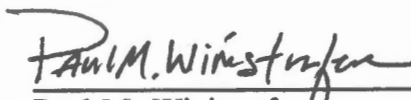


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Major Professor

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INTERNAL DENSITY VARIATION OF HOT-PRESSED WOOD PANELS IN
RESPONSE TO CHANGES IN FLAKE MOISTURE CONTENT
AND PRESS CLOSURE RATE

A Thesis

Presented for the

Master of Science

Degree

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David Layne McFarland

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ABSTRACT

Twenty-seven, 18 x 18 x 1/2 inch, 38 lbs/ft³, non-oriented flakeboard panels were manufactured from an Aspen furnish with three levels of flake moisture content (4%, 8%, and 12%) and three press closure rates (20, 60, and 100 seconds) in a complete factorial design with three replications. Panels were scanned with a gamma-ray densitometer for density using a 3-dimensional intense sampling scheme (grid of 8 x 8 x 16). Each scanned panel possessed 1,024 observations of density which were reassembled, using an x-y-z coordinate designation, to represent 16 surface response layers (z-layers) stepping through the panel thickness.

A preliminary study was undertaken to determine an acceptable number of density observations, with an associated sampling scheme, required to detect differences in panel z-layers due to experimental treatments. A set of panels were examined to determine relative magnitudes of density variation in three spatial components. Four panels, two pressed at a 20 second closure rate and two pressed at a 100 second closure rate, were intensively scanned on a grid of 15 x 17 x 16. A total of 4,080 observations of density were produced using this sampling strategy in order to assess the normal density variation exhibited in the x, y, and z spatial panel components in response to two extreme levels of a treatment. Variation attributed to the z dimension acted out in relative independence of the x and y dimensions. The variation in density across the x-y plane for any z-layer appeared to have random patterns and the variation appeared to remain consistent through the panel thickness.

Flake moisture content influenced density in the intermediate and core z-layers,

although not all z-layers inclusive. As flake moisture content increased, density also increased, except for the core z-layers. Variation in density, as indicated by standard deviation, was not consistent across all levels of flake moisture content in the interior z-layers. As flake moisture content increased, the standard deviation of density generally increased. Overall, average standard deviation of density decreased from the face z-layers to the core z-layers across all levels of flake moisture content.

The effect of press closure rate on density was limited to z-layers in the face and intermediate regions. Density increased with faster closing times in the face z-layers and then decreased in the intermediate layers relative to the same closure rate. Standard deviation of density in response to press closure rate was consistent across fifteen of the sixteen z-layers.

The interaction of main effects was significant for the core region z-layers. Highest densities, on average, resulted when intermediate flake moisture contents were teamed with slow closure rates. Standard deviation of density varied consistently across all treatment combinations.

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I. INTRODUCTION

Non-veneered, wood-based composite panels are subjected to heat and compaction pressure during manufacture. Conventional pressing methods employ press platen temperatures of 300-400° F and wood furnish moisture contents of 2-12%. Phenol and urea - based adhesives used to bond individual wood particles require heat to promote resin polymerization. To reach desired product thickness, loose mats of wood particles are compacted by hydraulic pressure in order to increase inter-particle contact, reduce airspace and promote the bonding process. The pressing operation involves the three simultaneous and interrelated processes of heat and mass transfer, stress relaxation and resin polymerization (Kayihan and Johnson 1983). As a result of the compaction, compressive stresses develop within individual particles during the simultaneous heat and mass transfer.

The compressive stresses, which cause densification, fractures, deformation, and elastic and inelastic strain within the particles, reduce inherent strength and stiffness properties of individual particles and of the composite as a whole (Geimer *et al.* 1985). Mahoney (1980) used Douglas-fir flakes in a study that examined flakes for physical changes due to hot-pressing. Compressed flakes exhibited lower tensile modulus values and tensile stress values compared to control flakes. Geimer *et al.* (1985) noted the degree of flake damage due to pressing depends on the pressure at a given location; a function of average and local variation in mat density and flake plasticization. They described the cellular structural damage with reference to cell wall buckling, shearing, tension, and bending failure. Most failures were found in earlywood caused by crushing

from the denser latewood areas of overlapping adjacent flakes. The degree and rate of mat compaction during pressing, with subsequent densification, influences heat transfer within the mat by conduction and convection and a somewhat symmetrical mass transfer from the mat faces to the core and from the mat center to the edges (Strickler 1959; Suchsland 1962; Kamke and Casey 1988; Kamke and Wolcott 1991).

Compaction pressure, temperature, and moisture interact in the pressing process to form a transient envelope of gas, heat, vapor pressure, and mass transfer within the mat environment. The envelope environment affects the rate and degree of adhesive cure, the bond quality, the density distribution or profile, and subsequently physical and mechanical panel properties (Strickler 1959; Suchsland 1962; Suchsland 1967; Kamke and Casey 1988). This theoretical transient envelope, though somewhat idealized, is illustrated in Figure 1.

The vertical density profile, known to influence important board physical and mechanical properties, results from a differential transfer of heat, mass, pressure, and moisture migration during the pressing of a mat (Kelly 1977). Densification occurs more in the surface layers of the mat due to the initial rapid heat transfer and plasticization which accelerates resin cure and mat consolidation (Smith 1982). The interaction of process variables relating to the temperature, steam, and compression gradients results in the progressive densification of individual layers within the mat from both faces to the core (Strickler 1959; Geimer *et al.* 1975; Wolcott *et al.* 1989).

Bolton *et al.* (1989) discuss the variation of stress development and relaxation within particles and how such variation affects board properties. Stress relaxation is "the

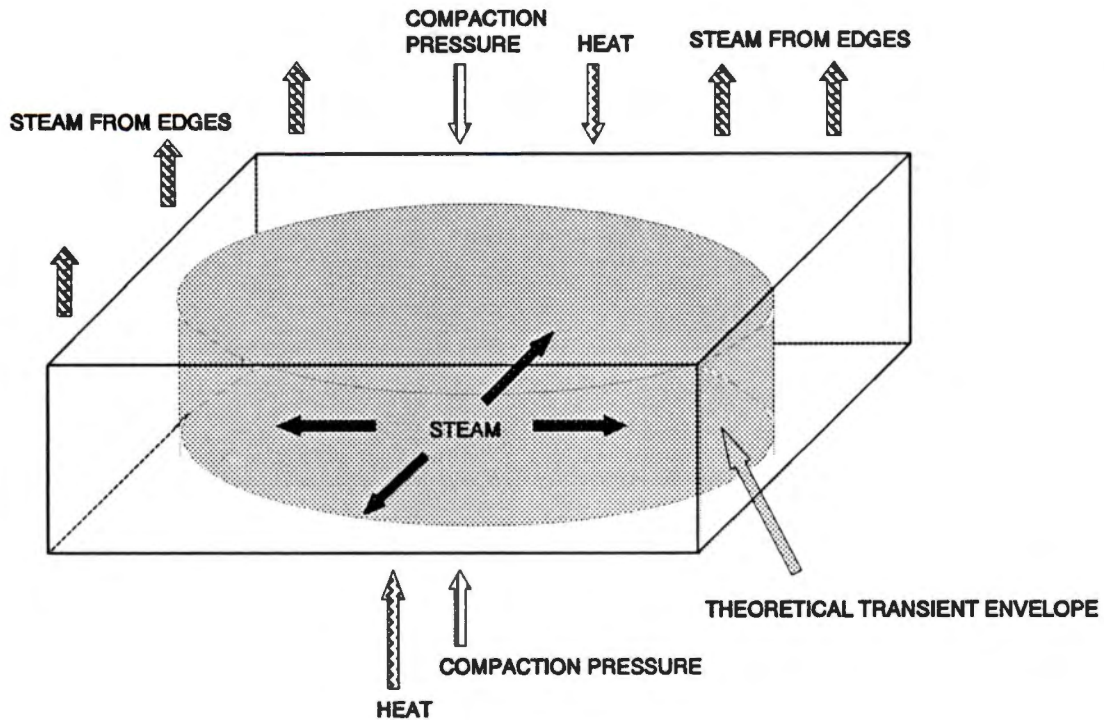


Figure 1. Idealized theoretical transient envelope formed within a panel in response to hot-pressing.

amount of stress decay occurring with time when a constant strain is maintained" (Kunesh 1961). Stress development and relaxation variation results from a three dimensional pattern of variation in mat temperature and moisture content, over time, during pressing. Stress development and relaxation are sensitive to changes in mat temperature and moisture content (Kunesh 1961); the density profile through the board thickness develops because of this phenomena (Strickler 1959; Suchsland 1962).

Residual stresses and resin bond strength result from the pressing operation. A continuum of resin bond strength exists throughout a board. An internal bond strength

results when the resin bond strength exceeds the residual stress level. If resin bond strength and residual stress level vary systematically with position in a mat, the internal bond strength will also vary; variation is inevitable due to the heterogeneity of the mat. If internal bond strength can vary systematically by position, it is conceivable that other board properties, such as density, can also vary systematically. The systematic variation of board properties will have random variation superimposed on it; random variation due to process aspects including, fluctuations in equipment performance used to produce furnish, and to form and press a mat.

The panel density can vary from some overall average density at any point in a plane. In fact, density variations exist within panels and even within samples smaller than panels (Steiner *et al.* 1978b). The average board density is dependent on the amount and density of the wood furnish used for a given board thickness. The final average board density is determined by furnish characteristics, final board thickness, and processing attributes that precede pressing - flaking, drying, and blending with resin. Examination of vertical density profiles, where the density is determined for successive layers from face to face, reveals a wide range of values. Density values obtained from several locations on a panel or one vertical density profile from one sample within a board does not characterize the density variation of an entire board. Recognition of and information about the inherent density variation of a hot-pressed wood panel is essential to improving the manufacturing process as well as the engineering application of these products.

II. RATIONALE

Little work exists where this transient envelope of temperature, steam and density within the mat has been quantitatively examined. Kelly (1977) suggests that unmeasured differences in the vertical density profile may be responsible for the many observed particleboard properties related to various process variables. Physical property variation can, in part, be attributed to variation in density profiles arising throughout the panel thickness (Geimer *et al.* 1975). Bond quality and panel stability may be influenced by density variation within a panel (Steiner *et al.* 1978b).

Mathematical models have been developed to predict internal mat temperature and moisture content during the pressing cycle (Kayihan and Johnson 1983; Harless *et al.* 1987). Kamke and Casey (1988) recorded real-time measurements of temperature, gas, and compaction pressure in the face and core regions of flakeboard panels during pressing. Temperature and vapor pressure variation in relation to board size has been determined experimentally (Humphrey and Bolton 1989). Measured gas pressure and temperature data has been used to derive the relative vapor pressure in the internal environment of a flakeboard. The vapor pressure in conjunction with temperature was used to develop a mathematical relation for equilibrium moisture content, which also determined the transient equilibrium moisture content conditions existing in the mat (Kamke and Wolcott 1991). The mathematical model developed by Harless *et al.* (1987) predicts the density profile based on the known input descriptions of press cycle, furnish, and the final board density, thickness and area. A computer simulation predicts the density profile based on physical changes and processes in the transient mat environment.

The model is restricted in that individual mat layers must be homogeneous and identical in moisture content, bulk density and specific gravity. At mill-scale, these ideal conditions are probably not valid. Also, the model ignores possible stress relaxation after press closure and possible changes in density. Kamke and Casey (1988) suggest that differential stress relaxation after press closure may be a significant factor in the formation of the vertical density profile. The dynamic nature of the envelope within the mat environment is fundamental to understanding the relationship between optimum process variable levels and the post-pressing board properties.

The 3-dimensional density distribution of composite wood panels has never been intensively examined. Most studies regarding density report on gradients in the thickness dimension and few studies (Steiner *et al.* 1978b) deal with density variation across the panel. Recognition of and information on the resulting 3-dimensional density distribution may aid in a more thorough understanding of the transient environment existing within a mat during pressing and the improvement of the manufacturing process and the resulting products.

III. OBJECTIVES

The premise for this study entails characterizing the 3-dimensional density distribution in a reconstituted wood panel and relating the distribution to the process variables flake moisture content and press closure rate.

The first objective involved the development of a three dimensional response surface graphical methodology to visually portray and characterize the density distribution in three dimensions. The response surfaces depict how the internal panel density responds to changes due to treatments within and between the x, y, and z planes. The second objective involves a quantitative examination of the influence of flake moisture content and press closure rate on the resulting density distribution for successive layers in the z-plane. The results relate changes in flake moisture content and press closure rate to the internal density formed as a result of hot-pressing.

IV. LITERATURE REVIEW

Density Distribution

Steiner *et al.* (1978a) noted that potential density distribution problems can exist for a particular wood composite (waferboard) production process. Plath (1974) mentioned that many waferboard properties such as internal bond strength and modulus of elasticity are directly or indirectly related to density distribution. When considering the density of a hot-pressed composite wood panel, a horizontal and vertical component of the density distribution should be recognized.

According to Suchsland (1962), the horizontal density distribution is determined by flake geometry. Suchsland (1959) theorized the horizontal density distribution followed a binomial distribution and the variation was a function of the amount of void space or air volume in the layers. Increasing the void space results in more density variation at a given panel density and thickness (Suchsland 1967). Excessive thickness swelling and "telegraphing", panel surface distortions or unevenness due to differential thickness swelling, result when the horizontal density distribution range is high (Suchsland 1962). Suchsland and Xu (1989) developed a flakeboard model to examine the influence of a horizontal density variation on board performance; the horizontal density variation directly affects internal bond strength and thickness swelling.

The vertical density distribution or profile is the result of flake characteristics and processing variables. The time dependent nature of temperature and heat transfer from the press platens to the core of the mat, along with moisture migration, all effect wood

compression strength and result in the formation of the vertical density profile (Suchsland 1962). Mechanical properties are notably affected by the vertical density profile (Strickler 1959). The vertical density profile influences panel strength properties in bending, but, for average density panels, usually at the expense of internal bond strength, shear strength, and screw withdrawal resistance (Kelly 1977). Thickness swell is also influenced by the vertical density profile (Price and Hse 1982; Davis 1989) and has been strongly correlated with changes in density (Steiner *et al.* 1978b). Davis (1989) reported a correlation between accelerated aged internal bond strength and the core density region; as density decreased, thickness swell increased.

Flake Moisture Content

Flake moisture content is an extremely important factor in the production of all (including veneered panels) hot-pressed wood panels. Moisture content controls heat transfer from the board faces to the core, which subsequently effects resin polymerization and the formation of board physical and mechanical properties. Too much furnish moisture interferes with resin cure and can cause overpenetration of resin solids (Wellons 1980). High flake moisture content dictates longer pressing times in order to reduce chances of internal delamination or "blows" due to excess steam pressure. Too little moisture content causes the wood substrate at the board faces to act as an insulator and inhibit heat transfer and retard resin cure. A condition known as dryout may result at low moisture content levels; resin solids are left immobilized at the glue-line (the opposite of overpenetration) (Wellons 1980).

Effects on the Vertical Density Profile

The compressive or crushing strength of wood is inversely related to moisture content (Strickler 1959; Kunesh 1961; Geimer *et al.* 1975). Densification results when press compaction pressure exceeds wood compression strength - wet wood is easier to press, in terms of force, than dry wood. As the press closes to a position defining a target board thickness, the degree of densification is not equal throughout the board thickness. Suchsland (1962) related this to the time dependence of moisture transfer through the mat thickness. Strickler (1959) noted that moisture content and moisture content distribution play important roles in the layer density throughout the board thickness. Higher mat moisture content results in a higher rate of temperature increase in board face and core layers (Strickler 1959; Kamke and Casey 1988; Kamke and Wolcott 1991). Higher flake moisture results in a larger disparity between face and core layer densities, with the face densities higher than the core densities. Other researchers have reported similar effects of flake moisture on the vertical density profile (Suchsland 1959; Heebink *et al.* 1972; Geimer *et al.* 1975; Harless *et al.* 1987; Winistorfer and DiCarlo 1988; Davis 1989).

Press Closure Rate

Press closure rate, also called time to stops, is the time required to press a mat, beginning when the mat surface touches the bottom platen surface, on an up-acting press, and ending when the mat is compacted to a final thickness. The closure rate can significantly influence board physical and mechanical properties (Strickler 1959;

Suchsland 1967; Kelly 1977; Geimer and Price 1978).

Effects on the Vertical Density Profile

Suchsland (1962) explains the formation of the vertical density gradient with respect to pressure, heat, and moisture transfer, and compressive strength failure of wood through the board thickness. A fast press closure rate induces greater compressive failure and densification near surface layers; A slower closure rate permits more densification in the interior layers by allowing the core region temperature to increase and thereby reduce wood compressive strength. A slower closure rate produces surface and core layers more similar in density. Strickler (1959), Heebink *et al.* (1972), and Geimer *et al.* (1975) studied closure rates and arrived at similar conclusions; fast closure rates influence the formation of a large vertical density gradient while slower closure rates result in more uniform density gradients. Kelly (1977) surmised the same points. Kamke and Casey (1988) noted that in general, a high mat densification rate was achieved using fast closure rates.

V. EXPERIMENTAL DESIGN

A preliminary study was conducted in order to assess the normal density variation expected in the x, y, and z planes of a pressed laboratory panel. The results of the prestudy were used to recommend a sampling scheme to achieve a desired level of precision for the actual experimentation. For the prestudy, six laboratory panels were pressed using established laboratory procedures. However, to effect a change in the density profile and perhaps the density distribution, press closure rate was the parameter selected to be varied; 20 second and 100 second rates, respectively. Three panels were pressed at each closure rate. Panel dimensions were 18 x 18 x 1/2 inches. Target panel density was 40 lbs/ft³. The press cycle was identical for all six panels except for closure rate; 4 minutes total with a 20 second degas period. Panels were minimally trimmed to ensure representation of the density changes near the panel edges. Two panels for each closure rate were randomly selected and scanned with a gamma-ray densitometer on a grid of 15 inches in the x dimension (width), 17 inches in the y dimension (length), and 16 steps (layers) in the z dimension (thickness), producing a total of 4,080 observations of density for each panel. The panels were intensively sampled to determine the relative magnitude of variation and establish an ideal grid size sampling scheme to produce plots.

Tables A1 and A2 in Appendix A show the analysis of variance (ANOVA) results where a linear model was fit based on grid positions with all main effects and interactions, except for the four-way interaction, for each closure rate or process. Slight panel to panel differences existed within each process. The z dimension was the largest contributor to variation in density which was to be expected because of the formation of

the vertical density profile. The z dimension effect was relatively independent of x and y since the x-z and y-z interaction mean squares were much smaller compared to the x-y interaction mean square. Variation in the x and y dimensions can usually be attributed to forming or press platen variation. Z-dimension variation is usually greater in magnitude than the variation in x-y dimensions and results primarily from the phenomenon of heat and mass transfer through the thickness of the panel.

In addition to the previous analyses of variance, the same model was fit to reduced data sets that essentially represented panels that were trimmed one inch along all four edges. Tables A3 and A4 show the ANOVA results for the same panels within each process trimmed an additional inch. The pattern of variation by position remained the same when comparing panels from the same process. The variation in density was reduced, as evidenced by a reduction in the mean squares, a measure of pooled variability which indicates an amount of naturally occurring experimental variation, when comparing minimally trimmed panels to panels trimmed an additional inch. Panel edges tend to be looser after mat felting and would typically exhibit lower density compared to other regions in a panel at similar thicknesses.

Future determinations of laboratory panel density, based on the sampling scheme producing 4,080 observations/panel, were deemed prohibitive due to practical reasons; approximately eight hours were required to sample one panel at this level.

A sampling scheme to reduce the number of panel samples was investigated. The concept was to efficiently sample, in terms of time and effort, in a systematic, fractional fashion producing a lesser number of observations, allowing an accurate characterization

of the density variation within a laboratory panel. A computer software package was employed that systematically generated a subset of a specified number of observations for a given panel, based on the original dataset of 4,080 observations. The least squares means, an adjusted mean that standardizes data from experimental units treated alike, for the two panels within a process (closure rate), were determined for all levels of x, y, and z grid positions (variables) from the full dataset of 4,080 observations per panel and from the reduced dataset containing a fractional subset of the full dataset. Tables A5 and A6 in Appendix A list the least squares means for all levels of x, y, and z from the full data set (largemeans) and reduced dataset (smallmeans) containing 85 and 255 observations per panel, respectively. A scatter plot of the least squares means from the full and reduced datasets for each variable x, y, and z reveals how the reduced dataset characterizes and represents the full dataset for that variable. If the points generally fall in a line for a given variable, the number of observations in the reduced dataset is adequate in terms of representing the full dataset, with its characteristic variation patterns.

Figures 2, 3, and 4, respectively, show the adequacy of a reduced dataset containing 85 observations per panel for variables x, y, and z. Variables x and y are not as well reflected as is z, based on this number of observations. Figures 5, 6, and 7 are based on 255 observations per panel for the x, y, and z variables, respectively. Variables x and y are better characterized when sampling a panel for this number of observations, based on the systematic sampling strategy developed by the software E4 (Evolutionary Software, Inc. 1991). Variable z is also better characterized and represented when using this scheme, as the tighter clustering indicates in Figure 7.

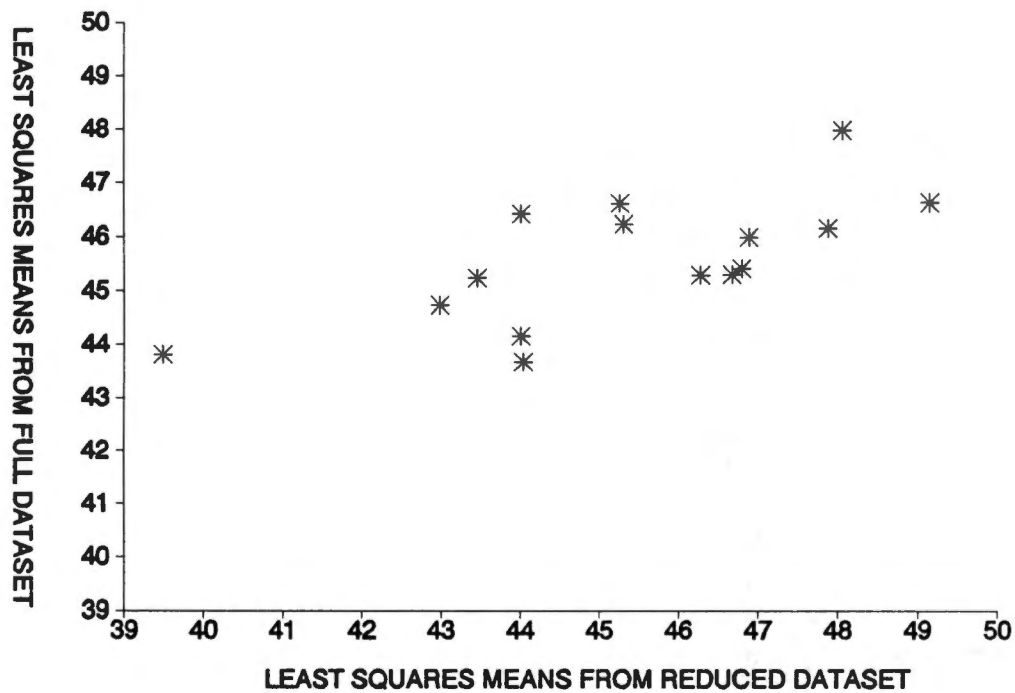


Figure 2. Scatter plot of least squares means of full and reduced datasets for variable x with 85 observations/panel. Density values reported in lbs/ft³.

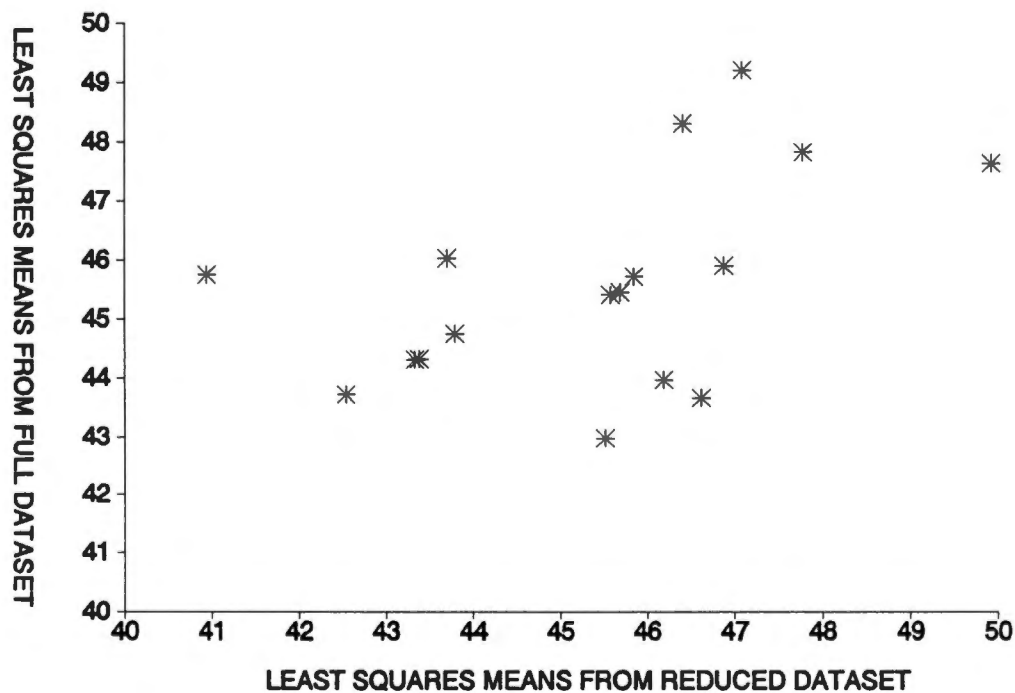


Figure 3. Scatter plot of least squares means of full and reduced datasets for variable y with 85 observations/panel. Density values reported in lbs/ft³.

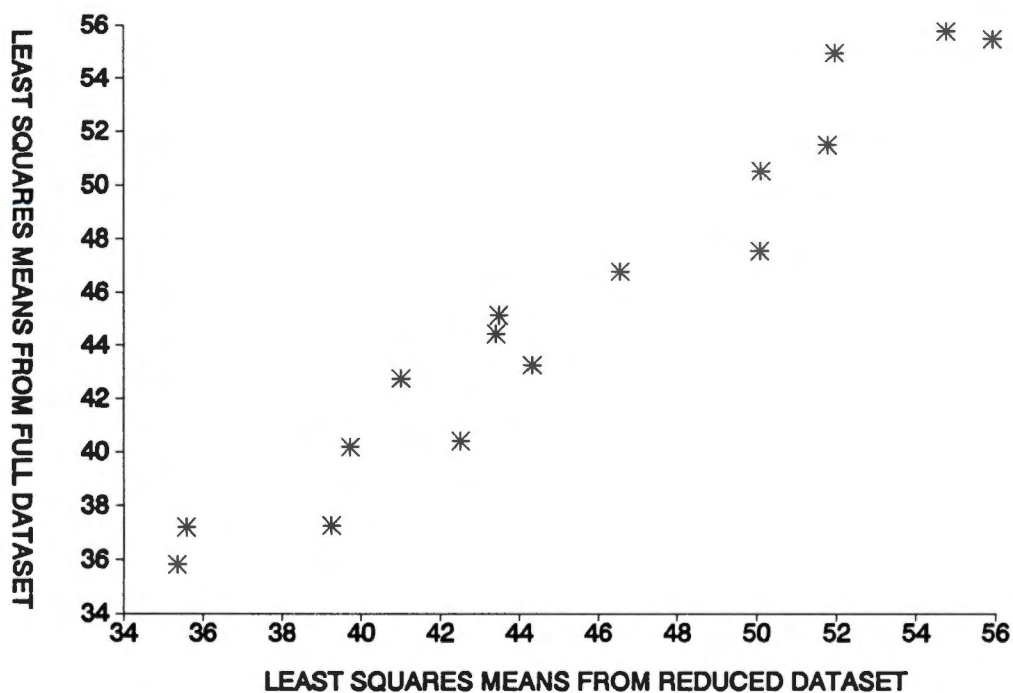


Figure 4. Scatter plot of least squares means of full and reduced datasets for variable z with 85 observations/panel. Density values reported in lbs/ft^3 .

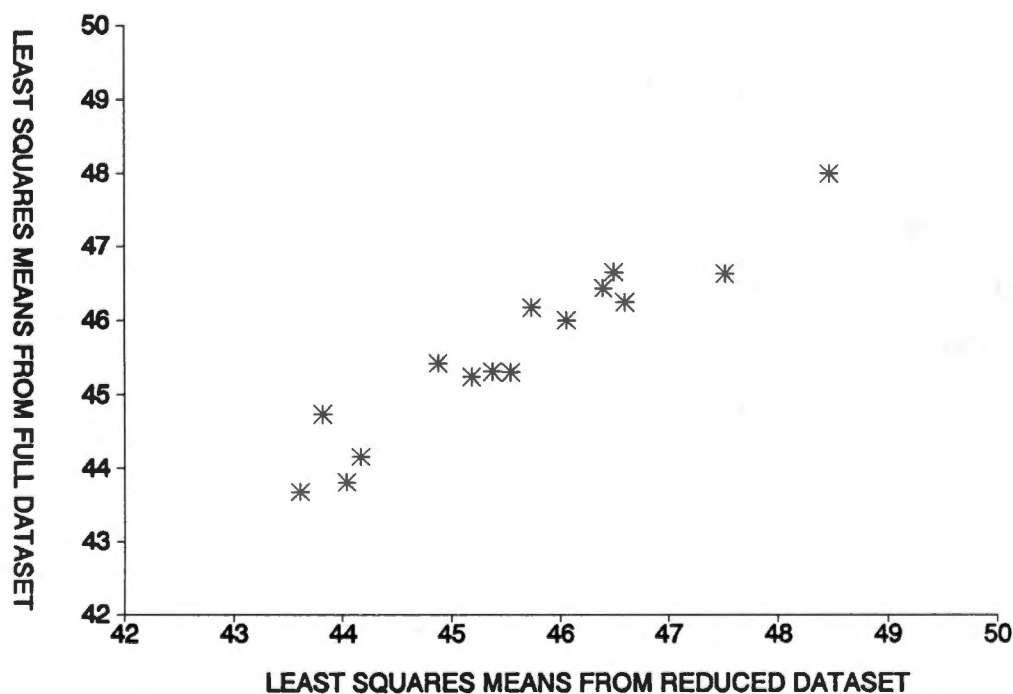


Figure 5. Scatter plot of least squares means of full and reduced datasets for variable x with 255 observations/panel. Density values reported in lbs/ft^3 .

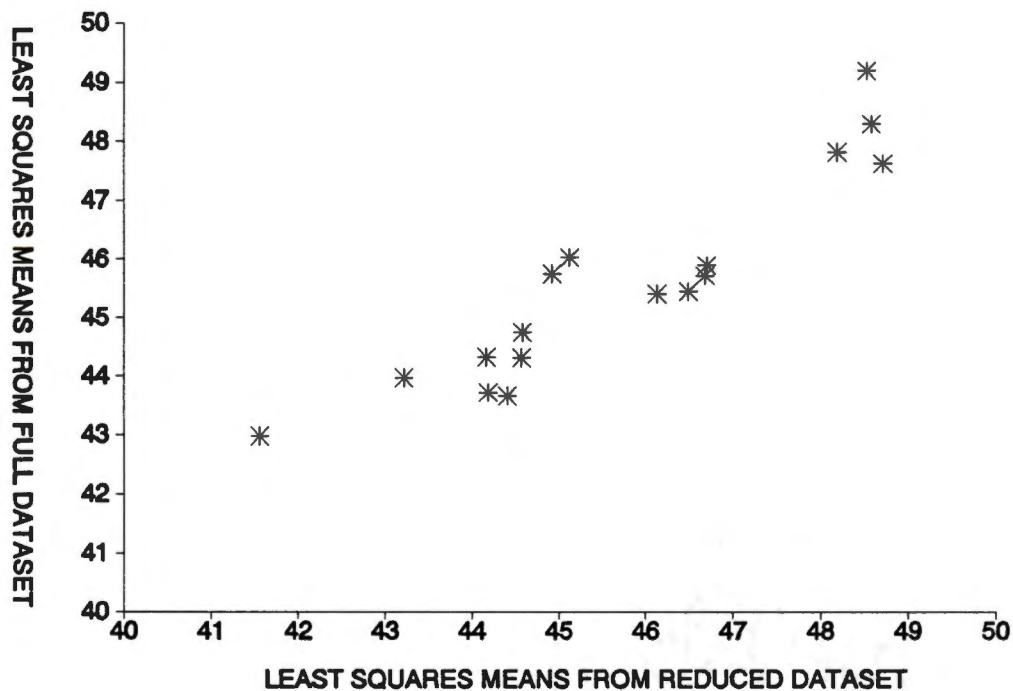


Figure 6. Scatter plot of least squares means of full and reduced datasets for variable y with 255 observation/panel. Density values reported in lbs/ft³.

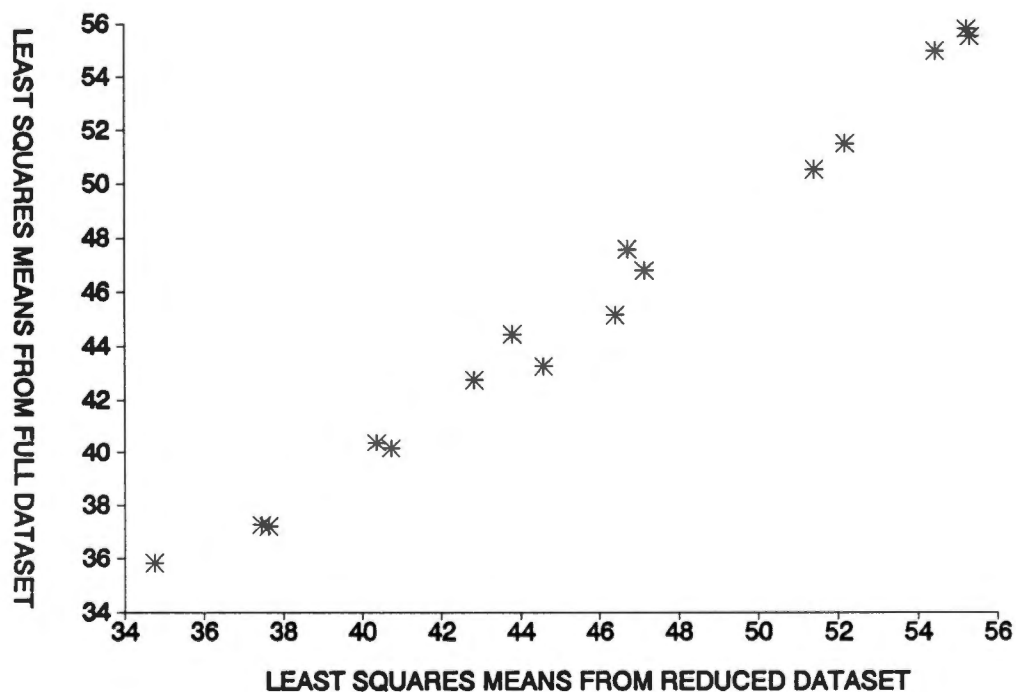


Figure 7. Scatter plot of least squares means of full and reduced datasets for variable z with 255 observations/panel. Density values reported in lbs/ft³.

Patterns of density change in the x-y plane appeared to vary randomly and were not predictable from one x-y plane (layer) in a panel to the same layer in another panel treated alike. This was evident among both panel sets examined.

The computer generated sampling scheme could not be applied to the future scanning of panels in the final experimentation due to the limited flexibility in setting the stepping interval for the z-dimension. While, stepping interval can be set at any value, once set, it usually remains at that setting for the entire scan. The computer generated scheme called for random samples in the z-dimension for a specified number of x-y points on a panel.

Final experimentation was conducted as a complete factorial with three replications, analyzed as a split-plot design (Figure 8) (Anderson and McLean 1974). Two factors, furnish moisture content and press closure rate, each at three levels resulted in nine treatments randomly assigned to the experimental units (panels) for each replication; a total of twenty-seven panels for the study. The whole plot treatment was furnish moisture content. Because replication served as a blocking factor, the interaction mean squares of replication by furnish moisture content was used for the whole plot error (error A). Press closure rate was the sub-plot treatment with the interaction mean square of replication by furnish moisture content by closure rate serving as the sub-plot error (error B). The whole plot and sub-plot treatment error sum of squares and degrees of freedom were partitioned into two components, one component to estimate the linearity of the response variable (density) to the treatment and the other component to estimate the lack-of-fit of the response variable to the linear model.

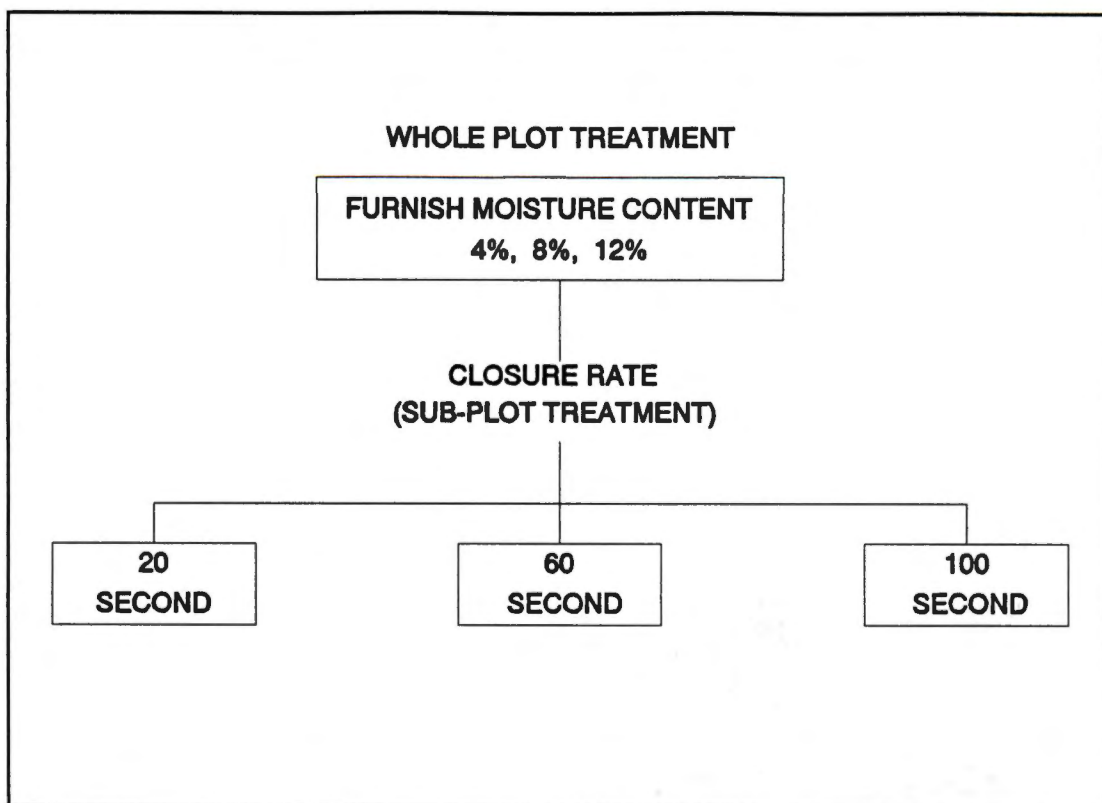


Figure 8. Flow chart of experimental design depicting factors and factor levels as a complete factorial analyzed as a split-plot design.

VI. MATERIALS AND METHODS

Furnish

Aspen (*Populus tremuloides*) was used as the flake material. Flakes (furnish) were manufactured to dimensions of 3 inches in length, 1 inch in width, and .026 - .028 inches in thickness, using a laboratory flaker. Furnish was divided into three batches and conditioned to three moisture contents - 4%, 8%, and 12%. Initial furnish moisture content ranged from 6% to 7%. Experimental laboratory dry kilns were used to condition flakes to 4% and 12% moisture content. A humidity chamber was used to condition the remaining flakes to 8% moisture content. Furnish moisture content was monitored by randomly sampling flake batches. After conditioning, flakes were placed in plastic bags and sealed from ambient air conditions until further processing.

Resin

The resin used was a commercially prepared liquid phenol-formaldehyde (Georgia Pacific GP-107C38 Resi-Stran) with a solids (nonvolatile) content of fifty-one percent. Application rate was 3.5 percent resin solids based on furnish oven-dry weight.

Panel Manufacture

Single panels served as the experimental unit and represented a randomly selected combination of treatments. A furnish moisture content level was randomly selected and a three panel batch of flakes was blended with resin. Resin was atomized on the flakes

using a pressurized air spray system within a rotary, cascading-action drum blender. Spray time was approximately 7.5 minutes for each of the nine individual blends. Air-atomization pressure at the nozzle was 30 pounds/inch² (psi). Mats were hand-felted in an 18 by 18 inch forming box, at 38 lb/ft³ per panel, oven-dry basis. One of three sub-plot treatment levels (press closure rate) was randomly assigned to each panel within a batch. Panels were pressed at 400°F to one-half inch thickness using steel stops on a computer controlled 100 ton hydraulic press with electrically heated platens, as described by McFarland and Winistorfer (1991). Total press time was 5.5 minutes with a 20 second degas period. Time to stops changed according to the closure rate treatment assigned to the panel. A longer press time, compared to the prestudy press time, was used in order to achieve adequate resin cure and reduce chances for blows, especially for panels with 12% furnish moisture content.

Sample Preparation

Nine panels were manufactured for each replication, resulting in twenty-seven panels as required for the experimental design. Panels were labelled consistently after pressing indicating top and bottom faces, as well as left, right, front, and back panel edges. Panels were trimmed to 16 by 16 inches, eliminating the loose edges. A sampling grid of 8 x 8 x 16 in the x, y, and z dimensions, respectively was used for the trimmed panels. Panels were subsequently cut into eight, 1.87 inch wide strips. Strips were labelled consecutively from left to right panel edges representing individual panel x - dimensions. Figure 9 illustrates panel sectioning and axes of orientation. Along the left

edge of each strip, marks were inscribed at two inch intervals, beginning from a one inch offset at the top edge of the strip. These marks corresponded to the sampling grid for the y - dimension. The strip top, corresponding to the back edge of the panel as it was pressed, was marked as the first y - position on all x - strips.

To reduce chances of inducing thickness swelling, strips were not conditioned to a similar equilibrium moisture content (EMC). The collection of density data was performed over a two week period in a room where ambient EMC never exceeded 10%. All panels from one replication were initially weighed when transferred to the room. Subsequent weighings, with a final weighing at the three week period, revealed slight weight increases in most panels. The largest increase in a panel weight was 13.1 grams or a change of 1%. Based on this information, post-pressing EMC of the strips was believed to be below 12% which, according to Laufenberg (1986), results in a predicted density error of less than 1% when using a scanning gamma ray densitometer for density profile measurement as described by Winistorfer *et al.* (1986).

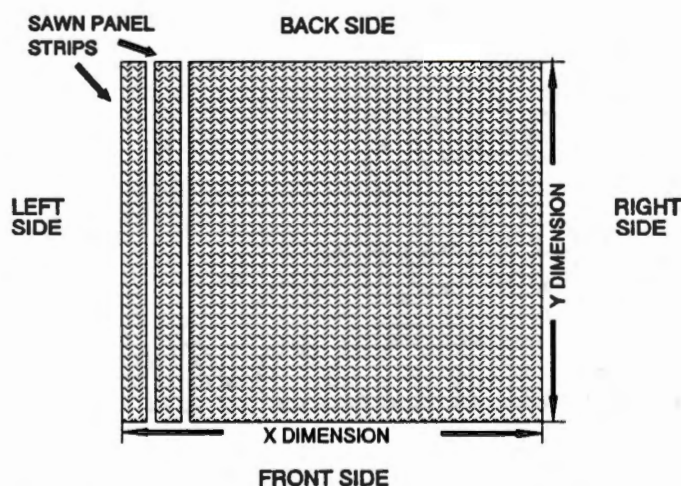


Figure 9. Panel axes of orientation in relation to panel edges. Panel front edge corresponds to front of hot-press. Panel sectioning into strips made along x-axis.

Gamma Ray Densitometry

Direct scanning radiation densitometry has seen increased applications in density gradient measurement of composite wood products (Ferraz 1976; Laufenberg 1986; Winistorfer *et al.* 1986; Winistorfer and Moschler 1987). Advantages of using this measurement technique over the traditional gravimetric method include the nondestructive nature of the test and faster density determination with greater accuracy and resolution (Laufenberg 1986; Winistorfer *et al.* 1986).

Scanning gamma ray densitometry works on the principle of passing a photon beam of radiation through a material that attenuates the radiation. An aperture positioned in front of the source and detector, usually a photoscintillator, focuses or collimates the radiation beam limiting the area scanned within a sample. Density is then related to the percentage of radiation absorbed over the scanning period.

Density measurements were made using a radiation source of 100 millicuries of americium 241 (Am^{241}) with a photon energy of 0.06 million electron volts (60 KEV). Panel strips were clamped in a mounting jig positioned on a movable carriage driven by a stepper motor. Strips were positioned in the jig along marks previously scribed on strip edges to coincide with the radiation beam. Scans were made at all panel x-y coordinates with sixteen steps through the thickness (z - dimension) using a ten second count interval. Figure 10 depicts strip positioning relative to the radiation source and photoscintillation detector.

Individual density determinations from the sixty-four vertical density profiles developed for all panels were reassembled to represent sixteen layers through the panel

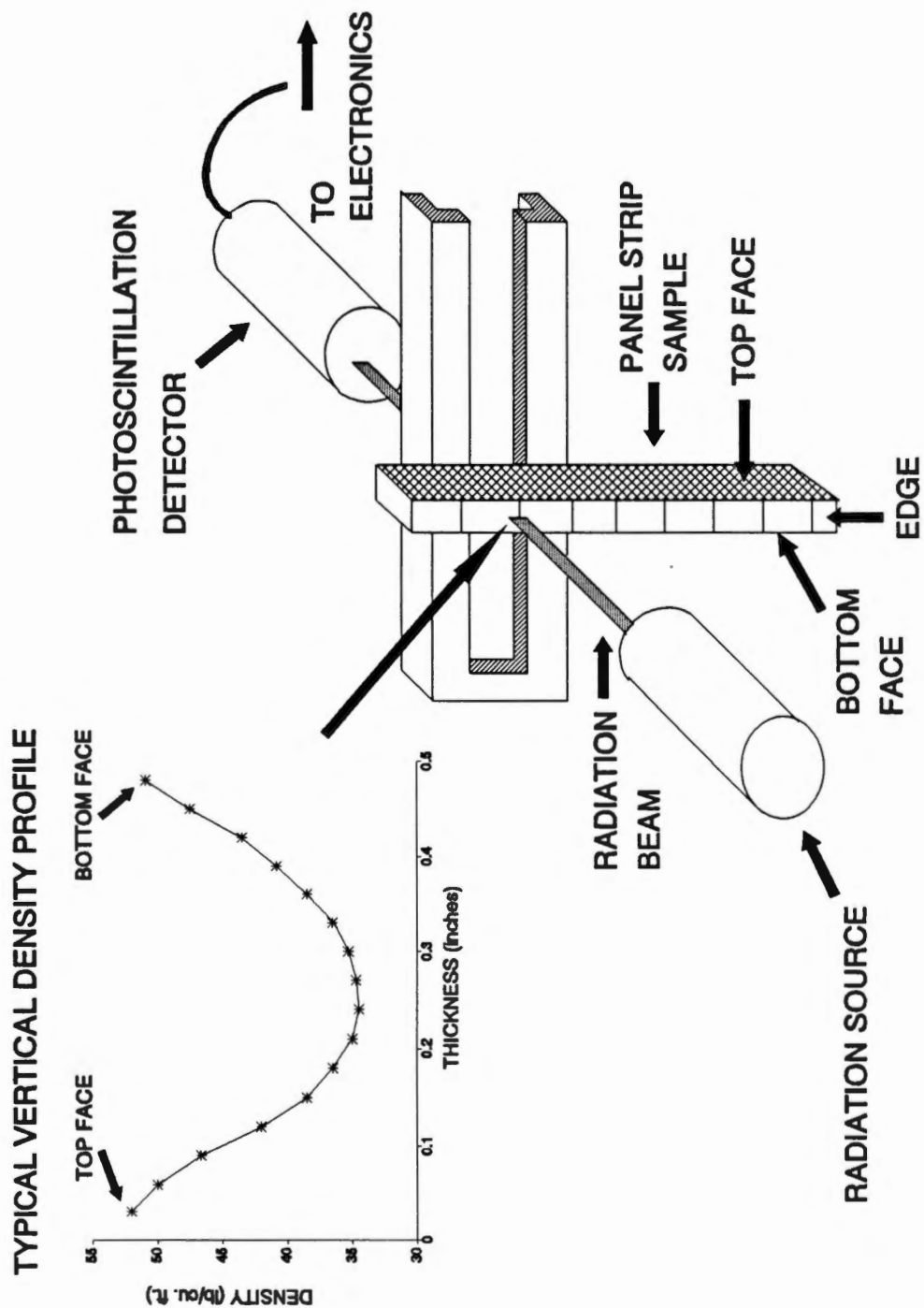


Figure 10. Scanning technique and sample placement in relation to radiation source, detector, and beam. Panel strip samples are scanned parallel to x-y plane. A graph of a scan is shown depicting change in density from panel top face to bottom face.

thickness for all twenty-seven panels. Figure 11 depicts the surfaces produced with the sampling point represented as a dot (surfaces are not to scale or representative of the 8 x 8 sampling grid). Each surface represents a 0.03 inch plane through the panel thickness. Each plane or surface contained 64 observations from x-y coordinates within a z - coordinate. A total of 1,024 observations (8x8x16) per board were collected for all twenty-seven laboratory panels.

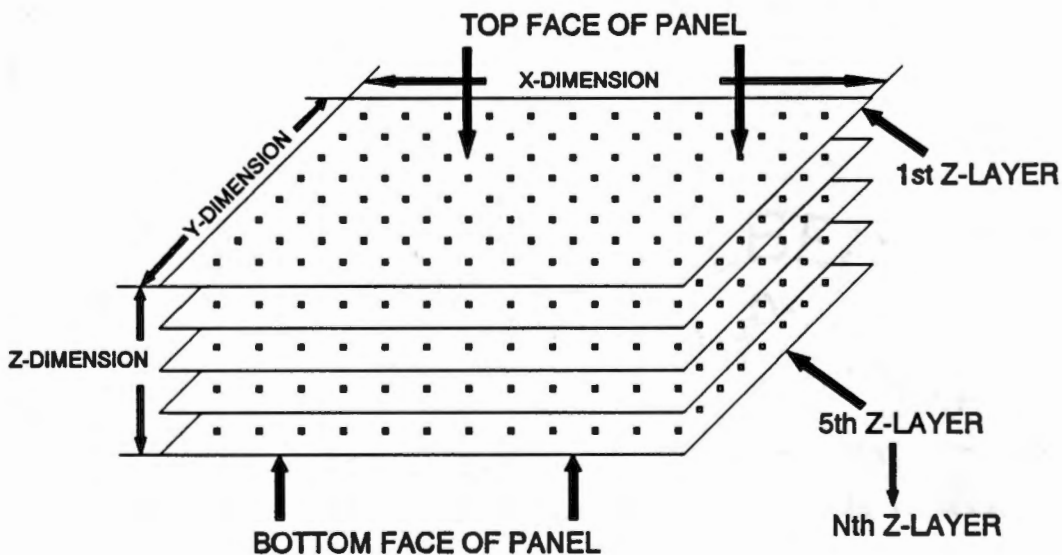


Figure 11. Representation of rearrangement of density values to express changes among layers throughout the panel thickness.

VII. RESULTS AND DISCUSSION

The process variables flake moisture content and press closure rate were analyzed statistically to determine their effects on density throughout the panel thickness (z-axis). The amount of density variation within panels and changes in density variation across treatments were also analyzed. Results are discussed by process treatment for panel density and standard deviation of panel density for all z-layers (16). All main effects (flake moisture content and press closure rate) mean densities and interaction of main effects mean densities by z-layer are listed in Tables A7 and A8, respectively. Response surface plots depicting panel density changes from z-layer to z-layer for all treatment combinations are shown in Appendix B. Plots were produced using SAS/GRAPH software and employing a spline interpolation procedure to create optimally smoothed surfaces (SAS 1990). The spline interpolation procedure generates a surface "that can be thought of as one that would be formed if a stiff, thin metal plate was forced through or near the given data points" (SAS 1990). All surfaces are displayed, each on a single page, for each panel in succession from panel top face (z-layer=1) to panel bottom face (z-layer=16) for all treatment combinations. Replications within all treatment combinations follow in succession for a total of 432 plotted surfaces or z-layers.

Flake Moisture Content

Density

To optimize sensitivity to experimental treatments, it was important to minimize within flake density variation. Aspen (*Populus spp.*) was therefore used as a

homogeneous furnish material. Table A9 in Appendix A lists the results of the analysis of variance (ANOVA) for panel density by z-layer for each treatment (factor). Contrasts testing the significance of a linear trend for each main effect (flake moisture content and press closure rate) are also shown. The probability values (p-values) are listed below each treatment by the z-layer.

Flake moisture content significantly influenced the density in panel z-layers 3-6, 8, 9, 12, 13, and 15 and marginally affected ($\alpha=0.1$) density in panel z-layers 11, 14, and 16. Z-layers where flake moisture content significantly affected density exhibited a statistically significant linear trend of increasing mean density as flake moisture content increased. The exceptions were z-layers 8 and 9 in the core regions where mean density did increase from 4% to 8% moisture content levels, but decreased at the 12% treatment. For example, as flake moisture content was increased from 4% to 12 %, mean density for z-layer 3 increased from 47.2 lbs/ft³ to 49.1 lbs/ft³ (Figure 14). The significance of the lack of fit for z-layers 7, 8, 9, and 10 indicates the inadequacy of the linear model in terms of describing the behavior of density formation in the core region attributable to flake moisture content. At the 12% treatment level, density decreased compared to the 8% level. This may indicate that to maximize density in the core region, relative to the press cycles for this study, high flake moisture content levels would be deleterious. Figures 12 through 27 display the results from Table A7, listing the means, and Table A9 for z-layers significantly affected by flake moisture content. The mean density for the face z-layers are higher, on average, compared to the core z-layers and increase as flake moisture content increases. Moving from the face z-layers to the core z-layers at

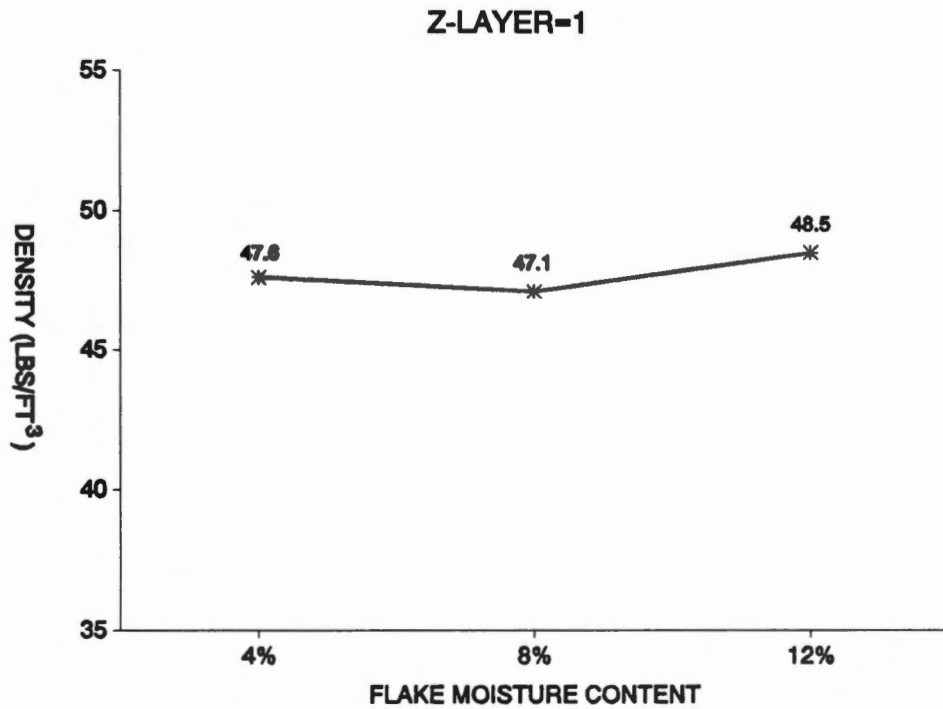


Figure 12. Density change in response to flake moisture content for z-layer 1.

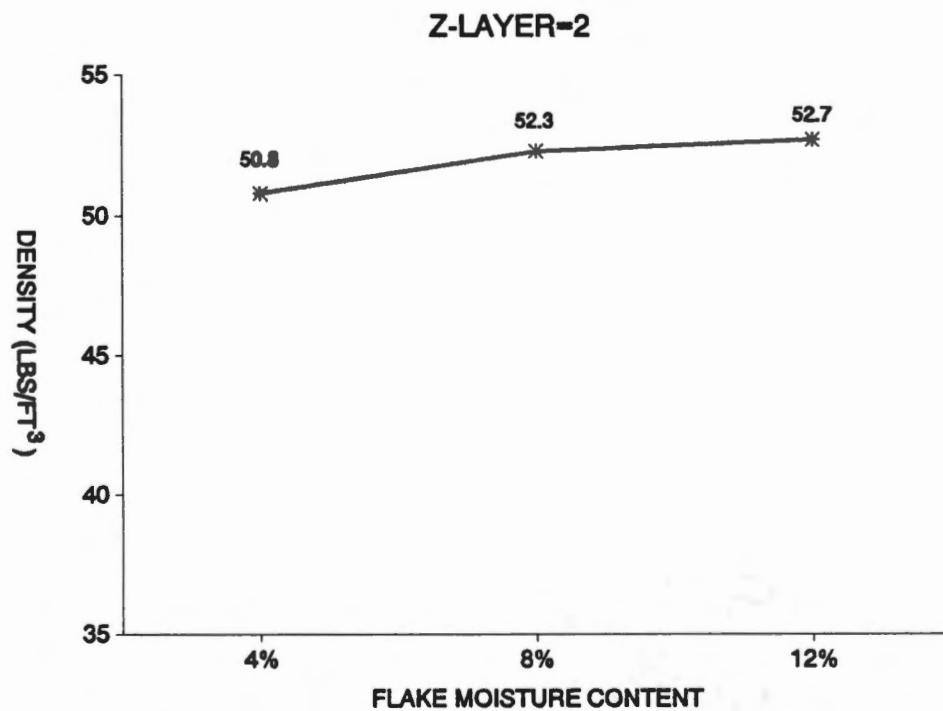


Figure 13. Density change in response to flake moisture content for z-layer 2.

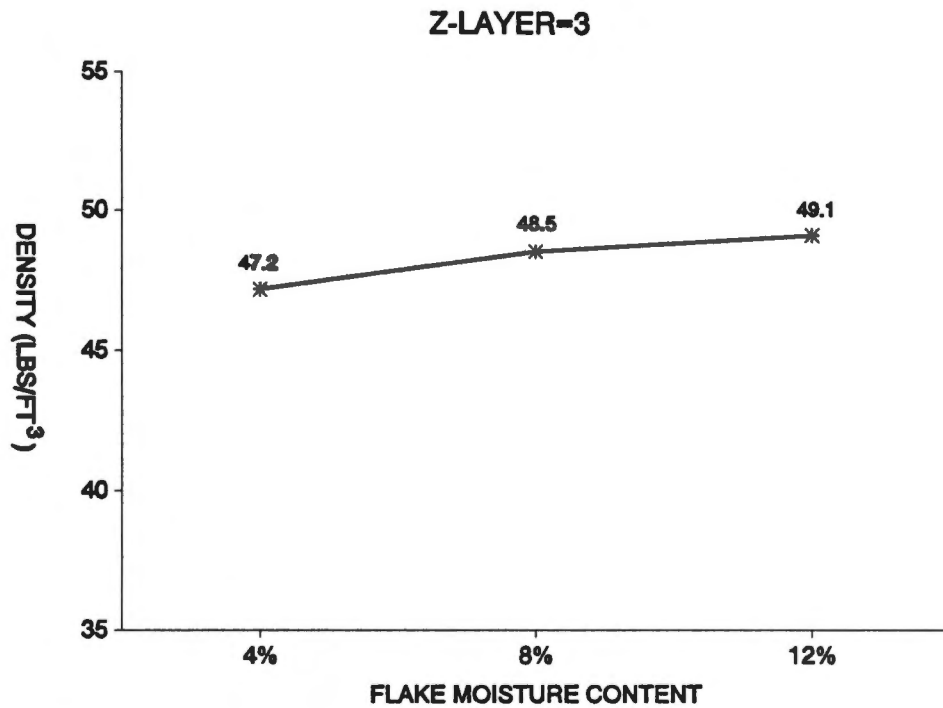


Figure 14. Density change in response to flake moisture content for z-layer 3.

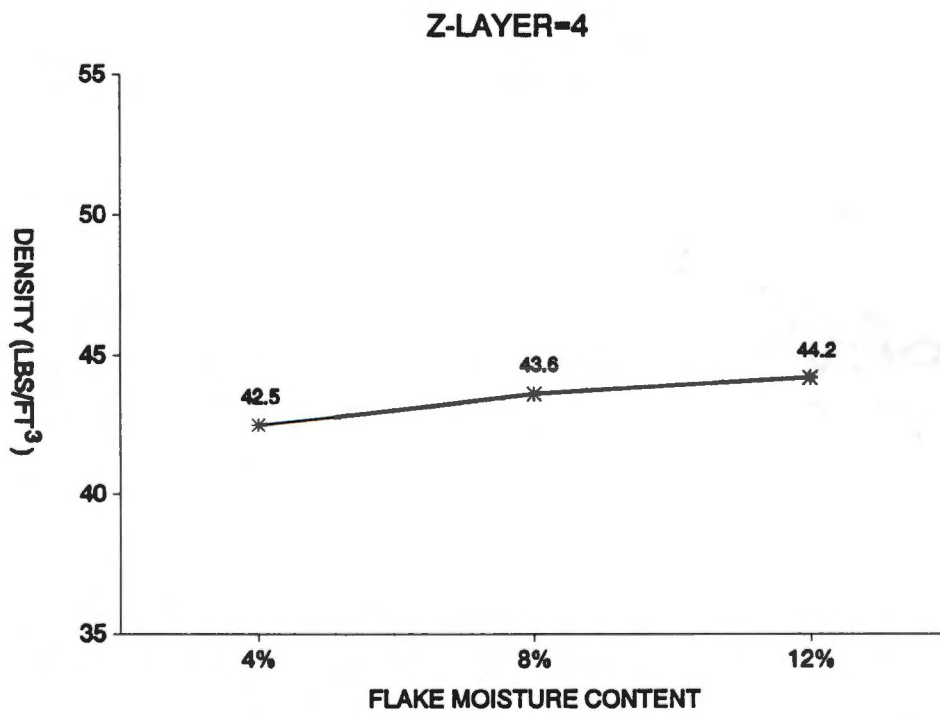


Figure 15. Density change in response to flake moisture content for z-layer 4.

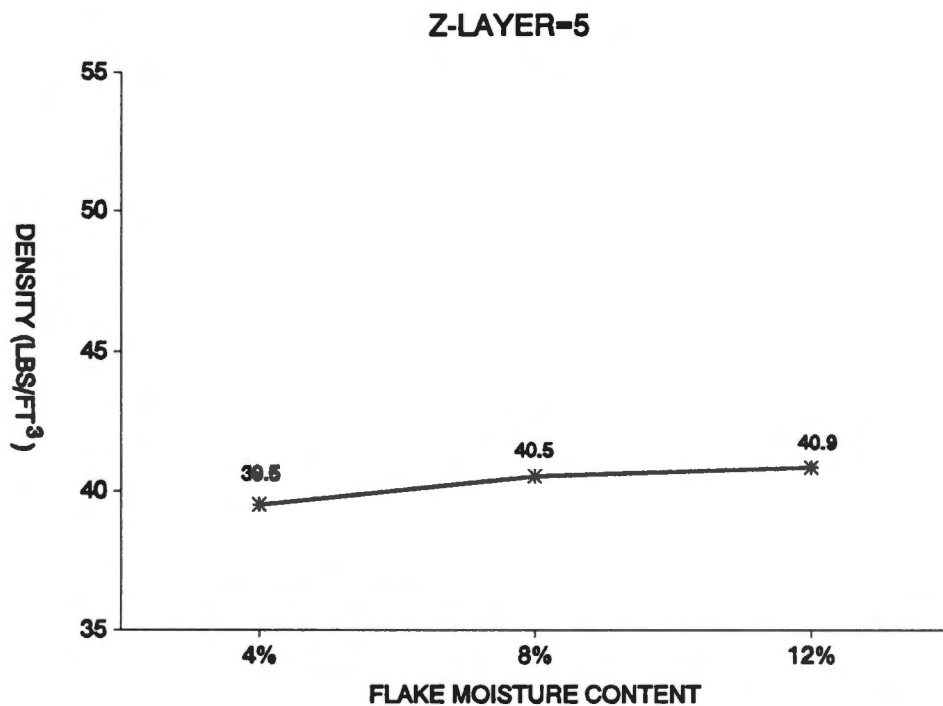


Figure 16. Density change in response to flake moisture content for z-layer 5.

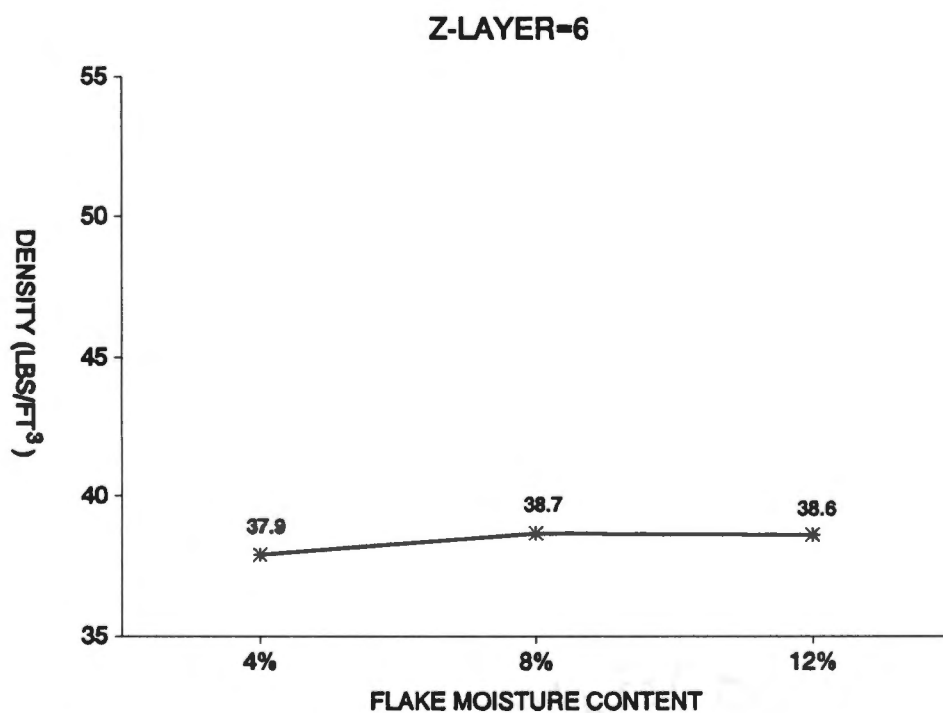


Figure 17. Density change in response to flake moisture for z-layer 6.

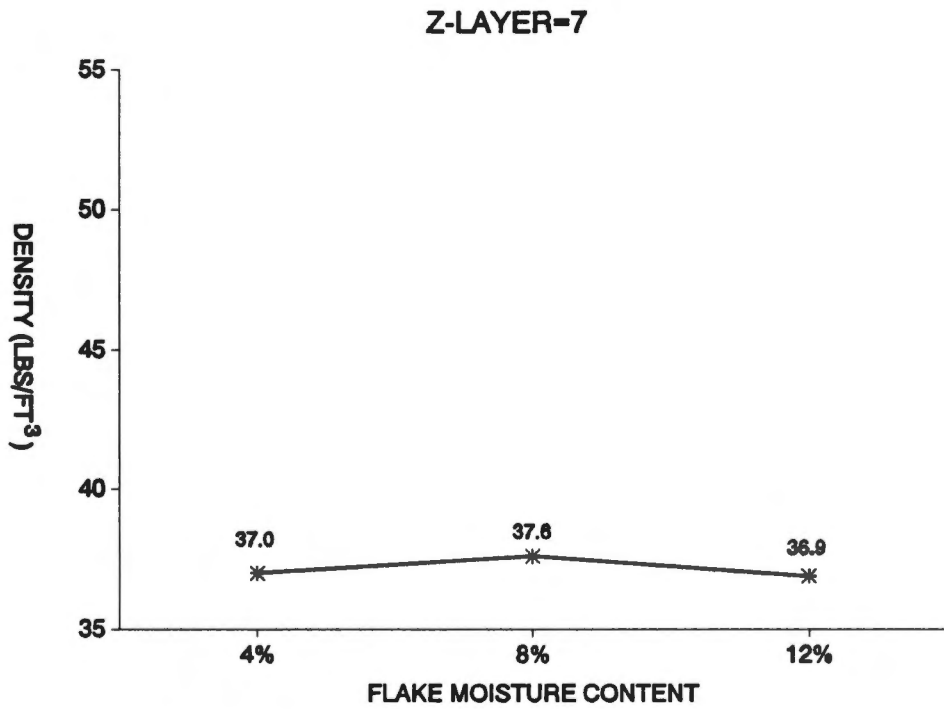


Figure 18. Density change in response to flake moisture content for z-layer 7.

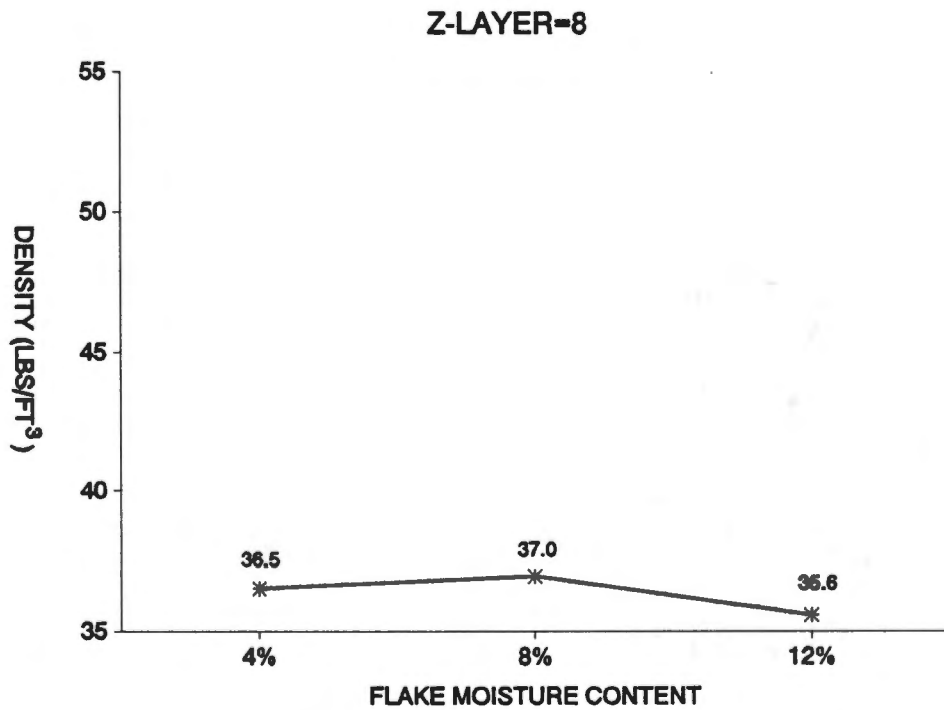


Figure 19. Density change in response to flake moisture content for z-layer 8.

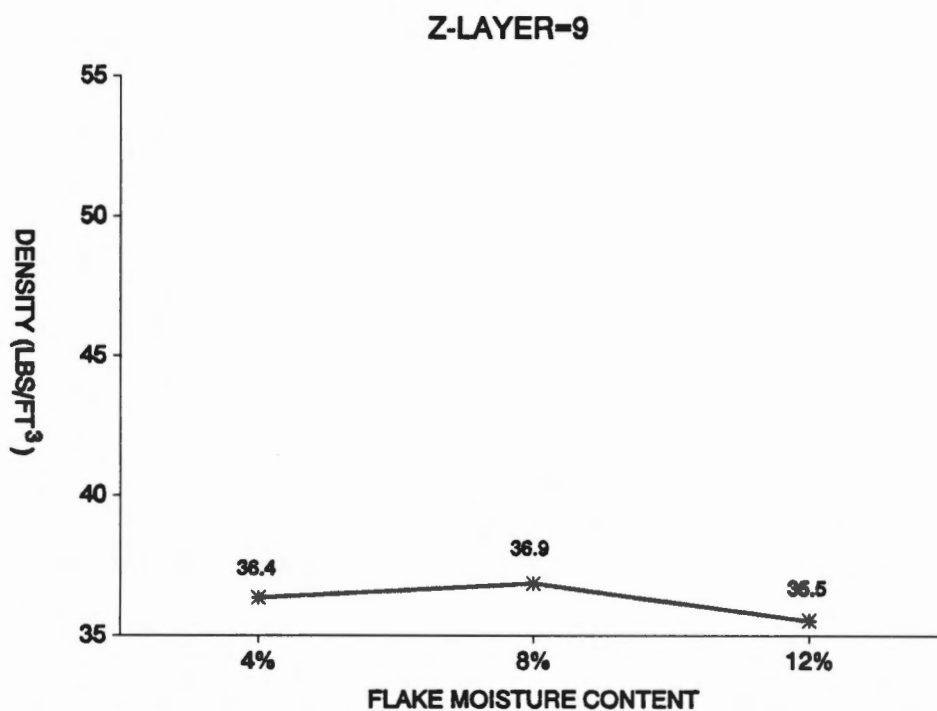


Figure 20. Density change in response to flake moisture content for z-layer 9.

