



Temporary Traffic Control Manual

First Edition



Engineering Judgement

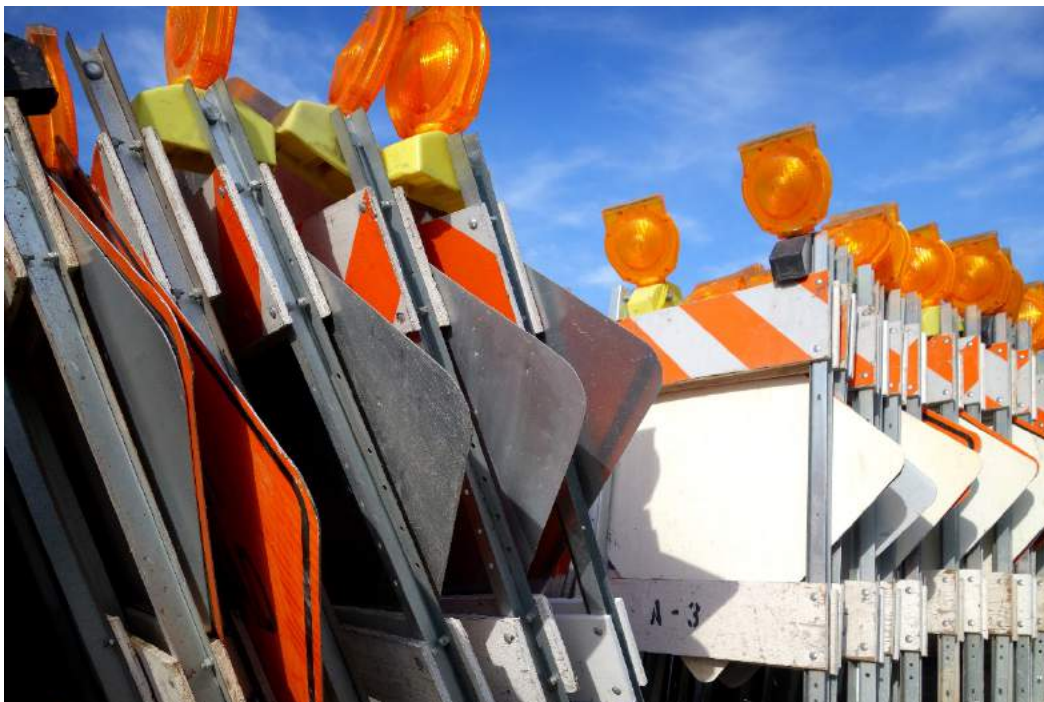
The 2009 MUTCD (Arizona Supplement) states in Section 1A.13 (64), “*Engineering Judgement – the evaluation of available pertinent information, and the application of appropriate principles, provisions, and practices as contained in this Manual and other sources, for the purpose of deciding upon the applicability, design, operation, or installation of a traffic control device. Engineering judgement shall be exercised by an engineer, or by an individual working under the supervision of an engineer, through the application of procedures and criteria established by the engineer. Documentation of engineering judgement is not required.*”

No single publication would be able to cover all diverse conditions and circumstances a Temporary Traffic Control practitioner may encounter in governing traffic on city streets. Engineering judgment is essential in applying the principles and practices contained in this 2017 Temporary Traffic Control Manual (TTCM). Variations from the requirements and typical illustrations in this manual may be needed based on analysis and engineering judgment of a specific situation. The City Traffic Engineer shall have the final authority with respect to such variations.

Acknowledgements

The City of Mesa Transportation Department sincerely appreciates and would like to acknowledge the following organizations for their contributions in the completion of this Temporary Traffic Control Supplement:

- American Traffic Safety Services Association (ATSSA), National
- American Traffic Safety Services Association (ATSSA), Arizona Chapter
- City of Mesa Engineering and Traffic Operations Departments
- City of Mesa Police Department



Introduction

Temporary traffic control planning is important as it minimizes impact on the traveling public. Proper planning allows needed work to be completed as quickly as possible and is vital to public and worker safety within the work zone.

The City of Mesa has adopted the current Arizona Supplement to the MUTCD, and the current MUTCD as the legal standards for traffic control devices used within City right-of-way and jurisdictional influence.

This 2017 TTCM augments the current MUTCD and was prepared for those working in public right-of-way (streets, sidewalks, multi-use paths, etc.) or planning special events requiring traffic restrictions within the City of Mesa. It includes but not limited to:

- Temporary Traffic Control (TTC), Permit Rules, and Procedures
- Information on Traffic Control permits and fees
- Corrective Action Notifications and/or Civil Sanctions
- Excerpts from applicable sections of Mesa City Code
- The ordinance adopting the Temporary Traffic Control Manual for the City of Mesa
- Sample Traffic Control Plans (TCP)

Copies of this manual are available online at the City of Mesa website (<http://mesaaz.gov/business/barricading-temporary-traffic-control-permits>). Hard copies of this manual are also available through the Transportation Department at no charge. Use the following contact information for questions, comments, or to request copies of this supplement.

Phone: 480-644-4TTC (4882) or email: barricade@mesaaz.gov.

NOTE: The Rules and Procedures may be revised from time to time. Any revisions will be posted at the City of Mesa website.

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Chapter 1

Temporary Traffic Control Program

1.0 Temporary Traffic Control Program

All persons, contractors, utilities, and other agencies including City departments shall obtain a Temporary Traffic Control (TTC) Permit if they are to restrict public ways except as noted in Section 1.2. The permit authorizes restrictions to be in place as specified on the permit, but does not guarantee the requester exclusive rights to occupy a particular portion of the public right-of-way. Weather, emergencies, incidents, or other projects and special events might require rescheduling of activities. The City will attempt to identify potential conflicts so they can be resolved cooperatively among those involved.

1.1 Permission to Restrict Public Ways

Per Mesa City Code, Title 10, Chapter 10, prior Transportation Department approval is required for all restrictions on any public way including streets, bike lanes, alleys, sidewalks/pathways, or multi-use paths within the City of Mesa except as noted in Section 1.2 below.

1.2 Exceptions

A TTC permit is not required if ALL of the following apply:

1. Restriction lasts less than one (1) hour, and
2. Only one (1) traffic lane (in a single direction) within multi lane streets is restricted, and
3. No part of the lane restriction (including taper) is closer than 300' to a signalized intersection, and,
4. The restriction does not take place during the peak traffic hours specified in the Temporary Traffic Control Manual (6:30 to 8:30 AM and 4:00 to 6:00 PM weekdays).

Note:

- TTC Staff may make an exception to any condition above.
- Under unique conditions such as roadway geometrics, inadequate sight distance, median lane restrictions, or time of day, TTC Staff may require a TTC Permit even though all of the above exceptions have been met.
- A TTC Permit shall be required when restrictions or closures are in place during hours of darkness.

In addition, a TTC permit may not be required on a local street for work in one location, where the street remains open to traffic in both directions, and where sidewalks are not restricted.

A permit is required when a sidewalk will be closed and pedestrians are redirected to the opposite side of the street. This also applies to pedestrian access maintained on the same side of the roadway where pedestrians are routed off an existing facility into any temporary pathway.

1.3 Temporary Traffic Control Permit Application

For work being done under a Right-of-Way (ROW) Permit or Utility (UTL) Permit and subject to permit fees, all fees must be paid and a ROW or Utility Permit issued before applying for a TTC Permit. See section 1.4 "Temporary Traffic Control Permit Fees."



Temporary traffic control fees are based on the number of days and type of traffic restrictions that are expected to be in place, not the number of permits. There could be several different traffic control setups throughout the life of a project. Each unique traffic control configuration requires specific approval, which means a single project could have several different TTC Permits associated with it. If the different traffic control configurations can be adequately described in one application, a single TTC Permit could be issued for the entire project. However, in many cases it may be easier to submit individual TTC Permit applications as the project progresses. Any number of TTC Permits can be issued throughout the life of a project.

- For questions or emergency notifications: Call: 480-644-4TTC (480-644-4882)

For unusual or complicated projects, the applicant is encouraged to call and discuss the temporary traffic control before submitting an application.

Typical review time for TTC Permit Application/TCP is four (4) City of Mesa business days (Monday-Thursday). The review time for applications submitted after 11:00am will begin the following City business day. Contractors are encouraged to plan ahead and submit applications based upon the City review schedule. While TTC Staff strive to process applications quickly, normal review times depend on the accuracy of the information provided by the applicant. Review times may be extended beyond the typical four days if inaccurate plan designs or incomplete TTC Permit Applications are submitted.

NOTE:

- If any City holidays fall within these time frames, review times will be longer.
- These review times do not account for required advance public notification as noted in Section 2.6. If advance public notice is required, applications need to be submitted with additional lead time.
- Requests for full arterial or intersection closures, half-street closures, and other restrictions with similar major traffic impacts, must have a minimum lead time of thirty (30) calendar days for City review and coordination. The request must be clear, complete, and correct with supporting documents to have a thorough and timely review.

1.4 Temporary Traffic Control Fees

Work involving temporary traffic control under a ROW Permit, UTL Permit, Capital Improvement Programs (CIP), City Maintenance Programs (CMP), or Special Events and subject to permit fees, must have those fees paid and the appropriate permit issued before applying for a TTC Permit.

The TTC fee must be paid prior to the issuance of a TTC Permit. The amount of the TTC fee is based on the number of days the permit holder plans to have restrictions in place per the following table. Each day or partial day that a restriction is in place is considered one restriction-day.

Table 1 - Temporary Traffic Control Fees

<i>Description of Service</i>	<i>Fee</i>
Minimum-No Restrictions Planned	\$50
Roadway/Alley Restriction	\$75 Per Day
Left Turn Prohibition –Signalized Intersection	\$50 Day/Direction
Sidewalk Closure	\$20 Per Day
Arterial Road Closure	\$2,500 Per Day
Plan Review Fee (3 rd and Subsequent Reviews)	\$50 Per Sheet/Review

NOTE:

TTC Permit fees may be revised as part of the City's annual budget process. The current Schedule of Fees and Charges is available on the web site: <http://www.mesaaz.gov/city-hall/office-of-management-budget/fees-charges>.

The number of paid restriction-days will be monitored based on the approved TTC permit. If additional restriction days are needed, a permit extension request is required. Additional temporary traffic control fees may also be required before the extension is approved. The following rules apply to use for calculation of TTC restriction-days:

- Restrictions in place for any portion of a day count as one restriction-day used. There will be no credit for restrictions in place for a partial day.
- Restriction-days are assumed to be used per the approved TTC Permit unless restrictions are cancelled or rescheduled as noted in Section 1.7.
- Except for cancelled and rescheduled restrictions mentioned above, no credit for unused restriction-days will be made. Credit will be given for cancelled restriction-days when proper notification is given as described above. The credit will remain with the original project under which the fees were paid.
- The minimum fee applies:
 - When work is in the right-of-way under a ROW or Utility Permit, but there will be no restrictions to public ways, or
 - When traffic control devices are placed in the right-of-way but they only restrict access to a private facility.

A Plan Review Fee will be assessed on Traffic Control Plans (TCP) requiring third and subsequent reviews. Beginning with the initial review of a TCP, if a plan is sent back to the applicant for additional corrections, the applicant must address all redline comments before resubmitting the plan for a final review. If the resubmitted plan fails to address all redline comments, the plan will be sent back to the applicant requiring all comments to be addressed. The third submittal of the plan will require the applicant to pay the Plan Review Fee for each sheet resubmitted for final review.

1.5 Traffic Control Plan

A TCP is required when **any** of the following conditions apply:

1. A complete street or alley closure is requested, or
2. Any portion of a sidewalk/pathway will be closed/restricted (plan must show pedestrian accommodation in detail), or
3. Lane restrictions (including tapers) are within 300 feet of a signalized intersection, or
4. Restrictions are requested during peak traffic hours (6:30 to 8:30 AM and 4:00 to 6:00 PM weekdays), or
5. The minimum number of lanes will not be available:
 - If more than four (4) lanes exist: Four (4) lanes (two each way)
 - If four (4) or fewer lanes exist: Two (2) lanes (one each way)
 - On one-way streets: Two (2) lanes open
6. Any time when required by the Transportation Department.

The requirement for a TCP may be waived by TTC Staff.

1.5.1 Traffic Control Plan Requirements

When a TCP is required, the traffic control plan shall be designed with the following features:

- Minimum sheet format shall be 11" x 17".
- Temporary Pedestrian Access Plans should be submitted on a separate sheet with a TCP.
- The location of the work area in relation to cross streets, driveways, alleys, bike lanes or other major reference point.
- Sidewalks, pathways, bike lanes, transit stops, nearby schools, hospitals, fire stations or other major facilities shall be noted.
- An accurate depiction of the street.
 - All pavement markings indicated on the plans (bike lanes, crosswalks, etc.)
 - Correct number of lanes.
 - Intersecting streets, driveways, addresses, and block numbers (labeled accurately).
 - Label signalized Intersections and all-way/two-way stops.
- The size of the work area including all dimensions.
- All temporary traffic control devices required for the work zone.
- Access considerations to properties within the work zone.
- Pedestrian access considerations within the work zone.
- Transit stop accommodations within the work zone.
- The posted speed limit.

- Duration of the project, work dates and hours, north arrow, and project number.

The traffic control plan designer must be a certified Traffic Control Design Specialist through ATSSA or another nationally recognized/accredited certification program.

If any of the required design criteria does not appear on a submitted traffic control plan, the plan may be denied and returned for additional corrections. This may result in additional review time and possibly delay to the TTC Permit process.

1.6 Temporary Traffic Control Permit Approval

Upon approval of the request, TTC Permit confirmation will be sent by email to the applicant, barricade company, and if noted, the City of Mesa inspector. If a request cannot be approved as submitted, a member of the TTC Staff will contact the applicant to discuss alternatives, and will keep the City of Mesa inspector and barricade company contact informed of the outcome.

A copy of the approved TTC Permit and TCP must remain on-site at all times. The contractor and traffic control company identified on the TTC Permit must have a copy of the permit to ensure compliance with the conditions of the TTC Permit and approved TCP.

1.7 Changes, Extensions, and Emergencies

All changes and extensions for existing permits and emergencies shall be reported to the Transportation Department by phone at (480) 644-4TTC (4882) or by email at barricade@mesaaz.gov. All submitted requests will receive an e-mail confirmation of the request. Notification of changes/extensions must be submitted by 1:00 p.m. the business day prior to the date the work was originally scheduled. If the work needs to extend beyond the date in the original permit, a request for extension must be made by 1:00 p.m. the business day prior to the expiration of the original permit. If the requested extension requires additional fees, those fees must be paid before an extension will be granted. Failure to submit an extension request as noted may result in the closure of the permit when the permit expires.

Transportation shall be notified of unplanned restrictions due to emergencies such as water main breaks, utility damage, pavement failures, etc. as soon as practical. An emergency is an unplanned event requiring immediate action to preserve or protect public health, safety or welfare. An event or incident that does not require an immediate response and can be scheduled for a future time does not meet the definition of an emergency.

1.8 Corrective Action Notices and Civil Sanctions

It is the City's intent to work with the temporary traffic control and contracting community to achieve voluntary compliance with the City's TTC regulations. However, if necessary, violations of the Temporary Traffic Control Manual or any provision of Mesa City Code Title 10, Chapter 10 may result in a corrective action notice or civil sanctions in the amount per day as listed in the following table.

Table 2 – Summary of Violations and Fines*

<i>CITY CODE</i>	<i>VIOLATION</i>	<i>CIVIL SANCTION</i>
10-10-3(E)(1)	Any act, error, or omission within the right-of-way that creates an imminent risk of death or injury.	\$1,500.00
10-10-3(E)(2)	Restricting the right-of-way or easement without a required Temporary Traffic Control Permit.	\$1,000.00
10-10-3(E)(3)	Restricting traffic during peak traffic hours as described in the Temporary Traffic Control Manual without authorization.	\$1,000.00
10-10-3(E)(4)	Failing to correct or cure a violation of the Traffic Barricade Manual within the time period stated on the notice of violation.	\$1,000.00
10-10-3(E)(5)	Restricting the right-of-way at an intersection with traffic signals without any work being conducted for which the restriction is necessary for a period of one continuous hour unless otherwise approved.	\$1,000.00
10-10-3(E)(6)	Improperly closing a sidewalk or closing a sidewalk without first obtaining a required traffic control permit.	\$500.00
10-10-3(E)(7)	Failing to comply with the conditions, restrictions, limits, or location of a Temporary Traffic Control Permit.	\$500.00
10-10-3(E)(8)	Failing to install advance warning signs or failing to install advance warning signs that comply with the Temporary Traffic Control Manual.	\$500.00
10-10-3(E)(9)	Failing to install traffic barricades or channelizing devices or failing to install barricades or channelizing devices that comply with the Temporary Traffic Control Manual.	\$500.00
10-10-3(E)(10)	Failing to remove an advance warning sign leaving the sign facing traffic after the traffic restriction has been removed.	\$250.00

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10-10-3(E)(11)	Failing to remove traffic control devices from the right-of-way within twenty-four hours after expiration of the Temporary Traffic Control Permit.	\$250.00
10-10-3(E)(12)	Failing to install and maintain traffic control devices that meet the quality requirements described in the Temporary Traffic Control Manual.	\$250.00
10-10-3(E)(13)	Rendering a bus stop inaccessible without relocating it or making other approved accommodations.	\$250.00
10-10-3(E)(14)	Failure to comply with any other provision of the Temporary Traffic Control Manual or this Chapter whether or not a Temporary Traffic Control Permit is required.	\$250.00

- Please refer to Mesa City Code Title 10 Chapter 10 Section 3 for the most current version of violations, enforcement, and associated civil sanctions.

Repetitive violations may be considered a separate violation for each calendar day.

Traffic control devices may be impounded by the City if:

- Left in the right-of-way and are not active to the work being performed.
- Not removed within 24 hours of an expired TTC Permit.
- Not removed in the time frame requested by TTC Staff.
- When devices present a hazard/nuisance to the public.

Impounded TTC devices will be stored by the City and owners may retrieve the devices during normal City business hours. The owners will be notified by the City to make arrangements to pick up impounded devices. Unclaimed devices may be disposed of at the City's discretion.



Chapter 2

General Traffic Regulations

2.0 General Traffic Regulations

2.1 Necessity for Restrictions

Restrictions and closures are permitted only when necessary considering safety, efficiency, and the impact on the traveling public. Restrictions shall not be in place when work activities are not being performed. Restrictions shall not be left in place simply for convenience or to avoid the need to remove barricades at the end of the work shift and reset them the following day. Restrictions shall not be left in place solely to accommodate storage of equipment, supplies, debris, etc. Excavations should be covered with steel plates or backfilled and the lanes opened to traffic at the end of the work day unless it is not feasible to do so.

Approval of a TCP that includes restrictions and closures for a given time period does not constitute approval to leave restrictions and closures in place in conflict with the requirements set forth above.

2.2 Designated Responsible Person

Any entity employing temporary traffic control on public streets, sidewalks, bike lanes, alleys or other public facilities must have a designated person who will be responsible for ensuring that all barricades, signs, barricade lights, signals, and other traffic control devices are established and maintained in compliance with this manual. The designated person shall be trained and possess a current certification in temporary traffic control standards and practices by ATSSA for Traffic Control Supervisor certification. The designated person may be an employee of a traffic control company hired by the entity conducting the work. However, use of a traffic control company does not relieve the entity doing the work from the responsibility to comply with the TTCM.

2.3 Peak Traffic Hours

City of Mesa peak traffic hours are 6:30 a.m. to 8:30 a.m. and 4:00 p.m. to 6:00 p.m. weekdays.

Traffic restrictions on arterial and collector streets are not permitted during peak traffic hours unless approved by TTC Staff.

2.4 Traffic Control Device Compliance

All temporary traffic control devices shall comply with the National Cooperative Highway Research Program (NCHRP) Report 350 requirements and the American Association of State Highway and Transportation Officials (AASHTO). Devices complying with the Manual for Assessing Safety Hardware (MASH) are acceptable.

2.5 Temporary Traffic Control Devices

It shall be the Permittee's/contractor's responsibility to provide, erect, maintain and remove all traffic control devices, off-duty law enforcement personnel, steel road plates, flaggers and any other devices necessary to properly mark and control the construction areas for the safe and efficient movement of

vehicular and pedestrian traffic. The Permittee shall provide additional traffic control devices and measures as deemed necessary by the City Traffic Engineer or TTC Staff.

Permittees are responsible for maintaining all traffic signs and pavement markings in their construction zones and for restoring the permanent traffic signs and pavement markings upon completion of their work.

During TTC operations, it is important to make sure that existing traffic control devices remain compatible with temporary traffic control being imposed. This includes, but is not limited to, signs, traffic signals, and pavement markings. The devices that remain applicable to the affected traffic must be maintained, while other devices must be covered, relocated, or in rare cases, completely removed.

All post mounted signs shall be maintained upright, clean, and in full view of the intended traffic by Permittee at all times. If these signs interfere with construction, the Permittee shall temporarily relocate the signs to permit construction. However, the devices must be kept in full effective view of intended traffic. Portable signs may be helpful to augment other signs, which temporarily cannot be placed in their optimum position.

Existing signs that are no longer applicable shall be removed or fully covered by the Permittee (with approval by City Traffic Engineer or TTC Staff), taking care not to damage the signs. The removed signs are to be salvaged by carefully storing them out of the way on the adjacent property line. The Transportation Department shall be notified immediately of all sign removals by calling (480) 644-2160. When construction nears completion, the Permittee, unless otherwise specified, shall reset all needed signs at permanent locations.

Temporary signs, barricades, and channelizing devices shall be:

1. Installed prior to the start of any work.
2. Properly maintained (clean, legible, and in good working condition) and comply with Section 4.0 of this manual for quality of devices.
3. Kept in place only as long as needed.
4. Removed from the roadway when no longer needed.
5. Removed from the right-of-way within 24 hours of completing work or expiration of the TTC Permit.
6. In accordance with MUTCD Standards and this manual.
7. Affixed with the current company name and emergency contact phone number on each device.

2.6 Advance Notice for Restrictions

Advance notice to the public is required for certain planned restrictions. The amount of advance notice provided to the public depends primarily on the functional classification of the street, the type, extent and duration of the restriction, and the amount of disruption to normal traffic the restriction will cause.

Minimum advance notice requirements are as follows unless an alternative is approved in the TTC Permit. Advance notice may be required for other situations as determined by TTC Staff.

- Full street closure10 full calendar days
 - Peak hour reduction in through lanes on major street.....5 full calendar days
 - Left turn prohibition at an arterial/collector signalized intersection.....5 full calendar days
- This 5-day notice is applicable to large projects that typically have traffic control in place for several weeks or months. Advance notice is not required when the turn prohibition is during non-peak hours only, and planned for no more than three consecutive days.*

The required advance notice is typically to be done with portable changeable message signs. Use of static signs for advance notice may be feasible in limited situations. Use of static signs must be approved in the TTC Permit.

2.7 Traffic Signals

For work affecting traffic signal equipment, notify Intelligent Transportation Systems (ITS) Staff at least two working days prior at 480-644-2160 or 480-644-5888.

If TTC at an intersection with protected left turns/left turn signals includes left turn prohibitions, care must be taken to avoid a situation where green left turn signals are displayed in conflict with “NO LEFT TURN” signing at the intersection. This can happen if through traffic is routed in what is normally a left turn lane, or if construction equipment occupies the vehicle detection zone in a closed left turn lane.

Notify ITS Staff at 480-644-5888 in advance when there is a need to deactivate a left turn signal. It is also critical for ITS Staff to know when a left turn signal is to be reactivated to avoid a situation where left turn traffic is faced with a red left turn signal that does not change. **At intersections with fully protected left turn signals (where a red arrow is part of the signal display), the left turn signals must be reactivated before removing the left turn prohibition.**

When traffic through a signalized intersection is guided into lanes other than the lanes normally used for that movement, visibility of the traffic signal indications should be checked. At least one, and preferably two signal faces shall be located within the 40-degree cone of vision approaching the signal. For the lateral and longitudinal locations of primary signal faces (cone of vision) reference figure 4D-4 of the MUTCD and/or Appendix A of the TTCM.

2.8 Detour/Bypass Surface Requirements

When traffic lanes are redirected adjacent to existing pavement, the materials used to create the detour/bypass should be as follows:



- Traffic detoured for less than seven (7) consecutive days will require a material such as asphalt millings, quarter minus gravel, or compacted aggregate base providing a smooth, rideable surface with dust control measures.
- Traffic detoured for seven (7) days or more will require a paved surface.

Paved surfaces will require engineered sealed plans to be submitted for review and approval by the City Traffic Engineer.

2.9 Vertical Pavement Drop

Vertical pavement drops exceeding one inch in depth need to be evaluated on a case-by-case basis and might require the following treatments:

- Asphalt ramps to provide a smooth riding surface suitable for all types of vehicles.
- Warning signing (grooved pavement, bump, dip, etc.)

2.10 Local Access Requirements

Local access should be maintained to all properties on all streets (major, collector, and local) at all possible times. When property access cannot be maintained, it is the responsibility of the TTC Permittee to notify the affected property owners, residents, or tenants a minimum of 72 hours in advance.

Reasonable access accommodations or other alternatives should be provided to the affected property owners.

2.10.1 Public Facility Access Requirements

Access to fire stations, police stations, hospitals, transit facilities, and schools should be maintained at all times. When restrictions are necessary, the TTC Permittee shall coordinate access restrictions with the responsible person in charge of the affected facility.

When school zones (15 MPH) are located within a work zone, the school zone signs shall remain clearly visible and identifiable. Depending on the condition, flagging or additional school zone signs may be required. School zone crosswalks should be maintained open and accessible at all times.

2.11 Holiday Construction Moratorium

Between November 15th and January 1st proposed restrictions that would interfere with traffic flow near major retail shopping areas and transportation hubs (airports, bus terminals, etc.) on arterial or collector streets are normally denied. Examples:

- The downtown area from Broadway Road to University Drive, and Country Club Drive to Hobson.
- Fiesta District
- Superstition Springs Mall Area
- Mesa Riverview
- Phoenix-Mesa Gateway Airport
- Mesa Falcon Field Airport



The above list is not all inclusive. TTC applications for work during this time frame will be reviewed by TTC Staff to determine if the proposed traffic restrictions can be accommodated.



Chapter 3

Signs, Devices, and Applications

3.0 Signs, Devices, and Applications

3.1 Temporary Barriers

Temporary barriers must be designed, installed, and maintained in compliance with the MUTCD and the AASHTO Roadside Design Guide. A detailed plan is required for any proposed use of temporary barriers. Such plans shall be prepared under the supervision of a registered professional engineer familiar with the design requirements for temporary barriers, sealed by the engineer, and approved by the City Traffic Engineer.

Barricade warning lights may be used on temporary barriers per the MUTCD.

3.2 Longitudinal Channelizing Devices

Longitudinal channelizing devices are lightweight, deformable channelizing devices that can be used singly as Type I, II, or III barricades, or connected so they are highly visible. They can be used to channelize vehicular and/or pedestrian traffic, and can provide a continuous separation between pedestrians and traffic lanes in work zones. When used to channelize pedestrian traffic, the channelizing devices shall be ADA compliant. When used during hours of darkness to channelize traffic, the channelizing devices are to have approved warning lights attached and operational and should be supplemented with retroreflective material or delineation for improved nighttime visibility as noted in Section 6F.71 in the MUTCD.

Longitudinal channelizing devices are not temporary traffic barriers. However, some devices can function either as a channelizing device or a temporary barrier depending on how they are installed. It is important to follow the manufacturer's instructions for a given device to make sure it is being installed properly for the intended use.

3.3 Barricades and Channelizing Devices

Barricades and channelizing devices shall comply with sections 6F.63-69 in the MUTCD. Acceptable barricades and channelizing devices for City roadways are noted in Figure 6F-7 in the MUTCD. Retroreflective sheeting shall be a minimum of Type IV retroreflective sheeting. When used to close streets, sidewalks, or alleys spacing between barricades should not exceed five (5) feet.

3.4 Arrow Boards

Arrow boards are required for all lane closures on multi-lane streets, day or night, except for short term closures (not to exceed 15 minutes) as described under "Service Vehicles" in section 6.0. Arrow boards shall comply with MUTCD requirements.

3.5 Sign Applications

3.5.1 Sheeting Requirements

All construction warning signs (black on orange) retroreflective sheeting shall be high intensity prismatic orange Type IV or better and all regulatory signs (black on white) retroreflective sheeting

shall be a minimum of Type IV retroreflective sheeting. For additional information on minimum sign sheet requirements, ref. Section 2A.08 of the MUTCD.

3.5.2 Sign Sizes

Guidelines for sign sizes, colors, and shapes can be found in Chapter 6F of the MUTCD.

3.5.3 Sign Mounting Heights

Portable, standard vertical supports, and permanent signing shall follow the same basic installation and placement guidelines as noted in Section 6F.03 of the MUTCD and this TTCM.

