Large Spherical Treadmill System - Appendix A
Examples, Parts, and Design files

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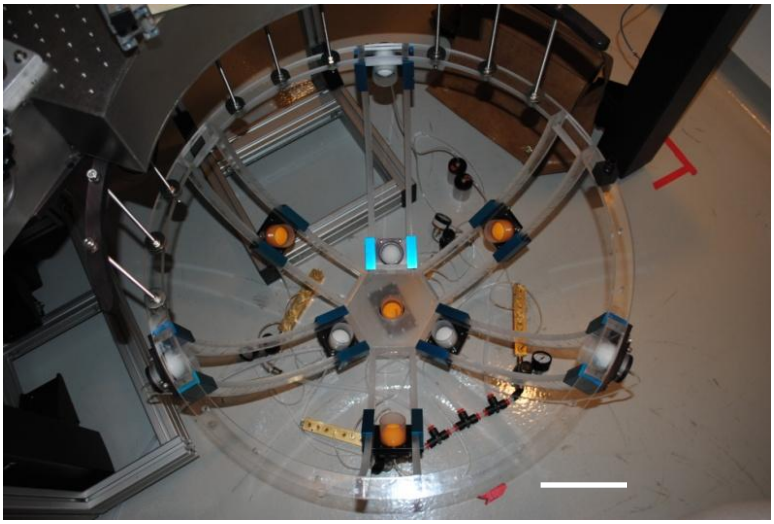


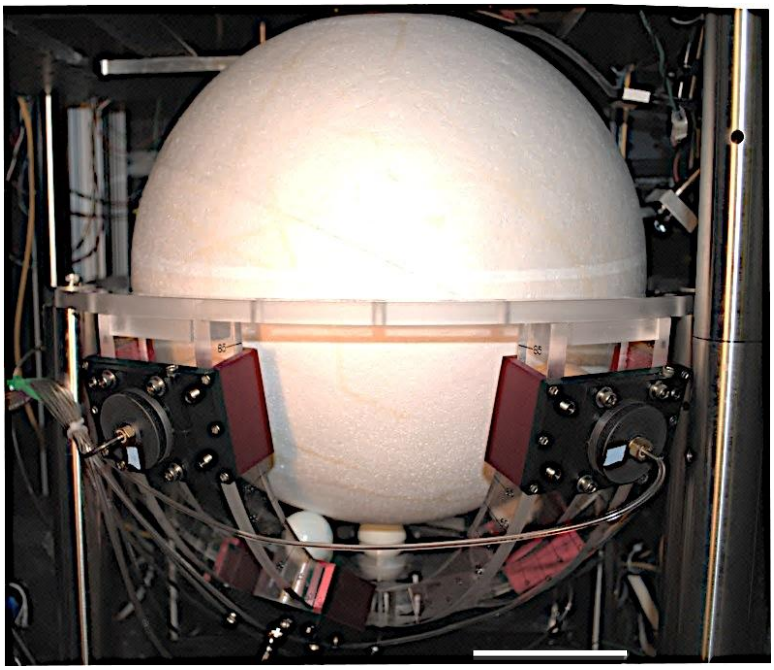


Fig A1. Overview of the principal components of the spherical treadmill system. A high-density polystyrene (HDP) sphere is supported by several independent air-cushioned ping-pong ball bearings (air cannons) clamped inside a lightweight acrylic treadmill frame. Loft is produced by continuously providing regulated air pressure (~5-15 psi) through small diameter tubing to each air cannon. (Top) 24" treadmill frame configured with ten air cannons. This treadmill system, hung from the underside of an air table, was designed for rats (60-150 g). (Bottom) A 16" treadmill system designed for mice (20-30 g). The 16" treadmill frame is configured with ten air-cannons and houses a 16" treadmill weighing ~65 g. (scale bars, 10 cm)

Fig A2. The treadmill frame. All panels, example of a fully assembled 24” treadmill frame
See fig A7-9 for parts.

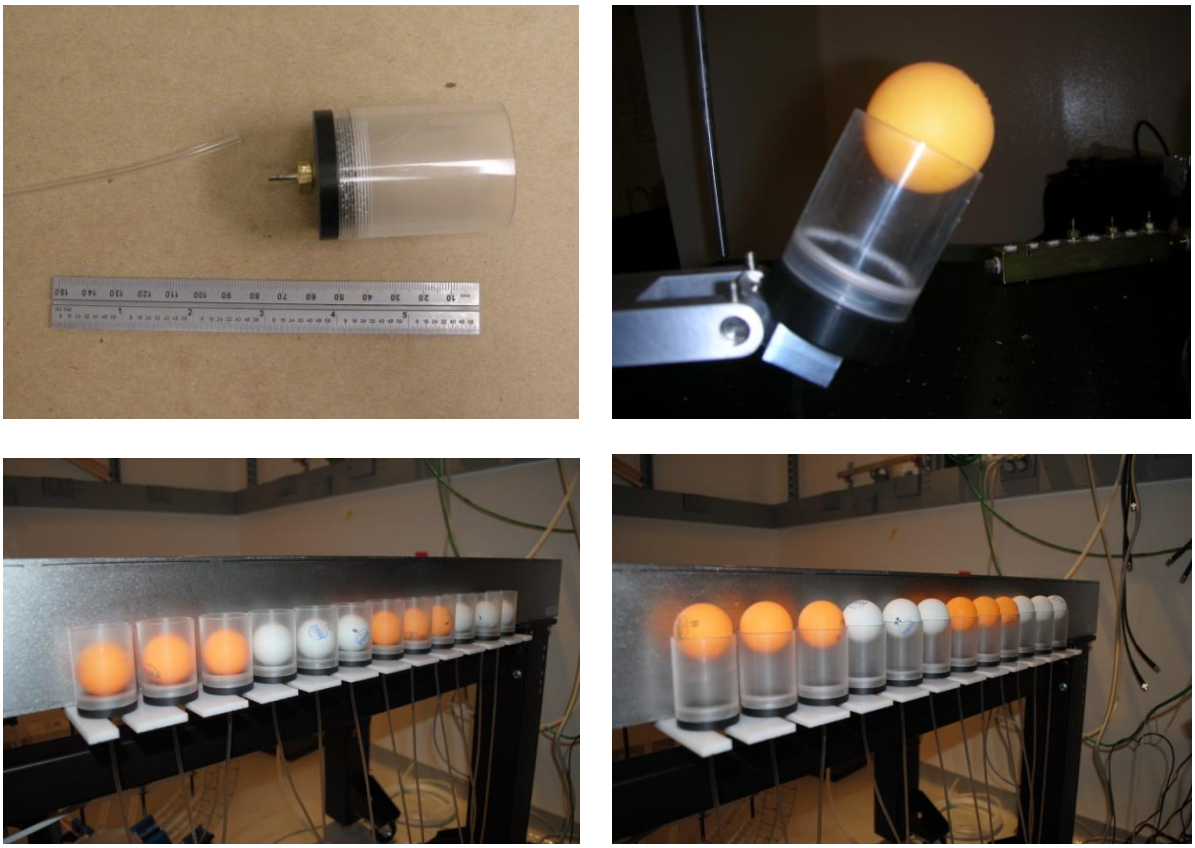
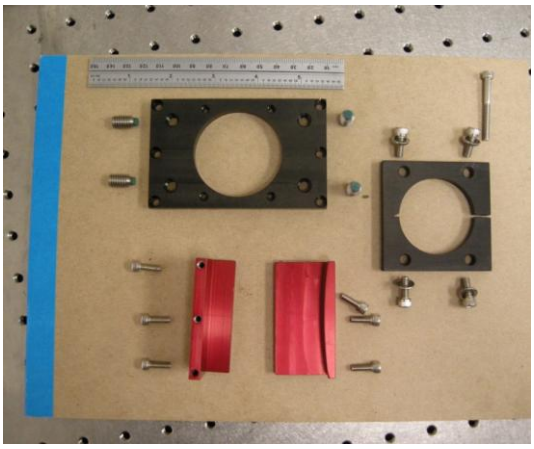
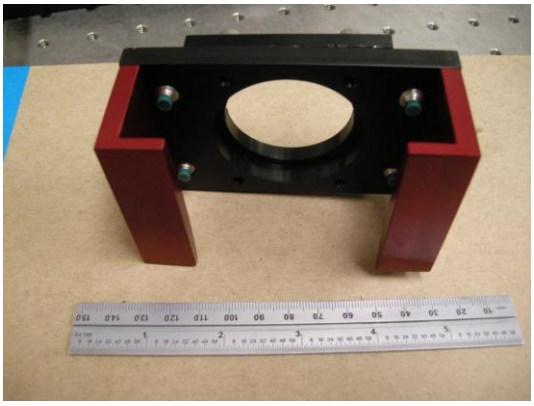


