

Howell, Rosa (NHTSA)

From: david.cook@daimler.com
Sent: Friday, August 04, 2017 4:23 PM
To: Seymour, Nate (NHTSA)
Subject: Detroit Axle VRTC Visit Questions

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Nate,

Below are responses to the remainder of the questions that were asked during our visit to VRTC.

1. Do we run a test end stop to end stop in product validation? Do we know what the pressure at the steer arm and tie rod arms are when they hit the end stop?
Full vehicle durability testing includes lock to lock static steering. After each lap around the track the vehicle stops and completes 2 lock to lock steering cycles. The hydraulic pressure is relieved approximately 5 deg before the wheels would reach the stops. DTNA has calculated data on the forces in the steering system that we can share in a follow up WebEx meeting if you are interested in seeing it.
2. Why are there no washers used on the steer arm and tie rod arm bolts?
The steering arm and tie rod arm material are hard enough that a washer is not required and would not provide any benefit.
3. Why are the bolts threaded the entire length, would a bolt with a shoulder reduce the amount of clearance between the bolt and the hole in the arms? Would this help to reduce the amount of relative motion between the arm and the knuckle?
The joint is designed so that the clamp load is sufficient to prevent movement within the joint so bolts are not needed to act as "fitting bolts".
4. What is the expected torque loss / clamp load loss over time & cycles for the steer and tie rod arm bolts? Do we have testing data or validation data that shows the amount of loss if any?
DTNA's expectation is to have low loss of clamp load over the life of the steering components. The latest returned durability vehicle shows no loss. The torque seal applied after the bolt was torqued in our prototype shop, was still intact after 12k mi.
5. Why is there no Loctite used on the bolts?
DTNA implemented precise production tooling for bolt installation which eliminates the need for Loctite application. Due to variation in service tools, Loctite is required as per service manual.
6. Are the bolts a one-time use, or can they be reused? Service documentation isn't clear. How many times can they be reused?
The bolts are considered a one-time use item. DTNA does not believe that the bolts experience loading beyond the yield point but out of an abundance of caution decided to make them one-time use items.
7. Is there any expected clamp load loss due to heat cycling from the front brakes? Have we tested or simulated this?
DTNA does not expect heat cycling to affect the clamp load. DTNA does not conduct specific heat cycling testing. Extensive full vehicle testing conducted on our test track and in the real world have shown that there is not a loss of clamp load.

Best Regards

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