United States
Consumer Product Safety Commission
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March 7, 2022

TRANSMITTED VIA EMAIL
Ms. Jennifer King
Chair, ASTM F15.18 Subcommittee on Play Yards and Non-Full-Size Cribs
ASTM International
100 Barr Harbor Dr.
West Conshohocken, PA 19428-2959

Dear Ms. King:

This letter proposes the enclosed revisions to American Society for Testing and Materials (ASTM) F406-19 Standard Consumer Safety Specification for Non-Full-Size Baby Cribs/Play Yards as a follow up to the U.S. Consumer Product Safety Commission (CPSC) staff's negative vote for ballot F15 (22-01), Item 5.[1] Item 5 proposed revisions to section 5.16 of ASTM F406-19 to allow mattresses up to 2 inches in thickness. The maximum sidewall gap between the mattress and play yard (when mattress is centered in the manufacturer's recommended use position and installed with all required attachment means) shall be no greater than 0.5 inches as measured by a specified gauge.

As explained in staff's letter accompanying staff's negative vote, staff is concerned that the proposed test to measure the gap between the mattress and sidewall does not apply any force to the play yard's flexible sidewall. Staff proposes the enclosed test method that applies a five pound outward force on the play yard's sidewall while maintaining the 0.5 inch mattress to sidewall gap requirement.

CPSC staff looks forward to continuing to collaborate with ASTM to develop these requirements.

Sincerely,

Digitally signed by FREDERICK DEGRANO
Date: 2022.03.07 11:15:47 -05'00'

Frederick deGrano,
Project Manager, Play Yards

cc: Jacqueline Campbell, CPSC Voluntary Standards Coordinator

[1] The views or opinions expressed in this letter are solely those of the staff, and have not been reviewed or approved by, and do not necessarily represent the views of, the Commission.

CPSC Staff Proposal

5.16.2 Mesh/fabric play yard products shall meet 5.16.2.1 or 5.16.2.2.

5.16.2.1 Mattresses up to 1.5 in. thick

5.16.2.1.1 For mesh/fabric products, the filling material of the mattress, such as foam or fiberfill shall not exceed 1 in. (25 mm) in thickness. The total thickness of the mattress, including all fabric or vinyl layers, filling material, and any structural members, such as wood or hardboard, shall not exceed 1 ½ in. (38.1mm).

5.16.2.2 Mattresses over 1.5 in. thick

5.16.2.2.1 Total thickness of the mattress, including all fabric or vinyl layers, filling material, and any structural members, such as wood or hardboard, shall not exceed 2 in. (50.8 mm).

5.16.2.2.2 Gap measurement--When a mattress is centered in the manufacturer's recommended use position, and installed with all required attachment means, no gaps greater than ½ in. (12.77 mm) shall be present when measured according to 8.XX.

8.XX Mattress Gap Measurement:

8.XX.1 Position the gap measurement sliding gauge shown in Figure X between the mattress and play yard sidewall at a location that is equidistant between the support structures of the play yard sidewall.

8.XX.2 Adjust the depth of the center vertical flange of the gauge to match the depth of the mattress.

8.XX.3 Insert the vertical flange of the gauge between the edge of the mattress and the play yard sidewall with the bottom of the horizontal section of the gauge flat on top of the mattress (see Figure Y).

8.XX.4 Pull the raised center section of the gauge away from the play yard sidewall until the center vertical flange contacts the edge of the mattress. While maintaining the position of the center section, apply 5 pounds (+/- 0.5 pound) of force laterally to the main gauge body towards the play yard sidewall until a static equilibrium position is reached and record the gap measurement in the loaded, static position (see Figure Z).

8.XX.5 Repeat 8.XX.3 and 4 on each of the other 3 sides of the mattress at a location that is equidistant between the support structures of the play yard sidewall.

