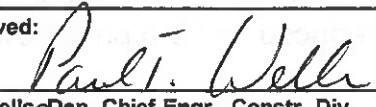
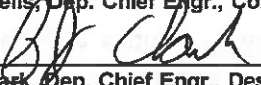


To: SUPERSEDED BY <u>EB 06-004</u> EFFECTIVE <u>9/7/06</u> MODIFIED BY EI 03-039 EFFECTIVE 5/6/04		ENGINEERING INSTRUCTION New York State Department of Transportation	96-001
Title: TEMPORARY RUMBLE STRIPS FOR CONSTRUCTION WORK ZONES			
Distribution: ☒ Main Office(30) ☐ Local Gov.(31) ☒ Regions(32) ☒ Contractors/AGC(39) ☒ Consultants(34) ☐ _____ ()	Approved:  P.T. Wells, Dep. Chief Engr., Constr. Div. <u>1/10/96</u> Date  P.J. Clark, Dep. Chief Engr., Design Div. <u>1/11/96</u> Date		

This Engineering Instruction presents usage guidelines and transmits specifications 18619.6460 and 18619.6460 M for Temporary Rumble Strips in construction work zones. Temporary Rumble Strips are grooves or raised strips placed transversely across a travel lane to alert motorists to changes in the roadway ahead. Because they are intended as a temporary measure, this type of rumble strip should only be used on pavement that will subsequently be overlaid, removed, or replaced, or can be otherwise restored to an acceptable condition.

This EI will be incorporated into Chapter 16 of the Highway Design Manual and into Section 619 of the forthcoming Construction Inspection Manual. The EI shall be effective for all projects beginning on January 22, 1996.

INTRODUCTION

To date, existing test data has not been conclusive in demonstrating that rumble strips are effective for slowing traffic. However, by providing audible and tactile warnings, rumble strips can be effective in alerting inattentive drivers. This effect is especially helpful in situations where drivers have been mesmerized by traveling long distances on an unrestricted roadway, and then suddenly encounter a construction zone with roadway width and alignment restrictions, and potential conflicts with slowing traffic and construction activities. Even if the rumble strips do not achieve a speed reduction, alerting drivers to the change in roadway character should reduce accident potential.

CRITERIA FOR USE

Warning signs are provided to inform drivers when they are approaching situations such as lane closures, alignment shifts, an end of pavement condition, or other significant disruptions to the normal travel pattern. Rumble strips may be used upstream from long-term warning signs for these conditions, such that drivers are alerted in time to see and read the signs. They should not normally be used in conjunction with short-term or portable warning signs where the work zone is set up and removed daily (or nightly), or the location of the situation is subject to frequent changes.

Rumble strips should not be placed on curves with a radius less than 437 meters (1433 feet), to ensure that the rumble strip does not adversely affect vehicle traction around the curve. Rumble strips should not be used during winter months when they may be damaged by snowplows, or interfere with snow removal.

Special caution should be taken when considering placement of rumble strips on approaches where the speed limit is 65 mph. However, since the criteria for use of rumble strips is similar to the criteria for reducing speed limits through a work zone, it is expected that the speed limit would be reduced to 55 mph or lower in nearly all situations where rumble strips would be used.

On designated bicycle routes where there is no usable shoulder, or the shoulder is less than 3' wide, the rumble strips should be ended 0.9 meters (3 feet) short of the edge of usable pavement.

The decision to use rumble strips will be made by the project designer, or by the E.I.C. for projects which are already under construction. Situations where there is heavy traffic, restricted sight distance, frequent interruptions due to construction equipment or vehicles, regular lines of stopped traffic, and/or a recurrence of rear-end accidents may be particularly good locations for rumble strips. The Regional Traffic Engineer should be consulted for advice as to the desirability of using rumble strips at a particular work zone. This recommendation should consider the integration of rumble strips into the overall traffic control plan, as well as the spacing and locations of the individual strips.

Rumble strips should be used on a very limited number of projects, since overuse may limit their effectiveness. Alternative and supplemental means for alerting inattentive drivers must be considered, including the use of oversize signs or Variable Message Signs, the use of warning lights and/or flags to draw attention to warning signs, and the posting of signs on both sides of the roadway.

