SUBJECT **MONITORING & CONTINGENCY GUIDELINES FOR KSC PAYLOAD PROCESSING FACILITIES**

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PURPOSE

This procedure defines the parameters and methods for monitoring Heating, Ventilation, and Air Conditioning (HVAC) systems and particle contamination monitoring systems for the Industrial Area Payload Processing Facilities (PPFs) at Kennedy Space Center as defined in KPL-PLN-50007 and KPL-PLN-50008. Contingency response guidelines for specific facilities are also covered in this procedure.

SCOPE AND APPLICABILITY

Per the Base Operations and Spaceport Services (BOSS) contract 80KSC0180017, this procedure provides the HVAC Department with a summary of actions to be carried out for monitoring of PPFs environmental operating conditions.

Note: The requirements are applicable regardless of where the operator is monitoring. Specifically during hurricane ride out from within the CCC, it is expected that the operator will perform with the same rigor monitoring, responding, and reporting as if at the IACP.

PROCESS

1. FACILITY MONITORING REQUIREMENTS

1.1 The environmental conditions for all Payload Processing Facilities (PPFs) and support buildings shall be continuously monitored on all shifts. All monitoring shall be performed via the Andover Control System and the IOZ Johnson MetaSys system located at the Industrial Area Chiller Plant (IACP) and/or Space Station Processing Facility (SSPF) control rooms. Buildings actively processing payloads will be monitored and data recorded hourly. The IACP plant operators shall perform this monitoring on the following facilities:

- M7-0360 (SSPF)
- M7-0777 (LASF)
- M7-1104 (MPPF)
- M7-1354 (PHSF)
- M7-0355 (IOZ)

- Normal Monitoring of the following processing areas is required but rounds sheets are not required.
  - M7-0505 (PSB)
  - M7-1357 (MOSB)
  - M7-1472 (RTGF)

1.2 The operator shall refer to the facility status screen for indication of which facility is active and the current Payload operating parameters.

1.3 The operator shall utilize the facility rounds sheets for each facility and record current operating conditions for active facilities. The rounds sheets will indicate the operating required ranges.

1.4 A list of the respective forms, for each facility is located in the Records Table in this document.

1.5 IACP Plant Operators shall perform an alarm function test on the Andover Workstation at start of each shift. Once the alarm test button is depressed from the main graphic screen the pager test will appear on the active alarm screen, then return to normal once it's completed. This test is to verify that the Andover workstation is receiving active alarms on the active alarm screen. If the pager Test alarm doesn't appear on the workstation notify the System Engineer (SE) for instructions on rebooting the workstation.

2. NOTIFICATION AND MODIFICATION REQUIREMENTS FOR FACILITY OPERATIONS

2.1 Notification of Operating Parameters

2.1.1 Facility environmental setpoints, limits and cleanliness conditions are established for the facilities through controlling documents. For the Orion customers, setpoints and limits are called out in Operational Agreements (OA):

- For the LASF - ORION-KSC-FAC-015
- For the IOZ - ORION-KSC-FAC-011

For other PPF customers, the requirements setpoints and limits are detailed in KPL-PLN-50007, table 3-1 (Shown below) and KPL-PLN-50008 documents.

Table 3-1. KSC CWA/CCZ Environmental Requirements [1]

CLEAN WORK AREA LEVELS/ ISO CLASS CLEAN ZONES		Level #1	Level #2	Level #3	Level #4	Level #5
ISO14644 CLASS		ISO14644 Class 6.7	ISO14644 Class 7	ISO14644 Class 7.7	ISO14644 Class 8	ISO14644 Class 8.5
[FED-STD-209 Class (Legacy Document)]		(Class 5K)	(Class 10K)	(Class 50K)	(Class 100K)	(Class 300K)
PARAMETER	Air Flow	Laminar	Laminar	Non-Laminar	Non-Laminar	Non-Laminar
Maximum Airborne Particle Counts (ISO14644 - per m^3) [FED-STD-209 - per ft^3]	Req. ≥ 0.5 µm	176,000 [5,000]	352,000 [10,000]	1,760,000 [50,000]	3,520,000 [100,000]	11,100,000 [300,000]
	Req. 5.0 m	1,470 [35]	2,930 [70]	14,700 [350]	29,300 [700]	92,500 [1,000]
	Monitoring	Continuous	Continuous	Continuous	Continuous	Monthly
Temperature (°C) [°F] [3]	Requirement	22±3 [71±6]	22±3 [71±6]	22±3 [71±6]	22±3 [71±6]	22±3 [71±6]
	Monitoring	Continuous	Continuous	Continuous	Continuous	Monthly
Relative Humidity (%) [3] [5] [6]	Requirement	30 Min to 60 Max	30 Min to 60 Max	30 Min to 60 Max	30 Min to 60 Max	30 Min to 60 Max
	Monitoring	Continuous	Continuous	Continuous	Continuous	Monthly
Maximum Particle Fallout [2]	Goal	Level 200	Level 200	Level 500	Level 750	N/A
	Monitoring [4]	Continuous	Continuous	Continuous	Continuous	N/A
Maximum NVR (mg/0.1m^2/month)	Requirement	1	1	1	1	N/A
	Monitoring [4]	Continuous	Continuous	Continuous	Continuous	N/A
Maximum Volatile Hydrocarbons (ppm) (v/v)	Requirement	15	15	15	15	N/A
	Monitoring [4]	Monthly	Monthly	Monthly	Monthly	N/A
Minimum Positive Pressure [7]	Requirement	0.05 in H_2O	0.05 in H_2O	0.05 in H_2O	0.02 in H_2O	N/A
	Monitoring	Continuous	Continuous	Continuous	Continuous	N/A
Minimum Air Changes [3]	Requirement	20/Hour	20/Hour	6/Hour	4/Hour	2/Hour

[1] During periods of operation
[2] Levels per IEST-STD-CC1246E for a 24 hour period
[3] Program Specific Requirements may supersede these requirements
[4] As specified by KPL-PLN-50008
[5] No work will be performed on ESD sensitive equipment below 30% Relative Humidity levels
[6] No emergency notification required if Relative Humidity levels fall below 30% during non-processing periods
[7] Differential pressure of water minimum with all doors and pass-throughs closed (except when HVAC system is configured in a launch abort safety mode)
NOTE: Continuous monitoring means data collection is continuous

2.1.2. Based on KPL-PLN-50007 table 3.1, the following table applies to KSC Processing and support facilities:

FACILITY	TEMPERATURE	Humidity	Pressure
M6-0547 (KDC)	73°F ± 3° F	RH<45%	under review
M7-0355 (IOZ)	71°F ± 6° F	35%<RH<60%	0.05"± 0.02" W.C.
M7-0360 (SSPF High Bay)	71°F ± 6° F	30%<RH<60%	Goal 0.01" W.C
M7-0777 (LASF)	71°F ± 6° F	0%<RH<60%	N/A
M7-1104 (MPPF)	71°F ± 6° F	0%<RH<60%	Goal 0.02" W.C
M7-1354 (PHSF)	71°F ± 6° F	30%<RH<60%	Goal 0.01" W.C
M7-1472 (RTGF)	*	*	*

* Covered by specific PRD when used.

2.1.2. Changes to environmental operating conditions may be made via customer EWR or Customer Payload Requirements Documents (PRD).

2.1.3. PRD are submitted as part of Mission/Payload requirements. These may only be temporary changes and once the Flight Hardware has been removed, the environmental conditions shall be returned to the normal specified setpoints.

2.1.4. All Facility operating environmental conditions Change Requests (CR) shall be submitted by EWR by the respective Facility Manager of each payload facility or the JSTC on off shifts if a real time change is required . An EWR will ensure changes are documented, any additional monitoring is captured and, if necessary, approved by the Configuration Control Board (CCB).” Reference Figure #1 below for flowchart for facility environmental conditions Change Request (CR) Process

This list shall contain per facility and room by room all areas requiring monitoring and specifications. These operating parameters will include temperature, relative humidity, particle levels, facility static pressure and/or fuel monitoring as required per the Payload/Mission being supported.

2.1.5. Per the CR workflow, JBAC shall notify the SE shall to receive/review this data. If this CR is within limits the SE need only be notified of the change. If the CR will violate existing setpoint limits, then the SE must approve the change and make necessary changes to system operating parameters to accomplish the required operating conditions. For approval requests that Violate limits, the SE call tree will be utilized if the responsible SE is unavailable. The SE/IACP Supervisor shall make changes to the Payload Rounds screens to indicate the required operating conditions. The Payload Rounds screen shall display activation date, required operating temperature, relative humidity, facility static pressure, particle levels, fuel monitoring set points and current payload name. The Payload rounds panel shall display current operating conditions. The SE may be required to make individual rounds log sheets to capture extra required data. Current specifications are shown on the various Rounds log sheets. These forms shall be updated/redlined as specifications change.

2.2. HVAC Operator/Tech Requirements: Monitoring Requirements

2.2.1. Monitoring requirements for all Payload Processing Facilities, support buildings: All buildings shall be maintained per the requirements.

2.2.2. When new Payload Facility requirements are established via Payload Requirement Documents (PRD) or other methods, all HVAC Operators/Techs and supervisors shall be advised and the IACP control board updated. Rounds sheets shall reflect the new setpoints.