3.5.4 Sign Mounting Procedures and Placement

Portable and post-mounted signs should be placed on the right side of the roadway. Where special emphasis is required, and where more than one lane of traffic in on direction is affected, dual signs should be provided approximately opposite each other. Signs shall not be placed in a manner obstructing access to driveways, intersecting streets, or create sight visibility concerns. Signs should not be placed in areas too narrow to accommodate the sign.

Standard vertical supports used for barricades, vertical panels, longitudinal channelizing devices, and flag trees may also be used for mounting portable signs. Suitable ballasts should be installed at the base of any portable support used to mount a sign to ensure the functionality of the sign.

Signs mounted on portable supports and used during hours of darkness shall be equipped with a Type-A flashing warning light.

Signs mounted on supports must have a minimum of 150 squares inches of orange high intensity retroreflective sheeting on the back of the sign exposed to opposing traffic. The retroreflective sheeting should be placed in strips not less than five (5) inches along the outer edge of the sign.

Signs mounted on portable stands and positioned in two-way turn lanes, must have at least one (1) Type I barricade placed at a maximum of five (5) feet behind the sign to alert opposing traffic. Channelizing devices such as traffic cones and vertical panels should not be used to substitute the Type I barricade.

3.6 Signs

Temporary traffic control signing should comply with the MUTCD and the Arizona Department of Transportation Manual of Approved Signs.

3.6.1 Advance Warning Sign Spacing

Recommended advance warning sign minimum spacing shall comply with Table 6C-1 of the MUTCD.

Speed categories for the City of Mesa as follows:

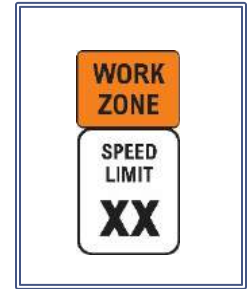
- Urban (low speed) = Posted speed 30 mph or less.

- Urban (high speed) = Posted speed 35-45 mph.
- Rural = Posted speed 45 mph or greater.

3.6.2 Work Zone Speed Limits

Work zone speed limit signs shall adhere to MUTCD requirements using the “Work Zone” (G20-5aP) sign mounted above the “Speed Limit” (R2-1) sign. When work zone speed limit signs are in place, existing/conflicting signing shall be covered. Signs shall be placed three (3) per 1/2 mile, per direction.

The “SPEED LIMIT 25” sign is typically used where the existing pavement has been removed, or where traffic is being maintained on a temporary detour road, on unpaved shoulders, or on traffic lanes that are severely restricted.



The “SPEED LIMIT 35” sign is commonly used in most work zones where temporary pedestrian pathways are established in the roadway within a work zone, on new asphalt during the completion of roadway paving project, on roadways with reduced number of travel lanes.

3.6.3 Steel Plate Ahead

The “Steel Plate Ahead” (W8-24) sign should be installed where steel road plates are milled into the roadway surface and exposed to traffic.



For low-speed (posted 30 mph or lower) or local roadways where road plates may not be milled into the roadway, a “Bump” (W8-1) sign shall be installed prior to the road plate location. The Bump sign may not always be used in conjunction with the Steel Plate Ahead sign.

3.6.4 Sidewalk Bump Signs

The “Sidewalk Bump” sign (W8-1aME) should be placed where horizontal/vertical displacement in the sidewalk greater than 1/2 inch have been identified.



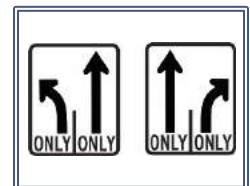
3.6.5 Bike Lane Closure Signing

The “Bike Lane Symbol” (W11-1) and “Share The Road” (W16-1p) signs should be used in work zones where travel lanes are too narrow for bicycles and vehicles to operate side-by-side. These signs should be placed at a location prior to the tapers on the approach to work zones (ex. beginning of a merging or shifting taper where traffic is narrowed to a single travel lane).



3.6.6 Advance Intersection Lane Control Signing

The “Intersection Lane Control” sign (R3-8LS, R3-8RS) should be used at intersections to control vehicular movement for temporary left/right turn lanes adjacent to through travel lanes.



3.6.7 Temporary No Parking Signs

Temporary No Parking signs should be used at locations where street side parking is available and must be prohibited for a specified length of time for planned roadway restrictions or special events. No Parking signs must have the date(s) and times of the prohibition on each sign. Signs should be spaced about 80 feet apart for collector and arterial streets. For local streets, a minimum of one (1) sign must be placed in front of each effected resident. For locations where parking stalls are prohibited, spacing should not exceed 40 feet between signs.



3.7 Channelization Device Applications

Barricades and channelizing devices are an integral component of TTC. They are used to warn motorists of upcoming temporary restrictions, and to guide motorists and pedestrians through restricted areas. They are also used to separate vehicular traffic from the workspace, pavement drop-offs, pedestrians, and opposing traffic. All channelizing devices, except traffic cones, shall comply with the MUTCD standards and guidelines. The minimum height for traffic cones is 18 inches and is acceptable for daytime use only. The use of 28-inch cones is encouraged and recommended for use on all City roadways. Traffic cones used during hours of darkness must be 28-inch cones and shall be equipped with reflectorized bands. The width of the reflectorized bands shall comply with the MUTCD. Traffic cones used during hours of darkness are normally reserved for emergency situations. Spacing between channelizing devices in the activity area should not exceed 50 feet. Maximum spacing between devices in a taper and/or tangent should comply with the distances shown in the chart below.

Table 3 - Maximum Spacing of Channelization Devices

Speed (mph)	Maximum Channelizing Device Spacing		
	Taper* (feet)	Tangent (feet)	Conflict** (feet)
20	20	40	10
25	25	50	12
30	30	60	15
35	35	70	17
40 and higher	40	80	20

* Maximum channelizing device spacing for all speeds on shifting tapers is 20 feet. Spacing for traffic cones used in a merging tapers shall not exceed 25 feet regardless of speed.

** Use on intermediate and short-term projects for shifting tapers where there are no pavement markings or where there is a conflict between existing pavement markings and channelizing devices.

Channelization must be provided when the existing two-way-left-turn lane marking is obliterated or missing (even if only one side of the two-way-left-turn lane marking is missing).

Channelization requires “KEEP LEFT” (R4-8a) and/or “KEEP RIGHT” (R4-7a) signs to clearly indicate the proper path to drivers. A “KEEP LEFT” or “KEEP RIGHT” sign shall be placed at the beginning of



a line of channelizing devices, except where the R3-8LS or R3-8RS sign is used. In addition, “KEEP LEFT” and/or “KEEP RIGHT” signs shall be placed at each intersection and at or near driveways to direct drivers to the correct lanes. One “KEEP LEFT” and/or “KEEP RIGHT” sign may serve more than one driveway where the driveways are closely spaced.

However, “KEEP RIGHT” and/or “KEEP LEFT” signs are not required in a short-term setup (less than one hour) where traffic is not being channelized left of center and where channelizing devices are set in such a way that the proper path to follow is self-evident to drivers.

3.7.1 Taper Lengths

Barricades and channelizing devices used to guide motorists must provide a smooth, gradual transition, when moving traffic from one lane to another, onto a bypass detour, or when reducing the width of the street. The minimum desirable merging taper length formulas are shown in the tables below and can be found in Section 6C.08 of the MUTCD.

Table 4 - Merging Taper Length Calculations

<i>Speed Limit</i>	<i>Formula</i>
40 mph or less	$L = WS^2/60$
45 mph and greater	$L = WS$

L = Taper Length (ft) W = Width of Lane (ft) S= Posted Speed Limit (mph)

The table below shows the typical merging length and spacing of devices for tapers calculated using the table above.

Table 5 - Typical Merging Taper Lengths and Spacing between Devices

Speed Limit Limit (mph)	Taper Length = L (ft)			Spacing between devices (ft)
	Lane Width = W (ft)			
	10	11	12	
25	104	115	125	25*
30	150	165	185	30
35	205	225	245	35
40	270	295	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55

**Distance between traffic cones used for tapers should not exceed 25 feet regardless of speed.*

3.8 Warning Light Application

Warning lights are yellow, mounted atop appropriate traffic control devices to call attention to the device, and to provide alignment information to motorists. Red warning lights should be used on signs for stop conditions only. Lights shall be mounted on all signs, barricades, and channelizing devices. Warning lights shall be in operation during hours of darkness.

For detail specification on warning lights reference section 6F.83 of the MUTCD.

3.9 Temporary Pavement Markings

Centerline markings are to be two 4-inch wide yellow lines with a 4-inch space between.

Lane line markings are to be 4-inch wide white lines, placed with 10-foot lineal feet of marking and 30 lineal feet of space between markings. When approaching marked crosswalks, the lane markings shall be 4-inch solid lines within approximately 75 feet of the crosswalk. Edge lines are to be 4-inch wide, continuous, white lines.

If done with temporary pavement markings, such markings shall be reflective and comply with ADOT Standard Specifications for Road and Bridge Construction, 2008, sections 701-2.05, 701-3.05, and 701-3.09. The Chip Seal Pavement Marker per 701-2.05 and ADOT Standard Drawing M-20, may be used for fog, slurry, microseal, overlay and other paving projects where traffic is maintained without permanent lane lines. The markers may be placed on the top surface of a paving course on overlay and similar projects. All temporary pavement markings placed on or visible on final surface courses shall be placed in line with the location of permanent pavement markings. Unless otherwise specified in the project plans or specifications, the minimum spacing of the Chip Seal Marker is one marker per 40 feet, as noted on ADOT Standard Drawing M-20. If more recent versions of the ADOT Standard Specifications and Standard Drawings for temporary pavement markings or the Chip Seal Pavement Marker have been issued since adoption of this supplement, the most recent version shall be used unless otherwise indicated by the City Traffic Engineer.

3.9.1 Pavement Marking Removal

Slurry seal is not to be used to obliterate markings unless specifically approved by the City Traffic Engineer.

3.9.2 Obliterated or Missing Lane Lines of Multilane Streets

Where traffic is maintained on multilane streets and lane lines have been removed, the following minimum requirements apply:

- Centerline must be delineated with channelizing devices except where a raised median or other physical feature serves to indicate the left edge of the traveled way. Temporary pavement markers shall not be used for centerline delineation.

- Separate left turn pockets are to be delineated with channelizing devices or temporary pavement markers.
- Exclusive right turn lanes at driveways and intersections are to be delineated with channelizing devices or temporary pavement markers.
- When either side of a two-way left turn lane is removed the missing line is to be delineated with channelizing devices or temporary pavement markers.
- Channelizing devices shall be spaced per the MUTCD: Spacing in feet shall not exceed 1 times the posted construction speed limit in mph on tapers, and 2 times the posted construction speed limit in mph on tangent and centerline sections. Depending on the location and existing urban conditions, unit spacing of TTC devices in a centerline may be reduced as directed by TTC Staff.
- Where the street normally carries no more than two lanes of traffic in one direction, no additional lane delineation between the centerline barricades (or raised median) and the curb is required.
- Where the street normally carries three or more lanes of traffic in one direction, delineation of the lanes between the centerline barricades (or raised median) and the outside curb is required. This can be done with channelizing barricades or with temporary pavement markings.
- If done with channelizing barricades, it is usually necessary to eliminate one through lane. For example, where there are normally three lanes, channelize traffic into two lanes. This type of setup requires review and approval by TTC Staff in advance.

3.9.3 Temporary Pavement Markers

Temporary pavement markers may be used instead of temporary paint or tape markings. When lane lines are obliterated or missing, temporary pavement markers may be used instead of channelizing devices to delineate traffic lanes, except centerlines. Temporary markers shall be reflective and comply with Arizona Department of Transportation (ADOT) Standard Specifications for Road and Bridge Construction, 2008, sections 701-2.05, 701-3.05, and 701-3.09. The Chip Seal Pavement Marker per 701-2.05 and ADOT Standard Drawing M-20, may be used in Mesa for fog, slurry, microseal, overlay, reconstruction and similar paving projects where traffic is maintained without permanent lane lines. When used on overlays, reconstruction and other projects that provide more than a surface treatment, the markers shall be placed on the new surface immediately after paving, rather than on the old surface before treatment. All temporary pavement markings placed on or visible on final surface courses shall be placed in line with the location of permanent pavement markings. If more recent versions of the ADOT Standard Specifications and Standard Drawings for temporary pavement markings or the Chip Seal Pavement Marker have been issued since adoption of this supplement, the most recent version shall be used unless otherwise directed by the City Traffic Engineer.



Chapter 4

Quality of Temporary Traffic Control Devices

4.0 Quality of Temporary Traffic Control Devices

The purpose of traffic control devices and equipment, as well as the principles for their use, is to promote roadway safety and efficiency by providing for the orderly movement of all road users on streets, bikeways, pedestrian facilities, and private roads open to public travel. Traffic control devices and equipment notify road users of regulations, provide warning and guidance needed for the uniform and efficient operation of the traffic system, and minimize the occurrence of crashes.

To be effective, temporary traffic control equipment should meet the following requirements:

- Fulfill a need;
- Command attention;
- Convey a clear, simple meaning;
- Command respect from the road users; and
- Give adequate time for proper response.

Design, placement, operation, maintenance, and uniformity are aspects that should be carefully considered in order to maximize the ability of the equipment to meet the above mentioned requirements. The quality of the TTC equipment should meet the following guidelines in order to achieve the requirements as noted above.

4.1 ATSSA Quality Guidelines

The quality of the TTC zone devices in this guideline has been divided into three categories: acceptable, marginal, and unacceptable.

Acceptable: Devices that meet the quality requirements in this TTCM for this classification and all other requirements such as design, size, color, weight, etc. in the plans and specifications shall be considered to be acceptable for use on roadway construction or contract maintenance projects.

Marginal: The term “Marginal” for the purpose of this TTCM means “marginally acceptable”, reaching the lower end of acceptability.

Unacceptable: Devices in this category shall not be used. When found in the TTC zone, they shall be replaced or repaired by the contractor as directed by TTC Staff or as contained in contract specifications.

The evaluation guide that follows is to be used to evaluate the quality of the reflective face and general appearance of signs, barricades, vertical panels, and cones. The City of Mesa Transportation Department acknowledges and appreciates the use of ATSSA copy written graphics and text to support these quality guidelines. A copy of the complete Quality Guidelines for Temporary Traffic Control Devices and Features can be obtained by visiting the ATSSA website at www.atssa.com.

4.2 Quality Guidelines for Channelizing Devices and Signs

Application of this guideline provides the means to meet the requirements of Section 1A.05 of the MUTCD which states:

“Functional maintenance of traffic control devices should be used to determine if certain devices need to be changed to meet current traffic conditions. Physical maintenance of traffic control devices should be performed to retain legibility and visibility of the device, and to retain the proper functioning of the device. Clean, legible, properly mounted devices in good working condition command the respect of road users.”

This guideline applies to all channelizing devices and signs used for TTC within the City’s right-of-way and/or public domain.

All channelizing devices and signs shall conform to the requirements of the MUTCD and this TTCM with regard to size, shape, color, placement and legend. Special signs, if required, are normally detailed in the plans. All devices requiring NCHRP-Report #350/M.A.S.H. testing shall meet those standards for approval by the Federal Highway Administration (FHWA).

Signs shall be plumb to the pavement. Sign positioning at the work site should be determined based on MUTCD, this Temporary Traffic Control Manual requirements, and then site conditions. Usually the sign spacing may be increased if a design location proves to be unsuitable. Vertically mounted signs on temporary stands should be as near vertical as practicable.

All requirements of the City of Mesa, for barricades and vertical panels, used in the work zone shall be met. Vertical panels shall be maintained in a vertical position. Barricades shall be considered unacceptable if they have bent or twisted legs, unfinished or excessively rusty metal parts, unfinished wooden rails, or a deformation of the support assembly to the extent that the barricade panel is not reasonably parallel to the roadway surface or visible to approaching traffic.

Acceptable channelizing devices and signs should be constructed and ballasted to perform in a predictable manner when struck by a vehicle. Channelizing devices and signs should be crashworthy as noted in NCHRP-350/M.A.S.H. testing requirements.

Any situation where there are more than two adjacent channelizing devices missing or substantially out of alignment will cause an unacceptable situation.

The guide that follows is to be used to evaluate the quality of the reflective face and general appearance of signs, barricades, and channelizing devices.

Evaluation Guide for Work Zone Signs	
Acceptable There are several abrasions on the surface but very little loss of lettering. There has been no tough-up of the lettering. This message is legible per the design criteria of the MUTCD.	
Marginal Of the many surface abrasions throughout the sign face, many are within the individual letters of the message. The sign surface is free of any residue. Although some color fading is evident, the background color and reflectivity are still apparent at night. This message is legible per the design criteria of the MUTCD.	
Unacceptable Signs with asphalt splatter or cement slurry of an amount similar to the abrasions that are evident throughout the face of this sign are unacceptable. Some letters have a loss of more than fifty percent (50%). There is a noticeable color fading. The message is illegible per the design criteria of the MUTCD.	

Evaluation Guide for Type I, II, III Barricade or Vertical Panels

Acceptable

Panel is not deformed to an extent so as to decrease the panel's target value. There are several abrasions on the surface but very little loss of reflective sheeting. The orange is vivid and the stripes provide contrasts.



Marginal

There are numerous surface abrasions through the panel surface. Some color fading is evident, however, it is free of large areas of residue or missing reflective material. The orange is vivid and the stripes provide contrast.



Unacceptable

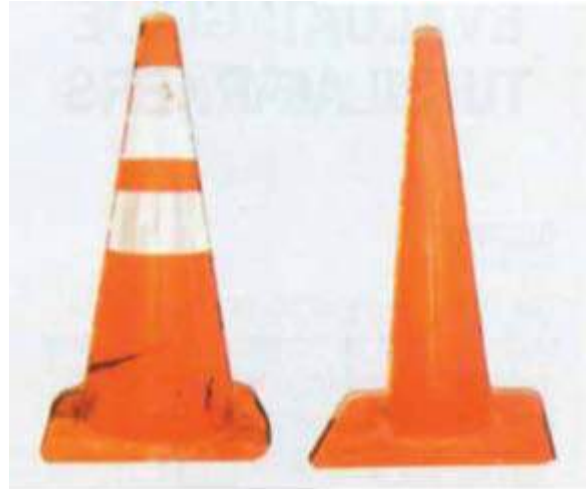
The surface is marred over a high percentage of the panel area. There is noticeable loss of reflectivity and obvious color fading. Panels with asphalt splatter and/or cement slurry, or any combination of missing and covered reflective material similar in area to that shown here would also make a panel unacceptable.



Evaluation Guide for Traffic Cones

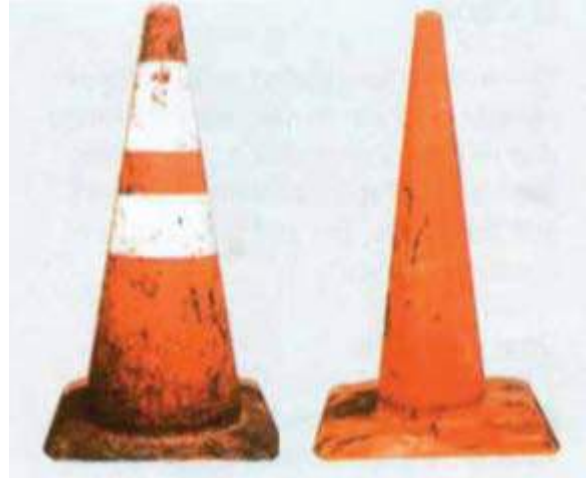
Acceptable

The conical shape should remain clearly identifiable with no significant distortion and must be free standing in its normal position. The surface is free of punctures and abrasions. The surface is free of asphalt splatter, cement slurry or other material and will readily respond to washing. The reflective bands, if required, have little or no loss of reflectivity, with only minor tears and scratches.



Marginal

The surface has some asphalt splattering or cement slurry and may not be readily cleaned due to abrasion and discoloration. The reflective bands, if required, have numerous tears and scratches, but are free of large areas of residue or missing material.



Unacceptable

Punctures and large areas of staining asphalt splatter or cement slurry make these an unlikely candidate for improvement. Large areas of missing or stained reflective material make the cone unacceptable.



4.3 Warning Lights, Arrow Boards, and Portable Changeable Message Signs

All Type A, B, C and D warning lights, advance warning arrow boards, and portable changeable message signs shall be in accordance with the most current version of the MUTCD.

For Type A, B, C and D warning lights to be functioning properly, they must meet the MUTCD criteria which states: “Type A low intensity flashing warning lights and Type C steady burn warning lights shall be maintained so as to be capable of being visible on a clear night from a distance of 3,000 feet. Type B high intensity flashing warning lights shall be maintained so as to be capable of being visible on a sunny day when viewed without the sun directly on or behind the device from a distance of 1,000 feet.”

The evaluation guide that follows is to be used to evaluate the appearance and function of Type A, B, C and D warning lights, advance warning arrow boards, and portable changeable message signs. Because of the different types of advance warning arrow boards approved for use, the evaluation guide will address each type (mode) of panel separately.

Any warning light, arrow board, or portable changeable message sign, which is out of alignment from the intended driver’s line of vision, shall be considered to be “unacceptable.”

4.3.1 Warning Lights

Acceptable: One hundred percent (100%) of all warning lights must be properly operating and meeting the MUTCD specifications.

Marginal: Not less than ninety percent (90%) of the warning lights must be properly operating and meeting the MUTCD specifications with no more than three (3) adjacent lights failing.

Unacceptable: Less than ninety percent (90%) of the warning lights properly operating and meeting the MUTCD specifications, or more than three (3) adjacent lights failing, or more than one (1) Type B warning light failing for more than twelve (12) consecutive hours or as specified in the contract document.

4.3.2 Arrow Boards

Arrow Board (Flashing Arrow Mode, or Sequential Arrow)

Acceptable: Not more than one (1) lamp out in stem and none out in arrowhead, and dimming properly.

Marginal: Two (2) or fewer lamps in stem out. No lamps out in the head. Dimming properly.

Unacceptable: Any lamp out in the head, or more than two (2) lamps out in the stem or arrow board not dimming properly.

Note: Any operating lamp that is out of alignment will be considered “not functioning.”

Arrow Board (Chevron Mode)

Acceptable: No lamps out in any chevron segment.

Marginal: Not more than one (1) lamp out in any one chevron segment, and dimming properly.

Unacceptable: Two (2) or more lamps out in any one chevron segment, or not dimming properly.

Note: Any operating lamp that is out of alignment will be considered “not functioning.”

Arrow Board (Double Arrow Mode):

Acceptable: Not more than one (1) lamp out in stem and none out in arrow heads, and dimming properly.

Marginal: Two (2) lamps out in stem, but both heads completely functional with no lamps out dimming properly.

Unacceptable: Any lamps in heads out or more than two (2) lamps out in the stem, or arrow board not dimming properly.

4.3.3 Portable Changeable Message Signs

Acceptable: Ninety percent (90%) or more of the pixels per character module are operating properly.

Marginal: No less than ninety percent (90%) of the pixels per character module are operating properly.

Unacceptable: Less than ninety (90%) of the pixels per character module are operating properly or not performing within the criteria of the MUTCD.

4.4 Storage of Temporary Traffic Control Devices

Temporary traffic control devices that are no longer applicable to a job shall not be stored in the City right-of-way. Traffic control devices are required to be removed from the City right-of-way within a twenty-four-hour period following the expiration of a TTC Permit.

When temporary traffic control devices are permitted to be stored in the City right-of-way, the devices should be stored using the “cluster” method, a minimum of three (3) units per cluster. Devices shall not be stored on raised medians. Devices shall be stored in a manner that will not obstruct pedestrian, bicyclist, motorist, or wheelchair access nor create a visibility limitation for street or driveway access.



Chapter 5

Manual Traffic Control

5.0 Manual Traffic Control

In some situations, off-duty police officers or flaggers may be required to assist with temporary traffic control.

5.1 Police Officers

Use of police officers for manual control of traffic is helpful with certain types of temporary control and at times may be required. Police officers are particularly helpful at major intersections where lanes are restricted and/or some movements are prohibited. Police officers can reinforce posted prohibitions, actively direct drivers in the appropriate direction, and can assess changing traffic conditions and respond accordingly.

The contractor, utility, agency or other entity responsible for the work should consider the need for a uniformed off-duty police officer to assist with temporary traffic control. Mesa police officers should be given priority for temporary traffic control within the City of Mesa, unless no off-duty Mesa officers are available. If no Mesa officers are available for a given date and time, off-duty State Department of Public Safety officers, or Maricopa County Sheriff's deputies should be used until the next date Mesa officers are available. If an officer is required as part of an approved traffic restriction, work shall not proceed until an officer is available and on site.

Scheduling and hiring of off-duty Mesa police officers for temporary traffic control is done through the Mesa Police Department at 480-644-2092. A minimum of forty-eight hours' advance notice is needed. All costs associated with using off-duty police officers are the responsibility of the contractor, utility, agency or other entity responsible for the work.

Police officers hired to support construction, maintenance or special event traffic control should be briefed by their employer in detail on how the traffic is to move through the temporary traffic control zone, and what the officer is expected to do. At a minimum, officers are typically expected to:

- Contact the TTC Permit holder or City inspector to obtain direction on what activities will be performed
- Position themselves so as to have a good view of traffic approaching from all directions
- Reinforce speed limits, signed prohibitions, and other restrictions near or in the work zone
- Be in uniform and equipped with proper equipment such as high-visibility safety vest, two-way radio, signal cabinet police panel key, etc.
- Remain at their post always except for planned breaks
- Assist pedestrians as needed through the work zone
- Direct traffic manually as needed to accommodate unforeseen or unusual traffic pattern changes
- Assist difficult flagging operations by providing a more authoritative presence to drivers.
- Position their vehicle in a manner that does not obstruct sidewalks or traffic.
- Request a copy of the TTC Permit and approved TCP from the permit holder.



- Observe and report traffic problems immediately to TTC Staff or City inspector.
- Assist, as needed, with setup and removal of temporary traffic control devices

5.2 Flaggers

Flagger operations within the City of Mesa shall comply with Chapter 6E of the MUTCD.

Any individual who is stationed in a work zone providing flagging operations shall have completed training and possess current certification from a program meeting the training and certification standards of the National Safety Council Highway Flagger Training Program, the American Traffic Safety Services Association (ATSSA) flagger program or an equivalent program meeting the same objectives. An equivalent program must meet the FHWA standards for the control of traffic through highway work zones as defined in the MUTCD for streets and highways. Flaggers shall repeat training and certification requirements at least once every four years. This section does not apply to law enforcement personnel who are employed by governmental entities (A.R.S. 28-653).

Depending on the complexity of the flagger control operations, two-way radio communications may be required.

Pilot car operations shall comply with the conditions of an issued TTC Permit, approved traffic control plan, and Section 6C.13 of the MUTCD.

5.3 High Visibility Apparel

Workers exposed to the risks of moving roadway traffic or construction equipment shall wear high-visibility safety apparel meeting the requirements of International Safety Equipment Association (ISEA) “American National Standard for High-Visibility Safety Apparel” (see Section 1A.11), or equivalent revisions, and labeled as American National Standards Institute (ANSI) 107-2004 (or current edition) standard performance for Class 1, 2, or 3 risk exposure.

For daytime and nighttime activity, flaggers shall wear safety apparel meeting the requirements of the ISEA “American National Standard for High-Visibility Apparel” (see Section 1A.11) and labeled as meeting the ANSI 107-2004 (or current edition) standard performance for Class 2 risk exposure. The apparel background (outer) material color shall be either fluorescent orange-red or fluorescent yellow-green as defined in the standard. The retroreflective material shall be orange, yellow, white, silver, yellow-green, or a fluorescent version of these colors, and shall be visible at a minimum distance of 300 m (1,000 ft.). The retroreflective safety apparel shall be designed to clearly identify the wearer as a person.





Chapter 6

Service Vehicles

6.0 Service Vehicles

A service vehicle is a vehicle used in the construction, operation, maintenance, or service provision of a municipal, utility or other similar facility, infrastructure or service. Service vehicle operations typically consists of a single vehicle or a single vehicle with a shadow vehicle (arrow board). Reference figure 36-38 in Appendix A. When service vehicles must travel slowly or stop for brief periods, they are to display the following operating high-level warning light system:

- High intensity rotating, flashing, oscillating, or strobe lights and four-way hazard flashers. Service vehicles with this type of lighting system may be used to close a lane for a maximum of 15 minutes. One (1) arrow board must be used in combination with this type of warning light system to increase the length of time to close a lane to a maximum of 60 minutes. This method is encouraged when closing lanes on arterial roadways.
- A short taper of cones (50-foot taper consisting of six (6) traffic cones) must be used behind a service vehicle in addition to the lighting system described above.