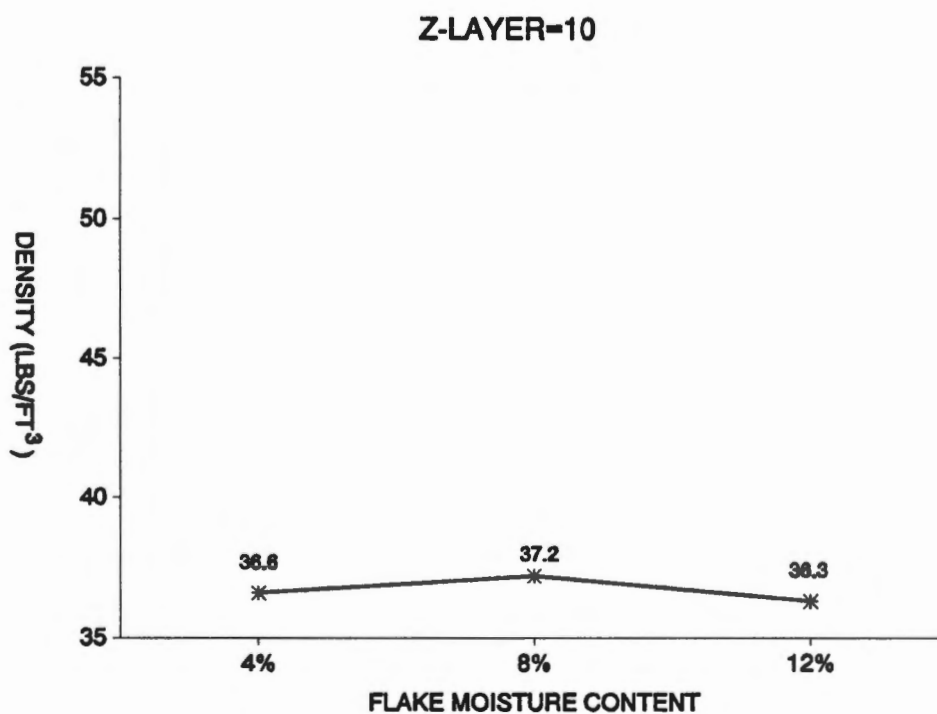


Figure 21. Density changes in response to flake moisture content for z-layer 10.

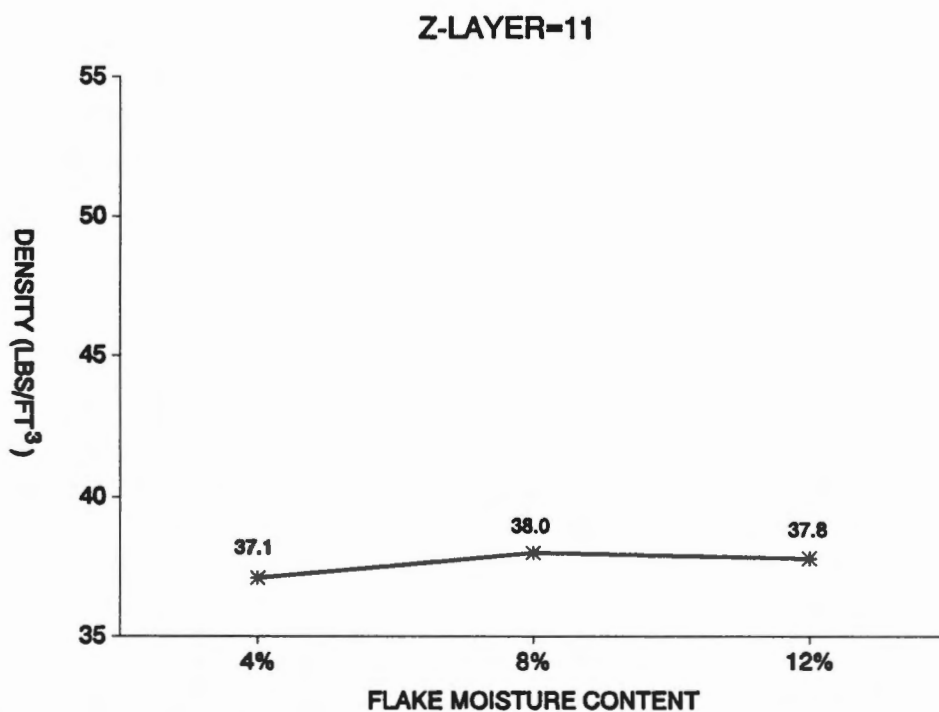


Figure 22. Density change in response to flake moisture content for z-layer 11.

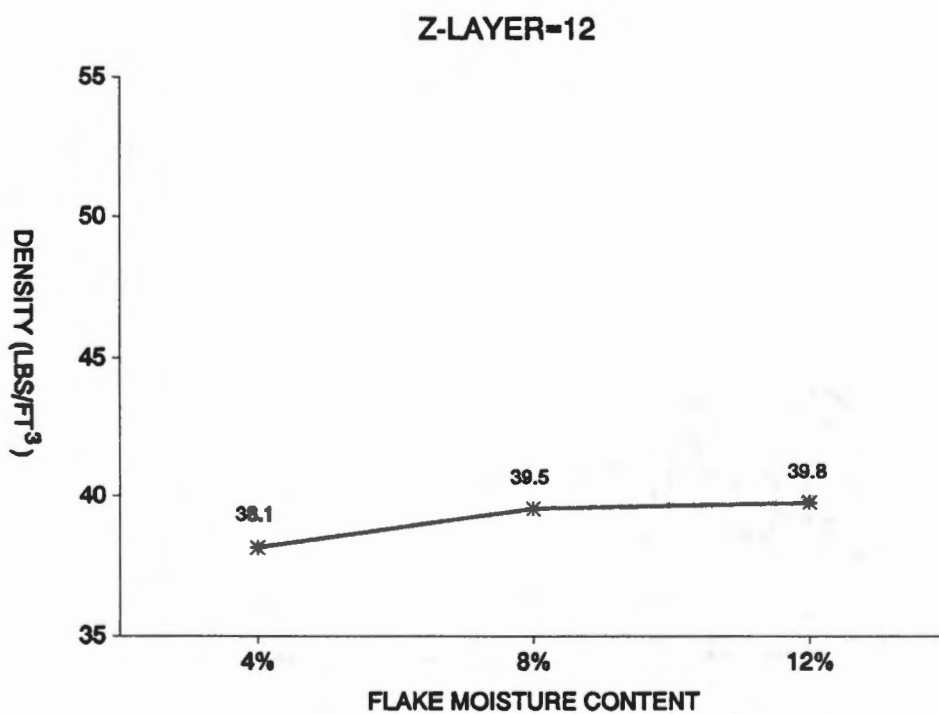


Figure 23. Density change in response to flake moisture content for z-layer 12.

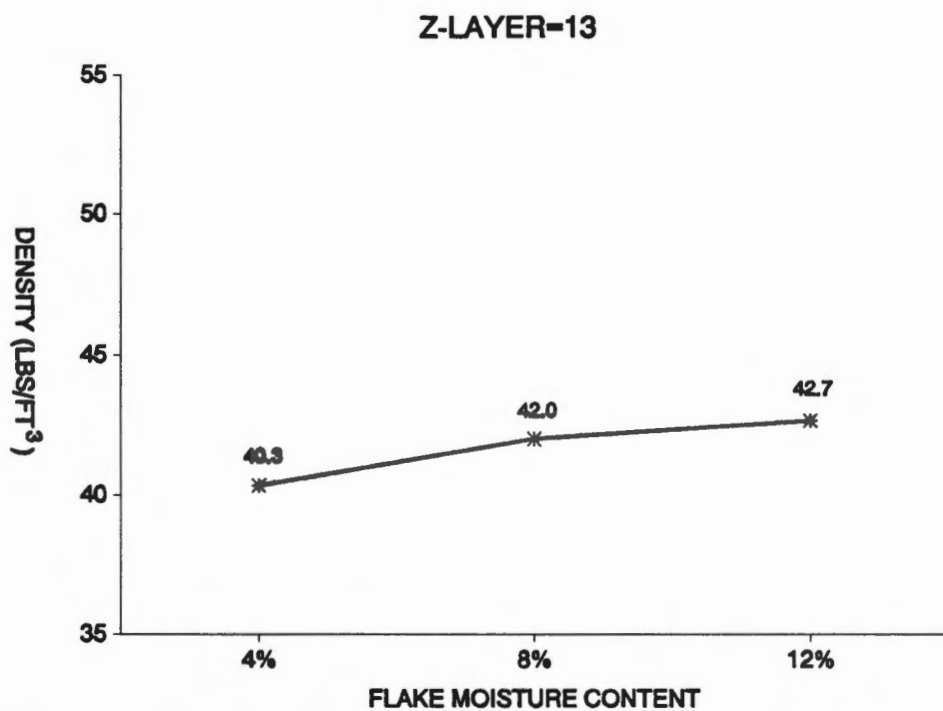


Figure 24. Density change in response to flake moisture content for z-layer 13.

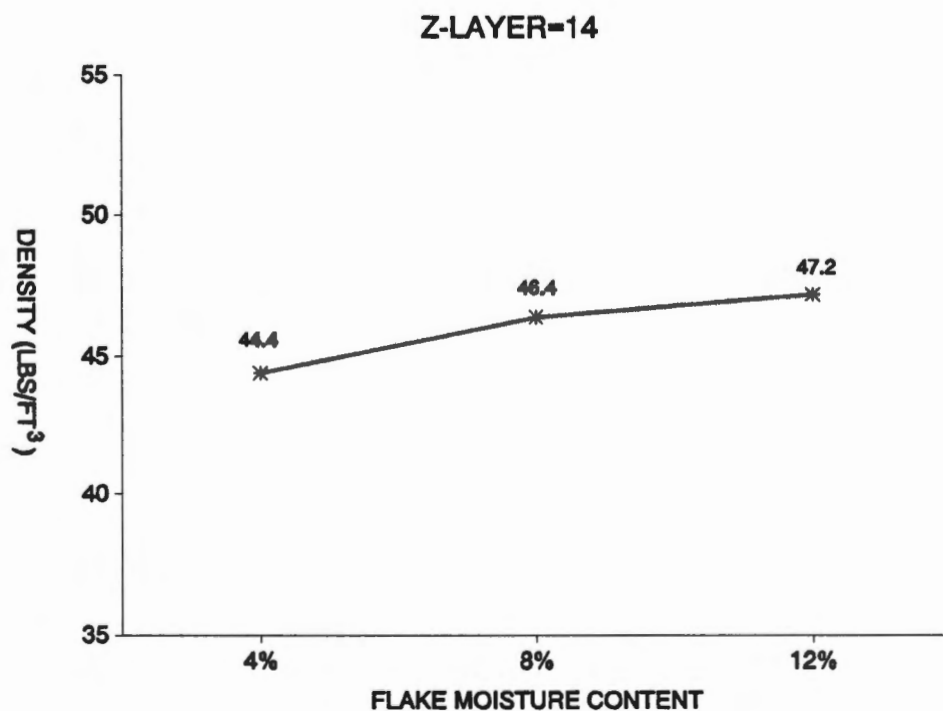


Figure 25. Density change in response to flake moisture content for z-layer 14.

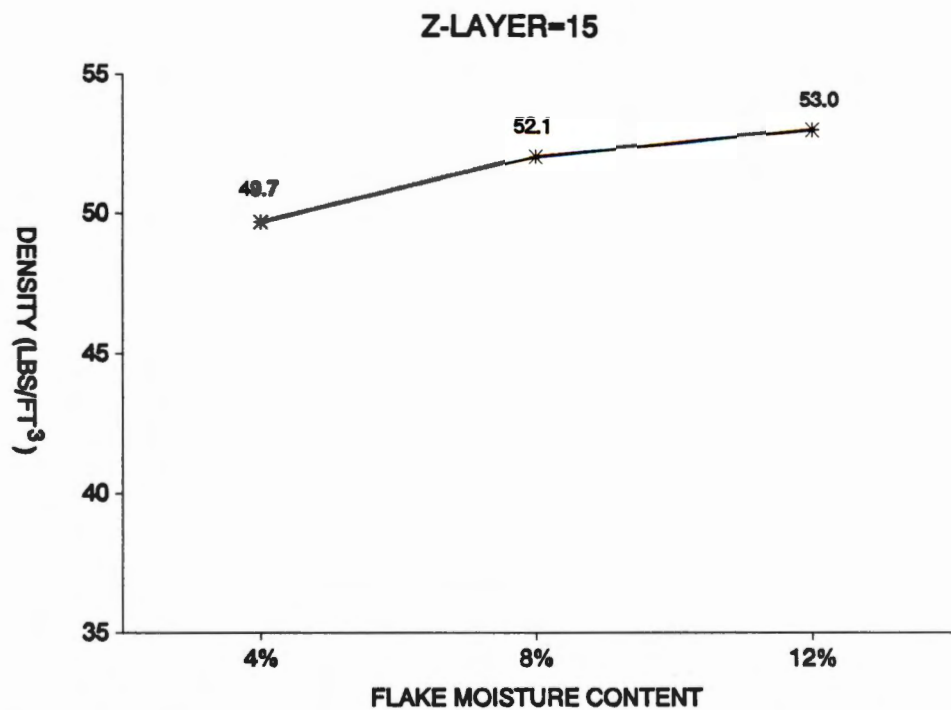


Figure 26. Density change in response to flake moisture content for z-layer 15.

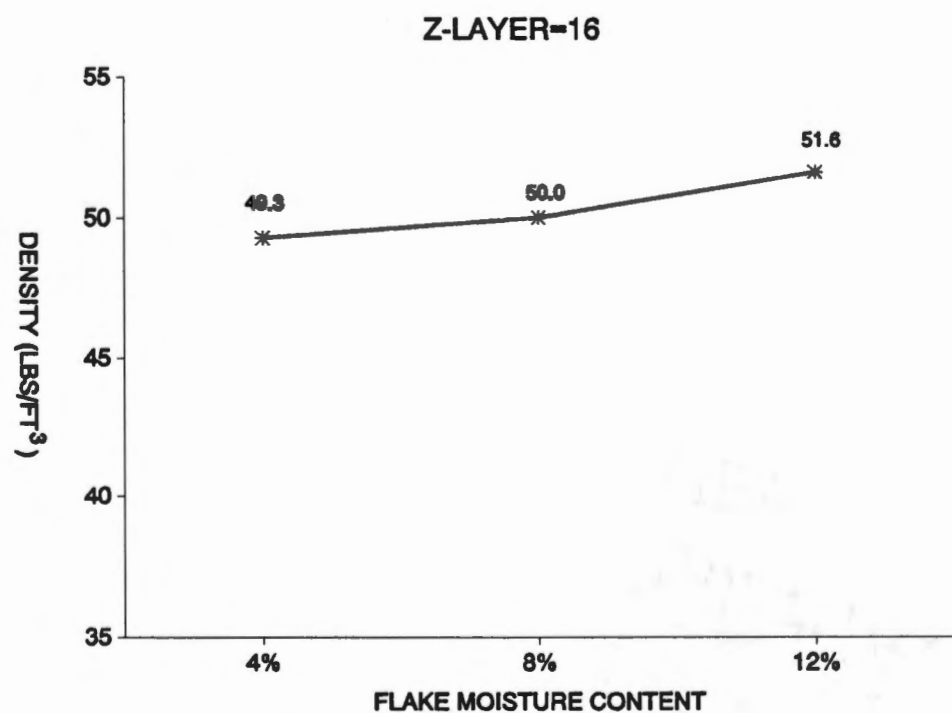


Figure 27. Density change in response to flake moisture content for z-layer 16.

any level of flake moisture content, the mean density decreases. These results agree with the finding of others; convective heat transfer is limited by the amount of moisture available to convert to steam; as a result higher flake moisture contents allow wood to densify more during hot-pressing because compressive strength is reduced with more densification occurring in the face layers (Strickler 1959; Kunesh 1961; Heebink *et al.* 1972; Geimer *et al.* 1975; Harless *et al.* 1987; Winistorfer and DiCarlo 1988; Davis 1989).

There was no established pattern of significance for the relationship between flake moisture content and density of individual z-layers (Table A7). The reason for this seemingly random significance or holistic effect may be related to the actual flake moisture contents at the time of blending. Prior to blending, two samples of flakes were obtained for each treatment condition to determine the moisture content of the flakes at the end of the conditioning period. Flakes targeted for 4% moisture content revealed moisture levels of 2.8% to 2.9%. Samples from the batches conditioned to the target 8% and 12% moisture content levels exhibited moisture contents of 7.7%, 7.8%, 10.7%, and 10.8%, respectively. Target flake moisture content levels were probably not achieved and the ranges between levels were not consistent. This conjecture may describe the role of flake moisture content as an insignificant factor in explaining mean density variation in a pattern related to its documented effects on producing density gradients.

After blending with resin, one sample of flakes from each condition for all replications was obtained in order to assess the increase in moisture added to the flakes. Samples were weighed, oven-dried and weighed again to determine actual flake moisture

contents prior to hot-pressing. The sample flake moisture contents from each replication and treatment blend are shown in Table A10 in Appendix A. These numbers reveal higher than target flake moisture contents for the 4% and 8% treatment levels and a lower than target actual flake moisture content for the 12% treatment level.

Standard Deviation

Table A9 in Appendix A lists the p-values from the ANOVA for the standard deviation of density (S) by z-layer in response to the treatments. The logarithm of the squared density standard deviation ($\text{LOG } S^2$) is also shown. The utility of the logarithm of the density standard deviation squared as a response variable is based on the fact that it is approximately normally distributed when the number of observations is greater than 4 (Anderson and McLean 1974). The analysis using S and $\text{LOG } S^2$ as dependent variables examined variation within panels and how variation changed across treatments. This analysis is one method to determine which treatments influence process variability (Anderson and McLean 1974); the analysis examined the repeatability of the process as related to the experimental design.

Flake moisture content was responsible for explaining variation in density standard deviation (variation) in the interior z-layers. Variation in density due to flake moisture content was not consistent across treatment levels for z-layers significantly affected. Flake moisture content was a significant factor ($\alpha=0.05$) for z-layers 4, 7-10, and 13 and a marginally significant factor for z-layers 5, 6, 12, and 15 (Table A10). Generally, as flake moisture content increased, the average standard deviation of density for these z-layers also increased (Table A12). Strickler (1959) also noted higher moisture contents

result in greater layer density variation throughout particleboard. Moving from the face and intermediate z-layers to the core z-layers, the average standard deviation of density dropped for all levels of flake moisture content (Table A12).

These results indicate that moisture migration from the face z-layers to the core layers reduces the amount of variation in density formed as a result of hot-pressing. Examination of a set of plots in Appendix B for any treatment combination shows a general "smoothing out" trend in the hills (representing regions of high density in the x-y plane of the panel z-layer) and valleys (representing regions of low density in the panel z-layer) progressing from the face z-layers to core z-layers. While the mean density of the face z-layers is on average greater than the mean density of the core layers, the magnitude of variation in the face z-layers is also larger.

The results also address our ability to control flake moisture content effects on density in an experimental laboratory setting. The existence of significant variation across treatment levels could arise from how individual flakes were deposited to form the mats. The inconsistent variation across the treatment levels may help explain the lack of a clear pattern flake moisture content affects on density in the z-layers previously addressed.

Press Closure Rate

Density

Press closure rate affected panel density, to a greater extent, in the face z-layers than in the core or interior z-layers. Z-layers 1 through 6 and 11 through 16, with the exception of z-layer 15, were all significantly affected by press closure rate at a significance level of 0.05 (Table A9, Appendix A). Panel z-layers significantly affected by press closure rate all exhibited a statistically significant linear trend of either increasing (z-layers 1, 2, and 16) or decreasing (z-layers 3, 4, 5, 6, 12, 13, and 14) density as press closure rate increased. Figures 28 through 37 display the results from Table A7 and A9. For z-layers 1, 2, and 16, representing the extreme face z-layers, mean density increased as press closure rate increased (Figures 28, 29, and 37, respectively) and, for z-layers 3 through 6 and 12 through 14, the mean density decreased as press closure rate increased.

The results of press closure rate significantly affecting density in the panel face layers is as expected. Other studies and reports generally acknowledge such an effect in the face layers (Suchsland 1962; Geimer *et al.* 1975; Kelly 1977). Davis (1989) also reported similar effects on density in regions significantly affected by press closure rate; faster press closure rates resulted in higher densities.

The results for density in the extreme face z-layers 1, 2, and 16 are not unexpected. Here the density increased as closure rate increased. These layers were the first ones to heat up, plasticize, and subsequently compress. When the press stops closing at the fast rates, all the densification that occurs remains in the face layers. Fast adhesive cure due

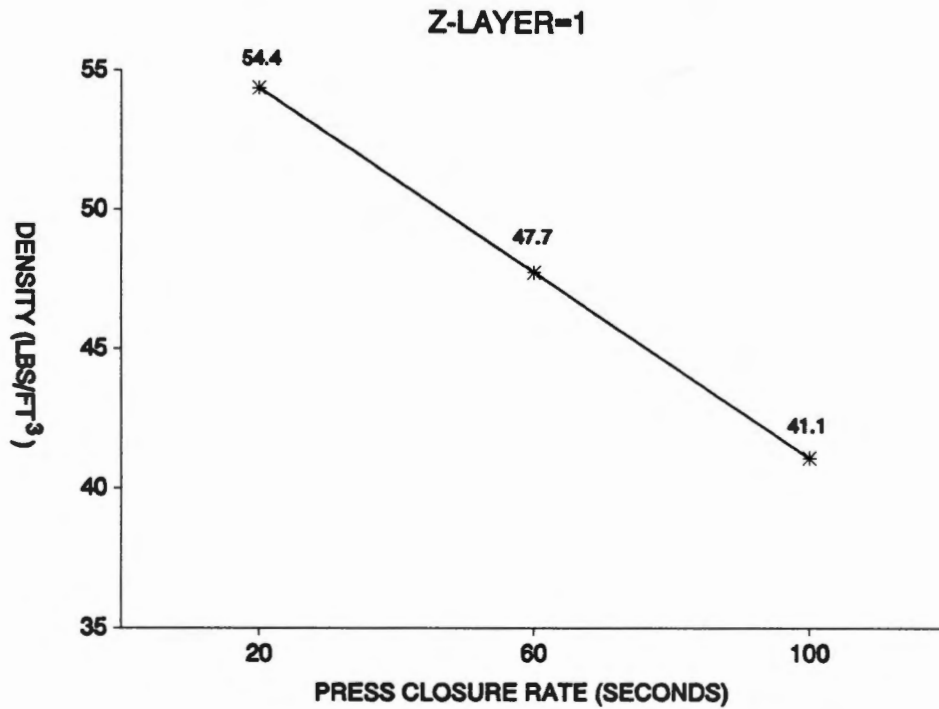


Figure 28. Density change in response to press closure rate for z-layer 1.

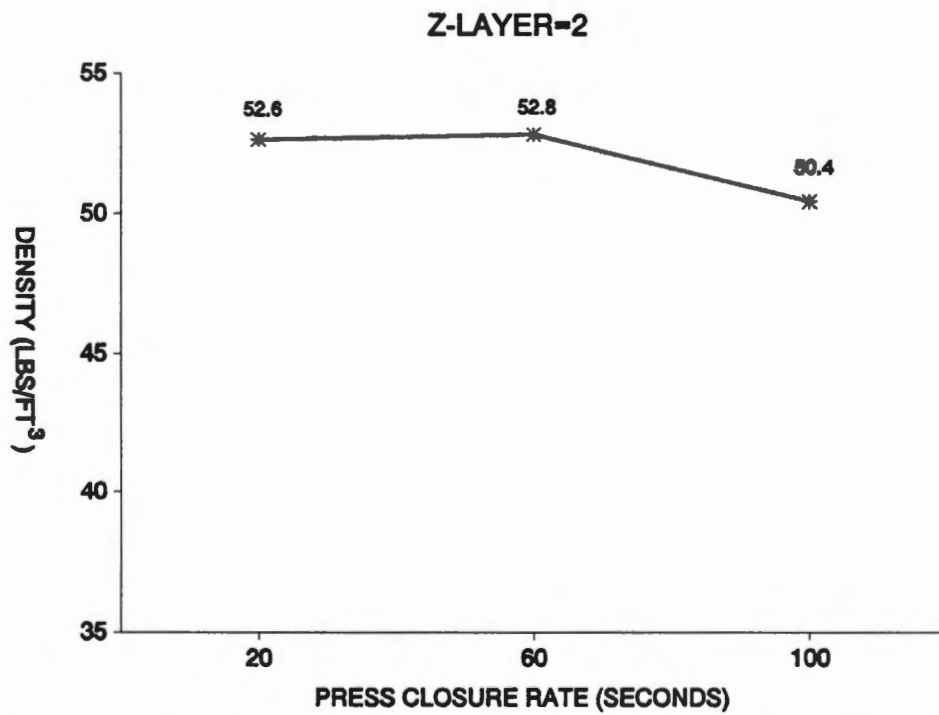


Figure 29. Density change in response to press closure rate for z-layer 2.

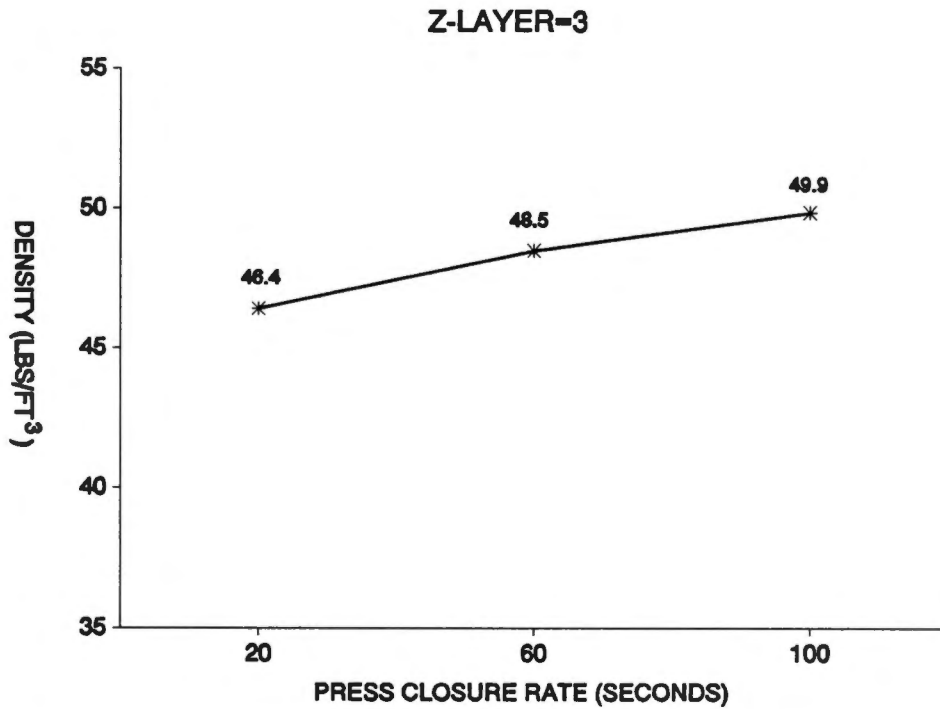


Figure 30. Density change in response to press closure rate for z-layer 3.

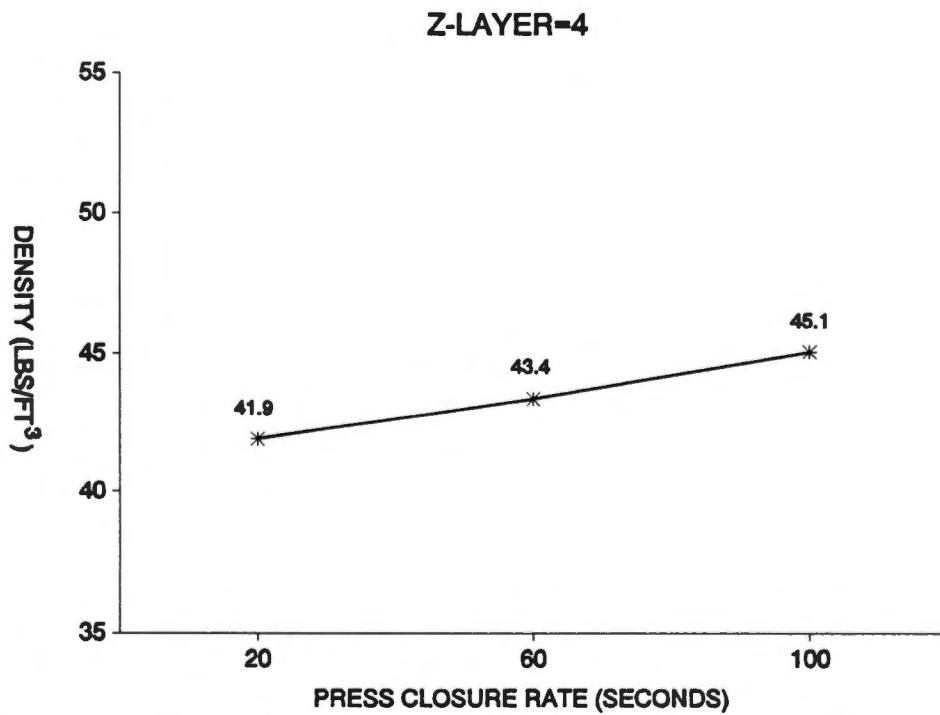


Figure 31. Density change in response to press closure rate for z-layer 4.

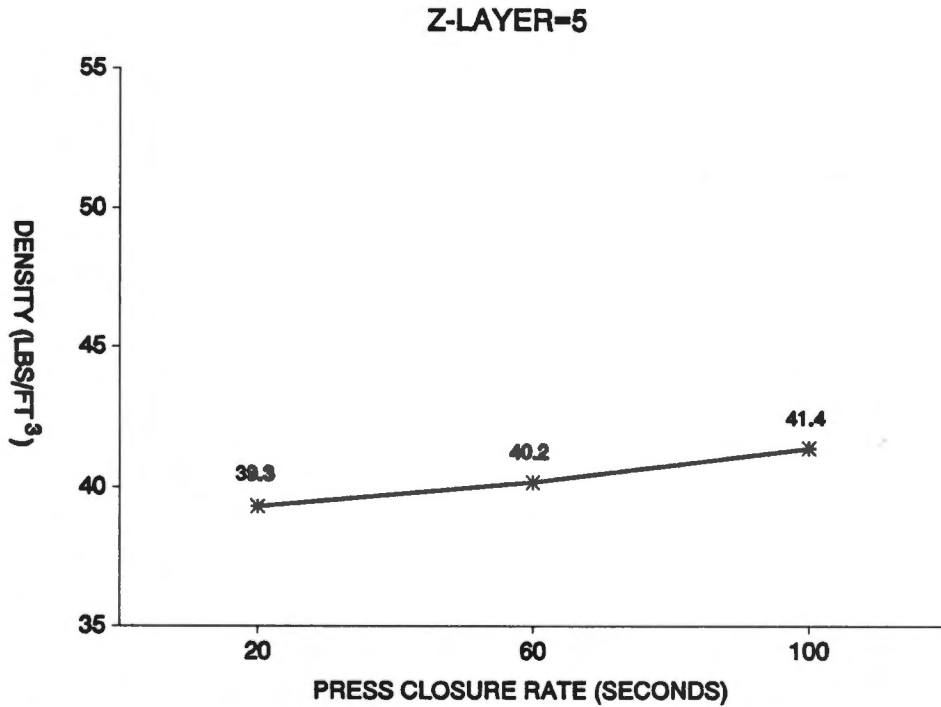


Figure 32. Density change in response to press closure rate for z-layer 5.

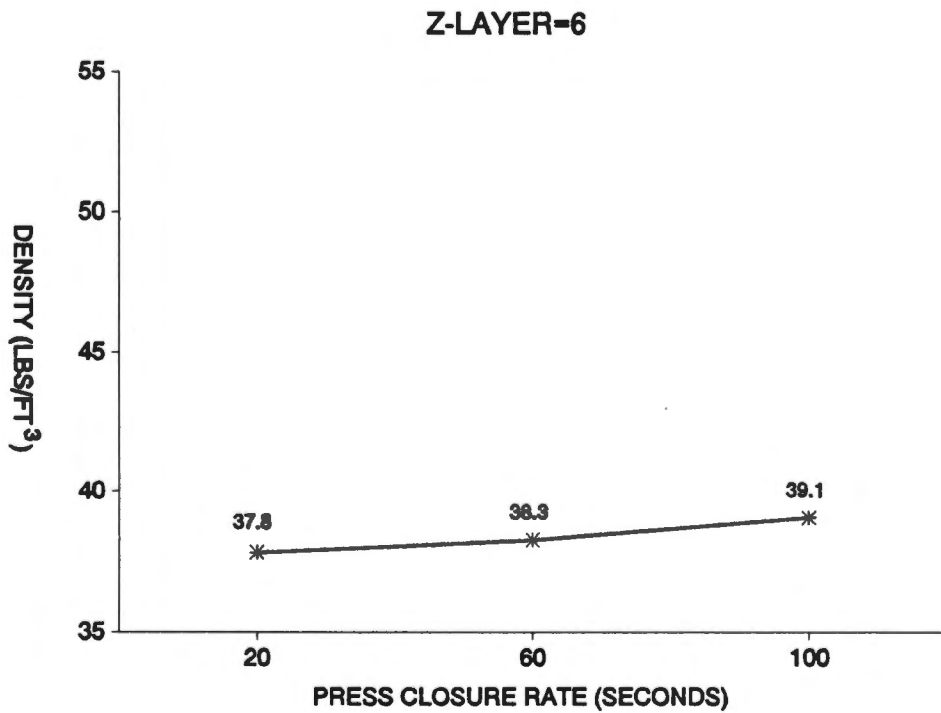


Figure 33. Density change in response to press closure rate for z-layer 6.

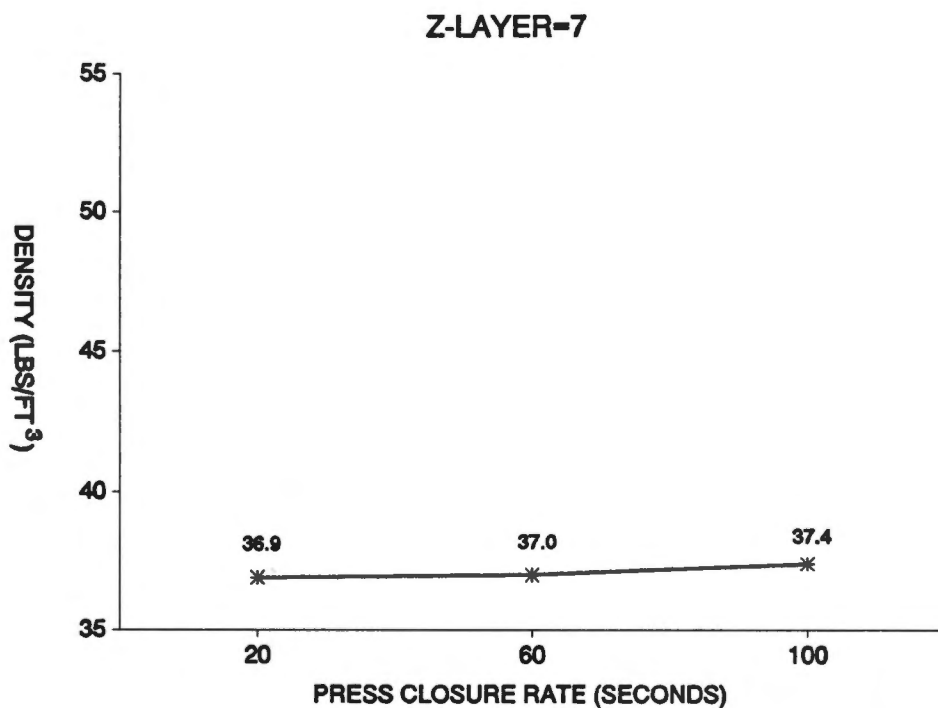


Figure 34. Density change in response to press closure rate for z-layer 7.

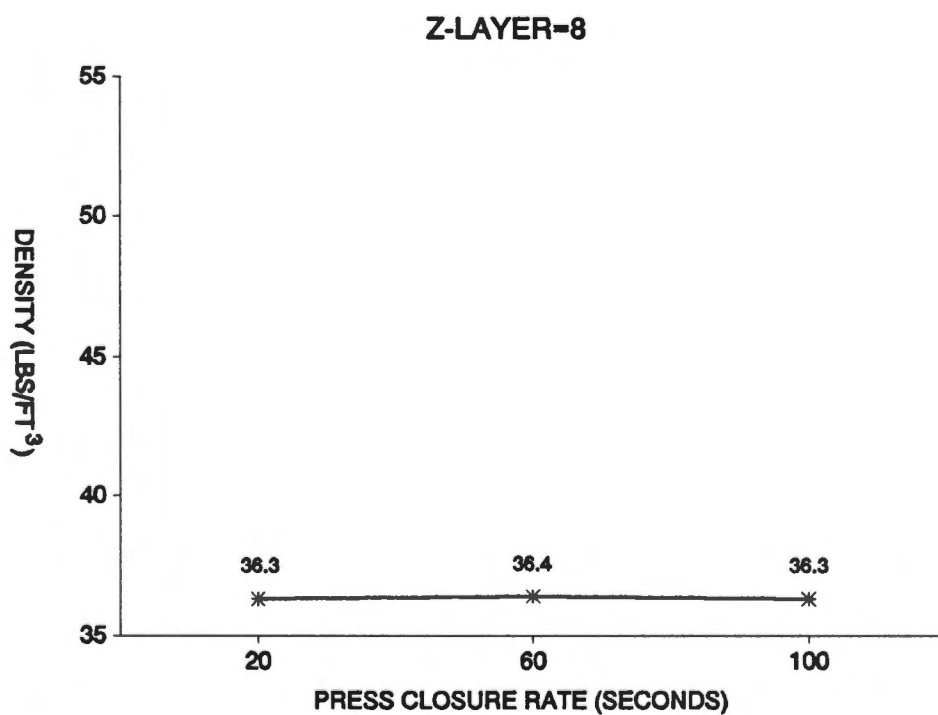


Figure 35. Density change in response to press closure rate for z-layer 8.

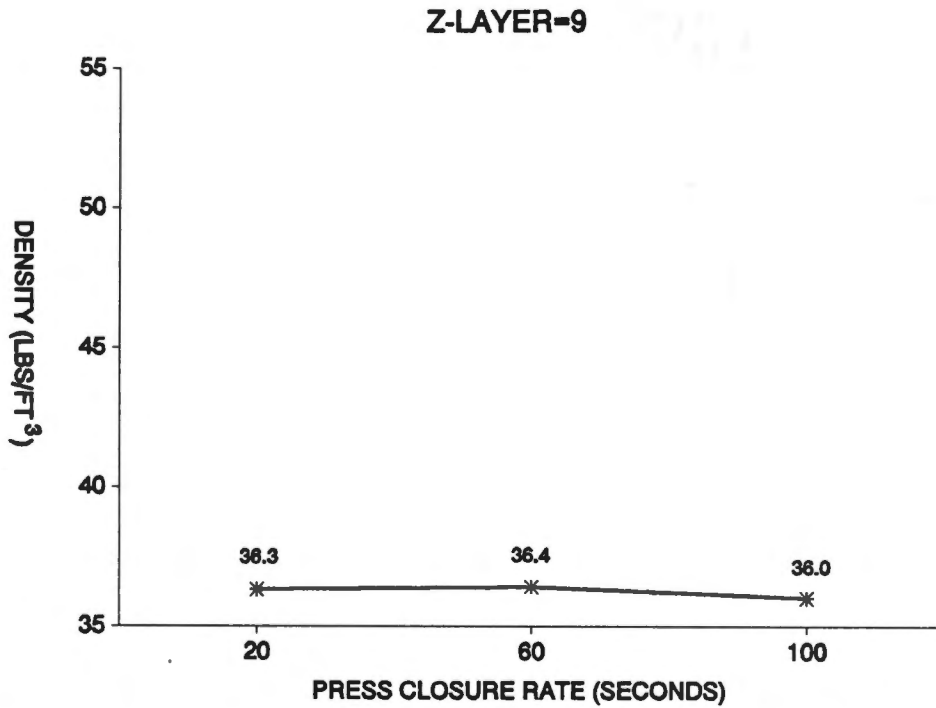


Figure 36. Density change in response to press closure rate for z-layer 9.

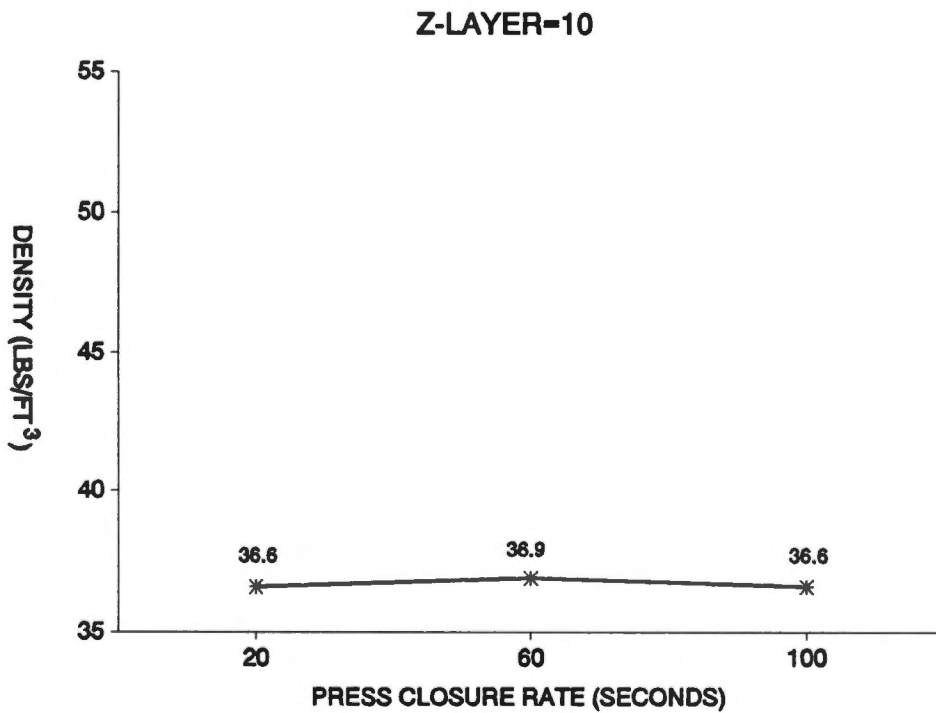


Figure 37. Density change in response to press closure rate for z-layer 10.

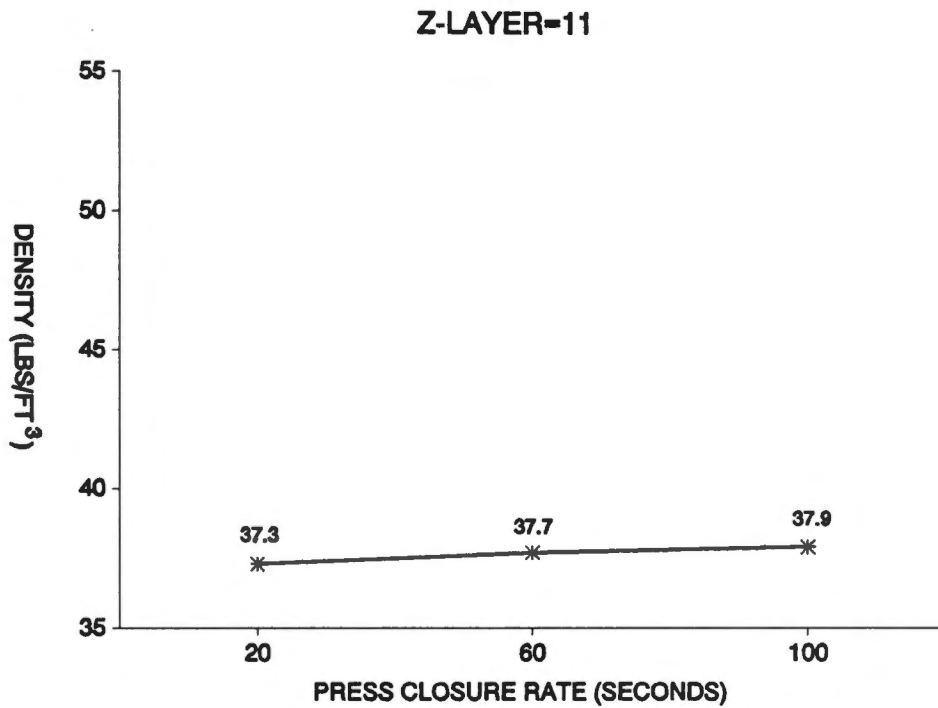


Figure 38. Density change in response to press closure rate for z-layer 11.

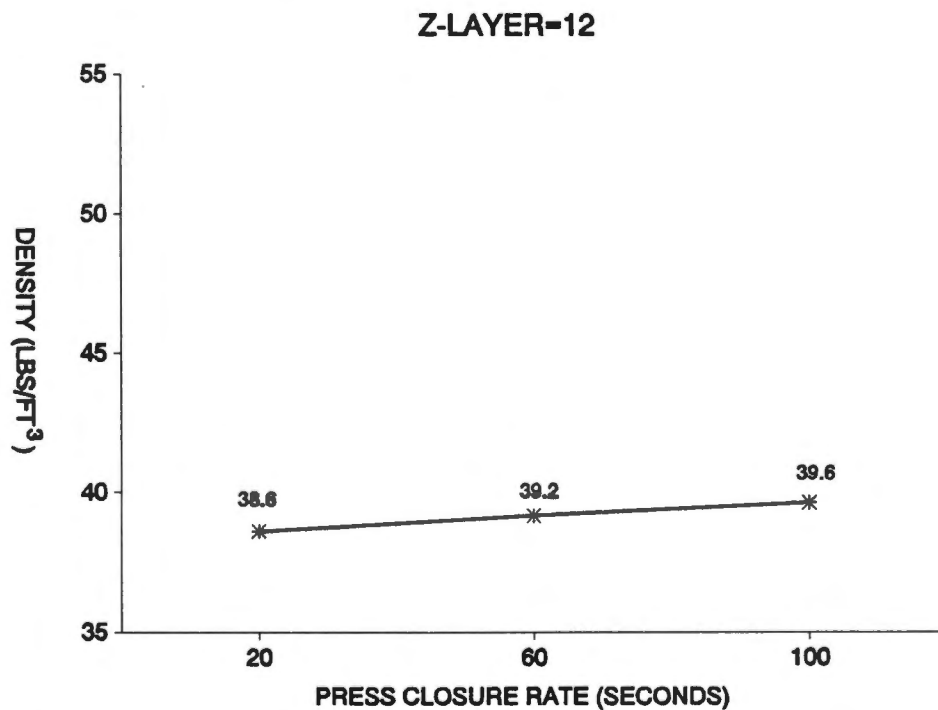


Figure 39. Density change in response to press closure rate for z-layer 12.

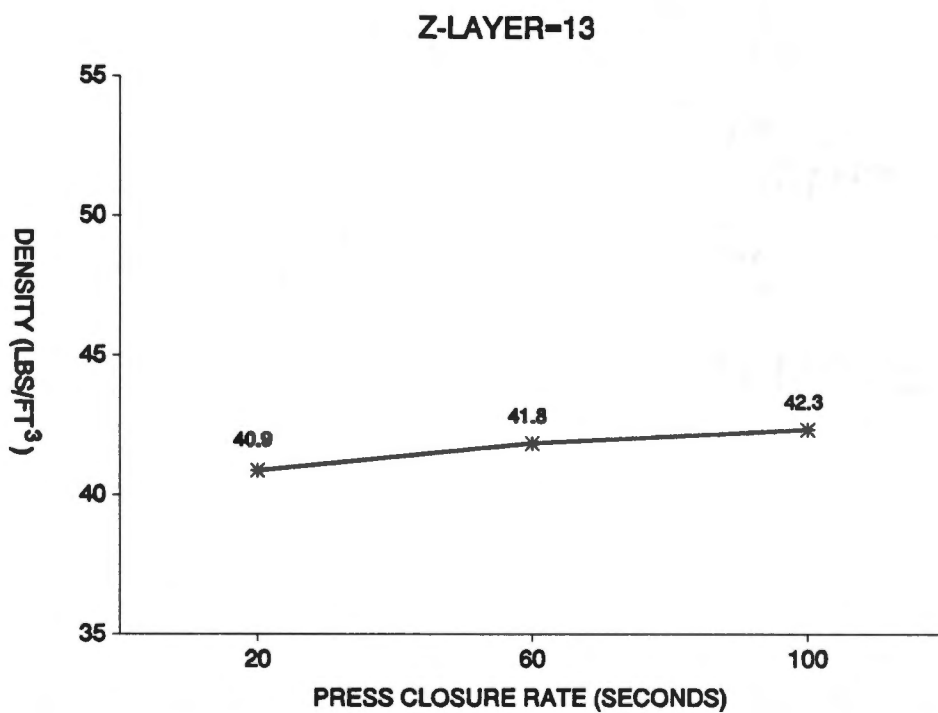


Figure 40. Density change in response to press closure rate for z-layer 13.

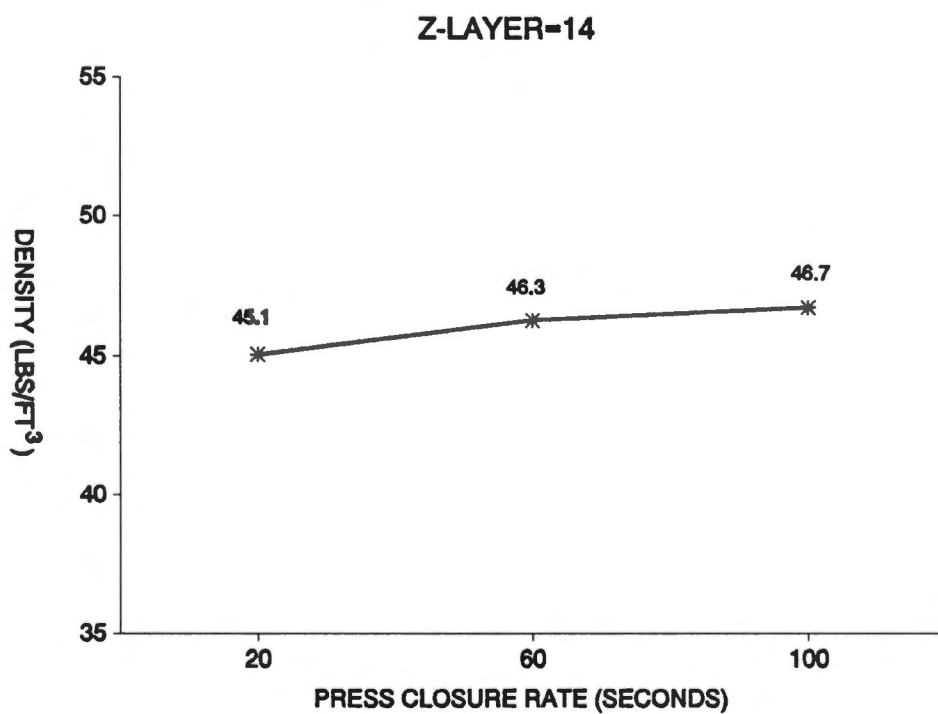


Figure 41. Density change in response to press closure rate for z-layer 14.

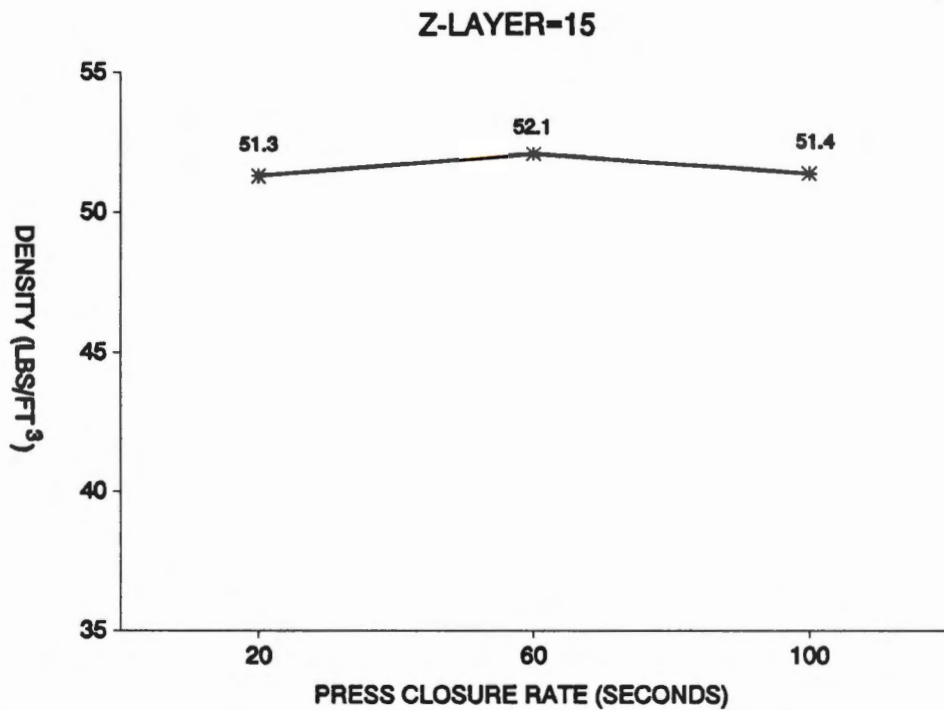


Figure 42. Density change in response to press closure rate for z-layer 15.

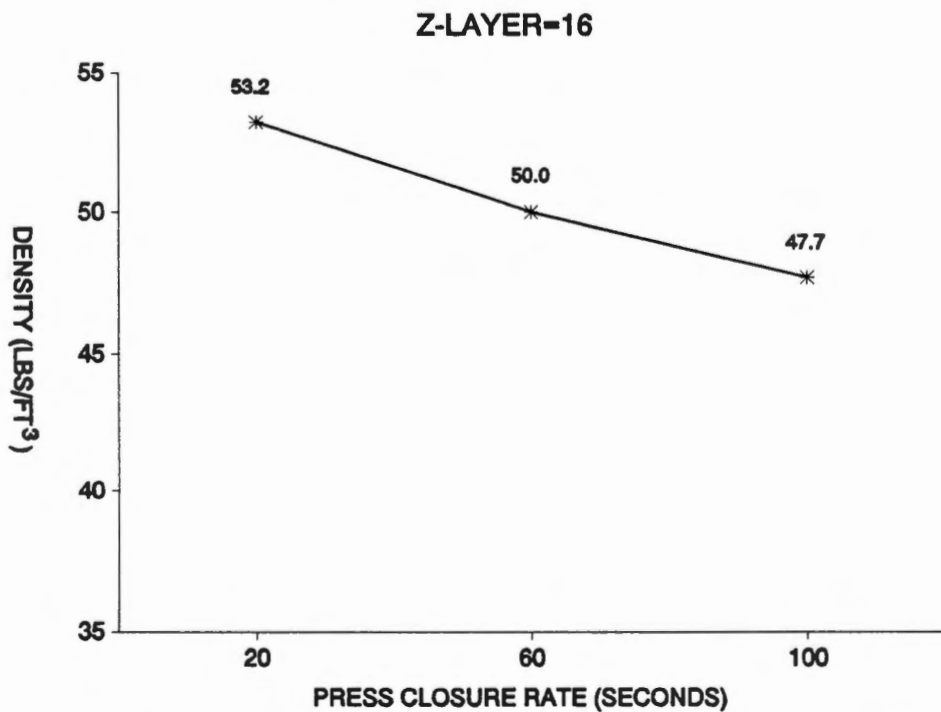


Figure 43. Density change in response to press closure rate for z-layer 16.

to increase rate of heat transfer may inhibit further densification progressing to the core.

The results of density increasing with longer press closing times is not unusual as exhibited by z-layers 3 through 6 and 12 through 14. Slower closure rates allow more heat transfer to the intermediate and core z-layers. Since crushing or compressive strength is reduced by heat, resulting in wood structure collapse and densification under pressure, the intermediate z-layers (below the face z-layers) are allowed to densify until the press stops closing (Suchsland 1962). This phenomenon appears to take place through the panel thickness, to a certain layer progressing towards the core region. At a point in time, dictated by when the press stops closing, the core region z-layers remain unaffected because of less void space reduction and less heating.

Standard Deviation

Table A9 in Appendix A lists the results of the ANOVA for standard deviation of density by z-layer in response to press closure rate. Press closure rate was not a significant factor for any z-layer, except z-layer 2, in accounting for increases or decreases in density standard deviation. For z-layer 2, the standard deviation of density increased, from 5.8 lbs/ft³ to 7.3 lbs/ft³, as the time to reach final thickness during pressing increased from 20 to 100 seconds.

These results indicate the laboratory procedure for producing press closure rate effects on density was consistent and repeatable across all levels. No unaccounted sources of variation due to closure rates were introduced into the study and validates the control of this part of the experimental process.

Interaction of Flake Moisture Content and Press Closure Rate

Density

Table A9 in Appendix A lists the results of the ANOVA for density by z-layer for the interaction of main effects. The interaction of flake moisture content and press closure rate played a significant role in densification within the core z-layers (6 through 12) as well as the extreme bottom panel face layer (z-layer=16). A significant interaction suggests that for a given z-layer, the changes in density are not consistent from one level of flake moisture content to the next level moving across all levels of press closure rate. Figures 44 through 51 show the interactions for z-layers significantly affected. Mean densities for all treatment combinations by z-layer are listed in Table A8. For example, at z-layer 6 (Figure 44) density is highest for 12% flake moisture content (38.4 lbs/ft³) at the 20 second closure rate, but does not maintain this position relative to the other flake moisture content levels for the other two press closure rates.

Faster rates of temperature rise and heat penetration from face to core regions were achieved by increasing flake moisture content which controls the panel center temperature (Strickler 1959; Kamke and Casey 1988). Highest densities in the core region, on average, resulted when intermediate flake moisture content levels in conjunction with slow press closing rates were employed in pressing strategies. Higher moisture contents in conjunction with slow closing speeds resulted in the lowest densities. The presence of too much furnish moisture may prevent a phase change (liquid water to steam) from occurring during the length of the pressing cycle and inhibit the compression phenomenon exhibited by wet wood under pressure. Significant interactions will often

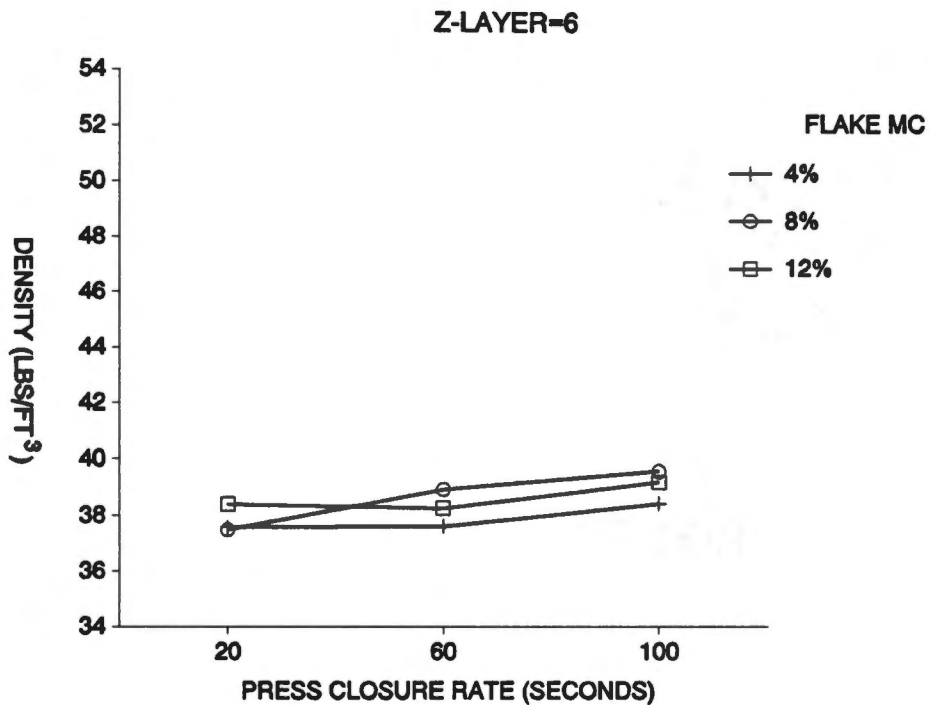


Figure 44. Density change in response flake moisture content and press closure rate for z-layer 6.

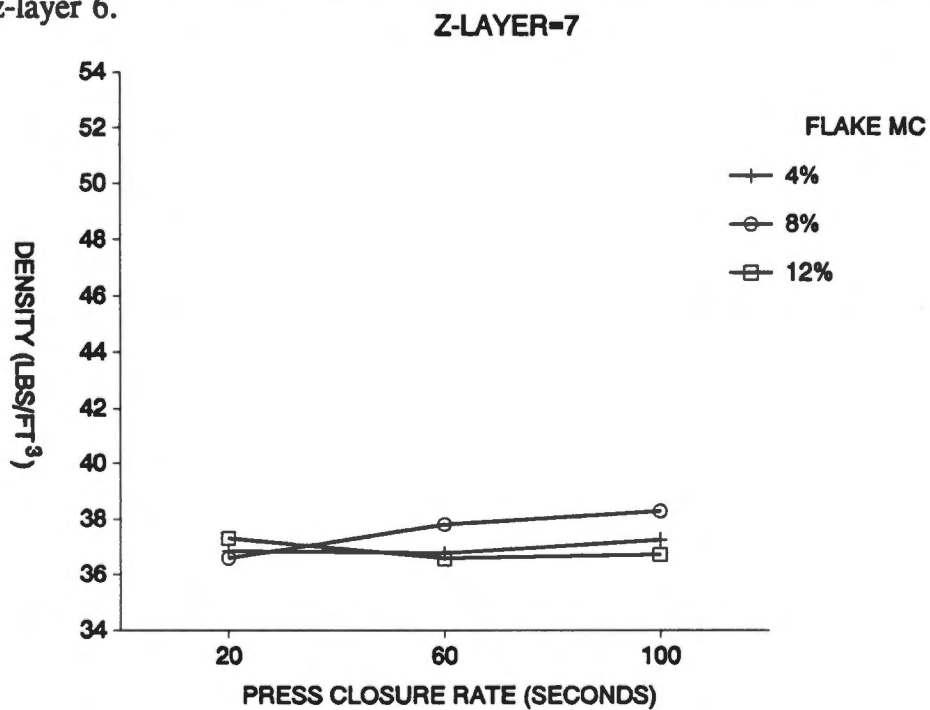


Figure 45. Density change in response to flake moisture content and press closure rate for z-layer 7.

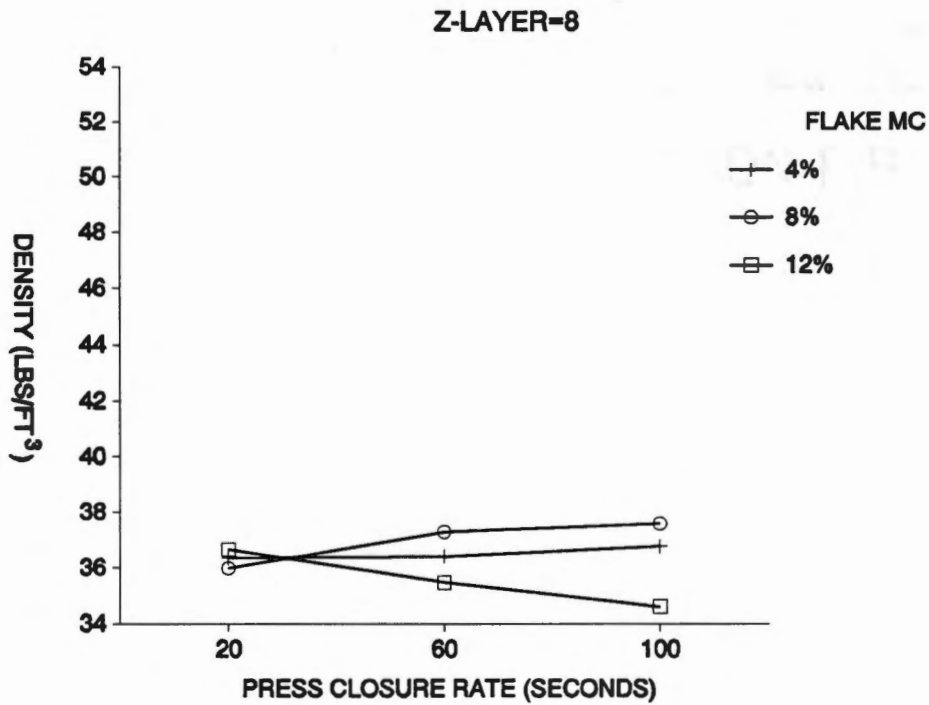


Figure 46. Density change in response to flake moisture content and press closure rate for z-layer 8.

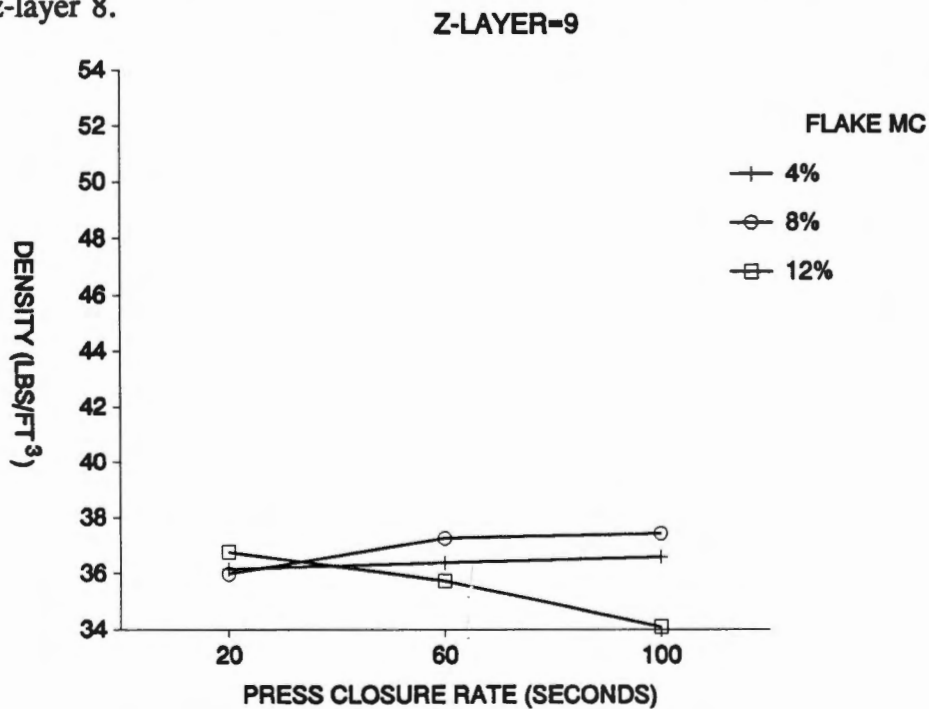


Figure 47. Density change in response to flake moisture content and press closure rate for z-layer 9.

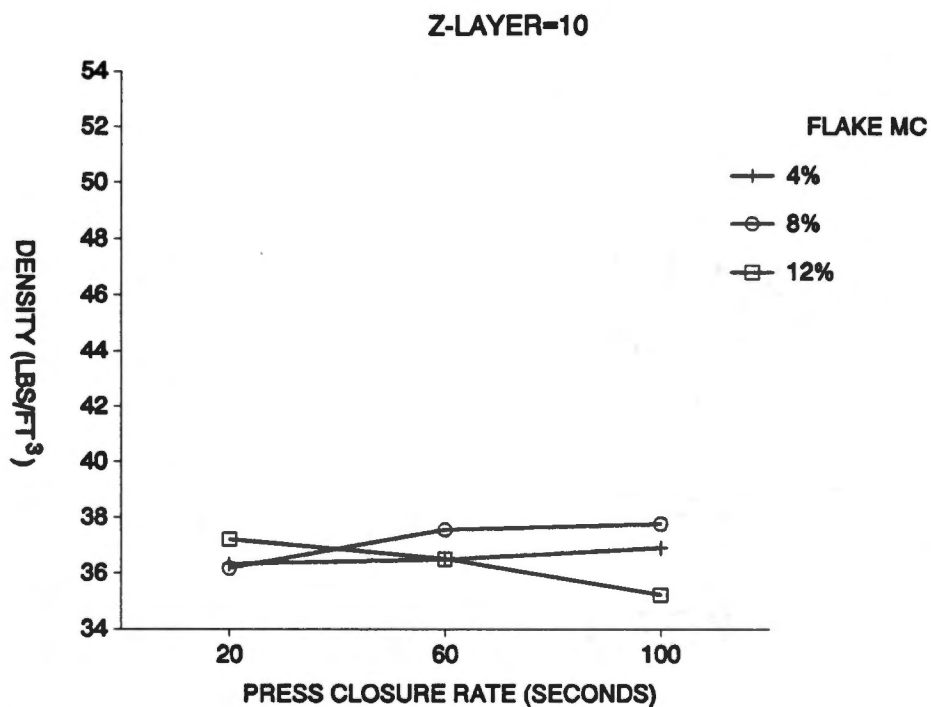


Figure 48. Density change in response to flake moisture content and press closure rate for z-layer 10.

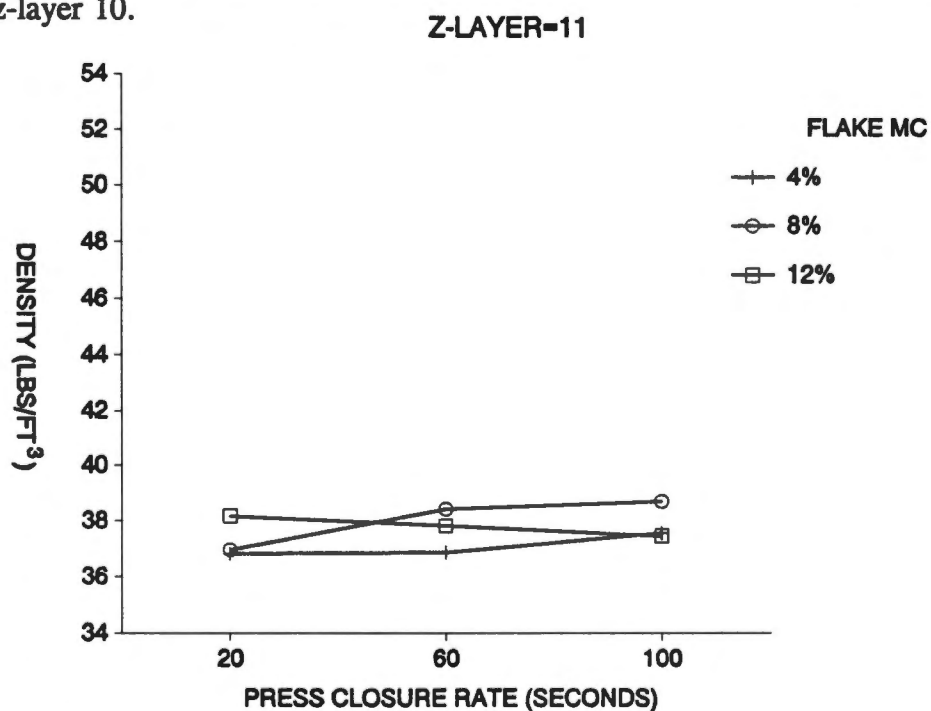


Figure 49. Density change in response to flake moisture content and press closure rate for z-layer 11.

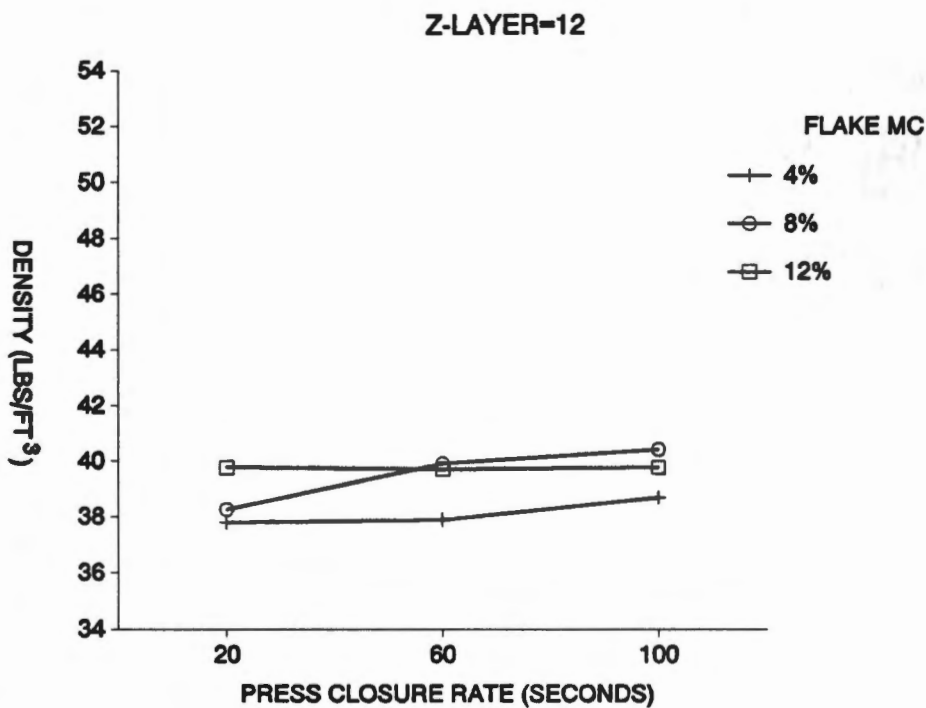


Figure 50. Density change in response to flake moisture content and press closure rate for z-layer 12.