Fig A3. Air cannons. Each air cannon consists of:
1 x acrylic tube (Fig A10)
1 x delrin bottom tube caps (Fig A11)
1 x 1/8-27 NPT to 1/16” I.D. barbed pipe nipple
1 x ping pong ball (Gold 3-Star)
1 x 1/16” I.D. tubing





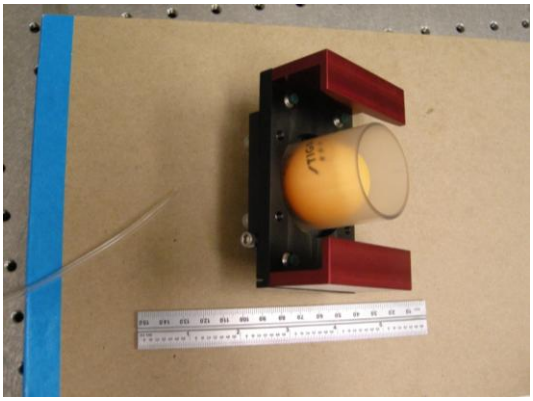


Fig A4. Air cannon clamp and bracket system. Each air cannon clamp and bracket system consists of:
1 x Cannon Clamp (Fig A12)
1 x Clamper Plate (Fig A13)
1 set of two Frame Clampers (Fig A14):
A) 2 x 9" radius Frame Clampers (Fig A14, top, shown here in red)
B) 2 x 13" radius Frame Clampers (Fig A14, bottom, shown in blue throughout the document)
6 x 8-32 1/2" Socket Cap Screws
1 x 8-32 1-1/2" Socket Cap Screws
4 x 10-32 1-1/2" Socket Cap Screws (with washers)
4 x 5/16"-18 1-1/2" Nylon Tip Set Screws

