

STATE OF COLORADO



Colorado Department
of Public Health
and Environment

**Advanced Technology Grant Program
Biennial Report to the Colorado General Assembly
Fiscal Year 2009**

Submitted to the Colorado Legislature
By the Office of Environmental Integration and Sustainability,
Colorado Department of Public Health and Environment
May 1, 2009

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DOCUMENT INFORMATION

Title: Advanced Technology Grants Biennial Report to the Colorado General Assembly, Fiscal Year 2009

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Subject: The report describes the status of the first two years of the Advanced Technology Grant Program managed by the Colorado Department of Public Health & Environment for the state of Colorado.

Statute: C.R.S Chapter 370 Article 19.7 25-16.5-105(2)(b)

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I. Executive Summary

The Advanced Technology Grant (ATG) Program is intended to fund research that will increase or improve recycling techniques and technology; create marketable uses for discarded materials, including but not limited to, strategies pertaining to waste tires; address problems caused by inappropriate disposal of solid waste materials, including but not limited to, waste tire stockpiles; and, make use where possible of the research capacities of Colorado institutions of higher education.

In the ATG cycle for fiscal year 2008, 17 applications were received totaling \$2,834,045 in requests. Seven applicants were awarded funding for a total of \$1,076,195. Grantees began their projects on February 1, 2008. The grant project duration varies from 12 to 28 months.

FY 2008 ATG Awards:

Grantee Name	Project Title	Amount Awarded	Project End Date
University of Colorado, Boulder	Premixed Rubberized Insulation Mortar	\$133,929	1/31/2010
University of Denver	Promoting Rubberized Asphalt and Other Scrap Tire Products in Colorado	\$96,601	6/30/2009
Engineered Vinyl Products	Noise Mitigation Walls Using Recycled Tires - 6th Avenue Frontage Road	\$224,000	6/30/2009
Green Giant Recycling	Creating Engineered Structural Building Components from Laminated Oriented Strand Board	\$72,100	1/31/2009
Colorado State University	Field Construction of Expansive Soil Rubber Mixtures for Civil Engineering Applications	\$149,320	1/31/2010
University of Colorado-Denver	Recycling Solid Waste into High Performance Environmental, Structural Insulated Panels	\$240,245	1/31/2010
Colorado Department of Transportation	Feasibility and Plan for Building the Best Practical Noise Mitigation Walls Utilizing Waste Tires along CDOT Highways	\$160,000	7/1/2010
Total Amount Awarded in FY 2008:		\$1,076,195.00	

In the ATG cycle for fiscal year 2009, 13 applications were received totaling \$1,909,139 in requests. Four applicants were awarded funding for a total of \$252,858. Grantees began their projects on February 1, 2009. The grant length varies from 12 to 24 months.

To specifically address footnote 52b in HB08-1375 Part XVI, which emphasizes the need to fund projects that will reduce waste tire stockpiles, the Pollution Prevention Advisory Board Assistance Committee requested a special grant project to evaluate the use of waste tires in asphalt. The grant was awarded to the Colorado Department of Transportation in April, 2009. Total reward for this grant is \$300,000 which will begin by June 1, 2009 and will end on December 31, 2011.

FY 2009 ATG Awards:

Grantee Name	Project Title	Amount Awarded	Project End Date
San Luis Valley Resource Conservation & Development Council	Combined Sanitation District for Recycling and Diversion of Municipal Solid Wastes in the San Luis Valley	\$46,915	12/1/2010
Skumatz Economic Research Associates	Best Management Practices in Education as the Cheapest and Most Efficient Technology/Technique to Increase Recycling in Colorado	\$49,983	2/1/2011
3R Roofing LLC	Roofs to Roads	\$59,300	7/31/2010
University of Colorado-Denver	Trash to Treasure: Using Crumb Rubber from Recycled Tires for Stormwater Pollution Control	\$96,660	1/31/2011
Colorado Department of Transportation	Use of Waste Tires (Crumb Rubber) on Colorado Roadways	\$300,000	12/31/2011
Total Amount Awarded in FY 2009:		\$552,858.00	

II. Background

The Advanced Technology Grant (ATG) Program was previously administered by the Colorado Commission on Higher Education until June 30, 2007. With the signing of Senate Bill 07-182 by Governor Bill Ritter on May 2, 2007, the administration of the ATG program was transferred to the Colorado Department of Public Health and Environment (the department) and is under the Office of Environmental Integration & Sustainability (OEIS) effective July 1, 2007. The ATG Fund receives approximately \$495,000 each year from a portion of the state's Waste Tire Fee (§25-17-202, C.R.S.).

The ATG program focuses on waste diversion, minimization and recycling research as well as the development of waste reuse opportunities. The objective of the grant program is to finance research, including research regarding the use of waste tires for noise mitigation along state highways, that will increase or improve recycling techniques and technology or create marketable uses for discarded materials, including strategies pertaining to waste tires, making use where possible of the research capacities of the Colorado Institutions of Higher Education (§25-16.5-105 (2) (b), C.R.S.).

Only those projects fitting under the Environmental Protection Agency's (EPA) definition of recycling were eligible for consideration. The EPA's definition of recycling: Recycling is a series of activities that includes collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, and manufacturing raw materials into new products. *Excludes* the use of these materials as a fuel substitute or for energy production.

The Pollution Prevention Advisory Board (the board) develops pollution prevention goals and objectives; reviews environmental regulatory programs, laws and policies to identify opportunities and incentives; provides direction for pollution prevention outreach, education, training and technical assistance programs; and supports non-regulatory public and private efforts that promote pollution prevention. The Pollution Prevention Advisory Board Assistance Committee (the committee) advises the board in connection with the awarding of grants, loans and rebates from the ATG program. The department, working through the board and the committee, evaluates and approves the grant projects to be funded each fiscal year.

III. ATG Program

a. Grant Solicitations

The Request for Applications (RFA) was prepared by the committee, with assistance from department staff, and was approved by the board for public release in October, 2007 and again in September, 2008. The department's purchasing and contracts division also reviewed the RFA to ensure compliance with state procurement guidelines.

