



**DEVELOPMENTAL SPECIFICATIONS
FOR
DIAMOND GRINDING RUMBLE STRIPS**

**Effective Date
July 16, 2024**

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE DEVELOPMENTAL SPECIFICATIONS AND THEY PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

23060.01 DESCRIPTION.

Provide equipment, furnish all necessary labor and materials, and perform all operations necessary for diamond grinding standard or sinusoidal rumble strips in HMA or PCC surfaces. Diamond grind rumble strips to the dimensions and spacing shown in the contract documents. Apply diluted asphalt emulsion to the **milled diamond ground** shoulder rumble strips on HMA surfaces by means of a bituminous distributor.

23060.02 MATERIALS.

- A. Use asphalt emulsion Grade CSS-1, CSS-1h, SS-1, or SS-1h meeting requirements of [Section 4140 of the Standard Specifications](#).
- B. Dilute the asphalt emulsion with water prior to application to the milled shoulder rumble strip. The dilution rate is one part of asphalt emulsion to one part of water.

23060.03 CONSTRUCTION.

A. General.

- 1. Notify the Engineer if degraded areas are encountered that will not accommodate diamond ground rumble strips. Skip those sections.
- 2. Allow PCC to cure for a minimum of 14 days prior to placing diamond ground rumble strips.

B. Equipment.

- 1. Perform grinding using stacked diamond blades mounted on a self propelled machine that has been designed for grinding PCC or HMA surfaces. Ensure the equipment will not cause strain or damage to the underlying pavement.
- 2. Do not use grinding equipment that causes excessive ravels, aggregate fractures, spalls, or excessive disturbance of the transverse and/or longitudinal joints. **The finished surface after grinding the rumble strips should have a corduroy like texture.**

3. For standard rumble strips use grinding equipment with a minimum effective head width suitable for grinding the entire width of the rumble strip in one pass. For centerline rumble strips use a grinding head equipped to grind the rumble strip on each side of the centerline in one pass.
4. Select the blade type and number of blades per foot to provide proper surface texture based on the material being ground, in particular, the coarse aggregate type.

C. Test Strip.

Demonstrate to the Engineer on an initial 500 foot test section that the equipment and method will provide the desired diamond ground rumble strip and surface inside each depression without damaging the adjacent pavement. If the desired results are not being provided, as determined by the Engineer, provide different equipment or methods, or make necessary adjustments to provide the desired results. If the initial 500 foot section results are unsatisfactory, repair or replace the section as determined by the Engineer, at no additional cost to the Contracting Authority.

D. Grinding.

1. Grind shoulder rumble strips in a straight line, offset from the painted edge line as shown in the contract documents. Do not deviate from that offset more than ± 2 inches. Ensure the depth of the rumble strips is as shown in the contract documents. The Engineer will randomly check the alignment and depth.
2. Grind centerline rumble strips in a straight line, on the centerline joint as shown in the contract documents. Do not deviate from that location more than ± 1 inch. Ensure the depth of the rumble strips is as shown in the contract documents. The Engineer will randomly check the alignment and depth.
3. Continuously remove all slurry or residue resulting from the grinding operations. Do not deposit on the slab or shoulder. Leave pavement and paved shoulders in a clean condition. Ensure residue from grinding operations does not flow across lanes occupied by public traffic or into gutters or other drainage facilities. This residue may be spread on the foreslope or removed according to [Article 1104.08 of the Standard Specifications](#). When residue is deposited on the foreslope in areas where cable guardrail is present, spread the residue in a manner that prevents it from collecting in the sockets for the cable guardrail system. Take measures to prevent damage to vegetation during spreading of residue. If damage occurs, repair at no cost to the Contracting Authority. Do not allow discharge of slurry or residue into gutters, drainage facilities, or bodies of water.

E. Asphalt Emulsion Fog Seal.

Per [Article 2548.03, C of the Standard Specifications](#).

F. Limitations.

Do not disturb desirable grass areas and desirable trees outside the construction limits. Do not park or service vehicles and equipment or use these areas for storage of materials. Obtain the Engineer's approval for storage, parking, and service areas.

