

# SPRACKLING CONSULTING COMPANY

324 Peery Parkway

Golden, Colorado 80403

## Safety Report Summarization Electronic Detoxification System Aqua-Chi Model 5400

This report is a summary of the Compliance Integrity Services Product Safety Evaluation Findings Letter. The tests were performed on April 7, 2007 on the Aqua-Chi model 5400, Electronic Detoxification System. Compliance Integrity Services stated that "the Standard IEC 60335-1 was used as a Guide and there is no Part 2 Particular Standard that covers the subject 'Electronic Detoxification System'."

This report also summarizes the Emissions testing performed by EMC Integrity. This device was evaluated in accordance with EN 55011, "Limits and methods of measurement of radio disturbance characteristics of industrial scientific and medical (ISM) radio-frequency equipment".

The device tested failed various safety tests and was non-compliant in other areas. This test device failed the Marked Mains Supply Input vs. Actual Mains Supply Input, Accessibility of Hazardous Voltages, and the Leakage Current tests for US Standards. It is missing required designations on the test device and has some wiring and grounding issues.

The test results and findings are further explained below.

### **Mode of Usage**

This system is described as a "Hydro-stimulation Spa" in the accompanying manuals, but similar units are sold as "Aqua Chi Foot Bath" and "Detox Foot Spa".

The instructions for this device state that the user places their feet in a tub containing salt water with the "Spa Module" or submersible electrodes. The manual also recommends using the salt content of the bath to maintain an electrical current between 1.5 A and 2.0 A. Adding salt to the bath increases the current carrying capacity of the saline solution.

### **Equipment Rating**

#### **(Marked Mains Supply Input vs. Actual Mains Supply Input)**

Power equipment is rated for specific voltages and currents. It is important to design equipment so that the power rating for any component is not exceeded. If the power rating for a component is exceeded it can overheat and become a fire hazard or potential shock hazard as the equipment may fail.

This test device failed this portion of the test, because it exceeds the marked ratings on the device. There is no clear documentation that states what the maximum output current is for the components of this device, but the rating was given in units of power. This value was half the actual maximum supplied power seen during testing.

### **Electrical Current in the Saline Solution**

#### **(Accessibility of Hazardous Voltages)**

It is important to avoid personal exposure to hazardous voltages and currents. The test device uses 37 Vdc which is considered an Extra Low Voltage to minimize electrical shock. Current and voltage combine to cause electrical shock so this test looks at both factors to determine an unsafe level for humans. The US Standards set limits for voltages exceeding 21.2 Vdc at 2 mA (milliamperes).

The DC Output circuit of the test device is considered accessible, because the electrodes in the Spa Module are not enclosed and the user can come in contact with the electrodes.

This test performed between the accessible electrodes in the Spa Module reached unacceptable levels for US Standards.

This test performed between the accessible electrodes and electrical ground passed for US Standards. Electrical ground can be any conductive surface at electrical ground such as plumbing including bathroom faucets.

# SPRACKLING CONSULTING COMPANY

324 Peery Parkway

Golden, Colorado 80403

## **(Leakage Current)**

The electronic detoxification system is designed to generate low levels of direct current (DC power) that flows through the user's body accessible through placing body parts in the saline bath with the Spa Module. Leakage current represents currents that should not be present and could result in electrical shock by touching two accessible components of the test device. Some medical devices are regulated to permit electrical current flow, but this device is not certified as a medical device. The United States and International standards require exposure to this electrical current to be limited.

The device tested reached unacceptable levels for US standards, but passed International Standards. The device uses 37 Vdc. The International Standards do not set limits for voltages under 42.4 Vdc where the US Standards are for voltages exceeding 21.2 Vdc.

This limitation of leakage current also applies to alternating current (AC or wall power). The test device passed this test for both US and International Standards.

## **Transformer Tests**

The following three tests are run specifically on the transformer used in this device. A transformer is a device that transfers electrical energy from one circuit to another by magnetic coupling without requiring relative motion between its parts. In this case the transformer is used to reduce the voltage from 120 V to 37 V. It is important that transformers work correctly otherwise they can be a potential shock and/or fire hazard.

## **(Dielectric Strength)**

Dielectric strength is the electric field strength that the transformer can withstand without experiencing failure of its insulating properties. If the insulative properties of the transformer fail the transformer will not function and is a potential fire and shock hazard. The test device complied with this test.

## **(Protective Earthing Resistance Measurement)**

A protective earth connection ensures that all exposed conductive surfaces are at the same electrical potential as the surface of the Earth. It is important for a transformer to have a protective earth ground to avoid the risk of electrical shock if a person touches a device in which an insulation fault has occurred. The device tested complied with this test.

## **(Short Circuit)**

A short circuit is the connection between two nodes of an electrical circuit that are meant to be at different voltages resulting in a large electrical current. It is important that equipment such as transformers is protected against short circuits using fuses or circuit breakers. The device tested complied with this test, because it did not overheat and the fuse and thermal protection worked.

## **Construction Deficiencies**

The unit has non-standard venting that could be unsafe by allowing small objects to penetrate the enclosure.

The test device is a potential fire hazard, because a shaving of the plastic enclosure of the test device indicated that the material is not the self-extinguishing type.

There are standards in place for wiring and grounding to prevent injury both during use and during servicing of a device. The test device did not follow standards for wiring and grounding. Some of the grounding and wiring issues can potentially result in electrical shock.

There are a number of electrical components that are not rated for their use in the design of the device tested and also some customary safety components are missing from the test unit.

## **Non-Standard or Non-Existent Power Markings**

# **SPRACKLING CONSULTING COMPANY**

---

324 Peery Parkway

Golden, Colorado 80403

It is important to designate the ratings of electrically powered equipment to prevent injury and unsafe use of a product.

It is required by the US standards to have the mains supply electrical rating marked on a device. It is also required that the Control Unit include markings to refer to the User Manual for instructions on the safe use of the equipment.

The test device did not have markings designating the correct electrical ratings, nor safety information.

## **Emissions Testing**

An Emissions test was performed on this device to determine its electromagnetic emissions. Devices have to be designed in a way that their electromagnetic emissions or disturbances do not interfere with the operation of radio and telecommunication and other devices in accordance with their purpose.

The test device passed this test.