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FOR THE EAST TENNESSEE TECHNOLOGY PARK MISSION

**UCOR-4931**

# Outfall 200 Mercury Treatment Facility, Startup Test Plan Oak Ridge, Tennessee

This document is approved for public release per review by:

Susan D. Faucher — 4/10/17

UCOR Classification & Information Control Office — Date

**UCOR-4931**

# Outfall 200 Mercury Treatment Facility, Startup Test Plan, Oak Ridge, Tennessee

Date Issued—August 2017

Prepared for the
U.S. Department of Energy
Office of Environmental Management

URS | CH2M Oak Ridge LLC
Safely Delivering the Department of Energy's Vision
for the East Tennessee Technology Park Mission
under contract DE-SC-0004645

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# APPROVALS

| Outfall 200 Mercury Treatment Facility,<br>Startup Test Plan,<br>Oak Ridge, Tennessee | UCOR-4931 |
|---|---|
| | August 2017 |

| | |
|---|---|
| ***USQD Review Determination*** | ☐ USQD ☐ UCD ☐ CAT X ☐ Exempt (Select Criteria 1-3 below)<br>USQD/UCD/CAT X<br>No. |
| ***Exemption Criteria*** | ☐ (1) Non-Intent Change<br>☐ (2) DOE-Approved Safety Basis Document<br>☐ (3) Chief Accounting Officer, Internal Audit, Labor Relations, General Counsel, Outreach & Public Affairs, or Project Controls Services<br>OR<br>☒ (4) Document identified in USQD-MS-CX-REPORTS-1074/R6 |
| ***USQD Preparer:*** | Name: [signature] Date: 8/24/17 |
| ***Exhibit L Mandatory Contractor Document*** | ☐ No (No PCCB Reviewer Signature Required.)<br>☐ Yes (Requires review by the Proforma Change Control Board.) |
| ***PCCB Reviewer:*** | Name Date |

***Prepared by:***

[signature] 8/24/17
Laird Ellis, Startup Manager — Date
CH2M, Inc.

[signature] 08/24/17
Marshall Johnson, Design Task Lead — Date
URS | CH2M Oak Ridge LLC

***Concurred by:***

[signature] 8/25/17
Teresa Pierce, Project Engineer — Date
URS | CH2M Oak Ridge LLC

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Steve Douglass, Construction Manager — Date
URS | CH2M Oak Ridge LLC

***Approved by:***

[signature] 8/28/17
Jimmy Massey, Senior Project Manager — Date
URS | CH2M Oak Ridge LLC

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| REVISION LOG | | |
|---|---|---|
| Revision Number | Description of Changes | Pages Affected |
| 0 | Initial issue of document. | All |

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# CONTENTS

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# ACRONYMS

| | |
|---|---|
| ATP | Acceptance Test Procedure |
| CAT | Construction Acceptance Test |
| CNS | Consolidated Nuclear Security, LLC |
| DCS | Document Control Specialist |
| DOE | U.S. Department of Energy |
| EMS | Environmental Management System |
| FAT | Factory Acceptance Test |
| IBC | International Building Code |
| ISMS | Integrated Safety Management System |
| MTF | Mercury Treatment Facility |
| NEC | National Electric Code |
| NNSA | National Nuclear Security Administration |
| OF200 | Outfall 200 |
| OREM | Oak Ridge Office of Environmental Management |
| O&M | operations and maintenance |
| OTP | operational test procedure |
| QA | quality assurance |
| SCADA | Supervisory Control and Data Acquisition |
| UCOR | URS \| CH2M Oak Ridge LLC |
| UEFPC | Upper East Fork Poplar Creek |

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# 1.0 INTRODUCTION

The Outfall 200 Mercury Treatment Facility (OF200 MTF) is a 3000 gpm treatment system to capture base and storm flows from the Upper East Fork of Poplar Creek (UEFPC), remove mercury, and return treated water to the creek. The remedial objectives for the project are established in *Amendment to the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee: Water Treatment at Outfall 200* (DOE/OR/01-2697&D2).

URS | CH2M Oak Ridge LLC (UCOR) is the Environmental Management prime contractor responsible for design of the project and construction management services for the Department of Energy (DOE) Oak Ridge Office of Environmental Management (OREM). OREM will procure a construction contractor with responsibility for facility construction through construction acceptance. UCOR and the OREM construction contractor will support system acceptance testing, with UCOR providing technical direction and the OREM construction contractor providing craft labor to support test implementation.

OREM will procure a facility operations contractor prior to completion of construction. The OREM facility operations contractor will have primary responsibility for operations planning, readiness, and facility transition to operations.

This startup test plan outlines the acceptance testing approach for the OF200 MTF, which is required as part of the overall construction, startup, and turnover to operations process. Successful completion of system acceptance testing is a key step in the transition to operations for the facility, and will require an integrated effort from each of the organizations under the leadership of the OREM Federal Project Director, who will be supported in the implementation of the startup test plan by the test manager.

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# 2.0 OBJECTIVE

This startup test plan is an implementing document that outlines the requirements for testing to establish acceptance and provide objective evidence that procured items and construction are performed in accordance with the OF200 MTF design, and as installed will safely and adequately perform their design functions under operating conditions.

Testing is defined and intended to be executed in a stepwise, progressive manner. Construction Acceptance Testing (CAT), including factory acceptance testing (FAT) as applicable, focuses on component installation and functionality. Construction acceptance requirements are typically addressed by the design specifications and construction contract documents. System acceptance testing will be completed for each system identified for testing following installation and successful CAT of the individual components. Test boundaries, test requirements, and acceptance criteria details for each system will be defined in Acceptance Test Plans (ATPs).

OREM will procure a facility operations contractor prior to completion of construction. Operational acceptance testing will be completed by the OREM facility operations contractor, and may include operations and maintenance (O&M) training and procedure development. Operations testing requirements and acceptance criteria details will be defined in operational test plans (OTPs) following acquisition of the OREM facility operations contractor.

Successful completion of testing under this plan is accomplished when acceptance criteria are met; test deficiencies are resolved; and the final test results reports are approved. Test result reports should provide a clear statement addressing the acceptability of the testing and ultimately of the system for operation, which is a critical input to the overall facility startup readiness and transition to operations process.

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# 3.0 SCOPE

The scope of this startup test plan follows implementation of the OF200 MTF design from equipment manufacturing through construction, startup, and transition to operations. The OF200 MTF will be divided into functional areas for testing purposes.

Tests within the scope of this plan include FATs, CATs, system ATPs, and OTPs. Each of these categories is discussed in the following paragraphs. The detail procedures for implementation will be included in the individual test plans.

## 3.1 CONSTRUCTION ACCEPTANCE TESTING

Completion of construction acceptance testing is primarily the responsibility of the OREM construction contractor, with coordination and verification of completion of the required testing by the UCOR test manager and construction support manager.

FATs are conducted by vendors at their facilities, prior to delivery, using their own procedures and controls. These may range from individual component qualification tests performed by the original equipment manufacturer, to full sub-system functional tests performed by an integrator/fabricator (e.g., testing of a chemical metering pump skid, etc.). The goal of FATs is to verify, prior to delivery, that the component or sub-system is complete and functional in accordance with the design, and is ready for delivery to the project.

CATs are conducted on site by the OREM construction contractor with the system under their control. The objective is to verify the integrity of installation and compliance to design. Typical tests may include structural (e.g. equipment anchoring, etc.); electrical and instrumentation (e.g., bench calibrations, arc flash, cable continuity, insulation resistance, motor rotation, etc.); mechanical (e.g., piping leak tests, equipment inspection and internal cleaning and flushing, alignment and adjustment, etc.); etc. Other third party inspections required by code, such as International Building Code (IBC) and National Electric Code (NEC), may be conducted separately or in conjunction with CATs; in either case, results will be documented as part of the associated CAT documentation package.

## 3.2 SYSTEM STARTUP ACCEPTANCE TESTING

As construction progresses to the point where various systems begin to reach mechanical and electrical completion, construction begins to re-direct efforts from a bulk construction mode to a system completion mode. Prior to acceptance of construction completion, system testing will be performed, under a coordinated effort integrating construction personnel and test engineers. Specific system testing and acceptance criteria will be defined in system ATPs, and completion will be verified by the test manager and accepted by the construction support manager.

Responsible test engineers will develop ATPs for their respective systems. ATPs are functional tests of installed systems, sub-systems, components, or processes; they may duplicate some aspects of the FATs previously performed at vendor facilities. Following the individual ATPs, an integrated ATP will be performed to support construction acceptance and turnover to OREM’s operations contractor for OTP.

