Product Description: Seesaw that produces musical chords.

Intended Customers: Elementary schools, parks.

Market: Playground equipment.

Customer Need	**Product Attribute(s)**	**Engineering Specification(s)**
SAFETY FEATURES:		
Avoid serious injury if kids fall off	Height off ground at extremes of motion should be limited	Max seesaw height less than 50” from ground level
Restrict fast movement	Damping: depending on piston diameter, output diameter, length of output pipe	Damping: B is proportional to (D/d)^4 estimating B, by assuming incompressible flow: B = 8pi*mu*L*(D/d)^4 w/ mu = 1.7e-5 Ns/m
No pinch points	Fulcrum is covered by pinch-less material; all moving parts are shielded	Accordion covering or similar joint shielding over all joints and moving interfaces
Kid-safe materials	Materials approved by CPSC for use with children	High-density plastic & steel. Colors are integral to the piece (as required by the US CPSC); contains no paint or other coating that peels or flakes off
COMFORT:		
Comfortable Seat	Curved seat	Standard molded seats
Comfortable Handles	Handles selected to be similar size of current seesaw handles	Purchase of rotating shifters, mounted in similar manner to current seesaw handles. Grips no smaller than 0.85” diameter
Easy to mount without assistance	Height of seat must be comfortable distance from ground	Level height within range of 19-29”
Will avoid extremes of motion	Will stay within comfortable flexure angles for knees and ankles (for seesaw propulsion) as well as wrists and fingers (for control grip motion)	50% ILE Max Rotations (assuming flexures comparable to adulthood): Ankle: 13^{o} up; 21^{o} down. Knee: 87^{o}. Wrist: 47^{o} up; 53.5^{o} down. Four fingers: 45
FUN:		

Allow for freedom & creativity	Kids control the frequency & duration of sound produced	Chords played based on seesaw motion and position of handles
Visually appealing	Pipes of different colors & lengths	Bright rainbow- colored pipes, ie. ROYGBIV
CONTROLS:		
Controls require two kids, age range 5-12	Easily operated from seats, intuitive interface	Incorporated into handles (rotary controls).
Do not decrease stability while seesawing	Operated with small movements	Maximum total angle of motion: 45°
PIPES:		
Well-placed, strategic mounting	Not mounted between the children (interference)	
Proportionate to seesaw, not too small to be fragile or too large to be cumbersome	Moderate size, suitable for kids	Square 1.75” x 1.75” with 1/8” thick walls
Reliable sound production	Air flow supplied by pumping mechanism sufficient to produce sound consistently	volume flow rate for a single pipe: 0.0015 m^3 / s (based on blowing for 4 seconds, assuming lung capacity of 6000 cm^3 (0.006 m^3)
Must not play by themselves in the wind	Open ends of pipes are kept out of direct wind paths	Open ends of pipes are kept low to the ground, and/or are surrounded by windbreaker panels on 3 sides
DURABILITY		
Weather-proof	Materials can withstand rain, sleet, snow, ice, hail, and high winds. Can operate in a variety of temperatures. Can survive (even if non-functional) at an even larger range of temperatures. Avoids pitting, corrosion, rotting, etc	Weatherproof coating on all materials. Low-freezing-point lubricants. No stress concentrations (cracks, holes, etc) in geometry. Sound tubes point downwards to avoid collection of rainwater and sediment.
Heavy load accommodation	Can support weight of adult without failure.	Design for two 200-lb adults.
Long lifespan	Materials with low fatigue rates.	Steel frame with welded joints; plastic for parts with lower stress. Designed for a warranty of 5 years and a lifespan of at least 15.

Stays in one piece	Prevent crack formations; materials do not splinter	Avoidance of stress concentrations in bellows, accumulator, and control system geometry
Vandal-proof	Resistant to marring	Steel body, tamper-proof nuts and bolts
MAINTENANCE		
Does not squeak	Rotary bearings & springs are robust	Non-lubricated bearings, or annual lubrication & inspection
Required maintenance involves little mechanical skill and no special tools	Failure mode of control system involves replacing a module instead of taking one apart	Modular control design
Musical elements require no retuning, little maintenance	Musical elements are durable; quality of sound does not vary significantly over time	Pre-tuned steel pipes for musical elements, with no upward openings
OTHER CONSIDERATIONS		
Can be easily shipped	Disassembles and reassembles easily	Modular architecture
Can be easily installed	Requires a minimum of site preparation and assembly. Requires few special tools	Standard nuts and bolts; standard procedures for playground installation: in ground concrete fixture
Doesn't take up too much space on playground	Small footprint	Under 12' X 4' in assembled configuration, with the plank width no greater than 12".