

# A bunch of dinosaur bones

Whether you build an environmental monument, playground sculpture or something for the back yard the sculpture can be permanent.

BY: SAM GENDUSA SCULPTOR DAYTON,  
OREGON

“Looks like a bunch of dinosaur bones” might be the typical reaction to this group of playground sculpture. As a matter of fact, the inspiration did come from dinosaur bones at the Field Museum in Chicago. The sculptures fascinate kids as well as adults and entice young people into creative group activities.

## A group project

The project to build these sculptures began as a class in basic sculpture at Oregon State University in the spring of 1969. The purpose was to build three environmental sculptures to serve as playground facilities as well. To build such large sculptures would require a whole crew of students so the concept was to bring the artist and student directly together on the project. Thirty men, women and students were chosen from several departments because of their interest in welding, metal work and constructing with portland cement mortar.

The site was prepared and footings placed. Then channel iron was shaped and welded to an armature embedded in the footing from measurements taken from a scale model. Expanded metal lath was shaped and wired to the finished armature and finally several layers of mortar were applied, the last troweled to a smooth finish. The finished sculptures were in three sections, the largest being 125 feet long and seven feet high. The other two sculptures were the same height and 30 feet in either direction, and were



The concept was to bring the artist and student together on the project.

arranged in such a way as to complement the largest sculpture.

## How to build it

While few sculptors, designers or contractors might be interested in such a large undertaking, the materials and method of construction used can be readily utilized in a smaller sculpture. The cost is low. For examples the materials for a sculpture nine feet high, 25 feet long and 15 feet wide would cost about \$700 complete. The building time, depending on the sculpture, could be anywhere from five to seven weeks for one person with some decent weather. The building technique is similar to ferro-cement boat hull construction. No forms or molds are used as normally done in casting concrete sculptures. Rather, building is done directly from measurements from a scale model, subtracting three to six inches from the final surface of the sculpture to allow for the thickness of the mortar.

The technique differs in several ways from that used in building fer-

rocement boats. It utilizes thinner metal supports,  $\frac{3}{4}$ -inch Ushaped channel iron instead of  $\frac{3}{4}$ -inch pipe, one or two layers of expanded metal lath instead of eight layers of wire mesh, and much more mortar. Some of the shell has a thickness of more than six inches compared to the 1- to 1½- inch shell thickness recommended for ferro-cement boats 60 feet long. It requires a lot of modeling of the fresh mortar which is applied in three separate layers, each of which is allowed to set and then cure for one full day. With each layer the workman gradually fills in depressions, rounds out contours and, when the concrete has become hard enough (usually within several hours), scrapes off rough edges to make the object look like a piece of sculpture.

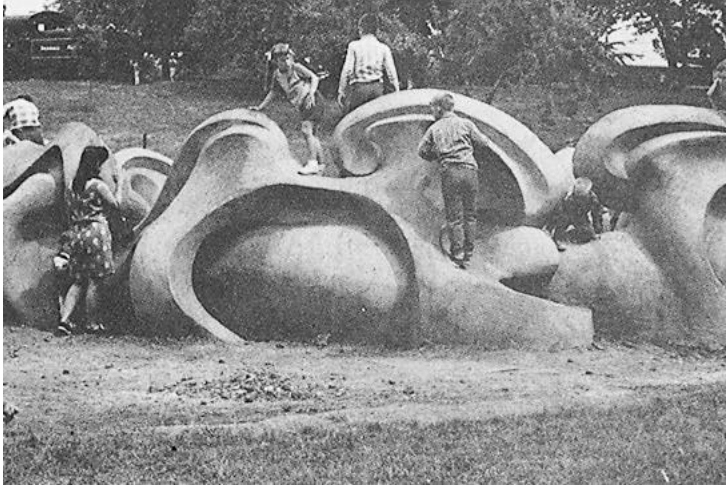
Because the entire framework is welded, and support bars are placed in specific areas to stop any movement in the framework, there is sufficient strength so that mortar need be applied only to the outside of the structure. If, however, one were to

build a very high sculpture or even a house it would be necessary to apply mortar to the inside for additional strength. A large structure could even be insulated on the interior with an insulating concrete or sprayed polyurethane foam, then coated with a thin layer of portland cement plaster or mortar containing alkali-resistant fiberglass.

There is no need, surprisingly, to mortar the inside of ordinary playground sculpture. Where there is no

mixed in a paddle-type mortar mixer and, except in nonfreezing climates, should contain enough air entraining agent to entrain 12 percent air by volume. As little water should be used as possible—just enough to permit easy workability and no more, in order to produce as high strength as possible in accordance with the water-cement ratio law and to minimize drying shrinkage.