ATPs are performed by the OREM construction contractor, under the direction of the test manager, with additional UCOR and system vendor support as required. ATPs are currently expected to be "cold" tests, meaning that the process fluid is potable water or water from another appropriate source. The functionality of process control software, including Supervisory Control and Data Acquisition (SCADA), will be

demonstrated during acceptance testing; however, pre-acceptance SCADA software testing analogous to FAT is the responsibility of the design agent and is not within the scope of this test plan. The SCADA development and pre-acceptance testing will be completed prior to installation at the OF200 MTF facility.

Following completion of individual system ATPs, systems required to support ongoing or follow-on testing may remain in service or be placed in standby in accordance with the applicable system test plan.

### 3.3 OPERATIONS ACCEPTANCE TESTING

Following the completion of CATs and successful integrated ATP, construction acceptance will be closed and the facility will transition to preparations for operations. OTPs will be conducted by the OREM facility operations contractor utilizing operations and maintenance personnel. OTPs are anticipated to include "hot" tests (using diverted UEFPC water), which demonstrate fully integrated system functionality, and will be used to validate operating procedures.

Operating procedures development and validation, operator training and qualifications, and development of maintenance requirements may be included as the OREM operations contractor's organization is defined and integrated with facility testing.

# 4.0 ORGANIZATION

A successful startup testing program for the OF200 MTF project will require attention to detail and close coordination between OREM, the National Nuclear Security Agency (NNSA), and the respective prime contractors to produce a safe and reliable operating facility. Startup testing will be performed in phases with various levels of responsibility for each organization during each phase.

## 4.1 ORGANIZATIONAL ROLES AND RESPONSIBILITIES

The organizations participating in OF200 MTF startup testing, including an overview of their roles, include:

- OREM – Facility owner; contracts for construction management, engineering, construction, and operations contractors. The OREM Federal Project Director has overall responsibility for implementation and completion of the capital project. Provides Facility Representative and functional oversight for construction and testing. Integrates with NNSA.
- CNS – NNSA prime contractor for Y-12 site operations; provides emergency response and fire department services, site utilities, security, and site-wide emergency notification and fire alarm infrastructure.
- OREM construction contractor – to be selected by OREM for construction of the facility in accordance with the design; provides material and labor through construction acceptance and system testing.
- UCOR – OREM Environmental Management contractor; responsible for design authority and Title III engineering during construction; provides construction support manager and construction management support to OREM; provides startup test manager and testing technical support; provides design agent (CH2M) for SCADA programming; and support during transition to operations and capital project completion.
- OREM operations contractor – to be selected by OREM for operations and maintenance of the facility; provides material and labor for operational testing, and has primary responsibility for facility transition to operations.

Coordination of the testing team and the OREM operations contractor team is essential to provide a smooth and successful transition to operations. OREM will have oversight of all project activities, with the UCOR construction support manager, UCOR test manger, and responsible OREM operations contractor manager serving key roles in the execution of the project through the transition to operations. Detailed roles and responsibilities within each organization will be documented in project execution plans as required by the governing organization's contract with OREM.

## 4.2 TEST PERSONNEL DESIGNATION AND RESPONSIBILITIES

Overall planning and implementation of startup testing will be coordinated by the test manager, who will integrate with the OREM Federal Project Director, construction support manager, and the OREM operations contractor project manager.

Test engineers will be assigned by the test manager, as needed, to develop individual test plans and ensure successful acceptance of systems for which the engineer has primary responsibility. Craft personnel supporting CATs and ATPs will be provided by the OREM construction contractor. The OREM operations

contractor will identify and assign appropriate personnel, including O&M staff, to complete OTPs and transition to operations.

Equipment vendor representatives will be utilized, as needed, to assist in the CATs and ATPs for key pieces of equipment as determined by the test manager with input from the responsible test engineers. The vendor representatives will be under the scope of the OREM construction contractor, and will be scheduled and coordinated through the construction support manager. Requirements for vendors to provide support are typically identified in the design specifications.

Continuity of testing team members, including test manager, construction support manager, test engineers, operations, and assigned support craft will be maintained throughout the duration of testing activities to the extent practical. This continuity of personnel will aid greatly in the effectiveness and efficiency of the startup testing.

# 5.0 DESCRIPTION OF TEST METHODS

## 5.1 TEST AREAS AND TEST BOUNDARY

Because the OF200 MTF is a new facility, the overall boundaries are readily defined as the entire system, except for interfaces with existing site infrastructure and utilities. The specific equipment and systems boundaries currently identified for testing are identified in Table 1. As the project progresses, these systems will be further described in the individual test plans, which will be consolidated in the appendices to this plan. Individual test plans will define the detailed boundaries for each test, along with specific interfaces and physical, operational, or work release requirements/limitations, etc. as applicable. An example CAT test plan template is included in Attachment 1, and an example ATP test plan template is included in Attachment 2.

**Table 1. ATP system summary**

| Process/system | Associated equipment to be commissioned |
|---|---|
| Intake and Base Flow | Bar screen, base flow gate, base flow Parshall flume, base flow transfer pumps, chemical metering system, transfer pipeline, associated equipment, valves, I&C |
| Storm Flow | Storm flow gate, storm flow Parshall flume, storm flow pumps, storm flow sump pumps, chemical metering system, associated equipment, valves, I&C |
| Grit Handling | Grit pumps, grit washer, grit room sump pumps, grit collection, associated equipment, valves, I&C |
| Stormwater Storage | Stormwater tank, tank mixers, associated equipment, valves, I&C |
| Equalization Tank | Equalization tank, tank mixers, equalization discharge pumps, associated equipment, valves, I&C |
| Dechlorination | Tanks, tank mixers, chemical metering systems, valves, I&C |
| Polymer Reaction | Tanks, tank mixers, chemical storage and metering systems, polymer makedown system, associated equipment, valves, I&C |
| Flocculation | Tanks, tank mixers, chemical metering systems, associated equipment, valves, I&C |
| Clarifier | Inclined plate clarifiers, mixers, chemical metering systems, polymer makedown system, sludge pumps, associated equipment, valves, I&C |
| Multimedia Filtration | Multimedia filters/underdrains, backwash pumps, associated equipment, valves, I&C |
| Solids Dewatering | Tanks, polymer makedown system, filtrate pumps, filter press feed pumps, filter presses, sludge solid waste collection, associated equipment, valves, I&C |
| Backwash Waste | Backwash waste pumps, associated equipment, valves, I&C |
| Effluent | Parshall flume, chemical metering system, I&C |
| Electrical | Headworks and Treatment Plant unit substations (primary switchgear, transformers, and secondary switchgear), electrical grounding systems, lightning protection systems, motor control centers, adjustable frequency drives, heat tracing, outdoor lighting, associated equipment |

**Table 1. ATP system summary (cont.)**

| Process/system | Associated equipment to be commissioned |
|---|---|
| I&C | Control systems (including SCADA and control room), emergency notification systems, fire alarm systems, communications systems, access control systems |
| Building Services Headworks and Treatment Plant | Lighting control systems, Treatment Plant sprinkler system, Headworks chemical storage facility, hot water systems, HVAC systems (including HEPA filtration), air compressor systems, air scour blowers, sample preparation hood, fire protection systems |

ATP = acceptance test procedure
I&C = instrumentation and control
HEPA = high-efficiency particulate air
HVAC = heating, ventilation, and air conditioning
MTF = Mercury Treatment Facility
SCADA = Supervisory Control and Data Acquisition

Boundaries for the systems in Table 1 may be redefined, and systems may be combined for the purpose of ATPs if applicable. Redefinition of systems will be subject to approval by the test manager, who has overall responsibility for maintaining test configuration and implementation.

In addition to the systems identified in Table 1, there will be a number of systems not subject to ATPs. These typically include elements of civil, structural, and architectural construction. Acceptance of these systems is generally addressed by CATs and/or through final construction acceptance as defined in the project construction execution and management plan (UCOR-4972). The construction support manager will coordinate with the test manager, as required, to confirm acceptance and availability of these systems and equipment. Initial systems not requiring ATPs include

- Site work
- Foundations
- Steel fabrications
- Building structures
- Site yard piping and transfer piping
- Fire proofing
- General interiors
- Paving and concrete surfaced areas
- Fencing
- Storm drains (catch basins, etc.)

### 5.2 TEST SPECIFICATIONS/TEST PROCEDURES

CATs will be performed incrementally as construction progresses, followed by ATPs within the independent functional areas as construction and CATs progress. For example, system testing at the Headworks may begin before the Treatment Plant systems are complete. ATPs will be stand-alone procedures; however, with construction and testing proceeding in parallel on various systems, some interfaces and boundaries between tests will need to be closely coordinated. An integrated system ATP will be performed after all system ATPs are successfully completed.

OTPs will be stand-alone procedures to be developed by the OREM facility operations contractor and implemented following integrated ATP. Specific sequencing and prerequisites for ATP/OTP performance will be defined within each test plan, as applicable, and coordinated by the test manager within the overall test schedule described in Section 6 of this test plan.

