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Active Vehicle Barrier (AVB) Safety Schemes

In This Issue...

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Overview

The 2019 edition of SDDCTEA's Pamphlet 55-15, *Traffic and Safety Engineering for Better Entry Control Facilities* has several new Active Vehicle Barrier Safety Schemes. They are detailed in this bulletin.

Installations require AVBs at the end of the threat response zone as a final denial barrier — a mechanism to provide containment if the entry control facility's (ECF's) security is compromised by a potential threat. There are many different types of AVBs, and the barrier rating utilized is dependent on service requirements and installation needs. Active vehicle barriers must be designed with a safety scheme that allows all non-threat road users to safely clear the barrier or stop in advance of it prior to deployment.

The decision on which type of AVB to install lies with an individual installation. Selected AVBs must be included on the list of DoD Certified Anti-Ram Vehicle Barriers maintained by the U.S. Army Corps of Engineers (USACE) Protective Design Center (PDC) which is available on their web site: https://www.nwo.usace.army.mil/About/Centers-of-Expertise/Protective-Design-Center/PDC-Library/ . Additional guidance can be found in UFC 4-022-01.

AVB Safety

Per UFC 4-022-01, AVBs must be operated safely. Safety must always be included in the operation of an AVB system to protect innocent motorists, even when operating in response to a true threat. Safety can be provided by following one of the safety schemes developed by SDDCTEA, as presented within this bulletin.

AVB safety requirements include providing warning to road users of AVB activation and providing sufficient time for road users to clear or stop prior to AVB deployment. When considering AVB designs and locations, the total response time must include:

- Guard reaction = no less than 3 seconds
- Time for safety and signalization = Variable, based on scheme
- Deployment time = no less than 2 seconds

The time for safety and signalization applies to AVB safety schemes with traffic signals or hybrid beacons. The signals and beacons must utilize a yellow safety warning interval that provides drivers with enough advance notice to properly stop

or clear the AVB. The 2 seconds minimum deployment time for the AVB must start at the completion of the safety and signalization time. The AVB can deploy in less than 2 seconds if the AVB is capable; however, threat calculations need to still utilize 2 seconds for the AVB deployment time.

Most AVB systems can incorporate devices such as push-button switches; wired and wireless hand operated switches; computer control systems; and radar or detection loops to monitor excessive speed or unauthorized entry. Active vehicle barrier activation shall be based on the actions of the security personnel manning the ECF (such as push button or hand operated switches). This will provide an opportunity for security personnel to distinguish confused, inattentive, or intoxicated drivers from potential threats attempting forced entry. Automatic detection equipment for wrong-way entry and excessive speed may be utilized for warning security personnel of potential threats. Another safety measure is the requirement to provide safety loops in front of and after the barrier to prevent deployment if a vehicle is still traversing the barrier just as it is activating. Final selection of control systems should follow UFC 4-022-01 guidance.

UFC 4-022-01 (2017), Section 5-5.4:
The design and operation of the ECF must include provisions to protect innocent users of the ECF from operation of the AVB whether deployment is accidental, during a test, or during an actual response to a threat. AVBs must be programmed with the required response time necessary to allow the sequencing of the AVB safety system to warn motorists of the activation, and to allow non-threat vehicles within the vicinity of the AVBs to safety traverse or stop before the AVBs prior to their deployment.

AVBs must be designed, implemented, and operated in accordance with UFC 4-022-02, UFGS 34 71 13.19 *Crash Rated Active Vehicle Barriers and Controls*. AVB safety requirements include proper signage, signals and delineation as well as providing adequate sequencing and timing… An SDDCTEA Pamphlet 55-15 recommended safety scheme must be implemented. Deviations from these safety schemes must be approved by the appropriate Service representative with consultation from SDDCTEA.

Security and safety considerations should be at the forefront of designs and operation for ECFs and AVBs. Installation officials must also be mindful of the potential tort liability that exists if AVBs are not properly functioning or do not operate using an approved safety scheme.

Active Vehicle Barrier Safety Schemes

The purpose of traffic control devices associated with the AVBs is to protect the innocent driver. SDDCTEA has developed several AVB safety schemes that utilize traffic control and warning devices to notify drivers when the AVB is activated, as well as provide the necessary timeline to operate the system. When speaking of threat containment time or threat response time, it is the time required for a guard to perceive and react to an incoming threat vehicle, and the time for the safety scheme to operate. When the AVB is correctly located in accordance with the time required by the given safety scheme, both safety and threat containment are provided. The schemes are to be used on roadways with relatively flat horizontal and vertical alignments. Stopping sight distance and a clear view of the warning devices near the AVB must be provided for motorists approaching the AVB. It is highly recommended that the approach to an AVB be located on a tangent section of roadway. If the calculated threat response time falls within 300 feet of an intersection, an intersection safety scheme is highly recommended to avoid driver confusion with the intersection control.

Traffic control and safety devices common to all schemes include:

- ☑ Advance warning signs
- ☑ Regulatory signs
- ☑ Advance and post-AVB vehicle detection loops
- ☑ Audible alarms
- ☑ Retroreflective markings on the AVB
- ☑ Retroreflective pavement markings
- ☑ Traffic signals or hybrid beacons
- ☑ Lighting

The table below provides an overview of the developed AVB safety schemes. Detailed descriptions and layouts for each scheme are provided in the remainder of this bulletin. Note that the AVB Safety Scheme Summary includes only the four primary schemes. These schemes can be used in combination, such as one scheme for the inbound direction and another for the outbound direction.

The following pages summarize the primary schemes, as well as identify several scheme combinations. Drawings for each scheme discussed are included at the end of this bulletin, specifically as follows:

- ☑ Figure 1: Full Containment Safety Scheme
- ☑ Figure 2: Stop Control Safety Scheme - Midblock (One Lane)
- ☑ Figure 3: Stop Control Safety Scheme - Midblock (Two Lanes)
- ☑ Figure 4: Stop Control Safety Scheme - Intersection
- ☑ Figure 5: Hybrid Beacon Safety Scheme (One Lane)
- ☑ Figure 6: Hybrid Beacon Safety Scheme (Two Lanes)
- ☑ Figure 7: Combination Intersection Stop Control / Hybrid Beacon Safety Scheme
- ☑ Figure 8: High Efficiency Presence Detection Safety Scheme (One Lane)
- ☑ Figure 9: High Efficiency Presence Detection Safety Scheme (Two Lanes)
- ☑ Figure 10: Intersection Traffic Signal Safety Scheme
- ☑ Figure 11: Combination Intersection Traffic Signal / Hybrid Beacon Safety Scheme

The AVB safety schemes, as described and as shown on the associated drawings, have been developed by SDDCTEA. Deviations from the AVB safety scheme traffic control components (signing, markings, detection loops, and signals) must be reviewed and approved by SDDCTEA. The intersections shown on the drawings are for illustration purposes only. Actual intersection geometry and number and length of storage bays would be

AVB Safety Scheme Summary

AVB Scheme	Response Time*	Capacity	Advantages	Disadvantages
Full Containment	0 seconds	200 veh/hr/ln	• 100% threat containment at all times • Can be utilized in land-constrained areas	• Can only be used at low volume ECFs • Can have significant traffic capacity impacts • Maintenance intensive due to excessive use of the AVBs
Stop Control	5 seconds	800 veh/hr/ln	• Shortest response zone possible with exception to Full Containment Safety Scheme • Ability to retrofit existing response zones	• All traffic must stop at the AVB at all times causing significant traffic capacity impacts • Drivers may not obey the STOP signs • Driver frustration
Hybrid Beacon	7 seconds	1800 veh/hr/ln	• Free-flowing traffic	• Longer vehicle detection loops as compared to the other safety schemes
High Efficiency Presence Detection	7 seconds	1200 veh/hr/ln	• Allows free-flowing traffic when continuous traffic is present • 100% threat containment when not processing vehicles • Provides 100% containment for the outbound lane, when designed properly	• Complex system • With lane separation islands at the AVBs, overwidth vehicles cannot be accommodated • Cannot utilize an AVB that spans multiple lanes
*The 'Response Time' needed to operate each system is a minimum, and is directly linked to how close the AVB(s) can be located to the ID check area. Providing more time than the minimum is allowable.				

Contact SDDCTEA for assistance with calculating response zone length and assistance in determining the most appropriate AVB safety scheme for an ECF.

determined per site and traffic volume requirements. Unified Facilities Guide Specifications (UFGS) have been developed by USACE for operation of the systems, specifically UFGS 34 71 13.19 – *Crash Rated Active Vehicle Barriers and Controls*.

Existing signs, signals, and markings conforming to previous versions of SDDCTEA safety schemes are considered grandfathered in and may remain in place until the end of their useful service life.

Full Containment Safety Scheme

The Full Containment Safety Scheme, consisting of two AVBs in series, operates with a minimum of one barrier deployed at all times; resulting in a threat response time requirement of 0-seconds. This safety scheme utilizes typical traffic control signals in coordination with manually operated AVBs.

At the start of the system, the first AVB is in the retracted position and the second AVB is deployed to provide containment. After the inbound traffic is vetted, vehicles traverse the first AVB and queue at the second AVB. Once the area is filled, or no more vehicles are entering, the ID check guard(s) deploy the first AVB behind the vehicles to maintain containment. Once fully deployed, the guard(s) retract the second AVB to allow the vetted personnel to enter the installation. After all traffic has cleared, the second AVB is fully deployed and then the first AVB is retracted to run the system again.

The Full Containment Safety Scheme can be sized to fit many situations, but typically AVBs should be spaced 300-ft apart to maximize traffic capacity. Maximum capacity for this safety scheme is approximately 200 vehicles per hour per lane.

Advantages of this scheme include:

- ☑ 100% threat containment at all times
- ☑ Can be utilized in land-constrained areas

Disadvantages of this scheme include:

- ☑ Can only be used at low volume ECFs
- ☑ Can have significant traffic capacity impacts
- ☑ Maintenance intensive due to excessive use of the AVBs

This safety scheme is illustrated in figure 1.

Stop Control Safety Scheme - Midblock

The Stop Control Safety Scheme-midblock utilizes STOP signs at the AVB (inbound and outbound), is located in-between intersections, and requires a 5-second (minimum) threat response time for both inbound and outbound lanes. Refer to the 5-second timeline given on the Stop Control Safety Scheme-midblock drawings for time allowances for individual safety scheme components.

Additional key characteristics include:

- ☑ 'DO NOT ENTER' LED blank-out regulatory signs
- ☑ Red signals mounted on top of the LED signs

This scheme is appropriate when the traffic volume is less than 800 vehicles per hour per lane. This applies to both the inbound and outbound directions for each lane approaching the barriers.

Advantages of this scheme include:

- ☑ Shortest response zone with exception to the Full Containment Safety Scheme
- ☑ Ability to retrofit an existing ECF's response zone and AVB(s)

Disadvantages of this scheme include:

- ☑ All traffic must stop at the AVB at all times
- ☑ Drivers may not obey the STOP signs
- ☑ Driver frustration

This safety scheme is not intended to be used on new ECF designs. It is primarily intended to be used for retrofit ECF designs where the response zone is too short for the hybrid beacon or HEPD safety schemes.

This safety scheme is illustrated in figure 2 (one-lane) and figure 3 (two lanes).

Stop Control Safety Scheme - Intersection

Similar to the midblock Stop Control Safety Scheme, this safety scheme uses stop control at the AVBs (inbound and outbound) and requires a 5-second (minimum) threat response time for both inbound and outbound lanes. Refer to the 5-second timeline given on the Stop Control Safety Scheme-Intersection drawings for time allowances for individual safety scheme components. This scheme differs from the Stop Control Safety Scheme-Midblock in

that it relocates the inbound AVB to an adjacent intersection.

Additional key characteristics include:

- ☑ Outbound AVB must be located a minimum of 155 feet from intersection radius point
- ☑ Passive barrier must be installed in the median connecting the inbound and outbound AVBs
- ☑ 'DO NOT ENTER' LED blank-out regulatory signs
- ☑ Red signals mounted on top of the LED signs

This scheme is appropriate when the incoming traffic volume is less than 800 vehicles per hour per lane and the intersected roadway (inside the installation) has relatively lower traffic volumes. As it is required that the intersection be unsignalized, the default intersection traffic control is all-way stop control. However, an intersection capacity analysis should be performed to ensure that all legs of the intersection operate at an acceptable level of service under all-way stop control. If the intersection does not operate at an acceptable level of service, it may be necessary to provide additional capacity by adding turning lanes where needed or by modifying the traffic control to two-way stop control or signalization. SDDCTEA is available to assist with evaluating intersection operations.

Advantages of this scheme include:

- ☑ Shortest response zone with exception to the Full Containment Safety Scheme
- ☑ Ability to retrofit an existing ECF's response zone and AVB(s)
- ☑ Inbound drivers stop at an intersection which is more intuitive than stopping at a midblock location, as required in the midblock Stop Control Safety Scheme

Disadvantages of this scheme include:

- ☑ Exiting traffic is required to stop at the intersection and then stop again at the outbound AVB.
- ☑ Drivers may not obey the STOP signs (outbound AVB)
- ☑ Driver frustration (outbound AVB)
- ☑ All-way stop control for intersection may not be warranted

This safety scheme is not intended to be used on new ECF designs. It is primarily intended to be used for retrofit ECF designs where the response zone is inadequate. If at all possible, it is recommended that the Combination Intersection Stop Control/Hybrid Beacon Safety Scheme be used which allows free flow traffic for the outbound lane(s). Also, although this safety scheme is intended to be used only at unsignalized intersections, the mere presence of an unsignalized intersection does not require the use of this scheme if another scheme is more appropriate.

This safety scheme is illustrated in figure 4.

Hybrid Beacon Safety Scheme

The Hybrid Beacon Safety Scheme uses hybrid beacons for traffic control and extended vehicle detection loops to detect the presence of vehicles approaching the AVB. The safety scheme's design provides adequate stopping sight distance for an innocent driver to stop prior to, or to clear, the AVB. The operation of this scheme requires a 7-second minimum threat response time. Refer to the 7-second timeline given on the Hybrid Beacon Safety Scheme drawings for time allowances for individual safety scheme components. Additional design options are available for the Hybrid Beacon Safety Scheme. Contact SDDCTEA for further information.

Additional key characteristics include:

- ☑ Design based on a roadway grade of 3% or less and a design speed of 25 mph
- ☑ Lengthened advance vehicle detection loops (6-ft x 76-ft quadrupoles)
- ☑ Lane separation islands for approaches with multiple lanes per directions.
- ☑ 'DO NOT ENTER' LED blank-out regulatory signs

Advantages of this scheme include:

- ☑ Free-flowing traffic

Disadvantages of this scheme include:

- ☑ Longer vehicle detection loops as compared to the other safety schemes
- ☑ The longer loops may introduce additional security risks which may be considered when determining AVB placement (hybrid)

This safety scheme is illustrated in figure 5 (one lane) and figure 6 (two lanes).

Combination Intersection Stop Control/Hybrid Beacon Safety Scheme

This scheme is a combination of the intersection Stop Control Safety Scheme for the inbound lane and the

Hybrid Beacon Safety Scheme for the outbound lane. Note that this combination safety scheme should only be used at unsignalized intersections. It shall not be used at signalized intersections or roundabouts. Each scheme acts independently, so the minimum threat response time for the inbound lane is 5-seconds (Stop Control Safety Scheme) and 7-seconds (Hybrid Beacon Safety Scheme) for the outbound lane. Refer to the 5-second and 7-second timelines given on the Combination Intersection Stop Control/Hybrid Beacon Safety Scheme drawings for time allowances for individual safety scheme components.

Note that the outbound AVB requires a longer threat response time than the inbound AVB. This increased threat response time can often be mitigated with wrong way detection and added roadway curvature for the outbound lanes.

Additional key characteristics include:

- ☑ Outbound AVB must be located a minimum of 155 feet from intersection radius point
- ☑ Design based on a roadway grade of 3% or less and a design speed of 25 mph for the outbound AVB
- ☑ Passive barrier must be installed in the median connecting the inbound and outbound AVBs
- ☑ 'DO NOT ENTER' LED blank-out regulatory signs
- ☑ Red signals mounted on top of the LED signs (inbound AVB)
- ☑ Lengthened advance vehicle detection loops (6-ft x 76-ft quadrupoles) for the outbound AVB

This scheme is appropriate when the inbound traffic volume is less than 800 vehicles per hour per lane and the intersected roadway (inside the installation) has relatively lower traffic volumes. As it is required that the intersection be unsignalized, the default intersection traffic control is all-way stop control. However, an intersection capacity analysis should be performed to ensure that all legs of the intersection operate at an acceptable level of service under all-way stop control. If the intersection does not operate at an acceptable level of service, it may be necessary to provide additional capacity by adding turning lanes where needed or by modifying the traffic control. SDDCTEA is available to assist with evaluating intersection operations.

Advantages of this scheme include:

- ☑ Shortest response zone with exception to the Full Containment Safety Scheme (inbound AVB)
- ☑ Ability to retrofit an existing ECF's response zone and AVB(s)
- ☑ Inbound drivers stop at an intersection which is more intuitive than stopping at a midblock location, as required in the midblock Stop Control Safety Scheme
- ☑ Outbound traffic is free flowing

Disadvantages of this scheme include:

- ☑ Longer vehicle detection loops as compared to the other safety schemes
- ☑ The longer loops may introduce additional security risks which may be considered when determining AVB placement (hybrid)
- ☑ All-way stop control for intersection may not be warranted

This safety scheme is illustrated in figure 7.

High Efficiency Presence Detection Safety Scheme

The High Efficiency Presence Detection (HEPD) Safety Scheme uses typical traffic control signals, traffic arm(s) and a series of quadrupole vehicle detection loops to detect the presence of vehicle(s) approaching the AVB. This safety scheme operates with the AVB normally deployed when no vehicle is present, but allows free-flow traffic once a vehicle is detected. The operation of this scheme requires a 7-second (minimum) threat response time. Refer to the 7-second timeline given on the HEPD Safety Scheme drawings for time allowances for individual safety scheme components. It is important to note that with this safety scheme, the AVB and associated traffic control devices for each travel lane operate independently of each other.

