

Chris Urmson
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Dear Dr. Urmson:

This responds to your November 12, 2015 letter^[1] requesting that the National Highway Traffic Safety Administration (NHTSA) interpret a number of provisions in the Federal Motor Vehicle Safety Standards (FMVSSs) as they apply to Google's described design for motor vehicles that it is in the process of developing and testing. According to Google, those self-driving vehicles (SDVs) are fully autonomous motor vehicles, *i.e.*, vehicles whose operations are controlled exclusively by a Self-Driving System (SDS). The SDS is an artificial-intelligence (AI) driver, which is a computer designed into the motor vehicle itself that controls all aspects of driving by perceiving its environment and responding to it.^[2] Thus, Google believes that the vehicles have no need for a human driver.

In this response, NHTSA addresses each of Google's requests for interpretation, and grants several of them. In some instances, the issues presented simply are not susceptible to interpretation and must be resolved through rulemaking or other regulatory means. NHTSA believes that many of these issues may be resolved on an interim basis through well-supported exemption petition(s), and invites Google to file such petitions. In other instances, if Google is able to provide sufficient additional information and evidence, it may be possible to resolve open issues through interpretations.

INTRODUCTION

Google describes its vehicles as having what NHTSA's May 2013 Preliminary Statement of Policy Concerning Automated Vehicles calls Level 4 Full Self-Driving Automation. According to that Statement, a Level 4 vehicle

is designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. Such a design anticipates that the driver will provide destination or navigation input, but is not expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles. By design, safe operation rests solely on the automated vehicle system.

Google is asking for interpretations to determine how it would certify its SDV to the FMVSS. In essence, Google seeks to produce a vehicle that contains L4 automated driving capabilities, and removes conventional driver controls and interfaces (like a steering wheel, throttle pedal, and brake pedal, among many other things). Given that the SDS controls all aspects of driving, and given Google's belief that the SDS consistently will make the optimal decisions for the SDV occupants' safety (as well as for pedestrians and other road users), the company expresses concern that providing human occupants of the vehicle with mechanisms to control things like steering, acceleration, braking, or turn signals, or providing human occupants with information about vehicle operation controlled entirely by the SDS, could be detrimental to safety because the human occupants could attempt to override the SDS's decisions. While the L4 automation is the impetus behind these design decisions, it is Google's design decisions that create the uncertainty over how to apply the FMVSS to Google's proposed vehicle.

Google's design choices in its proposed approach to the SDV raise a number of novel issues in applying the FMVSSs. Those standards were drafted at a time when it was reasonable to assume that all motor vehicles would have a steering wheel, accelerator pedal, and brake pedal, almost always located at the front left seating position, and that all vehicles would be operated by a human driver. Accordingly, many of the FMVSSs require that a vehicle device or basic feature be located at or near the driver or the driver's seating position. For vehicles with an AI driver that also preclude any occupant from assuming the driving task, these assumptions about a human driver and vehicle controls do not hold. As self-driving technology moves beyond what was envisioned at the time when standards were issued, NHTSA may not be able to use the same kinds of test procedures for determining compliance. And since the Safety Act creates a self-certification system for compliance, NHTSA's verification of a manufacturer's compliance (and thus, the agency's ability to enforce against non-compliance) is based on our established test procedures.

In order to determine where to place vehicle devices and features, or whether to provide them at all, Google has asked who or what is to be considered the driver and which seating position is considered to be the driver's seating position in its SDV. 49 CFR 571.3 defines driver as the occupant of a motor vehicle seated immediately behind the steering control system. Because Google's SDV design purposely does not have any mechanism by which human occupants could steer or otherwise drive the vehicle, it would be difficult in several instances to determine who the driver would be in its SDV, and thus to determine how to certify its motor vehicle design to certain FMVSS provisions that reference that driver. To attempt to solve this challenge, Google has offered different interpretations of driver or driver's seating position for NHTSA's consideration, varying with the specific requirement or circumstances, and requests that we confirm its interpretations.

Specifically, Google suggests two potential interpretations of driver and one potential interpretation for driver's position or driver's designated seating position in the context of its described motor vehicle design:

- 1) NHTSA could interpret the term driver as meaningless for purposes of Google's SDV, since there is no human driver, and consider FMVSS provisions that refer to a driver as simply inapplicable to Google's vehicle design;
- 2) NHTSA could interpret driver and operator as referring to the SDS; or
- 3) NHTSA could interpret driver's position or driver's designated seating position as referring to the left front outboard seating position, regardless of whether the occupant of that position is able to control the vehicle's operation or movements.

Google then applies these suggested interpretive approaches to a number of FMVSS provisions in order to justify being able to certify its intended motor vehicle design as compliant with the FMVSSs, without having to change the design in ways that Google finds problematic.

We will address each of Google's suggested interpretations in turn. The critical point of NHTSA's responses for many of the requested interpretations is that defining the driver as the SDS (or the driver's position as the left front position) does not end the inquiry or determine the result. Once the SDS is deemed to be the driver for purposes of a particular standard or test, the next question is whether and how Google could certify that the SDS meets a standard developed and designed to apply to a vehicle with a human driver. Related, in order for NHTSA to interpret a standard as allowing certification of compliance by a vehicle manufacturer, NHTSA must first have a test procedure or other means of verifying such compliance.

While some of Google's requested interpretations may be permissible given the facts presented here, we wish to make clear that many of the other requests present policy issues beyond the scope and limitations of interpretations and thus will need to be addressed using other regulatory tools or approaches. NHTSA further notes that in a number of instances (in particular, several included in Table B), it may be possible for Google to show that certain standards are unnecessary for a particular vehicle design. To date, however, Google has not made such a showing. We note that these interpretations are confined to the specific facts and circumstances set

forth in Google's letter, and that they do not apply to other facts and circumstances. We also emphasize that the interpretations NHTSA is issuing are subject to change or revocation if new or different facts or information comes to light.

DISCUSSION

NHTSA is authorized by the National Traffic and Motor Vehicle Safety Act (Safety Act, 49 U.S.C. Chapter 301) to issue FMVSSs that set performance requirements for new motor vehicles and new items of motor vehicle equipment. Under the Safety Act, NHTSA does not provide approvals of motor vehicles or motor vehicle equipment and does not make determinations as to whether a product conforms to the FMVSSs outside of a NHTSA compliance test. Instead, the Safety Act requires manufacturers to self-certify that their products conform to all applicable FMVSSs that are in effect on the date of manufacture. Manufacturers are also responsible for ensuring that their products are free of safety-related defects. NHTSA enforces compliance with the FMVSSs by testing vehicles and regulated equipment. NHTSA also investigates safety-related defects and conducts related enforcement and recall actions.

