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An Experiment in Designing and Constructing Sculptured Concrete Play Structures

Donald A. Scott

Central Washington University

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AN EXPERIMENT IN DESIGNING AND CONSTRUCTING
SCULPTURED CONCRETE PLAY STRUCTURES

A Thesis
Presented to
the Graduate Faculty
Central Washington College of Education

In Partial Fulfillment
of the Requirements for the Degree of
Master of Education

by
Donald A. Scott
August 1961
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CHAPTER I

INTRODUCTION AND PURPOSE OF THE EXPERIMENT

The near future will probably see a major change in the ideas of playground planning and equipment in this country. Progress in architectural planning and new concepts have led to realization that aesthetically well designed parks and play equipment are important.

The change of thinking first came about in northern Europe where playground planning introduced large sculptural forms to offset vast expanses of grassy areas and the effect of high-rising rectilinear buildings. It was natural for children to play on these forms; doing so, they were provided with an atmosphere of good taste along with physical exercise. Besides providing these values for the children, playground structures well designed and oriented to the landscape, with blending subdued colors, can make a play area a place of beauty and an asset to the community (2:18).

There is a need for research and planning of this type in our parks and school playgrounds. Growing children need to see and have physical association with well designed forms in order to nourish a sense of aesthetic values; such a sense allows them to make choices using good taste in later life. These associations should not be left
until a trip to the museum can be made but should be provided in
areas where the child works and plays.

The purpose of this experiment was to design and construct
a sculptured play structure to satisfy some of the physical and
aesthetic needs of children as well as add to the landscape decor.
The writer will present to the reader several points to consider
before the designing and constructing of such a structure and some
possible solutions to problems that may arise during the experiment.
CHAPTER II

REVIEW OF RELATED LITERATURE

In recent months some park and recreation leaders have been searching for better play equipment, equipment that will stimulate creative play, fit with esthetic beauty into our contemporary architecture and park planning, provide for various physical activities, and be able to withstand the strenuous torture of children. This is quite a challenge to designers and manufacturers of playground equipment, who evidently have as yet to produce equipment satisfying all these desired needs.

Most people seem to agree that the so-called "plumber's nightmare," with its maze of pipes, does not fit well with or enhance some of our beautiful new parks and playgrounds. Nor does this type of equipment stimulate the much needed creative physical activity in children.

I. CURRENT TRENDS IN PLAYGROUND PLANNING AND EQUIPMENT IN THE UNITED STATES

Across the nation new parks are being built and many more are being redeveloped with beautiful, well planned play areas including
equipment that fits into the planned landscape. Results of such planning appear to have brought about much interest and satisfaction.

In Philadelphia, Pennsylvania, where 130 parks are in operation, the Commissioner of Recreation reports, "Where we have rehabilitated a playground from the old concept of just a level ground with a backstop and a sand box, we have found the use of the site increases up to 600 per cent" (1:18).

The Park and Recreation Director of Detroit, Michigan, where the park employees are building their own creative play structures, has this to say about the success of their new program:

The public has reacted with an increased interest in the playground areas, and attendance figures at the parks have shot up. Department employees took greater interest in their work. They pride themselves in their results, and found a closeness out of the district rivalry, and enjoyed the opportunity to express themselves by designing and creating this new equipment (4:18).

This surge of new interest in overhauling recreation areas may be a result of several factors: the possible new interest by the average layman in the development of his community, the increase of younger, expertly trained recreation leaders and supervisors, the increasing new interest in the creative arts, and possibly most important of all, the type of play equipment being designed.

In comparing the new sculptured play forms with the old, David Aaron, President of Playground Corporation of America, says:
It's a matter of style. The new equipment does different things for the children. Give a child a stick, and in twenty minutes, it's a cane, a rifle, a sword, a fence, a horse, a spear. And these new pieces involve the child in the same creative play (1:90).

Many park and recreation leaders seem to agree on the type of equipment needed to stimulate creative play in children. They say it must induce young minds into creating fantasies which will in turn bring about physical activity. In order to better understand this new concept in play equipment planning, let us review briefly what our thinking was a few years ago. In reviewing the present evaluation of playgrounds and equipment, Frank Caplan states:

Playground patterns were drawn up without regard to the particular needs of a community and often without consultation with its leadership. Usually a design recommended by manufacturers was repeated endlessly like a rubber stamp throughout the city. There emerged a routine, set concept of a playground that has hindered the development of progress in the entire field of recreation (2:18).