This scheme is appropriate when the incoming traffic volume is less than 1200 vehicles per hour per lane.

Additional key characteristics include:

- ☑ Design based on a roadway grade of 3% or less and a design speed of 25 mph
- ☑ Lane separation (i.e., a median) is required for all lanes, in the same or opposite direction, to locate the HEPD equipment
- ☑ Individual AVBs must be used for each lane
- ☑ AVBs and associated traffic control devices must operate independently; a delay to one barrier cannot delay a barrier in another lane

- ☑ Vehicle detection loops at the traffic arm (6-ft x 10-ft loop), in advance of the AVB (6-ft x 34-ft loop), and just after the AVB (6-ft x 6-ft loop)

For normal operations, all vehicles spaced 3 seconds or less apart will be able to free-flow through the system due to the vehicle detection loops. Vehicles spaced more than 3 seconds apart will encounter a yellow or red light with the traffic arm down or in the process of lowering. The driver must wait for the signal to cycle to green and the traffic arm to raise before proceeding. When EFO is activated, the system allows the last vehicle in the line of free-flowing traffic to clear the AVB during the yellow and red signal cycles. Vehicles that arrive after the 3 second delay will encounter a red light with the traffic arm down or in the process of lowering. After the traffic light has changed to red and the traffic arm lowered, the AVB will begin to deploy.

Advantages of this scheme include:

- ☑ Allows free-flowing traffic when continuous traffic is present
- ☑ 100% threat containment when not processing vehicles
- ☑ Favorable option to use with a single outbound lane as it provides 100% containment. When traffic is not present, the AVB is up; when traffic is present, the AVB is down and the traffic flow restricts threat vehicle entry

Disadvantages of this scheme include:

- ☑ Complex system
- ☑ With lane separation islands at the AVBs, overwidth vehicles cannot be accommodated
- ☑ Cannot utilize an AVB that spans multiple lanes

This safety scheme is illustrated in figure 8 (one lane) and figure 9 (two lanes).

Intersection Traffic Signal Safety Scheme

This scheme colocates the AVBs at the intersection and utilizes typical traffic control signals. This safety scheme requires the AVB signals to be coordinated with the intersection signals. The operation of this scheme requires a 9-second inbound and an estimated 12-second outbound threat response time (minimums). Refer to the 9-second and 12-second timelines given on the Intersection Traffic Signal Safety Scheme drawings for time allowances for individual safety scheme components.

Note that the outbound AVB requires a longer threat response time than the inbound AVB. The longer response time results from the outbound lanes requiring an additional 3 seconds (approximate) of safety time for innocent drivers to clear both the intersection and the barrier. However, this increased threat response time can often be mitigated with wrong way detection and added roadway curvature for the outbound lanes.

Additional key characteristics include:

- ☑ Additional traffic control signals are required at the inbound AVB
- ☑ Outbound AVB threat response time is dependent on the width of the intersection that an exiting vehicle must cross
- ☑ 'NO TURN ON RED' LED Blank-out regulatory signs

Advantages of this scheme include:

- ☑ AVB signal and intersection traffic control signals are collocated and operate together
- ☑ Can process a high volume of traffic

Disadvantages of this scheme include:

- ☑ Longer threat response times as compared to the other safety schemes

This scheme should only be used at signalized intersections. However, the mere presence of a signalized intersection does not require the use of this safety scheme if another safety scheme is more appropriate. An intersection capacity analysis should be performed to ensure that all legs of the intersection operate at an acceptable level of service under traffic signal control and that the MUTCD signal warrants are met. The traffic volumes (capacity) achieved by this scheme will be governed by the operations at the traffic signal.

This safety scheme is illustrated in figure 10.

Combination Intersection Traffic Signal/Hybrid Beacon Safety Scheme

This scheme is a combination of the Traffic Signal Safety Scheme for the inbound lane and the Hybrid Beacon Safety Scheme for the outbound lane, and is to be used only at signalized intersections. Each scheme acts independently, so the minimum threat response time for the inbound lane is 9-seconds (Intersection Traffic Signal Safety Scheme) and 7-seconds for the outbound lane (Hybrid Beacon Safety Scheme). Refer to the 9-second and 7-second timelines given on the Combination Intersection Traffic Signal/Hybrid Beacon Safety Scheme

drawings for time allowances for individual safety scheme components.

This scheme should only be used at signalized intersections. However, the mere presence of a signalized intersection does not require the use of this safety scheme if another safety scheme is more appropriate. An intersection capacity analysis should be performed to ensure that all legs of the intersection operate at an acceptable level of service under traffic signal control and that MUTCD signal warrants are met. The traffic volumes (capacity) achieved by this scheme will be governed by the operations at the traffic signal.

Additional key characteristics include:

- ☑ Design based on a roadway grade of 3% or less and a design speed of 25 mph
- ☑ Outbound AVB must be located a minimum of 155 feet from intersection radius point
- ☑ Passive barrier must be installed in the median connecting the inbound and outbound AVBs
- ☑ Additional traffic control signals are required at the inbound AVB
- ☑ 'NO TURN ON RED' LED Blank-out regulatory signs
- ☑ Lengthened advance vehicle detection loops (6-ft x 76-ft quadrupoles)

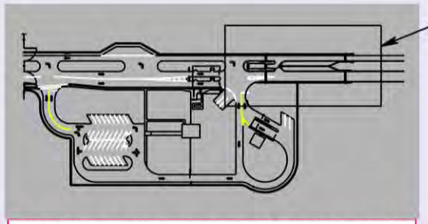
Advantages of this scheme include:

- ☑ Shortened threat response time (7-seconds) in the outbound lane as compared to the Intersection Traffic Signal Safety Scheme (estimated 12-seconds).
- ☑ Can process a high volume of traffic

Disadvantages of this scheme include:

- ☑ Additional traffic control (i.e., hybrid beacons) is required for outbound traffic as opposed to the Intersection traffic Signal Safety Scheme where the outbound AVB is located at the signalized intersection and controlled by the intersection
- ☑ Longer vehicle detection loops as compared to the other safety schemes (hybrid)
- ☑ The longer loops may introduce additional security risks which may be considered when determining AVB placement (hybrid)
- ☑ Longer inbound threat response time as compared to the other safety schemes (signal)

This safety scheme is illustrated in figure 11.



SAFETY SCHEME DETAIL

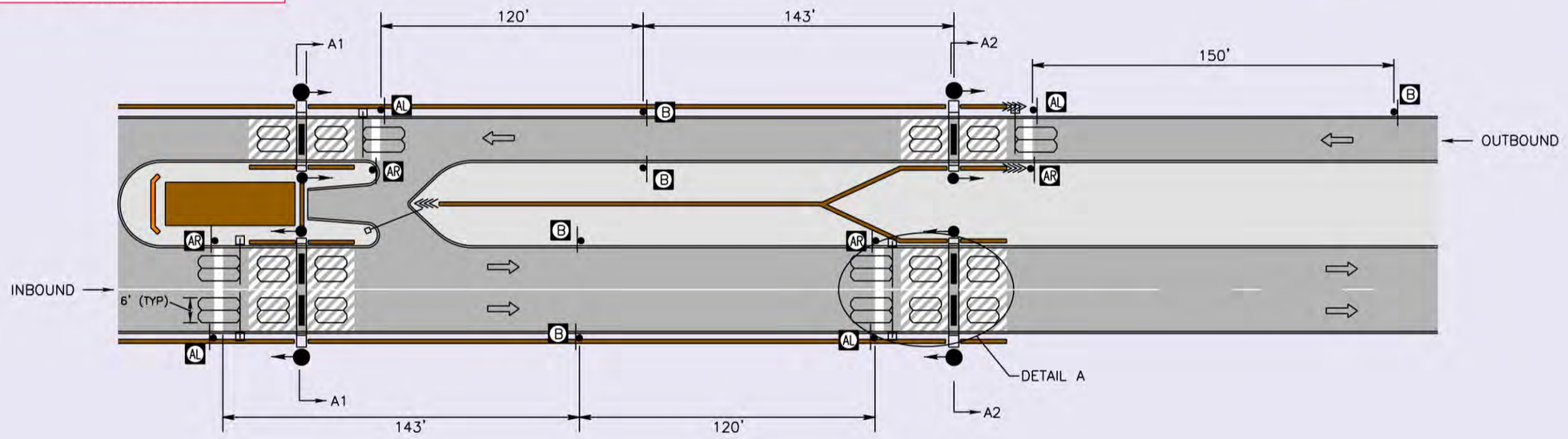
SCHEME LAYOUT IS SUBJECT TO CHANGE. VERIFY CURRENT VERSION WITH SDDCTEA. 22 AUGUST 2019

AL
STOP HERE ON RED
R10-6AL
24" X 30"
(600MM X 750MM)

AR
STOP HERE ON RED
R10-6AR
24" X 30"
(600MM X 750MM)

B
BARRIER ACTIVATED AHEAD
WHEN FLASHING
W3-3A-TEA
36" X 36"
(900MM X 900MM)
W16-13P
30" X 24"
(750MM X 600MM)

NOT TO SCALE

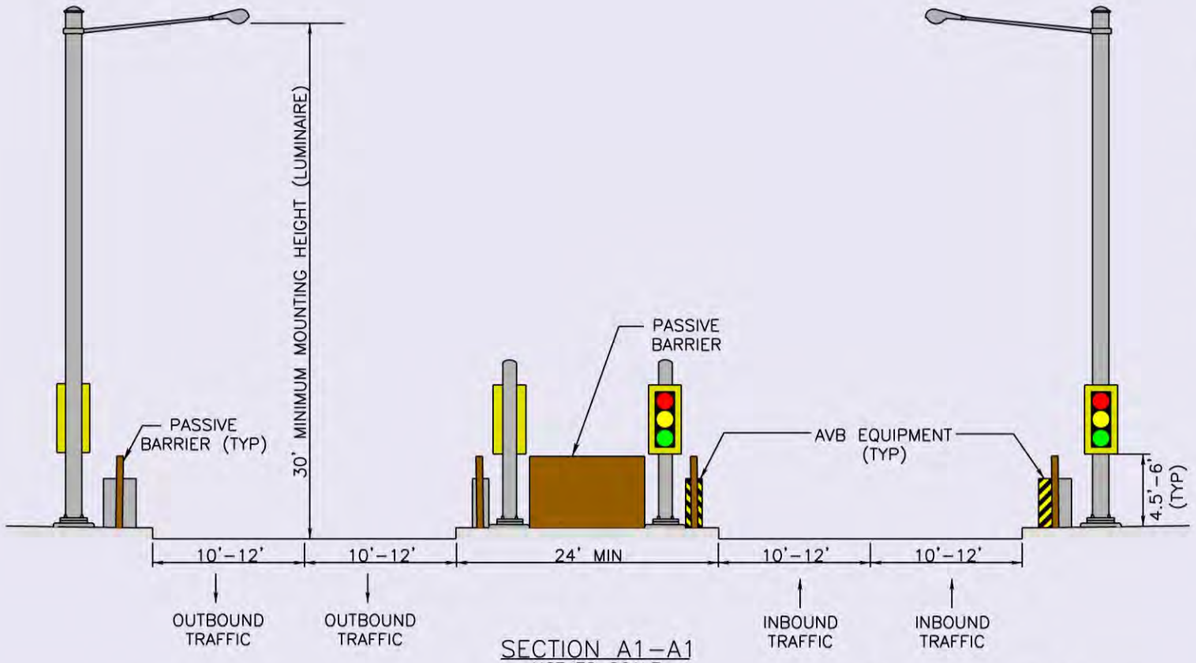


NOTES

1. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
2. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON TRAFFIC ARMS AND ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
3. OBJECT MARKERS ARE REQUIRED ON TRAFFIC ARM BASE AND NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
4. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
5. LOOP 1 – GATE ARM LOOP (IF USED), LOOP 2 – ENTRY SAFETY LOOP, LOOP 3 – EXIT SAFETY LOOP.
6. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
7. AVB EQUIPMENT WIDTHS SHOWN ON SECTIONS A1-A1 AND A2-A2 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
8. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12-INCH INDICATIONS SHALL BE USED.
9. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (TRAFFIC ARM, SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.

LEGEND

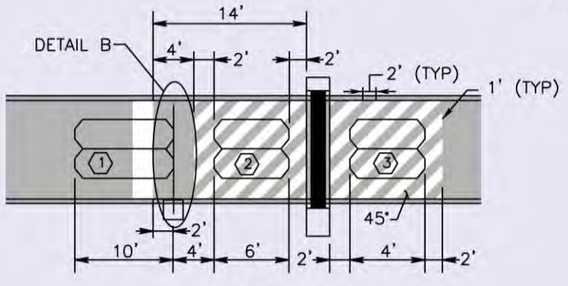
- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- (#) LOOP DETECTION AREA NUMBER
- POST MOUNTED SIGN
- POLE-MOUNTED TRAFFIC SIGNAL
- POLE-MOUNTED TRAFFIC SIGNAL WITH LUMINAIRE
- STOP LINE PAVEMENT MARKING
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- TRAFFIC ARM (OPTIONAL)
- CRASHWORTHY END TERMINAL/CRASH CUSHION



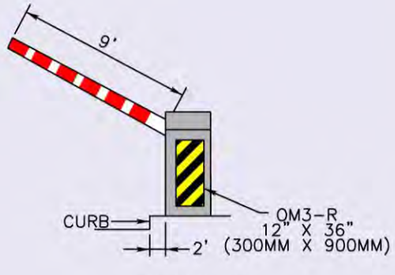
SECTION A1–A1
NOT TO SCALE

NOTES CONT'D

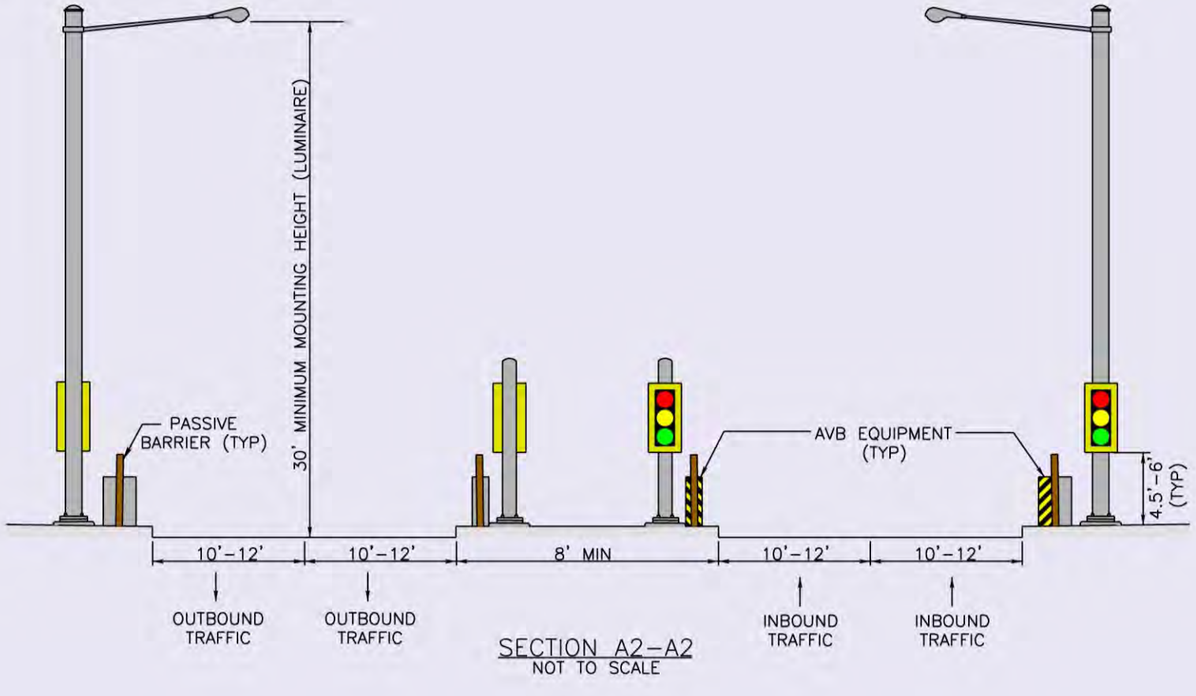
10. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
11. DISTANCE BETWEEN THE FIRST AND SECOND AVB MAY VARY TO MEET FIELD CONDITIONS.
12. MIRRORS ARE RECOMMENDED TO DISPLAY AVB TO DRIVER AT STOP LINE TO VERIFY AVB IS FULLY RETRACTED.
13. TRAFFIC ARM IS OPTIONAL.
14. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED TO BE GRANDFATHERED IN AND MAY REMAIN IN–PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
15. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK–AWAY SUPPORTS.



