PAVEMENT MARKINGS
DESIGN GUIDELINES
2017

CITY OF CHARLOTTE
DEPARTMENT OF TRANSPORTATION

PURPOSE:

THE CHARLOTTE DEPARTMENT OF TRANSPORTATION DESIGNS AND INSTALLS PAVEMENT MARKINGS IN ACCORDANCE WITH THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD) AND THE TRAFFIC CONTROL DEVICES HANDBOOK (TCDH). SINCE THE MUTCD AND THE TCDH ALLOW FOR SOME FLEXIBILITY IN THE WAY CERTAIN MARKINGS CAN BE DONE, THE PURPOSE OF THIS DOCUMENT IS TO STANDARDIZE PAVEMENT MARKING APPLICATIONS WITHIN THE CITY OF CHARLOTTE. THIS DOCUMENT SHOULD SERVE AS A GUIDELINE FOR THE DESIGN OF PAVEMENT MARKINGS ON CITY MAINTAINED ROADS. THIS DESIGN STANDARD MAY BE USED ON STATE MAINTAINED ROADS WITHIN THE CITY LIMITS. FOR ANY MARKING SCENARIO THAT IS NOT COVERED IN THIS DOCUMENT, THE DESIGNER SHOULD USE THE NCDOT MARKING STANDARD.

ALL MARKINGS MUST BE RETROREFLECTIVE AND INSTALLED FOLLOWING NCDOT STANDARD SPECIFICATIONS FOR MATERIAL TYPE, THICKNESS AND TEMPERATURE AT TIME OF INSTALLATION.

IN MANY CASES SIGNS ARE USED TO COMPLEMENT OR SUPPLEMENT MARKINGS. THESE GUIDELINE DO NOT COVER SIGNAGE.

DEFINITIONS:

BAY TURN LANE: TURN LANE DESIGNED NOT TO ENTRAP THROUGH TRAFFIC. SUCH A LANE IS PROVIDED BY PHYSICAL CHANNELIZATION OR PAVEMENT MARKINGS TO KEEP THROUGH TRAFFIC FROM ACCIDENTALLY ENTERING IT. A BAY TURN LANE THAT EXTENDS BETWEEN TWO INTERSECTIONS SHALL BE CONSIDERED A DROP TURN LANE.

CROSSWALK: CROSSWALKS MAY BE USED TO GUIDE PEDESTRIANS CROSSING A STREET.

CURB RAMP: CURB RAMPS ARE USED TO FACILITATE PROPER ACCESS BETWEEN SIDEWALK AND CROSSWALK WHEN CURB OR BARRIER IS PRESENT AT THE EDGE OF THE PAVEMENT. CURB RAMP DESIGN SHALL BE IN ACCORDANCE WITH THE ACCESSIBILITY GUIDELINES FOR PEDESTRIAN FACILITIES IN THE PUBLIC RIGHT-OF-WAY (PROWAG).

DROP TURN LANE: THROUGH LANE THAT BECOMES A MANDATORY TURN LANE AT AN INTERSECTION. THROUGH TRAFFIC IN SUCH A LANE CAN BE TRAPPED IF NOT WARNED BY SIGNS AND MARKINGS. THE THROUGH TRAFFIC MUST INTENTIONALLY MANEUVER OUT OF SUCH LANE OR BE REQUIRED TO TURN. A BAY TURN LANE THAT EXTENDS BETWEEN TWO INTERSECTIONS SHALL BE CONSIDERED A DROP TURN LANE.

INTERSECTION: THE JUNCTION OF TWO OR MORE STREETS AT GRADE.

STOP BAR: STOP BARS MAY BE USED TO INDICATE THE POINT BEHIND WHICH VEHICLES ARE TO STOP DUE TO A REQUIRED TRAFFIC CONTROL STOP CONDITION.

TAPER- BAY BAY TAPERS ARE USED TO GUIDE VEHICULAR TRAFFIC TO ENTER A LEFT TURN OR A RIGHT TURN LANE. THE STANDARD LENGTH OF A BAY TAPER IS 150' .

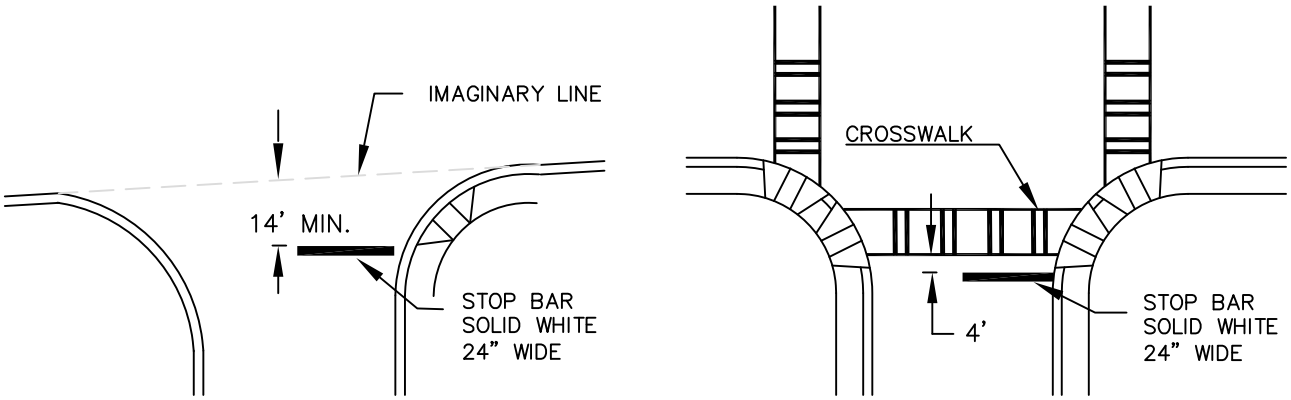
TAPER- MERGE MERGING TAPERS ARE USED TO GUIDE VEHICULAR TRAFFIC TO SHIFT SIDEWAYS LEAVING AN ENDING LANE INTO AN ADJACENT LANE.

TAPER- SHIFT: SHIFTING TAPERS ARE USED TO GUIDE VEHICULAR TRAFFIC TO SHIFT SIDEWAYS WITHOUT CHANGING LANES. THE LANE IS CONTIGUOUS BUT SHIFTS SIDEWAYS.