The high intensity rotating, flashing, oscillating, or strobe lights must be visible to drivers who are approaching the service vehicle in the same lane the service vehicle is in, and to drivers approaching from the same direction in adjacent lanes. The lights cannot be obstructed by dump beds, vehicle-mounted equipment, or work activities. Minimum mounting height should be seven feet. It may also be desirable for the rotating, flashing, oscillating, or strobe lights to be visible to drivers approaching from different directions depending on specific circumstances such as time of day, proximity to traffic in opposing lanes, etc.

The arrow board shall be mounted on a vehicle, a trailer, or other suitable support. Minimum mounting height should be seven feet from the roadway to the bottom of the board, except on vehicle-mounted boards, which should be as high as practical. The size and operation of the arrow board shall meet the requirements as noted in Chapter 6 of the MUTCD.

Line of sight issues based on roadway geometry, landscaping, or other mitigating circumstances, shall require the use of a separate shadow vehicle (and in some cases, additional traffic control devices) behind the service vehicle in order to provide adequate advance notification of the lane restriction. The use of multiple shadow vehicles to close more than one lane of traffic is prohibited.

Service vehicle operations are prohibited on arterial or collector streets during peak traffic hours as noted in Section 1.2 of this manual, except when authorized by TTC Staff or under emergency conditions.

15- Minute Short Term Service Vehicle Example



Service vehicle should be equipped with the following:

- High intensity rotating, flashing, oscillating, or strobe lights
- Four-way hazard flashers
- A short taper of cones (50-foot taper consisting of six (6) traffic cones)

60- Minute Short Term/Slow-Moving Service Vehicle Example



Service vehicle should be equipped with the following:

- High intensity rotating, flashing, oscillating, or strobe lights
- Four-way hazard flashers
- A short taper of cones (50-foot taper consisting of six (6) traffic cones)
- One (1) arrow board



Chapter 7

Pedestrian and Bicycle Access Considerations

7.0 Pedestrian Access Considerations

Access to sidewalks/pathways (paved or unpaved), marked and unmarked crosswalks (including school crosswalks), and bus stops shall be maintained in a safe, usable condition as described in this chapter and in accordance with the Americans with Disabilities Act (ADA). Pedestrian access considerations shall comply with Chapter 6D of the MUTCD.

7.1 Closure/Detour of Pedestrian Facilities

Pedestrian facilities should remain open and accessible at all times. If the work being performed by the contractor warrants a closure or detour of a pedestrian facility the contractor must apply for a TTC Permit and submit a Temporary Pedestrian Access Plan (TPAP) to TTC Staff for review. The information on the TPAP shall comply with Section 6F.14 of the MUTCD for signing and barricade requirements of the sidewalk/pathway closure or detour. A sample of a TPAP may be found in Appendix A of this manual.

7.2 Relocation of Pedestrian Facilities

When pedestrian routes (paved or unpaved) need to be temporarily relocated, the relocated routes should be maintained on the same side of the street as the original route unless otherwise approved by TTC Staff. If a traffic lane is used for a temporary pedestrian route, the pedestrians should be separated from traffic by temporary traffic barrier or longitudinal channelizing devices where feasible. Longitudinal channelizing devices must comply with Section 6F.74 of the MUTCD for detectible edging for pedestrians. Factors to be considered in determining the separation method include length of relocated route, duration of relocation, volume and speed of traffic, volume of pedestrians, physical constraints to placing barriers or longitudinal channelizing devices, curb height, and lane width. An ADA compliant ramp shall be installed perpendicular or parallel to the sidewalk and include a compliant landing at the top and bottom of the ramp. The maximum ramp slope allowed is 1:12. The “Pedestrian Guide” R11-11a sign should be used to guide pedestrians into a temporary pathway. A minimum of one sign should be used at each access point into a temporary pathway. In some urban locations where there may not be room behind the sidewalk to place the R11-11a sign, a smaller 12” x 18” size may be used on a sign support with a base of no wider than 12-inches.

Temporary pedestrian pathway design features should contain the following:

- The width of the existing pedestrian facility should be provided for the temporary pathway
- A 5' x5' passing space should be provided every 200 feet when it is not possible to maintain a minimum width of five feet throughout the entire length of the pedestrian pathway
- All-weather, compacted, smooth surface with dust control
- 5% maximum cross slope in either direction
- No abrupt change in grade height greater than ½ inch

- When pedestrian access is maintained by the use of steel road plates, the surface must be maintained level, smooth, and the approach to the plates must be ADA compliant (a grade no greater than 1:12)

When pedestrians are maintained in a temporary pathway in the roadway behind channelizing devices, the speed limit of the work zone must not exceed 35 mph.

Steel plates used in crosswalk areas must have the smooth side of the plate up and cold mix used at the edge of the plates (12:1 slope) to accommodate pedestrian access. Steel road plates shall be installed per MAG standard trench plating detail.

For pedestrian access design samples see Appendix A of this manual.

For any additional pedestrian access considerations not noted in this manual, refer to Part 6 of the MUTCD.

7.3 Special Pedestrian Requirements for Demolition and Construction of Buildings

Where demolition and construction of buildings near sidewalks is taking place, special provisions need to be made for pedestrians. Gates and/or temporary fencing serving as access to the construction site shall not open out into the street or impede pedestrian walkways. If the activity has the potential for dropping loads or creating hazards for pedestrians on the sidewalk, a covered walkway shall be provided for pedestrian protection. Construction of a covered walkway may require additional permitting through Development Services. This is commonly necessary when the building wall is within six feet of the walkway, or when the distance of the walkway from the building is less than one-half the height of the exterior wall. The TTC Staff will determine when a covered walkway is necessary, but is generally not required if the walkway is a greater distance than one-half of the height of the exterior wall from the building. In that case, a construction fence is typically required to be installed prior to beginning of either the construction or demolition of the site. Access to fire hydrants, traffic signal control boxes, traffic signal pedestrian push buttons, manholes, and other utilities shall be maintained at all times.

A contractor intending to demolish or construct buildings in the area of pedestrian facilities, shall submit a TPAP to TTC Staff for review. No loading or unloading of material, staging or stopping of vehicles, will be allowed on the street side of walkways and fences without approval from TTC Staff.

7.4 Bicycle Considerations

Bicyclist use of City streets, paths, designated lanes, and routes need to be considered during construction or other limiting activities. If any of these facilities cannot be maintained, the contractor is responsible to provide alternative bicycle access considerations.



When closing bicycle lanes/routes on City streets, the use of the W11-1/W16-1 “Bicycle Symbol/Share The Road” sign assembly shall be used to indicate the closure of that facility. This sign assembly is normally placed 50 feet prior to a merging or shifting taper. A sample of this application can be found in Appendix A of this manual.

When closing bicycle pathways or multi-use pathways the contractor will need to provide an alternative detour route for bicycles. The use of M4-9 (a, b, c) signs should be used to guide bicycles from the existing pathway onto the temporary route. If the pathway is a designated bicycle route, the route number may be required to be included on the detour signing. Route numbering for bike routes on detour signing should be placed above the M4-9 sign or incorporated into the sign. Reference Section 6F.59 in the MUTCD for additional guidance on sign placement and sign design requirements.



Chapter 8

Transit Services

8.0 Transit Services

Contractor shall maintain all existing transit stop locations or provide alternate bus stop locations as required by TTC Staff. All temporary traffic control devices, signs, and temporary pedestrian ramps for transit stop locations shall comply with the Americans with Disabilities Act (ADA), and where noted, the MUTCD. Contractor shall prepare and submit a TCP for City's review and approval prior to any relocation of a transit stop. Contractor shall notify City of Mesa Transit Coordinator (480-644-4131) at least fourteen (14) days prior to any bus stop relocations or access restrictions. See Appendix A in this manual for examples of transit stops within a work zone.

When an individual transit stop is closed and a temporary stop is utilized, the contractor shall place way finding signing for the transit user from the closed stop to the temporary stop. Existing transit stop signing must be covered/bagged while temporary signs are in use. The Contractor shall provide approximate distances between the closed stop and temporary stop to the Mesa Transit Coordinator at least (14) calendar days prior to relocation in order to coordinate with Valley Metro Operations.

When construction activities require that transit services are rerouted, detoured, or when multiple stop locations on the same route are affected, a notification must be submitted to the City of Mesa Transit Coordinator in the same time frame as noted above. The Contractor will be responsible for posting route modification information at the individual stop locations seven (7) days in advance of the beginning of the detour. A template of the route modification notice may be obtained from the City of Mesa Transit Coordinator. The Contractor is responsible for removing all route modification notices once the route has been restored to normal operations or is no longer needed.

If a transit stop is closed or impacted by a route detour or construction activities for more than (24) hours, the Contractor shall be responsible for maintaining the general cleanliness of the affected stop locations and all signing related to the reroute, detour, or closure. This includes emptying trash receptacles, trash pick-up within a minimum fifteen (15) foot radius of the stop, general cleanup in and around the shelter or designated stop, and power washing if necessary. Transit stop cleanliness and maintenance issues will be monitored by the Transit Coordinator for the duration of the project through periodic inspections. The Contractor shall be responsible for correcting cleanliness and maintenance issued within (24) hours of notification by the Transit Coordinator or TTC Staff.



Chapter 9

Special Events

9.0 Special Events

A special event is an activity conducted on, or adjacent to, City roadways where certain aspects of the event have the potential to disrupt the City's transportation system by contributing to higher than normal traffic volumes and unexpected delays. These events can be beneficial in showcasing a specific area, community, or an entire city. Advance planning with City departments may mitigate delay and frustration by reducing confusion for those drivers traveling in the event area.

Activities of an event may include:

- Parking, access and exiting, which could affect normal traffic flow.
- Restricting or closing a portion of any City street.
- Higher than normal pedestrian activity in the event area.
- The use of temporary traffic control devices to facilitate movement of event and non-event traffic.

9.1 Special Event Traffic Related Concerns

As part of the special event planning process, applicants should consider:

- Other scheduled events.
- Availability of parking and ADA accessibility.
- Drop-off and pick-up locations.
- The impact on local and business access.
- Emergency services (fire, police, hospitals, etc.).
- Transit routes and stops.
- Time of day.
- The impact on City streets (i.e. restrictions and possible closures)

Addressing these concerns early in the event planning process may reduce the traffic control requirements for a special event.

9.2 Requirements

Any special event as specified in Section 5 Chapter 1 of Mesa City Code, requires a Special Event License from the Finance Director. Special Event Licenses can be obtained from the Licensing Office at 55 N. Center St., Mesa, Arizona. Additional information is available on the Licensing website at <http://www.mesaaz.gov/business/licensing>.

If public ways such as streets, sidewalks, pathways, or alleys are impacted by the event, a TTC Permit and a TCP are required. A TCP must be submitted to the Transportation Department for review. Depending on the complexity of the event and the potential for the Tax and Licensing processing time of thirty (30) to ninety (90) days, it is recommended that the event coordinator meet with TTC Staff at least sixty (60) days in advance of the event date to discuss TTC requirements.

9.2.1 Pre-Event Temporary Traffic Control Planning

For events requiring closures, restrictions, or impacts of City right-of-way, a special event applicant shall contact TTC Staff within seven (7) days of filing for the Special Event License (Licensing Office) to



discuss TTC needs. The applicant will be responsible for hiring a professional traffic control provider to design and submit the TCP which meets the design criteria noted in Section 1.5.1 of this manual.

The applicant is required to apply for and obtain a TTC Permit for the event. The applicant shall comply with all conditions of the TTC Permit and approved TCP.

9.2.2 Special Requirements

For events with street or lane closures, portable changeable message signs and/or static signs are required a minimum of ten (10) calendar days in advance of the event to notify the public of upcoming restrictions or closures. The number and location of these signs are dependent upon the size of the event and the number of streets impacted. See Appendix A FIG-02 for a sample of the special event static sign.

Lane restrictions, street closures, or affected signalized intersections may require one or more uniformed police officers to direct traffic. Volunteers or flaggers are not permitted to direct traffic. The number and location of these officers are dependent upon the size of the event and the number of streets or intersections impacted.

Full street closures should be considered for static events, parades, and marches held in the street. Full street closures or directional closures should also be considered for running, biking and walking events whenever possible to separate participants from traffic.

Channelization shall be used to separate running, walking, and biking participants from traffic when full closures are not permitted. Police escorted biking event may not require the same level of channelization.

TTC staff shall inspect the proposed event route and notify the appropriate City departments of any potential hazards on the route. Hazards to runners, walkers, bicycles, and motorcycles may include potholes, pavement grooves, missing utility inspection covers, sand, gravel, rocks, or construction debris.



Appendix A

Typical Temporary Traffic Control Applications

The following pages show typical applications for signs, barricades, and channelizing devices for commonly encountered situations. Each illustration represents strategic applications of temporary traffic control devices proven to be both effective and efficient for urban conditions throughout Mesa. Specific situations, not specifically illustrated, need to be addressed making best use of the general principles and guidelines found in this TTCM, the MUTCD, and these illustrations. Specific situations may also require additional engineering judgment.

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	Channelizing Device
	Arrow Panel
	Rigid Sign Stand
	Type I Barricade
	Longitudinal Channelizing Device
	Barrier
	High Level Warning Device
	Type III
	Changeable Message Sign
	Flagger
	Direction of Traffic
	Shadow Vehicle
	Work Vehicle
	Work Area



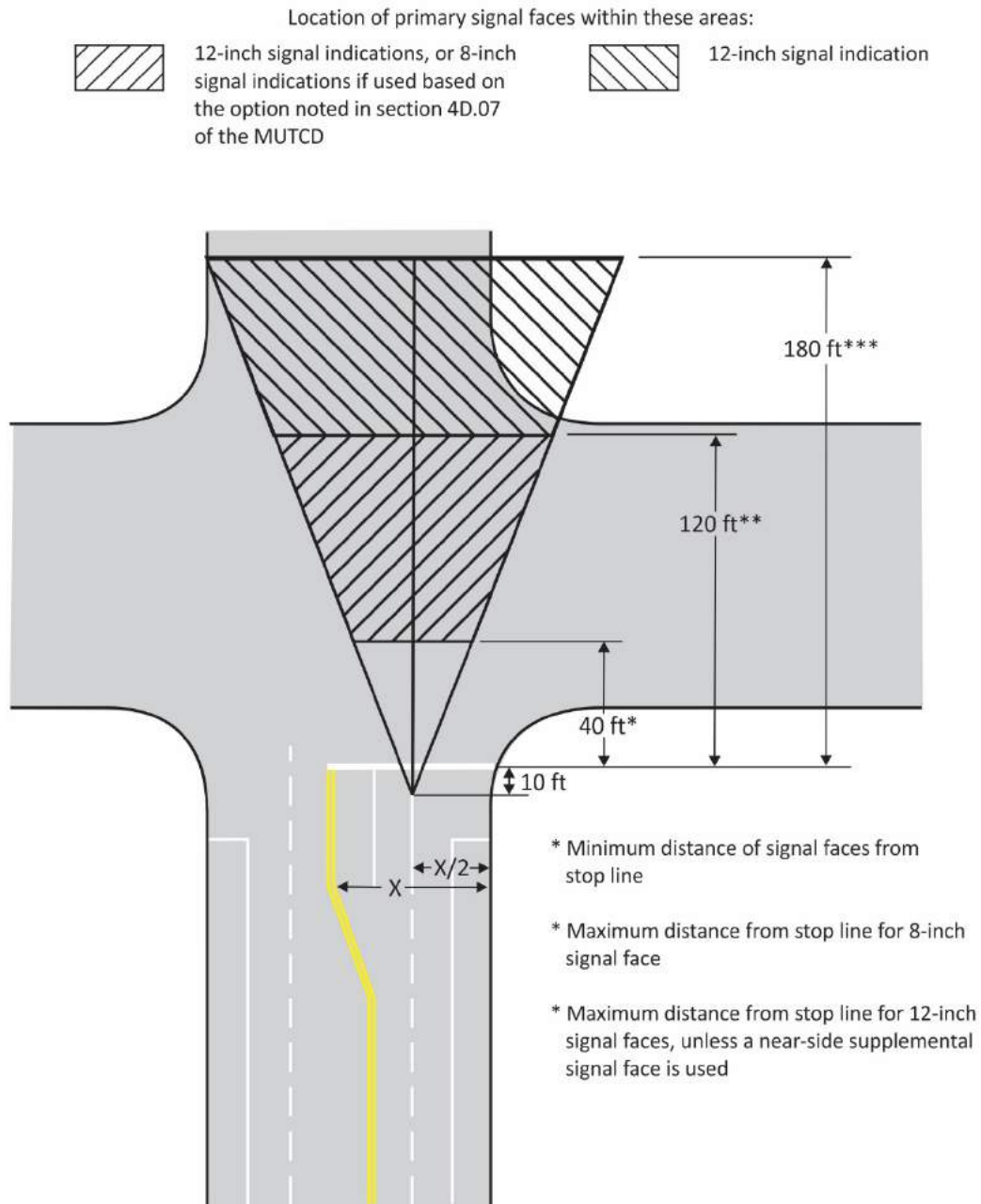
City of Mesa Department of Transportation
Traffic Engineering Department

LEGEND

(FOR SYMBOLS USED ON TYPICAL APPLICATIONS)

Date
07-29-16

Detail
FIG-01



NOTE: Reference Section 4D.13 Lateral Position of Signal Faces in the MUTCD for additional information on the Driver Cone of Vision.



City of Mesa Department of Transportation
Traffic Engineering Department

DRIVER'S CONE OF VISION

At Traffic Signals

Date
07-15-16

Detail
FIG-02

Recommended Advance Warning Sign Minimum Spacing			
Road Type	Distance Between Signs		
	A	B	C
Urban (low speed)	100 feet	100 feet	100 feet
Urban (high speed)	350 feet	350 feet	350 feet
Rural	500 feet	500 feet	500 feet
Expressway / Freeway	500 feet	500 feet	500 feet
Ref. Table 6C-1 Recommended Advance Warning Sign Minimum Spacing in the MUTCD			

Maximum Spacing of Channelizing Devices			
Speed (mph)	Maximum Channelizing Device Spacing		
	Taper* (feet)	Tangent (feet)	Conflict** (feet)
20	20	40	10
25	25	50	12
30	30	60	15
35	35	70	17
40 or higher	40	80	20
* Maximum channelizing device spacing for all speeds on shifting tapers is 20 feet. Spacing for traffic cones used in merging tapers shall not exceed 25 feet regardless of speed.			
** Use on intermediate and short-term projects for shifting tapers where there are no pavement markings or where there is a conflict between existing pavement markings and channelizing devices.			

Buffer Spacing	
Speed*	Distance
20 mph	115 feet
25 mph	155 feet
30 mph	200 feet
35 mph	250 feet
40 mph	305 feet
45 mph	360 feet
50 mph	425 feet
* Posted speed, off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed	
Ref. Table 6C-2 Stopping Sight Distance as a Function of Speed in the MUTCD	



City of Mesa Department of Transportation
Traffic Engineering Department

REFERENCE MATERIALS

Sign Spacing, Buffer Distance, & Channelizing Spacing

Date
06-15-17

Detail
FIG-03

Taper Length Criteria for Temporary Traffic Control Zones	
Type of Taper	Taper Length
Merging Taper	at least L
Shifting Taper	at least 0.5 L
Shoulder Taper	at least 0.33 L
One-Lane, Two-Way Traffic Taper	50 feet min., 100 feet max.
Downstream Taper	50 feet min., 100 feet max.
Ref. Table 6C-3 Taper Length Criteria for Temporary Traffic Control Zones	

Formulas for Determining Taper Lengths	
Speed Limit	Formula
40 mph or less	$L = WS^2 / 60$
45 mph or greater	$L = WS$
$L = \text{Taper Length (ft)}$ $W = \text{Width of Lane (ft)}$ $S = \text{Posted Speed Limit (mph)}$	
Ref. Table 6C-4 Taper Length Criteria in the MUTCD	

Typical Taper Lengths				
Speed Limit (mph)	Taper Length (L) (feet)			Spacing Between Devices (feet)
	Lane Width:			
	10'	11'	12'	
25	104	115	125	25*
30	150	165	185	30
35	204	225	245	35
40	267	293	320	40
45	450	495	540	45
50	500	550	600	50
55	550	605	660	55



City of Mesa Department of Transportation
Traffic Engineering Department

REFERENCE MATERIALS

Tapers

Date
06-15-17

Detail
FIG-04

						
W1-3L 36" x 36"	W1-3R 36" x 36"	W1-4L 36" x 36"	W1-4R 36" x 36"	W1-4bL 36" x 36"	W1-4bR 36" x 36"	W1-6(R)(L) 48" x 24"
						
W1-7 48" x 24"	W3-4 36" x 36"	W4-2L 36" x 36"	W4-2R 36" x 36"	W6-3 36" x 36"	W8-1 36" x 36"	W8-2 36" x 36"
						
W8-3 36" x 36"	W8-6 36" x 36"	W8-11 36" x 36"	W8-12 36" x 36"	W8-24 36" x 36"	W9-3 36" x 36"	W9-101 36" x 36"
						
W11-1 30" x 30"	W11-2 36" x 36"	W12-101 18" x 18"	W13-1P 18" x 18"	W16-1p 18" x 24"	W20-1 36" x 36"	W20-2 36" x 36"
						
W20-3 36" x 36"	W20-3 36" x 36"	W20-4 36" x 36"	W20-5 36" x 36"	W20-5 36" x 36"	W20-5a 36" x 36"	W20-5a 36" x 36"
						
W20-5aP 24" x 18"	W20-7 36" x 36"	W21-2 30" x 30"	W21-5 36" x 36"	W21-103 36" x 36"	W9-102 36" x 36"	W8-1aME 18" x 18"
Note: Referenced sign sizes are minimum requirements.						
 City of Mesa Department of Transportation Traffic Engineering Department		WARNING SIGNS				Date 06-15-17 Detail FIG-05



R1-1
30" x 30"



R1-2
36" x 36" x 36"



R1-3P
18" x 6"



R2-1
18" x 24"



R3-1
24" x 24"



R3-2
24" x 24"



R3-4
24" x 24"



R3-5L
18" x 24"



R3-5R
18" x 24"



R3-6R(L)
18" x 24"



R3-7L
30" x 30"



R3-7R
30" x 30"



R3-8LS
18" x 18"



R3-8SR
18" x 18"



R4-7a
12" x 18"



R4-8a
12" x 18"



R5-1
30" x 30"



R5-1a
36" x 24"



R6-1
36" x 12"



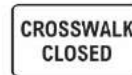
R6-2
18" x 24"



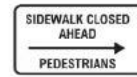
R9-3
24" x 24"



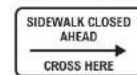
R9-9
24" x 12"



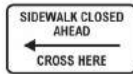
R9-9
24" x 12"



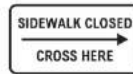
R9-11
24" x 12"



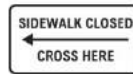
R9-11
24" x 12"



R9-11
24" x 12"



R9-11a
24" x 12"



R9-11a
24" x 12"



R10-6a
24" x 36"



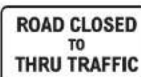
R10-11a
24" x 30"



R11-2
48" x 30"



R11-3a
60" x 30"



R11-4
60" x 30"



R11-11a
24" x 30"
or
12" x 18"



R9-9aME
24" x 18"



R7-2bME
12" x 18"

Note: Referenced sign sizes are minimum requirements.

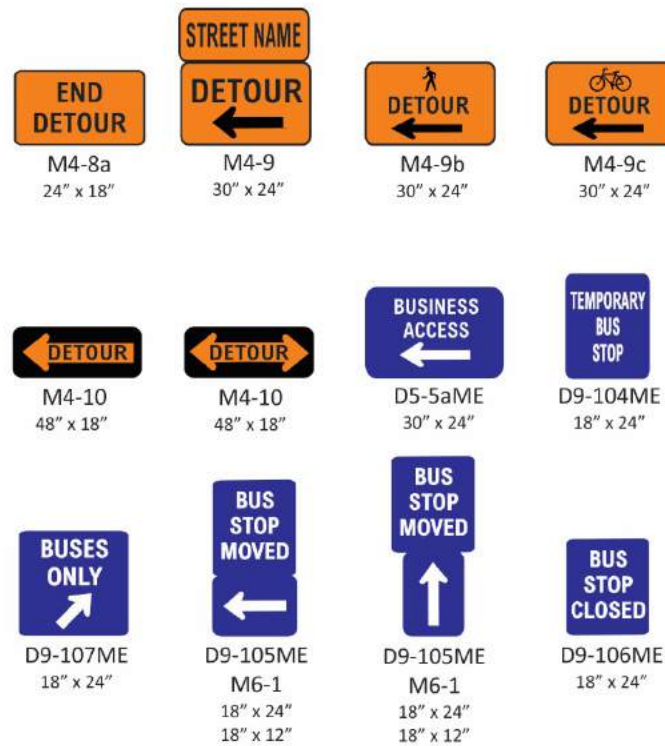


City of Mesa Department of Transportation
Traffic Engineering Department

REGULATORY SIGNS

Date
11-18-16

Detail
FIG-06



Note: Referenced sign sizes are minimum requirements.