Most playgrounds consisted of a square area of asphalt jammed between two unsightly buildings, with a few lonesome looking pipe structures or perhaps a swing or slide. Each piece of equipment was designed for one activity. The participants were limited as to what they could do. A swing was to swing on and nothing else. Since certain set rules had to be followed by the user, the equipment soon lost popularity.
When it was finally realized that these "stereotyped" playgrounds were not attracting enough children, many parks and cities hired "efficiency experts" to see what could be done to entice young people back to the playgrounds.

Many playgrounds merely painted the equipment with bright colors and installed a circus or fairyland theme, hoping it would increase participation. The children were not fooled by elephants painted on the sides of the play equipment; to them, a slide is a slide.

The new paint-up campaign attracted visitors to the parks out of curiosity, but failed to increase participation. The Old Woman in the Shoe soon was nothing new to most children because they knew the story and did not care to alter it.

The comment has been made that "children seem to never tire of something which provides both exercise and an outlet for imagination. Playground equipment does not need to be stereotyped in order to be safe, practical, and within a reasonable financial range" (3:138).

Some advantages of installing this contemporary equipment in parks and school playgrounds throughout the nation may well be derived from Alfred Ledermann's writings on the importance of play:

Play is of decisive importance for the psychological development and the maturing of man. The consequences
of insufficient possibilities for active and creative play clearly show results such as: poor imagination, nervousness, and irritability of children, waste of spare time and craving for entertainment, aggressiveness, and rowdyism of many teen-agers (5:9).

Some children's hospitals are using new play forms for therapeutic purposes. They use large rectangular boxes with open ends and holes for children to crawl through after they have made their way through staggered rods. This piece of equipment was designed to help the child overcome the feeling of being cramped or boxed in. Other pieces of equipment were made like ramps over culverts, forming inclined planes to provide crippled children with experiences that help alleviate their fears of slopes. Other challenging activities, such as the wheel chair maze, are being used to stimulate and encourage the convalescent patients to participate in physical activity (8:157).

II. CURRENT TRENDS IN PLAYGROUND PLANNING IN EUROPE

Europe first came up with the idea of sculptured play forms. During the reconstruction after World War II, many new, long, tall buildings were built. In order to counteract these massive rectangular forms, some architects, while developing the area, placed large sculptural forms near the buildings. The children in the area became intensely interested in these new forms and were soon clam-barking over them constantly. This new form of play became so
popular that more similar forms were placed in recreation areas. Thus the era of play sculpture began.

A German recreational leader at the 1956 International Recreation Congress stated:

In Germany today we have the same cultural problems as the United States in that automation is making fast progress and that the natural, physical activities of the people are being hindered more and more. Commercial entertainment is growing up and enticing us--especially the younger people--into passive experiences and "spectatoritis" (6:151).

Some European countries have not let this problem go unattended. There, where space is so precious, they are providing many new play forms (in appropriate, landscaped settings) which encourage children to create their own entertainment and physical activities.

Probably the most unusual contemporary play structures yet built in Europe are in Copenhagen's Tivoli Amusement Park. Here Simon Henningsen, with Pierre Lubcker as consultant, hired six leading artists, all specialists in their field, to re-design the century old park. The result is indescribable here, but their achievement is spectacular in that most of their play structures appear to be pure abstract sculpture (7:68-73).

Related literature notes a definite need for research in designing and constructing new playgrounds and equipment to meet the
physical and aesthetic needs of children. Many parks and recreational areas have recently been experimenting with new concepts in playground planning, designing play forms that fit in with appropriate landscaping. Indications are that these new play forms and parks should each be considered a work of art and not duplicated. No information was given as to construction methods for the various new play forms.
CHAPTER III

PROPOSED PROCEDURE FOR THE EXPERIMENT

I. GENERAL INFORMATION

The problem was to design and construct a sculptured play form for the College Elementary School, Ellensburg, Washington. The materials, with limitations, were to be furnished by the school, supplemented by funds donated by the local Parent Teachers Association. The writer designed and constructed the experimental structure under the direction of Associate Professor of Art, E. Frank Bach, Central Washington College Art Department, and Associate Professor of Education, Bill J. Ranniger, Director of the College Elementary School.

