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Grid Dynamics

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As for your collection of "Beginning Design Course" problems, enclosed please find a "proven effective" problem set I've developed and tested sucessfully over the last few years.

I've selected this problem set because it evokes a lot of good work and involvement and progressive development in beginning design students. It tests them effectively on a broad spectrum of skills -- media handling -- and introduces a number of fundamental architectural concepts. It covers a lot of ground in a short period and leaves them much in the way of theory, method and skills to use in future problems. They also usually get a good portfolio entry from it -- pictures of the final model. While deceptively simple, this problem has sufficient depth to challenge the best students. As for relevancy to the students, to educational goals and to course and curriculum, please refer to my paper.

Department of Architecture
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Architecture 171: Formal Fundamentals of Architectural Design
Spring 1979 Professor R.T. Meeker

PROBLEM SET #2: GRID DYNAMICS

Duration: 3 weeks (36 hours)

Introduction: Grid Dynamics

Consider and explore the potential of grids in terms of cellular permutation and the patterns that may be created. A grid and its dynamic potentials represents a far-ranging architectural concept. Grids provide two and three dimensional matrices for organizing space, form and structure in orderly and consistent ways.

Grid Related Design Principles

A GRID is a regular and repetitive lattice formed by intersecting lines which generate a network of cells, all of which may be geometrically similar.

We are especially interested in the three grids whose cells are squares, equilateral triangles and hexagons, respectively. One may explore the dynamics of these grids by introducing color. When the cells of these grids are colored, the designer may explore a host of strategic design principles. In this set of exercises the cells will measure 1½" [redacted] and will be internally divided by their own diagonals. Colors may be applied to these subcells. Permutation is achieved by rotating the cells. A "cell" in these exercises is precisely defined as a specific set of colors in a specific relationship which does not change.

