

Tire-Derived Aggregate (TDA) Used as a Lightweight Fill Material

Economic, Environmental and Social Assets

- May be cost effective: When compared to other fill products used in construction, such as soil, gravel, or stone, TDA costs less for the same volume of product.
- Replace traditional or virgin material: The use of TDA can replace traditional or virgin materials that are used as fill.
- Waste Diversion: Turning tires into TDA diverts a solid waste from landfills.
- Repurposed: Tires that are made into TDA are repurposed which is a more favorable outcome for a solid waste material on the waste management hierarchy.
- Sustainable Material: For the foreseeable future, there is not a replacement for tires on vehicles. Therefore, scrap tires will always be available as a material. With this knowledge, the consideration of scrap tires as a sustainable material may factor into long-term solutions to global demands for finite virgin materials.



Image from US EPA

TDA as Lightweight Fill in Civil Engineering Applications

As a lightweight fill material, TDA has been successfully utilized in the following civil engineering applications:

Highway/Road Embankment Development and Failure Repair

For these types of projects, TDA can be used as a strong, lightweight, and free draining material. In addition to being free draining and lightweight, TDA is stronger than many soils, often making TDA fill the best option.



Subgrade fill (typically soil) should be adequate to withstand the loads acting upon it by providing strength and support, drainage and frost protection and prevent settlement. When used to construct on weak and/or compressible foundation soils, TDA brings engineering benefits by reducing the chance of shear failure, and often increasing the factor of safety of the repair.

Settlement is an engineering challenge that must be considered in the design or repair of highway/road embankments and roadway transitions to a stationary surface. TDA can be used to limit settling by decreasing the weight of the fill, resulting in a significant advantage to engineers in both cost and construction of the project.

Landslide Repair/Slope Stabilization

When a road landslide or "slip out" occurs, it is often necessary to excavate the sliding road material down to more stable soil and then rebuild the slope and road in compacted layers of soil called lifts. Drainage networks are typically installed so that hydrostatic pressure does not build up behind the fill, causing potential instability. By using TDA as a lightweight backfill material, less excavation may be necessary and TDA's internal strength and free-draining properties often result in a more cost-effective design (calrecycle.ca.gov/Tires/TDA/uses/).



Backfill for Retaining Walls, Bridge Abutments and Building Foundations

Several properties make TDA a good backfill material for retaining walls, bridge abutments and building foundations. TDA is lighter than soil, is free draining and has a high internal angle of friction, which results in significant pressure reduction on the wall (calrecycle.ca.gov/Tires/TDA/uses/). As well, the good thermal insulation property of TDA can also reduce problems with water and frost build up behind walls (USEPA).



Engineering Properties

The following properties of TDA make them well-suited for the applications described previously:

- ***Light weight*** – TDA is 1/3 the weight of soil which is helpful when constructing on weak, compressible soils that lack the bearing soil capacity needed for the structure, etc.
- ***Internal shear strength*** – TDA is very strong, type B TDA phi angle ranges from 30 - 40 degrees.
- ***High permeability and associated large void space*** – Contributes to TDA's capacity to transmit water which can improve drainage and can result in a fill that will not internally fail in very wet conditions.
- ***Low earth pressure*** – TDA's light weight and earth pressure coefficient, K_0 , contributes to less horizontal pressure against surfaces.
- ***Good thermal insulation*** – thermal conductivity of TDA is less than commonly used backfill materials such as aggregates and native soils.

Subject Matter Experts Available as a Resource to USSTW Members

- Joaquin Wright, Joaquin.Wright@ghd.com
- Monte Niemi, MonteMKN@firststatetire.com

Publications

Please search the following websites to find pertinent TDA research:

- ASTMs, [Standards & Publications - Products & Services \(astm.org\)](https://www.astm.org/standards)
- [Tire Engineering Research Center – California Pavement Preservation Center – Chico State \(csuchico.edu\)](https://www.csuchico.edu/tire-engineering-research-center)

Completed Projects in the United States

An inventory of successfully completed projects can be found at the following websites:

- Please Ctrl + Click here [Tire Engineering Research Center – California Pavement Preservation Center – Chico State \(csuchico.edu\)](https://www.csuchico.edu/tire-engineering-research-center) Remember to use the guest login.
- [First State Tire Recycling & R.-T.E.A. Manufacturing - Call Us for ALL Your Tire Recycling Needs at 763-434-0578](https://www.firststatetire.com)