DETAIL A



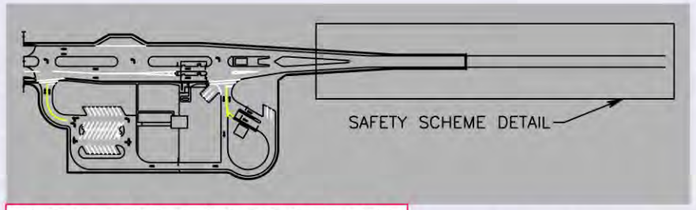
DETAIL B



SECTION A2–A2
NOT TO SCALE

FIGURE 2: Stop Control Safety Scheme – Midblock (One Lane)

		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION					
STOP CONTROL AVB SAFETY SCHEME – 1 LANE	TRAFFIC CONTROL	GUARD REACTION			DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6
	W3–3A–TEA WARNING SIGN WITH BEACONS	BEACONS DARK			ALTERNATING FLASHING YELLOW		
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED		
	RED SIGNAL	DARK			STEADY RED		
	100dB HORN	SILENT			ACTIVATED		
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED			DEPLOYING		DEPLOYED



SCHEME LAYOUT IS SUBJECT TO CHANGE. VERIFY CURRENT VERSION WITH SDDCTEA. 7 AUGUST 2019

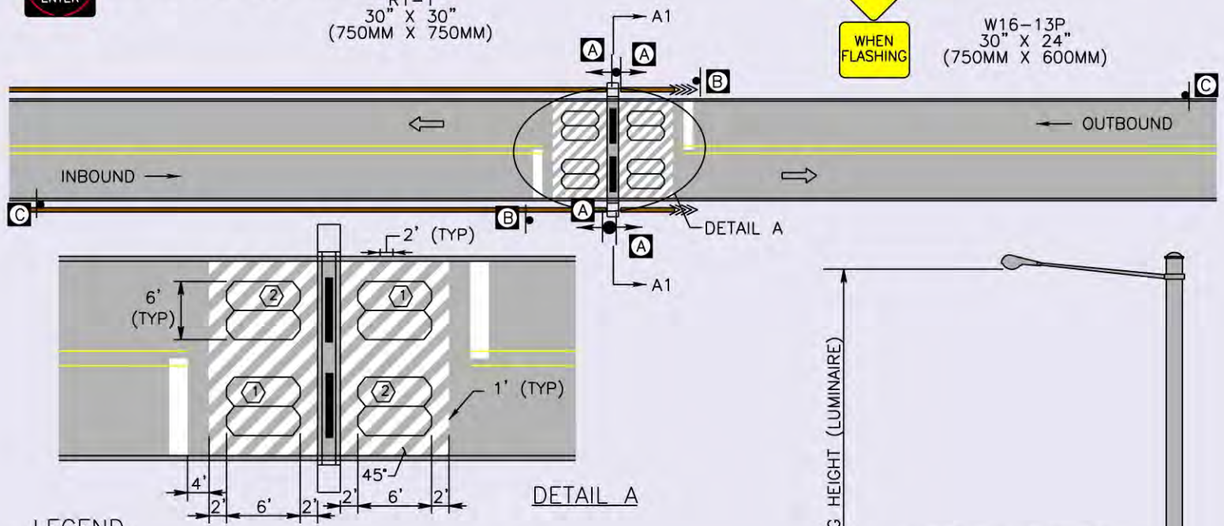
R5–1
30" X 30"
(750MM X 750MM)
LED BLANK–OUT SIGN
WITH 12" RED SIGNAL FACE

R1–1
30" X 30"
(750MM X 750MM)

NOT TO SCALE

W3–3A–TEA
36" X 36"
(900MM X 900MM)

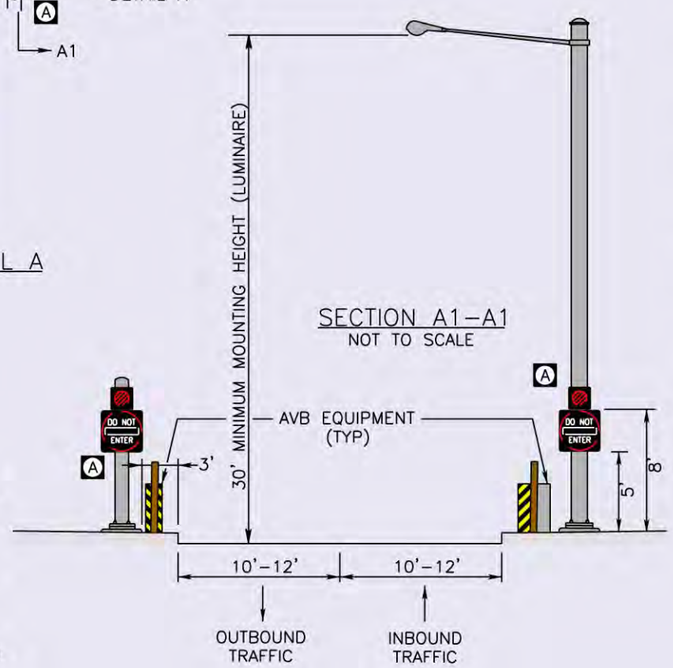
W16–13P
30" X 24"
(750MM X 600MM)



DETAIL A

LEGEND

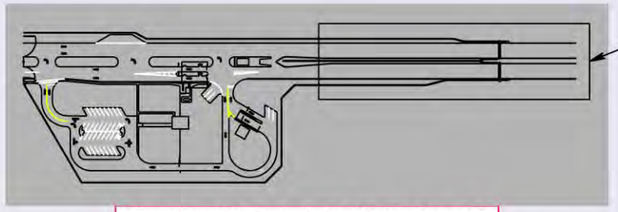
- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- (#) LOOP DETECTION AREA NUMBER
- POST MOUNTED SIGN
- POLE–MOUNTED TRAFFIC SIGNAL AND SIGN
- POLE–MOUNTED TRAFFIC SIGNAL AND SIGN WITH LUMINAIRE
- STOP LINE PAVEMENT MARKING
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION



SECTION A1–A1
NOT TO SCALE

NOTES

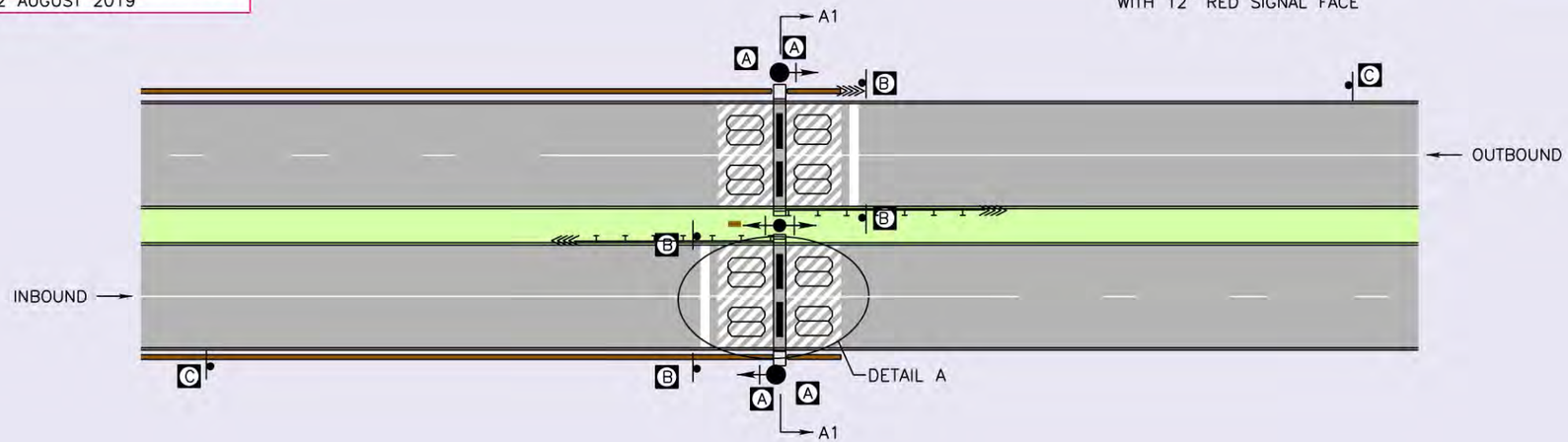
1. THIS SCHEME NOT INTENDED FOR USE WHERE INBOUND OR OUTBOUND TRAFFIC VOLUME EXCEEDS 800 VEHICLES PER HOUR PER LANE.
2. ILLUSTRATION SHOWS ONE LANE PER DIRECTION, BUT SCHEME CAN BE USED FOR MULTIPLE LANES PER DIRECTION.
3. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
4. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55–15 AND LOCAL REGULATIONS.
5. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55–15.
6. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
7. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
8. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
9. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
10. LED BLANK–OUT SIGN SHALL NOT AUTOMATICALLY DIM.
11. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
12. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1–A1 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
13. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
14. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
15. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
16. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
17. FOR SINGLE LANE ROADWAYS WITH NO MEDIAN, A NO PASSING ZONE SHALL EXTEND FROM THE ID CHECK AREA TO 300 FEET BEYOND THE AVB ON THE INSTALLATION SIDE OF THE BARRIER.
18. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED TO BE GRANDFATHERED IN AND MAY REMAIN IN–PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
19. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK–AWAY SUPPORTS.

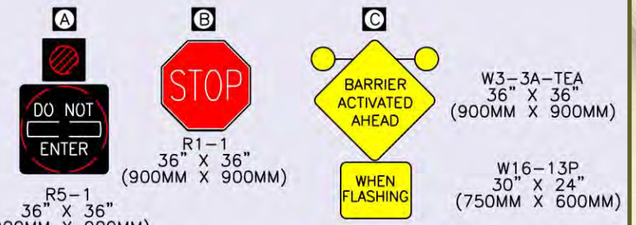


SAFETY SCHEME DETAIL

SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

NOT TO SCALE





NOTES

1. THIS SCHEME NOT INTENDED FOR USE WHERE INBOUND OR OUTBOUND TRAFFIC VOLUME EXCEEDS 800 VEHICLES PER HOUR PER LANE.
2. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
3. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
4. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
5. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
6. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
7. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
8. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
9. LED BLANK-OUT SIGN SHALL NOT AUTOMATICALLY DIM.
10. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
11. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1-A1 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.

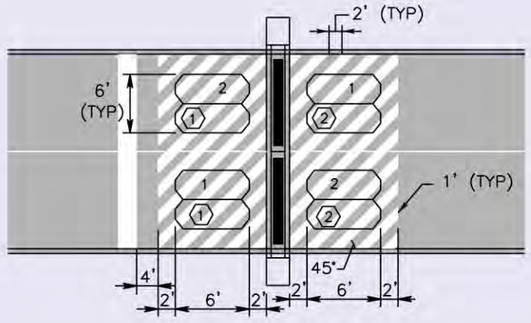
LEGEND

- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POST MOUNTED SIGN
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN WITH LUMINAIRE
- STRUCTURE MOUNTED SIGN
- STOP LINE PAVEMENT MARKING
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION
- GUARDRAIL

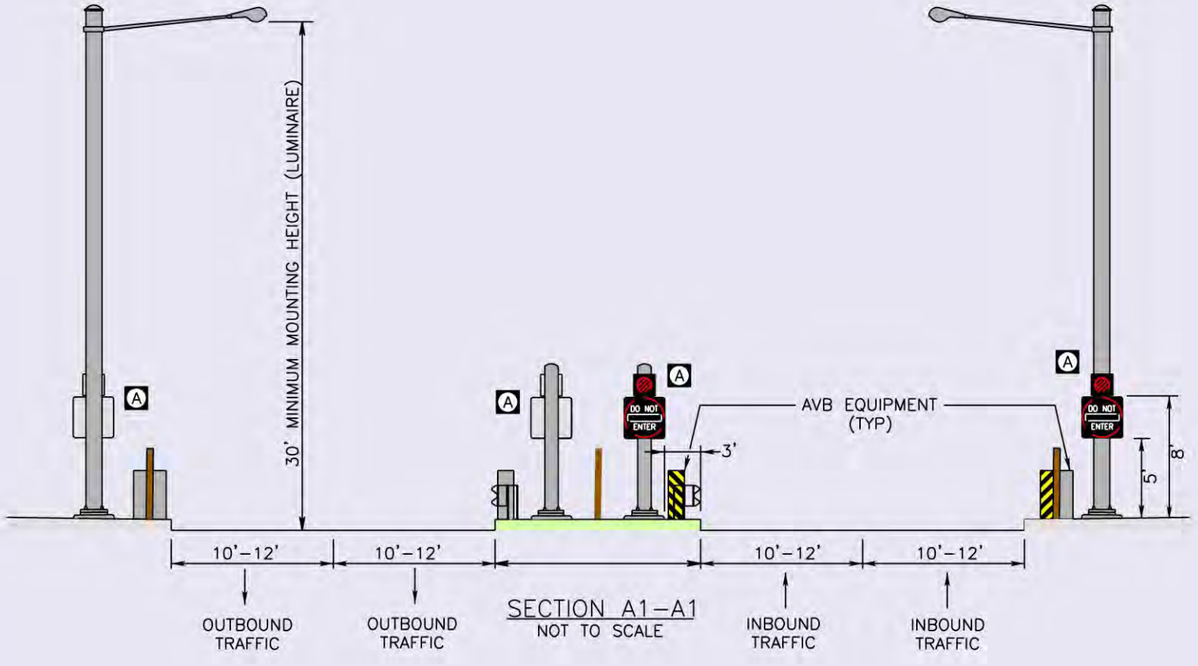
STOP CONTROL AVB SAFETY SCHEME – 2 LANE		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION					
	TRAFFIC CONTROL	GUARD REACTION			DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6
	W3–3A–TEA WARNING SIGN WITH BEACONS	BEACONS DARK			ALTERNATING FLASHING YELLOW		
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED		
	RED SIGNAL	DARK			STEADY RED		
	100dB HORN	SILENT			ACTIVATED		
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED			DEPLOYING		DEPLOYED

NOTES CONT'D

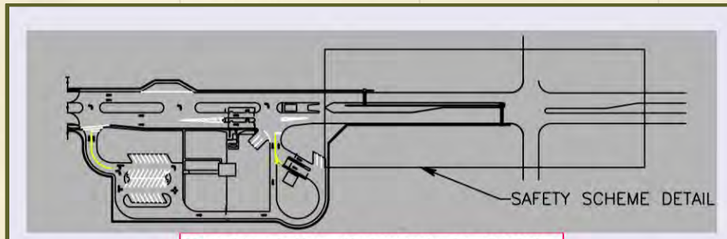
12. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
13. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
14. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
15. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
16. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED TO BE GRANDFATHERED IN AND MAY REMAIN IN–PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
17. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK–AWAY SUPPORTS.



DETAIL A

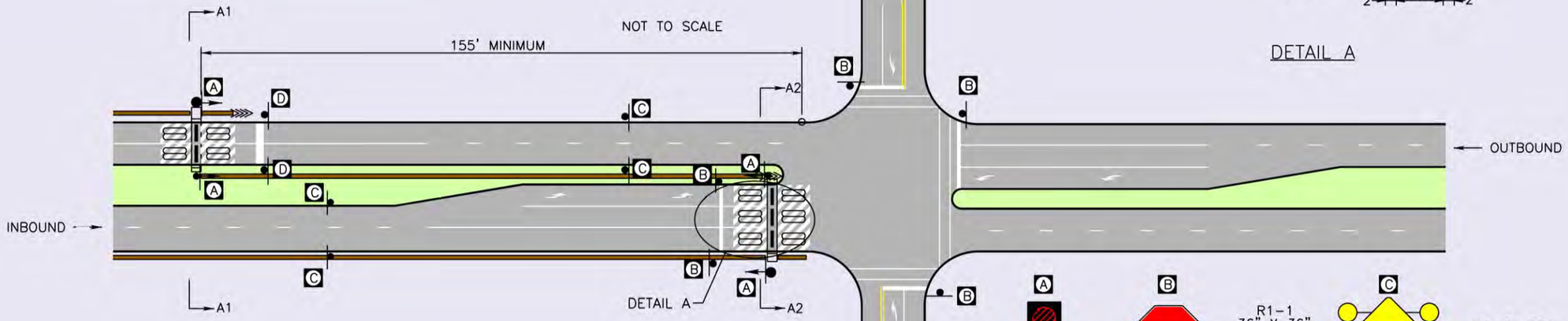


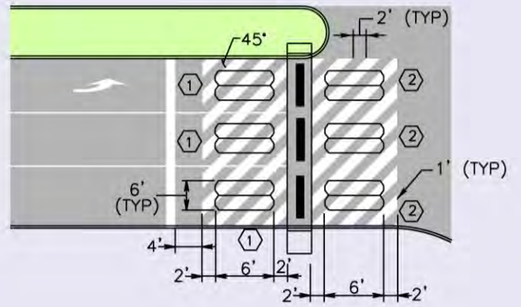
SECTION A1–A1
NOT TO SCALE



SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

NOT TO SCALE

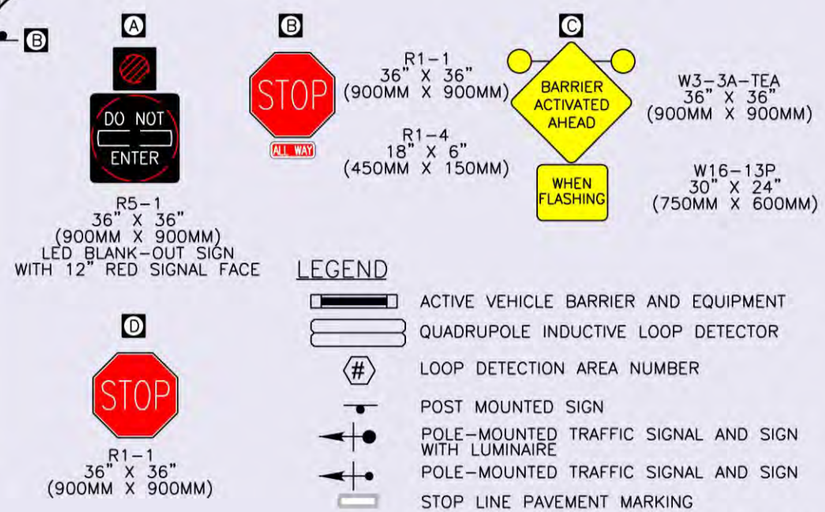




DETAIL A

NOTES

1. THIS SCHEME NOT INTENDED FOR USE WHERE INBOUND OR OUTBOUND TRAFFIC VOLUME EXCEEDS 800 VEHICLES PER HOUR PER LANE.
2. SCHEME CAN BE USED FOR ONE LANE PER DIRECTION OR FOR MULTIPLE LANES PER DIRECTION.
3. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
4. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
5. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
6. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
7. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
8. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
9. SECTION A1-A1, A2-A2, AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGE.
10. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
11. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-AWAY SUPPORTS



