



Tire Stewardship Manitoba

“Strengthening Manitoba Community Infrastructure using Tire Derived Aggregate (TDA)”

Presented By:
Brett Eckstein, Tire Stewardship Manitoba
Peter Schroedter, Engineered Rubber Aggregate Corporation

Manitoba Association of Regional Recyclers
Thursday October 17, 2024





Before TDA - Too Soft To Haul Grain

Our extreme climate, poor drainage and soil type create the perfect conditions for frost heaving to occur in Manitoba's municipal roads.

Frost heaving is due to:

High ground water level close to the surface. Fine soils that "wick" the moisture into the road-bed.

Temperatures cold enough to cause "frost lenses" to form in the road-bed.

When these frost lenses thaw the road breaks down.



Decades of Proven Performance

- TDA has been quietly strengthening Manitoba community infrastructure for decades.
- TDA meets all the requirements engineers and environmentalists ask for in a repurposed product
- Superior performance
- Costs less than mineral aggregate



TDA Strengthens Community Economics, Offers Robust Material Properties

Economic and Material Advantage For Type B TDA

- One time application eliminating annual repair costs associated with using mineral aggregate
- TDA is 1/3 the weight of rock aggregate which means lower hauling costs
- TDA bridges weak subgrade soils to where they can carry heavier loads
- All other earth moving costs are the same with mineral or rubber aggregate
- TDA has material properties that exceed mineral aggregate for many applications.
- The research has been done and proven in countless applications

Hamiota, Manitoba – After TDA



TDA Solving Soft Street Problems in Town

Winnipeg Beach 2016

- Repair 1000 meters of frost boil damaged roads
- Frost boils are costly maintenance problems that require permanent cost-effective solution
- Terrain and soil types in region are especially prone to damage roads
- Spring 2016 worst for frost boils throughout much of the Interlake

TDA's Environmental Benefits

- TDA can be used to replace mineral aggregate which is a non-renewable resource
- Quarrying aggregate creates environmental damage through GHG emissions and habitat destruction
- TDA cost to the environment is insignificant in comparison while fulfilling the circular economic directive of converting waste to value.



Strengthening Infrastructure

TDA is beneficial to Manitoba because of its ability to handle our cold climate.

TDA permeability makes it a feasible alternative to natural aggregate in high water table applications.

Sections of road repaired with TDA continue to be smooth and show no damage from frost lensing.

This is conclusive evidence of the practical application of Type B TDA in Manitoba.

Advantages of Tire Derived Aggregate

- TDA was first used in Manitoba in 1998
- Since then, it has been used to reduce problems due to frost action affected roads all over Manitoba
- There has been a steady increase in the use of TDA since 2009 in roads and agricultural infrastructure applications



There has not been a soft road that TDA could not permanently fix.

Winnipeg Beach, Strollway Avenue - Before



Rural councilors witnessing firsthand how TDA builds better roads.

RM of Hamiota 2013-2014

- Municipal Road 136W between 78 & 79N
- Municipal Road 87N between 137 & 138W
- Municipal Road 80N between 135 & 136W
- Town of Hamiota 4th Street between Spruce Avenue and Ash Avenue

Decades of Science Back the use of TDA

- Decades of Research in Manitoba, by Manitoba institutions like U of M and Red River Polytech.
- Funded research done by one of Manitoba's top geotechnical firms (TREK Geotechnical) carried out testing of TDA as a replacement for mineral aggregates relative to retaining wall backfill.
- TSM engaged a Chemical / Environmental Engineer to review and report on current TDA Applications, Environmental and Product Safety. Study is in final draft stage and will be made available later this year.



Thorough Research and Decades of Application

The Manitoba Government confirms TDA in civil engineering and geotechnical projects as an acceptable end use for end-of-life tires.

TSM requires disposition of tires in a manner consistent with proper authorization and standards for use:

- ASTM Standard Practice for Use of Scrap Tires in Civil Engineering Applications.
- Guideline for Tire Stewardship 2006.
- Guidelines for the Storage of Scrap Tires in Manitoba.
- TSM Scrap Tire Life Cycle Assessment 2018-2022

Obstacles and Signs of Progress

- We have successfully fulfilled our responsibility by recycling and reusing end-of-life tires, contributing to the circular economy.
- Despite appearances of success, provincial bureaucracy has shown itself to be an obstacle to fully utilizing TDA's social, economic, and environmental potential.....
- However, change is on the horizon, Manitoba Transportation and Infrastructure (MTI) has expressed interest in utilizing TDA in projects. TSM is working with the department to build TDA awareness and technical expertise.
- TSM Manitoba Processors can deliver the goods. It's up to government to walk the walk and commit to TDA use as an environmental and geotechnical preferable material.

