

Wainwright, Scott

From: Matthews, KC [K.C.Matthews@dot.state.co.us]
Sent: Thursday, December 23, 2004 5:56 PM
To: Wainwright, Scott; Allen, Marcee
Subject: RE: Protected/Permitted Signal Heads

Marcee and Scott,

Thanks for all your help with this subject. After consulting with our Traffic Operations Engineers, they would like an Official Interpretation of the MUTCD so they have a definitive direction going forward. Scott, let me know if there's anything you need from my end to assist in this effort.

Thanks again,

K.C. Matthews, P.E.
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M:

From: Wainwright, Scott [mailto:Scott.Wainwright@fhwa.dot.gov]
Sent: Thursday, December 16, 2004 3:14 PM
To: Matthews, KC; Allen, Marcee
Subject: RE: Protected/Permitted Signal Heads

Marcee & KC:

MUTCD Section 4D.16 contains this Standard statement: "The signal lenses in a signal face shall be arranged in a vertical or horizontal straight line, except that in a vertical array, signal lenses of the same color may be arranged horizontally adjacent to each other at right angles to the basic straight line arrangement. Such clusters shall be limited to two identical signal lenses or to two or three different signal lenses of the same color."

Figure 4D-3 is titled "Typical Arrangements of Signal Lenses in Signal Faces." Nowhere is it stated or implied that these are the ONLY allowable arrangements.

So---your offset head, 2 sections on left, 3 on right, is perfectly legal, as long as the alignment is such that the green arrow is horizontally aligned with the green ball and same for the yellow arrow and yellow ball sections. I'm pretty sure that CO is not the only State or local agency that uses it. I know I've seen it elsewhere, just can't remember where (two 12" arrows alongside three 8" balls is what I remember). But I would estimate that doghouses outnumber straightline arrangements for 5-section faces in a ratio of perhaps 75-25 and I can't imagine your offset type face capturing more than 1% of the total nationally. I cannot recall any research that has compared the 2 configurations for effectiveness or any other measures. Your offset 2-3 head is "rare" and therefore not something the vast majority of US drivers are accustomed to seeing. But is it so significantly different from a doghouse that it confuses people?---I wouldn't think so.

12/29/2004

However, I feel very strongly that an attempt to communicate to drivers what type of LT phasing is used by differentiating between doghouse and 5-section offset head is bound to fail. It's a "secret code" that you are just "hoping" people will come to understand. Furthermore, even if CO drivers eventually unlock the code, drivers from other States will have NO CLUE. Nowhere else is such a code being used. I would urge CO not to try make such a distinction.

What really distinguishes to the driver whether it's a PPLT mode or a protected-only mode is not the head configuration but the actual signal indications displayed in the cycle---red arrow for the LT while the thru signals are green ball sends the specific message that the LT driver cannot turn permissively, while seeing a green ball for the left turn lane (either in a shared or separate signal face, without a red arrow) tells the LT driver he can turn permissively after yielding.

As for the red arrow at the top of a doghouse signal used in a variable mode LT operation, I am assuming the CO doghouse is the THIRD signal face for the approach, located over the left turn lane and not a shared face as one of the 2 required primary signal faces on the approach. (Many States do not use a third signal face when the LT phasing is protected-permissive--they would make the left-most of the 2 primary faces a doghouse and locate it on the lane line separating the LT lane and the leftmost thru lane.) It's allowable to use a doghouse (or your offset 2-3 face) as a 3rd signal face, but what you display in that doghouse is governed by Section 4D.06, and it depends on what LT mode is in operation. As stated in item D of Section 4D.06:

"D. Variable Left-Turn Mode-If the protected only mode occurs during one or more periods of the day, and the permissive only mode or the combined protected/permissive mode occurs during other periods of the day, the requirements of Items A, B, and C in this Standard that are appropriate to that mode of operation shall be met, subject to the following:

1. The CIRCULAR GREEN and CIRCULAR YELLOW signal indications shall not be displayed when operating in the protected only mode.
2. The left-turn GREEN ARROW and left-turn YELLOW ARROW signal indications shall not be displayed when operating in the permissive only mode. "

So, during the times of day when protected only mode is in operation, item B and item D.1. apply. That requires a separate (third) signal face specifically for the LT lane and the indications that are illuminated during the sequence are red arrow, yellow arrow, and green arrow, OR red ball, yellow arrow, and green arrow (with the red ball visibility-limited or else accompanied by a sign.) The circular green & circular yellow indications in the 5-section head would never be illuminated during the protected mode operation times. But use of the red arrow during protected-only mode is obviously OK.

During the times of day when PPLT is in effect, item C and item D.2. apply. For PPLT you can have either a shared face or a separate face. Since you need and have the separate face for the protected-only times, you're therefore going to have a separate face for the PPLT times. Nothing in item C (or anywhere else) says you can't use a red arrow in that separate face. But you need to be very careful about what the LT driver sees during PPLT operation. That red arrow cannot be on simultaneously with any green or yellow arrow or ball lenses in the LT face. During PPLT, the red arrow can ONLY be on when the adjacent thru signals are red, but it can NOT be on during the time when adjacent thru has red but the LT green arrow is on (such as occurs in typical quad left PPLT operation.)