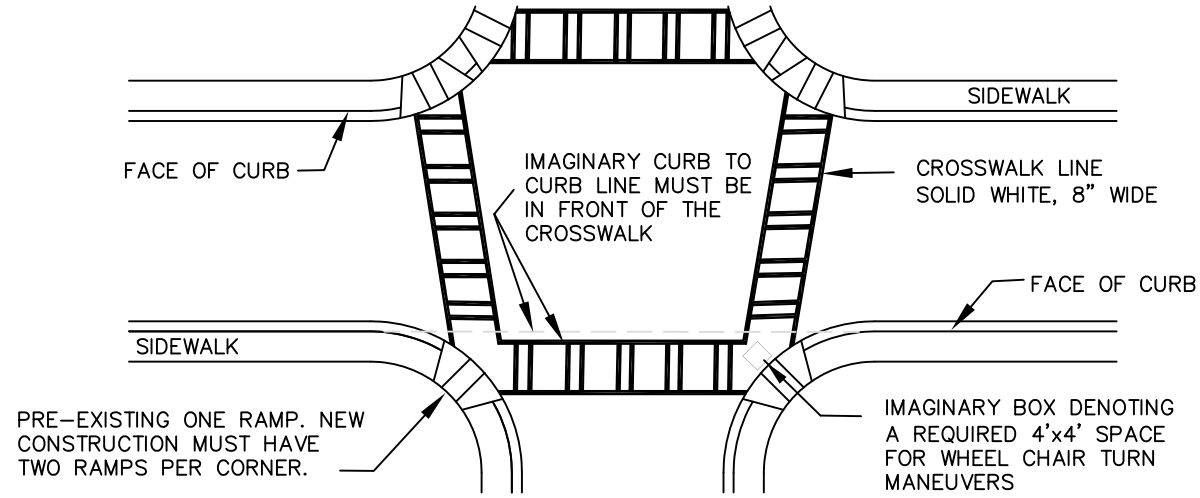
TABLE OF CONTENT:

PAVEMENT MARKINGS GUIDELINE:

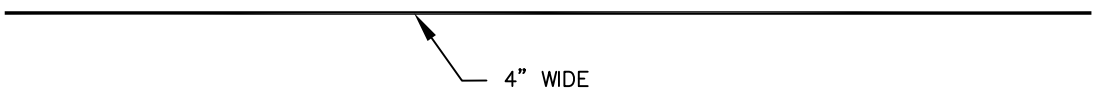
STOP BARS: A STOP BAR SHALL BE SOLID WHITE AND 24" IN WIDTH. WHEN INSTALLED, A STOP BAR SHOULD BE PLACED A MINIMUM OF 14' FROM THE EDGE OF THE CROSSING ROAD. IF CROSSWALKS ARE PRESENT, THE STOP BAR SHALL BE A MINIMUM OF 4' IN ADVANCE OF THE NEAREST CROSSWALK LINE. A STOP BAR SHOULD BE INSTALLED PERPENDICULAR TO THE LEG OF THE INTERSECTION IT IS BEING INSTALLED ON.



CROSSWALK: CROSSWALKS MUST PROVIDE DIRECT AND UNOBSTRUCTED CONNECTION BETWEEN CURB RAMPS. CROSSWALK LINES SHALL BE SOLID WHITE AND 8" IN WIDTH. THE CROSSWALK WIDTH SHOULD BE 10' WIDE UNLESS OTHERWISE SPECIFIED ON THE PLAN BUT SHALL NOT BE LESS THAN 6'. CURB RAMPS MUST BE CONTAINED WITHIN THE CROSSWALK BUT NOT NECESSARILY THE FLARES THE CENTERLINE OF THE CROSSWALK DOES NOT HAVE TO LINE UP WITH CENTERLINE OF RAMP.

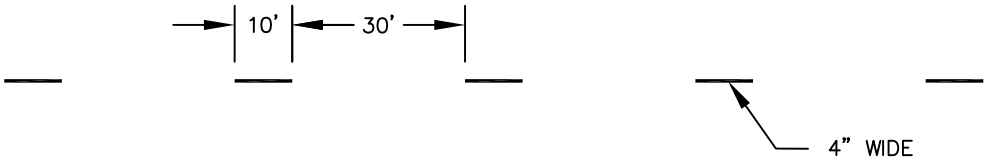


EDGE LINES: EDGE LINES SHALL BE 4" WIDE. SOLID WHITE EDGE LINES SHALL BE INSTALLED TO THE RIGHT OF MOTORISTS TRAVELING IN THE FAR RIGHT LANE WHEN CONCRETE CURB AND GUTTER ARE NOT PRESENT OR WHEN CONCRETE CURB IS PRESENT BUT GUTTER IS EITHER FILLED IN WITH ASPHALT OR NOT PRESENT. SOLID YELLOW EDGE LINES SHALL BE INSTALLED ON ALL DIVIDED TO THE LEFT OF MOTORISTS TRAVELING IN THE EXTREME LEFT LANE (EVEN IF CONCRETE CURB AND GUTTER IS PRESENT). EDGE LINES SHALL NOT CONTINUE THRU INTERSECTIONS AND/OR STREET-TYPE ENTRANCE DRIVEWAYS (TYPES III AND IV, CHARLOTTE LAND DEVELOPMENT STANDARDS 10.28 AND 10.25F, RESPECTIVELY). EDGE LINES SHALL NOT BE BROKEN FOR DROP CURB CONCRETE RAMP DRIVEWAYS (TYPES I AND II, CHARLOTTE LAND DEVELOPMENT STANDARDS).

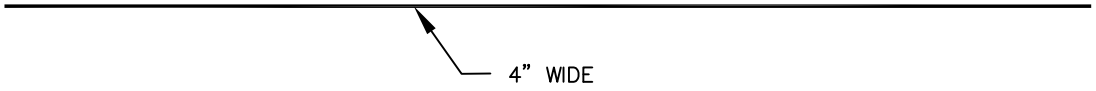


LANE LINES: LANE LINES SHALL BE WHITE AND 4" WIDE. LANE LINES CAN BE SKIP OR SOLID AND SHALL BE INSTALLED TO SEPARATE LANES OF TRAFFIC TRAVELING IN THE SAME DIRECTION.

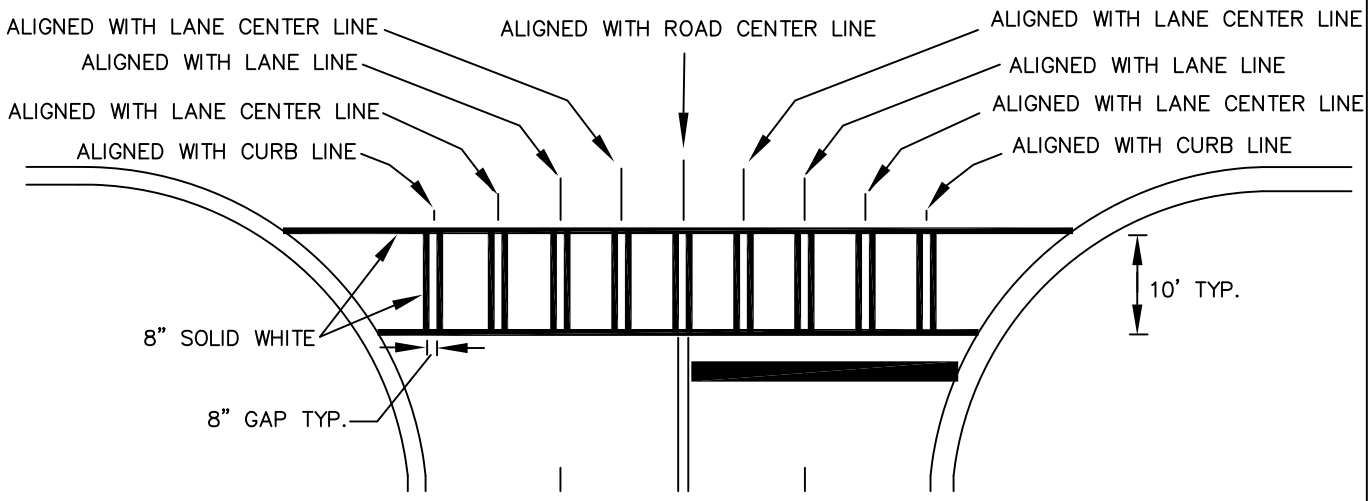
SKIP LANE LINES: SKIP LANE LINES SHALL BE INSTALLED TO SEPARATE THROUGH LANES TRAVELING IN THE SAME DIRECTION. EACH SKIP LINE SHALL BE 10' IN LENGTH PLACED AT 30' INTERVALS.