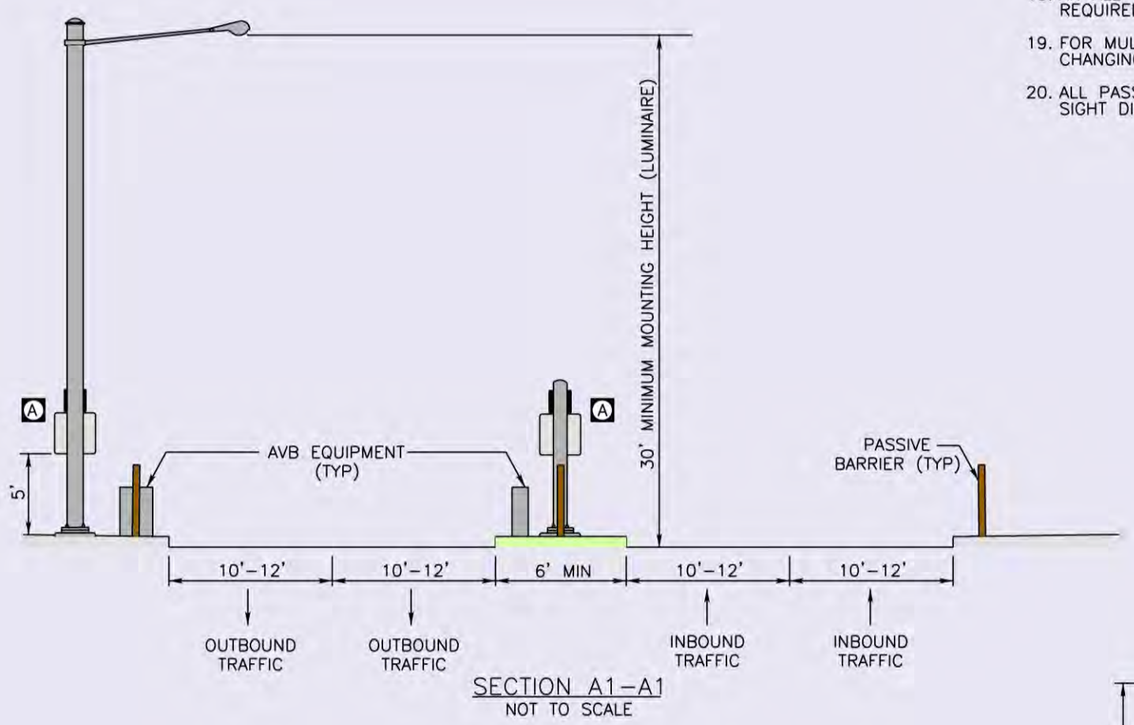
LEGEND

- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POST MOUNTED SIGN
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN WITH LUMINAIRE
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN
- STOP LINE PAVEMENT MARKING
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION

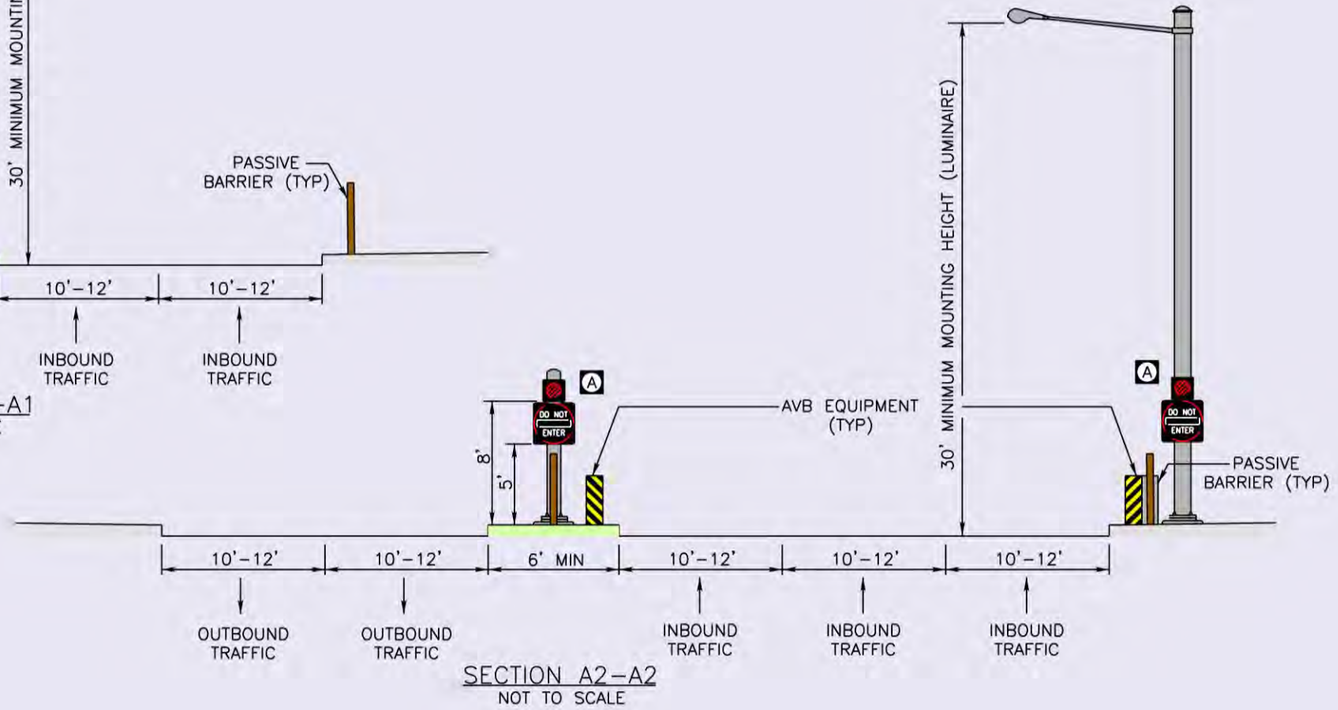
STOP CONTROL AVB SAFETY SCHEME – INTERSECTION		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION					
	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6
	W3–3B–TEA WARNING SIGN WITH BEACONS	BEACONS DARK			ALTERNATING FLASHING YELLOW		
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED		
	RED SIGNAL	DARK			STEADY RED		
	100dB HORN	SILENT			ACTIVATED		
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED			DEPLOYING		DEPLOYED

NOTES CONT'D

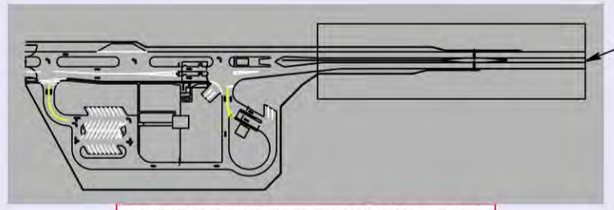
12. LED BLANK–OUT SIGN SHALL NOT AUTOMATICALLY DIM.
13. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
14. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1–A1 AND A2–A2 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
15. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
16. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
17. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATIONS IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
18. AN ALL–WAY STOP IS THE PREFERRED TRAFFIC CONTROL; HOWEVER A TWO–WAY STOP MAY BE REQUIRED. A TRAFFIC STUDY WILL NEED TO VALIDATE TRAFFIC CONTROL.
19. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
20. ALL PASSIVE BARRIERS PLACED AT INTERSECTION MUST NOT OBSTRUCT INTERSECTION SIGHT DISTANCE.



SECTION A1–A1
NOT TO SCALE



SECTION A2–A2
NOT TO SCALE



SAFETY SCHEME DETAIL

SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

A

W3-3A-TEA
36" X 36"
(900MM X 900MM)

W16-13P
30" X 24"
(750MM X 600MM)

B

R10-6A
24" X 30"
(600MM X 750MM)

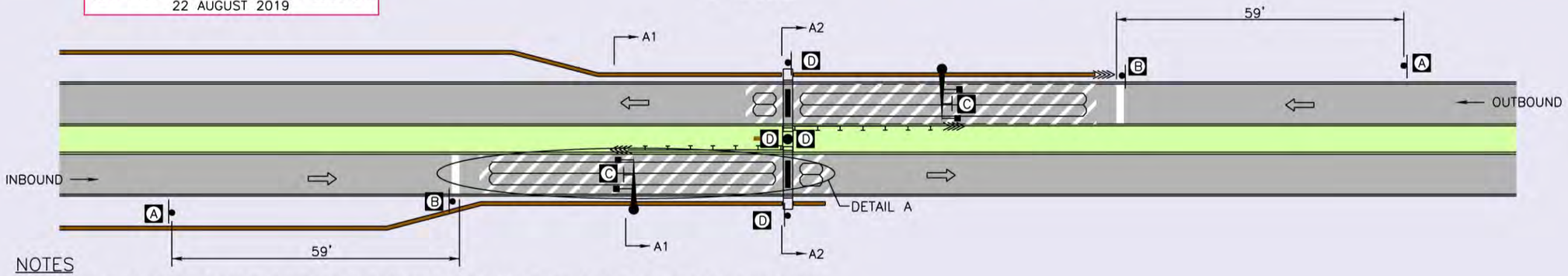
C

R10-13-TEA
36" X 24"
(900MM X 600MM)

D

R5-1
30" X 30"
(750MM X 750MM)
LED BLANK-OUT SIGN

NOT TO SCALE

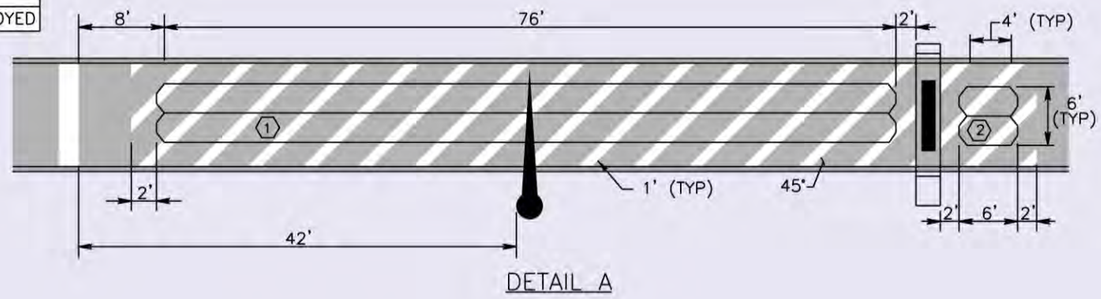


NOTES

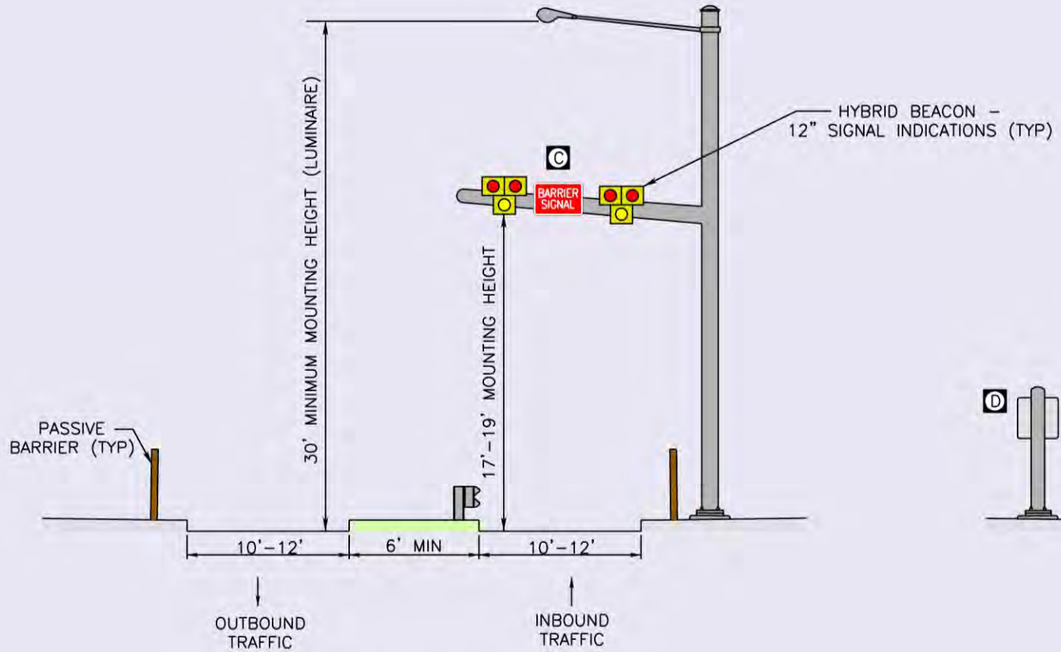
1. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
2. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
3. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
4. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
5. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
6. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
7. SECTION A1-A1, A2-A2, DETAIL A, AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGE.
8. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
9. MEDIAN LENGTH SHALL EXTEND AT LEAST 25 FEET PRIOR TO THE STOP LINE ON EACH APPROACH.
10. LED BLANK-OUT SIGN, IF USED, SHALL NOT AUTOMATICALLY DIM.
11. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
12. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A2-A2 VARIES BY AVB TYPE, MODEL, AND MANUFACTURER.
13. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12-INCH INDICATIONS SHALL BE USED.
14. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
15. DESIGN IS BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRED FOR POSTED SPEEDS HIGHER THAN 25 MPH.
16. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
17. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-AWAY SUPPORTS.
18. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED GRANDFATHERED IN AND MAY REMAIN IN-PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
19. THE LONGER LOOPS MAY INTRODUCE ADDITIONAL SECURITY RISKS WHICH MAY BE CONSIDERED WHEN DETERMINING AVB PLACEMENT

LEGEND

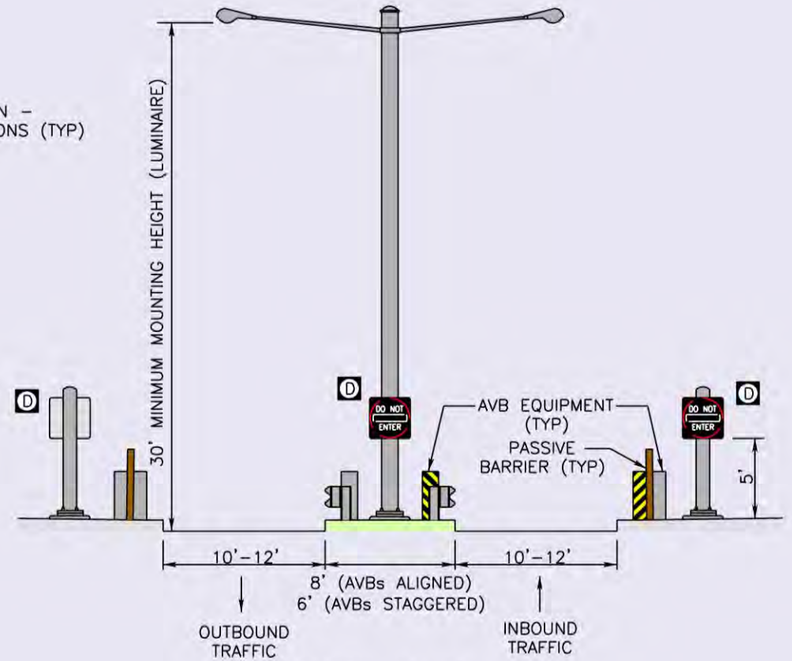
		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION							
ONE–LANE HYBRID BEACON SAFETY SCHEME	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6	7	8
	W3–3B–TEA WARNING SIGN WITH BEACONS	DARK			ALTERNATING FLASHING YELLOW				
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED				
	HYBRID BEACON	DARK			SOLID YELLOW		ALTERNATING FLASHING RED		
	100dB HORN	SILENT			ACTIVATED				
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED					DEPLOYING		DEPLOYED



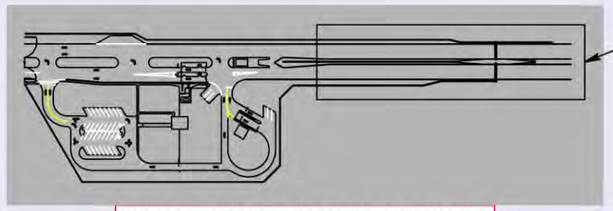
DETAIL A



SECTION A1–A1
NOT TO SCALE



SECTION A2–A2
NOT TO SCALE



SAFETY SCHEME DETAIL

SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

A

W3-3A-TEA
36" X 36"
(900MM X 900MM)

BARRIER ACTIVATED AHEAD

W16-13P
30" X 24"
(750MM X 600MM)

WHEN FLASHING

HB

STOP HERE ON RED

R10-6AL
24" X 30"
(600MM X 750MM)

BR

STOP HERE ON RED

R10-6AR
24" X 30"
(600MM X 750MM)

C

BARRIER SIGNAL

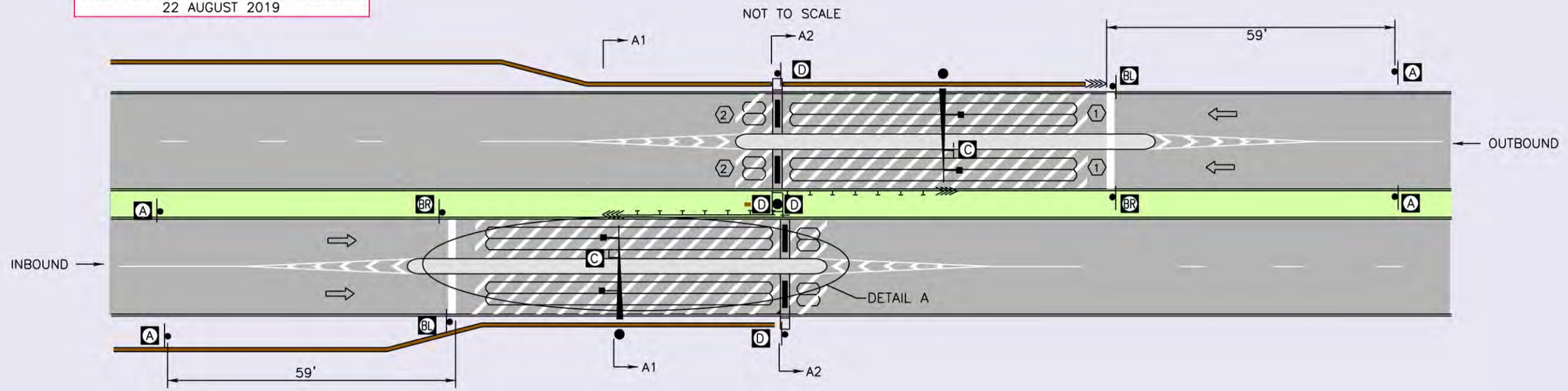
R10-13-TEA
36" X 24"
(900MM X 600MM)