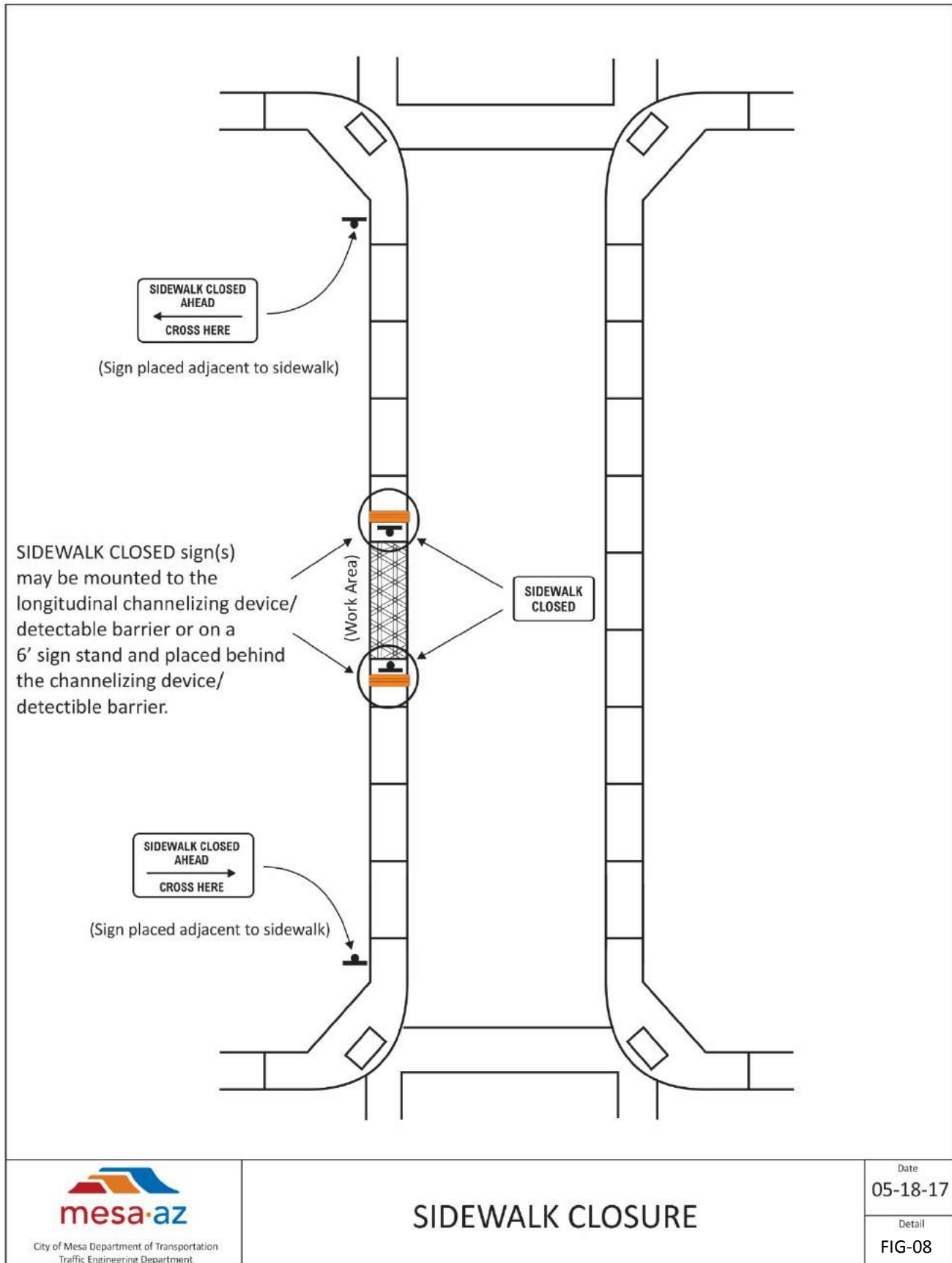


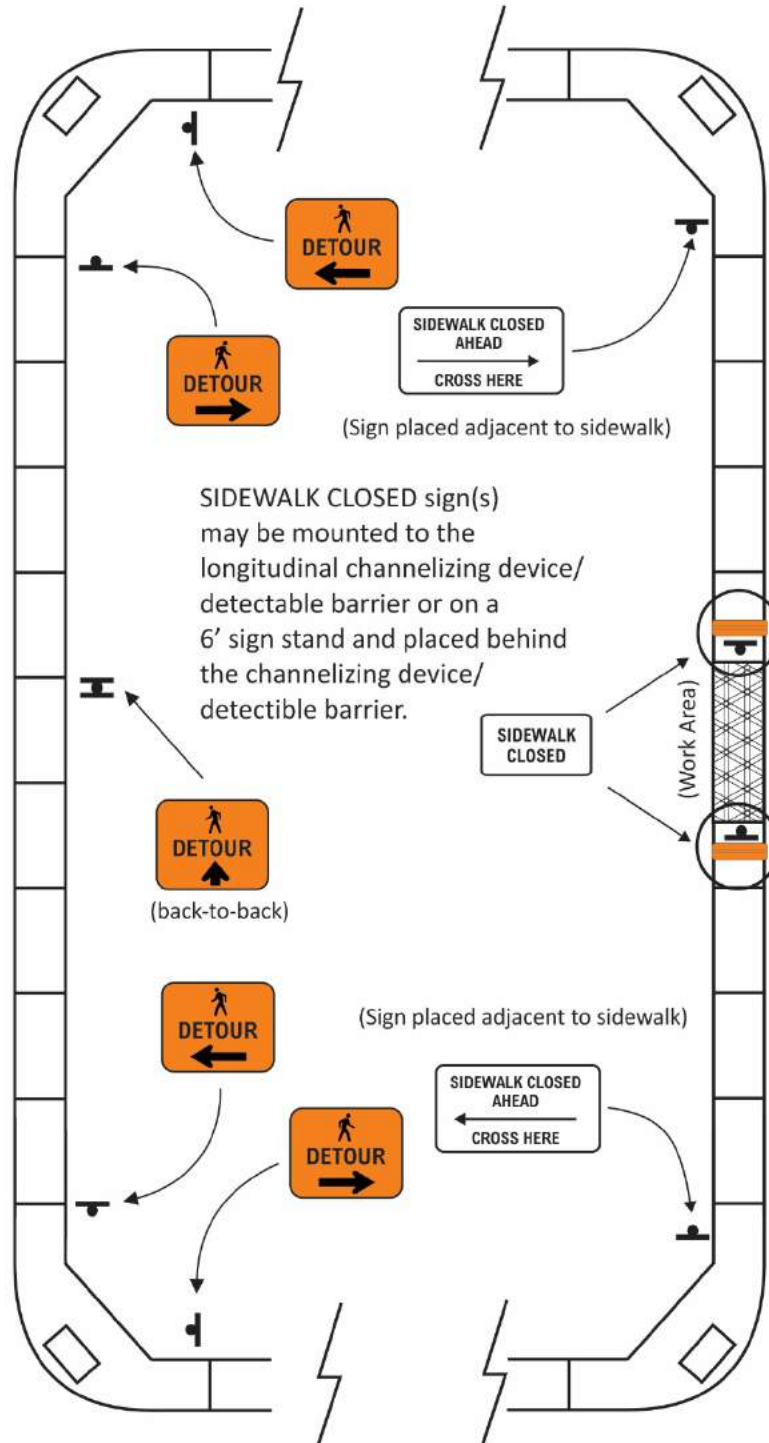
City of Mesa Department of Transportation
Traffic Engineering Department

GUIDE SIGNS

Date
11-18-16

Detail
FIG-07





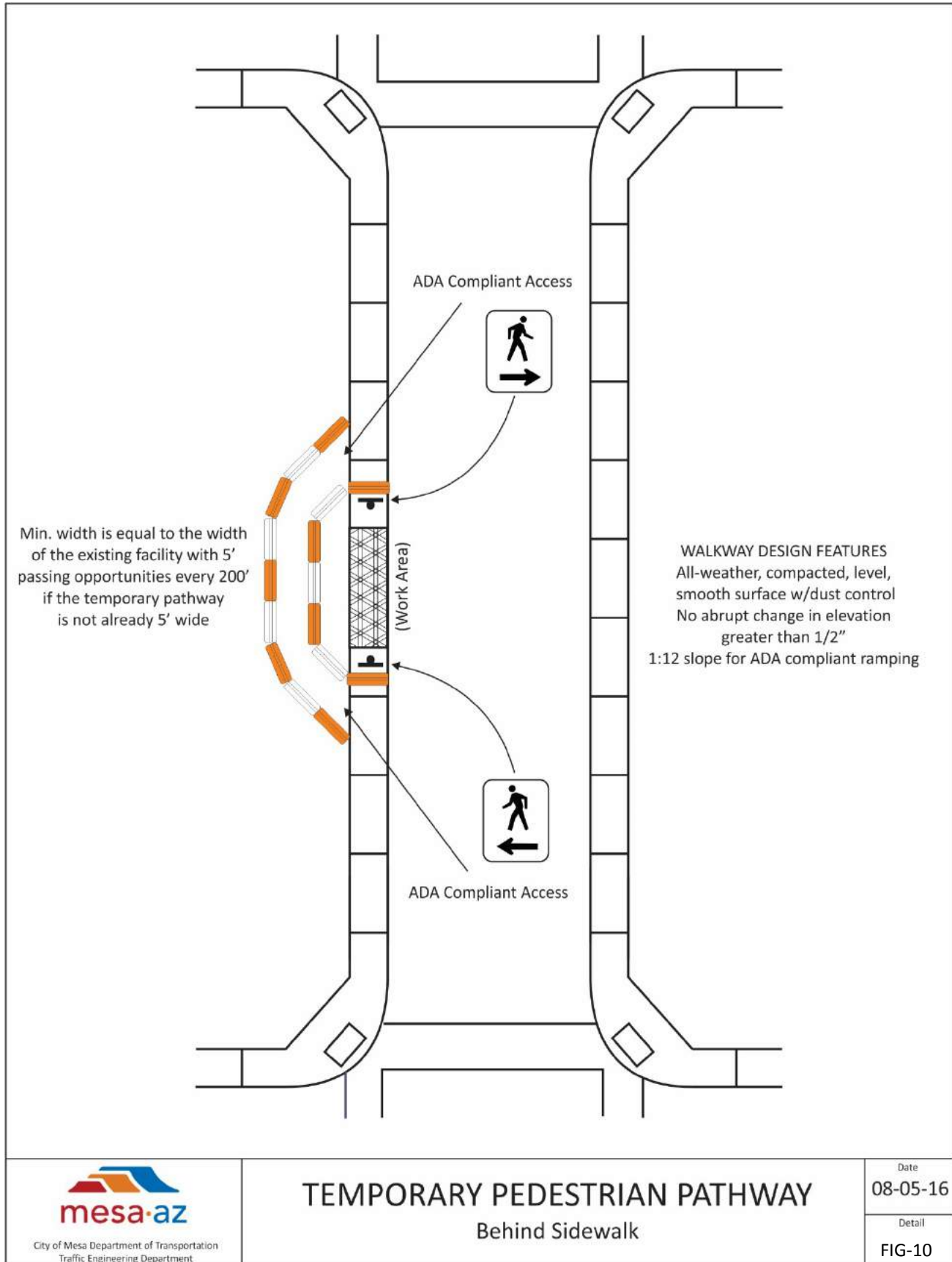
City of Mesa Department of Transportation
Traffic Engineering Department