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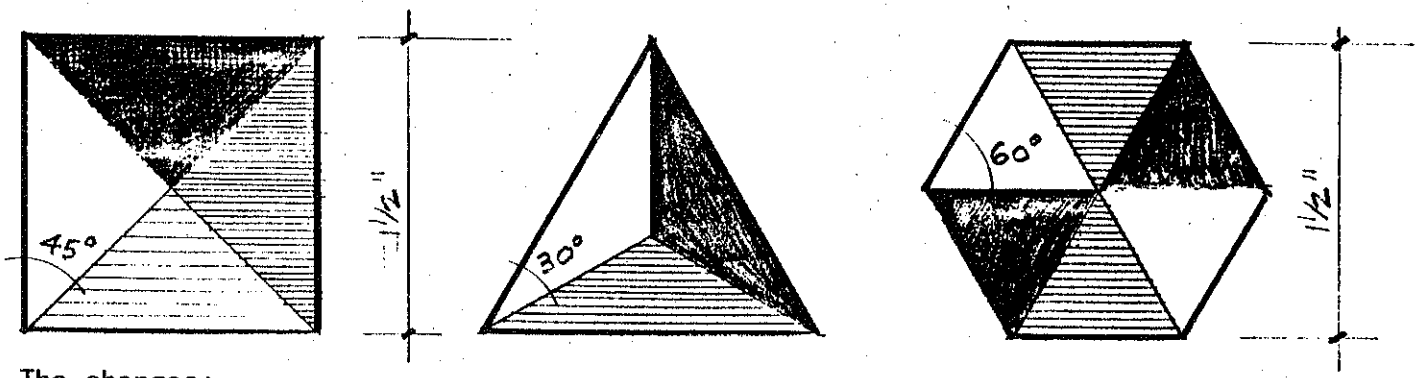
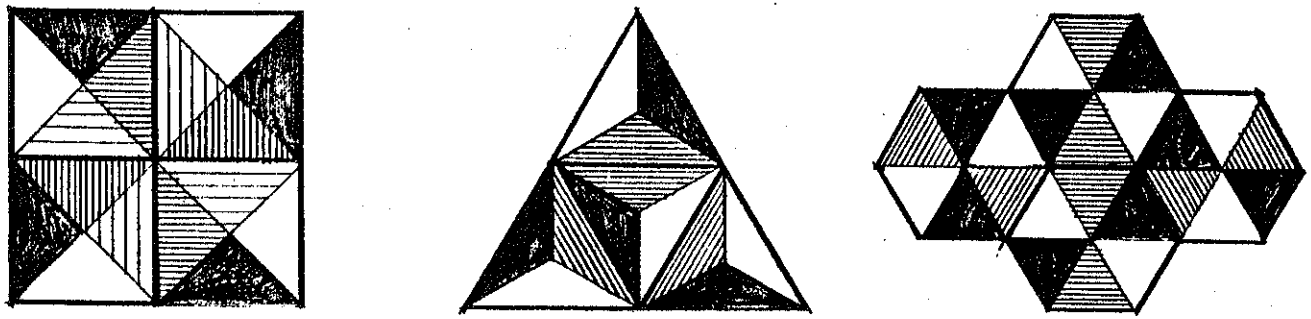
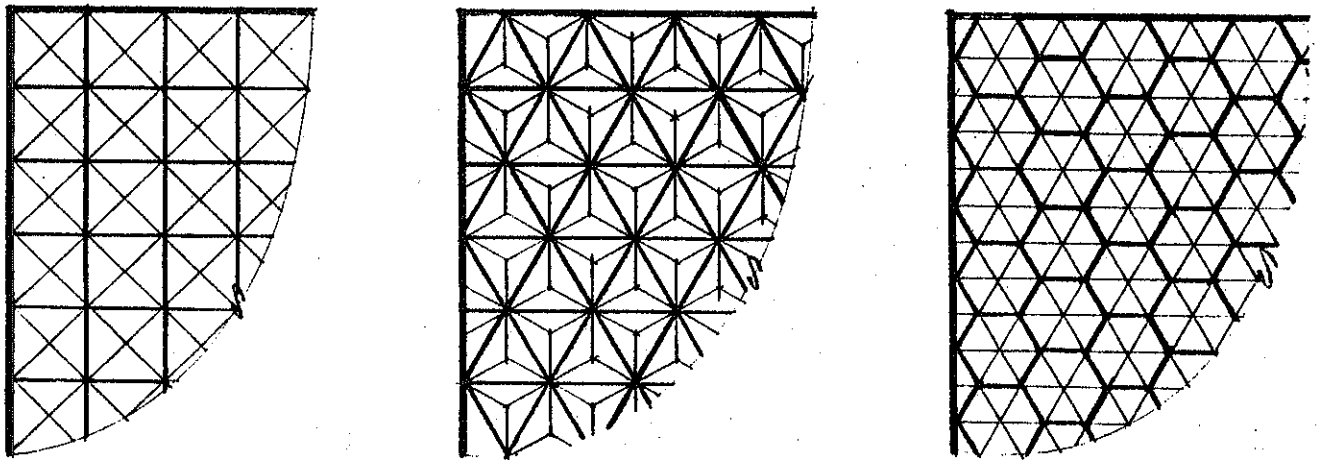
The cells:



The changes:



The grids:



SQUARE

EQUILATERAL TRIANGLE

HEXAGON

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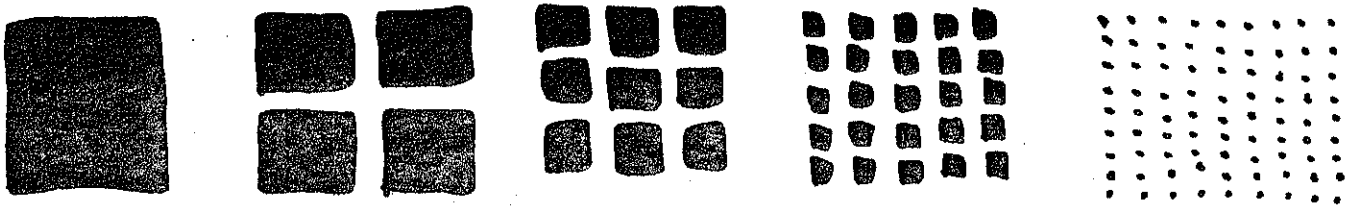
Grid Related Design Principles, cont'd.

A GRID, continued. It is essential that a designer understand grid dynamics if the designer will use structural grids effectively and appropriately.

REPETITION means the reoccurance of similar qualities, elements and patterns. In perceptual terms people perceive repetition first according to reoccurring qualities such as shape, size, color, texture, mass and relative position in space. An element or component may be said to exhibit qualities. If several elements exhibit the same qualities, they may be said to be similar. The more of the same qualities they exhibit, the more similar they are, thus the more repetitive they are. The mind notes such similarities. Grid cells are similar in shape, size, and in this case, in color organization as well. Cells in these exercises are differentiated in two ways: by color organization and by relative position -- rotational, locational and relational.