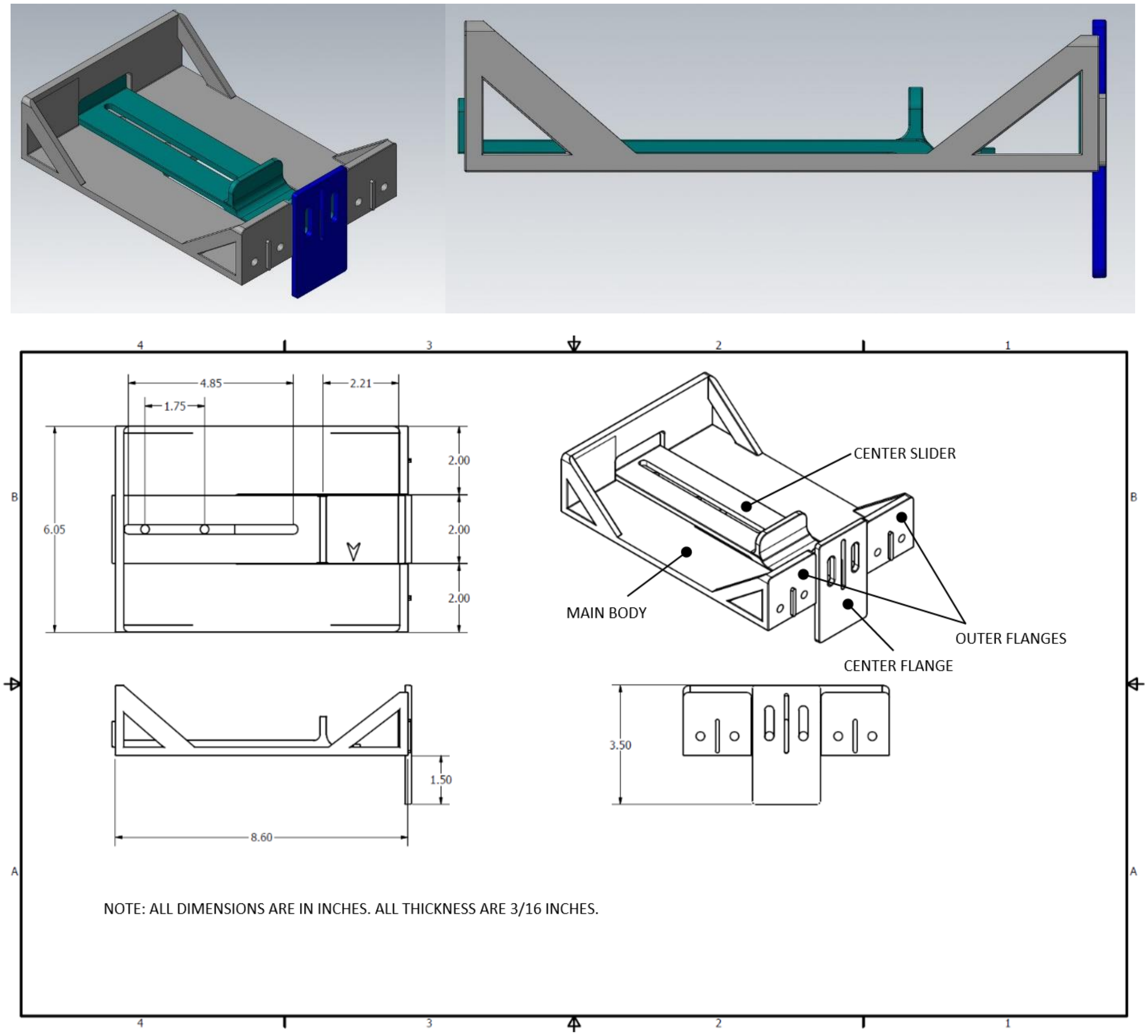

Figure X. Gap measurement sliding gauge.

Figure Y. Gap measurement sliding gauge positioned with vertical flanges between edge of mattress and play yard sidewall.

Figure Z. Gap measurement sliding gauge with 5 lbf. applied to main gauge body towards play yard sidewall, and resulting gap measured in the loaded, static position. The raised center section of the gauge is held in place while the force is applied.

Rationale

The gap limitation is intended to prevent the risk of entrapment between the edge of the mattress and the play yard sidewall. Item 5 proposed a maximum dimension of 0.5 inch between the mattress and play yard sidewall when the mattress is centered and secured in the product. CPSC staff concurs that limiting the dimension between the mattress and sidewall to 0.5 inches will prevent entrapment of an infant.

To account for the flexibility typical to play yard sidewalls, staff modified the current ballot-proposed sliding gauge and test method to incorporate a horizontal force on the gauge and afford additional adjustments. As shown below in Figure 1, the sliding gauge placed on top of the mattress in way of the play yard sidewall measures the pocket width, "*w*," while a horizontal force of a specified magnitude is applied to the sliding gauge body.