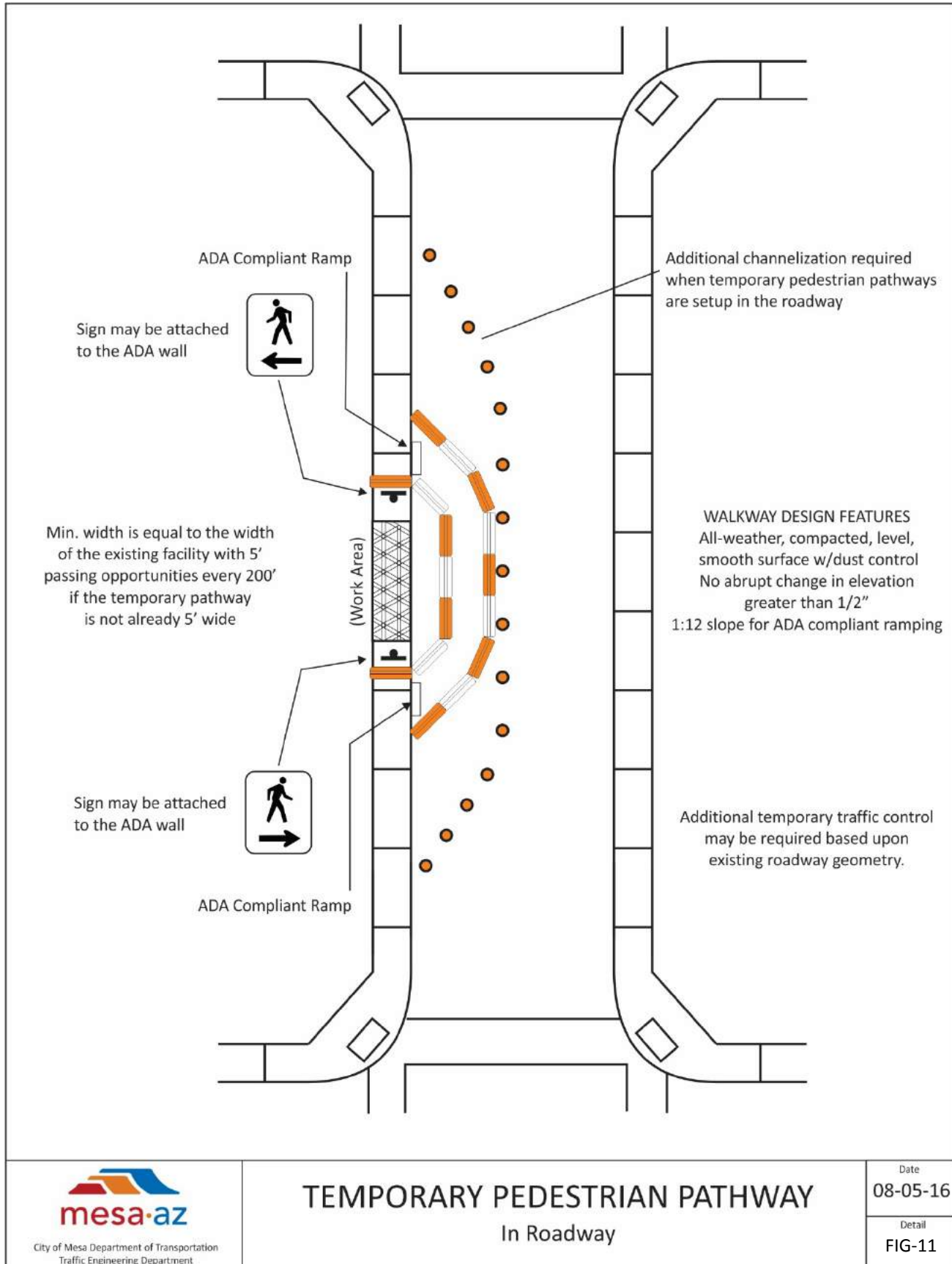
SIDEWALK CLOSURE

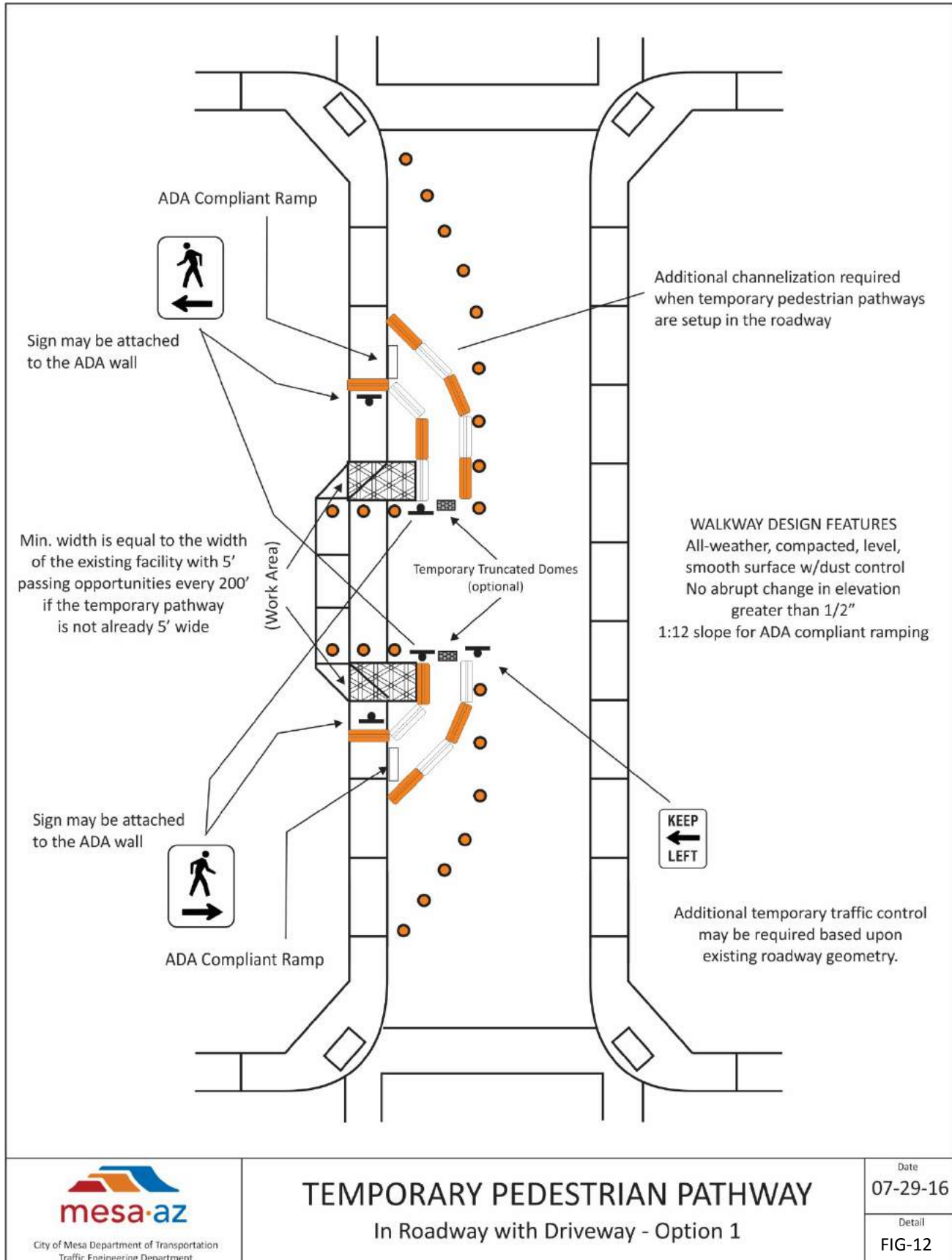
Pedestrian Detour

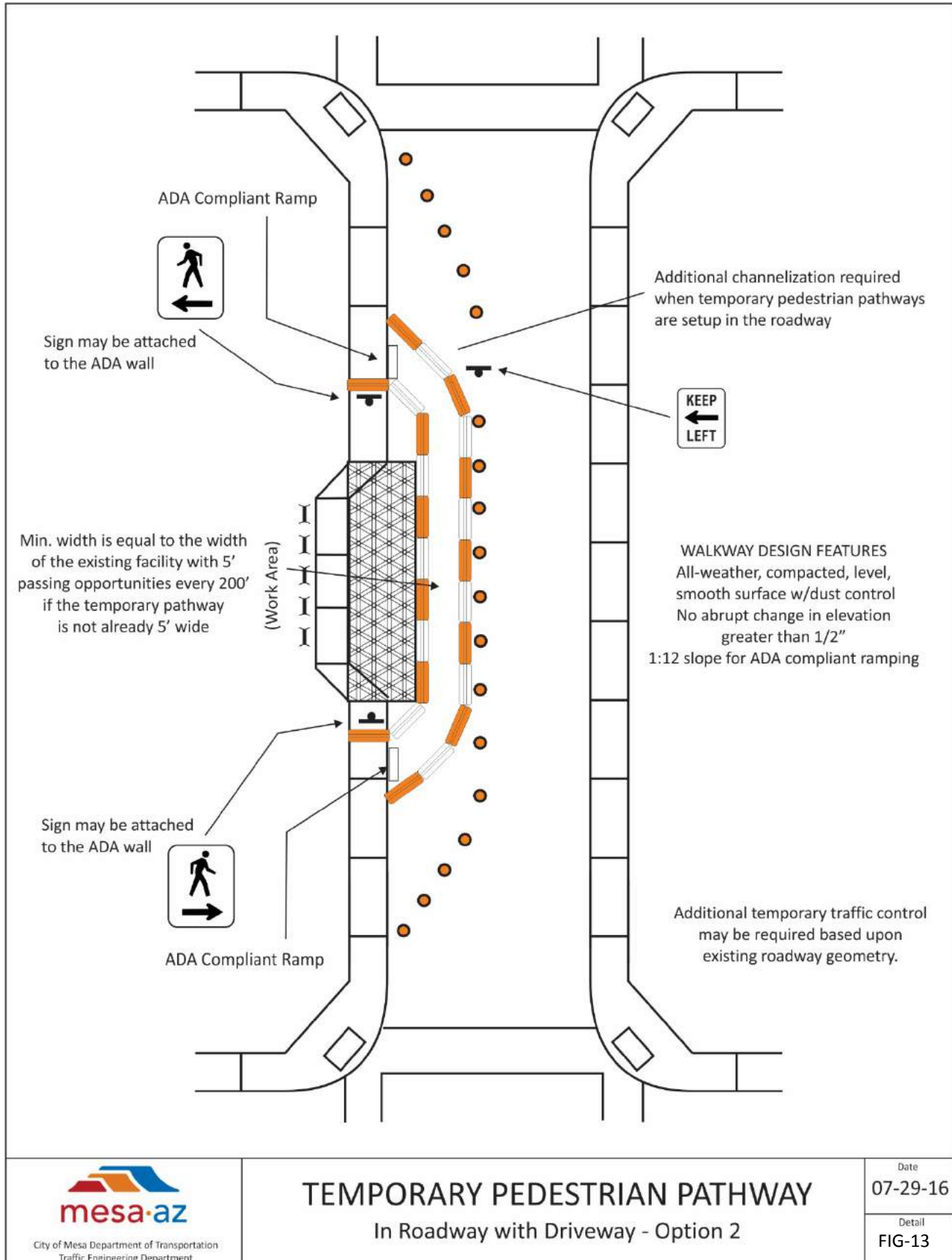
Date
05-28-17

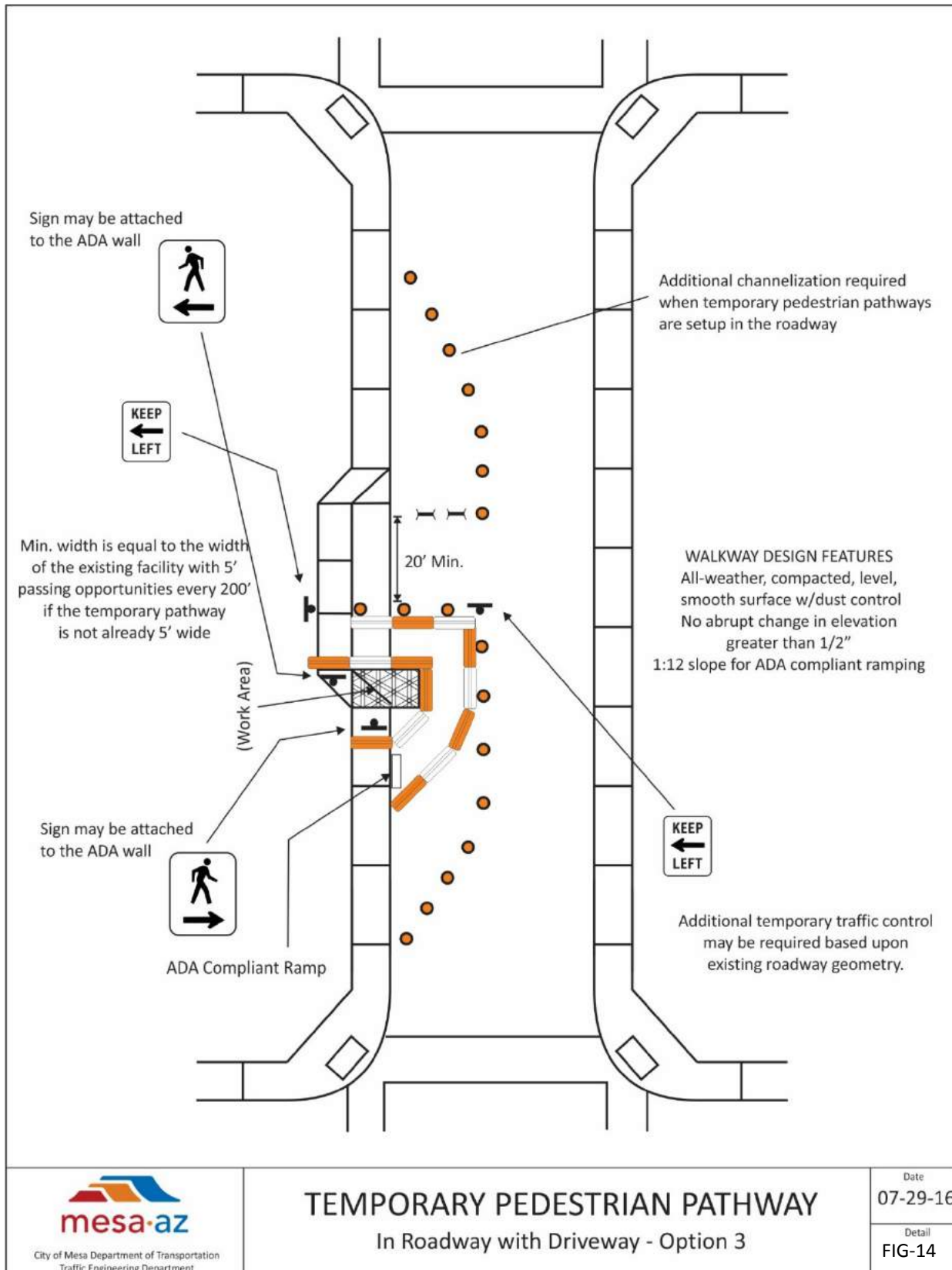
Detail
FIG-09

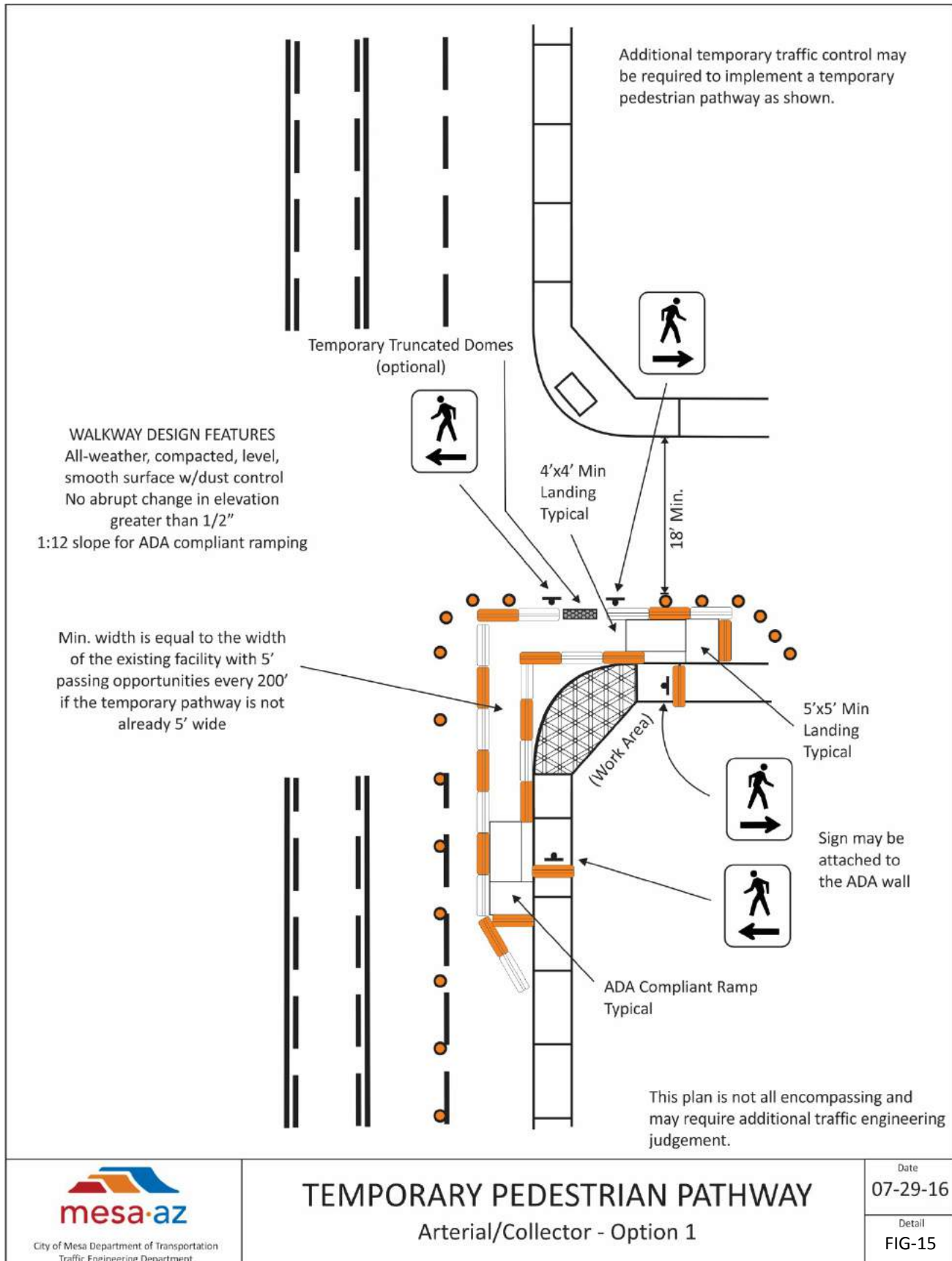


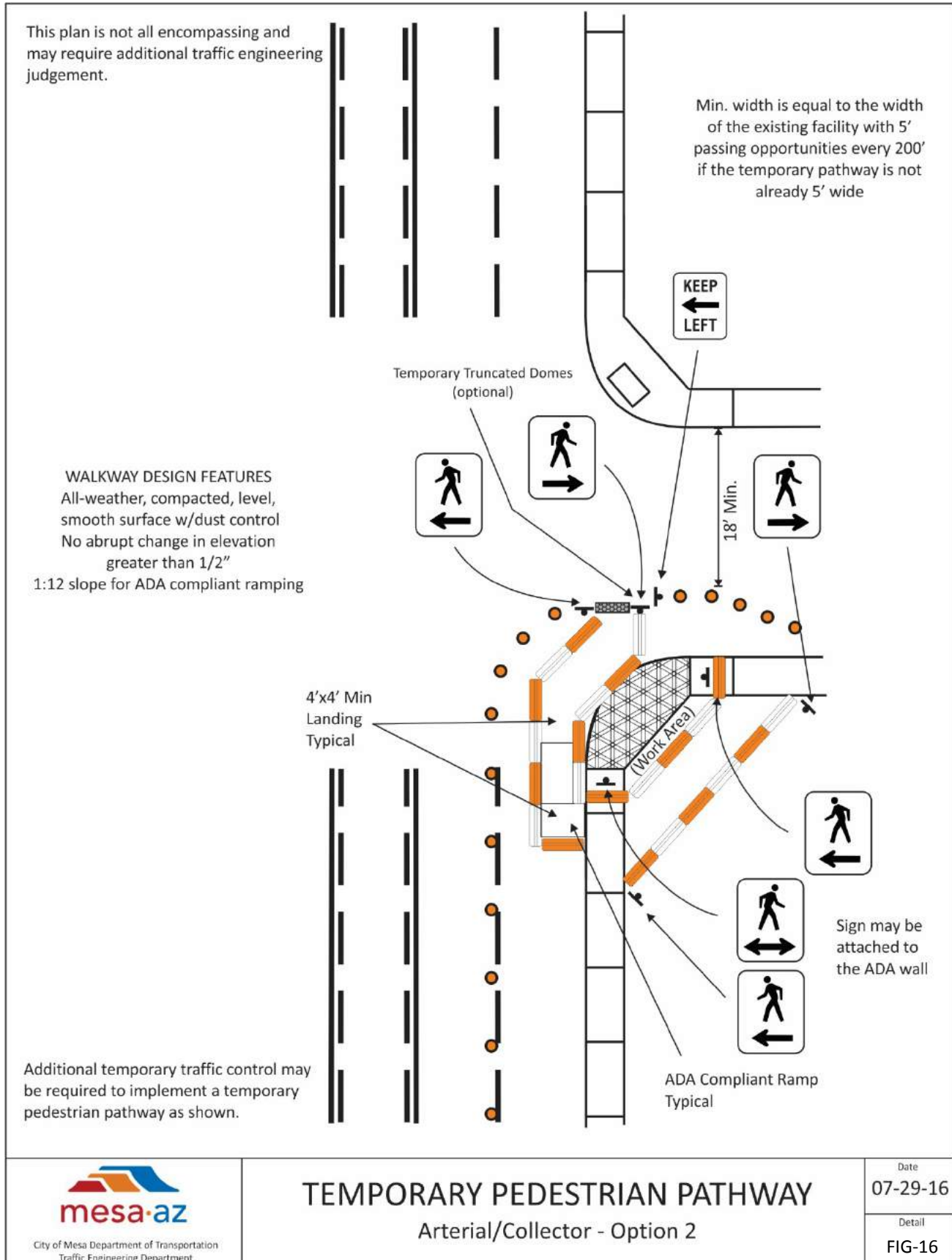












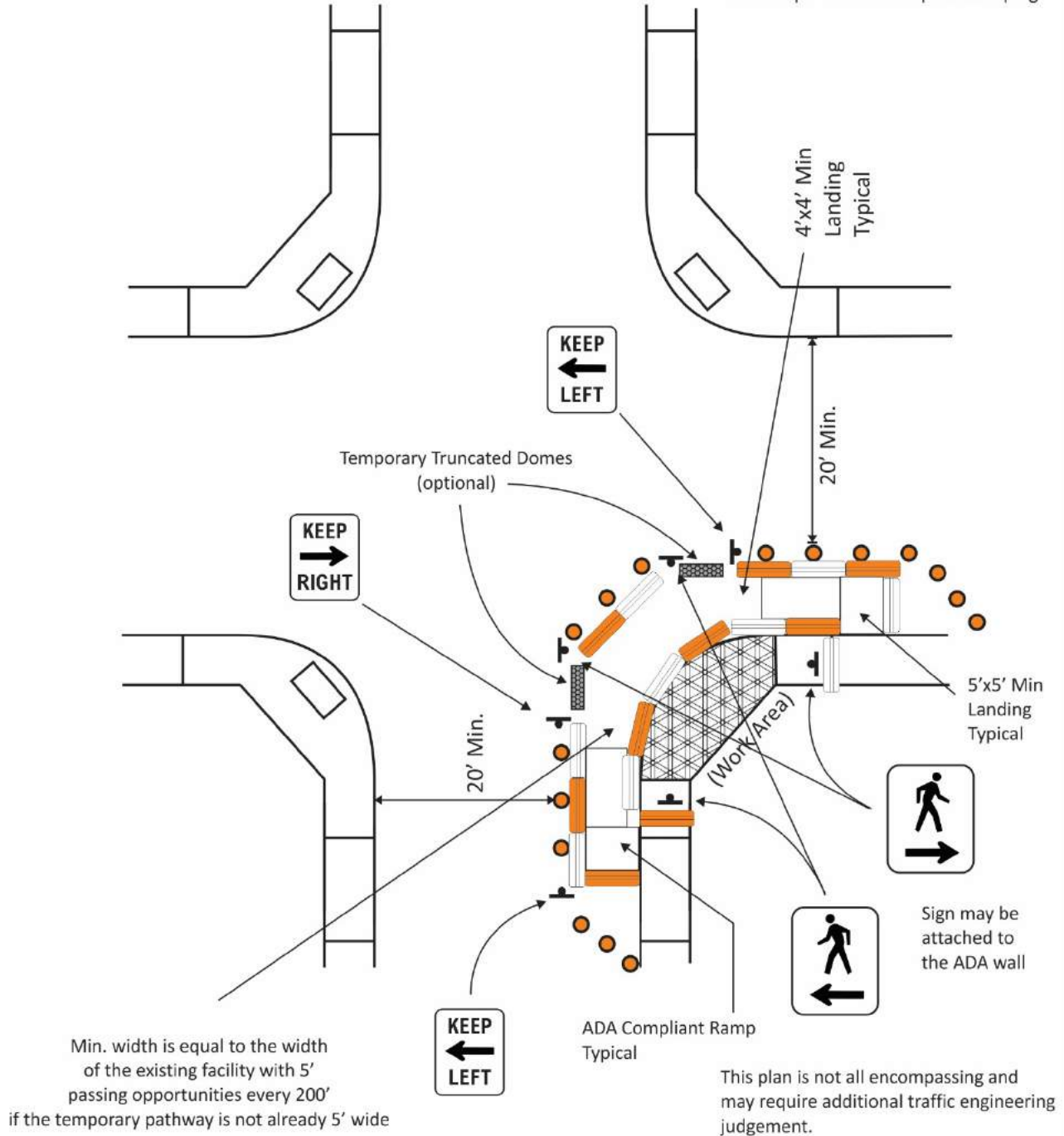
NOTE:

Parking prohibition and additional temporary traffic control may be needed based upon existing roadway geometry and residential/business access considerations.

WALKWAY DESIGN FEATURES

All-weather, compacted, level, smooth surface w/dust control
No abrupt change in elevation greater than 1/2"

1:12 slope for ADA compliant ramping



City of Mesa Department of Transportation
Traffic Engineering Department

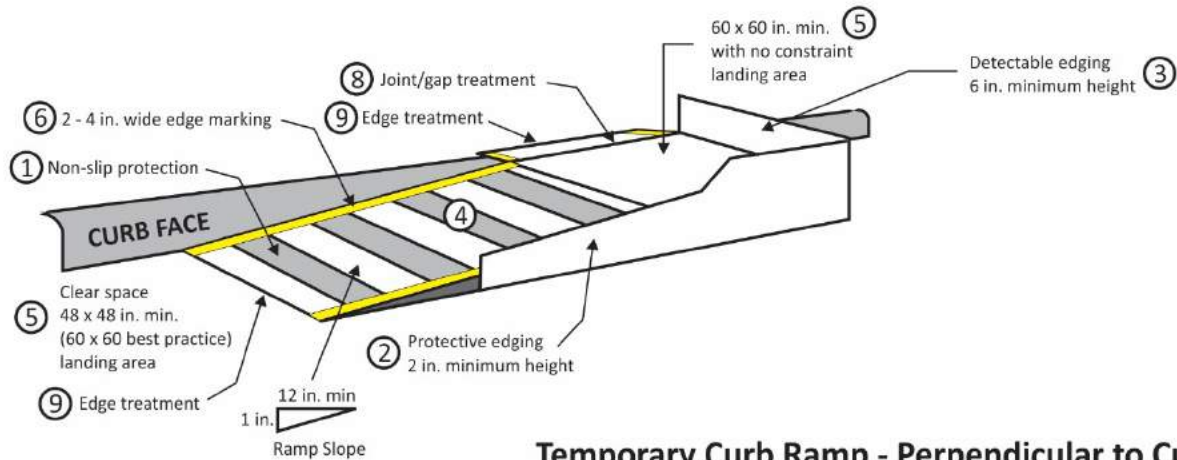
TEMPORARY PEDESTRIAN PATHWAY

Local Street

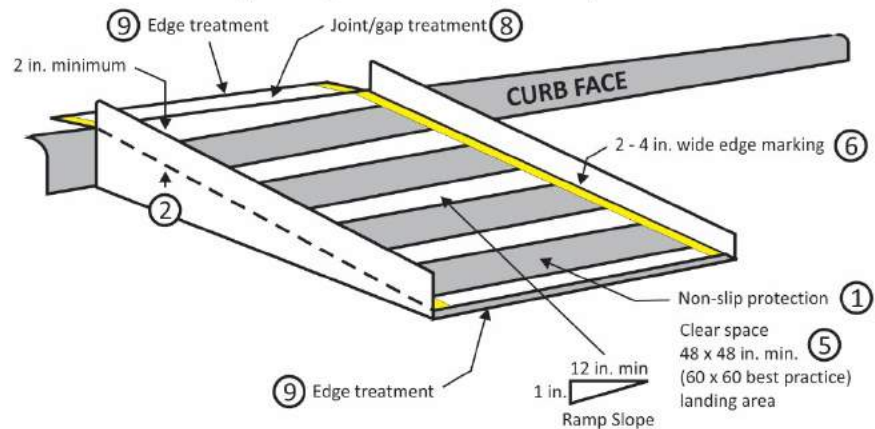
Date
07-29-16

Detail
FIG-17

Temporary Curb Ramp - Parallel to Curb



Temporary Curb Ramp - Perpendicular to Curb



NOTES:

1. Curb ramps shall be 48 in. minimum width (60 x 60 in. best practice) with a firm, stable and non-slip surface.
2. Protective edging with a 2 in. minimum height shall be installed when the curb ramp or landing platform has a vertical drop of 6 in. or greater or has a side apron slope steeper than 1:3 (33%). Protective edging should be considered when curb ramps or landing platforms have a vertical drop of 3 in. or more.
3. Detectable edging with 6 in. minimum height and contrasting color shall be installed on all curb ramp landings where the walkway changes direction (turns).
4. Curb ramps and landings should have a 1:50 (2%) max. cross-slope.
5. Clear space of 60 x 60 in. minimum shall be provided at the top for parallel ramps and a clear space of 48 x 48 in. minimum (60 x 60 in. best practice) above and below all other curb ramps.
6. The curb ramp walkway edge shall be marked with contrasting color 2 to 4 in. wide marking. The marking is optional where color contrasting edging is used.
7. Water flow in the gutter system shall not be restricted.
8. Lateral joints or gaps between surfaces shall be less than 0.5 in. width.
9. Changes between surface heights should not exceed 0.5 in. lateral edges should be vertical up to 0.25 in. high, and beveled at 1:2 between 0.25 in. and 0.5 in. height.

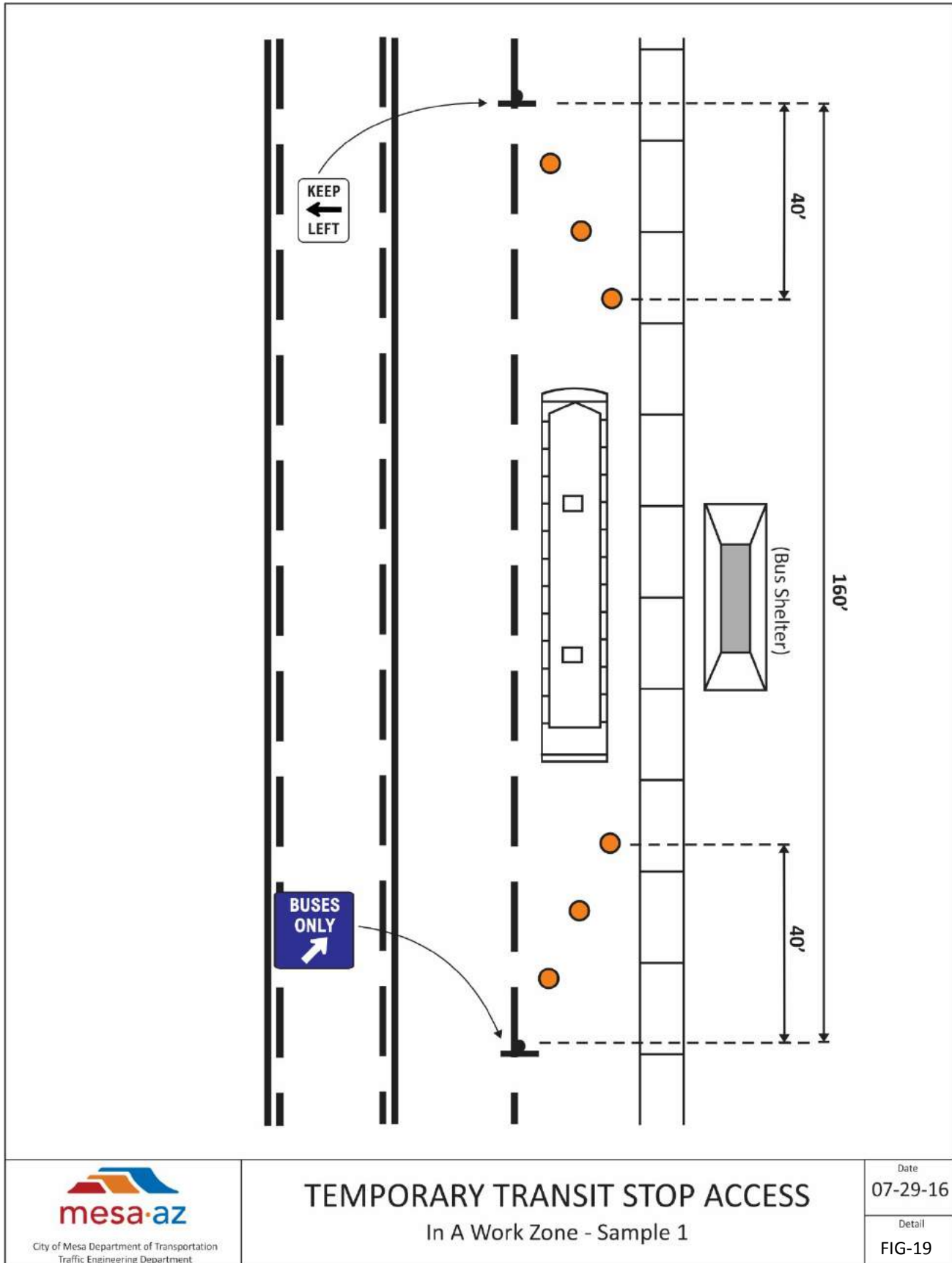


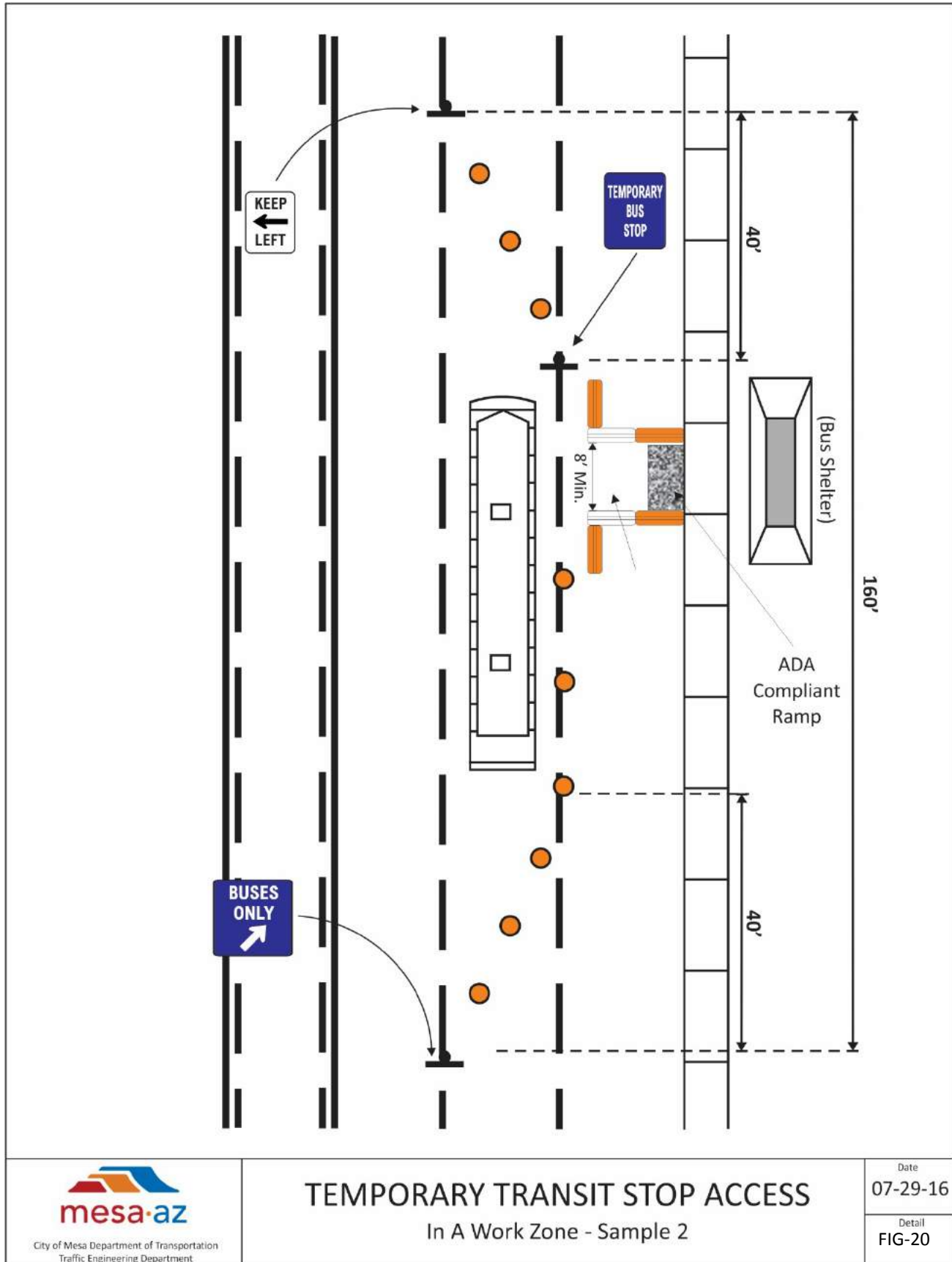
City of Mesa Department of Transportation
Traffic Engineering Department