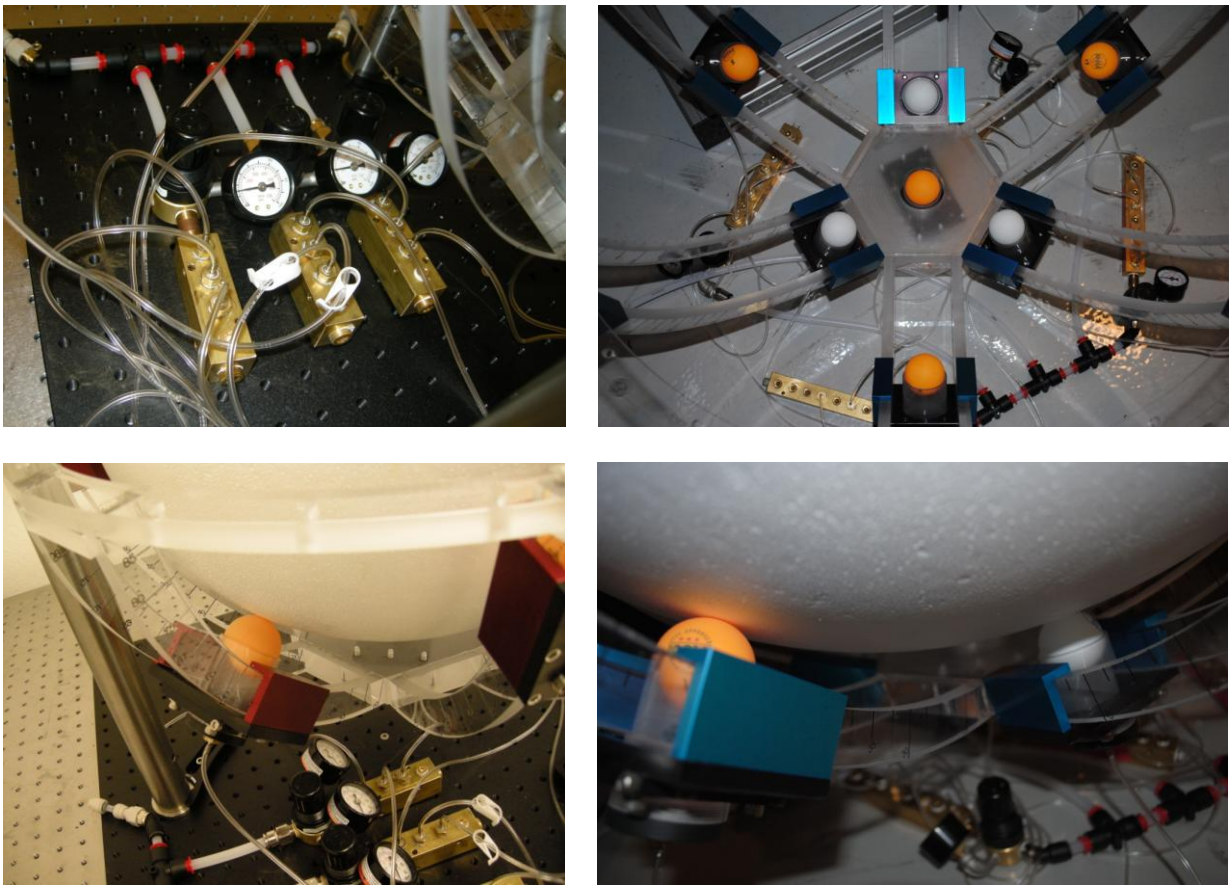
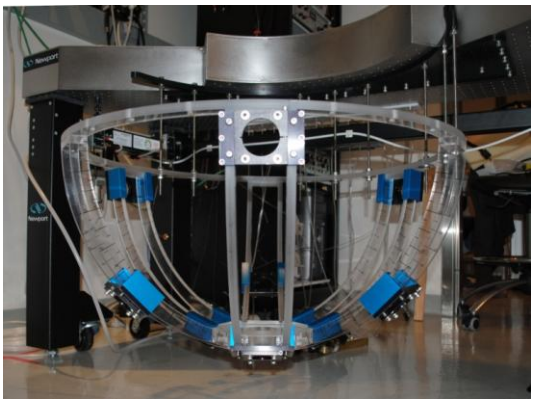
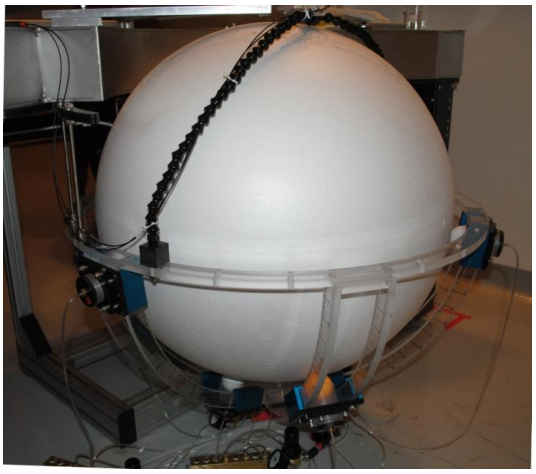


Fig A5. Air regulation. Each set of three air cannons is regulated by one air regulation system. Each air regulation system consists of:
1 x air regulator (rated to 0-50 psi recommended)
3 x 1/8-27 NPT to 1/16” I.D. barbed pipe nipples
3 x pieces of 1/16” I.D. tubing





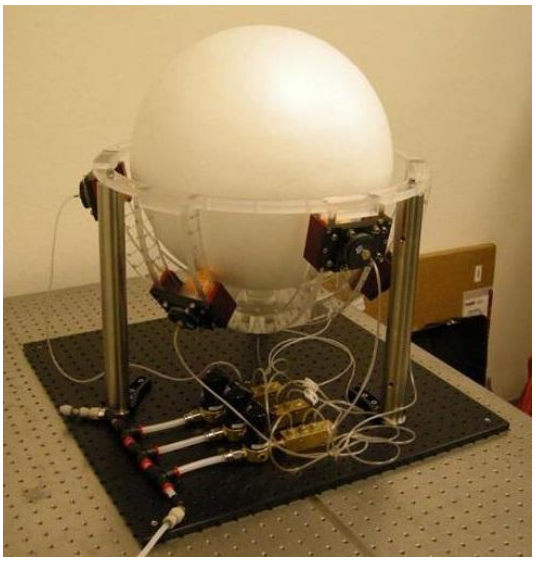


Fig A6. Examples of assembled treadmill suspension. (Top) 24” treadmill frame hung from the underside of an air floatation table - designed for rats. (Middle) 24” treadmill in the frame, hung from the underside of the air table. (Bottom) 16” treadmill system resting on three 1.5” diameter stainless steel posts - designed for mice.