II. PROPOSED PROCEDURE FOR DESIGNING THE STRUCTURE

Several experiments with different materials were done in order to arrive at possible ideas for the basic design of the structure. By doing research on previous and current related projects, some ideas for a design were formulated. Information was found that might help solve some future construction problems.
Several models were constructed from cardboard or other appropriate material. This provided a three-dimensional view of possible designs for the structure. Experiments in surface coloring may be done on these models at a later time.

A committee made up of members of the college, elementary school faculty, and the writer examined the models, discussed the possibilities, and selected one for construction.

Templates were made actual size from cardboard or similar material. These templates determined the size and shape of the structure. A full size mock-up was made from them to determine the proper proportions of the structure's components.

After a permanent site was selected, a construction area was set up close by with access to water and a power outlet. A flat concrete area was deemed desirable for the construction site.

Some experimenting with various construction methods was done prior to the actual construction in order to solve some problems before the arise. Experimentation with different construction materials such as steel, concrete, wood, and others, was done in order to decide from what suitable material the construction could be made.

A complete list of materials was made and ordered at this time. Specification as to size, grade, length, weight, and other pertinent information was listed to insure receiving the correct materials. It was difficult to estimate the amount needed in some cases.
III. PROPOSED STEPS FOR CONSTRUCTING THE STRUCTURE

Since the structure was to be made from concrete, forms were constructed, reinforcing steel fabricated, and the cement poured. In any case, the primary structure had to be made first. The secondary structure could be fabricated before the primary section is completed, depending upon the design of the total structure. Regardless of the structure's design, it had to have some sort of footings. Possibly the footings could be built before the primary structure. Here again the construction procedure depended upon the design of the structure.

At this point of the construction, fixtures such as railings, ladders, grillwork, or other possible sections could be made and installed. Some pre-planning had to be done in order to make provisions for fastening these fixtures to the structure. The surface had to be treated for preservation, appearance, and safety. The type of treatment depended on the material used for the construction and the desired effect.
CHAPTER IV

THE EXPERIMENT

Since this experiment was divided into two separate operations, this chapter will be divided into two basic parts; the first will deal with the problem of designing the play structure and the second with the actual construction.

I. DESIGNING THE STRUCTURE

The first step, after the general information was sought, was to check current literature to seek ideas for a possible design for the structure. Sketches were made of new ideas which could be adapted to the design of play sculpture. From these sketches, four models were developed from cardboard, wire, and masonite. The size of the models ranged from ten to twelve inches in height. Figure 1 shows three of these models.

The next step was to select a model that would serve the purpose desired by the elementary school. Before proceeding further, it was found that the school's wants were not yet solidified. In order to better clarify the needs and desires of the parties concerned, a committee was formed to discuss the matter further. The committee...
FIGURE 1

THREE PLAY SCULPTURE MODELS
was made up of Assistant Professor of Education Bill J. Ranniger, Director of the College Elementary School; Associate Professor of Art E. Frank Bach, representing the college art department; Assistant Professor of Education Barbara E. Kohler, kindergarten teacher in the College Elementary School; Assistant Professor of Physical Education Eric Beardsley, representing the physical education department; and the writer. The committee, except the writer, are on the regular staff of Central Washington College of Education.

The committee met, discussed the proposed experiment and the merits of different models. From this discussion the writer formulated several points to be considered before proceeding with final plans. The following points had a direct bearing on the design of the project:

**Basic characteristics of the design.** The design of the structure had to be functional, well designed sculpturally as well as structurally to make it an aesthetic form that will fit well in the landscape. The structure must withstand considerable stress and be able to weather the elements, human as well as natural.

**Adaptability to grade school children.** Since this structure was to be erected in a grade school playground, it had to be designed to fit the physical size of elementary age children and relate to their imaginative play activities.
Accommodation and activities. The structure had to accommodate several children, each doing a different physical activity simultaneously. A traffic pattern had to be established to prevent congestion, making it possible for more participation at one time.

Safety factors. The structure had to be free of moving parts and so designed that one activity does not interfere with another. High platforms needed protective rails and sharp projections had to be eliminated. Areas near where slides terminate had to be free of other activities. The structure must not obstruct the participants from view of persons supervising the activities.