The RFA was looking for applications that met the general objectives of:

- Research which strengthens the feasibility and efficiency of solid waste minimization, diversion and or/recycling (for materials or products of any kind, including waste tires)
- Research that increases waste stream diversion and recycling
- Research that identifies best practices in recycling, waste minimization and diversion
- Market research on waste reuse opportunities
- Research that quantifies the economic impacts of the recycling industry in Colorado
- Technology transfer

b. Fiscal Year 2008 Advanced Technology Grants

The department received 17 applications totaling \$2,834,045 in funding requests. Seven applicants were awarded funding for a total of \$1,076,195. Grantees began their projects on February 1, 2008. The grant length varies from 12 to 28 months. The applications were evaluated based on 4 main criteria:

- Practical Technological Innovation
- Viable Results and Implementation
- Environmental Benefits and Economic Impact
- Experience and Qualifications

FY 2008 grant recipients:

Grantee Name: University of Colorado, Boulder
Project Title: Premixed Rubberized Insulation Mortar
Legal Tax Status: School/University
Location of Grantee: Boulder County
Grant Award: \$133,929
Project End Date: 1/31/2010
Abstract: The grant is aimed to develop technology for manufacturing a new mortar product called Premixed Rubberized Insulation Mortar (PRIM) to be used as an insulation material in the construction industry. In this project, fine particles of waste tires will be used to replace part of the natural sand in premixed mortar. PRIM will have the special features of low unit weight and high insulation capability. The project will help prove PRIM will reduce the heating and cooling energy consumption in residential and public buildings when it is used on exterior walls. In this project, the relationship between composition and properties of PRIM will be developed. The characteristics of manufacturing process, application methods, and quality control procedures will be studied, and a small scale application will be conducted so that the technology for PRIM will be ready to use in the construction industry.
Current Status (2/1/08 – 5/1/09): The testing on the PRIM optimum mix design was completed. There were three different types of additive used in the first set of specimens. Among the three additives, Redispersible Polymer Powder (RPP) has the most significant effect on compressive strength of PRIM, and therefore, the second set of experiments were designed to examine the effect of RPP content on compressive strength of PRIM. The results were analyzed and used in the next step

for developing PRIM with very fine rubber particles. A literature review was also completed. The purpose of this review was to find out the current methods and materials used for installation of the insulation layer for residential buildings. An experimental plan was also developed for PRIM with larger rubber particle sizes.

Grantee Name: University of Denver

Project Title: Promoting Rubberized Asphalt and Other Scrap Tire Products in Colorado

Legal Tax Status: School/University

Location of Grantee: Denver County

Grant Award: \$96,601

Project End Date: 6/30/2009

Abstract: The grant is a combination of activities to greatly increase the use of scrap tire rubber in Colorado, including laboratory and field efforts relating especially to rubberized asphalt. Terminal blends (TBs), a proprietary version of rubberized asphalt, are a step towards the use of Asphalt Rubber Hot Mix (ARHM), not yet tested here but an important goal. The project will sponsor additional workshops with expert consultants for local communities and CDOT entities. The project will also promote new asphalt rubber chip seal maintenance projects for 2008. SofTrails tests are also of importance because such pedestrian trails are an alternative to asphalt or concrete trails and contain up to 45% tire rubber. These products, along with asphalt rubber chip seal overlays, will make an impact in the state's surplus of scrap tires while providing citizens with quieter, safer, roadways and safer, more comfortable hiking/jogging trails and playgrounds.

Current Status (2/1/08 – 5/1/09): Sound monitoring field tests were conducted along Broadway Avenue which compared older dense-graded polymer asphalt vs. recently paved Stone Mastic Asphalt [SMA]. For the SofTrails paving, specifications were reviewed on the LeeBoy Trail Master 5000, which is now commercially available. Information has been collected from several state departments of transportation regarding their specifications for crack sealant materials. DU staff also attended several workshops to discuss the benefits of rubberized asphalt products use in Colorado.

Grantee Name: Engineered Vinyl Products (EVP)

Project Title: Noise Mitigation Walls Using Recycled Tires - 6th Avenue Frontage Road

Legal Tax Status: For Profit

Location of Grantee: Jefferson County

Grant Award: \$224,000

Project End Date: 6/30/2009

Abstract: The grant is to evaluate a marketable method for using recycled tires in sound migration walls. A pilot noise mitigation wall will be built just north of the frontage road on the north side of 6th Avenue in partnership with Colorado Department of Transportation (CDOT) and Colorado School of Mines (CSOM). Two types of recycled rubber tire walls will be evaluated: precast concrete panel walls using crumb rubber, and a 6-foot high layered recycled tire wall. Crumb

rubber has been used in concrete pavement with much success in Arizona and has been studied in depth by Arizona State University. Crumb rubber concrete has improved thermal cycling (freeze/thaw) resistance, reduces the weight of the concrete, requires less cement and hence, is less costly, and promotes recycling. The goal is to determine if the crumb rubber concrete will perform similarly to normal concrete walls and reduce noise pollution.

Current Status (2/1/08 – 5/1/09): The wall design was completed by CSOM. The precast concrete panel wall construction has been completed. Construction on the layered recycled tire wall has begun. The project completion date was extended until June 30, 2009 due to poor weather conditions. EVP has worked with CDOT to ensure right of way and design do not conflict.

Grantee Name: Green Giant Recycling (GGR)

Project Title: Creating Engineered Structural Building Components from Laminated Oriented Strand Board that has been Diverted from Landfill Waste Stream

Legal Tax Status: For Profit

Location of Grantee: Adams County

Grant Award: \$72,100

Project End Date: 1/31/2009

Abstract: The grant is to investigate if scrap Oriented Strand Board (OSB) can be laminated into thicker boards and beams that are suitable for replacing new lumber in residential building, commercial building and other applications. OSB is similar to plywood, only it is made from many small chips bound together in a resin matrix and it is the primary component of the scrap wood waste stream resulting from residential building. Re-use in the building industry is the only diversion that can actually reduce the demand for new lumber.

Current Status (2/1/08 – 1/31/09): The project was completed on January 31, 2009. Five phases of product testing were completed with assistance from Colorado State University. Several positive results occurred and GGR will continue to test OSB and work with local businesses to present and promote its findings. The final grant report is available on the board's website:

http://www.cdphe.state.co.us/el/p2_program/ppabgrants.html.