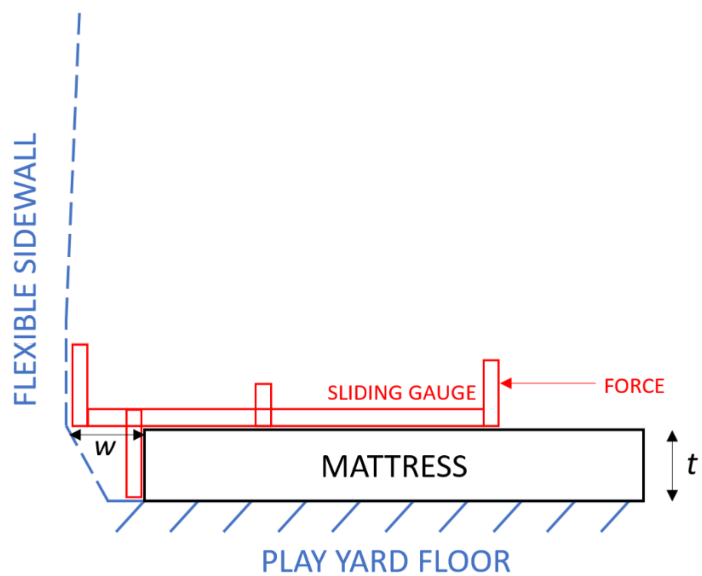

Figure 1. Sliding gauge gap measurement diagram

Staff modified the sliding gauge design to allow application of a lateral force as shown in Figure 1. The design allows the center sliding portion of the gauge to engage the mattress via an adjustable flange extending down into the space between the mattress and the sidewall and allows the main sliding body to be pushed into the sidewall. The expanded flange of the gauge on the end opposite the sidewall provides a surface area to apply a push force via a force gauge uniformly onto the sidewall thus expanding the pocket width, *w*, until static equilibrium is reached with a specified applied force.

Staff estimated the lateral forces on the sidewall by calculating the weight of the infant leaning against the sidewall. Staff is not aware of existing data on dynamic forces due to an infant rolling or pushing against the sidewall. Therefore, staff focused on the side forces generated by the static weight of an infant leaning against a vertical sidewall.

<u>Calculated force:</u>

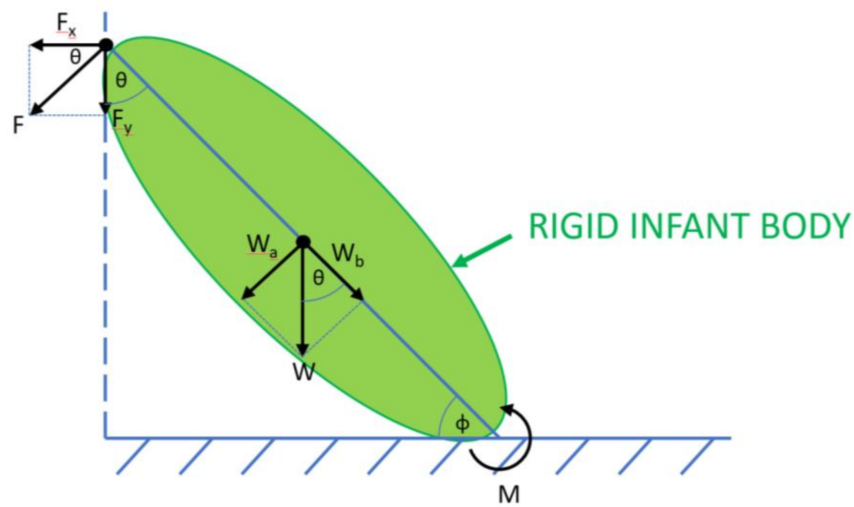

Figure 2. Force calculation freebody diagram

Assuming a rigid infant body that is static and not sliding, staff calculated that the maximum horizontal component of the infant's weight against a vertical sidewall is below. Staff determined that infants between 2 and 6 months old are developing new skills in stages, such as rolling over and crawling. Therefore, in this age range, infants may end up in hazardous gaps from which they cannot extricate themselves.