23060.04 METHOD OF MEASUREMENT.

Measurement will be as follows:

A. Diamond Ground Shoulder Rumble Strips.

Stations shown in the contract documents for each type, measured along each edge of mainline pavement. Unless stated otherwise in the contract documents, no deduction will be made for gapped areas. The quantity will be adjusted for the length of degraded shoulders skipped, as defined in Article DS-23060.03 of this specification. The quantity will be adjusted for test sections

that were deemed unsatisfactory.

B. Diamond Ground Centerline Rumble Strips.

Stations shown in the contract documents for each type, measured along the centerline of mainline pavement. Unless stated otherwise in the contract documents, no deduction will be made for gapped areas. The quantity will be adjusted for the length of degraded pavement skipped, as defined in Article DS-23060.03 of this specification. The quantity will be adjusted for test sections that were deemed unsatisfactory.

C. Asphalt Emulsion for Fog Seal (Shoulder Rumble Strips).

Gallons computed from field measurements of distributors or from tank cars or transport trucks as provided in [Article 4100.03 of the Standard Specifications](#). When quantities computed from field measurements check within 1.0% of the billed gallons, payment will be based on billed gallons. When quantities computed from field measurements differ from billed gallons by more than 1.0%, payment will be based on the quantity from field measurements. From these quantities, any amount used by the Contractor as fuel, left in cars, or otherwise not delivered to the road surface will be deducted. The Engineer will advise the Contractor promptly, in writing, of quantities deducted.

23060.05 BASIS OF PAYMENT.

Payment will be the contract unit price as follows:

A. Diamond Ground Shoulder Rumble Strips.

Per station for the type specified.

B. Diamond Ground Centerline Rumble Strips.

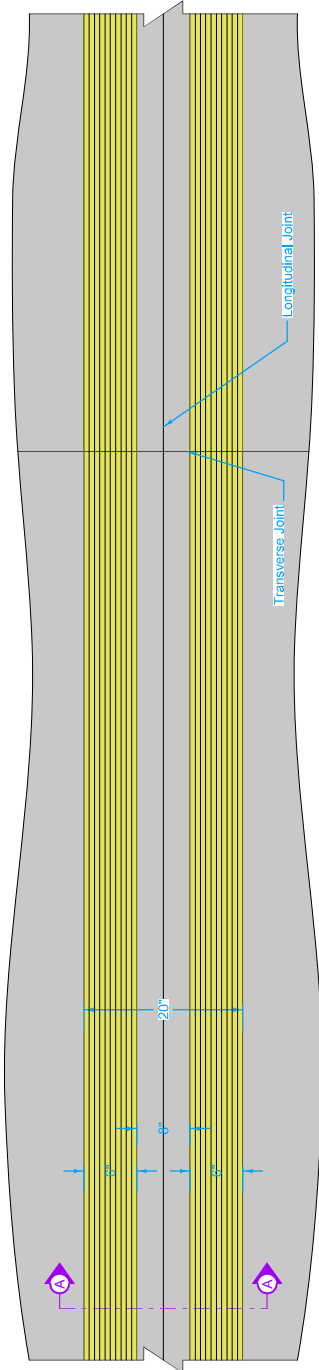
Per station for the type specified.

C. Asphalt Emulsion for Fog Seal (Shoulder Rumble Strips).

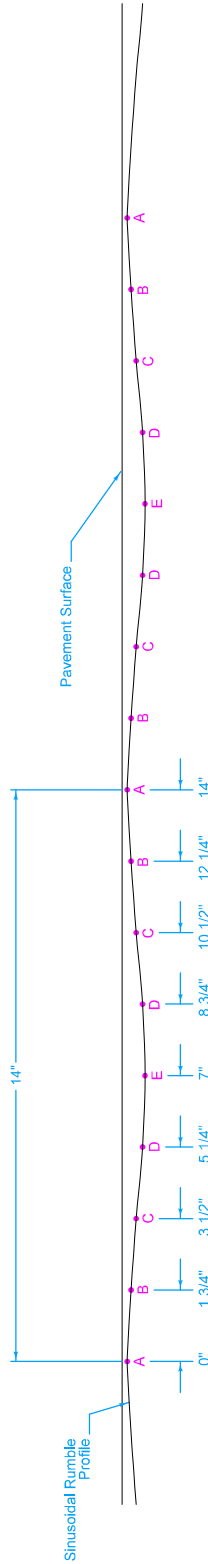
1. Per gallon for undiluted Asphalt Emulsion for Fog Seal (Shoulder Rumble Strips) that is mixed and used on the project. Diluted asphalt emulsion that is delivered to the project site, but not applied to the roadway surface will not be considered for payment.
2. Payment is full compensation for cleaning the shoulder surface, furnishing and applying diluted asphalt emulsion, mixing water, and protecting the adjacent pavement and edge lines.

