receiver condensate trap (TRAP-1). Continuous air leakage from the trap could indicate that the trap has lost its prime. If so, shutdown (CMP-1), depressurize the system, and re-prime system using instructions on page 23 of Ingersoll-Rand Form SCD-421, Instruction Manual. ____/____

Note:
The distance piece pressure (refer to instruction manual) is piped across all cylinders and is vital for the satisfactory operation of the I-R Model 10T3NLM-E15 air compressor.

3.1.5 Record the distance piece pressure indicated on (PI-2) while the compressor is loading. The pressure should be 25-30 psig when the receiver pressure (PI-3) is at least 80 psig. Periodically monitor the distance piece pressure.

(PI-2) loading ____psig ____/____

3.1.6 Allow the receiver pressure to build until (CMP-1) unloads. Record, for information purposes only, the pressure at which (CMP-1) unloads as sensed by pressure gauge (PI-3).

(CMP-1) UNLOADS at ____psig ____/____

3.1.7 Open valve (V-2) until (PI-3) indicates a slowly dropping receiver pressure. Allow the receiver pressure to decay until (CMP-1) loads. Record, for information purposes only, the pressure at which (CMP-1) loads as sensed by pressure gauge (PI-3).

(CMP-1) LOADS at _____psig _____/_____

3.1.8 Close valve (V-2). Air receiver pressure should increase to and maintain approximately 100 psig. Disconnect hose from valve (V-2) leaving outer end anchored. _____/_____

3.1.9 SLOWLY open valve (V-17) to pressurize the Air Dryer. _____/_____

3.1.10 Open valve (V-19) and close valve (V-18) to direct the compressed air flow through the Air Dryer. _____/_____

3.1.11 Switch the **POWER SWITCH** on the Air Dryer Console to the "ON" position. **NOTE:** When the air dryers are first turned "ON" or when a new tower is switched to, Dew points may be above -40°F as listed the data sheet 4.1. Dew point should drop below -40°F within 2 minutes. _____/_____

3.1.12 Verify that the **SWITCHING FAILURE ALARM** light, located on the Air Dryer Console, is not illuminated. _____/_____

3.1.13 Depress and hold the **CYCLE SELECTOR SWITCH**, until the **TEST MODE LIGHT** illuminates, placing the air dryer in manual control. (The switch and light are located on the Air Dryer console.) **NOTE:** The manual control change will not be acknowledged by the air dryer controller until its current cycle is completed. There may be a few seconds of delay. _____/_____

3.1.14 Step the air dryer through the cycle by depressing and releasing the **ALARM RESET SWITCH**. The dryer status at each

step should conform to the table below. Initial the space provided at each step to confirm dryer status (as indicated by the **TOWER STATUS** lights).

AIR DRYER DIAGNOSTIC SIGNALS

	LEFT		RIGHT		INITIAL
	DRYING	REGENERATION	DRYING	REGENERATION	
START	ON	OFF	ON	OFF	
STEP 1	ON	OFF	OFF	OFF	
STEP 2	ON	OFF	OFF	ON	
STEP 3	ON	OFF	OFF	ON	
STEP 4	ON	OFF	OFF	OFF	
STEP 5	ON	OFF	ON	OFF	
STEP 6	OFF	OFF	ON	OFF	
STEP 7	OFF	ON	ON	OFF	
STEP 8	OFF	ON	ON	OFF	
STEP 9	OFF	OFF	ON	OFF	
The test is now complete. The Air Dryer is re-initialized.					

The above table was taken from the Hankison Operation Manual, Section 4.5

3.1.15 If table is verified with no exceptions the Test Director shall sign and date below. Otherwise note the exception on the Acceptance Test Exception sheet.