Location and orientation of the structure on the site. The site and how the structure was placed on it were important. These had a direct bearing on the shape of the design. The structure had to fit in with the landscape, have functional elongations, and, in order to best exhibit its form, be placed where it can be seen and appreciated by those not participating. The structure was to be placed where it can be easily supervised and be observed from the classrooms.

The orientation in relation to the sun, the shadows it may cast, and the amount of sunny or shaded activities that are desirable during certain months of the year were factors to be considered.
Concrete and steel as a construction material. Concrete and steel were considered as a basic construction material because of their availability, cost, strength, durability, and ease of forming. Concrete will stand years of abuse and weathering with little maintenance and upkeep.

Cost of materials and equipment. Cost of materials and construction equipment were a factor which might alter the design. The design's elaborateness were determined by the funds available.

After discussing the merits of the four models, the committee selected model "A" as the design to be built. Figure 2 shows four views of model "A." This model, according to the committee, came closest to the requirements for their concept of the ideal play sculpture. Of the four models, model "A" was the most difficult to construct because of its curved surfaces. The committee recommended some minor changes be made in the model to better fit the needs of children who will use the completed structure.

The fact that this particular play structure was to be built for primary grade children placed limitations on its size and necessitated certain safety factors, such as height from the ground and steepness of the ramps. These would vary depending upon the size of the final product.

It was decided that the total height of the structure should
FIGURE 2

FOUR VIEWS OF MODEL "A"
be around ten and one half feet. Using this measure as a guide, full sized templates were then cut from large sheets of cardboard. With templates made for each part of the structure, it was easier to visualize the appearance of the full-sized structure. A few alterations were needed to better the basic form.

The decision was made to construct the structure basically of reinforced concrete because of its ease of forming and its permanency. Concrete also requires little upkeep and maintenance.

II. CONSTRUCTING THE STRUCTURE

The first thing that had to be done before any construction could take place was to make an estimate of needed materials. The material list appearing in the appendix of this thesis is not a complete list of materials used. A considerable amount of materials already on hand was not placed on the bill of materials.

For reference purposes, the design was divided into sections and labeled alphabetically in the order built. Figure 3, the key to these sections, will be of value to the reader during the remainder of this text.

Section "A." Section "A" was the first to be built of the two primary sections of the project. Because of its angular shape, it was decided that it should be cast horizontally. Three sheets of 1/2"
FIGURE 3

THE DESIGN DIVIDED INTO SECTIONS ACCORDING TO THE ORDER OF THEIR CONSTRUCTION
fir plywood were used in making the basic form. A framework of 2" x 4" boards were bolted and nailed together to form the supports, with sand shoveled under the flared sides for additional stability.

The cardboard template for this section was used in making the layout for the boundaries of the form. Four-penny nails were partially driven into the plywood approximately four inches apart, giving assurance of finding the outside boundaries during the pouring of the cement. The forms for the two center holes were formed by four circular pieces of 18 gauge sheetmetal. Two pieces for each hole had to be used because of the angle of the forms. Several 2 x 4 blocks were nailed inside the circles to hold them in place. Holes 1" in diameter were drilled through the plywood where other sections were to be joined to section "A." Doweling 8" in length was then driven into the holes, leaving 7" projecting above the surface of the form. By drilling these plugs out at a later date, holes formed in the hardened cement would receive reinforcing steel, joining the sections together. After the forms were completed, two 3/4" rods were bent to the contour of the forms, with smaller steel cross pieces wired to them for extra strength. The reinforcing rods were extended beyond the form at the base so that they could be fastened to the footings. The steel was suspended about 2" above the surface of the form at the extreme ends. This was done to make sure
the steel would not project through the surface walls and so that the rods would insure proper strength.

Figure 4 shows section "A" ready to receive cement. A mix of two parts pea gravel, two parts sand, and one part Portland cement was used through the main portion of the construction. The cement on this section was poured and troweled to a thickness of about four inches at the top, tapering to about eight inches at the base.

A problem arose here that affected the bottom surface of this section. Because of the steep angle of the form, the cement had to be mixed slightly drier than usual in order to have enough body to be troweled. This increased viscosity caused air pockets not to surface, leaving pockmarks on the bottom side of the casting. The poured piece was then covered with plastic sheets and allowed to cure. Since concrete requires twenty-eight days to reach its maximum strength, six days setting time was allowed before removing the forms.