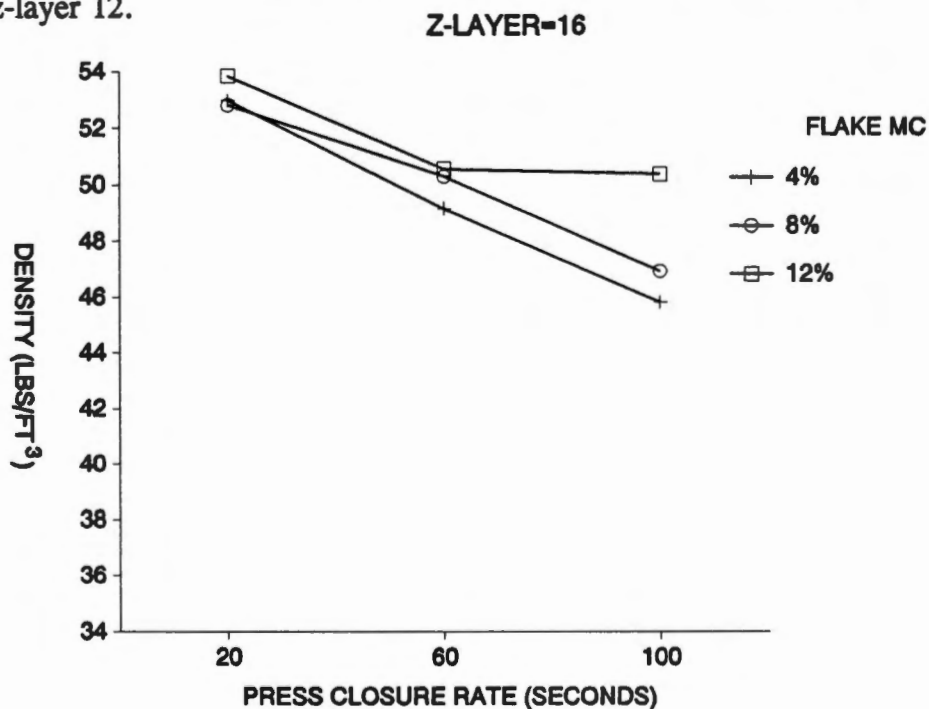


Figure 51. Density change in response to flake moisture content and press closure rate for z-layer 16.

mask the significance of main effects. The conclusions in the core region about the main effect of flake moisture content levels must be examined with the levels of press closure rate.

Standard Deviation

Table A11 in Appendix A lists the results of the ANOVA for the standard deviation of density by z-layer for the interaction of flake moisture content and press closure rate (MC x PCR). The interaction term was not a significant factor in explaining changes in density standard deviation throughout all 16 z-layers. Therefore, flake moisture content and press closure rate considered together do not affect the density standard deviation. This source of variation did not change considerably across all treatment level combinations to significantly alter experimental outcomes examined in this study.

VIII. CONCLUSIONS AND FUTURE STUDY

Flake Moisture Content

Flake moisture content generally affected the density in all z-layers except for the two top face z-layers. Density in z-layers 3-6, 8, 9, 12, and 13 was significantly affected ($\alpha=0.05$) and marginally affected ($\alpha=0.1$) in z-layers 11, 14, and 16 by flake moisture content. All mean densities in the influenced z-layers exhibited meaningful linear trends of higher mean densities with an increase in flake moisture content. The average standard deviation, while generally increasing with an increase in flake moisture content, dropped across all levels progressing from the face and intermediate z-layers to the z-layers in the core region. Moisture migration and heat transfer tended to minimize the variation in density, to a greater extent, in the core regions.

Press Closure Rate

Density in the face and intermediate z-layers was affected by the three press closure rates. The density in the core region z-layers was not affected by press closure rate. Where press closure rate was a significant factor in accounting for density variation in a particular z-layer, a general linear trend of increasing mean density in response to an increase in press closure rate was acknowledged for the extreme face z-layers. The opposite, a decrease in mean density as press closure rate increased, trend was evident for the intermediate z-layers; slower closure rates resulted in higher densities in the intermediate z-layers until the effect of closure rate became negligible in or near the core

region.

Interaction of Flake Moisture Content and Press Closure Rate

The interaction of flake moisture content and press closure rate played the largest role in affecting density in z-layers within the core regions. Generally, panels pressed at slow closure rates with intermediate flake moisture contents maximized the density in the z-layers within the core region.

Future Study

Future directions based on this study would be to examine individual z-layers for trends in density and density variation, i.e., are there mathematical or statistical differences among any of the locations, within a z-layer, sampled for this study. Also, future studies might involve correlating dimensional stability properties with the 3-dimensional density distribution since the sectioned panels were analyzed relatively nondestructively. Finally, a similar study could entail repeating this study, but using a particleboard-type furnish to further minimize density variation, during forming due to particle size; this would improve experimental sensitivity to treatments and illuminate clearer effects of moisture content on density in the z-layers.

100% COTTON BOND
100% COTTON BOND
100% COTTON BOND

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VITA

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APPENDICES

APPENDIX A

Table A1. Analysis of variance table for full dataset representing minimally trimmed panels pressed at a 100 second closure rate.

SOURCE*	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
PANEL	1	3005.83	3005.83	311.97
X	14	16640.33	1188.59	1.14
Y	16	13662.15	853.88	1.00
Z	15	196038.25	13069.22	124.06
X*Y	224	92383.79	412.43	1.47
X*Z	210	5403.95	25.73	1.62
Y*Z	240	2722.63	11.34	0.78
X*Y*Z	3360	31020.18	9.23	0.96
PANEL*X	14	14571.55	1040.82	108.02
PANEL*Y	16	13599.84	849.99	88.22
PANEL*Z	15	1580.25	105.35	10.93
PANEL*X*Y	224	62742.12	280.10	29.07
PANEL*X*Z	210	3343.52	15.92	1.65
PANEL*Y*Z	240	3483.49	14.51	1.51

*The sources of variation indicated here represent positional variation based on grid coordinates where the total variation is partitioned into PANEL, X, Y, and Z components.

Table A2. Analysis of variance table for full dataset representing minimally trimmed panels pressed at a 20 second closure rate.

SOURCE*	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
PANEL	1	1745.75	1745.75	192.22
X	14	10655.93	761.14	0.92
Y	16	24338.91	1521.18	3.63
Z	15	338664.83	22577.66	108.88
X*Y	224	96578.40	431.15	1.15
X*Z	210	9089.72	43.28	3.19
Y*Z	240	5728.25	23.88	2.29
X*Y*Z	3360	29840.44	8.88	0.98
PANEL*X	14	11600.15	828.58	91.23
PANEL*Y	16	6710.42	419.40	46.18
PANEL*Z	15	3110.55	207.37	22.83
PANEL*X*Y	224	83991.83	374.96	41.29
PANEL*X*Z	210	2852.80	13.58	1.50
PANEL*Y*Z	240	2503.85	10.43	1.15

*The sources of variation indicated here represent positional variation based on grid coordinates where the total variation is partitioned into PANEL, X, Y, and Z components.

Table A3. Analysis of variance table for dataset representing panels pressed at a 100 second closure rate and trimmed an additional inch on all four edges.

SOURCE*	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
PANEL	1	1782.60	1782.60	184.40
X	12	9321.82	776.82	1.08
Y	14	7278.78	519.91	0.69
Z	15	161705.03	10780.34	89.18
X*Y	168	55939.97	332.98	1.22
X*Z	180	3097.54	17.21	1.11
Y*Z	210	2123.73	10.11	0.61
X*Y*Z	2520	23957.41	9.51	0.98
PANEL*X	12	8670.23	722.52	74.74
PANEL*Y	14	10538.00	752.71	77.86
PANEL*Z	15	1813.22	120.88	12.50
PANEL*X*Y	168	45894.02	273.18	28.26
PANEL*X*Z	180	2801.35	15.56	1.61
PANEL*Y*Z	210	3464.92	16.50	1.71

*The sources of variation indicated here represent positional variation based on grid coordinates where the total variation is partitioned into PANEL, X, Y, and Z components.

Table A4. Analysis of variance table for dataset representing panels pressed at a 20 second closure rate and trimmed an additional inch on all four edges.

SOURCE*	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE
PANEL	1	1945.11	1945.11	236.99
X	12	6391.70	532.64	0.66
Y	14	16098.24	1149.87	3.18
Z	15	290971.08	19398.07	107.62
X*Y	168	55956.93	333.08	0.93
X*Z	180	2742.92	15.24	1.22
Y*Z	210	3026.88	14.41	1.62
X*Y*Z	2520	21680.86	8.60	1.05
PANEL*X	12	9642.86	803.57	97.91
PANEL*Y	14	5066.93	361.92	44.10
PANEL*Z	15	2703.81	180.25	21.96
PANEL*X*Y	168	60263.95	358.71	43.70
PANEL*X*Z	180	2252.49	12.51	1.52
PANEL*Y*Z	210	1873.86	8.92	1.09

*The sources of variation indicated here represent positional variation based on grid coordinates where the total variation is partitioned into PANEL, X, Y, and Z components.

Table A5. Least squares means of all grid coordinates for full (LARGEMEANS-4,080 observations/panel) and reduced (SMALLMEANS-85 observations/panel) datasets.

X	Y	Z	LARGEMEANS	SMALLMEANS
1			43.68	44.04
2			45.24	43.46
3			48.00	48.06
4			46.43	44.01
5			45.42	46.80
6			45.30	46.28
7			46.17	47.88
8			46.24	45.31
9			44.74	42.99
10			44.16	44.01
11			46.65	49.15
12			46.63	45.26
13			45.31	46.88
14			46.00	46.89
15			43.81	39.49
	1		46.03	43.70
	2		47.64	49.93
	3		47.83	47.78
	4		45.72	45.85
	5		43.66	46.62
	6		42.98	45.52
	7		43.72	42.54
	8		44.32	43.38
	9		45.75	40.94
	10		45.41	45.58
	11		43.97	46.19
	12		44.31	43.33
	13		45.90	46.88
	14		44.75	43.79
	15		45.45	45.69
	16		48.31	46.41
	17		49.21	47.09
		1	55.84	54.76
		2	55.55	55.92
		3	51.53	51.78
		4	47.59	50.08
		5	45.15	43.49
		6	43.27	44.33
		7	40.41	42.52
		8	37.21	35.59
		9	35.83	35.36
		10	37.27	39.25
		11	40.18	39.72
		12	42.76	41.01
		13	44.45	43.42
		14	46.80	46.56
		15	50.55	50.11
		16	55.00	51.96

Table A6. Least squares means of all grid coordinates for full (LARGEMEANS-4,080 observations/panel) and reduced (SMALLMEANS-255 observations/panel) datasets.

X	Y	Z	LARGEMEANS	SMALLMEANS
1			43.68	43.61
2			45.24	45.19
3			48.00	48.47
4			46.43	46.40
5			45.42	44.88
6			45.30	45.55
7			46.17	45.74
8			46.24	46.60
9			44.74	43.82
10			44.16	44.17
11			46.65	46.50
12			46.63	47.52
13			45.31	45.38
14			46.00	46.06
15			43.81	44.04
	1		46.03	45.12
	2		47.64	48.71
	3		47.83	48.19
	4		45.72	46.68
	5		43.66	44.41
	6		42.98	41.56
	7		43.72	44.19
	8		44.32	44.17
	9		45.75	44.92
	10		45.41	46.13
	11		43.97	43.22
	12		44.31	44.57
	13		45.90	46.70
	14		44.75	44.58
	15		45.45	46.49
	16		48.31	48.58
	17		49.21	48.53
		1	55.84	55.23
		2	55.55	55.31
		3	51.53	52.18
		4	47.59	46.71
		5	45.15	46.40
		6	43.27	44.58
		7	40.41	40.36
		8	37.21	37.63
		9	35.83	34.75
		10	37.27	37.45
		11	40.18	40.73
		12	42.76	42.83
		13	44.45	43.79
		14	46.80	47.14
		15	50.55	51.41
		16	55.00	54.44

Table A7. Main effects means of density by z-layer for all levels. Lbs/ft³ basis.

Z LAYER	FLAKE MOISTURE CONTENT			PRESS CLOSURE RATE		
	4%	8%	12%	20 sec.	60 sec.	100 sec.
1 ²	47.6	47.1	48.5	54.4	47.7	41.1
2 ²	50.8	52.3	52.7	52.6	52.8	50.4
3 ^{1,2}	47.2	48.5	49.1	46.4	48.5	49.9
4 ^{1,2}	42.5	43.6	44.2	41.9	43.4	45.1
5 ^{1,2}	39.5	40.5	40.9	39.3	40.2	41.4
6 ^{1,2}	37.9	38.7	38.6	37.8	38.3	39.1
7	37.0	37.6	36.9	36.9	37.0	37.4
8 ¹	36.5	37.0	35.6	36.3	36.4	36.3
9 ¹	36.4	36.9	35.5	36.3	36.4	36.0
10	36.6	37.2	36.3	36.6	36.9	36.6
11	37.1	38.0	37.8	37.3	37.7	37.9
12 ^{1,2}	38.1	39.5	39.8	38.6	39.2	39.6
13 ^{1,2}	40.3	42.0	42.7	40.9	41.8	42.3
14 ²	44.4	46.4	47.2	45.1	46.3	46.7
15 ¹	49.7	52.1	53.0	51.3	52.1	51.4
16 ²	49.3	50.0	51.6	53.2	50.0	47.7

¹Flake moisture content significantly affects ($\alpha=0.05$) density of the z-layer.

²Press closure rate significantly affects ($\alpha=0.05$) density of the z-layer.

See Table A9 for p-values.

Table A8. Interaction of main effects means of density by z-layer for all treatment combinations. Lbs/ft³ basis.

Z LAYER	INTERACTION OF TREATMENT LEVELS FOR FLAKE MOISTURE CONTENT/PRESS CLOSURE RATE								
	4/20	4/60	4/100	8/20	8/60	8/100	12/20	12/60	12/100
1	53.8	47.3	41.6	53.5	47.8	40.2	55.9	48.1	41.5
2	52.0	51.4	49.1	52.5	53.8	50.7	53.4	53.2	51.5
3	45.9	47.2	48.3	46.1	49.0	50.4	47.2	49.2	50.8
4	41.4	42.3	43.7	41.6	43.9	45.4	42.7	43.9	46.0
5	38.9	39.3	40.3	39.0	40.8	41.7	40.1	40.4	42.1
6*	37.6	37.6	38.4	37.5	38.9	39.6	38.4	38.3	39.2
7*	36.8	36.7	37.3	36.6	37.8	38.3	37.3	36.6	36.7
8*	36.3	36.4	36.8	36.0	37.3	37.6	36.7	35.5	34.6
9*	36.1	36.4	36.6	36.0	37.2	37.4	36.8	35.7	34.1
10*	36.3	36.5	36.9	36.2	37.5	37.8	37.2	36.5	35.2
11*	36.8	36.9	37.5	37.0	38.4	38.7	38.2	37.8	37.4
12*	37.8	37.9	38.7	38.3	39.9	40.4	39.8	39.7	39.8
13	39.6	40.3	41.1	40.5	42.3	43.2	42.4	42.9	42.7
14	43.5	44.5	45.4	44.7	46.7	47.8	47.0	47.7	47.0
15	49.5	50.0	49.5	51.0	52.9	52.3	53.4	53.3	52.4
16*	53.0	49.1	45.8	52.8	50.3	46.9	53.8	50.6	50.4

* - indicates a significant effect ($\alpha=0.05$) on density of the z-layer. See Table A9 for p-values.

Table A9. Probability values (p-values) from analysis of variance of panel density by z-layer in response to flake moisture content and press closure rate with linear (LIN) and lack of fit (LOF) effects partitioned from treatments. Interaction (MC x PCR) of main effects and replication (REP) p-values also shown by z-layer. Statistical significance at $\alpha=0.05$ indicated by (*).

Z LAYER	FLAKE MOISTURE CONTENT			PRESS CLOSURE RATE			MC x PCR	REP
	FACTOR	LIN	LOF	FACTOR	LIN	LOF		
1	0.5858	0.5076	0.4504	8×10^{-9} *	2×10^{-9} *	0.9846	0.2459	0.9152
2	0.1355	0.0686	0.4368	0.0110 *	0.0094 *	0.0524	0.7140	0.9848
3	0.0205 *	0.0088 *	0.3378	4×10^{-5} *	1×10^{-5} *	0.2696	0.3425	0.3741
4	0.0178 *	0.0074 *	0.3952	1×10^{-5} *	4×10^{-6} *	0.6973	0.2138	0.4922
5	0.0057 *	0.0026 *	0.1146	6×10^{-5} *	2×10^{-5} *	0.3744	0.1125	0.2907
6	0.0236 *	0.0167 *	0.0648	0.0011 *	0.0003 *	0.3605	0.0667 *	0.3986
7	0.1062	0.7571	0.0461 *	0.0958	0.0405 *	0.5362	0.0166 *	0.4900
8	0.0457 *	0.0631	0.0459 *	0.9273	0.9563	0.7094	0.0012 *	0.3735
9	0.0350 *	0.0636	0.0298 *	0.2431	0.2975	0.1806	0.0008 *	0.3486
10	0.1019	0.4362	0.0493 *	0.3427	0.7556	0.1636	0.0006 *	0.4267
11	0.0928	0.0904	0.1099	0.1116	0.0449 *	0.6628	0.0254 *	0.5195
12	0.0168 *	0.0087 *	0.1155	0.0091 *	0.0029 *	0.8192	0.0392 *	0.3260
13	0.0441 *	0.0198 *	0.3931	0.0023 *	0.0008 *	0.3586	0.0705	0.4492
14	0.0911	0.0416 *	0.5183	0.0038 *	0.0014 *	0.2520	0.0703	0.4827
15	0.0454 *	0.0204 *	0.4005	0.2169	0.7999	0.0923	0.2758	0.5278
16	0.0530	0.0234 *	0.4711	3×10^{-6} *	1×10^{-6} *	0.2331	0.0297 *	0.9924

Table A10. Actual* post-blend flake moisture content for all treatment levels and replications (REP).

REP	TARGET FLAKE MOISTURE CONTENT		
	4%	8%	12%
1	5.5%	9.1%	12.0%
2	6.3%	9.7%	11.7%
3	5.0%	9.1%	10.6%

* Numbers come from one sample and are not indicative of any average.

Table A11. Probability values (p-values) from analysis of variance with sample standard deviation (S) of density and logarithm of sample variance (LOG S²) of density as response variables by z-layer. Main effects, interaction of main effects (MC x PCR), and replication are shown. Statistical significance at $\alpha=0.05$ indicated by (*).

Z LAYER	MOISTURE CONTENT		PRESS CLOSURE RATE		MC x PCR		REPLICATION	
	S	LOG S ²	S	LOG S ²	S	LOG S ²	S	LOG S ²
1	0.9649	0.9835	0.0709	0.0908	0.0963	0.0770	0.6616	0.6451
2	0.6197	0.5927	0.0045 *	0.0033 *	0.6588	0.5047	0.6638	0.5963
3	0.3937	0.3853	0.6657	0.6712	0.2091	0.1959	0.5299	0.5346
4	0.0361 *	0.0327 *	0.8375	0.8312	0.2813	0.2569	0.8429	0.8478
5	0.0604	0.0555	0.4918	0.4023	0.5332	0.4618	0.9940	0.9948
6	0.0553	0.0459 *	0.8677	0.8275	0.8894	0.8556	0.9266	0.9628
7	0.0346 *	0.0280 *	0.8517	0.8166	0.8417	0.8628	0.9231	0.9421
8	0.0143 *	0.0133 *	0.8985	0.9138	0.5636	0.6125	0.8214	0.7869
9	0.0248 *	0.0228 *	0.4123	0.5518	0.1188	0.1971	0.6906	0.6770
10	0.0369 *	0.0336 *	0.8462	0.8266	0.2777	0.3382	0.8721	0.9020
11	0.0424 *	0.0344 *	0.5505	0.4611	0.8501	0.9089	0.7842	0.7966
12	0.0607	0.0518	0.3920	0.3646	0.7924	0.8710	0.8707	0.8465
13	0.0384 *	0.0348 *	0.4109	0.4094	0.6823	0.7332	0.9813	0.9503
14	0.1099	0.1049	0.3179	0.2926	0.8748	0.9166	0.7572	0.7345
15	0.0611	0.0542	0.5544	0.5458	0.4919	0.3938	0.2406	0.2302
16	0.2619	0.2256	0.1478	0.1208	0.2482	0.1935	0.4166	0.4169

Table A12. Average density standard deviation by z-layer for levels of flake moisture content.

Z LAYER	FLAKE MOISTURE CONTENT		
	4%	8%	12%
1	7.46	7.42	7.54
2	6.77	6.58	6.27
3	5.27	5.74	5.60
4*	4.44	5.41	5.33
5	3.98	4.91	4.90
6	3.64	4.55	4.60
7*	3.47	4.38	4.67
8*	3.49	4.36	4.82
9*	3.54	4.24	4.76
10*	3.59	4.35	4.71
11*	3.74	4.54	4.73
12	4.02	4.81	4.95
13*	4.49	5.37	5.38
14	5.26	5.88	5.66
15	6.55	6.40	5.73
16	7.46	7.27	6.87

* - indicates a significant effect ($\alpha=0.05$) of the flake moisture content treatment on density of the z-layer. See Table A11 for p-values.

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APPENDIX B

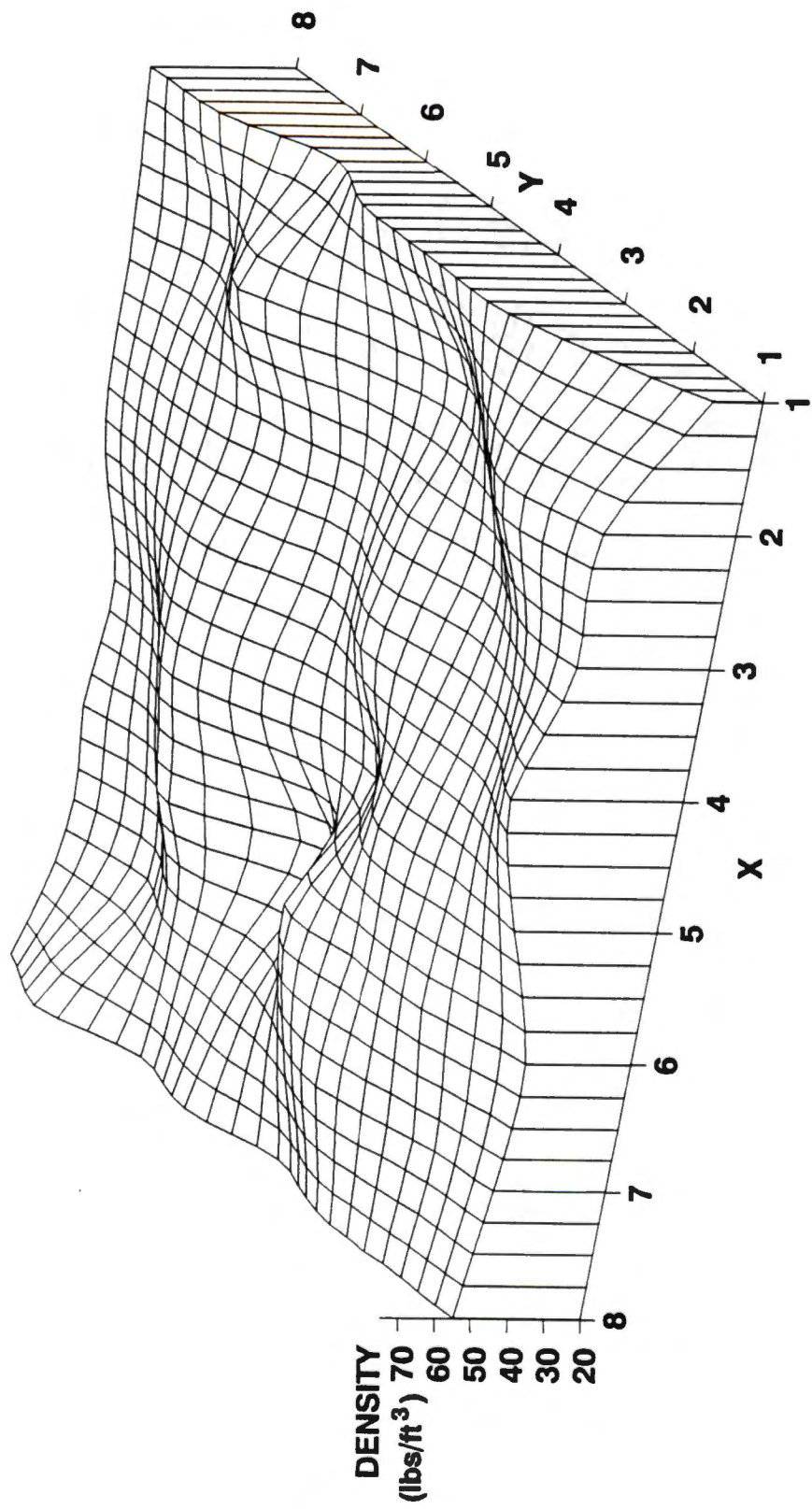
Response surface plots listed by treatment combination for z-layers=1 to z-layers=16.

Grid scale: 1.87" on x-axis for every numbered tic-mark, 2" on y-axis for every numbered tic-mark.

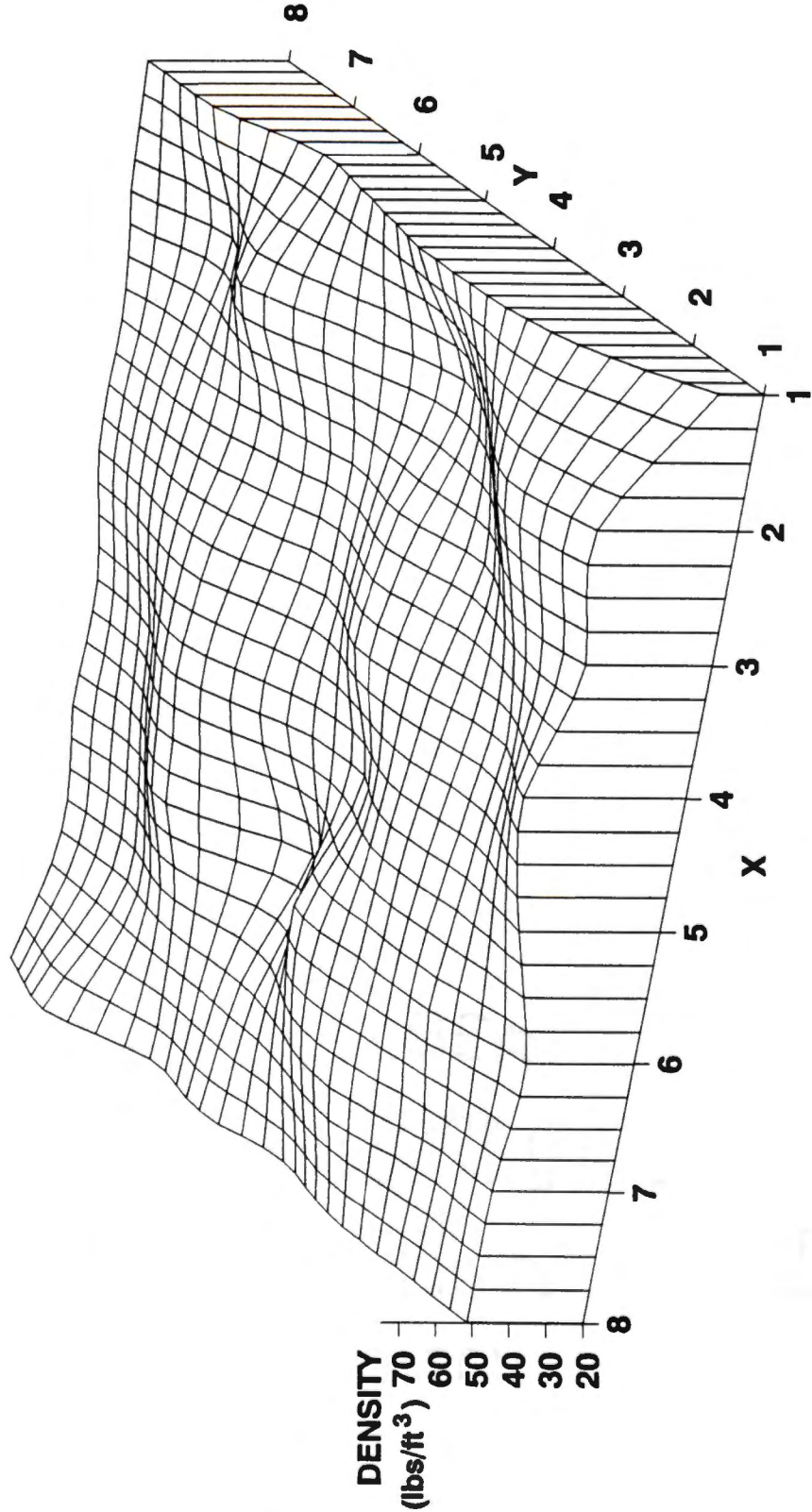
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PRESS CLOSURE RATE - 20 SECONDS

