

URBAN MINING

Using Recycled Aggregates



In 2006, Dufferin Construction crushed 400,000 tonnes of concrete rubble at Lester B. Pearson International Airport and used it as a road base material for in the preparation of new aprons – one of the largest single uses of recycled aggregate in the province.

Recycling aggregate conserves resources and saves landfill space. The aggregate is already where it needs to be, close to construction projects, which saves transportation costs and reduces greenhouse gas emissions. You don't need any permits or licences. And, as an added bonus, it keeps large quantities of material out of the landfills and saves taxpayers money.

So why aren't municipalities fighting to get their hands on this valuable resource?

INSIGHT

Recycled Aggregate

Source: demolition of buildings, bridges, sidewalks, roads and other structures.

Processing: crushing, removal of reinforced steel and screening.

Applications

- 50 mm recycled aggregate as granular base and sub-base for pavements
- 19 mm recycled aggregate as granular base for pavements
- trench backfill material
- engineered fill
- stabilization of soft sub-grades
- fill under concrete slab-on-grade
- pavement shoulders construction
- access roads, bicycle paths and trails, and rural driveways

Benefits

- Reduces emissions
- Reduces landfill materials
- Conserves energy
- Conserves natural resources
- Qualifies for LEED credits
- Saves costs
- Provides good drainage
- Readily compactable
- Reduces haul distances and transportation

Governing Specification

Ontario Provincial Standard Specification 1010: Material Specification for Aggregates Base, Subbase, Select Subgrade and Backfill Material

In 2010, the Town of Caledon won a long-standing fight against a proposed quarry when the Ontario Municipal Board rejected a construction firm's rezoning application. The ruling brought an end to a 13-year battle led by the grassroots Coalition of Concerned Citizens, which spent about \$2-million in legal costs in its efforts to defeat the quarry.

The battle in Caledon is one more example of the uneasy relationship between Ontario's pits and quarries and their urban neighbours. Ontario is built on rock. About 170 million tonnes of aggregate (equivalent to about 5 million truck load) is used every year to build roads and bridges, lay sewer and water mains, and construct every type of building from houses to high rises. But as urban areas expand, so too do concerns about dust, noise and environmental damage pushing pits and quarries further away from the market, significantly adding to transportation costs and reducing the supply of readily accessible high quality materials.

Instead of going further afield, municipalities should take a closer look at their own backyards – urban mines with a readily available supply of high quality aggregate.

"There are more than 2.5 million tonnes of aggregate salvaged from roads and sidewalks stockpiled in yards around the GTA just waiting to be recycled," says Mike O'Connor, executive director of the Toronto and Area Road Builders Association. "All municipalities have to do is stake their claim."

Most of the recycled aggregate comes from concrete demolition waste from sidewalks, curbs, bridges and buildings, almost all of which is processed by local contractors, who crush the concrete, remove the reinforcing steel, and then carefully screen the aggregate. The reclaimed material is stockpiled as 19 mm and 50 mm crusher run aggregates and are used as an alternate to pit run or quarried granular materials such as Granular A and B.

Once screened, crushed and stockpiled to specification, recycled aggregate can be used in place of virgin aggregate in most applications including road bases and engineered fill, trench backfill, pavement shoulders and to build access roads and trails. And by using recycled aggregates, municipalities help conserve a non-renewable resource, cut down on greenhouse gases (it takes a lot of fuel to haul aggregates from rural pits and quarries), and keep materials that still have value from ending up in landfill.

Recycled Aggregate in Road Construction

With more than 160,000 kilometres (expressed in two lane equivalents) of municipal and provincial roads to maintain and new roads being built every year, road construction is the single biggest market for aggregates in the province. About 52 percent of Ontario's annual aggregate production is used to build road bases and an additional 7 percent is used in asphalt pavement. It takes about 6,500 tonnes of aggregate to build one kilometre of a local road and about 44,000 tonnes to build the same length of a four-lane freeway.

Between 2005 and 2008, the Ministry of Transportation, the biggest single road construction agency in the province, used about 42 million tonnes of aggregates for primary and secondary highway and related transportation infrastructure construction. But MTO is also one of the most enthusiastic proponents of using recycled aggregate and see it as an integral part of their stated objective to have the greenest roads in North America. About 20 percent of the aggregates used on MTO projects in that four-year period were recycled.

"We use recycled aggregate for road bases, shoulders and backfill," says Becca Lane, the head of MTO's Pavements and Foundations Section. "As long as it meets OPSS standards, we are confident of its engineering properties and consider it to be every bit as good as virgin aggregate. And of course, by using recycled materials we are meeting our obligations to build sustainable roads and help reduce greenhouse gas emissions as well."

So why aren't municipalities fighting to get their hands on this valuable resource? Local contractors are mystified, says Mike O'Connor.