PATTERNS AND LOCATION

As a guide, a rumble strip pattern consisting of six separate strips placed on three meter (ten foot) centers and traversing the full width of each travel lane is generally acceptable for use on high speed roadways. The dimensions of individual strips are provided in the specifications. On curbed roadways, rumble strips should end a minimum of 0.9 meters (3 feet) from the curb in order not to interfere with drainage.

Unless site conditions warrant otherwise, for a standard rumble strip installation, the six strip pattern shall be placed in advance of each of the last three advance warning signs for the condition drivers are being alerted to. On expressways and similar roadways with typically long sign spacings, rumble strip patterns placed 150 to 300 meters (500 to 1000 feet) upstream from each sign (with the higher values used for larger signs that can be read at a greater distance) should provide adequate driver response time. On highways where warning signs are spaced only 150 meters (500 feet) apart, each of the last two patterns should be placed approximately 15 meters (50 feet) downstream of the preceding sign in the series.

Suggested layout details are shown in the attached drawings.

Other patterns and locations may also be appropriate, but should be used only with the approval of the Regional Traffic Engineer.

Project plans or drawings by E.I.C.'s should show the actual spacing and locations of rumble strips at each installation.

REMOVAL

When, in the opinion of the Engineer, the temporary rumble strips are no longer necessary, the Engineer should direct the Contractor to fill in or remove them as described in the specification. Rumble strips must also be filled in or removed before the start of the winter plowing season, and before the placement of an overlay.

On multi-year projects where it is desired to have rumble strips in place for more than one construction season, the rumble strips must be installed, removed and paid for separately each year they are used.

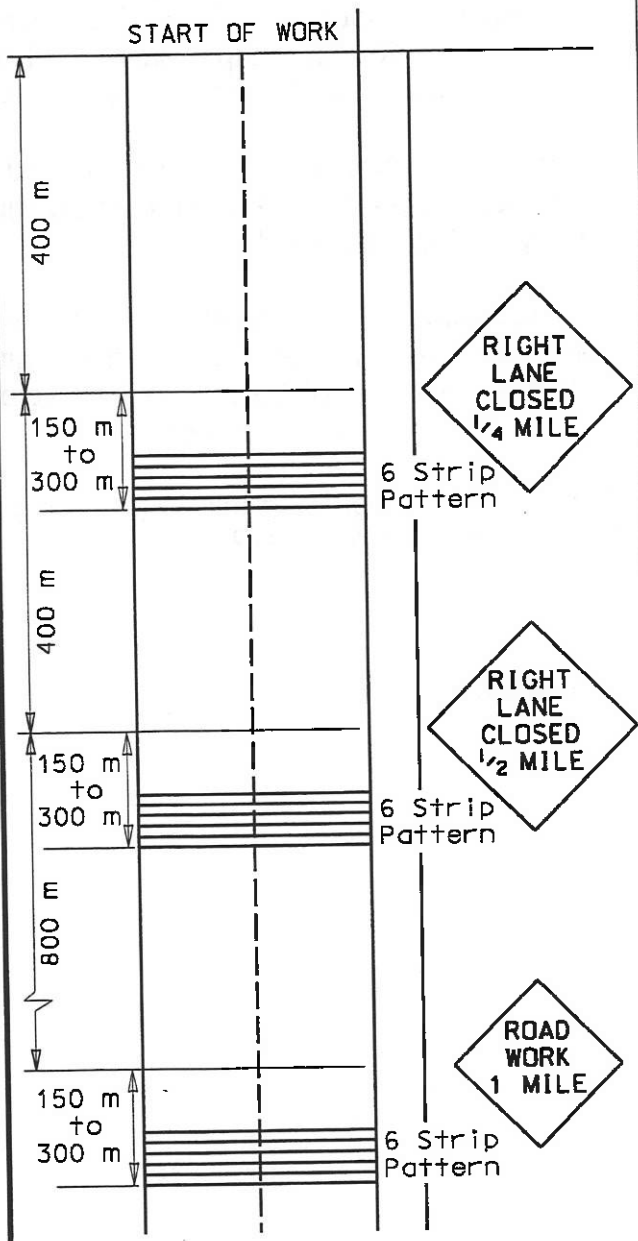
An evaluation of rumble strip performance will be made by means of a questionnaire containing specific evaluation criteria, which will be developed by the Construction Division. This questionnaire will be sent to the Regions following completion of projects that contain the temporary rumble strip pay item.

Any questions regarding this Engineering Instruction should be directed to the Construction Division at (518) 457-6472.