Exceptions, limitations, or open items will be explained in sufficient detail within the individual test reports to facilitate development of corrective or mitigative actions. Completion of corrective or mitigative actions will be documented in the test report.

### 5.3 CRITERIA/CONSTRAINTS

Each individual test plan (e.g., ATP, OTP) will incorporate the applicable test requirements and acceptance criteria. The startup team is responsible to ensure that the comprehensive set of startup requirements has been addressed by the various testing and turnover processes.

Test requirements and methods, acceptance criteria, and data collection methods will be detailed in each individual test plan. Test parameters affected by potential sources of uncertainty and error will be identified and controlled, as required.

In general, FATs, CATs, and ATPs are currently expected to be performed in a "cold" condition (e.g., using potable water or water from another source), requiring only standard industrial controls. OTPs are expected to be run “hot,” utilizing diverted UEFPC water. OTPs, therefore, require compliance with applicable regulatory and procedural requirements for facility operation, including calibration of required equipment, recording of process data, managing of waste streams, availability of treatment chemicals, etc.

Spare parts to be provided by the OREM construction contractor are identified in design specifications and construction contract documents and will be verified and turned over to the OREM operations contractor at the completion of construction as part of the transition to operations. The test manager will work with the OREM operations contractor personnel to maintain an inventory of spare parts purchased or utilized during startup testing. The OREM operations contractor will be responsible to identify, procure and maintain, an inventory of spare parts needed to support OF200 MTF operations. The OREM operations contractor will also be responsible for the purchase, delivery, and management of treatment chemicals to support OTPs and operations.

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# 6.0 SAFETY

As with design and construction activities, facility testing emphasizes health, safety, and quality. Integrated Safety Management (ISM) will be integrated into the planning and execution of all startup testing activities addressed by this plan and applies to all organizations and personnel.

The OF200 MTF is a *Less Than Category 3* nuclear facility. There are no criticality concerns for the facility. A formal Hazard Analysis was performed for OF200 MTF, as documented in HAR-YT-OF200MTF-0001/R2, *Hazard Analysis Report for the Outfall 200 Mercury Treatment Facility, Y-12 National Security Complex, Oak Ridge, Tennessee (Project Number 14-D-403)*. The general conclusions are that standard industrial hazards are the primary safety concern for construction and operation of the facility. The OREM construction contractor Safety Management Programs will adequately mitigate any radiological, chemical, or release-of-energy hazards during CATs and ATPs, and OREM operations contractor Safety Management Programs will adequately address OTPs. No additional testing requirements were identified and established based on these analyses.

## 6.1 WORK CONTROL

Specific safety issues applicable to individual tests will be detailed, as required, in the test plans and associated work control documents (e.g., Job Hazard Analysis, etc.) applicable to all testing activities in accordance with governing contract requirements and ISMS/EMS principles. Applicable contractor work control programs and processes will apply to test activities.

Test plans will include instructions for responding to potential upset conditions or unexpected test results, and any test-specific criteria for when test deficiency reports must be initiated. Test plans will include sufficient prerequisites and initial plant conditions (e.g., detailed valve and electrical lineups, etc.) as required to establish test configuration and boundaries for the specific test. Test steps must be sufficiently detailed that competent project personnel can perform them without reference to the author.

A detailed testing schedule will be developed by the test manager and integrated with the overall project schedule. Testing activities will be integrated with other project activities throughout construction in accordance with the construction execution and management plan. Schedule details for testing to support the transition to operations will be integrated with the OREM operations contractor's startup and readiness plans.

## 6.2 TRAINING

Training for project personnel supporting startup test activities shall comply with the applicable requirements of the respective OREM contractor (i.e., UCOR, construction contractor, or operations contractor). Any test-specific training or qualifications will be identified in the applicable test plan. Each contractor is responsible for providing trained and qualified personnel to support assigned activities.

Development of vendor training material is addressed in the design specifications and will be included in the transition to operations process. Training and documentation on SCADA equipment will be addressed in the operations contract. It is currently anticipated OREM operations contractor personnel will be available to support testing and transition to operations as outlined in Section 4 of this test plan.

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# 7.0 QUALITY ASSURANCE

Quality assurance (QA) is integrated into the OF200 MTF project for all activities and phases of work. UCOR activities, including support to OREM for startup testing, are subject to applicable requirement of the UCOR QA Program as documented in UCOR-4141, *URS | CH2M Oak Ridge LLC Quality Assurance Program Plan, Oak Ridge, Tennessee*. The OREM construction contractor and OREM operations contractor will develop and submit QA programs/plans that address all aspects of their respective work, including testing. QA personnel from OREM, UCOR, and the OREM construction and operations contractors will support applicable testing activities on an ongoing basis to ensure project quality requirements are adhered to at all times.

Specific QA requirements will be established within each test plan, as necessary, to verify critical acceptance criteria. FAT QA requirements are typically addressed by the design specifications and construction contract documents. Additional witness or inspection points may be added for a representative sampling of test steps to ensure overall quality performance in accordance with the governing contract requirements and applicable QA program.

Documentation and test records will be maintained as described in Sect. 9 of this startup test plan, the construction execution and management plan, and the governing contract requirements.

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# 8.0 DOCUMENTATION AND RECORDS

Documentation for each test plan, including CAT and ATP, will be maintained and included in the turnover package as part of the overall OF200 MTF transition to operations. Configuration control during construction will be maintained through the design change process, with as-constructed design documentation included in the turnover package.

FAT test results will be documented and managed as submittals per construction contract requirements. Construction submittals are maintained by the UCOR Document Control Specialist (DCS) as defined in the construction execution and management plan. Vendor documentation, including O&M manuals, will be submitted in accordance with the design specifications and construction contract documents and maintained as submittals in accordance with the construction execution and management plan.

CAT test reports, including test logs, data sheets, changes, resolved test deficiencies, and any open items, will be documented within their respective test plan, with results summarized in the test report.

Completed ATPs, including associated test logs, test deficiency reports, test changes, and other supporting documentation will be documented within the applicable test plan, with results captured within the test reports.

OTP test reports are anticipated to be generated and documented within the test plan, and will be managed in accordance with the OREM operations contractor's requirements.

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# 9.0 REFERENCES

DOE/OR/01-2697&D2. *Amendment to the Record of Decision for Phase I Interim Source Control Actions in the Upper East Fork Poplar Creek Characterization Area, Oak Ridge, Tennessee: Water Treatment at Outfall 200*, 2016, U.S. Department of Energy, Office of Environmental Management, Oak Ridge, TN.

HAR-YT-OF200MTF-0001. *Hazard Analysis Report for the Outfall 200 Mercury Treatment Facility, Y-12 National Security Complex, Oak Ridge, Tennessee (Project Number 14-D-403)*, 2017, URS | CH2M Oak Ridge LLC, Oak Ridge, TN

UCOR-4141. *Construction Execution/Management Plan, Outfall 200 Mercury Treatment Facility at the Y-12 Nuclear Security Complex, Oak Ridge, Tennessee*, 2016, URS | CH2M Oak Ridge LLC, Oak Ridge, TN

—— UCOR-4971. *Construction Execution/Management Plan, Outfall 200 Mercury Treatment Facility at the Y-12 Nuclear Security Complex, Oak Ridge, Tennessee*, 2017.

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# APPENDIX A.
# CONSTRUCTION ACCEPTANCE TEST PLAN TEMPLATE

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# Construction Acceptance Test

## MTF-CAT-Template

## Revision 0

Developed By: CH2M 8/03/2017

| Approvals: | Signature | Date |
|---|---|---|
| Startup Manager | | |
| Project Manager | | |
| Project Engineer Electrical | | |
| Project Engineer I/C | | |
| Project Engineer Mechanical | | |

**SUMMARY OF KNOWN ISSUES:**

# 1.0 TEST OBJECTIVE

This Construction Acceptance Test (CAT) procedure is prepared in accordance with, and for implementation of, the UCOR-4931, Outfall *200 Mercury Treatment System Startup Test Plan*. The scope of this CAT includes the following system components:

Test scope includes a visual observation of the equipment, instrumentation, valves, anchoring, tag numbers, verification that QA documentation is complete, and power is available to components.

Components included in this CAT comprise all instruments and equipment identified in Appendix A, Data Sheets and Appendix D, Instrument, Equipment, and Valve Tag Number List.

Upon completion of this CAT, System will be ready for configuration of instruments and the subsequent Acceptance Test Procedure (ATP).

