RUMBLE STRIPS AND ALTERNATE STRIPING MATERIALS

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Engineering Operations Branch Manager
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<tbody>
<tr>
<td>1</td>
<td>RS (1)</td>
<td>4-12</td>
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<tr>
<td>2</td>
<td>RS (2)</td>
<td>13-19</td>
</tr>
<tr>
<td>3</td>
<td>RS (3)</td>
<td>20-27</td>
</tr>
<tr>
<td>4</td>
<td>RS (4)</td>
<td>28-37</td>
</tr>
<tr>
<td>5</td>
<td>RS (5)</td>
<td>38-39</td>
</tr>
<tr>
<td>6</td>
<td>RS (1) &amp; (4)</td>
<td>40-42</td>
</tr>
<tr>
<td></td>
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<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>7</td>
<td>Different Striping Materials Used by the Atlanta District</td>
<td>43</td>
</tr>
<tr>
<td>8</td>
<td>High Build Paint</td>
<td>44-45</td>
</tr>
<tr>
<td>9</td>
<td>All-Weather Paint</td>
<td>46-49</td>
</tr>
<tr>
<td>10</td>
<td>All-Weather Thermoplastic Pavement Markings</td>
<td>50-52</td>
</tr>
<tr>
<td>11</td>
<td>Inverted Profile Pavement Marking (Audible)</td>
<td>53-54</td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RS (1) Edgeline Rumble Strips on Freeways and Divided Highways

**General Notes**
1. Rumble strips and profile markings should be placed on
   shoulders of divided highways at a minimum of 8 feet
   wide.
2. Where rumble strips are proposed along edges of
   pavement, approaches into intersections should be
   at least 8 feet wide.
3. Where rumble strips are placed on shoulders of
   divided highways, they should be placed at
   intervals of 30 to 60 feet.
4. Rumble strips shall be kept in good condition by
   periodic inspection and maintenance.

**Typical Rumble Strip Placement at Exit and Entrance Ramps**

**Profile View**

**Continuous Milled Depressions (Rumble Strips)**

**Profile View**

**Continuous Milled Depressions (Rumble Strips)**

**Profile View**

**Continuous Milled Depressions (Rumble Strips)**

**Profile View**

**Continuous Milled Depressions (Rumble Strips)**

**Profile View**

**Raised Edgeline Rumble Strips**

**Profile Edgeline Markings**
- Changed the name
- Revised the General Notes
- Eliminated references to texturing
- Deleted the option for continuous rolled depressions
RS (1)

<table>
<thead>
<tr>
<th>Greater Than 2 Feet</th>
<th>Equal To or Greater Than 4 Feet</th>
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<tbody>
<tr>
<td>Option 1, 2, 3, 5 or 6</td>
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<table>
<thead>
<tr>
<th>Less Than 2 Feet</th>
<th>Equal To or Greater Than 4 Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2, 4, 5 or 6</td>
<td></td>
</tr>
</tbody>
</table>

**Plan View**

**Edge of pavement**

7" (± 1/2")

R=12" (Max.)

1/2" Typ.
5/8" Max.

**Profile View**

OPTION 1

**Continuous Milled Depressions**
(Rumble Stripes)

**Plan View**

7" (± 1/2")

R=12" (Max.)

1/2" Typ.
5/8" Max.

**Profile View**

OPTION 2

**Continuous Milled Depressions**
(Rumble Stripes)

**Plan View**

7" (± 1/2")

R=12" (Max.)

1/2" Typ.
5/8" Max.

**Profile View**

OPTION 3

**Continuous Milled Depressions**
(Rumble Stripes)
RS (1)

<table>
<thead>
<tr>
<th>GREATER THAN 2 FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>EQUAL TO OR LESS THAN 2 FEET</td>
</tr>
<tr>
<td>LESS THAN 4 FEET</td>
</tr>
<tr>
<td>EQUAL TO OR GREATER THAN 4 FEET</td>
</tr>
<tr>
<td>Option 1, 5</td>
</tr>
<tr>
<td>Option 1, 2, 3, 5 or 6</td>
</tr>
</tbody>
</table>

**PLAN VIEW**

OPTION 5

RAISED EDGELINE RUMBLE STRIPS

See Note 3

Non-reflective raised traffic buttons (yellow or white)

4" Min.
10" Max.