Centerline rumble strip placement is the same regardless of centerline pavement marking.

① Depth tolerance is $\pm 1/16$.

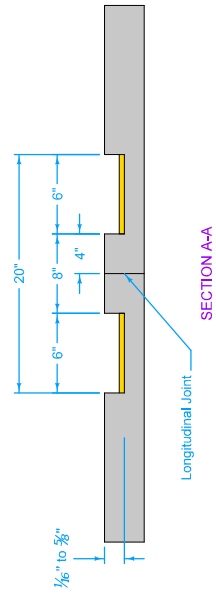


PLAN



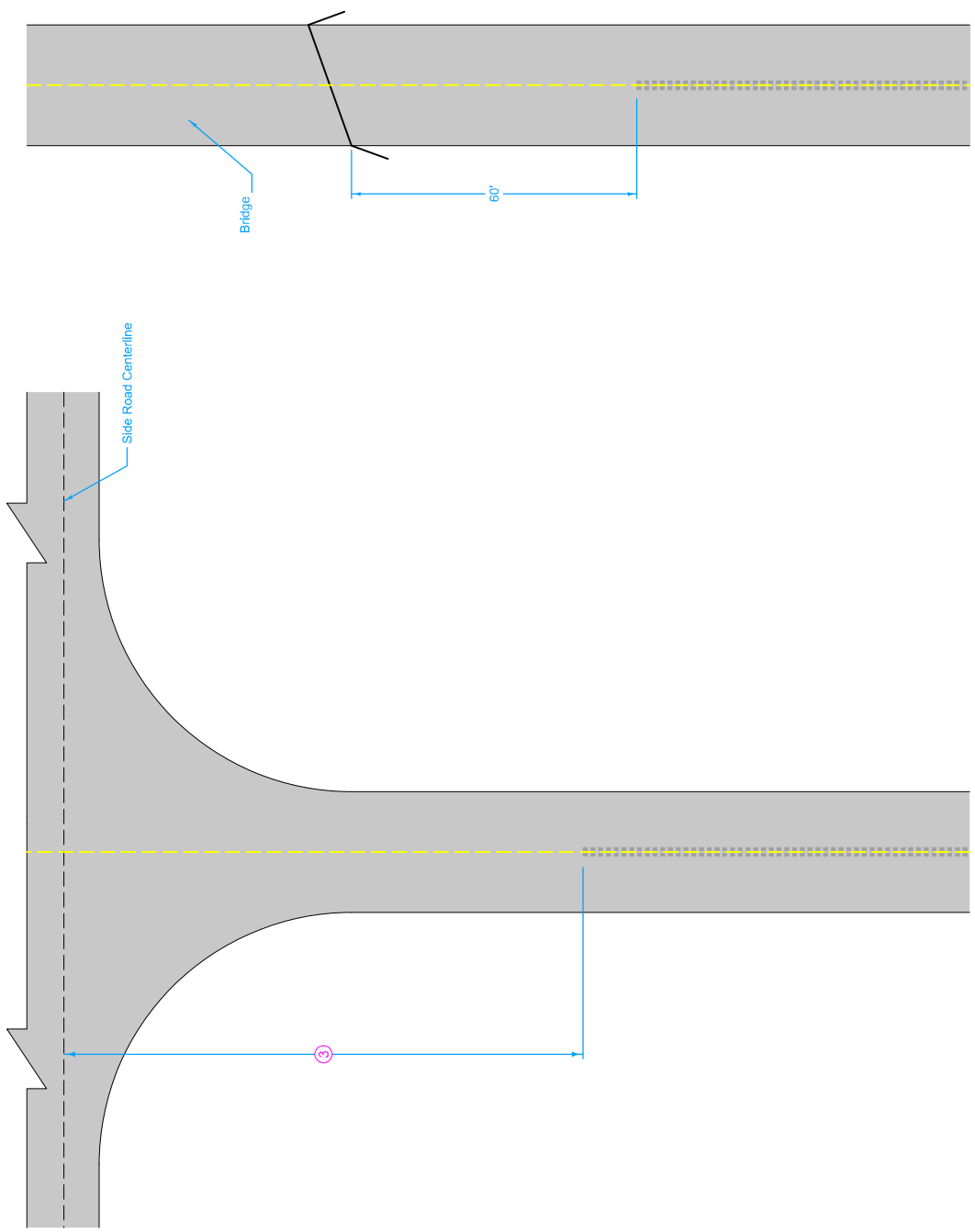
PROFILE