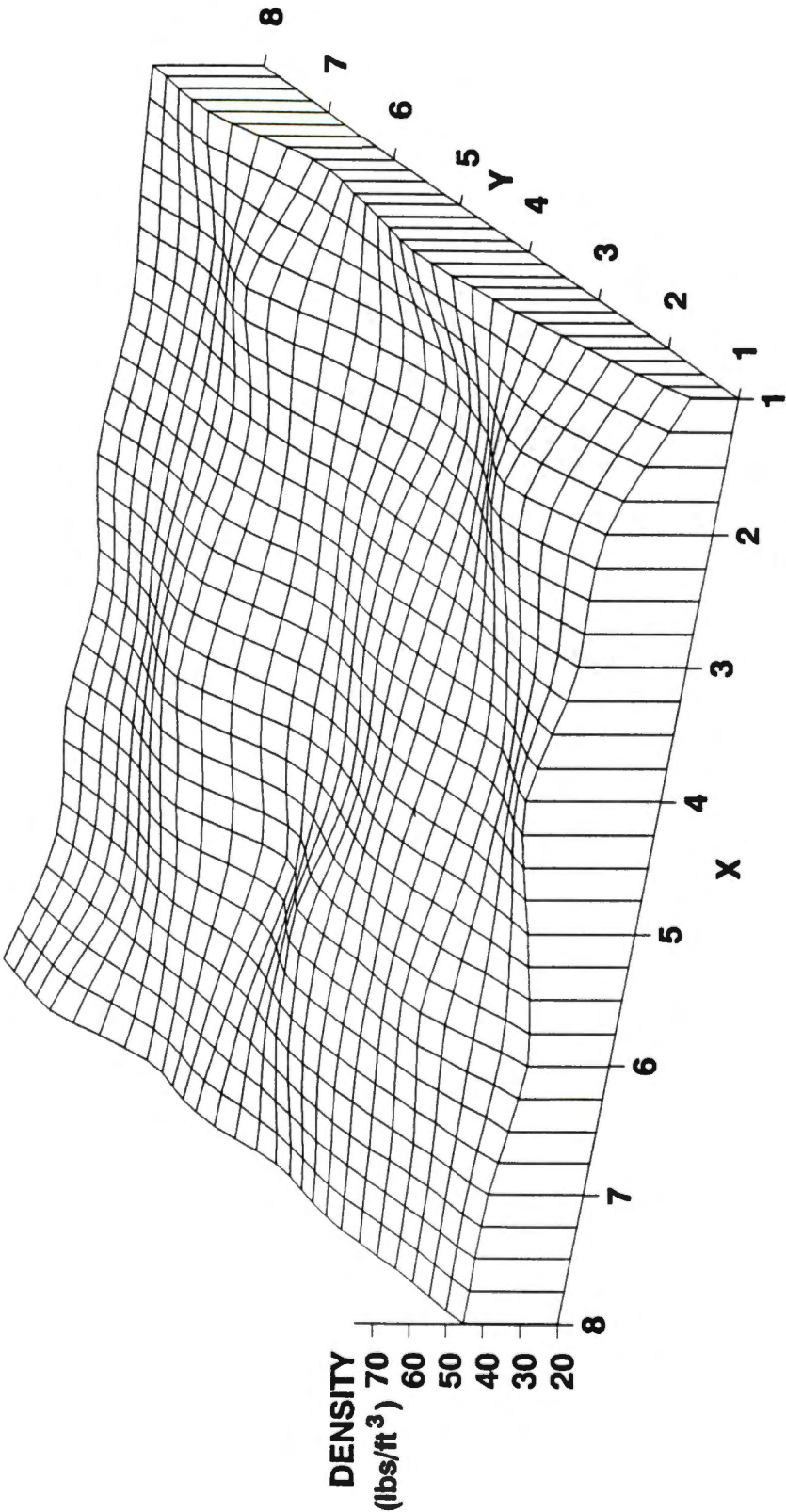
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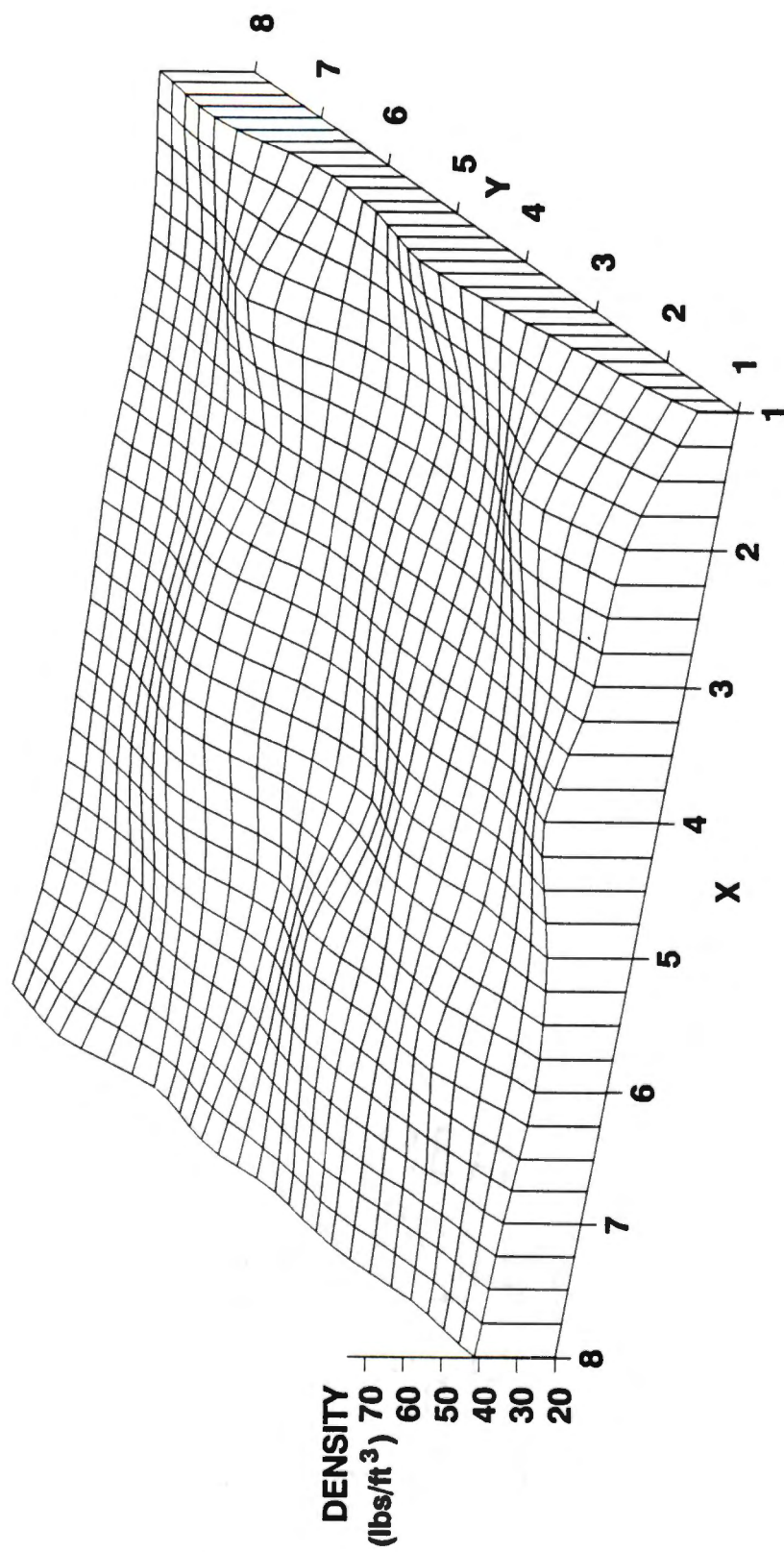
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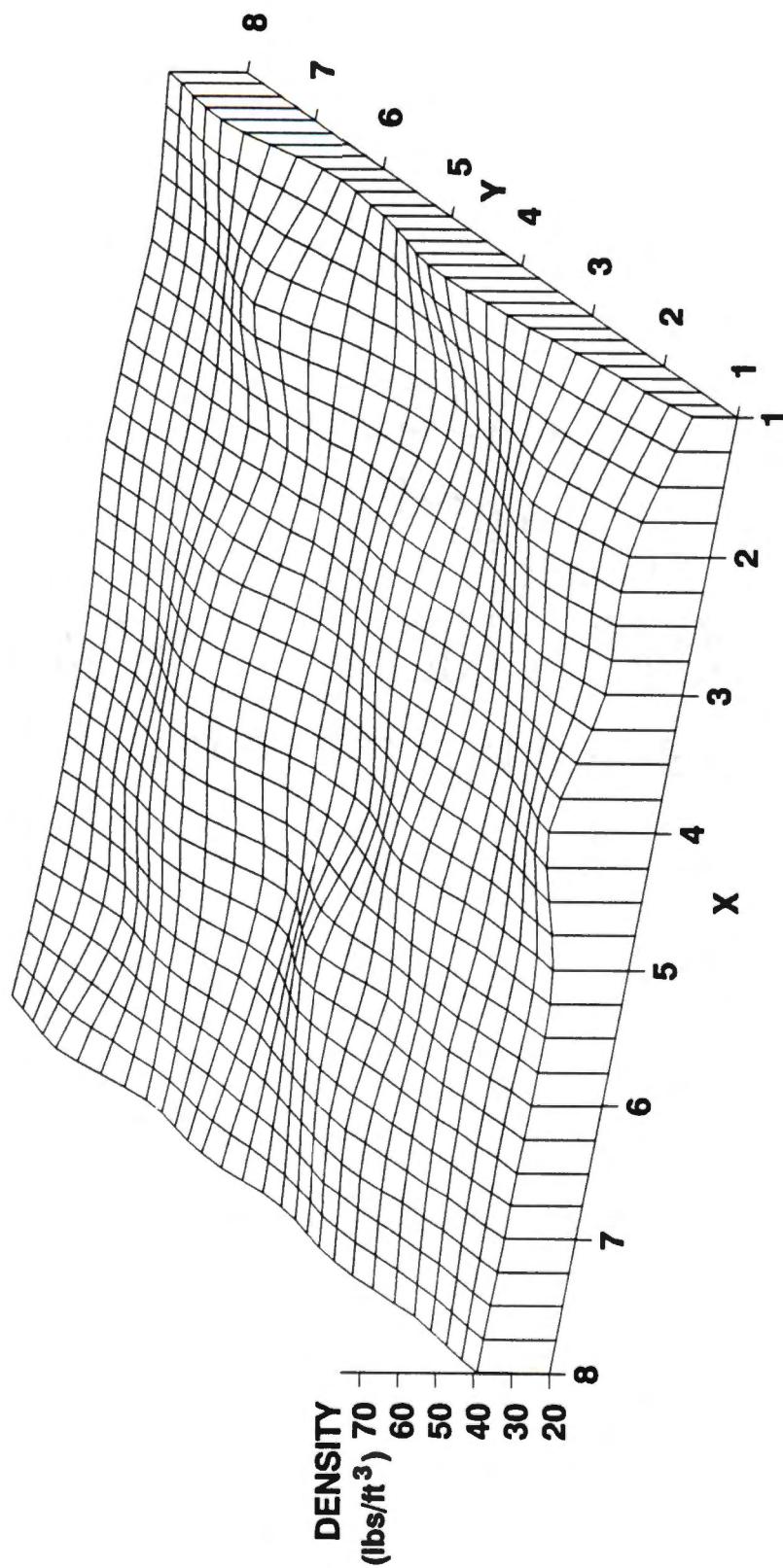
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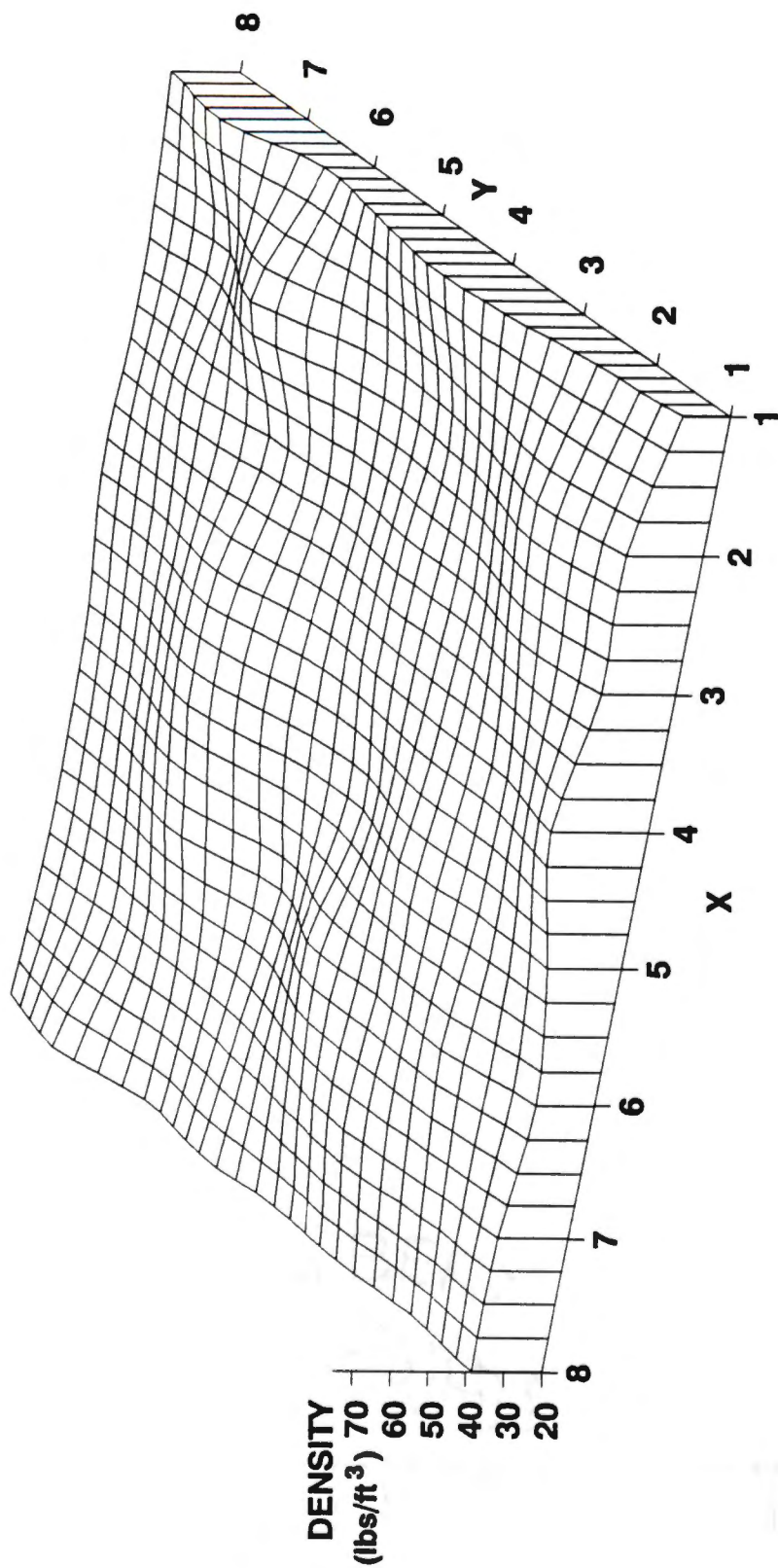
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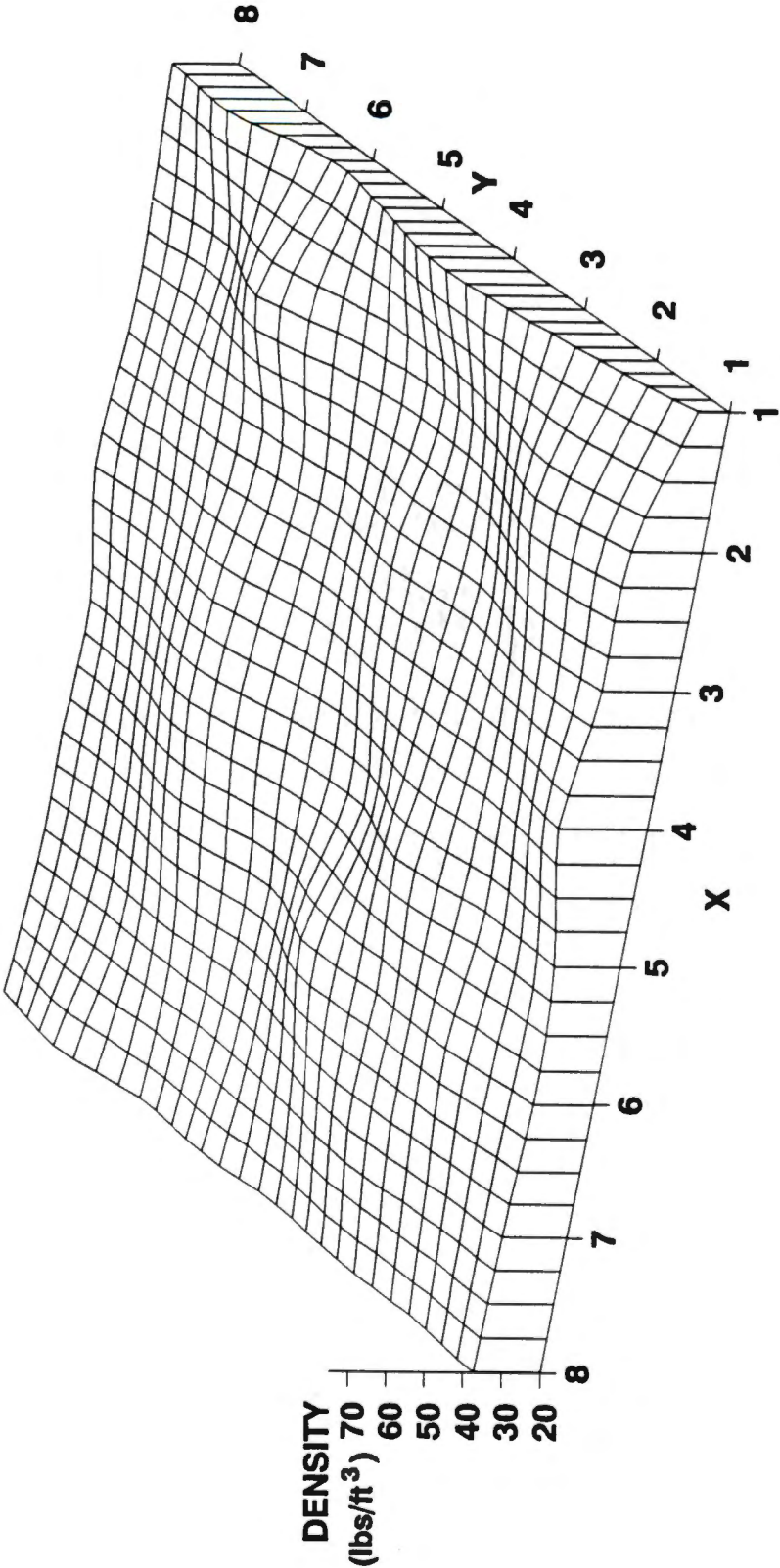
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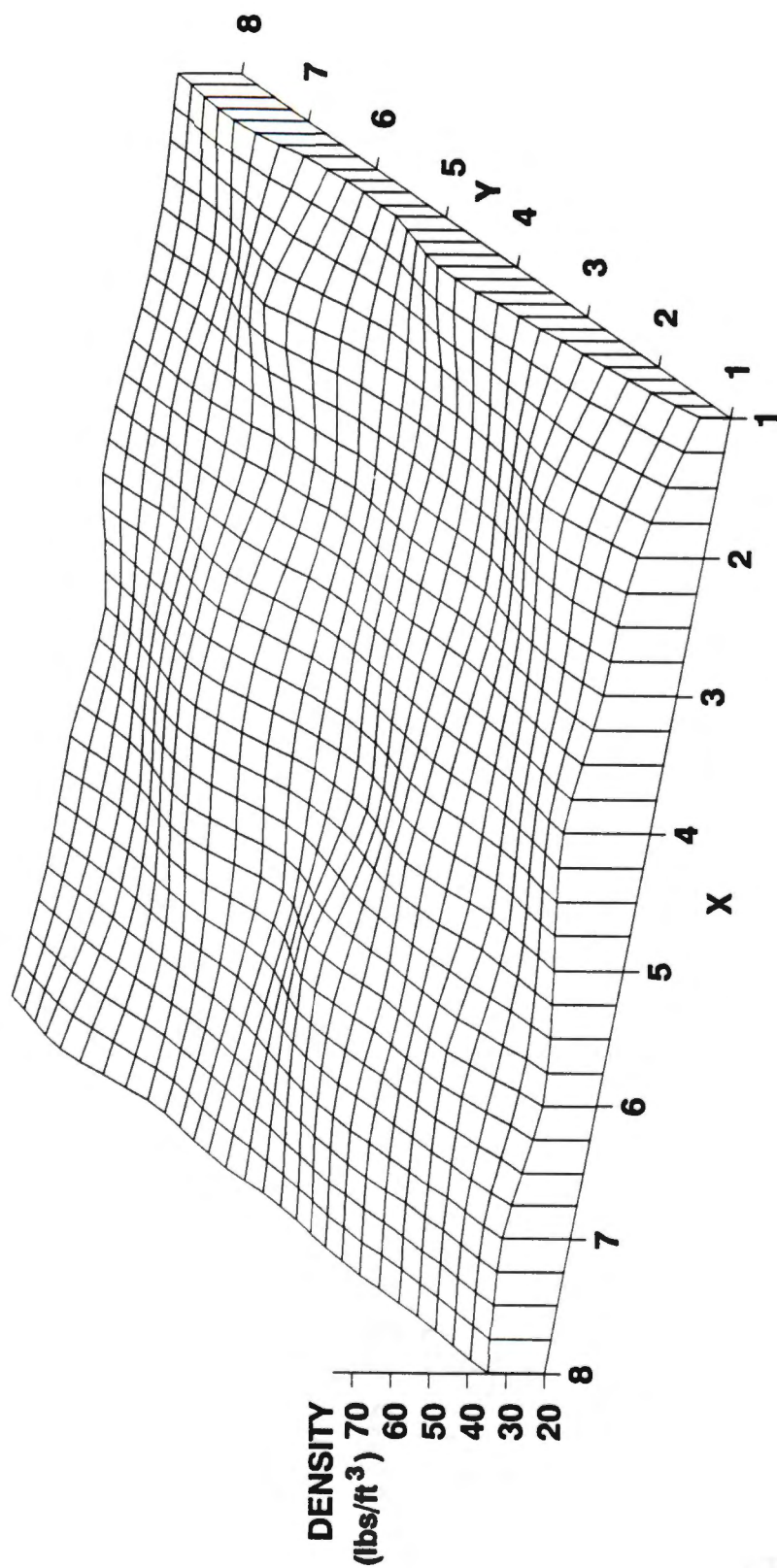
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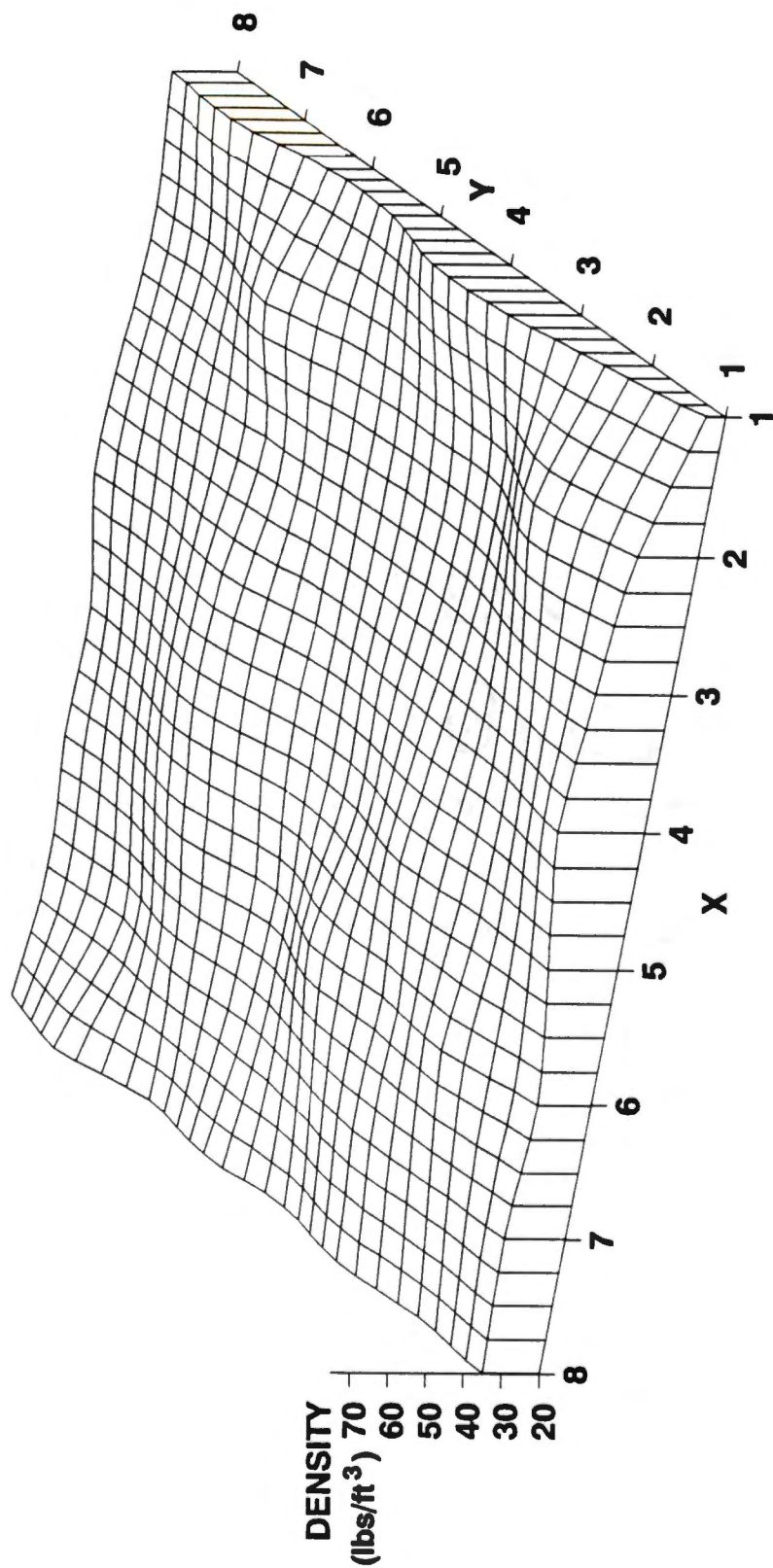
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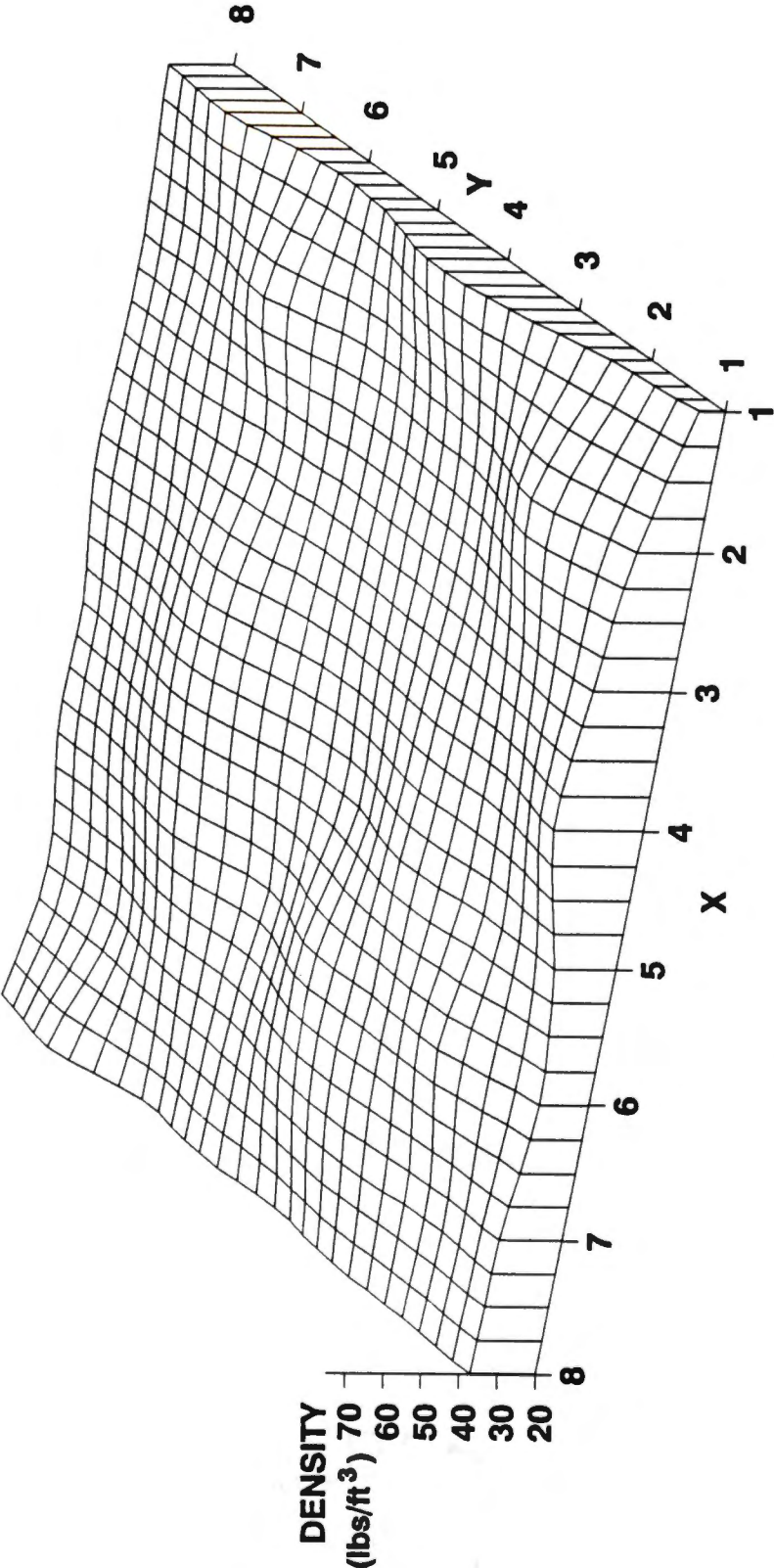
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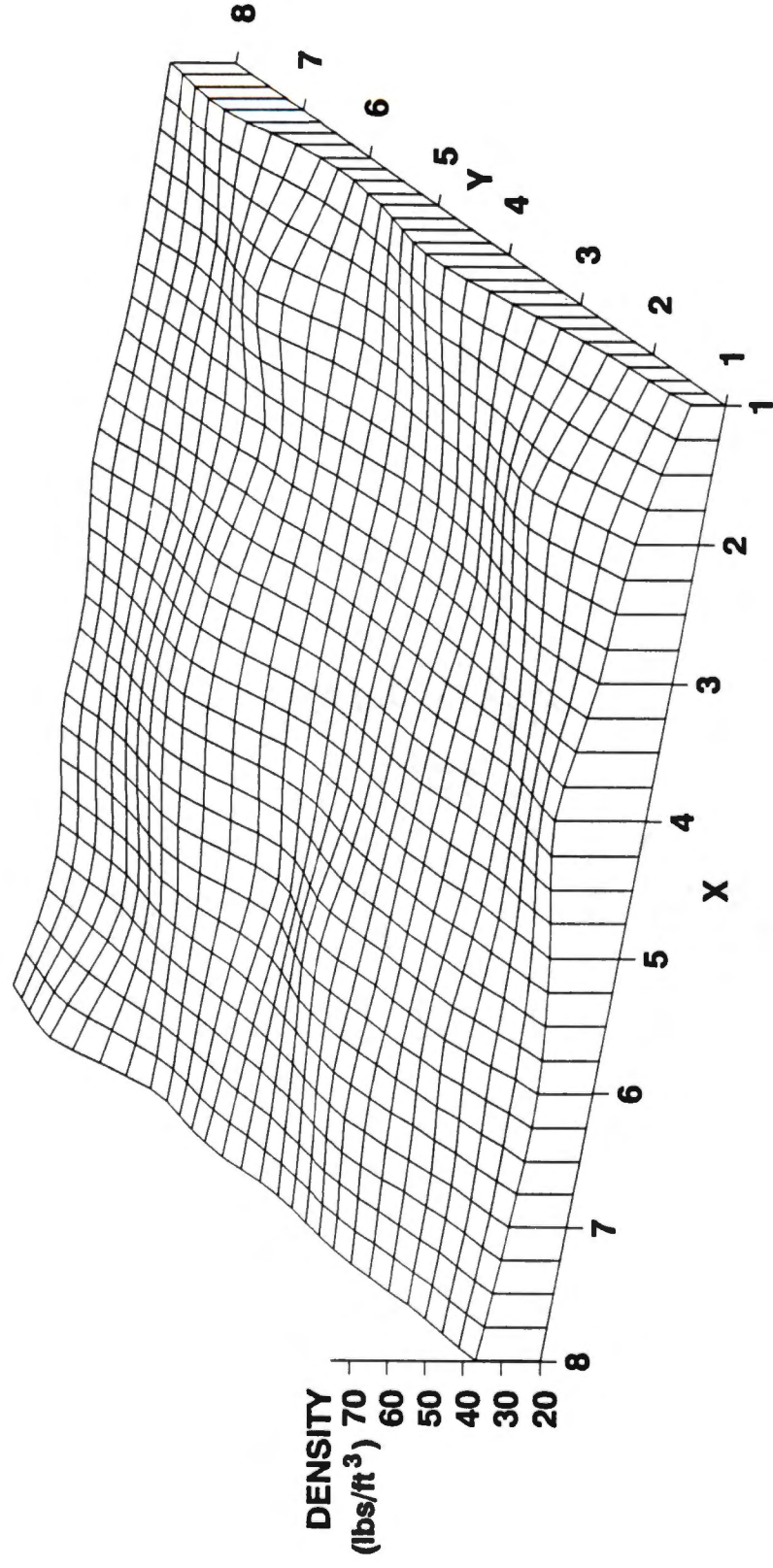
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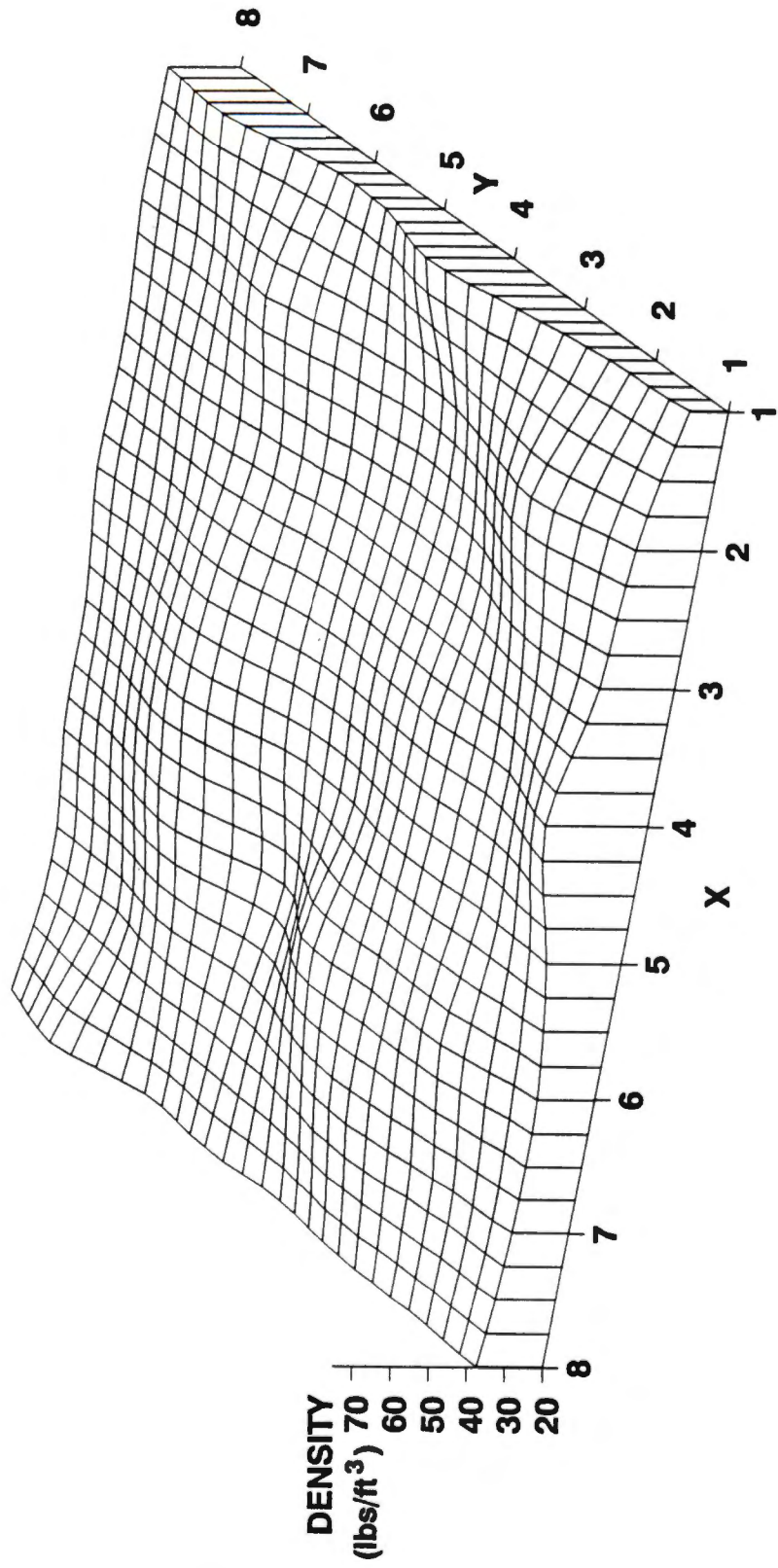
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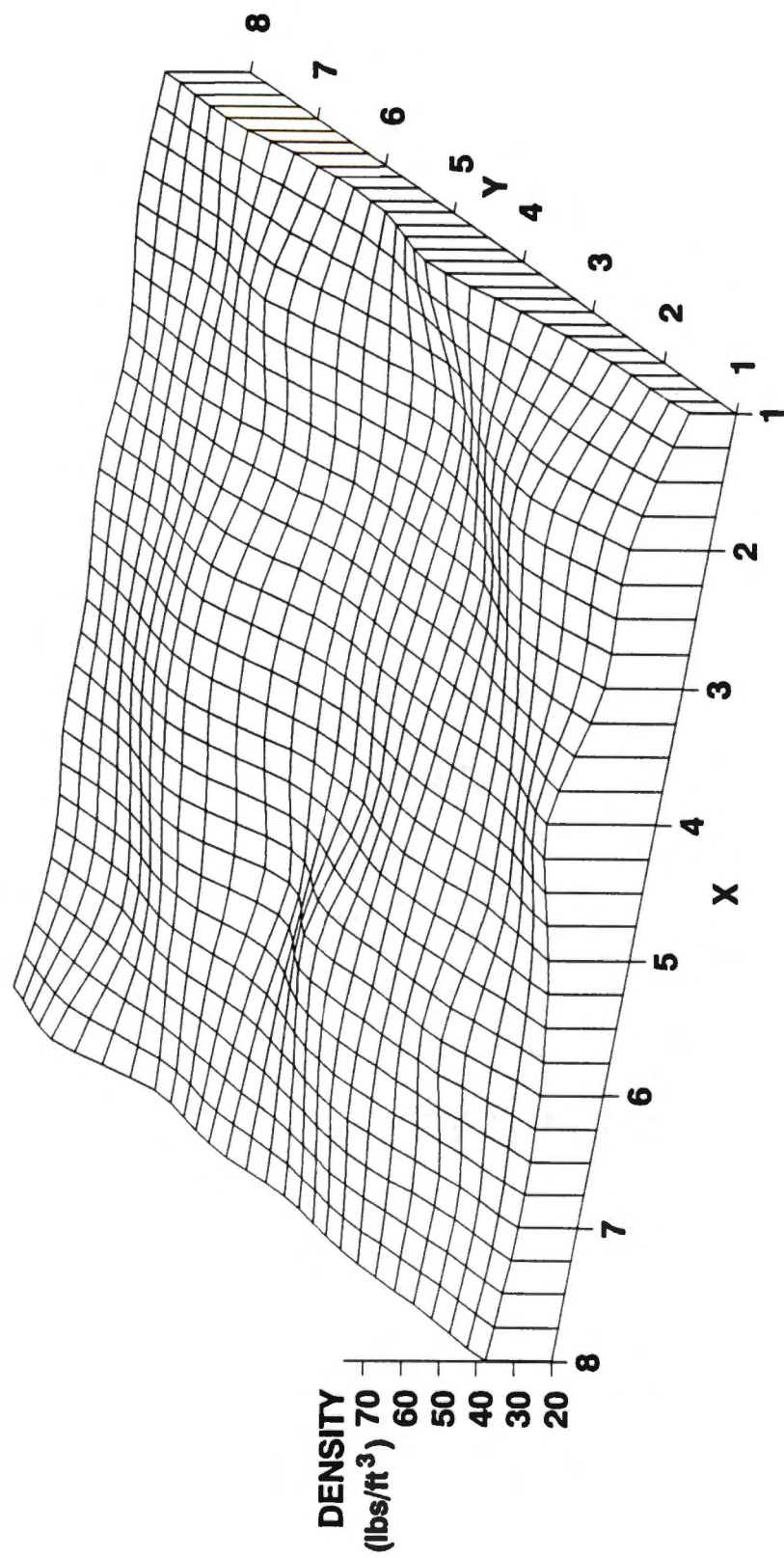
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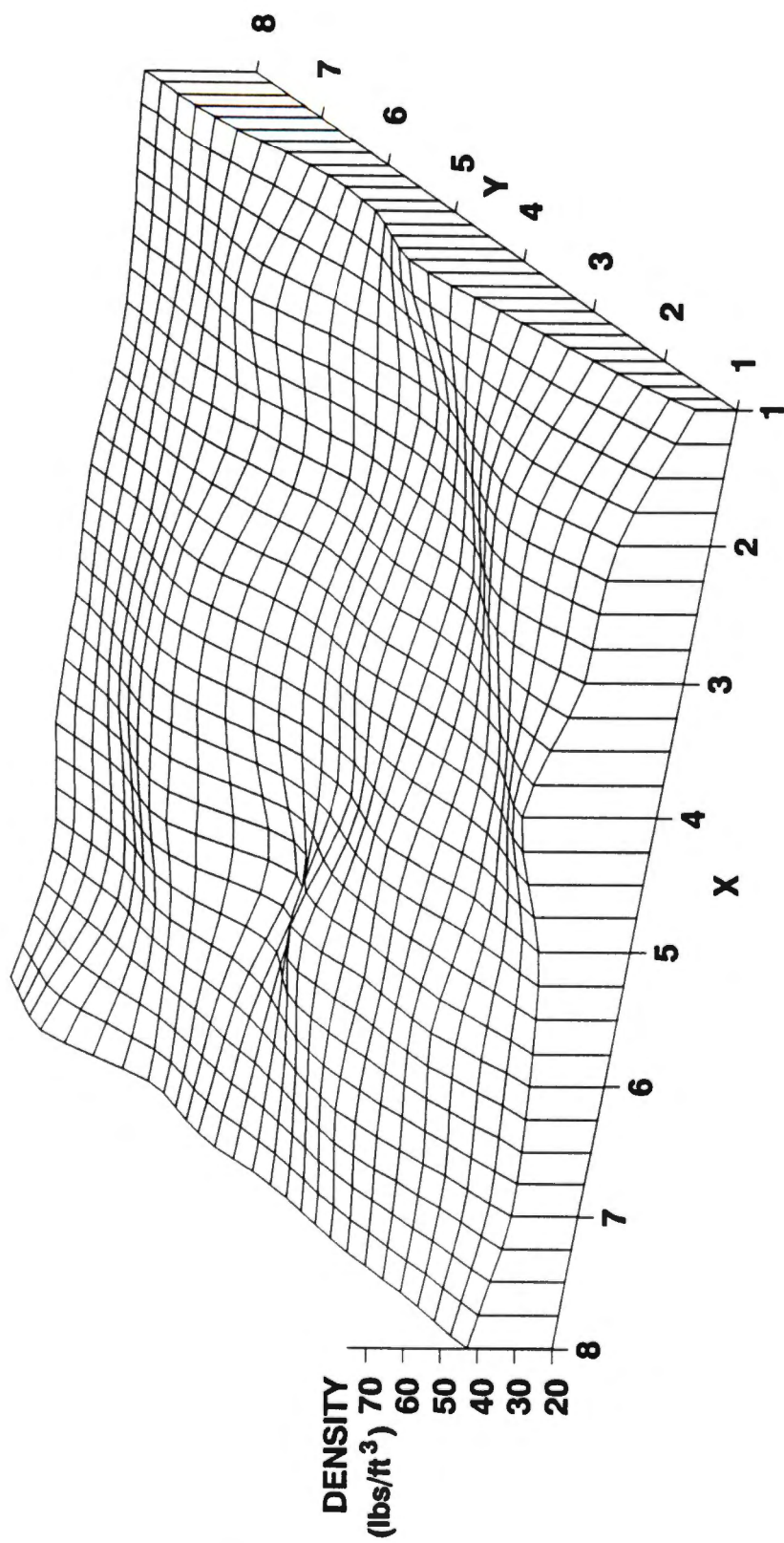
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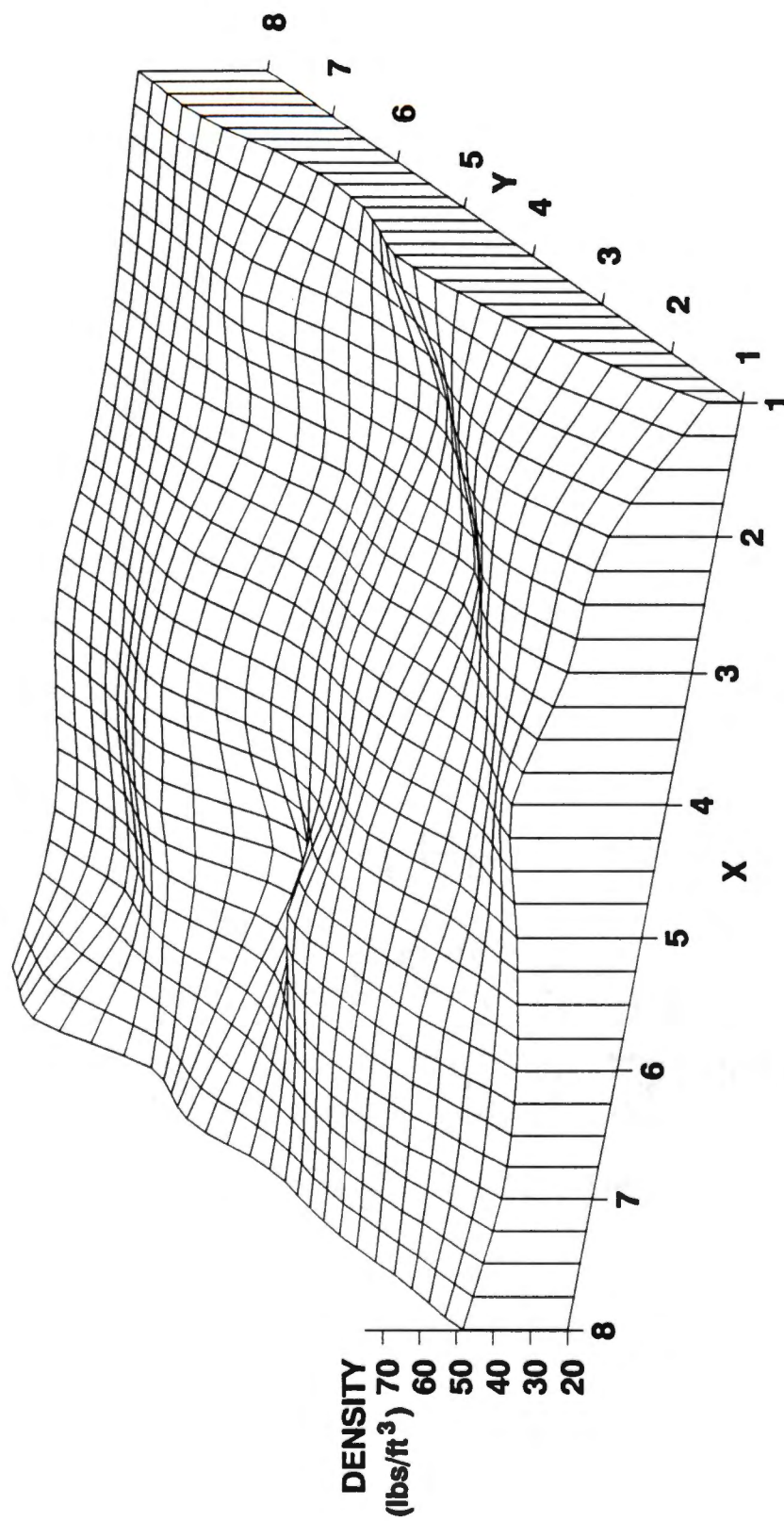
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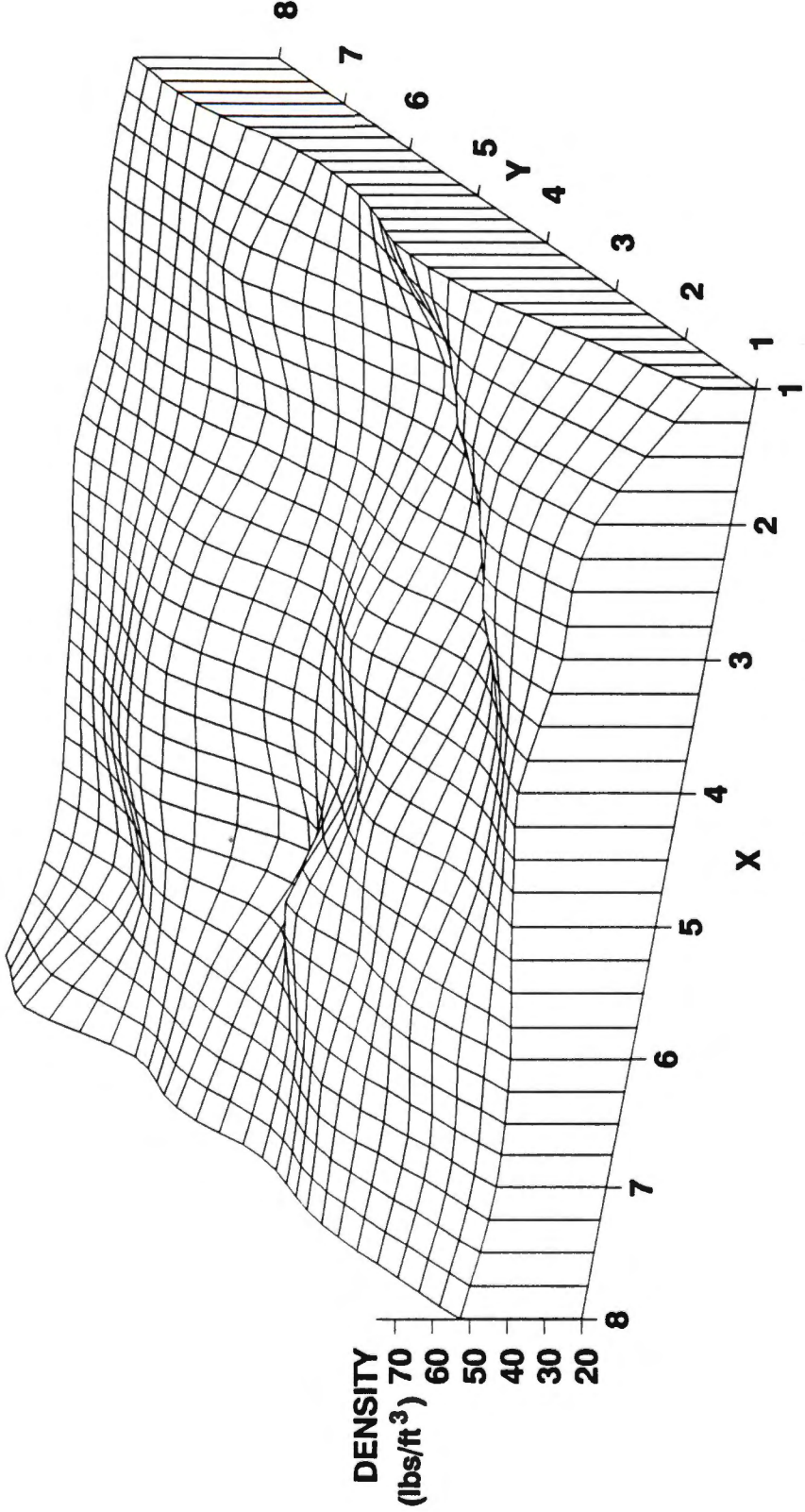
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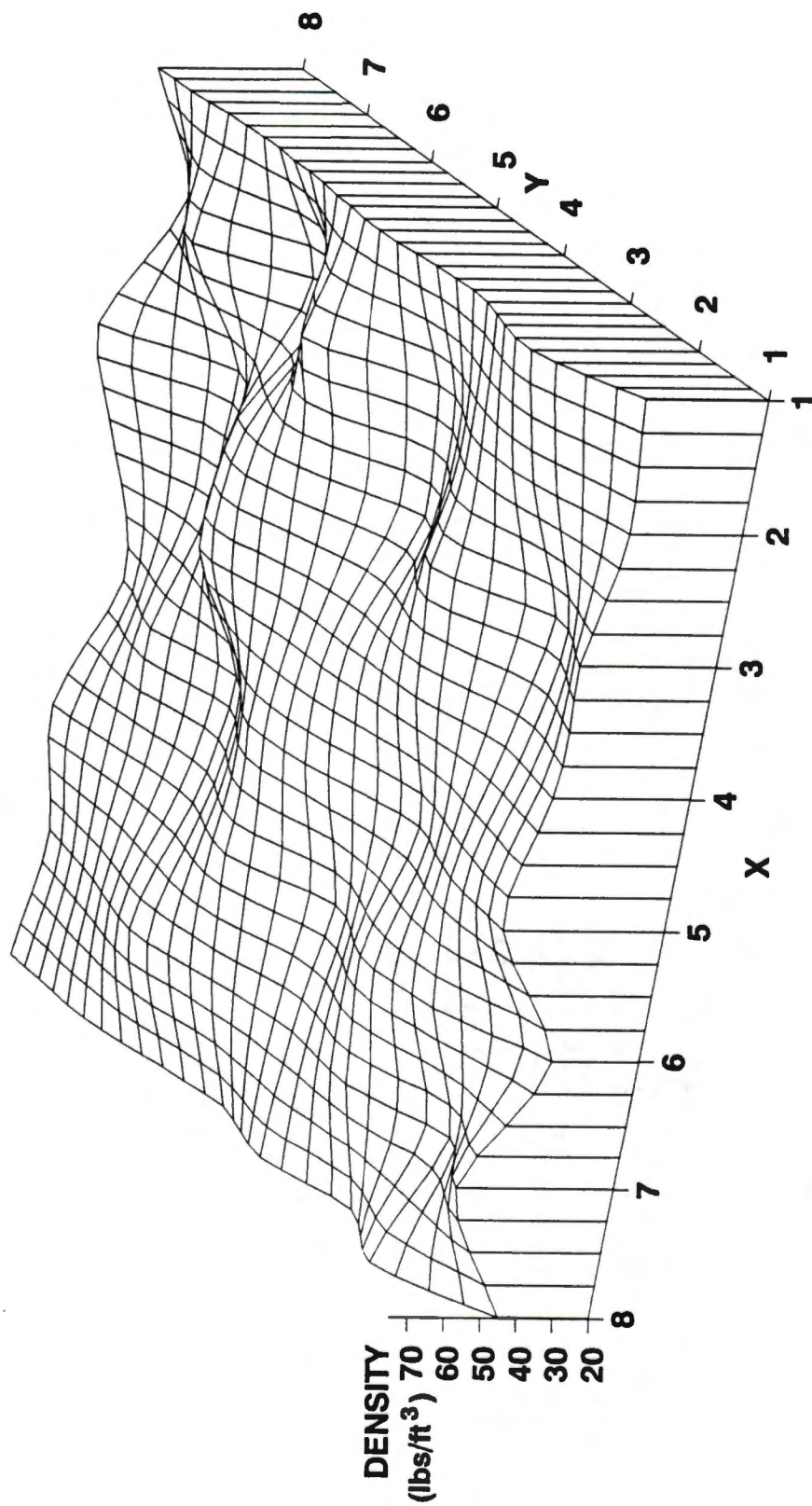
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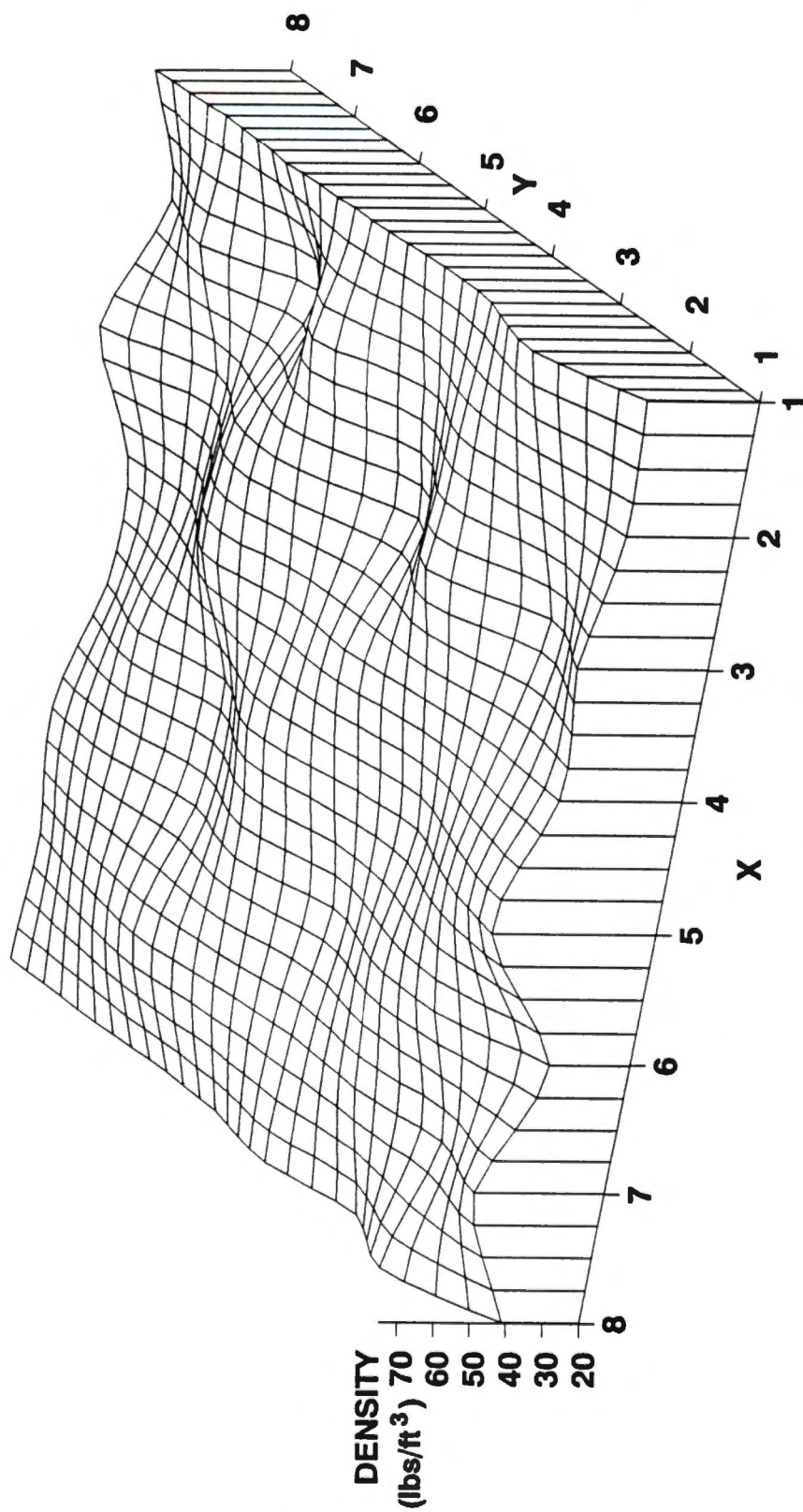
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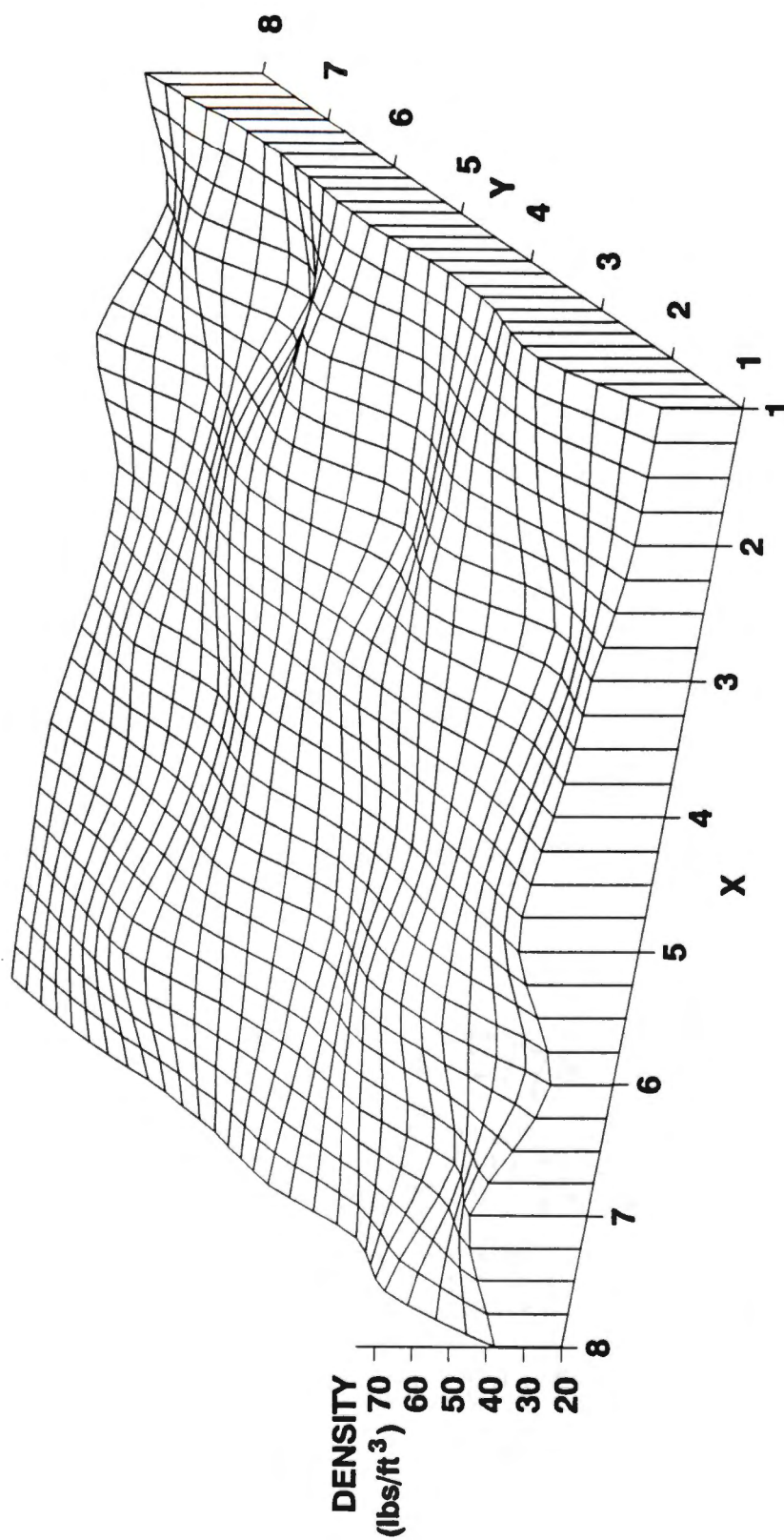
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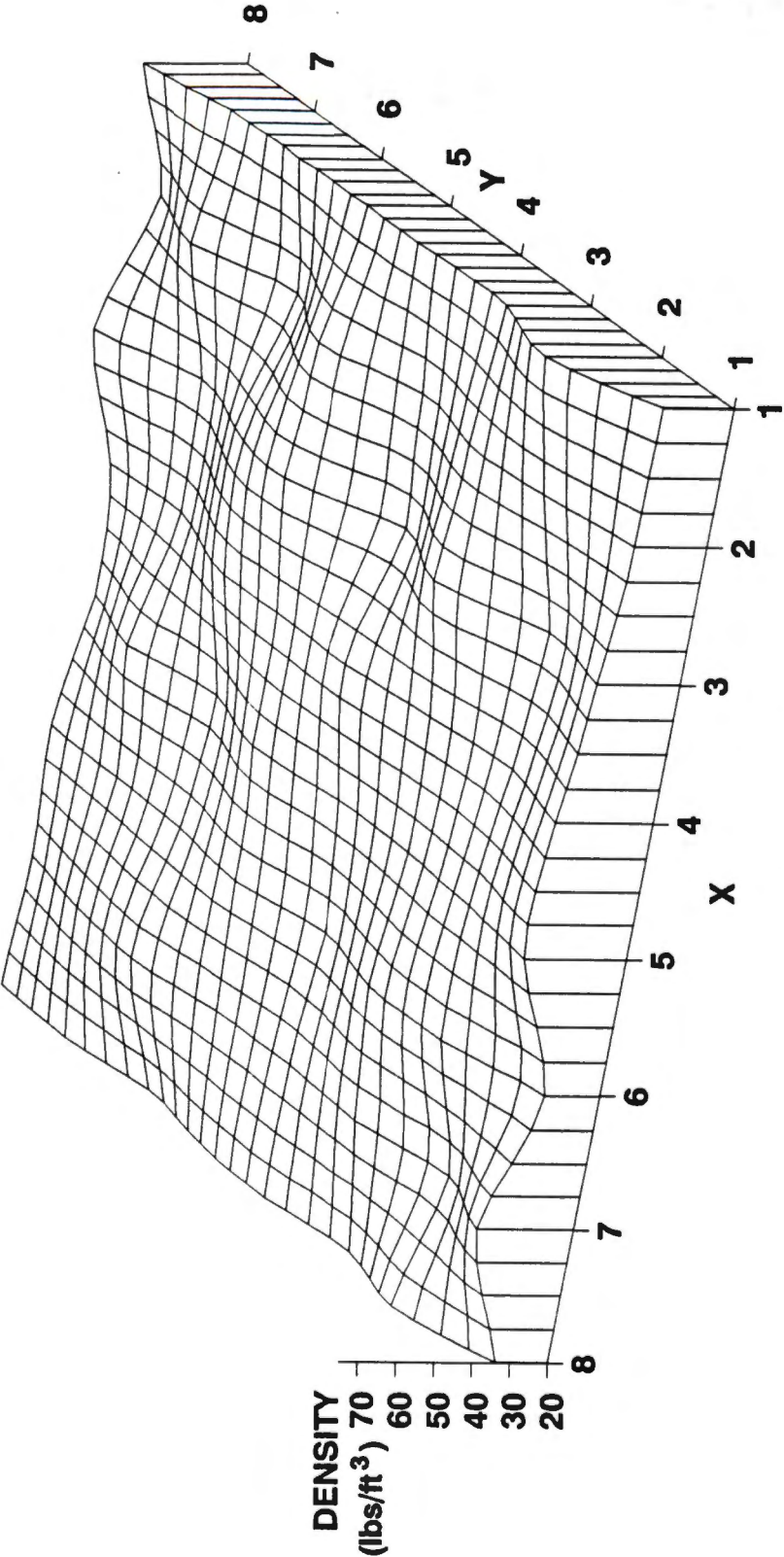
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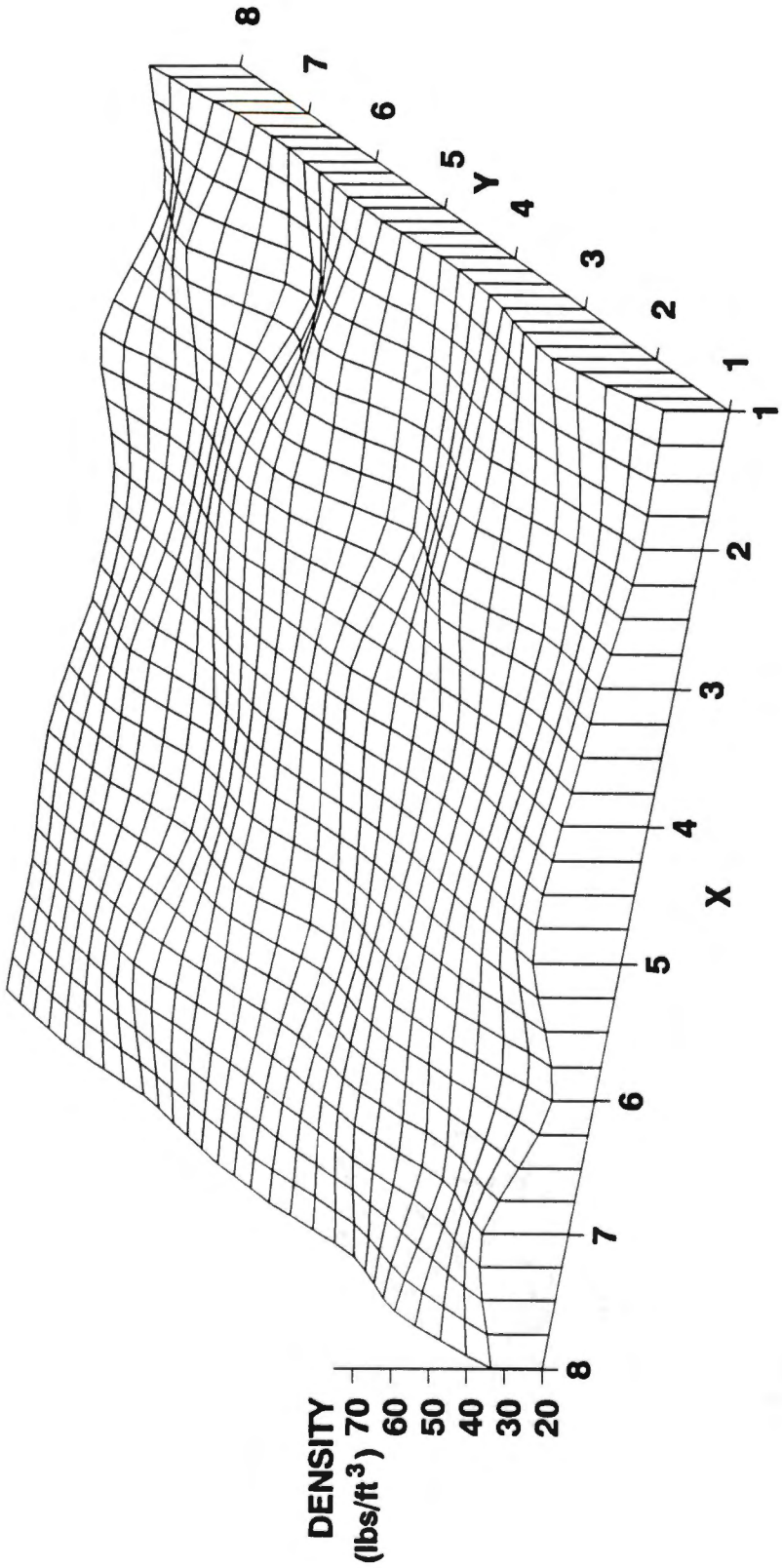
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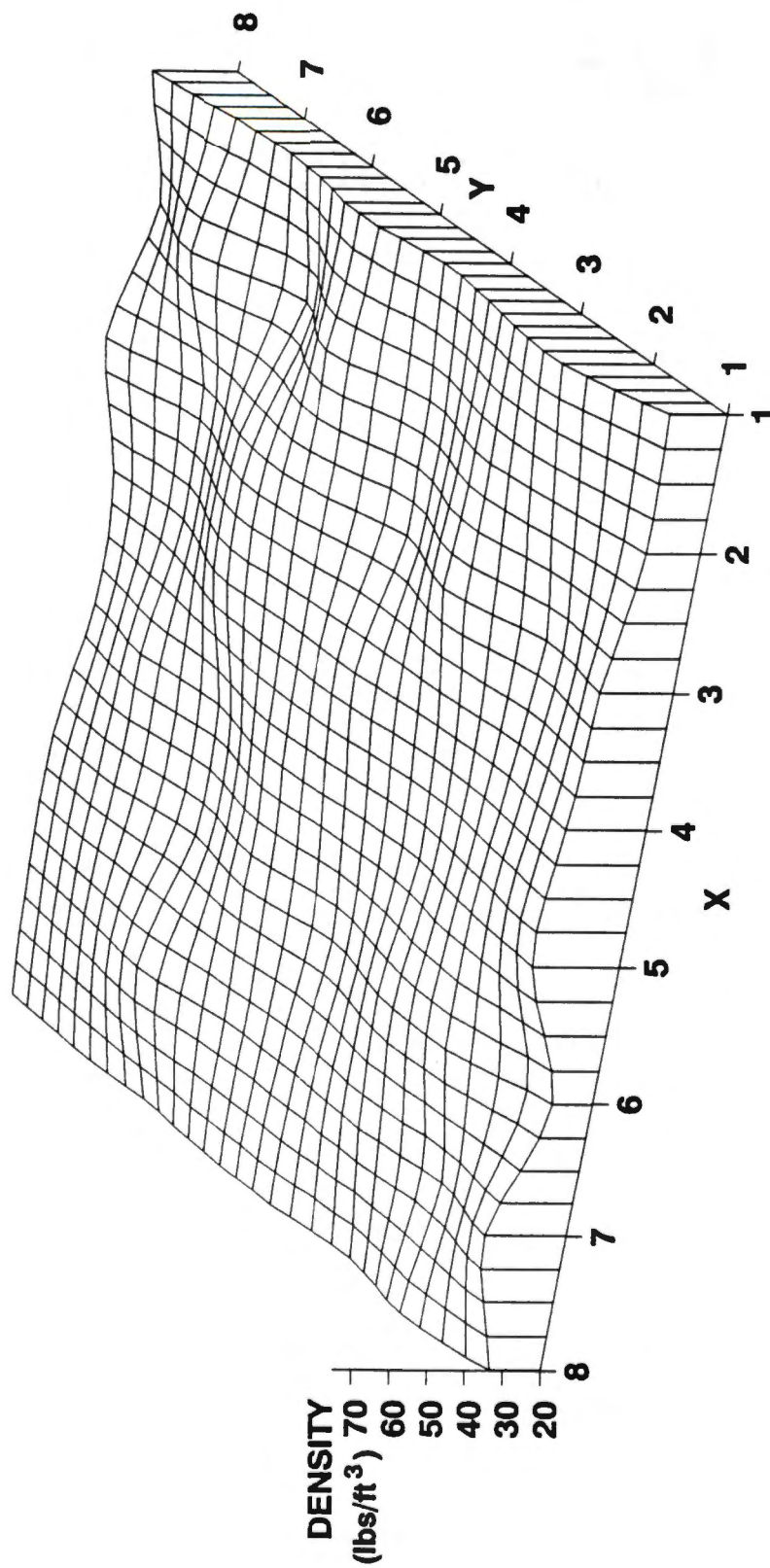
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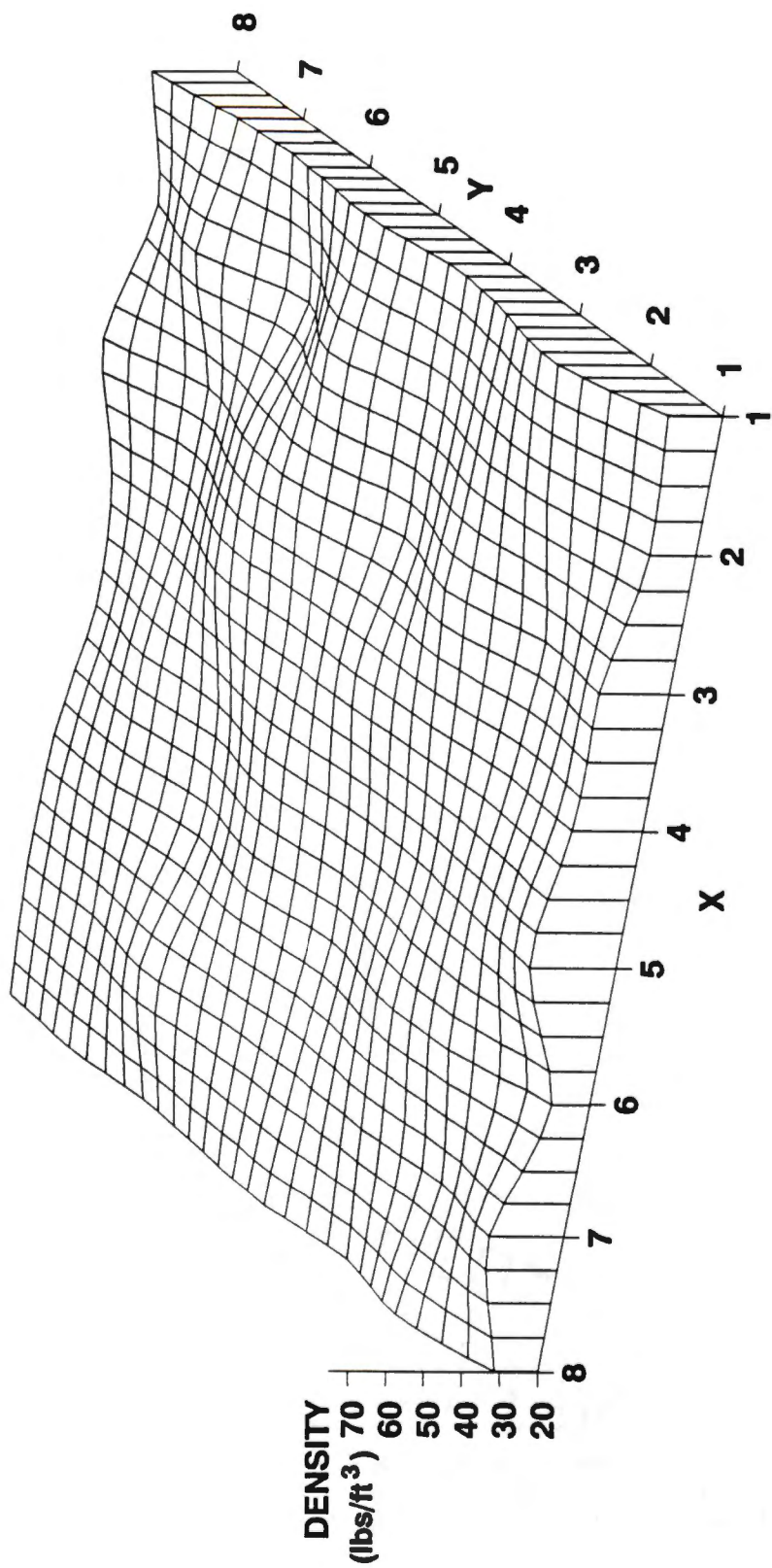
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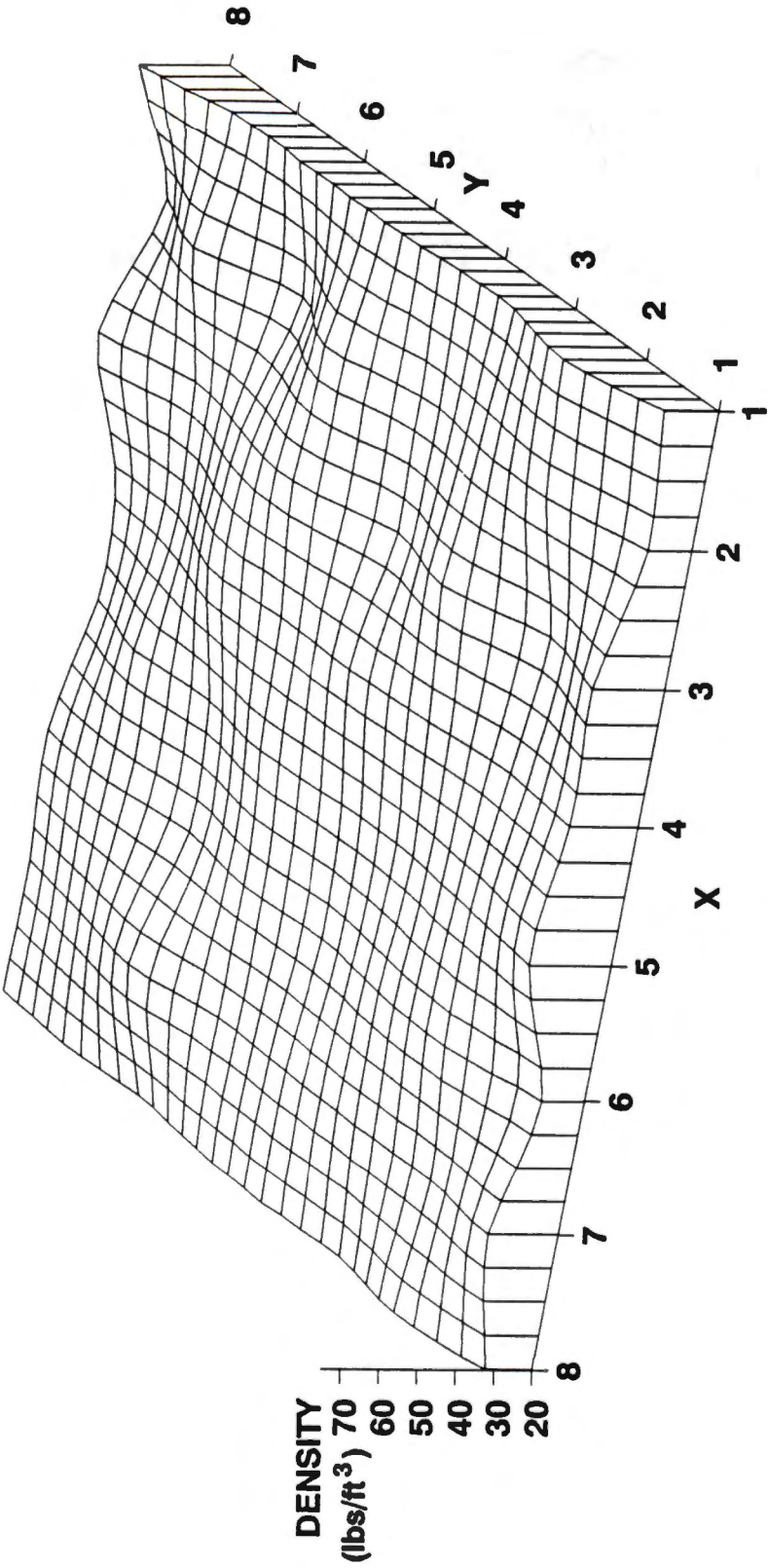
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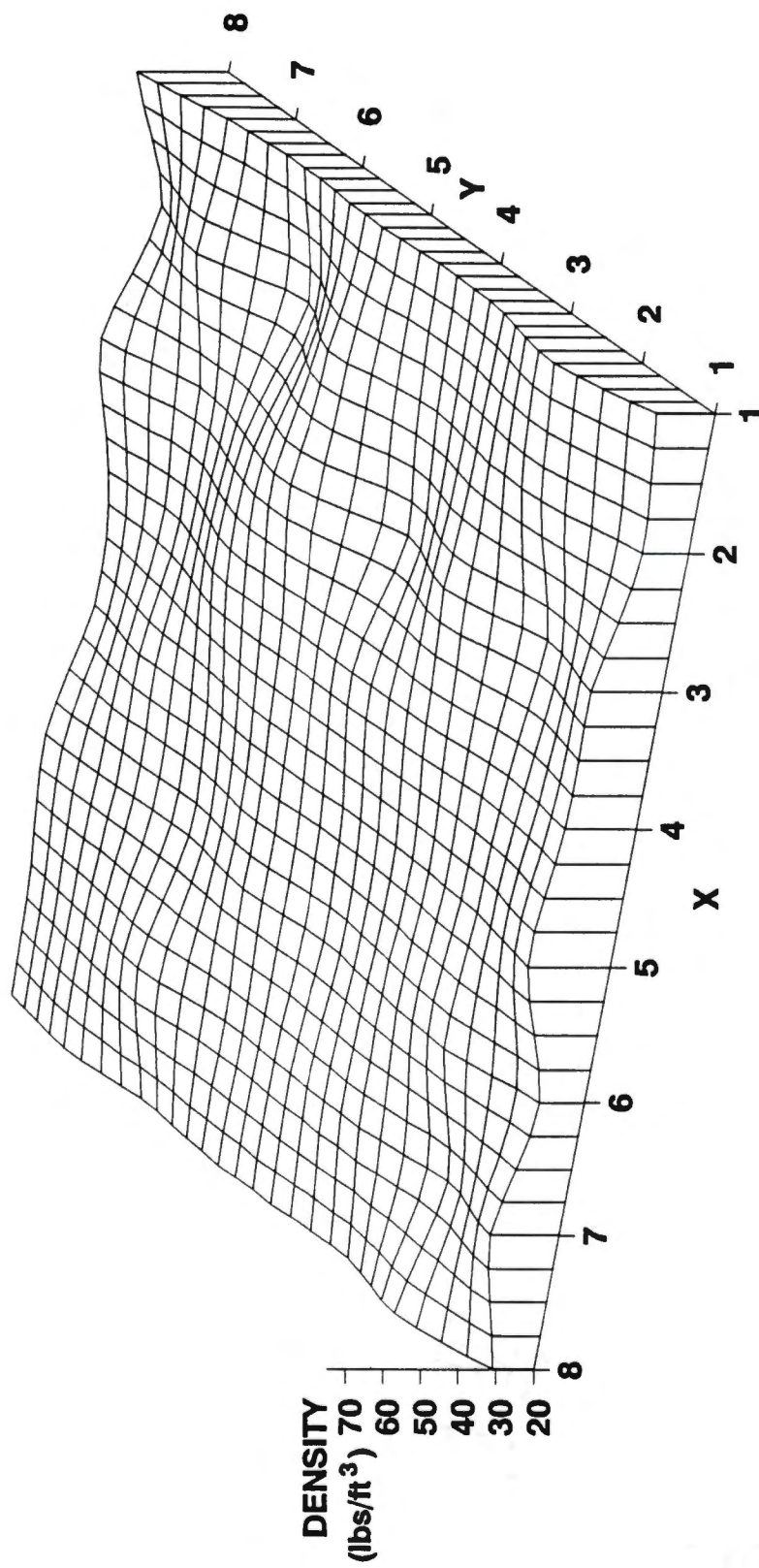
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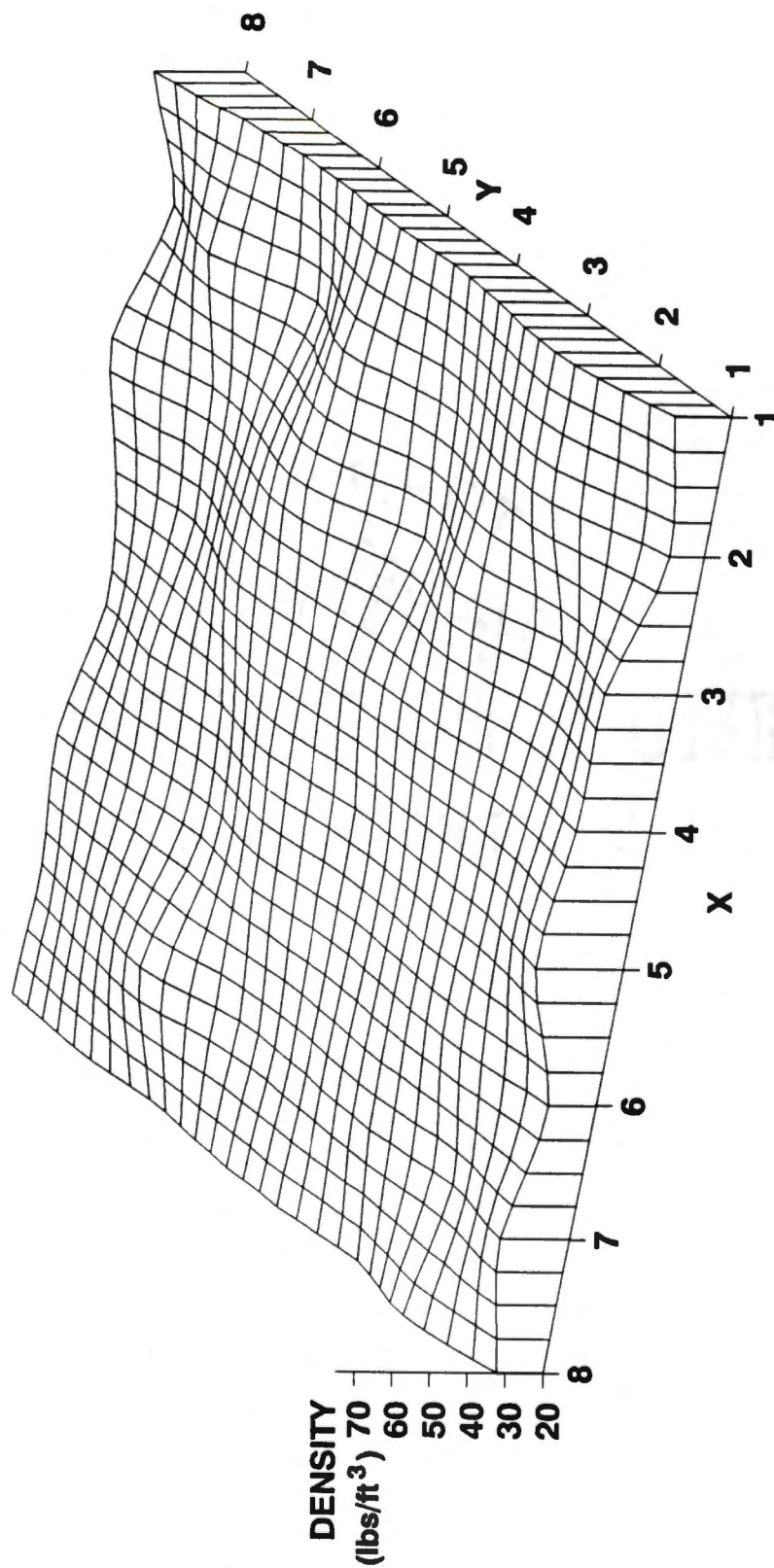
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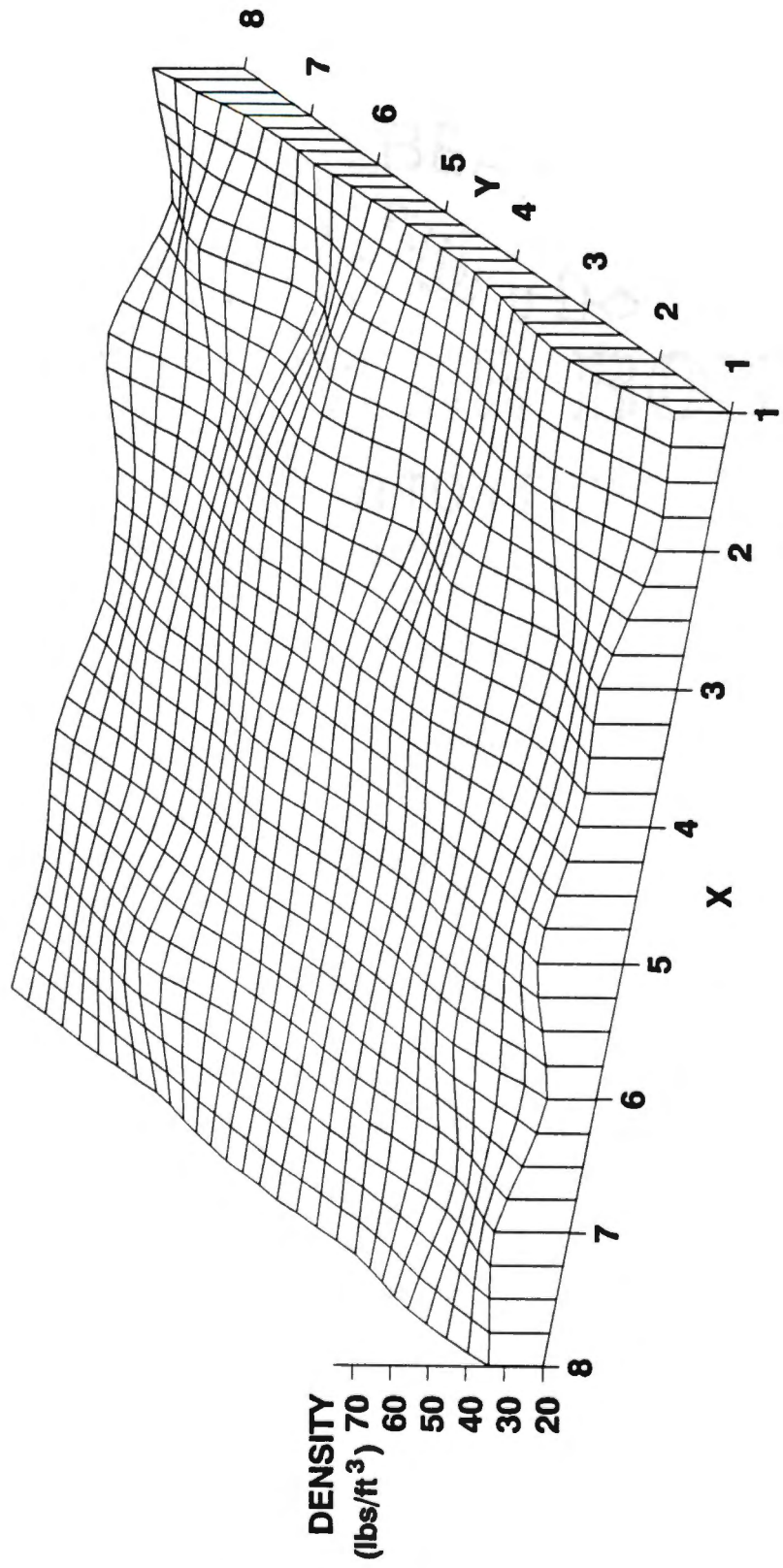
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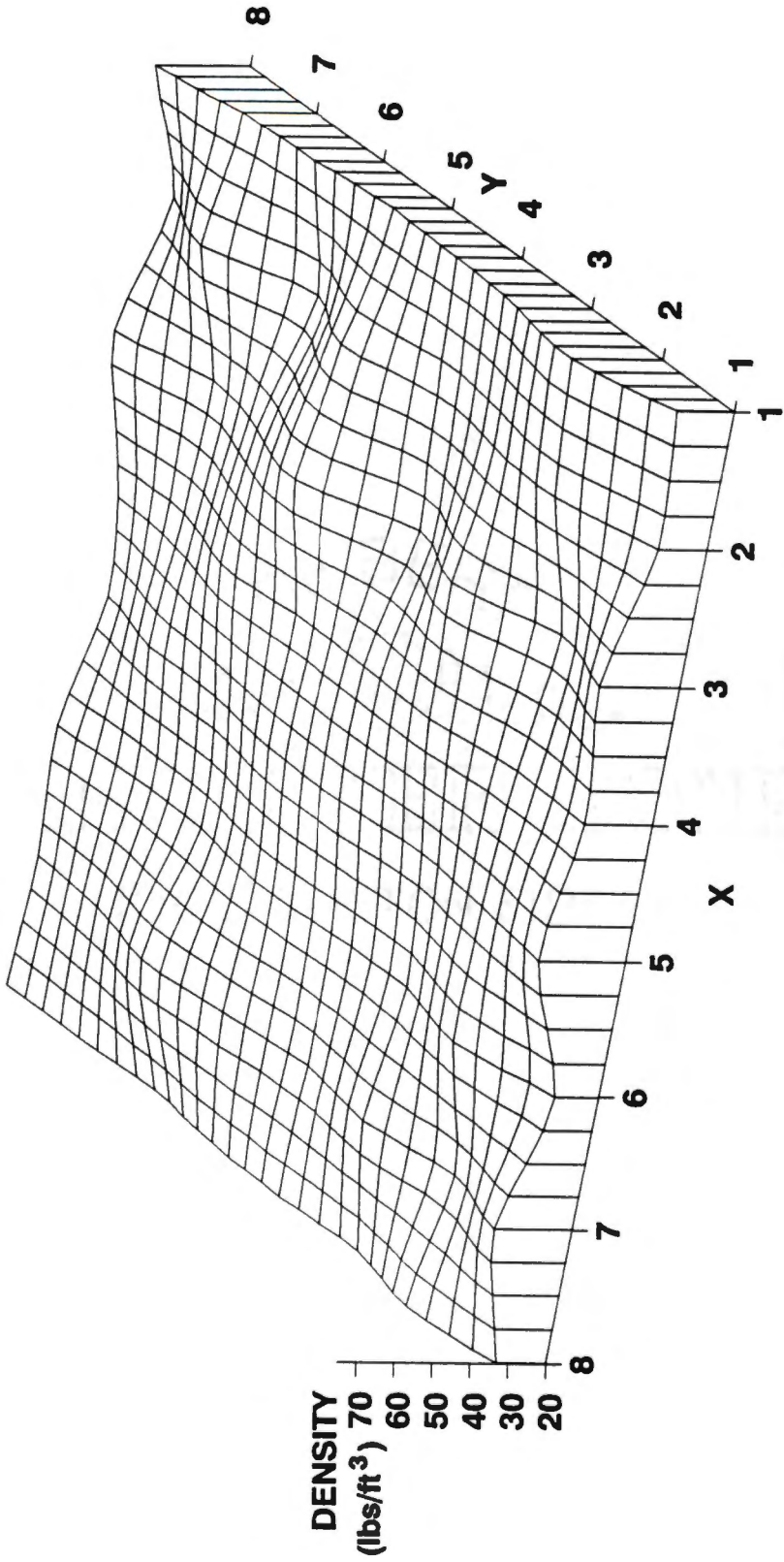
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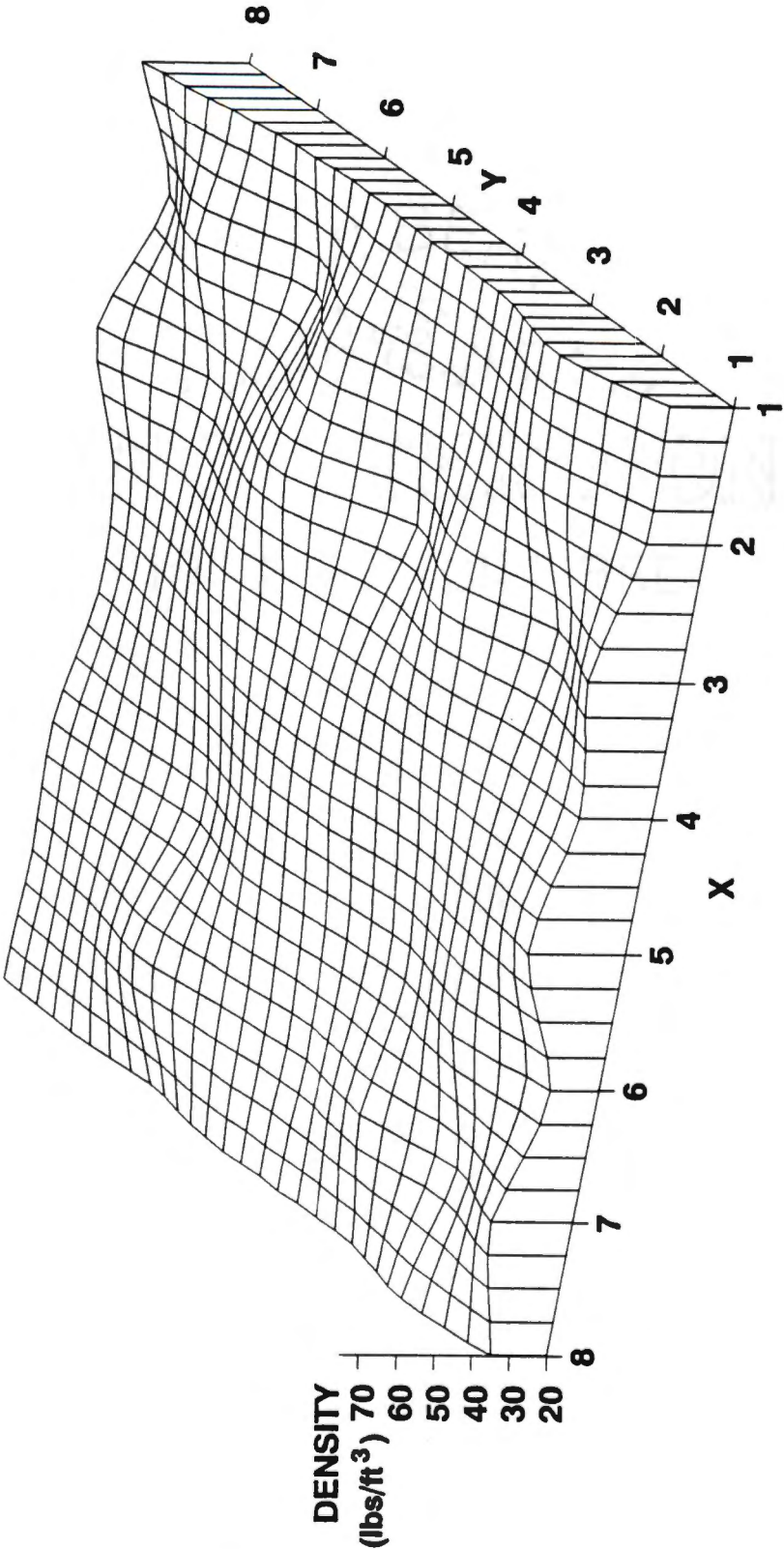
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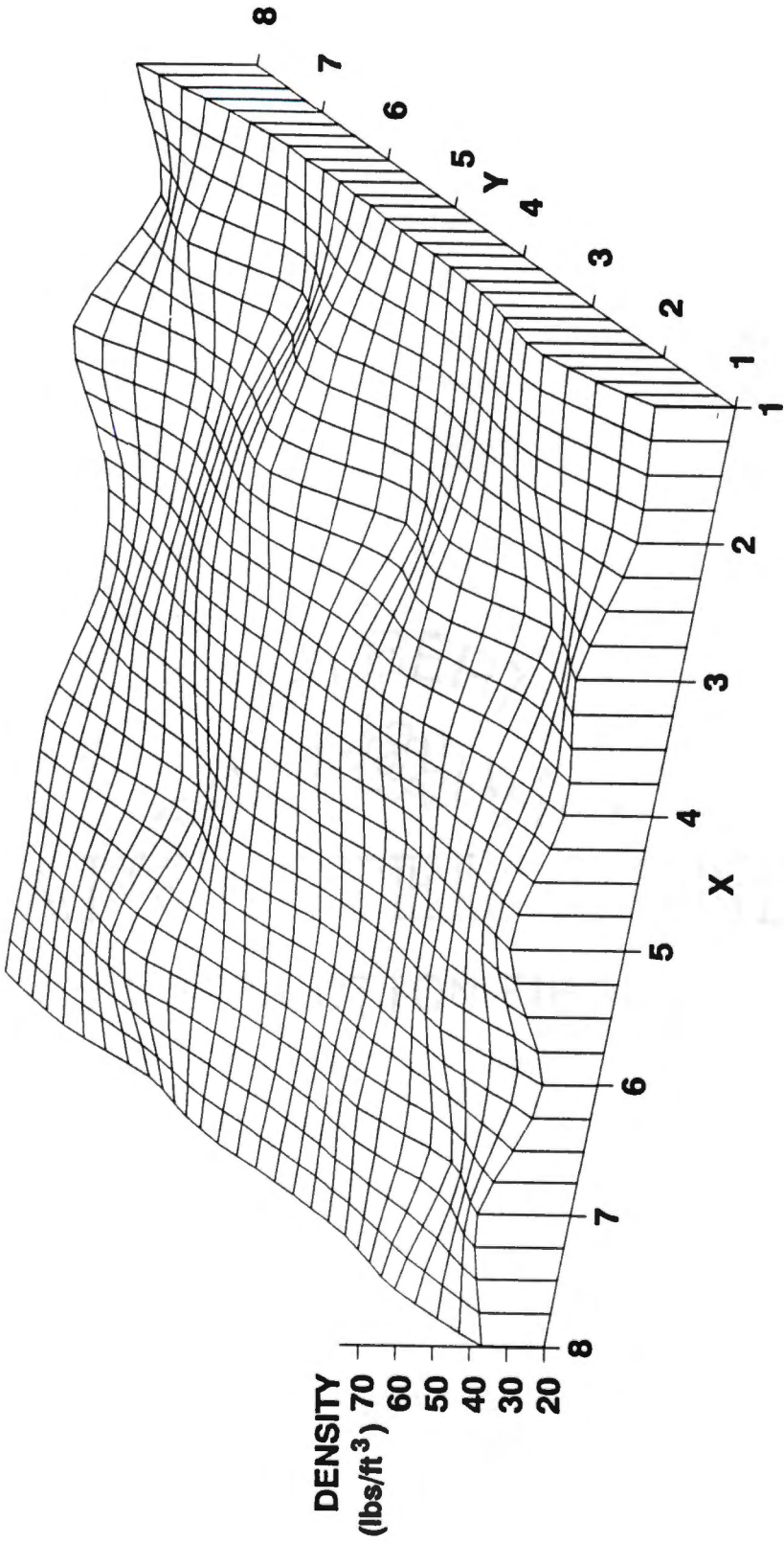
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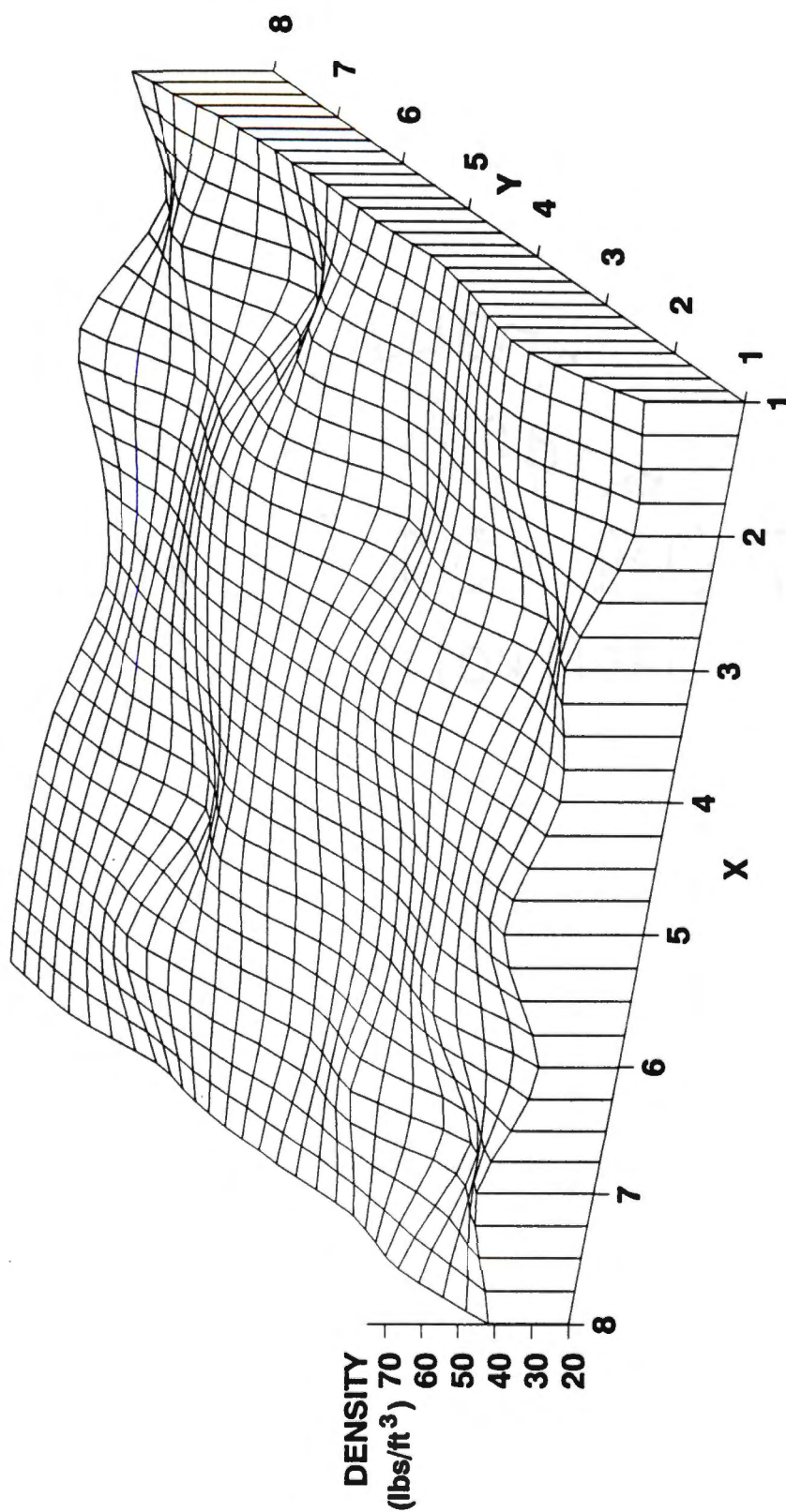
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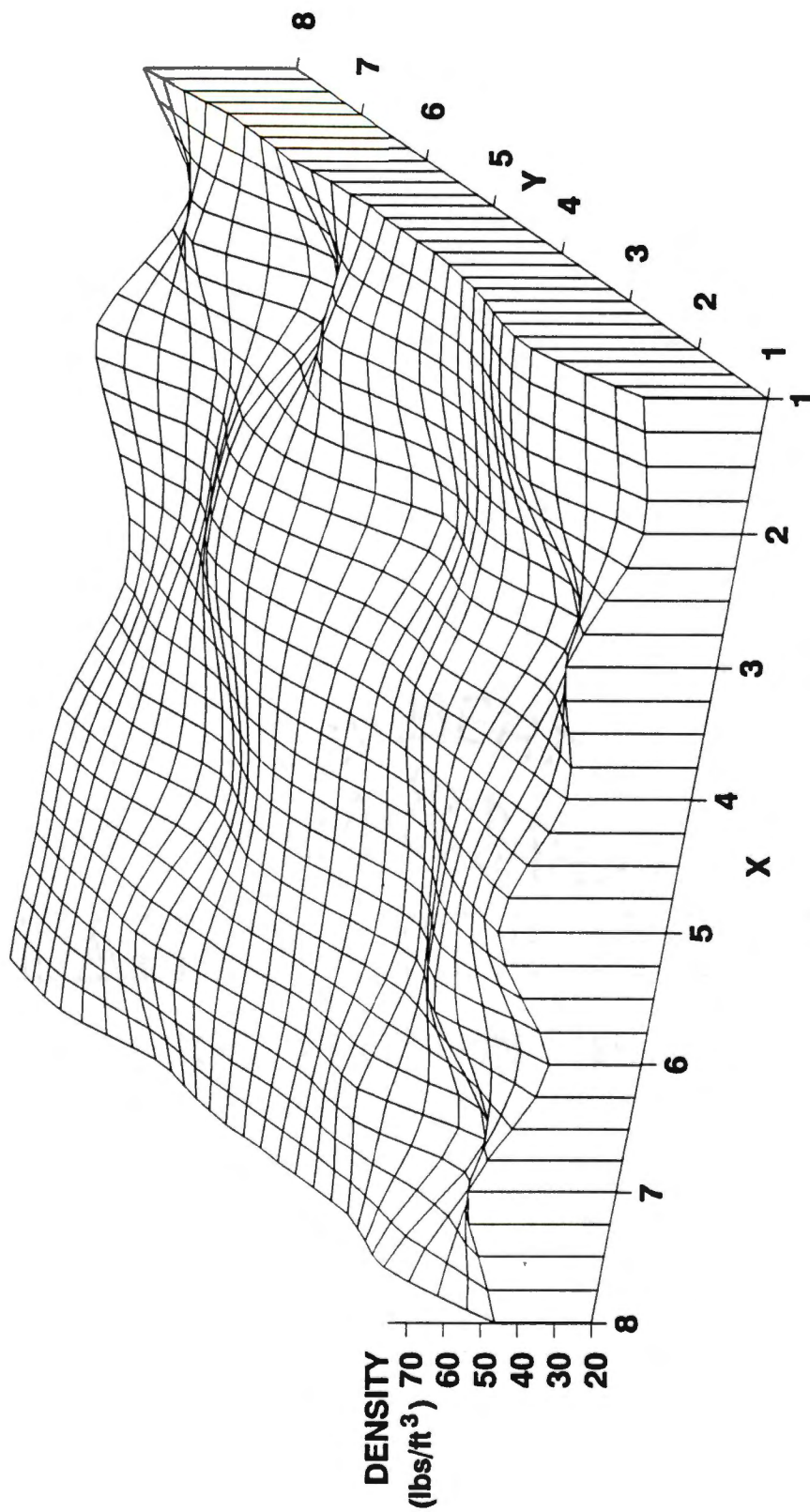
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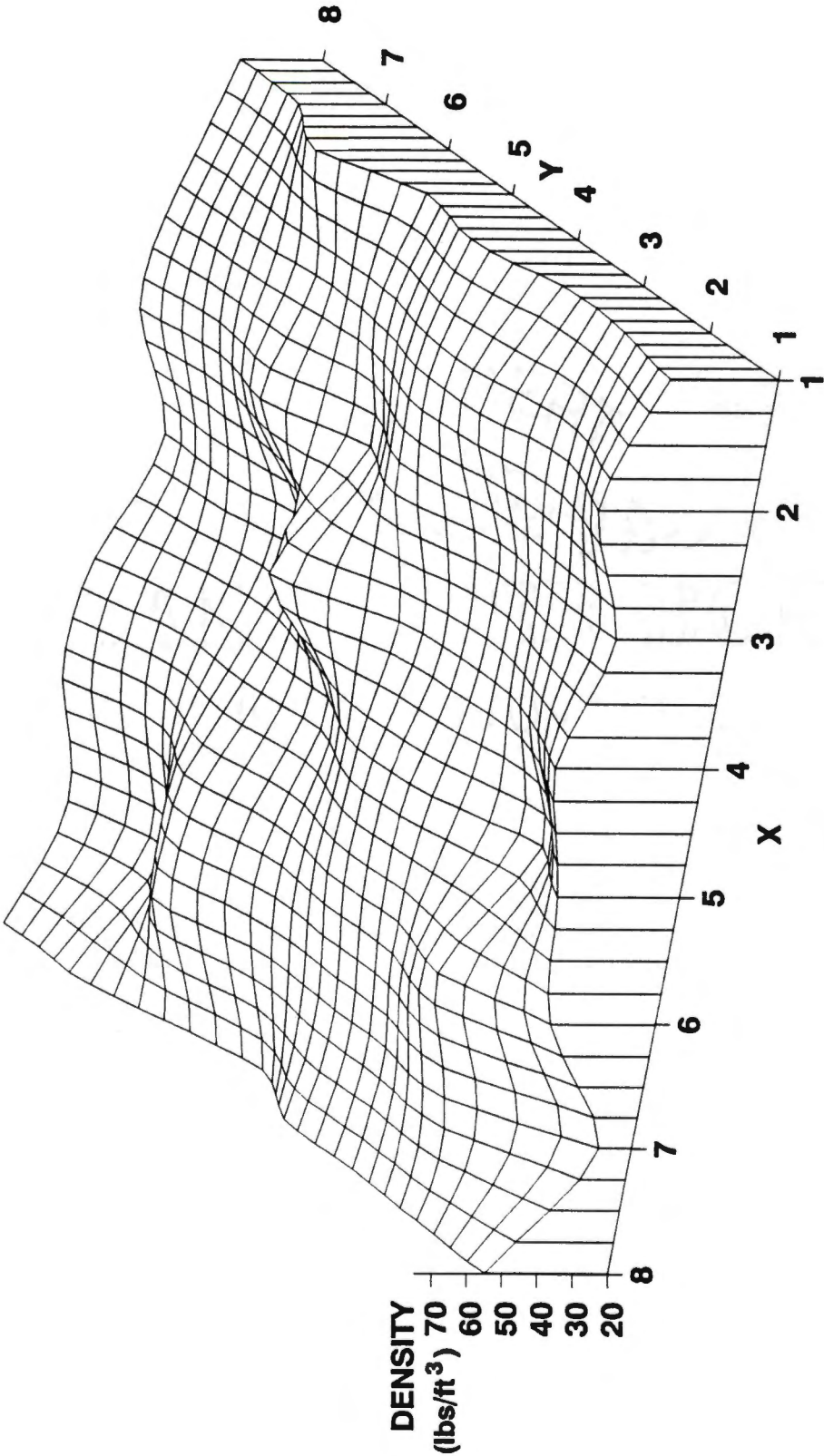
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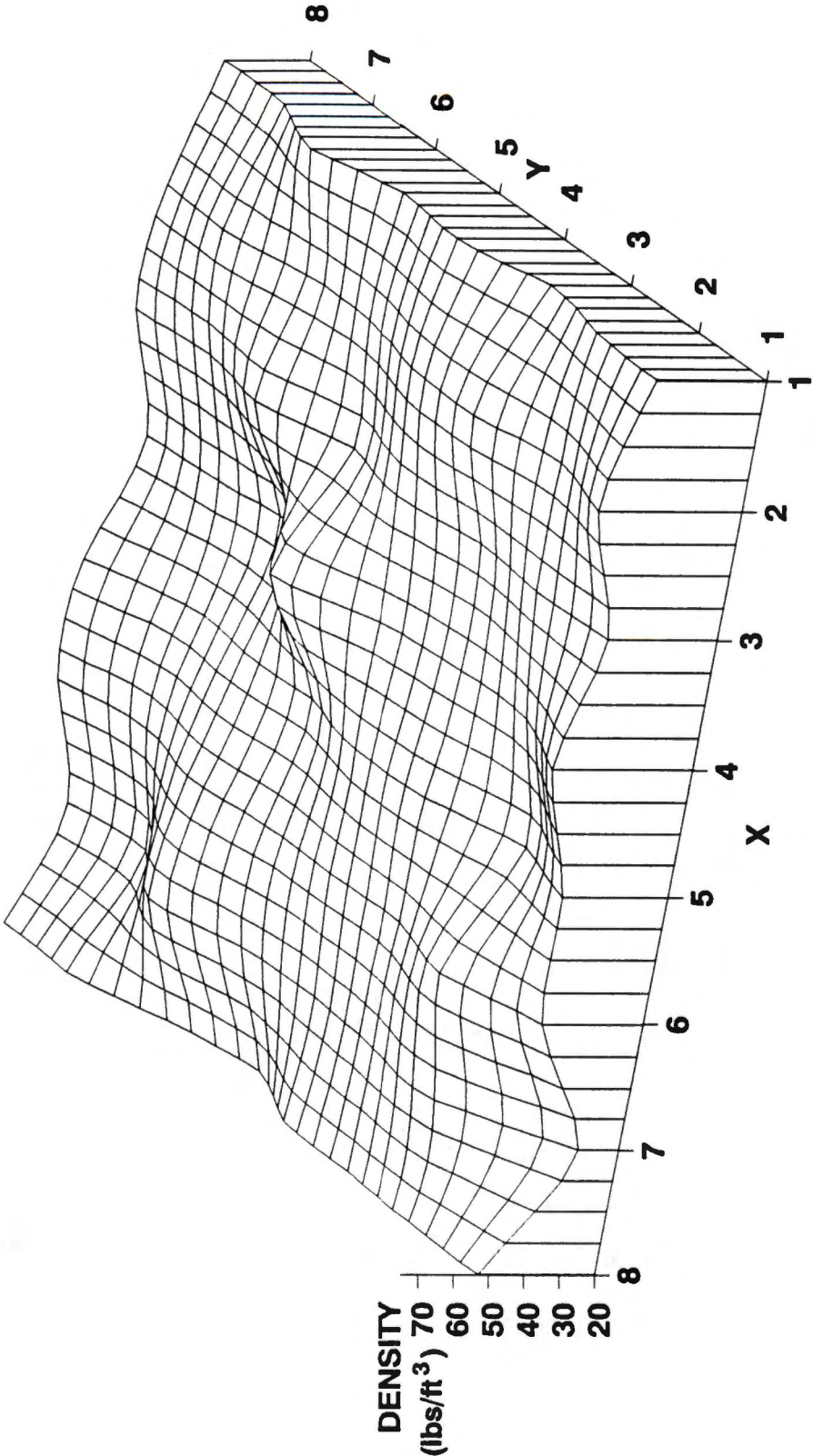
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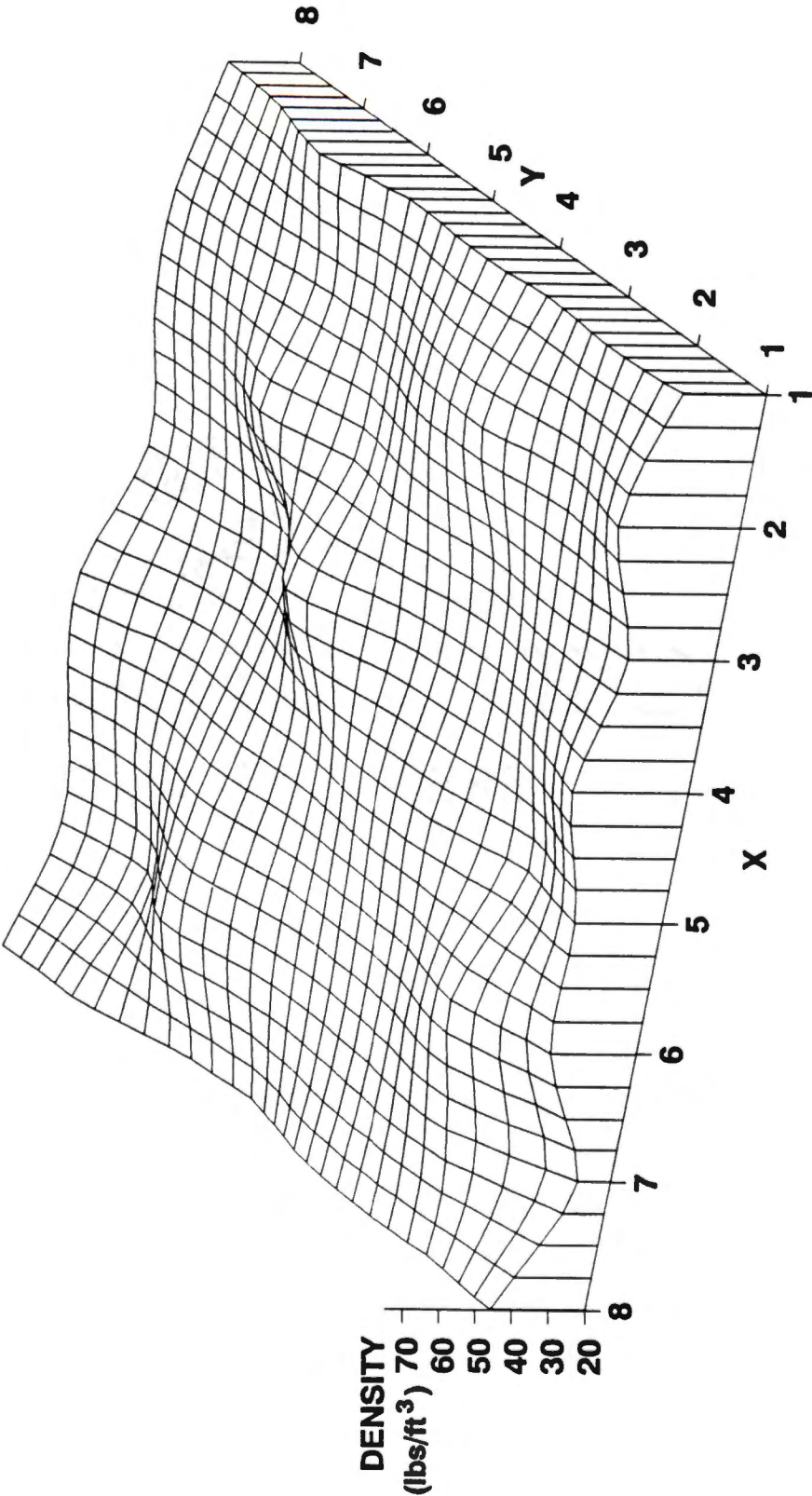
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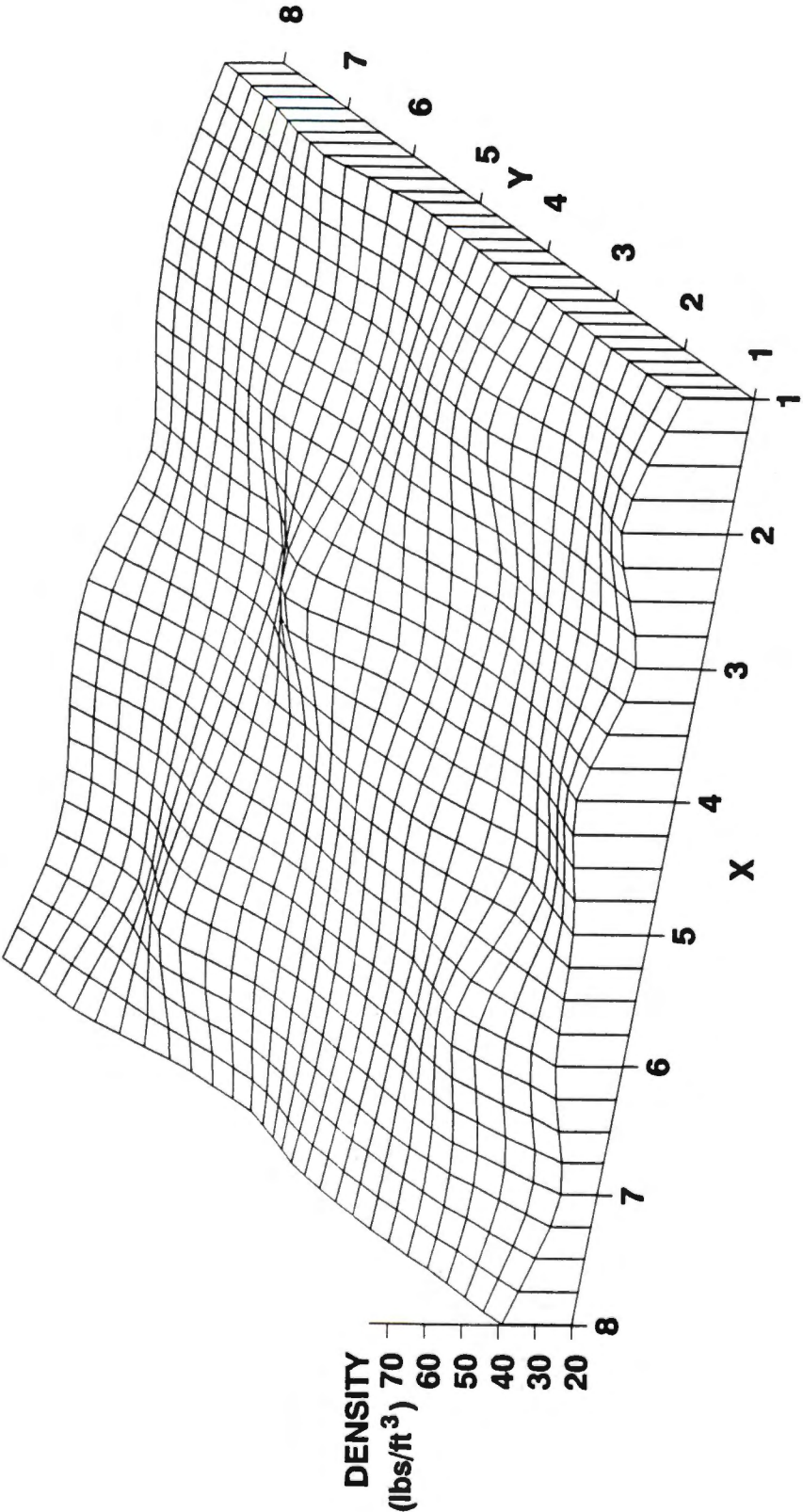
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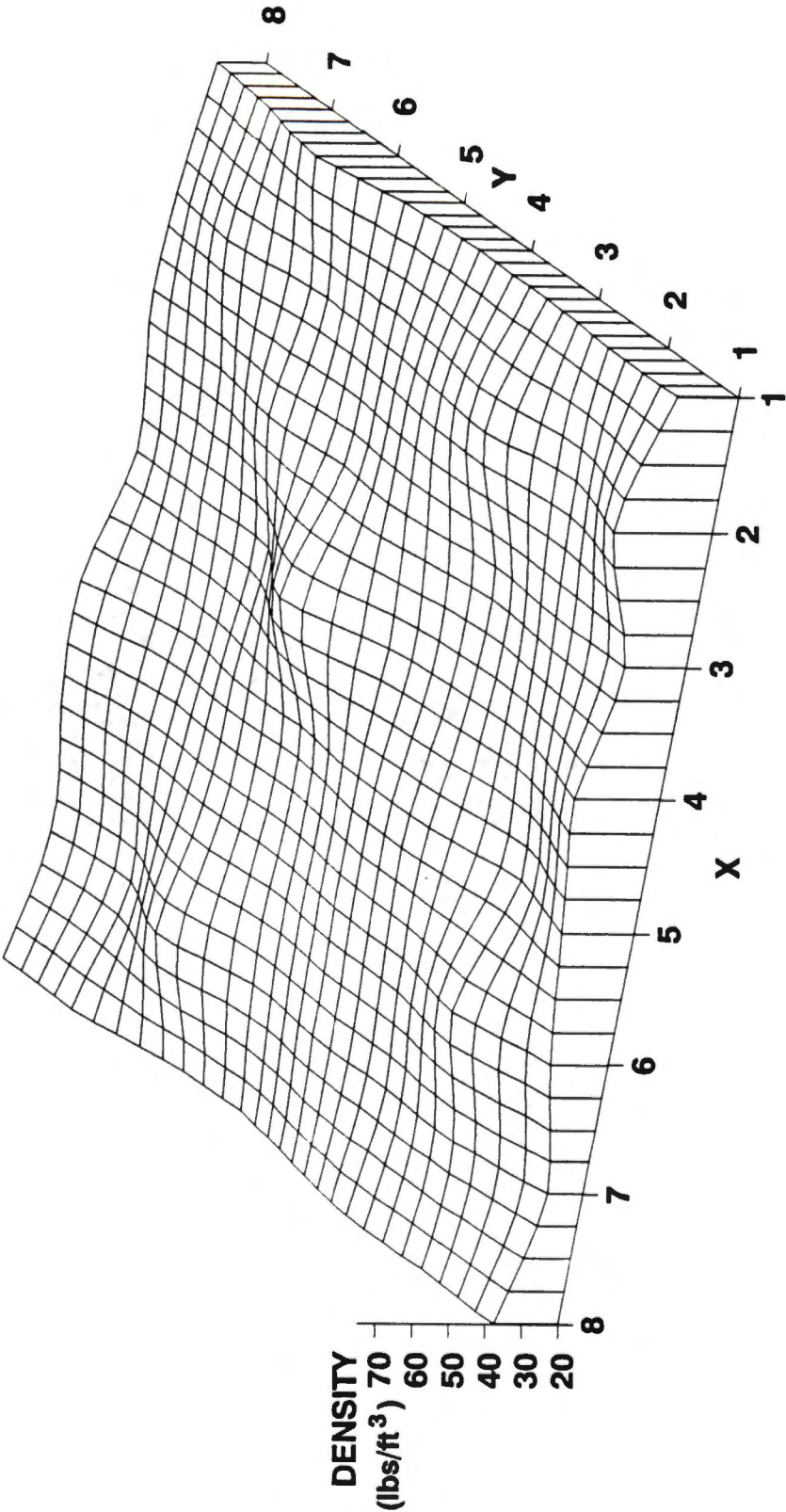
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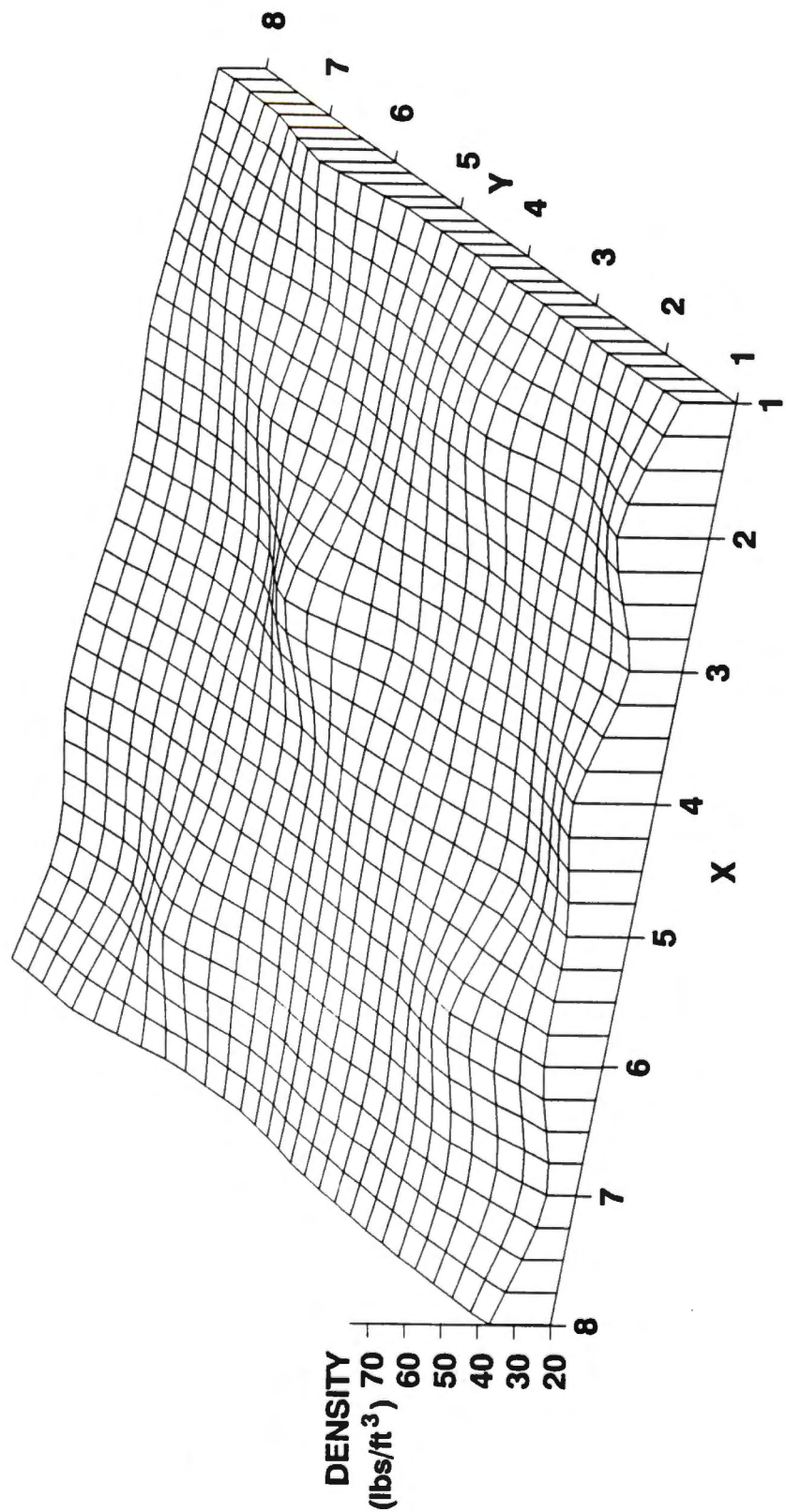
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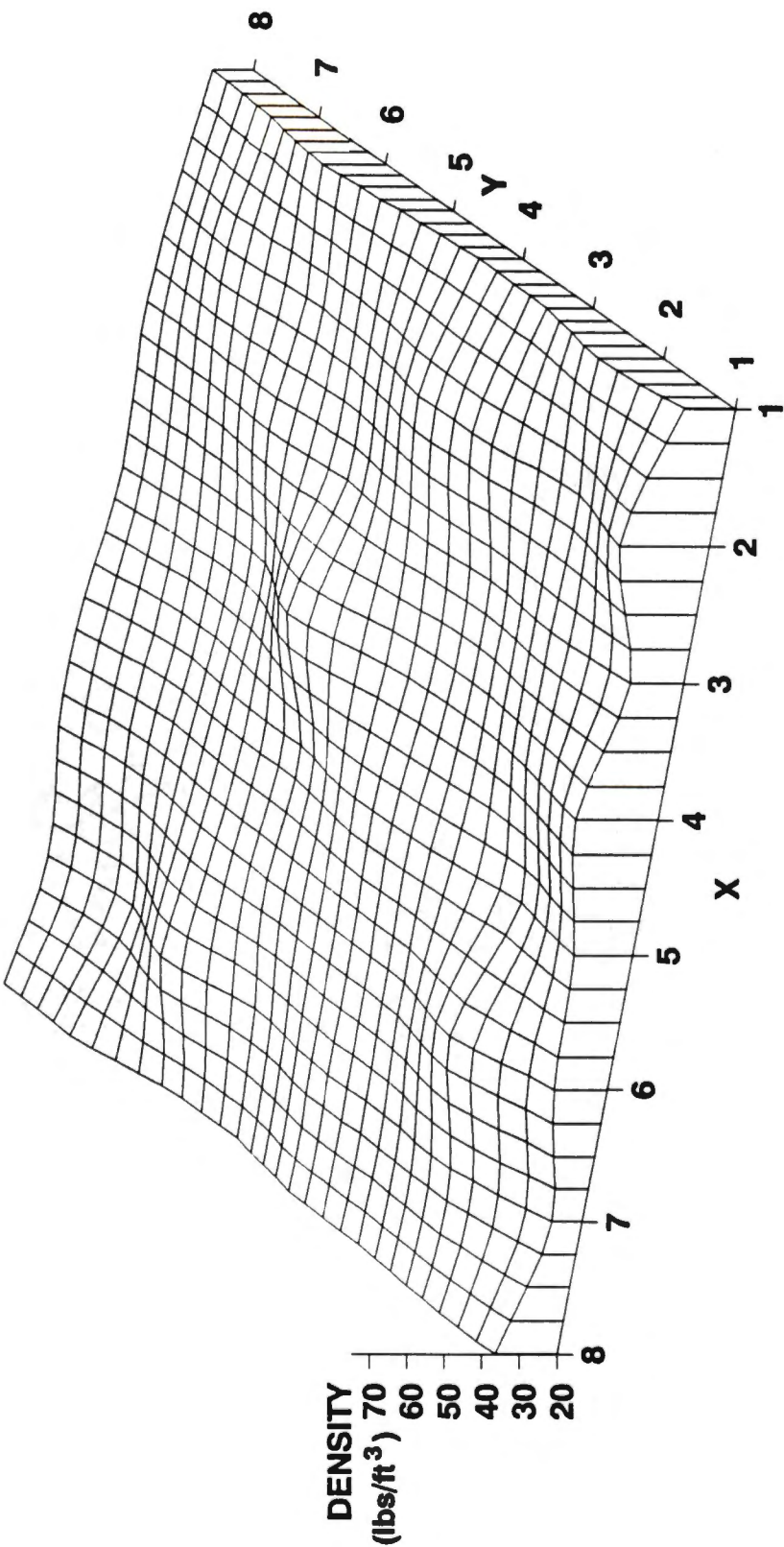
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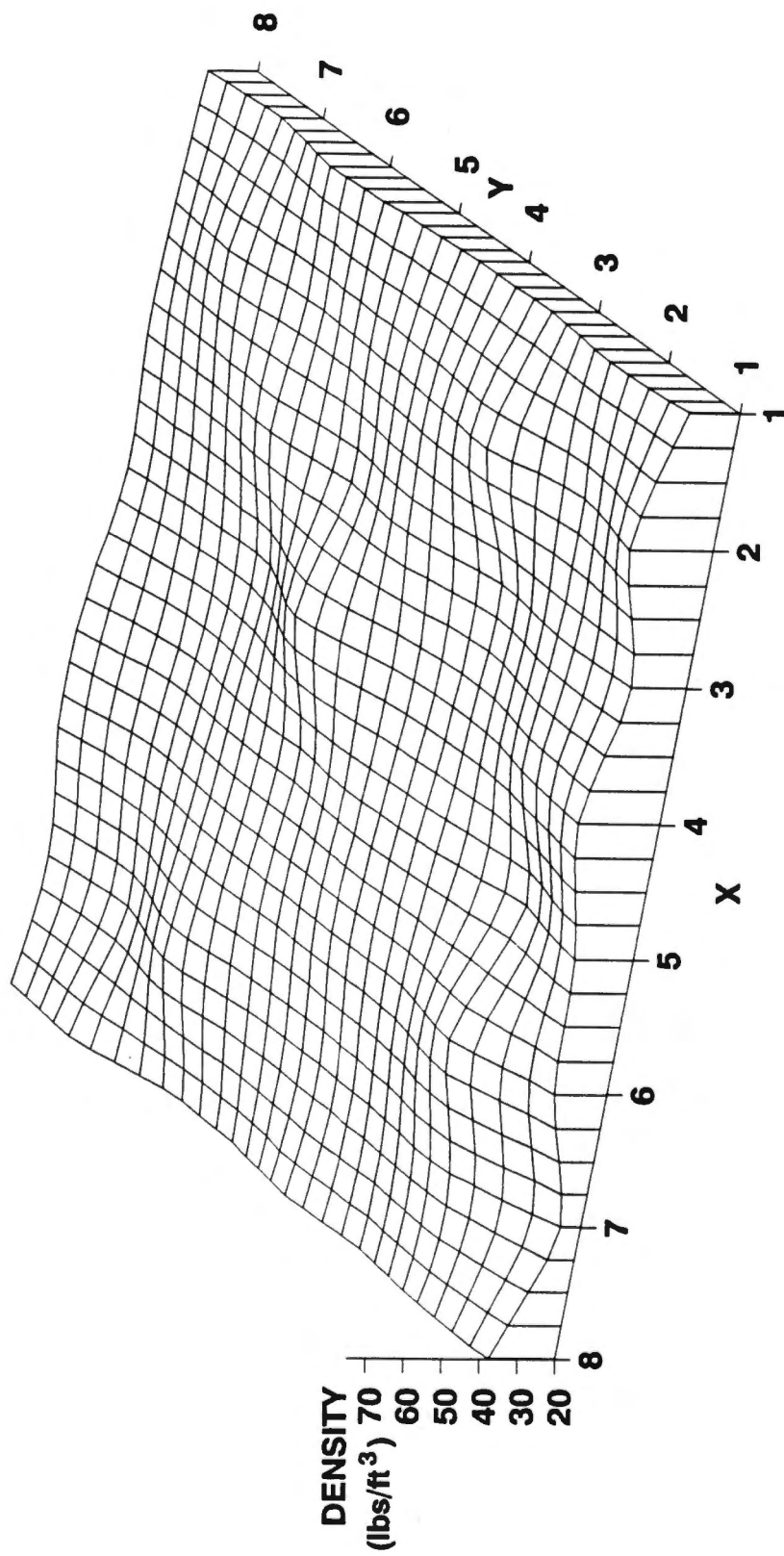
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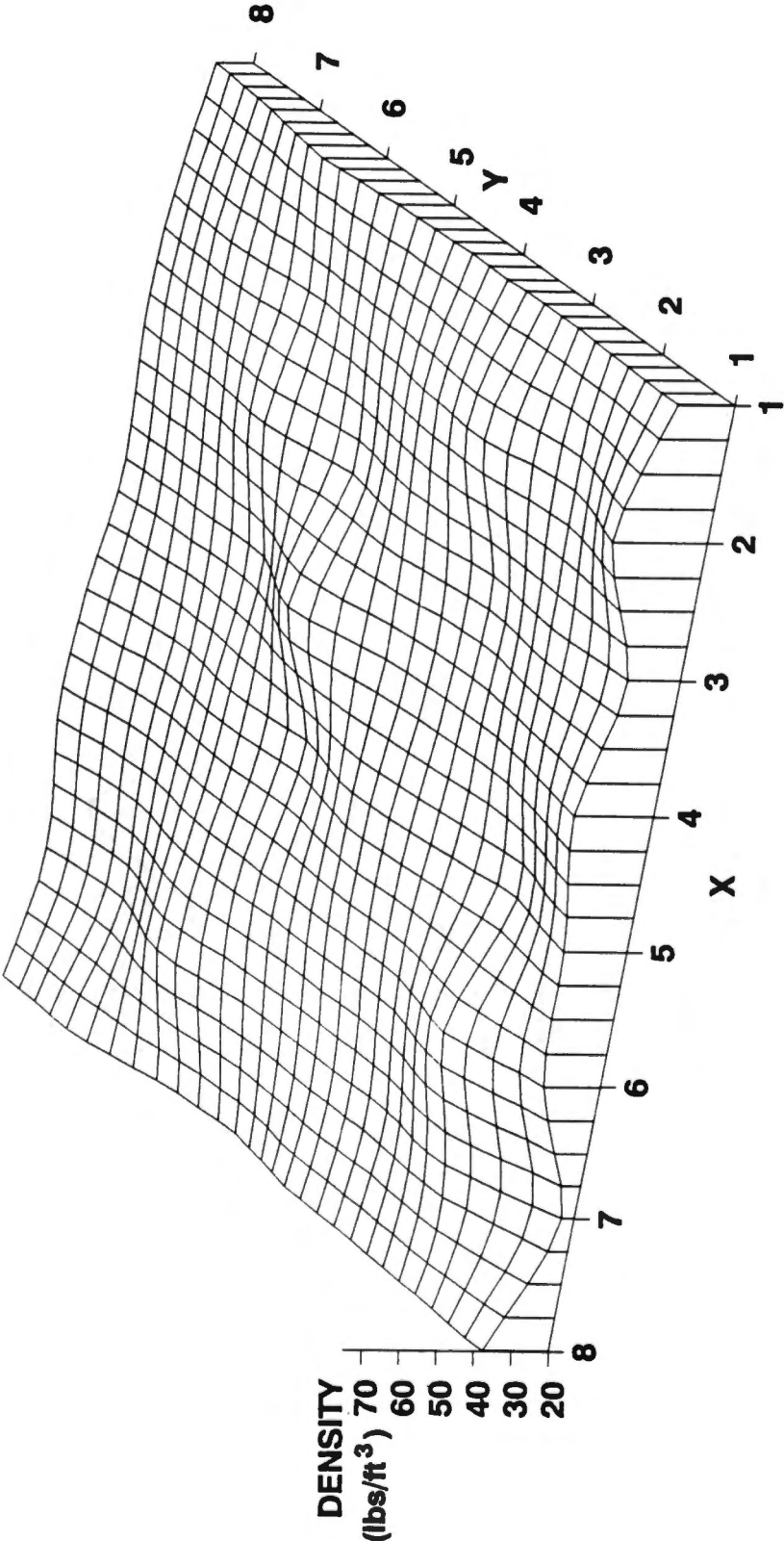
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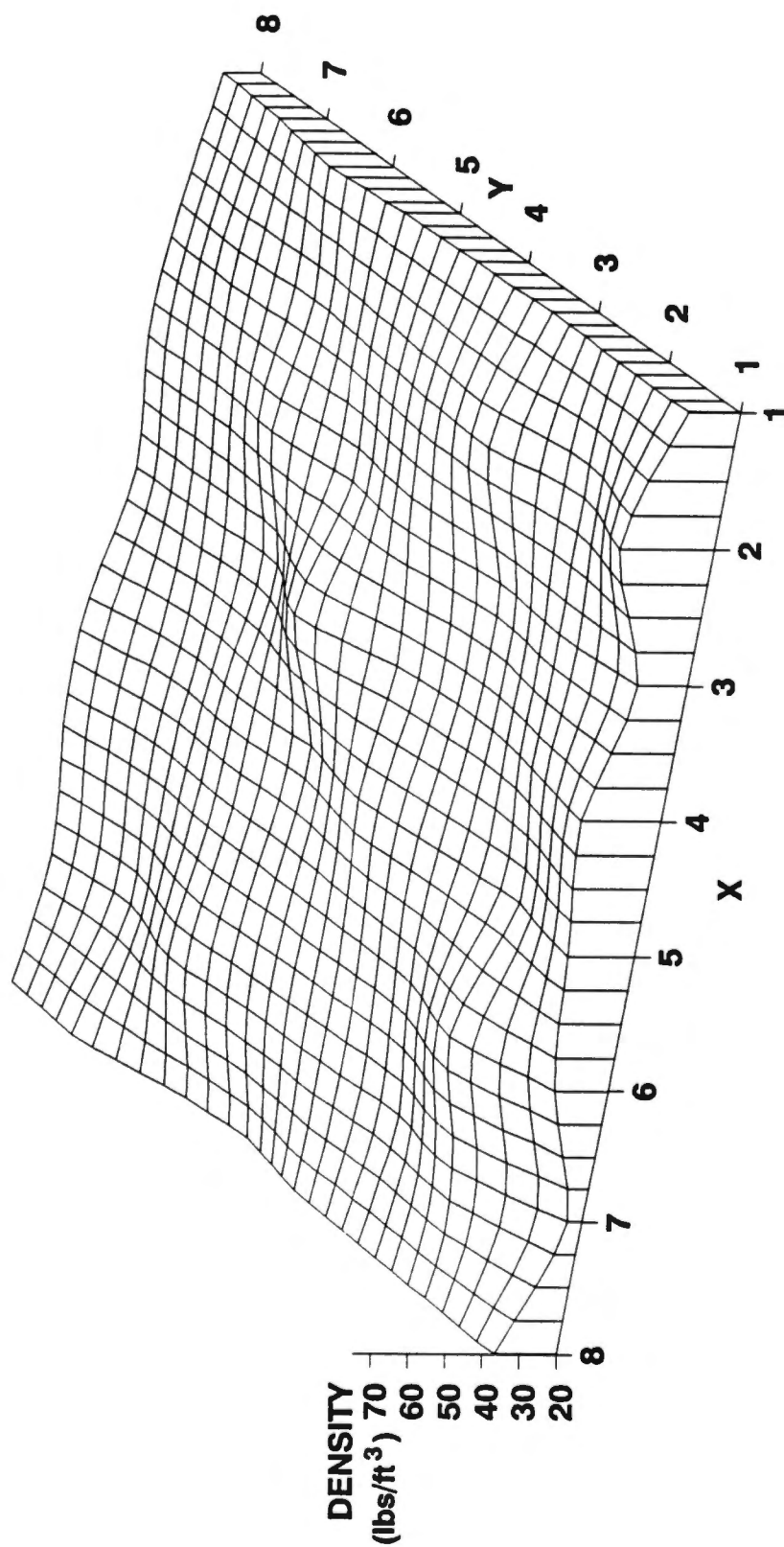
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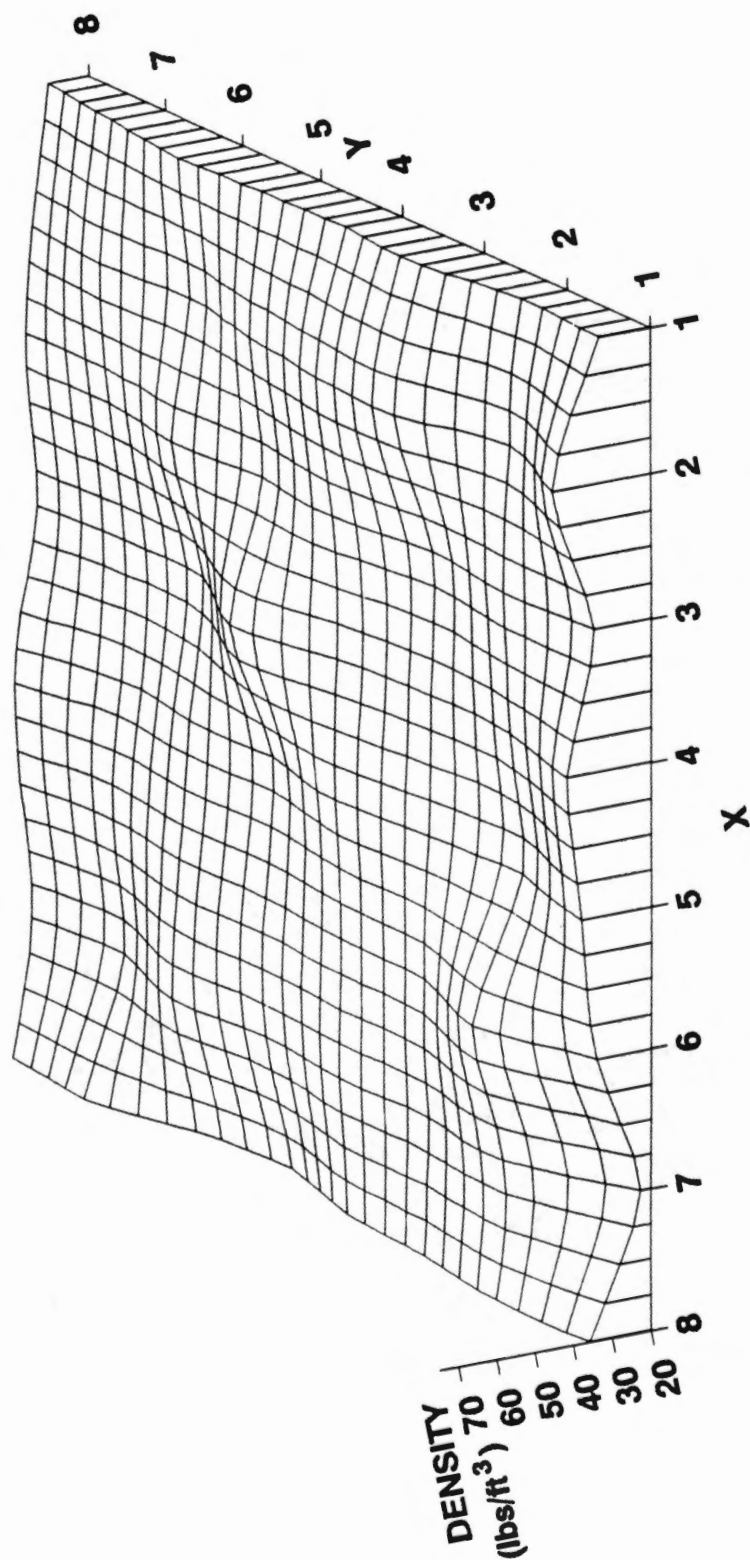
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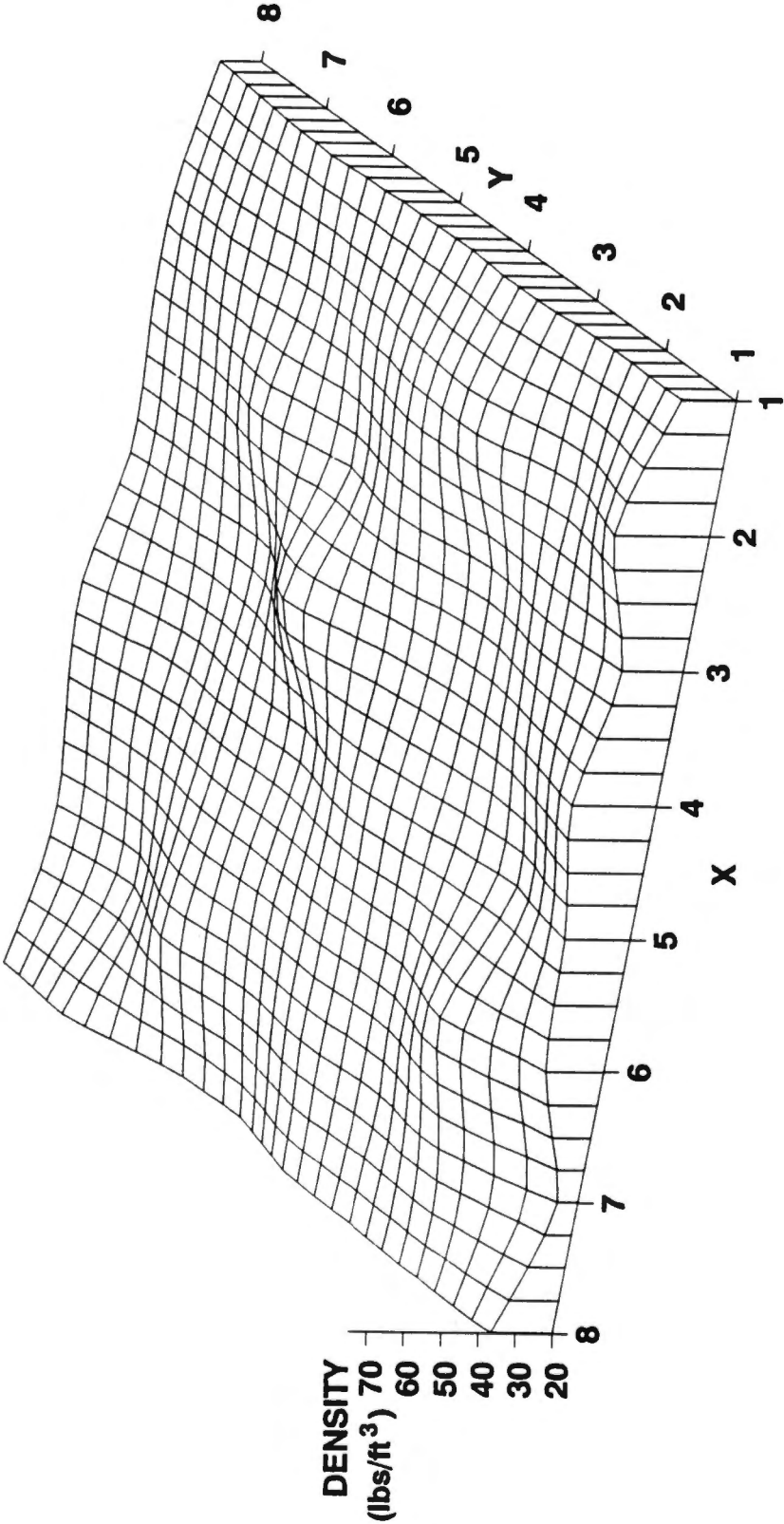
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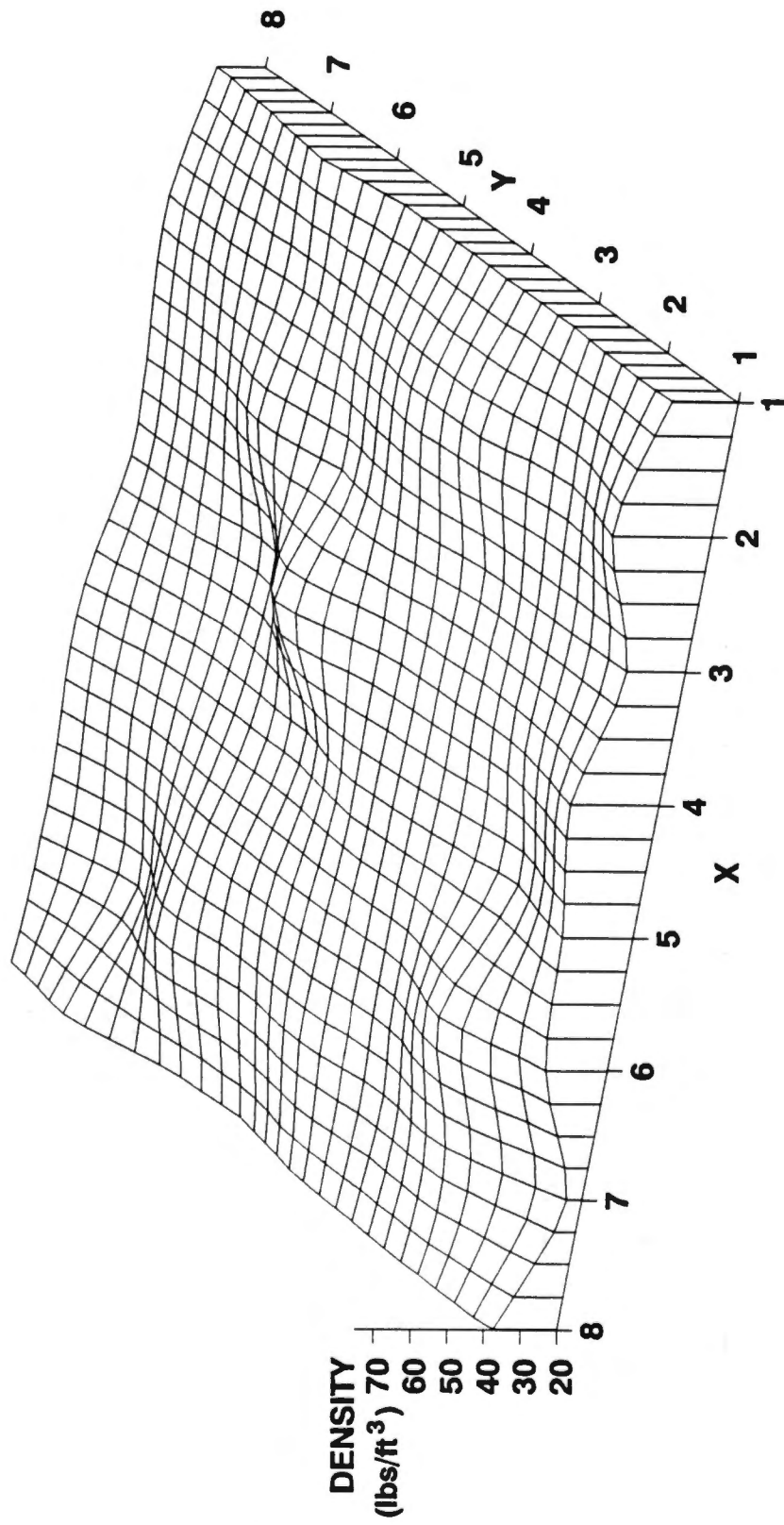
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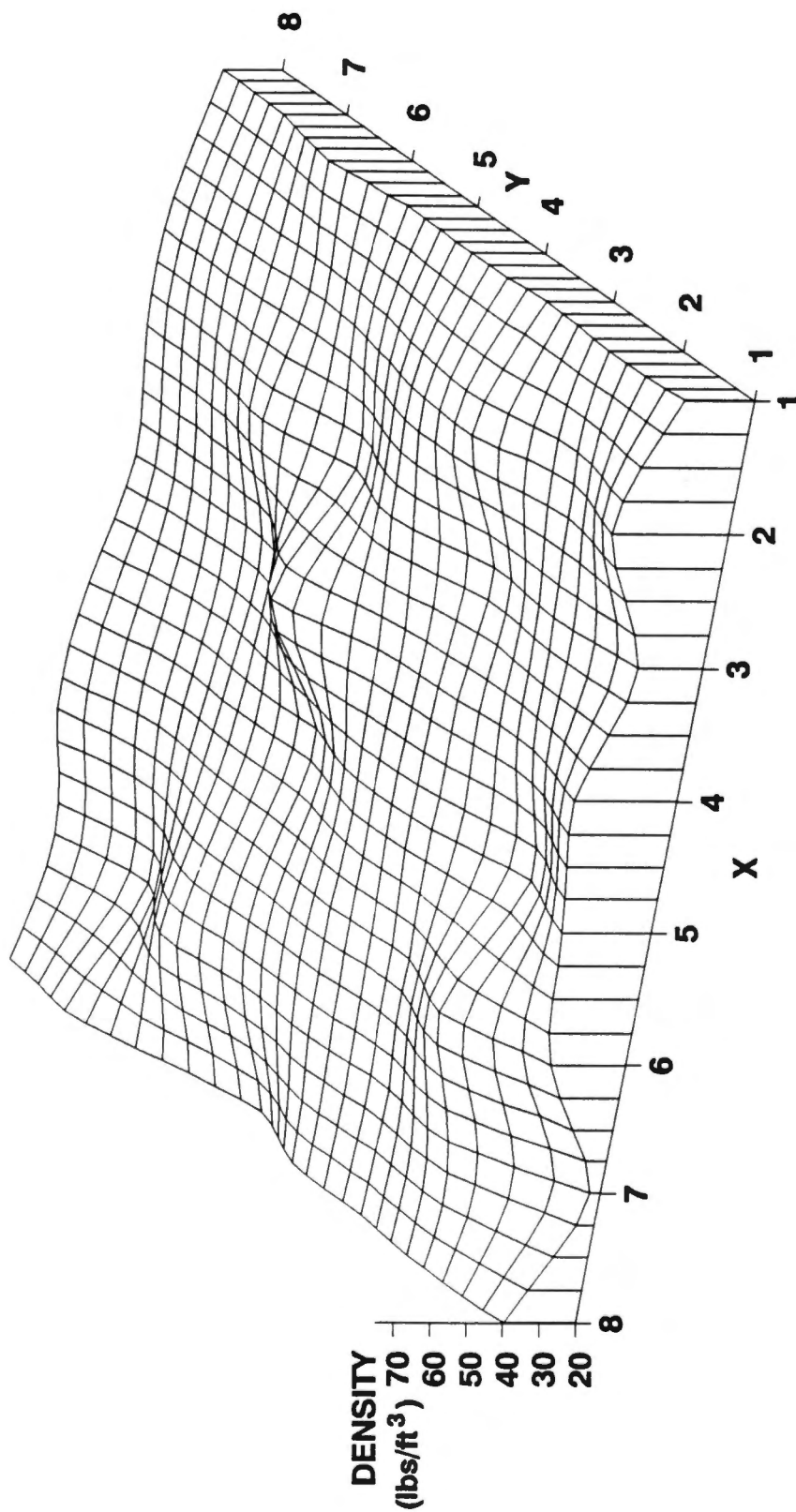
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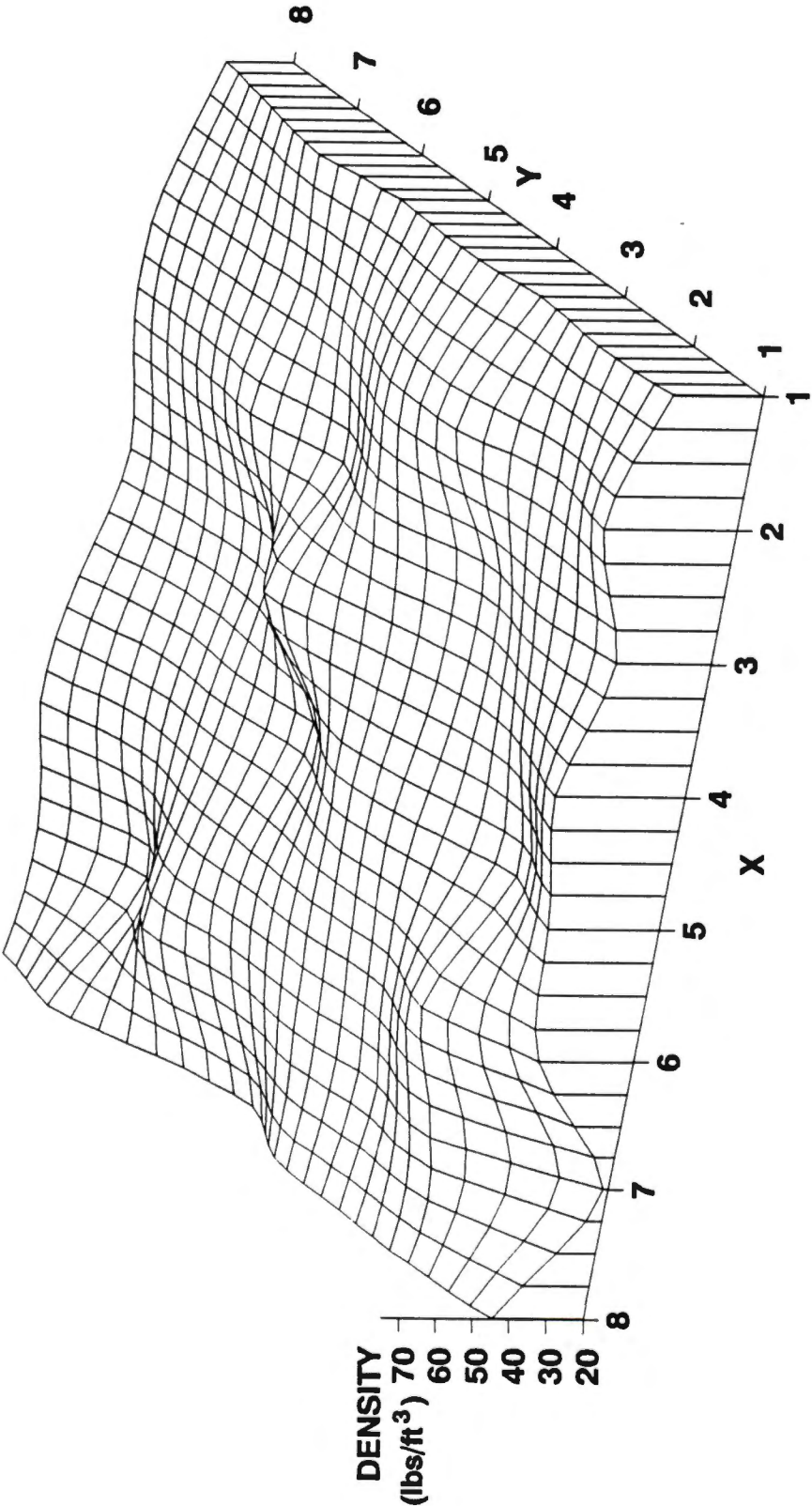
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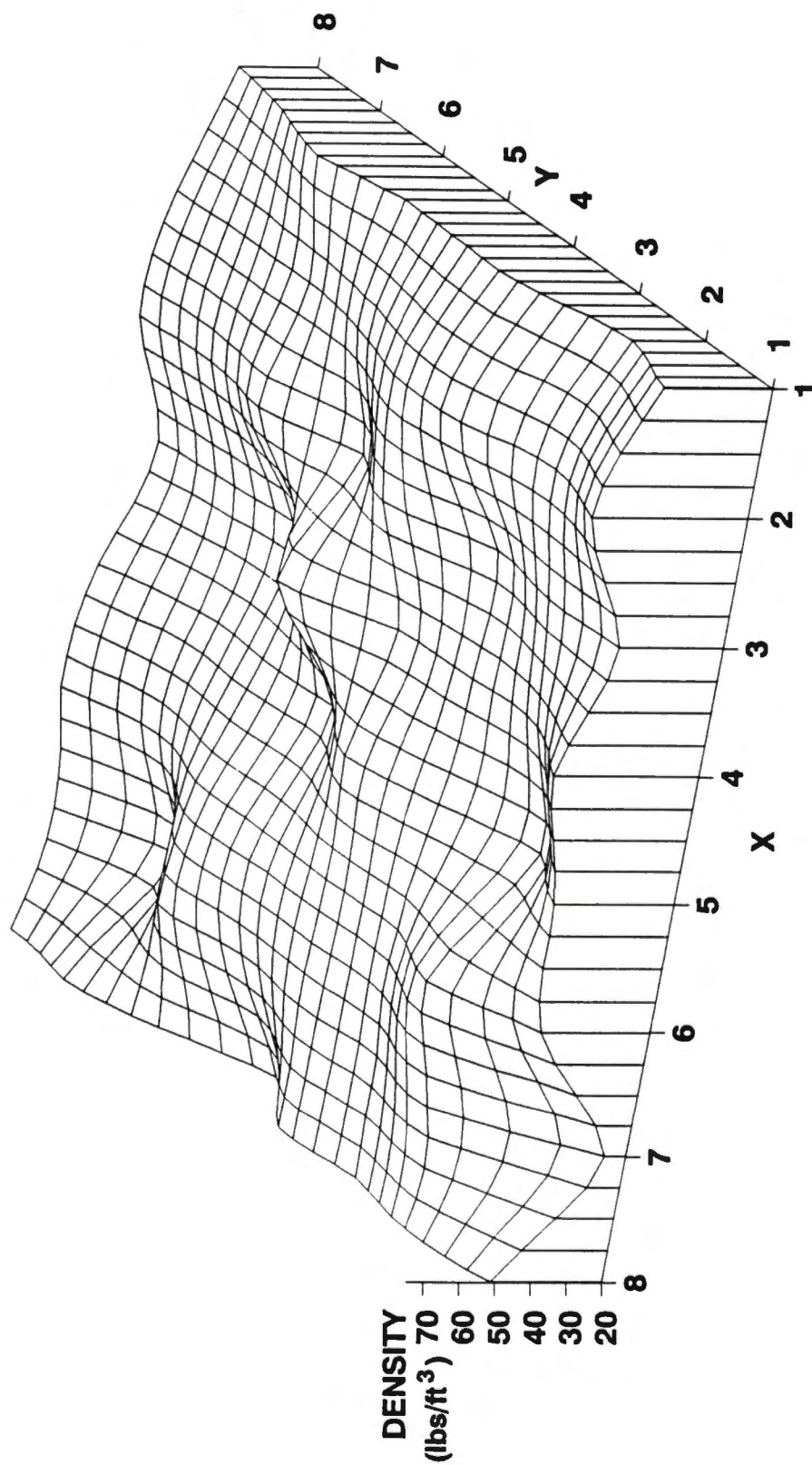
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REPLICATION=3
Z=14



FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=15



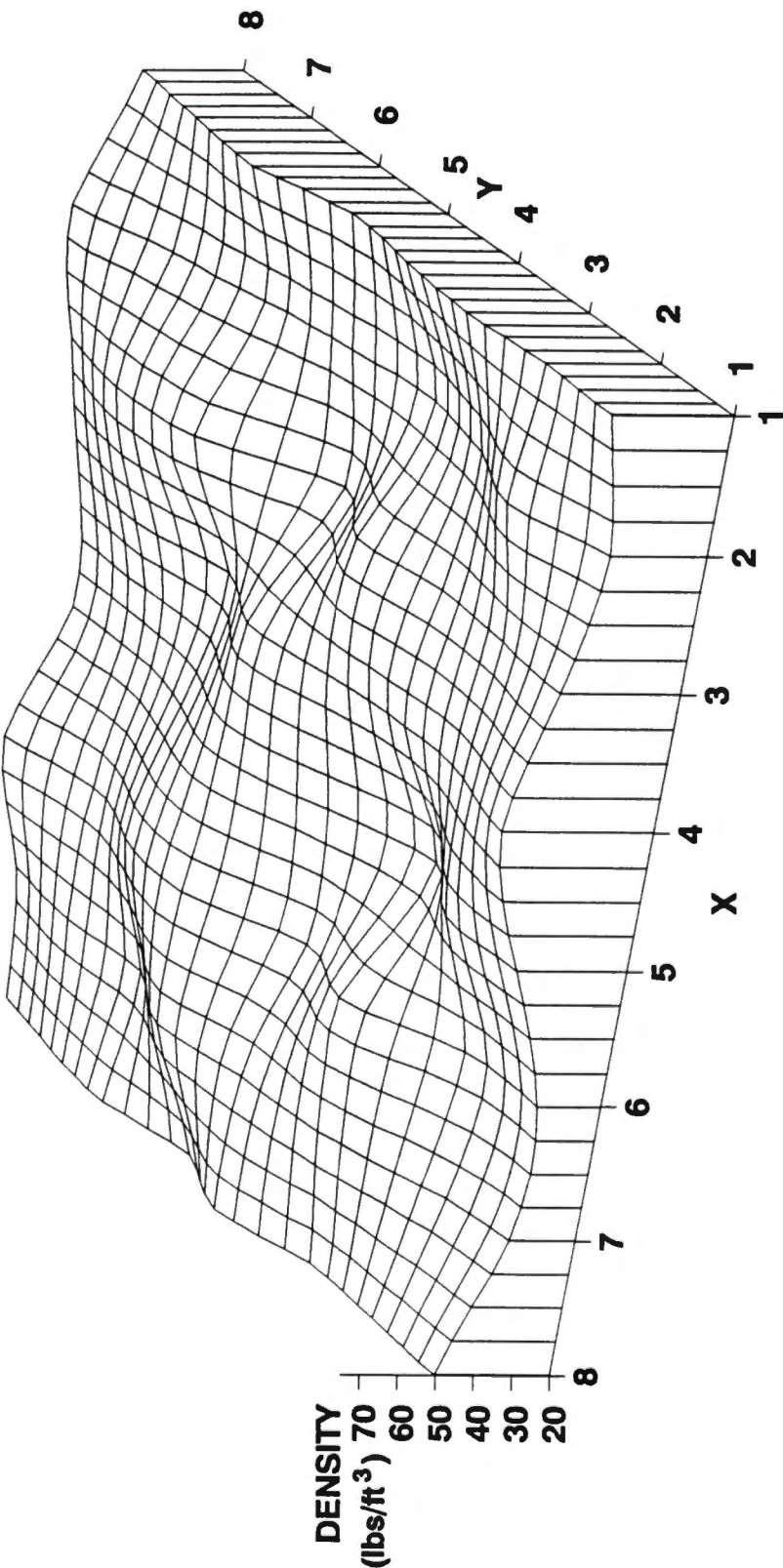
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=16



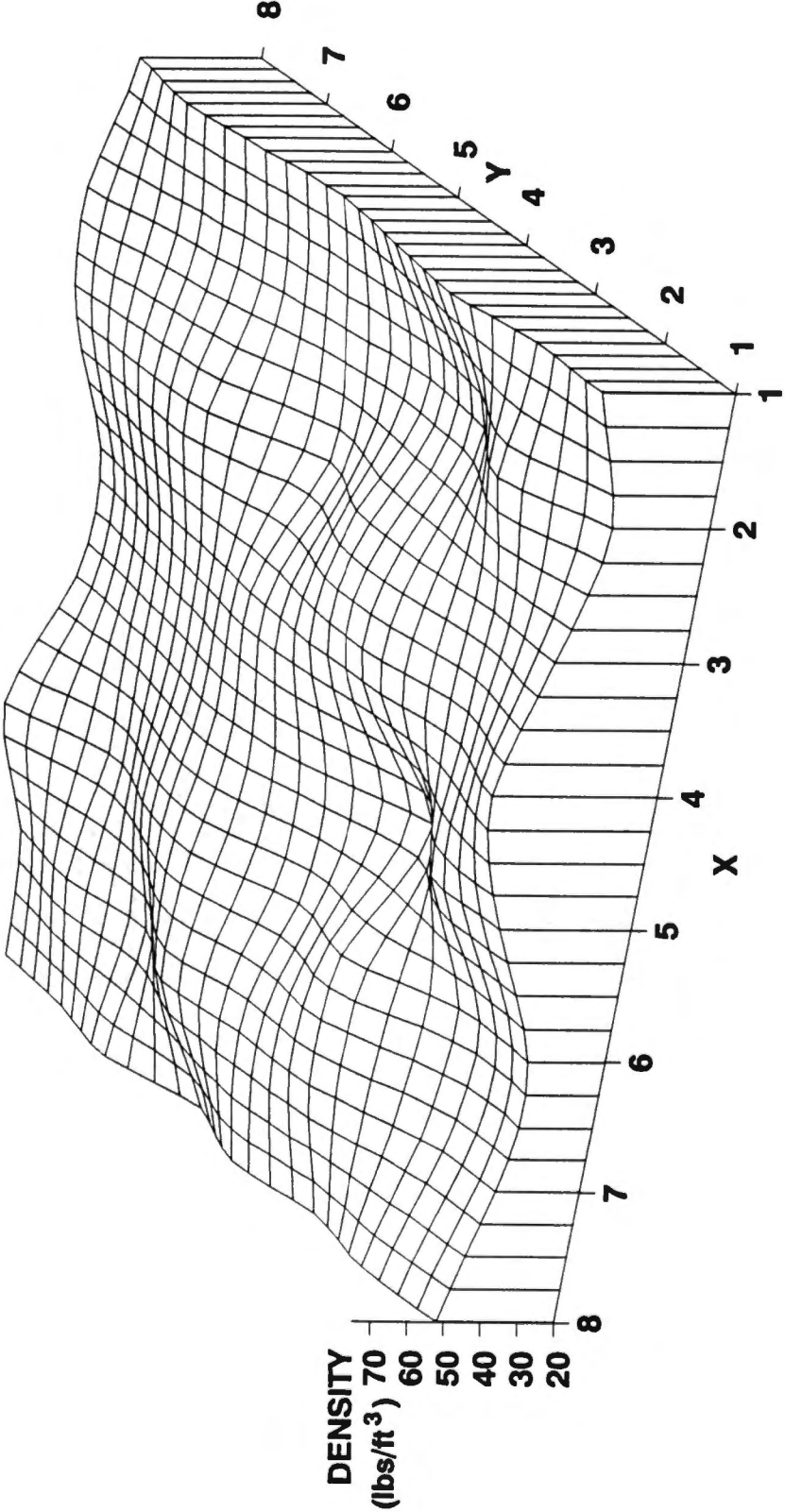
FLAKE MOISTURE CONTENT - 4%

PRESS CLOSURE RATE - 60 SECONDS

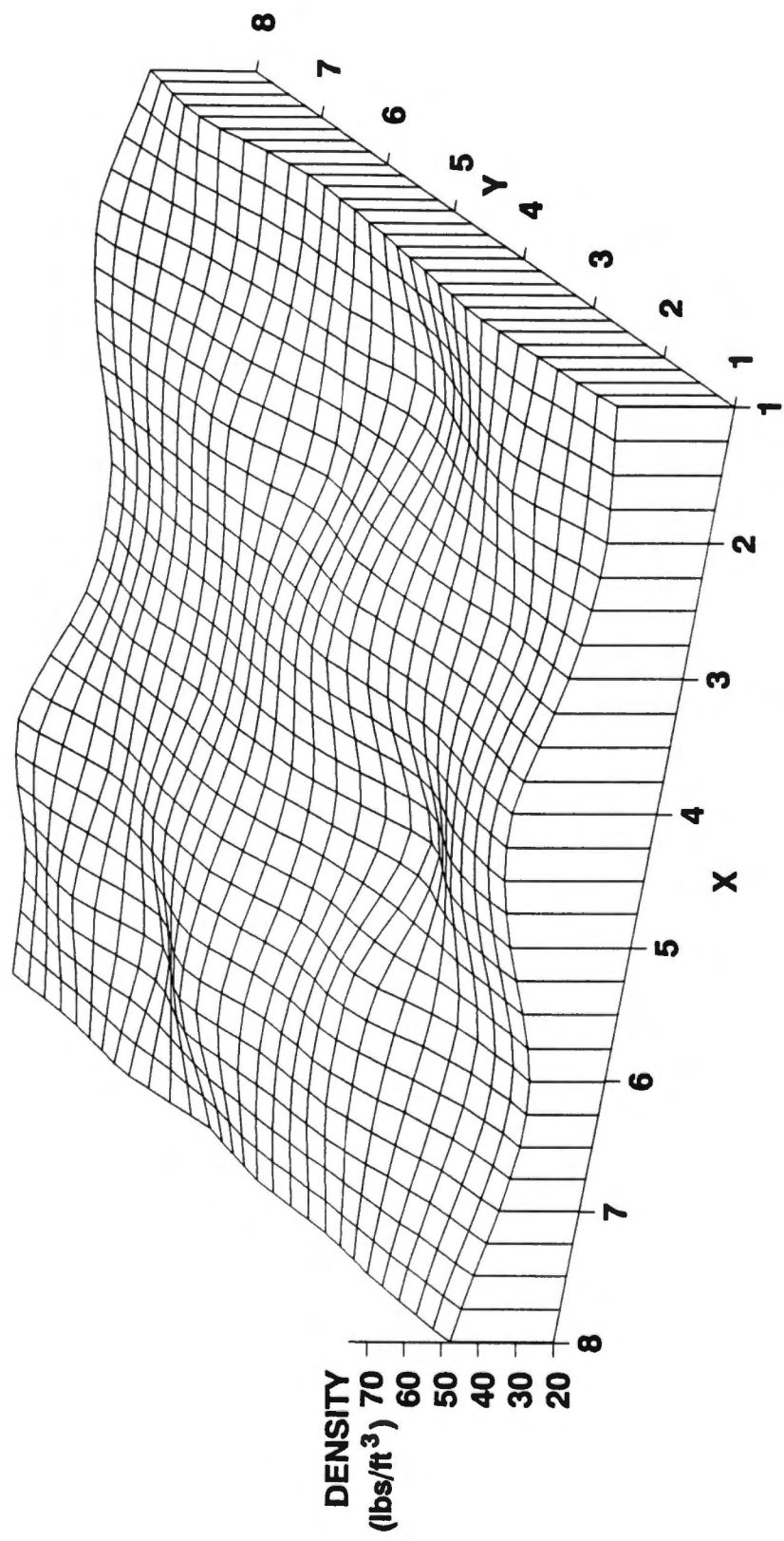
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=1



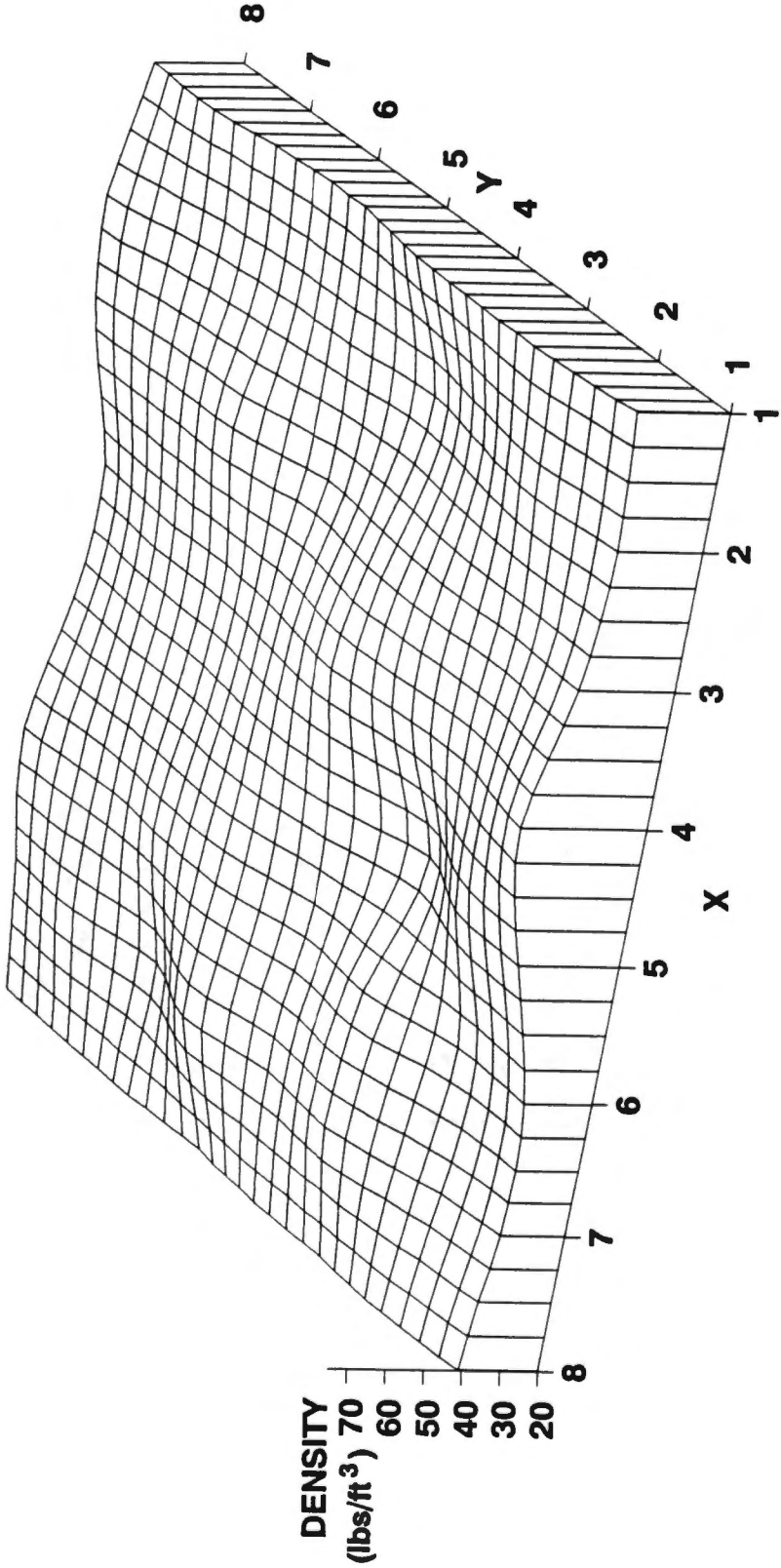
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=2



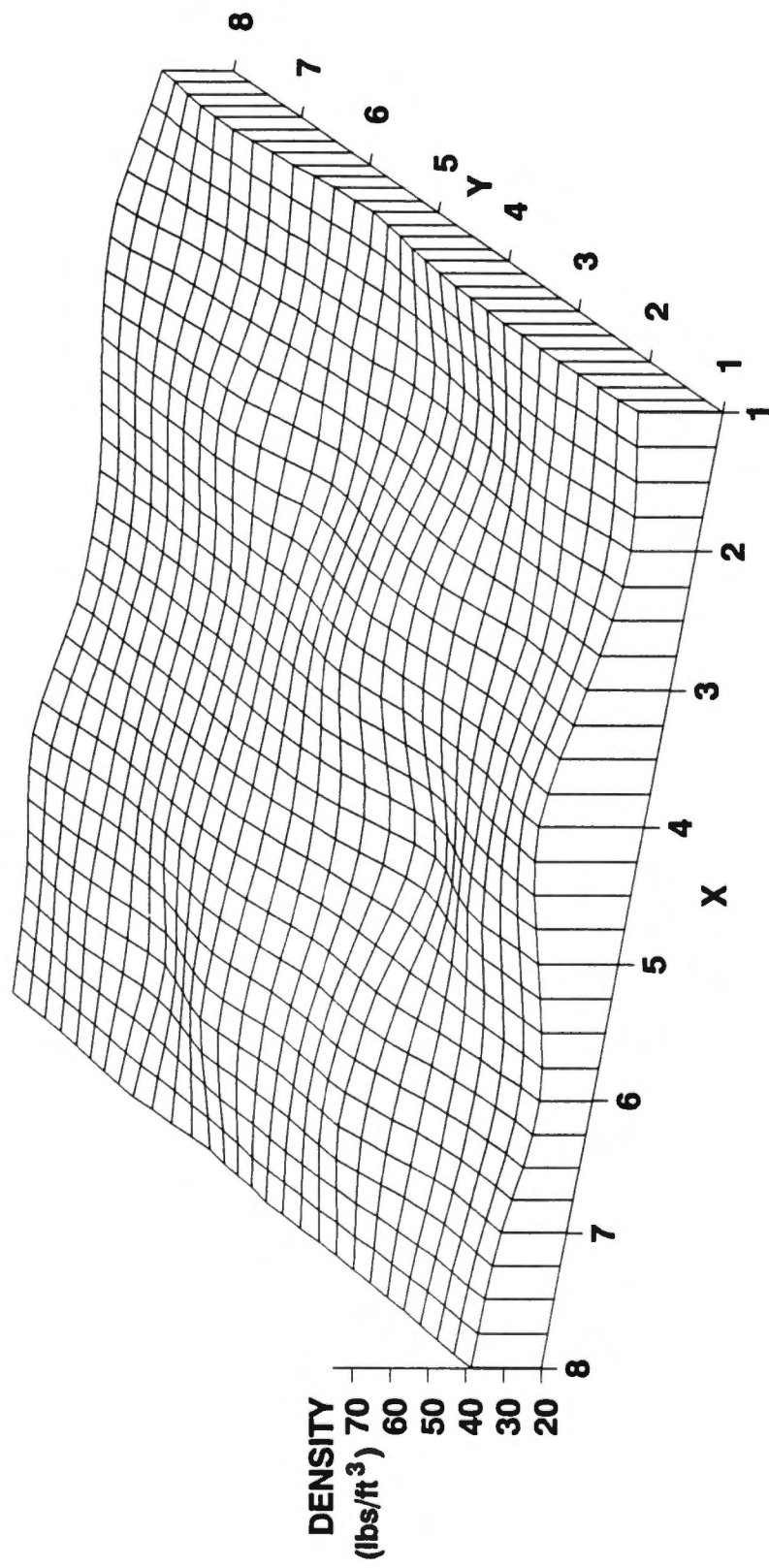
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 3