RMBSTRIP.EI

TEMPORARY RUMBLE STRIPS

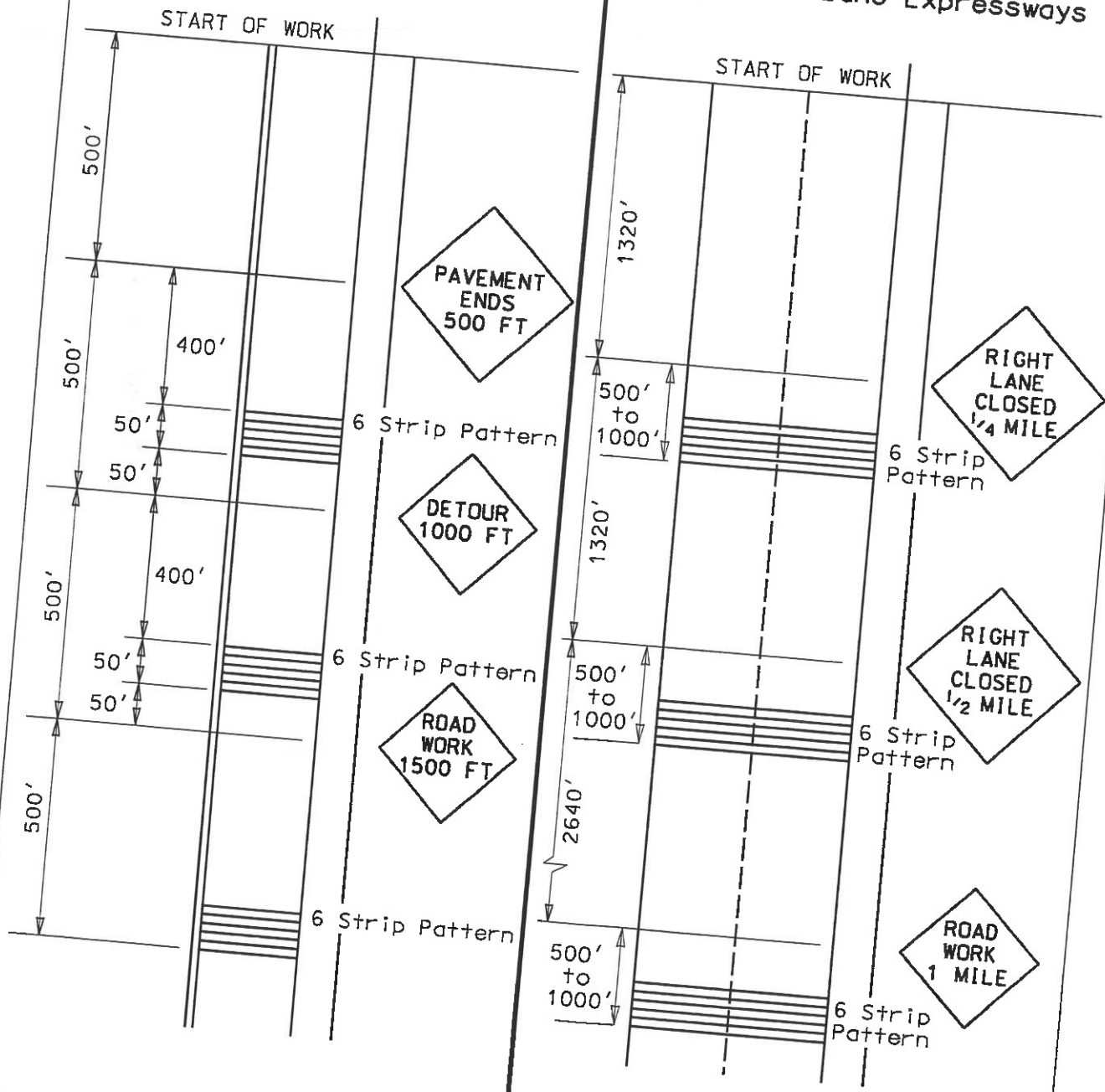
Multi - Lane Expressways



SUGGESTED LAYOUT DETAILS
TEMPORARY RUMBLE STRIPS

2 - Lane highways

Multi - Lane Expressways



ITEM 18619.6460 M TEMPORARY RUMBLE STRIPS (METRIC)

DESCRIPTION. This work shall consist of the installation, maintenance and subsequent removal of temporary rumble strips in construction work zones at the locations shown in the plans or as established by the Engineer.