SOLID LANE LINES, 4" WIDE: 4" WIDE SOLID LANE LINES SHALL BE INSTALLED TO SEPARATE DUAL TURN LANES AS WELL AS THROUGH LANES FROM TURN LANES THAT ARE TRAVELING IN THE SAME DIRECTION.

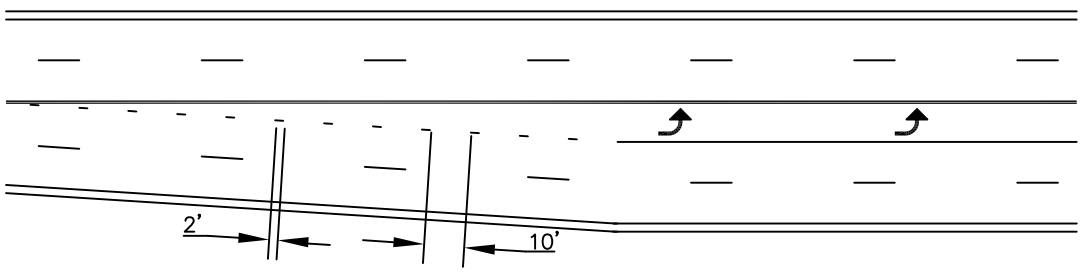


PIANO STYLE CROSSWALKS: PIANO STYLE CROSSWALK MARKINGS WILL BE USED AT ALL SIGNALIZED INTERSECTIONS, SCHOOL ZONE CROSSINGS, AND MARKED MID-BLOCK CROSSINGS.

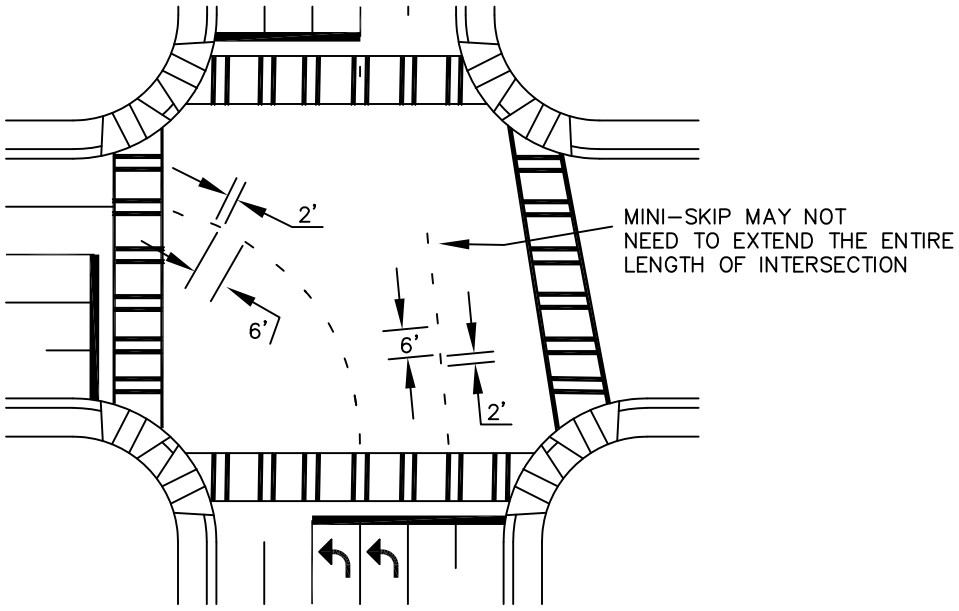


MINI-SKIP LINES: MINI-SKIP LINES (DASHED LINES) SHALL BE WHITE, 2' LONG, AND 4" WIDE. THE SPACING BETWEEN THE MINI-SKIP LINES VARIES DEPENDING ON THE APPLICATION:

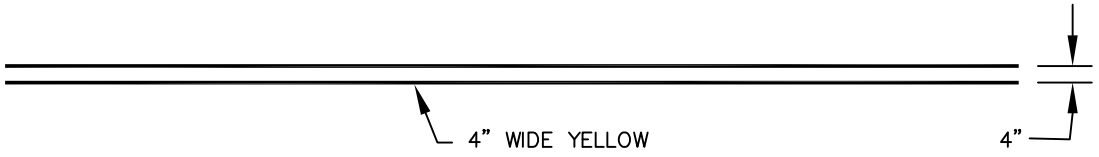
MINI-SKIP LINE AS TAPERS: MINI-SKIP LINES SHALL BE SEPARATED BY 10' GAPS WHEN USED TO TAPER THROUGH TRAFFIC AWAY FROM TURN LANES.



MINI–SKIP LINE THROUGH INTERSECTION: MINI–SKIP LINES SHALL BE SEPARATED BY 6' GAPS WHEN USED THROUGH AN INTERSECTION, i.e. FOR DUAL TURNS OR TO DELINEATE AN OFFSET. ENGINEERING JUDGEMENT SHOULD BE APPLIED WHEN MINI–SKIPS ARE USED THRU AN INTERSECTION WITH A CURVE.

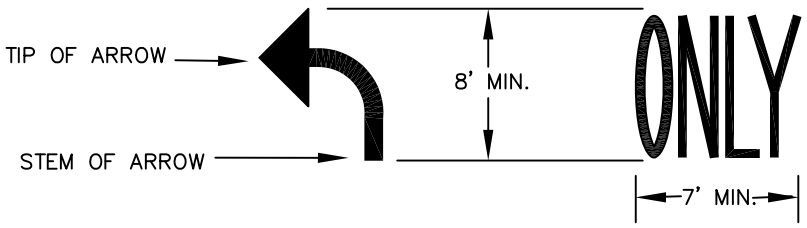


CENTER LINES SHALL BE A DOUBLE YELLOW LINE. A DOUBLE YELLOW LINE SHALL CONSIST OF TWO SOLID 4" SIDE YELLOW LINES PLACED 4" APART. WHEN WARRANTED, CENTER LINES SHALL BE USED TO SEPARATE TRAFFIC TRAVELING IN OPPOSITE DIRECTIONS WHERE A MEDIAN ISLAND IS NOT PRESENT. CENTER LINE MARKINGS SHALL BE PLACED ON STREETS THAT HAVE AN ADT OF 6000 VEHICLES PER DAY OR MORE AND ALSO ARE 20' OR MORE IN WIDTH.