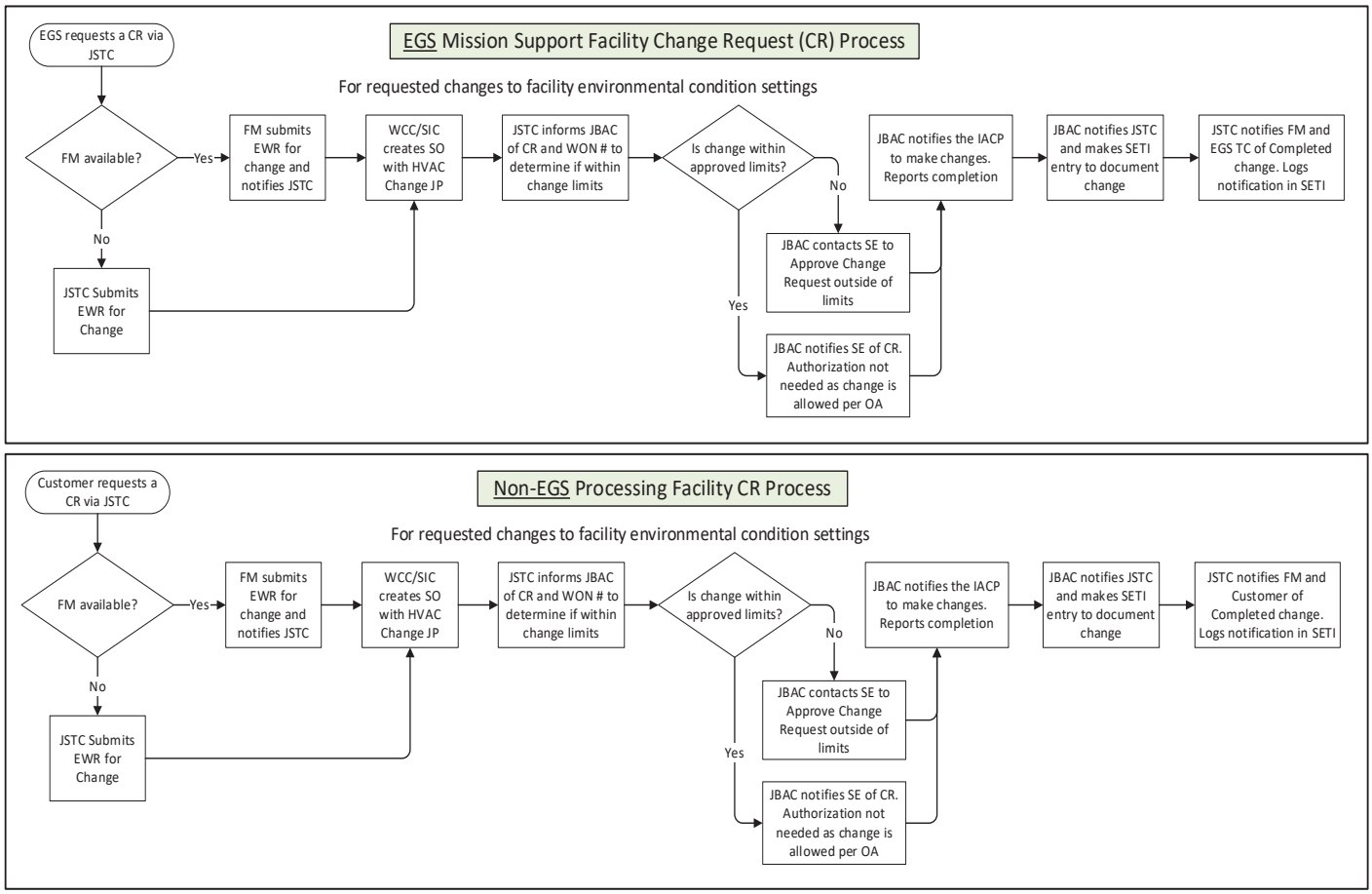

Figure #1 – Facility Environmental conditions Change Request (CR) process

2.2.3. Each **active** payload building will have a 'rounds' page log sheet (see below) in which the operator will use to record the required data every hour. Each building has a payload rounds page that indicates temperature, relative humidity, facility static pressure, particle count specifications and what payloads are present in the facility. The log sheets shall be reviewed by the operator to look for any trending towards out of specification conditions. This will aid in response actions to get conditions under control. Any conditions being recorded that are in Warning/Alarm conditions will be circled in red on the rounds sheets and noted in Systems

Electronic Tie-In (SETI). The note shall indicate Work Order Number (WON) and time.

KSC Form 50-181NS "Log/Andover Rounds, PHSF

KSC Form 50-105NS "Log/Andover Rounds, LASF

KSC Form 50-106NS "Log, SSPF Rounds"

KSC Form 50-134NS "Log, IOZ Rounds"

KSC Form TBD "Log, MPPF Rounds"

2.2.4. Standby Mode – Payload facilities not currently supporting payload processing will continue to be monitored for all warnings/alarms and Technicians will continue to respond to warnings/ alarms in these buildings. Payload facilities not currently supporting payload processing will be considered in "Standby Mode". The facility Manager shall notify the IACP or C-2 console via DO/JSTC of transition to Standby mode and when expected to go back to processing mode. Specifications for the Standby Mode shall be a goal of temperature 60 – 80 º F, Relative Humidity of 0-60% and standard payload particle counts of < 100,000. These specifications shall remain in effect until payload processing resumes. The Neil Armstrong Operations and Checkout building (NAO&C), M7-0355 IOZ, is considered the exception to the rule. Conditions shall be maintained per the applicable OA.

2.2.5. The operator shall respond to any and all warning/alarm notifications received through any workstation. Warnings/Alarms shall be reviewed by the operator. The operator shall review the equipment operating, set points, space conditions, and disabled points. Then call applicable the OPS desks to determine what action(s) to take to reverse the adverse warning. The operator shall utilize the contingency guidelines provided in this document as an aid and shall use SETI to log the event(s), actions taken, and adjustments made. The BOSS Duty Office (DO)or BOSS CCC Test Conductor (JSTC) shall be notified (861-5050) and a WON issued, if the operator is unable to reverse the warning condition and needs to send a technician for assistance for all warnings or alarms for Payload processing areas, Processing Equipment, or Payload Data Centers.

2.2.6. For alarms, the operator shall notify the DO of the issue and a WON shall be issued to investigate/repair the problem. HVAC shall be dispatched to the facility to aid in the correction/repair. The operator shall take immediate action to investigate the cause and ascertain what is required to correct the alarm condition. The operator shall make necessary adjustments to the operations of the system to mitigate the alarm condition. The operator or technician shall log all adjustments made to the system in SETI and report back to the DO/JSTC giving status on the condition of the problem. This allows the DO/JSTC to report the status to the customer.

2.2.7. If warning/alarm condition continues and cannot be mitigated, the technician shall notify Supervisor/SE for instructions. If Supervisor and/or SE are not available, the operator shall notify the DO to continue Supervisor/SE notification.

2.2.8. In the event an 'out of specification' condition occurs for equipment failure, temperature, humidity, facility static pressure or particle count in any Payload Facility actively processing payloads; the technician shall notify the DO of the out of specification condition. The operator/technician will be instructed to prepare an Event Report in accordance with Procedure SMA-P-0016, *Event and Near Miss Reporting and Investigation.* In the event of a Fuel Cart alarm, the operator shall immediately notify the DO of the alarm. HVAC personnel will not respond to the facility until an all clear is given.

2.2.9. If the Operator receives a communication loss alarm or loses visibility of system status and it does not return within 10 minutes, the Operator shall notify the BOSS DO to initiate a WON and notify Supervisor/SE for instructions. The operator shall dispatch HVAC technicians to initiate manual hourly rounds. The manual hourly rounds shall continue until instructed to return to normal operator rounds.

APPENDIX A: SETI STANDARDS – UTILITY ANNEX, INDUSTRIAL AREA CHILLER PLANT, BOILER PLANT

Purpose: Provide guidance for personnel in the Utility Annex (UA), Industrial Area Chiller Plant (IACP), and boiler plant on specific requirements for SETI use, and general Control log entry requirements.

Affected Personnel: Utilities Branch Technicians, Supervisor, Managers, and Systems Engineering (SE)

Reference: FAM-P-2019, *Systems Electronic Tie-In (SETI) Log*, MSO-REF-0003, *BOSS Systems Electronic Tie-In User's Guide*.

Background:

Per Performance Work Statement (PWS) section 3.1.1.6, the SETI log shall be utilized All Complex Control Center (CCC) console operators and Utility Annex and Industrial Area Chiller Plant (IACP) plant operators as the official log to document and status all activities that occur during their work shifts including opening, extending and closing outages; operating equipment; test support; troubleshooting efforts; unexplained alarms received; and all construction/modification/repair work The SETI log enhances the overall communications between Technicians, CCC Console Operators, Engineering, and NASA.

Purpose:

To define the responsibilities and expectations for the IACP/UA/Boiler Plant Technicians when using the SETI log, and provides the guidelines for documenting in narrative format, the chronological sequence of events occurring with systems and equipment. The SETI log is a web-based application available to all of the Base Operations and Spaceport Services (BOSS) to be used for the purpose of operational communications. The log keeping program is in place to provide an accurate history of facility operations and to aid in controlling equipment and system status. The SETI log replaces hard copies log books and any shared logs that were in place:

- Plant log books (Hard copy logs will be maintained at the plants, as a contingency, should the SETI system shutdown temporarily
- UA shall have 2 separate SETI logs. 1 for the Chiller Operations (U-Annex) and 1 for Boiler operations (Heat Plant)

General Requirements:

Logbooks/Logs are used to record significant events and instructions to facilitate communication, shift turnover, troubleshooting, engineering analysis and event reconstruction. Logs are part of the official record of the BOSS contract and are essential for safe operation.

Logs must contain sufficient, accurate facility data and narrative logs of events to provide an accurate history, and the capability for effective evaluation and oversight of facility operations and maintenance.

Since logs are regarded as legal documents, they should meet high standards for accuracy and consistency.

Logs have many characteristics in common with round sheets, in that both provide information concerning the condition and status of equipment, and both are treated as legal records. Round sheets normally record only data collected from instruments. Logs are used to record an understandable account of the changes in the status of equipment, information obtained from sources in addition to instruments, and explanations for unusual data readings. This information makes logs a valuable tool in reconstructing events. If an unusual event occurs, its precursors and its progress can often be traced by analyzing logs, round sheets, and other records.

Logs provide a method for transferring information from one person or shift, to another, and are an important part of the operations/maintenance turnover. The transfer of information through logs enables current personnel to benefit from the experiences of previous operators of the equipment. The record of problems and attempted solutions may be reviewed whenever a new or similar problem occurs. The lessons learned can save time and effort in the search for solutions to current problems and can help personnel avoid situations that caused problems in the past. The information contained in logs is also often used by engineers to track the performance of components or processes, by training personnel to provide examples for instruction, and by others requiring specific information concerning operations.

Logbook/Log Entries:

Information regarding activities or events for each area shall be recorded throughout the shift in order to ensure the accuracy of the entry. Events will be recorded in a timely fashion in order to ensure the accuracy of the entry, however, logbook/log entries will not take precedence over controlling and monitoring the facility. If log entries are delayed because of immediate response actions needed to be taken in the field, the Technicians shall document the actual event/issue time in a delayed log entry. Since SETI automatically time stamps the actual log entry time, actual event/issues/action times must be manually documented.

- When an entry is made that is not in chronological sequence; the entry shall be identified as a late entry as follows:
  - Type “Late Entry”
  - The time the event being entered, actually happened
  - Entry information

<u>Information to be recorded</u>

- Equipment status changes
- Plant mode or condition changes
- Abnormal configurations
- Upset conditions (i.e. equipment failure, power outages, out of spec conditions, warnings/alarms)

- Duty Office/JSTC requests for HVAC response along with the work order number, and log technician findings/actions from their response
- Customer notifications of Operating mode, status changes such as door openings, etc.
- Status changes to safety significant and other major plant or area equipment
- Out-of-specification chemistry or process results
- Process sample results i.e. water treatment tests
- Related engineering, maintenance activities, and or related activities from other shops/divisions
- Off-going and oncoming crews review of log and assumption of the watch annotation to include any ongoing significant issues. The log entries should also document any major/key components systems out of service
- Placing equipment into “Disabled” mode or returning the equipment back into “Enabled” mode.
- Shop input shall consist of work performed any turnover either to the next shift or if 1st shift is to respond. Log any system failures found out in the field, work orders generated, access issues or any operations issues.
- Supervisors shall enter PLT dates & Delegation information so personnel know which Supervisor is available if support is required.
- Overtime call-ins (who authorized, who was called, who came in, etc.)
- Testing or major project status
- Outages opening or closing that impact HVAC
- WON generated, tracked for closure that are plant or payload facility related that impacts or pertains to HVAC

Initial Entry

- An initial entry should be made in the log at the beginning of each shift. Some facilities require a more detailed entry on a daily or per-shift basis summarizing plant conditions, equipment status, and work in progress.

Incomplete Tasks

- The events recorded in the log may require follow-up action by the person keeping the log. If the action cannot be performed immediately, because of plant conditions or higher priority tasks, an entry should be made in the log to identify the task as incomplete. This is a way of reminding the person keeping the log, or the person who will fill the position on another shift, that the required action has not yet been performed.

Final Entry

- The off-going operator or supervisor should make a final log entry when relieved by another person or at the end of the shift. The final entry should indicate the name of the relief person (if the position is relieved through a turnover) and should be signed by the off-going individual to authenticate the entries made during the shift.

Correcting Errors or appending new information to previous log entries

- Append an entry when there is an existing entry for the same work order number, outage number or subject when conditions exist that warrant additions, updates or correction annotations to an existing entry
- Use Append to annotate on duty/off duty personnel for all three shifts on one workday (for continuity during a 24-hour workday).
- If there is an important equipment issue that is ongoing, each shift should append the entry so that the following shift review of log entries will be reminded of the ongoing issue/status.

Logbook Review:

At the beginning of each shift, the oncoming personnel should review the log entries since their last shift (or for a time period specified in facility guidelines). This review will familiarize personnel with recent changes in the status of equipment and bring them up to date on current processes or activities.