TDA Technical Overview

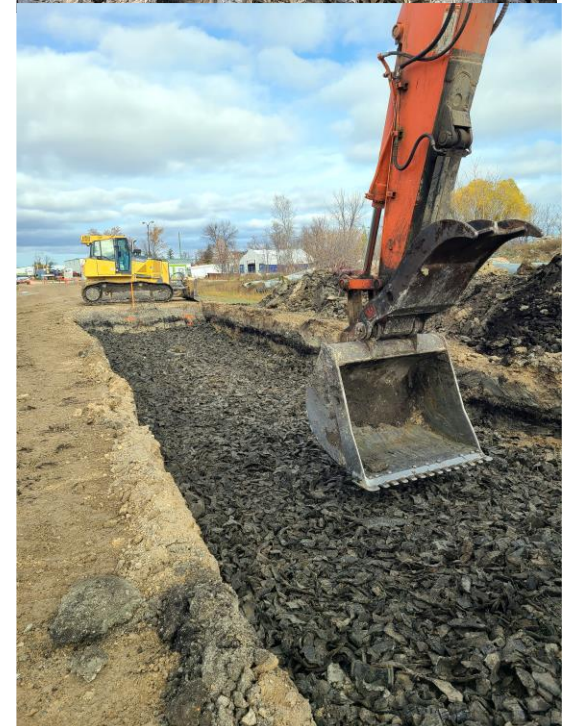
- Tire Derived Aggregate (TDA) consists of pieces of shredded scrap tires. There are two general types of shred:
 - Type A - maximum size 75 mm (3 in.)
 - Type B - maximum size of 300 mm (12 in.)
- TDA provides an opportunity for high volume use of scrap tires.
- Depending on the application, TDA can be considered for use as a construction material, often as a replacement for natural aggregate.
- TREK recently carried out laboratory testing to provide technical support for submissions where TDA is being considered as an (approved) alternate to natural aggregate for retaining wall backfill.

TDA Potential Applications

- TDA has been used as a construction material for various applications for many years with the range of uses growing.
 - Drainage systems (e.g. pipe trenches)
 - Embankments (e.g., lightweight fill)
 - Retaining wall backfill (e.g., reduction in earth pressures)
 - Slope stabilization (e.g. lightweight fill at top of bank)
 - Thermal insulation (e.g., reduce frost penetration in roadways)
 - Lightweight subgrade for roads over weak subgrades
 - Landfill construction (e.g., drainage layers, leachate collection lines)
 - Vibration damping (e.g., rail lines and heavy vehicle use roadways)

The use of TDA is governed by ASTM standard D6270-08, which outlines the use of shredded tire fill.

- Potential uses for TDA as a replacement for natural mineral aggregates depend on project-specific requirements including (but not limited to):
 - *Bearing capacity*
 - *Settlement tolerances*
 - *Technical and environmental requirements*
- For some applications, the engineering properties of TDA may be of benefit while in other applications they may not be.
- A good technical understanding of the merit of these benefits and potential limitations (as with any material) is important when evaluating specific applications.



Engineering Property Ranking (based on TREK testing and subject matter literature)

Score	Definition
1	Performs poorer against comparative material for given criteria
2	Performs moderately well against comparative material for given criteria
3	Performs better against comparative material for given criteria

Criteria	Material Type			Comments relative to TDA
	Mineral Aggregate		TDA	
	Well Graded	Poorly Graded		
Drainage	1	3	3	The influence of shred size (gradation) and vertical stress is generally of small consequence
Compressibility	3	2	1	Compressibility depends predominantly on the initial voids ratio (e_0) – generally decreases with increasing unit weight
Thermal conductivity	2	2	3	Literature suggests thermal conductivity can be several times less than mineral aggregate
Unit weight	1	2	3	Unit weight is ~ 30 % that of gravel
Lateral earth pressure	1	2	3	K_0 is about ~equal for gravel and TDA but low TDA unit weight results in lower wall pressure
Absorption	2	2	2	No alteration in physical properties when in contact with water.
Shear strength	3	2	1	TDA - High strength at large deformation but low strength at low deformation
Vibration attenuation	1	2	3	Less attenuation in dense materials

TSM Community Rubber Aggregate Grant

- The Tire Stewardship Manitoba (TSM) Community Rubber Aggregate Grant provides funding for the use of recycled projects made from Tire Derived Aggregate (TDA) delivered by Manitoba communities and non-profit organizations.
- Grant funding per approved road and geotechnical project is 50% of the project cost up to \$20,000 provided to communities and non-profit organizations to use and benefit from a recycled tire aggregate.
- Grant eligibility is subject to one grant per community organization per calendar year.

<https://www.tirestewardshipmb.ca/assets/tsm-community-rubber-aggregate-grant-application-2024---fillable.pdf>