As a foundational starting point for the interpretations below, NHTSA will interpret "driver" in the context of Google's described motor vehicle design as referring to the SDS, and not to any of the vehicle occupants. We agree with Google its SDV will not have a "driver" in the traditional sense that vehicles have had drivers during the last more than one hundred years. The trend toward computer-driven vehicles began with such features as antilock brakes, electronic stability control, and air bags, continuing today with automatic emergency braking, forward crash warning, and lane departure warnings, and continuing on toward vehicles with Google's SDV and potentially beyond. No human occupant of the SDV could meet the definition of "driver" in Section 571.3 given Google's described motor vehicle design even if it were possible for a human occupant to determine the location of Google's steering control system, and sit "immediately behind" it, that human occupant would not be capable of actually driving the vehicle as described by Google. If no human occupant of the vehicle can actually drive the vehicle, it is more reasonable to identify the "driver" as whatever (as opposed to whoever) *is* doing the driving. In this instance, an item of motor vehicle equipment, the SDS, is actually driving the vehicle.

NHTSA will consider initiating rulemaking to address whether the definition of "driver" in Section 571.3 should be updated in response to changing circumstances, as contemplated by Executive Order 12866, Regulatory Planning and Review. Section 5, Reducing Regulations, of that Order provides that each federal regulatory agency will

[i]n order to determine whether regulations promulgated by the executive branch of the Federal Government have become unjustified or unnecessary as a result of changed circumstances periodically review its existing significant regulations to determine whether any such regulations should be modified or eliminated so as to make the agency's regulatory program more effective in achieving the regulatory objectives

NHTSA recognizes that it can take substantial periods of time to develop some rulemaking proposals and final rules, including time spent obtaining review of those proposals and seeking and analyzing public comments. NHTSA further understands that the time it takes to conduct rulemakings may, in some instances, make such proceedings ill-suited as first-line regulatory mechanisms to address rapidly-evolving vehicle technologies. That said, there are limits to the result the agency may reach in an interpretation, even if it believes that result might be sound policy. An interpretation describes an agency's view of the meaning of an existing statute or regulation. It can make sense of the overall legal framework and provide clarity for regulated entities and the public. For example, an interpretation may clarify a statutory or regulatory term or provide crisper and more detailed lines than the regulation or statute being interpreted. An interpretation may not, however, make a substantive change to the statutory or regulatory regime or to the clear language of a provision. In particular, an interpretation may not adopt a new position that is irreconcilable with or repudiates existing statutory or regulatory provisions.

In many instances, interpreting the term "driver" in a manner that Google has requested does not necessarily change the requirements of the regulation or otherwise fully resolve the issue Google seeks to

address. Because the interpretations provided by this letter do not fully resolve all of the issues Google has raised, Google may wish to explore the interim step of seeking exemptions. Exemptions are available under 49 U.S.C. 30114 and 49 CFR Part 555 for manufacturers able to demonstrate that features of their products provide equivalent levels of safety to those required by the FMVSS.

I. Priority Interpretive Issues

Google requested NHTSA's interpretation of several priority interpretive issues related to the absence of a human driver. Google also provided two tables, Attachments A and B, listing FMVSS provisions for which Google requested that NHTSA interpret the driver or operator to be the SDS (provisions in Attachment A) and other provisions for which Google requested that NHTSA interpret driver to be the human occupant seated in the left front designated seating position (primarily provisions in Attachment B). We address these interpretation requests in the order presented by Google's November 12 letter.

FMVSS No. 135, Light Vehicle Brake Systems

Deeming the SDS to be the driver of a motor vehicle does not excuse that vehicle from compliance with the brake requirements of applicable standards. FMVSS No. 135 contains requirements for service brakes and associated parking brake systems. Among these requirements is S5.3.1, which states that service brakes shall be activated by means of a foot control, and also that control of the parking brake shall be independent of the service brake control, and may be either a hand or foot control. Google's described motor vehicle design does not include hand or foot controls for either the service brakes or the parking brake. Google argues that because the SDS will control all aspects of braking, it would not be necessary or beneficial for safety for a human occupant to be able to brake the vehicle. Google therefore requests that NHTSA interpret these provisions regarding the activation or control of braking systems to be inapplicable to its described motor vehicle design. Similarly, Google requests that NHTSA interpret S6.5.1 of FMVSS No. 135 to allow the service brake system performance requirements to be met if the SDS activates the service brakes, rather than solely by use of the service brake control as the provision directs.

We agree that Google's SDS may be deemed to be the driver for purposes of compliance with these provisions. Given that there will be no foot (or even hand) control to be activated indeed, given that the SDS will have neither feet nor hands to activate brakes we understand that Google's described vehicle design would not comply with S5.3.1 as written. We also understand Google's assertions that the SDS will be able to activate the brakes electronically such that its vehicle will stop [] safely and in accordance with all performance requirements of FMVSS No. 135. The fact that the SDS may be programmed to perform the tests enumerated in FMVSS No. 135 does not, however, overcome the plain language of S5.3.1. NHTSA would need to commence a rulemaking to consider how FMVSS No. 135 might be amended in response to changed circumstances in order to ensure that automated vehicle designs like Google's, i.e., ones that control all braking through an AI driver and do not provide brake controls to vehicle occupants, have a way to comply with the standard. Such a rulemaking would also consider S6.5.1 and any other provisions that implicate the potential use of a foot-actuated service brake control. In the interim, Google may wish to consider petitioning the agency for an exemption from these provisions. ^[3]

FMVSS No. 101, Controls and Displays

FMVSS No. 101 contains requirements for location, identification, color, and illumination of motor vehicle controls, telltales, and indicators. S5.1.1 requires the controls listed in Tables 1 and 2 of the standard to be located so that they are operable by the [belted] driver. S5.1.2 requires the telltales and indicators in those Tables and their identification to be located so that, when activated, they are visible to a [belted] driver. Google states that its motor vehicle will not have any of the controls listed in Tables 1 and 2 because there will not be a human driver in its vehicle. Further, Google believes that allowing the human occupants to affect the operation of, for example, lamps or turn signals otherwise controlled by the SDS could be detrimental to safety. Google therefore asks that NHTSA interpret S5.1.1 to be inapplicable to its motor vehicle design, or that NHTSA interpret Google's SDS to be the driver for the purposes of S5.1.1. For S5.1.2, Google says it will equip its vehicle's occupant compartment with the telltales and indicators required by other FMVSSs (like the

telltale/indicators for malfunctions of the brake system, electronic stability control system, or tire pressure monitoring system). For purposes of placement of those telltales and indicators, Google requests that NHTSA interpret the **driver position** to be the left front seating position.