Section "B." Section "B," the second section of the primary structure to be constructed, also was cast in a horizontal position. The base of the form was made of two 1/4" plywood sheets placed on a flat slab of concrete walkway. Outlines of the boundaries of this section were made by tracing around the templates directly onto the plywood. Sides for the form were then cut from 1/2" plywood and
FIGURE 4

PRIMARY SECTION "A" FORMS PREPARED TO RECEIVE CEMENT
nailed into place. At the joints, 2 x 4's were nailed vertically and later tied together at the top to keep the form from spreading during the pouring process. Reinforcing steel was then placed in the form, spaced, tied secure, and readied for cement. Space was left under the ties for troweling.

At the area where sections "K" and "M" were to be joined to this section, in two 1/2" holes drilled into the form wall, 1/2" x 8" carriage bolts were placed, threads out. The bolt heads projected into the form seven inches, giving it sufficient holding strength. Extra steel was placed at points where there would be extra stress. Hole plugs placed in the forms at the extreme ends of this section made possible later connection to section "A." The cement was then poured, troweled, and allowed to cure. This section was made with a taper, running 9" thick at the base to 4" at the top. Figure 5 shows the form ready for cement.

Choosing the site. At this time, the exact site had not been established, although a tentative area had been decided upon. From the start of the project to this point in the construction, a new controlling committee had been formed on the college campus, called the Improvement and Beautification Committee. The site had to meet its approval before further construction could take place. A sketch of the tentative site, showing possible development, along with a model
FIGURE 5

PRIMARY SECTION "B" FORMS WITH REINFORCING STEEL IN PLACE
of the project was submitted to the committee for consideration. The committee said the tentative site or any area close to it would be satisfactory. The area was chosen because of its easy supervision and closeness to classrooms of the children for whom the play sculpture was designed.

A new problem arose at the selected site. Two steam lines and an electrical conduit ran directly through where the footings were to have been. The structure had to be placed closer to the buildings than was originally planned. Being this close, the building appears to dominate the form, which is not too desirable.

In the submitted over-all plan, a large textured screen was placed behind the structure, isolating it from the building.

**Constructing the footings.** The next step in the experiment was to excavate for and build the footings. The two excavations made for the primary sections were dug to a depth of 3' with a length of 4' and a width of 3'. This depth was necessary in order to reach a solid soil base. Excavation C was dug perpendicular to excavation "F," which coincided with the planned orientation of the base portions of section "A" and "B." A flat framework of 2 x 10's was built around the perimeter of the excavations. Two 3" steel pipes, with angle iron brackets welded to them, were then bolted across each excavation hole at the proper spacing. This framework made a
receiver for the two primary sections and insured their proper posi-
tion when in place.

Figure 6 shows these base supports ready to receive
sections "A" and "B."

Figure 7 shows the large wrecker used to hoist section "B" into its position.

Figure 8 illustrates how section "B" was held in place while the footings were poured around it.

Figure 9 shows section "A" being hoisted into place using the wrecker.

Figure 10 shows how the base of section "A" fits into the footing brackets.

After section "A" was in place, a chain was used to temporarily hold it in place until the footing could be poured and bracket "G" fastened in place. (Figure 11).

Figure 12 shows the completed footing. Note that the cement was troweled about 8" up around the primary sections for added support. The projecting base frames were later cut off well below the ground surface.

Section "H." Section "H," the middle platform, was the next step in the construction. Six 2 x 10" posts were erected with three 2 x 10" planks nailed across them for the basic support of the
FIGURE 6