# 2.0 REFERENCES

| Document Number | Revision/Issue Date Rev/MM/DD/YY | Title |
|---|---|---|
| **2.1 DESIGN SPECIFICATIONS** | | |
| | ____/___/___/___ | |
| **2.2 FORMS** | | |
| | ____/___/___/___ | |
| **2.3 UCOR DESIGN DRAWINGS** | | |
| | ___/___/___/___ | |
| **2.4 VENDOR/CONTRACTOR INFORMATION** | | |
| | ____/___/___/___ | |

# 3.0 TEST EQUIPMENT NEEDED

**3.1** Testing is nominally performed using equipment installed in the facility. Miscellaneous tools and equipment may be required; Measuring and Test Equipment (M&TE) control methods are not required for commercial equipment such as rulers, tape measures, level, if such equipment provides the required accuracy.

**3.2** M & TE is required when used to calibrate, certify, measure, gauge, troubleshoot, test, or inspect in order to control data to verify conformance to specified requirements. M&TE shall be selected that is of the proper type, range, accuracy, and is uniquely identified and traceable to its calibration data.

**3.3** Before use, M&TE shall be checked to ensure that the calibration is current and will remain current throughout the test period; i.e., the expiration date is after the expected use date. M&TE equipment will be visually inspected for damage prior to each use.

**3.4** RECORD the measuring and test equipment number, calibration due date, and verifier identification number. Vender supplied M&TE equipment will be calibrated based on a traceable NIST Standard.

**3.5** Record items identified as "Deficient" on the *Test Deficiency Report*, for final resolution.

# 4.0 PREREQUISITES NEEDED TO BE COMPLETED

Note: Record items identified as "Deficient" to the deficiency list for final resolution.

| Step No. | PREREQUISITES ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| 4.1 | UCOR Designated Competent Person shall verify that electrical equipment, within the boundary of this CAT, have NEC Electrical Acceptance. | |
| 4.2 | Quality Assurance Inspection Plans (QAIP). QA shall verify inspections identified in the following QAIPs are complete and acceptable:<br>• General Contractor QAIPs as applicable, e.g. process piping, electrical, grounding systems, etc. | |
| 4.3 | UCOR QA to confirm the 1st line inspection reports submitted by Contractor and Sub-Contractors are complete. | |
| 4.4 | UCOR Designated Competent Person shall review Contractor approved and completed Installation Hydrostatic Test Reports for tanks identified in Appendix E figures for completeness. | |
| 4.5 | UCOR Designated Competent Person shall review Contractor approved and completed Installation Pipe Flush and Pressure Test Reports for fluid lines identified in Appendix E figures for completeness. | |
| 4.6 | UCOR Designated Competent Person – Attach copies of the following QA approved verification documentation for Instrument and Equipment electrical wiring "Point to Point" terminations:<br>1. Contractor installation records of terminations are per Electrical Wiring Diagrams submitted by vendors and contractors. This record will consist of wiring diagrams with installer(s) initials at each wire termination point on the wiring diagram, and installer(s) completion date and signature.<br>2. Contractor witness verification records of correct wire termination, wire number, color code, and successful test signal verification for panel to panel, panel to equipment, panel to instrumentation, and equipment to instrumentation for individual wires. Contractor witness to record verifications on the Data Sheets provided in Appendix A. | |

| Step No. | PREREQUISITES ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| | 3. Test report/inspection certifications for Field Testing and final installation of the Lightning Protection system completed by LPI 175 Certified inspector. | |
| 4.7 | Contractor to perform walkdown and record system CONFIGURATION in Test Log. Section 8.0 requires the system to be RESTORED to "As Found" conditions". UCOR Designated Competent Person is to witness | |
| **COMPLETED BY:** | | **DATE** |

# 5.0 INITIAL CONDITIONS

NOTES: Record items identified as "Deficient" on the *Test Deficiency Report*, for final resolution.

| Step No. | INITIAL CONDITIONS ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| 5.1 | Written notification received from Contractor (addressed to QA, Engineering, and Startup) advising that the necessary construction and equipment, within the boundaries of this CAT, are installed, anchored, powered and the system is configured for CAT procedures to begin. | |
| 5.2 | UCOR Designated Competent Person shall obtain only approved, final and controlled drawings and documents for use onsite from Document Control and record revision and issue dates in the CAT Section 2.0 list. | |
| 5.3 | Contractor shall verify that personnel participating in this CAT test procedures have signed and initialed *UCOR Test Signatures/Initials.* | |
| **COMPLETED BY:** | | **DATE** |

# 6.0 PRECAUTIONS AND LIMITATIONS

1. Visual inspections of electrical wiring must be completed before energization to prevent potential personal injury and/or equipment damage.

2. Water use is not specifically planned during the execution of this Procedure. However, if water is required, only **potable** water will be used. The Project Environmental Compliance Officer will be consulted and approve the path forward when using water. This will be documented in the Test Log (form XXXXX).

# 7.0 PROCEDURE

**Notes:**

1. Calibration of Process Instruments is not required to perform this CAT.
2. Test sections may be performed in any order to accommodate field activities and provide execution flexibility. Test steps within individual test sections are to be performed sequentially unless otherwise stated. (Steps or items in a list designated by numbering may be performed in the any order, but must be completed before moving to the next numbered step.)
3. If test steps are repeated, pages or signoffs may be reproduced and attached as needed to document completed conditions and actions for each test. Attached pages retain their original number followed by a letter sequence (e.g., 15a, 15b, etc.). Any change to this procedure will follow guidelines in procedure UCOR-XXXXX, *Testing of Equipment and Systems.* Documentation of the reason for the change, and the approvals obtained, will be kept in the Test Log (form XXXXX, Test Log).
4. UCOR Designated Competent Person will identify discrepancies between the documents and field conditions by reviewing potential discrepancies with the UCOR Project Engineer, recording the discrepancies and submitting for formal action by using the Test Deficiency Report. The steps in the section will need to be reperformed after formal revision to verify system integrity using the process in note three above.
5. Record items identified as "Deficient" on the XXXXX, Test Deficiency Report, for final resolution.
6. Record UCOR Designated Competent Persons completing this procedure on form XXXXX, U*COR Test Signatures/Initials*.

| Step No. | PROCEDURE ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| 7.1 | Contractor to check equipment lubrication fluid levels before bump testing. | |
| 7.2 | Electrical Equipment Verification/Testing:<br>• UCOR Competent Person - Obtain QA Records/Data Sheets for installation of Electrical Equipment with field wiring connections and RECORD as an attachment to Appendix A.<br>• UCOR Competent Person – Applicable QA Records can be used to verify Correct Installation, Tag Number/Nameplate Labels, and Point-to-Point wiring connections, and Circuit Continuity. Check-off applicable status "Sat" or "Unsat" on Appendix A test data sheets.<br>• Where no QA Records/Data Sheets can be found; visually verify components were installed, named and wired per referenced drawings. Contractor to witness and verify correct wire termination, wire number, color code, and successful test signal verification for panel to panel, panel to equipment, panel to instrumentation, and equipment to instrumentation for individual wires. Continuity verification must be | |

| Step No. | PROCEDURE ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| | accomplished by testing. Check-off applicable status "Sat" or "Un-Sat" on Appendix A test data sheets and record any additional drawings such as wiring diagrams used to verify circuit continuity. | |
| 7.3 | Contractor to schedule AFD input voltage measurement, motor bump test with UCOR Designated Competent Person to ensure UCOR has an opportunity to witness test. Contractor to complete the Test Data Sheets (Appendix A) and summarize test data on the attached CAT forms in Appendix B for the Motor Bump Test and motor/pump coupling alignment and submit report (See form in Appendix B) to UCOR Designated Competent Person - Attach motor bump test and coupling alignment reports for the following pumps: | |
| 7.4 | UCOR Designated Competent Person to confirm fluid processing equipment is installed in accordance with drawings as follows:<br>Verify exterior piping, filters and process instruments are installed and have the proper identification in accordance with the drawings. Interior features to be verified based on visual observation from vendor provided observation ports. Record results on attached equipment tag list (Appendix D). Note differences from listed item, add item to Deficiency List (XXXXX, Test Deficiency Report) for comparison to the approved submittals.<br>Identify analytical elements not installed at this time on the Deficiency List, (XXXXX6, Test Deficiency Report) these elements will be installed and calibrated for ATP. | |
| 7.5 | Operate manual valves (Open/Close) to verify proper operation. Record results in Appendix D. | |
| 7.6 | UCOR Designated Competent Person to verify piping connections and utility tie-ins are complete per drawings. | |
| 7.7 | General Contractor to verify anchor bolts on pumps and equipment are tightened in accordance with Approved Seismic calculations and drawings, and complete forms in Appendix C, *Equipment Anchor Verifications*. | |
| 7.8 | Torque values for pipe flange bolting to FRP tank flanges are shown on the installation drawings. UCOR to verify by random sampling bolts for each pump and FRP vessel nozzle. | |

**System/Component Name:** System 01 / Name

| Step No. | PROCEDURE ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| **COMPLETED BY:** | | **DATE** |