TEST DIRECTOR: _____ DATE: _____

3.1.16 Depress and hold the **CYCLE SELECTOR SWITCH**, until the **4 MINUTES** light illuminates, placing the air dryer in automatic mode. Use the **ALARM RESET SWITCH** to manually step the dryer through its operating sequence until the left tower **DRYING**

light is illuminated and the **ALARM RESET SWITCH** cannot be used to step through the cycle. _____/_____

3.1.17 Remove plug in Dew Point Test Port at valve (V-30). Attach anchored hose to Dew Point Test Port using 3/8" NPT fittings of 2.1.6. **SLOWLY** open valve (V-30) until the flow rate through the air dryer is 35 scfm. This can be read on the flowmeter (FI-1). _____/_____

3.1.18 When either dryer tower is purging (air is exhausting through the dryer vent); Adjust the Purge Air Pressure, indicated on (PI-7), to 44-46 psi with needle valve (V-35). The receiver pressure as indicated on (PI-3) should be drawn down to less than 75 psi. _____/_____

3.1.19 Verify the following Condensate Drain Valves operate properly, open and close on the set cycle. (45 min. closed, 0.5 sec. open). Listening for the contacts and air flow in the pipe will determine whether the valve is open or closed.
(EV-14) _____/_____
(EV-13) _____/_____
(EV-26) _____/_____

3.2 48-HOUR ON-LINE TEST

The following 48-hour on-line test consists of testing the new compressor, air dryer, heat pump, and associated equipment, and developing a baseline of system measurements for Operations, Maintenance, and Engineering. Shift Operations will be responsible for these measurements for the Test Director during this portion of the test.

3.2.1 Verify that the heat pump, air compressor, and air dryer are operating, and verify that compressed air is being exhausted from the 1" hose, installed per step 3.1.17. _____/_____

Note:
The following two steps may be performed at anytime the conditions are met during the 48 hour on-line test; however, humidistat readings when valve (V-30) is fully closed will be erroneous.

- 3.2.2 Whenever the dew point drops to and remains below -20F during drying cycles of both towers, verify the pressure at (PI-6) is 20 to 22 psig; then, open valve (V-28) supplying instrument air to the U-farm. _____/_____
- 3.2.3 Partially close valve (V-30) until flowmeter (FI-1) reads approximately 5 scfm. _____/_____
- 3.2.4 Monitor and record the required items on Data Sheet 4.1 at 15 minute intervals for the first hour, or until the system is stabilized, then continue readings at hourly intervals for the remainder of the first 8 hours. _____/_____
- 3.2.5 During the second hour of operation, record the duty cycle of the compressor. This is done by measuring the time from start of the compression (load) cycle to the end of the compression cycle divided the total time of one complete load/unload cycle. This measurement should be done three times and the average noted. Time refers to the time of day the recordings are taken.

Time _____	Time _____	Time _____
Load _____sec.	Load _____sec.	Load _____sec.
Unload _____sec.	Unload _____sec.	Unload _____sec.
Duty Cycle ____%	Duty Cycle ____%	Duty Cycle ____%

Average duty cycle: _____%

If the duty cycle is not 50% or less the test should be suspended. Running the compressor above the 50% duty cycle range could cause irreversible damage to the compressor.

_____/_____

3.2.6 After the first 8 hours of operation, continue monitoring the system every four hours for the remainder of the 48-hour test. On Data Sheet 4.1, record the date and time the system is monitored, the initials of the person taking the readings, and the reading on each gauge. Every person recording data must print their name, sign, and date one of the lines below the table. If any unusual conditions are noticed, make a note on the data sheet and/or record the details on an Exception Sheet and notify the Test Director and Cog Engineer. _____/_____

Note:
Complete the next step near the end of the 48 hour on-line test.

3.2.7 Close valve (V-30), remove hose & fittings of ¶ 2.1.6, and replace 3/8" NPT plug. _____/_____

3.2.8 Obtain a final reading on (PI-6).
(PI-6) _____psid _____/_____

3.3 SYSTEM SHUT DOWN

Test Director shall notify Operations the compressed air system will be shut down.