4", 60" + 1/2"

**PLAN VIEW**

OPTION 6

PROFILE EDGELINE MARKINGS

4" or 6" edgeline marking

See Note 3

11
**RS (1)**

**SHOULDERS**

- **EQUAL TO OR GREATER THAN 4 FEET**
  - Option 1, 5 OR 6
- **EQUAL TO OR LESS THAN 2 FEET**
  - Option 2, 4, 5 OR 6

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**PLAN VIEW**

**OPTION 2**

**Profile View**

**CONTINUOUS MILLED DEPRESSIONS**
(Rumble Stripes)

**OPTION 4**

**Profile View**

**CONTINUOUS MILLED DEPRESSIONS**
(Rumble Stripes)

---

**RAISED EDGELINE RUMBLE STRIPS**

**PLAN VIEW**

**OPTION 5**

**Profile View**

**OPTION 6**

**Profile Edgeline Markings**

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*This distance may vary based on width of shoulder*
CENTERLINE RUMBLE STRIPS

GENERAL NOTES
1. This standard sheet provides guidelines for installing centerline rumble strips on multilane undivided highways.

2. Centerline and shoulder rumble strips or profile markings shall not be placed on roadways with a posted speed limit of 45 MPH or less.

3. Milled rumble strips are preferred when adequate pavement depth is available. If adequate pavement depths are less than 7 inches, raised rumble strips shall be used. The rumble strip shall not be milled or depressed into a filled depth.

4. See dimensions for milled rumble strips. Other shapes and dimensions may be used if approved by the Traffic Operations Division.

5. Spaces in milled centerline rumble strips shall occur at least 50 feet and no more than 150 feet in absence of bridges, railroad crossings, intersections and driveways with high usage of large trucks.

6. Use standard sheet sizes for positioning, dimensioning, and spacing of all reflective road markings, pavement markings and profile markings.

7. Construction should be given to noise levels when centerline rumble strips are installed near residential areas, schools, churches, etc. A maximum of 1 ft from depth of milled rumble strips may be considered in these areas.

8. Pavement markings must be applied over milled centerline rumble strips for proper centerline posiiting. For wider applications, specific dimensions shall be given based on the rype of the rumber strips. Please the available guidance in each section for planning or centering in the middle of the roadway.

WHEN INSTALLING CENTERLINE RUMBLE STRIPS
9. Milled rumble strips consisting of non-reflective raised traffic buttons may be used. Non-reflective raised traffic buttons can be offset or spaced closer than those of other types as long as they are manufactured according to the manufacturer's recommendations.

10. When using non-reflective raised traffic buttons on a centerline rumble strip, the surface shall be placed adjacent to the pavement markings. The surface shall be at least 1 inch away from the pavement markings. The rumble strip shall be placed in accordance with the centerline location. The rumble strip must be placed in a manner that satisfies its intended function.

WHEN INSTALLING BUMBLE STRIPS ON MULTILANE UNDIVIDED HIGHWAYS
11. See standard sheet sizes.

12. See standard sheet sizes.
- Created a new sheet
- Shows guidelines for installing centerline rumble strips on multilane undivided highways
RS (2)

**PLAN VIEW**

**OPTION 1**
MILLED CENTERLINE RUMBLE STRIPS

**OPTION 2**
RAISED CENTERLINE RUMBLE STRIPS

**OPTION 3**
PROFILE CENTERLINE MARKINGS

- Non-reflective raised traffic buttons (yellow or black)
- Centerline markings
- See Note 6
- RPM (reflectorized)
- See Note 6
- 1" Min, 2" Max.
- Created a new sheet
- Shows guidelines for installing centerline rumble strips on two-lane, two way highways
Filling in the Gaps for Centerline Rumble Strips
New Processes Being Evaluated
New Processes Being Evaluated
- Created a new sheet
- Shows guidelines for installing edgeline rumble strips on undivided or two-lane highways
**Plan View Option 1**

- **Continuous Milled Depressions** (Rumble Stripes)

**Profile View Option 1**

- **Continuous Milled Depressions** (Rumble Stripes)

**Plan View Option 2**

- **Continuous Milled Depressions** (Rumble Stripes)

**Profile View Option 2**

- **Continuous Milled Depressions** (Rumble Stripes)

**Plan View Option 3**

- **Continuous Milled Depressions** (Rumble Stripes)

**Profile View Option 3**

- **Continuous Milled Depressions** (Rumble Stripes)
### RS (4)

**Table: Edge Treatment**

<table>
<thead>
<tr>
<th>Condition</th>
<th>Option 1</th>
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<tr>
<td>Greater than 2 feet</td>
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<td>Less than 4 feet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equal to or greater than 4 feet</td>
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<td></td>
</tr>
</tbody>
</table>

**Plan View Options**

**Option 5:**
- **RAISED EDGELINE RUMBLE STRIPS**
- 4" to 60" raised traffic buttons (yellow or white)
- 4" min., 18" max.
- See Note 3