TURN ARROWS AND "ONLY" LEGENDS

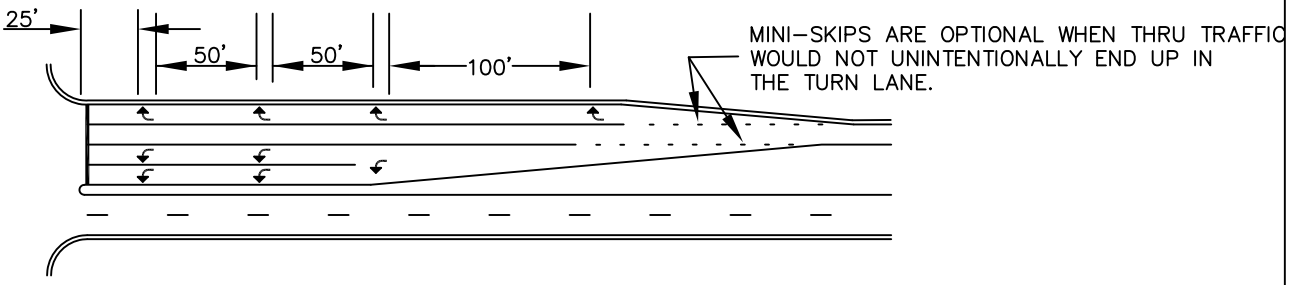
TURN ARROWS AND "ONLY" LEGENDS SHALL BE WHITE. ALTHOUGH ALL TURN LANES MUST HAVE ARROWS IN THEM, SOME MUST ALSO HAVE "ONLY" LEGENDS. THE LOCATIONS OF ARROWS AND "ONLY" LEGENDS AND THE USE OF THE "ONLY" LEGEND SHALL DEPEND ON WHETHER THE TURN LANE IS CONSIDERED A "BAY TURN LANE" OR A "DROP TURN LANE" (SEE DEFINITIONS SECTION).



TURN LANES:

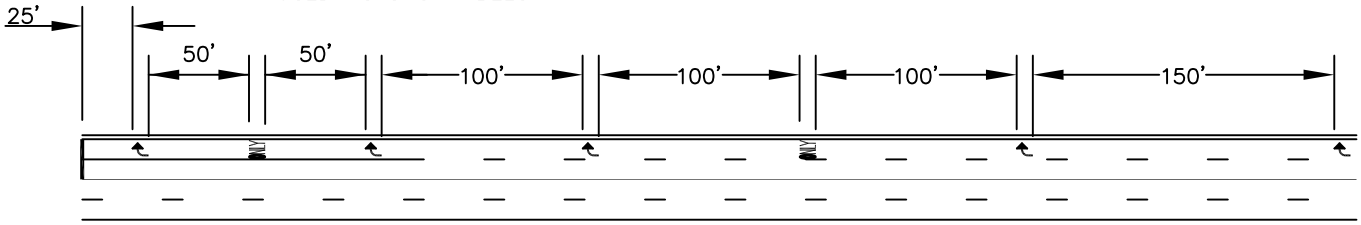
BAY TURN LANES: BAY TURN LANES SHALL HAVE ARROWS BUT NOT "ONLY" LEGENDS. THE NUMBER OF ARROWS TO BE INSTALLED IN A BAY TURN LANE SHALL DEPEND ON THE LENGTH OF THE TURN LANE. THE SPACING BETWEEN THE ARROWS IN A BAY TURN LANE SHALL BE AS FOLLOWS:

* TIP OF 1ST ARROW AT 25' FROM STOP BAR OR EXIT POINT OF THE TURN LANE
* TIP OF 2ND ARROW AT 50' FROM THE STEM OF THE 1ST ARROW
* TIP OF 3RD ARROW AT 50' FROM THE STEM OF THE 2ND ARROW
* TIP OF 4TH ARROW AT 100' FROM THE STEM OF THE 3RD ARROW
* TIP OF 5TH ARROW AT 100' FROM THE STEM OF THE 4TH ARROW
* TIP OF 6TH ARROW AT 100' FROM THE STEM OF THE 5TH ARROW
* TIP OF 7TH ARROW AT 150' FROM THE STEM OF THE 6TH ARROW
* TIP OF 8TH ARROW AT 150' FROM THE STEM OF THE 7TH ARROW

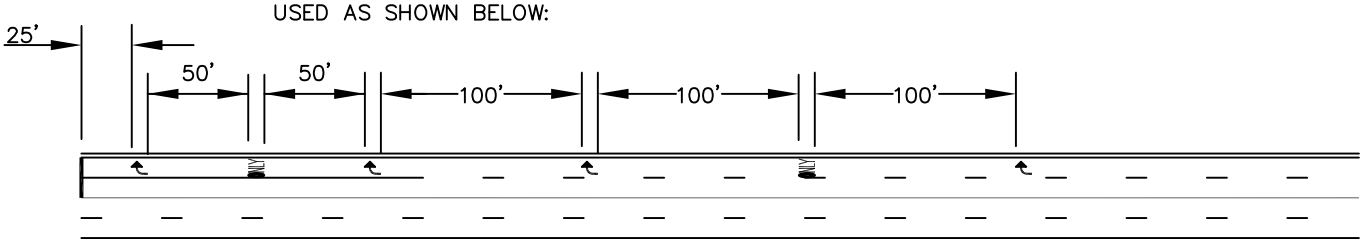


DROP TURN LANES: DROP TURN LANES SHALL HAVE ARROWS AND "ONLY" LEGENDS. THE NUMBER AND LOCATION OF THE ARROWS AND THE "ONLY" LEGENDS SHALL DEPEND ON THE POSTED SPEED LIMIT EXCEPT WHERE THE DROP TURN LANE IS ON THE STEM OF A T – INTERSECTION.

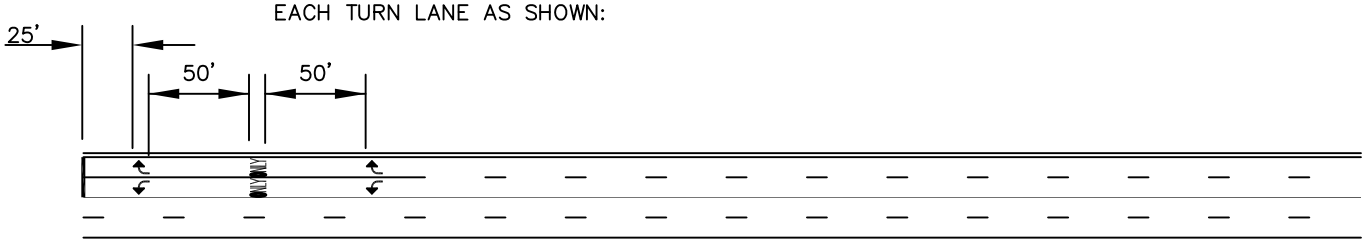
– FOR POSTED SPEED OF 40 MPH OR MORE, 5 ARROWS AND 2 "ONLY" LEGENDS SHALL BE USED AS SHOWN BELOW:



– FOR POSTED SPEED OF 35 MPH OR LESS, 4 ARROWS AND 2 "ONLY" LEGENDS SHALL BE USED AS SHOWN BELOW:

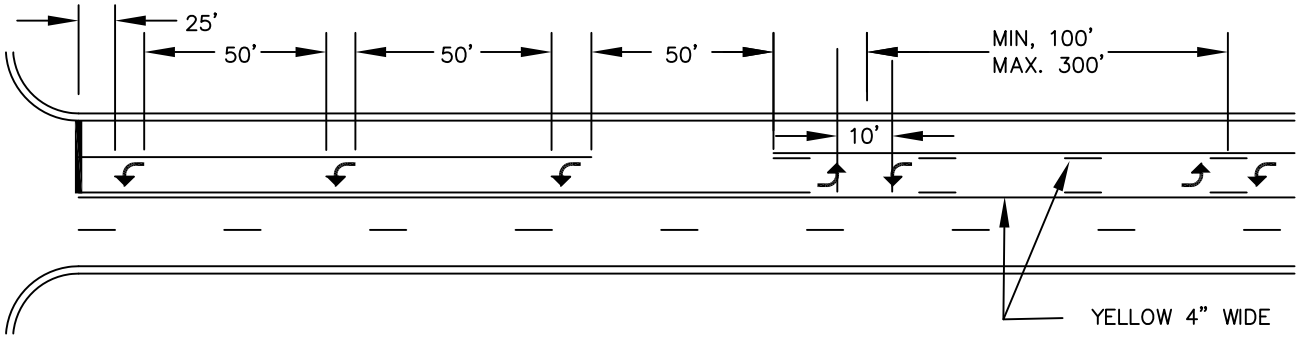


– FOR STEM OF A T – INTERSECTION, 2 ARROWS AND 1 "ONLY" LEGEND SHALL BE USED IN EACH TURN LANE AS SHOWN:



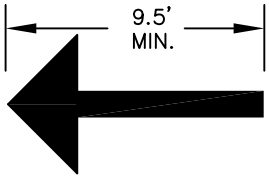
TWO WAY LEFT TURN LANES:

TWO WAY LEFT TURN LANES (TWLTL), COMMONLY REFERRED TO AS CENTER TURN LANES, SHALL BE MARKED USING A COMBINATION OF A YELLOW SKIP LINE AND A SOLID YELLOW LINE ON EACH EDGE OF THE LANE. THE SOLID LINE AND THE SKIP LINE ARE PLACED 4" APART WITH THE SKIP LINE ON THE INSIDE OF THE LANE. WHERE THE TWLTL IS TERMINATED BY AN EXCLUSIVE TURN LANE, THERE SHALL BE A 50' LONG GAP BETWEEN THE SOLID SKIP YELLOW LINE OF THE TWLTL AND THE WHITE LANE LINE OF THE EXCLUSIVE TURN LANE. WHITE ARROWS SHALL BE INSTALLED IN THE LANE AS SHOWN BELOW.



STRAIGHT ARROWS:

STRAIGHT ARROWS SHALL BE WHITE. THE ONLY STANDARD APPLICATION REGARDING STRAIGHT ARROWS IS IN THE THROUGH LANES OF ONE-WAY STREETS THAT ARE SIGNALIZED.

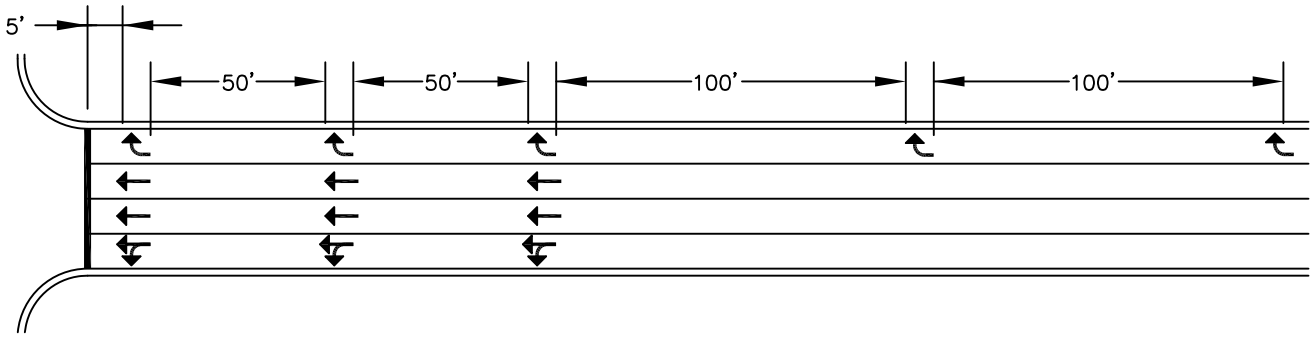


ONE-WAY STREET:

A SET OF 3 STRAIGHT ARROWS SHALL BE USED IN EACH THROUGH LANE SPACED AS FOLLOWS:

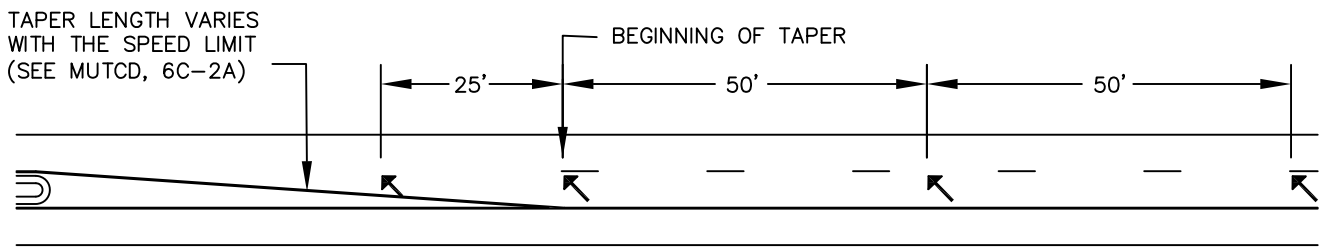
TIP OF 1ST ARROW AT 5' FROM STOP BAR
TIP OF 2ND ARROW AT 50' FROM THE STEM OF THE 1ST ARROW
TIP OF 3RD ARROW AT 50' FROM THE STEM OF THE 2ND ARROW

WHERE STRAIGHT ARROWS ARE USED, ARROWS SHOULD BE PLACED IN EACH LANE. COMBINATION STRAIGHT/TURN ARROWS SHOULD BE USED APPROPRIATELY.