Supervisors should review the logs of subordinates for all shifts. This review enables the supervisor to ensure that the entries are accurate and adequate. It also provides the supervisor with an additional perspective on the operation & maintenance of each shift.

Logs will be made available for review by persons outside the operating organization. For example, system engineers can use operating logs to help detect potential problems in the equipment or procedures. Training personnel can use logs to develop instructive examples that accurately reflect facility operations or problems.

APPENDIX B: GUIDE TO GOOD PRACTICES FOR CONTROL OF EQUIPMENT AND SYSTEM STATUS

Purpose: Provide Management Expectations Related to reporting and logging of equipment control, status and monitoring at processing facilities

Affected Personnel: Plant Technicians / Console Operators / Engineering

Background:

In processing areas, upset conditions exceeding operating specifications, have specific "Conduct of Operations" expectations related to control of equipment, monitoring, and responding to equipment alarms and trends. This section provides overall management expectations on several key areas related to equipment/facility monitoring, control, and response.

Certain facilities and areas require more rigor to prevent equipment damage and upset conditions to Flight Hardware and Flight Processing Facilities. These guidelines primarily focus on areas, see section 1.1, in which flight hardware processing is or is going to be taking place.

Good operating discipline ensures that facility configuration is maintained in accordance with design requirements and that the operating shift worker always knows the status of equipment and systems.

Requirements:

SETI:

All plant log entrees shall be entered into the SETI system. Plant operators shall follow logging Instructions spelled out in FAM-P-2019 section 4.0. Plant hard Log books shall be kept readily available to use should there be access issues with SETI.

Tracking of Equipment Status/Configuration (Equipment Status Log):

All equipment configuration changes, status changes and tracking shall be done in the SETI log.

Appendix B: Good Practices Guidelines (Cont)

- At a minimum, the SETI log will be utilized at the Utility Annex and the Industrial Area Chiller Plant,

- Any Hard Copy logs showing equipment status will be maintained in a hard binder. The Utility Annex will maintain a binder labeled "Control of Equipment and System Status" Log. The IACP logs will be maintained in a combined binder called "IACP Change Log" with a tab labeled as "Control of Equipment and System Status"
- Any Hard copy logs will use a standardized form for tracking equipment.

- Each Department Manager will be responsible for determining minimum equipment tracking defaults, to ensure equipment that could affect the safe and reliable operations of processing facilities will be known at all times.
- Any anomalous equipment/facility condition will be annotated in SETI.
- As part of the Technician turnover process between shifts, the Technicians shall review and discuss their normal log entries, screens, and all equipment status changes. Supervisors will review and discuss SETI log entries for the previous 24 hours.
- The SETI log will be used to track the following types of information:
    - Equipment out of service for repairs,
    - Equipment that is operable but has degraded operational performance and may require operating work-a-rounds,
    - Equipment that is being operated in an abnormal condition for whatever reason such as (bypass open, control valve in manual, speed controller in manual, operating in manual vs. remote/auto (HOA))
- Developing equipment/facilities issues should follow the standard Duty Office and Supervisor notification requirements. The Complex Control Center (CCC) C-2 console (867-2723 or JBAC over OIS) should also be notified of equipment/facility condition problems.

Maintaining Control over Set Points and Operating Parameters

- Deviation from automatic controls such as Manual Control override should be the exception and not the normal operating mode. Equipment operation in manual for short durations such as to stroke a component or test equipment after a PM, requires no special approval or action other than logging the manual operation in SETI (Reason for Manual mode, and restoration back into auto).
- Technicians should also take appropriate actions to respond to an upset condition, which in some cases may require performing manual operations. After initial upset condition response or the need for longer term manual operations the Supervisor and System Engineer must be contacted to discuss and approve any longer term manual control.
- For any items that will affect facility set points or involve manual operations, shall be reported to the CCC C-2 console and JSTC to notify the processing customer of the issue.
- Technicians shall log notification and approval of manual operations into SETI book.
- Change of operating set points shall be logged on the plant's control board and in the SETI log. All set point changes within the limits require notification to the System engineer. All set point changes that may fall outside of the limits will require Approval from the SE. See Flow chart notification/Approval process in Figure #1

Adverse Equipment/Facility Conditions/Anomalies Notification

- In Accordance With (IAW) with site procedures, response to warnings/alarms require Duty Office notification and Work Order generation. Notification requirements and level of investigation into system anomalies are ranked into three Technical Anomaly Levels (TAL).
  - TAL1 - Problems with well understood accepted causes are categorized as routine. The Shop Supervisor has the responsibility for final closure.
  - TAL2 anomalies are classified as non-routine problems that do not have any mission constraint. Repeat problems, adverse trends or significant technical issue are examples. The SE has the authority and responsibility to investigate and ensure that the problem is resolved and closed.
  - TAL3 anomalies are classified as non-routine problems that occur and have a potential mission constraint. Loss of temperature spec in a processing bay is an example. The Engineering Review Board is responsible for addressing these issues.

  See ENG-P-0027, *Technical Anomaly Event Disposition Process*, for further definition and examples by system.
- Adverse operating trends, warnings, and alarms require the Technicians to perform *enhanced operator monitoring* to prevent exceedance of allowable operating parameters, and prompt recovery from upset conditions. Enhanced monitoring includes: More frequent review of console screens, field walkdowns and verifications of operating conditions, monitoring for adverse trending, request for additional support, validation of equipment and equipment valve and switch alignments, etc. Follow plant procedure UTI-P-2001, section 2.2. for Operator/Tech requirements on responding to warnings/alarms.
- Processing Areas that receive alarms require immediate supervisor notification. Technicians should be prepared with the following minimum information when making notifications (Alarm/Alert status, current indications, length of alarm, trending conditions, known failures, actions taken to recover, recommendation for recovery)

Monitoring, trending, and response to warnings/alarms and indications

- The largest single safeguard in both safety and environmental compliance is the ability of the facility to remain in the automatic mode of control. Operation will normally be conducted in automatic mode with the Technicians closely monitoring the status of the process
- To minimize unnecessary alarms and shutdowns, Technicians shall monitor for parameters with trends, analysis, or values toward the extremes of the normal ranges, and then manually control the process as necessary to return the parameters to normal. Control in manual will be considered non-routine and not the preferred method of process control. Therefore, the time in manual mode should be minimized, returning process control to fully automatic mode as soon as possible
- Response to Indications: Personnel shall believe instrument readings and treat the instruments as accurate unless proven otherwise. Ignoring an unusual reading because the employee believes an instrument is faulty can cause abnormal conditions

to be undetected. Personnel shall check other indications, if possible, when unexpected readings are observed. Prompt action shall be taken to investigate the cause of abnormal or unexpected indications so that prompt corrective action can occur. When malfunctioning or inaccurate instruments are discovered, the instruments shall be appropriately identified with the initiation of a work order and logged in SETI. In situations of personnel doubt, personnel shall be instructed to take actions to achieve Facility, personnel and environmental safety.

- Technicians shall be alert and attentive to control panel indications warnings and alarms. Control panel indications shall be monitored frequently, and prompt action taken to determine the cause of and to correct abnormalities
- Emphasis shall be placed on closely monitoring and trending to detect problem situations early
- Technician response to warnings/alarms shall be prompt and actions shall be taken to address and correct the alarm causes. All reasonable actions shall be taken to clear alarm conditions. Alarms and enunciators shall not be disabled without initiating compensatory measures and receiving concurrence from Supervisor/System Engineering.
- Trending w/ Round Sheets: It is expected that when Technicians are logging readings that they also look at the previous shift's parameters/readings to determine if there are any adverse negative trends occurring. Unexplained/uncontrolled trends require operator actions which include; logging of negative trends in SETI, take appropriate actions to recover before a warning/alarm occurs, rovers should be utilized when additional field inspections are required to understand the causes for adverse trending, make notifications where appropriate.

APPENDIX C: IOZ CONTINGENCY GUIDELINES

IOZ Humidity out of Spec (Hi/Lo)

Primary Causes: Chilled or Hot water failure, Chilled or Hot water valve failure, Humidifier Failure/Abnormal Operation, Air Handling Unit (AHU) motor failure, control failure, facility operations such as door openings.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area is out of specification and associated equipment that serve the area.
3. CALL OPS DESK or (FM) to verify if any activities are occurring that may be causing negative trends/warning/alarms.
4. REVIEW IOZ – MAIN PAGE for initial assessment
5. ACCESS individual AHU screens to further review details regarding the specific operating unit by clicking the AHU button.
6. LOG any and all changes in SETI.

Low Humidity Condition	High Humidity Condition
REMINDER: If a WARNING/ALARM occurs OR troubleshooting steps do not stop negative humidity trend, then initiate required notifications to SUPV/ENG/Duty Office.	
a. At individual AHU Re-Circulation screens determine if humidifier is commanded to run (look for % amount)	a. At individual AHU Re-Circulation screens determine if humidifier is commanded to run (look for % amount)
b. IF Control System is calling for the humidifier to be on, but it is not, GENERATE WON & DISPATCH Technician to troubleshoot humidifier problem.	b. IF Control System is calling for the humidifier to be on, check to see if humidifier is disabled on if disabled on release manual override to allow humidifier to operate be SP. c. Check Humidity SP ensure it is set to control within High Bay requirements per the OA.
c. IF Control System is not calling for the humidifier to be on then • CHECK whether remaining AHUs humidifiers are operating • IF the other AHU humidifiers are commanded on and conditions are not	d. Check bay temp to ensure it is at or near SP. If lower than SP low air temp could cause saturation problem • Check chilled water modulating valves that they are in proper position and modulating

reversing then override the non-operating humidifier to activate. • MONITOR humidity % on IOZ – Main page to determine if manually starting the unit has begun to reverse the negative humidity trend condition.	• Dispatch Techs to field verify valve are modulating and not leaking by • Verify supply air temperature from the AHU Re-Circulating e. Manually OPERATE chilled water valve / hot water valve only as last resort. f. Field/Console VERIFY valve position
c2. If overriding the humidity command fails to reverse the trend generate won for HVAC techs to respond to check humidifier operation at AHUs.	g. CHECK IOZ chilled water temp ensure it is maintaining SP h. If not meeting SP check O&C bridge valve (V-5) operation. i. Check IOZ tertiary pumps (IOZ basement and IOZ west Mech room) for proper operation. j. If pumps are off command them to run. Dispatch techs if pumps fail to indicate run and trouble shoot failure k. . If troubleshooting steps fail to address negative trend/alarm. Engineering/MGMT support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION)
c3. If troubleshooting steps fail to address negative trend/alarm. Engineering/MGMT support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION).	

Appendix C: IOZ Contingency Guidelines (Cont)

IOZ Particulates out of Specification

Primary Causes: Loss of High Bay (Building) pressure, HEPA filter failure, loss of door seals or room/duct/AIRH enclosure boundary integrity (Doors) compromised, work event causing actual HI particulate problem, particle counter failure.

WARNING: Maintaining IOZ in a positive pressure condition is key in preventing particulate infiltration into the IOZ processing areas. DO NOT place the IOZ into a "Bottle-Up" state, in which ventilation is shut down and or dampers are secured to processing areas. Only under significant Emergency events conditions such as a fire in the High bay and direction to secure ventilation is given, should building HVAC be secured.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance have occurred or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. REVIEW IOZ – SUMMARY SCREEN and determine which sensor(s) are in warning/alarm (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) Note: just because only 1 sensor is in warning/alarm, is not basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.
3. CALL OPS DESK or (FM) to verify if any activities are occurring that may be causing negative trends/warning/alarms.
4. GENERATE WON & DISPATCH TECHNICIAN to the IOZ if determined by the operator.
5. TECHNICIAN: CHECK High Bay for signs of particle generations NOTE: Do not enter bay unless directed. (Smoke, dust, and other work occurring that could be generating high particle counts). IF no apparent causes of particles are found PREPARE to INSTALL backup particle counter in the same area as elevated particle counter to validate reading. NOTE: Do note enter bay unless directed *Note: This step is only to be performed if 1 particle counter is in a negative trend or alarm, and no other causes are found. A 2nd permanent installed particle counter that has trended high or in alarm is sufficient to validate another particle counter.* INSPECT operating AHU units for obvious signs of duct or enclosure compromises, and potential source of particulate intrusion.
6. TECHNICIAN CHECK door seals
7. CALL OPS DESK to verify door seal conditions
8. CHECK Bay pressure trending to determine if particulates are infiltrating though through failed seals
9. DEVELOP PLAN w/Engineering & management to troubleshoot and repair suspect unit.