The sculpture should be cured



Simple abstract forms invite the viewer to touch and climb upon them rather than simply view them.

oxygen there is no rusting of steel. This was demonstrated after some vandals, using hammers, had managed to break a hole in one such sculpture as these. This provided an unexpected opportunity to examine the inside. The metal structure looked as though it had just been installed, with no rust on it even though every spring for about four years the sculpture had been submerged almost entirely when the river flooded.

#### Mortar proportions

The best mortar proportions for building playground sculptures are one part portland cement to three parts mason's sand by volume. In areas that are difficult to get at, one tenth part hydrated lime can be added for better trowelability and intimate contact. The mix should be

under a plastic tarp for a full 28 days and sprayed with water every day during that time. Keeping the plastic tarp on for 28 days is another matter. Although the wind may blow the tarp off and expose the sculpture to the sun and wind, the biggest problem is young children, who pull or cut the tarp off so that they can play on the sculpture. The best solution is to load down the tarp with mud and thoroughly wet it down—most kids would not risk trouble from their parents for getting as dirty as it would make them to get under the tarp.

After the tarp has been removed the surface should be sprayed with a clear rubber-base curing compound meeting the requirements of ASTM C 309. This will allow the moisture in the sculpture to evaporate gradually, for it is the rapid

evaporation of this moisture that causes shrinkage cracks. Though this type of curing compound is not supposed to come off, on playground sculptures nothing is permanent, and it will disappear after it has done its job.

#### Some questions and answers

Q. What about special cements?

A. If you are building in an area where the soil has a high sulfate content (sometimes referred to as an alkali soil) which could have a deleterious effect on the mortar, a Type V or Type II portland cement should be used for its sulfate resistance.

Expansive cement expands while setting, and is used where there is a need to compensate for later shrinkage cracking. However, to be effective, it requires restraint from heavy formwork and would not be useful here. The curing methods described here are effective with regular portland cements in preventing surface cracking.

Q. Is there such a thing as putting on too much mortar?

A. Yes. One should not exceed six inches of mortar thickness. Although there are no set rules on this, thick concrete may crack on a hollow structure because of the rapid expansion-contraction rate. The inside of the sculpture might, for example, be as low as 60 degrees F at a time when the outside surface temperature is over 100 degrees F possibly causing the outside to expand more rapidly than the inside and to crack.

Q. What subject matter is possible?

A. Anything. Needless to say, making the Venus di Milo would be difficult. The method of construction lends itself better to simple abstract forms that invite the viewer to touch and climb upon them rather than simply view them. Choosing a form that nobody could recognize would probably be the best bet for many reasons. Animal sculptures are rec-

ognizable and soon lose their attraction. But you don't have to be a Michelangelo to create an abstract form and nobody can criticize what they can't recognize, except perhaps for the workmanship.

Q. How do you go about making one? Can a contractor do it himself?

A. It really depends on where the sculpture is to be placed, and who is going to use it. Probably the best way would be to ask a sculptor or designer to make a small scale model, get it approved, and have the contractor enlarge the model to the desired scale. Or perhaps an art teacher at the local grade school, high school or college would be willing to donate a scale model. The community could raise the necessary funds and hire a contractor to build the sculpture.

Q. What about building something in the back yard for the children and not spending all that money on professional help?

A. Why not build a yard form? Dream up a simple shape (driftwood, an interesting stone), rent a pair of bolt cutters and a paddle type mortar mixer (but not until

you've finished building the armature), and buy cement, sand, iron channel, metal lath and galvanized tie wire. Cut one-foot segments from the iron channel and hammer them into the ground for the footings, cut and shape the iron channel to the desired shape and wire it to the footing (there's no need for welding on a small sculpture). Apply the lath and several good layers of mortar to the surface and cure. Maybe your family will help you build it instead of pestering you while you are working.

Q. Can shotcreting methods be used to apply the concrete to the metal armature?

A. Hand troweling is the most efficient and inexpensive method of applying mortar if you want a quality sculpture. One of the problems of shotcreting is that when mortar is sprayed over the armature it tends to repeat the high and low spots of the armature. If you plaster properly you can even these depressions out, but in shotcreting you are likely to be stuck with a bumpy sculpture. Another disadvantage is that since you must apply several layers of shotcrete and allow each to set and

cure for a day, this might be an expensive use of equipment. It might also be difficult to control the mixing water adequately to prevent hairline shrinkage cracks.

### More sculpture

Whether you build an environmental sculpture for the new civic center, a playground sculpture for the local park or school, or something in the back yard for the children, the results will be as lasting and permanent as any concrete structure today. Building playground sculptures in concrete may become a valuable form of expression for everyone. [3C

---

Mr. Gendusa's book, Building Playground Sculpture has recently been published. Those interested may contact him at P.O. Box 432, Dayton Oregon 97114.

PUBLICATION #C750095  
Copyright © 1975, The Aberdeen Group  
All rights reserved