



U.S. Department  
of Transportation

**Federal Highway  
Administration**

400 Seventh St., S.W.  
Washington, D.C. 20590

September 30, 2005

Refer to: HOTO-1

Mr. Keith Golden  
State Traffic Safety and Design Engineer  
Georgia Department of Transportation  
935 East Confederate Avenue, Suite 300  
Atlanta, GA 30316

Dear Mr. Golden:

Thank you for your September 28 email to Mr. Scott Wainwright of this office, requesting an official interpretation of the Manual on Uniform Traffic Control Devices (MUTCD) regarding ramp metering signal displays for a two-lane freeway entrance ramp with staggered release. You asked whether Chapter 4H of the MUTCD requires two signal faces for the entire ramp or two signal faces for each separately-controlled lane on the ramp. You also asked whether all the required ramp metering signal faces may be mounted overhead.

Ramp metering systems on two-lane entrance ramps use either "simultaneous release," in which both lanes receive the green indication concurrently and both lanes are stopped concurrently, or a "staggered release," in which one lane receives the green while the other lane is stopped and then the other lane receives the green while the first lane is stopped. When staggered release is used, the question arises regarding whether two signal faces per ramp (one face per lane) is adequate or whether two faces per lane should be used.

Section 4H.02 states that ramp control signals shall meet all of the standard design specifications for traffic control signals except as noted otherwise in that section. One of the specific exceptions is "a minimum of two signal faces per ramp shall face entering traffic." It is our interpretation that this MUTCD text assumed a one-lane ramp or a simultaneous release on a two-lane ramp and did not contemplate the use of a staggered release operation, which has come into use only relatively recently.

The traffic control signal design requirements contained in Chapter 4D require a minimum of two signal faces per approach. This requirement is based on the need for signal visibility when trucks or other conditions obscure the view of one face and the need to ensure the operation of at least one signal indication in the case of burnouts or other failures in one signal face. When a separately controlled turn movement is included in the signal phasing, such as a protected-only mode left turn, at least one additional separate signal face is required for that separate movement. Section 4D.15 states that, if the turn movement is the major movement from an approach, two left turn signal faces should be provided.

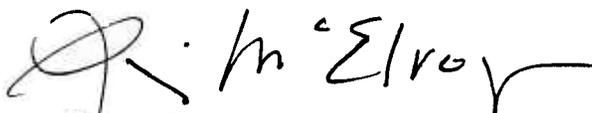


Since each of the two lanes on the ramp are separately controlled and receive the "go" and "stop" indications at separate times in a staggered release operation, this is comparable to the situation of the separately-controlled turn movement at a signalized intersection. Since the two ramp lanes are presumed to be approximately equal in volume and importance, each of the two lanes should be provided with two signal faces. This display assures that at least one signal indication will always be provided to each separately controlled lane in the event of failure or knockdown of one of the two signal faces, and it provides improved signal visibility for approaching traffic in each lane as well as the first vehicles in the queues.

Neither Chapter 4H nor Chapter 4D specifically require overhead mounting of signal faces. The Option statement in Section 4H.02 refers to allowable heights of signal faces "if located at the side of the ramp roadway." In practice, many agencies operating ramp metering systems have found it desirable to have one signal face low-mounted (4.5 to 6 feet above the ramp pavement) at the side of the ramp and one signal face mounted higher, either over the ramp or at the side. However, either overhead or side mounting of ramp metering signal faces is acceptable. The signal faces must be a minimum of 8 feet apart horizontally (Section 4D.15). Some States using staggered release have used signs similar to the R10-10 (Left Turn Signal) sign to more clearly identify which signal faces control which ramp lane. These signs use the legends "LEFT LANE SIGNAL" and "RIGHT LANE SIGNAL".

Thank you for writing on this subject. If you have any questions, please feel free to contact Mr. Wainwright at [scott.wainwright@fhwa.dot.gov](mailto:scott.wainwright@fhwa.dot.gov) or call him at 202-366-0857. Please note that we have assigned your request the following official interpretation number and title: "4-294(I)—Ramp Metering Signals for Staggered Release." Please refer to this number in any future correspondence on this matter.

Sincerely yours,



Regina S. McElroy  
Director, Office of Transportation  
Operations

cc: Mr. Roger Wentz, ATSSA

## Wainwright, Scott

From: Golden, Keith [Keith.Golden@dot.state.ga.us]  
Sent: Wednesday, September 28, 2005 12:33 PM  
To: Wainwright, Scott  
Subject: RE: Ramp Metering MUTCD compliance issue for dual signal indications

Scott:

We had a lengthy meeting and discussion on this issue this morning with the GA Division. Msh provided your e-mail to me and I would like to request a formal response to Georgia stating the intention as you offered. The other question I would ask is can these both be mounted over the individual lanes (totaling 4) mounted on a mast arm in your opinion? Our ITS Operations group is strongly desiring to have them overhead and we have several safety and behavior issues if we mix ground mounted and overhead .

Keith Golden, P.E.  
State Traffic Safety and Design Engineer  
404-635-8117  
SL # 28005

-----Original Message-----

From: Smith, Mshadoni [mailto:Mshadoni.Smith@fhwa.dot.gov]  
Sent: Wednesday, September 28, 2005 12:21 PM  
To: steve.henry@dot.state.ga.us  
Cc: Shanine, Gus; Golden, Keith  
Subject: FW: Ramp Metering MUTCD compliance issue for dual signal indications

Guys

Here is the email I recieved from FHWA HQ and will follow-up with a formal interpretation.

Msh

> -----Original Message-----

> From: Wainwright, Scott  
> Sent: Thursday, August 25, 2005 1:46 PM  
> To: Smith, Mshadoni  
> Cc: Kalla, Hari; Robbins, Dana; Yung, Jessie  
> Subject: RE: Ramp Metering MUTCD compliance issue for dual signal indications

>

> Msh, let me clarify a bit.

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> Section 4H.02 of the MUTCD requires "a minimum of two signal faces per ramp", so, strictly speaking, the dual lane design with only 2 signal

faces could arguably be compliant with the actual words in the MUTCD. However, my recollection is that 2-lane operation with staggered release was not even thought about when the words for 4H.02 were written!

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> If I were asked to prepare a formal official interpretation on how to apply Section 4H.02 to a control scheme in which green is shown to one lane only at a time (staggered release) I would write it to say the INTENTION of 4H.02 is to have 2 signal faces for each separately-controlled movement. The reason is just as Jessie cited---backup in case of failure of one of the faces. In your 2-lane ramp situation with staggered release, if the red indication in the left lane signal fails, the green indication in the right lane signal face will be interpreted by drivers in the left lane as applying to them also.

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> Best engineering practice in the staggered release situation is to provide 2 faces per lane. Costs to add the 2nd faces (pole mount or overhead) are minimal and I would strongly recommend that design be used.

>

> If you feel that a formal official MUTCD interpretation is needed as per Section 1A.10, let me know and I will have it prepared.

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> W. Scott Wainwright, P.E., PTOE  
> Highway Engineer, MUTCD Team  
> Federal Highway Administration  
> Office of Transportation Operations, HOTO-1  
> 400 Seventh Street, SW, Room 3408  
> Washington, DC 20590

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[Smith, Mshadoni]