Location	Depth (inches)
A	1/8
B	7/32
C	11/32
D	1/2
E	9/16



DIAMOND GROUND
SINUSOIDAL
CENTERLINE RUMBLE STRIPS

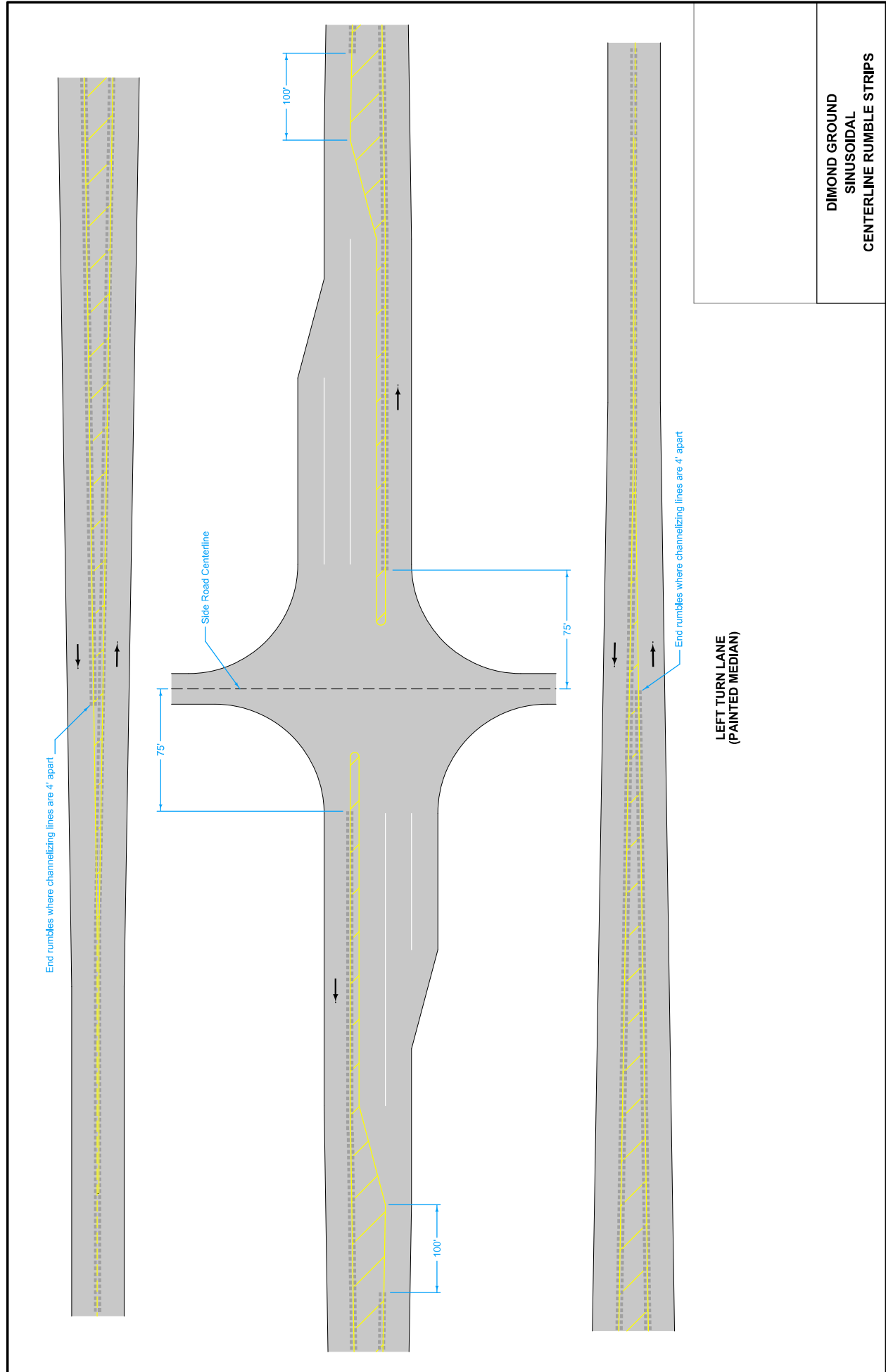
③ Stop rumbles 180 feet in advance of paved side roads or 75 feet for granular side roads.