# 8.0 RESTORATION COMPLETE

NOTES: Record items identified as "Deficient" to the deficiency List for final resolution.

| Step No. | ACTION | Satisfactory (S) Deficient (D) |
|---|---|---|
| 8.1 | General Contractor to ENSURE test equipment has been disconnected and removed. UCOR Designated Competent Person is to verify. | |
| 8.2 | General Contractor to RESTORE System back to "As Found" conditions using the information in Step 4.7. UCOR Designated Competent Person is to witness. | |
| 8.3 | UCOR Designated Competent Person is to compile and Close Deficiency List. | |
| **COMPLETED BY:** | | **DATE** |

# 9.0 ATTACHMENTS

Attachment 1 System Data Sheets

Attachment 2 Pump Installation Test Sheet

Attachment 3 Equipment Anchor Verifications

Attachment 4 Instrument, Equipment, and Valve Tag Number List

Attachment 5 CAT Test and Hydrostatic Test Boundaries

# 10.0 APPROVALS

APPROVAL AND REVIEW:

Completed by: Name _____ Date: _____

Startup Test Engineer/UCOR
(Name/Signature)

Reviewed by: Name _____ Date _____

Project Engineer Mechanical
(Name/Signature)

Reviewed by: Name _____ Date: _____

Project Engineer Electrical
(Name/Signature)

Reviewed by: Name _____ Date _____

Project Engineer I/C
(Name/Signature)

Approved by: Name _____ Date: _____

Test Authority
(Name/Signature)

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# CAT Attachment 1
# System Data Sheets

| **System 01, Electrical Power Test Data Sheet**<br>Drawings | | | |
|---|---|---|---|
| **Tag Number/Item** | **Description** | **Sat/UnSat** | **Comment** |
| | Installed per Drawing<br>Labeled per Drawing<br>Circuit Continuity to XXXXX | ☐ ☐<br>☐ ☐<br>☐ ☐ | |
| **COMPLETED BY:** | | | **DATE** |

**System/Component Name:** System 01 / Name

| **System 01 Heat Trace Test Data Sheet**<br>Drawings | | | |
|---|---|---|---|
| **Tag Number/Item** | **Description** | **Sat / UnSat** | **Comment** |
| | Installed Per drawing<br>Labeled Per drawing<br>Continuity to XXXXX | ☐ ☐<br>☐ ☐<br>☐ ☐ | |
| **COMPLETED BY:** | | | **DATE** |

**System/Component Name:** System 01 / Name

| **System 01, HVAC Test Data Sheet**<br>Drawings | | | |
|---|---|---|---|
| **Tag Number/Item** | **Description** | **Sat / UnSat** | **Comment** |
| | Installed Per drawing<br>Labeled Per drawing<br>Circuit Continuity to XXXXX | ☐ ☐<br>☐ ☐<br>☐ ☐ | |
| **COMPLETED BY:** | | | **DATE** |

**System 01, Process Test Data Sheet**
**Drawings**

| Tag Number/Item | Description | Sat / UnSat | Comment |
|---|---|---|---|
| | Installed Per drawing<br>Labeled Per drawing<br>Circuit Continuity to XXXXX | ☐ ☐<br>☐ ☐<br>☐ ☐ | |
| | Installed Per drawing<br>Labeled Per drawing<br>Circuit Continuity to XXXXX<br>PROFIBUS - Connected to XXXXX | ☐ ☐<br>☐ ☐<br>☐ ☐<br>☐ ☐ | |
| **COMPLETED BY:** | | | **DATE** |

| **System 01, "Energization Test Data Sheet"** | | | |
|---|---|---|---|
| **Tag Number/Item** | **Description** | **Sat / UnSat** | **Comment** |
| Adjustable Frequency Drive | AFD Powered Up Display | ☐ ☐ | |
| Power Panel | 480 Volt reading<br>AC = $V_{LL}$ = 456 – 504 Volts | _____<br>$Volts_{AVE}$<br>☐ ☐ | |
| Mini Power Center | 208/120 Voltage Reading<br>AC = 198 – 218 Volts | _____<br>$Volts_{AVE}$<br>☐ ☐ | |
| **COMPLETED BY:** | | | **DATE** |

| **System 01, "Process filtration and VOC control Test Data Sheet"** | | | |
|---|---|---|---|
| **Tag Number/Item** | **Description** | **Sat / UnSat** | **Comment** |
| VPGAC Drum | VOG line connectors are installed on drum and drum is mounted/set properly | ☐ ☐ | |
| Cartridge Filter | Installed Per drawing<br>Labeled Per drawing | ☐ ☐<br>☐ ☐ | |
| Tank | Installed Per drawing<br>Labeled Per drawing<br>Hydrostatic test record complete | ☐ ☐<br>☐ ☐<br>☐ ☐ | |
| **COMPLETED BY:** | | | **DATE** |

| **Measuring and Test Equipment (M&TE)** | **M&TE Number** | **Calibration Due Date** | **Verifier "HID" Number** |
|---|---|---|---|
| Digital Multi-Meter (DMM) | | | |
| Megger | | | |
| | | | |

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# CAT Attachment 2
# Pump Installation Test Sheet

**Appendix B - Pump Installation Test Sheet**
**Pump: XXXXX**

| **System 01 "**Process Motor Bump Test and Megger Test**"**;<br>Reference Drawings: | | | |
|---|---|---|---|
| **Tag Number** | **Description** | **Sat / UnSat** | **Initial / Date** |
| Pump | Motor Leads Megger Readings<br>AC > 1 Meg Ohm | _____<br>Meg Ohms<br>☐ ☐ | _____ /_____ |
| Pump | Verify motor wiring is correct at the motor and at the AFD (Where present) per motor and AFD wiring diagrams. | ☐ ☐ | _____ /_____ |
| Pump | Pump Motor Rotation Correct<br>Per Markings on Pump | ☐ ☐ | _____ /_____ |
| AFD- | 480 Volt Reading<br>AC = $V_{LL}$ = 456 – 504 Volts | _____<br>$Volts_{AVE}$<br>☐ ☐ | _____ /_____ |
| **Measuring and Test Equipment (M&TE)** | **M&TE Number** | **Calibration Due Date** | **Verifier "HID" Number** |
| Digital Multi-Meter (DMM) | | | |
| Megger | | | |
| | | | |
| | | | |

| **Pump XXXXX**<br>**Manufacturer Recommended Alignments (Coupling=Woods SC9S)** | | | |
|---|---|---|---|
| **Alignment Data Record – Manufacturer Recommended (Acceptance Criteria)** | | | |
| **Parallel (inches)** | | **Angular (inches)** | |
| 0.025 | | 0.109 | |
| **Alignment Data Record – Final Condition** | | | |
| **Parallel (inches)** | | **Angular (inches)** | |
| | | | |
| Name | Hanford ID | Date | Initial |
| | | | |

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# CAT Attachment 3
# Equipment Anchor Verifications

**Appendix C – Anchor Requirements:**

**Tank XXXXX**

| **Anchor Installation Requirements** | **Qty/Value** | **OK/Initial** |
|---|---|---|
| | | |
| 1. Number of Anchor Bolts/Rods | | |
| 2. Bolt/Rod Material | | |
| 3. Bolt/Rod Diameter | | |
| 4. Hole Diameter in Concrete | | |
| 5. Anchor Installation Torque | Note 1. | |
| 6. Minimum Embedment Depth | | |
| 7. Critical (Concrete) Edge Distance | | |
| | | |
| **Notes:** | | |
| 1. Reference Vendor drawing (AB xxxx-y) for details on anchor bolt tightening procedures. | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| **Certification of Installation per Manufacturer Design Drawing (XXXXX) for Requirements 1 through 7 as described above.** | | |

| Name | Y-12 ID | Date | Signature |
|---|---|---|---|
| | | | |

**Appendix C - Anchor Requirements:**

**Pump XXXXX**

| **Anchor Installation Requirements** | **Qty/Value** | **OK/Initial** |
|---|---|---|
| | | |
| 1. Number of Anchor Bolts/Rods | | |
| 2. Bolt/Rod Material | | |
| 3. Bolt/Rod Diameter | | |
| 4. Hole Diameter in Concrete | | |
| 5. Anchor Installation Torque | | |
| 6. Minimum Embedment Depth | | |
| 7. Minimum Concrete Edge Distance | | |
| | | |
| **Notes:** | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| | | |

| Name | Y-12 ID | Date | Signature |
|---|---|---|---|
| | | | |

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# CAT Attachment 4
# Instrument Equipment, and Valve Tag Number List

**System/Component Name:** System 01 / Name

**Appendix D: Tag Number List – Instruments Equipment, and Valve Tag List**

| Component/ Instrument | Field Tag Number | Manufacturer | Description (Size, Type, Model, Serial No.) | Manual Valve Operation Sat / UnSat | OK / Comment |
|---|---|---|---|---|---|
| **VALVE LIST** | | | | | |
| | | | | ☐ ☐ | |
| **OTHER INSTRUMENTATION AND EQUIPMENT** | | | | | |
| | | | | | |
| **COMPLETED BY:** | | | | | **DATE** |

# CAT Attachment 5
# System 01 Test and Hydrostatic Test Boundaries

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# APPENDIX B.
# SYSTEM ACCEPTANCE TEST PLAN TEMPLATE

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# Acceptance Test Procedure

**MTF-ATP-Template**
**Revision: 0**

Developed By: CH2M 8/02/2017

| **Approvals:** | **Name/Signature** | **Date** |
|---|---|---|
| Startup Manager | | |
| Project Management | | |
| Operations Director | | |

# 1.0 TEST OBJECTIVE

This Acceptance Test Procedure (ATP) is prepared in implementation of the *UCOR-4931, Outfall 200 Mercury Treatment System Startup Test Plan*. The scope of this ATP is to ensure that the System 01 equipment is ready to *FUNCTION DESCRIPTION*.