Because we interpret **driver** as referring to the SDS, we agree with Google that the controls listed in Tables 1 and 2 may simply be operable by the SDS and need not be located so that they are available to any of the human occupants of the motor vehicle. Similarly, telltales and indicators must also be **visible** to the SDS. For purposes of both S5.1.1 and S5.1.2, we interpret the SDS to be the **driver**. However, we have no defined way at this time of verifying Google's compliance with this interpretation of these requirements. Thus, if Google certified its compliance with these provisions consistent with this interpretation, NHTSA would be unable to conduct confirmatory testing to satisfy ourselves that the Google vehicle is compliant. Therefore, unless and until NHTSA has a standard and testing procedures to confirm compliance with S5.1.1 and S5.1.2, or a standard providing equal or greater safety, it cannot conclude that Google's SDV is compliant with those requirements. In order to determine what **operable by** and **visible to** the SDS mean, and to establish procedures for testing compliance with those requirements using its existing regulatory tools, NHTSA would be required to conduct a rulemaking.

In the interim, Google may wish to petition the agency for an exemption from these provisions.^[4] Additionally, we agree with Google that it could be beneficial to vehicle occupants to be aware of certain aspects of vehicle status through telltales and indicators while they are traveling in the vehicle. Given the historical status of the left front seating position as the location of the human in charge of vehicle operation, we agree that Google may voluntarily locate telltales and indicators so that they are visible to that position. However, if it is foreseeable that a different seating position is more likely to be occupied, it may make more sense for the telltales and indicators to be located so that they are visible in another position.

FMVSS No. 108, Lamps, Reflective Devices, and Associated Equipment

FMVSS No. 108 contains requirements for original and replacement lamps, reflective devices, and associated equipment. Google states that it **recognizes** that all vehicles must comply with all of the performance requirements of FMVSS No. 108 with respect to external lamps and reflectors, **but** asks that NHTSA interpret S6.6.1 of FMVSS No. 108 to allow certain internal controls **to be excluded** from the occupant compartment, as long as their functions are performed by the vehicle autonomously. S6.6.1 requires all vehicles covered by FMVSS No. 108 to be **equipped** with a turn signal operating unit, a turn signal flasher, a turn signal pilot indicator, a headlamp beam switching device, and an upper beam headlamp indicator meeting the requirements of S9.

With respect to turn signal operating units, Google requests that NHTSA interpret the term **operator** in the S4 definition of **turn signal operating unit** to mean the SDS. That definition states that the unit is **an operating unit** that is part of a turn signal system by which the operator of a vehicle causes the signal unit to function. Google notes that, in its vehicle, the turn signals will be operated and controlled by the SDS. Google's letter also addresses S9.1.1, which requires that the **turn signal operating unit** must be self-canceling by steering wheel rotation and capable of cancellation by a manually operated control. Google requests that NHTSA interpret this provision to be met by Google's SDS since there would not be any steering wheel or conventional turn signal stalk. Google also argues that providing either a steering wheel or the ability to control turn signal operation to the vehicle occupants could be detrimental to safety. Google further asks that NHTSA **expressly acknowledg[e]** that a steering wheel is not required by the FMVSS. The supplemental information Google provided on January 11, 2016 stated that the SDV's turn signal operating unit self-cancels based on the position of the steering rack (which is controlled by the SDS), **which is what happens** in a conventional vehicle by virtue of the link between the steering rack, steering column, and steering wheel, **and** that Google therefore believes that the SDV complies with S9.1.1.

With respect to the S9.4 requirement for headlamp beam switching devices, which provides that **[e]ach vehicle** must have a means of switching between lower and upper beams designed and located so that it may be operated conveniently by a simple movement of the driver's hand or foot, Google again states that the SDS will control headlamp beam switching **fully and appropriately** and that human occupant control over such

functions could be detrimental to safety.

For purposes of these provisions of FMVSS No. 108, we interpret the SDS to be the [driver](#). We also agree that the [operator](#) of a turn signal operating unit is the SDS, because NHTSA has typically used [driver](#) and [operator](#) interchangeably in its interpretations over time. We further agree that a steering *wheel* is not expressly required by any FMVSS. We agree with Google that, as described, the SDV appears to be designed to self-cancel the turn signal operating unit as NHTSA would have intended, had vehicles without steering wheels been available when FMVSS No. 108 was developed. Similar to the provisions of FMVSS No. 135, however, the fact that the SDS may be programmed to cancel the turn signal and switch headlamp beams does not overcome the (other) plain language of S9.1.1 and S9.4. Even if we agree that Google's self-cancellation for the turn signal operating unit is consistent with our intent in S9.1.1., that provision further expressly requires that the turn signal be capable of cancellation by a [manually operated control](#). We understand Google's argument that in the case of the SDV, manual cancelation of the turn signal operating unit by a human occupant could interfere with decisions already made by the SDS in ways that could affect safety. However, this is an issue that cannot be addressed through interpretation alone. Similarly, S9.4 specifically requires operation of headlamp switches by movement of the [driver's hand or foot](#).^[5] Under existing test procedures, we cannot verify Google's compliance with these express requirements.

Unless and until NHTSA has a standard and testing procedures to confirm compliance with these provisions, it cannot interpret Google's SDV as compliant with these standards and requirements. In order to determine what requirements would be appropriate, and to establish procedures for testing compliance with those standards, using its existing regulatory tools, NHTSA would be required to conduct a rulemaking. NHTSA would need to consider how it could propose to amend FMVSS No. 108 in order to ensure that automated vehicle designs like Google's, i.e., those that control all lighting and signals through the AI driver and do not provide lighting or signal controls to vehicle occupants, have a way to comply with the standard. Meanwhile, Google may wish to petition the agency for an exemption from these provisions. An exemption petition could seek to demonstrate that Google's SDV would provide an equivalent level of safety to that provided by compliance with the FMVSS.^[6]

II. Interpretive Issues regarding [Miscellaneous Provisions in Other FMVSS](#)

Google also requested interpretation of several other [miscellaneous provisions in other FMVSS](#) relating to the absence of a human driver.