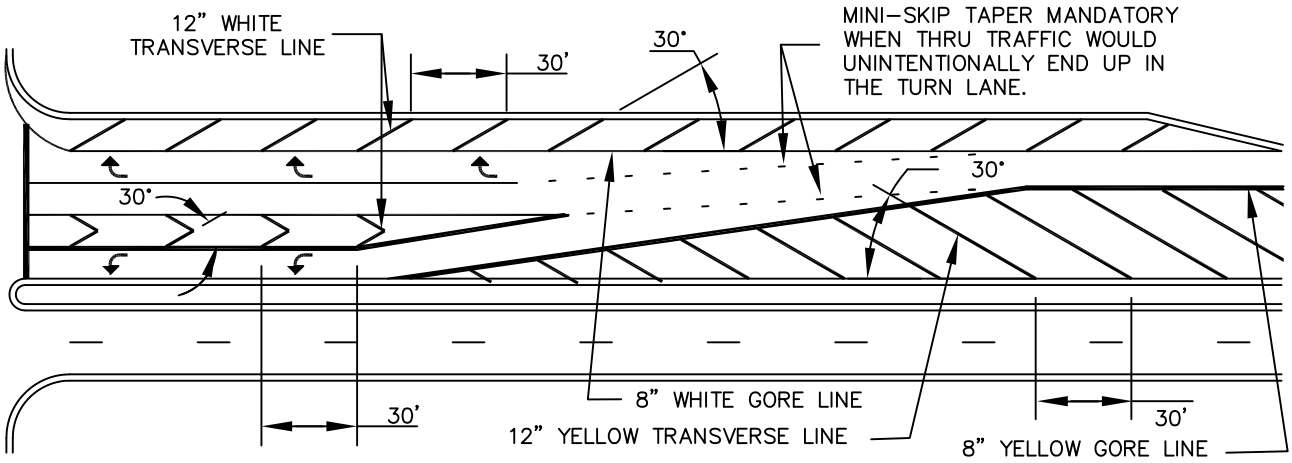
MERGE LANE ARROWS:

STRAIGHT WHITE ARROWS AT 45° ANGLE TO THE LANE LINE SHALL BE INSTALLED IN THE THROUGH LANE THAT IS MERGED INTO AN ADJACENT THROUGH LANE AS SHOWN BELOW:

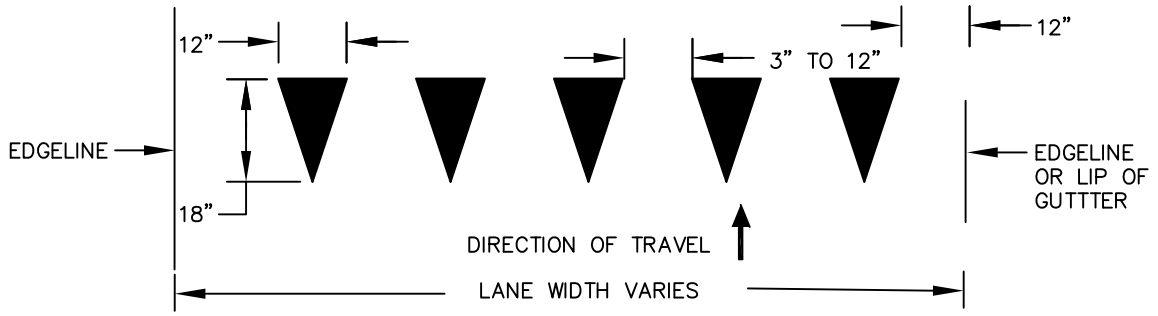


GORE LINES: GORE LINES SHALL BE SOLID 8" WIDE LINES. A GORE LINE SHALL BE WHITE WHEN PLACED TO FORM A CHANNELIZATION ISLAND SEPARATING TRAFFIC TRAVELING IN THE SAME DIRECTION. A GORE LINE SHALL BE WHITE WHEN PLACED TO RIGHT OF MOTORISTS TRAVELING IN THE EXTREME RIGHT LANE, AND SHALL BE YELLOW WHEN PLACED TO THE LEFT OF MOTORISTS TRAVELING IN THE EXTREME LEFT LANE.

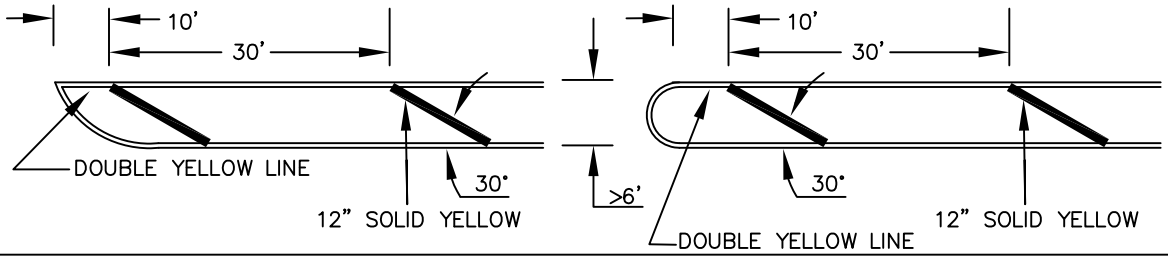
TRANSVERSE LINES: TRANSVERSE (HATCH) LINES SHALL BE SOLID 12" WIDE LINES. TRANSVERSE LINES SHALL BE YELLOW WHEN PLACED TO THE LEFT OF MOTORISTS TRAVELING IN THE EXTREME LEFT LANE. TRANSVERSE LINES SHALL BE WHITE WHEN PLACED TO THE RIGHT OF MOTORISTS TRAVELING IN THE EXTREME RIGHT, AND WHEN PLACED IN CHANNELIZATION ISLANDS SEPARATING TRAFFIC TRAVELING IN THE SAME DIRECTION. TRANSVERSE LINES SHOULD BE ANGLED 30° TO THE APPROACHING TRAFFIC. THE DIRECTION OF THE ANGLE SHOULD BE SUCH THAT THE TRAFFIC FOLLOWING THE TRANSVERSE LINES IS DIRECTED BACK INTO THE TRAVEL LANE.



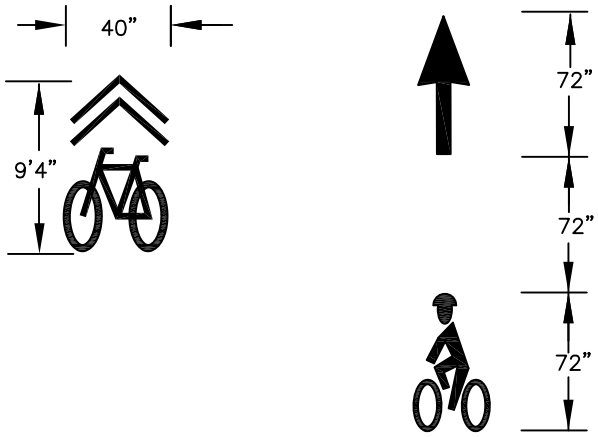
YIELD LINE: YIELD LINES INDICATE THE POINT BEHIND WHICH VEHICLES ARE REQUIRED TO YIELD. THE ARROWS IN THE YIELD LINE SHOULD BE LAID OUT WITH A BASE DIMENSION OF 12" AND A HEIGHT OF 18". THE SEPARATION OF THE ARROWS SHOULD NOT EXCEED 12" AND NOT BE SMALLER THAN 3".