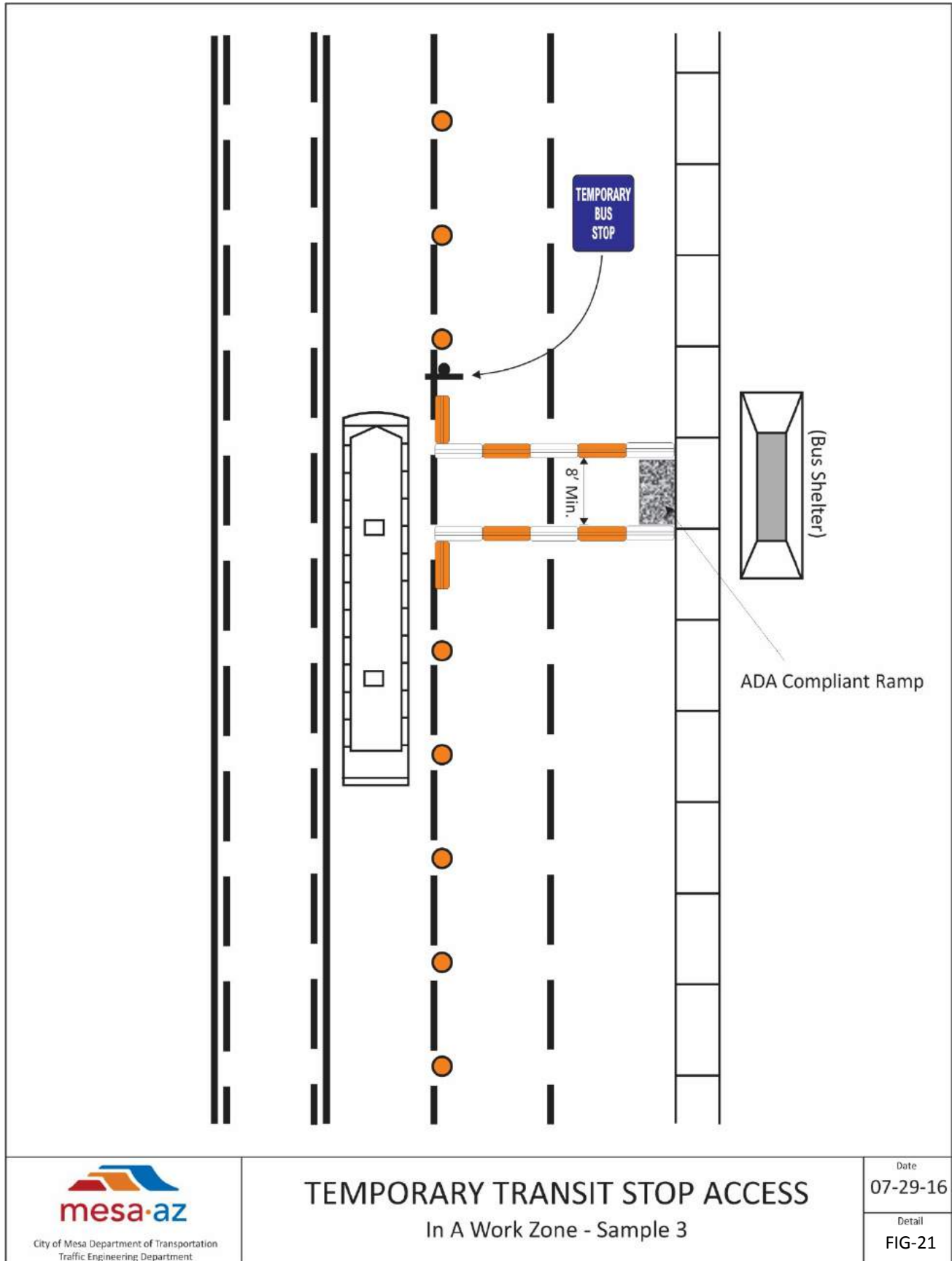
TYPICAL ADA PEDESTRIAN DEVICES

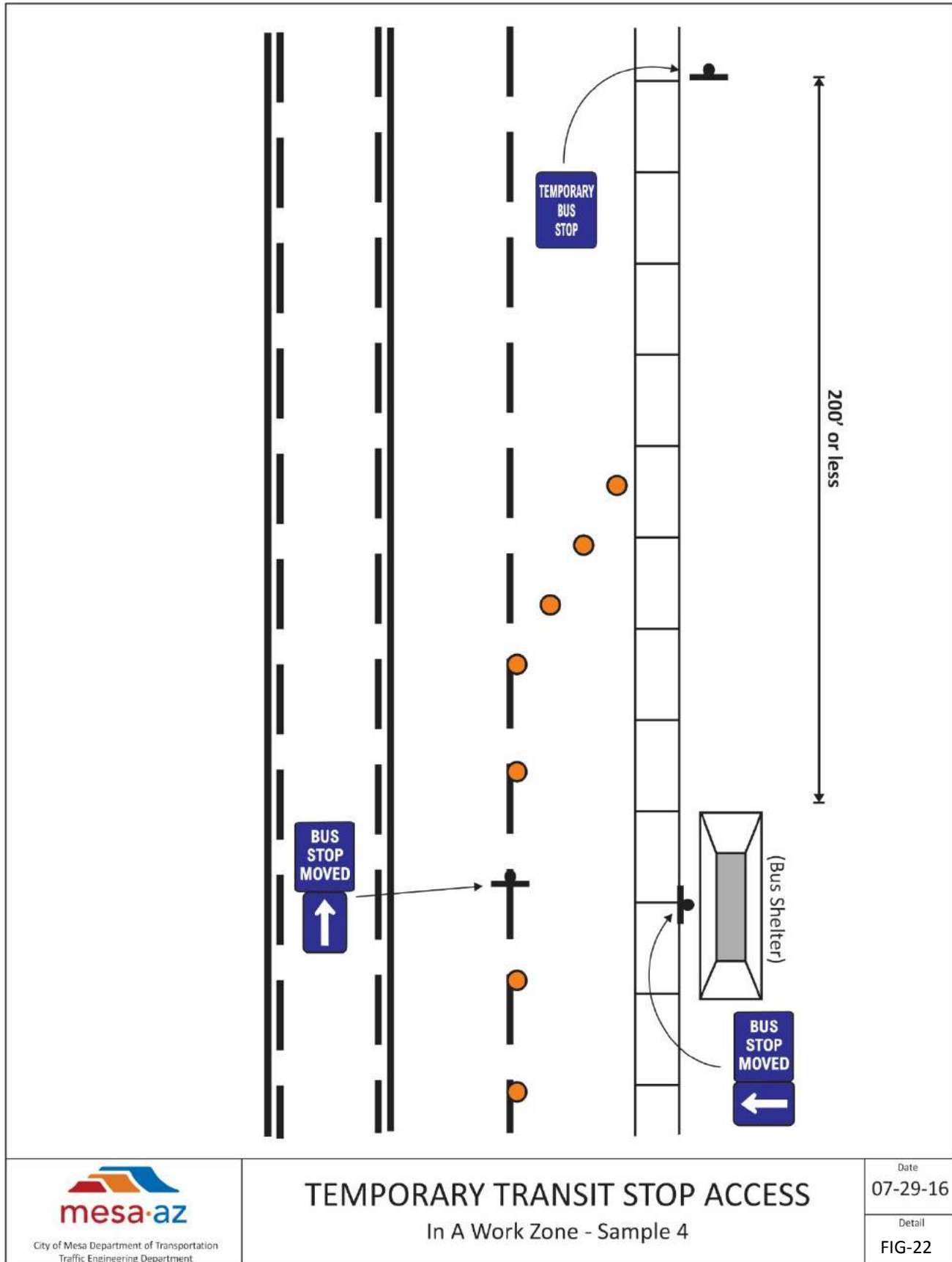
Date
07-29-16

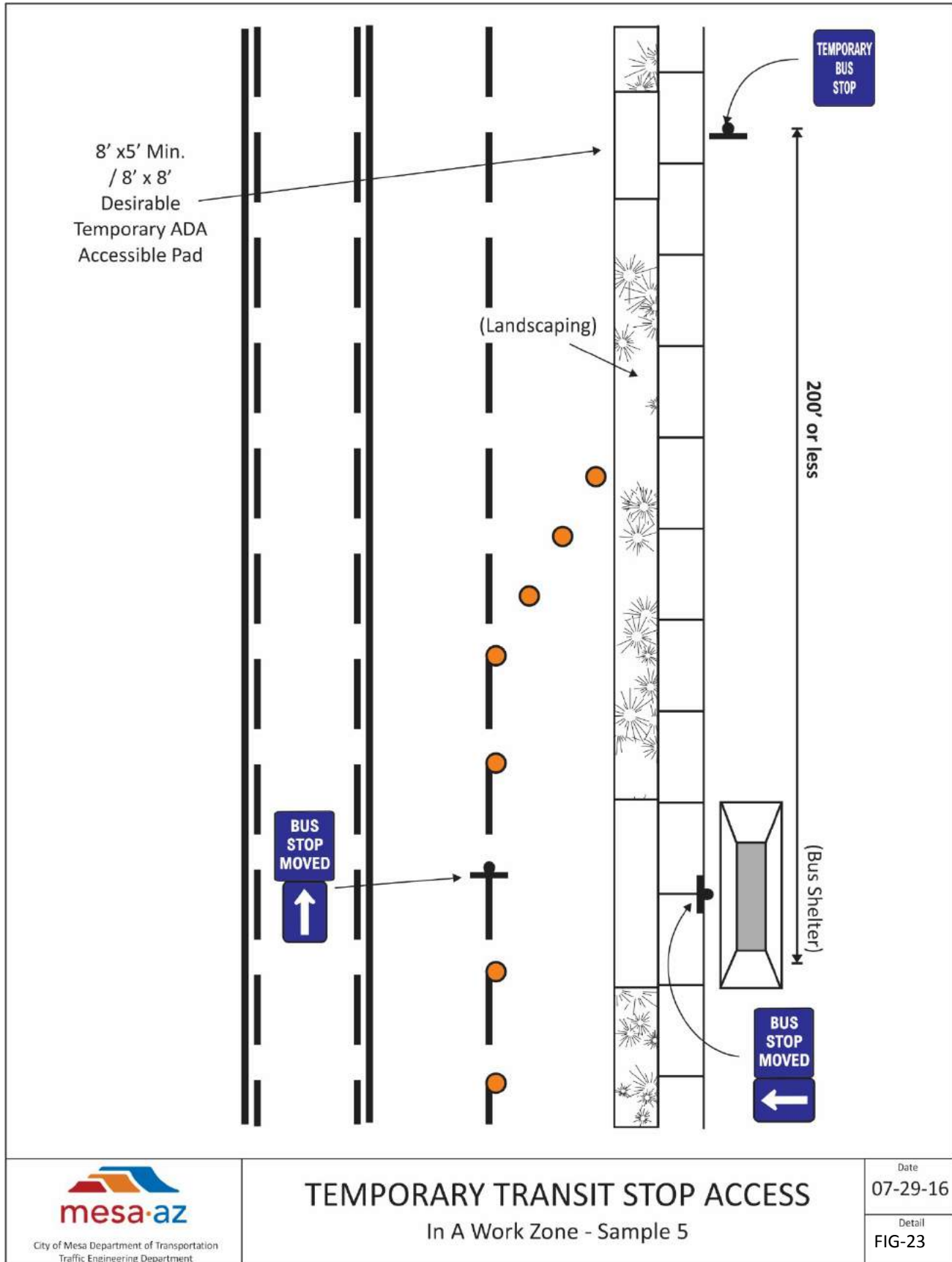
Detail
FIG-18

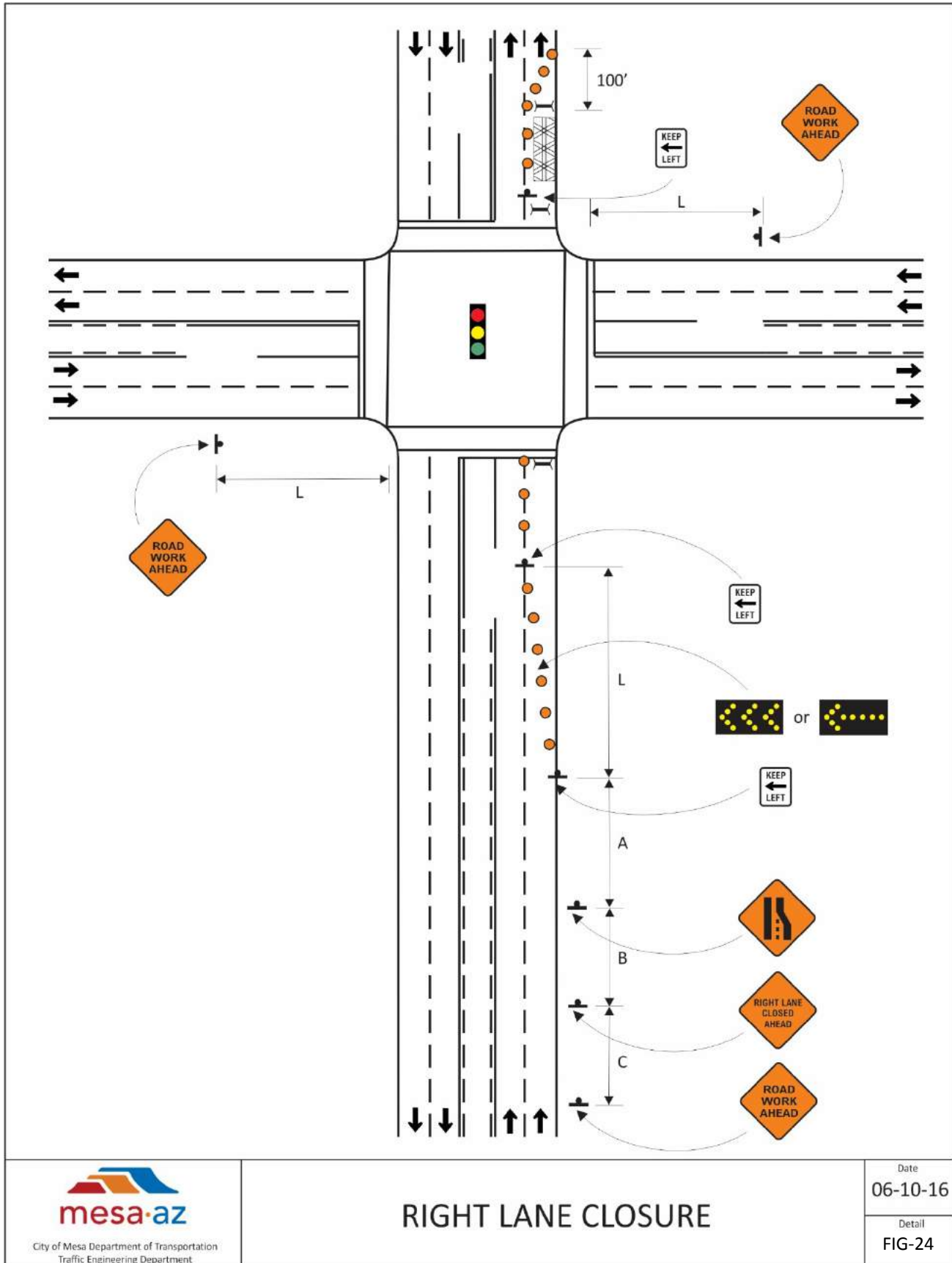










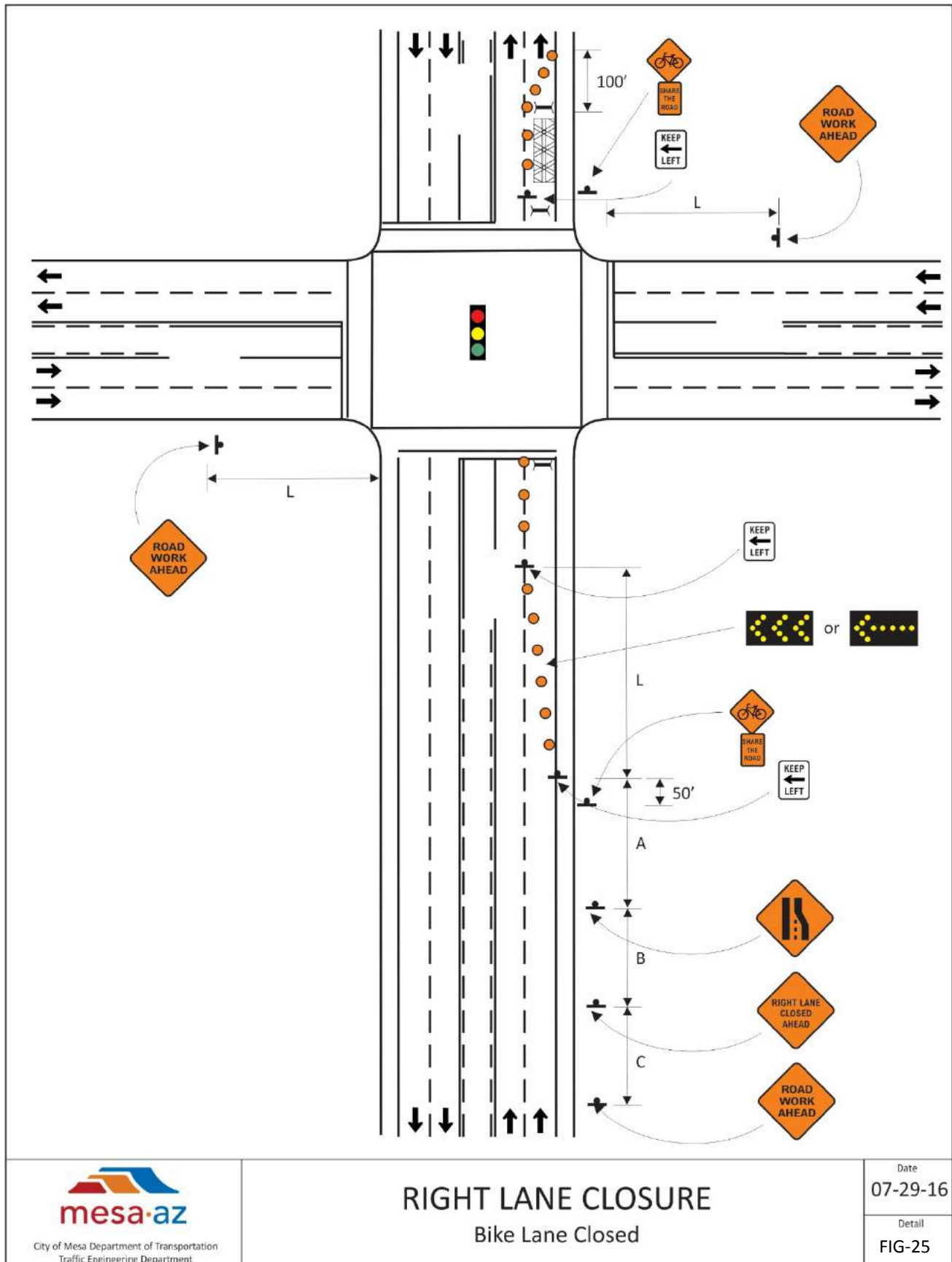


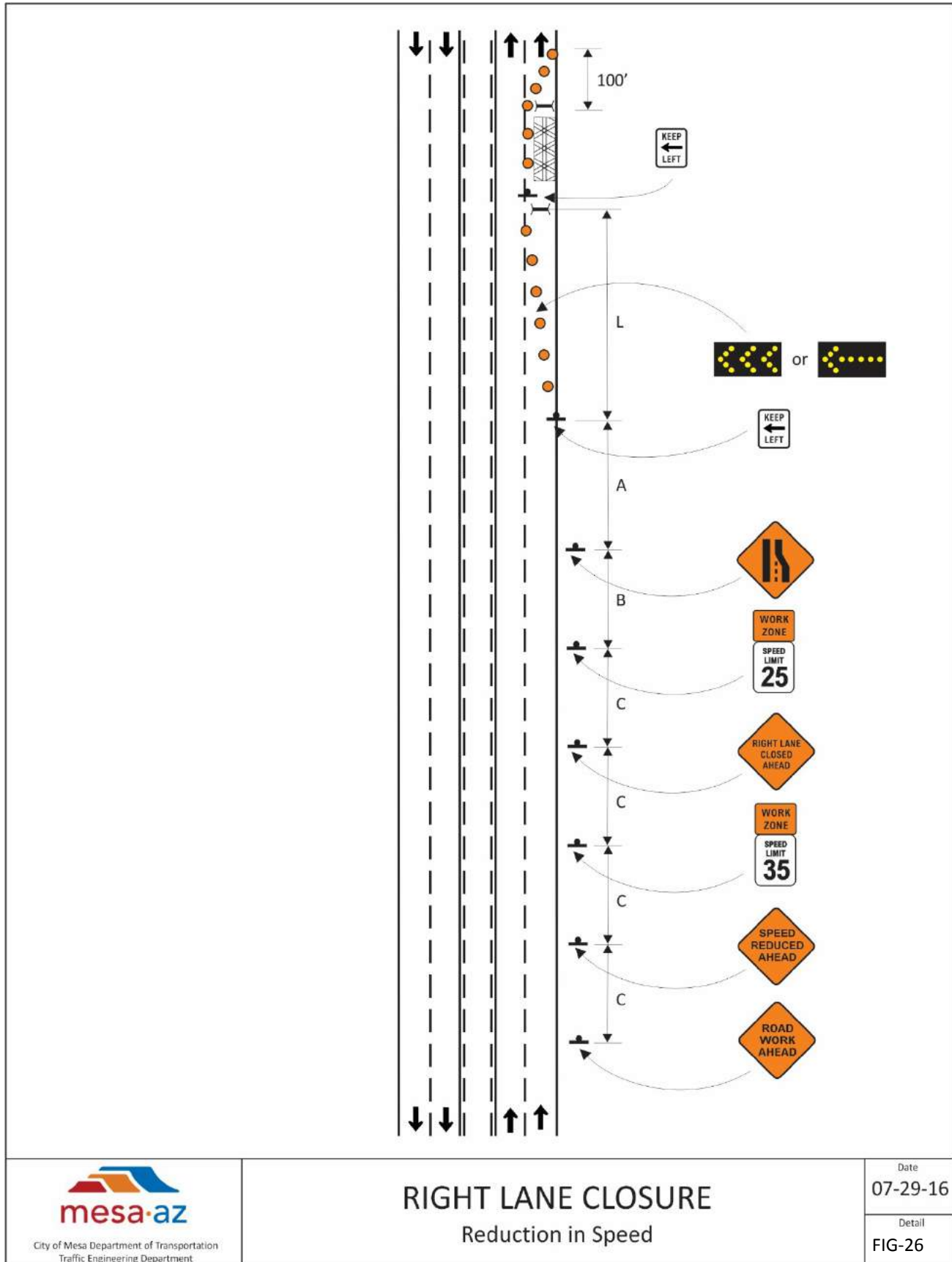
City of Mesa Department of Transportation
Traffic Engineering Department