D

DO NOT ENTER

R5-1
36" X 36"
(900MM X 900MM)
LED BLANK-OUT SIGN

NOT TO SCALE



NOTES

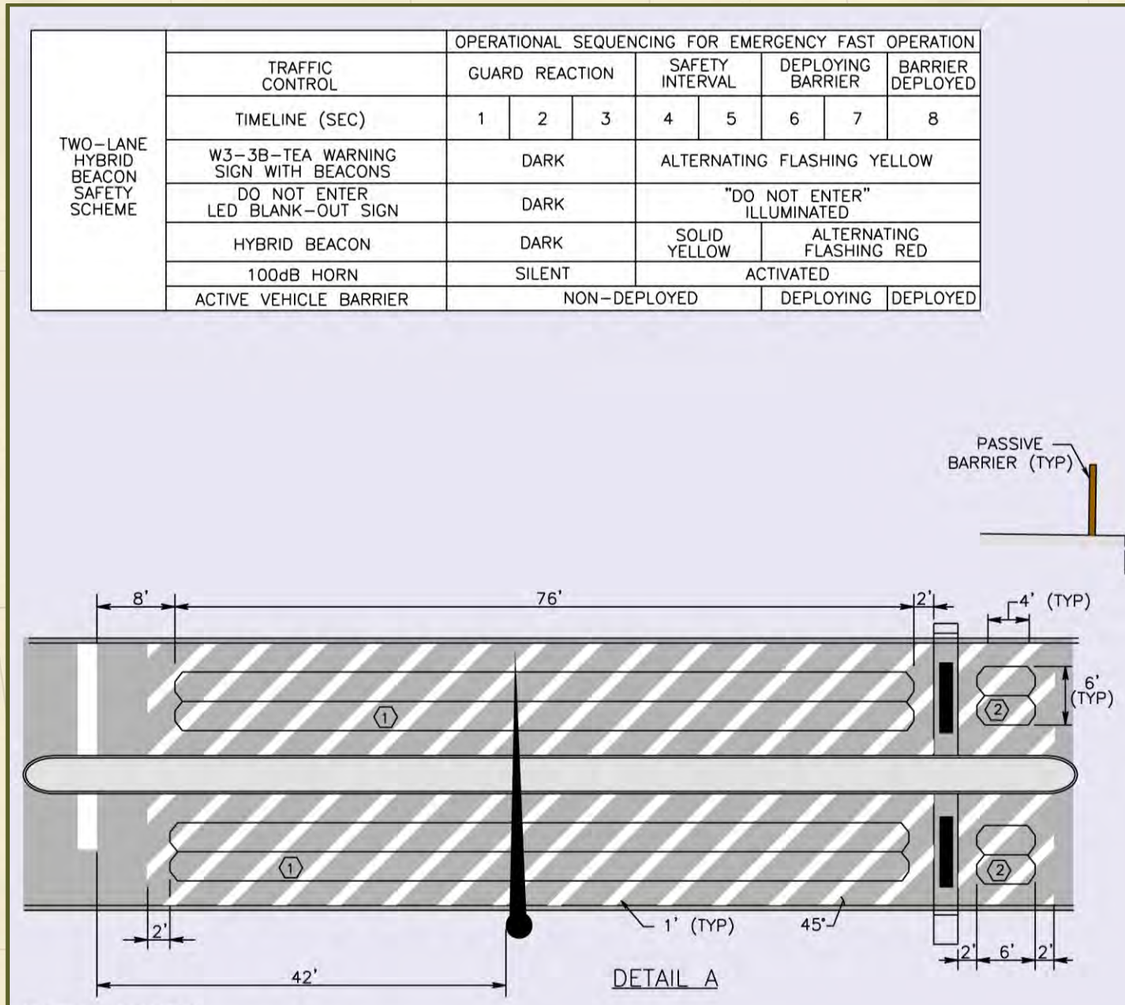
1. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
2. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
3. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
4. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
5. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
6. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
7. SECTION A1-A1, A2-A2, DETAIL A, AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGE.
8. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
9. MEDIAN LENGTH SHALL EXTEND AT LEAST 25 FEET PRIOR TO THE STOP LINE ON EACH APPROACH.
10. LED BLANK-OUT SIGN, IF USED, SHALL NOT AUTOMATICALLY DIM.
11. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
12. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-AWAY SUPPORTS.

LEGEND

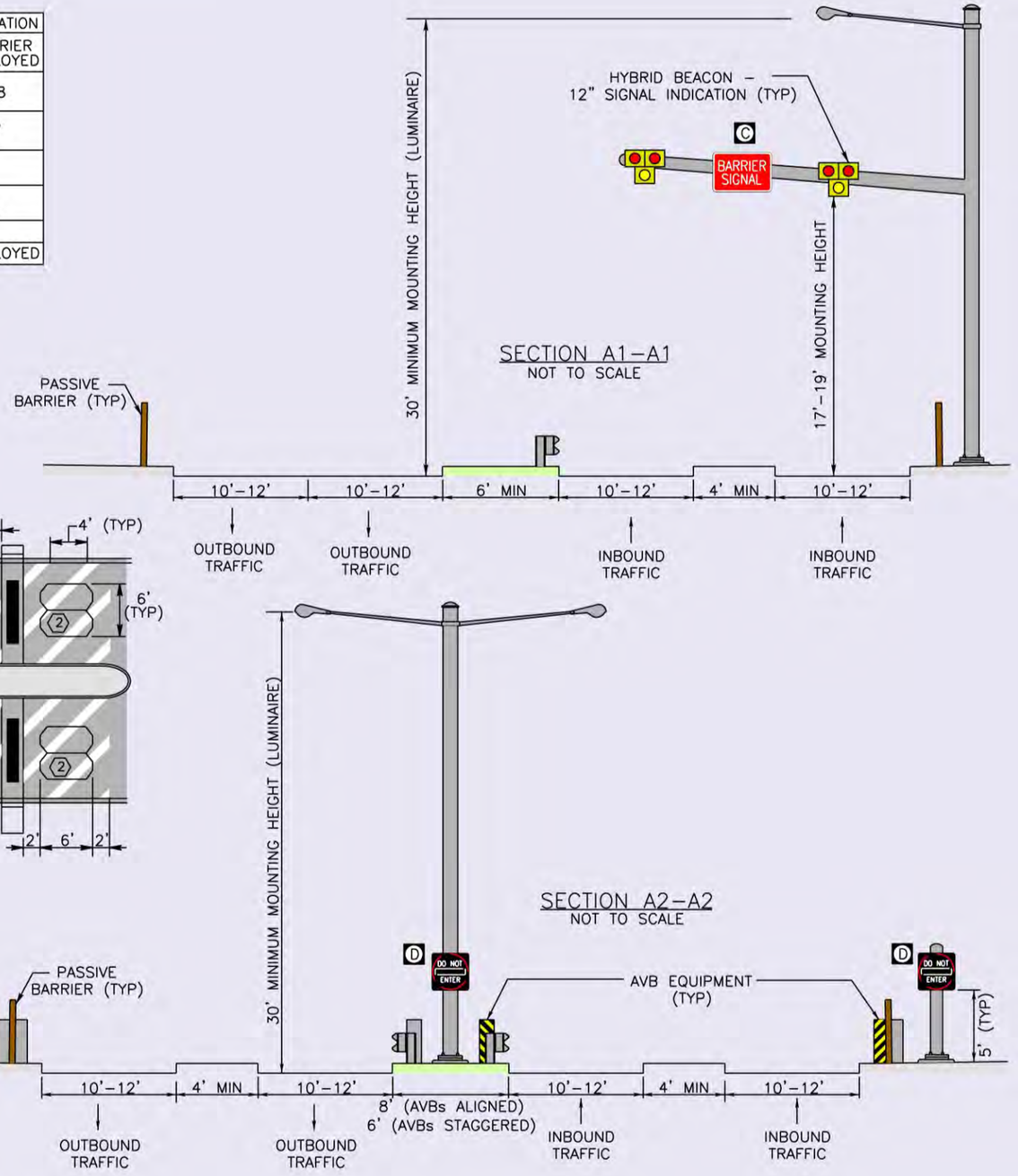
- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POLE-MOUNTED SIGN WITH LUMINAIRE
- POST MOUNTED SIGN
- HYBRID BEACON
- STRUCTURE MOUNTED SIGN
- MAST ARM WITH LUMINAIRE
- STOP LINE PAVEMENT MARKING
- GUARDRAIL
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION

FIGURE 6: Hybrid Beacon Safety Scheme (Two Lanes) – Page 2 of 2

		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION							
TWO–LANE HYBRID BEACON SAFETY SCHEME	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6	7	8
	W3–3B–TEA WARNING SIGN WITH BEACONS	DARK			ALTERNATING FLASHING YELLOW				
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED				
	HYBRID BEACON	DARK			SOLID YELLOW		ALTERNATING FLASHING RED		
	100dB HORN	SILENT			ACTIVATED				
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED					DEPLOYING		DEPLOYED



DETAIL A



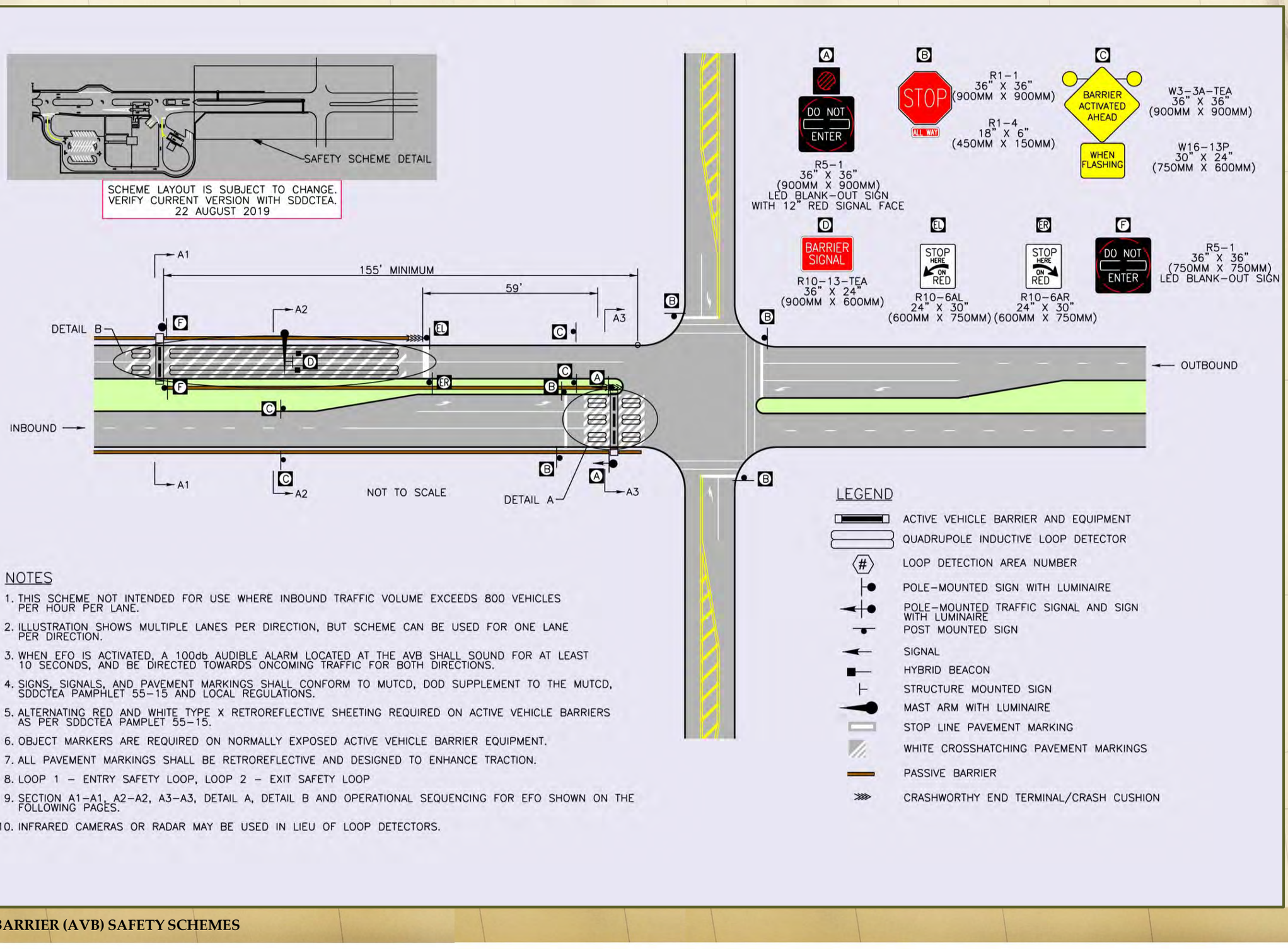
SECTION A1–A1
NOT TO SCALE

SECTION A2–A2
NOT TO SCALE

NOTES CONT'D

13. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A2–A2 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
14. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
15. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONCERNS. ANY ALTERATIONS IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
16. DESIGN BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRED FOR POSTED SPEEDS HIGHER THAN 25 MPH.
17. UNDER EFO CONDITION, AVBs SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
18. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
19. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED GRANDFATHERED IN AND MAY REMAIN IN–PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
20. THE LONGER LOOPS MAY INTRODUCE ADDITIONAL SECURITY RISKS WHICH MAY BE CONSIDERED WHEN DETERMINING AVB PLACEMENT

FIGURE 7: Combination Intersection Stop Control/Hybrid Beacon Safety Scheme – Page 1 of 3

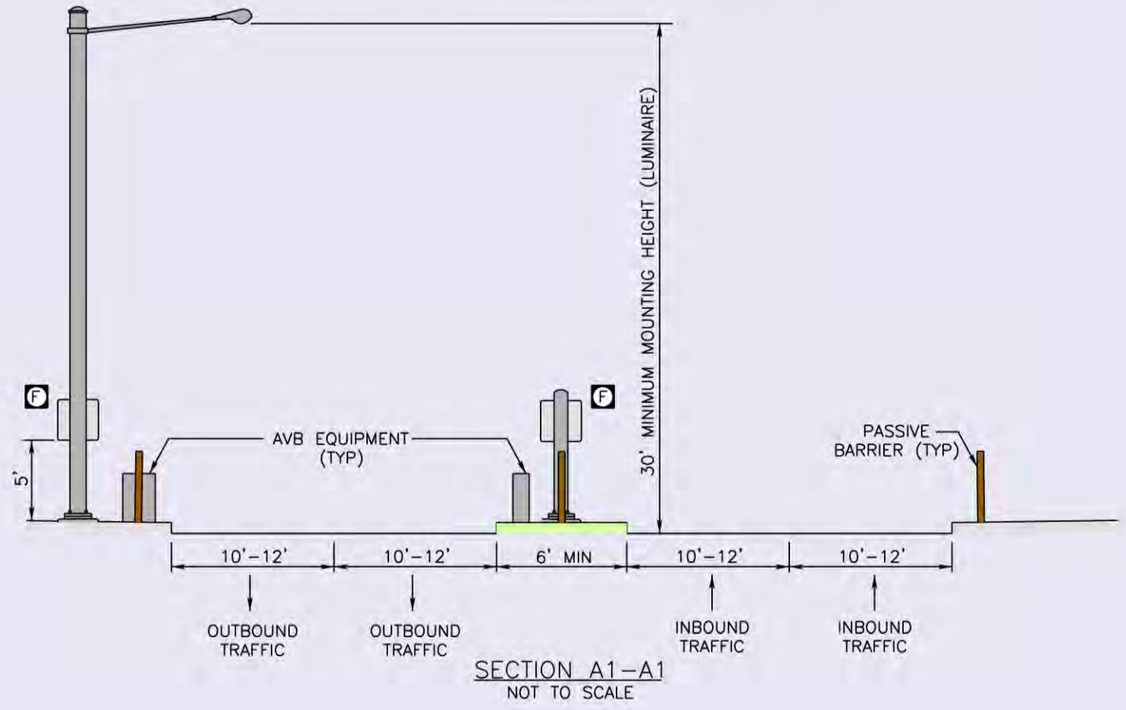


NOTES

1. THIS SCHEME NOT INTENDED FOR USE WHERE INBOUND TRAFFIC VOLUME EXCEEDS 800 VEHICLES PER HOUR PER LANE.
2. ILLUSTRATION SHOWS MULTIPLE LANES PER DIRECTION, BUT SCHEME CAN BE USED FOR ONE LANE PER DIRECTION.
3. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
4. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
5. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPLET 55-15.
6. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
7. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
8. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP
9. SECTION A1-A1, A2-A2, A3-A3, DETAIL A, DETAIL B AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGES.
10. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.