Appendix C: IOZ Contingency Guidelines (Cont)

IOZ Hi/Lo Processing Area Temperatures

Primary Causes: Chilled water supply to IOZ loss, AHU Unit(s) failure, chilled/hot water control valve failure, Hot water/Boiler upset conditions, IOZ Chilled or hot water pump failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been disabled. Restore to previous configuration where possible to restore normal operating specifications and help identify cause.
2. REVIEW IOZ – SUMMARY SCREEN and determine which sensor(s) are in warning/alarm or in an adverse trend (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?)

   Note: just because only 1 sensor is in alarm, is not basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.
3. CALL IOZ OPS DESK to determine if area has been upset by user activities (i.e. doors open, testing, etc…). Direct customer to restore local configuration to recover from upset specification.
4. ACCESS IOZ – MAIN PAGE to determine which equipment is operating in the area affected
5. VERIFY that individual Air Handler Units (Re- Circ and Outside Air) set points, control variables are appropriate for the current condition. Compare temperature sensor against other area sensors to assess whether temperature condition may be caused by a bad temperature transmitter/element.
6. INITIATE notification requirements.
7. IF previous actions have not corrected temperature conditions then perform the following additional troubleshooting actions.
   a. Check individual AHU chilled water / hot water temperatures. Review sensors to determine if the temperature problem is tied to a localized area within the processing bay to focus on individual AHU units, or whether the entire bay is showing temperature problems to focus troubleshooting on the chilled water/hot water temperature control.

Appendix C: IOZ Contingency Guidelines (Cont)

Low Temperature	High Temperature
Chilled Water / Hot Water Loop Troubleshooting	**Verify proper Chilled Water temperature/flow to AHUs.**
1. Check entire hi-bay area to determine if upset condition is trending low or if isolated to one area.	1. Check for proper chilled water flow/temperature is occurring by reviewing IACP Plant CHW Flow screen and Building pump screen.
2. Verify HWS temperatures (normal range is at or > 140° F) by contacting Boiler Plant operator at the UA. If temps are low have Boiler operator generate a won and dispatch Boiler tech to trouble shoot.	2. Verify V-5 bridge valve is operational generate won and dispatch tech if found non-operational.
3. If entire bay is low click the individual AHU buttons to view Hot Water off coil temps.	3. If no CHW flow is found, check O&C tertiary pumps for proper operation. If flow is good check chilled water temps to ensure temp is at or near set point.
4. Verify if AHU HW/CHW valves are responding check % open.	4. If unable to reverse water temp increase consult Engineering/MGMT to determine if load shedding is appropriate. LOAD SHED based upon specific technical/management direction.
5. Check space temp and supply temp request for heat at individual AHU screens	**Air Handler Unit Troubleshooting**
6. Low temp verify proper % on chilled water valves	1. Access IOZ – Main Page Screen, and review the following parameters: Is temp excursion isolated to one area or is it the entire High Bay
7. Check for flow or leakage – field verification by tech may be required.	2. Based on area of concern go to the individual AHU screens and monitor discharge air temperature on AHU to determine if HW valve is operating properly or leaking by. If valve is leaking by generate a won to dispatch a technician to trouble shoot/ or manually close off the HW valve if unable to gain control of valve.

	3a. Override CHW valve to try to achieve discharge air set point. 3b. Send tech to verify CHW valve operation if it has not responded.
	4. If troubleshooting steps fail to address negative trend/alarm. Contact Engineering/MGMT for support and direction for actions.

APPENDIX D: PHSF CONTINGENCY GUIDELINES

Purpose: To provide first response guidelines for PHSF unsatisfactory payload environmental conditions (Temperature, Particulates, and Humidity

Affected Personnel: Utilities Branch Manager, HVAC Supervision, HVAC Technicians/Operators

Introduction:

Due to the complex & dynamic nature of the PHSF HVAC system, these contingency guidelines have been developed to aid the HVAC Operators in responding to adverse PHSF operating trends or out of specification conditions, to ensure prompt corrective actions are taken to place the PHSF HVAC system back into a stable and compliant operating condition.

Scope:

It is neither realistic nor the intent of these guidelines to define every possible contingency scenario response action that could occur at the PHSF. The three most important environmental parameters (Humidity, Temperature, Particulates) for the payload customer were used when developing the following guidelines. The guidelines are built upon the most probable areas for failure and build upon those failures to narrow down locations and response actions.

Technicians should refer to this section when troubleshooting and implementing corrective actions to place the HVAC parameters back into control but also must use thinking compliance & technical inquisitiveness when doing so, through additional monitoring of warnings/alarms & operating parameters, Technician feedback, and ongoing work activities. If data shows that different or additional actions should be taken beyond what is contained within these guidelines, HVAC operators should take the appropriate technical actions and notify Supervision in near real time.

Requirements:

- Update contingency guidelines as system changes occur (software or hardware)
- Provide training on contingency guidelines, and technical basis for recommended response actions
- Utilize Contingency Guidelines during PHSF upset conditions unless system configuration or other technical data necessitates different actions than what is contained in the guidelines
- Return system configuration to normal operations as soon as possible

APPENDIX E: PHSF HUMIDITY OUT-OF-SPEC (HI/LO)

Primary Causes: Bad Damper Positions, Chilled or Hot water failure, Chilled or Hot water valve failure, Humidifier Failure/Abnormal Operation, AHU motor failure, software failure, facility operations such as door openings.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area is out of specification
3. CALL OPS DESK or (FM) to verify if any activities are occurring that may be causing negative trends/warning/alarms.
4. IDENTIFY equipment serving the area of the warning/ alarm
5. REVIEW OVERVIEW SCREEN (PHSF/PHSF_ROUNDS) for initial assessment
6. ACCESS individual AHU screens to further review details regarding the specific operating unit by clicking the AHU button.
7. LOG any and all changes in SETI.

Low Humidity Condition	High Humidity Condition
REMINDER: If a WARNING/ALARM occurs OR troubleshooting steps do not stop negative humidity trend, then initiate required notifications to SUPV/ENG/Duty Office.	
a. Access PHSF\PHSF\HUMID screen	a. Compare AHU RA RH with IEMS reading, if RA RH sensor reads 40% or lower vs the IEMS readings override RA RH to a setting above SP to stop humidifier.
b. VERIFY humidifier is activated on. Verify water and air is activated ON. • IF humidifier is not activated on, Activate to ON. VERIFY MODE is ON, • IF mode is OFF, compare Set point (SP) to RA duct RH sensor. (Note humidity control sensor is located in the RA duct for each AHU).	b. If both IEMS and the RA RH sensor are within 2% create won to dispatch Techs c. VERIFY humidifier is not operating (Humidifier should be showing not active). IF humidifier is operating, disable to not active. Verify that Water and Air are in the non-active state.
c. IF Control System is calling for the humidifier to be on, but it is not, GENERATE WON & DISPATCH Technician to troubleshoot humidifier problem.	d. VERIFY PCC air off-coil temperature is maintained at or below (65 deg. Or below) on individual **Air Handler Units**. • VERIFY chilled water valve position on PCC AHU. • VERIFY dampers.

	• GENERATE WON and DISPATCH Technicians to begin field checks on strainers / valve positions and dampers.
d. Verify Water valve & Air valve are operating and flowing to spray nozzles.	e. Check bay temp to ensure it is at or near SP if lower than SP low air temp could cause saturation problem.
f. IF Control System is not calling for the humidifier to be on then • CHECK whether remaining AHUs humidifiers are operating • IF the other AHU humidifiers are activated on and conditions are not reversing then override the non-activated humidifier to activate. • MONITOR humidity % on screen (PHSF/PHSF_ROUNDS) to determine if manually starting the unit has begun to reverse the negative humidity trend condition.	• Check chilled water modulating valves that they are in proper position and modulating • Dispatch Techs to field verify valve are modulating and not leaking by • Verify supply air temperature from the AHU and VU *(Low supply air temp could cause saturation problem)*
g. If troubleshooting steps fail to address negative trend/alarm. Engineering/MGMT support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION)	f. CHECK to see that unit is in **OpsHumModulating = Dehumidification)** mode. If not lower Ops RA tSpt by changing the dHum SP valve to initiate the dHum mode.
	g. Manually OPERATE chilled water valve / hot water valve only as last resort.
	h. Field/Console VERIFY damper/valve positions (ENSURE dampers and valves are in proper positions)
	i. If troubleshooting steps fail to address negative trend/alarm. Engineering/MGMT support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION)
	j. CHECK PHSF chilled water temp ensure it is maintaining SP

	k. If not meeting SP switch to other Chiller dispatch tech to trouble shoot secured chiller.
	l. Check primary and secondary chilled water pump status, only one pump is required for operations.

APPENDIX F: PHSF PARTICULATES OUT-OF-SPECIFICATION

Primary Causes: Loss of High Bay (Building) pressure, HEPA filter failure, loss of door seals or room/duct/AIRH enclosure boundary integrity (Doors) compromised, work event causing actual HI particulate problem, particle counter failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area(s) have negative trends or are in warning/alarm states
3. REVIEW (PHSF/PHSF ROUNDS) SCREEN, and determine which IEMS sensor(s) are in warning/alarm (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) *Note: just because only 1 sensor is in warning/alarm, is not basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.*
4. INITIATE notification requirements IAW /UTI-P-2001/SMA-P-0016
5. GENERATE WON & DISPATCH Technician to the PHSF
6. TECHNICIANS CHECK the analog Magnahelic gauge through the observation window.
7. TECHNICIANS CHECK High Bay for signs of particle generations NOTE: Do not enter bay unless directed. (Smoke, dust, and other work occurring that could be generating high particle counts). IF no apparent causes of particles are found PREPARE to INSTALL backup particle counter in the same area as elevated particle counter to validate reading. NOTE: Do note enter bay unless directed

Note: This step is only to be performed if 1 particle counter is in a negative trend or alarm, and no other causes are found. A 2nd permanent installed particle counter that has trended high or in alarm is sufficient to validate another particle counter.

8. TECHNICIANS INSPECT operating AHU units for obvious signs of duct or enclosure compromises, and potential source of particulate intrusion.
9. TECHNICIANS CHECK door seals
10. CALL Facility Manager 867-0947 to verify door seal conditions
11. CHECK Bay pressure trending (observe magnahelic gauge via observation window) to determine if particulates are infiltrating though through failed seals
12. DEVELOP PLAN with Engineering & management to troubleshoot and repair suspect unit.