CONTRAST means comparative dissimilarity of qualities in elements. If relative (adjacent in space) elements share such qualities as shape, size, color, texture, mass, and relative position (in Cartesian terms), then contrast is the apparency of differences in qualities between the elements. As the number of differences and the degree of dissimilarity in qualities increases, the apparency of contrast will also increase. The more elemental qualities which differ by greater degrees, the greater the apparent contrast. By our mind's capacity to note, analyse and evaluate REPETITION and CONTRAST, we are able to better organize our comprehension of reality.

HIERARCHY means a graduated series of elements which are repetitive in most qualities, but contrast in one or two qualities. The dominant concept of hierarchy states that the graduated series of elements are similar in most qualities and vary only in size and number of occurances. That is to say, as size increases, the number of occurances decreases -- repetition of the elements in space and time decreases. There are fewer large elements in the series and more small elements.



A "Family" of elements would be a group of elements which are generally similar, contrasting only in size and possibly shape, but here in a modulated way; that is the contrast is not great and tends to be proportional.

Grid Related Design Principles, cont'd.

PATTERN is a perceptible and orderly arrangement, constellation or composition of contrasting and similar elements.

PERMUTATION means an alteration in pattern of a given set of objects or of an object in space; the alteration [redacted] rotational, locational or relational. The qualities of the lements are not changed, only their relative positions. The more elements ir the pattern, the greater the number of all possible permutations.

TO PERMUTE means to change the order of, to change through, to go through changes.

Problem Statements

Problem #2-A: Drafting Grids (6 hours)

Draw each of the three grids described in this problem set on sheets of fine white tracing paper or plastic drafting film, sized 24" x 30"(one sheet for each grid, thus three sheets). Each grid should measure 18" x 24", centered on the 24" x 30" sheet. First layout the grids lightly in pencil. Then draft in ink the border of the whole grid with a #4 inking pen (about 1/16" thick). Draft the cell outlines in ink with a #2½ inking pen (about 1/32" thick). Draft the cell diagonals with a #0 inking pen (about 1/64" thick). Get three clear reading blackline prints of each of the three grids, thus nine prints in all.

Problem #2-B: Single Cell Permutation (6 hours)

Select one of the grids (prints) and color it with felt-tip markers or colored pencils. It is very important that you use only one cell, i.e. color organization in this exercise, so that you may see the variety of patterns to be made [redacted] by single cell permutation. Explore column, row and block patterning. You should be able to develop several clearly distinct patterns. Be aware of your color selection, especially in terms of contrast. When you are finished, cut out the grid along the border and mount in with glue on a vertically oriented 20" x 30" sheet of illustration board (white, cream, tan or light grey), leaving 1" borders at the top and sides. Use a heavy black line to create a 1" border at the bottom and a 4" x 20" space at the bottom for titles. Develop an appropriate title block, printing in felt-tip markers and pens.

Problem Statements, continued

Problem #2-C: Two Cell Permutation (6 hours)

Select a different grid and color it with felt-tip markers or colored pencils, using two different cells (different color organizations). Explore patterning. Mount and title in the same manner as in problem #2-B.

Problem #2-D: Multiple Cell Permutation (6 hours)

With the remaining grid, color it as you wish, exploring patterns. Mount and title in the same manner as in problem #2-B.

Problem #2-E: Three-Dimensional Grid Dynamics (12 hours)

In this problem you have one week to develop an architectonic construction by applying the principles you have learned thus far. Previously the problems have been more constrained; this problem allows you more latitude. Select one of the three grids and mount prints of it on 1/8" "Foamcore Board" or corrugated cardboard. These shall be floors, ceilings and the roof. They may be shaped as you wish and have holes in them. They may be colored or plain. At regular intervals in the grids, use 1/8" diameter dowells as the columns of your construction, running continuously from floor to floor and glued in place. For walls use colored cardboard. Develop systems of walls, where for example, different height walls may be different colors. Walls may be shaped and have holes in them, but they must run along the lines of your grid cells. Explore the design principles we have been studying. Think three-dimensionally. Sketch your ideas first or work with study models. Use the walls and floors and roof to make space. Organize space in a meaningful and systematic way. This architectonic construction is at 1/8" scale; that is, 1/8" in the model equals 1'-0" in actuality. Put some scale figures in your construction.