



# Beneficial use of tire derived products

## Background

After World War II, the United States experienced a huge surge in the demand for tires as a result of an expanding auto industry, a greatly improved system of highways, and an increase in the economy which provided for a better standard of living and an increase in leisure time. This increase in the demand for tires in turn led to an increase in the problems associated with the disposal of waste tires. Many of the waste tires that were generated were either burned or landfilled, but a significant portion of the waste tires were collected and dumped on private properties. These waste tires – sometimes numbering in the millions – were often owned by persons who had no viable plan to dispose of them. In 1984, Minnesota became the first state to regulate the disposal of waste tires and encourage the abatement of waste tire dumps. This Minnesota waste tire legislation provided funding and technical assistance to help businesses properly recycle waste tires and to help property owners clean up waste tire dumps.

As a result of the waste tire legislation, waste tires generated in Minnesota were diverted from landfills into a number of different processing options. While most of the waste tires were shredded and utilized as a fuel source for power plants and other permitted facilities, shredded tires were also used as a material for construction purposes, primarily as “lightweight fill” for roads constructed through unstable soils. To date, over 40 million tires have been removed from the waste stream and reused for some other purpose.

Although lightweight fill was a major use of the tire-derived products (TDP), the marketplace for TDP was new and the potential uses for the material kept growing because of its perceived value to the project engineers to build better projects. To address the growing demand, and to address public concerns that TDP posed environmental problems or was being disposed of in the land without a viable plan, the Minnesota Pollution Control Agency (MPCA) established guidelines for several different uses of the TDP. These uses could include road-bed construction, building construction, utility construction and rehabilitation, and landscaping. Since there were no rules specifically governing the use of TDP, the MPCA requested persons proposing projects involving the use of TDP in the ground to submit a proposal to the MPCA for technical review. The proposal was to contain the following information:

- methods of construction
- quantity of tire shreds to be used
- depth to water table
- maps, diagrams and cross-sections to show construction details

In general, the proposal was to identify that:

- the proposed construction was above the water table
- measures were taken to limit infiltration of surface water
- measures taken to eliminate exposure of tires to the environment

In addition, the MPCA requested documentation that the project represented a “beneficial use” of the TDP, and that it was not simply an inexpensive method of disposal. The MPCA also requested the proposer to illustrate why the TDP was a better alternative to traditional construction methods. In all instances, the proposer was required to obtain local zoning approvals from city, township or county officials prior to beginning the construction project.

Based upon the submittals, the MPCA approved a number of projects, but because there was no standard for approval, it was difficult for the MPCA to determine whether the project represented a genuine beneficial use, and the resulting approvals were inconsistent. In addition, some projects still took place without MPCA knowledge or approval. In early 2004, the MPCA adopted rules governing the use of wastes. In an effort to encourage persons to use waste-based materials, the rules allowed for certain uses of specific solid wastes, including TDP, without the need for prior MPCA staff review and approval. The rule also established a process for approval of proposed waste uses that did not meet the specified categories of uses that do not require MPCA approval. TDP was allowed to be used in three specific situations without prior MPCA approval and is discussed in the Standing Beneficial Use Determination (BUD) section.

## Purpose

This guidance document is intended to: 1) encourage a wider acceptance by the general public for using TDP in construction projects; 2) provide guidance on acceptable uses for TDP; and 3) reduce the number of violations and enforcement actions involving uses of TDP that do not conform to the beneficial use rules. This guidance document supersedes all other previous MPCA fact sheets and publications relating to the beneficial use of TDP. This guidance document is not a rule. The MPCA will not use this guidance document to determine compliance in a particular case. Persons who disagree with the suggested interpretations in this guidance document are free to assert alternative interpretations in a particular case.

## Compliance

The MPCA encourages the use of TDP. However, the MPCA will consider the excessive use of TDP in any project to be disposal as stated in Minn. R. 7035.2860, subpart 2, item E. This could result in an enforcement action against the contractor and/or property owner, and could potentially result in fines and an order to remove the TDP and dispose of the materials at a permitted facility.