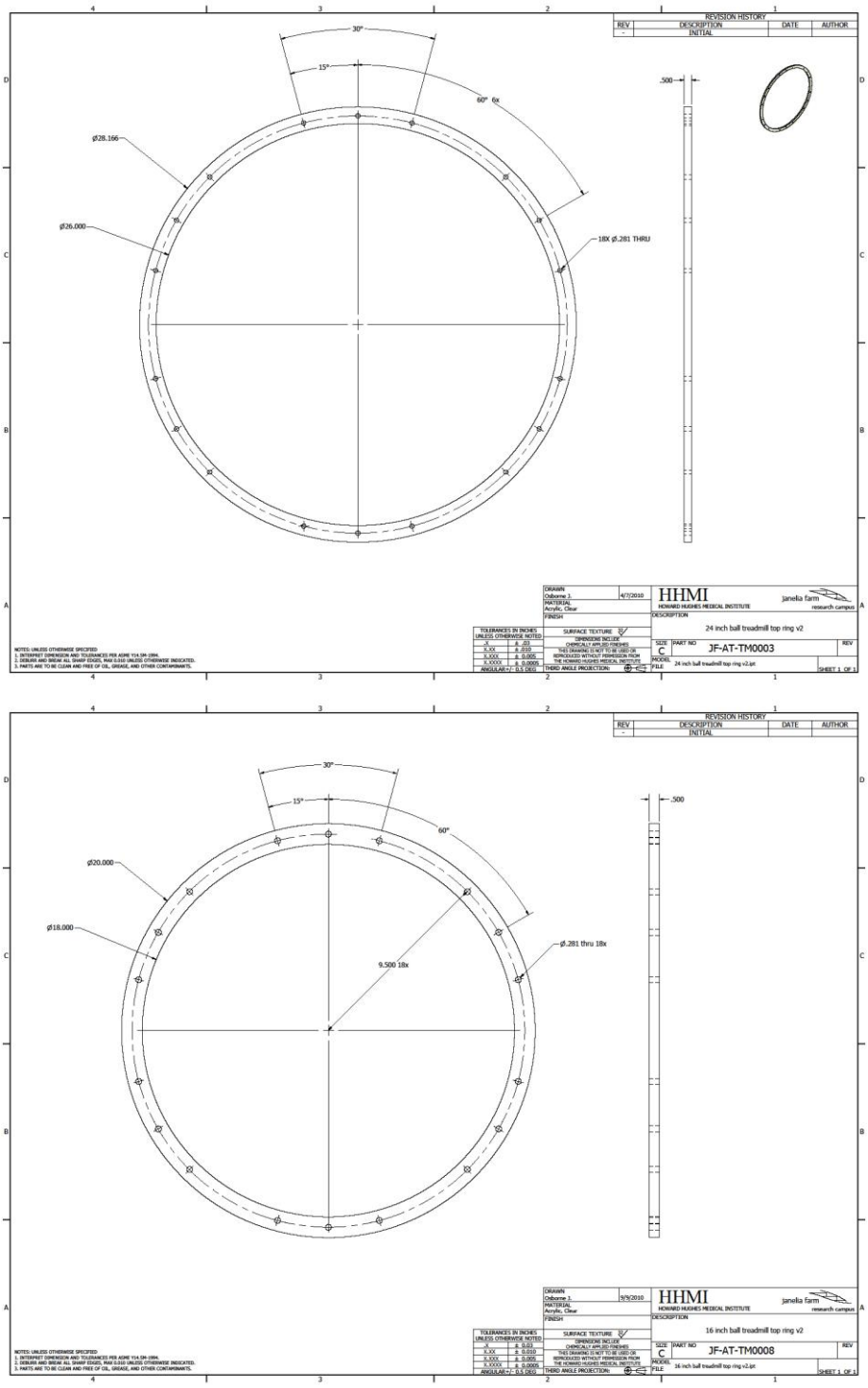


Fig A7. Treadmill frame top ring. (Top): 24” treadmill frame top ring. (Bottom): 16” treadmill frame top ring.

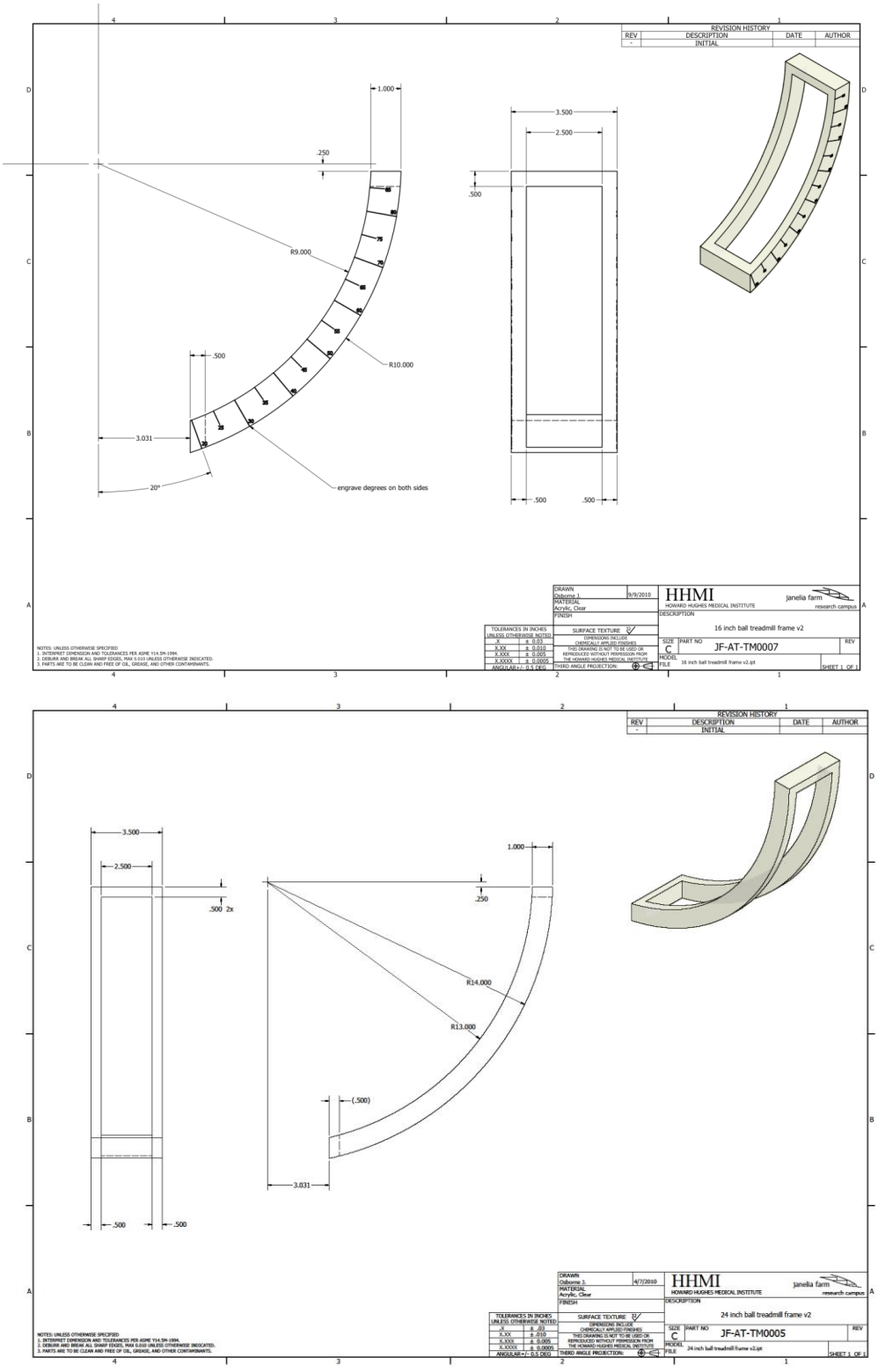


Fig A8. Treadmill frame arms. (Top) Note that the 16” treadmill requires 9” radius curvature arms for the 18” I.D. treadmill frame. (Bottom) Note that the 24” treadmill requires 13” radius curvature arms for the 26” I.D. treadmill frame. (6 x arms required).

