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December 16, 2020

James Clayton Owens, Acting Administrator
National Highway Traffic Safety Administration
Docket Management Facility, M-30
U.S. Department of Transportation
1200 New Jersey Avenue S.E.
West Building Ground Floor, Room W12-140
Washington, DC 20590-0001

Subject: NHTSA NPRM HIII 5F Request for Comments
Docket No. NHTSA-2019-0023

Humanetics Innovative Solutions appreciates the opportunity to provide supplemental information regarding NHTSA's Notice of Proposed Rulemaking (NPRM) announced December 26, 2019 to update the Hybrid III 5th Female spine box design.

Humanetics is the leading global designer, manufacturer and supplier of crash test dummies, calibration equipment, crash sensors, and crash simulation software models and has been dedicated to the advancement of occupant safety testing to create safer vehicles for over 65 years.

The supplemental information herein is complimentary to the comments provided by Humanetics to the original NPRM closing February 20, 2020 (italicized) on the Hybrid III 5th Female ATD and address item 1 of that response.

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Hybrid III 5th Percentile Female ATD (HIII-5F) Item 1 comments from 2/20/2020:

1. *NPRM Page 6: We propose to adopt the SAE (spine box) modification, details of which are specified within engineering drawings provided in the J2915 information report.*

   Humanetics supports the inclusion of the SAE reinforced spine box, 880105-1045, as detailed in SAE J2915.

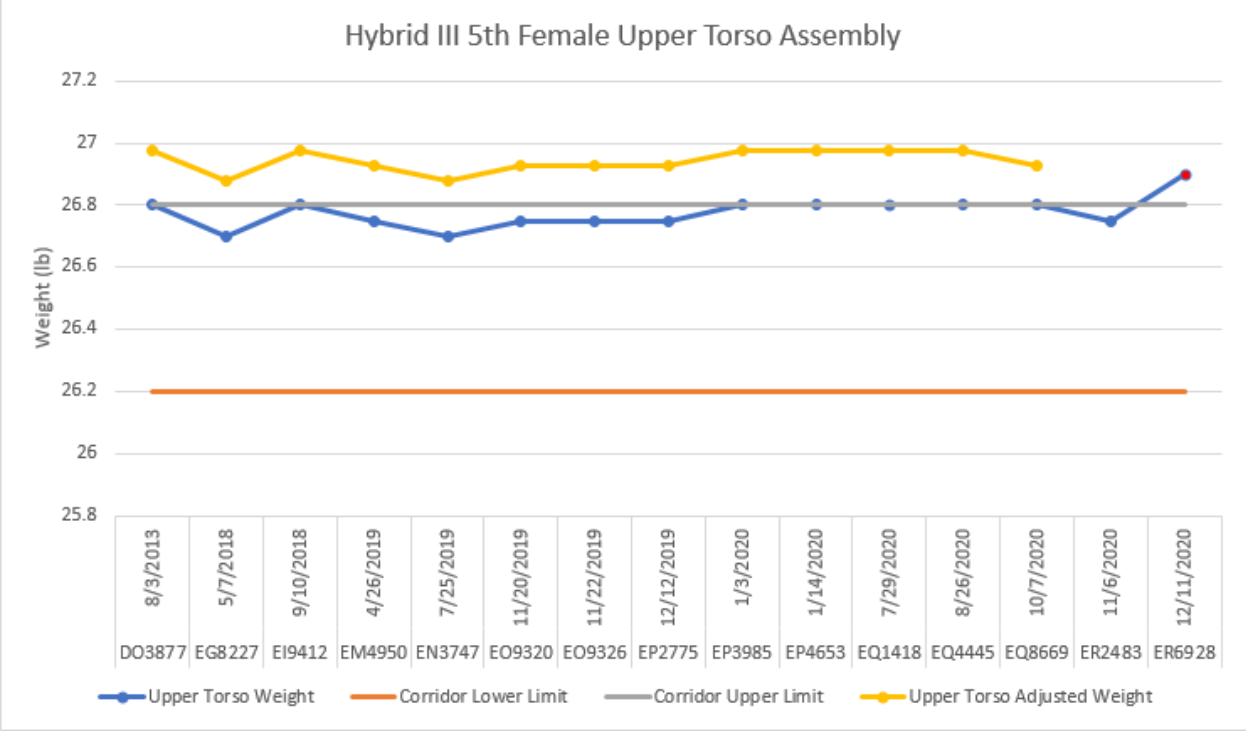
   Since the Hybrid III 5th Female was first adopted into CFR Part 572 in March of 2000 (amended in 2002), some users observed mechanical noise artifacts from the chest accelerometers. SAE Hybrid III Dummy Family Task Force began discussing this problem in 2007 and concluded their analysis in 2009, linking the noise to the rocking of the spine box on the thorax load cell mounting bolts.

