

# P11411 - Testing Plan

## Objective:

The objective of this test plan is to develop an accurate and functioning desalination unit using renewable energy sources. This will be defined by the successful completion of each of the three tests listed below and the defined engineering specifications for the device. By completing this testing plan the device will quantifiably be defined as accurate and functioning. All tests must be completed under the standard testing conditions (see Appendix: Standard Testing Conditions). Overall this test plan calls for 10 days of testing.

## System Test:

### *Objective:*

This test is designed to test that all components of the system are operating correctly. After the system is finally assembled this first test will allow for any flaws to be revealed prior to the major testing. By testing the physical system without any of specifications in mind it will allow for the engineers to focus on each component of the design and make sure it is functioning properly. If at the end of the procedure any component is still not achieving its required functionality, then that component must be redesigned and the Systems Test should be repeated after the new component is installed.

### *Outline:*

This test will be completed twice prior to the Specifications Test beginning; therefore no measurements are required to be taken.

Each mechanical component of the design will be observed during testing. The performance will be rated as Satisfactory or Poor. Any components ranked Poor during the first test will be adjusted by the engineers before the second test.

The second test will be run after all required adjustments are made. Each component again will be ranked during the testing. Any components ranked Poor will have to be redesigned by the engineers.

### *Documentation:*

A list name every component on the device will be created. This list will be put into a table and for each test the components ranking will be placed next to it. Every component must be ranked for each of the two tests.

Component	Test 1 Ranking	Test 2 Ranking

### *Timeline:*

Each test should take approximately four to eight hours to complete (depending on design). At least one day must be given between the two tests for any components that were ranked Poor to be adjusted.

## Data Acquisition Test:

### *Objective:*

The goal of the data acquisition test is to verify that all devices which measure/record data are functioning properly before and after they are installed on the system. These devices include, but are not limited to, flow meters, thermometers, salinity measuring devices and manometer.

### *Outline:*

Prior to all measuring devices being installed, each device will be tested with a control. The device must be installed to the data collection device that is installed to a computer. This will verify that the devices is reading properly as well as installed to the computer system correctly. An example of this would be using a thermocouple to measure the temperature of a room that has a known temperature.

All devices will then be installed to the system and tested again. If there is some discrepancy between the initial test value and the new test value calibration may be necessary for that particular device

### *Documentation:*

Each device will be listed, and will be labeled either “Pass” or “Fail” for each of the two tests. If any devices fail the test, the team will decide if the test should be run again or if a new device is needed to replace the current, non-functioning one.

Measuring Device	Test 1 (Prior to Installation)	Test 2 (Post Installation)

### *Timeline:*

This process should take approximately 1 day in its entirety. If major problems are encountered (devices are not operating properly) this may take longer if a new one has to be delivered.

## Specifications Test:

### *Objective:*

This test will be the most intensive and require the most amount of time because it will determine the nominal values for each specification. Using the defined engineering specifications the device will operate for a typical day time period and all specifications will be measured and recorded. This test will be re-run until all engineering specifications are satisfied.

### *Outline:*

The system will be run for the daytime period after all measurement and control devices are installed. Using these controls all required measurements for each specifications will be taken.

This value will then be ranked using the following scale:

- Above Nominal (Better than the Target Value)
- Nominal (The Target Value)
- Marginal (In Acceptable Value Range)
- Below Marginal (Unacceptable Value, Specification not met)

Any specification that receives a “Below Marginal” ranking the system will be evaluated by the engineers and a **Plan of Action** will be filled out by the team. This plan will then be executed and the specifications test will be run again after the systems is fixed.

The specifications test must be run at least three times and documented to validate that all results are consistent.

*Documentation:*

Each engineering specification will be listed as well as the Nominal and Marginal values for that specification (see VOE Nom-Marg Values on Google Docs). There will then be a space for recording the test results for the specification and the proper rank next to it. This will be done for each of the tests and save in one document.

Specification	Nominal Value	Marginal Value	Ranking for T1	Ranking for T2	Ranking for T3

*Timeline:*

This test requires at least three full days of testing. This does not include any issues that are encountered (larger or small). A safe estimate is that this testing will take 6 days to complete.

## **Appendix: Standard Testing Conditions:**

To demonstrate the system functionality the following are the parameters that will be used in order to do so:

- Input water salinity: 35,000 - 40,000 ppm
- Input water temperature: 13C (+/- 1C)
- Testing will be completed on a Mostly Sunny to Completely Sunny day.

Each of the tests specified above MUST be run under these lab conditions in order to verify that the system meets the customers needs and the engineering specifications.