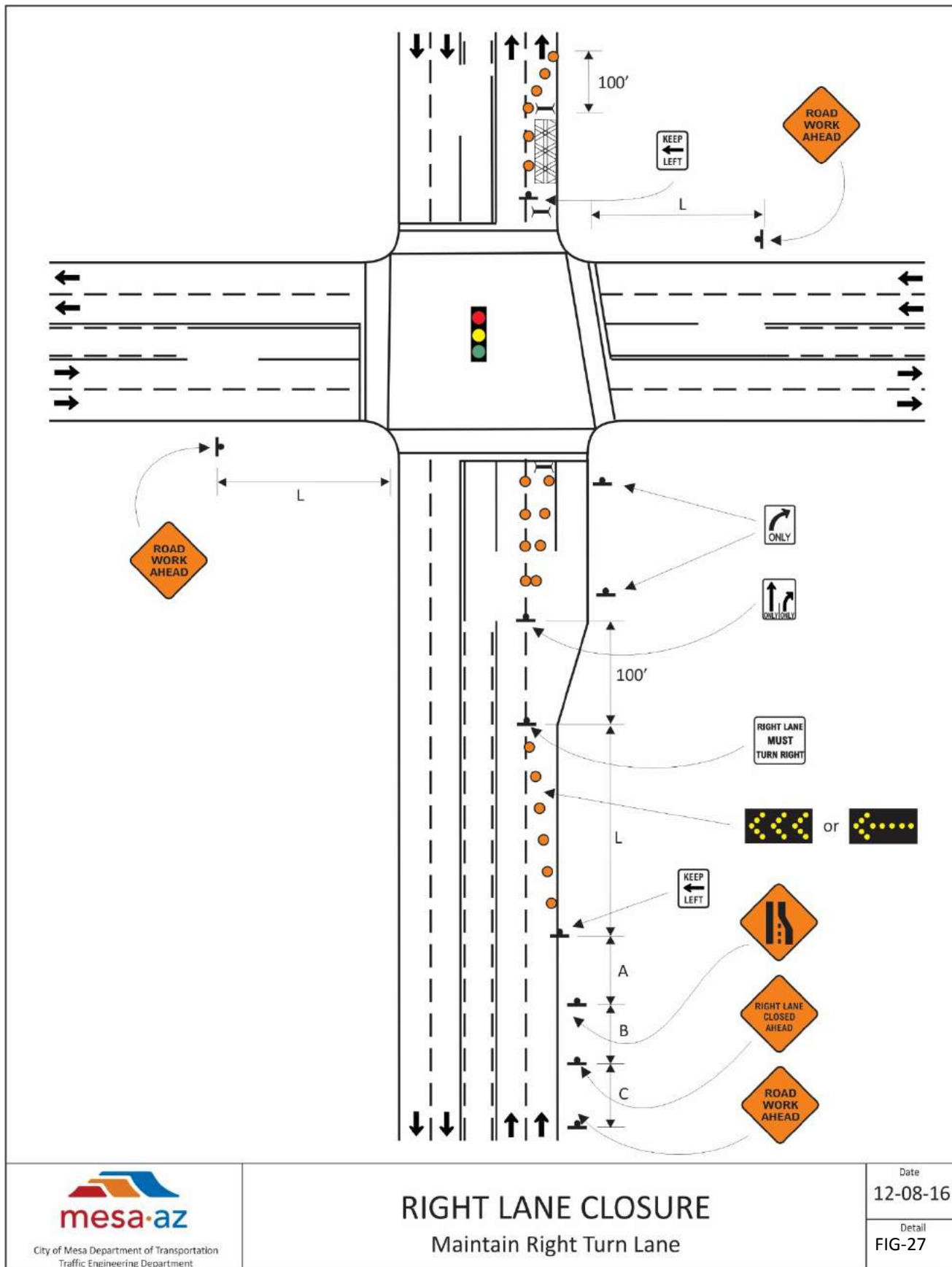
RIGHT LANE CLOSURE

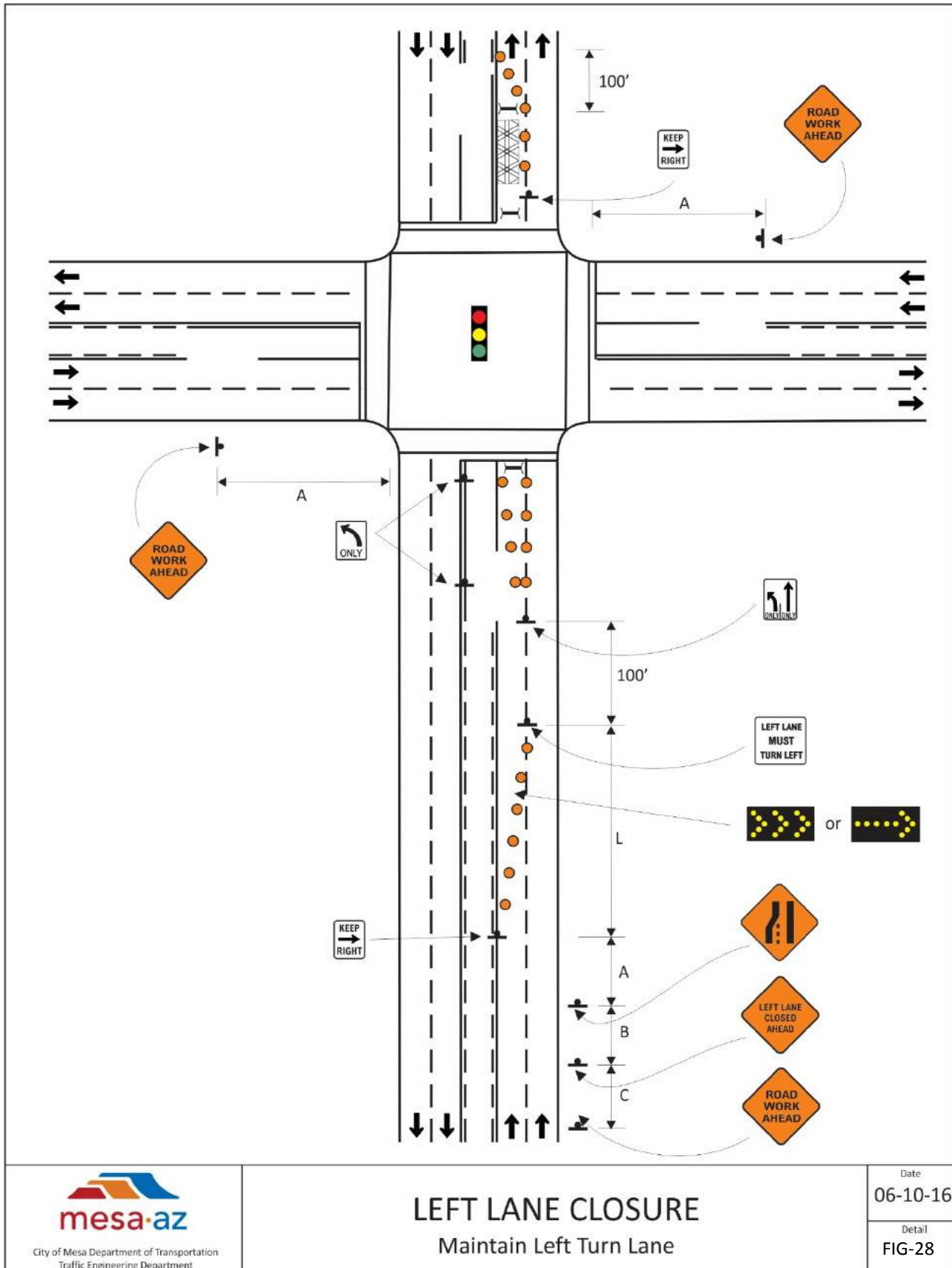
Date
06-10-16

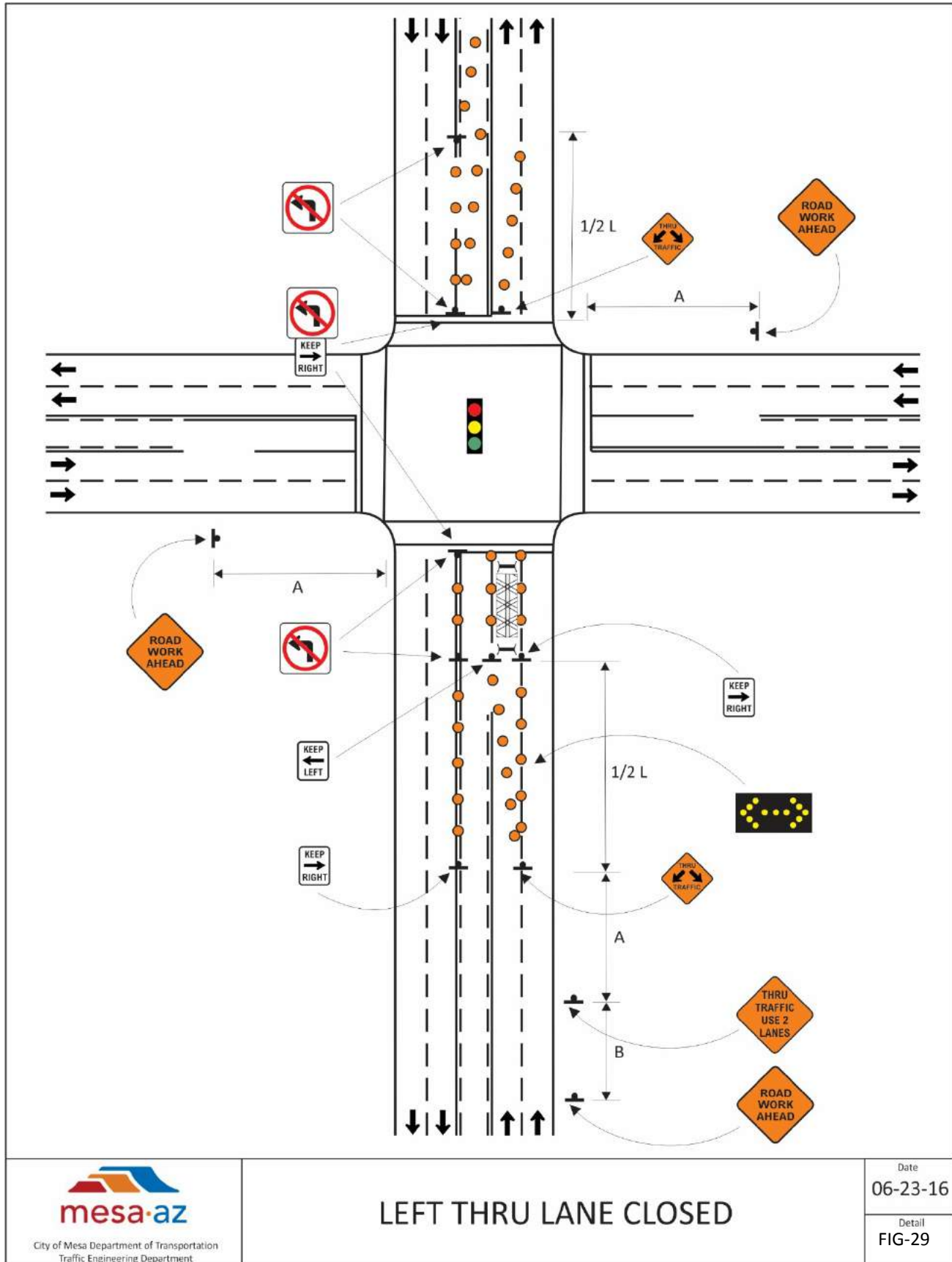
Detail
FIG-24

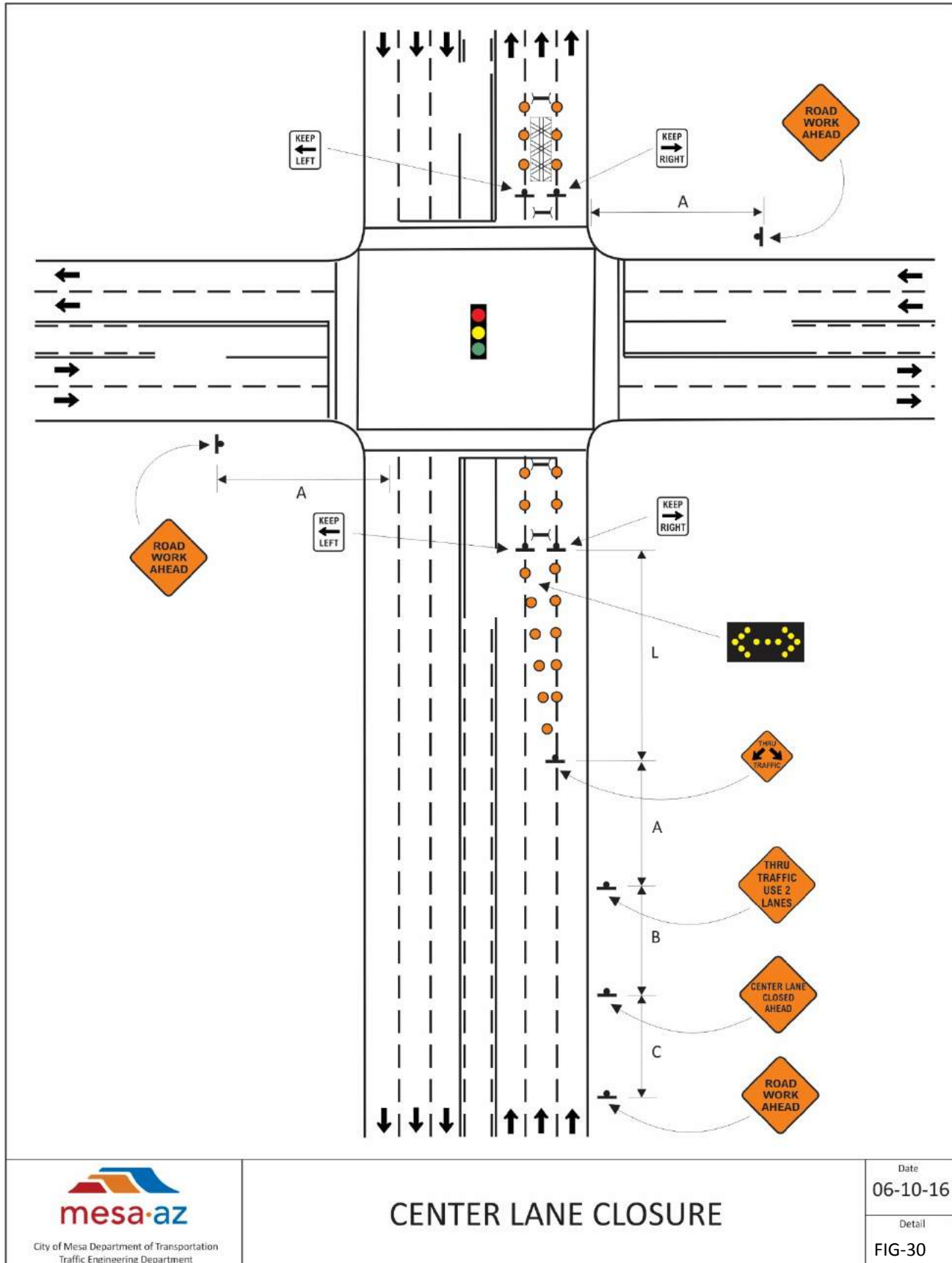


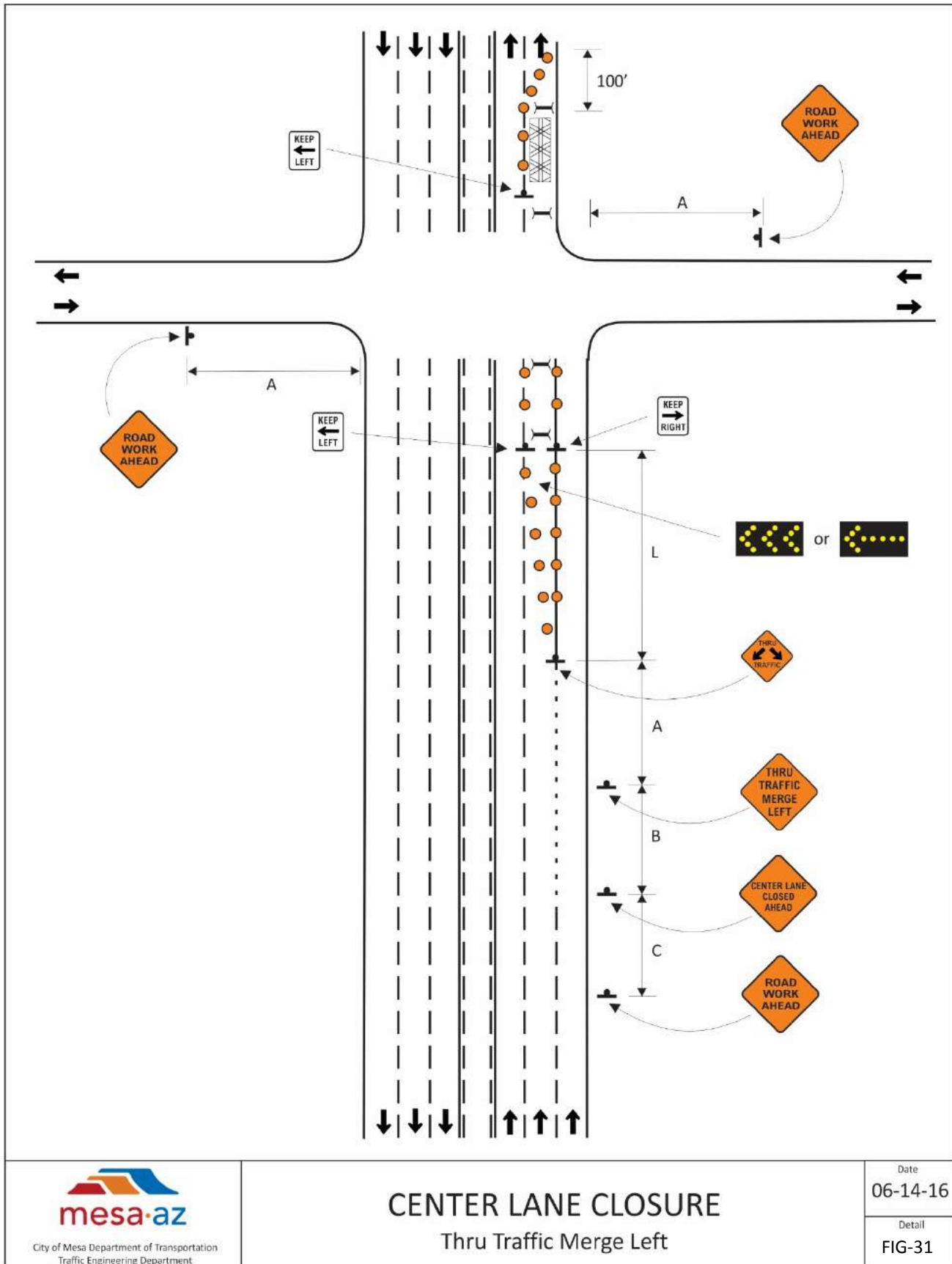












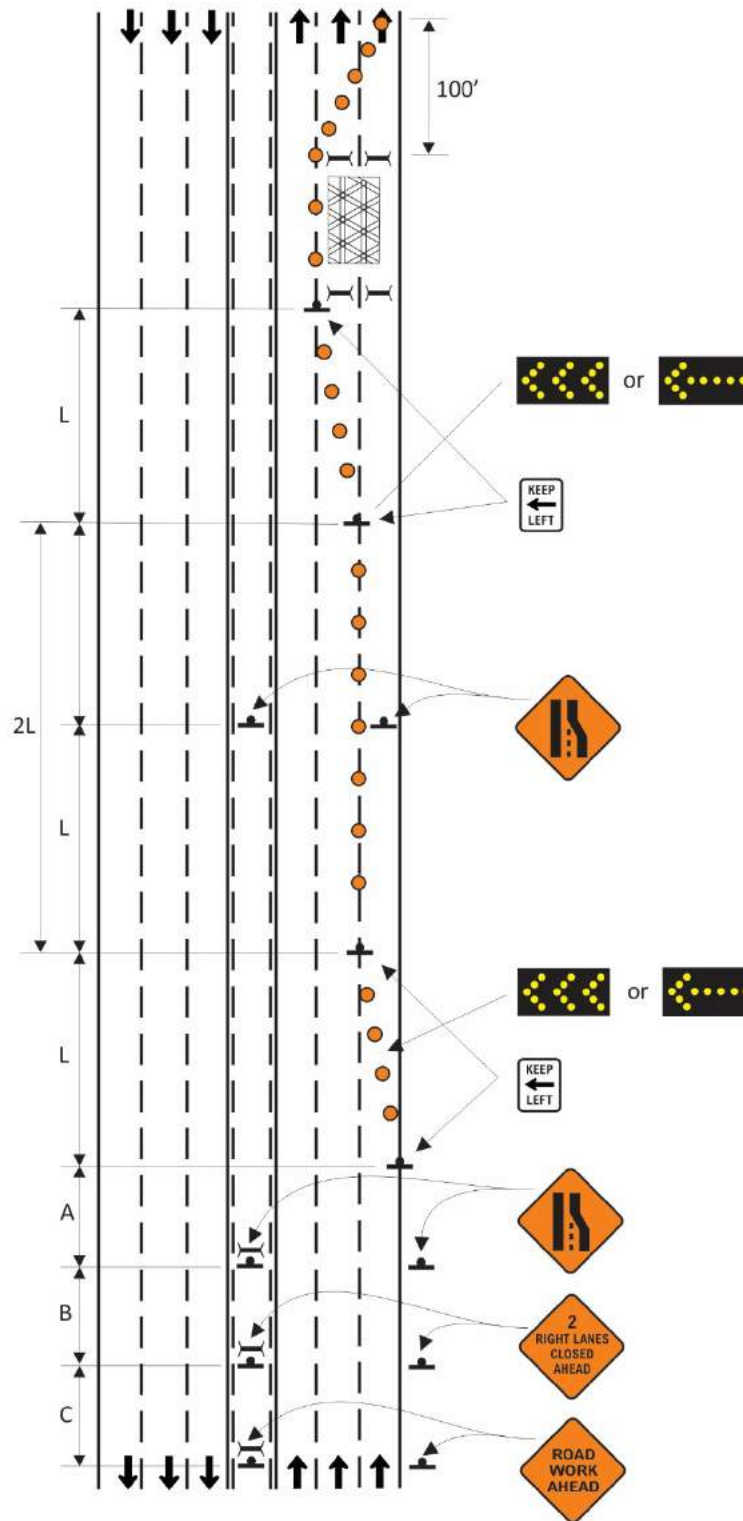
City of Mesa Department of Transportation
Traffic Engineering Department

CENTER LANE CLOSURE

Thru Traffic Merge Left

Date
06-14-16

Detail
FIG-31

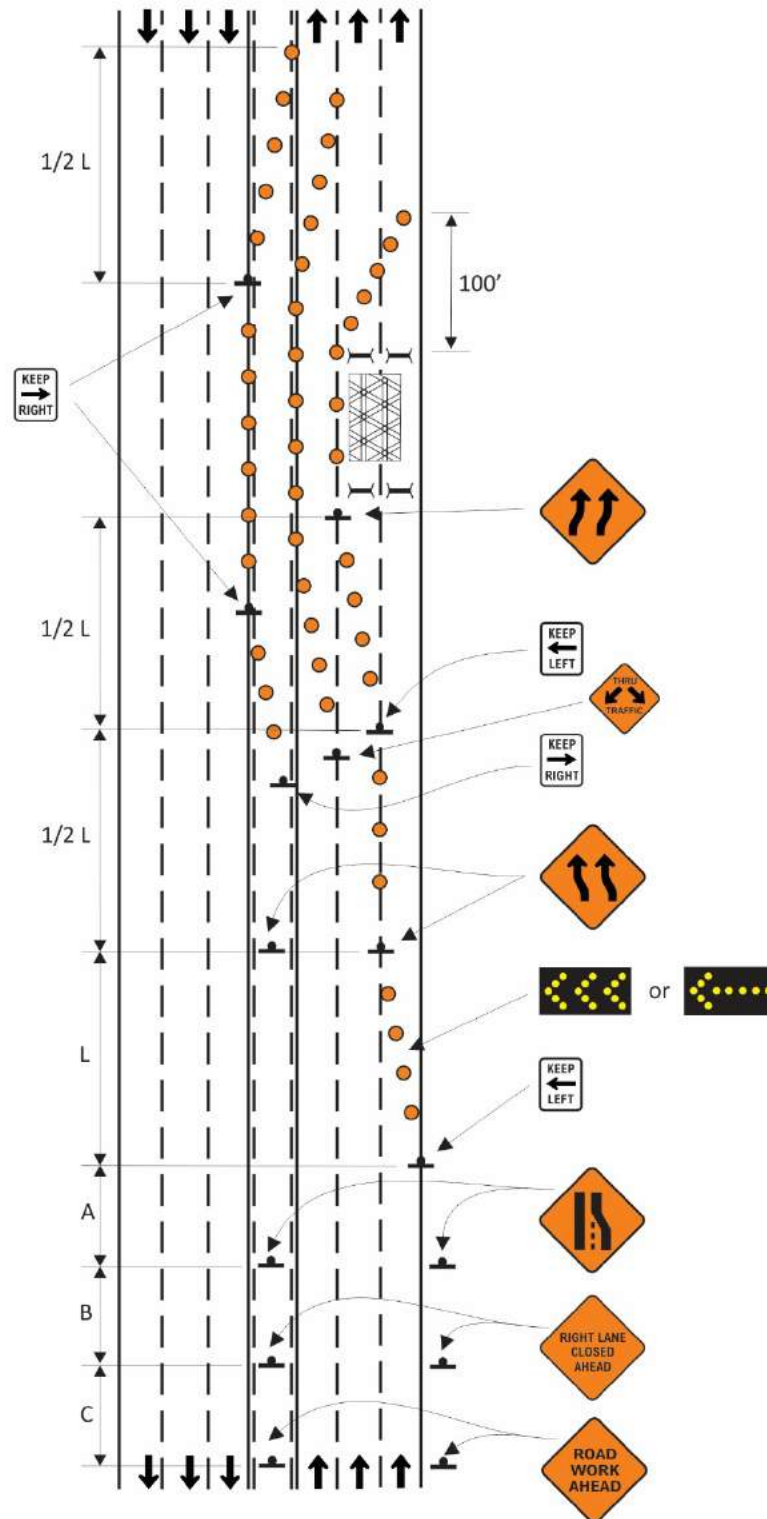


City of Mesa Department of Transportation
Traffic Engineering Department

RIGHT TWO LANE CLOSURE

Date
07-15-16

Detail
FIG-32



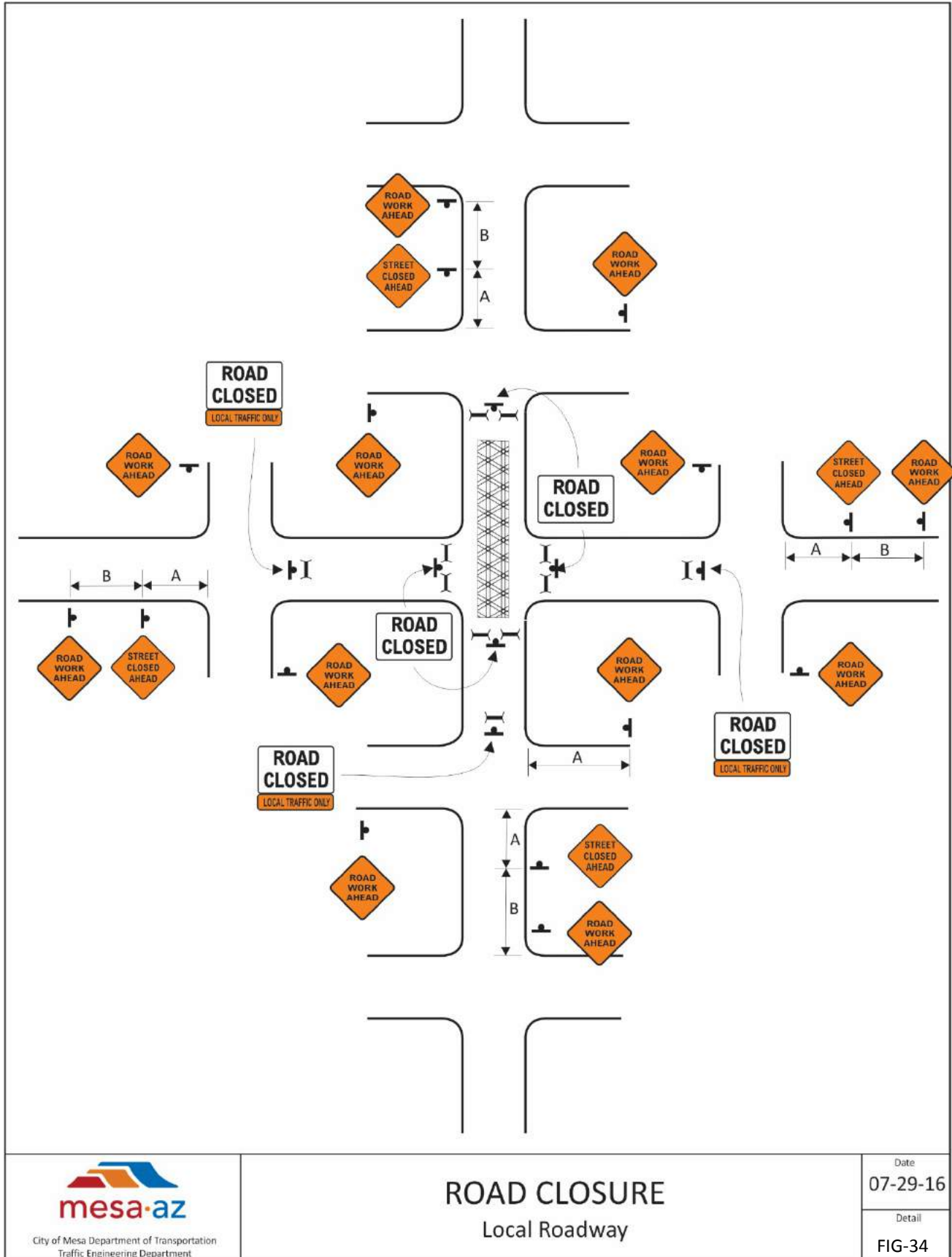
City of Mesa Department of Transportation
Traffic Engineering Department

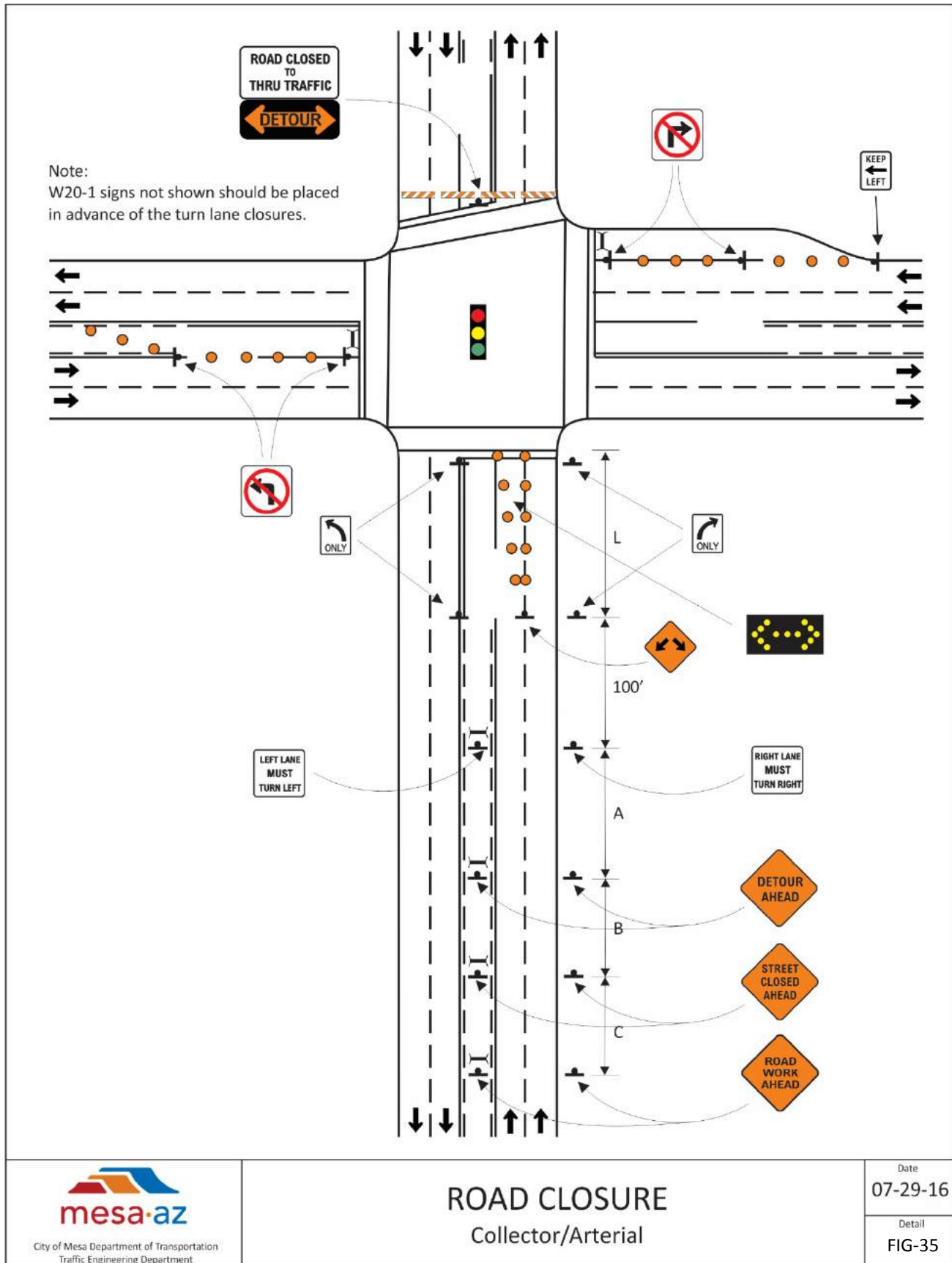
RIGHT TWO LANES CLOSED

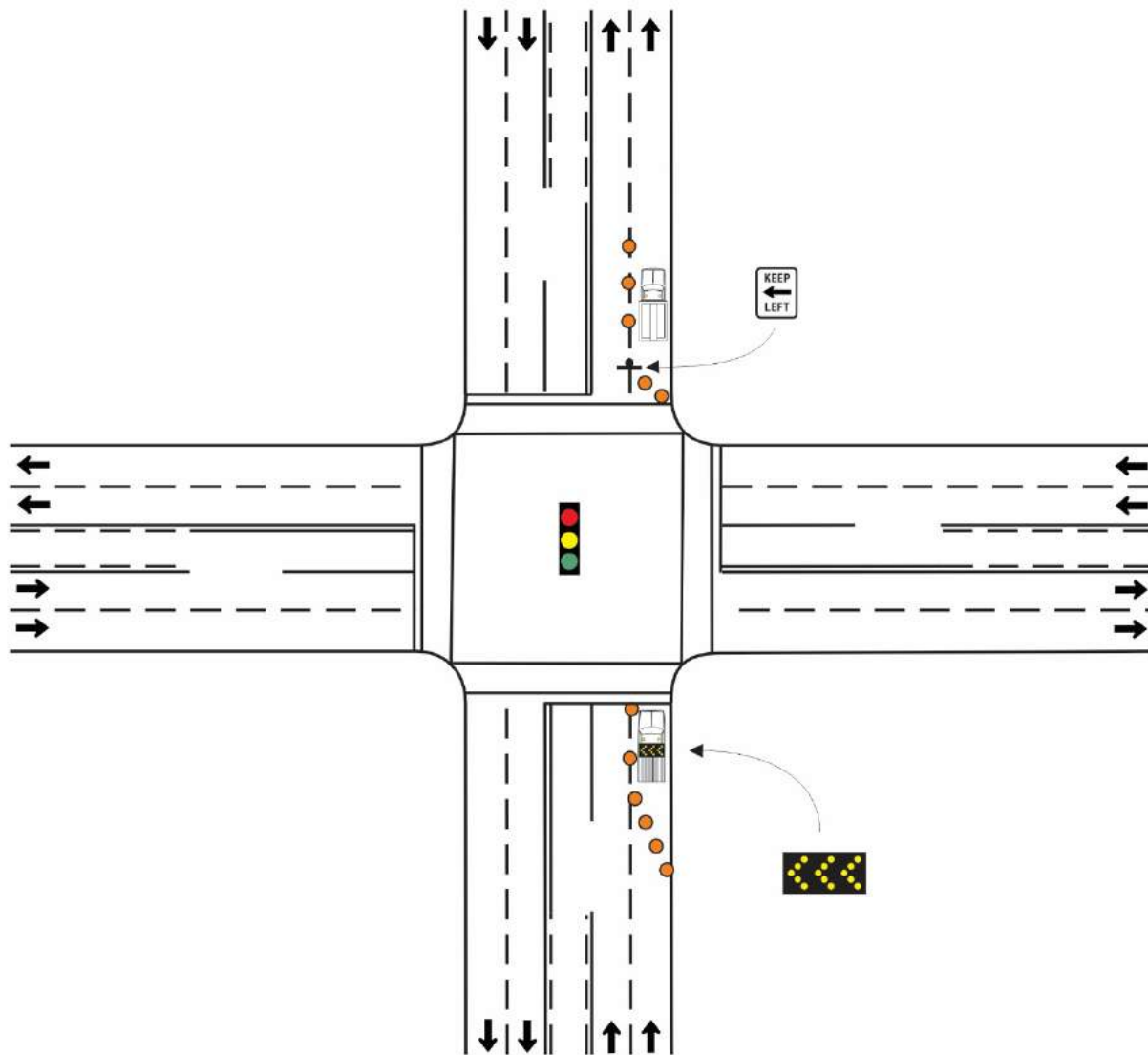
Maintain Two Lanes

Date
07-15-16

Detail
FIG-33







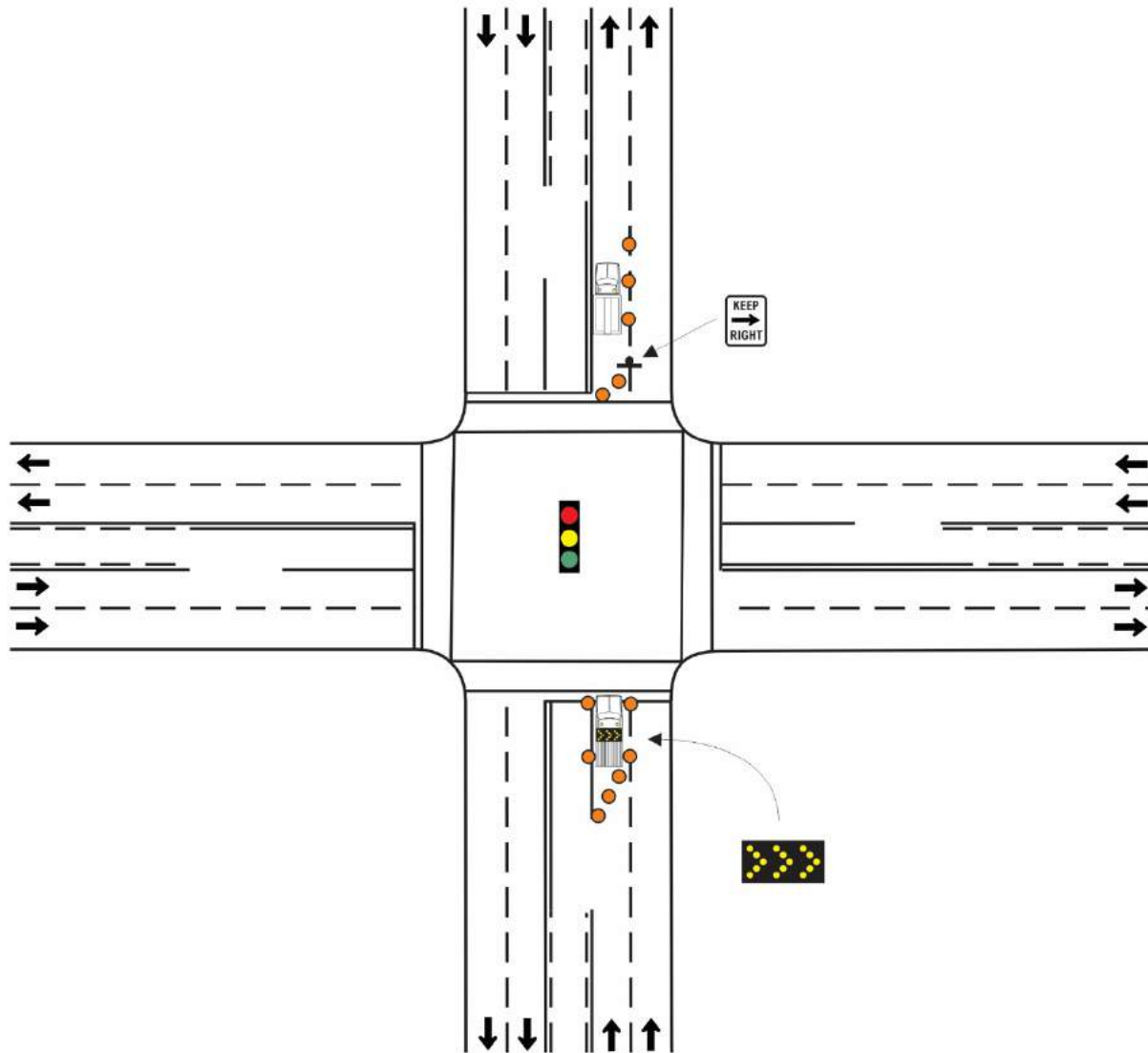
City of Mesa Department of Transportation
Traffic Engineering Department

SERVICE VEHICLE OPERATION

Option 1

Date
07-15-16

Detail
FIG-36



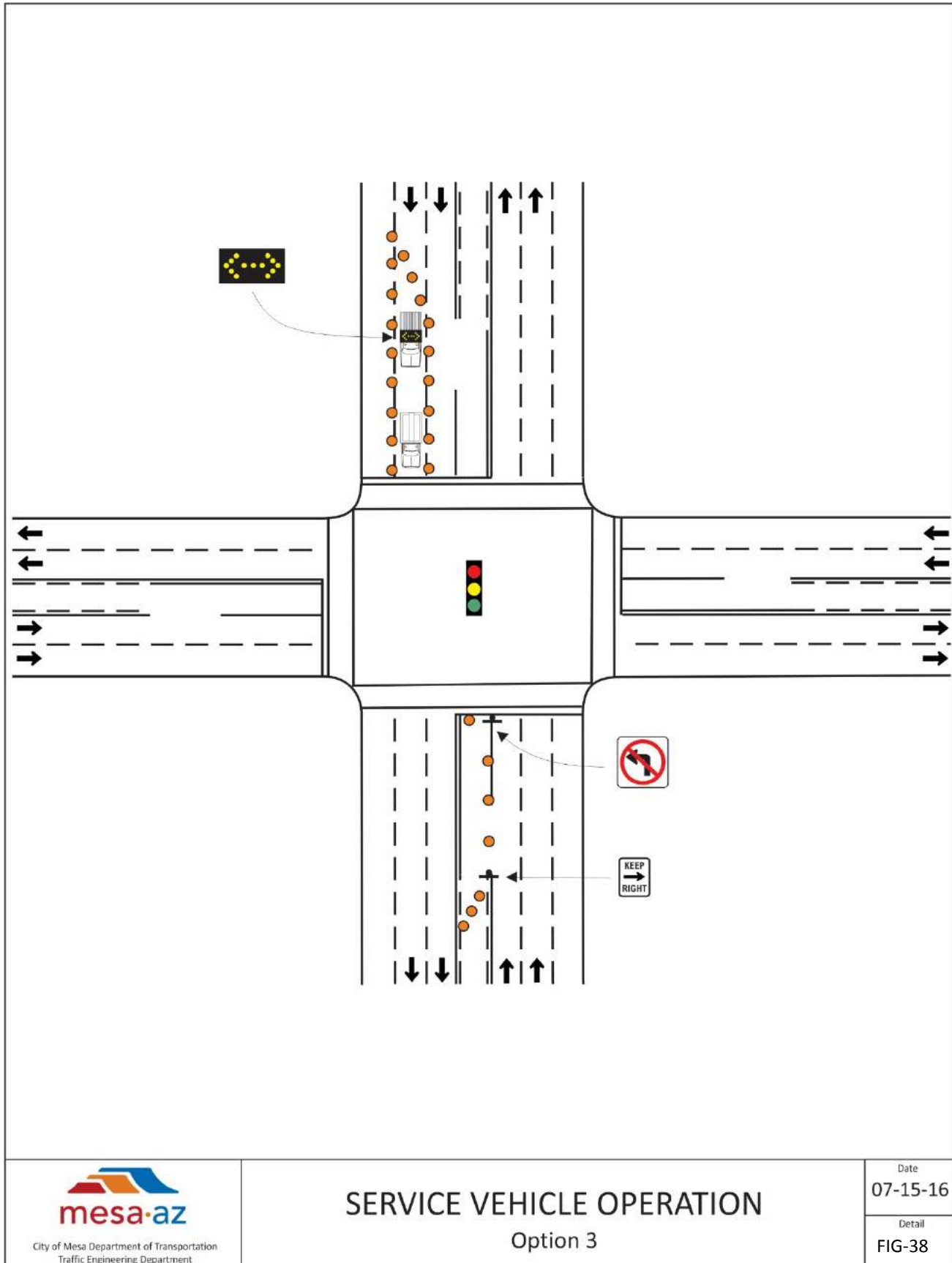
City of Mesa Department of Transportation
Traffic Engineering Department