FMVSS No. 111, [Rear Visibility](#)

FMVSS No. 111 contains requirements for rear visibility devices and systems, requiring that vehicles have external and internal rear view mirrors to provide the driver with certain fields of view around and behind the vehicle. FMVSS No. 111 also requires that vehicles display a rearview image (of a specified area of certain dimensions behind the vehicle) to the vehicle operator. Google asks that NHTSA interpret these provisions as requiring that the specified view be provided to the SDS, rather than to the human occupant. Google further requests that [the vehicle would be deemed compliant if the SDS receives sensor input at least equivalent to the images a driver would be able to view through mirrors and a rear visibility system meeting the field of view and other performance requirements of the standard.](#)

As above, because we are interpreting [driver](#) and [operator](#) in this instance to refer to the SDS, we agree that the information required by the provisions of FMVSS No. 111 that must be provided to the [driver](#) or [operator](#) may be provided to the SDS. Here again, we have no defined way at this time of verifying Google's compliance with this interpretation of those requirements. Thus, if Google certified its compliance with these provisions consistent with this interpretation, NHTSA would be unable to conduct confirmatory testing to satisfy ourselves that such certification was valid.

Therefore, unless and until NHTSA develops and adopts appropriate performance criteria and test procedures for evaluating whether the sensor input received by the SDS provides enough information to ensure that the SDS is as well informed by its sensors of the conditions behind and around it as a human driver of a conventional vehicle that meets the existing requirements of FMVSS No. 111 (or a standard providing equal or greater safety),

it cannot interpret Google's SDV as compliant with these standards and requirements. This would need to be undertaken through rulemaking. NHTSA may also consider as part of such a rulemaking whether there is benefit to conveying this information to human occupants in the case of vehicle designs like the Google SDV. Google may wish to petition the agency for an exemption from these provisions, in which it could seek to demonstrate that its SDV would provide an equivalent level of safety to that provided by compliance with the FMVSS. [7]

FMVSS No. 114, Theft Protection and Rollaway Prevention

FMVSS No. 114 contains requirements intended to reduce the incidence of crashes resulting from theft and accidental rollaway of vehicles. Among these requirements is S5.3, which requires vehicles with an automatic transmission that includes a park position to have a system that requires the service brake to be depressed before the transmission can be shifted out of park. Google states that its vehicle will not have any brake pedal, and that its SDS will determine the appropriate transmission position and will not select a position other than park unless the service brake is first applied by the SDS. Google therefore requests that NHTSA interpret S5.3 as met by this described approach.

We agree that the language of S5.3 requiring the service brake to be depressed does not necessarily require the service brake itself to be pressed or applied by any particular object or function, such as a human foot. We also agree that if the SDS is controlling the service brake, in theory, it would be able to make the decisions that would accomplish the intent of this provision. In order for NHTSA to assess compliance of Google's vehicle with this standard, however, we would need more information regarding how the SDS applies the service brake. We would also intend to develop and adopt through rulemaking performance standards and test procedures for evaluating how (for example) the SDS determines the appropriate transmission position and avoids selecting a position other than park unless the service brake is first applied. NHTSA might also consider as part of such a rulemaking the safety intent of the standard, and how human occupants should be protected when the vehicle is making decisions about when to initiate movement. Google may wish to petition the agency for an exemption from these provisions. [8]

FMVSS No. 126, Electronic Stability Control Systems

FMVSS No. 126 contains performance and equipment requirements for electronic stability control (ESC) systems. Google argues that because its vehicle will not have a steering wheel, and the SDS will control all aspects of steering, NHTSA should interpret the relevant provisions of FMVSS No. 126 to allow compliance with the performance requirements of the standard to be tested on the basis of appropriate steering inputs provided by the SDS. Google cites in particular the definition of an ESC system in S4 as referring to a means to monitor driver steering inputs and the test conditions in S6 and test procedures in S7, which refer to steering wheel velocity and angle.

Test procedure provisions in S7 (such as S7.5.2, S7.5.3, S7.6, S7.6.1, S7.9.3, and others) refer specifically to measurement of steering wheel angle, which is, literally, a measurement of the angle of the steering wheel in degrees. Without a steering wheel, we agree that Google cannot certify its vehicle design to such provisions. As above, in order for NHTSA to assess compliance of Google's vehicle with this standard, we would need to determine how to evaluate the SDS control of the steering inputs, and whether and how to modify test conditions and procedures to address more clearly the situation of a vehicle with steering controlled entirely by an AI driver, with no mechanism for the vehicle occupants to affect the steering. Google could petition for exemption from the relevant provisions of FMVSS No. 126

and the agency could work to develop alternate test procedures. Over the longer term, NHTSA would need to undertake rulemaking to incorporate test procedures into FMVSS No. 126 to provide a clearer path to compliance for similar future vehicle designs.

Google's letter concludes with two attachments, summarily listing numerous additional provisions for which it seeks interpretation. Attachment A lists Requirements for which the Driver or Operator should be

considered to be the Self-Driving System. The letter provides no further explanation or justification for those requested interpretations. Attachment B provides a similar list of FMVSS Requirements for which the Driver should be considered to be a person seated in the left front designated seating position. We address these numerous items in Attachments A and B in Tables A and B, to this letter, respectively (attached). The Tables in those attachments reproduce each of Google's requests in the first three columns, and provide NHTSA's response in the final column.

In closing, we note that, in some instances, it may be possible for Google to provide more information and explanations that would allow NHTSA to expand or otherwise revise interpretations set forth in this letter. If Google believes it can address concerns and limitations expressed in this letter that prevent us from providing the full interpretation it seeks, we encourage the company to submit more information to do so. In addition, as discussed above, Google may wish to seek exemptions from standards and requirements addressed in this letter. I hope this information provided in this letter and its attachments is helpful. If you have further questions, please feel free to contact me at (202) 366-2830, or Steve Wood, Assistant Chief Counsel for Vehicle Safety Standards and Harmonization, at (202) 366-2992.

Sincerely yours,

Paul A. Hemmersbaugh
Chief Counsel

Dated: 2/4/16

Ref: Stds 571.3, 101, 102, 104, 108, 110, 111, 114, 124, 126, 135, 138, 201, 206, 207, 208, 216a and 226

III. Table A

NHTSA interprets the SDS to be the driver or operator for the following specific FMVSS provisions. As discussed above, we have no defined way at this time of verifying Google's compliance with this interpretation of these requirements. Thus, if Google certified its compliance with these provisions consistent with this interpretation, NHTSA would be unable to conduct confirmatory testing to satisfy ourselves that such compliance was valid. Therefore, unless and until NHTSA develops performance criteria and test procedures for evaluating whether the SDS satisfies the FMVSS provision in question to be met, or a standard providing equal or greater safety, it cannot interpret Google's SDV as compliant with these standards and requirements. Google may wish to petition the agency for exemption from these petitions in the interim.