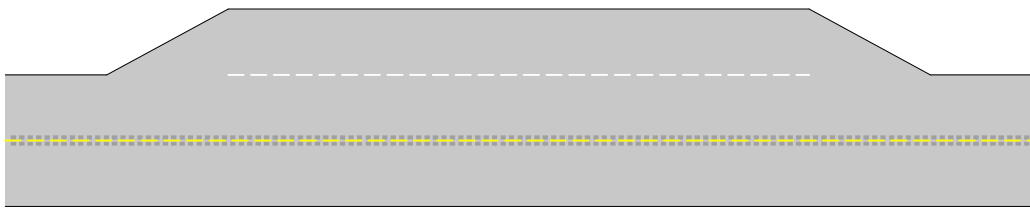


DIMOND GROUND
SINUSOIDAL
CENTERLINE RUMBLE STRIPS

BRIDGE APPROACH

INTERSECTION WITH
SIDE ROAD

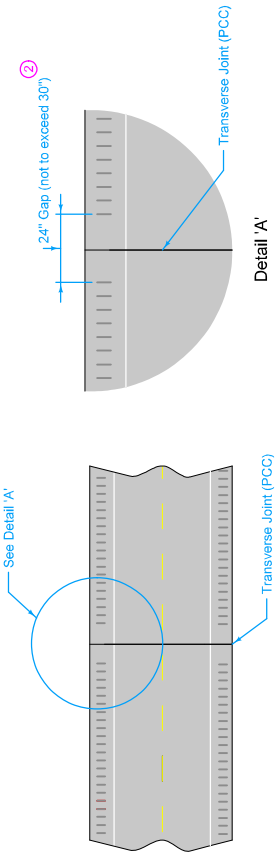
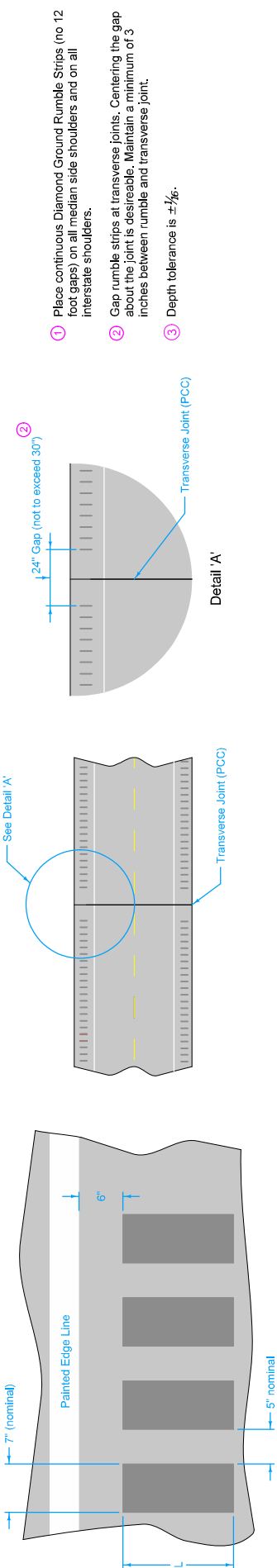