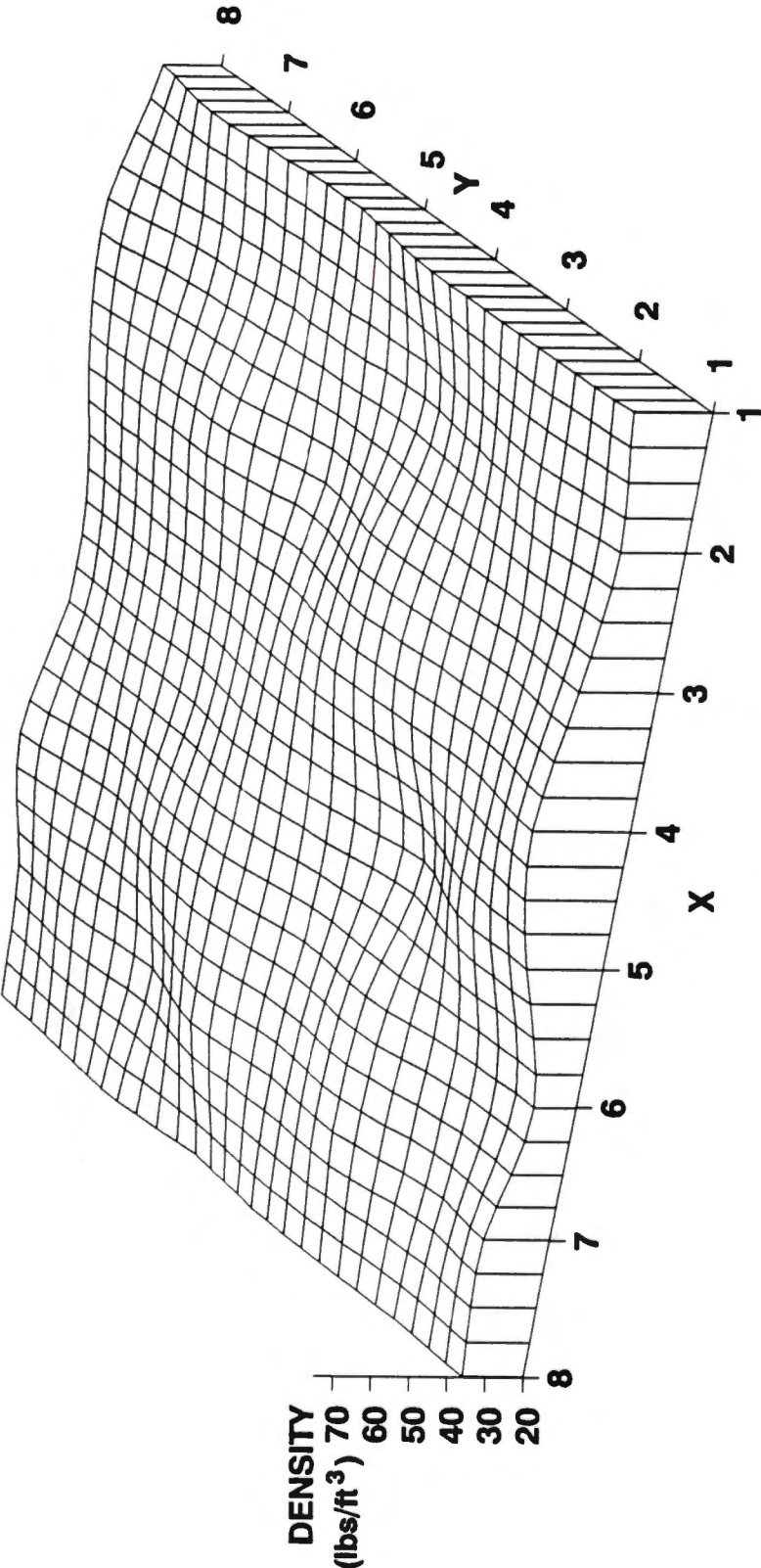
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 4



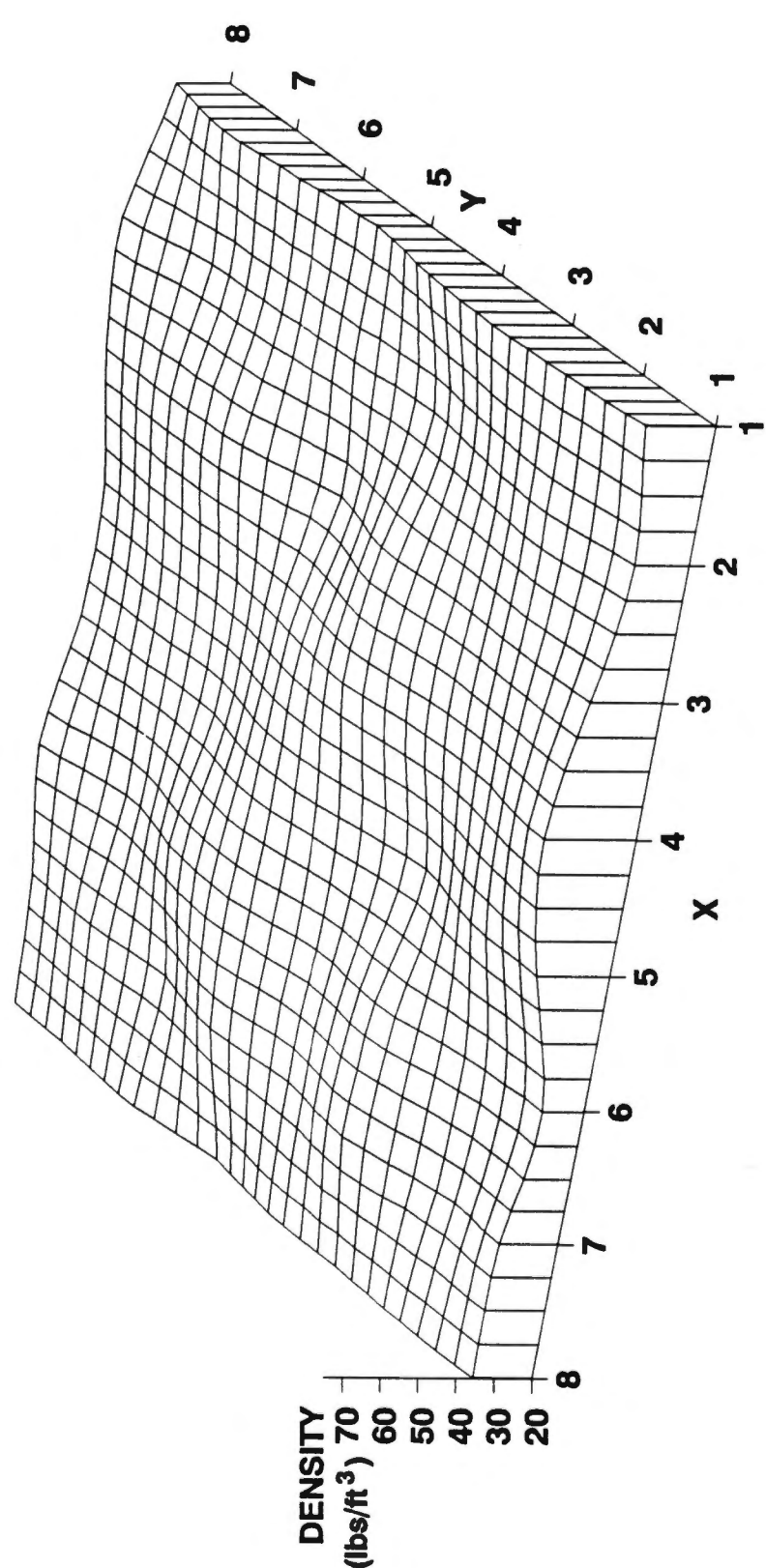
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=5



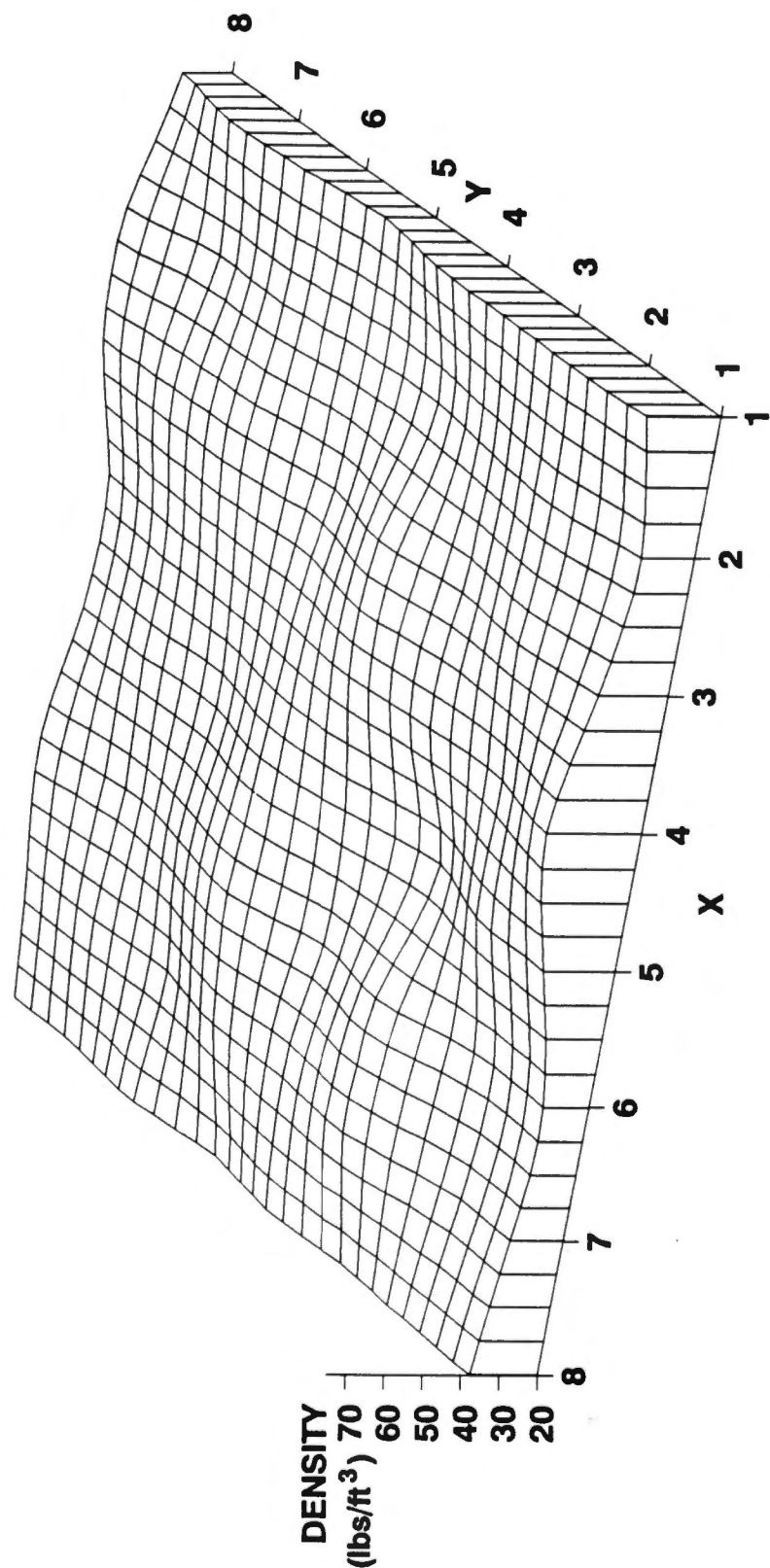
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=6



FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=7



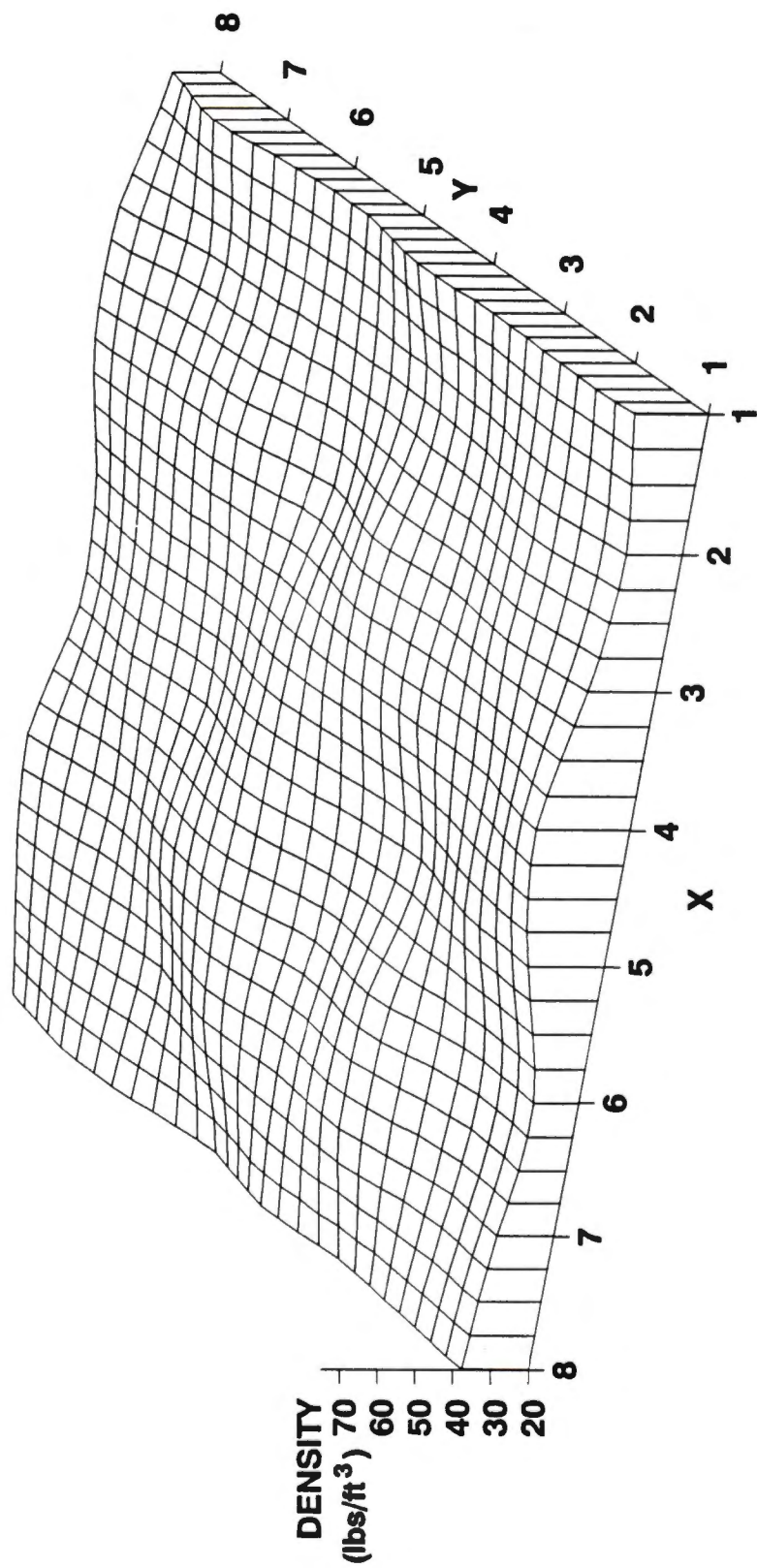
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 8



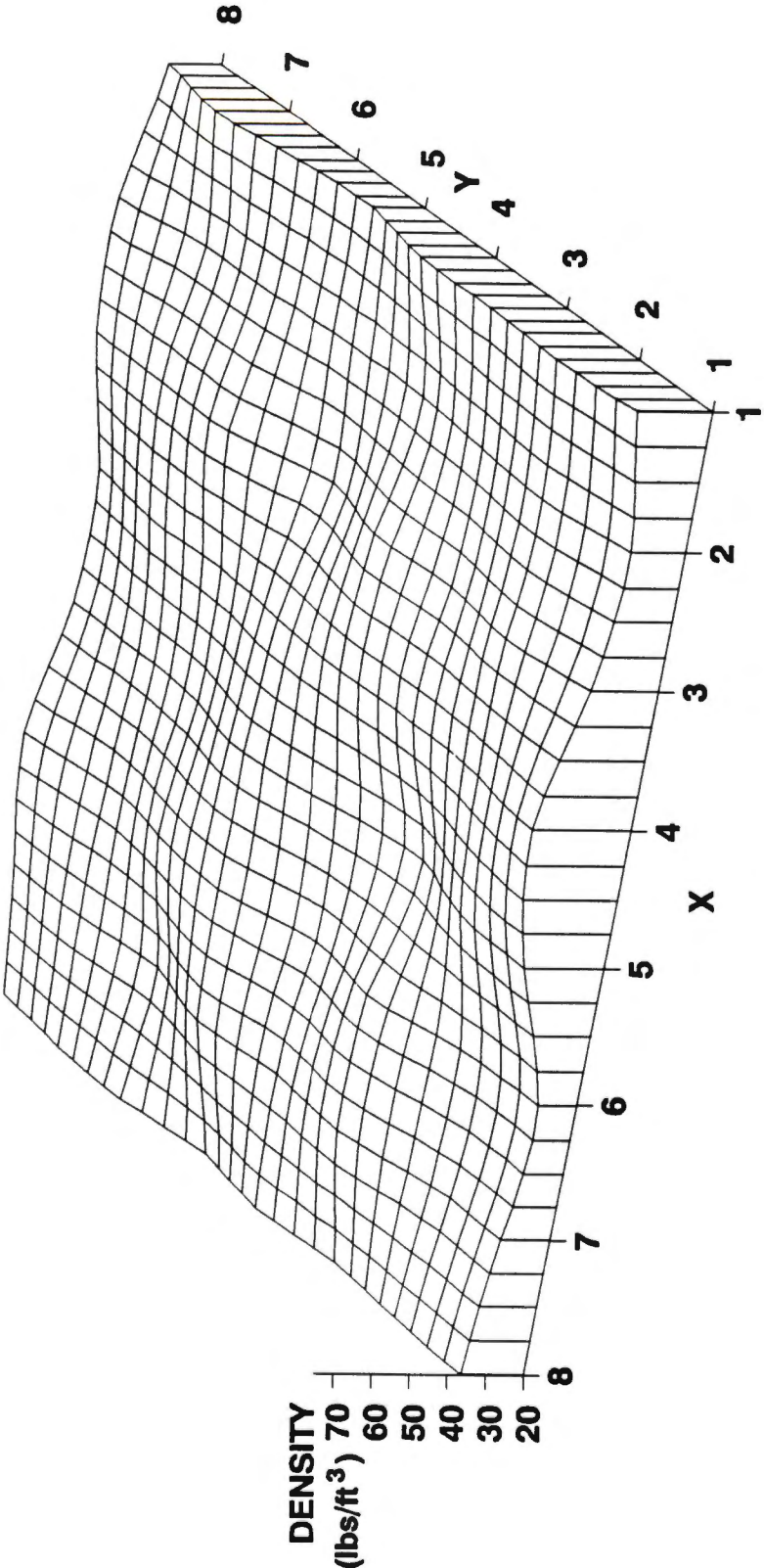
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 1

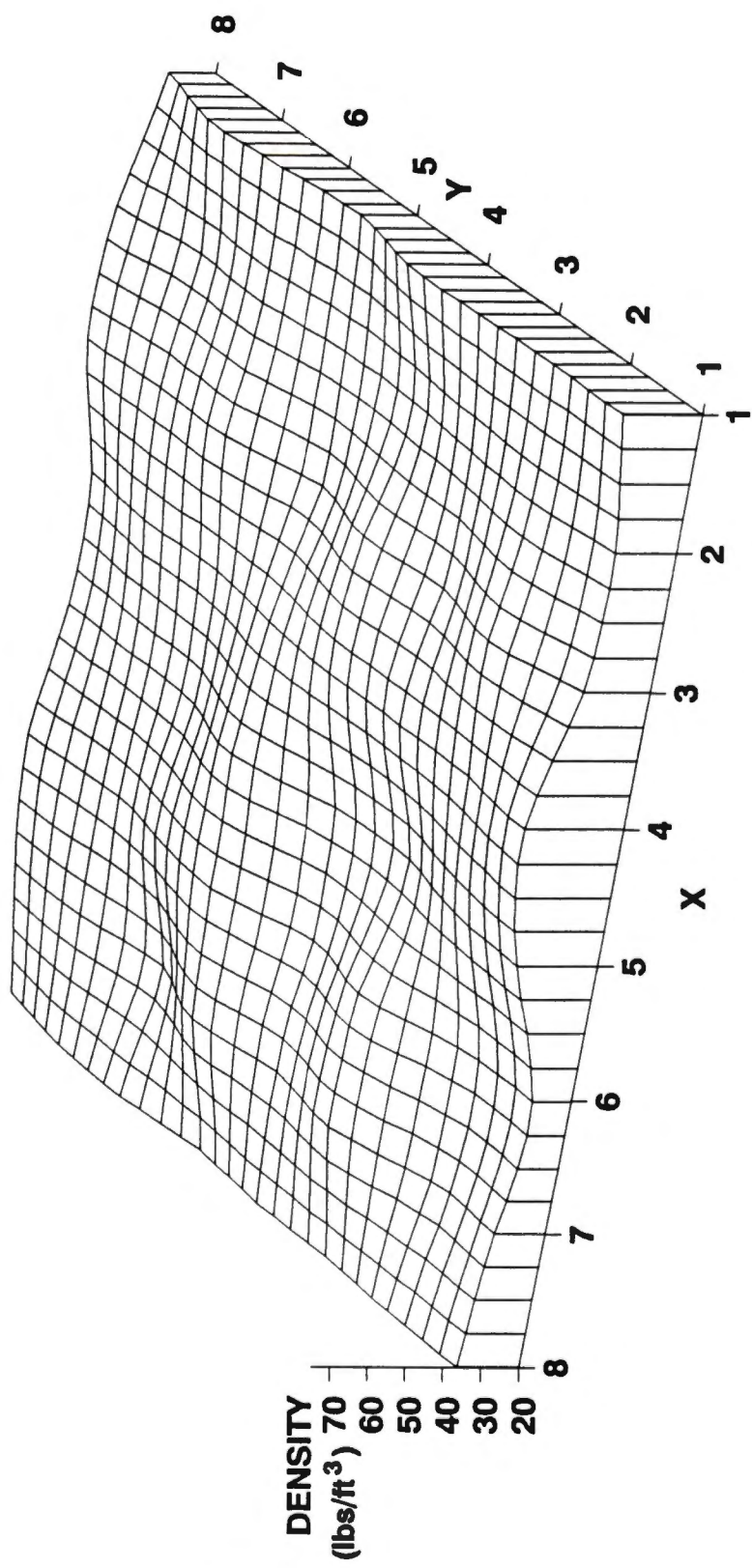
Z = 9



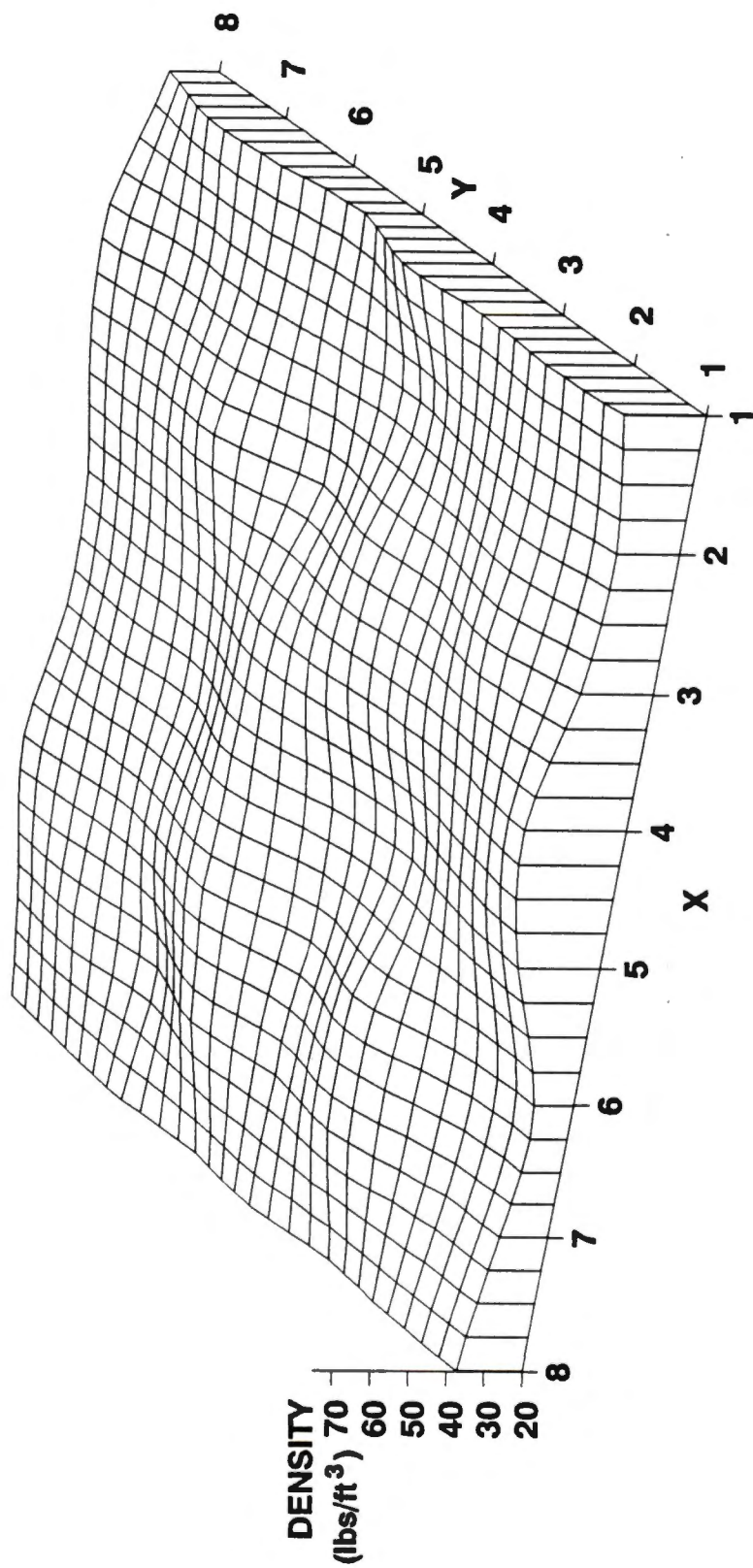
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 10



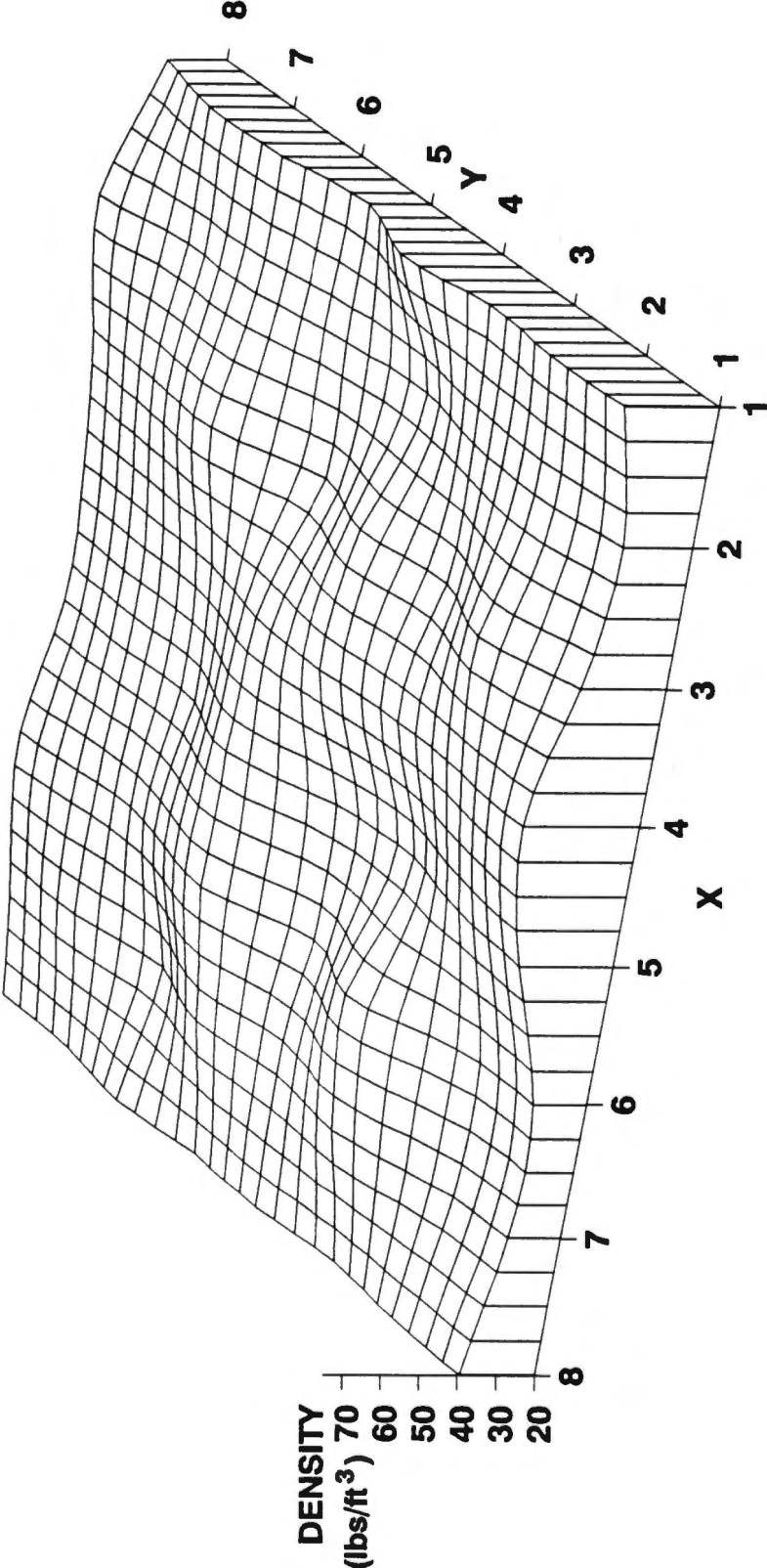
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=11



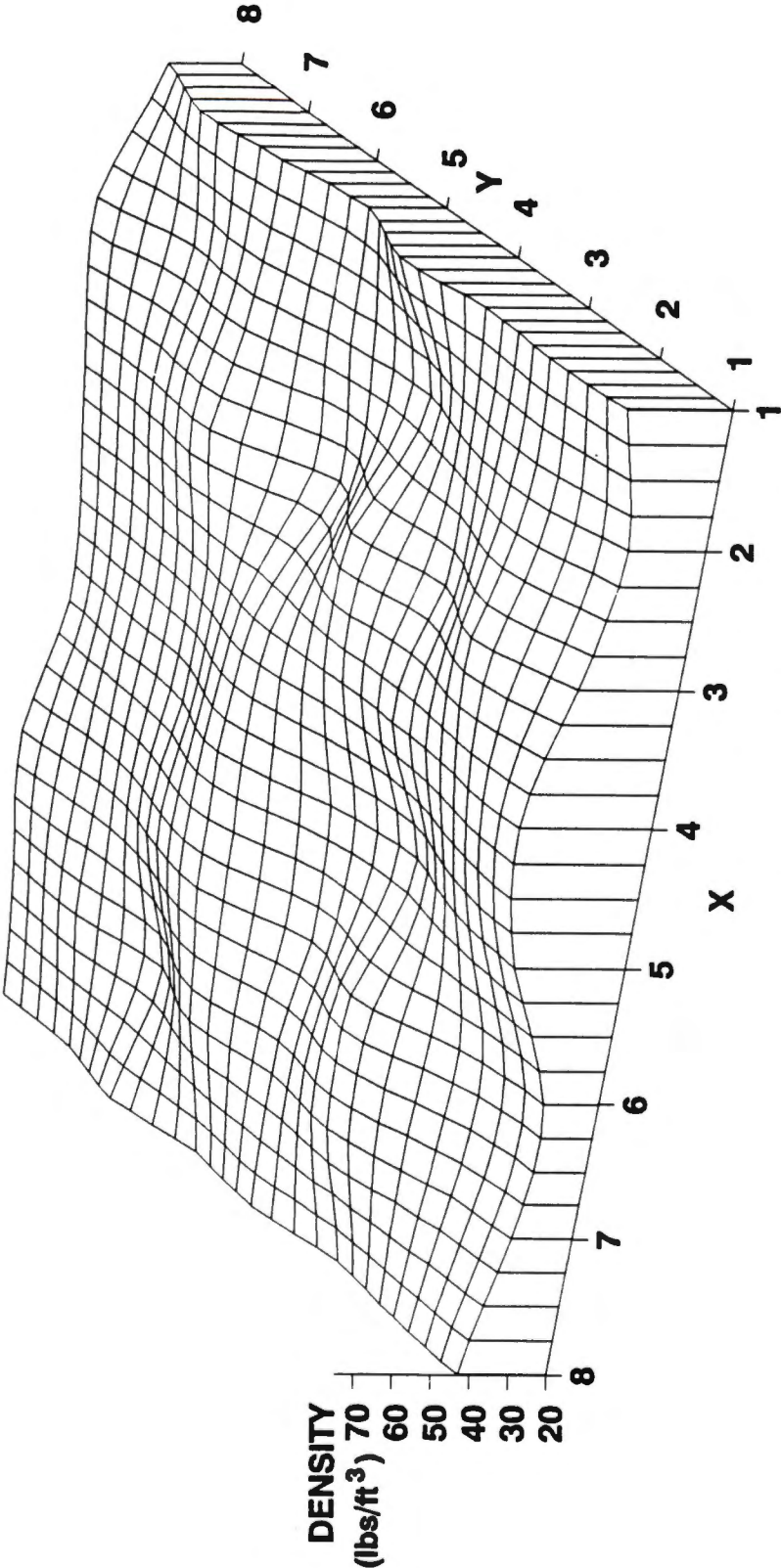
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=12



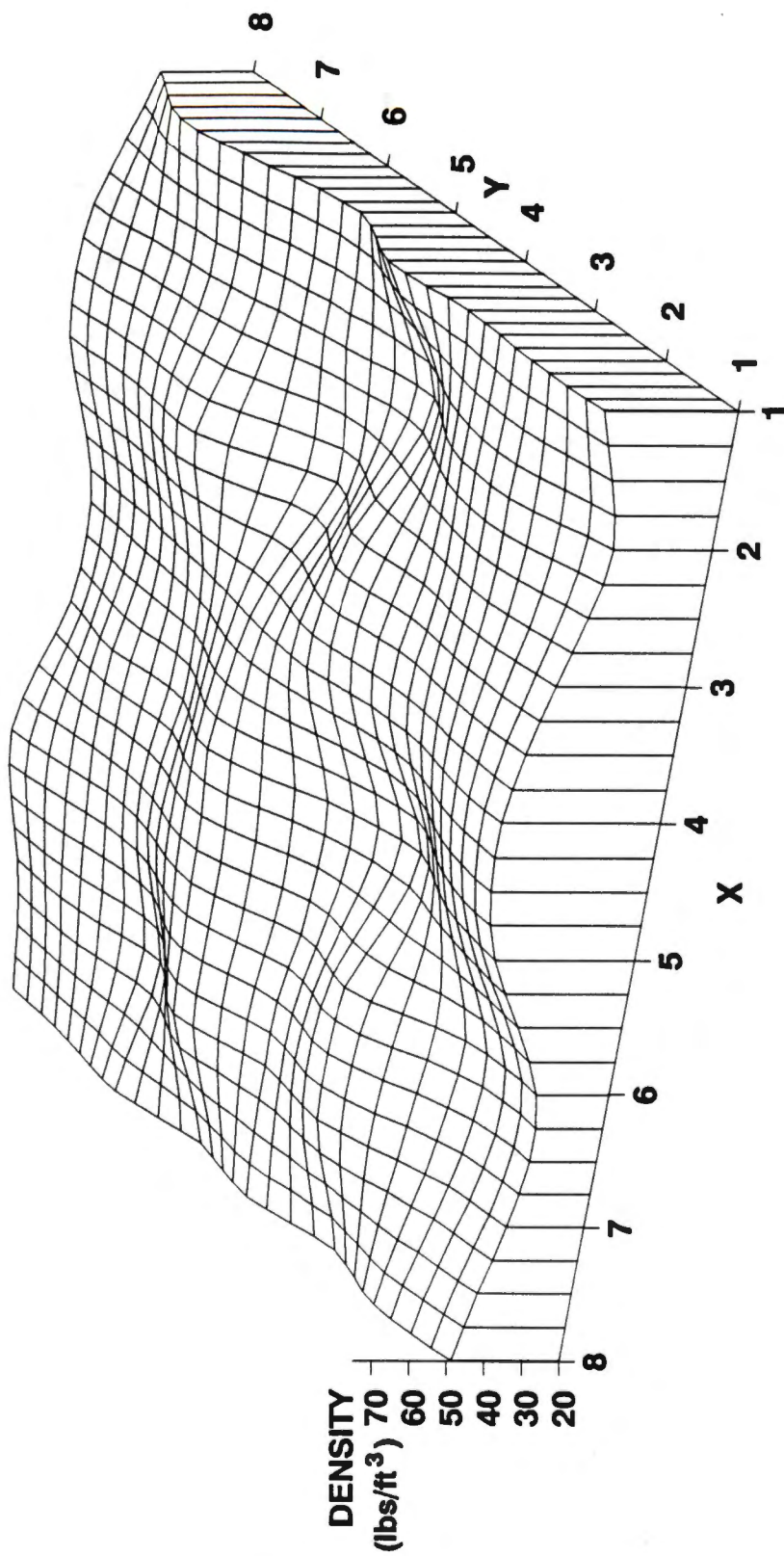
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 13



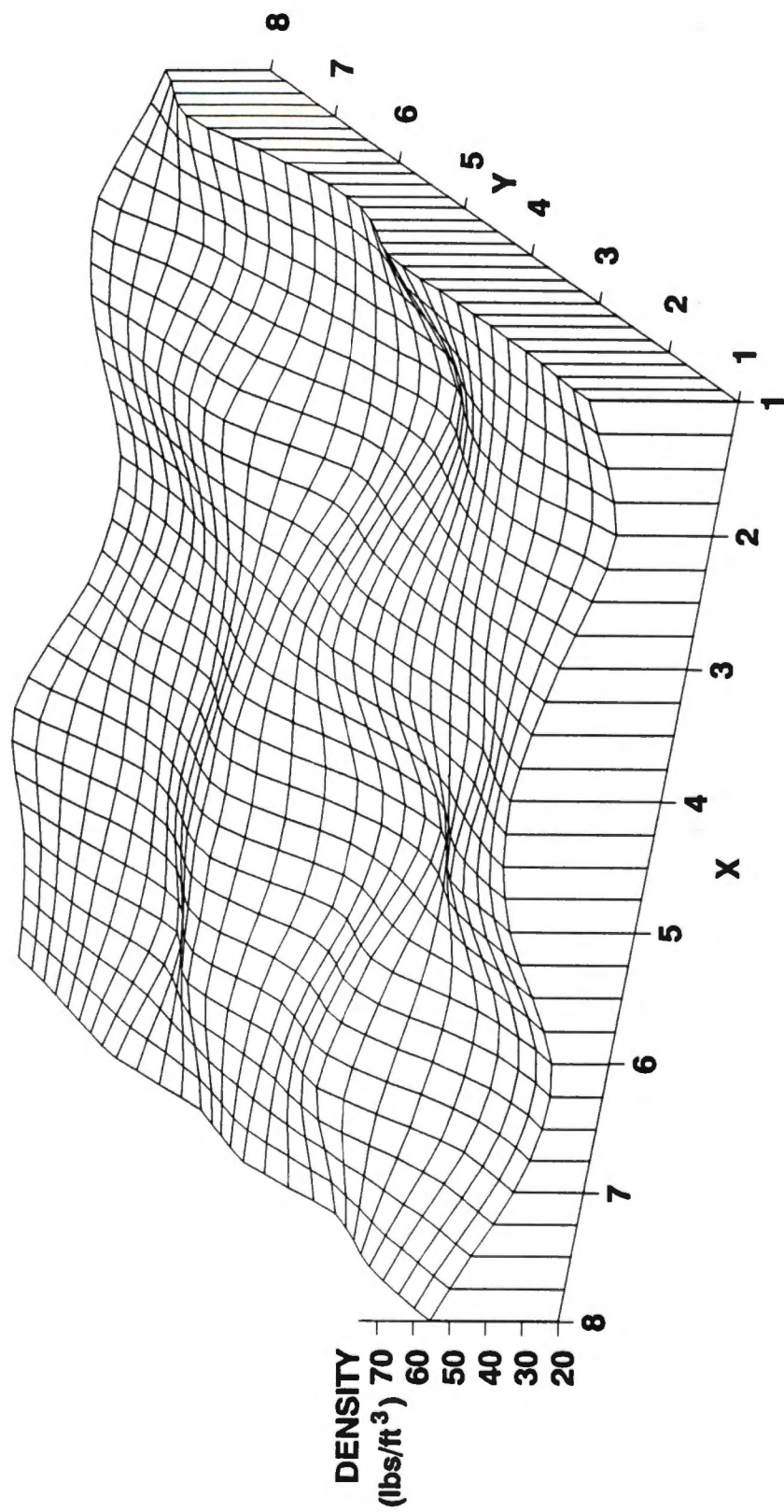
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 14



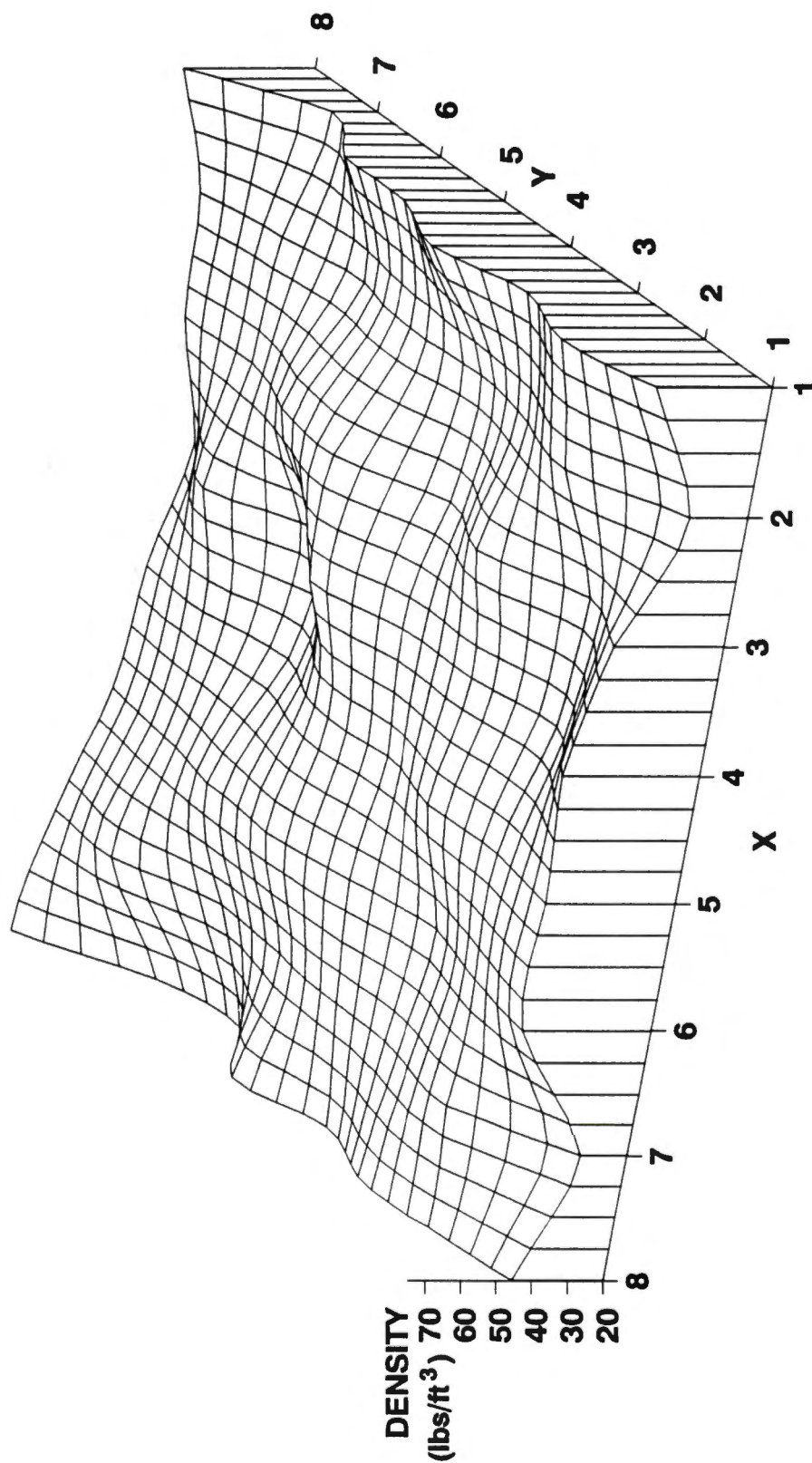
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 15



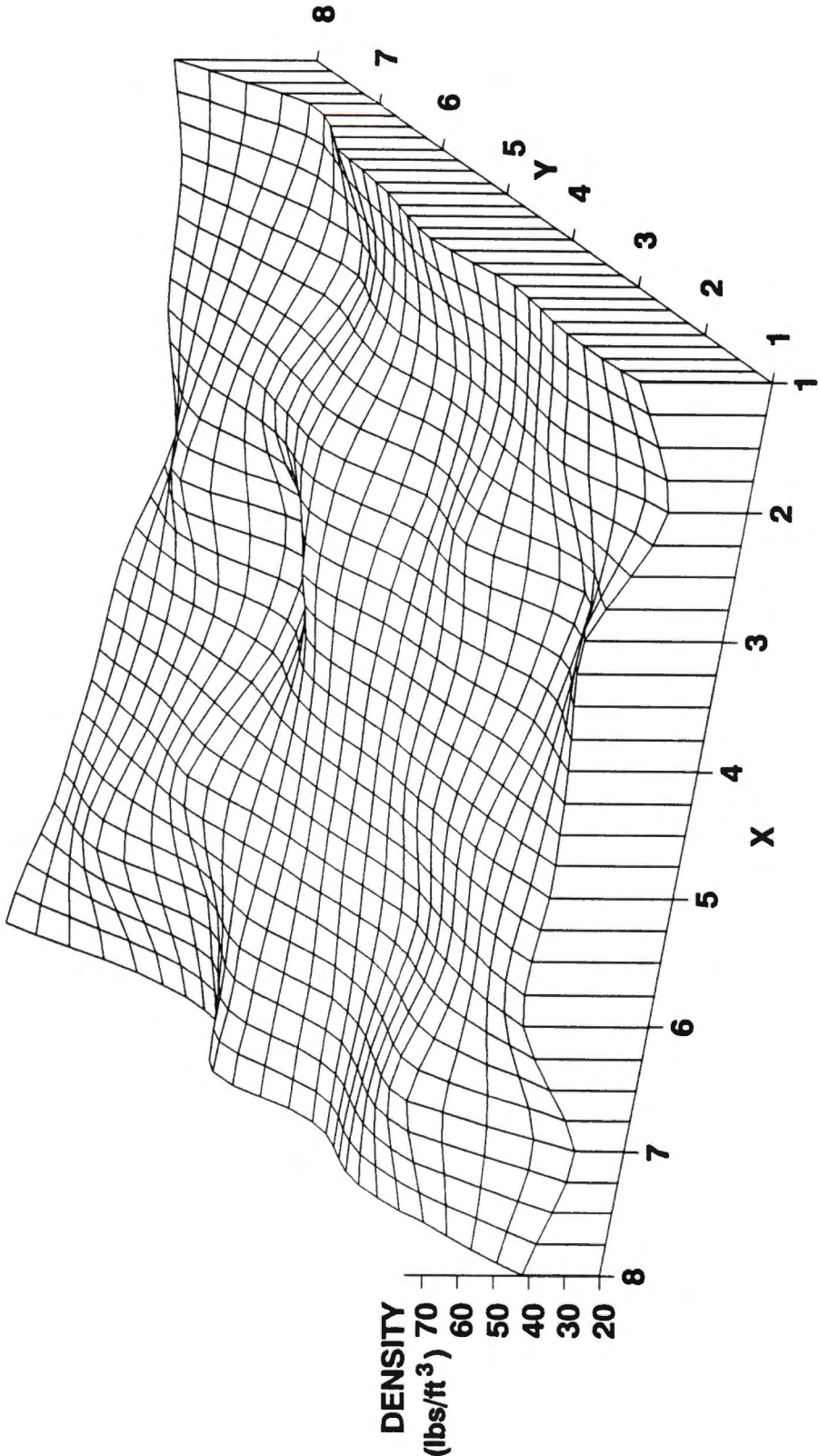
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 16



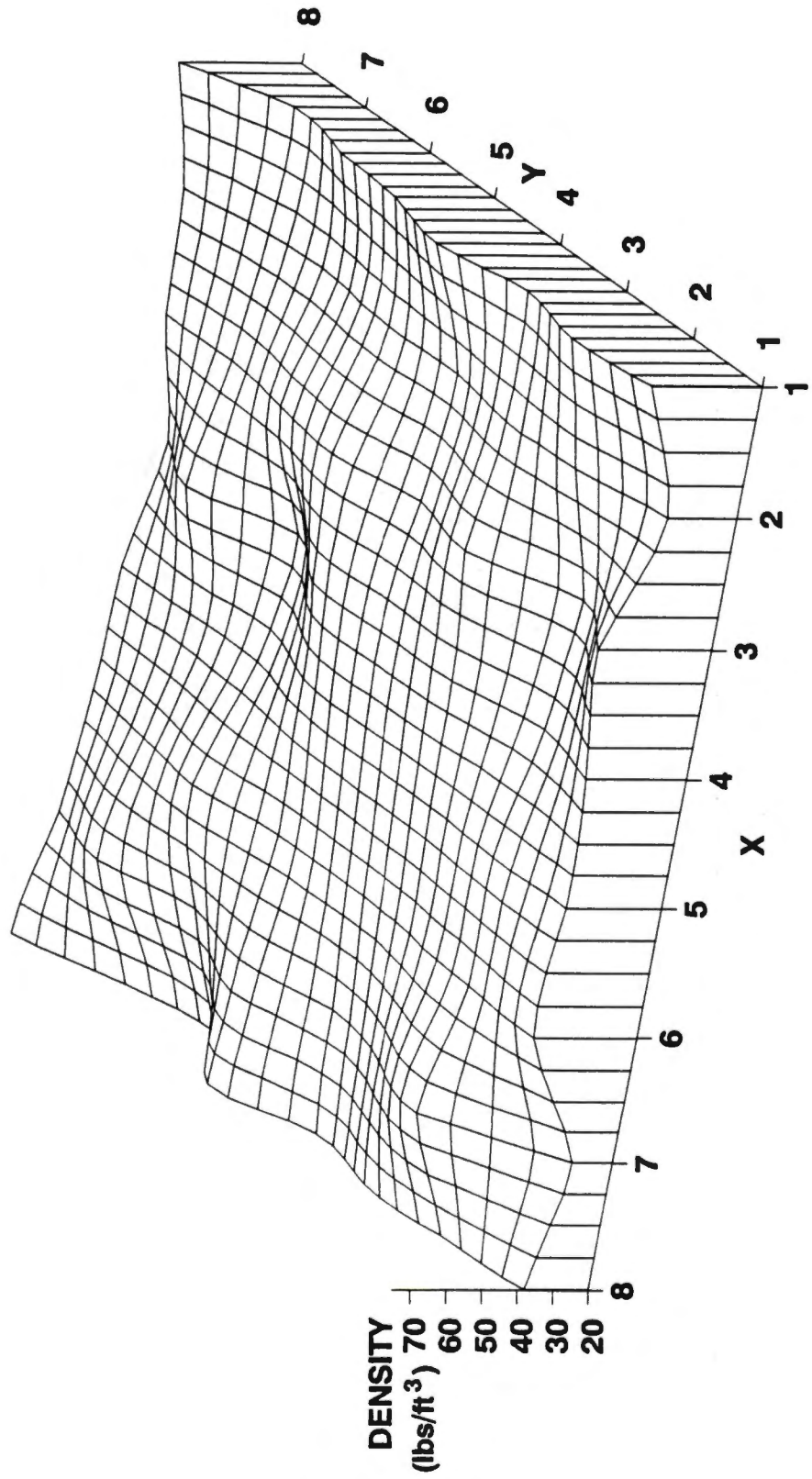
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 1



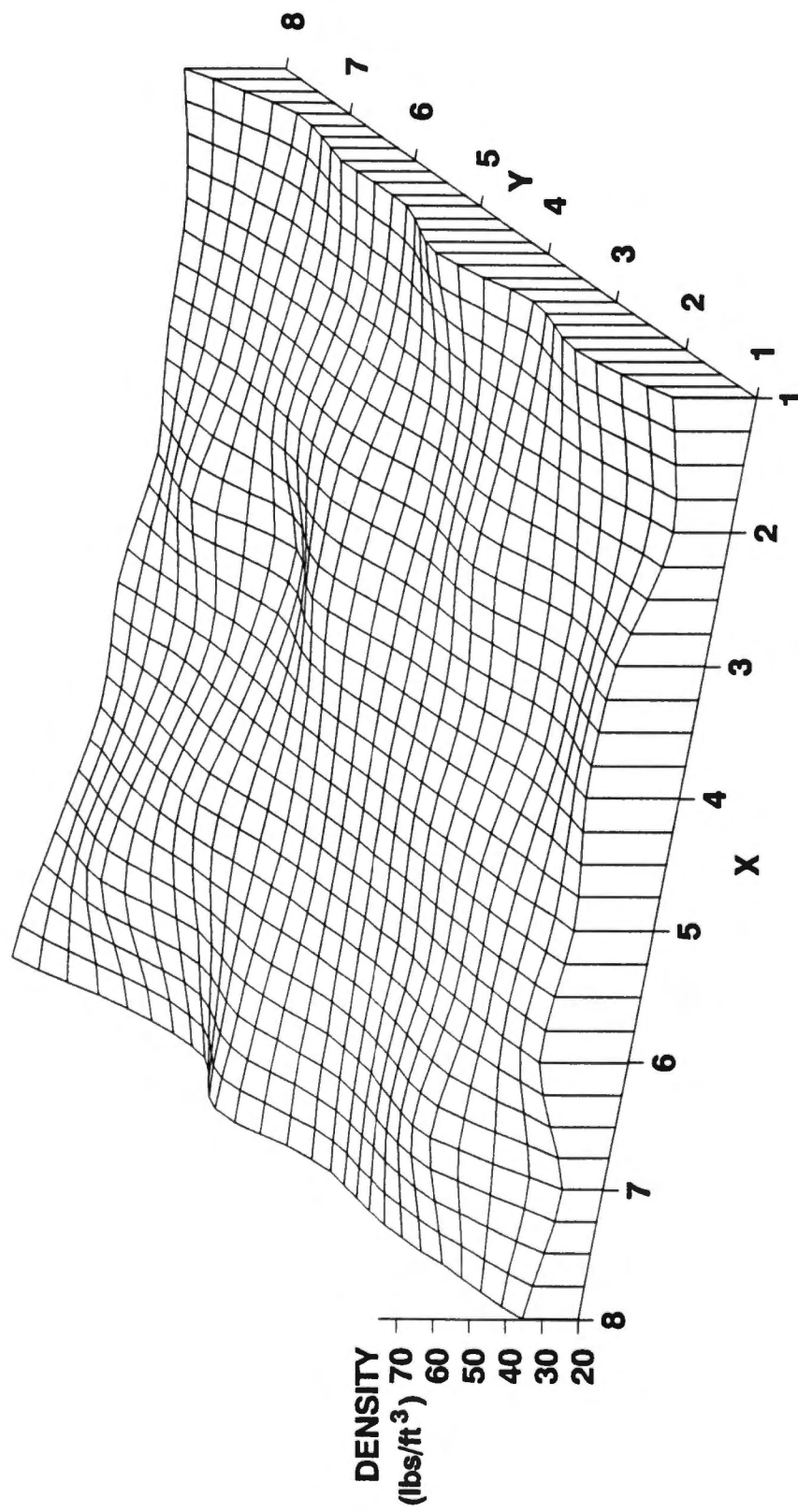
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 2



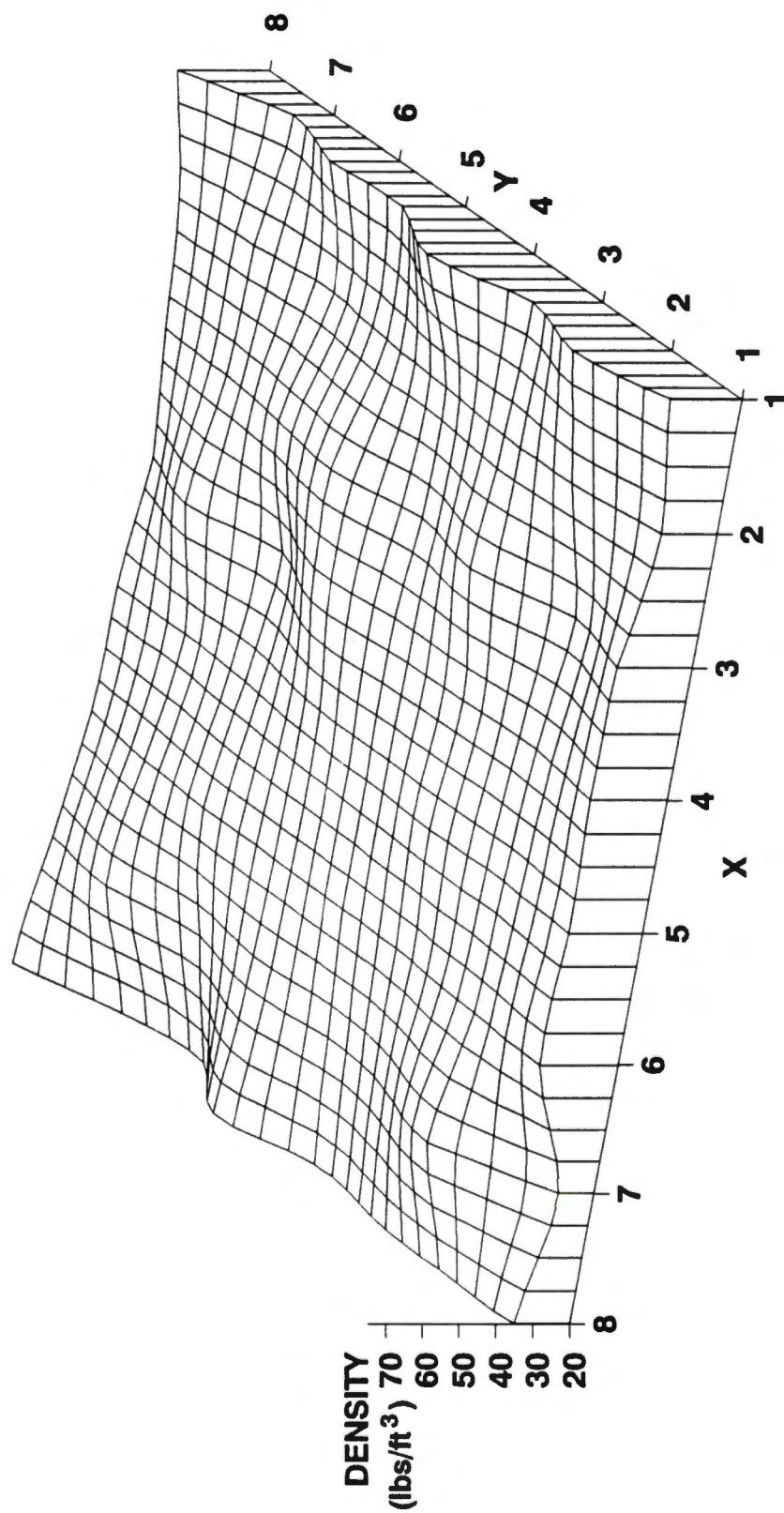
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=3



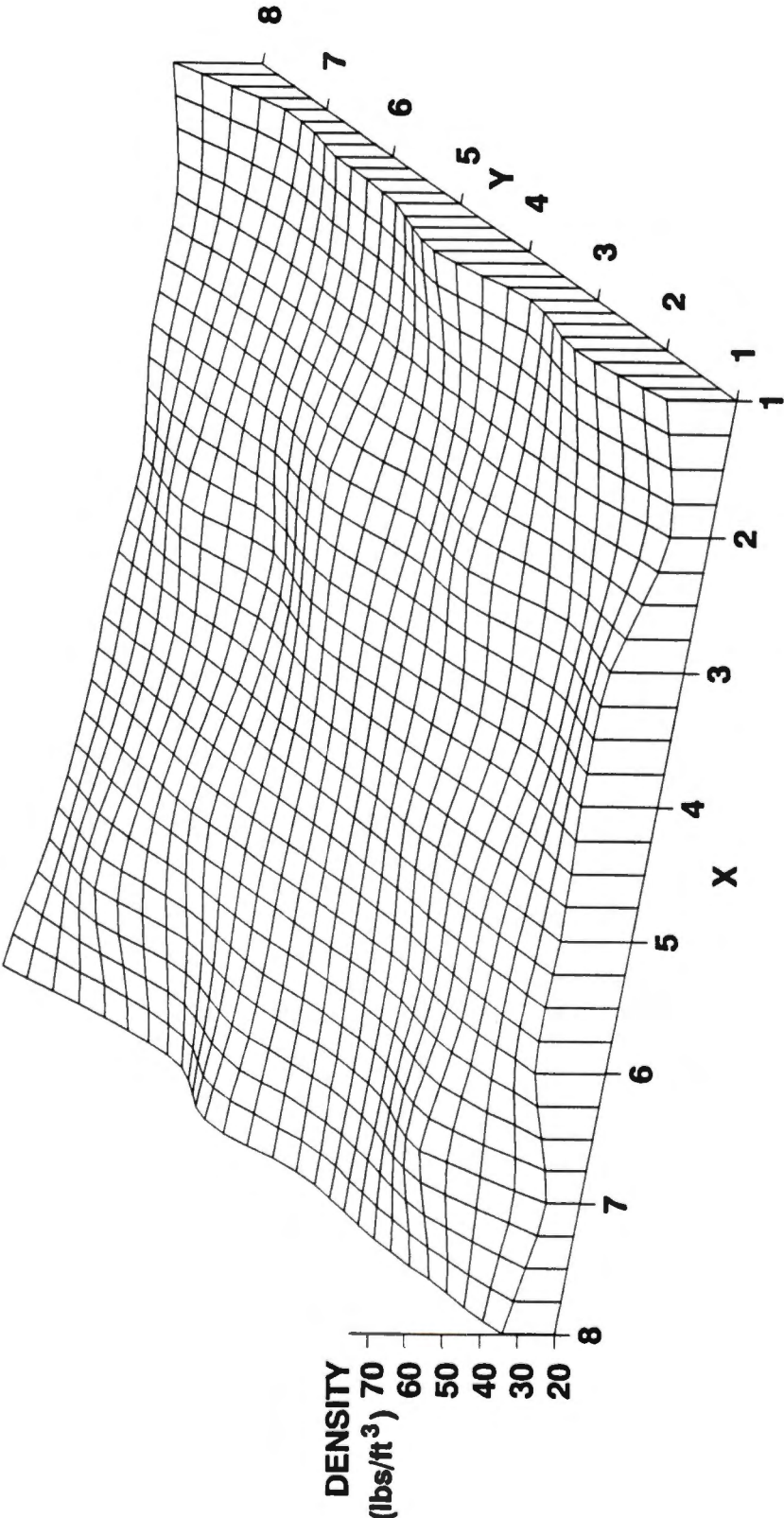
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=4



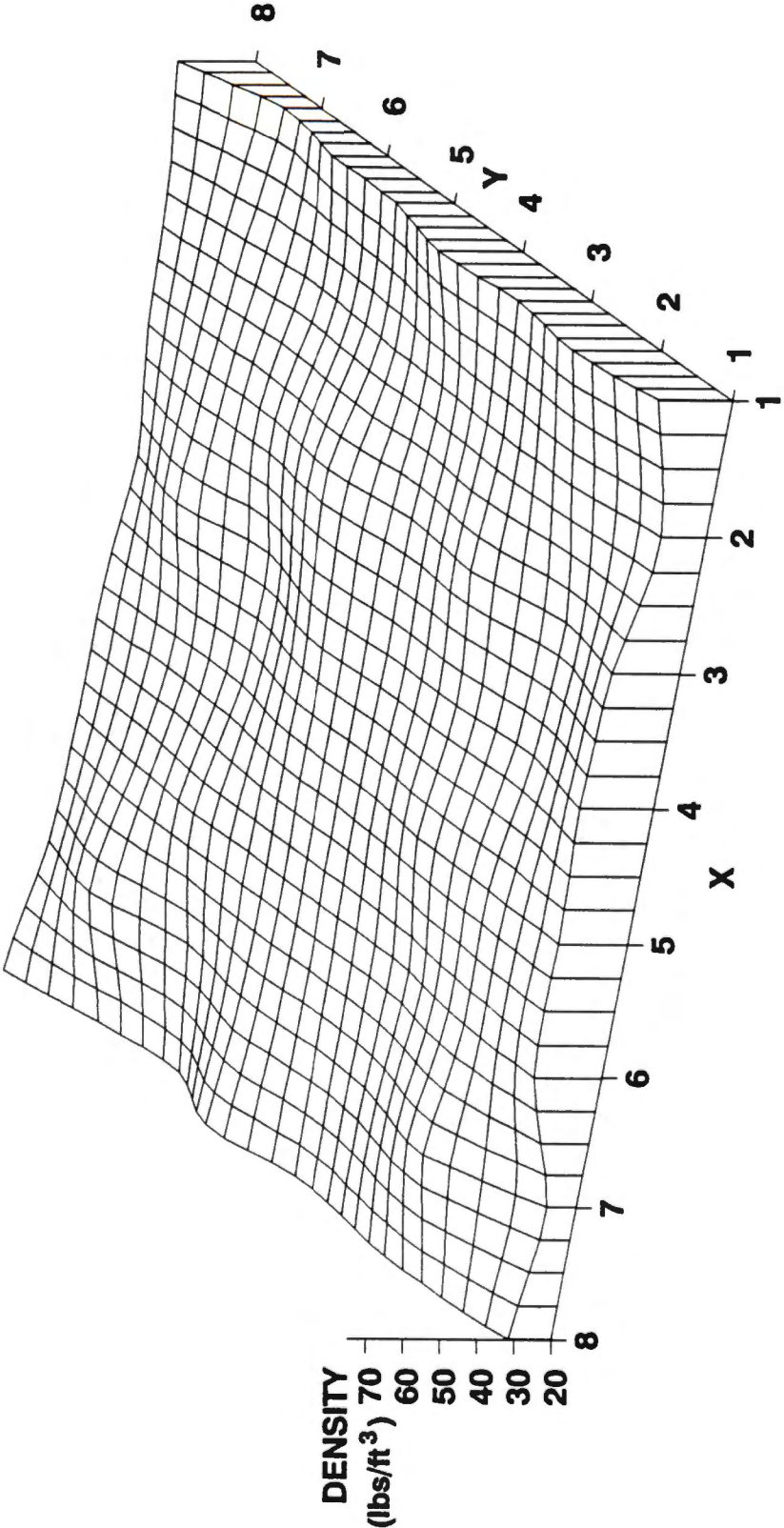
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=5



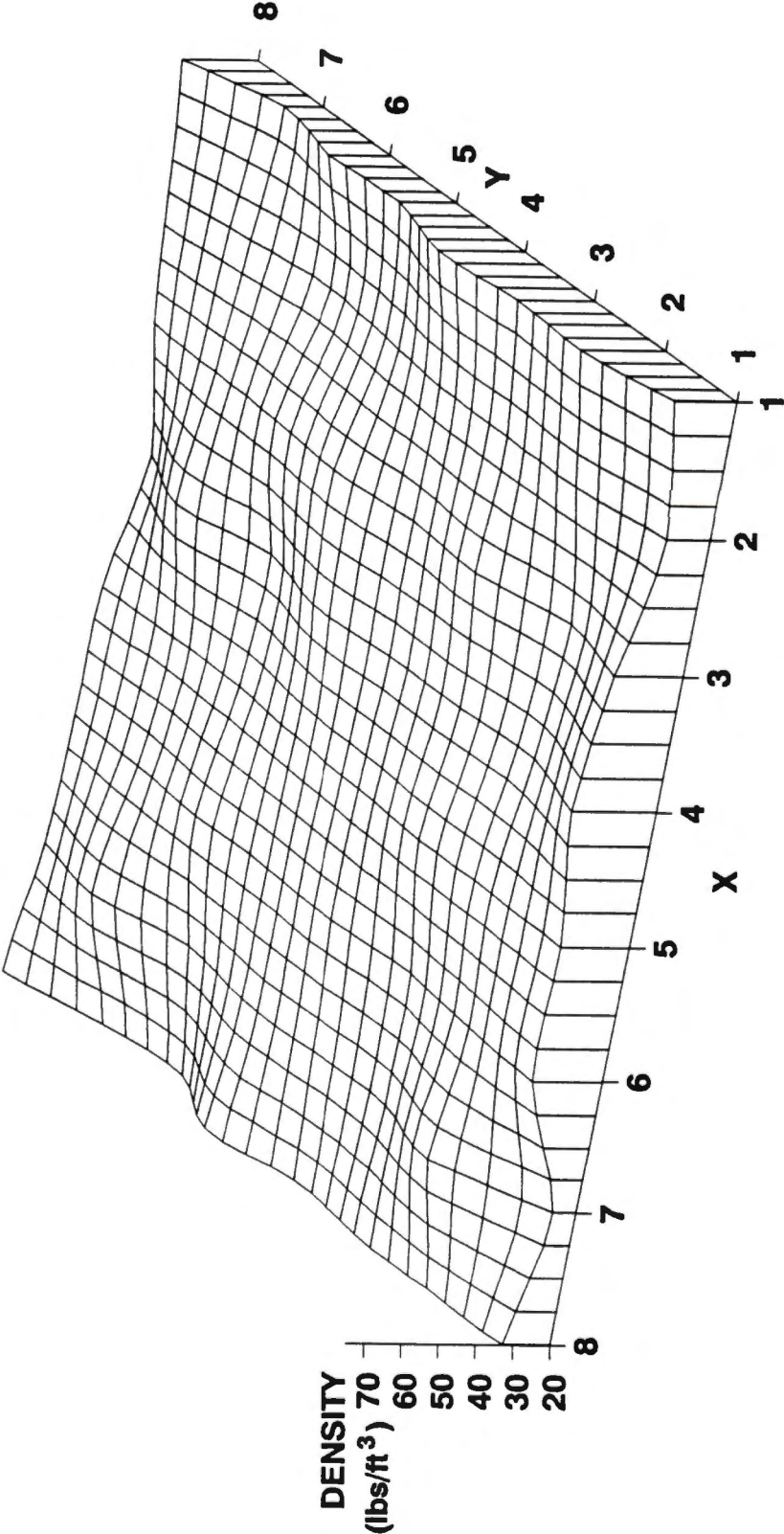
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=6



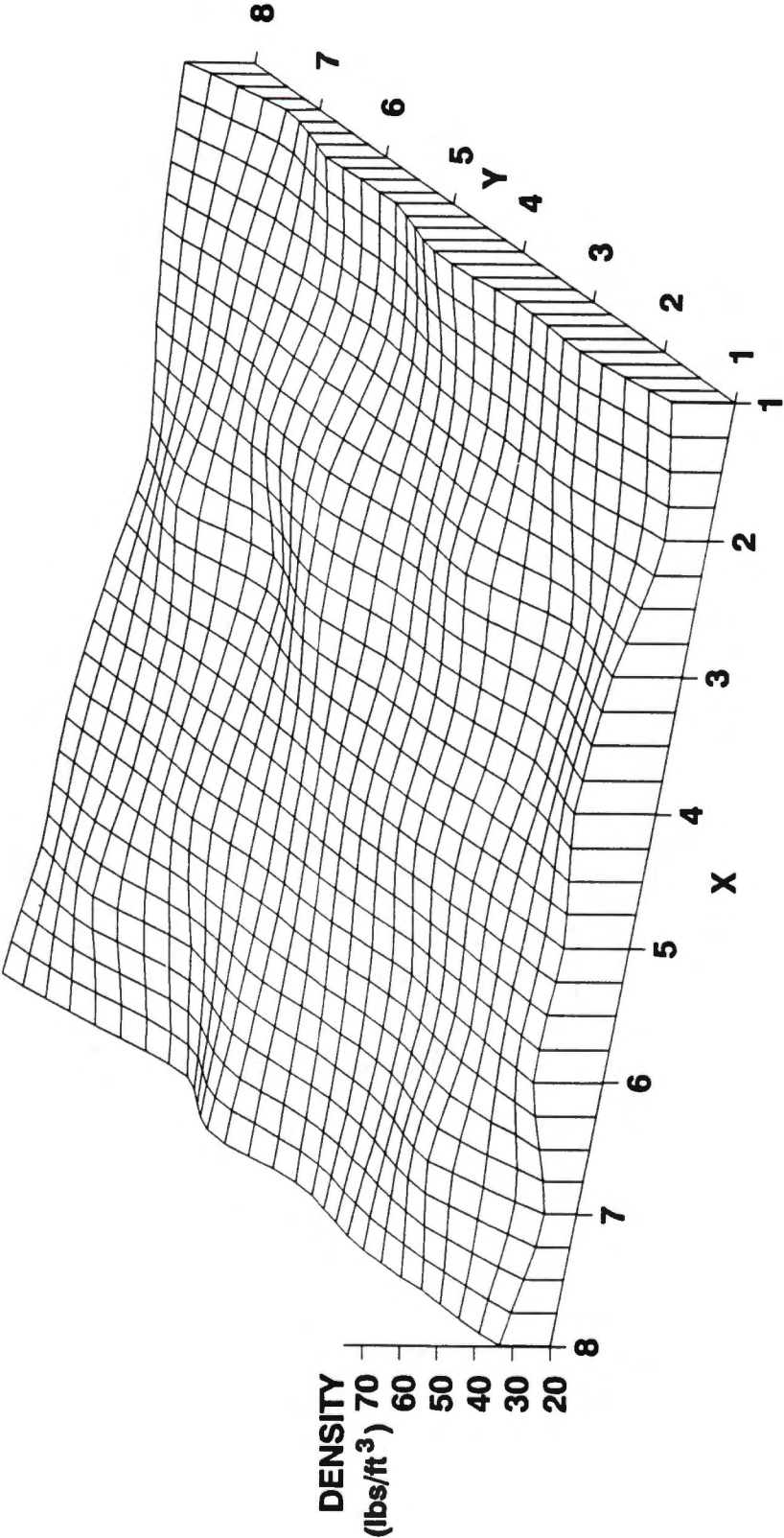
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 7