STOP CONTROL AVB SAFETY SCHEME – INTERSECTION		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION						
	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		BARRIER DEPLOYED	
	TIMELINE (SEC)	1	2	3	4	5	6	
	W3–3B–TEA WARNING SIGN WITH BEACONS	BEACONS DARK			ALTERNATING FLASHING YELLOW			
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED			
	RED SIGNAL	DARK			STEADY RED			
	100dB HORN	SILENT			ACTIVATED			
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED			DEPLOYING		DEPLOYED	

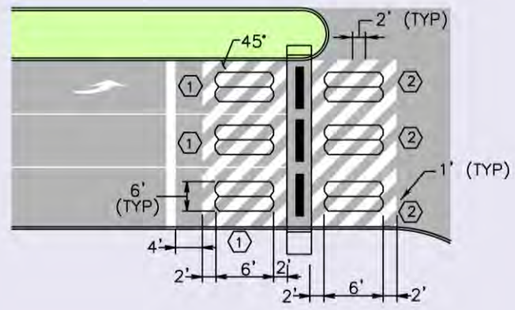
HYBRID BEACON SAFETY SCHEME		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION							
	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6	7	8
	W3–3B–TEA WARNING SIGN WITH BEACONS	DARK			ALTERNATING FLASHING YELLOW				
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED				
	HYBRID BEACON	DARK			SOLID YELLOW		ALTERNATING FLASHING RED		
	100dB HORN	SILENT			ACTIVATED				
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED					DEPLOYING		DEPLOYED



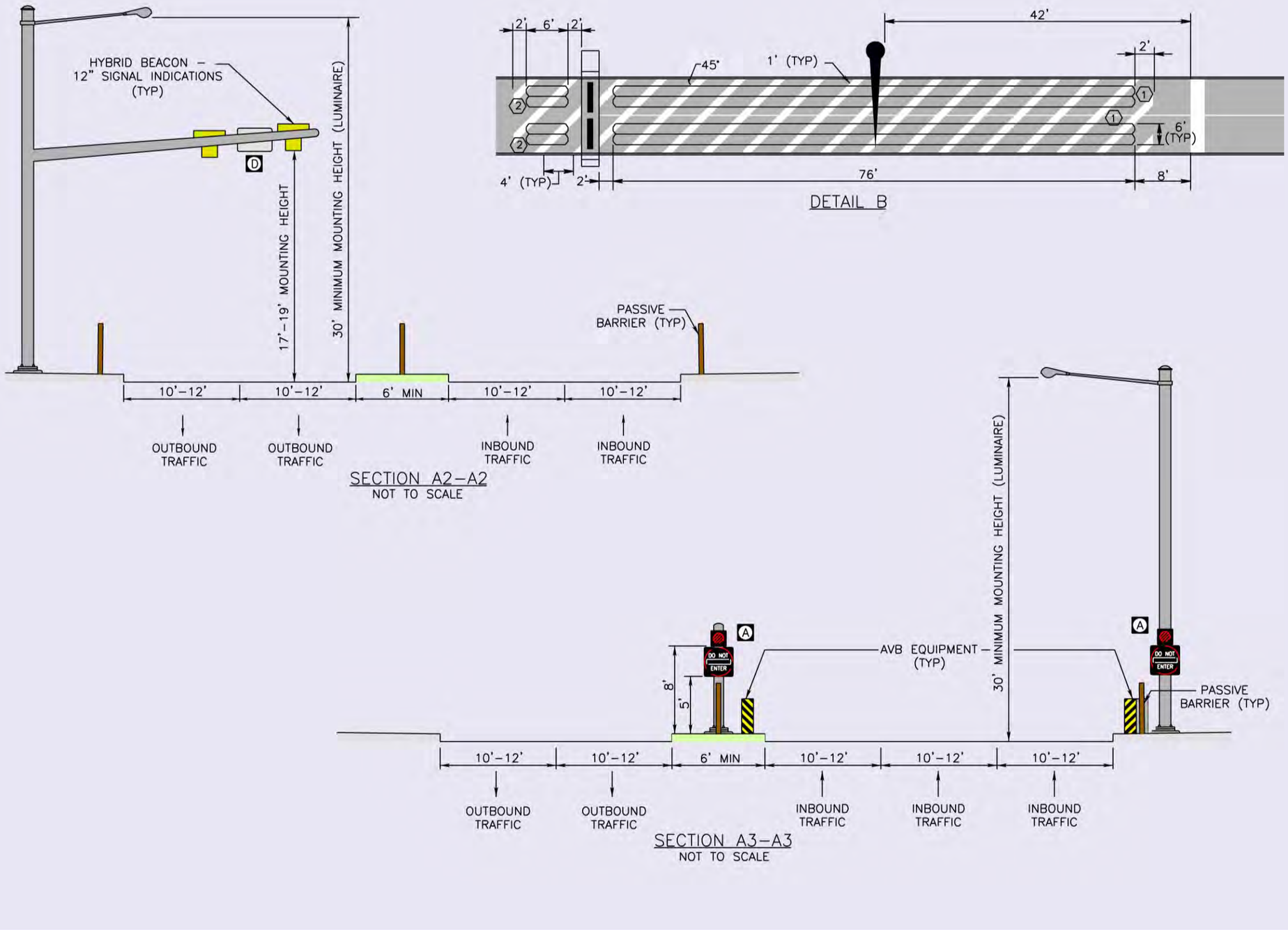
SECTION A1–A1
NOT TO SCALE

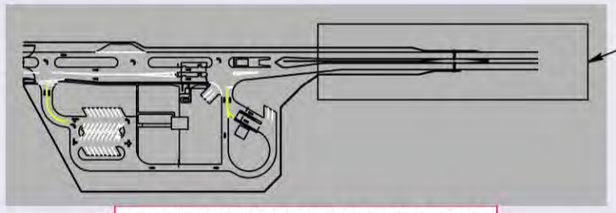
NOTES CONT'D

11. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK–AWAY SUPPORTS.
12. LED BLANK–OUT SIGN, IF USED, SHALL NOT AUTOMATICALLY DIM.
13. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
14. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1–A1 AND A3–A3 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
15. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
16. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
17. DESIGN IS BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRED FOR POSTED SPEEDS HIGHER THAN 25 MPH.
18. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
19. AN ALL–WAY STOP IS THE PREFERRED TRAFFIC CONTROL; HOWEVER A TWO–WAY STOP MAY BE REQUIRED. A TRAFFIC STUDY WILL NEED TO VALIDATE TRAFFIC CONTROL.
20. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
21. ALL PASSIVE BARRIERS PLACED AT INTERSECTION MUST NOT OBSTRUCT INTERSECTION SIGHT DISTANCE.



DETAIL A


HYBRID BEACON – 12" SIGNAL INDICATIONS (TYP)
D
17'–19' MOUNTING HEIGHT
30' MINIMUM MOUNTING HEIGHT (LUMINAIRE)
PASSIVE BARRIER (TYP)
10'–12'
10'–12'
6' MIN
10'–12'
10'–12'
OUTBOUND TRAFFIC
OUTBOUND TRAFFIC
INBOUND TRAFFIC
INBOUND TRAFFIC
SECTION A2–A2
NOT TO SCALE
2'
6'
2'
45°
1' (TYP)
42'
2'
1
2
6' (TYP)
4' (TYP)
2'
76'
8'
DETAIL B
A
DO NOT ENTER
8'
5'
AVB EQUIPMENT – (TYP)
30' MINIMUM MOUNTING HEIGHT (LUMINAIRE)
PASSIVE BARRIER (TYP)
10'–12'
10'–12'
6' MIN
10'–12'
10'–12'
10'–12'
OUTBOUND TRAFFIC
OUTBOUND TRAFFIC
INBOUND TRAFFIC
INBOUND TRAFFIC
INBOUND TRAFFIC
SECTION A3–A3
NOT TO SCALE



SAFETY SCHEME DETAIL

SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

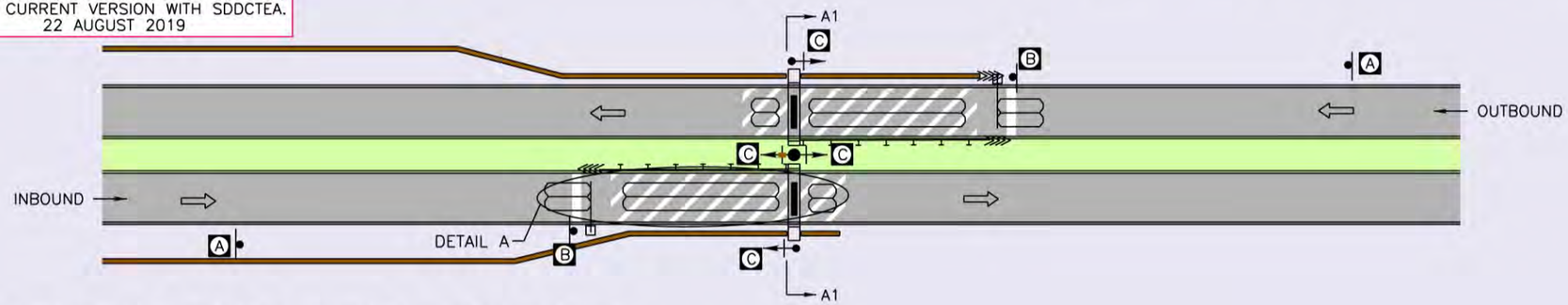
W3-3A-TEA
36" X 36"
(900MM X 900MM)

W16-13P
30" X 24"
(750MM X 600MM)

R10-6A
24" X 30"
(600MM X 750MM)

R5-1
30" X 30"
(750MM X 750MM)
LED BLANK-OUT SIGN

NOT TO SCALE



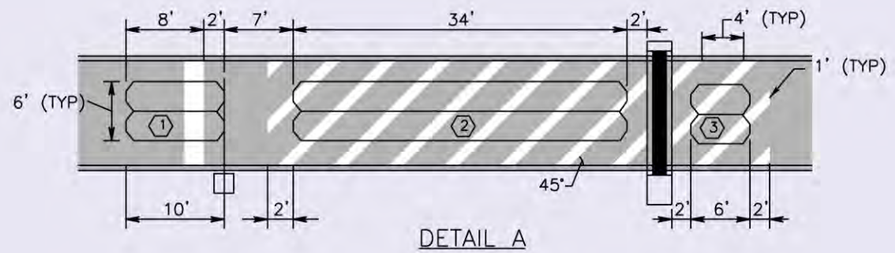
NOTES

1. SIGNAL PROGRAMMING SHALL INCLUDE A MINIMUM OF 3 SECONDS OF YELLOW DURING NORMAL OPERATIONS. TWO SECONDS OF YELLOW IS PERMITTED FOR EFO.
2. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
3. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
4. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON TRAFFIC ARMS AND ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
5. OBJECT MARKERS ARE REQUIRED ON TRAFFIC ARM BASE AND NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
6. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
7. LOOP 1 – GATE ARM LOOP, LOOP 2 – ENTRY SAFETY LOOP, LOOP 3 – EXIT SAFETY LOOP.
8. SECTION A1-A1, DETAIL A, DETAIL B, AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGE.
9. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
10. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-A-WAY SUPPORTS.
11. MEDIAN LENGTH SHALL EXTEND AT LEAST 25 FEET PRIOR TO THE STOP LINE ON EACH APPROACH.
12. LED BLANK-OUT SIGN SHALL NOT AUTOMATICALLY DIM.
13. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
14. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1-A1 VARIES BY AVB TYPE, MODEL, AND MANUFACTURER.
15. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12-INCH INDICATIONS SHALL BE USED.
16. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (TRAFFIC ARM, SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
17. DESIGN IS BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRED FOR POSTED SPEEDS HIGHER THAN 25 MPH.
18. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
19. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED GRANDFATHERED IN AND MAY REMAIN IN-PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
20. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-AWAY SUPPORTS.

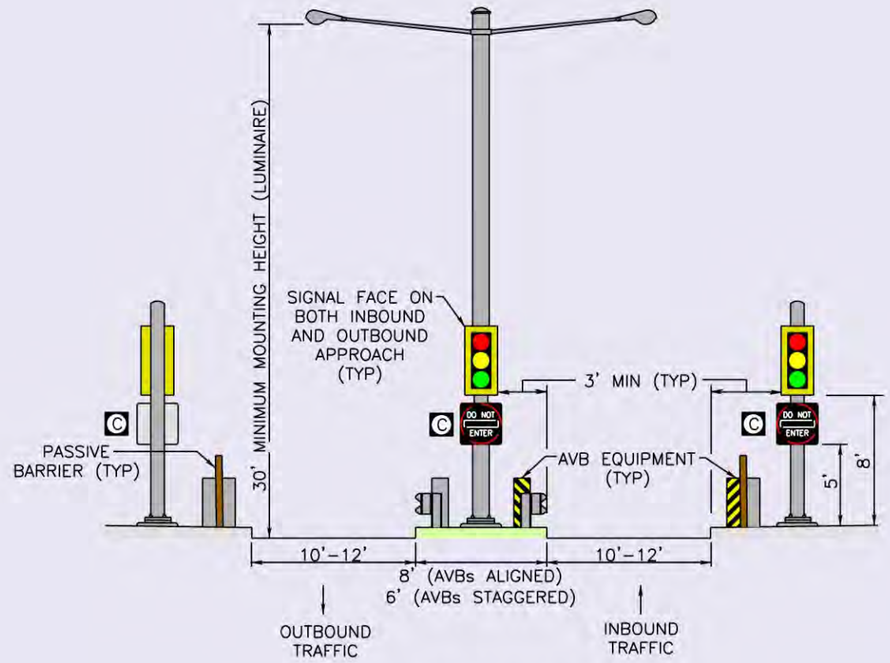
LEGEND

- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POST MOUNTED SIGN
- TRAFFIC GATE ARM
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN WITH LUMINAIRE
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN
- STOP LINE PAVEMENT MARKING
- GUARDRAIL
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION

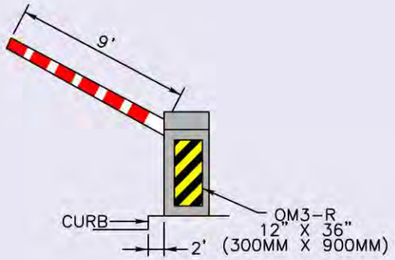
		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION							
ONE–LANE HIGH EFFICIENCY PRESENCE DETECTION SAFETY SCHEME	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6	7	8
	W3–3B–TEA WARNING SIGN WITH BEACONS	DARK			ALTERNATING FLASHING YELLOW				
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED				
	TRAFFIC SIGNALS	NORMAL OPERATIONS			YELLOW		RED		
	100dB HORN	SILENT			ACTIVATED				
	TRAFFIC ARM (WITH TRAFFIC IN SYSTEM)	NORMAL OPERATIONS			DEPLOYING		DEPLOYED		
	ACTIVE VEHICLE BARRIER (WITH TRAFFIC IN SYSTEM)	NON–DEPLOYED					DEPLOYING		DEPLOYED
	TRAFFIC ARM (WITH NO TRAFFIC IN SYSTEM)	DEPLOYED							
	ACTIVE VEHICLE BARRIER (WITH NO TRAFFIC IN SYSTEM)	DEPLOYED							



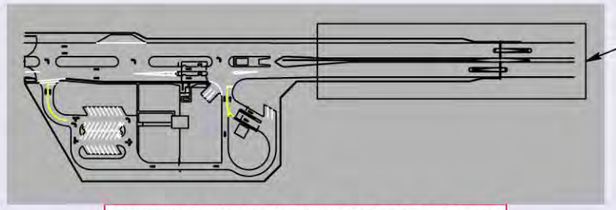
DETAIL A



SECTION A1–A1
NOT TO SCALE



DETAIL B



SAFETY SCHEME DETAIL

SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

A

W3-3A-TEA
36" X 36"
(900MM X 900MM)

BARRIER ACTIVATED AHEAD

W16-13P
30" X 24"
(750MM X 600MM)

WHEN FLASHING

BL

STOP HERE ON RED

R10-6AL
24" X 30"
(600MM X 750MM)

BR

STOP HERE ON RED

R10-6AR
24" X 30"
(600MM X 750MM)

C

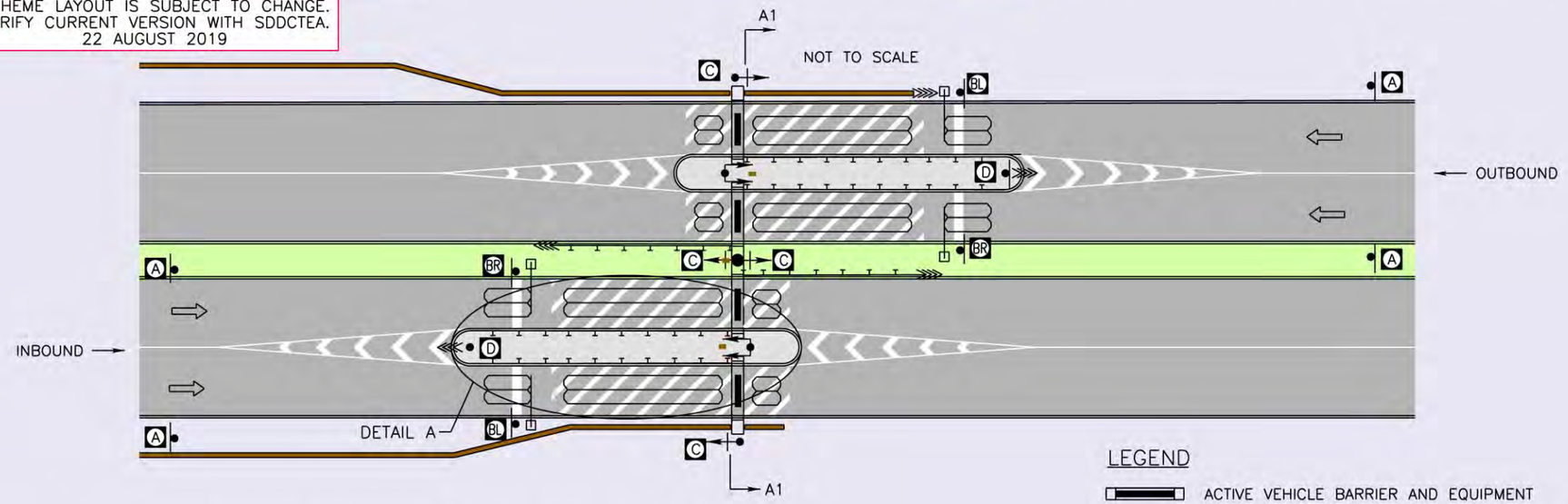
DO NOT ENTER

R5-1
36" X 36"
(900MM X 900MM)
LED BLANK-OUT SIGN

D

OM3-C
12" X 36"
(300MM X 900MM)

NOT TO SCALE



LEGEND

- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POST MOUNTED SIGN
- TRAFFIC GATE ARM
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN WITH LUMINAIRE
- POLE-MOUNTED TRAFFIC SIGNAL AND SIGN
- POLE-MOUNTED TRAFFIC SIGNAL
- STOP LINE PAVEMENT MARKING
- GUARDRAIL
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION

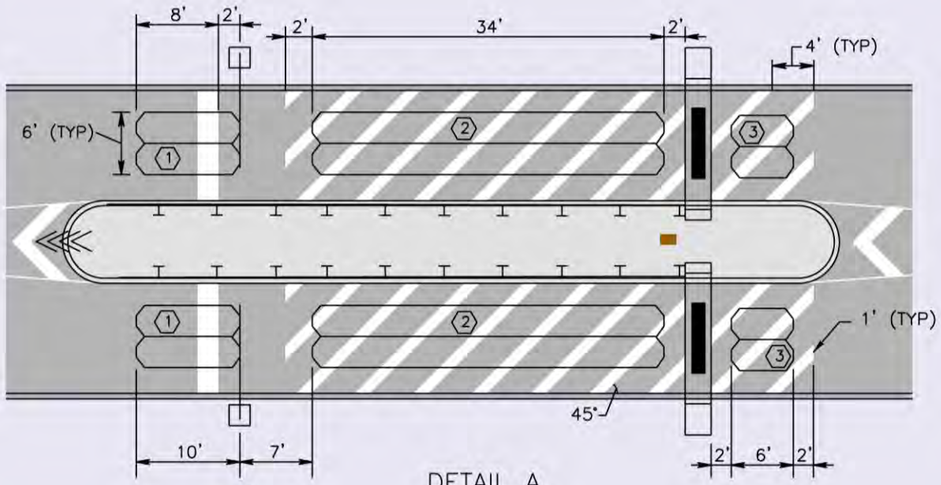
NOTES

1. SIGNAL PROGRAMMING SHALL INCLUDE A MINIMUM OF 3 SECONDS OF YELLOW DURING NORMAL OPERATIONS. TWO SECONDS OF YELLOW IS PERMITTED FOR EFO.
2. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
3. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
4. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON TRAFFIC ARMS AND ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55-15.
5. OBJECT MARKERS ARE REQUIRED ON TRAFFIC ARM BASE AND NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
6. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
7. LOOP 1 – GATE ARM LOOP, LOOP 2 – ENTRY SAFETY LOOP, LOOP 3 – EXIT SAFETY LOOP.
8. SECTION A1-A1, DETAIL A, DETAIL B, AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGE.
9. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
10. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-AWAY SUPPORTS.
11. MEDIAN LENGTH SHALL EXTEND AT LEAST 25 FEET PRIOR TO THE STOP LINE ON EACH APPROACH.
12. LED BLANK-OUT SIGN SHALL NOT AUTOMATICALLY DIM.
13. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
14. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1-A1 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.