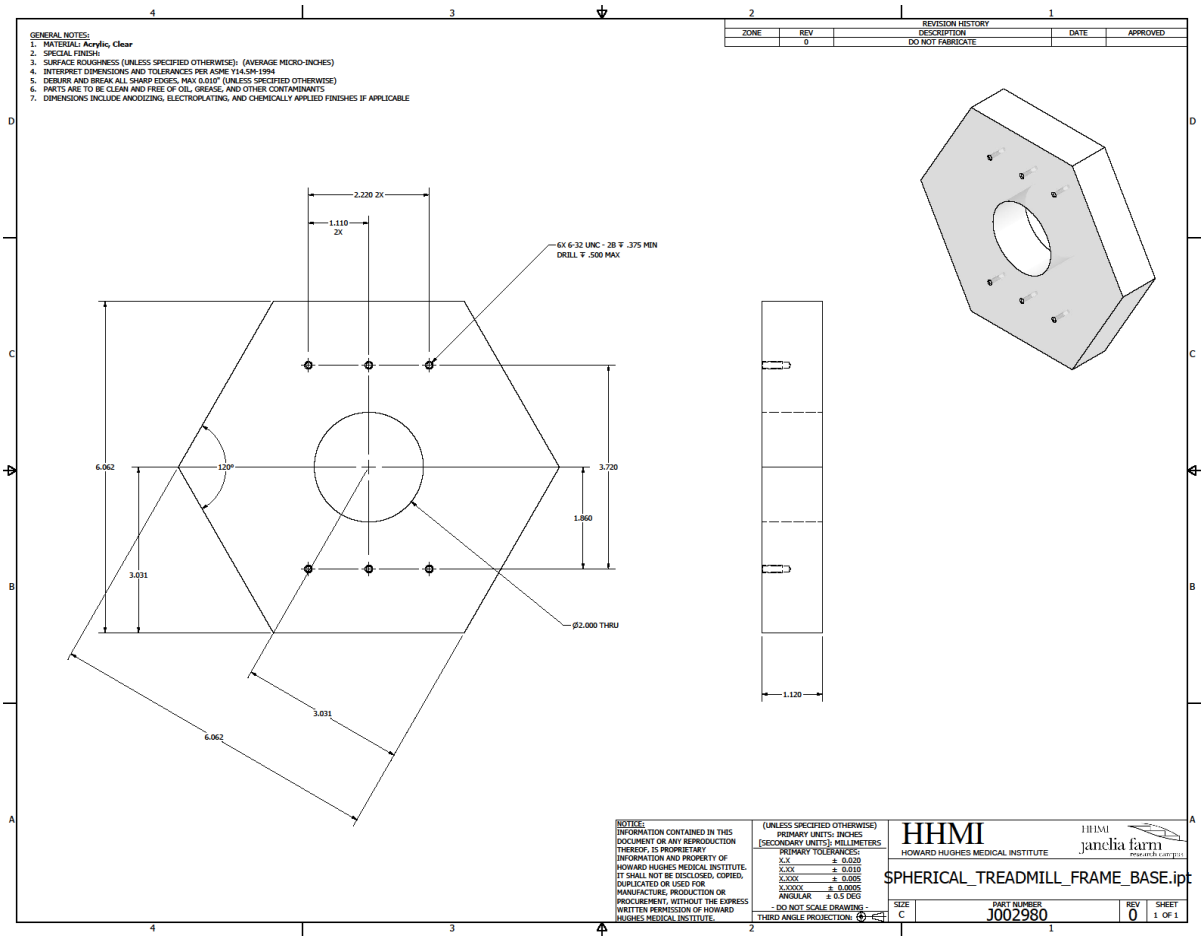


Fig A9. Treadmill frame base
(one size only)