- 4.3 lbs for 6-month-old weighing 17.2 lbs. at 45-degree lean
- 4.4 lbs for a 50^{th} percentile 6-month-old male weighing 17.6 lbs. at 45-degree lean
- 5.05 lbs for a 95^{th} percentile 3-5-month-old male weighing 20.2 lbs. at 45-degree lean

<u>Empirical Measurements</u>

Staff conducted laboratory testing in which staff placed a CRABI dummy (17.2 lb. weight), representing 50^{th} percentile 6-month-old male, in various positions against a vertical force plate to measure the lateral loads generated by the dummy leaning against a sidewall.[1] As shown in Figure 3, the test fixture

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[1] The CRABI (Child Restraint Airbag Interaction) Child Anthropomorphic Test Devices (ATD) are commonly known as crash test dummies and were developed to evaluate child restraint systems in automotive crash testing. In 1990 the Society of Automotive Engineers (SAE) Mechanical Human Simulation Subcommittee formed the Infant Dummy Task Group. The group developed design specifications for three sizes of infant dummies: a 6-month-old, 12-month-old, and 18-month old. The group approved the weight distribution and scaling methods.

includes a rigid horizontal platform and a vertical board mounted to a load cell that measures the total horizontal push force on the vertical board. The highest side force measured by staff was 4.35 lbs. with the CRABI dummy leaning against the vertical force plate. Based on this measurement, the extrapolated force generated by a 95th percentile 3-5 month old weighing 20.2 lbs. is 5.11 lbs.

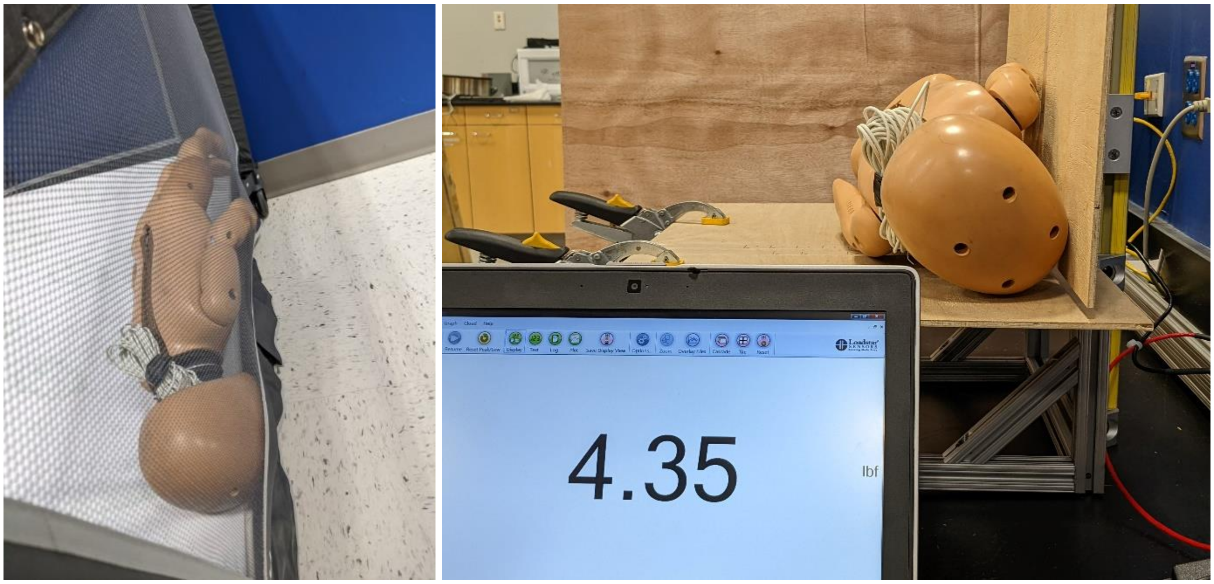

Figure 3. CRABI dummy positioned in play yard vs. on loadcell test rig

Summary

The empirical measurements of the side force generated by the CRABI dummy leaning against a vertical side were consistent with calculated values (4.3 lbs. calculated vs 4.35 lbs. measured). Staff's empirical measurements verify that the calculations for a child leaning against the side wall were reasonable. Calculating the side force generated by large 3-to-5-month-old infants weighing 20.2 lbs., staff determined 5 lbs. is an appropriate lateral force to apply to the play yard side to determine maximum gap measurement. This value represents the maximum lateral force that may be generated by a 5-month-old infant leaning longitudinally against the sidewall of a play yard.