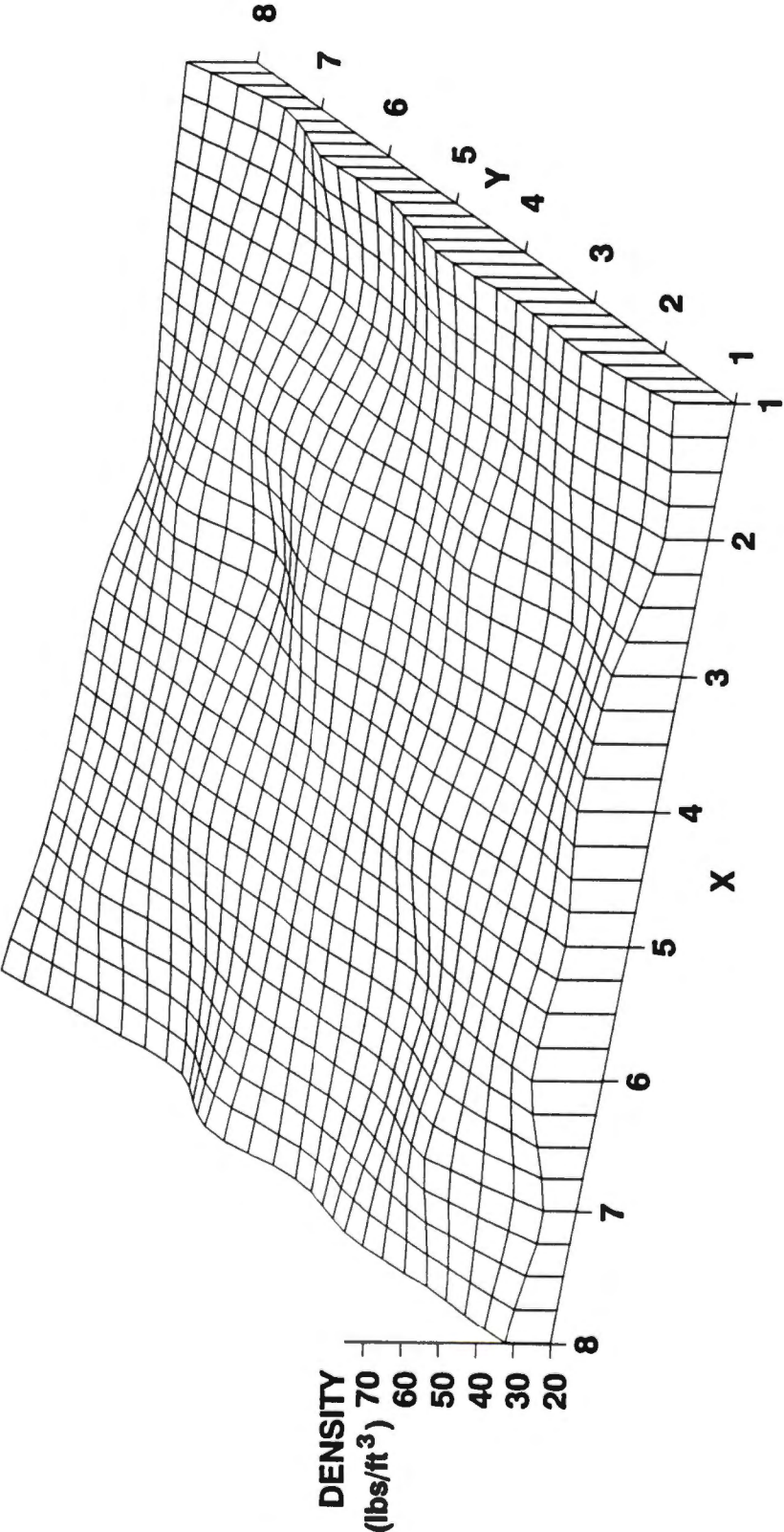
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=8



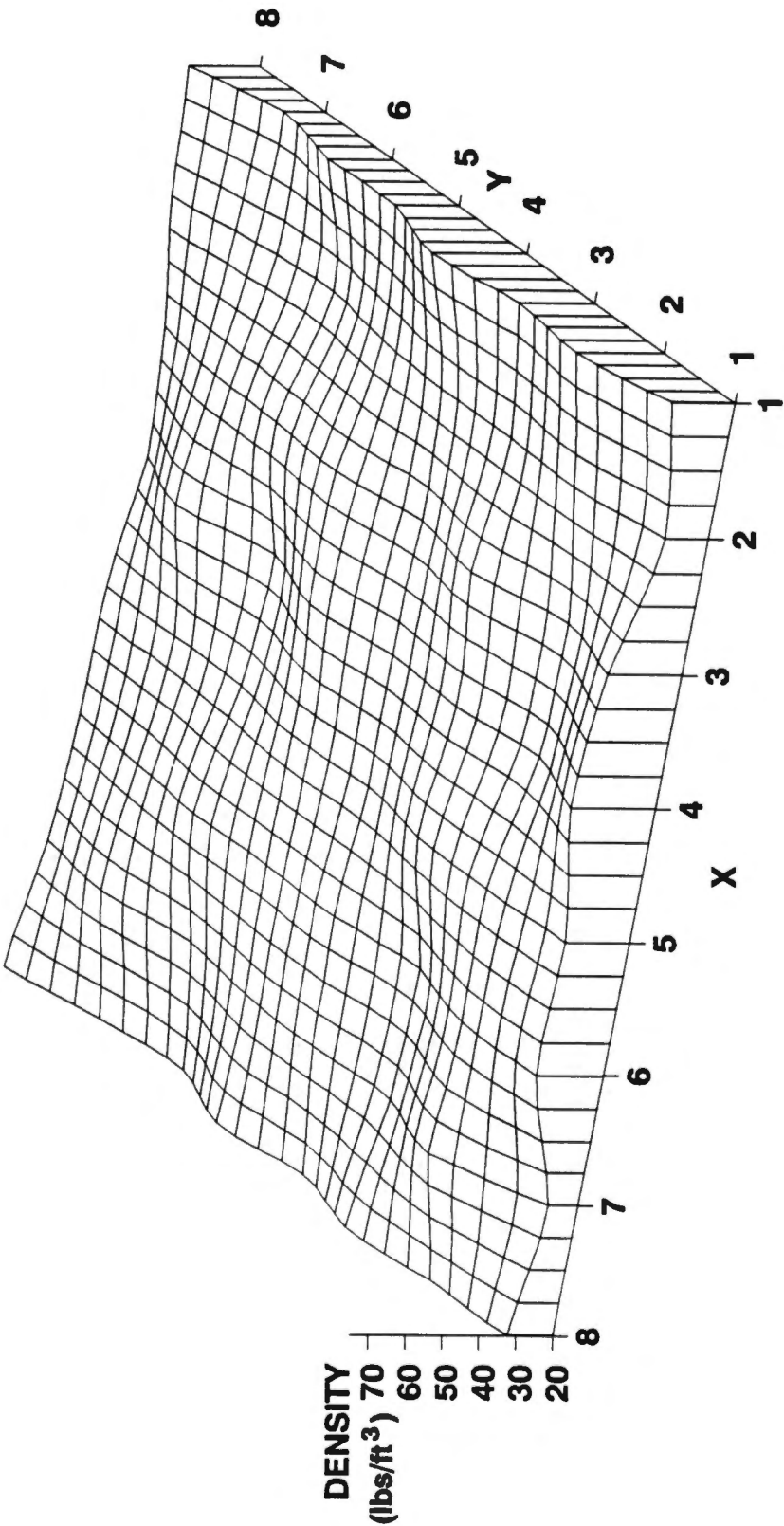
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 9



FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 10



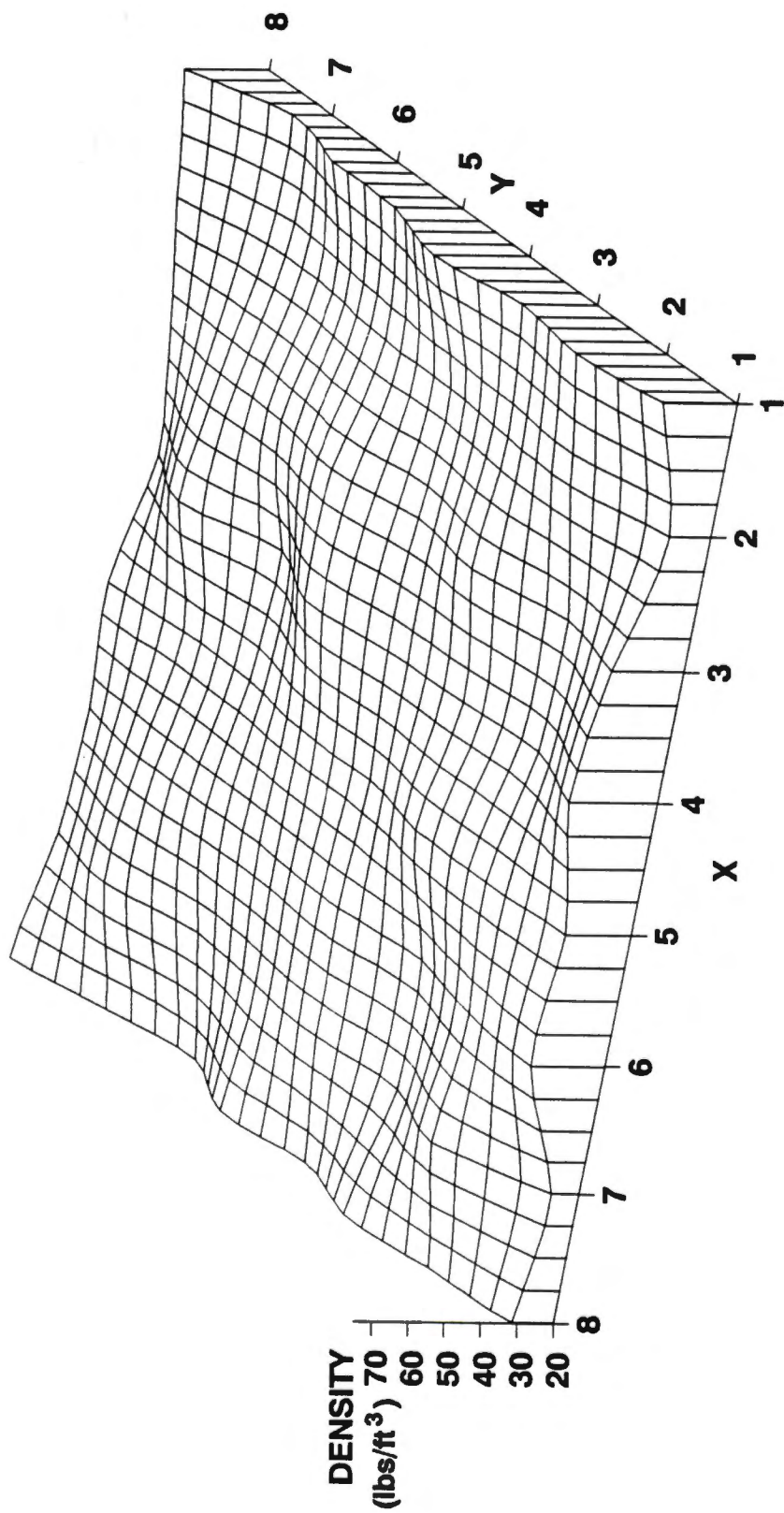
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=11



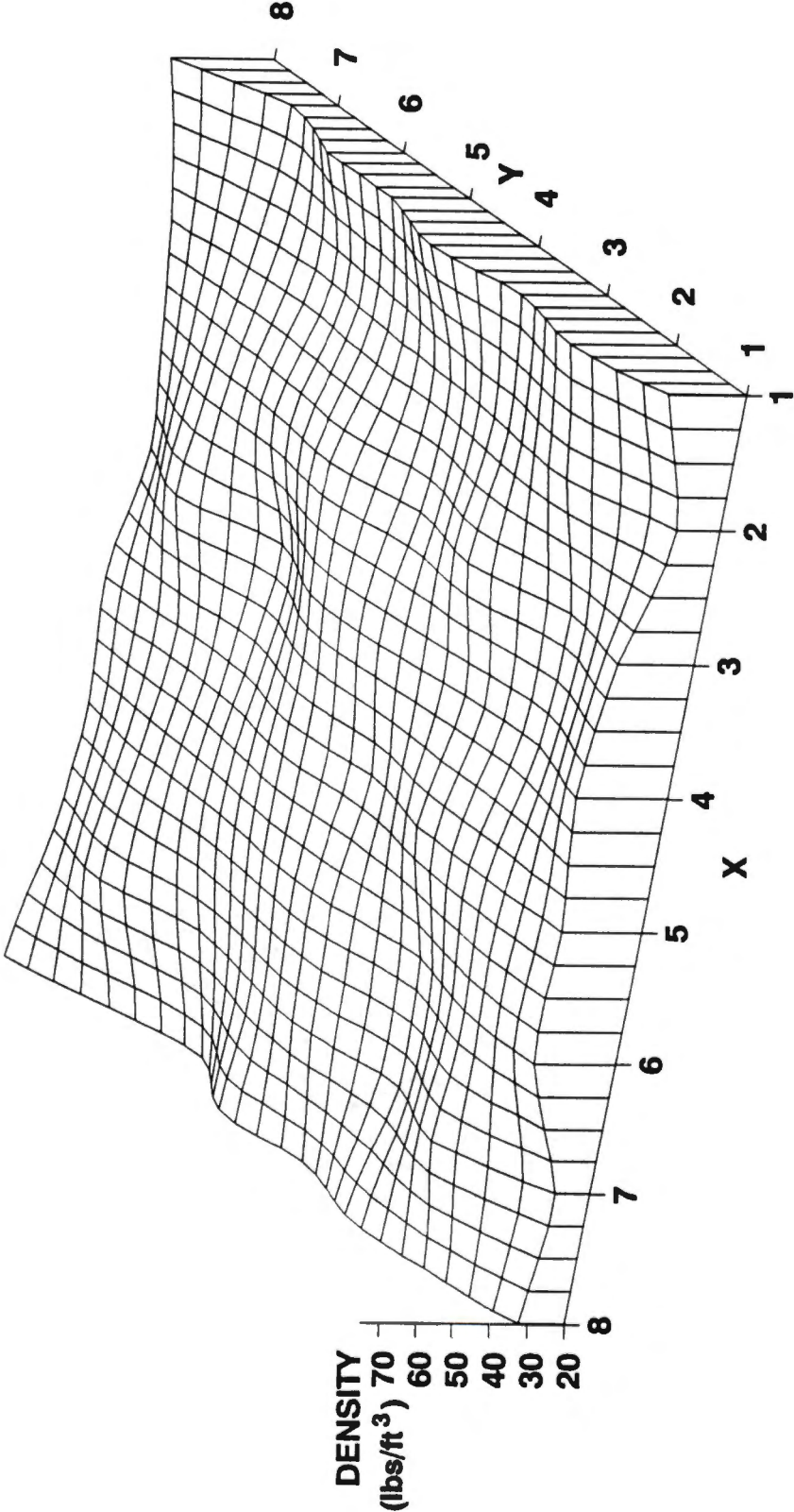
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

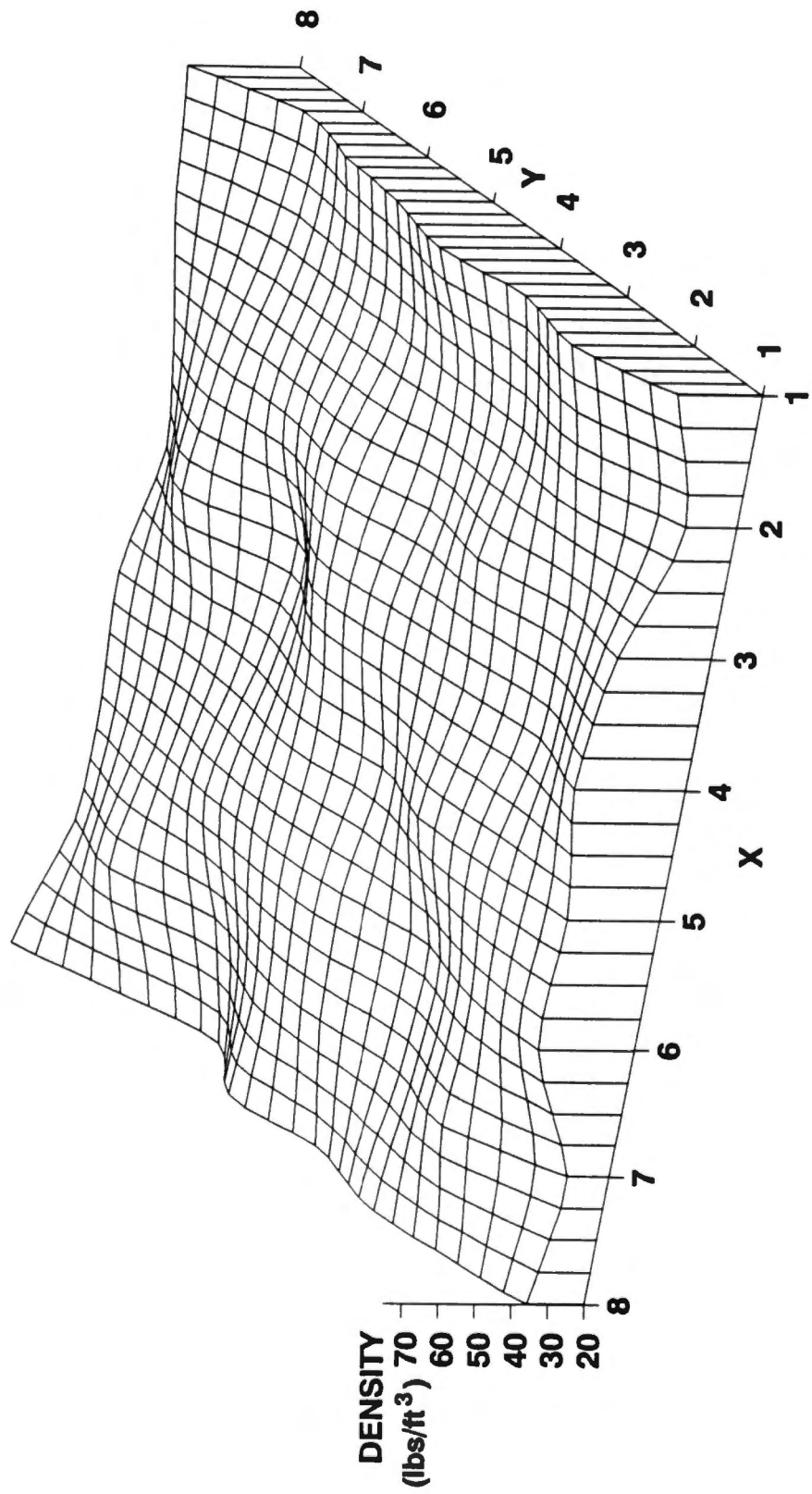
Z = 12



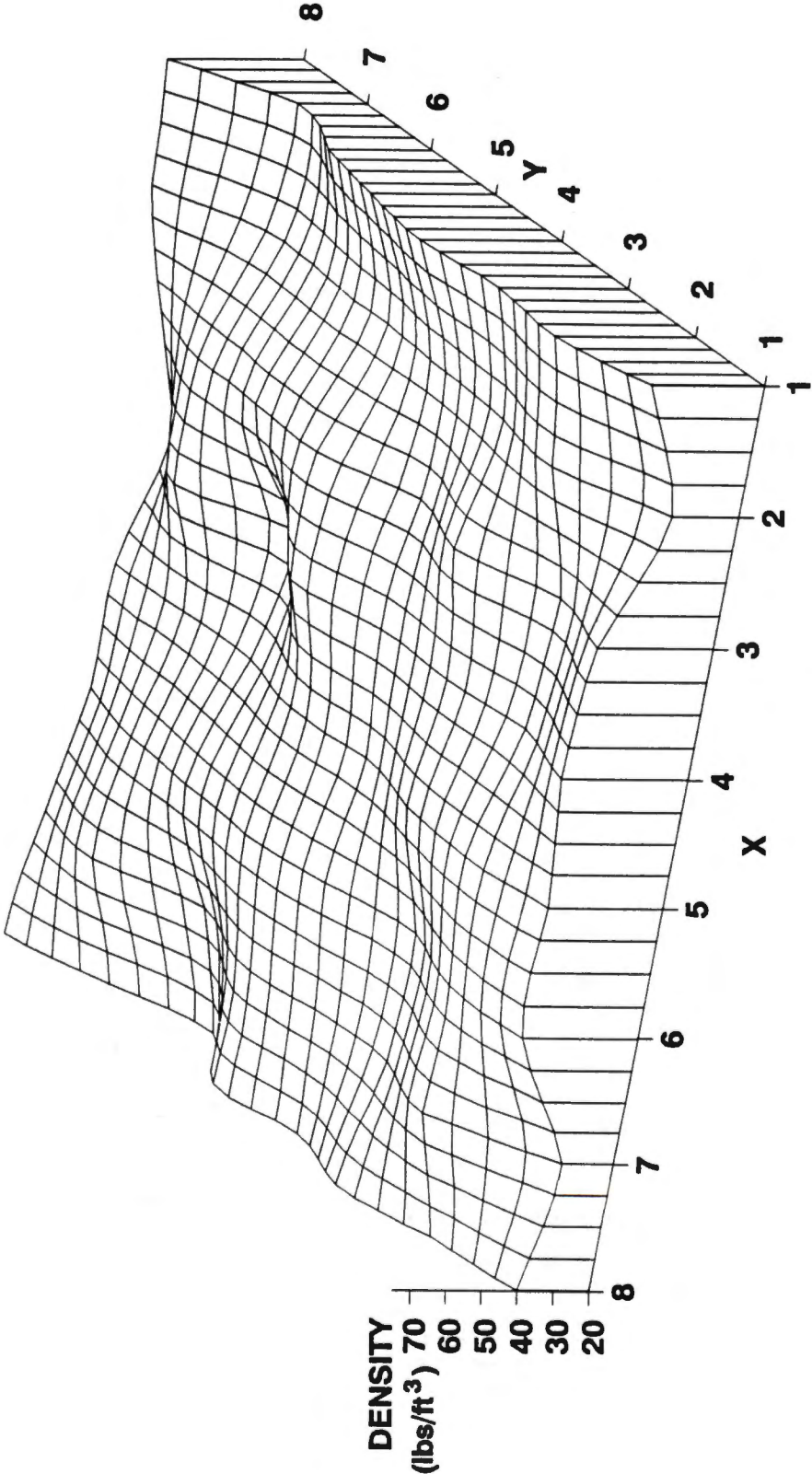
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=13



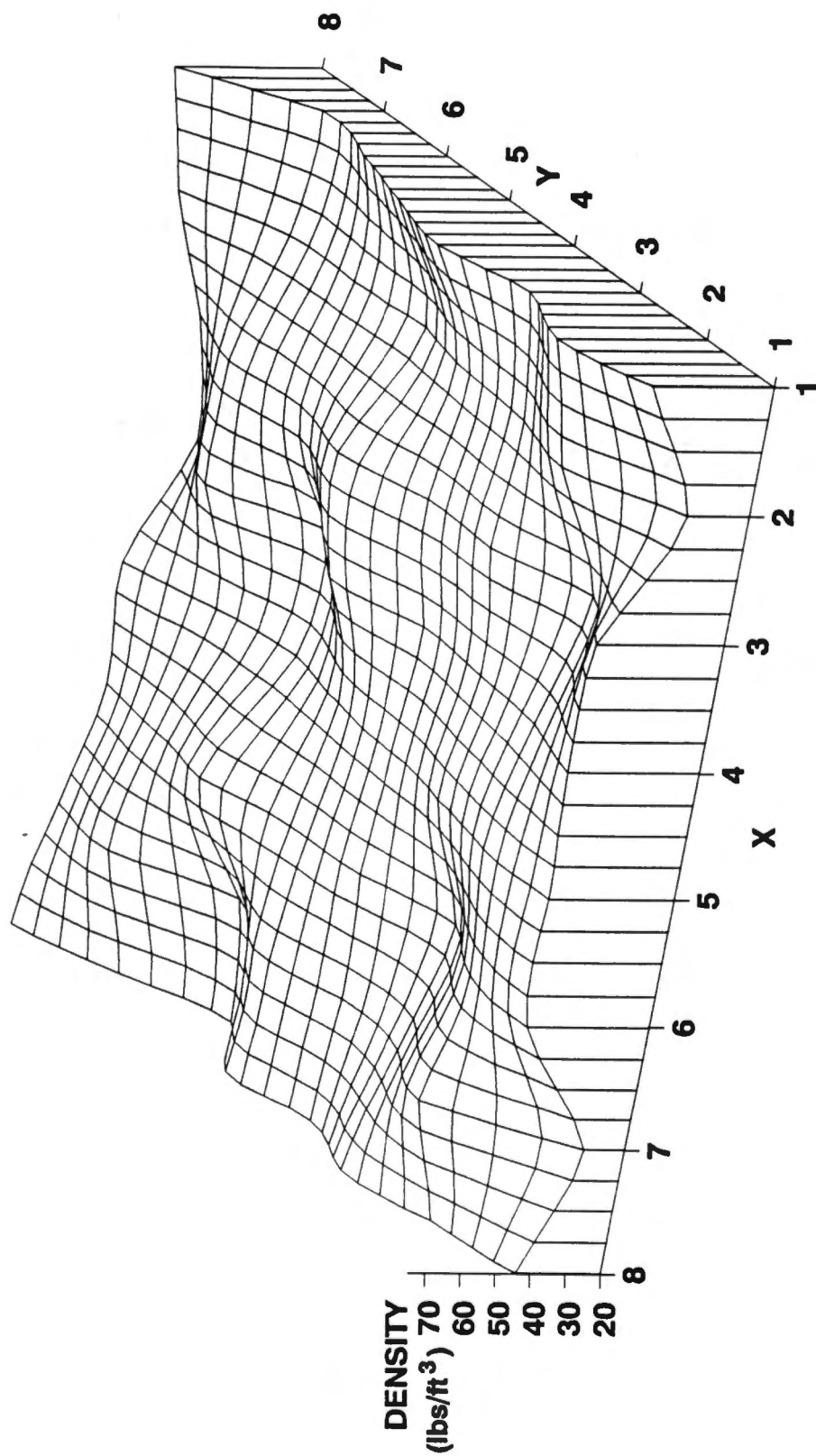
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 14



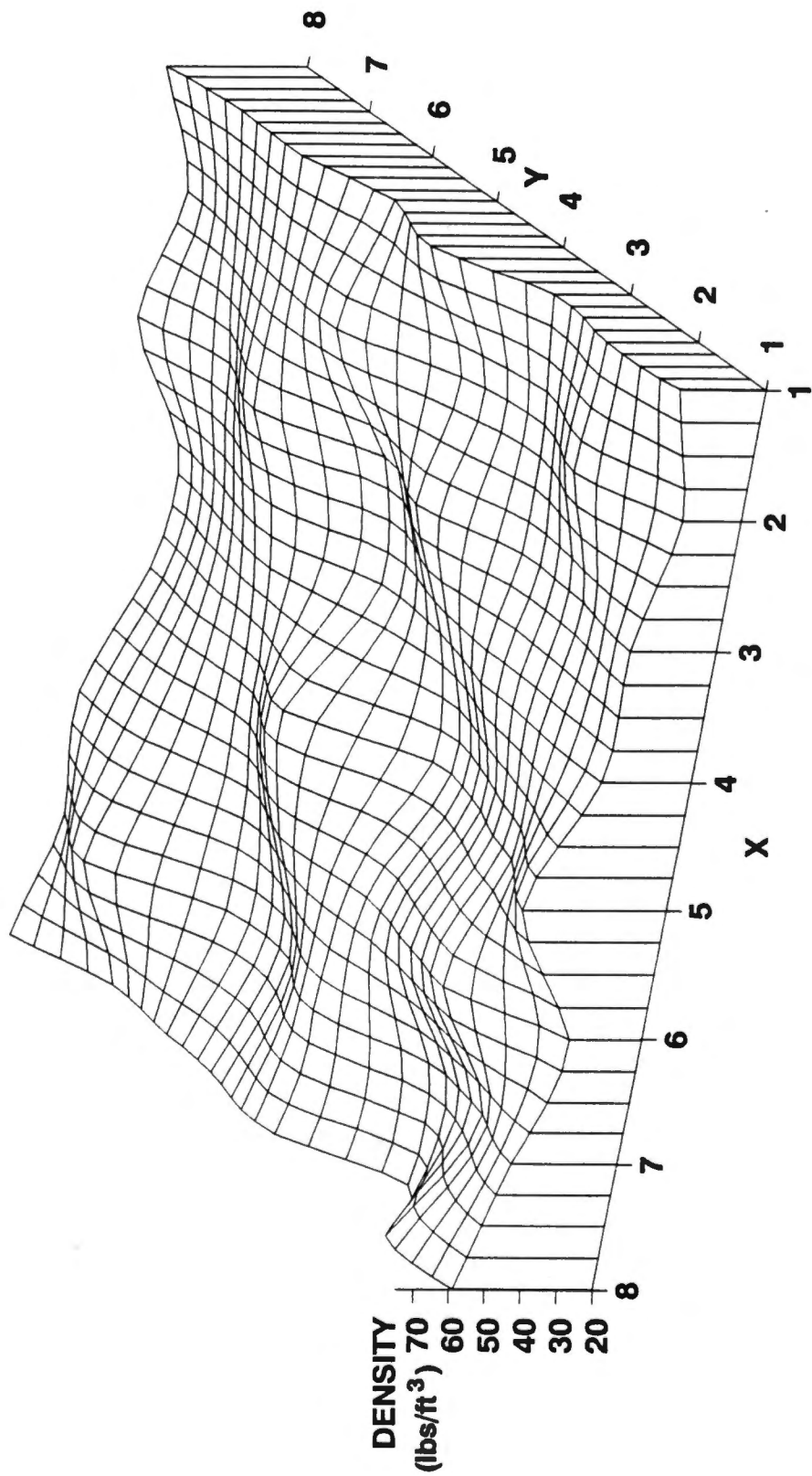
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=15



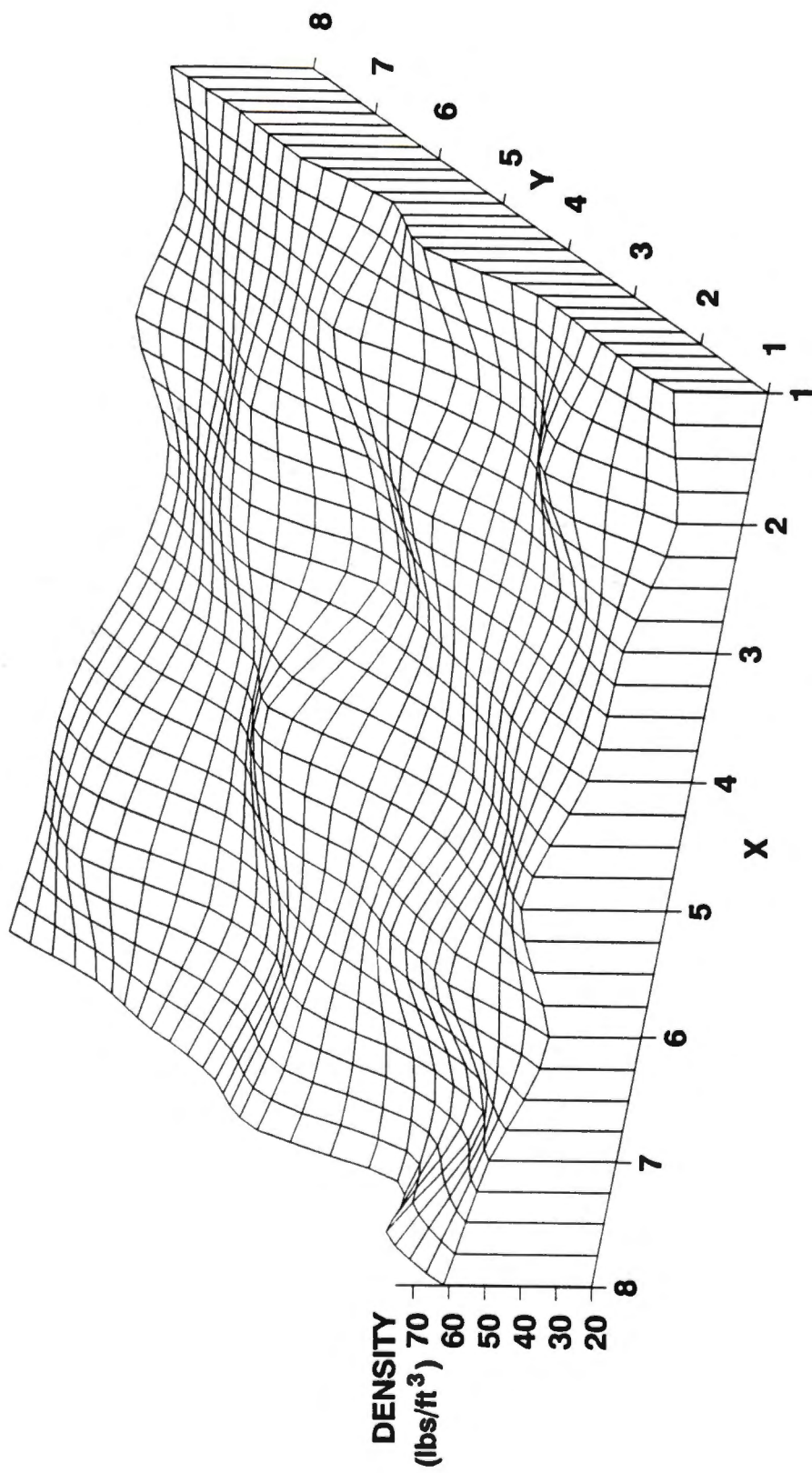
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=16



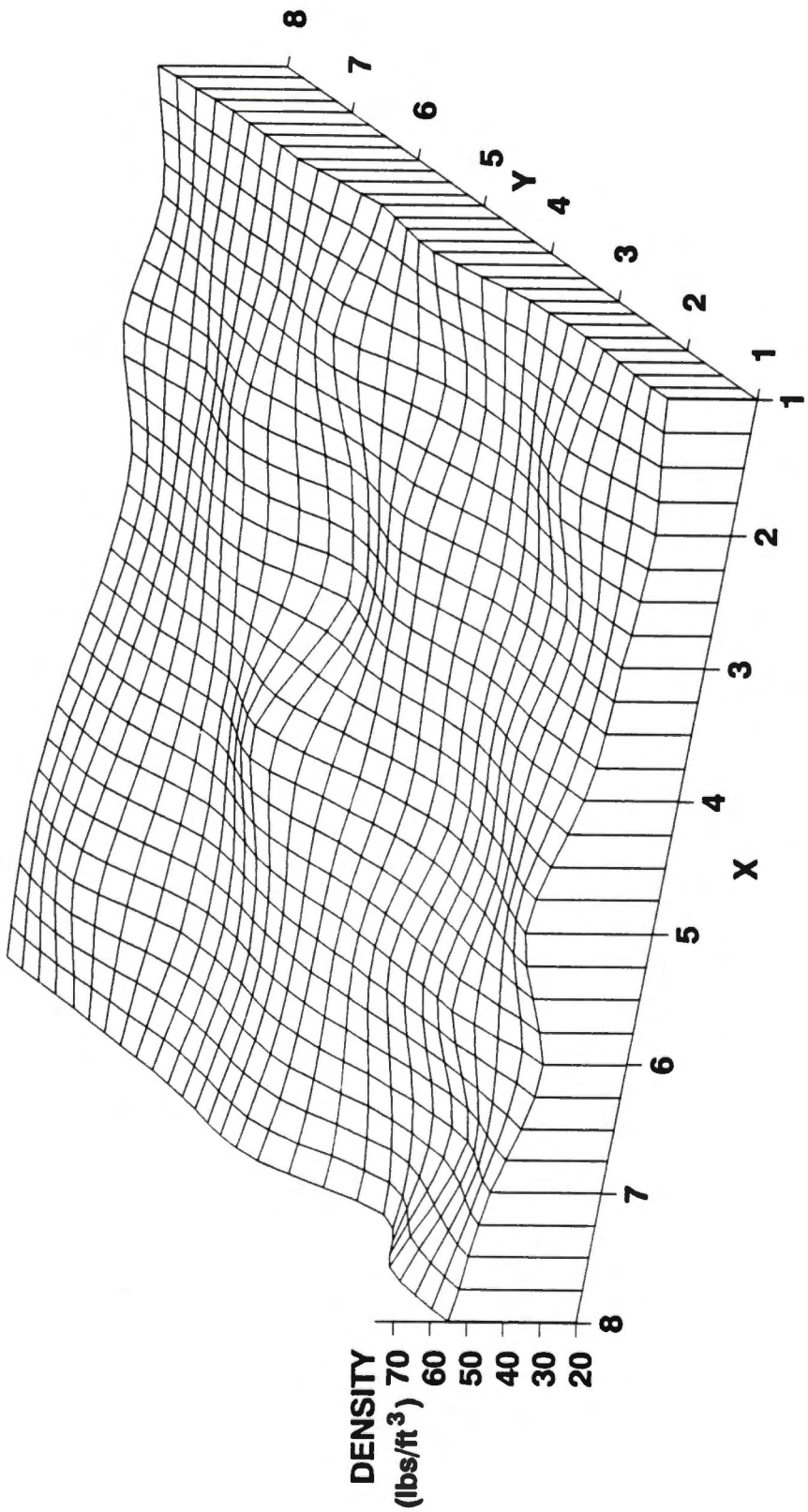
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=1



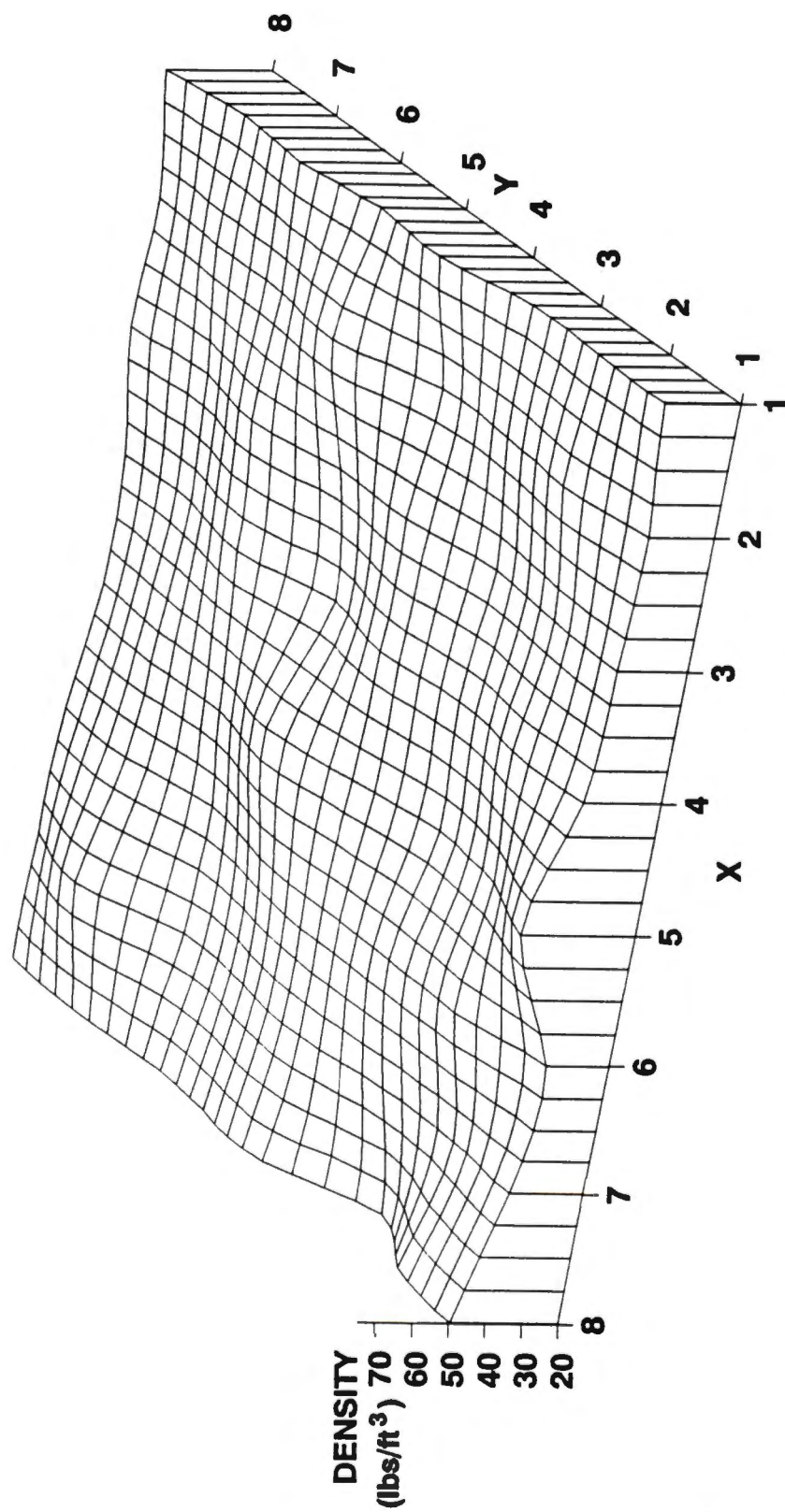
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 2



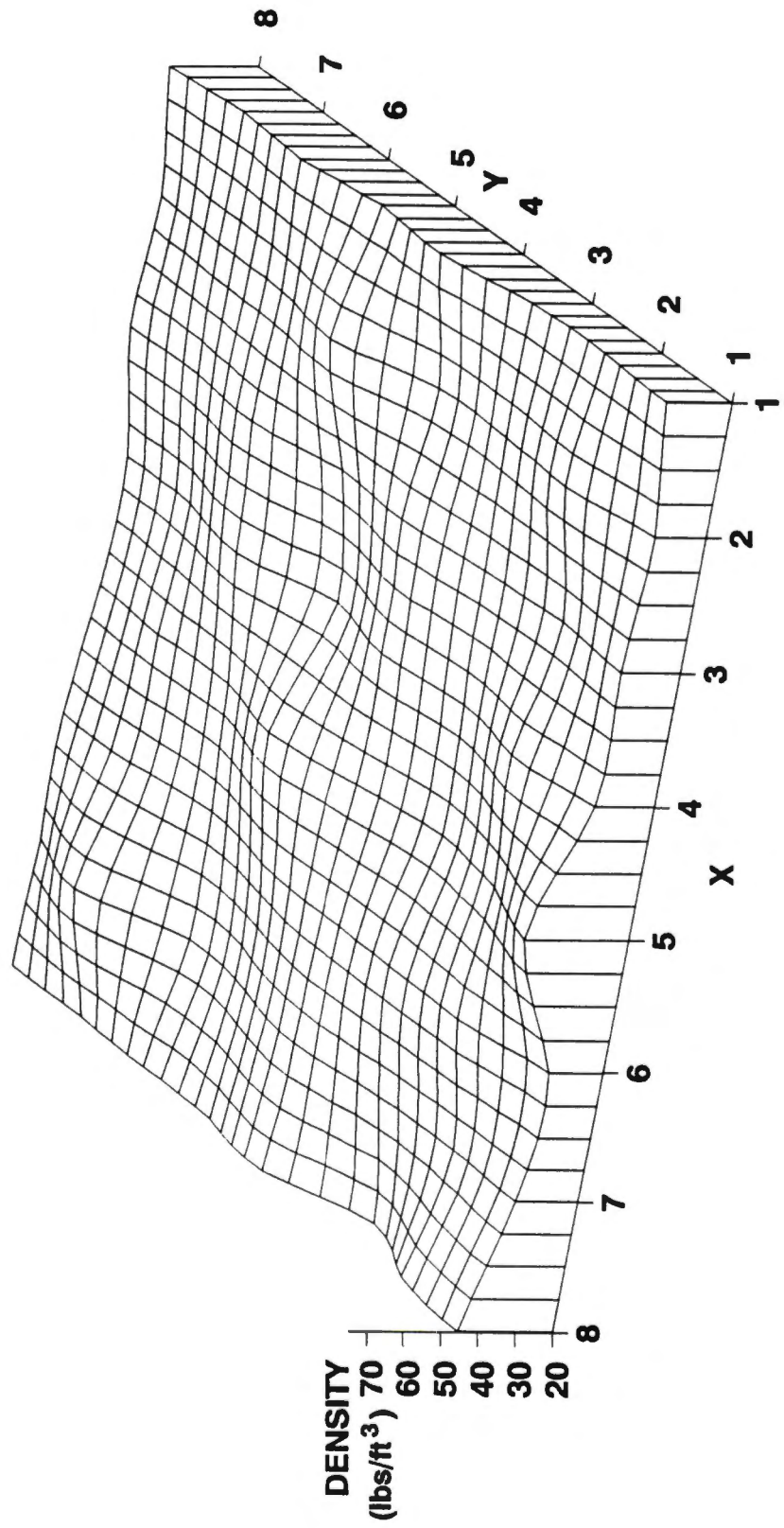
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=3



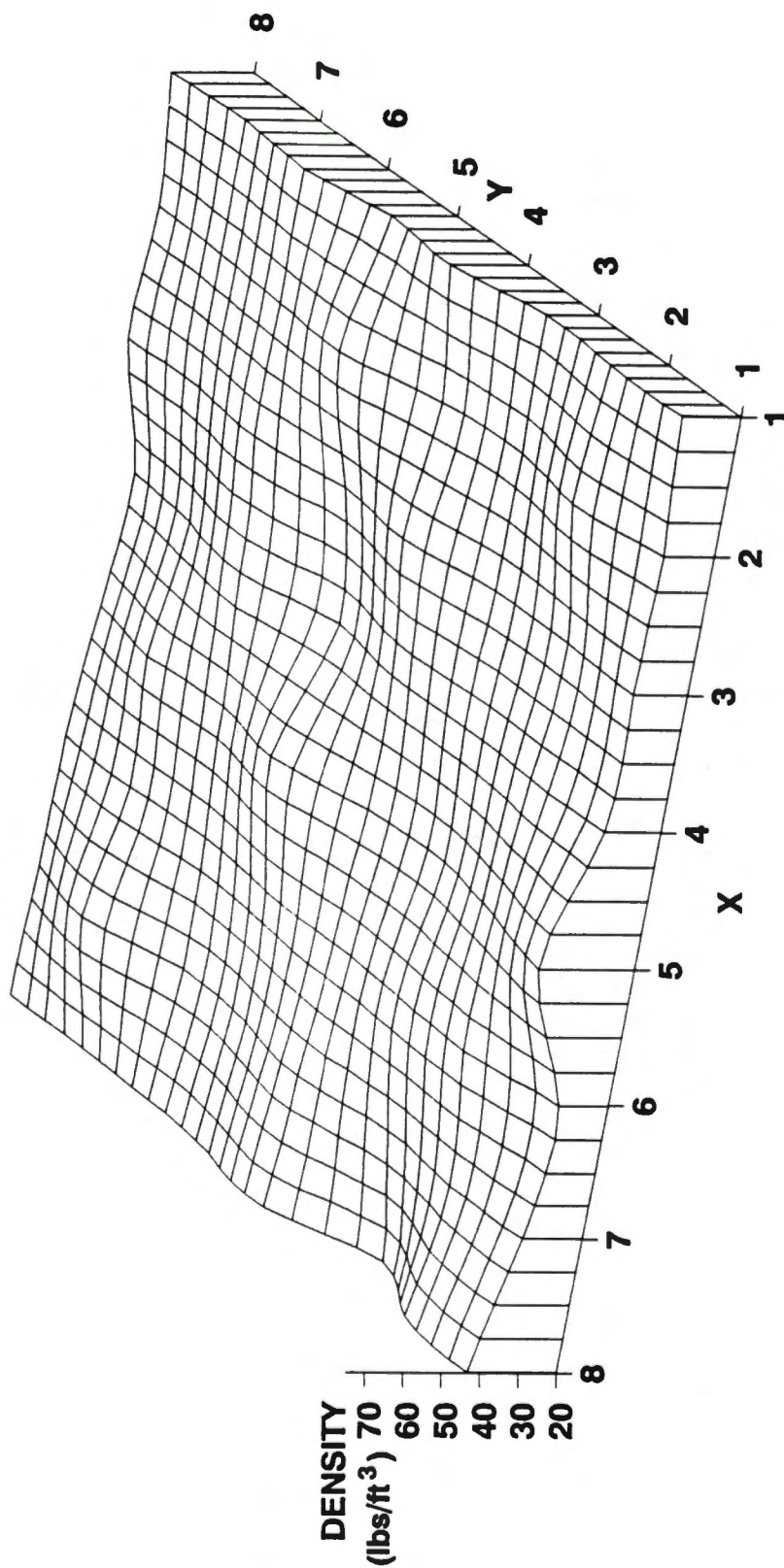
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 4



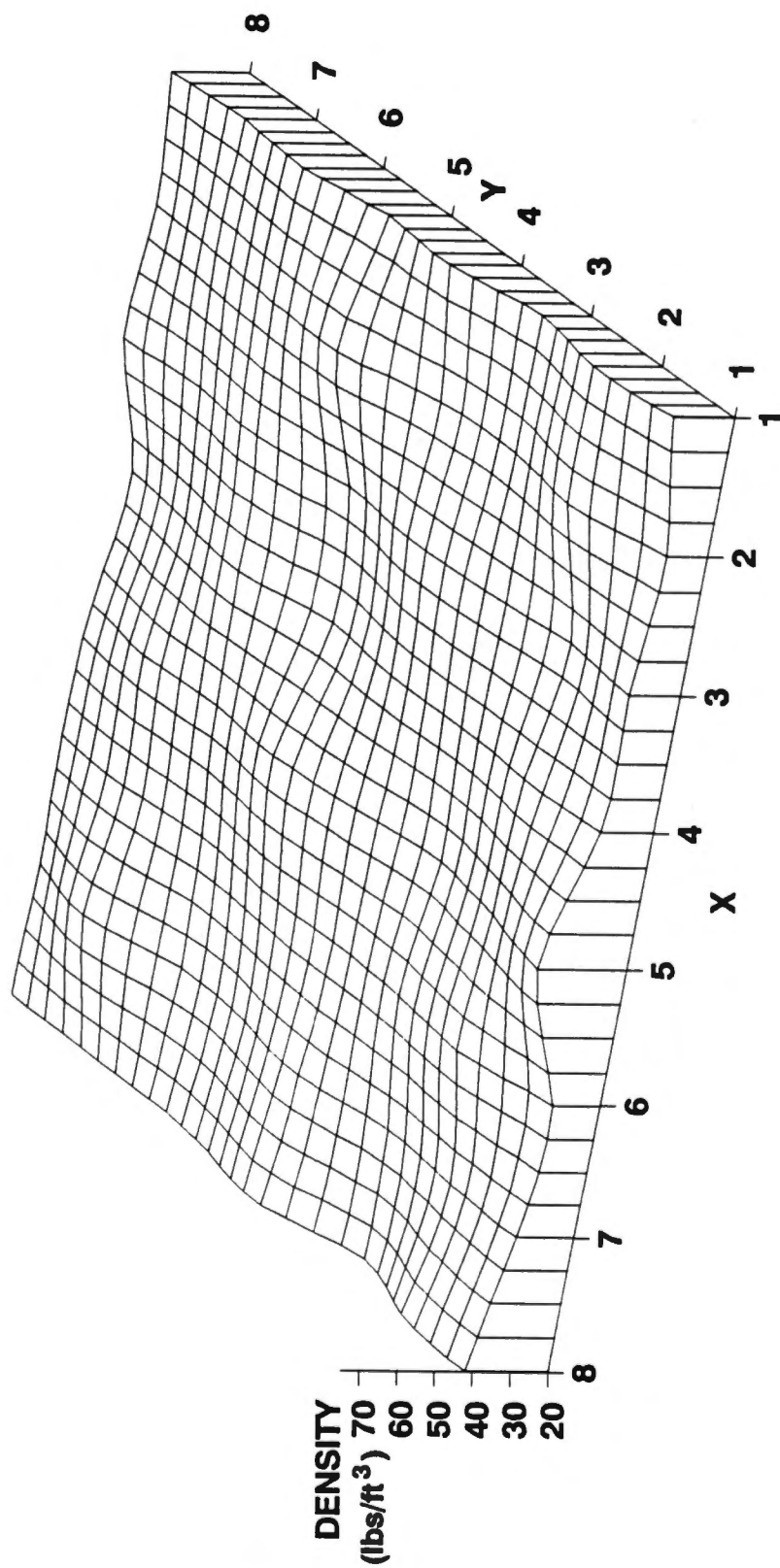
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=5



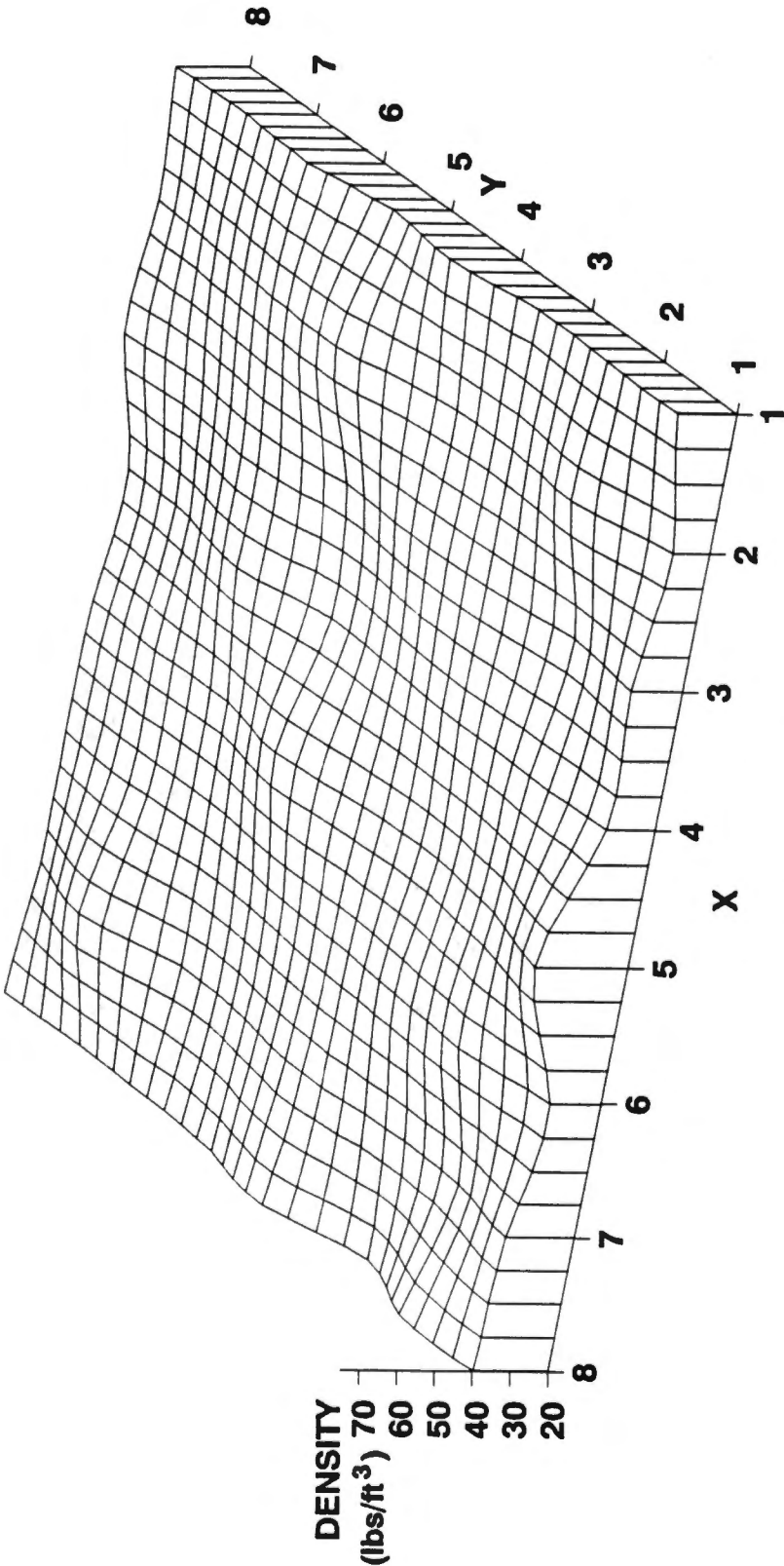
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=6



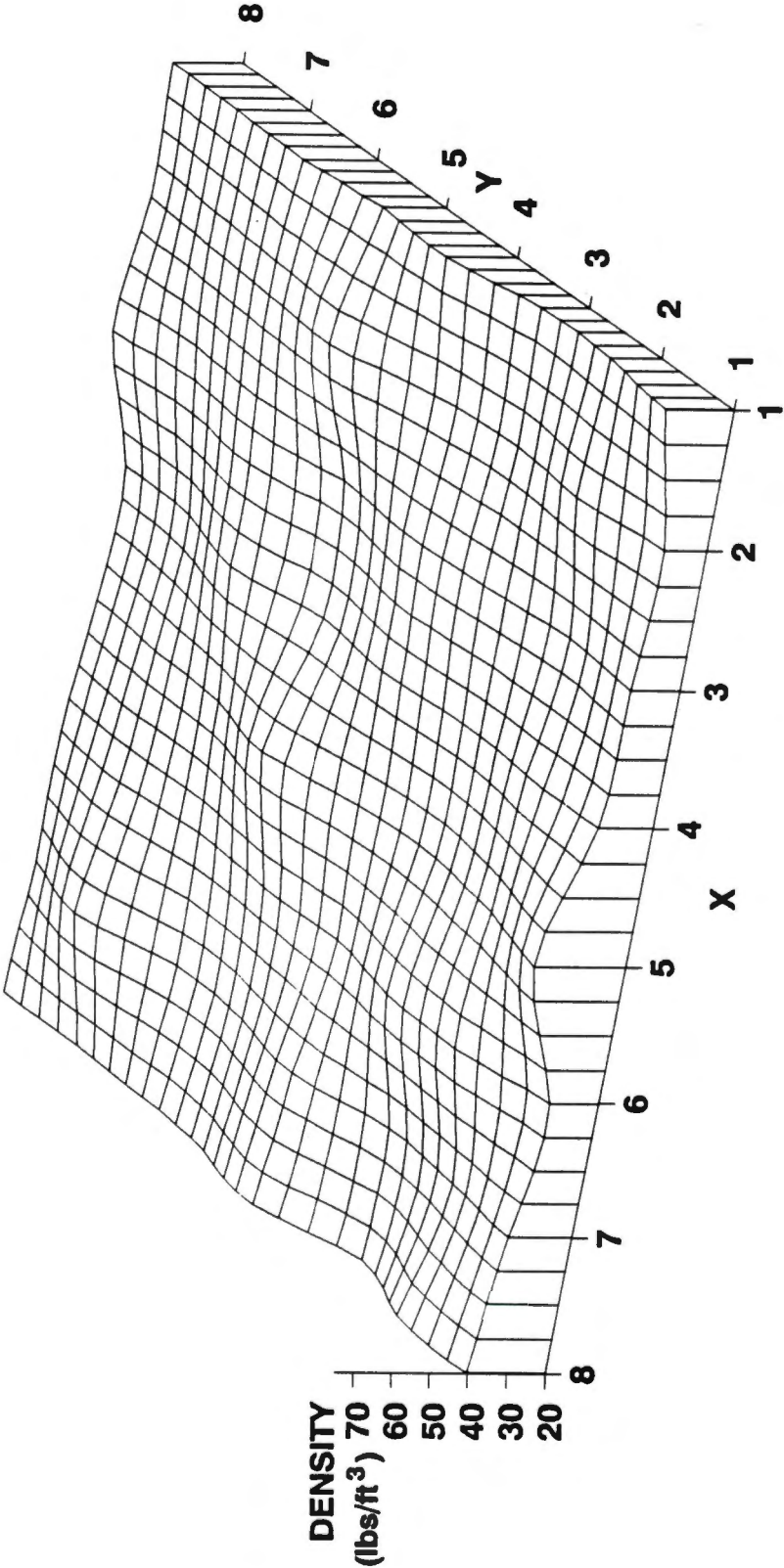
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=7



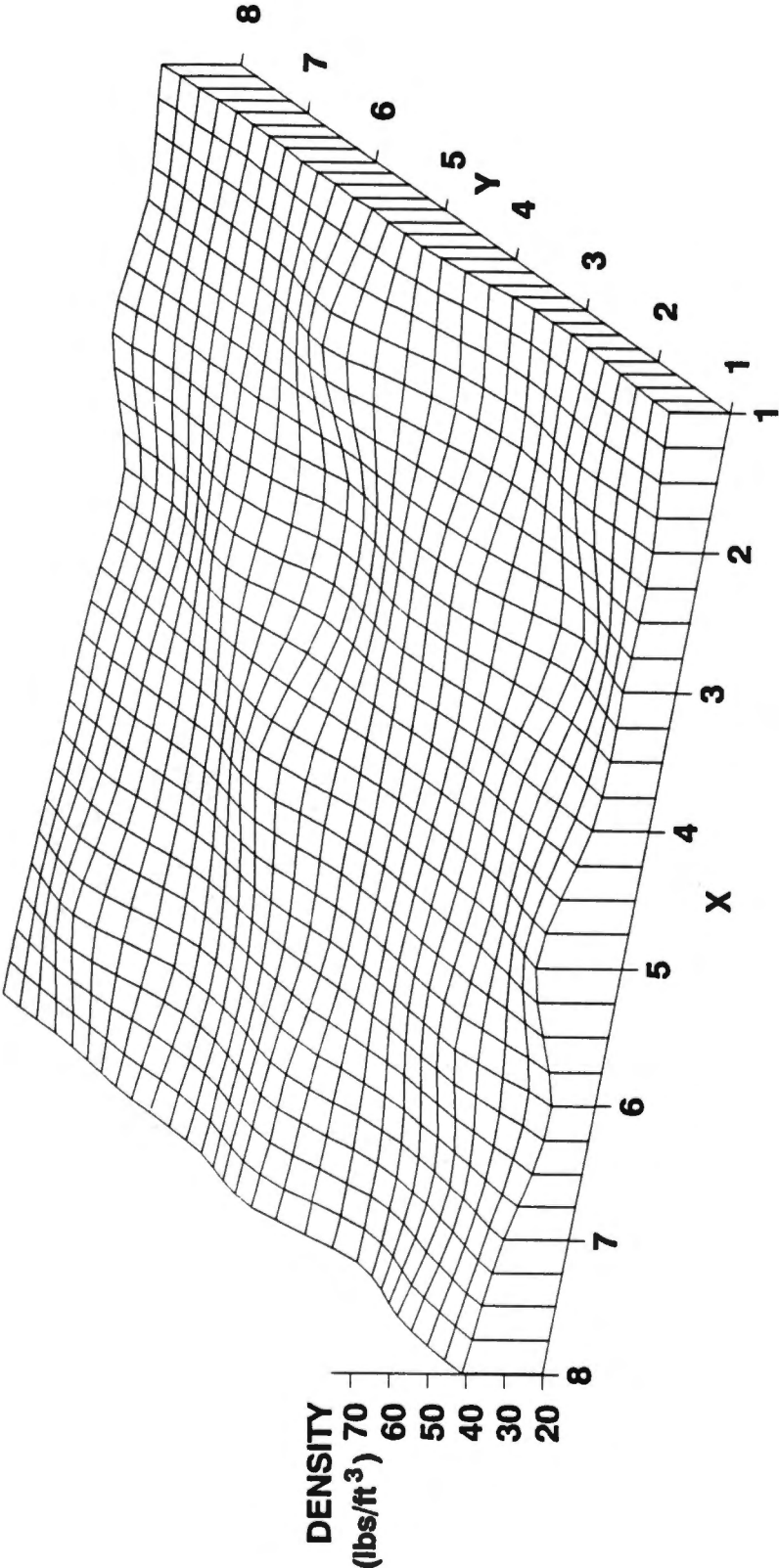
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 8



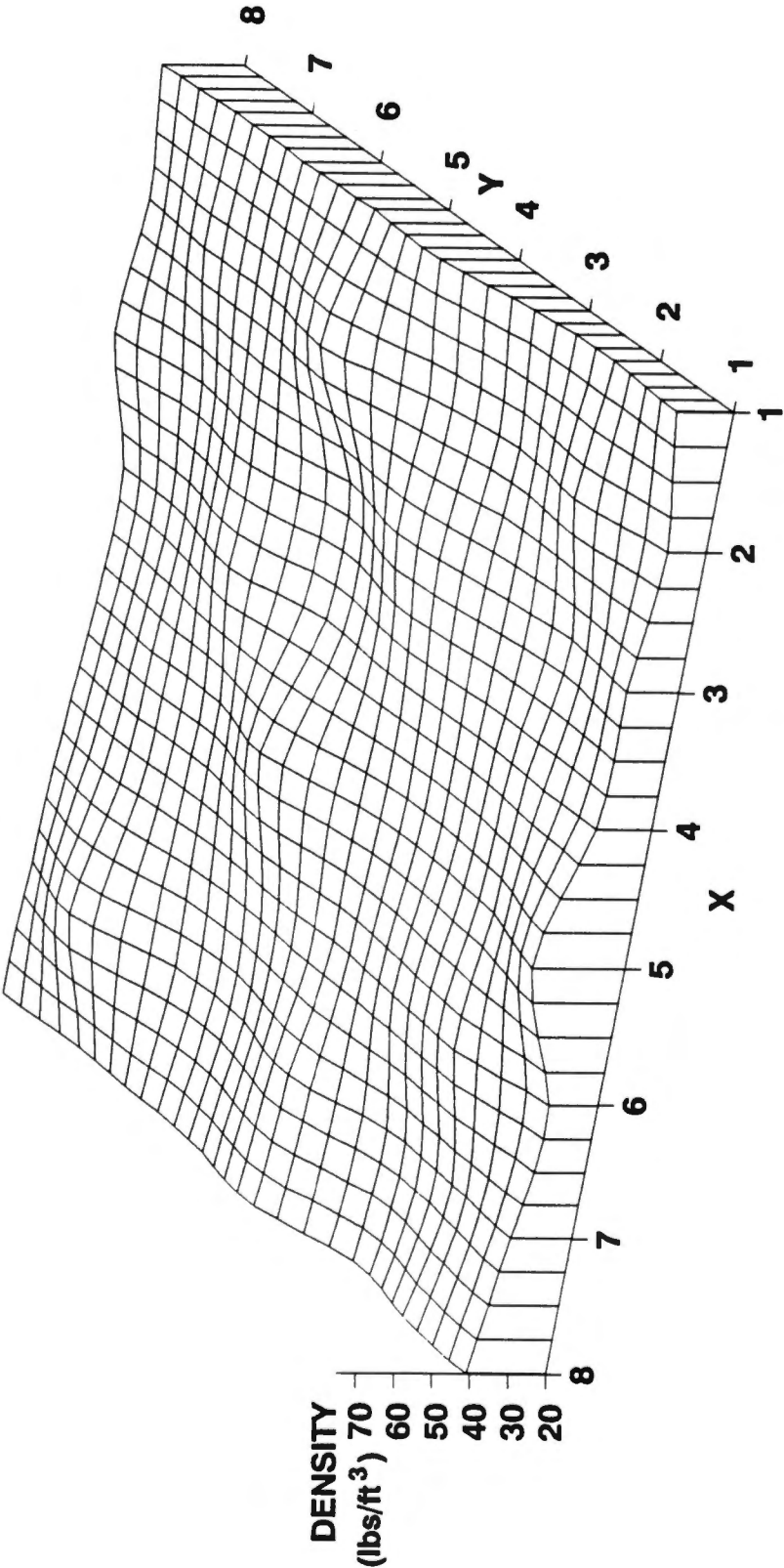
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=9



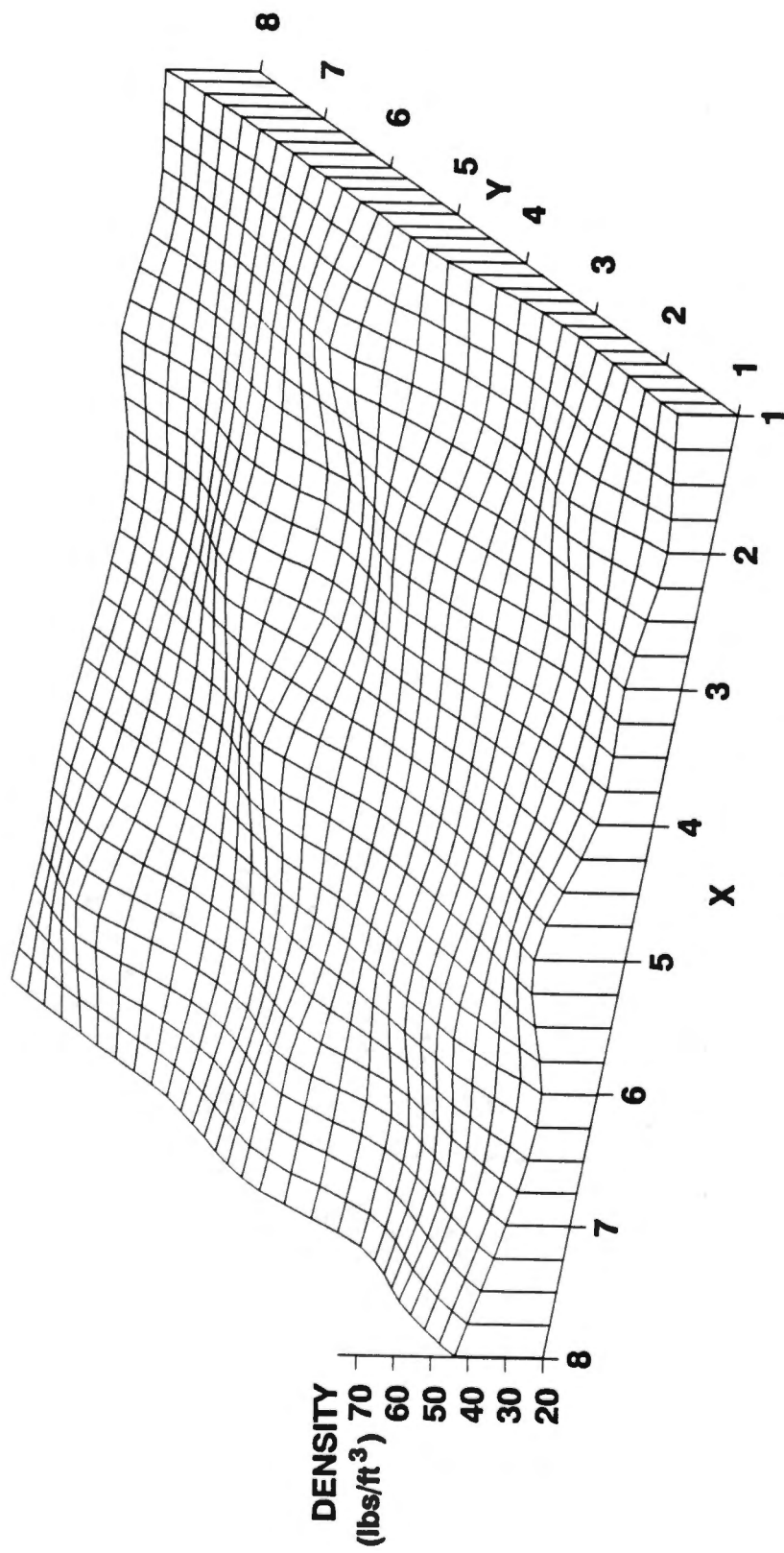
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 10



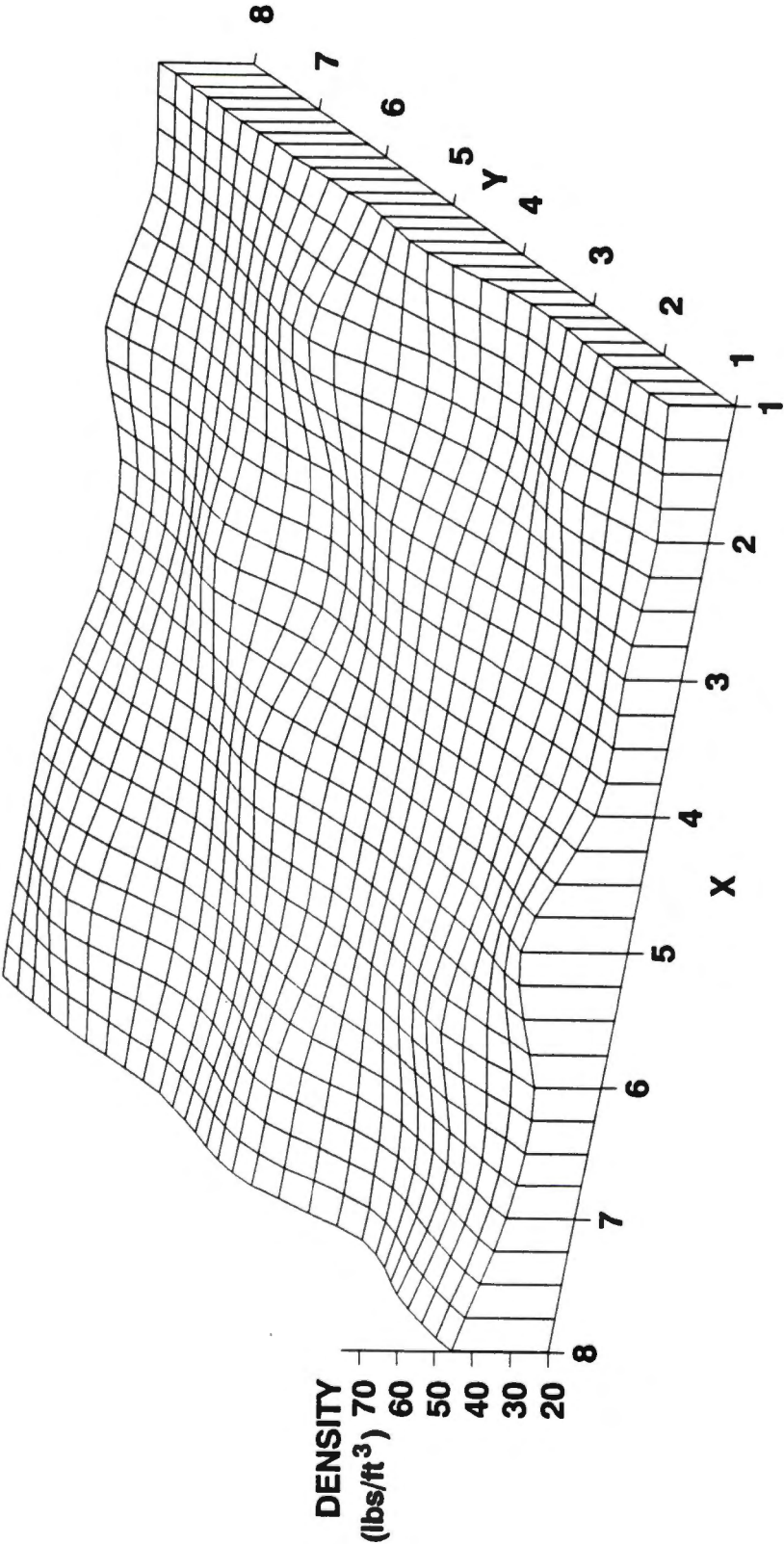
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=11