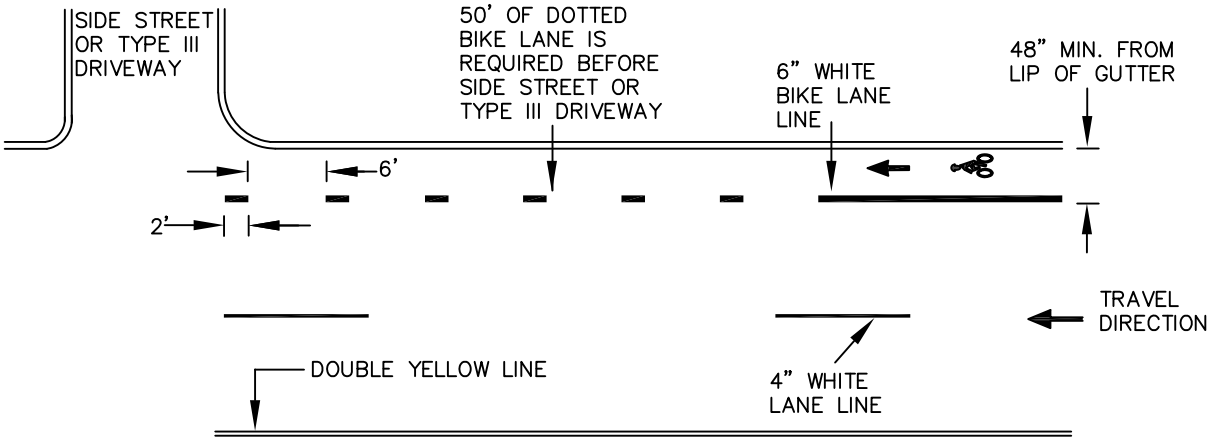
MARKED MEDIAN ISLANDS: TWO DOUBLE YELLOW LINES SHALL BE USED TO FORM A MARKED MEDIAN ISLAND THAT SEPARATES TRAFFIC TRAVELING IN OPPOSITE DIRECTIONS. A MARKED ISLAND SHOULD BE NO LESS THAN 6' IN WIDTH AND SHOULD HAVE AT LEAST TWO SOLID YELLOW TRANSVERSE LINES, 12" WIDE, INSTALLED AT THE NOSE OF THE ISLAND AT AN ANGLE OF 30 DEGREES, WHENEVER POSSIBLE. THE ISLAND NOSE CAN BE A HALF BULLET NOSE OR A CIRCULAR NOSE DEPENDING ON THE TIGHTNESS OF THE OPENING BETWEEN ISLAND NOSES RELATIVE TO APPROPRIATE TURNING RADII OF LEFT TURNING TRAFFIC FROM THE SIDE STREET.



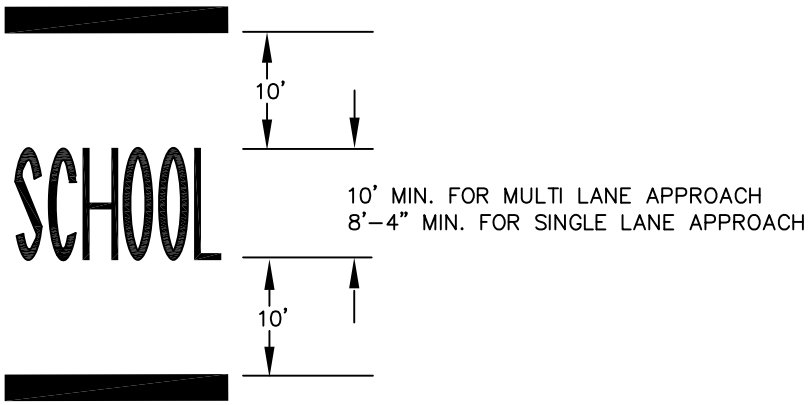
BIKE LANE SYMBOLS:



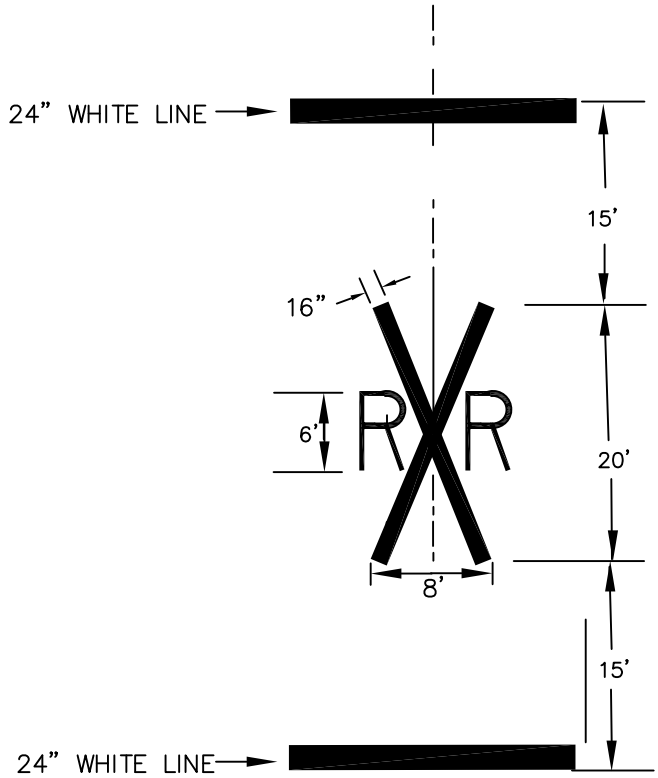
BIKE LANE: BICYCLE LANE MARKINGS DESIGNATE THE PORTION OF THE ROADWAY FOR PREFERENTIAL USE BY BICYCLISTS. MARKINGS INFORM ALL ROAD USERS OF THE RESTRICTED NATURE OF THE BICYCLE LANE. BICYCLE LANE MARKINGS SHOWN IN THIS DOCUMENT SHALL BE WHITE AND 6" IN WIDTH. BIKE LANE MARKING DESIGNS VARY DEPENDING ON THE SITUATION. IN SOME SITUATIONS GREEN BICYCLE RELATED MARKING MAY BE USED FOLLOWING CDOT'S "GREEN PAVEMENT MARKINGS FOR BICYCLE FACILITIES".



SCHOOL LEGEND: THE "SCHOOL" WORD MARKING WHEN USED MAY EXTEND TO THE WIDTH OF TWO APPROACH LANES.