MATERIALS. Rumble strips shall be either constructed in place from a raised strip of asphalt concrete, constructed in place with removable pavement marking tape, sawcut into existing pavement, or milled into existing pavement.

Raised removable tape rumble strips shall be formed from black non-reflectORIZED removable pavement marking tape.

Raised asphalt rumble strips shall be formed from asphalt concrete meeting the requirements of Type 5 Shim Course or Type 7 Top Course. Tack coat meeting the requirements of Materials Designation 702-90 Asphalt Emulsion Tack Coat shall be used to adhere the rumble strip to the existing pavement.

CONSTRUCTION DETAILS.

Raised Asphalt Rumble Strips. The roadway surface on which the rumble strips are to be attached shall be dry, free of surface contaminants such as dust or oil, and thoroughly swept with a stiff broom. The surface temperature of the pavement shall be 8°C or greater unless otherwise authorized by the Engineer. The pavement surface shall be cleaned with compressed air just prior to tack coating and subsequent installation of the rumble strips.

Raised rumble strips shall be between 150 mm and 225 mm in width and have a final compacted thickness of 10 mm $\pm$ 3 mm. The strips shall be formed using a specially constructed rumble strip paver (drag box) pulled transversely across the pavement, or by hand placement between forms fixed to the pavement. If forms are used, they shall be removed prior to compaction of the asphalt mixture. Compaction shall be accomplished using a plate tamper or a static roller.

Any raised rumble strips that fail to adhere to the pavement, or become damaged or flattened such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be replaced or repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These replacements or repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall completely remove the rumble strips from the pavement. Any pavement that is damaged in the process of removing the rumble strips shall be repaired by the Contractor to the satisfaction of the Engineer, and within the price bid for this item.

ITEM 18619.6460 M TEMPORARY RUMBLE STRIPS (METRIC)

Raised Removable Tape Rumble Strips. The rumble strips shall be formed by applying one or more layers of removable preformed pavement marking tape. The tape shall be applied to a clean, dry pavement surface in accordance with the manufacturer's recommendations. The pavement surface shall be cleaned with compressed air just prior to application of the tape.

Sufficient layers of tape shall be applied such that each finished rumble strip has a thickness of $10 \text{ mm} \pm 3 \text{ mm}$.

Any raised rumble strips that fail to adhere to the pavement, or become damaged or flattened such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be replaced or repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These replacements or repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall completely remove the rumble strips from the pavement. Any pavement that is damaged in the process of removing the rumble strips shall be repaired by the Contractor to the satisfaction of the Engineer, and within the price bid for this item.

Sawcut Rumble Strips. The rumble strips shall be sawcut into existing pavement using either wet or dry cutting methods. The blade or blades shall be of such configuration that the desired dimensions of the sawcut can be made with one pass. No spacers between blades will be allowed.

The finished rumble strips shall have a width measured in the direction of traffic of $100 \text{ mm} \pm 13 \text{ mm}$. The depressions shall have a rectangular cross-section with a depth of $10 \text{ mm} \pm 3 \text{ mm}$.

Before a work area is reopened to traffic, the pavement shall be cleaned to the satisfaction of the Engineer by sweeping, flushing, or with a stream of compressed air. Sawing slurry from the wet sawing process shall be flushed from the pavement surface immediately.

Any rumble strips which become damaged such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall fill in the rumble strip

ITEM 18619.6460 M TEMPORARY RUMBLE STRIPS (METRIC)

depressions with a compacted asphalt concrete meeting the requirements of Type 5 Shim Course. Before they are filled, the depressions shall be blown clean with a stream of compressed air and coated with tack coat meeting the requirements of Materials Designation 702-90 Asphalt Emulsion Tack Coat. The rumble strips shall then be overfilled slightly so that the final compacted surface will be flush with the existing pavement. Compaction shall be accomplished using a plate tamper or a static roller.

Milled-in Rumble Strips. The rumble strips shall be milled into existing pavement using a rotary-type cutting head with a maximum nominal outside diameter of 600 mm. The cutting head shall be on its own suspension system, independent from that of the power unit, to allow the head to align itself with the slope of the pavement and/or any irregularities in the pavement surface. The pattern of cutting tips on the head shall be arranged to produce a relatively smooth cut with no more than 2 mm between peaks and valleys. Prior to beginning work, the Contractor shall demonstrate to the Engineer the ability to achieve the desired surface without tearing or snagging the pavement.