FMVSS	Paragraph	Requirement	NHTSA response
101	S5.1.1	The controls listed in Table 1 and in Table 2 must be located so that they are operable by the [belted] driver.	We agree that the SDS is the driver for purposes of this paragraph.
102	S3.1.4.1	Except as specified in S3.1.4.3, if the transmission shift position sequence includes a park position, identification of shift positions, including the positions in relation to each other and the position selected, shall be displayed in view of the driver.	We agree that the SDS is the driver for purposes of this paragraph.
102	S3.1.4.4	All of the information required to be displayed by S3.1.4.1 or S3.1.4.2 shall be displayed in view of the driver in a single location.	We agree that the SDS is the driver for purposes of this paragraph.
108	S4	Turn signal operating unit means an operating unit that is part of a turn signal system by which the operator of a vehicle causes the signal units to function.	We agree that the SDS is the operator for purposes of this definition.

108	S4	❖ <i>Vehicular hazard warning signal operating unit</i> means a driver controlled device which causes all required turn signal lamps to flash simultaneously to indicate to approaching drivers the presence of a vehicular hazard.❖	We agree that the SDS is the driver for purposes of the phrase ❖ driver controlled device.❖ [9]
108	S9.4	❖ Each vehicle must have a means of switching between lower and upper beams designed and located so that it may be operated conveniently by a simple movement of the driver❖s hand or foot❖.❖	See discussion above under ❖ Priority Interpretive Issues.❖

108	S9.6.2	❖ The [vehicular hazard warning signal operating] unit must operate independently of the ignition or equivalent switch. If the actuation of the hazard function requires the operation of more than one switch, a means must be provided for actuating all switches simultaneously by a single driver action.❖	We agree that the SDS is the driver for purposes of the phrase ❖ single driver action.❖
111	S4	❖ <i>Rearview image</i> means a visual image, detected by means of a single source, of the area directly behind a vehicle that is provided in a single location to the vehicle operator and by means of indirect vision.❖	We agree that the SDS is the operator for purposes of this definition, but see discussion above of FMVSS No. 111.
111	S5.5.1	❖ When tested in accordance with the procedures in S14.1, the rearview image shall include: (a) A minimum of a 150-mm wide portion along the circumference of each test object located at positions F and G specified in S14.1.4; and (b) The full width and height of each test object located at positions A through E specified in S14.1.4.❖	NHTSA does not understand what interpretation Google is seeking of this specific paragraph. S14.1, to which S5.5.1 refers, contains multiple references to the driver❖s seat, eye position, etc., to which Google❖s proposed vehicle design could not certify if the SDS is the driver, because the eye position of the SDS does not exist, among other things. See discussion above of FMVSS No. 111.
124	S1	❖ <i>Scope.</i> This standard establishes requirements for the return of a vehicle❖s throttle to the idle position when the driver removes the actuating force from the accelerator control, or in the event of a severance or disconnection in the accelerator control system.❖	We agree that the SDS is the driver for purposes of this paragraph.
124	S4.1	❖ <i>Driver-operated accelerator control system</i> means all vehicle components, except the fuel metering device, that regulate engine speed in direct response to movement of the driver-operated control and that return the throttle to the idle position upon release of the actuating force.❖	We agree that the SDS is the driver for purposes of this definition.
124	S4.1	❖ <i>Throttle</i> means the component of the fuel	We agree that the SDS is the driver for purposes of this

metering device that connects to the driver-operated accelerator control system and that by input from the driver-operated accelerator control system controls the engine speed.❖

definition.

124	S5.1	❖There shall be at least two sources of energy capable of returning the throttle to the idle position within the time limit specified by S5.3 from any accelerator position or speed whenever the driver removes the opposing actuating force. In the event of failure of one source of energy by a single severance or disconnection, the throttle shall return to the idle position within the time limits specified by S5.3, from any accelerator position or speed whenever the driver removes the opposing actuating force.❖	We agree that the SDS is the driver for purposes of this paragraph. However, NHTSA will need to determine how to evaluate compliance with the ❖driver removing the opposing actuating force❖ in the context of Google❖s described motor vehicle design. We would need to consider conducting rulemaking to amend FMVSS No. 124. Google may wish to consider petitioning for exemption in the interim.
124	S5.2	❖The throttle shall return to the idle position from any accelerator position or any speed of which the engine is capable whenever any one component of the accelerator control system is disconnected or severed at a single point. The return to idle shall occur within the time limit specified by S5.3, measured either from the time of severance or disconnection or from the first removal of the opposing actuating force by the driver.❖	We agree that the SDS is the driver for purposes of this paragraph. However, NHTSA will need to determine how to evaluate compliance with the ❖first removal of the opposing actuating force❖ in the context of Google❖s described motor vehicle design. We would need to consider conducting rulemaking to amend FMVSS No. 124. Google may wish to consider petitioning for exemption in the interim.
126	S4	❖ <i>Electronic stability control system</i> or <i>ESC system</i> means a system that has all of the following attributes❖. (4) That has a means to monitor driver steering inputs❖.❖	We agree that the SDS is the driver for purposes of this definition.
126	S5.1.2	❖Vehicles to which this standard applies must be equipped with an electronic stability control system that is operational during all phases of driving❖except when the driver has disabled ESC❖.❖	We agree that the SDS is the driver for purposes of this provision in the context of Google❖s proposed vehicle design. However, NHTSA would need to evaluate through rulemaking how the provision might be amended to accommodate the unique aspects of Google❖s proposed vehicle design. Meanwhile, Google may wish to petition for exemption from this provision.

126	S5.4.1	❖The vehicle❖s ESC system must always return to the manufacturer❖s original default ESC mode that satisfies the requirements of S5.1 and S5.2 at the initiation of each new ignition cycle, regardless of what ESC mode the driver had previously selected❖.❖	See response for S5.1.2, directly above.
126	S5.6.1	❖ESC System Technical Documentation❖.the vehicle manufacturer must make available to the agency, upon request, ❖a system diagram that identifies all ESC system hardware. The diagram must identify what components are used to generate brake torques at each wheel, determine vehicle yaw rate, estimated side slip or the side slip derivative and driver steering inputs.❖	See response for S5.1.2, above.
135	S4	❖Brake power assist unit means a device installed in a hydraulic brake system that reduces the amount of muscular force that a driver must apply to actuate the system, and that, if inoperative, does not prevent the driver from braking the vehicle by a continued application of muscular force on the service brake control.❖	While we agree that it is logical to continue to interpret ❖driver❖ as Google❖s SDS for purposes of consistency, we do not understand what interpretation Google is seeking with respect to this definition.
135	S4	❖Brake power unit means a device installed in a brake system that provides the energy required to actuate the brakes, either directly or indirectly through an auxiliary device, with driver action consisting only of modulating the energy application level.❖	We agree that the SDS is the driver for purposes of this provision.
135	S5.1.3	❖❖if there is no means provided for the driver to disconnect or otherwise reactivate it❖❖	We agree that the SDS is the driver for purposes of this provision.