Grantee Name: Colorado State University

Project Title: Field Construction of Expansive Soil Rubber Mixtures for Civil Engineering Applications

Legal Tax Status: School/University

Location of Grantee: Larimer County

Grant Award: \$149,320

Project End Date: 1/31/2010

Abstract: The grant is aimed at conducting field measures to develop construction guidelines for the use of Expansive Soil Rubber (ESR) mixtures in civil engineering applications such as house, road and bridge construction. The research will demonstrate the practical feasibility of using waste tire rubber to reduce the swell potential of local, expansive soils in Colorado by: 1) developing and testing field scale ESR sections that will be used to attract and secure additional funding

from other agencies; 2) establishing new and consolidating existing collaborations with partners from the private sector, state, federal, and local governments; and 3) continuing to raise the level of exposure and awareness of engineering professionals and Colorado college students regarding sustainable technologies.

Current Status (2/1/08 – 5/1/09): Several partnerships have been established, both with other universities and within the private sector. Three field tests were conducted with encouraging results. Further field tests will be completed and final conclusions will then be made.

Grantee Name: University of Colorado-Denver

Project Title: Recycling Solid Waste into High Performance Environmental, Structural Insulated Panels

Legal Tax Status: School/University

Location of Grantee: Denver County

Grant Award: \$240,245

Project End Date: 1/31/2010

Abstract: The grant will address the technical and economic feasibility of recycling post-consumer waste into environmentally sound, economically viable, high-performance building materials that will help lessen dependence on solid wood and petroleum based construction products. The project goals are: 1) the development of sustainable wall, floor and roof panel products using recycled waste stream feedstocks; 2) outline a business plan quantifying volumes of waste diverted from the solid waste stream through creation of a business producing these products; and 3) facilitate the technical transfer of the products to private business in order to move into the commercialization stage.

Current Status (2/1/08 – 5/1/09): Laboratory testing is still ongoing with several constructed test models. The full-scale project using recycled materials will begin in spring 2009.

Grantee Name: Colorado Department of Transportation (CDOT)

Project Title: Feasibility and Plan for Building the Best Practical Noise Mitigation Walls Utilizing Waste Tires along CDOT Highways

Legal Tax Status: Government

Location of Grantee: Statewide (project located in Jefferson County)

Grant Award: \$160,000

Project End Date: 7/1/2010

Abstract: The grant is to conduct a research project to design and build noise mitigation walls using waste tires. This project would summarize the designs that CDOT will consider in implementing the noise wall application and building program that is outlined in and required by House Bill 06-1257. The project will 1) include research for the design, construction, and maintenance of noise mitigation walls utilizing waste tire material; 2) prepare designs for several of the most promising technologies which meet all applicable specifications; 3) complete planning for a test wall at a location approved by CDOT; 4) construct a prototype wall which incorporates several designs with an evaluation of the cost, constructability and contract documents. The prototype wall location will be on CDOT's right-of-way along the north side of 6th Avenue between Indiana and

Kipling Streets in Lakewood, in partnership with the tire wall being constructed by Engineered Vinyl Products (EVP). CDOT will monitor the prototype wall and the EVP wall for 12 months for durability, maintenance, and recommended improvements for future wall design and construction. CDOT will also conduct long-term monitoring, maintenance and, if needed, decommissioning and sampling of deteriorated sections of CDOT's wall after the grant ends.

Current Status (2/1/08 – 5/1/09): Feisberg, Holt & Ullevig was contracted to do the research, design and monitoring portions of the research project. Three prototype wall designs were selected based on cost, location and use of recycled tires. An internal study panel determined to "bid out" three prototype walls based on technical criteria. The prototype wall construction will be completed by August 2009 and monitored following completion.

c. Fiscal Year 2009 Advanced Technology Grants

In the FY 2009 ATG cycle, 13 applications were received totaling \$1,909,139 in requests. Four applicants were awarded funding for a total of \$252,858. Grantees began their projects on February 1, 2009. The grant length varies from 12 to 24 months. The applications were evaluated by the committee based on 4 main criteria:

- Practical Technological Innovation
- Viable Results and Implementation
- Environmental Benefits and Economic Impact
- Experience and Qualifications

FY 2009 grant recipients:

Grantee Name: San Luis Valley Resource Conservation & Development Council
Project Title: Combined Sanitation District for Recycling and Diversion of Municipal Solid Wastes in the San Luis Valley
Legal Tax Status: Non Profit
Location of Grantee: Alamosa County
Grant Award: \$46,915
Project End Date: 12/1/2010
Abstract: The grant will evaluate the San Luis Valley (SLV) waste stream that is currently non-productive or even potentially harmful to the environment and convert it into marketable products. The recycling processes will take place within the San Luis Valley Sustainable Environmental and Economic Development Park (SEED Park), which is designed to address specifically the economic needs of the SLV and create 100 or more living-wage jobs based on enterprises that are sustainable in this high desert region. The project is a companion piece to a current study that is identifying uses for local potato wastes to benefit the local economy.
Current Status (2/1/09 – 5/1/09): The council is currently working with local officials to identify current waste streams that have potential for recycling and recycled products.

Grantee Name: Skumatz Economic Research Associates (SERA)
Project Title: Getting the most from Colorado's Existing Recycling Programs and Infrastructure - Best Management Practices (BMP) in Education as the Cheapest and Most Efficient Technology/Technique to Increase Recycling in Colorado
Legal Tax Status: For Profit
Location of Grantee: Boulder County
Grant Award: \$49,983
Project End Date: 2/1/2011
Abstract: The grant aims to deliver more recycling tons in Colorado without increasing costs by making better use of existing outreach expenditures – increasing recycling for free, more sustainable, and with no new routes or capital expenditures. About 90% of Colorado residents already have access to curbside or drop-off recycling. Getting more from the programs that exist – using well-designed social marketing technology/techniques – may be the cheapest and most cost-effective way to dramatically increase Colorado's recycling rate. Most importantly, these approaches are completely transferable to other Colorado communities, can increase recycling and bring source reduction and composting into the fold, and do it inexpensively. The grant will develop "best management practices" (BMP) in recycling outreach for Colorado, and estimate the impact Colorado-wide from transfer of this BMP technology to communities across the state.
Current Status (2/1/09 – 5/1/09): SERA is currently developing BMP tools for use in research and determining best methodology for research and delivery of BMP tools.