**Plan View Options**

**Option 6:**
- **PROFILE EDGELINE MARKINGS**
- 4" or 6" edgeline marking
- See Note 3

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Note 3: Further details on setup and requirements are provided in the notes section.
**RS (4)**

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**PLAN VIEW**

- **OPTION 2**
  - Edge of pavement
  - 7" Min. edge of pavement
  - 1/2" Typ.
  - 5/8" Max.
  - 5" Width rail

- **OPTION 4**
  - Edge of pavement
  - 7" Min.
  - 1/2" Typ.
  - 5/8" Max.
  - 1/2" Typ.
  - 5/8" Max.

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**RAISED EDGELINE RUMBLE STRIPS**

- **OPTION 5**
  - 4" Min.
  - 8" Max.
  - Non-reflective raised traffic buttons (yellow or white)
  - See Note 3

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**PROFILE VIEW**

- **OPTION 2**
  - Continuous milled depressions
    - (Rumble Stripes)

- **OPTION 4**
  - Continuous milled depressions
    - (Rumble Strips)

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**SHOULDER**

<table>
<thead>
<tr>
<th>EQUAL TO OR GREATER THAN 4 FEET</th>
<th>OR THAN 4 FEET</th>
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</thead>
<tbody>
<tr>
<td>Option 1, 5 OR 6</td>
<td>Option 2, 4, 5 OR 6</td>
</tr>
</tbody>
</table>
**RS (5)**

**STANDARD PATTERN**

1. Transverse or in-line rumble strips should only be used at high
   incidence and special geometric locations. These special geometric
   locations may include approaches to rural-highway or arterial-
   controlled intersections with sight restrictions under
   high-speed conditions, approaches to uncontrolled urban intersections,
   approaches to newly installed stop or signalized controlled
   intersections, approaches to all-plug approaches to hazardous
   horizontal curves, and approaches to railroad grade crossings.

2. When used, the rumble strips shall be placed 200 feet prior to and
   after the placement of the warning device.

3. The use of rumble strips should not be widespread or used
   indiscriminately.

4. Preferred black raised rumble strips should be used. They should
   be installed in accordance with the manufacturer's recommendations.

5. A list of approved, prefabricated raised rumble strips can be obtained
   from the Traffic Operations Division.

6. Consideration should be given to noise levels when in-line or
   transverse rumble strips are installed near residential areas,
   schools, churches, etc.

7. The use of the "Rumble Strips Ahead" sign may be used in advance
   of in-line or transverse rumble strips, based on engineering
   judgment. This sign is typically not necessary for rumble strip
   installations but is a good practice. When the signs are used, the sign
   should be installed in advance of the rumble strip.

8. Consideration should be given to engineering judgment. In some
   installations, additional gap in the in-line or transverse rumble
   strips are not recommended since they could cause motorists to swerve
   to avoid the rumble strip.

9. Other signs can be used as conditions warrant.

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**ALTERNATIVE PATTERN**

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**GENERAL NOTES**

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**TRANVERSE OR IN-LINE RUMBLE STRIPS**

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- Revised some General Notes
- Minor changes to clean up details
Revised General Note to give consideration for bicycle use of the highway

Referenced FHWA Technical Advisory T 5040.39

On roadways with high bicycle activity, consideration should be given before the installation of edgeline rumble strips. Things to consider include size of rumble strips, rumble strip material and location of rumble strips on the shoulder. If the designer determines that gaps are needed in the rumble strips due to bicycle use of the road, then follow the requirement shown in FHWA Technical Advisory T5040.39, or latest version. A detail of the spacing shall be included in the plans.
Federal Highway Administration
TECHNICAL ADVISORY
SHOULDER AND EDGE LINE RUMBLE STRIPS
T 5040.39, Revision 1
November 7, 2011

1. **PURPOSE:** To transmit updated information and guidelines for the design and installation of shoulder and edge line rumble strips on appropriate segments of paved roads in the United States. This information applies to a wide range of projects including new construction, reconstruction, resurfacing, and safety improvements. Highway professionals should consider the needs of all road users, existing roadway conditions, the scope of the project, and the surrounding environment when applying this information and guidance.
- Designer choice to use the gaps for bicycles if heavy bicycle use on roadways
- Designer will need to add signed and sealed details in plans
Different Striping Materials Used by the Atlanta District

- High Build Paint
- All-Weather Paint
- All-Weather Thermoplastic Pavement Markings
- Inverted Profile Pavement Marking (Audible)
High Build Paint