3.3.1 Turn the following switches to OFF.

POWER SWITCH on the Air Dryer Console OFF _____/_____
Air Compressor Control Switch (HS-1) OFF _____/_____

3.3.2 Turn OFF and verify caution tags on the following disconnect switches:

Air Compressor Disconnect Switch (DS-3) OFF _____/_____
Mini Power Center (MPC-1), breaker #1 AIR DRYER & DRAINS
OFF _____/_____

Warning:
Eye and ear protection is required while venting compressed air to atmosphere

3.3.3 Depressurize receiver tank through (V-1) until receiver pressure is between 5-20 psig, then close (V-1). ____/____

3.3.4 Verify valves are in the positions indicated:
Initial the space provided at each valve position and at completion of valve lineup.

POST-TEST VALVE LINEUP

(V-1)	CLOSED		(V-13)	OPEN		(V-25)	CLOSED	
(V-2)	CLOSED		(V-14)	OPEN		(V-26)	OPEN	
(V-3)	CLOSED		(V-15)	OPEN		(V-27)	OPEN	
(V-4)	OPEN		(V-16)	OPEN		(V-28)	CLOSED	
(V-5)	CLOSED		(V-17)	CLOSED		(V-29)	OPEN	
(V-6)	CLOSED		(V-18)	CLOSED		(V-30)	CLOSED	
(V-7)	OPEN		(V-19)	OPEN		(V-35)	ADJ'D	
(V-8)	OPEN		(V-20)	OPEN				
(V-9)	CLOSED		(V-21)	OPEN				
(V-10)	CLOSED		(V-22)	OPEN				
(V-11)	OPEN		(V-23)	CLOSED				
(V-12)	CLOSED		(V-24)	CLOSED				

____/____

3.4 POST TEST INSPECTION AND MAINTENANCE

- 3.4.1 Check frame oil level and, if necessary, add oil in accordance with page 11 of Ingersoll-Rand Form SCD-421, Instruction Manual. _____/_____
- 3.4.2 Verify there is no visible oil leakage through compressor oil seals. _____/_____
- 3.4.3 Check and adjust the compressor drive belt tension in accordance with page 21 of Ingersoll-Rand Form SCD-421, Instruction Manual. Lock and Tag if required. _____/_____
- 3.4.4 Check all exterior bolts and nuts on the compressor unit. If necessary, tighten per page 21 of Ingersoll-Rand Form SCD-421, Instruction Manual. _____/_____
- 3.4.5 Check foundation nuts on pipe supports, dryer foundation, and compressor foundation. Tighten nuts if necessary. _____/_____

3.5 STEP COMPLETION VERIFICATION

QC HOLD

- 3.5.1 Verify all steps are signed off and exceptions resolved. _____/_____

3.6 ISSUANCE OF PMP'S AND POP'S

- 3.6.1 The Facility Systems Engineer shall verify that the preventative maintenance procedures and operation procedures are issued. List the procedure numbers below.