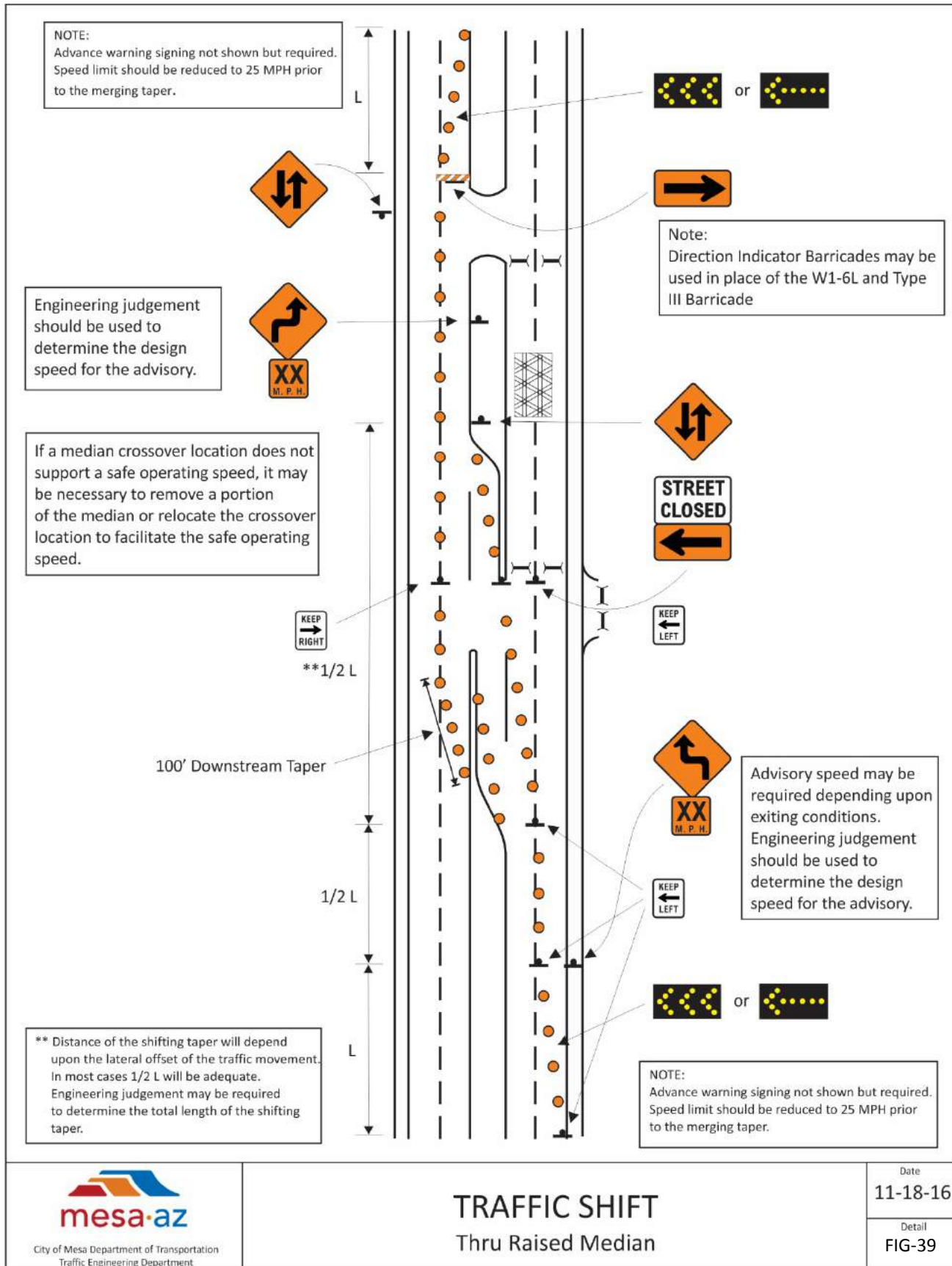
SERVICE VEHICLE OPERATION

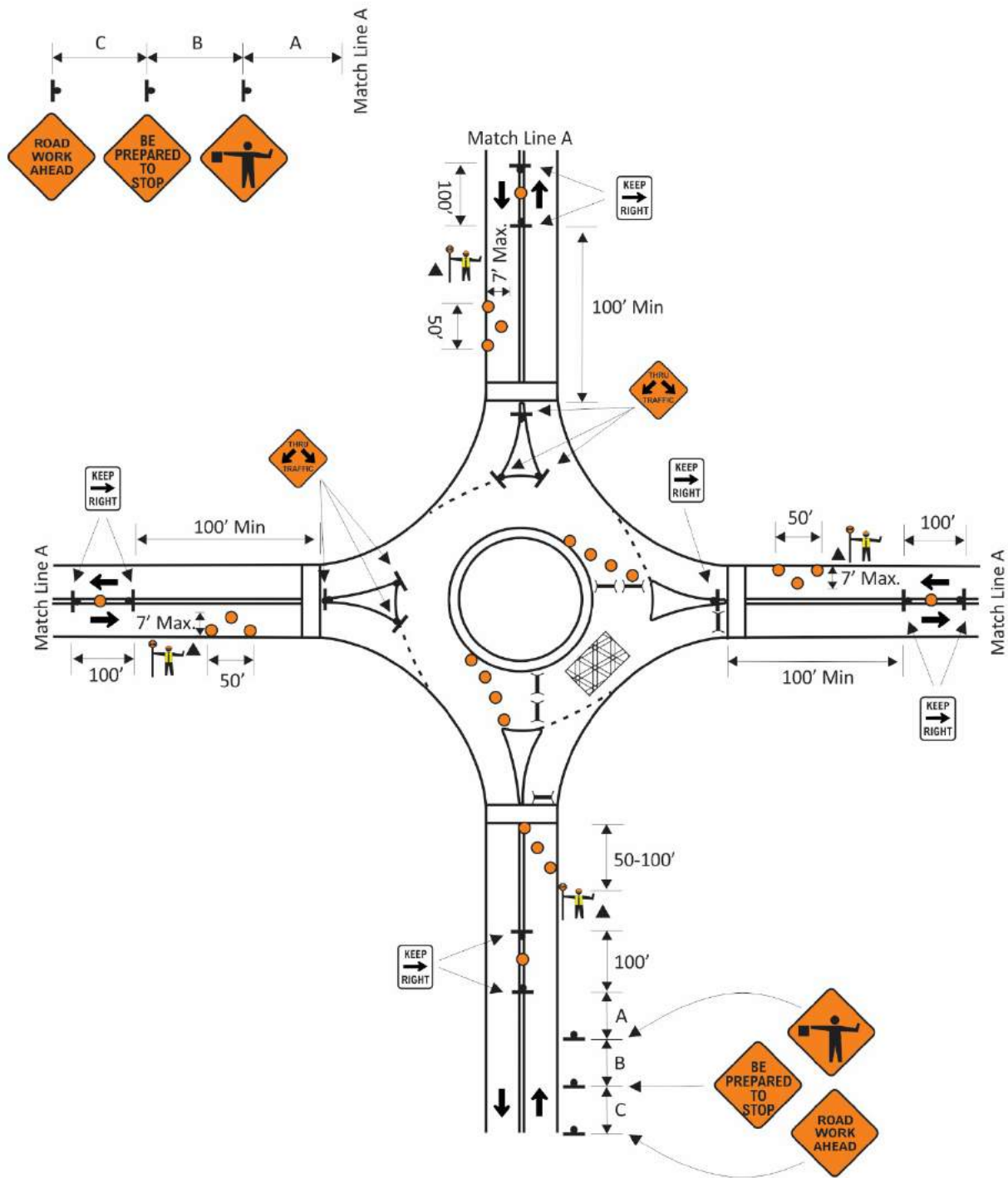
Option 2

Date
07-15-16

Detail
FIG-37







City of Mesa Department of Transportation
Traffic Engineering Department

SINGLE-LANE ROUNDABOUT Partial Closure

Date
05-10-17

Detail
FIG-40

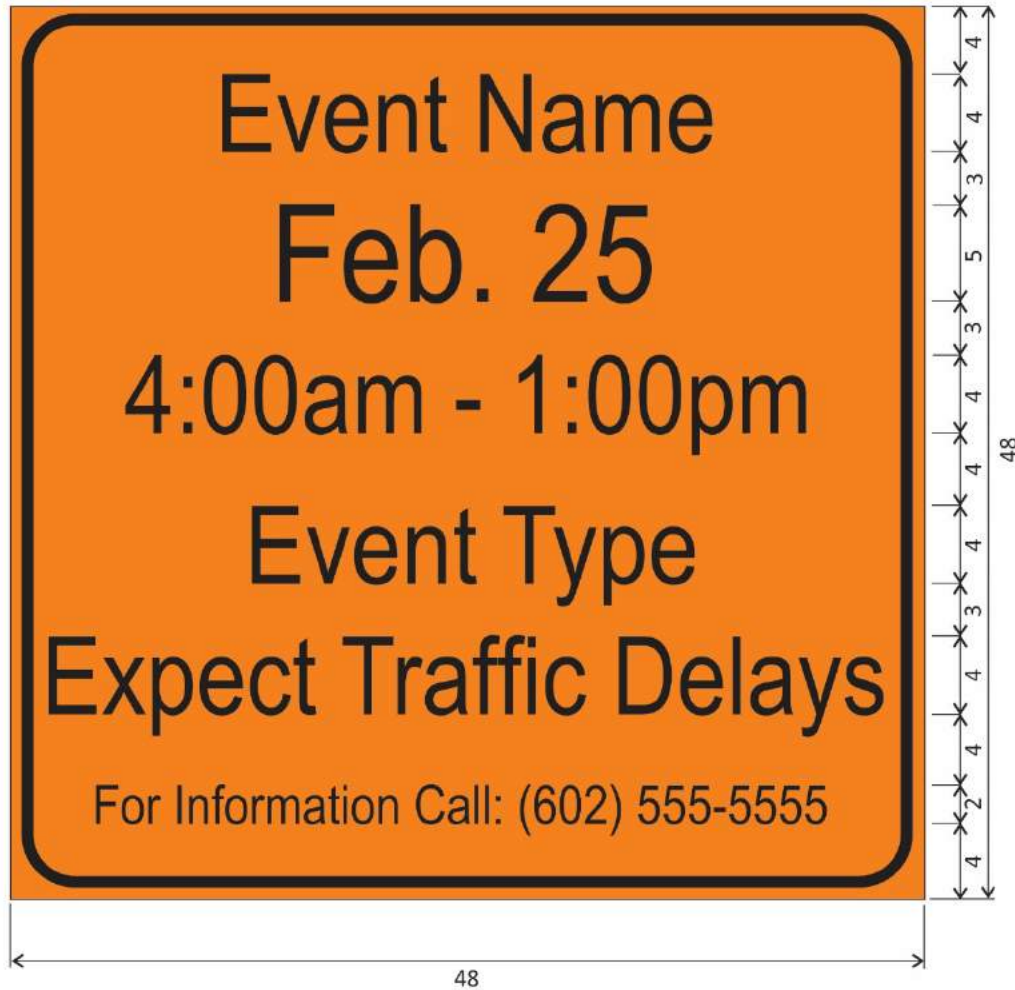




Appendix B

Mesa Sign Detail

SIZE: 48" x 48"



48.000" across sides 3.000" Radius, 1.250" Border, 0.750" Indent, Black on Orange

COLORS:

Legend & Border - Black (Non-Refl.)

Background - Orange (Refl.)

ALL DIMENSIONS ARE IN INCHES



City of Mesa Department of Transportation
Traffic Engineering Department

SPECIAL EVENT SIGN

Date
11-18-16

Detail
SEV-1

SIZE: 24" x 18"



1" Radius, .375" Border, 0.375" Indent, Black on White

COLORS:

Legend & Border - Black (Non-Refl.)

Background - White (Refl.)

Font: Highway C

ALL DIMENSIONS ARE IN INCHES



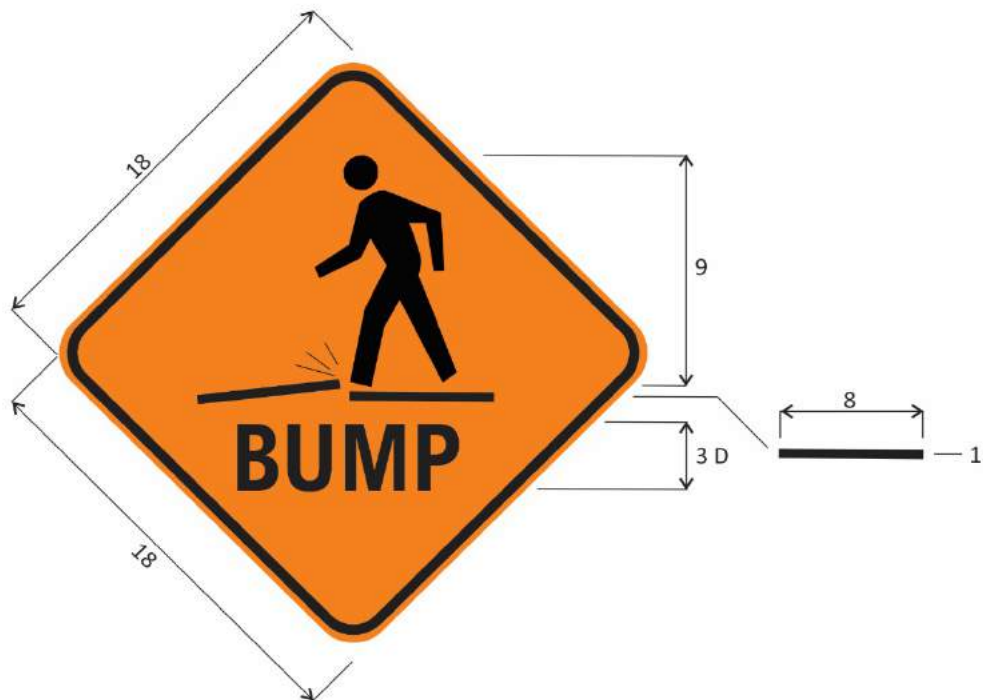
City of Mesa Department of Transportation
Traffic Engineering Department

SIDEWALK CLOSED AHEAD SIGN

Date
05-17-17

Detail
R9-9aME

SIZE: 18" x 18"



1" Radius, .375" Border, 0.375" Indent, Black on White

COLORS:

Legend & Border - Black (Non-Refl.)

Background - Orange (Refl.)

Font: Highway D

ALL DIMENSIONS ARE IN INCHES



City of Mesa Department of Transportation
Traffic Engineering Department

SIDEWALK BUMP SIGN

Date
06-19-17

Detail
W8-laME

SIZE: 12" x 18"



1" Radius, .375" Border, 0.375" Indent, Red on White

COLORS:

Legend & Border - Black (Non-Refl.)

Background - White (Refl.)

Font: Highway B

ALL DIMENSIONS ARE IN INCHES



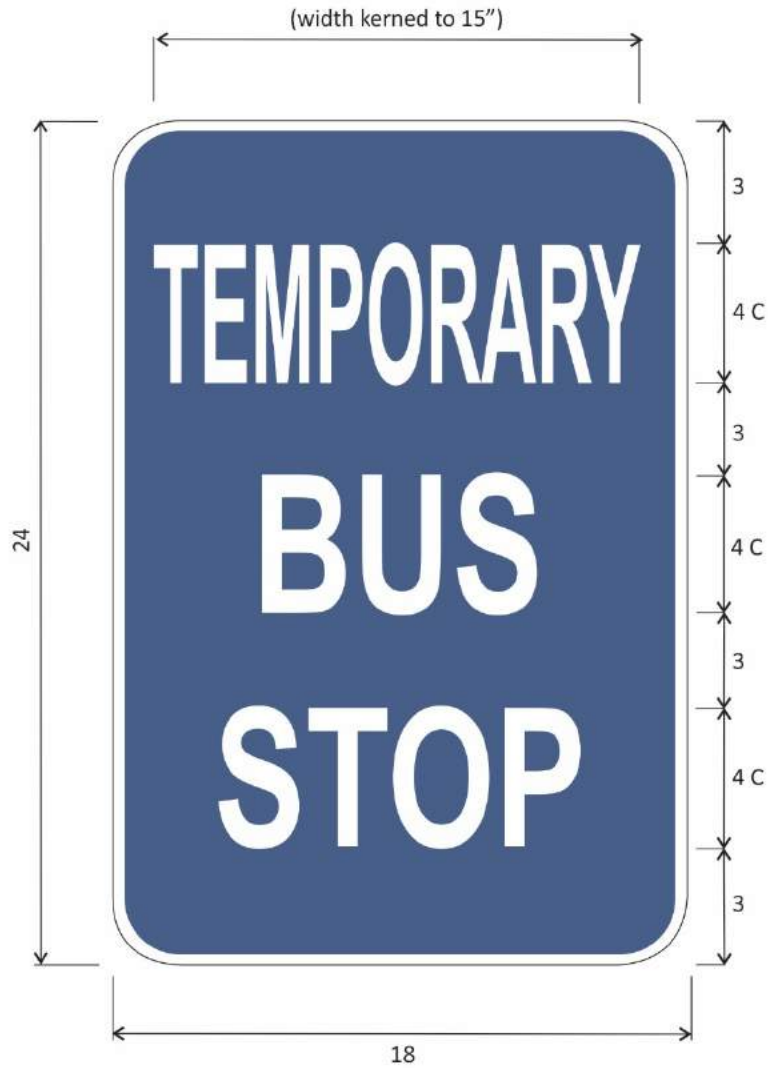
City of Mesa Department of Transportation
Traffic Engineering Department

TEMPORARY NO PARKING SIGN

Date
06-19-17

Detail
R7-2bME

SIZE: 18" x 24"



1" Radius, .375" Border, Blue on White

COLORS:

Legend & Border - White (Refl.)

Background - White (Refl.)

Font: Highway C

ALL DIMENSIONS ARE IN INCHES



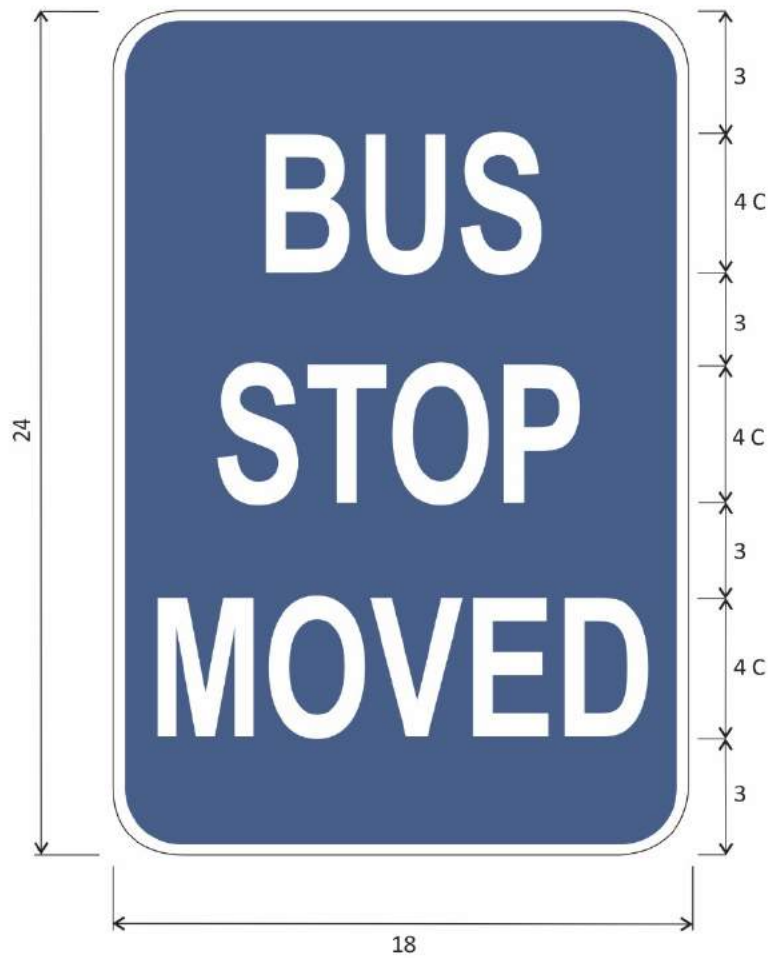
City of Mesa Department of Transportation
Traffic Engineering Department

TEMPORARY NO PARKING SIGN

Date
06-19-17

Detail
D9-104ME

SIZE: 18" x 24"



1" Radius, .375" Border, White on Blue

COLORS:

Legend & Border - White (Refl.)

Background - Blue (Refl.)

Font: Highway C

ALL DIMENSIONS ARE IN INCHES



City of Mesa Department of Transportation
Traffic Engineering Department

BUS STOP MOVED SIGN

Date
06-19-17

Detail
D9-105ME

SIZE: 18" x 24"



1" Radius, .375" Border, White on Blue

COLORS:

Legend & Border - White (Refl.)

Background - Blue (Refl.)

Font: Highway C

ALL DIMENSIONS ARE IN INCHES



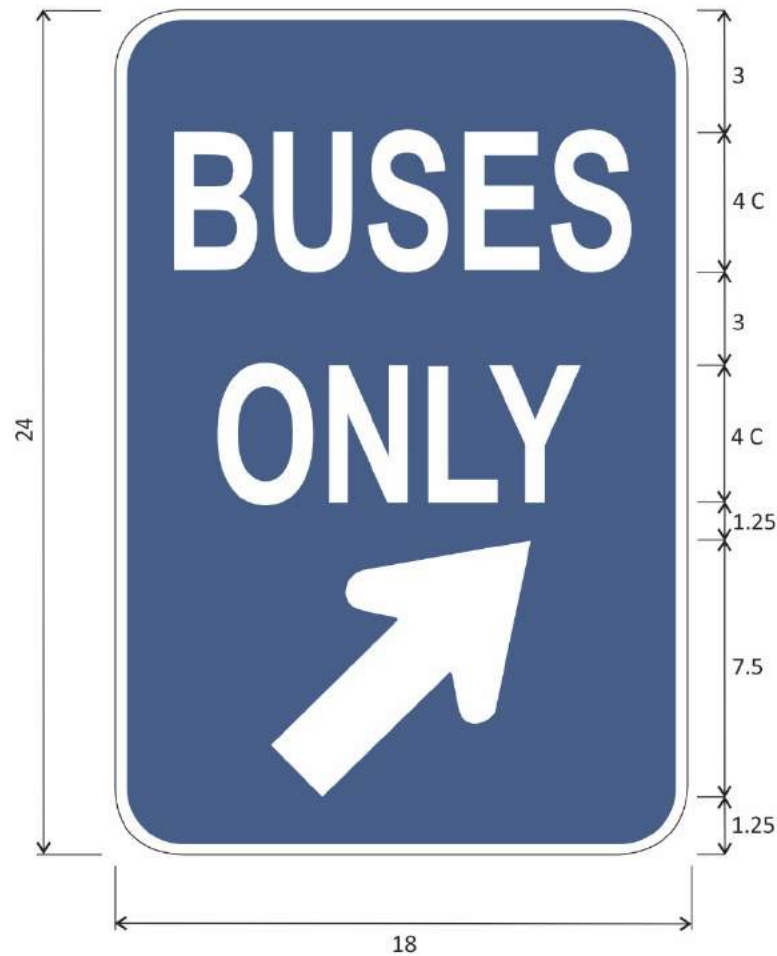
City of Mesa Department of Transportation
Traffic Engineering Department

TEMPORARY BUS STOP CLOSED SIGN

Date
06-19-17

Detail
D9-106ME

SIZE: 18" x 24"



1" Radius, .375" Border, White on Blue

COLORS:

Legend & Border - White (Refl.)

Background - Blue (Refl.)

Font: Highway C

ALL DIMENSIONS ARE IN INCHES



City of Mesa Department of Transportation
Traffic Engineering Department

TEMPORARY BUSES ONLY SIGN

Date
06-19-17

Detail
D9-107ME





Appendix C

Definitions and Abbreviations

Appendix C – Definitions

AASHTO: American Association of State Highway and Transportation Officials.

ADOT: Arizona Department of Transportation.

ADVANCE NOTICE: Represents the minimum number of calendar days in advance of the work.

ANSI: American National Standards Institute.

ARTERIAL STREET: Streets designated as “Arterial” streets should meet the roadway design criteria as provided in the Mesa Standard Details & Specifications (latest edition) detail number M-19.01.

ATSSA: American Traffic Safety Services Association.

CHANNELIZING DEVICE: Temporary traffic control devices used in conjunction with one another to provide for smooth and gradual vehicular traffic flow from one lane to another. They are used to channelize vehicular traffic away from work areas and opposing directions of traffic.

COLLECTOR STREET: Streets designated as “Collector” streets should meet the roadway design criteria as provided in the Mesa Standard Details & Specifications (latest edition) detail number M-19.01.

DETOUR: A temporary relocation of roadway users onto an existing street in order to avoid a temporary traffic control zone.

EMERGENCY: An unplanned event requiring immediate action to preserve or protect public health, safety or welfare.

FHWA: Federal Highway Administration.

HOURS OF DARKNESS: Hours from sunset to sunrise.

IMSA: International Municipal Signal Association.

INTERSECTION: An at-grade junction where two or more roads meet or cross.

ISEA: International Safety Equipment Association.

ITS: Intelligent Transportation Systems.

LOCAL STREET: Streets designated as “Local” streets should meet the roadway design criteria as provided in the Mesa Standard Details & Specification (latest edition) detail number M-19.01.

MASH: Manual for Assessing Safety Hardware.

MUTCD: The Manual on Uniform Traffic Control Devices as adopted by the Arizona Department of Transportation.

NCHRP 350: National Cooperative Highway Research Program.

NON-PEAK TRAFFIC HOURS: Times not defined as “peak traffic hours”.

PEAK TRAFFIC HOURS: Hours between 6:30 a.m. to 8:30 a.m. and 4:00 p.p. to 6:00 p.m., weekdays (Monday-Friday).

POLICE OFFICER: A uniformed City of Mesa, Maricopa County Sheriff’s Department, or Department of Public Safety law enforcement officer, on-duty or off-duty, duly authorized to enforce the Arizona Revised Statutes and Mesa City Code in the City of Mesa.

PUBLIC RIGHT-OF-WAY: All land in the City of Mesa dedicated and/or expressly used for the use of vehicular and traffic and/or utilities.

RESTRICTION: Any induced reduction to the normal flow/access of vehicular or pedestrian traffic in the public right-of-way.

ROW: Right-of-way.

SERVICE VEHICLE: Any vehicle used in the construction, operation or maintenance of a municipal, utility, or other similar facility or infrastructure, or in the provision of service for a municipal, utility, or other similar service.

SHADOW VEHICLE: Any vehicle used in the construction, operation or maintenance of a municipal, utility, or other similar facility or infrastructure, or in the provision of service for a municipal, utility, or other similar service following a service vehicle to provide directional guidance for motorists.

TPAP: Temporary Pedestrian Access Plan

TRAFFIC: Pedestrians, bicyclists, vehicles, trains, and other conveyances either singularly or together using any street for purposes of travel.

TTCM: Temporary Traffic Control Manual

TTC: Temporary Traffic Control

TCP: Traffic Control Plan

Definitions of headings, words, and phrases used in this manual not appearing in Appendix B may be found in Section 1A.13 of the MUTCD.



Appendix D

City Contact Numbers

Appendix D-City Contact Numbers

Temporary Traffic Control Permits & Information, 480-644-4882(4TTC)

Traffic Engineering Main Number, 480-644-2160

Traffic Management Center (Traffic Signals), 480-644-5888

Engineering Construction, 480-644-2253

Transit Services, (480) 644-4131

After Hours, Weekends & Holidays, Emergency Numbers

Fire/Police/Medical Emergency, 911

Police (Non-emergency), 480-644-2211

Utilities Control Center (UCC), 480-644-2262

UCC will call out staff as needed to deal with an emergency involving City utilities, streets, traffic signals, etc.

Other Numbers

Development Services, 480-644-4273

Energy Resources Admin. (Gas, Electric), 480-644-2749

Fire Department non-emergency, 480-644-2622

Graffiti Hotline, 480-644-3083

Police—Off-duty Officers, 480-644-2092

Solid Waste, 480-644-2688

Storm Drains, 480-644-3038

Streetlights, 480-644-3038

Transportation Field Operations, 480-644-3038

Utilities, see Energy Resources or Water Resources

Water Resources Admin. (Water, Wastewater), 480-644-2142



City of Mesa

Transportation Department

300 E. 6th Street

P.O. Box 1466

Mesa, Arizona 85211-1466

480-644-2160