IV. Table B

For specific FMVSS provisions set forth on Google❖s Attachment B, Google requested that NHTSA interpret the human occupant seated in the left front designated seating position (❖DSP❖) as the ❖driver.❖ As discussed above, NHTSA defines ❖driver❖ for purposes of the FMVSS at 49 CFR 571.3. We also discuss above the need to amend that definition in light of the possibility that Google raises, that an AI driver could be the sole means of driving a vehicle. Given the focus of the definition of ❖driver❖ as, essentially, the entity that controls steering, and given that Google❖s proposed vehicle design gives the human occupant no means to steer the vehicle, the human occupant of the left front DSP could not be the driver. Moreover, interpreting ❖driver❖ as the human occupant of the left front DSP in the instances below that Google cites would not, in most cases, provide Google with a means of certifying that its proposed vehicle design complies with the applicable standard, because the agency would need to establish standards and tests to verify that the design complies.

It may be that for some of these provisions, the elimination of a human driver makes the provision unnecessary,

as Google implies in its letter. NHTSA will consider these issues further and looks forward to receiving additional information from Google to assist us in this consideration. For the following provisions, we are therefore continuing to interpret "driver" as referring to the SDS, and discuss what steps would need to be taken next in order to provide a path forward:

FMVSS	Paragraph	Requirement	NHTSA Response
101	S5.1.2	<p>The telltales and indicators listed in Table 1 and Table 2 and their identification must be located so that, when activated, they are visible to a [belted] driver.</p>	<p>See discussion above of FMVSS No. 101 for NHTSA's position on this request. As discussed above, NHTSA agrees that Google may also provide telltales and indicators in the interior compartment that would be visible to a human occupant of the left front DSP.</p>
104	S3(b)	<p><i>Plan view reference line</i> means (b) For vehicles with individual-type seats, either (i) A line parallel to the vehicle longitudinal centerline which passes through the center of the driver's designated seating position; or (ii) A line parallel to the vehicle longitudinal centerline located so that the geometric center of the 95 percent eye range contour is positioned on the longitudinal centerline of the driver's designated seating position.</p>	<p>Because we interpret "driver" in this section as referring, in Google's case, to the SDS, and because the SDS has no DSP, Google could not certify to this provision as written. The agency would need to consider whether to evaluate through rulemaking whether a vehicle design without a mechanism by which humans can drive it even needs windshield wipers for safety purposes. In the interim, Google may wish to petition for exemption from this provision.</p>

108	S6.1.3.4.1	<p>A high-mounted stop lamp mounted inside the vehicle must have means provided to minimize reflections from the light of the lamp upon the rear window glazing that might be visible to the driver when viewed directly, or indirectly in the rearview mirror.</p>	<p>We interpret "driver" in this section as referring, in Google's case, to the SDS. Google may therefore be able certify that its vehicle design <i>does</i> minimize reflections into the SDS's eyes. Google may wish nonetheless to consider designing its vehicle such that no human occupant might be unintentionally subject to glare by the reflection from the CHMSL. NHTSA may also consider addressing this issue through rulemaking.</p>
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108	S9.3.1	<p>where any turn signal lamp is not visible to the driver must also have an illuminated pilot indicator to provide a clear and unmistakable indication that the turn signal</p>	<p>We interpret "driver" in this section as referring, in Google's case, to the SDS. Because the SDS would</p>
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		system is activated.❖	receive this information electronically, NHTSA would not currently be able to verify Google❖s certification of compliance with this provision. The agency may consider evaluating through rulemaking how it would verify this electronic indication of headlamp illumination to the SDS. In the interim, Google may wish to petition for exemption from this provision.
108	S9.5	❖Each vehicle must have a means for indicating to the driver when the upper beams of the headlighting system are activated.❖	We interpret ❖driver❖ in this section as referring, in Google❖s case, to the SDS. Because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google❖s certification of compliance with this provision. The agency may consider evaluating through rulemaking how it would verify this electronic indication of headlamp illumination to the SDS. In the interim, Google may wish to petition for exemption from this provision.
110	S4.3	❖Each vehicle❖shall show the information specified in S4.3(a) through (g)❖on a placard permanently affixed to the driver❖s side B-pillar❖.❖	Given the custom of locating the placard on the left side of the vehicle (facing the vehicle from behind), we agree that Google may affix the required placard to the B-pillar on that side of the vehicle.
111	S5.1.1	❖The location of the driver❖s eye reference points shall be those established in Motor Vehicle Safety Standard No. 104 (❖571.104) or a nominal location appropriate for any 95 th percentile male driver.❖	We interpret ❖driver❖ in this section as referring, in Google❖s case, to the SDS. It is possible that the provision as written is not necessary for safety as applied to Google❖s vehicle design, but Google has not demonstrated that in its present interpretation request. FMVSS No. 111 would need amendment to clarify how a vehicle design like Google❖s might appropriately comply with it. Meanwhile, Google may wish to petition for exemption from this provision.

111	S5.2.1	<p>◆The mirror shall provide the driver a view of a level road surface extending to the horizon from a line, perpendicular to a longitudinal plane tangent to the driver's side of the vehicle at the widest point, extending 2.4 m out from the tangent plane 10.7 m behind the driver's eyes, with the seat in the rearmost position. The location of the driver's eye reference points shall be those established in Motor Vehicle Safety Standard No. 104 (◆571.104) or a nominal location appropriate for any 95th percentile male driver.◆</p>	<p>See response directly above. One of the issues, among others, that NHTSA would seek to examine through the exemption is the fact that the field of view from an inside rear view mirror could be different from the field of view for a camera located on the vehicle bumper, and the relevance of this difference to the SDS's ability to ◆see◆ behind the vehicle.</p>
114	S5.1.3	<p>◆Except as specified below, an audible warning to the vehicle operator must be activated whenever the key is in the starting system and the door located closest to the driver's designated seating position is opened.◆</p>	<p>We interpret ◆driver◆ in this section as referring, in Google's case, to the SDS. It is possible that the provision as written is not necessary for safety as applied to Google's vehicle design, but Google has not demonstrated that in its present interpretation request. FMVSS No. 114 would need amendment to clarify how a vehicle design like Google's might appropriately comply with it. We recommend that Google consider activating the audible warning whenever the vehicle's starting system is ready to put the vehicle in motion and any door is opened, to account for the fact that occupants could choose to sit in any DSP. In the interim, Google may wish to petition for exemption from this provision.</p>
126	S5.3	<p>◆The vehicle must be equipped with a telltale that provides a warning to the driver of the occurrence of one or more malfunctions that affect the generation or transmission of control or response signals in the vehicle's electronic stability control system.◆</p>	<p>We interpret ◆driver◆ in this section as referring, in Google's case, to the SDS. Because the SDS would receive this information about malfunctions electronically, NHTSA would not currently be able to verify Google's certification of compliance with this provision. The agency may consider evaluating through rulemaking how it would verify this electronic indication of ESC malfunctions to the SDS. In the interim, Google may wish to petition for exemption from</p>