		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION							
TWO–LANE HIGH EFFICIENCY PRESENCE DETECTION SAFETY SCHEME	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6	7	8
	W3–3B–TEA WARNING SIGN WITH BEACONS	DARK			ALTERNATING FLASHING YELLOW				
	DO NOT ENTER LED BLANK–OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED				
	TRAFFIC SIGNALS	NORMAL OPERATIONS			YELLOW		RED		
	100dB HORN	SILENT			ACTIVATED				
	TRAFFIC ARM (WITH TRAFFIC IN SYSTEM)	NORMAL OPERATIONS			DEPLOYING		DEPLOYED		
	ACTIVE VEHICLE BARRIER (WITH TRAFFIC IN SYSTEM)	NON–DEPLOYED					DEPLOYING		DEPLOYED
	TRAFFIC ARM (WITH NO TRAFFIC IN SYSTEM)	DEPLOYED							
	ACTIVE VEHICLE BARRIER (WITH NO TRAFFIC IN SYSTEM)	DEPLOYED							

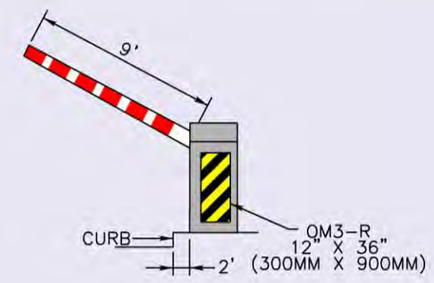
NOTES CONT'D

15. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
16. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (TRAFFIC ARM, SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOP) REQUIRE APPROVAL THROUGH SDDCTEA.
17. DESIGN IS BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRED FOR POSTED SPEEDS HIGHER THAN 25 MPH.
18. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
19. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
20. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED TO BE GRANDFATHERED IN AND MAY REMAIN IN–PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.



DETAIL A

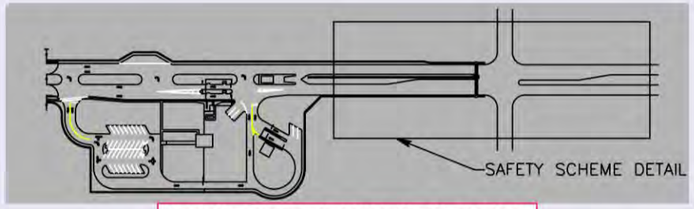
SECTION A1–A1
NOT TO SCALE



DETAIL B

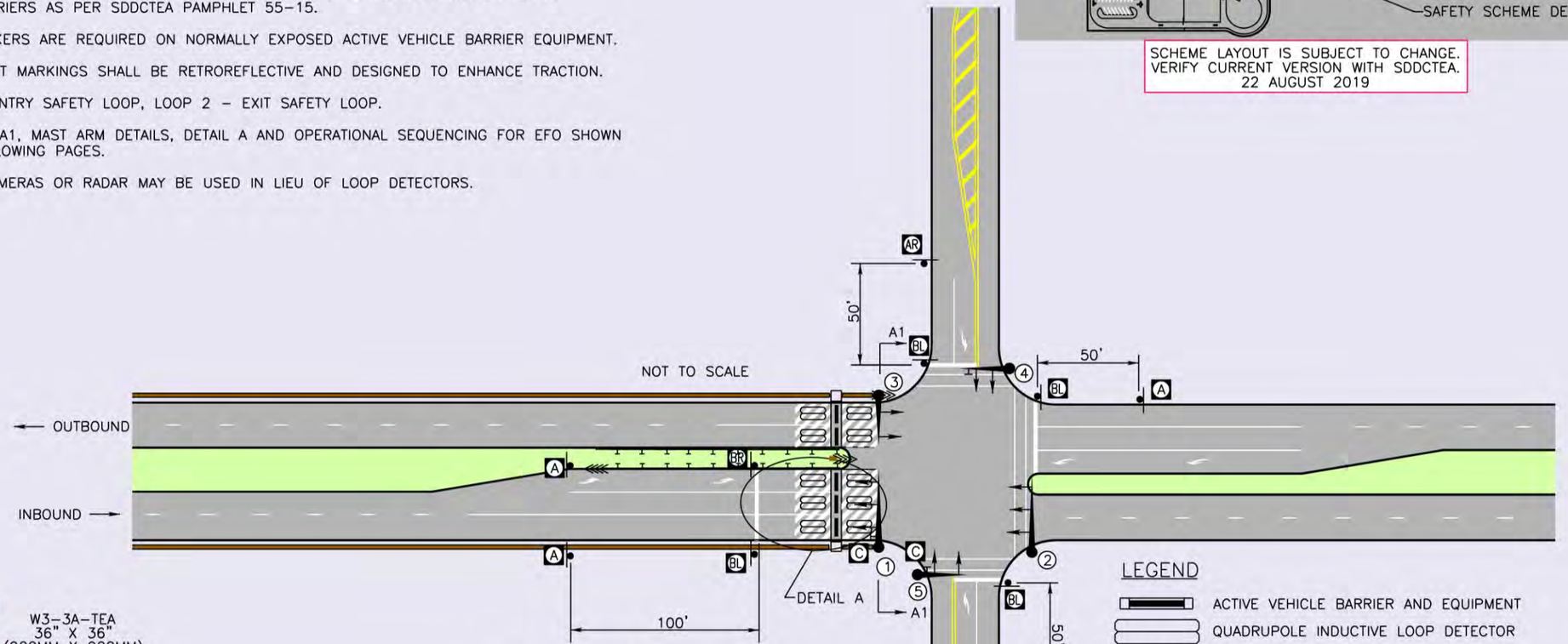
NOTES

1. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
2. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55–15 AND LOCAL REGULATIONS.
3. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPHLET 55–15.
4. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
5. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
6. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
7. SECTION A1–A1, MAST ARM DETAILS, DETAIL A AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGES.
8. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.



SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

NOT TO SCALE



W3–3A–TEA
36" X 36"
(900MM X 900MM)

W16–13P
30" X 24"
(750MM X 600MM)

R10–6AL
24" X 30"
(600MM X 750MM)

R10–6AR
24" X 30"
(600MM X 750MM)

W3–3A–TEA
36" X 36"
(900MM X 900MM)

W16–13P
30" X 24"
(750MM X 600MM)

W16–6R
30" X 24"
(750MM X 600MM)

W3–3A–TEA
36" X 36"
(900MM X 900MM)

W16–13P
30" X 24"
(750MM X 600MM)

W16–6L
30" X 24"
(750MM X 600MM)

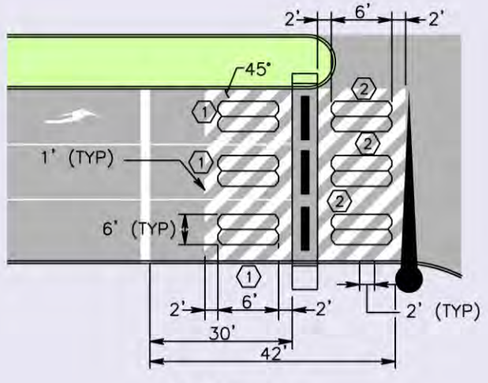
R3–1
36" X 36"
(900MM X 900MM)
LED BLANK–OUT SIGN

LEGEND

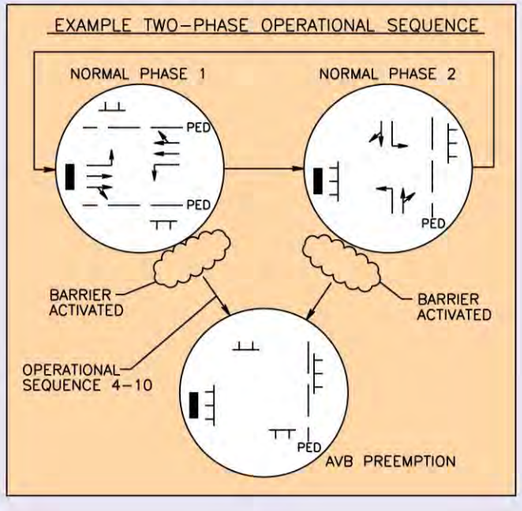
- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POLE–MOUNTED SIGN WITH LUMINAIRE
- POST MOUNTED SIGN
- TRAFFIC SIGNAL
- STRUCTURE MOUNTED SIGN
- MAST ARM WITH LUMINAIRE
- STOP LINE PAVEMENT MARKING
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION

INTERSECTION TRAFFIC SIGNAL SAFETY SCHEME INBOUND	OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION											
	TRAFFIC CONTROL	NORMAL OPS	GUARD REACTION			YELLOW CHANGE (MUTCD MINIMUM)			RED SAFETY	DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	–	1	2	3	4	5	6	7	8	9	10
	W3–3A–TEA WARNING SIGN WITH BEACONS	DARK				ALTERNATING FLASHING YELLOW						
	TRAFFIC SIGNAL	GREEN				YELLOW			RED			
	100dB HORN	SILENT				ACTIVATED						
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED								DEPLOYING		DEPLOYED
	NO RIGHT TURN LED BLANKOUT (POLE 1)	DARK							R3–1 ILLUMINATED			

INTERSECTION TRAFFIC SIGNAL SAFETY SCHEME OUTBOUND	OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION											
	TRAFFIC CONTROL	NORMAL OPS	GUARD PERCEPTION AND REACTION TIME TO THREAT (EFO BUTTON)			YELLOW CHANGE (MUTCD MINIMUM)			RED SAFETY			DEPLOYING BARRIER	BARRIER DEPLOYED
	TIMELINE (SEC)	–	1	2	3	4	5	6	7	8	9	10–11	12
	W3–3A–TEA WARNING SIGN WITH BEACONS	DARK				ALTERNATING FLASHING YELLOW							
	TRAFFIC SIGNAL	GREEN				YELLOW			RED			RED	
	ACTIVE VEHICLE BARRIER	NON–DEPLOYED										DEPLOYING	DEPLOYED
	NO RIGHT TURN LED BLANKOUT (POLE 5)	DARK							R3–1 ILLUMINATED				
	NO LEFT TURN LED BLANKOUT (POLE 4)	DARK							R3–2 ILLUMINATED				



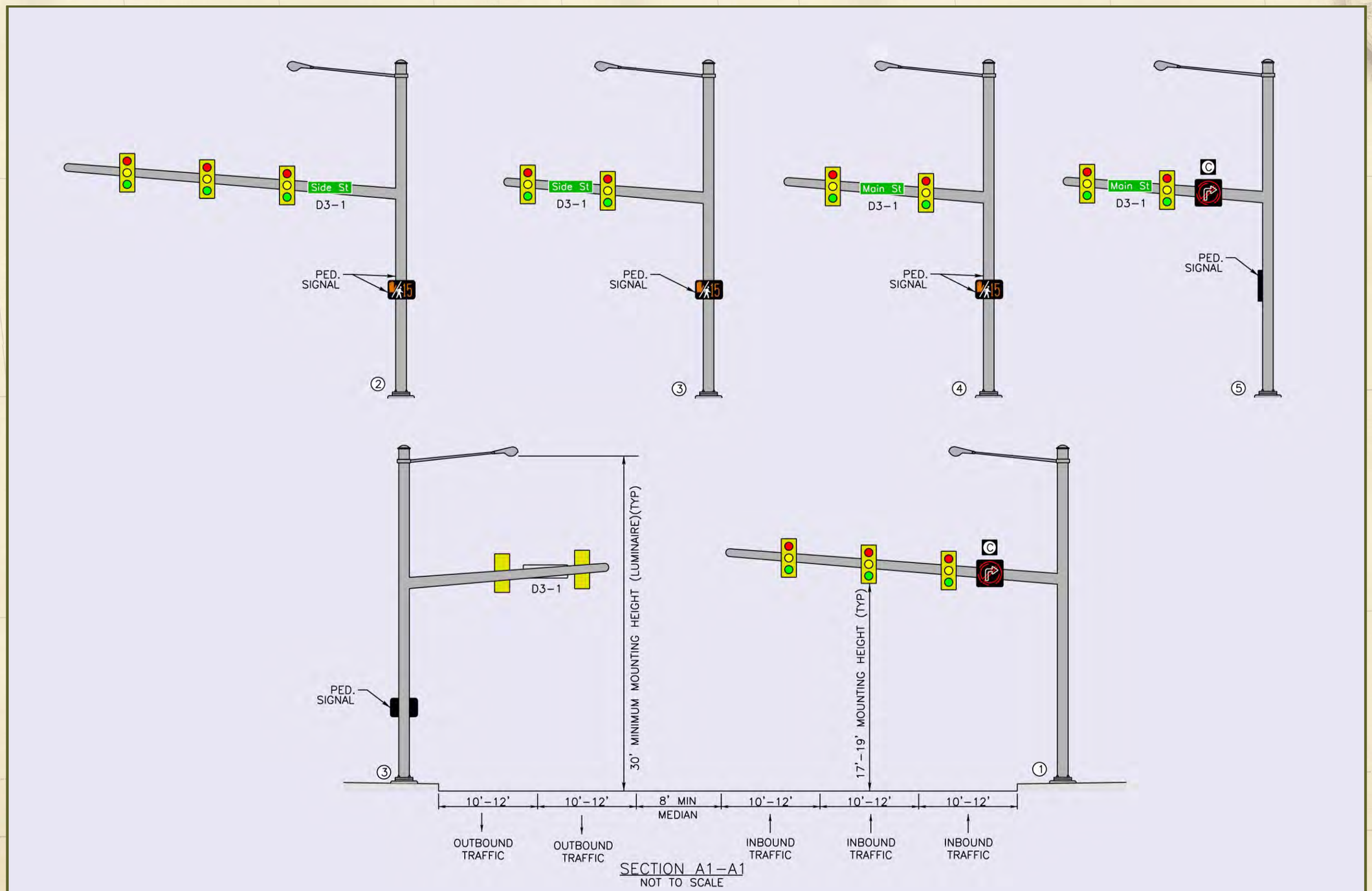
DETAIL A

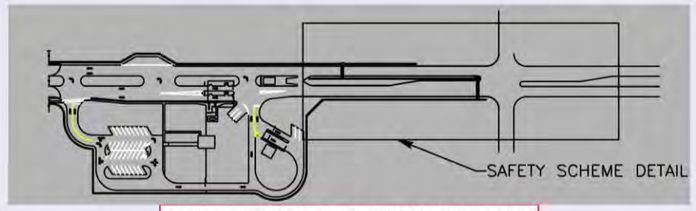


NOTES CONT'D

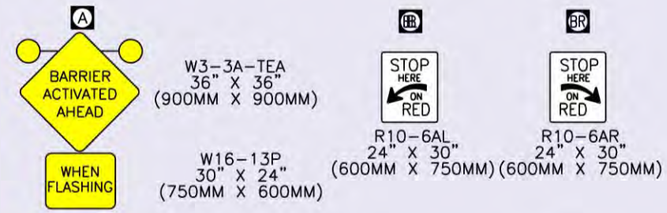
9. LED BLANK–OUT SIGN SHALL NOT AUTOMATICALLY DIM.
10. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
11. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1–A1 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
12. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12–INCH INDICATIONS SHALL BE USED.
13. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
14. DESIGN IS BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRED FOR POSTED SPEEDS HIGHER THAN 25 MPH.
15. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
16. FOR MULTI–LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
17. FINAL DESIGN AND OPERATIONAL ANALYSIS SHALL BE PERFORMED BY A TRAFFIC ENGINEER. PLANS SHALL BE REVIEWED BY SDDCTEA.
18. FINAL YELLOW AND RED CLEARANCE INTERVALS FOR NORMAL OPERATIONS SHALL BE CALCULATED IN ACCORDANCE WITH THE MUTCD.
19. INTERSECTION SIGNALIZATION GOES TO ALL–RED IN COORDINATION WITH THE AVB SIGNAL.
20. SIGNS AND SIGNAL INDICATIONS MAY VARY BASED ON THE SPECIFIC PHASING OPERATION.
21. SIGNAL TO RUN NORMAL PHASING PLAN WHEN EFO IS NOT ACTIVATED.
22. UPON EFO ACTIVATION, ALL INTERSECTION TRAFFIC SIGNALS WILL IMMEDIATELY CEASE THE GREEN INTERVAL AND TRANSITION TO INBOUND OPERATIONAL SEQUENCE 4 IF THE SIGNAL IS FLASHING, TRANSITION TO INBOUND OPERATIONAL SEQUENCE 4.
23. ALL "WALK" INDICATIONS WILL IMMEDIATELY TRANSITION TO "FLASHING DON'T WALK" (FDW) INTERVAL. NORMAL FDW SHALL BE PROVIDED AND MAY BE COMPLETED BEYOND INBOUND OPERATIONAL SEQUENCE 10.
24. ALL DEVICES TO REMAIN IN INBOUND OPERATIONAL SEQUENCE 10 AND OUTBOUND OPERATIONAL SEQUENCE 12 UNTIL THE SYSTEM IS RESET. NORMAL OPERATIONS TO RESET IN MAINLINE GREEN ONCE ALL AVBS HAVE BEEN FULLY RETRACTED.
25. EXISTING SIGNS AND MARKINGS CONFORMING TO EARLIER VERSIONS OF SDDCTEA SAFETY SCHEMES ARE CONSIDERED GRANDFATHERED IN AND MAY REMAIN IN–PLACE UNTIL THE END OF THEIR USEFUL SERVICE LIFE. REPLACE WITH CURRENT STANDARD AT THAT TIME.
27. ALL PASSIVE BARRIERS PLACED AT INTERSECTION MUST NOT OBSTRUCT INTERSECTION SIGHT DISTANCE.
28. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK–AWAY SUPPORTS.

