ATTACHMENT 4.12: EXAMPLE MAINTENANCE AND SERVICE PROCEDURES SCHEDULE

The Design-Builder shall include in the required Operations and Maintenance Plan a Maintenance and Service Procedures table similar to that shown below. This shall include all manufacturer-recommended maintenance and service procedures in addition to all tasks and maintenance schedules required by the Hydrogen Fueling Station.

In addition, Design-Builder shall propose who shall be the responsible party for each item in the Maintenance and Service Procedures table: Design-Builder or HTA Staff. Design-Builder will balance technical difficulty with reductions in Annual Fees with the goal of minimizing Annual Fees. For those tasks where HTA Staff are the proposed responsible party, Design-Builder will include the necessary training in their Training Plan for HTA to competently complete those tasks.

| **Maintenance and Service Procedure** | **Responsible Party** | **Monthly** | **Every 3 Months** | **Every 6 Months** | **Every 12 Months** | **Every 24 Months** | **Every 36 Months** |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Visually inspect equipment compound and equipment, note any issues. |  |  |  |  |  |  |  |
| During operation, check/record/verify equipment performance data. |  |  |  |  |  |  |  |
| Visually inspect pump, vaporizer, tank, hoses, tubing, piping, valves, and nitrogen supply system for leaks and abnormalities. Visually inspect VJ piping for frost. Additional snooping of the tubing/piping to identify very small leaks. |  |  |  |  |  |  |  |
| Listen for any abnormal sounds (e.g., banging or hissing). |  |  |  |  |  |  |  |
| Check and inspect dispenser hose and nozzle. |  |  |  |  |  |  |  |
| Check bolts, clamps, and nuts for tightness. Torque if necessary. |  |  |  |  |  |  |  |
| Check for any sign of damage to the paint and apply touch up paint as required. |  |  |  |  |  |  |  |
| Wipe down and clean |  |  |  |  |  |  |  |
| Visually inspect all pressure relief devices for signs of failure or leakage. |  |  |  |  |  |  |  |
| Verify ESD control function. |  |  |  |  |  |  |  |
| Inspect all health and safety equipment. |  |  |  |  |  |  |  |
| - Ensure temperature probe has not been tampered with  - Inspect temperature controller settings, valve and tubing  - Ensure any vent is not blocked |  |  |  |  |  |  |  |
| Check alarm history. Address, as necessary. |  |  |  |  |  |  |  |
| Perform test fill using each dispenser |  |  |  |  |  |  |  |
| Leak check |  |  |  |  |  |  |  |
| Functional test on E-Stops |  |  |  |  |  |  |  |
| Check control voltage |  |  |  |  |  |  |  |
| Inspect and verify all control valves for operation |  |  |  |  |  |  |  |
| Check liquid hydrogen tank level and compare to PLC/HMI |  |  |  |  |  |  |  |
| Visually examine piping and supports for corrosion, icing, leaking |  |  |  |  |  |  |  |
| Liquid hydrogen pump: inspect fasteners, supports, drive system, valves, piping and instrumentation |  |  |  |  |  |  |  |
| Check liquid hydrogen pump belt for wear and/or stretch |  |  |  |  |  |  |  |
| LH2 pump system:  - Check for abnormal noise / temp / vibration  - Check lubrication  - Inspect cables and boxes  - Check ground connections  - Check for obstructions  - Check filters and heaters |  |  |  |  |  |  |  |
| Hydrogen Vaporizers:  - Check for ice damage, corrosion, mechanical integrity  - Clear ice from piping  - Check all PSVs are free from obstruction  - Check discharge temperature  - Check low temperature protection settings  - Check field instrumentation |  |  |  |  |  |  |  |
| Fire systems:  - Check fire detection central panel for alarms  - Check emergency power supply  - Check alarm connections to control room |  |  |  |  |  |  |  |
| LH2 Cryogenic Pumps- change oil in drive pump |  |  |  |  |  |  |  |
| Test and inspect electrical personal protection equipment |  |  |  |  |  |  |  |
| Purity checks at the nozzle following any repairs to equipment valves or tubing that could introduce impurities to the system. |  |  |  |  |  |  |  |
| Bi-annal hydrogen purity tests |  |  |  |  |  |  |  |
| Visually inspect PRV’s |  |  |  |  |  |  |  |
| LH2 Cryogenic Pumps-change out cold end (if needed depending on performance) and replace soft goods  - Inspect valves, piping  - Inspect actuator and positioner  - Inspect inside any valve boxes |  |  |  |  |  |  |  |
| Low temperature probe - isolate, remove probe and calibrate |  |  |  |  |  |  |  |
| Earth Fault Protection Device Functional Test |  |  |  |  |  |  |  |
| - Review Hazardous Material Inventory  - Operating procedures certified annually |  |  |  |  |  |  |  |
| Check fire detection sensors / push buttons |  |  |  |  |  |  |  |
| Thermographic survey of electrical switchgear, MCC, electrical distribution, control panels, motors, outdoor substation equipment, transformers, etc. |  |  |  |  |  |  |  |
| Review list of all vents   * Analyze atmosphere at vents |  |  |  |  |  |  |  |
| Replace PRVs that are exposed to vibration |  |  |  |  |  |  |  |