P11412 UV Water Treatment Team

Test Plans for CW4TW

Verification of Flow Rate Test Plan

Endurance and Durability of System Enclosure Test Plan

Auxiliary Output Test Plan

Ensure Safe Operation Test Plan

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Clean Water for the World: Flow Rate Test

This test is designed to verify that the flow rate of water through the system is appropriate. This test is required because of the changes to the system, reversing flow of water through the UV chamber. Water will now enter the UV chamber at the bottom and exit at the top. This requires the flow rate to be measured to ensure that the system is not impacted adversely, most notably, the flow rate being too great. This will cause the water to not be treated properly by the UV lamp. To verify the target flow rate, the current system will be tested. To test the flow rate of the system, the device will be energized for two minutes and the amount of clean water produced will be measured.

This test will also measure the training time required to operate the Clean Water for the World device. Individuals unfamiliar with the operation of the system will be briefed and then will operate the system. The time required to properly brief the individuals will be measured.

The test setup shall be inspected for defects, which will be recorded below. Upon Failure an investigation will be conducted to determine the cause of failure within the control logic.

Equipment Needed:

1. **Clean Water for the World device**
2. **Two buckets**
3. **timer**

Resources Needed:

1. **Room with a table and an AC power outlet**
2. **People unfamiliar with operation of Clean Water for the World device**

Start Date: **Finish Date:**

Engineer set-up experiment: Robert Zwecker

Assistant:

Are there any visual defects before testing: Yes No
If yes then Explain:_____
_____

Test #	Component / System Tested	Description	Engineering Spec	Pass/Fail Criteria
1	Clean Water for the World Device	Flow rate of water through the system	15	< 5 gpm
2	Clean Water for the World Device	Training time required for an individual unfamiliar with system to operate	26	< 5 minutes

Test #	Measured Result	Pass/Fail?	Comments
1			
2			

Failure: Yes No

Comments/Observations:_____
_____
_____
_____

Clean Water for the World: System Enclosure Test

This test is designed to verify the customer's need of redesigning the enclosure for Clean Water for the World. The enclosure needs to be resistant to the environment, durable to shipping hazards, light weight when compared to the previous enclosure have enough volume to contain two years of extra filters and UV lamps, and cost efficient when compared to the previous enclosure. To verify that these needs will be met, the cost, weight, strength, and volume of enclosure will be measured. Also, to determine the resistance to the environment, the clearance of protruding components will be measured. Failure occurs when the enclosure is more expensive, weighs more, and the volume is insufficient. Also, failure occurs when fracture or crack propagation occurs prior to 200 lbs being statically loaded onto the enclosure. The test setup shall be inspected for defects, which will be recorded below. Upon Failure an investigation will be conducted to determine the cause of failure and a new solution will be pursued.

Equipment Needed:

1. **Scale**
2. **Tape Measure**
3. **Calipers**
4. **masses**

Resources Needed:

1. **Room with a table**
2. **Clean Water for the World device components mounted in enclosure**

Start Date: **Finish Date:**

Engineer set-up experiment:

Assistant:

Are there any visual defects before testing: **Yes** **No**
If yes then Explain:_____
_____

Component / System Tested	Description	Engineering Spec	Pass/Fail Criteria

Test #	Result	Pass/Fail?	Comments
1			
2			
3			
4			
5			

Failure: Yes No

Comments/Observations:_____
_____
_____
_____

Clean Water for the World: Auxiliary Output Test

This test is designed to verify the customer's need of developing a system to charge cell phones when the Clean Water for the World water device is treating water. Cell phone charging will be a way to incent the operator of the device to continue to operate and maintain the device. An interlock requiring the device to be satisfactorily treating the water before the phone charging circuit will energize will be included. The device will be able to charge four cell phones simultaneously. The power of the phone charging circuit will be determined by measuring the voltage and the current of the supply lines. Failure occurs when the voltage is less than 5V and the current is less than required to charge four cellular phones simultaneously. The test setup shall be inspected for defects, which will be recorded below. In the event that the test does not pass all requirements, actions will be taken to verify that the buck circuit and system logic is operating as expected.

Equipment Needed:

1. **Digital multimeter (DMM)**

Resources Needed:

1. **Room with a table and AC outlet**
2. **Clean Water for the World device**

Start Date: **Finish Date:**

Engineer set-up experiment: Daniel Lopez

Assistant:

Are there any visual defects before testing: **Yes** **No**
If yes then Explain:_____
_____

Test #	Component / System Tested	Description	Engineering Spec	Pass/Fail Criteria
1	Buck Circuit	Measure voltage for supply lines	19	≥ 5V
2	Buck Circuit	Measure current for supply lines	18	≥ 1.5A
3	Auxiliary Port Logic	Measure voltage with water flowing	24	When water flows, power at Auxiliary Port
4	Auxiliary Port Logic	Measure voltage with no water flowing	24	No power supplied to Auxiliary Port when water does not flow

Test #	Result	Pass/Fail?	Comments
1			
2			
3			
4			

Failure: Yes No

Comments/Observations:_____
_____
_____
_____

Clean Water for the World: Ensure Safe Operation Test

This test is designed to verify the customer's need of having safeties to ensure water is properly treated before consumption. The system is designed to prevent water from flowing out of the device if current is not flowing through the current sensor. To verify that this need is met, the flow of water will be monitored as the load is toggled on and off. Failure occurs when the control signal to the solenoid does not react appropriately to current changes in the system and warning LED does not light when a fault in the system is detected. The test setup shall be inspected for defects, which will be recorded below. Upon Failure an investigation will be conducted to determine the cause of failure within the control logic.

Equipment Needed:

1. **Power Supply**
2. **Better Water Maker generator**
3. **Digital Multimeter**

Resources Needed:

1. **Room with a table and an AC power outlet**

Start Date: **Finish Date:**

Engineer set-up experiment: Daniel Lopez

Assistant:

Are there any visual defects before testing: **Yes** **No**
If yes then Explain:_____
_____

Test #	Component / System Tested	Description	Engineering Spec	Pass/Fail Criteria
1				Water flo

Test #	Measured Result	Pass/Fail?	Comments
1			
2			
3			

Failure: Yes No

Comments/Observations:_____
_____
_____
_____