**Special Problem 01**

**Question**:

You are about to buy a vacuum cleaner for your house.  
  
List five operational requirements you would want in your vacuum cleaner.   
  
Describe how you would go about evaluating whether your set of operational requirements are sufficient and complete enough to go to the store and actually buy a vacuum cleaner that meets those requirements.

**Response**:

Five operational requirements I would want in my vacuum cleaner would include:

1. The system shall weigh no more than 20 pounds.
2. The system shall accept only 120Hz AC power for a power source.
3. The system shall emit sound no louder than 90dB.
4. The system shall occupy a total space no greater than 4.5ft. by 2.0 ft. by 3.0 ft (4.5’ x 2.0’ x 3.0’).
5. The system shall be operable at a distance of 20 ft. away from an AC wall socket.

In general, the following guidelines should be adhered to in order to ensure completeness and sufficiency in requirements writing:

* Necessary and verifiable (quantifiable, traceable, measureable, demonstrative)
* Concise and unambiguous, devoid of generalities and with little explanation
* Complete and consistent with one another
* Implementation free, so as to not guide design
* Use of the term “shall”

With regards to the characteristics listed above, all requirements listed match the guidelines prescribed.

Regarding the actual evaluation and testability of these requirements, the following would be methods on how one could test each individual requirement. Note that the step numbers here map to the requirements listed above:

1. [Test] – Weigh the vacuum cleaner on a scale to determine its total weight.
2. [Inspection] – Look at the overall power interface and verify that the power connector is a NEMA 1 – 15 plug (standard 3-prong wall connector) or NEMA 5 – 15 plug (standard 2-prong wall connector).
3. [Test] – Turn on the system, and use a decibel meter to verify the < 90dB noise level during any and all operating modes.
4. [Test] – Utilize measuring tape or a finely calibrated measuring tool to verify the system meets the specified dimensions.
5. [Demonstration] – Plug the system into a standard wall socket, and utilize measuring tape or a finely calibrated measuring tool to verify the system can operate at a radial distance of 20 ft. from the wall socket. Note that this requirement would be coupled with 2) and 4), and the power source must be valid for operation and the system should never extend outside the allowed dimensions, even during operation.

By performing the tests listed above, one would be able to completely and sufficiently evaluate the operational requirements defined for the vacuum cleaner, prior to purchasing the system.