The finished rumble strips shall have a nominal width measured in the direction of traffic of 150 mm. The depressions shall have a circular concave cross-section with a depth of 10 mm $\pm$ 3 mm.

Before a work area is reopened to traffic, the pavement shall be cleaned to the satisfaction of the Engineer by sweeping, flushing, or with a stream of compressed air.

Any rumble strips which become damaged such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These repairs shall be made at no additional expense to the State.

When directed by the Engineer, or prior to the placement of successive pavement courses, the Contractor shall fill in the rumble strip depressions with a compacted asphalt concrete meeting the requirements of Type 5 Shim Course. Before they are filled, the depressions shall be blown clean with a stream of compressed air and coated with tack coat meeting the requirements of Materials Designation 702-90 Asphalt Emulsion Tack Coat. The rumble strips shall then be overfilled slightly so that the final compacted surface will be flush with the existing pavement. Compaction shall be accomplished using a plate tamper or a static roller.

METHOD OF MEASUREMENT. Temporary rumble strips shall be measured as the number of meters of individual rumble strip that is satisfactorily installed, maintained, and filled in or removed in accordance with the requirements of this specification.

BASIS OF PAYMENT. Payment for temporary rumble strips shall include the cost of all

ITEM 18619.6460 M TEMPORARY RUMBLE STRIPS (METRIC)

labor, equipment and materials necessary to install, maintain, and fill in or remove the rumble strips as shown on the plans or as directed by the Engineer. Payment shall include the cost of any asphalt concrete used to form or fill in the rumble strips, and the cost of tack coat. Fifty percent (50%) of the bid price will be paid upon installation of the rumble strips, and the remaining fifty percent (50%) when the rumble strips are filled in or removed.

Payment will be made under:

Item No.	Item	Pay Unit
18619.6460 M	Temporary Rumble Strips (Metric)	Meter

18619.M

ITEM 18619.6460 TEMPORARY RUMBLE STRIPS

DESCRIPTION. This work shall consist of the installation, maintenance and subsequent removal of temporary rumble strips in construction work zones at the locations shown in the plans or as established by the Engineer.

MATERIALS. Rumble strips shall be either constructed in place from a raised strip of asphalt concrete, constructed in place with removable pavement marking tape, sawcut into existing pavement, or milled into existing pavement.

Raised removable tape rumble strips shall be formed from black, non-reflectorized removable pavement marking tape.

Raised asphalt rumble strips shall be formed from asphalt concrete meeting the requirements of Type 5 Shim Course or Type 7 Top Course. Tack coat meeting the requirements of Materials Designation 702-90 Asphalt Emulsion Tack Coat shall be used to adhere the rumble strip to the existing pavement.

CONSTRUCTION DETAILS.

Raised Asphalt Rumble Strips. The roadway surface on which the rumble strips are to be attached shall be dry, free of surface contaminants such as dust or oil, and thoroughly swept with a stiff broom. The surface temperature of the pavement shall be 46°F or greater unless otherwise authorized by the Engineer. The pavement surface shall be cleaned with compressed air just prior to tack coating and subsequent installation of the rumble strips.

Raised rumble strips shall be between 6 and 9 inches in width and have a final compacted thickness of 3/8 inch $\pm$ 1/8 inch. The strips shall be formed using a specially constructed rumble strip paver (drag box) pulled transversely across the pavement, or by hand placement between forms fixed to the pavement. If forms are used, they shall be removed prior to compaction of the asphalt mixture. Compaction shall be accomplished using a plate tamper or a static roller.

Any raised rumble strips that fail to adhere to the pavement, or become damaged or flattened such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be replaced or repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These replacements or repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall completely remove the rumble strips from the pavement. Any pavement that is damaged in the process of removing the rumble strips shall be repaired by the Contractor to the satisfaction of the Engineer, and within the price bid for this item.

ITEM 18619.6460 TEMPORARY RUMBLE STRIPS

Raised Removable Tape Rumble Strips. The rumble strips shall be formed by applying one or more layers of removable preformed pavement marking tape. The tape shall be applied to a clean, dry pavement surface in accordance with the manufacturer's recommendations. The pavement surface shall be cleaned with compressed air just prior to application of the tape.