PASSING LANE SITUATIONS

DIMOND GROUND
SINUSOIDAL
CENTERLINE RUMBLE STRIPS

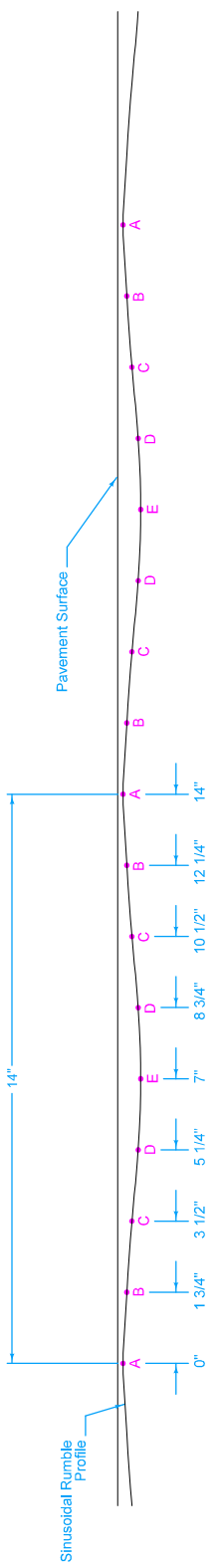
DESIGNER INFORMATION



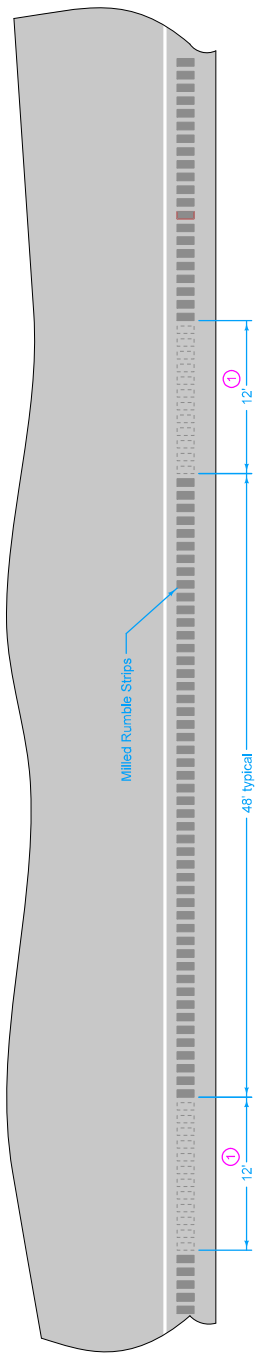
- ① Place continuous Diamond Ground Rumble Strips (no 12 foot gaps) on all median side shoulders and on all interstate shoulders.
- ② Gap rumble strips at transverse joints. Centering the gap about the joint is desirable. Maintain a minimum of 3 inches between rumble and transverse joint.
- ③ Depth tolerance is $\pm 1/16$.