_____/_____

4 DATA AND EXECUTION SHEETS

4.1 DATA SHEETS FOR 48-HOUR ON-LINE TEST

4.2 OTP EXECUTION SHEET

4.2 OTP EXECUTION SHEET

Test Completed: With Exceptions _____ Without Exceptions _____

Test Performed By

Test Director

Date

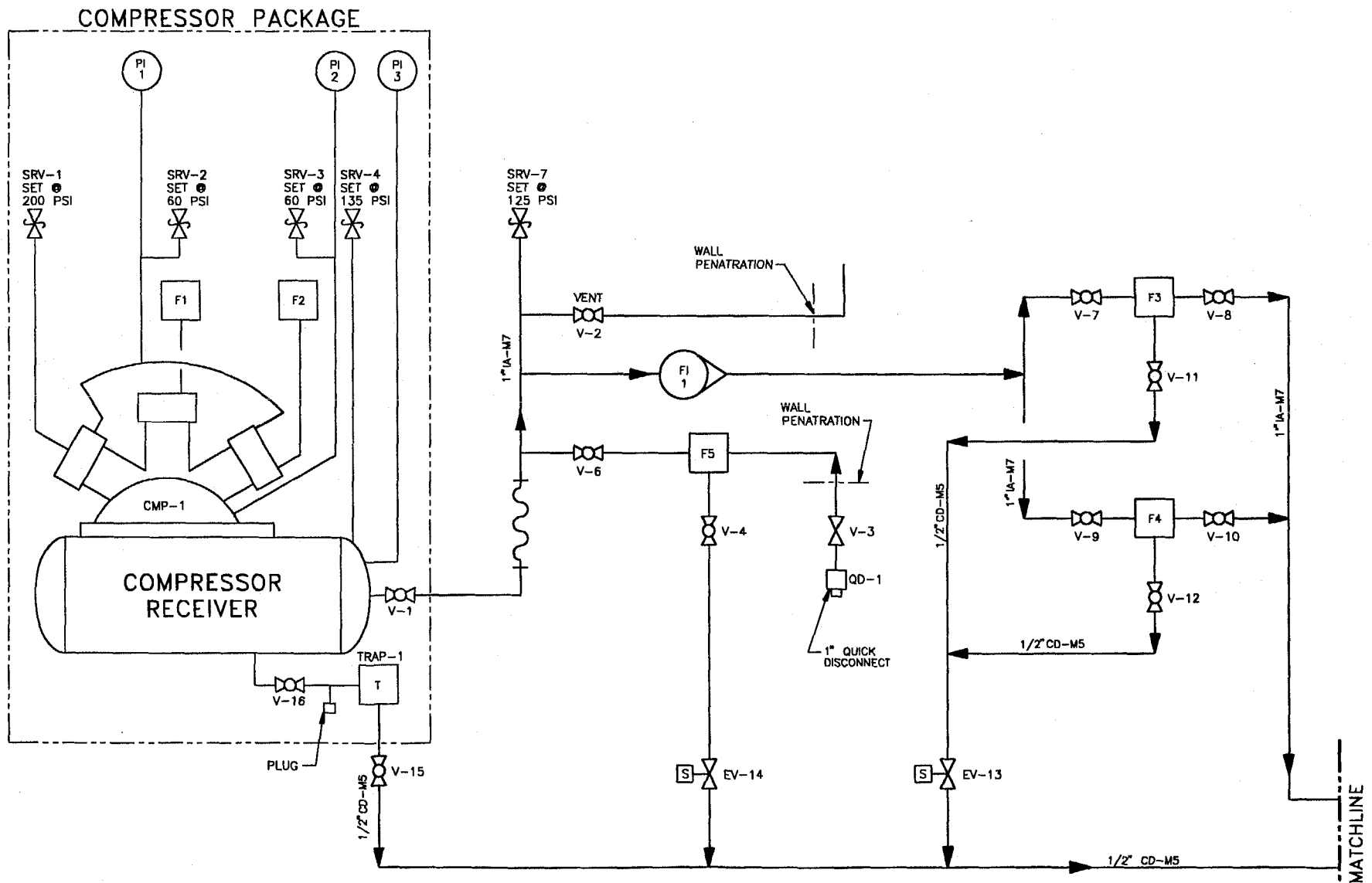
Facility Systems Engineer

Date

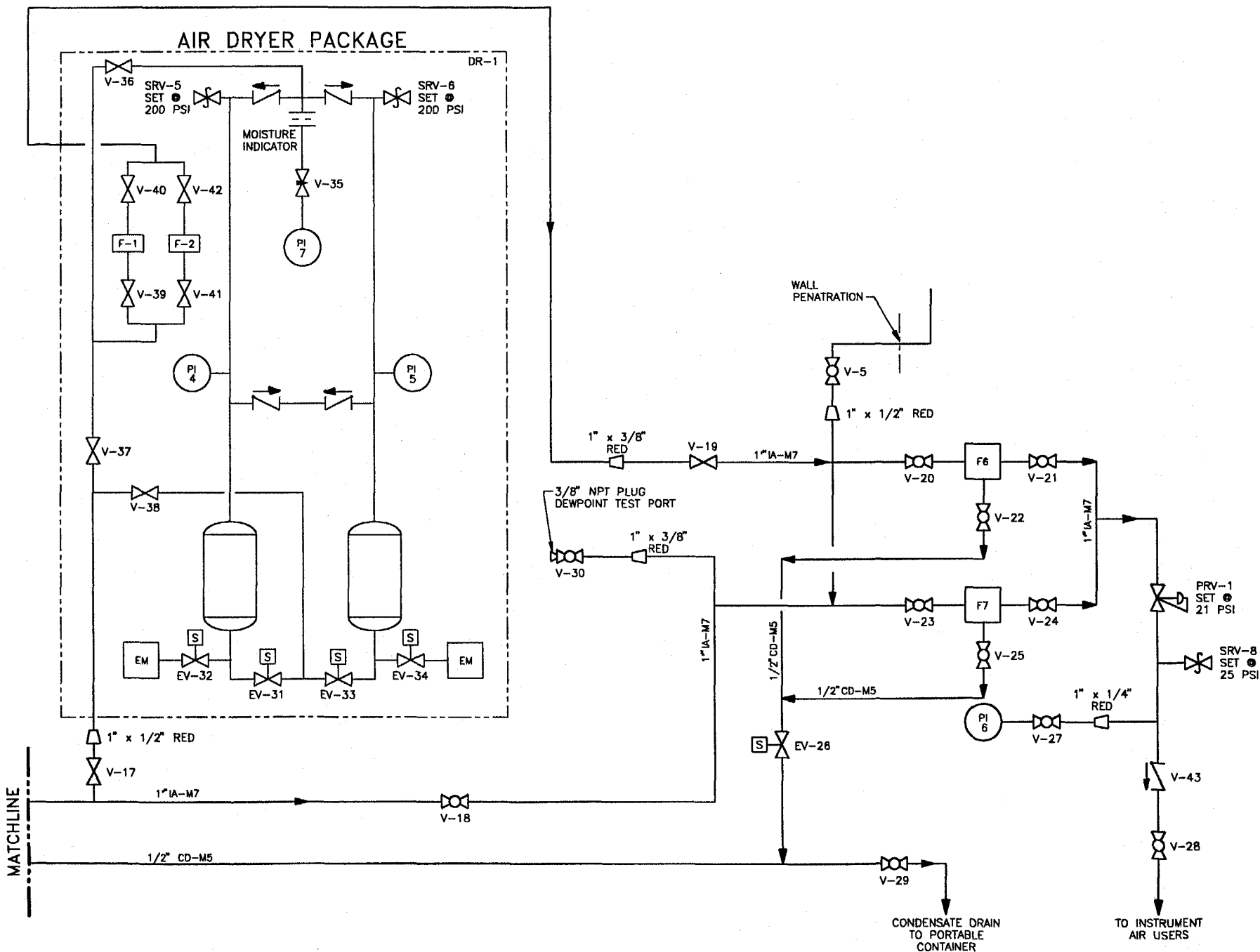
Test Verified By

QC Inspector

Date



FLOW DIAGRAM



FLOW DIAGRAM

ATTACHMENT 3

OTP ACCEPTANCE

Acceptance of Test Results

The test has been completed and the results, including red-line changes, have been reviewed. Any exceptions discovered during the OTP have been satisfactorily recorded and resolved. The results of the Operability test of the 241-U-701 compressed air system and heat pump are accepted by the undersigned.

Air Systems Cognizant Engineer

Date

Single Shell Tank Cognizant Engineer

Date

Electrical Cognizant Engineer

Date

Facility Systems Engineer

Date

Quality Assurance Engineer

Date

Manager, West Tank Farm Operations

Date

Manager, Facility Systems

Date

ATTACHMENT 4

OTP EXCEPTION SHEET NUMBER _____

Procedure Step: _____

Make copies of this page as necessary.

Description of Problem:

Exception Resolution:

Date Exception Resolved: _____

Test Director _____

Facility Systems Engineer _____

Quality Assurance Engineer _____

(NA for clarification)