BASE SUPPORTS READY TO RECEIVE PRIMARY SECTIONS "A" AND "B"
FIGURE 7

WRECKER HOISTING SECTION "B" INTO POSITION
FIGURE 8

SECTION "B" BEING HELD IN PLACE WHILE FOOTINGS SET
FIGURE 9

SECTION "A" BEING HOISTED INTO PLACE
FIGURE 10

BASE OF SECTION "A" IN POSITION ON THE FOOTING BRACKETS
FIGURE 11

CHAIN HOLDING SECTION "A" IN POSITION WHILE FOOTINGS WERE Poured
FIGURE 12

THE COMPLETED FOOTINGS
forms. Several 2 x 4's were spaced on the planks, depending on the weight distribution. A sheet of 1/2" plywood was placed on top of this framework and leveled to form the base of the form. The layout and preparation were similar to that of the previous sections. Steel was inserted through the proper holes in section "B" to support that end of the section. The opposite end was supported by the large notch in section "B." Reinforcing steel was left projecting from section "H," next to section "B," for the purpose of connecting the upper end of ramp "L." A view of this portion of section "H" may be seen in Figure 13. Figure 14 shows the completed joint where section "H" joins section "A." A top finish coat of one to one mix of sand and cement was used to finish this section and all the remaining section.

The extreme hot air temperature caused some difficulty with the forming of all the remaining troweled pieces. The air hardened the cement quickly, making it very difficult to shape the contours. Slight surface cracking appeared in a few places that were exposed to the direct sun. This problem was checked somewhat by frequent sprinklings.

Section "I." Section "I," the curved ramp attached to section "B," was chosen next for construction. This section could be built without disturbing the green cement just poured.
FIGURE 13

COMPLETED SECTION "H" SHOWING PROJECTING STEEL AT THE POINT WHERE SLANTING RAMP "L" WILL BE JOINED TO IT
FIGURE 14

THE COMPLETED JOINT WHERE SECTION "H" JOINS SECTION "A"
Stakes were driven, leveled, and capped across to form the base for this form. Two sheets of 1/4" plywood were nailed over this base to make the curved form. When first applying the plywood, it tended to break because of the arc it had to reach. The plywood was removed and soaked with water to soften the wood fibers. This treatment solved the problem of bending the plywood. Steel was wired in place and attached to metal stakes driven into the footing excavation. The cement was then troweled on, top coated, and left to cure. A side view of the form with some steel in place is shown in Figure 15. Figure 16 shows the cement after it was poured, and Figure 17 shows the section with the forms removed.

Section "J." Section "J," the lower pole slide, was made from a length of 3" galvanized steel gas pipe. The base was set in twelve inches of concrete below the ground surface and the top suspended by section "K." The pipe was put in position and section "K" was poured around it, holding it permanently in place. A 1" pipe was welded to the top of the pole slide to form one of the railing posts for section "K." This smaller pipe was not cut off until the railing height was definitely established.

Section "K." The next part of the play sculpture to be built was section "K," the upper platform. The scaffolding that held
FIGURE 15

FORM FOR SECTION "I"
WITH SOME REINFORCING STEEL IN PLACE
FIGURE 16

SECTION "I" AFTER CONCRETE WAS LAID
FIGURE 17

SECTION "I" WITH THE FORMS REMOVED
the forms for section "H" had not been removed because of the possibility of using part of them for support of the forms for this section. The posts were extended, new 2 x 10 cross pieces were installed and cross-braced. Over the top of this base, 2 x 4's spaced approximately 8" apart were toe-nailed, giving substantial support to the plywood that was to form the base of the platform form. The two sheets of 1/2" plywood used to make this base are shown in Figure 18. A layout was made and steel installed, spaced, and tied. Figure 19 shows the reinforcing steel partially in place for this section.

The next step was to cut three 1" pieces of pipe for railing posts. These posts were placed in position in the form around the outer circle of section "K" and welded to the reinforcing steel 2" above the surface of the plywood base. Welding to the steel helped hold them in place until the concrete was poured and also held the reinforcing rods off the surface of the form in that area. The cement was then poured, top coated, troweled, and let cure. Sprinkling of the green cement was done at three-hour intervals to insure against cracking. The completed section is shown in Figure 20.

Section "L." The slanting ramp, section "L," was next in the order of construction. An excavation for the footing was made 12" deep, 24" wide, and 45" long. Stakes were driven to support the lower ends of the 2 x 10 form planks. A 2 x 12 was nailed across
FIGURE 18

PLYWOOD FORM BASE FOR SECTION "K"
FIGURE 19

SECTION "K" FORM WITH REINFORCING STEEL
PARTIALLY IN PLACE
FIGURE 20

COMPLETED SECTION "K" WITH RAILING POSTS IN PLACE
between two existing posts to support the upper end of the form. Sides were installed and reinforcing steel put in place. Broken chunks of concrete were used as fillers in the footing area. Figure 21 shows how the form appeared before the cement was poured. Pouring was not done until the forms for the next section were completed. This saved time and effort by pouring both forms during one mixing operation. The section was made about 6" thick to support the weight it will bear.