Location	Depth (inches)
A	1/8
B	7/32
C	11/32
D	1/2
E	9/16

PLAN

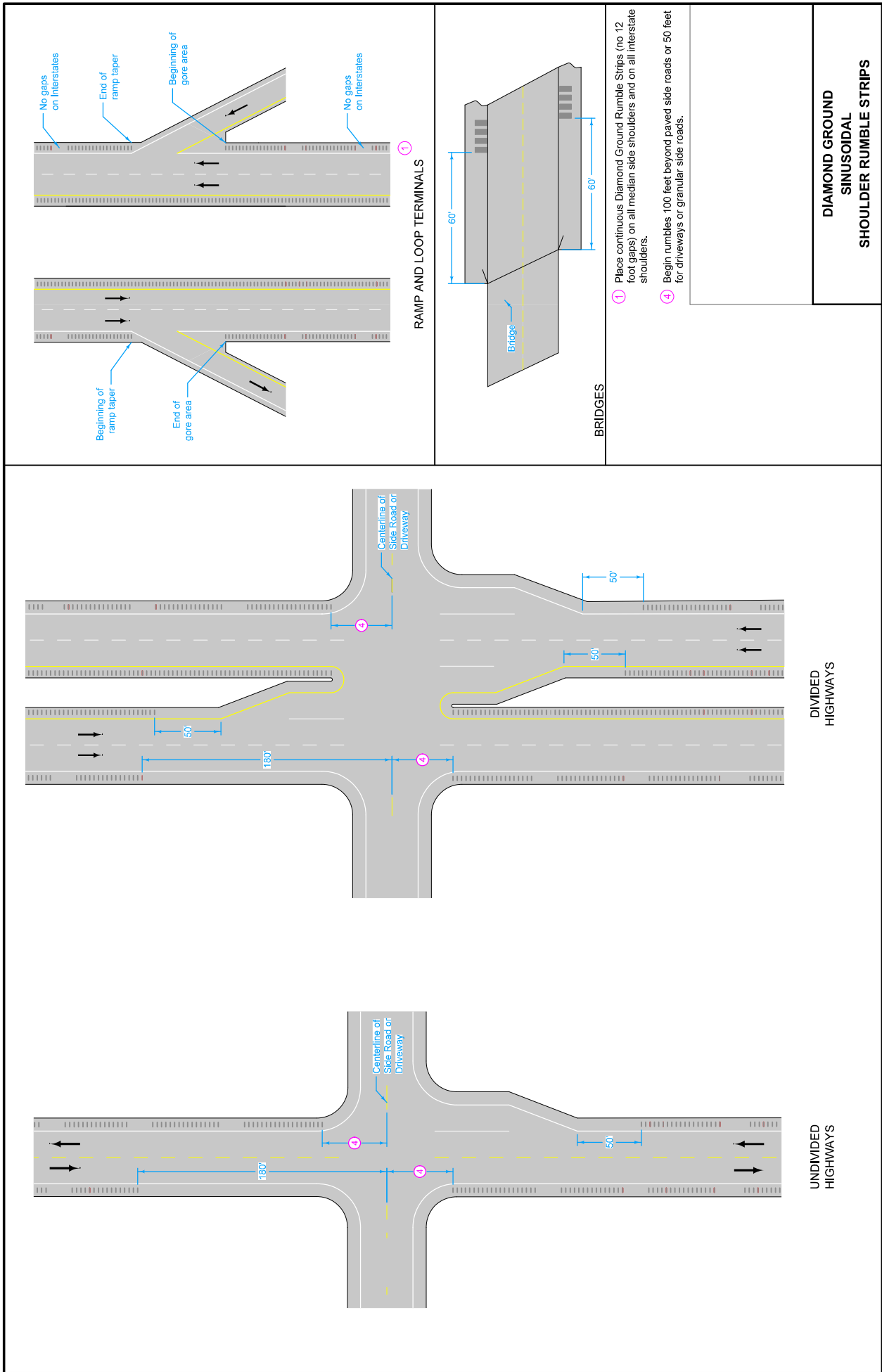


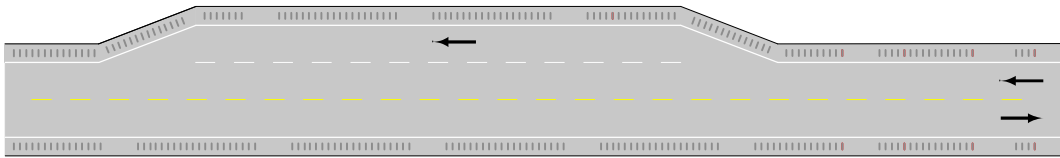
PROFILE



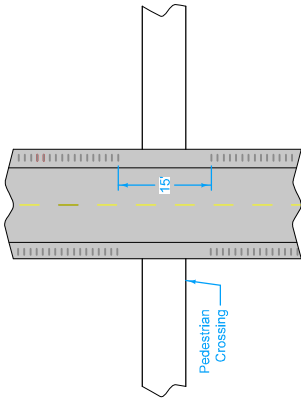
GAP DETAILS

DIAMOND GROUND
SINUSOIDAL
SHOULDER RUMBLE STRIPS

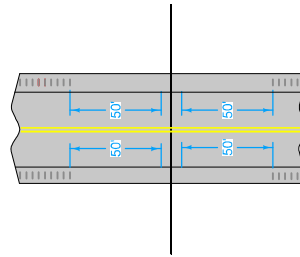




PASSING LANE



PEDESTRIAN CROSSING



RAILROAD CROSSING

DIAMOND GROUND
SINUSOIDAL
SHOULDER RUMBLE STRIPS