   The screws can loosen during testing and the spine box can contact the sides of the screws. This causes high frequency mechanical noise within the accelerometers. Another result of this rocking is that the spine box can move approximately one degree off axis, altering the head position relative to the pelvis.

   Humanetics fully supports the design as shown in the NPRM as it has been proven to eliminate the noise while preserving the dynamic response.

Continuation of comments:

The SAE spine box design, 880105-1045, as proposed in the NPRM adds approximately ~.170 lbs. (~0.077 kg) to the upper torso assembly per SAE J2915. We estimate the design adds ~.178 lbs. when we include the welds. The change in mass has an adverse effect on the upper torso part grouping assembled weight requirement on sheet 6 of the top-level assembly drawing, 880105-000(-H). The mass becomes out of spec above the upper limit of the corridor when the SAE spine box is implemented. The design adds mass to the upper torso roughly 30% of the allowable tolerance. The current weight specification for the upper torso assembly segment is 26.50 +/- .30 lbs.



**Note, the 12/11/2020 ATD shown (red dot), is the first NPRM prototype ATD going through production.

A review of past mass data from 14 previously shipped ATDs shows the harmonized upper torso data in the upper quarter of the weight specification when fitted with the current spine box, 880105-1000-FT. The graph above shows the upper torso assembly mass for harmonized ATDs in blue and the theoretical adjusted weight if implementing the SAE spine box in yellow. Weight is adjusted by .178 lbs. to reflect the added mass. All 14 harmonized ATDs shipped fail the upper torso assembly weight specification once the mass is adjusted to accommodate the SAE spine box design.

An update to the weight specification for the upper torso assembly is required to implement the SAE spine box as proposed in the NPRM. We request to update the weight specification to represent the population of ATDs currently in the field. The upper torso assembly is comprised primarily of machined and welded components; with the chest jacket providing the bulk of mass due to molded components. It is unlikely there's harmonized ATDs in the lower limit of the weight corridor.