Specific acceptance test objectives are as follows:

- Perform initial valve lineups.
- Perform initial electrical equipment lineups.
- Setup instrumentation and AFD hardware.
- Sump Pump and level detection system are functional.
- Tank level system is functional.
- Transfer Pump checks.

Upper East Fork Poplar Creek water will not be used as part of this ATP. System checks will be limited to what can be tested with a remote source of potable water.

Instrument set points, alarms, and interlocks will be tested during the SCADA System ATP.

# 2.0 REFERENCES

| Document Number | Revision/Issue Date REV/MM/DD/YY | Title |
|---|---|---|
| **2.1 UCOR DESIGN SPECIFICATIONS** | | |
| | ___/___/___/___ | |
| **2.2 UCOR DESIGN DRAWINGS** | | |
| | ___/___/___/___ | |
| **2.3 FORMS** | | |
| | ____/___/___/___ | *Worksite Job Hazard Analysis for Skill-Based Work* |
| | ____/___/___/___ | *UCOR Test Authority Approval/Recommendation* |
| | ____/___/___/___ | *UCOR Test Deficiency Report* |
| | ____/___/___/___ | *UCOR Test Deficiency Report Log form* |
| | ____/___/___/___ | *UCOR Test Log Sheet* |
| | ____/___/___/___ | *UCOR Test Results Package Checklist* |
| | ____/___/___/___ | *UCOR Test Signatures/Initials* |
| | ____/___/___/___ | *UCOR Testing Package Release To Customer* |
| **2.4 VENDOR/CONTRACTOR INFORMATION** | | |
| | ___/___/___/___ | |

# 3.0 MATERIALS AND TEST EQUIPMENT NEEDED

Testing is nominally performed using equipment installed in the facility. Miscellaneous tools and equipment may be required; Measuring and Test Equipment (M&TE) control methods are not required for commercial equipment such as rulers, tape measures, level, if such equipment provides the required accuracy.

M&TE is required when used to calibrate, certify, measure, gauge, troubleshoot, test, or inspect in order to control data to verify conformance to specified requirements. M&TE shall be selected that is of the proper type, range, accuracy, and is uniquely identified and traceable to its calibration data.

Before use, calibration label shall be checked to ensure that the calibration is current and will remain current throughout the test period; i.e., the expiration date is after the expected use date. M&TE equipment will be visually inspected for damage prior to each use.

Record in the following table all measuring and test equipment used by M&TE number and Calibration Due Date in accordance with *Procedure,* Calibration Management Program. The use of "NA" in the table below indicates that the equipment will be used but does not need to be in the M&TE program.

| **Measuring and Test Equipment (M&TE)** | **M&TE Number** | **Calibration Due Date** | **Verifier "HID" Number** |
|---|---|---|---|
| Digital Multi-Meter (DMM), | | | |
| Torque Wrench | | | |
| Thermometer | | | |
| Hart Communicator | N/A | N/A | |
| Ice | N/A | N/A | |
| Ice Bath | N/A | N/A | |
| Freeze Spray | N/A | N/A | |
| Measuring Tape | N/A | N/A | |

# 4.0 PREREQUISITES

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Note: Steps in this section can be completed in any order. | |
| 4.1 | UCOR Competent Person - Verify System 01, Construction Acceptance Test, MTF-CAT-01 is complete as applicable. | _____ /_____ |
| 4.2 | Contractor shall provide completed "Manufacturer's Certificate of Proper Installation" for applicable equipment covered in this ATP. | _____ /_____ |
| 4.3 | UCOR Competent Person - M&TE required for testing is listed and recorded in Section 3.0. | _____ /_____ |
| 4.4 | UCOR Competent Person - Open items have been evaluated and verified to not affect the performance of this ATP or portion thereof (quality assurance nonconformance reports, construction punch list, outstanding engineering or design change notices, and test deficiency reports). | _____ /_____ |

# 5.0 INITIAL CONDITIONS

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Contractor sends written notification (addressed to Construction Support Manager, Engineering, and Startup Team) advising that the necessary construction and equipment installation activities are complete and the system is configured for testing to begin. | _____ /_____ |
| | Contractor shall verify that personnel participating in this ATP have signed and initialed *Form Number*, UCOR Test Signatures/Initials. | _____ /_____ |
| | The prerequisites and initial conditions required to commence testing are complete.<br><br>**Test Authority** _____<br><br>**Date** _____ | |

# 6.0 PRECAUTIONS AND LIMITATIONS

Only **potable water** will be used during this ATP. The Project Environmental Compliance Representative will be consulted and approve the path forward (disposal) when using potable water. This will be documented in the Test Log (form *Number*).

# 7.0 PROCEDURE

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Notes:<br>• Calibration of Process Instruments beyond manufacturer certification is not required for this ATP based on the preliminary calibration evaluation per *Procedure Number*.<br>• Test sections may be performed in any order to accommodate field activities and provide execution flexibility as long as the necessary prerequisites are completed in Section 4.0. Test steps within individual test sections are to be performed sequentially unless otherwise stated. (Steps or items in a list designated by bullets may be performed in any order, but numbered steps must be completed before moving to the next numbered step.)<br>• If test steps are repeated, pages or signoffs may be reproduced and attached as needed to document completed conditions and actions for each test. Attached pages retain their original number followed by a letter sequence (e.g., 15a, 15b, etc.). Any change to this procedure will follow guidelines in procedure *Procedure Number*, *Testing of Equipment and Systems*. Documentation of the reason for the change, and approvals obtained, will be kept in the Test Log (form *Number*, Test Log).<br>• UCOR Test Engineer may make minor changes to the drawing to match field conditions and submit for formal review by using the Test Deficiency Report (form *Number*). The steps in the section will need to be re-performed after formal revision to verify system integrity using the process as described above. | |

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Perform initial valve lineup as shown in Appendix A. | _____ /____ |
| | Perform initial electrical lineup as shown in Appendix B. | _____ /____ |
| | Level Indicating Transmitter Checks<br>• Using Hart Communicator, ensure the Level Indicating Transmitters are ranged at 0-10 feet and record on data sheet in Appendix C.<br>**Acceptance Criteria:** 0-10 **feet range.** | _____ /____ |
| | Pressure Indicating Transmitter Checks<br>• Using Hart Communicator, ensure the Pressure Indicating Transmitters are ranged at 0-150 psig for each pressure transmitter and record on data sheet in Appendix D.<br>**Acceptance Criteria: 0-150 psig range.** | _____ /____ |
| | Flow Indicating Transmitter Checks<br>• Using Hart Communicator, ensure the Flow Indicating Transmitters are ranged at 0-250 gpm for each flow transmitter and record on data sheet in Appendix E for each well.<br>**Acceptance Criteria: 0-250 gpm range.** | _____ /____ |
| | Pump Discharge Flow Indicating Transmitter Checks<br>• Using Hart Communicator, ensure the Flow Indicating Transmitters are ranged at 0-800 gpm for each pump discharge flow transmitter and record on data sheet in Appendix F for each pump.<br>**Acceptance Criteria: 0-800 gpm range.** | _____ /____ |
| | Differential Pressure Indicating Transmitter Checks<br>• Using Hart Communicator, ensure the Differential Pressure Indicating Transmitters are ranged at 0-10 psid for each differential pressure transmitter and record on data sheet in Appendix G for each transmitter.<br>**Acceptance Criteria: 0-10 psid range.** | _____ /____ |

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Temperature Indicating Transmitter Checks<br>• Using Hart Communicator, ensure the Temperature Indicating Transmitters are ranged at 0-150 deg F and record on data sheet in Appendix H for each transmitter.<br>**Acceptance Criteria: 0-150 deg F range.** | _____ /____ |
| | Adjustable Frequency Drive Checks.<br>• Setup pump AFDs in accordance with manufacturer's manual.<br>**Acceptance Criteria: Settings entered per Appendix I data sheet.** | _____ /____ |