## Terminology

Certain terms used in the beneficial use rules are not defined. Where terms are not defined, the MPCA looks to commonly accepted industrial/commercial definitions to arrive at a reasonable interpretation of the rule. Other terms commonly used within the industry, such as tire-derived aggregate (TDA), are not used in this document and are not included in the list of definitions. While respecting the right of a party to assert a different definition is appropriate in a specific case, the MPCA believes that the following are reasonable definitions of terms used in the beneficial use rule and in this guidance document:

**Conventional aggregate** is rock, sand or gravel recovered from a natural deposit or made from crushed stone. Aggregates are classified by particle size, source, and other criteria based on the specific performance that is required for an engineering application, as specified by an engineer.

**Crumb rubber** consists of tire shreds that are processed to a fine consistency that is typically less than 3/16 of an inch in size with the fabric and metal removed.

**General construction fill or clean fill** is material that is placed and compacted in an area for the purpose of filling a hole or depression or raising the grade, where the material properties aren't critical to the project.

**Lightweight fill** is any material used to replace a heavier in situ soil to reduce the load on subgrade soils and/or structures thereby eliminating or reducing long term soil settlement.

**Public roads** are roads that are under the jurisdiction of, and maintained by, a public authority, and which are open to public travel.

**Tire chips** are pieces of waste tires that are generally smaller than twelve inches in length and that have most of the exposed metal removed. Actual dimensions should be specified by the design engineer or design professional based on the specific performance criteria needed for the project.

**Tire shreds** are pieces of scrap tire which have removed at least one sidewall and have generally been reduced to a size that ranges between two to twelve inches.

**Tire derived products (TDP)** are materials that are obtained by processing waste tires into products such as tire shreds, tire chips, crumb rubber, etc.



Photo courtesy of Blake Nelson, MnDOT

## Beneficial Use Determinations

The beneficial use rule establishes a procedure for determining when the use of solid waste is classified as a beneficial use. The Standing BUDs have been determined to be approved uses of solid waste by the MPCA. The Case-Specific BUD section applies to all other proposed beneficial uses of solid waste.

### Standing Beneficial Use Determination

Minn. R. 7035.2860, subp. 4 addresses Standing BUD and in part reads as follows:

*Subp. 4. Standing beneficial use determinations. A standing beneficial use determination means that the generator or end user of a material can do so in accordance with this subpart without contacting the agency. Only those specific solid wastes and the uses designated in items A to Q have been given standing beneficial use determinations. Any other uses of the solid waste are not authorized and must follow the procedure outlined in subpart 5.*

Of the items listed in this subpart, items F, G and H address the utilization of TDP. Subpart 4; item F of the beneficial use rules states the following:

*F. Crumb rubber when used in asphalt paving or applications where it is used as a substitute for rubber or similar elastic material.*

Since crumb rubber is generally used in a manufacturing process or in surface applications that require relatively small sizes of TDP, this guidance document does not address this material.

Subpart 4, item G states:

*G. Tire shreds when used as lightweight fill in the construction of public roads in accordance with Minnesota Statutes, section 115A.912, subdivision 4.*

This item specifically addresses the use of tire shreds in the design and construction of public roads. The rule requires the user to comply with Minn. Stat. § 115A.912, and must be consistent with the current lightweight tire fill engineering practices as developed for roadways by the Minnesota Department of Transportation (MnDOT). The statute, and the "Official MnDOT Standard of Engineering Practice for the Use of Shredded Tires in Roadways," require the design and project description to be developed by a registered professional engineer with experience in geotechnical projects, geotextile encapsulation surrounding the tire shreds, and adequate cover soil to compact the shreds, as well as other requirements. Users are encouraged to consult the MnDOT requirements prior to commencing any project.

Finally, subpart 4, item H states:

- H. Tire chips when used as a substitute for conventional aggregate in construction applications when the ratio of this substitution is no greater than one to one by volume. This does not include use of tire chips as general construction fill or clean fill.*

It is this standing use that has generated the most difficulty in interpretation. The remainder of this guidance document addresses this use. In general, the MPCA will evaluate the “item H” uses against the language of the rule and also the general beneficial use standard in Minn. R. 7035.2860, which states:

*Subp. 2. Beneficial use standards. To constitute a beneficial use under this part, the following standards must be met:*