Sufficient layers of tape shall be applied such that each finished rumble strip has a thickness of $3/8$ inch $\pm 1/8$ inch.

Any raised rumble strips that fail to adhere to the pavement, or become damaged or flattened such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be replaced or repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These replacements or repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall completely remove the rumble strips from the pavement. Any pavement that is damaged in the process of removing the rumble strips shall be repaired by the Contractor to the satisfaction of the Engineer, and within the price bid for this item.

Sawcut Rumble Strips. The rumble strips shall be sawcut into existing pavement using either wet or dry cutting methods. The blade or blades shall be of such configuration that the desired dimensions of the sawcut can be made with one pass. No spacers between blades will be allowed.

The finished rumble strips shall have a width measured in the direction of traffic of 4 inches $\pm 1/2$ inch. The depressions shall have a rectangular cross-section with a depth of $3/8$ inch $\pm 1/8$ inch.

Before a work area is reopened to traffic, the pavement shall be cleaned to the satisfaction of the Engineer by sweeping, flushing, or with a stream of compressed air. Sawing slurry from the wet sawing process shall be flushed from the pavement surface immediately.

Any rumble strips which become damaged such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall fill in the rumble strip

ITEM 18619.6460 TEMPORARY RUMBLE STRIPS

depressions with a compacted asphalt concrete meeting the requirements of Type 5 Shim Course. Before they are filled, the depressions shall be blown clean with a stream of compressed air and coated with tack coat meeting the requirements of Materials Designation 702-90 Asphalt Emulsion Tack Coat. The rumble strips shall then be overfilled slightly so that the final compacted surface will be flush with the existing pavement. Compaction shall be accomplished using a plate tamper or a static roller.

Milled-in Rumble Strips. The rumble strips shall be milled into existing pavement using a rotary-type cutting head with a maximum nominal outside diameter of 24 inches. The cutting head shall be on its own suspension system, independent from that of the power unit, to allow the head to align itself with the slope of the pavement and/or any irregularities in the pavement surface. The pattern of cutting tips on the head shall be arranged to produce a relatively smooth cut with no more than 1/16 inch between peaks and valleys. Prior to beginning work, the Contractor shall demonstrate to the Engineer the ability to achieve the desired surface without tearing or snagging the pavement.

The finished rumble strips shall have a nominal width measured in the direction of traffic of 6 inches. The depressions shall have a circular concave cross-section with a depth of 3/8 inch $\pm$ 1/8 inch.

Before a work area is reopened to traffic, the pavement shall be cleaned to the satisfaction of the Engineer by sweeping, flushing, or with a stream of compressed air.

Any rumble strips which become damaged such that, in the opinion of the Engineer, they are no longer performing their intended function, shall be repaired by the Contractor to the satisfaction of the Engineer. Any associated damage to the pavement shall also be repaired by the Contractor to the satisfaction of the Engineer. These repairs shall be made at no additional expense to the State.

When directed by the Engineer, (e.g. prior to the start of the winter plowing season), or prior to the placement of successive pavement courses, the Contractor shall fill in the rumble strip depressions with a compacted asphalt concrete meeting the requirements of Type 5 Shim Course. Before they are filled, the depressions shall be blown clean with a stream of compressed air and coated with tack coat meeting the requirements of Materials Designation 702-90 Asphalt Emulsion Tack Coat. The rumble strips shall then be overfilled slightly so that the final compacted surface will be flush with the existing pavement. Compaction shall be accomplished using a plate tamper or a static roller.

METHOD OF MEASUREMENT. Temporary rumble strips shall be measured as the number of linear feet of individual rumble strip that is satisfactorily installed, maintained, and filled in or removed in accordance with the requirements of this specification.

ITEM 18619.6460 TEMPORARY RUMBLE STRIPS

BASIS OF PAYMENT. Payment for temporary rumble strips shall include the cost of all labor, equipment and materials necessary to install, maintain, and fill in or remove the rumble strips as shown on the plans or as directed by the Engineer. Payment shall include the cost of pavement cleaning, asphalt concrete used to form or fill in the rumble strips, and tack coat. Fifty percent (50%) of the bid price will be paid upon installation of the rumble strips, and the remaining fifty percent (50%) when the rumble strips are filled in or removed.

Payment will be made under:

Item No.	Item	Pay Unit
18619.6460	Temporary Rumble Strips	L.F.

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