"Every tonne of aggregate that is recycled means one less tonne of aggregate that has to be extracted from a quarry," he says. "The aggregate is already where it needs to be, close to construction projects. Since about 60 percent of the cost of aggregate is for transportation having the aggregate source close to the project not only reduces costs but also cuts down on greenhouse gas emissions. You don't need any permits or licences to mine an urban quarry and, as an added bonus, it saves taxpayers money."

Nevertheless, some municipalities are still reluctant to use recycled aggregates and as a result, contractors are facing a looming crisis. With 2.5 million tonnes of recyclable aggregate already stockpiled in GTA contractor yards and the quantity growing almost daily, their yards are close to capacity. If contractors are forced to close their yards, municipalities will have to find new places to

stockpile construction waste. Ironically, their own landfills are not an option. Concrete is considered a reusable and recyclable product.

Last year, the Toronto and Area Road Builders Association started a campaign to encourage municipalities to increase the use of recycled aggregates in public works projects. Cameron MacKinnon, a specialist in environmental studies and president of Blackwater Communications, helped with the campaign and met with a number of municipalities and consulting firms.

"We were astonished to find that many municipal and consulting engineers have a deep-rooted professional bias to the use of recycled aggregate," he recalls. "Many of the adverse comments were about old anecdotal stories of contaminated concrete but no one ever offered any "concrete" evidence that properly recycled aggregates produced to established specifications were the source of a failure. But urban legend had become urban fact."

"We countered by demonstrating that this was not breaking new ground, so to speak. We were not asking the engineers to take a risk and that the precedents have all been set. The Ministry of Transportation has shown extraordinary leadership in recycling both concrete aggregate and asphalt pavement. The specifications are established. Recyclers abide by the highest standards and not only live up to OPSS standards but more often than not exceed them."

Setting the Standard

Even though there are a number of standard specifications that prescribe the use of recyclable materials (for instance, OPSS 1010, Material Specification for Aggregates – Base, Subbase, Select Subgrade, and Backfill Material), many agencies and consultants continue to prohibit or restrict the use of approved recycled granular materials, largely due to lack of experience or as the result of an unfavourable past experience. It is, in the view of many contractors, an outmoded response.

The physical properties of recycled aggregates are similar to crushed limestone and they are considered structurally equivalent to crushed limestone when used as a pavement base or sub-base.

"Recycled aggregates are a crushed product which makes them easier to work with and much more compactable than pit run granular materials, which lack angularity," says Tony Gaglia, operations manager of D. Crupi & Sons, a contractor that has been successfully recycling concrete since 1979.

The OPSS specifications define the properties that recycled aggregate must meet but not the standards that contractors must meet in order to produce the recycled aggregates. To encourage high quality production and give contractors proven guidance, the **Toronto and Area Road Builders Association** has issued a new Best Practices Guide with guidelines and standards for producing quality recycled aggregates for road and sidewalk bases, trench backfill, engineered fill, access roads, trails, and other construction applications. The guide includes measures needed to meet Ontario Provincial Standard Specifications and Ministry of Labour and Ministry of Environment standards and covers raw material quality, production, quality control and production safety.

"It took our committee about six months of hard work to review all the current practices and come up with what we consider are the best practices that the industry has to offer," says Mike O'Connor. "It not only provides our members with the guidance that they need but also gives municipal and consulting engineers the assurance that recycled aggregate meets all the engineering standards of virgin aggregate."

Local Production

The Ministry of Natural Resources defines the recycling of mineral aggregate resources and derived products such as asphalt and concrete, as a "mineral aggregate operation" and that "...the conservation of mineral aggregate resources should be promoted by making provision for the recovery of these resources, wherever feasible." In other words, **municipalities can help promote the recycling of aggregates by allowing recycling operations in properly managed and licensed facilities.**

No special equipment or procedures are required for the material handling. **Most recycled aggregates are processed at local aggregate supply yards or hot mix asphalt production facilities.** The personnel on site are trained and experienced in the handling of these materials and all processing is carried out under a Certificate of Approval, ensuring that environmental requirements, including air emissions and noise restrictions, are met.

Recycled aggregates do not pose any significant environmental risks. They meet all applicable leachate quality criteria (under O Reg 558-TCLP Metals & Inorganics) and do not exhibit any leaching problems. They do not contain toxic materials and are considered environmentally safe.

The **Aggregate Resources of Ontario Provincial Standards** recognize recycling as an allowable use within a licensed site. AROPS states that if a zoning by-law allows

for accessory uses to a mineral aggregate operation, then recycling of aggregate should be considered as an accessory use and a minor amendment should be processed to allow the activity. If the zoning by-law does not discuss recycling, the licensee must request and obtain a letter of approval from the municipality prior to any approval of a site plan amendment.

AROPS policies restrict the location of recycled aggregate stockpiles. These materials cannot be within 30 metres of any water body or within 2 metres of the surface of the established water table. Approved recycling areas must be shown on the site plan.

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