- A. the solid waste must not be stored in anticipation of speculative future markets;*
- B. the solid waste must be adequately characterized in accordance with part 7035.2861;*
- C. the solid waste must be an effective substitute for an analogous material or a necessary ingredient in a new product;*
- D. the use of the solid waste does not adversely impact human health or the environment; and*
- E. the solid waste must not be used in quantities that exceed accepted engineering or commercial standards. Excess use of solid waste is not authorized by this part and is considered disposal.*

## Case-Specific Beneficial Use Determination

The MPCA strongly recommends that the user apply for a Case-Specific BUD for any project for which compliance with the Standing BUD is uncertain before proceeding with the project. This includes projects which entail a new use of the TDP or where the design deviates from industry standards. For example, mixing tire chips with soil has not been sufficiently evaluated in Minnesota and would need to be approved under the Case-Specific BUD.

The process of applying for a Case-Specific BUD is set out in subpart 5 of the beneficial use rules. Additional information, including how to submit a proposal, can be found on the MPCA’s Solid Waste Utilization/Case-Specific BUD webpage at: <http://www.pca.state.mn.us/sbiz860>.

## Frequently asked questions

What is a “tire chip”?

As noted above, the rule does not define “tire chip.” The Statement of Need and Reasonableness that supported the rule indicates that “tire chips” are generally smaller than twelve inches in size. In general, the size of the tire chip should be consistent with the proposed use as supported by industrial standards or research.

What is a “construction application”?

A construction application is one where the tire chip is being used for its engineering properties, and not just as “general construction fill” or “clean fill.” Tire chips have many beneficial engineering qualities. For instance, they are lightweight, do not degrade under most construction applications and, if properly sized, may promote drainage, stabilize embankments, reduce lateral loading, eliminate capillary action (pumping), and have large void spaces that can be utilized in various applications.

Finally, a project meeting the beneficial use standard utilizes the properties of tire chips for a specific benefit to a project, and not just as fill to elevate a particular area.

Is geotextile fabric encapsulation required?

Yes and no, based on the specific item under the Standing BUD rule which applies. The use of a geotextile fabric is mandatory when tire shreds are used as a lightweight fill in the construction of public roads under item G. However, when used as an aggregate replacement under item H, the use of a geotextile fabric is at the discretion of the user. While not a requirement, the use of geotextile encapsulation will help ensure that the desired construction properties of the tire chip are maintained throughout the life of the project by separating the tire chips from the soil. In addition, geotextile encapsulation will help avoid a potential larger disposal problem in the event the project requires repair or replacement at some future date.

What is a “one to one substitute for conventional aggregate”?

Item H allows the use of tire chips as a substitute for conventional aggregate when the ratio of this substitution is no greater than one to one by volume.

The MPCA will expect that a design engineer/professional who is using waste tire chips under this standing beneficial use will be able to justify the volume used on the basis of the construction application. The design engineer/professional should have a clear understanding of why the waste tire chips are being used, and what volume is required for the specific purpose to be achieved. The volume of material may not exceed what would have been required if conventional aggregate was utilized, even if more use of waste tire chips is considered desirable. The rule specifically prohibits the use of tire chips for fill, even if aggregate might have been used for that purpose. The design engineer/professional should study the site proposed for use (soil physical properties, water table, climate, etc.) to ensure that the volume of tire chips does not exceed the volume that is necessary for the particular project.

In general, the design engineer/professional should be able to support the volume based on engineering analysis, including calculations based on the site conditions and the engineering properties of the particular tire chip to be used. Where engineering analysis is available from published literature for certain sizes of tire chips, the user can rely on the literature’s conclusions as support for the project. However, the MPCA will not accept that a particular volume is consistent with the one-to-one substitution solely because that volume is consistent with a prior project, particularly if that project was completed many years ago on a different site.

Is a TDP considered a solid waste?

According to the beneficial use rules, a material (including TDP) remains a solid waste until it is incorporated into a manufactured product or utilized in accordance with a standing or a case-specific BUD. Until that time, the material must be stored and managed as a solid waste. For more information regarding the proper storage of a solid waste, please refer to Minn. R. 7035.2855.

## Final considerations

The MPCA encourages the public to consider utilizing TDP products under the conditions set forth in this guidance document. When using TDP, the MPCA also strongly encourages the user to communicate with local governmental units and nearby residents of the proposed project to inform them of the scope of the project and of the benefits of using TDP.