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Pipe Heat Trace Checks | |
| | 1. Ensure Circuit Breakers (CB) in MPC-XXX are ON/CLOSED. | _____ /____ |
| | 2. Ensure installation contractor has programmed heat trace controller in heat trace panel as specified. | _____ /____ |
| | 3. Place breakers CB-1, CB-3, CB-5, and CB-7 in heat trace panel HTP-XXX to OFF/OPEN and apply LOTO per DOE-0336. | _____ /____ |
| | 4. Adjust insulation to access the RTDs. | _____ /____ |
| | 5. Remove LOTO to CB-1, CB-3, CB-5, and CB-7 in heat trace panel HTP-XXX per DOE-0336 and place breakers in ON/CLOSED position. | _____ /____ |
| | 6. Place RTD for each branch heat trace circuit in ice water bath or use a freeze spray and verify that heat trace controller energizes the associated heat trace line. | _____ /____ |
| | 7. Record temperature that the heat trace energized on Appendix K data sheet for each heat trace RTD. **Acceptance Criteria: Heat trace energizes at 63 deg F to 68 deg F**. | _____ /____ |
| | 8. Increase temperature on each branch line RTD until heat trace de-energizes. | _____ /____ |
| | 9. Record temperature that the trace de-energized on Appendix K data sheet for each heat trace RTD. **Acceptance Criteria: Heat trace de-energized at 68 deg F to 71 deg F**. | _____ /____ |
| | 10. Place breakers CB-1, CB-3, CB-5, and CB-7 in heat trace panel HTP-XXX to OFF/OPEN and apply LOTO per DOE-0336. | _____ /____ |
| | 11. Restore Insulation and RTDs to pipe system. | _____ /____ |
| | 12. Remove LOTO to CB-1, CB-3, CB-5, and CB-7 in heat trace panel HTP-Y2A per DOE-0336 and place breakers in ON/CLOSED position. | _____ /____ |

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Sump Pump and Sump Level Detection Checks. | |
| | 1. Verify valve lineup for the Sump is complete as shown in Appendix A. | _____ /____ |
| | 2. Ensure CB in MPC-XXX is ON/CLOSED to supply power to the sump pump. | _____ /____ |
| | 3. Add potable water to the sump pit and record sump level when the pump starts with a measuring tape.<br>Sump level _____ inches. | _____ /____ |
| | Acceptance Criteria: Sump level is less than 6" when pump starts. (Circle Yes / No) | |
| | 4. Ensure CB-3 in MPC-XXX is OFF/OPEN to shut-off power to sump pump. | _____ /____ |
| | 5. Fill sump with potable water. (~ 230 gallons) | _____ /____ |
| | 6. Measure water level in sump and record value in inches. _____ inches | _____ /____ |
| | 7. Ensure CB-3 in MPC-XXX is ON/CLOSED to supply power to sump pump. | _____ /____ |
| | 8. Measure time that it requires the sump pump to transfer water until it shuts off automatically. Record in minutes. _____ minutes. | _____ /____ |
| | 9. Confirm current switch IS-XX closes when sump pump is energized. | _____ /____ |
| | 10. Measure and record water level of sump and record in inches. _____ inches | _____ /____ |
| | 11. Determine sump pump rate exceeds 100 gallons per minute.<br>(Step 6 – Step 10) × (10 gallons/inch) ÷ Step 8 = _____ gals/minute (gpm). | _____ /____ |
| | **Acceptance Criteria: Sump pump rate greater than 100 gpm. (Circle Yes / No)** | _____ /____ |

| Step No. | ACTION | Initials/Date |
|---|---|---|
| | Tank level system functional checks.<br><br>Note: It is assumed that water will be present in the tank from the hydro-testing performed during the CAT. If not, water will be added.<br><br>1. Record value on LIT-XX. _____ feet<br><br>2. Using measuring tape record water level from ETT-Y2. _____ feet.<br><br>3. Compare LIT-Y2 reading and manual tape reading. They should agree within 0.5%.<br><br>**Acceptance Criteria: LIT-Y2 reading and manual tape reading agree within 0.5%. (Circle Yes / No)** | _____ /____<br><br>_____ /____<br><br>_____ /____<br><br>_____ /____ |
| | Cartridge filter checks.<br><br>1. Verify valve lineups for filters in Appendix A are complete.<br>2. Open filter housing and check that filter cartridges are present and free of visible debris.<br>Filter CF-XX Filters present Yes / No<br><br>**Acceptance Criteria: Extraction Filter Housings contain filters and are free of visible debris. (Circle Yes / No)** | _____ /____<br>_____ /____<br>_____ /____ |
| | Pump checks.<br><br>Ensure The following pumps have been lubricated per the manufacturer's instructions:<br>• Pump 1<br>• Pump 2<br>3. Pump 3<br><br>**Acceptance Criteria: Pumps have been lubricated per manufacturer's instructions. (Circle Yes / No)** | _____ /____<br><br>_____ /____ |

# 8.0 RESTORATION COMPLETE

| Step No. | ACTION | Initials/Date |
|---|---|---|
| 8.1 | Contractor Competent Person to ENSURE test equipment has been disconnected and removed. UCOR to witness. | _____ /_____ |
| 8.2 | Perform valve lineup in Appendix A and electrical lineup in Appendix B. | _____ /_____ |
| 8.3 | UCOR Competent Person to compile and Close Deficiency List. | _____ /_____ |
| 8.4 | Leave potable water in the tank. This water shall remain in the tank until OTP. | _____ /_____ |

# 9.0 SYSTEM ACCEPTANCE APPENDICES

Appendix A, Initial Valve Lineup

Appendix B, Initial Electrical Lineup

Appendix C, Level Indicating Transmitter Data Sheet

Appendix D, Pressure Indicating Transmitter Data Sheet

Appendix E, Flow Indicating Transmitter Data Sheet

Appendix F, Filter Differential Pressure Indicating Transmitter Data Sheet

Appendix G, Temperature Indicating Transmitter Data Sheet

Appendix H, Pump AFD Data Sheets

Appendix I, Heat Trace Check Data Sheet

Appendix J, P&ID boundary of ATP

# 10.0 APPROVALS

Completed by: Name _____ Date: _____

Test Engineer
(Name/Signature)

Accepted by: Name _____ Date _____

Test Authority
(Name/Signature)

| ATP Attachment 1<br>System 01 ATP – Initial Valve Lineup | | | | |
|---|---|---|---|---|
| **Valve Number** | **Description** | **Position** | **Initials/Date** | **Comments** |
| Filter CF-YE1 | | | | |
| V02-YE01 | Filter CF-YE1 inlet isolation valve | Closed | | |
| V03-YE01 | YE01 sample isolation valve | Closed | | |
| V04-YE01 | Filter CF-YE1 pressure differential high pressure | Open | | |
| V06-YE01 | Filter CF-YE1 pressure differential low pressure | Open | | |
| V05-YE01 | Filter CF-YE1 vent valve | Open | | |
| V07-YE01 | Filter CF-YE1 drain valve | Closed | | |
| V08-YE01 | Filter CF-YE1 outlet drain valve | Closed | | |
| V09-YE01 | Filter CF-YE1 outlet isolation valve | Closed | | |
| System 01 Sump | | | | |
| V02-Y03 | Pump outlet drain valve | Closed | | |
| V03-Y03 | Pump outlet valve | Open | | |
| Storage Tank 2 | | | | |
| V02-Y02 | Tank outlet valve | Closed | | |
| V01-Y02 | Tank drain valve | Closed | | |
| V03-Y02 | Tank outlet line drain valve | Closed | | |
| V04-Y02 | Tank outlet line vent valve | Closed | | |
| V01-Y02L | LIT-Y2 transmitter isolation valve | Open | | |
| V01-Y02H | LIT-Y2 transmitter isolation valve | Open | | |
| Pump 1 | | | | |
| V01-Y03A | Pump inlet isolation valve | Closed | | |
| V02-Y03A | Pump casing drain valve | Closed | | |
| V03-Y03A | Pump transmitter isolation valve | Open | | |
| V04-Y03A | Pump transmitter vent valve | Closed | | |
| V06-Y03A | Pump outlet line drain valve | Closed | | |
| V07-Y03A | Pump outlet isolation valve | Closed | | |

| ATP Attachment 1<br>System 01 ATP – Initial Valve Lineup | | | | |
|---|---|---|---|---|
| **Valve Number** | **Description** | **Position** | **Initials/Date** | **Comments** |
| V08-Y03A | Pump outlet line vent valve | Closed | | |
| V09-Y03A | Pump outlet line drain valve | Closed | | |
| V08-Y03 | Pump bypass valve | Closed | | |
| V10-Y03A | Pump transfer line drain valve | Closed | | |
| V11-Y03A | Pump transfer line sample valve | Closed | | |
| V12-Y03A | Pump transfer line isolation valve | Closed | | |