Section "M." This section, the lower platform, was constructed along with section "L." The forms were constructed similar to the other platforms, using 2 x 4's to support a plywood base. Since the sides of this section were straight, two boards were used on each side to hold the cement in position. As this section did not have to be troweled as did the others, the cement mixture was made thinner before pouring. Figure 22 shows the reinforcing rods protruding from section "A." These rods continue through the form to an angle iron bracket bolted to section "B." Several rods of cross reinforcing were added before the cement was poured. The poured form is seen in Figure 23.

Section "N." Section "N," the upper pole slide, was made of the same material as the lower pole slide, 3" gas pipe. A hole was cut in the plywood base form of section "K" near the center of its
SECTION "L" FORM READY FOR CEMENT
FIGURE 22

SECTION "M" FORM WITH REINFORCING STEEL SECURED IN ANCHOR HOLES IN SECTION "A"
FIGURE 23

SECTION "M" AFTER POURING
large outer hole. A footing hole was dug in the ground directly below the hole in the plywood. The pipe was lowered through this hole into the footing hole, plumbed, and the footing poured. The upper portion of the pole was held in place by the section "K" forms. Railing pipes welded from the three railing posts horizontally to the pole held it in position after the forms were removed.

Section "O." Section "O," fabricated from 1" gas pipe, was bolted to joining bracket "G" on one end and welded to the top end of the lower pole slide, "J." This made a strong safe railing and did not distract from the over-all design of the structure. All welds were done with an oxyacetylene torch to insure smooth joints.

Section "P." Section "P," the upper pole slide cap, was added to terminate or finish off the end of the pole. This cap was made by pouring concrete into a form constructed in place. Figure 24 shows two lengths of steel rods that were welded horizontally onto the top of the pole to help connect it with the cap. A platform for the form was first built by nailing two pieces of 1/2" plywood onto the edges of three pieces of 2 x 10's supported by the platform railing. A circle 12" in diameter was scribed on the platform concentric to the pole. A circular form was made from sheet metal and placed on the circle with several four-penny nails driven around it to keep it centered. This form was poured to a depth of five inches and puddled.
FIGURE 24

THE TOP OF THE UPPER POLE SLIDE WITH CONNECTING BARS FOR THE POLE CAP
The form in place after pouring may be seen in Figure 25.

Finishing the structure. Another form, Figure 26, was used to finish the joint where the top of sections "A" and "B" join. The joining bracket was cemented over to make a smoother, nicer looking joint and give the appearance of one whole piece.

This completed the construction with the exception of finishing the surface. The sharp edges were ground off with the aid of a portable grinder. A few minor faults in the surface were repaired, and construction of the play structure was complete.

It was decided to experiment with surface coloring at a later date. Figure 27 shows the construction after completion.

The tools used in the construction. A construction job of this size requires many types of tools ranging from a large wrecker down to a small screw driver. Carpenter's tools, machinist tools, mechanic's and cement tools were all used for this construction job. Because of the small and varied mixes needed, a regular electric cement mixer was used for all the concrete work. (Figure 28).

Figure 29 shows some of the other tools needed in order to construct the play structure.
FIGURE 25
FORM FOR SECTION "P"
FIGURE 26

FORM FOR FINISHING JOINT BETWEEN SECTIONS "A" AND "B"
FIGURE 27

THE FINISHED PLAY SCULPTURE
FIGURE 28

THE CEMENT MIXER USED IN THE CONSTRUCTION
FIGURE 29

SOME OF THE TOOLS REQUIRED FOR THE EXPERIMENT
CHAPTER V

SUMMARY AND CONCLUSION

In summarizing this experiment, recent writings express a need for developing new ideas and concepts in playground planning and play equipment. Some areas in Europe and in the United States are experimenting and developing many new ideas in play sculpture. This has resulted in a tremendously increased use of their recreation areas and at the same time provided an area that stimulates and helps develop aesthetic growth among its participants.

This experiment was conducted to find possible means and methods of designing and constructing children's sculptured concrete playground structures. Research was done on related projects, experiments were made, and models of possible designs were constructed.