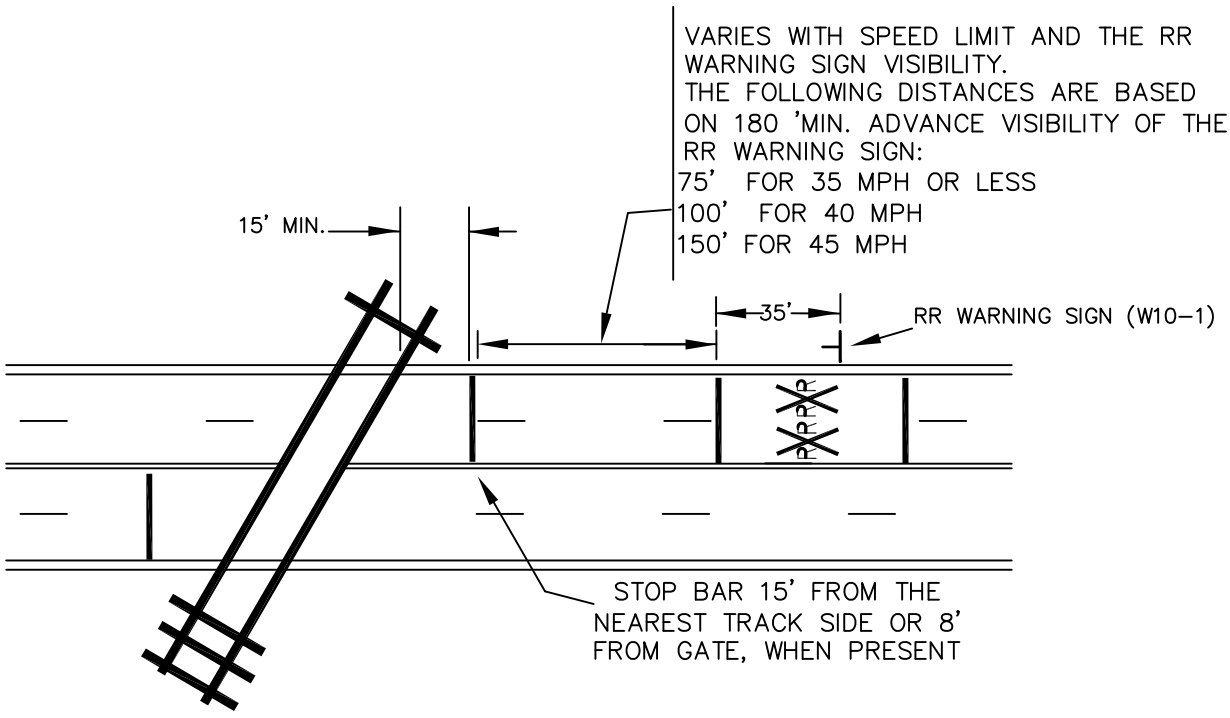


RAILROAD SYMBOL:



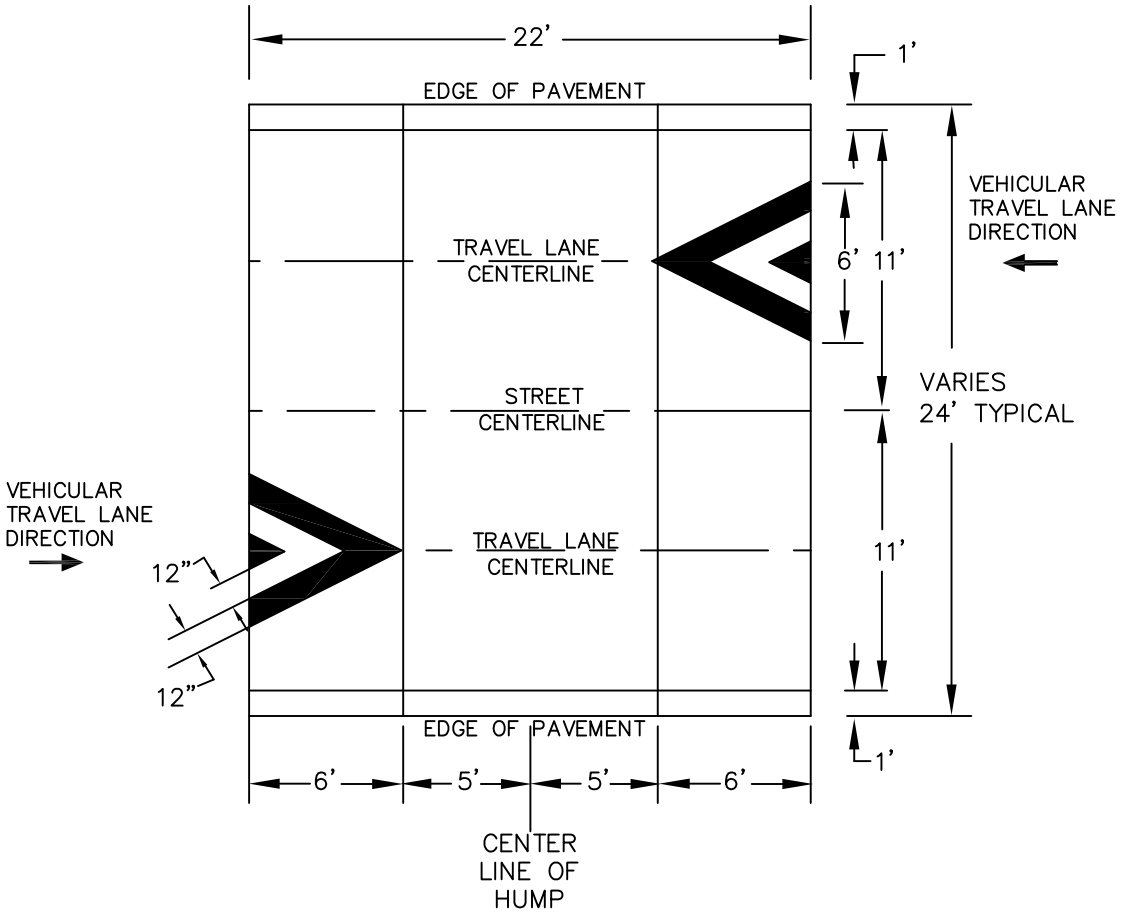
RAILROAD MARKINGS AT GRADE CROSSING:

PAVEMENT MARKINGS IN ADVANCE OF A RAILROAD AT GRADE CROSSING SHALL CONSIST OF AN "X", THE LETTERS "RR", STOP BARS AND NO PASSING ZONE (DOUBLE YELLOW CENTER LINE OR RAISED MEDIAN). IDENTICAL MARKING SHALL BE PLACED IN EACH APPROACH LANE TO THE GRADE CROSSING.



SPEED HUMP TABLE:

SPEED HUMP TABLE MARKING SHALL CONSIST OF WHITE MARKINGS AND SHALL BE BE USED WHEN A ROAD HUMP TRAFFIC CALMING STRUCTURE IS PLACED ACROSS THE TRAVEL LANE. IF THE SPEED HUMP TABLE IS ALSO USED AS A CROSSWALK, THEN HIGH VISIBILITY CROSSWALK MARKING SHALL BE ALSO INSTALLED ON THE TABLE PART OF THE SPEED HUMP.



RAISED MARKERS:

WHEN USED, RAISED PAVEMENT MARKERS SHALL BE INSTALLED IN ACCORDANCE WITH STANDARDS 1250.01, 1251.01 AND 1253.01 OF THE NORTH CAROLINA ROADWAY STANDARDS DRAWINGS.

TAPER LENGTH TABLE:

THE REQUIRED LENGTH OF A TAPER IS RELATED TO THE SPEED LIMIT. A SHIFTING TAPER (TRAFFIC SHIFTS SIDEWAYS BUT DO NOT CHANGE LANES) IS USUALLY $\frac{1}{2}$ OF THE LENGTH OF A MERGING TAPE (TRAFFIC CHANGES LANES). SEE TABLE BELOW:

FORMULAS FOR DETERMINING TAPER LENGTH

Speed Limit (S)	Merging Taper Length (MTL)	Shifting Taper Length (STL)
40 mph or less	MTL = (WxSxS)/60	STL = (WxSxS)/120
45 mph or more	MTL = WxS	STL = (WxS)/2

Where:
S = Speed Limit
W = Width of offset in feet
MTL = Merging Taper Length
STL = Shifting Taper Length