WARNING: *Maintaining PHSF in a positive pressure condition is key in preventing particulate infiltration into PHSF processing areas. DO NOT place the PHSF into a "Bottle-Up" state, in which ventilation is shut down and or dampers are secured to processing areas. Only under significant Emergency events conditions such as a fire in the High bay and direction to secure ventilation is given, should building HVAC be secured.*

APPENDIX G: PHSF HI/LO PROCESSING AREA TEMPERATURES

Primary Causes: Chiller shutdown/Chilled water supply to PHSF loss, AHU Unit(s) failure, chilled/hot water control valve failure, Hot water/Boiler upset conditions, PHSF Chilled or hot water pump failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance have occurred or any systems/components have been disabled. Restore to previous configuration where possible to restore normal operating specifications and help identify cause.
2. REVIEW (PHSF/PHSF ROUNDS) SCREEN, and determine which IEMS sensor(s) are in warning/alarm or in an adverse trend (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) *Note: just because only 1 sensor is in alarm, is not basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.*
3. CALL PHSF Facility Manager (867- 0947) to determine if area has been upset by user activities (i.e. doors open, testing, etc…). Direct customer to restore local configuration to recover from upset specification.
4. ACCESS (PHSF/PHSF_EMS) to determine which equipment is operating in the area affected
5. VERIFY that individual Air Handler Units set points, control variables are appropriate for the current condition. Compare Andover temperature sensor against IEMS to assess whether temperature condition may be caused by a bad temperature transmitter/element.
6. INITIATE notification requirements IAW UTI-P-2001/SMA-P-0016
7. IF previous actions have not corrected temperature conditions then perform the following additional troubleshooting actions.
8. CHECK individual AHU chilled water / hot water temperatures. Review IEMS sensors to determine if the temperature problem is tied to a localized area within the processing bay to focus on individual AHU units, or whether the entire bay is showing temperature problems to focus troubleshooting on the chilled water/hot water temperature control.

Appendix G: PHSF Contingency Guidelines (Cont)

Low Temperature	High Temperature
a. **Chilled Water / Hot Water loop Troubleshooting**	a. **Verify proper Chilled Water temperature/flow to AHUs**
b. Check entire hi-bay area to determine if upset condition is trending low or if isolated to one area.	b. Check for proper chilled water flow/temperature AT PHSF is occurring.
c. Verify HWS temperatures (normal range **is at or > 105° F).**	c. Verify Chiller is operational
d. **If entire bay is low click the PHSF\PHSF_ROUNDS to view Hot Water pumps and verify pump is operational if not - open WON, dispatch Boiler tech to access and restart.**	d. If no CHW flow is found, rotate to redundant pump. Note manual rotation of building pumps is required dispatch tech to perform on site. If loss of flow occurs on the building pumps Andover will initiate an Auto shut down of all AHUs
e. Verify if AHU valves are responding check % open.	e. If flow is good check chilled water temps ensure temp is at or near set point. If not rotate to idle chiller. Dispatch tech to trouble shoot secured chiller.
f. Check space temp and supply temp request for heat at individual AHU screen	f. Consult Engineering/MGMT to determine if load shedding is appropriate. LOAD SHED based upon specific technical/management direction.
g. Low temp verify proper % on chilled water valves	g. **Air Handler Unit Troubleshooting**
h. Check for flow or leakage – field verification by tech.	h. Access PHSF/PHSF_ROUNDS High Bay Screen and review the following parameters: Comparison between: Space/Supply/PCC air temperatures valve position and IEMS sensors.
i. Check program line on individual AHU.	i. Determine if the AHU program is in Modulating, Temperature or Dehumidification to determine what program mode the system is operating in.
j. Note: For Temperature problems involving the Hot water system, review Boiler system alarms to determine appropriate recovery actions to take.	j. Monitor discharge temperature on PCC to determine if discharge temperature is at or below 65°.
	• If space temperature does not match IEMS sensors, suspect temperature transmitter/element have tech verify space temperature and IEMS sensor with

	TESTO meter. Permission to enter is required before entering.
	k. Based on area of concern go to AHU screen and monitor discharge air temperature on AHU to determine if HW valve is operating properly or leaking by. If valve is leaking by send a technician to manually close off the HW valve. If OK go to PCC.
	l. Verify that the PCC program is in modulating mode. • Verify that the PCC is modulating and controlling to correct discharge air temp at or below 65°. • Override CHW valve to try to achieve discharge air set point • Verify PCC damper is open • Send tech to verify CHW valve operation if it has not responded • Send technician to verify PCC damper position • Notify SME/Supervisor if system is not responding.
	m. From PHSF/PHSF_ROUNDS high bay screen verify pump status one pump should be sufficient per area.
	n. Compare supply and return water temperature to verify flow by delta-T temperature difference should be greater than 5 degrees.
	o. If not correct need to send technician to check strainer and verify proper valve configuration and then verify pump is running. SWAP to alternate or backup pump if needed.

APPENDIX H: PHSF HAZARDOUS VAPOR DETECTION SYSTEM (HVDS) CONTINGENCY GUIDELINES FOR AMMONIA OPERATIONS

NOTE: The following only applies during operations.

Primary Causes: Commodity leak inside high bay. Ammonia (NH3) Component failure.

Operator Response Actions During Ammonia Operations: During ammonia operations there will be an operator on station via OISM or another communications network. In the event of an HVDS ammonia warning for 25.0 ppm or an alarm for 50.0 ppm the operator shall:

1. Immediately shut down AHUs 1 & 2 for the high bay via the AHU screens by disabling the Occupancy bit to “Off”. This does NOT include the airlock.
2. Operator shall make notification of action to Test Team leader.
3. Operator shall await further instructions from the Test Team Leader via the communications net. AHUs 1 & 2 shall not be restarted unless instructed to by Test Team Leader. No additional notifications are required.
4. Follow instructions given by the test team via the communications net. NOTE: operator should be prepared to have to restart AHUs 1 & 2 in “OA Mode” as directed by Test Team Leader.

NOTE: The following only applies during NON-operations

Primary Causes: Commodity leak inside high bay. Ammonia (NH3) Component failure (false alarm).

Operator Response Actions during non-operations: In the event of an HVDS ammonia warning for 25.0 ppm or an alarm for 50.0 ppm the operator shall:

1. Immediately shut down AHUs 1 & 2 for the high bay via the AHU screens by disabling the Occupancy bit to “Off”. This does NOT include the airlock.
2. Notify the Duty Office (1-5050) and ask them to make the appropriate notifications. .
3. Follow instructions given by the Duty Office. NOTE: operator should be prepared to have to restart AHUs 1 & 2 in “OA Mode” as directed by Test Team Leader.

NOTE: The following only applies during operations

Primary Causes: Commodity leak inside high bay.

Operator Response Actions during ammonia operations: During ammonia operations there will be an IACP operator on station via OISM or another communications network. In the event of a HVDS ammonia alarm the operator shall:

Appendix H: PHSF HVDS Contingency Guidelines (Cont)

1. Immediately shut down all AHUs for the high bay. This does NOT include the airlock.
2. Operator shall await further instructions from the test team leader via the communications net. No additional notifications are required.
3. Follow instructions given by the test team via the communications net.

NOTE: The following only applies during NON-operations

Primary Causes: Commodity leak inside high bay.

Operator Response Actions during non-operations: In the event of a HVDS ammonia alarm the operator shall:

1. Immediately shut down all AHUs for the high bay. This does NOT include the airlock.
2. Notify the Duty Office (1-5050) and ask them to activate the call tree.
3. Follow instructions given by the Duty Office.

APPENDIX I: SSPF HVAC CONTINGENCY GUIDELINES

Purpose: To provide first response guidelines for SSPF unsatisfactory payload environmental conditions (Temperature, Particulates, and Humidity).

Affected Personnel: Utilities Branch Manager, HVAC Supervision, HVAC Technicians/Operators.

Reference: SSPF HVAC Contingency Guidelines

Introduction:

Due to the complex & dynamic nature of the SSPF HVAC system, these contingency guidelines have been developed to aid the HVAC Operators in responding to adverse SSPF operating trends or out of specification conditions, to ensure prompt corrective actions are taken to place the SSPF HVAC system back into a stable and compliant operating condition.

After all SSPF HVAC hardware and software upgrades/projects are completed, these contingency guidelines shall be updated.

Scope:

It is neither realistic nor the intent of these guidelines to define every possible contingency scenario response action that could occur at the SSPF. The three most important environmental parameters (Humidity, Temperature, Particulates) for the payload customer were used when developing the following guidelines. The guidelines are built upon the most probable areas for failure and build upon those failures to narrow down locations and response actions.

Technicians should refer to this procedure when troubleshooting and implementing corrective actions to place the HVAC parameters back into control but also must use thinking compliance & technical inquisitiveness when doing so, through additional monitoring of warnings/alarms & operating parameters, Technician feedback, and ongoing work activities. If data shows that different or additional actions should be taken beyond what is contained within these guidelines, the HVAC operators should take the appropriate technical actions and notify Supervision in near real time.

Requirements:

- Update contingency guidelines as system changes occur (software or hardware)
- Provide training on contingency guidelines, and technical basis for recommended response actions
- Utilize Contingency Guidelines during SSPF upset conditions unless system configuration or other technical data necessitates different actions than what is contained in the guidelines
- Return system configuration to normal operations as soon as possible

APPENDIX J: SSPF HUMIDITY OUT-OF-SPEC (HIGH/LO)

Primary Causes: Bad damper positions, Chilled or Hot water loop failure, Chilled or Hot water valve failure, Humidifier(s) failure/abnormal operation, AHU motor failure, software failure, facility operations such as door openings.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to reestablish normal operating specifications and help identify cause.
2. DETERMINE which area is out of specification
3. CALL OPS DESK (867-5800) to verify if any activities are occurring that may be causing negative trends/warning/alarms.
4. IDENTIFY equipment serving the area of the warning/alarm

   (Note: No IMS sensors for AHU 15/17 and will require use of surrounding equipment/areas to determine problem)
5. REVIEW overview screen SSPF.03HIBAY for initial assessment
6. ACCESS individual AHU screen to further review details regarding the specific operating unit
7. NOTE: Low humidity warnings/alarms for the Hardware Inspection area only require notification to the Duty Office. Continue to monitor and provide updates when requested.

Appendix J: SSPF Contingency Guidelines (Cont)

Low Humidity Condition	High Humidity Condition
REMINDER: If a WARNING/ALARM occurs OR troubleshooting steps do not stop negative humidity trend, then initiate required notifications to SUPV/ENG/Duty Office.	
a. From the SSPF.03HIBAY screen click the "Humidifiers" button to VERIFY the humidifiers are operating (Humidifier should be showing outputs greater than 0%)	a. From the AHU screen VERIFY humidifier <u>is not</u> operating (Humidifier should be showing standby and output should be 0%). IF humidifier is operating, disable to zero percent output.
b. IF humidifiers are not operating, VERIFY whether the control system is calling for its operation by comparing set point (SP) to % output or actual humidity at the space sensor. If space humidity does not match IEMS sensors, suspect humidity transmitter/element have tech verify space humidity with TESTO meter.	b. VERIFY makeup air off-coil temperature is maintained at or below SP (55 deg. Or below) • VERIFY chilled water valve position on makeup MAU. • VERIFY MAU damper to active recirc AHU is open and MAU damper to inactive recirculated AHU is closed. • If conditions have not changed GENERATE WON, and DISPATCH Technicians to begin field checks on strainers / valve positions and dampers.
c1. IF Control System is calling for the humidifier to be on, but you are still in a negative trend in the space, GENERATE WON & DISPATCH Technician to troubleshoot humidifier problem. c2. IF Control System is not calling for the humidifier to be on then:	c. Verify supply air temperature from the recirc AHU *(Low supply air temp could cause saturation problem).* • CHECK to see that unit is in MODULATING mode FMRP.03\AHU#___. IF MODULATING mode cannot be verified ROTATE to alternate AHU.
• CHECK whether remaining AHUs humidifiers are operating	• If alternate AHU is not available DISABLE and manually OPERATE chilled water valve / hot water valve only as last resort.
• IF the other AHU humidifiers are on from high bay screen click humidifier button "SSPF.03humidity", then DISABLE non-operating humidifier ON and set desired percent output (if there are two humidifiers disable both to desired value).	• Field/Console VERIFY damper/valve positions (ENSURE dampers and valves for offline and operating units are in proper positions) • Rotation will only work for High Bay, not airlock).
• MONITOR instantaneous humidity % on screen SSPF.03Hibay to determine if manually starting the unit has begun to	d. CHECK SSPF Bridge Valve (Main SSPF chilled water valve). MANUALLY throttle in field if valve control from console is not functioning.

reverse the negative humidity trend condition.	
• DISPATCH Technician to field to aid in trouble shooting if system is not responding properly.	• MONITOR building chilled water temperature “SSPF.03highbay”.
c. Consider rotating to redundant recirculating AHU with an operable humidifier.	
d. If troubleshooting steps fail to address negative trend/alarm. Engineering/Mgt support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION)	
e. If all system checks prove the system is running normally, CONSIDER STARTING the redundant AHU for the area, if available, to help increase humidity output.	