Grantee Name: 3R Roofing LLC
Project Title: Roofs to Roads
Legal Tax Status: For Profit
Location of Grantee: Boulder County
Grant Award: \$59,300
Project End Date: 7/31/2010
Abstract: The grant, in partnership with Boulder County's Transportation Department, Architects Division, and Resource Conservation Division, investigates the feasibility of bringing Recycled Asphalt Shingle (RAS) technology to Colorado. This will be achieved through a demonstration project that will compare conventional asphalt to asphalt with 5% RAS from tear-offs at up to three paving installations in Boulder County. This project will be the first in Colorado to use RAS content in asphalt pavement. Asphalt roofing shingles from residential re-roofing (tear offs), rather than manufacturer scrap, are the target of this project. Current estimates indicate that more than 240,000 tons of asphalt shingles are dumped into Colorado's landfills every year. Reuse of this valuable material would prevent more than 12 billion pounds of carbon dioxide, a highly potent greenhouse gas, from being released.
Current Status (2/1/09 – 5/1/09): 3R Roofing is conducting training with roofing contractors on the economic and environmental benefits of this project. It is also collecting tear-off shingles for use in research paving installations.

Grantee Name: University of Colorado-Denver
Project Title: Trash to Treasure: Using Crumb Rubber from Recycled Tires for Stormwater Pollution Control
Legal Tax Status: School/University
Location of Grantee: Denver County
Grant Award: \$96,660
Project End Date: 1/31/2011
Abstract: The grant is to research using crumb rubber, a tire-derived material, in granular media filters to treat stormwater runoff. Because stormwater runoff carries sediments and contaminants that degrade aquatic habitats and impair water supplies, Colorado requires stormwater to be treated to the maximum extent practical. Crumb rubber has been used successfully to filter treated sewage, and has the potential to remove suspended solids, organics, nutrients, and pathogens, which are also main concerns in stormwater runoff. The grant outlines a series of laboratory experiments to determine the safety and effectiveness of crumb rubber filters, a market research plan to estimate the demand for crumb rubber filters, and a technology transfer plan to disseminate results to researchers, business, and government. If successful, the results of this study could significantly enlarge the scope of application of crumb rubber filters and broaden the market of waste tire reuse.
Current Status (2/1/09 – 5/1/09): The university is currently reviewing regulations and identifying possible test sites for research.

d. Fiscal Year 2009 Special Grant Projects on the Use of Waste Tires in Asphalt

Grantee Name: Colorado Department of Transportation (CDOT)
Project Title: Use of Waste Tires (Crumb Rubber) on Colorado Highways
Legal Tax Status: Government
Location of Grantee: Statewide
Grant Award: \$300,000
Project End Date: 12/31/2011
Abstract: The Colorado Department of Transportation (CDOT) proposes to evaluate the feasibility of using waste tires (crumb rubber) in the construction of asphalt pavements. As part of the evaluation, CDOT will build two pilot test sections and a control section using the Superpave Performance Grade, PG 64-28 asphalt binder in dense graded hot mix asphalt. The two pilot test sections will be built with crumb rubber modified (CRM) asphalt mix using the wet method (crumb rubber is first reacted with asphalt binder in an open system plant before mixing with the aggregates) and the terminal blend method (a special form of the wet process in which reaction takes place in a closed system plant). The control section will be constructed with the conventional polymer modified binder, PG 64-28 without the crumb rubber modifier. The ultimate goal of the research project is to develop applicable Colorado-specific materials and construction specifications for rubberized asphalt that will ensure long-term pavement performance and at the same time promote the continued use of CRM. Also, the research project aims to develop guidelines and best management practices for the construction of rubberized asphalt pavements

that the local government entities including counties, cities, towns, and municipalities may use as appropriate.
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Current Status (4/15/09 – 5/1/09): The department is currently in the process of executing an Interagency Agreement with CDOT for this project.
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e. Grant Monitoring and Reporting

Department staff monitors all grants to ensure they are meeting the requirements of their scope of work and contract or purchase order. Ongoing communication with the grantees is done through conference calls, e-mails, meetings and site visits. Each grantee is also assigned two members of the committee to act as grant monitors and provide technical assistance.

At minimum the grantee must provide a biannual and a final report to the department. The final report will include:

- A financial summary
- All deliverables
- A list of completed tasks and outcomes
- Description of unanticipated outcomes or roadblocks encountered
- Communication to Colorado businesses and communities
- A discussion on continuing research and development

Final reports will be available on the board's website as they are completed:

http://www.cdphe.state.co.us/el/p2_program/ppabgrants.html

IV. Conclusions

a. Next Steps

All grants awarded in fiscal year 2008 will be completed by July 1, 2010. All grants awarded in fiscal year 2009 (with the exception of CDOT's Waste Tire on Colorado Roadways project) began on February 1, 2009 and are scheduled to be completed by February 1, 2011. The 2011 legislative update will include a discussion on the final results of these grants. CDOT's project, Use of Waste Tires on Colorado Roadways, will begin as soon as a fully executed Interagency Agreement has been completed and will end December 31, 2011. A project update will be included with the 2011 report to the Legislature.

b. Final Thoughts

Currently, the majority of the ATG projects are still ongoing. Therefore, it is difficult to measure the actual impact of these grants at this time. It is clear that the Advanced Technology Grant was created, in part, with the intention of addressing Colorado's waste tire problem. As of 2007, 54.1 million tires were located in Colorado storage facilities. Although Colorado recycled approximately 82% of the 4.5 million tires generated in

2007, the state's waste tire inventory increased by more than 800,000 tires¹. Of the 12 projects funded by the ATG program, seven are projects whose research aims to help address the waste tire issue in the state. The research ranges from using fine particles of waste tires in mortar for residential insulation to building sound mitigation walls using stacked waste tires in high traffic areas. All of the grants show great promise to have multiple end uses for waste tires that can reduce the number of tires stored as well as generate new markets and job opportunities for the state. CDOT's project to use waste tires in asphalt pavement has the potential to provide a use for more than 100,000 waste tires per year on CDOT highway construction and repaving projects. This very conservative estimate does not take into account local municipalities or private industry using the recommended specifications by CDOT if the project is successful.

Another intention of the grant program is to make use of the state's institutions of higher education in conducting research either in a primary or secondary role. Of the 12 projects funded by the ATG program, seven are either being managed by a university or are have a university actively participating in the research. The research ranges from using shredded waste tires in expansive soils to stress testing of recycled Oriented Strand Board (OSB) in new home construction.

Much of the work being done on these grants may not show immediate results in waste tire and general waste diversion needs for the state. Like other research grants, it does take time and innovative thinking to create new technology and products to address existing problems. Continued funding of these types of projects is vital to finding innovative solutions to the state's waste tire issue as well as increasing general waste diversion in the state.

¹ Colorado Department of Public Health and Environment. *Fourth Annual Report to the Transportation Legislation Review Committee on the Status of Waste Tire Recycling In Colorado for Calendar Year 2007*. Denver: Colorado, 2008

APPENDIX

STATE OF COLORADO

Bill Ritter, Jr., Governor
James B. Martin, Executive Director

Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department
of Public Health
and Environment

POLLUTION PREVENTION ADVISORY BOARD ASSISTANCE COMMITTEE

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Susie Gordon, City of Fort Collins	(970) 221-6265	sgordon@fcgov.com
Marjorie Griek, Colorado Association for Recycling	(720) 839-9531	mgriek@cafr.org
Brent Hildebrand, Alpine Waste and Recycling	(303) 744-9881	bhildebrand@alpinewaste.com
Chris Hoofnagle, Pitkin County	(970) 923-3487	chrisho@co.pitkin.co.us
Gary Horton, Western Disposal	(303) 448-2344	ghorton@westerndisposal.com
Scott Myers, Envirogroup, Ltd	(720) 935-3600	smyers@envirogroup.com
Susan Piatt, Colorado Office of Economic Development and International Trade	(303) 892-3840	sue.piatt@state.co.us
Seth Portner, Governor's Energy Office	(303) 866-2201	seth.portner@state.co.us
Jo Scher, Pueblo Recycles	(719) 583-4942	scher@co.pueblo.co.us
Joe Schieffelin, Colorado Department of Public Health and Environment	(303) 692-3356	joe.schieffelin@state.co.us
Mike Wright, Guaranteed Recycling Xperts	(720) 377-7700	mikew@grxrecycles.com

CDPHE Staff:

Patrick Hamel, PPAB Ex Officio, Sustainability Unit Leader	(303) 692-2979	patrick.hamel@state.co.us
Brian Gaboriau, Recycling Grants Administrator	(303) 692-2097	brian.gaboriau@state.co.us
Rachel Wilson-Roussel, PPAB Administrator	(303) 692-2976	rachel.wilson-roussel@state.co.us
Phyllis Woodford, Acting Director of Sustainability	(303) 692-2978	phyllis.woodford@state.co.us

STATE OF COLORADO

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Phone (303) 692-2000 Denver, Colorado 80230-6928
TDD Line (303) 691-7700 (303) 692-3090
Located in Glendale, Colorado

<http://www.cdphe.state.co.us>



Colorado Department
of Public Health
and Environment

Advanced Technology Fund Research Grant CRS Chapter 370 Article 19.7 25-16.5-105(2)(b)

Request for Applications (RFA) October 2007

1.0 Grant Program Goals

The Colorado Department of Public Health and Environment (the department) working through its Pollution Prevention Advisory Board (the board) and the Assistance Committee (the committee) to the board, is requesting applications for grant monies from the Advanced Technology Fund. Total grant monies expected to be available in the 2008 grant cycle are \$1,250,000 and the board and committee expect to fund 6-8 projects. The Advanced Technology Grant (ATG) Program is intended to fund research that will increase or improve recycling techniques and technology; create marketable uses for discarded materials, including but not limited to, strategies pertaining to waste tires; address problems caused by inappropriate disposal of solid waste materials, including but not limited to, waste tire stockpiles; and, make use where possible of the research capacities of Colorado institutions of higher education. The committee is looking to fund projects that have the ability to continue beyond the scope of the grant, for practical technologies that will be transferable to practical applications and that will enhance recycling in Colorado.

2.0 Application Time Line:

October 15 th , 2007	Release of Grant Application
November 5 th , 2007 1:00 – 3:00 pm	Bidders' Meeting
November 15 th , 2007 5:00 pm	Application Due Date
November 19 th - December 3 rd , 2007	Application Review by Assistance Committee
December 11 th	Board to Approve Funding Recommendations
December 18 th , 2007– January 31 st , 2008	Notice of Grant Award and Issuance of Contracts and Purchase Orders
February 1 st , 2008	Effective Start Date for Awardees

There will be an optional applicants' meeting on Monday, November 5th, 2007 from 1:00 – 3:00pm located in the Sabin Room at the Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, 80246. Questions related to this RFA will be addressed at that time. Answers to questions posed during this meeting will be posted on the department's website November 7th. Please RSVP for the meeting by contacting Rachel Wilson-Roussel, PPAB Administrator, at 303-692-2976 or rachel.wilson-roussel@state.co.us. Applicants who are unable to attend the Bidders' Meeting in person may join the meeting via teleconference. See the Pollution Prevention Advisory Board Website for more information; http://www.cdphe.state.co.us/el/p2_program/ppab.html .

3.0 Scope of Grant Program

The funds available for this program are from the state's Advanced Technology Fund, which is financed by a portion of the waste tire recycling fee. Responsibilities for administering the grant program are now under the jurisdiction of the department, after having been previously administered by the Colorado Commission on Higher Education. Under new statutory requirements through Senate Bill 07-182, the scope of these grants focuses on waste diversion, minimization and recycling research as well as the development of waste reuse opportunities.

Proposals will be considered for:

- Research which strengthens the feasibility and efficiency of solid waste minimization, diversion and or/recycling (for materials or products of any kind)
- Research that increases waste stream diversion and recycling
- Research that identifies best practices in recycling, waste minimization and diversion.
- Market research on waste reuse opportunities
- Research that quantifies the economic impacts of the recycling industry in Colorado
- Technology transfer

Note: Only those projects fitting under the Environmental Protection Agency's definition of recycling will be eligible for consideration. The EPA's definition of recycling: Recycling is a series of activities that includes collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, and manufacturing raw materials into new products. *Excludes* the use of these materials as a fuel substitute or for energy production.

Public or private entities are eligible to apply. Out-of-state organizations may apply for funding, provided the project directly benefits Colorado.

Proposals for projects 12-24 months in length will be accepted. Projects exceeding 24 months may be accepted at the board's discretion. Grantees will receive money in accordance with rules stipulated by the department.

4.0 Proposal Evaluation Criteria

Threshold requirements include completeness of application, merit of proposed tasks, and all goals and objectives must be clearly stated with outcomes defined.

4.1 Practical Technological Innovation (0-25 points)

- Potential for sustainability beyond the funding period
- Degree of practical innovation
- Amount of funding leveraged
- Merit of proposed tasks

4.2 Viable Results and Implementation (0-25 points)

- Potential for success and measurable results.
- Does the project involve research pertinent for practical application in Colorado
- Technology/innovation transferable to the private or government sector

4.3 Environmental Benefits and Economic Impact (0-25 points)

- Is there a potential for economic growth or for emerging Colorado businesses
- Will the project results have a significant impact on recycling, waste diversion, and/or waste minimization within the state of Colorado

4.4 Experience and Qualifications (0-25 points)

- What is the level of the applicants' relevant education and/or experience
- What abilities does the applicant possess that will make the project a success
- Ability to complete the project

5.0 Required Proposal Format

Sections 5.1 – 5.7 of this proposal must not exceed ten (10) consecutively numbered (bottom center), 8.5x11-inch pages of single-spaced, standard 12-point type with 1-inch margins.

5.1 Cover Sheet

The application cover sheet will contain the following information: Project title, organizational contact information, federal tax identification number, total amount of funding requested, contact of both the project director as well as the financial officer.

5.2 Proposal Narrative

5.21 Project Abstract

Provide a brief description of your proposal including goals and objectives. Abstract should be no more than one half page. Please keep this page free of any proprietary information.

5.22 Project Objectives and Relevancy to Grant Program Goals

- Describe the project's measurable goals and objectives and describe how you will achieve them.
- How will this project increase or improve waste diversion in Colorado or introduce technologies and techniques that will advance Colorado's waste diversion?
- Will this project address problems caused by inappropriate disposal of solid waste materials, including waste tire stockpiles in Colorado?
- How will the findings of this project be important to Colorado businesses and communities either by useful research, technology transfer, increased jobs and business or an improved environment?
- Please indicate major challenges for project success/completion and the approach that will be used to address them.
- How do you plan on communicating your findings or transfer your technology to the business sector?
- What are plans for sustainability after the grant period ends?

5.3 Methodology

Provide a well-planned strategy for the project that shows a thorough knowledge of the existing work in the field and how this project will build upon existing work or fill gaps in previous research. Explain how the project will be of value for technology transfer or new industry opportunities and increased waste diversion in Colorado. Assess the feasibility of project completion and identify successful outcomes within the proposed budget and schedule.

5.4 Work Plan

Indicate with a simple chart the project schedule and timeline, including estimated completion dates for major activities, tasks and deliverables during the grant period. Clearly define who is responsible for each activity and deliverable. Include key decision points for early project termination if the project is not meeting scheduled deliverables.

5.5 Budget

5.51 Itemized Budget

Provide a spreadsheet of all project costs, such as personnel salaries (showing budgeted hours and rate), benefits, equipment, materials, supplies, subcontracts, etc. Travel costs are limited to those which are directly essential to accomplish the project. Indirect costs such as facility rental and utilities must not exceed 20% and must solely benefit this project or be pro-rated or could be subject to exclusion from funding. Indicate any other funding sources that will be used for this project and include plans to attract additional funding.

5.52 Budget Narrative

The budget narrative describes how costs are determined and how they relate to the project.

During the course of the project the project director may elect to reallocate up to 5% of the funds awarded to accommodate unforeseen task changes. Any amount for reallocation over 5% will require written approval by the board.

5.6 Project Staff Experience, Qualifications and Facilities Requirements

Describe the project staff responsibilities and qualifications. Include resume(s) for project leader(s). Include previous accomplishments of similar nature to the current proposal.

Describe the resources available, including facilities, manufacturing capabilities, major equipment, and other technical and administrative resources that will be required.

5.7 Evaluation Plan

Please include:

- A description of the measures or indicators that will be used to evaluate the project;
- A description of the methods/strategies that will be used to determine the project's effectiveness and impact on waste diversion in Colorado; and
- A description of how the results of the evaluation will be used, disseminated and communicated.

5.8 Appendix

Please include citations of any patents or references used in the proposal. Include any letters of support or other important materials critical to evaluating the proposal.

6.0 Proprietary Information Policy

If proprietary information is provided by an applicant that constitutes a trade secret, confidential personnel information, or proprietary commercial or financial information, it will be treated in confidence by the department and the board provided this information is clearly marked with the term "Proprietary Information" on each appropriate page.

7.0 Reporting Requirements

Reports will be due for milestones identified by the grant applicant or at a minimum bi-annually. Please indicate milestones and deadlines for progress reports. A draft final report is due 45 days after the grant closes and a final report is due 90 days after grant closes that incorporates feedback from the committee and the board.

All reporting must include a financial status summary, and identify the deliverables and tasks completed during the reporting period. Include a description of the work completed, the findings or results, any unanticipated outcomes or roadblocks encountered and potential future applications of project results. Explain how this project successfully achieved the goals of the grant program to date and how the findings have been communicated to Colorado businesses and communities. The final report may be placed on the department's website. The committee reserves the right to request grantees to present their findings to the committee.

8.0 Grant funding

Funded projects will be reimbursed on a monthly basis for expenses incurred the previous month. Reimbursement requests must include backup documentation of payment such as receipts or invoices marked paid or with zero balances. The state will not reimburse any cost incurred by the applicant prior to the issuance of a legally executed contract, task order, or authorized purchase order.

9.0 Submission of Applications

Only electronic applications will be accepted. The full application, including any appendices, must be contained in a single document and must be in PDF format. Please e-mail your application to Rachel Wilson-Roussel, PPAB Administrator at rachel.wilson-roussel@state.co.us. The deadline for receipt of applications is 5:00 PM on November 15th, 2007. Incomplete applications and applications received after this deadline will **not** be accepted. All applicants will receive e-mail notification of the receipt of their proposal within 1 business day.

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Colorado Department
of Public Health
and Environment

Advanced Technology Fund Research Grant CRS Chapter 370 Article 19.7 25-16.5-105(2)(b)

Request for Applications (RFA) September 2008

1.0 Grant Program Goals

The Colorado Department of Public Health and Environment (the department) working through its Pollution Prevention Advisory Board (the board) and the Assistance Committee (the committee), is requesting applications for grant funds from the Advanced Technology Fund. Total grant funds expected to be available in the FY 2009 grant cycle is \$800,000. The Advanced Technology Grant (ATG) Program is intended to fund research that will increase or improve recycling techniques and technology; create marketable uses for discarded materials, including but not limited to, strategies pertaining to waste tires; address problems caused by inappropriate disposal of solid waste materials, including but not limited to, waste tire stockpiles; and, make use where possible of the research capacities of Colorado institutions of higher education. The committee is looking to fund projects that have the ability to continue beyond the scope of the grant, for practical technologies that will be transferable to practical applications and that will enhance recycling in Colorado.

2.0 Application Time Line:

September 8th, 2008	Release of Grant Application
September 29th, 2008 1:00 – 3:00 pm	Bidders' Meeting
October 31st, 2008 2:00 pm	Application Due Date
November 3rd - 24th, 2008	Application Review by Assistance Committee
December 2nd, 2008	Board to Approve Funding Recommendations
December 3rd, 2008– January 31st, 2009	Notice of Grant Award and Issuance of Contracts and Purchase Orders
February 1st, 2009	Effective Start Date for Awardees

There will be an optional bidders' meeting on Monday, September 29th, 2008 from 1:00 – 3:00 pm located in the Sabin Room at the Colorado Department of Public Health and Environment, 4300 Cherry Creek Drive South, Denver, 80246. Questions related to this RFA will be addressed at that time. Answers to questions posed during this meeting will be posted on the department's website September 30th. Please RSVP for the meeting by contacting Brian Gaboriau, Recycling Grants Administrator, at 303-692-2097 or cdphe.ppp2@state.co.us, subject line: RSVP for ATG Bidder's Meeting. Applicants who are unable to attend the bidders' meeting in person may join the meeting via teleconference. See the Pollution Prevention Advisory Board website for more information; http://www.cdphe.state.co.us/el/p2_program/ppab.html.

3.0 Scope of Grant Program

The funds available for this program are from the state's Advanced Technology Fund, which is financed by a portion of the waste tire recycling fee. Responsibilities for administering the grant program are under the jurisdiction of the Colorado Department of Public Health & Environment. Under statutory requirements through Senate Bill 07-182, the scope of these grants focuses on waste diversion, minimization and recycling research as well as the development of waste reuse opportunities.

Proposals will be considered for:

- Research which strengthens the feasibility and efficiency of solid waste minimization, diversion and or/recycling (for materials or products of any kind)
- Research that increases waste stream diversion and recycling
- Research that identifies best practices in recycling, waste minimization and diversion.
- Market research on waste reuse opportunities
- Research that quantifies the economic impacts of the recycling industry in Colorado
- Technology transfer

Note: Only those projects fitting under the Environmental Protection Agency's (EPA) definition of recycling will be eligible for consideration. The EPA's definition of recycling: Recycling is a series of activities that includes collecting recyclable materials that would otherwise be considered waste, sorting and processing recyclables into raw materials such as fibers, and manufacturing raw materials into new products. *Excludes* the use of these materials as a fuel substitute or for energy production.

Public or private entities are eligible to apply. Out-of-state organizations may apply for funding, provided the project directly benefits Colorado. Previous grant performance will be considered with rewarding of grant.

4.0 Proposal Evaluation Criteria

Threshold requirements include completeness of application; merit of proposed tasks, and clearly stated goals and objectives with outcomes identified.

4.1 Practical Technological Innovation (0-25 points)

- Potential for sustainability beyond the funding period
- Degree of practical innovation
- Amount of funding leveraged
- Market information describing competitive landscape for product/process

4.2 Viable Results and Implementation (0-25 points)

- Potential for success and measurable results.
- Research pertinent for practical application in Colorado
- Technology/innovation transferable to the private or government sector

4.3 Environmental Benefits and Economic Impact (0-25 points)

- State potential for economic growth or for emerging Colorado businesses
- State how results of project will have a significant impact on recycling, waste diversion, and/or waste minimization within the state of Colorado
- Define how the process/project lead to a reduction in greenhouse gas production

4.4 Experience and Qualifications (0-25 points)

- State level of the applicants' relevant education and/or experience
- State abilities the applicant possesses that will make the project a success
- Ability to complete the project – businesses should have a proven track record and a 2 – 3 page business plan for this project
- Identify partners/collaborators

5.0 Required Proposal Format

Sections 5.1 – 5.7 of this proposal must not exceed ten (10) consecutively numbered (bottom center), 8.5x11-inch pages of single-spaced, standard 12-point type with 1-inch margins.

5.1 Cover Sheet

The application cover sheet will contain the following information: Project title, organizational contact information, federal tax identification number, total amount of funding requested, matching/in-kind contributions (if any), contact information of both the project director as well as the financial officer.

5.2 Proposal Narrative

5.21 Project Abstract

Provide a brief description of your proposal including goals and objectives. Abstract should be no more than one half page. Please keep this page free of any proprietary information.

5.22 Project Objectives and Relevancy to Grant Program Goals

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- How will the findings of this project be important to Colorado businesses and communities either by useful research, technology transfer, increased jobs and business or an improved environment?
- Please indicate major challenges for project success/completion and the approach that will be used to address them.
- How do you plan on communicating your findings or transferring your technology to the business or public sector?
- What are plans for project sustainability after the grant period ends?

5.3 Methodology

Provide a well-planned strategy for the project that shows a thorough knowledge of the existing work in the field and how this project will build upon existing work or fill gaps in previous research. Explain how the project will be of value for technology transfer or new industry opportunities and increased waste diversion in Colorado. Assess the feasibility of project completion and identify successful outcomes within the proposed budget and schedule.

5.4 Work Plan

Using the standardized chart provided in application, indicate the project schedule and timeline, including completion dates for objectives of each major goal during the grant period. Clearly define who is responsible for each activity and/or deliverable. Deliverables include task results, project section completion, reports, etc. Include key decision points for early project termination if the project is not meeting scheduled deliverables.

5.5 Budget

5.51 Itemized Budget

Using the standardized format and budget categories provided in the application, supply a spreadsheet of all project costs, such as personnel salaries (showing budgeted hours and rate), fringe benefits, equipment purchases, consultants, etc. Travel costs are limited to those that are directly essential to accomplish the project. Indirect costs such as facility rental and utilities must not exceed 20% and must solely benefit this project

or be pro-rated or could be subject to exclusion from funding. Indicate any other funding sources that will be used for this project and include plans to attract additional funding.

5.52 Budget Narrative

The budget narrative describes how costs are determined and how they relate to the project.

During the course of the project the project director may elect to reallocate up to 5% of the funds awarded to accommodate unforeseen task changes. Any amount for reallocation over 5% will require written approval by the board.

5.6 Project Staff Experience, Qualifications and Facilities Requirements

Describe the project staff responsibilities and qualifications. Include resume(s) for project leader(s). Include previous accomplishments of similar nature to the current proposal.

Describe the resources available or required; including facilities, manufacturing capabilities, major equipment, and other technical and administrative resources.

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Please include:

- A description of the measures or indicators that will be used to evaluate the project;
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Please include citations of any patents or references used in the proposal. Include any letters of support or other important materials critical to evaluating the proposal.

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Reports will be due for milestones identified by the grant applicant or at a minimum bi-annually. Please indicate milestones and deadlines for progress reports. A draft final report is due 45 days after the grant closes and a final report is due 90 days after grant closes that incorporates feedback from the committee and the board.

All reporting must include a financial status summary, and identify the deliverables and tasks completed during the reporting period. Include a description of the work completed, the findings or results, any unanticipated outcomes or roadblocks encountered and potential future applications of project results. Explain how this project successfully achieved the goals of the grant program to date and how the findings have been communicated to Colorado businesses and communities. The final report may be placed on the department's website. The committee reserves the right to request grantees to present their findings to the committee.

8.0 Grant funding

Funded projects will be reimbursed on a monthly basis for expenses incurred the previous month. Reimbursement requests must include backup documentation of payment such as receipts or invoices marked paid or with zero balances. The state will not reimburse any cost incurred by the applicant prior to the issuance of a legally executed contract, task order, or authorized purchase order. CDPHE reserves the right to withhold final reimbursement payment until final report is completed and reviewed by the board.

9.0 Submission of Applications

Only electronic applications will be accepted. The full application, including any appendices, must be contained in a single document and must be in PDF format. Please e-mail your application to Brian Gaboriau, Recycling Grants Administrator, at cdphe.ppp2@state.co.us. The deadline for receipt of applications is 2:00 PM on October 31st , 2008. Incomplete applications and applications received after this deadline will **not** be accepted. All applicants will receive e-mail notification of the receipt of their proposal within 1 business day.

**Advanced Technology Grant Program
2008 - 2009 Project Application
COVER SHEET**

Organization: _____

Project Title: _____

Address: _____

City, State, Zip: _____

E-Mail Address: _____ URL Address: _____

Phone Number: _____

Fax Number: _____

Federal Tax Identification Number: _____

Legal Tax Status (check one): ___ For Profit ___ Non-Profit ___ Govt. ___ School/University

By signing and submitting this application, the applicant agrees to operate the program as described in the Application for Funding and in accordance with the grant terms and assurances.

Print name of Authorized Official: _____

Signature of Authorized Official:

*Please insert electronic signature into the box on the right or sign and fax ONLY the cover sheet to Brian Gaboriau at 303-782-4969.

Date: _____ Title: _____

Project Director or Contact Person:

Financial Officer:

Name:

Name:

Title:

Title:

Address:

Address:

Phone:

Phone:

E-Mail:

E-Mail:

Total Amount of Funds Requested: _____
Total Matching/In-Kind Contributions: _____
Total Project Cost: _____

Advanced Technology Grant Program
2008-2009

WORK PLAN FORMAT
(Use this format when listing your major goals for the project)

GOAL 1:				
Objective	Activity	Deliverable/ Product	Responsible Party	Completion Date*
1.	1a 1b 1c			MM/DD/YYYY
2.	2a 2b 2c			MM/DD/YYYY

GOAL 2:				
Objective	Activity	Deliverable/ Product	Responsible Party	Completion Date*
1.	1a 1b 1c			MM/DD/YYYY
2.	2a 2b 2c			MM/DD/YYYY

*Completion date must end on a regular business day (exclude weekends and holidays).

Advanced Technology Grant Program
2008-2009

LINE ITEM BUDGET FORMAT

You are required to use the following individual budget categories for your proposal:

Personnel Salaries & Wages- Personnel directly working on grant (employees, professors, students, etc).

Fringe Benefits- Related to those indicated on "Personnel Salaries & Wages". Includes health insurance, retirement funds, Social Security, FICA, etc.

Tuition/Fees- Support other than indicated in "Personnel Salaries & Wages" & "Fringe Benefits", in-state residents rates only.

Travel Costs- In state only, includes mileage, room and board. Out of state travel must be pre-approved by Assistance Committee.

Materials/Supplies/Equipment (under \$5,000) - Construction materials, lab work materials, brochures, mailings, stamps, printing, etc.

Equipment Purchases- Cost of \$5,000+ and has life of 1 year or more. Includes fabrication or upgrading of current equipment.

Contractors/Subcontractors- Outside labor for construction, etc. Names of contractors/subcontractors and budget breakdown for each required.

Consultants- Professional services directly related to grant. Provide names and work to be completed. Budget breakdown for each required.

Training/Educational classes- For schools, businesses, etc.

Marketing/Advertising- TV, radio, internet, etc.

Other Direct Costs- Costs not covered by categories listed.

Indirect Costs- Cannot be more than 20% of Total Direct Costs (all categories listed above).

List only those budget categories you are asking to be funded for your grant application. Itemize each individual budget category, include sub-totals and overall total of budget. See example below:

	Grant Application Amount	Matching/In Kind Amount (if any)	Total Amount
Personnel Expenses – Sub-total	\$10,000		\$10,000
John Smith-Owner	\$7,000		\$7,000
Joan Smith- Co-Owner	\$3,000		\$3,000
Equipment Purchases – Sub-Total	\$25,000	\$10,000	\$35,000
Used Baler	\$25,000	\$10,000	\$35,000
Project Cost	\$35,000	\$10,000	\$45,000
Indirect Cost: (Not to exceed 20%)	\$7,000		\$7,000
Total Project Cost:	\$42,000	\$10,000	\$52,000

Advanced Technology Grants (ATG) Awarded, Colorado, 2008-2009