Variable mode LT operation is a pretty complicated subject, but the bottom line is to think about what the drivers see for all possible combinations of displays that can occur on the approach and ask "is the signal display and the sequence of displays telling the driver (both the LT driver and the thru driver) the right message" and does it comply with Section 4D.08 (Prohibited Steady Signal Indications). If the answer to both is yes, you're most likely OK.

By the way, this is just my unofficial take on your question about the red arrow in the doghouse. If you need an Official Interpretation of the MUTCD, please let me know and I can write it up for that purpose for the signature of our office director.

I hope this provided you with the assistance you needed. Please take a just a couple of seconds to double click on the attached Customer Service Feedback icon, answer the three questions and submit. Thanks.

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

From: Matthews, KC [mailto:K.C.Matthews@dot.state.co.us]

Sent: Wednesday, December 15, 2004 5:28 PM

To: Allen, Marcee; Wainwright, Scott

Subject: FW: Protected/Permitted Signal Heads

Marcee/Scott,

As you can see below, the discussion regarding 5-section signal heads at our Traffic Engineers meeting last week has generated some questions.

Specifically, the only documentation of the offset head (2 on left, 3 on right) is in our S-standards. MUTCD (2003 Fig 4D-3, 2000 Fig 4D-3, and 1988 Fig 4-1) and the ITE Manual on Signal Design do not reference the offset style, only the doghouse style.

1. Is the offset style in conflict with the MUTCD?
2. Has any research been done regarding the effectiveness of either (offset vs. doghouse)?
3. Should we change the standard and show both options for the five section head?
4. Is it permissible to use a red arrow on top of the doghouse left configuration instead of a red ball. The MUTCD does not

mention whether or not it's permissible.

K.C. Matthews, P.E.
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 Traffic Specs & Standards Engineer
 4201 E. Arkansas Ave, EP 770

12/29/2004

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

From: McDaniel, Scott
Sent: Wednesday, December 15, 2004 9:26 AM
To: DePinto, Ken; Meyer, Charles E; Matthews, KC
Cc: Haas, Larry; McVaugh, Mike; Hu, Ajin; Lancaster, Jeffrey; Bower, Tanya; Kononov, Jake
Subject: RE: Protected/Permitted Signal Heads

In addition to Ken's comment, when we use a doghouse left, we have a red arrow on top instead of a red ball. The MUTCD does not mention whether this is permissible or not.

KC,

Is this something you can look into for us?

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

From: DePinto, Ken
Sent: Wednesday, December 15, 2004 9:03 AM
To: McDaniel, Scott; Meyer, Charles E; Matthews, KC
Cc: Haas, Larry; McVaugh, Mike; Hu, Ajin; Lancaster, Jeffrey; Bower, Tanya; Kononov, Jake
Subject: Re: Protected/Permitted Signal Heads

Should we change the standard and show two options for the five section? Are we in conflict with the MUTCD.

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

From: McDaniel, Scott <Scott.McDaniel@dot.state.co.us >
To: Meyer, Charles E <Charles.E.Meyer@DOT.STATE.CO.US >, Matthews, KC
<K.C.Matthews@dot.state.co.us >
CC: DePinto, Ken <Ken.DePinto@dot.state.co.us >, Haas, Larry <Larry.Haas@DOT.STATE.CO.US >, McVaugh, Mike <Mike.McVaugh@DOT.STATE.CO.US >, Hu, Ajin <Ajin.Hu@DOT.STATE.CO.US >, Lancaster, Jeffrey <Jeffrey.Lancaster@dot.state.co.us >, Bower, Tanya <Tanya.Bower@dot.state.co.us >, Kononov, Jake <Jake.Kononov@dot.state.co.us >

Sent: Wed Dec 15 08:48:23 2004
Subject: RE: Protected/Permitted Signal Heads

My personal opinion, for what it is worth, is that the 2x3 that we traditionally use differentiates a protected/permissive left turn verses a protected by time of day left turn.

In Region 6, we are using more and more of the protected by time of day left turn phasing which uses the doghouse signal head configuration. We are finding that in many cases, we need to protect left turns during the majority of the day due to the lack of adequate gaps in opposing through traffic but, there is usually more than adequate sight distance and gaps to allow permissive left turns in the late evening hours and weekends.

I prefer using 2x3 section heads for protected permissive left turns and doghouses for protected by time of day left turns. I think that drivers will eventually figure out the difference and we will get better compliance with our left turn signalization.

- Scott -

From: Meyer, Charles E
Sent: Tuesday, December 14, 2004 4:42 PM
To: Matthews, KC
Cc: DePinto, Ken; McDaniel, Scott; Haas, Larry; McVaugh, Mike; Hu, Ajin
Subject: Protected/Permitted Signal Heads

KC,

At the most recent TE meeting Ken mentioned the state's use of different types of 5-section heads. He and I discussed it by phone and a little research has found that the only documentation of the offset head (2 on left, 3 on right) is in our S-standards. MUTCD (2003 Fig 4D-3, 2000 Fig 4D-3, and 1988 Fig 4-1) and the ITE Manual on Signal Design do not reference the offset style, only the doghouse style.

Should we be endorsing the offset style? Has any research been done regarding the effectiveness of either? In R3, we've been requiring the offset style, mostly for ease of mtce and installation (according to our mtce forces).

Thanks, Charles