FIGURE 10: Intersection Traffic Signal Safety Scheme – Page 3 of 3





SCHEME LAYOUT IS SUBJECT TO CHANGE.
VERIFY CURRENT VERSION WITH SDDCTEA.
22 AUGUST 2019

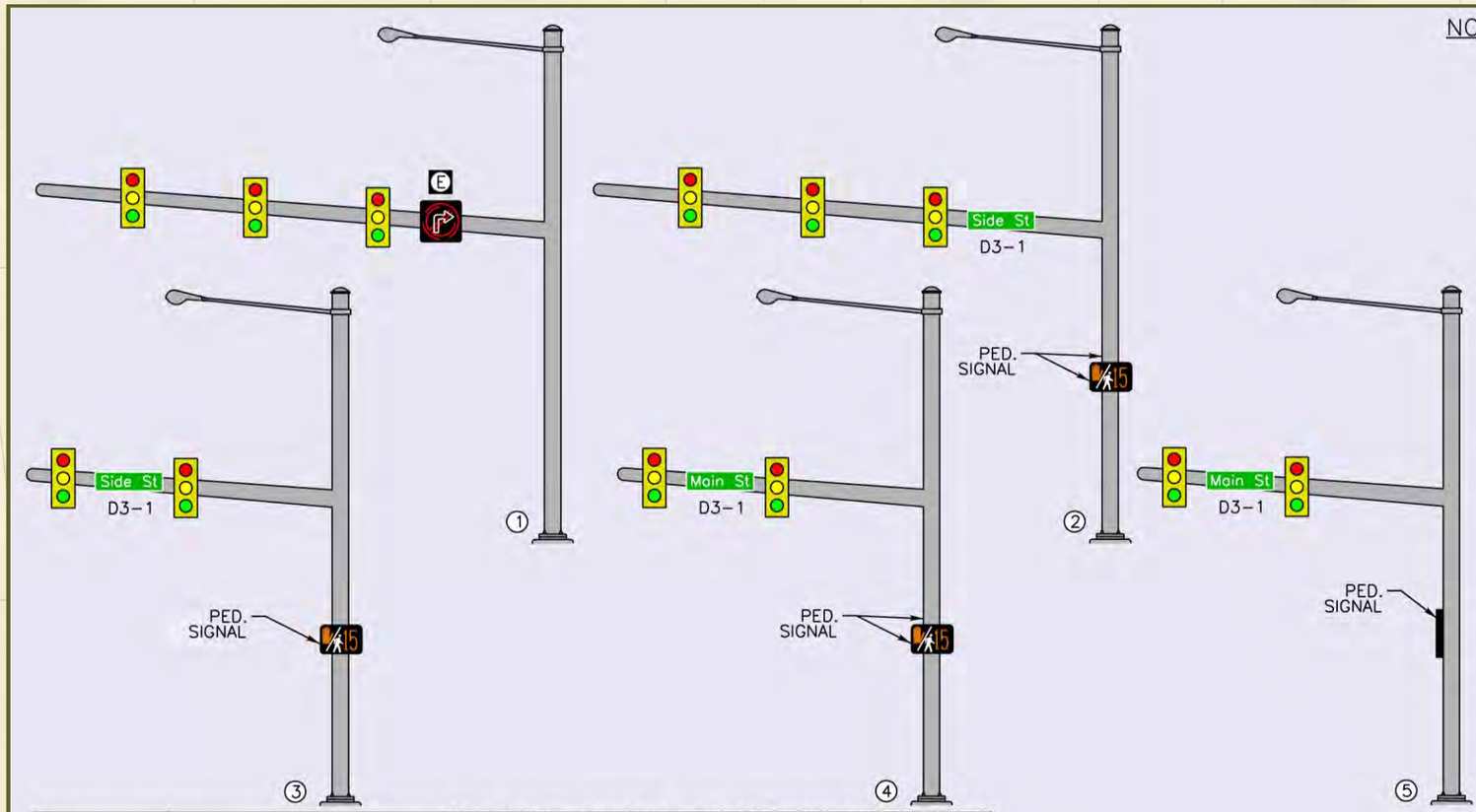


NOTES

1. WHEN EFO IS ACTIVATED, A 100db AUDIBLE ALARM LOCATED AT THE AVB SHALL SOUND FOR AT LEAST 10 SECONDS, AND BE DIRECTED TOWARDS ONCOMING TRAFFIC FOR BOTH DIRECTIONS.
2. SIGNS, SIGNALS, AND PAVEMENT MARKINGS SHALL CONFORM TO MUTCD, DOD SUPPLEMENT TO THE MUTCD, SDDCTEA PAMPHLET 55-15 AND LOCAL REGULATIONS.
3. ALTERNATING RED AND WHITE TYPE X RETROREFLECTIVE SHEETING REQUIRED ON ACTIVE VEHICLE BARRIERS AS PER SDDCTEA PAMPLET 55-15.
4. OBJECT MARKERS ARE REQUIRED ON NORMALLY EXPOSED ACTIVE VEHICLE BARRIER EQUIPMENT.
5. ALL PAVEMENT MARKINGS SHALL BE RETROREFLECTIVE AND DESIGNED TO ENHANCE TRACTION.
6. LOOP 1 – ENTRY SAFETY LOOP, LOOP 2 – EXIT SAFETY LOOP.
7. SECTION A1-A1, A2-A2, A3-A3, MAST ARM DETAILS, DETAIL A, DETAIL B AND OPERATIONAL SEQUENCING FOR EFO SHOWN ON THE FOLLOWING PAGES.
8. INFRARED CAMERAS OR RADAR MAY BE USED IN LIEU OF LOOP DETECTORS.
9. MEDIAN LENGTH SHALL EXTEND AT LEAST 25 FEET PRIOR TO THE STOP LINE ON EACH APPROACH.
10. ALL TRAFFIC CONTROL DEVICES AND POLES INSTALLED NEXT TO THE ROADWAY AND INSIDE OF THE PASSIVE BARRIER SHALL UTILIZE BREAK-AWAY SUPPORTS.

LEGEND

- ACTIVE VEHICLE BARRIER AND EQUIPMENT
- QUADRUPOLE INDUCTIVE LOOP DETECTOR
- LOOP DETECTION AREA NUMBER
- POLE-MOUNTED SIGN WITH LUMINAIRE
- POST MOUNTED SIGN
- TRAFFIC SIGNAL
- HYBRID BEACON
- STRUCTURE MOUNTED SIGN
- MAST ARM WITH LUMINAIRE
- STOP LINE PAVEMENT MARKING
- WHITE CROSSHATCHING PAVEMENT MARKINGS
- PASSIVE BARRIER
- CRASHWORTHY END TERMINAL/CRASH CUSHION



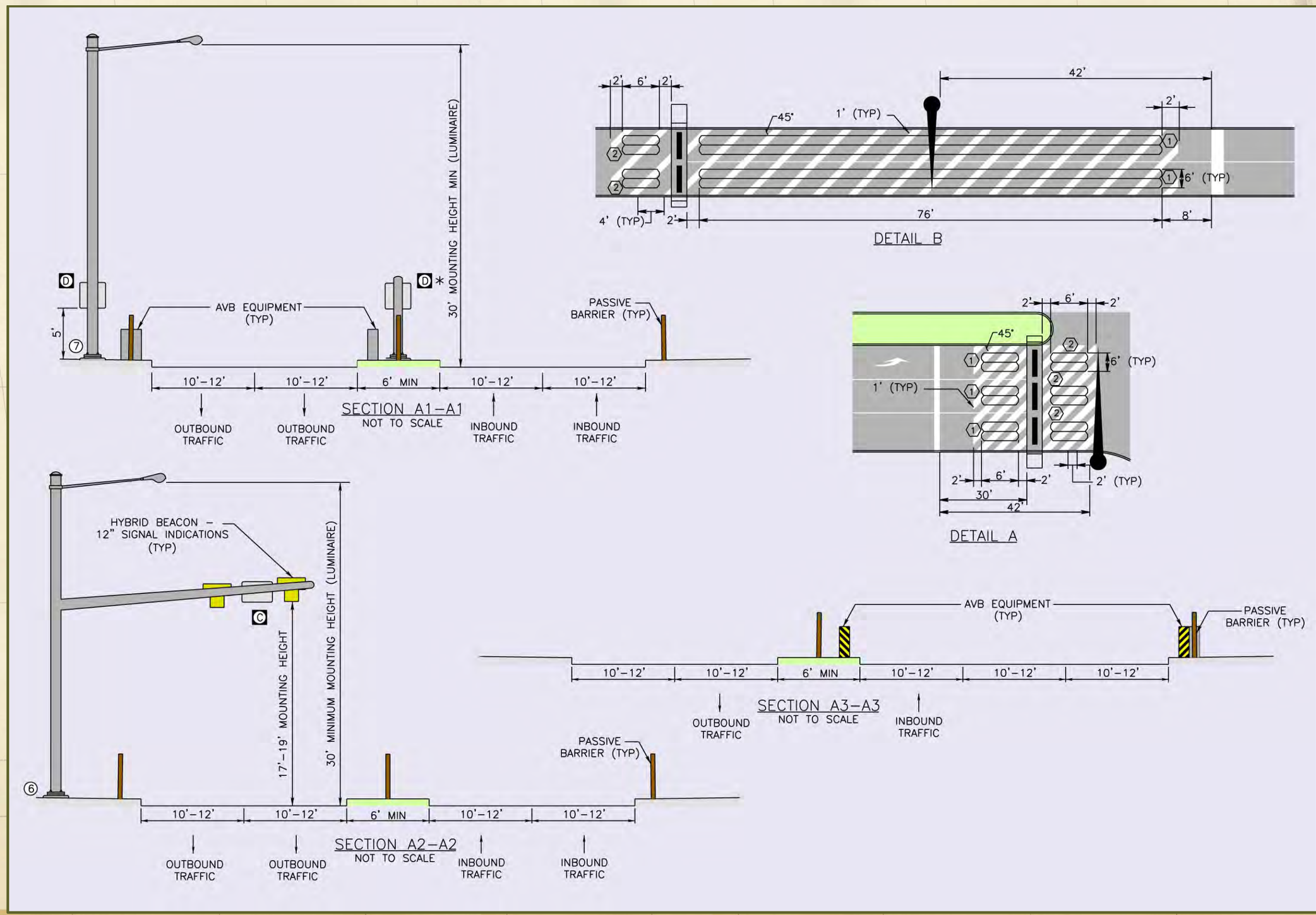
		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION							
	TRAFFIC CONTROL	GUARD REACTION			SAFETY INTERVAL		DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	1	2	3	4	5	6	7	8
TWO-LANE HYBRID BEACON SAFETY SCHEME OUTBOUND	W3-3A-TEA WARNING SIGN WITH BEACONS	DARK			ALTERNATING FLASHING YELLOW				
	DO NOT ENTER LED BLANK-OUT SIGN	DARK			"DO NOT ENTER" ILLUMINATED				
	HYBRID BEACON	DARK			SOLID YELLOW		ALTERNATING FLASHING RED		
	100dB HORN	SILENT			ACTIVATED				
	ACTIVE VEHICLE BARRIER	NON-DEPLOYED					DEPLOYING		DEPLOYED

		OPERATIONAL SEQUENCING FOR EMERGENCY FAST OPERATION										
	TRAFFIC CONTROL	NORMAL OPS	GUARD REACTION			YELLOW CHANGE (MUTCD MINIMUM)			RED SAFETY	DEPLOYING BARRIER		BARRIER DEPLOYED
	TIMELINE (SEC)	–	1	2	3	4	5	6	7	8	9	10
INTERSECTION TRAFFIC SIGNAL SAFETY SCHEME INBOUND	W3-3A-TEA WARNING SIGN WITH BEACONS	DARK				ALTERNATING FLASHING YELLOW						
	TRAFFIC SIGNAL	GREEN				YELLOW			RED			
	100dB HORN	SILENT				ACTIVATED						
	ACTIVE VEHICLE BARRIER	NON-DEPLOYED								DEPLOYING		DEPLOYED
	NO RIGHT TURN LED BLANKOUT (POLE 1)	DARK							R10-11 ILLUMINATED			

NOTES CONT'D

11. LED BLANK-OUT SIGN, IF USED, SHALL NOT AUTOMATICALLY DIM.
12. DESIGN, CONSTRUCTION AND MATERIALS FOR TRAFFIC CONTROL AND RELATED EQUIPMENT SHALL CONFORM TO THE STATE DOT OR LOCAL STANDARDS.
13. AVB EQUIPMENT WIDTHS SHOWN ON SECTION A1-A1 AND A3-A3 VARY BY AVB TYPE, MODEL, AND MANUFACTURER.
14. ALL SIGNALS SHALL BE LED AND HAVE FULL CIRCLE TUNNEL VISORS WITH BACKPLATES WITH RETROREFLECTIVE STRIP. 12-INCH INDICATIONS SHALL BE USED.
15. PLAN DETAILS ARE TYPICAL AND MAY BE ADJUSTED TO MEET SITE CONDITIONS. ANY ALTERATION IN TRAFFIC CONTROL (SIGNALS, BEACONS, SIGNING, MARKINGS AND DETECTION LOOPS) REQUIRE APPROVAL THROUGH SDDCTEA.
16. DESIGN IS BASED ON A 25 MPH DESIGN SPEED. SDDCTEA APPROVAL REQUIRE FOR POSTED SPEEDS HIGHER THAN 25 MPH.
17. UNDER EFO CONDITION, AVBS SHALL BE DESIGNED TO OPERATE INDEPENDENTLY IN CONJUNCTION WITH SAFETY LOOP DETECTION.
18. FOR MULTI-LANE ROADWAYS, UTILIZE A SOLID WHITE LINE BETWEEN LANES TO DISCOURAGE LANE CHANGING.
19. FINAL DESIGN AND OPERATIONAL ANALYSIS SHALL BE PERFORMED BY A TRAFFIC ENGINEER. PLANS SHALL BE REVIEWED BY SDDCTEA.
20. FINAL YELLOW AND RED CLEARANCE INTERVALS FOR NORMAL INTERSECTION OPERATIONS SHALL BE CALCULATED IN ACCORDANCE WITH THE MUTCD.
21. INTERSECTION SIGNALIZATION GOES TO ALL-RED IN COORDINATION WITH THE AVB SIGNAL.
22. SIGNS AND SIGNAL INDICATIONS MAY VARY BASED ON THE SPECIFIC PHASING OPERATION.
23. SIGNAL TO RUN NORMAL PHASING PLAN WHEN EFO IS NOT ACTIVATED.
24. UPON EFO ACTIVATION, ALL INTERSECTION TRAFFIC SIGNALS WILL IMMEDIATELY CEASE THE GREEN INTERVAL AND TRANSITION TO INBOUND OPERATIONAL SEQUENCE 4. IF THE SIGNAL IS FLASHING TRANSITION TO INBOUND OPERATIONAL SEQUENCE 4.
26. ALL "WALK" INDICATIONS WILL IMMEDIATELY TRANSITION TO "FLASHING DON'T WALK" (FDW) INTERVAL. NORMAL FDW SHALL BE PROVIDED AND MAY BE COMPLETED BEYOND INBOUND OPERATIONAL SEQUENCE 10.
27. ALL DEVICES TO REMAIN IN INBOUND OPERATIONAL SEQUENCE 10 AND OUTBOUND OPERATIONAL SEQUENCE 8 UNTIL THE SYSTEM IS RESET. NORMAL OPERATIONS TO RESET IN MAINLINE GREEN ONCE ALL AVBS HAVE BEEN FULLY RETRACTED.
28. ALL PASSIVE BARRIERS PLACED AT INTERSECTION MUST NOT OBSTRUCT INTERSECTION SIGHT DISTANCE.

FIGURE 11: Combination Intersection Traffic Signal/Hybrid Beacon Safety Scheme – Page 3 of 3



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WEBSITE: http://www.sddc.army.mil/sites/tea for pamphlets, bulletins and studies

Reference List

- ☑ TEA Home: http://www.sddc.army.mil/sites/tea
- ☑ SDDCTEA Pamphlet 55-15: *Traffic and Safety Engineering for Better Entry Control Facilities*: https://www.sddc.army.mil/sites/TEA/Functions/SpecialAssistant/TrafficEngineeringBranch/Pages/default.aspx
- ☑ UFC 4-020-02FA *Security Engineering: Concept Design.*
- ☑ UFC 4-020-03FA *Security Engineering: Final Design*.
- ☑ UFC 4-022-01 *Entry Control Facilities / Access Control Points*.
- ☑ UFC 4-022-02 *Selection and Application of Vehicle Barriers, with Change 1*.
- ☑ All of the UFCs above can be downloaded at the Whole Building Design Guide website:
- ☑ https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc