

Building with Paper Bales

Imagine the amount of waste paper generated by a university with 35,000 students. Much of that paper is recyclable, but there are still tons of paper that go into landfills each year. Glossy magazine stock, paper with fluorescent colors, wrappers for the reams of copy paper, chipboard, etc. are not acceptable at many recycling centers. In partnership with the University of Arizona, a Tucson company (Resource Recycling Service) took a step to discover solutions to this growing dilemma by experimenting with the production of shredded paper bales. By shredding mixed paper to achieve uniform consistency, compressing it in a bailer, and banding it with 1/2" steel bands, the Resource Recycling Service developed the ECO-BALE.

Initial testing showed the bales to be stronger under a compressive load than straw bales, with a lesser insulating value (estimated thermal resistance of R-30) due to greater mass and density. Like straw bales, the paper bales performed well in fire tests because their compression left little oxygen within the bales to aid in combustion. The production of paper bales makes sense in a desert setting where straw is not normally cultivated and has to be trucked in from other parts of the state or country. The Resource Recycling Service saw the paper bales as a potential material for housing construction, either as a loadbearing system or as infill walls in a post and beam system.

A Paper Bale Project

In the Spring semester of 1998, a team of Architecture students at the University of Arizona set out to build an experimental structure of shredded paper bales, in an endeavor to reroute the non-recyclable material that is otherwise headed for landfills. Jean Nielsen, the coordinator of campus organization Arizona Resource Exchange (AzRE), contacted Professor Mary Hardin and her students with a unique challenge: to design and construct a building with 150 ECO-BALES.

Architecture graduate student Obadiah Swafford took on the project as part of his Master's thesis and coordinated the materials lists, tool gathering, and construction labor schedule. Professor Hardin suggested a construction strategy based on her previous experience with load bearing straw bales. Graduate students Lance Lewis and Siobhan Kirby, as well as undergraduates Jeffrey Lavy and Richard Begay, joined the team for independent study credit and work commenced.

With the cooperation of the College of Agriculture, the Architecture team created a floor plan and a construction strategy for a storage building that would house a tractor and other equipment needed for honey bee research. The structure covers an area of 1000 square feet - 600 square feet are enclosed and an addi-

tional 400 square feet are defined by walls and an overhead shade structure.

The entire project is built of salvaged, donated, and recycled materials, with a budget of \$0.00. Design decisions were modified weekly in response to available materials and tools. Many choices of materials and methods were compromises. While this may be a frustrating way to build, it does bring out creativity and cause debate (rewards in themselves in the educational setting).

The initial step in the construction was to trench for footings that would support the bale walls. The paper bales measure 48" long by 24" wide and 18-20" high. The trenches were dug 24" wide and 18" deep by the University Grounds crew, who donated their time and backhoe. The formwork was borrowed from a local concrete company, and used to define the top 4 inches of the footings, which were to remain above grade.

