**Functional Specification Validation**

*Please refer to the attached “User Survey,” which contains questions we will ask the client before the mock delivery.*

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| **Functional Spec** | **Validation Plan** | **Outcome** |
| Be safe | * Complete Designsafe Risk Analysis * Complete User Survey (attached, see question 1) at least one week before delivery, then re-survey at delivery. |  |
| Be portable | * Complete User Survey (attached, see questions 2 and 3) at least one week before delivery, then re-survey at delivery. |  |
| Fit in the client’s van, alongside the scooter | * Test at next client meeting. |  |
| Allow for unassisted operation by client’s mother | * Complete User Survey (attached, see question 4) at least one week before delivery, then re-survey at delivery. * Test if client’s mother can perform the following tasks independently:   a. Set up ramp  b. Load & unload cart from van via ramp  c. Transfer lights from van to cart  d. Transfer mixing table & laptop from van to cart  e. Transfer other accessories from van to cart  f. Hitch & unhitch cart to scooter  g. Lock & unlock wheels  h. Lower lighting poles to ground  i. Insert & remove upper poles  j. Attach & detach lights to truss  k. Raise & lower lighting truss  l. Lock & unlock lighting truss in raised position  m. Set up & stow away stool  n. Pull out & push back tabletop  o. Plug in & unplug all electrical connections |  |
| Maximize autonomous use by client | * Complete User Survey (attached, see questions 7, 11, and 15) at least one week before delivery, then re-survey at delivery. * Test if the client can perform tasks A through O (from the previous functional spec.) independently. |  |
| Contain all of the client’s DJ equipment | * Complete User Survey (attached, see question 5) at least one week before delivery, then re-survey at delivery. |  |
| Be intuitive for use by the client | * Complete User Survey (attached, see questions 9, 12, and 16) at least one week before delivery, then re-survey at delivery. |  |
| Easily attach to the client’s electric scooter | * Test at next client meeting and determine whether the cart hitch fits inside the scooter hitch attachment. |  |
| Easily connect to one power source | * Complete User Survey (attached, see question 8) at least one week before delivery, then re-survey at delivery. * Determine if the power cords can physically plug into one wall outlet. * Determine if current drawn by the equipment is ≤ 13 A for the outlet and power strips. |  |
| Incorporate lighting supports | * Complete User Survey (attached, see question 10) at least one week before delivery, then re-survey at delivery. |  |
| Allow for addition of new equipment | * Complete User Survey (attached, see question 6) at least one week before delivery, then re-survey at delivery. |  |
| Be aesthetically pleasing to the client | * Complete User Survey (attached, see question 13) at least one week before delivery, then re-survey at delivery. |  |
| Include a ramp | * Complete User Survey (attached, see question 14) at least one week before delivery, then re-survey at delivery. * Determine if the cart can be loaded into the van with the ramp. |  |

**Performance Specification Verification**

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| **Category** | **Performance Spec.** | **Verification Plan** | **Outcome** |
| Safety | Light truss does not fall when subject to load of 15lb (weight of all lights). | * Achieve a factor of safety of 2. * Subject light truss to loads of 0 lbs, 10 lbs, 20 lbs, and 30 lbs. * Measure the vertical displacement of the truss at each weight. Use tape to mark the original and final positions of the truss on the poles and measure displacement using a tape measure. |  |
| Ramp incline ≤ 20**°** based on the angle at which the cart contacts the van’s roof. | * Calculate angle of incline between height and length of ramp.   \* Also note that the purpose of the ramp is for the loading of the cart, not the user. |  |
| Cart does not roll or slide on a linoleum floor when a horizontal force ≤ 100 lbs is applied to the tabletop. | * Pull on tabletop with rope attached to force gauge and find the force applied when cart starts to move. |  |
| Cart deflects ≤ ½“ when pushed sideways and back/forth from table height. | * Measure deflection of cart with a ruler when wheels are locked in place and applied force is 100 lbs. |  |
| Dimensional | Space between cart & scooter in back of van ≥ 6”. | * Measure width between cart and scooter at the point where the scooter is at its maximum width. |  |
| Cart must not extend past the headrest of the backseat. | * Measure depth available between the cart and headrest. |  |
| Seat height > 24” but < 34”. | * Measure height of seat. |  |
| Light supports display lights at a height ≥ 7’. | * Measure height of lights on truss. |  |
| Electrical | ≥ 9 electrical outlets. | * Count the number of electrical outlets available. * Test that all existing plugs physically fit into the power strips. |  |
| Electrical loads are within a safe range for the outlet and power strips. | * Using the power specifications of all DJ equipment, calculate the load on each power strip. * Compare loads to safe operating ranges provided in power strip and extension cord operating instructions. * Achieve a factor of safety of 2. |  |
| Ease of Use | Require 1 trip (from van to stage) to transport all equipment. | * Count the number of trips from van to stage required to transport speakers, lights, mixing table, laptop, microphone, smoke machine, tip jar, and any necessary cords/power cables. |  |
| Require ≤ 5 minutes to wire & plug in all equipment. | Using a stopwatch, record the time required to:   * Connect all electrical equipment to each other and to power. * Disconnect all electrical equipment from each other and from power. |  |
| Force required to pull cart must be less than force of scooter. | * Calculate pulling force of scooter with force gauge because force is not available in scooter specification. * Calculate force required to pull cart on level ground. |  |
|  | Force required to pull cart up ramp must be less than force of winch. | * The winch has a pulling capacity of 2000 lbs. Measure the force required to pull cart up ramp with force gauge. |  |

Good work. Please respond to suggestions and resubmit to prepare for the final.