- Normally Used for Edge Lines Only
- Acrylic, High Build, Fast Drying Paint
- Double Drop of Type II and Type III Beads
- Retro Reflectivity Requirements
  - White = 250
  - Yellow = 175
- Applied at 25 mil +/- 2 mill Wet Film Thickness
- Cost per 4” Stripe = 0.09/lf
- Cost per 6” Stripe = 0.14/lf
<table>
<thead>
<tr>
<th>White Edge Lines</th>
<th>Yellow Edge Lines</th>
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<tr>
<td>443</td>
<td>248</td>
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<td>430</td>
<td>278</td>
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<td>317</td>
<td>297</td>
</tr>
<tr>
<td>359</td>
<td>289</td>
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</table>
All-Weather Paint

- Normally Used for Center Lane and White Skips
- Acrylic High Build Paint
- Furnish a Traffic Bead System to Meet Desired Performance Requirements
- Smooth Pavement Retro Reflectivity Requirements
  - Dry Method
    - White = 350
    - Yellow = 275
  - Wet Recovery Method
    - White = 350
    - Yellow = 275
  - Wet Continuous Method
    - White = 100
    - Yellow = 75
All-Weather Paint

• Rough Pavement Retro Reflectivity Requirements
  • Dry Method
    • White = 250
    • Yellow = 200
  • Wet Recovery Method
    • White = 250
    • Yellow
      – 150 (Direction of Striping)
      – 125 (Opposite Direction of Striping)
  • Wet Continuous Method
    • White = 75
    • Yellow = 75
All-Weather Paint

- Applied at 25 mil +/- 2 mill Wet Film Thickness
- Markings Must Meet These Requirements a Minimum of 40 Calendar Days after Installation and Readings Cannot Be Measured Earlier Than 30 Calendars after Installation
- Cost per 4” Stripe = 0.24/lf
## Retro Readings for All-Weather Paint on Seal Coats

<table>
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<tr>
<th></th>
<th>FM 995 Yellow Readings</th>
<th>FM 3129 Yellow Readings</th>
<th>FM 249 Yellow Readings</th>
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<td><strong>Dry Readings</strong></td>
<td>• 2009 – 343&lt;br&gt;• 2010 – 270&lt;br&gt;• 2011 – 226</td>
<td>• 2010 – 298&lt;br&gt;• 2011 – 212</td>
<td>• 2010 – 284&lt;br&gt;• 2011 – 195</td>
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<tr>
<td><strong>Wet Readings</strong></td>
<td>2009 – 274</td>
<td>2010 – N/A</td>
<td>2010 – 202&lt;br&gt;2011 – N/A</td>
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</tbody>
</table>
All-Weather Thermoplastic Pavement Markings

- Used for any Stripe
- Approved TxDOT Thermoplastic Material
- Furnish a Traffic Bead System to Meet Desired Performance Requirements
- Dry Method
  - White = 400
  - Yellow = 325
  - White = 75
  - Yellow = 75
- Wet Continuous
  - White = 150
  - Yellow = 125
All-Weather Thermoplastic Pavement Markings

- Markings Must Meet These Requirements a Minimum of 40 Calendar Days after Installation and Readings Cannot Be Measured Earlier Than 30 Calendars after Installation
- Cost per 4” Stripe = 0.45/lf
- Cost per 6” Stripe = 0.62/lf
Initial Readings for All Weather Thermoplastic Markings

- US 259 White Edge Lines
  - 459
  - 448
  - 582
  - 522

- US 259 Yellow Edge Lines
  - 458
  - 507
  - 430
  - 474

- US 259 White Broken Lines
  - 754
  - 716
  - 692
  - 426
Inverted Profile Pavement Marking (Audible)

- Used for Yellow Centerline and Edge Lines
- Thermoplastic Material
- Double Drop Bead System
  - 1.9 Refractive Bead
  - Class B Drop-on Glass Bead
- Wheel System to Create the Inverted Profile
- Inverted Profile Allows for Rapid Draining of Marking During Rain
- Inverted Mil Thickness is 140 Mil and the Profile Bump is Between 300 mil to 500 mil
Inverted Profile Pavement Marking (Audible)

- **Initial Dry Readings**
  - White = 450
  - Yellow = 350
- **Initial Wet Readings**
  - White = 200
  - Yellow = 175
- **4 Year Readings**
  - Dry = 150
  - Wet = 75
- **Cost per 4” Stripe = 2.25/lf**
- **Cost per 6 “ Stripe = 2.55/lf**
Rumble Strips and Alternate Striping Materials

Questions?

Brian Stanford, P.E.
(512) 416-3122