Tensar Geogrid Trench Repair

Frequently Asked Questions

Tensar geogrids are routinely excavated through in order to place guardrail posts, bridge piers, and underground utilities. To understand this process, as well as how to more effectively properly deal with the effects of trenching (both with and without Tensar geogrid stabilization), the following sections have been provided: 1) How the trench cut effects the pavement section, and 2) How to repair a trench cut.

Section 1: How the trench cut effects the pavement section.

A. When repairing a trench, what are the key issues to be aware of that may cause future problems?

Issue #1: Trench backfill is only as good as the material used and the quality control of the backfill moisture and density. Improper compaction, inadequate material, or the wrong moisture/density relationship could result in post-construction subsidence.

Issue #2: When a trench cut is made, the native material surrounding the perimeter of the trench is subjected to a loss of lateral support causing subsidence. Material is lost under the pavement and soil bulges on the trench sidewalls into the excavation. Subsequent refilling of the excavation does not necessarily restore the original strength of the soils in this weakened zone. The weakened zone around a utility cut excavation is called the "zone of influence," and extends beyond borders of the trench by 2-3 feet or more.[1] Subsidence is typically observed after the trench is repaired and is exhibited by alligator cracking around the trench patch, but not on the patch itself. This makes sense because a properly placed backfill in the trench cut will not subside. The Statewide Urban Design and Specification (SUDAS) study referenced in the endnote section of this paper provides some very good information regarding a number of different ways to repair a trench as well as critical factors to consider.

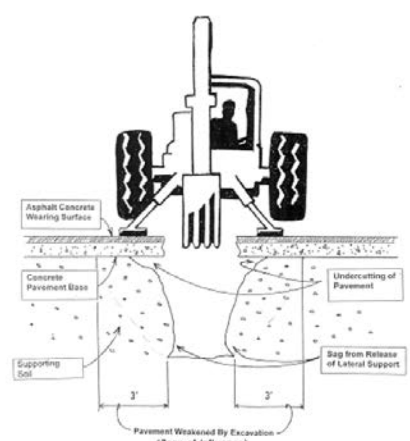

Figure 1- Loss of support caused by trenching (Source SUDAS study, Figure 9)[1]

B. How do pavement sections originally built with Tensar Geogrids help alleviate the above Issue #2?

Tensar geogrids provide aggregate stabilization by transferring the loads from the unbound aggregate into the stiff geogrid. The inherent features of Tensar geogrids such as improved stiffness and confinement, in effect form a bridge within the pavement structure, to help mitigate the differential settlement around the trench cut. By mechanically interlocking the aggregate in place, the Tensar geogrid provides more stabilization in the zone of influence, compared to a pavement structure without Tensar geogrid.

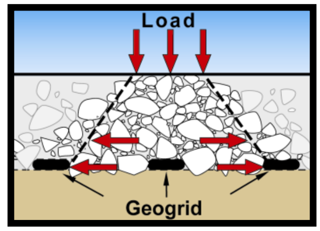

Figure 2 – Stabilization effect of geogrid

C. Will the trenching equipment be able to cut through the geogrid and if so, will the geogrid tear or unravel back into the undisturbed fill section outside the trench zone?

The process used to manufacture Tensar geogrids results in a structure with full strength junctions and stiff ribs. This process includes stretching the material, which pre-stresses the geogrid, ultimately optimizing its strength properties. The resulting stiffness allows Tensar geogrids to easily shear when subjected to the excavation equipment typically used in trenching operations. This results in a "clean" cut and will not unravel into the zone outside the trench cut. The same may not be possible for "flexible" woven and non-woven geotextiles and flexible geogrids. Tensar geogrids are routinely excavated through and punched through in order to place guardrail posts, bridge piers, and underground utilities.

Figure 3 – Examples of trenching through sections with Tensar geogrids.

Section 2: How to repair a trench cut.

A. When trenching through a pavement section with existing geogrid, is it necessary to replace the excavated geogrid with a patch of geogrid?

In an effort to maintain the street's expected lifespan, return the street to an equal strength as before the trenching took place. Because the repaired trench section is often competent due to the thicker section and/or higher quality of backfill material required by most agencies, repairing the Tensar geogrid in this high strength area is often unnecessary. As shown in the diagram below, by adding 6 more inches of structural fill (AB) to the repaired trench section, the street was returned to an equal strength as the existing pavement section.

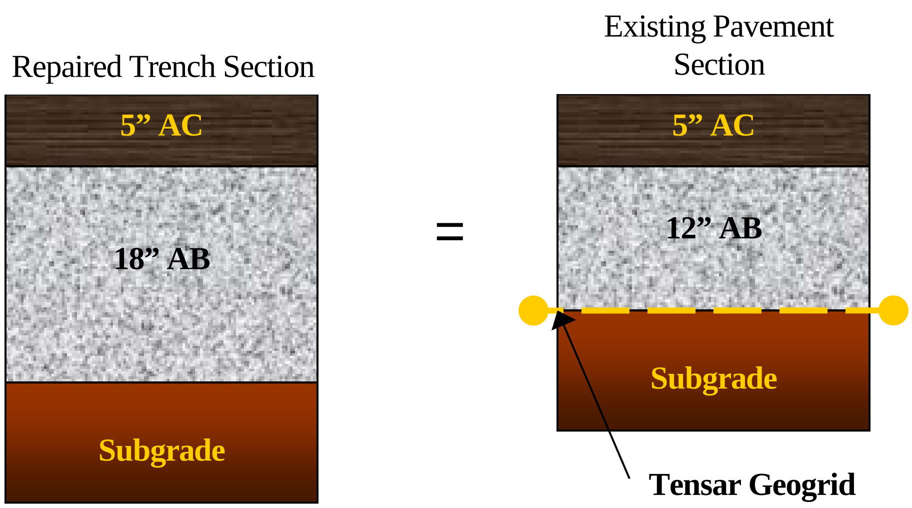

Figure 4 – If proper backfill materials are used and compacted, replacing the geogrid may not be structurally necessary.

If the agency desires an added measure of safety, due to uncertainty on actual pavement support, additional consideration could be given to placing a layer of Tensar geogrid over potentially problematic areas.

B. What are the recommendations for repairing a trench cut with geogrid?

In all circumstances, patching a trenched pavement section with Tensar geogrid will increase the performance of the pavement section. The following instructions and attached detail is provided to serve as a guideline to engineers and contractors in utilizing Tensar geogrids.

Trench Cut and Backfill

a) In a pavement already reinforced with Tensar geogrid, the cut will not damage the geogrid surrounding the cut area as the cutting procedure will shear cleanly through existing layer(s) of the geogrid.

b) Optional: If subgrade strength at the bottom of a trench cut is low, creating a suitable working platform for the utility installation can be difficult. Therefore, adding a layer of Tensar geogrid at the subgrade level will improve compaction of fill when preparing the trench bottom to receive utilities. Prior to placing the new utility, place a single layer of Tensar geogrid on the bottom of the excavation with edges (about 12") curled up on the sides of the trench to provide a firm working platform, support for the pipe or conduit, and reduce contamination of the granular backfill. Minimum 4-inch fill is recommended over the Tensar geogrid. (See Figure 5.)

c) Backfill trench with native or imported materials in the usual manner up to the level of the existing Tensar geogrid. A granular fill material compacted in uniform lifts is a preferred method of utility backfilling.

d) After the backfill has been properly compacted, perform a lateral cutback by removing the pavement section a distance equaling the depth of the pavement section. Next, excavate to the approximate depth of the existing Tensar geogrid. For example if the existing Tensar geogrid is 8-inches below grade, perform a lateral cutback of 8-inches around the edge of the trench, approximately 8-inches deep. Exposing the original geogrid is not necessary.

<u>Granular Base Layer</u>

e) Place a single layer of Tensar geogrid on top of the filled trench (at the base-subgrade interface) cut to the specified width of the trench overlapping the existing Tensar geogrid. This layer of geogrid will aid in distributing load from the pavement to the new trench backfill and provide a stiffened platform over the weakened zone of influence to minimize differential settlement.

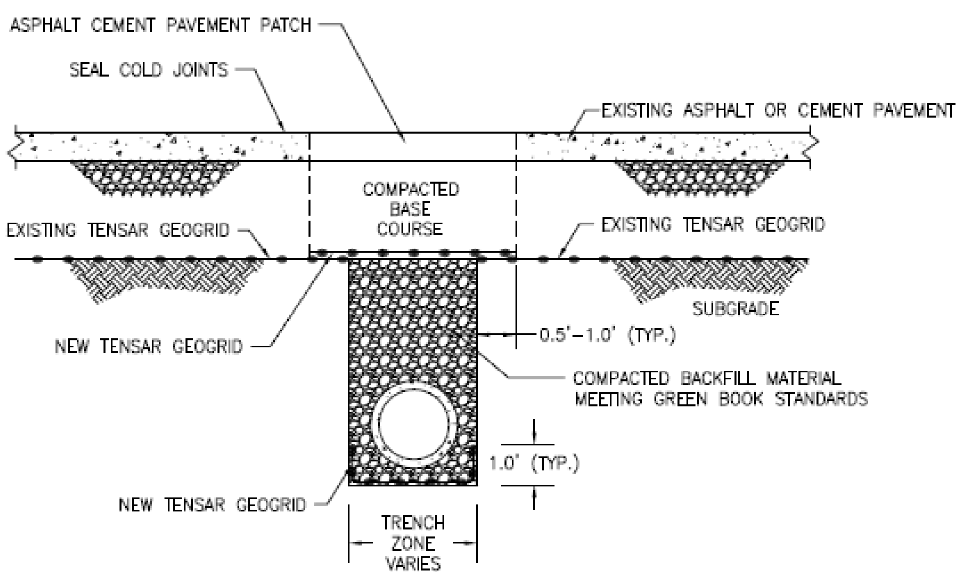

Figure 5 – Typical Utility Trench Repair Detail (Stabilized Pavement Section)

C. When trenching through an <u>un-stabilized pavement section (without geogrid)</u>, what is the most effective way to repair a trench that would minimize the differential settlement around the trench area?

The Statewide Urban Design and Specification (SUDAS) manual shows that a properly repaired patch will last and that there are advantages to using Tensar geogrids in the repair (they have test sections in place). Based on the SUDAS manual, the following instructions and attached detail is provided to serve as a guideline to engineers and contractors when repairing an un-reinforced pavement section without geogrid.

<u>Trench Cut and Backfill</u>

a) After the backfill has been properly compacted into the trench containing the utility, perform a 3 foot cutback (pavement removal) with an excavation approximately 2 feet deep into the native material.

<u>Granular Base Layer</u>

b) Place a single layer of Tensar geogrid on top of the filled trench (at the base-subgrade interface) cut to the specified width of the trench. This layer of geogrid will aid in distributing load from the pavement to the new trench backfill and provide a stiffened platform over the weakened zone of influence to minimize differential settlement.

c) The trench should then be filled with the proper material (e.g. aggregate base course or granular fill) and compacted to the agency standards with the correct moisture/density relationship.

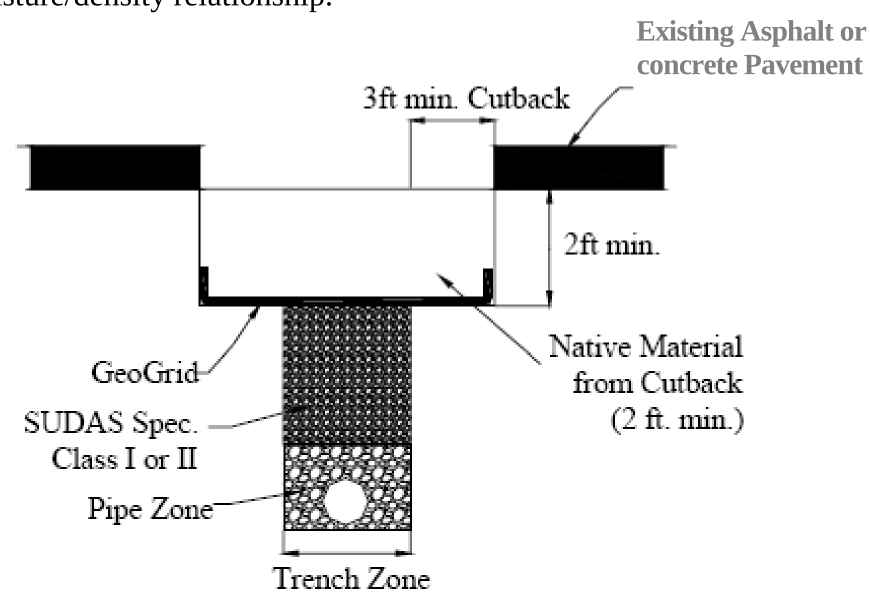

Figure 6 – Proposed cutback and grid placement guidelines. (Source: SUDAS Study, Figure 93)

D. Conclusion

Some agencies spend millions of dollars each year to maintain and repair utility cuts made in pavements. Understanding what causes these problems, and identifying better approaches, can save considerable time and cost. Future maintenance dollars will be significantly impacted by the quality of the trench repair. It is important that public agencies take ownership of the process/requirements that ensure proper trench repairs.

Endnotes

[1] Statewide Urban Design Standards Manual (SUDAS, www.ctre.iastate.edu), 2005, Utility Cut Repair Techniques Investigation of Improved Cut Repair Techniques to Reduce Settlement in Repaired Area