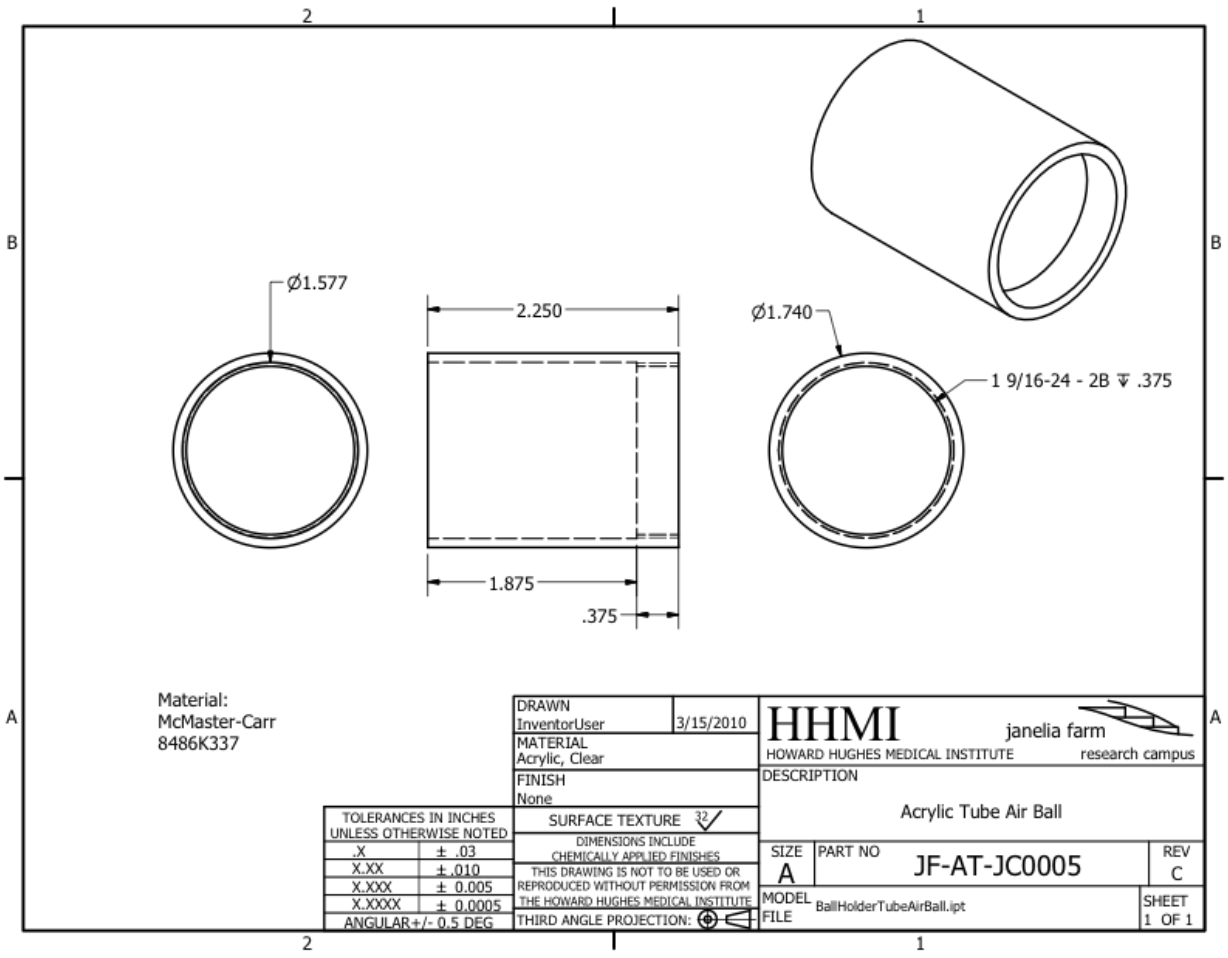


Fig A10. Air cannon tube.
(one size only)

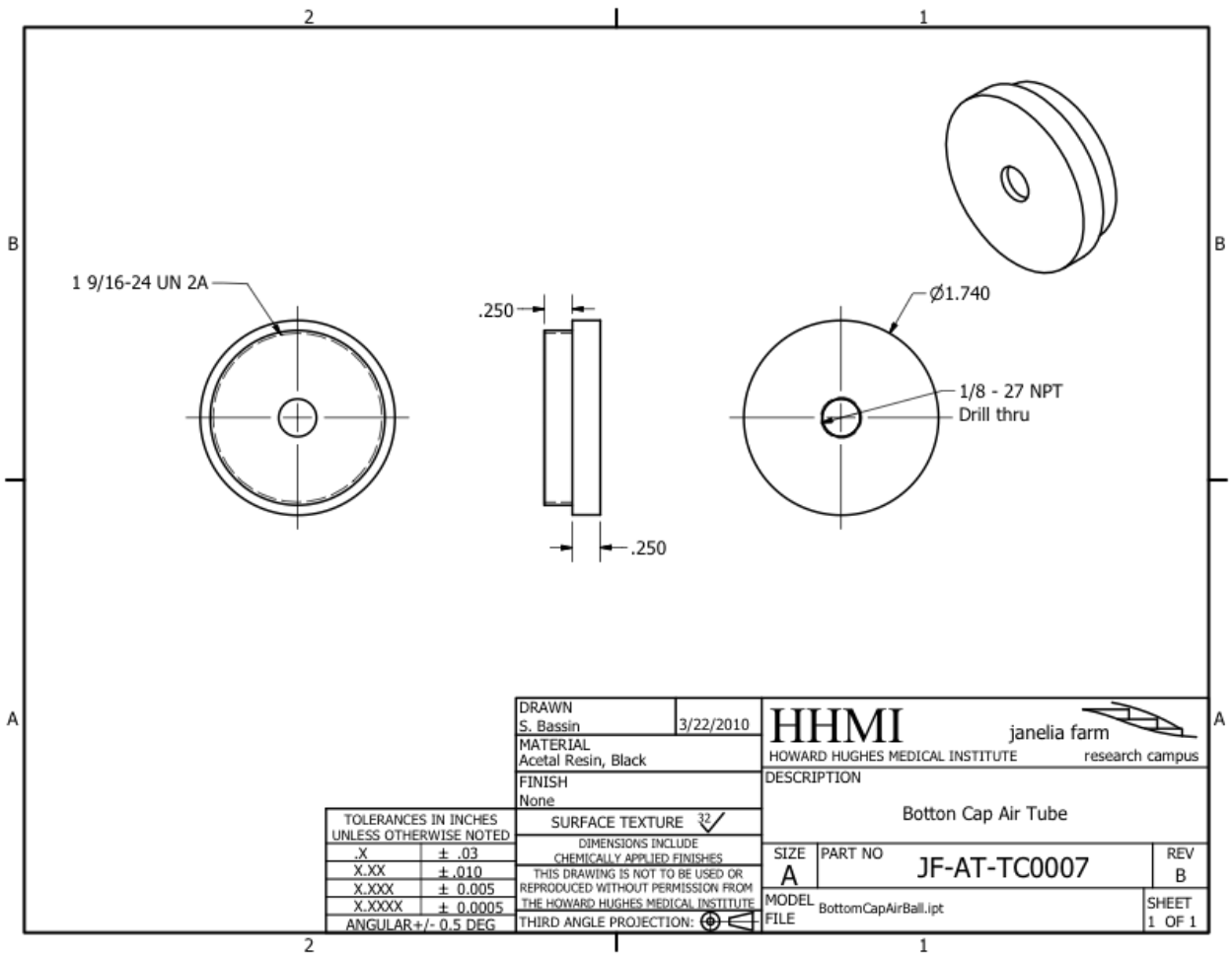


Fig A11. Air cannon tube cap
(one size only)