APPENDIX K: SSPF PARTICULATES OUT OF SPECIFICATION

***WARNING**: Maintaining SSPF in a positive pressure condition is key in preventing particulate infiltration into SSPF processing areas. DO NOT place the SSPF into a "Bottle-Up" state, in which ventilation is shut down and or dampers are secured to processing areas. Only under significant Emergency events conditions such as a fire in the High bay and direction to secure ventilation is given, should building HVAC be secured.*

Primary Causes: Loss of High Bay (Building) pressure, HEPA filter failure, loss of door seals or room/duct/AIRH enclosure boundary integrity (Doors) compromised, work event causing actual HI particulate problem, particle counter failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area(s) have negative trends or are in warning/alarm states
3. REVIEW SSPF.04IEMS SCREEN and determine which IEMS sensor(s) are in warning/alarm (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?)

   Note: just because only 1 sensor is in warning/alarm, is not basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.
4. INITIATE notification requirements IAW /UTI-P-2001/SMA-P-0016
5. GENERATE WON & DISPATCH Technician to the SSPF Hi Bay
6. TECHNICIANS CHECK High Bay for signs of particle generations (Smoke, dust, crane Ops/Maint, HB battery charging off-gassing, and other work occurring that could be generating high particle counts). IF no apparent causes of particles are found PREPARE and INSTALL backup particle counter in the same area as elevated particle counter to validate reading.

   Note: This step is only to be performed if 1 particle counter is in a negative trend or alarm, and no other causes are found. A 2nd permanent installed particle counter that has trended high or in alarm is sufficient to validate another particle counter.
7. TECHNICIANS INSPECT mechanical equipment room and operating AHUs for obvious signs of duct or enclosure compromise, and potential source of particulate intrusion.
   - CHECK Individual AHUs Magnehelic (Readings available on the control screens or locally at each AHU) that monitor the HEPA filter DP, to determine if possible breakthrough has occurred.

Appendix K: SSPF Contingency Guidelines (Cont)

- ROTATE to a backup AHU if HEPA filter DP readings are abnormal, indicating a potential HEPA filter failure. This will allow sufficient time to research previous Magnehelic readings and perform full HEPA filter inspections.

8. SWAP to alternate AHU unit.
   - START alternate AIRH unit
   - SHUTDOWN suspect AIRH unit
   - VERIFY both units are in normal Operating and Shutdown alignment
9. DEVELOP PLAN with Engineering & Mgt to troubleshoot and repair suspect unit
10. TECHNICIANS CHECK High Bay door seals
    - CALL OPS DESK to verify door seal conditions
    - CHECK Bay pressure trending (PT2 & PT6) to determine if particulates are infiltrating though through failed seals

APPENDIX L: SSPF HI/LO PROCESSING AREA TEMPERATURES

Primary Causes: Chiller Plant shutdown/Chilled water supply to SSPF loss, AHU Unit(s) failure, chilled/hot water control valve failure, Bridge Valve failure, Hot water/Boiler upset conditions, SSPF Chilled or hot water pump failure to Zone(s), or hot water primary pump #57 or #58 failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been disabled. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. REVIEW SSPF.03HIBAY SCREEN and determine which IEMS sensor(s) are in warning/alarm or in an adverse trend (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) *Note: just because only 1 sensor is in alarm, is not basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.*
3. CALL SSPF OPS DESK (867-5800) to determine if area has been upset by user activities (i.e. doors open, testing, etc…). DIRECT customer to restore local configuration to recover from upset specification. Due to recent changes in Ops Desk coverage (Weekday hours only), if the Ops desk does not answer CONTACT the Facility Manager of the issue.
4. ACCESS “SSPF.03HIBAY” SCREEN to determine which equipment is operating in the area affected.
5. VERIFY that individual Air Handler Units are modulating to achieve desired set points. COMPARE Andover temperature sensor against IEMS to ASSESS whether temperature condition may be caused by a bad temperature transmitter/element.
6. IF there is a clear indication of an AHU that is not showing proper air conditioning, then ROTATE equipment to the backup Air Handler Unit (startup backup unit first, then shutdown suspect unit).
7. VERIFY Air Handler Unit equipment rotation begins to resolve adverse trend.
8. INITIATE notification requirements IAW UTI-P-2001/SMA-P-0016
9. IF previous actions have not corrected temperature conditions then CHECK individual AHU chilled water / hot water temperatures. REVIEW IEMS sensors to determine if the temperature problem is tied to a localized area within the processing bay to focus on individual AHU units, or whether the entire bay is showing temperature problems to focus troubleshooting on the chilled water/hot water temperature control loops

Appendix L: SSPF Contingency Guidelines (Cont)

Low Temperature	High Temperature
Chilled Water / Hot Water loop Troubleshooting	**Verify proper Chilled Water temperature/flow to AHUs.**
a. CHECK entire hi-bay area to determine if upset condition is trending low or if isolated to one area.	a. CHECK IACP flow screen to DETERMINE if proper chilled water flow/temperature to the SSPF is occurring.
b. VERIFY HWS temperatures (normal range is 140 deg F to 180 deg F).	b. IF CHW Supply temperature to SSPF is found to be less than 40 degrees F., INCREASE bridge valve % open to feed more chilled water to the SSPF.
c. If entire bay air temperature is low, CLICK boiler button to VERIFY boilers and main pumps operation. IF failure is found, GENERATE WON, RESTART equipment, and DISPATCH Technician.	c. VERIFY increased SSPF chilled water flow results in appropriate temperature changes in required areas.
d. VERIFY if mixing valves at pump stations are responding. CHECK % open. e. Note: For Temperature problems involving the Hot water system, review Boiler system alarms to determine appropriate recovery actions to take.	d. If no improved temperature response is achieved DISPATCH Technicians to MANUALLY OPEN the bridge valve (Assumes bridge valve controller/linkage has failed).
f. VERIFY HWS Flow GPM (normal range is 120-155 GPM with one pump). ROTATE to alternate pump if abnormal flow is identified. INITIATE WON for suspect pump.	e. VERIFY Chilled water flow to SSPF increases when bridge valve is manually throttled opened.
g. If HWS Temp & Flow are normal, CHECK zones from SSPF.03HIBAY Main rounds screen. CLICK “HW Loop” button to verify Zone Temperatures and Pumps. One pump should be sufficient per zone.	f. If chilled water temperature/flow to SSPF is still a problem, REVIEW IACP plant operating conditions, and TAKE plant ACTIONS where appropriate.
h. ACCESS SSPF.03 High Bay Screen to VERIFY if hot water valves are enabled or disabled. Enable is BLUE, Disable is RED. For normal operations the valves should be enabled. If deficient condition, then RE-ENABLE.	g. CONSULT with Engineering/Mgmt to determine if load shedding is appropriate. LOAD SHED based upon specific technical/management direction.
i. VERIFY if AHU valves are responding, CHECK % open.	**Air Handler Unit Troubleshooting** (Actions to be taken if redundant AHU is unavailable for swap over)
j. CHECK space temp and supply temp request for heat at individual AHU screen.	a. ACCESS SSPF.03 High Bay Screen and REVIEW the following parameters: Comparison between: Space/Supply/Makeup air temperatures valve position and IEMS sensors.

k. VERIFY proper % on chilled water valves.	b. DETERMINE if the HB recirculating AHU program is in Standby or Modulating, to DETERMINE what program mode the system is operating in.
l. CHECK for flow or leak on CHW valves – FIELD VERIFICATION by Tech	c. MONITOR discharge temperature on MAU to determine if discharge temperature is within 3 deg F. of matching the set point.
m. CHECK program line on individual AHU. (SPACETEMP CNTRL)	d. If space temperature does not match IEMS sensors, SUSPECT temperature transmitter/element & have Tech VERIFY space temperature and IEMS sensor with TESTO meter.
	e. Based on area of concern ACCESS AHU screen and MONITOR discharge air temperature on recirculating AHU to DETERMINE if HW valve is operating properly or leaking by. If valve is leaking by send a Technician to MANUALLY CLOSE off the HW valve.
Verify damper position on high bay AHU	f. Verify that the MAU program is in modulating mode.
a. CHECK that exhaust dampers are closed except AHU #17 & #19 (1 should be open & 1 should be closed).	g. VERIFY MAU damper is open.
b. CHECK outdoor air dampers and field VERIFY closed.	• VERIFY that system is modulating and controlling to correct discharge air temp (<u>range is 48 to 60 degrees. COMPARE set point to supply air temperature)</u>
c. If troubleshooting steps fail to address negative trend/alarm. REQUEST Engineering/Mgt support to recommend next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION).	• OVERRIDE CHW valve to achieve 48-degree supply air temp. • DISPATCH Tech to VERIFY CHW valve operation IF temperature has not responded to previous override.
	• DISPATCH Tech to verify MAU damper position. • NOTIFY SE/Supervisor if system is not responding.
	h. From SSPF.03 high bay screen ACTIVATE CHW Pumps button and VERIFY zone pump status. One pump should be sufficient per zone.
	i. COMPARE supply and return water temperature to VERIFY flow by delta-T temperature difference which should be less than 20 degrees F.

	j. If not correct DISPATCH Tech to CHECK strainer and VERIFY proper valve configuration, then VERIFY pump is running. SWAP to alternate or backup pump if needed.

APPENDIX M: LASF Contingency Guidelines

Purpose: To provide first response guidelines for HVAC Operator during unsatisfactory High Bay environmental conditions (Temperature and Humidity) at the LASF.

Affected Personnel: Utilities Branch Manager, HVAC Supervision, HVAC Technicians/Operators

Introduction:

These contingency guidelines have been developed to aid the HVAC Operators in responding to adverse LASF operating trends or out of specification conditions, to ensure prompt corrective actions are taken to place the LASF HVAC system back into a stable and compliant operating condition. Note: At the LASF there are no particle counters that are remotely monitored at the IACP. The user will be responsible for any setup and location of the particle counter instruments if necessary, per the Operational Agreement (OA).

Scope:

It is neither realistic nor the intent of these guidelines to define every possible contingency scenario response action that could occur at the LASF. The guidelines are built upon the most probable areas for failure and build upon those failures to narrow down locations and response actions.

Technicians should refer to this section when troubleshooting and implementing corrective actions to place the HVAC parameters back into control but also must use thinking compliance & technical inquisitiveness when doing so, through additional monitoring of warnings/alarms & operating parameters, Technician feedback, and ongoing work activities. If data shows that different or additional actions should be taken beyond what is contained within these guidelines, HVAC operators should take the appropriate technical actions and notify Supervision in near real time.