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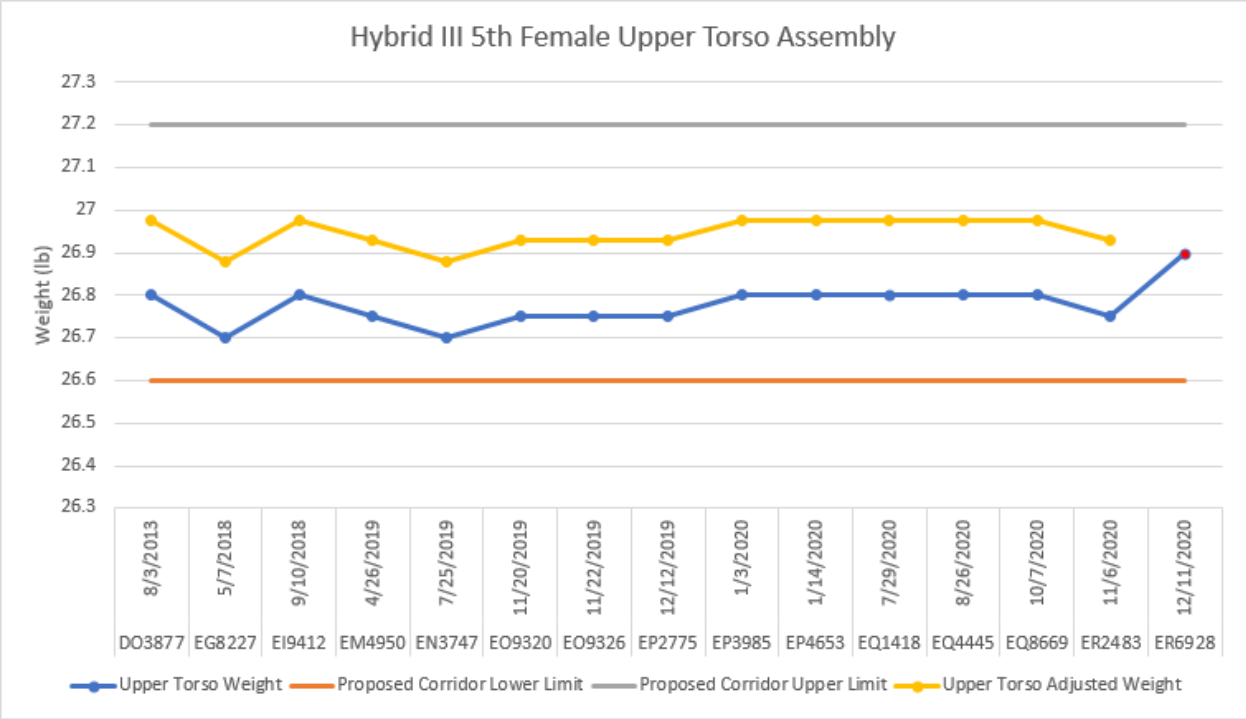
We request an update to Sheet 6 of the top-level drawing, 880105-000(-H), to shift the weight corridor for the upper torso assembly segment to allow for retrofitting of the SAE spine box design into existing ATDs in the field. This update would more accurately capture the existing harmonized population while also mitigating any issues with installing SAE spine box upgrades going forward.

Updates to Sheet 6 assembly weights would include a shift of the nominal weight specification for the upper torso assembly to **26.90** +/-.30 lbs from 26.50 +/- .30lbs. This change will allow the corridor to shift upwards .40 lbs. Approval of this update would also shift the total dummy weight to **108.43** +/- 2.50 lbs. from 108.03 +/-2.50 lbs. (shown below)

ASSEMBLY WEIGHTS				
SEGMENT ASSEMBLY	SPECIFIED WEIGHTS			
	lbs	lbs	kg	kg
HEAD ASSEMBLY	8.23	±0.10	3.73	±0.05
NECK ASSEMBLY	2.00	±0.20	0.91	±0.09
UPPER TORSO ASSEMBLY WITH TORSO JACKET (INCLUDES FROM NECK BRACKET TO BOTTOM OF SPINE BOX)	26.90	±0.30	12.20	±0.14
LOWER TORSO ASSEMBLY (INCLUDES FEMURS AND THE LOWER LUMBAR ADAPTING PLATE)	29.20	±0.30	13.25	±0.14
UPPER ARM ASSEMBLY, LEFT OR RIGHT	2.60	±0.10	1.18	±0.05
LOWER ARM ASSEMBBLY, LEFT OR RIGHT	1.98	±0.10	0.90	±0.05
HAND ASSEMBLY, LEFT OR RIGHT	0.62	±0.10	0.28	±0.05
UPPER LEG ASSEMBLY, LEFT OR RIGHT	6.90	±0.20	3.13	±0.09
LOWER LEG ASSEMBLY, LEFT OR RIGHT	7.20	±0.20	3.27	±0.09
FOOT ASSEMBLY, LEFT OR RIGHT	1.75	±0.10	0.79	±0.05
TOTAL DUMMY WEIGHT	108.43	±2.50	49.19	±1.13

Updated graph of the proposed shifted corridor is shown below



**Note, the 12/11/2020 ATD shown (red dot), is the first NPRM prototype ATD going through production.

Summary:

Humanetics recommends updating 880105-000(-H) Sheet 6 upper torso assembly segment weight specification to shift the nominal value to 26.90 +/- .30 lbs. and the total dummy weight to 108.43 +/- 2.50 lbs.

Humanetics has included with these submission comments a Microsoft Excel workbook containing all data and calculations for data shown in these comments.

If there are any additional questions, or NHTSA requires further information regarding this submission, do not hesitate to contact us. Thank you.

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