## ATP Attachment 2
## System 01 – Initial Electrical Lineup

| Breaker/Switch Number | Description | Position | Initials/Date | Comments |
|---|---|---|---|---|
| System 01 | | | | |
| DS-289TC | Main Disconnect | On | | |
| Power Panel | | | | |
| 1 | Lights | On | | |
| 3 | Spare | Off | | |
| 5 | Spare | Off | | |
| 7, 9, 11 | Mini Power Center, 15KVA Trans. | On | | |
| 13,15,17 | 1.5 Hp Exhaust Fan | On | | |
| 19, 21, 23 | 3 Hp Supply Fan | On | | |
| 25, 27, 29 | 25 Hp Transfer Pump | On | | |
| 31, 33, 35 | 25 Hp Transfer Pump | On | | |
| 37, 39, 41 | 25 Hp Transfer Pump | On | | |
| 43, 45, 47 | 25 Hp Transfer Pump | Off | | |
| Mini Power Center | | | | |
| 1 | PS-Y0Q (DPC-Y0Q) | On | | |
| 3 | RCPT Sump Pump | Off | | |
| 5 | ECP<br>Environmental control panel | Off | | |
| 7 | Spare | Off | | |
| 9 | Spare | Off | | |
| 11 | Spare | Off | | |
| 13 | Spare | Off | | |
| 15 | Spare | Off | | |
| 17 | Spare | Off | | |

## ATP Attachment 3
## Level Indicating Transmitter Data Sheet

**7.3** Level Indicating Transmitter Checks

| **Level Transmitter** | **Level Range set to 0-10 feet.** | **Acceptance Criteria Met (0-10 feet) Yes / No** | **Initial/Date** |
|---|---|---|---|
| LIT-Y2 | As-Found _____ feet<br>As-Left _____ feet | ☐ ☐ | |
| LIT-Y3 | As-Found _____ feet<br>As-Left _____ feet | ☐ ☐ | |

## ATP Attachment 4
## Pressure Indicating Transmitter Data Sheet

**7.4** Pressure Indicating Transmitter Checks

| Pressure Transmitter | Pressure Range set to 0-150 psig. | Acceptance Criteria Met (0-150 psig) Yes / No | Initial/Date |
|---|---|---|---|
| PIT-Y2A | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PIT-Y2B | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PIT-Y2C | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PIT-Y3A | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PIT-Y3B | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |

## ATP Attachment 5
## Flow Indicating Transmitter Data Sheet

**7.5** Flow Indicating Transmitter Checks

| Flow Transmitter | Flow Range set to 0-250 gpm. | Acceptance Criteria Met (0-250 gpm) Yes / No | Initial/Date |
|---|---|---|---|
| FIT-YE1B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE3B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE12B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE15B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE9B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE10B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE7B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE6B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE16B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |
| FIT-YE2B | As-Found _____ gpm<br>As-Left _____ gpm | ☐ ☐ | |

## ATP Attachment 6
## Filter Differential Pressure Indicating Transmitter Data Sheet

**7.7** Filter Differential Pressure Indicating Transmitter Checks

| Pressure Transmitter | Pressure Range set to 0-10 psid. | Acceptance Criteria Met (0-10 psid) Yes / No | Initial/Date |
|---|---|---|---|
| PDIT-YE1 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE3 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE12 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE15 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE9 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE10 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE7 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE6 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE16 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |
| PDIT-YE2 | As-Found _____ psig<br>As-Left _____ psig | ☐ ☐ | |

## ATP Attachment 7
## Temperature Indicating Transmitter Data Sheet

**7.8** Temperature Indicating Transmitter Checks

| Temperature Transmitter | Temperature Range set to 0-150 deg F | Acceptance Criteria Met (0-150 deg F) Yes / No | Initial/Date |
|---|---|---|---|
| TIT-Y2 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-Y3 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE1 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE3 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE12 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE15 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE9 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE10 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE7 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE6 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE16 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |
| TIT-YE2 | As-Found _____ deg F<br>As-Left _____ deg F | ☐ ☐ | |

# ATP Attachment 8
# Transfer Pumps AFD Data Sheet

**7.9** Adjustable Frequency Drive Settings

| Parameter | Index | Request | Tagname | Value | | |
|---|---|---|---|---|---|---|
| 1-21* | 0 | 3 | HP | 25 | | |
| 1-22 | 0 | 2 | V | 480 | | |
| 1-23 | 0 | 2 | Hz | 60 | | |
| 1-24 | 0 | 3 | A | 40 | | |
| 1-25 | 0 | 2 | RPM | 3450 | | |
| 0-21 | 0 | 2 | Display2 | 1612 | (Motor Voltage) | |
| 0-23 | 0 | 2 | Display2 | 1617 | (RPM) | |
| 1-03 | 0 | 2 | Efficiency | 1 | (Variable Torque) | |
| 3-03 | 0 | 3 | RefMax | 3600 | 1000X | |
| 3-41 | 0 | 3 | tRampUp | 2 | 100X | |
| 3-42 | 0 | 3 | tRampDn | 2 | 100X | |
| 4-10 | 0 | 2 | Direction | 2 | (Both) | |
| 4-13 | 0 | 2 | RPMmax | 3600 | | |
| 5-10 | 0 | 2 | Term18 | 2 | (Coast Inverse) | |
| 5-12 | 0 | 2 | Term 27 | 0 | (No Operation) | |
| 8-03 | 0 | 3 | TimeOut | 1 | 10X | |
| 8-04 | 0 | 2 | f(TimeOut) | 5 | (Stop & Trip) | |
| 8-54 | 0 | 2 | Reversing | 1 | (Bus) | |
| 9-16 | 0 | 7 | Read1 | 1603 | (Status word) | Profibus Index is 1 |
| 9-16 | 1 | 7 | Read2 | 1617 | (RPM) | Profibus Index is 2 |
| 9-16 | 2 | 7 | Read3 | 1614 | (Motor Current) | Profibus Index is 3 |
| 9-16 | 3 | 7 | Read4 | 1612 | (Motor Voltage) | Profibus Index is 4 |
| 9-16 | 4 | 7 | Read5 | | (not used) | Profibus Index is 5 |
| 9-16 | 5 | 7 | Read6 | | (not used) | Profibus Index is 6 |
| 9-16 | 6 | 7 | Read7 | 1630 | (DC Link Voltage) | Profibus Index is 7 |
| 9-16 | 7 | 7 | Read8 | 1634 | (Heatsink Temp) | Profibus Index is 8 |
| 9-16 | 8 | 7 | Read9 | 1690 | (Alarm word) | Profibus Index is 9 |
| 9-16 | 9 | 7 | Read10 | 1601 | (Reference) | Profibus Index is 10 |
| 14-04 | 0 | 2 | PWMrandom | 1 | | |
| 14-20 | 0 | 2 | AutoResets | 0 | Parm 9-18: shows PB address | |
| 9-71 | 0 | 2 | Save | 1 | (Returns to "0" after SAVE is done) | |
| 0-50 | --- | --- | Save to LCP | 1 | (All to LCP) | |

* if 1-21 is not available/visible, set parameter 0-03 to 1 (North America).

| AFD | AFD Settings per above table. | Acceptance Criteria AFD Settings Entered Yes / No | Initial/Date |
|---|---|---|---|
| AFD-Y2A | See above. | ☐ ☐ | |
| AFD-Y2B | See above. | ☐ ☐ | |
| AFD-Y2C | See above. | ☐ ☐ | |

## ATP Attachment 9
## Heat Trace Checks Data Sheet

**7.14** Pipe Heat Trace Checks

| RTD/Branch ID | Heat Trace On Degrees F | Acceptance Criteria Met (63F – 68F On) Yes / No | Heat Trace Off Degrees F | Acceptance Criteria Met (Off 68F - 71F) Yes / No | Initial/Date |
|---|---|---|---|---|---|
| RTD-E201<br>E201 | _____ F | ☐ ☐ On | _____ F | ☐ ☐ Off | |
| RTD-E202<br>E202 | _____ F | ☐ ☐ On | _____ F | ☐ ☐ Off | |
| RTD-E203<br>E202 | _____ F | ☐ ☐ On | _____ F | ☐ ☐ Off | |
| RTD-E204<br>E204 | _____ F | ☐ ☐ On | _____ F | ☐ ☐ Off | |
| RTD-E205<br>E205 | _____ F | ☐ ☐ On | _____ F | ☐ ☐ Off | |
| RTD-E206<br>E205 | _____ F | ☐ ☐ On | _____ F | ☐ ☐ Off | |

# ATP Attachment 10
# P&ID boundary of ATP

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