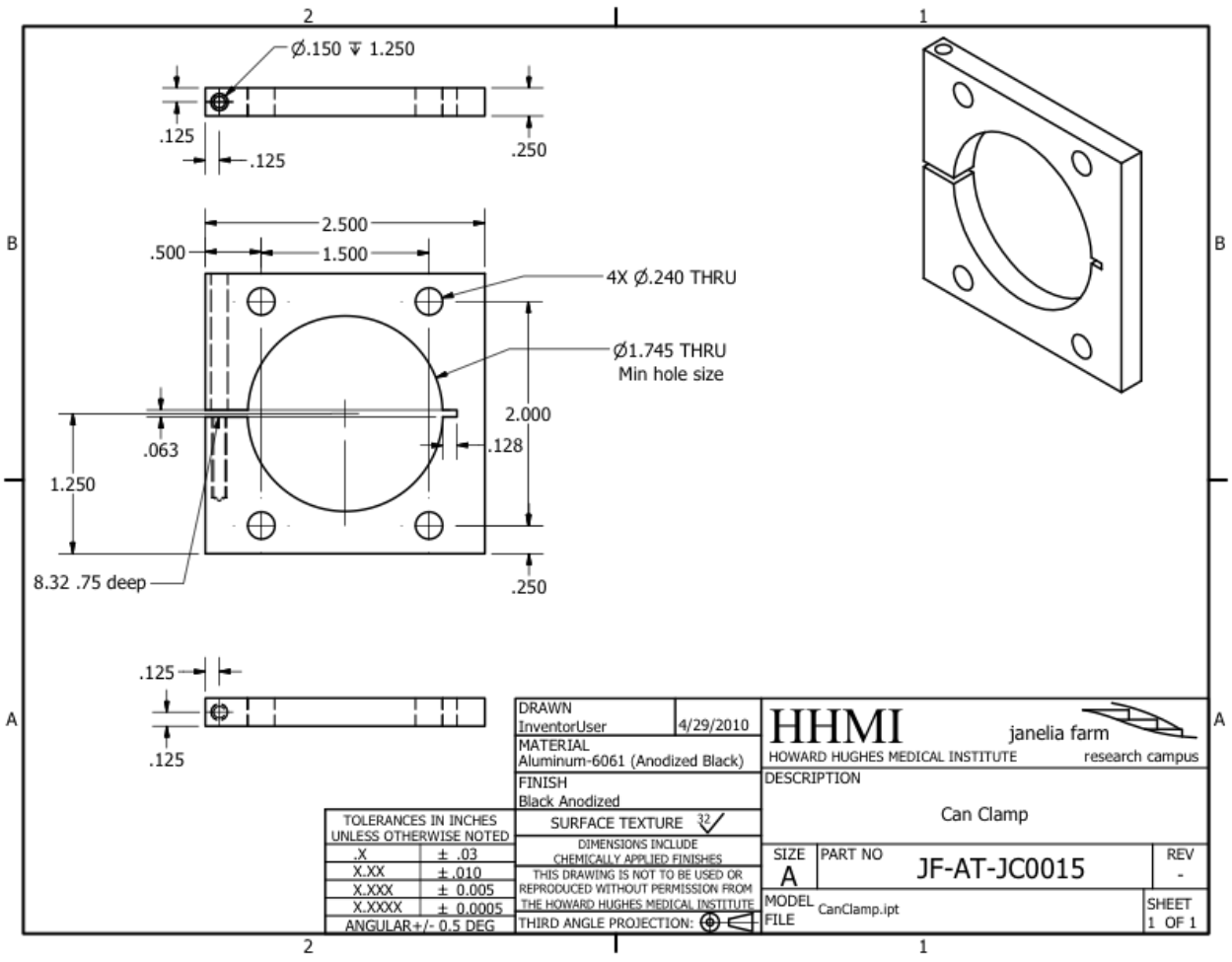


Fig A12. Air cannon clamp.
(one size only)

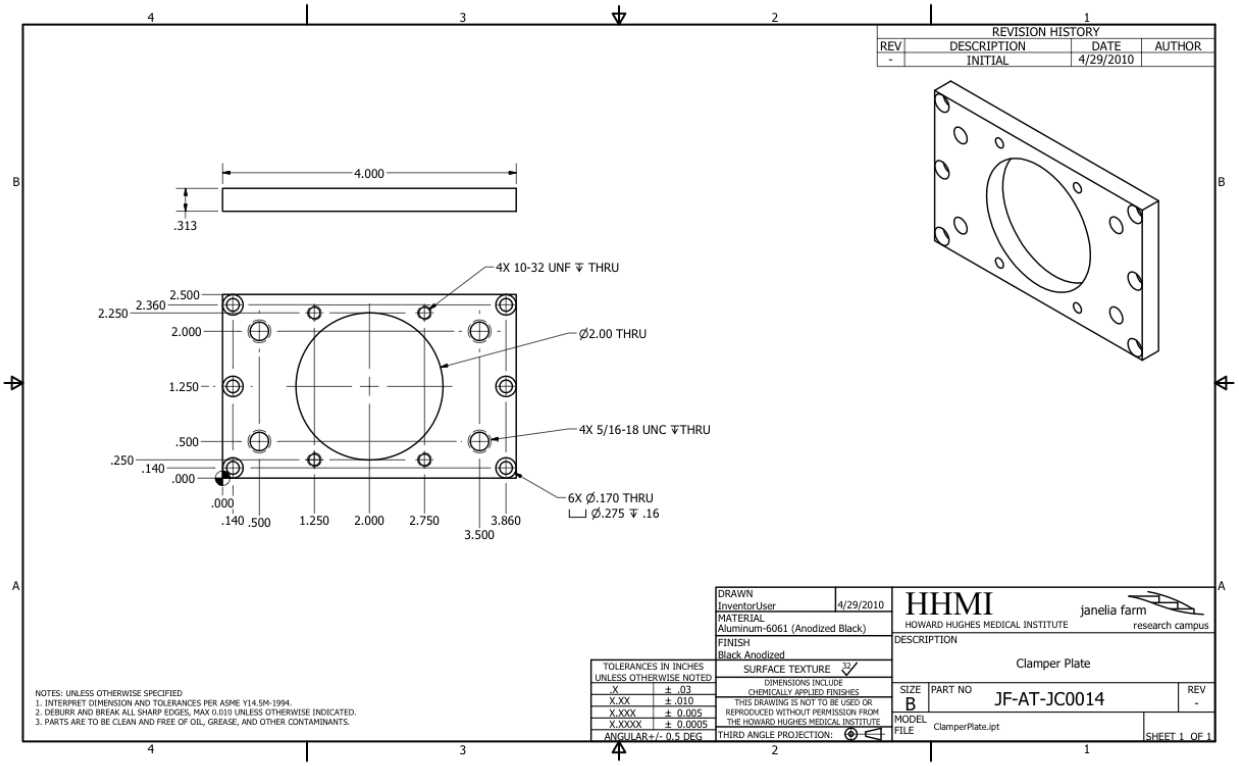


Fig A13. Treadmill clamper plate
(one size only)

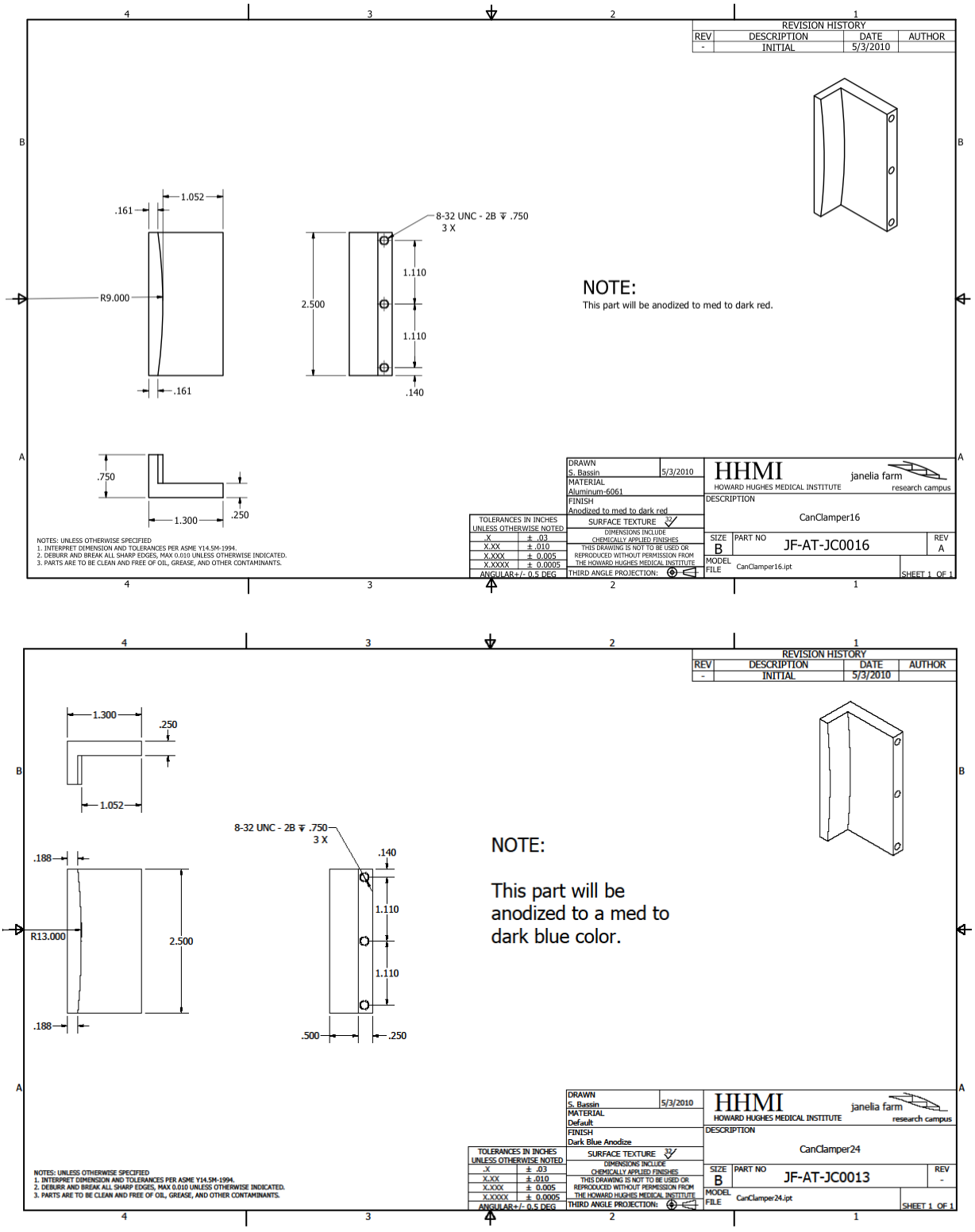


Fig A14. Treadmill frame clampers. (Top) Note that the 16” treadmill requires the 9” radius curvature clampers for the 18” I.D. bowl. (Bottom) Note that the 24” treadmill requires the 13” radius curvature clampers for the 26” I.D. bowl.

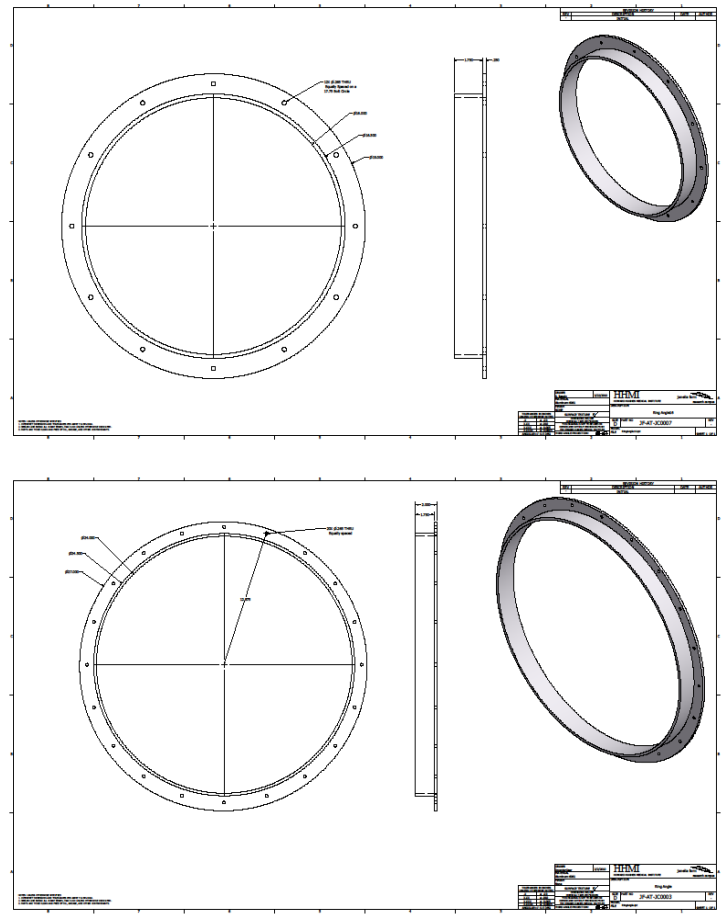


Fig A15. Treadmill gluing ring. (Top) 16” gluing ring. (Middle) 24” gluing ring. (Bottom) 24” half-sphere in the 24” gluing ring (surrounded by parafilm). The gluing ring is resting on three 1.5” thick, 11” high pillars. This configuration places the equator of the forged sphere in the center of the gluing ring. (***NOTE*** Oddly, the 16” spheres from Smoothfoam.com are actually 15.5625” diameter. We recommend a gluing ring of 15.6” I.D. for that specific product).