			<p>this provision. We also encourage Google to consider in its vehicle design locating the telltale in view of at least one DSP in the vehicle, so that occupants concerned about the vehicle's safety may either choose not to ride in the vehicle, or to alert Google to the presence of the malfunction.</p>
126	S5.3.1	<p>As of September 1, 2011, [the ESC malfunction telltale] must be mounted inside the occupant compartment in front of and in clear view of the driver.</p>	<p>See response to S5.3 directly above.</p>

126	S5.5.3	<p>As of September 1, 2011, the ESC Off telltale must be mounted inside the occupant compartment in front of and in clear view of the driver.</p>	<p>See response to S5.3 directly above.</p>
135	S5.1.2	<p>The wear condition of all service brakes shall be indicated by either (a) Acoustic or optical devices warning the driver at his or her driving position when lining replacement is necessary, or (b) A means of visually checking the degree of brake lining wear, from the outside or underside of the vehicle, utilizing only the tools or equipment normally supplied with the vehicle. The removal of wheels is permitted for this purpose.</p>	<p>We interpret driver in this section as referring, in Google's case, to the SDS. Manufacturers must certify to (a) or (b). If certifying to (a), because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google's certification of compliance with this provision. However, because paragraph (b) of this provision offers a means of compliance that does not depend on the interpretation of driver, we believe Google should be able to certify to this provision.</p>
135	S5.5	<p>Each vehicle shall have one or more visual brake system warning indicators, mounted in front of and in clear view of the driver, which meet the requirements of S5.5.1 through S5.5.5.</p>	<p>We interpret driver in this section as referring, in Google's case, to the SDS. Because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google's certification of compliance with this provision. It is possible that the provision as written is not necessary for safety as applied to Google's vehicle design, but Google has not demonstrated that in its</p>

			present interpretation request. The agency could evaluate through rulemaking how it would verify this electronic indication of brake system warnings to the SDS, and whether the human occupant might still benefit from an additional warning. In the interim, Google may wish to petition for exemption from this provision.
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135	S5.5.5	<p>◆(a) Each visual indicator shall display a word or words in accordance with the requirements of Standard No. 101 (49 CFR 571.101) and this section, which shall be legible to the driver under all daytime and nighttime conditions when activated.◆</p>	<p>We interpret ◆driver◆ in this section as referring, in Google◆s case, to the SDS. Because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google◆s certification of compliance with this provision. It is possible that the provision as written is not necessary for safety as applied to Google◆s vehicle design, but Google has not demonstrated that in its present interpretation request. The agency could evaluate through rulemaking how it would verify this electronic display to the SDS. In the interim, Google may wish to petition for exemption from this provision.</p>
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138	S4.3.1	<p>◆Each tire pressure monitoring system must include a low tire pressure warning telltale that (a) Is mounted inside the occupant compartment in front of and in clear view of the driver◆.◆</p>	<p>We interpret ◆driver◆ in this section as referring, in Google◆s case, to the SDS. Because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google◆s certification of compliance with this provision. It is possible that the provision as written is not necessary for safety as applied to Google◆s vehicle design, but Google has not demonstrated that in its present interpretation request. The agency could evaluate through rulemaking how it</p>
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			would verify this electronic display to the SDS, and whether the human occupant might still benefit from an additional warning. In the interim, Google may wish to petition for exemption from this provision.
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138	S4.4	<p>◆(a) The vehicle shall be equipped with a tire pressure monitoring system that includes a telltale that provides a warning to the driver not more than 20 minutes after the occurrence of a malfunction that affects the generation or transmission of control or response signals in the vehicle's tire pressure monitoring system. The vehicle's TPMS malfunction indicator shall meet the requirements of either S4.4(b) or S4.4(c).◆</p>	<p>We interpret ◆driver◆ in this section as referring, in Google's case, to the SDS. Because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google's certification of compliance with this provision. It is possible that the provision as written is not necessary for safety as applied to Google's vehicle design, but Google has not demonstrated that in its present interpretation request. The agency could evaluate through rulemaking how it would verify this electronic display to the SDS. In the interim, Google may wish to petition for exemption from this provision.</p>
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201	S3	<p>◆<i>A-pillar</i> means any pillar that is entirely forward of a transverse vertical plane passing through the seating reference point of the driver's seat.◆</p>	<p>Given the custom of defining the A-pillar as any pillar located in front of the front-most seat on the left side of the vehicle (facing the vehicle from behind), we agree that Google may designate that pillar as the A-pillar for purposes of Google's described vehicle design complying with this provision.</p>
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201	S3	<p>◆<i>B-pillar</i> means the forwardmost pillar on each side of the vehicle that is, in whole or in part, rearward of a transverse vertical plane passing through the seating reference point of the driver's seat◆.◆</p>	<p>Given the custom of defining the B-pillar as the pillar located rearward of a transverse vertical plane passing through the seating reference point of the front-most seat on the left side of the vehicle (facing the vehicle from behind), we agree that Google may designate that pillar as the B-pillar for</p>
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			purposes of Google's described vehicle design complying with this provision.
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201	S3	<p>◆ <i>Pillar</i> means any structure which: (1) Supports either a roof or any other structure (such as a roll-bar) that is above the driver's head. ◆</p>	<p>Given the custom of defining ◆ pillar ◆ as any structure supporting either a roof or any structure above the front-most seat on the left side of the vehicle (facing the vehicle from behind), we agree that Google may designate such structures as pillars for purposes of Google's described vehicle design complying with this provision.</p>
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206	S3	<p>◆ <i>Side Front Door</i> is a door that, in a side view, has 50 percent or more of its opening area forward of the rearmost position on the driver's seat back, when the driver's seat is adjusted to its most vertical and rearward position. ◆</p>	<p>Given the custom of identifying the side front door as the door that, in a side view, has 50 percent or more of its opening area forward of the rearmost position on the seat back of the front-most seat on the left side of the vehicle (facing the vehicle from behind), we agree that Google could designate that door as the side front door for purposes of Google's certifying the compliance of its described vehicle design with this provision.</p>
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206	S3	<p>◆ <i>Side Rear Door</i> is a door that, in a side view, has 50 percent or more of its opening area to the rear of the rearmost point on the driver's seat back, when the driver's seat is adjusted to its most vertical and rearward position. ◆</p>	<p>Given the custom of identifying the side rear door as the door that, in a side view, has 50 percent or more of its opening area to the rear of the rearmost position on the seat back of the front-most seat on the left side of the vehicle (facing the vehicle from behind), we agree that Google could designate that door as the side rear door for purposes of Google's certifying the compliance of its described vehicle design with this provision.</p>
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206	S4.3.1	<p>Each rear side door shall be equipped with at least one locking device which has a lock release/engagement mechanism located within the interior of the vehicle and readily accessible to the driver of the vehicle or an occupant seated adjacent to the door. ◆</p>	<p>We do not have enough information about Google's proposed vehicle design to know whether safety would be appropriately served if we interpreted this provision as</p>
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			<p>allowing locks to be controlled entirely by the AI driver, nor whether Google would be able to locate the required locking device in the interior where it could be readily accessible by an occupant. The agency needs more information to respond to this request.</p>
206	S5.1.1.4(b)(ii)	<p>❖(C) Transverse Setup 1. Orient the vehicle so that its transverse axis is aligned with the axis of the acceleration device, simulating a driver-side impact.❖</p>	<p>Given the custom of identifying the ❖driver-side❖ as the left side of the vehicle (facing the vehicle from behind), we agree that Google could designate that side as the driver-side for purposes of Google❖s certifying the compliance of its described vehicle design with this provision.</p>
207	S4.1	<p>❖Driver❖s seat. Each vehicle shall have an occupant seat for the driver.❖</p>	<p>Because we interpret the term ❖driver❖ as the SDS, the ❖driver❖ in this provision would not need an occupant seat. We would recommend, however, that Google consider all of the seats in its vehicle as ❖occupant seats❖ subject to FMVSS No. 207 requirements.</p>
208	S7.3(a)	<p>❖A seat belt assembly provided at the driver❖s seating position shall be equipped with a warning system❖.❖</p>	<p>We interpret ❖driver❖ in this section as referring, in Google❖s case, to the SDS. It is possible that the provision as specifically written is not necessary for safety as applied to Google❖s vehicle design, but Google has not demonstrated that in its present interpretation request. FMVSS No. 208 would need amendment to clarify how a vehicle design like Google❖s might comply with it. One safety concern is that a human occupant could sit in any DSP, and that therefore the non-wearing of a seat belt by any occupant could create a safety risk. We would recommend that Google consider activating, for example, an audible warning for the benefit of human occupants whenever the vehicle is ready to begin motion and any occupied DSP</p>

			does not have a seat belt engaged. NHTSA may consider this issue in future seat belt reminder rulemakings.
216a	S7.1	<p>◆◆ Measure the longitudinal vehicle attitude along both the driver and passenger sill. Determine the lateral vehicle attitude by measuring the vertical distance between a level surface and a standard reference point on the bottom of the driver and passenger side sills. The difference between the vertical distance measured on the driver side and the passenger side sills is not more than ± 10 mm.◆</p>	<p>Given the custom of identifying the ◆ driver-side◆ as the left side of the vehicle and the ◆ passenger-side◆ as the right side of the vehicle (facing the vehicle from behind), we agree that Google could designate the driver and passenger side sills as belonging to those two sides, respectively, for purposes of Google's certifying the compliance of its described vehicle design with this provision.</p>
226	S4.2.2	<p>◆ Vehicles that have an ejection mitigation countermeasure that deploys in the event of a rollover must have a monitoring system with a readiness indicator. The indicator shall monitor its own readiness and must be clearly visible from the driver's designated seating position.◆</p>	<p>We interpret ◆ driver◆ in this section as referring, in Google's case, to the SDS. Because the SDS would receive this information electronically, NHTSA would not currently be able to verify Google's certification of compliance with this provision. It is possible that the provision as written is not necessary for safety as applied to Google's vehicle design, but Google has not demonstrated that in its present interpretation request. The agency could evaluate through rulemaking how it would verify this electronic display to the SDS, and whether human occupants could also benefit from similar information. In the interim, Google may wish to petition for exemption from this provision.</p>
226	S6.1(d)	<p>◆ Pitch: Measure the sill angle of the driver door sill and mark where the angle is measured.◆</p>	<p>Given the custom of identifying the ◆ driver-side◆ as the left side of the vehicle (facing the vehicle from behind), we agree that Google could designate the driver door sill as the sill on that side for purposes of Google's certifying the</p>

			compliance of its described vehicle design with this provision.
226	S5.1(f)	◆ Support the vehicle off its suspension such that the driver door sill angle is within ± 1 degree of that measured at the marked area in S6.1(d)◆.◆	Given the custom of identifying the ◆ driver-side◆ as the left side of the vehicle (facing the vehicle from behind), we agree that Google could designate the driver door sill as the sill on that side for purposes of Google◆s certifying the compliance of its described vehicle design with this provision.

[1] Google also submitted a supplemental letter dated January 11, 2016, providing more detailed information on its approach to canceling the turn signal, which is discussed below.

[2] NHTSA considers this AI driver to be an item of motor vehicle equipment within the meaning of 49 U.S.C. 30102 and other applicable law and regulations.

[3] Google may also wish to reconsider its view that a pedal may never be needed in any circumstance, and that there is not a risk of harm associated with a pedal◆s absence.

[4] Google may also wish to reconsider its view that the controls listed in Tables 1 and 2 of S5.1.1 may never be needed in any circumstance, and that there is not a risk of harm associated with their absence.

[5] We note that S9.4.1 of FMVSS No. 108 provides a mechanism by which a manufacturer can certify a ◆semi-automatic headlamp beam switching device,◆ but Google did not ask for interpretation of this provision, nor do we have enough information to assess whether Google◆s proposed design would comply with this provision.

[6] Google may also wish to reconsider its view that a steering wheel and the vehicle occupants◆ ability to control any lighting and signals may never be needed in any circumstance, and that there is not a risk of harm associated with their absence.

[7] Google may also wish to reconsider its view that rear visibility devices and systems may never be needed in any circumstance, and that there is not a risk of harm associated with their absence.

[8] Google may also wish to reconsider its view that a pedal may never be needed in any circumstance, and that there is not a risk of harm associated with a pedal◆s absence.

[9] We note that NHTSA has previously interpreted this provision as prohibiting automatic (i.e., non-driver initiated) control of turn signal lamp flashing, but we do not consider this interpretation as inconsistent with those, because in this instance we are interpreting the ◆driver◆ (the SDS, given that the human occupants have no mechanism by which they can drive the vehicle) as being the entity controlling the vehicular hazard warning signal operating unit. NHTSA would like to explore further with Google the instances in which Google would intend for the SDS to flash the hazard warning signals.