Requirements:

- Update contingency guidelines as system changes occur (software or hardware)
- Provide training on contingency guidelines, and technical basis for recommended response actions
- Utilize Contingency Guidelines during LASF upset conditions unless system configuration or other technical data necessitates different actions than what is contained in the guidelines
- Return system configuration to normal operations as soon as possible

Appendix M: LASF Contingency Guidelines (Cont)

LASF HUMIDITY OUT-OF-SPEC (HI/LO)

Primary Causes: Bad Damper Positions, Chilled or Hot water failure, Chilled or Hot water valve failure, Humidifier Failure/Abnormal Operation, AHU motor failure, software failure, facility operations such as door openings.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area is out of specification
3. CALL OPS DESK or (FM) to verify if any activities are occurring that may be causing negative trends/warning/alarms.
4. IDENTIFY equipment serving the area of the warning/ alarm
5. REVIEW OVERVIEW SCREEN (LASF_ROUNDS) for initial assessment
6. ACCESS individual AHU screens to further review details regarding the specific operating unit by clicking the AHU button.
7. LOG all changes in SETI.

Low Humidity Condition	High Humidity Condition
REMINDER: If a WARNING/ALARM occurs OR troubleshooting steps do not stop negative humidity trend, then initiate required notifications to SUPV/ENG/Duty Office.	
a. At individual AHU determine if humidifier is commanded to run (look for % amount)	a. At individual AHU determine if humidifier is commanded to run (look for % amount)
b. IF Humidifier Control System is calling for the humidifier to be on, but it is not, GENERATE WON & DISPATCH Technician to troubleshoot humidifier problem.	b. IF Control System is calling for the humidifier to be on, check to see if humidifier is disabled on. If disabled on, release manual override to allow humidifier to operate by Set Point (SP). c. Check Humidity SP ensure it is set to control within High Bay requirements per the OA.
• Verify demineralized filter water source for flow. • Check Humidifier Heating element and associated safeties.	d. Check bay temp to ensure it is at or near SP (Bay air temperature below SP could cause saturation problem) e. Verify chilled water and Hot water control valves are in proper position and modulating. • Dispatch Techs to field verify valves are modulating and not leaking by.

	f. Verify supply air temperature from the Outside Air Units (OAU) and Recirculating AHUs g. Manually OPERATE chilled water valve/hot water valve only as last resort. h. Field/Console VERIFY valve positions agree.

Appendix M: LASF Contingency Guidelines (Cont)

LASF HIGH/LO PROCESSING AREA TEMPERATURES

Primary Causes: Chiller shutdown/Chilled water supply to LASF loss, AHU Unit(s) failure, chilled/hot water control valve failure, Hot water/Boiler upset conditions, Chilled or Hot water pump failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance have occurred, or any systems/components have been disabled. Restore to previous configuration where possible to restore normal operating specifications and help identify cause.
2. REVIEW (LASF_ROUNDS) SCREEN, and determine which IEMS sensor(s) are in warning/alarm or in an adverse trend (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) *Note: Only 1 sensor in alarm, is not a basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.*
3. CALL LASF Facility Manager to determine if area has been upset by user activities (i.e. doors open, testing, etc…). Direct customer to restore local configuration to recover from upset specification.
4. ACCESS (LASF_EMS) to determine which equipment is operating in the area affected.
5. VERIFY that individual Air Handler Units set points, control variables are appropriate for the current condition. Compare Andover temperature sensor against IEMS to assess whether temperature condition may be caused by a bad temperature transmitter/element.
6. INITIATE notification requirements IAW UTI-P-2001/SMA-P-0016
7. IF previous actions have not corrected temperature conditions then perform the following additional troubleshooting actions.
8. CHECK individual AHU chilled water / hot water temperatures. Review IEMS sensors to determine if the temperature problem is tied to a localized area within the processing bay to focus on individual AHU units, or whether the entire bay is showing temperature problems to focus troubleshooting on the chilled water/hot water temperature control.

Appendix M: LASF Contingency Guidelines (Cont)

Low Temperature	High Temperature
Chilled Water / Hot Water loop Troubleshooting	**Verify proper Chilled Water temperature/flow to AHUs.**
a. CHECK entire high-bay area to determine if upset condition is trending low or if isolated to one area.	a. Chiller operating and discharging CHW to proper setpoint
b. VERIFY HWS temperatures (normal range is 140 deg F to 180 deg F).	b. Verify Chilled water pumps are operational.
c. If entire bay air temperature is low, Check the electric Boiler output temp and circulation pump.	c. VERIFY Chilled water valve at AHUs are modulating toward open and HW are modulating toward closed. Note AHU 1 & 2 have stacked coils make sure both CHW valves are functioning with the bottom as lead, top as lag.
d. VERIFY if mixing valves at pump stations are responding. CHECK % open. Note: For Temperature problems involving the Hot water system, review Boiler system alarms to determine appropriate recovery actions to take.	d. Verify Temp sensors for accuracy.
e. VERIFY if AHU valves are responding, CHECK % open for HW Valve (should be open) CHW valves should be nearly closed.	**Air Handler Unit Troubleshooting** (Actions to be taken if redundant AHU is ***unavailable*** for swap over)
f. CHECK space temp and supply temp request for heat at individual AHU.	a. Verify dampers on AHU and OAU are functioning and open.
g. Verify Temp sensors for accuracy.	b. Verify Air flow, check motor and belt on AHUs
	c. Verify control modulation of Chilled water and Hot water valves.
	d. Verify Outside Air Unit is functioning, and the off-coil temp is below 55 degrees F
	e. IF CHW valve are full open and Chilled water is at setpoint, but temperature set point is not made, check strainers at AHU.

Appendix M: LASF Contingency Guidelines (Cont)

LASF PARTICULATES OUT-OF-SPECIFICATION

Note: Particulates are not remotely monitored at the IACP. The user would be providing notification of an out-of-specification concern.

Primary Causes: Loss of High Bay pressure, HEPA filter failure, loss of door seals or room/duct enclosure boundary integrity (Doors) compromised, work event causing actual high particulate problem.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance have occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. Verify OAU is operational and providing outside air to high bay supply air flow.
3. INITIATE notification requirements IAW /UTI-P-2001/SMA-P-0016
4. GENERATE WON & DISPATCH Technician to the LASF
5. TECHNICIANS CHECK High Bay for signs of particle generations NOTE: Do not enter bay unless directed. (Smoke, dust, and other work occurring that could be generating high particle counts).
6. TECHNICIANS INSPECT operating AHU units for obvious signs of duct or enclosure compromises, and potential source of particulate intrusion.
7. TECHNICIANS CHECK door seals
8. CALL Facility Manager to verify door seal conditions
9. DEVELOP PLAN with Engineering & management to troubleshoot and repair suspect unit.

WARNING: *Maintaining LASF in a positive pressure condition is key in preventing particulate infiltration into processing areas. DO NOT place the LASF into a "Bottled-Up" state, in which ventilation is shut down and or dampers are secured to processing areas. Only under significant Emergency events conditions such as a fire in the High bay and direction to secure ventilation is given, should building HVAC be secured.*

APPENDIX N: MPPF Guidelines

Purpose: To provide first response guidelines for HVAC Operator during unsatisfactory payload environmental conditions (Temperature, Particulates, and Humidity) at the MPPF.

Affected Personnel: Utilities Branch Manager, HVAC Supervision, HVAC Technicians/Operators

Introduction:

Due to the complex & dynamic nature of the MPPF HVAC system, these contingency guidelines have been developed to aid the HVAC Operators in responding to adverse MPPF operating trends or out of specification conditions, to ensure prompt corrective actions are taken to place the MPPF HVAC system back into a stable and compliant operating condition.

Scope:

It is neither realistic nor the intent of these guidelines to define every possible contingency scenario response action that could occur at the MPPF. The three most important environmental parameters (Humidity, Temperature, Particulates) for the payload customer were used when developing the following guidelines. The guidelines are built upon the most probable areas for failure and build upon those failures to narrow down locations and response actions.

Technicians should refer to this section when troubleshooting and implementing corrective actions to place the HVAC parameters back into control but also must use thinking compliance & technical inquisitiveness when doing so, through additional monitoring of warnings/alarms & operating parameters, Technician feedback, and ongoing work activities. If data shows that different or additional actions should be taken beyond what is contained within these guidelines, HVAC operators should take the appropriate technical actions and notify Supervision in near real time.

Requirements:

- Update contingency guidelines as system changes occur (software or hardware)
- Provide training on contingency guidelines, and technical basis for recommended response actions
- Utilize Contingency Guidelines during MPPF upset conditions unless system configuration or other technical data necessitates different actions than what is contained in the guidelines
- Return system configuration to normal operations as soon as possible

Appendix N: MPPF Contingency Guidelines (Cont)

MPPF HUMIDITY OUT-OF-SPEC (HIGH/LO)

Primary Causes: Bad Damper Positions, Chilled or Hot water failure, Chilled or Hot water valve failure, Humidifier Failure/Abnormal Operation, AHU motor failure, software failure, facility operations such as door openings.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance has occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area is out of specification
3. CALL OPS DESK or (FM) to verify if any activities are occurring that may be causing negative trends/warning/alarms.
4. IDENTIFY equipment serving the area of the warning/ alarm
5. REVIEW OVERVIEW SCREEN (MPPF_ROUNDS) for initial assessment
6. ACCESS individual AHU/VU screens to further review details regarding the specific operating unit by clicking the AHU/VU button.
7. LOG all changes in SETI.

Appendix N: MPPF Contingency Guidelines (Cont)

Low Humidity Condition	High Humidity Condition
REMINDER: If a WARNING/ALARM occurs OR troubleshooting steps do not stop negative humidity trend, then initiate required notifications to SUPV/ENG/Duty Office.	
a. Access MPPF VU-1, VU-2 screen	a. Compare Humidity Sensor RH readings with IEMS readings, if a sensor reads 40% or lower vs the IEMS readings override sensor to a setting above SP to stop humidifier.
b. VERIFY humidifier is activated on. Verify water and air is activated ON. • IF humidifier is not activated on, Activate to ON. VERIFY MODE is ON, • IF mode is OFF, compare Set point (SP) to RA duct RH sensor. (Note humidity control sensor is in the RA duct for each AHU).	b. If both IEMS and the RA RH sensor are within 2% create won to dispatch Techs. c. VERIFY humidifier is not operating (Humidifier should be showing not active). IF humidifier is operating, disable to not active. Verify that Water and Air are in the non-active state.
c. IF Control System is calling for the humidifier to be on, but it is not, GENERATE WON & DISPATCH Technician to troubleshoot humidifier problem.	d. VERIFY AHUs are in high RH override control mode • VERIFY chilled water valve position on AHUs is modulated to fully open position. • VERIFY dampers are open • GENERATE WON and DISPATCH Technicians to begin field checks on strainers / valve positions and dampers.
d. Verify Water valve & Air valve are operating and flowing to spray nozzles.	e. Check bay temp to ensure it is at or near SP (if lower than SP low air temp could cause saturation problem. • Check chilled water modulating valves that they are in proper position and modulating • Dispatch Techs to field verify valves are modulating and not leaking by • Verify supply air temperature from the AHU and VU

e. IF Control System is not calling for the humidifier to be on then • CHECK whether remaining AHUs humidifiers are operating • IF the other AHU humidifiers are activated on and conditions are not reversing then override the non-activated humidifier to activate. • MONITOR humidity % on screen (MPPF_ROUNDS) to determine if manually starting the humidifier has begun to reverse the negative humidity trend condition.	f. Check MPPF chilled water temp and ensure it is maintaining SP. • If not meeting SP switch to other Chiller dispatch tech to trouble shoot secured chiller.
f. If troubleshooting steps fail to address negative trend/alarm. Engineering/MGMT support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION)	g. If troubleshooting steps fail to address negative trend/alarm. Engineering/MGMT support will review next actions. Review team may consider Hot Water / Chilled water valve over-ride (TEAM DECISION)
	h. Manually OPERATE chilled water valve / hot water valve only as last resort.

Appendix N: MPPF Contingency Guidelines (Cont)

MPPF PARTICULATES OUT-OF-SPECIFICATION

Primary Causes: Loss of High Bay (Building) pressure, HEPA filter failure, loss of door seals or room/duct enclosure boundary integrity (Doors) compromised, work event causing actual HI particulate problem, particle counter failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance have occurred, or any systems/components have been DISABLED. RESTORE to previous configuration where possible to restore normal operating specifications and help identify cause.
2. DETERMINE which area(s) have negative trends or are in warning/alarm states
3. REVIEW (MPPF ROUNDS) SCREEN, and determine which IEMS sensor(s) are in warning/alarm (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) *Note: Only 1 sensor in warning/alarm is not a basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.*
4. INITIATE notification requirements IAW /UTI-P-2001/SMA-P-0016
5. GENERATE WON & DISPATCH Technician to the MPPF
6. TECHNICIANS CHECK High Bay for signs of particle generations NOTE: Do not enter bay unless directed. (Smoke, dust, and other work occurring that could be generating high particle counts). IF no apparent causes of particles are found PREPARE to INSTALL backup particle counter in the same area as elevated particle counter to validate reading. NOTE: Do note enter bay unless directed

Note: This step is only to be performed if 1 particle counter is in a negative trend or alarm, and no other causes are found. A 2nd permanent installed particle counter that has trended high or in alarm is enough to validate another particle counter.

7. TECHNICIANS INSPECT operating AHU units for obvious signs of duct or enclosure compromises, and potential source of particulate intrusion.
8. TECHNICIANS CHECK door seals
9. CALL Facility Manager to verify door seal conditions
10. CHECK Bay pressure trending to determine if particulates are infiltrating though through failed seals
11. DEVELOP PLAN with Engineering & management to troubleshoot and repair suspect unit.

WARNING: *Maintaining MPPF in a positive pressure condition is key in preventing particulate infiltration into MPPF processing areas. DO NOT place the MPPF into a "Bottled-Up" state, in which ventilation is shut down and or dampers are secured to processing areas. Only under significant Emergency events conditions such as a fire in the High bay and direction to secure ventilation is given, should* ***building HVAC be secured.***

Appendix N: MPPF Contingency Guidelines (Cont)

MPPF HI/LO PROCESSING AREA TEMPERATURES

Primary Causes: Chiller shutdown/Chilled water supply to MPPF loss, AHU Unit(s) failure, chilled/hot water control valve failure, Hot water/Boiler upset conditions, MPPF Chilled or Hot water pump failure.

Operator Response Actions:

1. DETERMINE if any recent equipment rotations, equipment cycles, damper state changes, scheduled/unscheduled maintenance have occurred, or any systems/components have been disabled. Restore to previous configuration where possible to restore normal operating specifications and help identify cause.
2. REVIEW (MPPF_ROUNDS) SCREEN, and determine which IEMS sensor(s) are in warning/alarm or in an adverse trend (Is this an isolated sensor/area out of spec or are there indications from other sensors that validate conditions?) *Note: Only 1 sensor in alarm, is not a basis to disregard indications. All indications/warning/alarms must be treated as real until PROVEN otherwise.*
3. CALL MPPF Facility Manager to determine if area has been upset by user activities (i.e. doors open, testing, etc…). Direct customer to restore local configuration to recover from upset specification.
4. ACCESS (MPPF_EMS) to determine which equipment is operating in the area affected.
5. VERIFY that individual Air Handler Units set points, control variables are appropriate for the current condition. Compare Andover temperature sensor against IEMS to assess whether temperature condition may be caused by a bad temperature transmitter/element.
6. INITIATE notification requirements IAW UTI-P-2001/SMA-P-0016
7. IF previous actions have not corrected temperature conditions then perform the following additional troubleshooting actions.
8. CHECK individual AHU chilled water / hot water temperatures. Review IEMS sensors to determine if the temperature problem is tied to a localized area within the processing bay to focus on individual AHU units, or whether the entire bay is showing temperature problems to focus troubleshooting on the chilled water/hot water temperature control.

Appendix N: MPPF Contingency Guidelines (Cont)

Low Temperature	High Temperature
a. **Chilled Water / Hot Water loop Troubleshooting**	a. **Verify Chillers are operational.**
b. Check entire hi-bay area to determine if upset condition is trending low or if isolated to one area.	b. Check for proper chilled water flow/temperature to MPPF.
c. Verify HWS temperatures are nominal.	c. Verify proper Chilled Water temperature/flow to AHUs.
d. If entire bay is low click the MPPF_ROUNDS to view Hot Water pumps and verify pump is operational if not - open WON, dispatch Boiler tech to access and restart.	d. If insufficient CHW flow is found, verify status of pumps and attempt to restart pumps as needed. **Note: If manual operation of building pumps is required dispatch tech to perform on site. If loss of flow occurs on the building pumps Andover will initiate an Auto shut down of all AHUs**
e. Verify if AHU valves are responding check % open.	e. If flow is good check chilled water temperatures to ensure temp is at or near set point. If not rotate to idle chiller. Dispatch tech to trouble shoot secured chiller.
f. Check space temp and supply temp request for heat at individual AHU screen	f. Consult Engineering/MGMT to determine if load shedding is appropriate. LOAD SHED based upon specific technical/management direction.
g. Verify proper % on chilled water valves	g. Access MPPF_ROUNDS High Bay Screen and review the following parameters: Space/Supply air temperatures, valve position and IEMS sensors.
h. Check for flow or leakage – field verification by tech.	h. Determine if the AHU program is in Modulating, Temperature or Dehumidification to determine what program mode the system is operating in.
i. Check program line on individual AHU.	i. Monitor discharge temperature on AHU to determine if discharge temperature is at or below 65°.
j. Note: For Temperature problems involving the Hot water system, review Boiler system alarms to determine appropriate recovery actions to take.	j. If space temperature does not match IEMS sensors, suspect temperature transmitter/element and have tech verify

	space temperature and IEMS sensor with portable meter. Permission is required before entering.
	k. Based on area of concern go to AHU screen and monitor discharge air temperature on AHU to determine if HW valve is operating properly or leaking by. If valve is leaking by send a technician to manually close off the HW valve.

RECORDS

The following records shall be retained by the organizations listed below:

Record	Responsible Organization
KSC Form 50-104NS "Log/Andover Rounds (LASF/PHSF)"	FSEU / HVAC
KSC Form 50-105NS "Log/Andover Rounds (CRF/RTG)"	FSEU / HVAC
KSC Form 50-106NS "Log, SSPF Rounds"	FSEU / HVAC
KSC Form 50-134NS "Log, IOZ Rounds"	FSEU / HVAC
IACP log book	FSEU / HVAC
Facility Operating Conditions	FSEU / HVAC

AFFECTED DIVISIONS/OFFICES

Engineering Services

FSEU and OM&E

ROLES AND RESPONSIBILITIES

Division Manager - Ensures compliance within the Division to the requirements stated in this procedure.

Utilities Department Manager: Ensures compliance at the Department level to the requirements stated in this procedure Has overall responsibility in ensuring that flight hardware is protected through disciplined operations of equipment and facilities. Responsible that a trained and certified workforce is in place to take appropriate upset condition response actions

Supervisor II/III- Responsible for ensuring that all HVAC Technicians are trained and understand the technical basis for response actions contained within the contingency guidelines. As new revisions are released based upon system configuration changes, all previous guideline revisions must be destroyed to ensure that Operators are always using the most current revision of the contingency guidelines. Supervision should audit these documents on recurring basis to verify revision postings. It is the responsibility of the Utilities Supervision to maintain control of the system configuration. All HVAC system configurations changes should only be authorized through the direct approval of HVAC Supervision.

Facility Manager– To provide facility requirement of building customer

System Engineer - Responsible for reviewing any HVAC sequence of operations changes, screen changes, software disables, and equipment modifications and upgrades with the Utilities Management Team to ensure systems changes are reflected in revisions

to these contingency guidelines. Changes should also be documented in a SETI log entry.

HVAC Operators: Review this procedure and attached contingency guidelines. Monitor and take appropriate action when flight hardware specifications are adversely trending or have exceeded allowable operating ranges. The contingency guidelines shall be followed during response actions, unless the contingency situation requires additional actions that are not fully covered within this procedure. HVAC Operators play a key role in maintaining the overall HVAC system performance. As changes or new information becomes available, Operators should provide suggestions in improving the Contingency Guidelines.

REFERENCE DOCUMENTS

The following documents are referenced in this procedure:

Document Number	Title
ORION-KSC-FAC-015	Operational Agreement between Lockheed Martin Space Orion Program & BOSS, Joint Operations of the Launch Abort System Facility Industrial Operating Zone HVAC System
ORION-KSC-FAC-011	Operational Agreement between Lockheed Martin Space Orion Program & BOSS, Joint Operations of the O&C Building Industrial Operating Zone HVAC System
ENG-P-0027	Technical Anomaly Event Disposition Process,
FAM-P-2019	Systems Electronic Tie-In (SETI) Log
KPL-PLN-50007	KSC Payload Facility Contamination Control Requirements/Plan
KPL-PLN-50008	Payload Facility Contamination Control Implementation Plan
KSC Form 50-105NS	Log/Andover Rounds (CRF/RTG)
KSC Form 50-106NS	Log, SSPF Rounds
KSC Form 50-134NS	Log, IOZ Rounds
KSC Form 50-181NS	Log. PHSF Rounds
LSP-UG-411.08	
MSO-REF-0003	BOSS Systems Electronic Tie-In User's Guide
SMA-P-0016	BOSS Event and Near Missing Report

ACRONYMS

AHU	Air Handling Unit
BOSS	Base Operations and Spaceport Services
CESS	Control of Equipment and System Status
CCC	Complex Control Center
CCZ	ISO Class Clean Zone
CWA	Clean Working Area
DO	Duty Office
DMSO	Division Management Standing Order
HVAC	Heating, Ventilation and Air Conditioning
IACP	Industrial Area Chiller Plant
IAW	In Accordance With
IEMS	Integrated environmental Monitoring System
IAW	In Accordance With
IOZ	Industrial Operating Zone
JBAC	BOSS Complex Control Center HVAC Console Operator
JSTC	BOSS Test Conductor
KSC	Kennedy Space Center
LMSSC	Lockheed Martin Space Systems Company
NAO&C	Neil Armstrong Operations and Checkout
PPF	Payload Processing Facility
PRD	Payload Requirements Document
QSE	Quality, Safety and Environmental
SE	System Engineer
SETI	Systems Electronic Tie-In
SSPF	Space Station Processing Facility
UA	Utility Annex
WON	Work Order Number

DEFINITIONS

None.

REVISION RECORD

The following revisions have been applied to this document:

Revision Number	Change Description	Date
1	Initial Release	9/14/2010
2	Revised Instructions for Technicians	4/7/2011
3	Revised Instructions for Technicians	6/22/2012
4	Revised to include section 2.1 and other minor changes.	5/2/2013
5	Revised to add minor operator requirements for monitoring.	3/14/2014
6	Incorporated DMSO-FSEU-14-001, DMSO-FSEU-13—002 REV 2, and added IOZ guidelines	3/14/2014
7	Added note on page 2, reference expectations when operating from the CCC	5/31/2017
8	Added alarm function test in section 1.5	8/21/2018
9	Administrative change only. Document updated to remove branding of previous contract	04/01/2019
10	Update to BOSS format. Added MPPF requirements.	05/19/2021

DOCUMENT APPROVALS

Expired certificate

X Mike Lopez

Mike Lopez
Technical Manager, FSEU OM&E
Signed by: Melquiades Lopez (affiliate)

Expired certificate

X Ellen S. Feeney

Ellen Feeney
Manager, Systems Engineering
Signed by: Ellen Feeney (affiliate)