A faculty committee made up of representatives of various departments concerned chose the model to be built. An estimate of materials was made and ordered. Full-sized templates were made to determine the size of the structure and to aid in further planning. After careful consideration, a site was chosen and construction begun. The two primary structures were cast in forms on the ground and
hoisted into place with a wrecker. The remaining portions were cast in place, with forms built in position for each section. The steel pipe slides and railings were put in place as construction progressed.

Several minor problems occurred during the experiment. The estimate of materials was inadequate because of an increase in size and thickness of the structure. Materials for form supports were underestimated. Much of the needed material, however, was already on hand or could be acquired readily. The hot weather caused some minor surface cracking and some problems in forming. In some areas the cement had to be mixed drier in order to be troweled into shape. The hot air caused it to set up before it could be shaped properly. This situation could have been altered by additional assistance during this part of the construction. The original site had to be changed because of existing steam lines, causing the structure to be in a less desirable location.

The experiment proved to be successful and provided a stimulating experience for the designer and builder.

At this time we do not know in what direction play sculpture will be developed in the future or to what extent this type of equipment will be accepted by the public. Indications are that we are moving in the right direction in our thinking. It will depend a great deal on the education of the people and the design of future play structure. These
play forms should be considered sculpture as well as play equipment, and if so considered, they should be a lasting thing. As the public becomes more conscious of the importance of art in their lives, they will realize the values that play sculpture can bring into their lives and those of children.

There is much need for future research in the designing and building of new play forms for our parks and recreational areas. The direction we take will definitely affect the future.
BIBLIOGRAPHY


APPENDIX
ESTIMATE OF MATERIALS

PLAYGROUND STRUCTURE FOR THE COLLEGE ELEMENTARY SCHOOL

ELLENSBURG, WASHINGTON

by

DONALD A. SCOTT

<table>
<thead>
<tr>
<th>ITEM - DESCRIPTION</th>
<th>UNIT</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. PORTLAND CEMENT</td>
<td>SACKS</td>
<td>12</td>
</tr>
<tr>
<td>2. SAND - FINISH GRADE</td>
<td>YARDS</td>
<td>4</td>
</tr>
<tr>
<td>3. PEA GRAVEL</td>
<td>YARDS</td>
<td>4</td>
</tr>
<tr>
<td>4. PLYWOOD--1/2&quot; SHOP GRADE</td>
<td>4' x 8' SHEET</td>
<td>4</td>
</tr>
<tr>
<td>5. PLYWOOD--1/4&quot; SHOP GRADE</td>
<td>4' x 8' SHEET</td>
<td>4</td>
</tr>
<tr>
<td>6. 2&quot; x 4&quot;s</td>
<td>10 FT.</td>
<td>6</td>
</tr>
<tr>
<td>7. PIPE, GALVANIZED -- 2&quot; DIAMETER</td>
<td>12 FT.</td>
<td>2</td>
</tr>
<tr>
<td>8. PIPE, GALVANIZED -- 2&quot; DIAMETER</td>
<td>8 FT.</td>
<td>2</td>
</tr>
<tr>
<td>9. PIPE, GALVANIZED -- 3/4&quot; DIAMETER</td>
<td>10 FT.</td>
<td>3</td>
</tr>
<tr>
<td>10. STEEL ROD, REINFORCED,</td>
<td>FT.</td>
<td>200</td>
</tr>
<tr>
<td>3/4&quot; DIAMETER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. METAL LATH, HEAVY DUTY</td>
<td>SQ. FT.</td>
<td>165</td>
</tr>
<tr>
<td>12. BOLTS, 1/2&quot; DIAMETER,</td>
<td>6 INCH</td>
<td>24</td>
</tr>
<tr>
<td>SQUARE HEAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. BOLTS, 1/2&quot; DIAMETER,</td>
<td>8 INCH</td>
<td>12</td>
</tr>
<tr>
<td>SQUARE HEAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. ANGLE IRON, 3&quot; x 3&quot;</td>
<td>FT.</td>
<td>10</td>
</tr>
</tbody>
</table>
15. NAILS, 16# PENNY COMMONS  LBS.  5
16. NAILS, 6# PENNY BOX      LBS.  5
17. NAILS, 4# PENNY BOX      LBS.  2