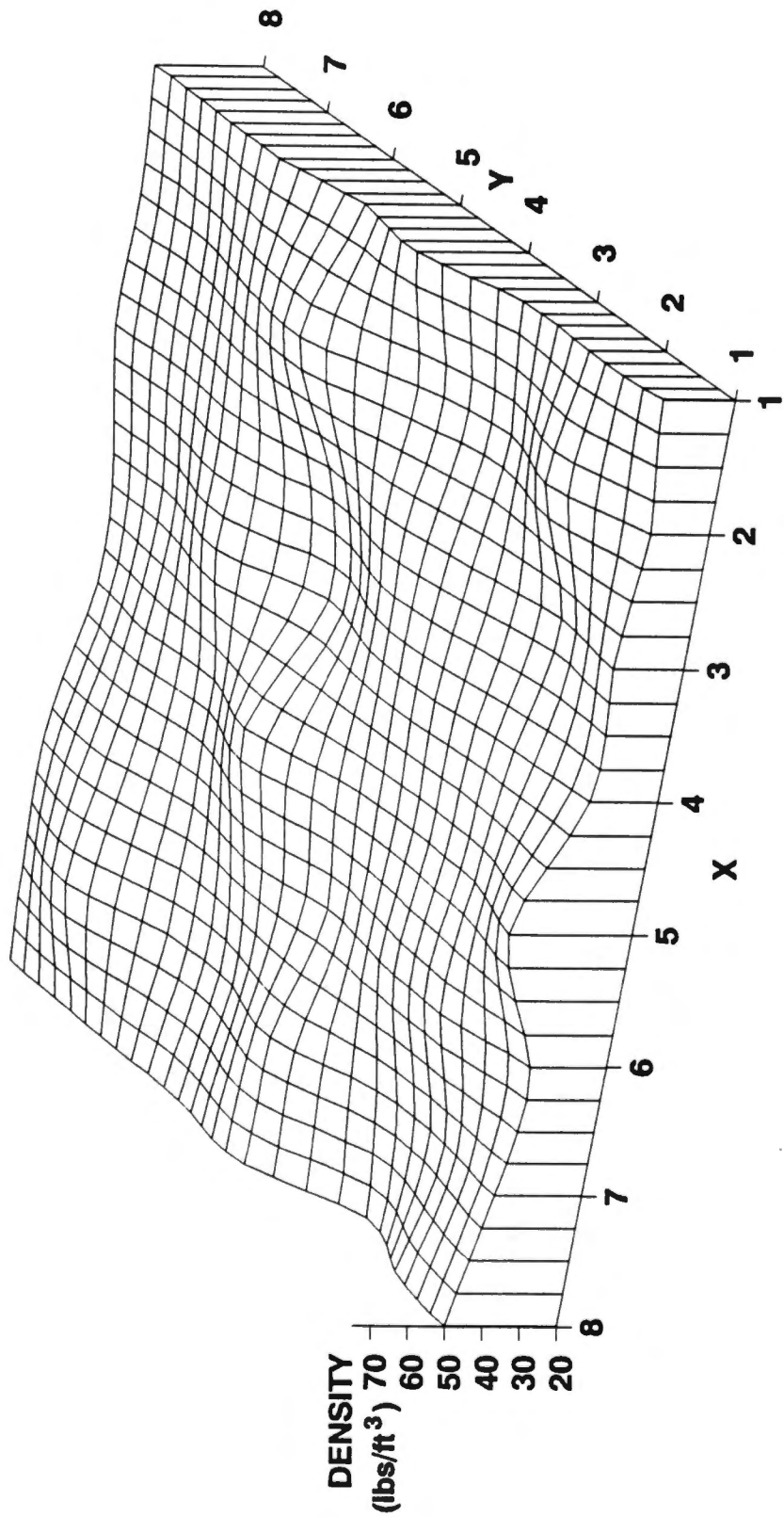
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 12



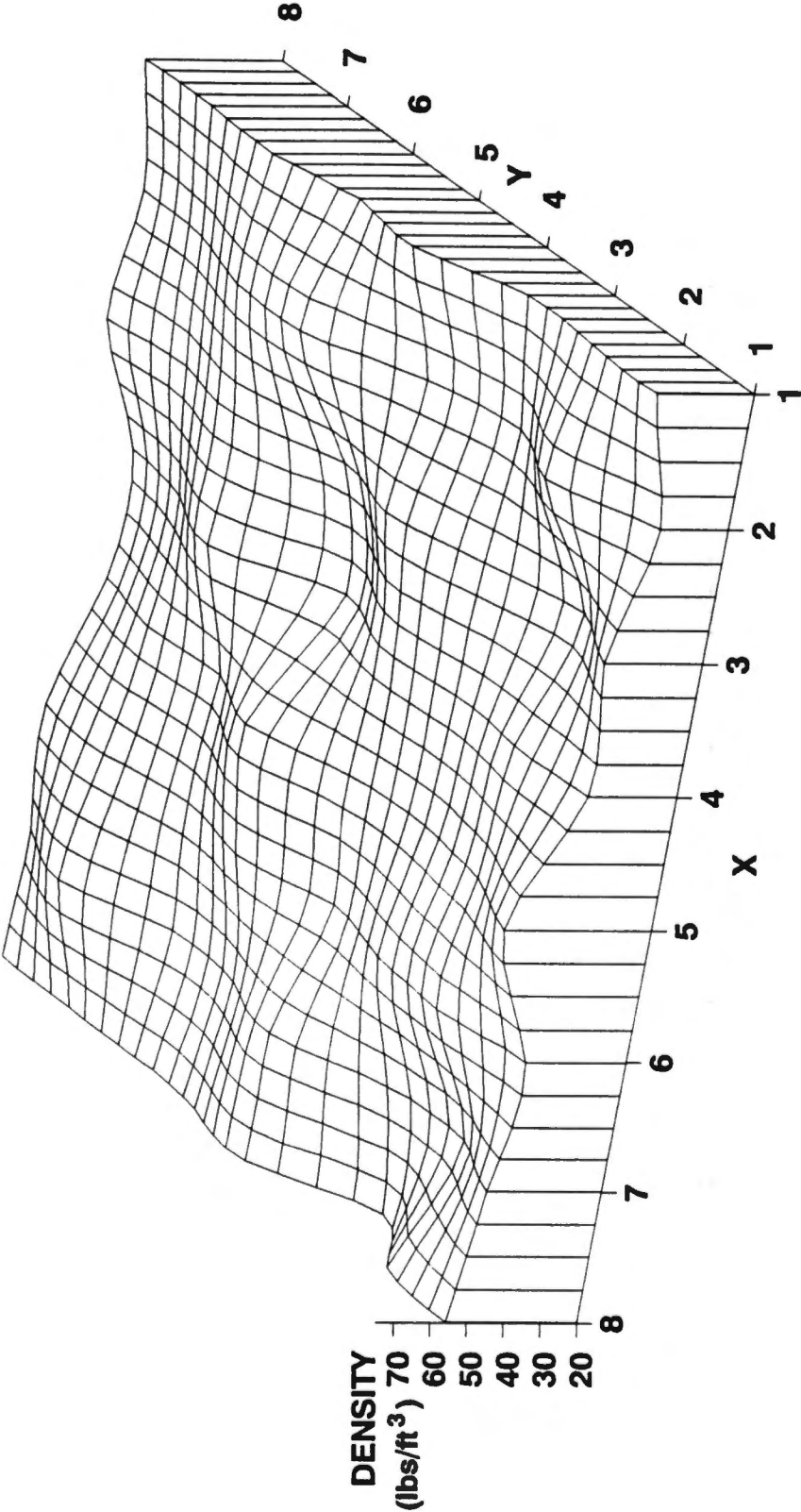
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 13



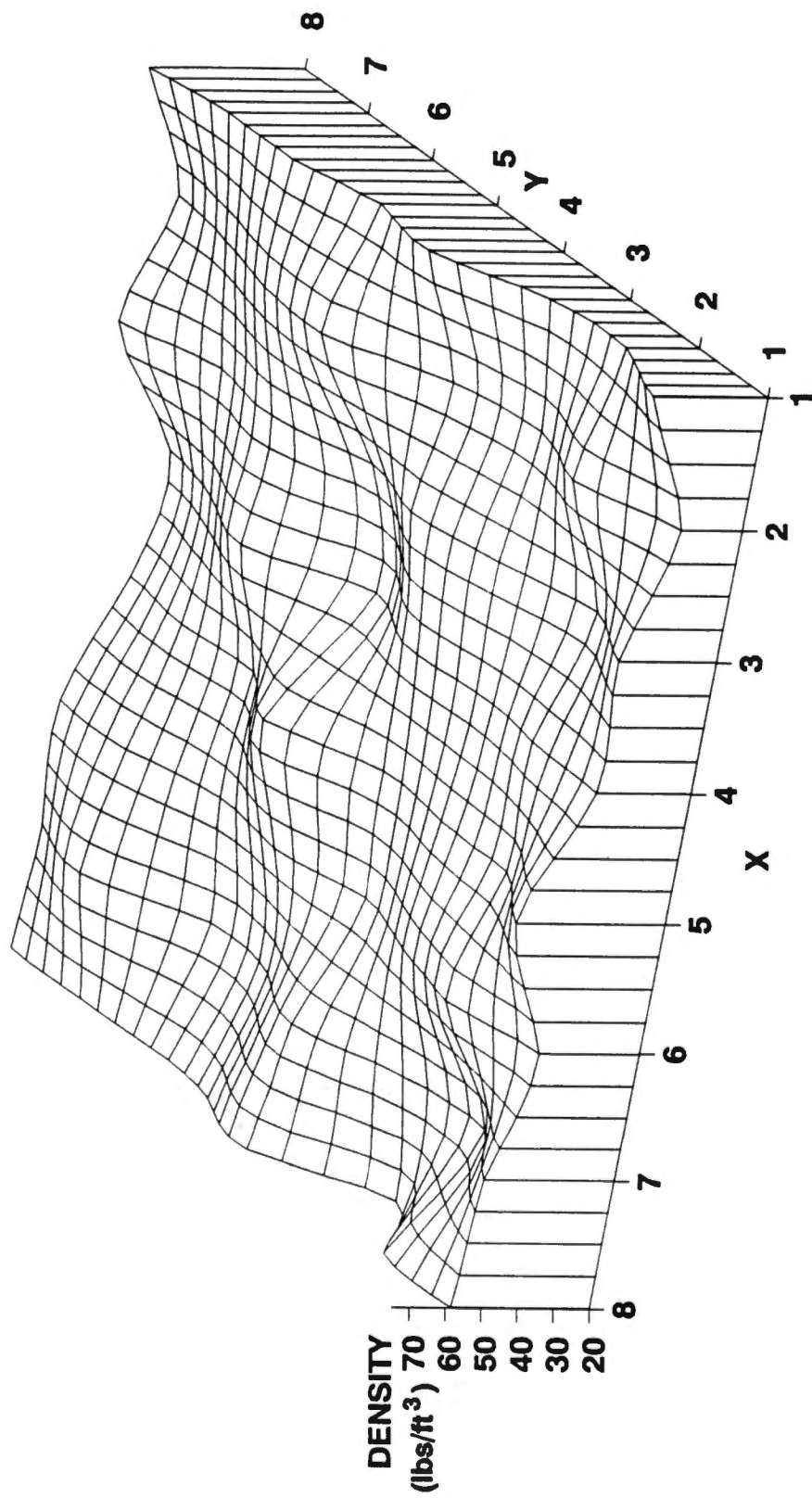
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 14



FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=15



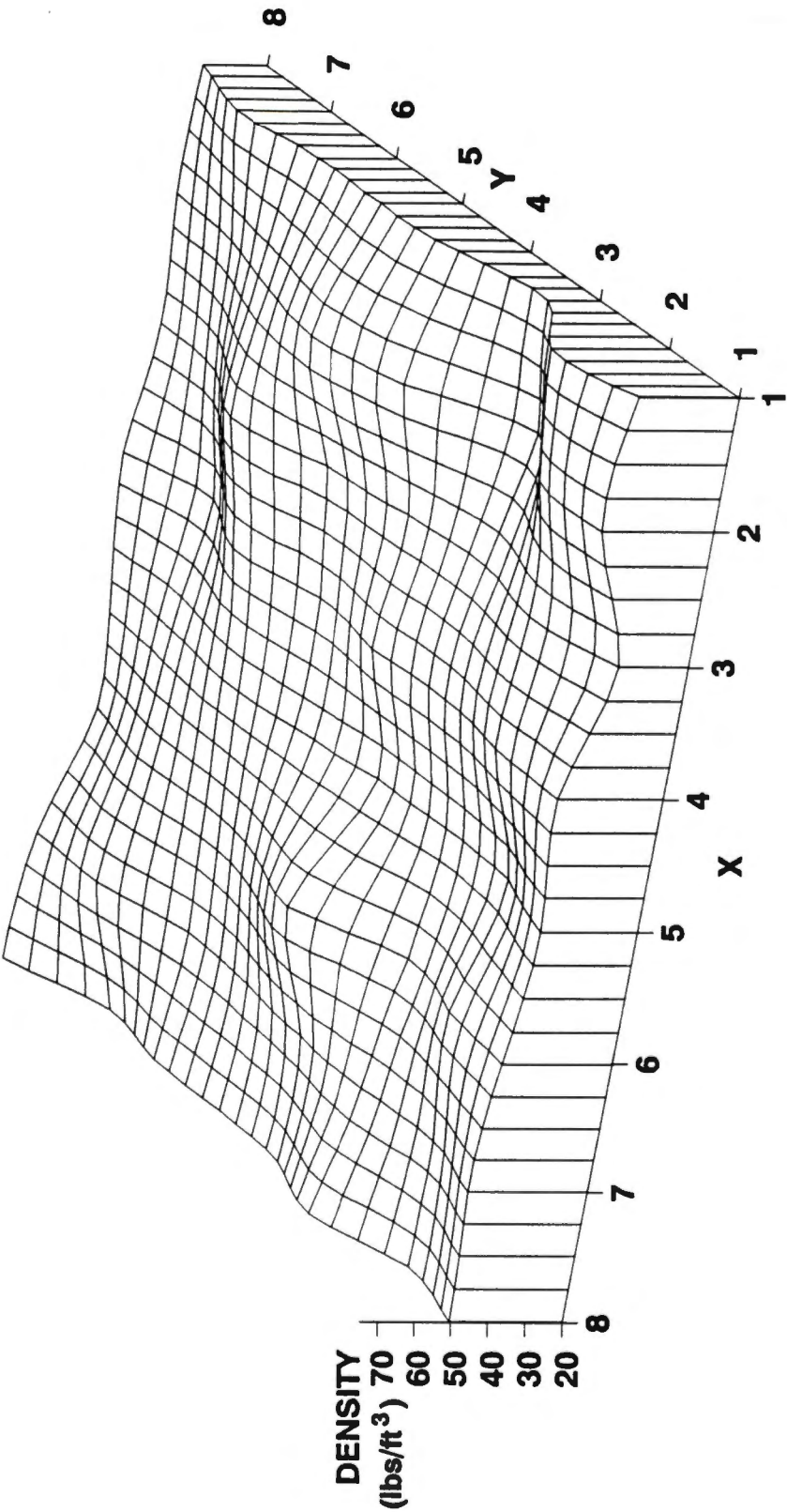
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 16



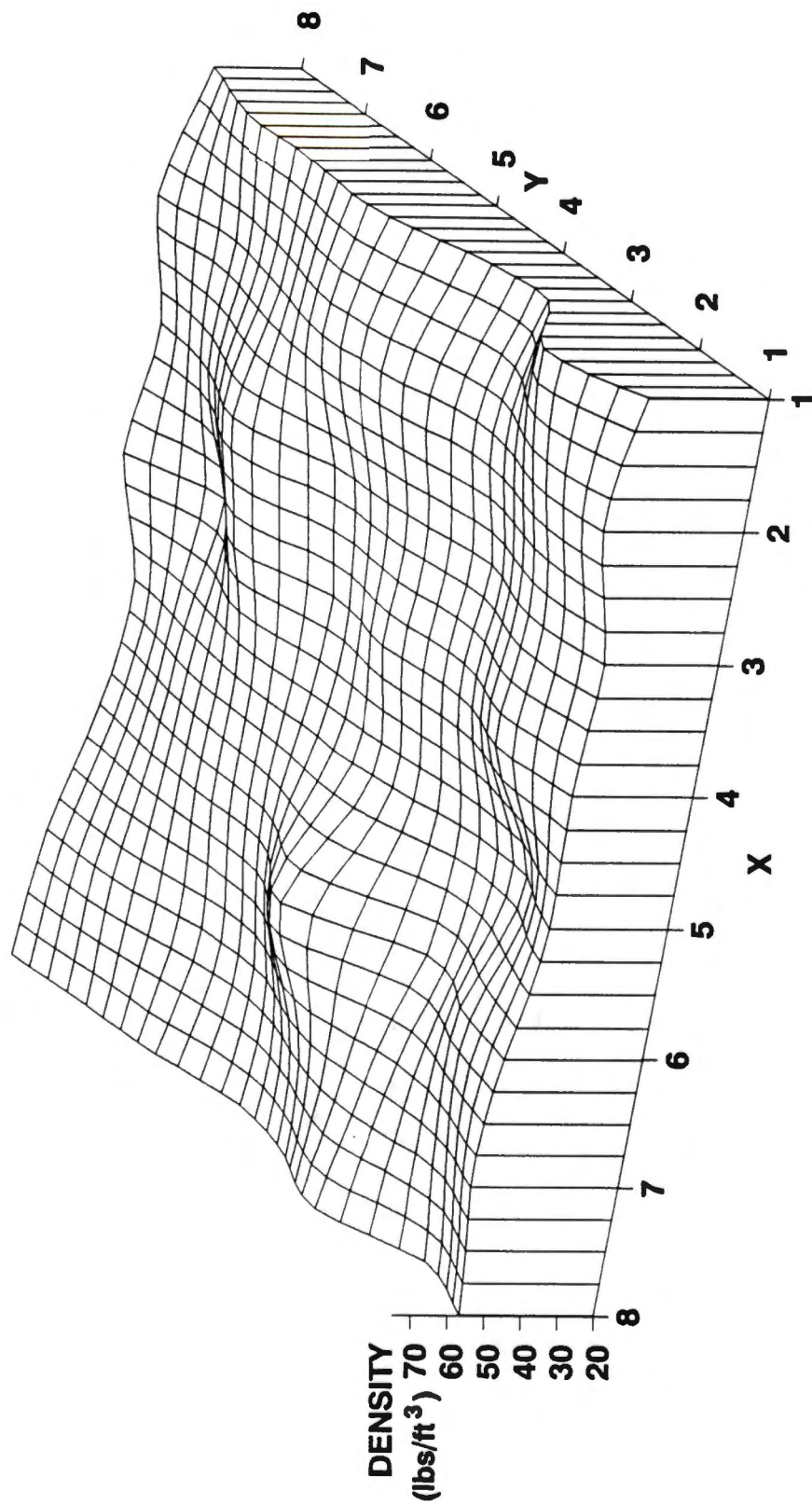
FLAKE MOISTURE CONTENT - 4%

PRESS CLOSURE RATE - 100 SECONDS

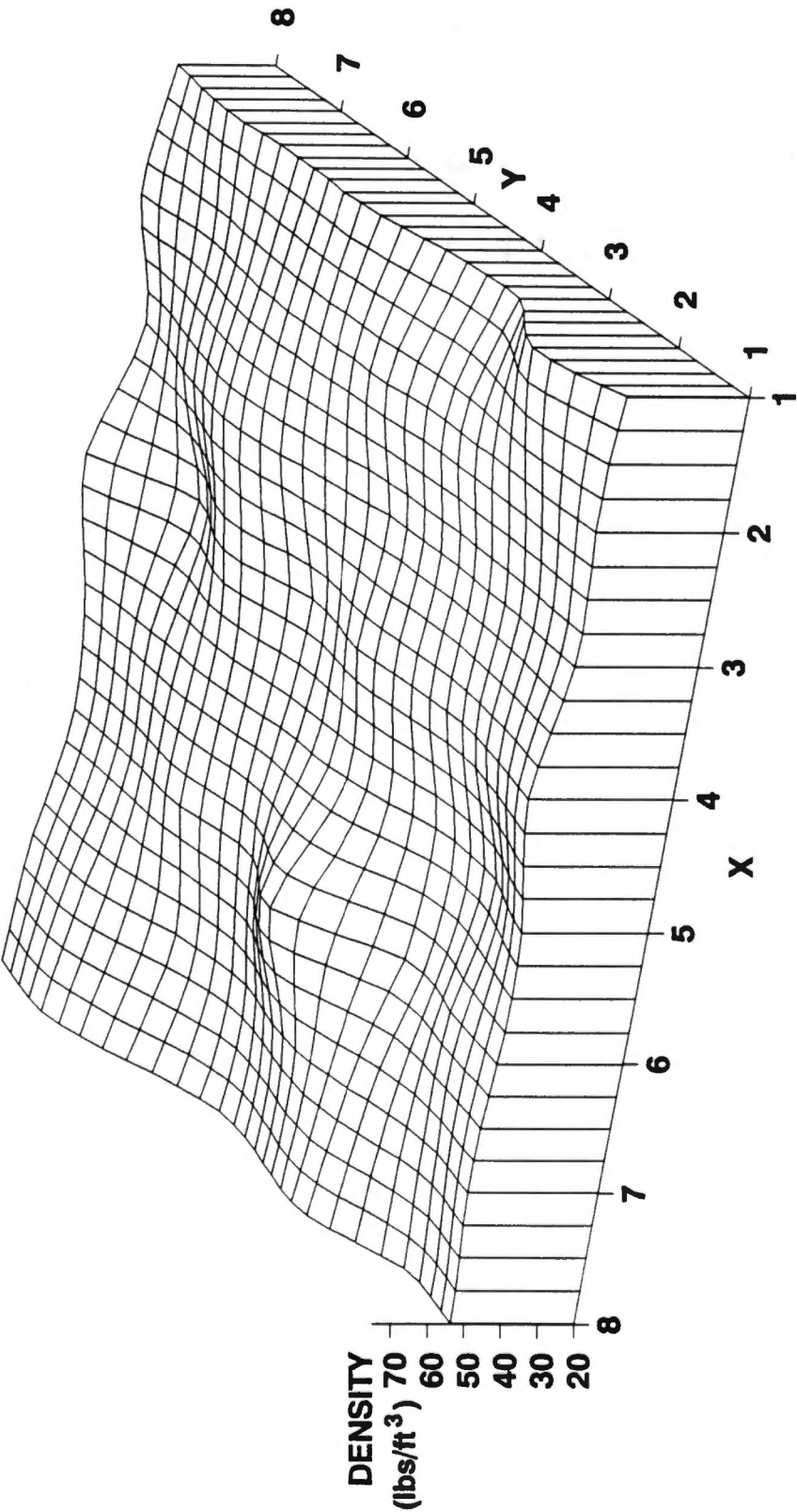
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 1



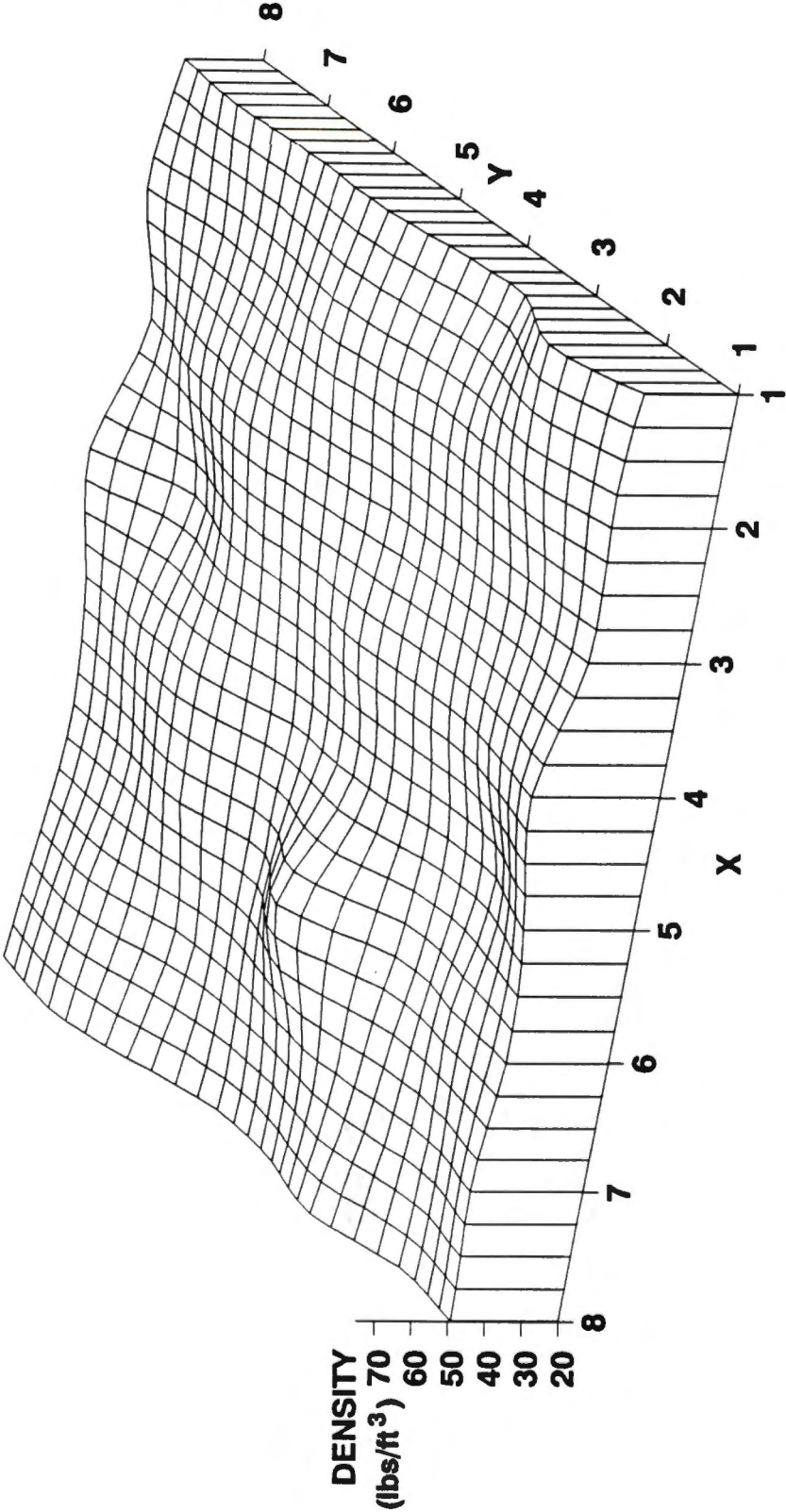
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 2



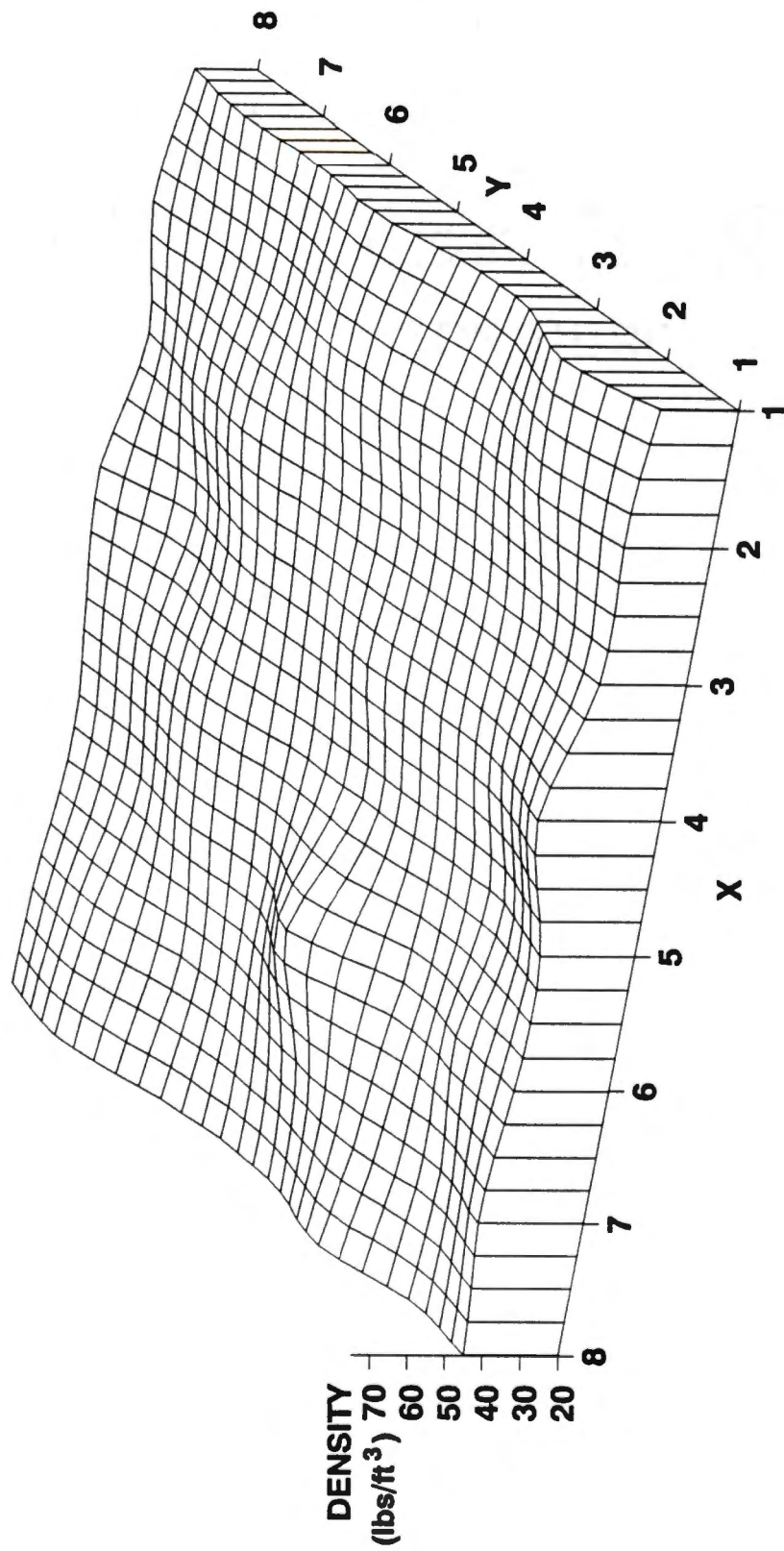
FLAKE MOISTURE CONTENT =4%, PRESS CLOSURE RATE =100 SECONDS
REPLICATION =1
Z=3



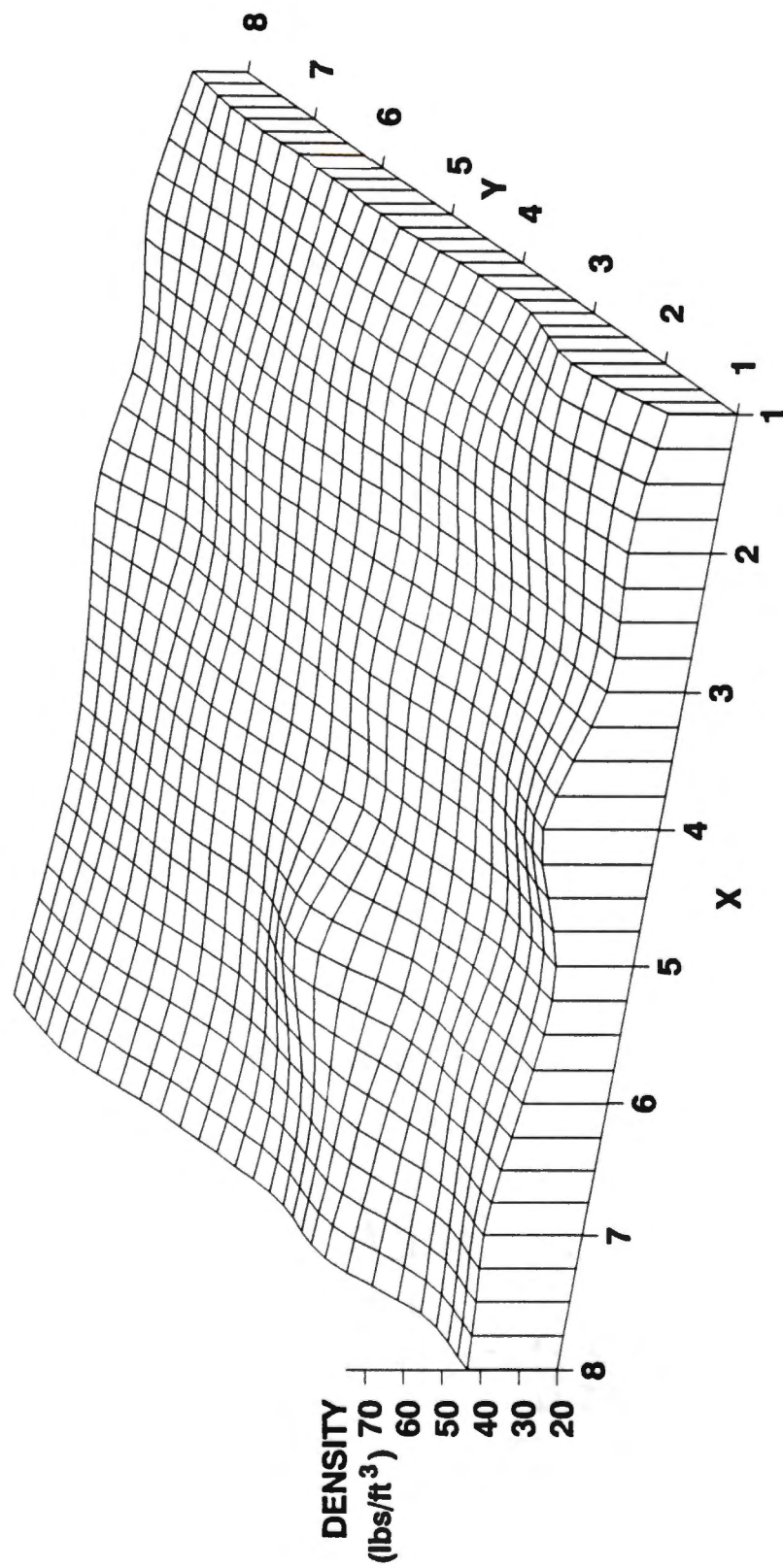
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 4



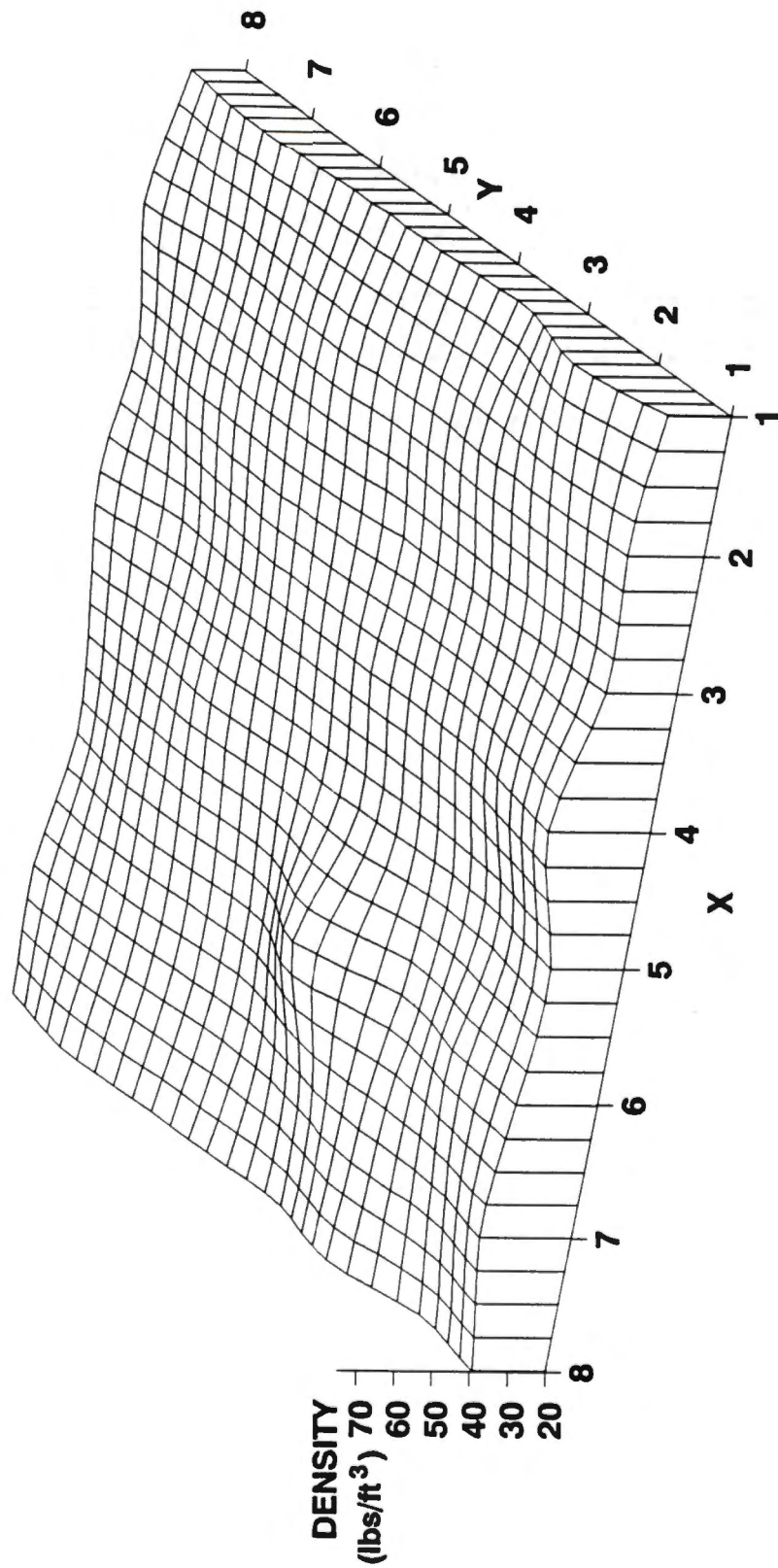
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=5



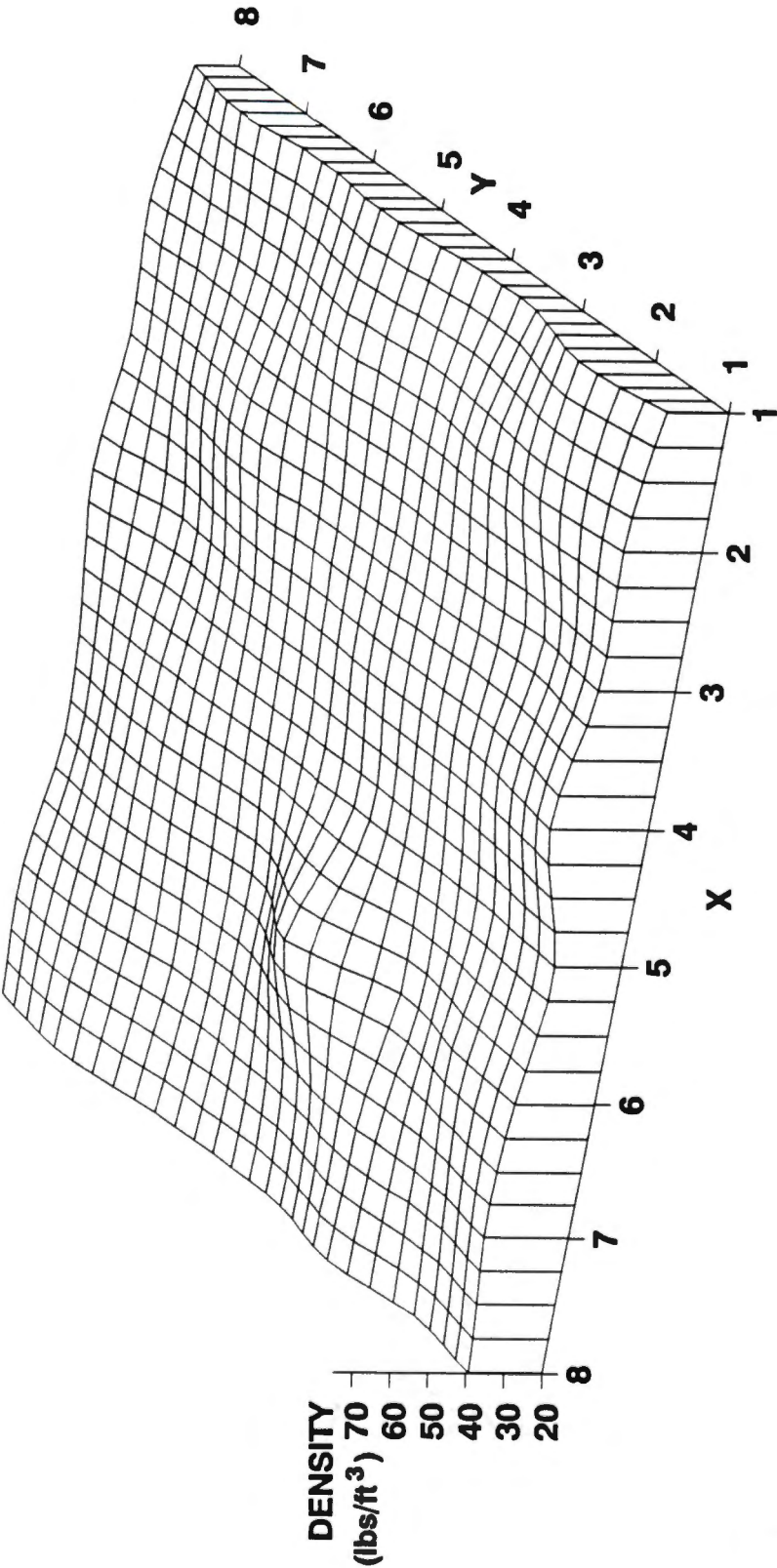
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=6



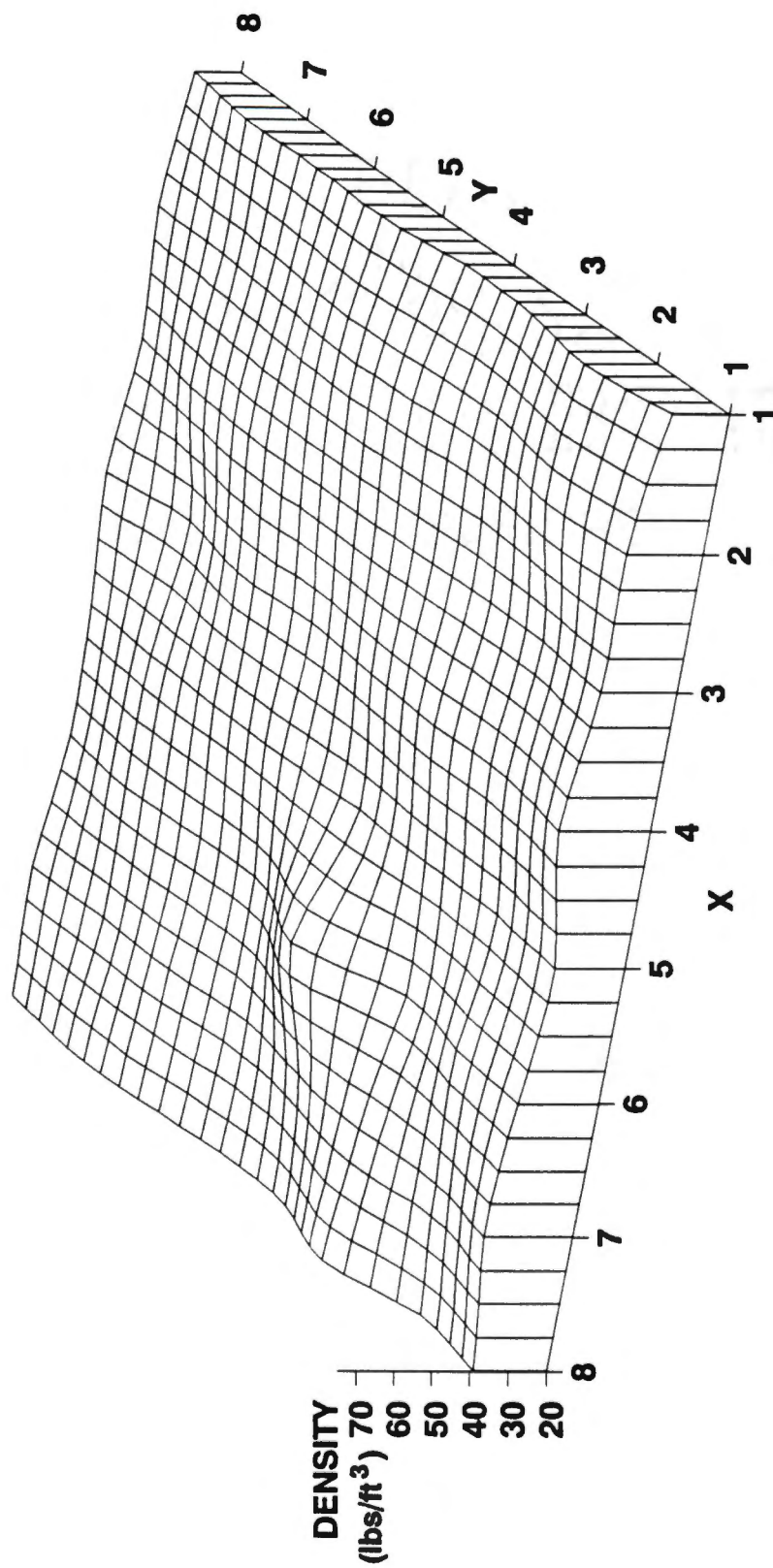
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 7



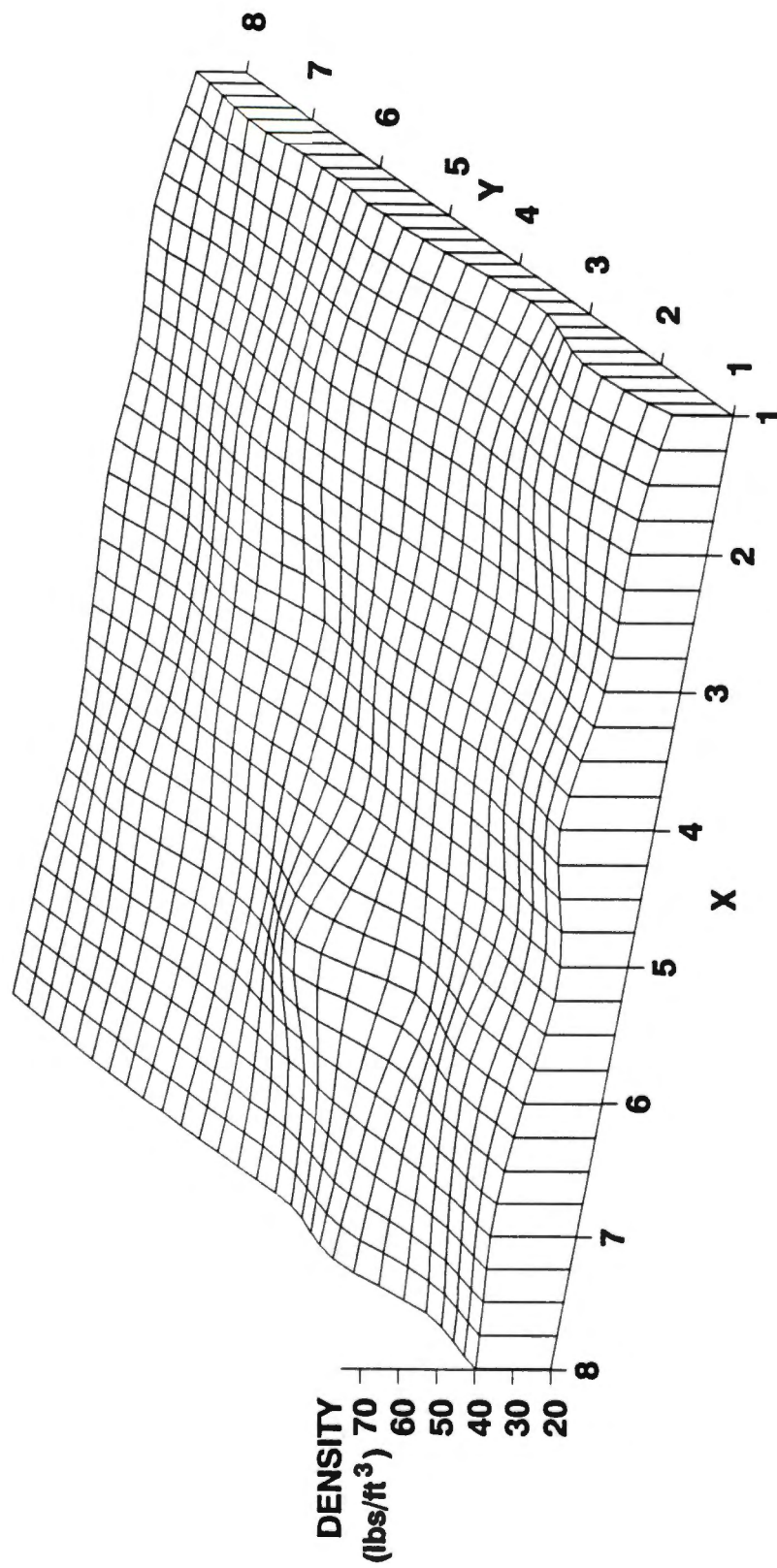
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=8



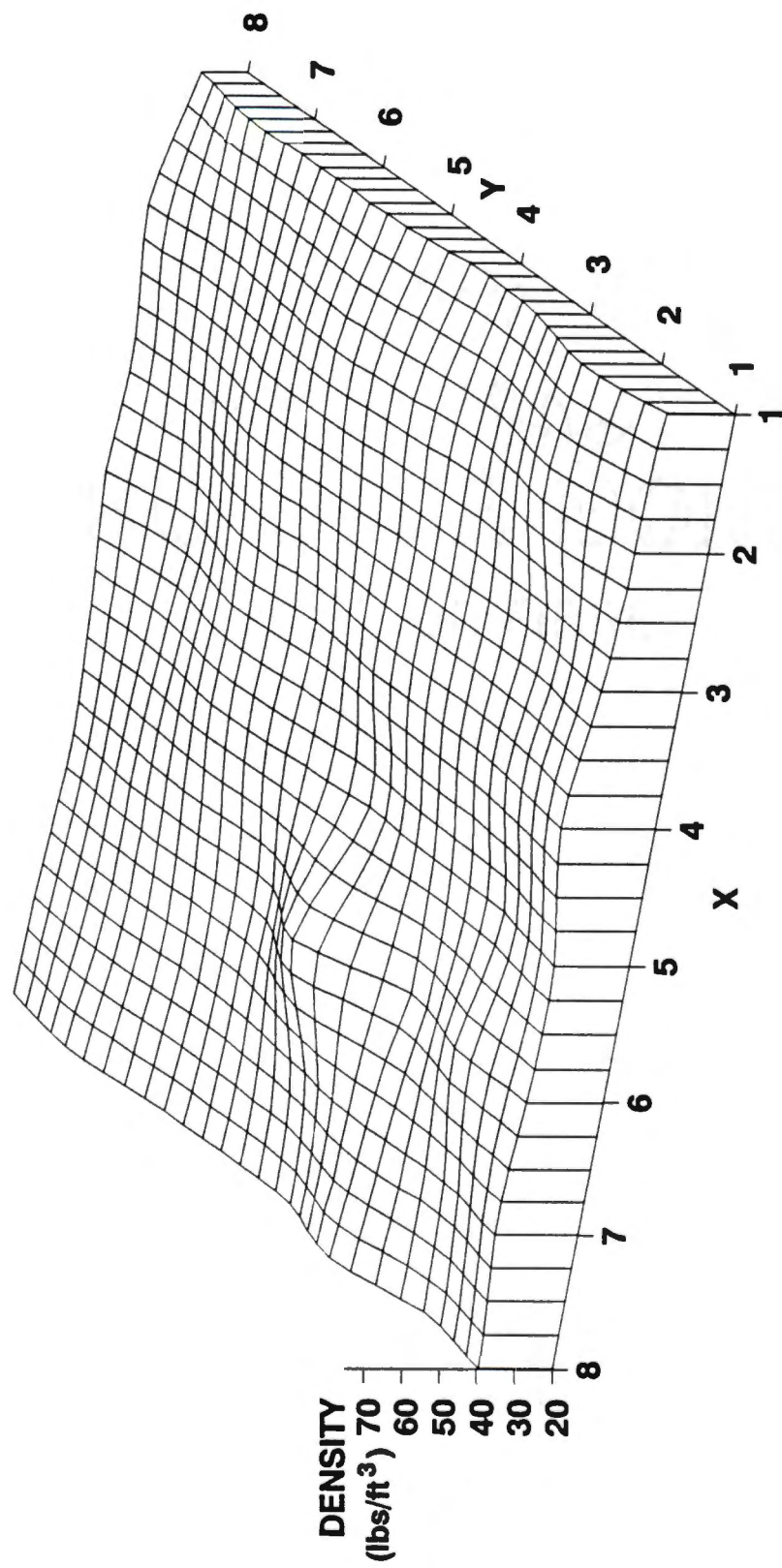
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=9



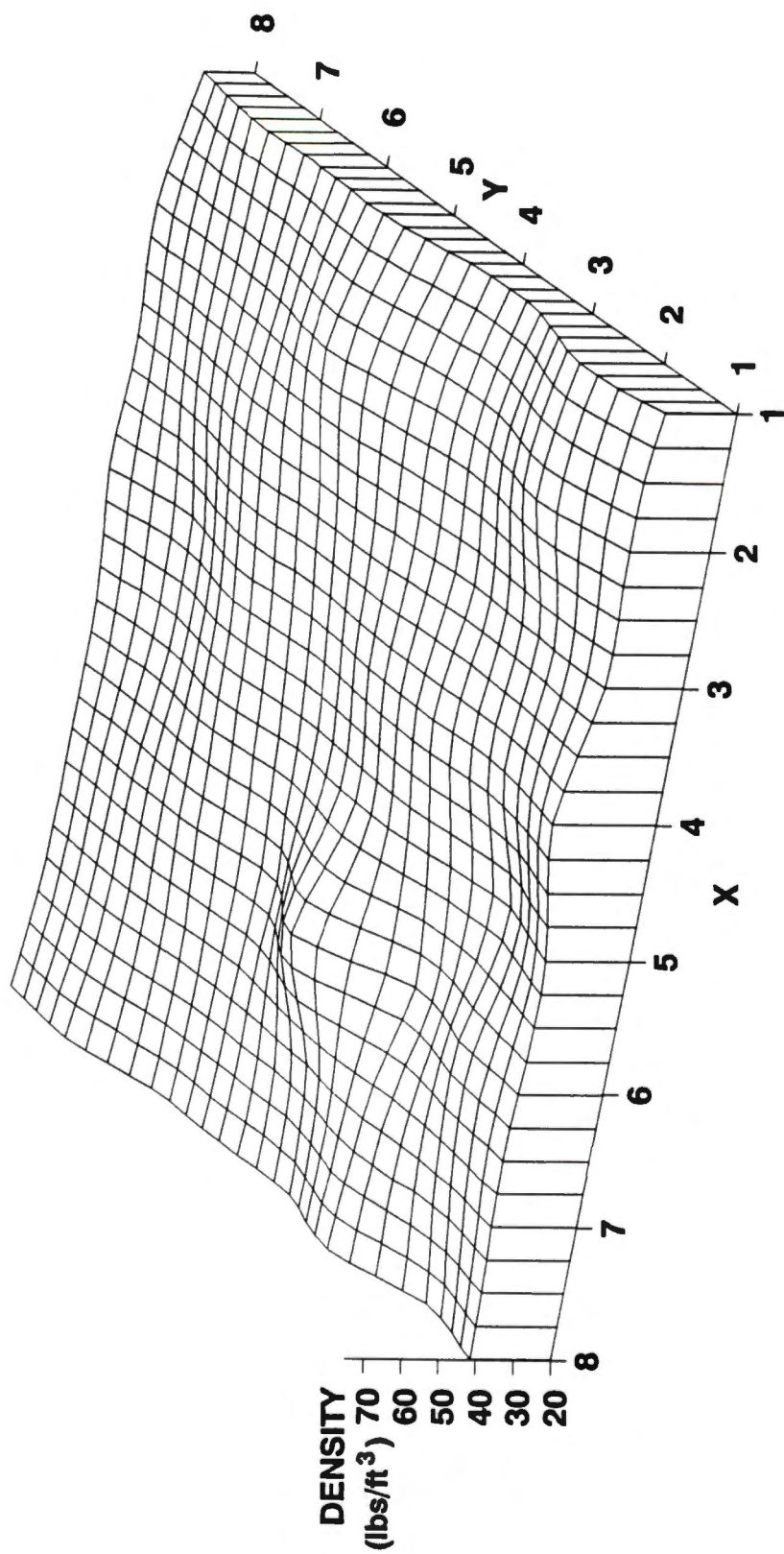
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 10



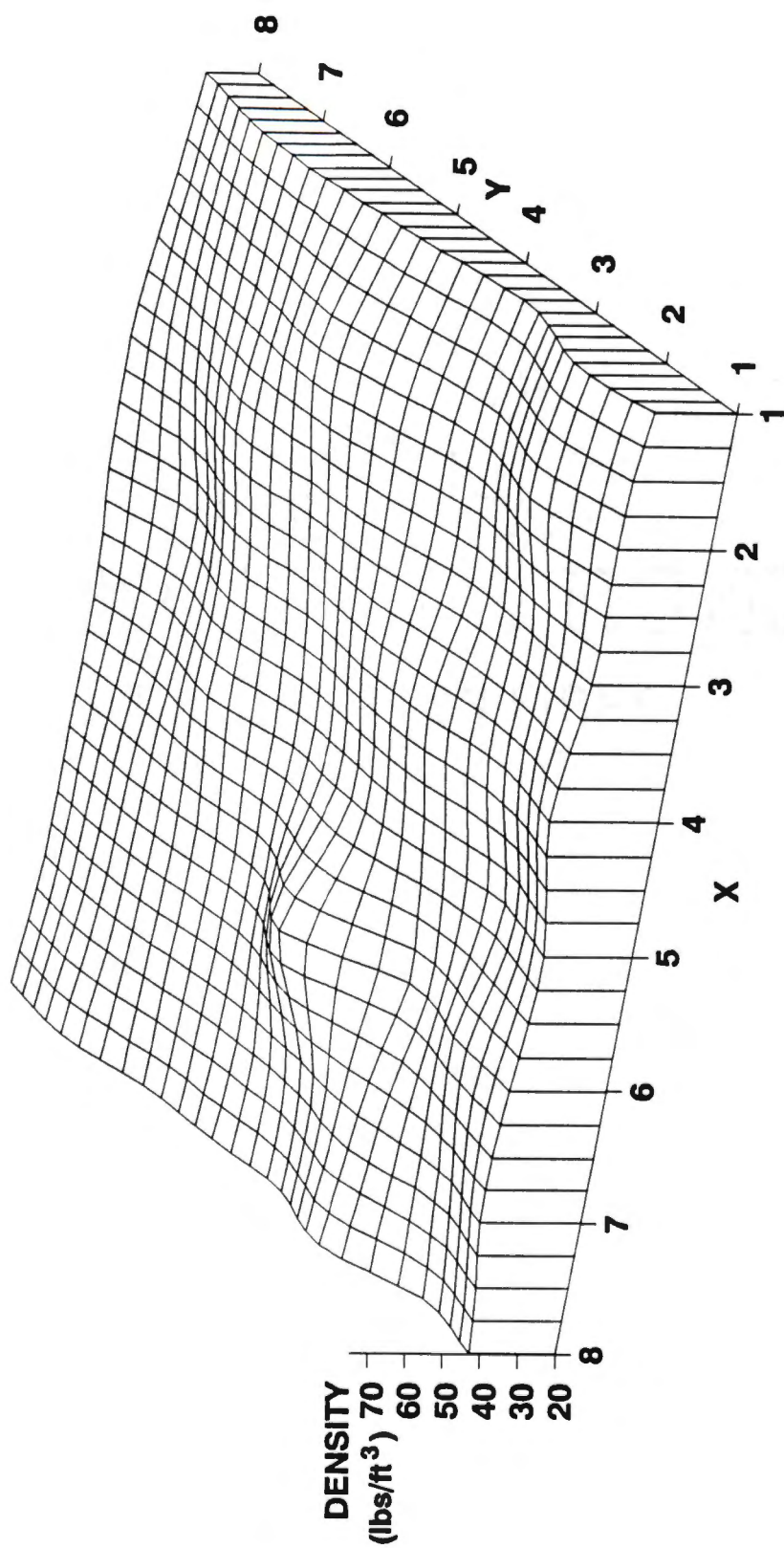
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=11



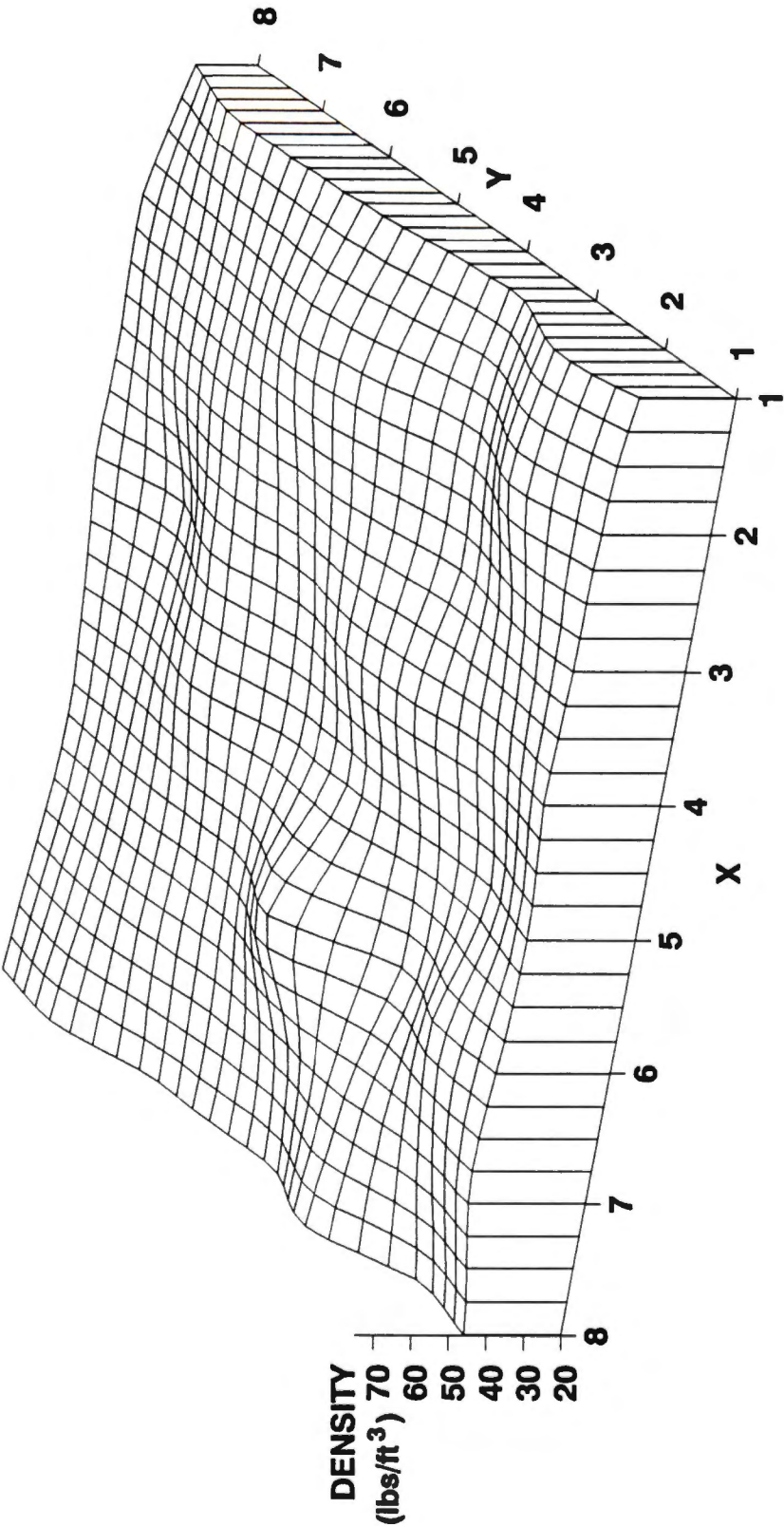
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=12



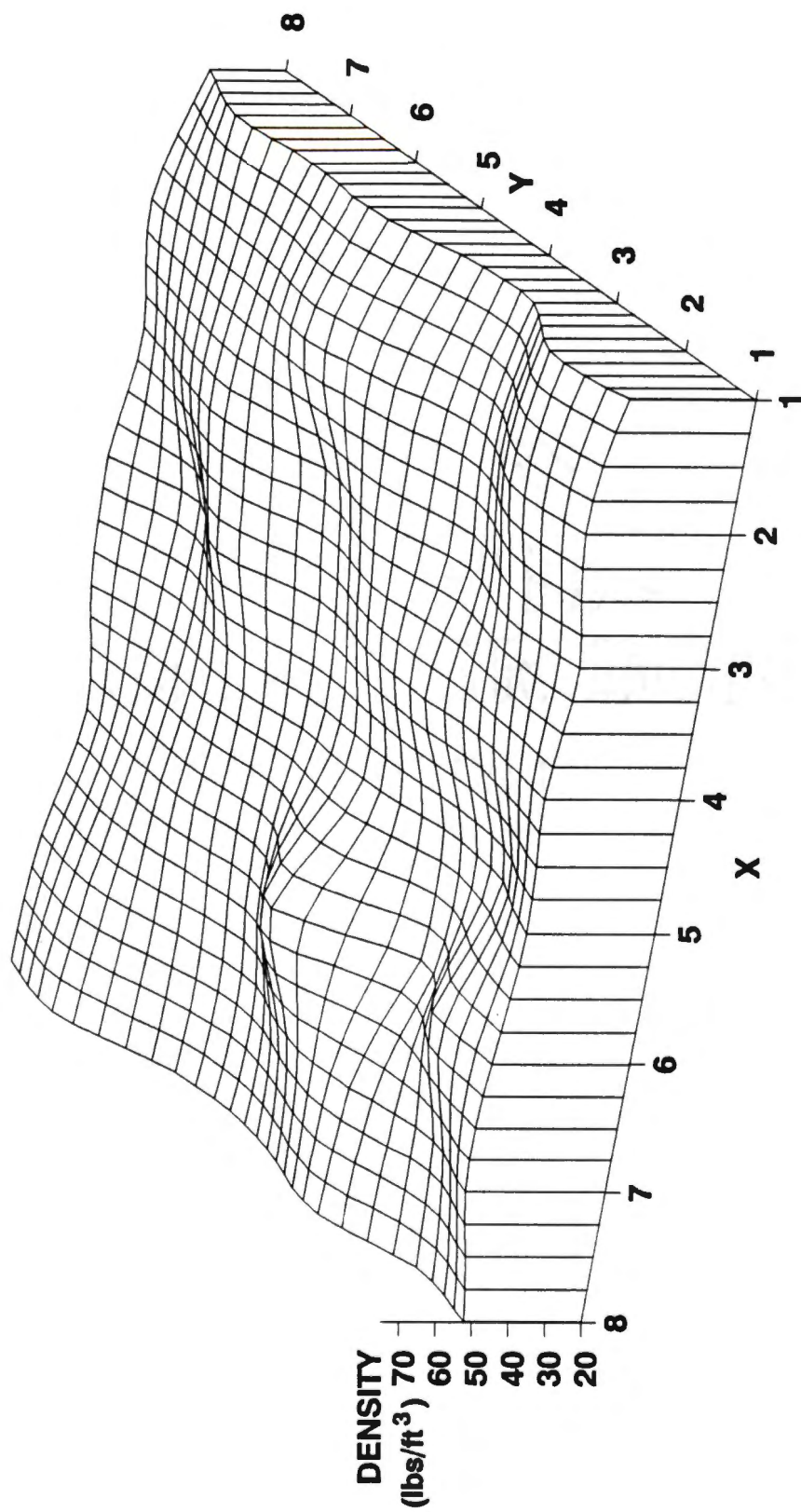
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 13



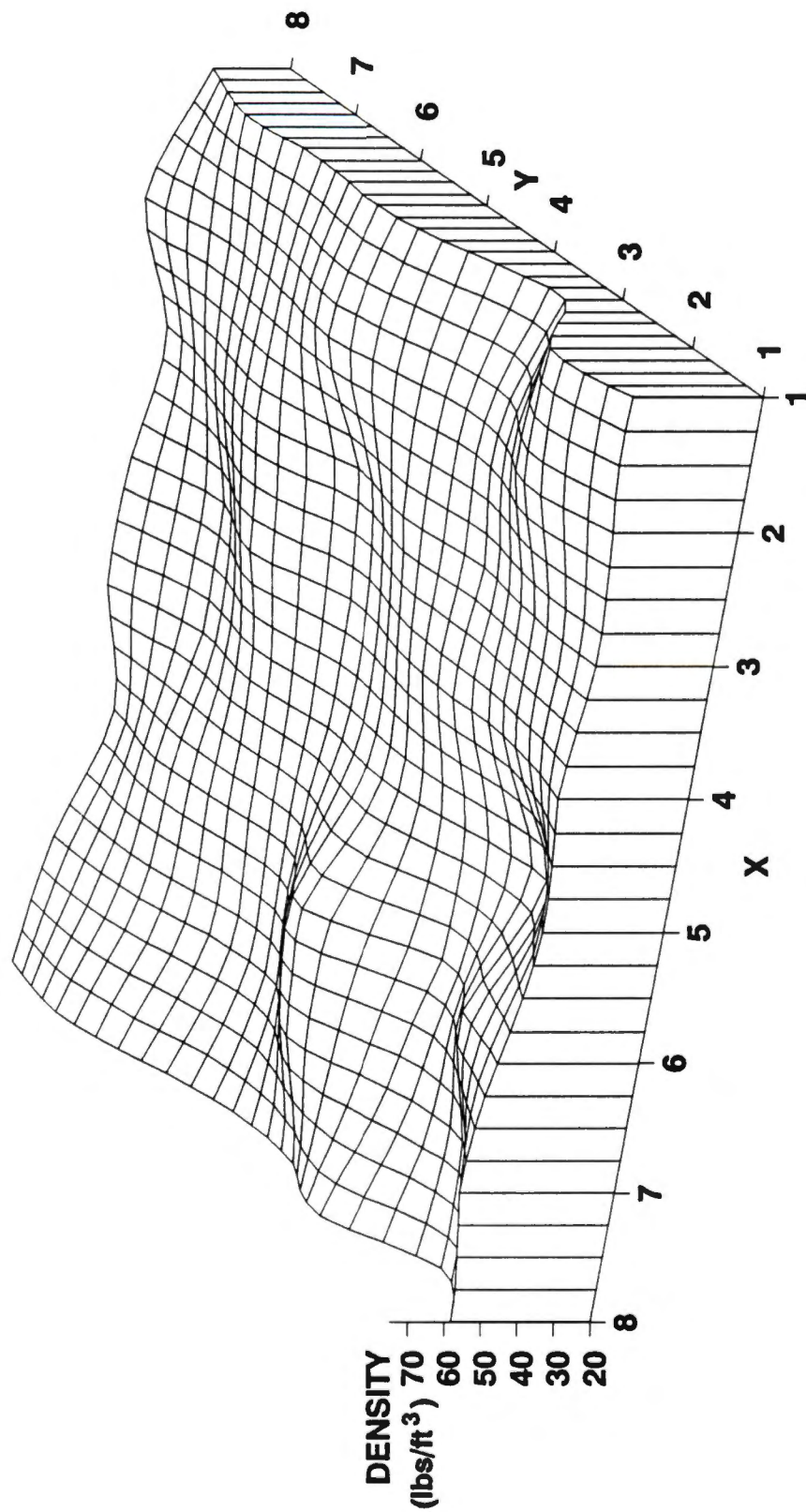
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 14



FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 15



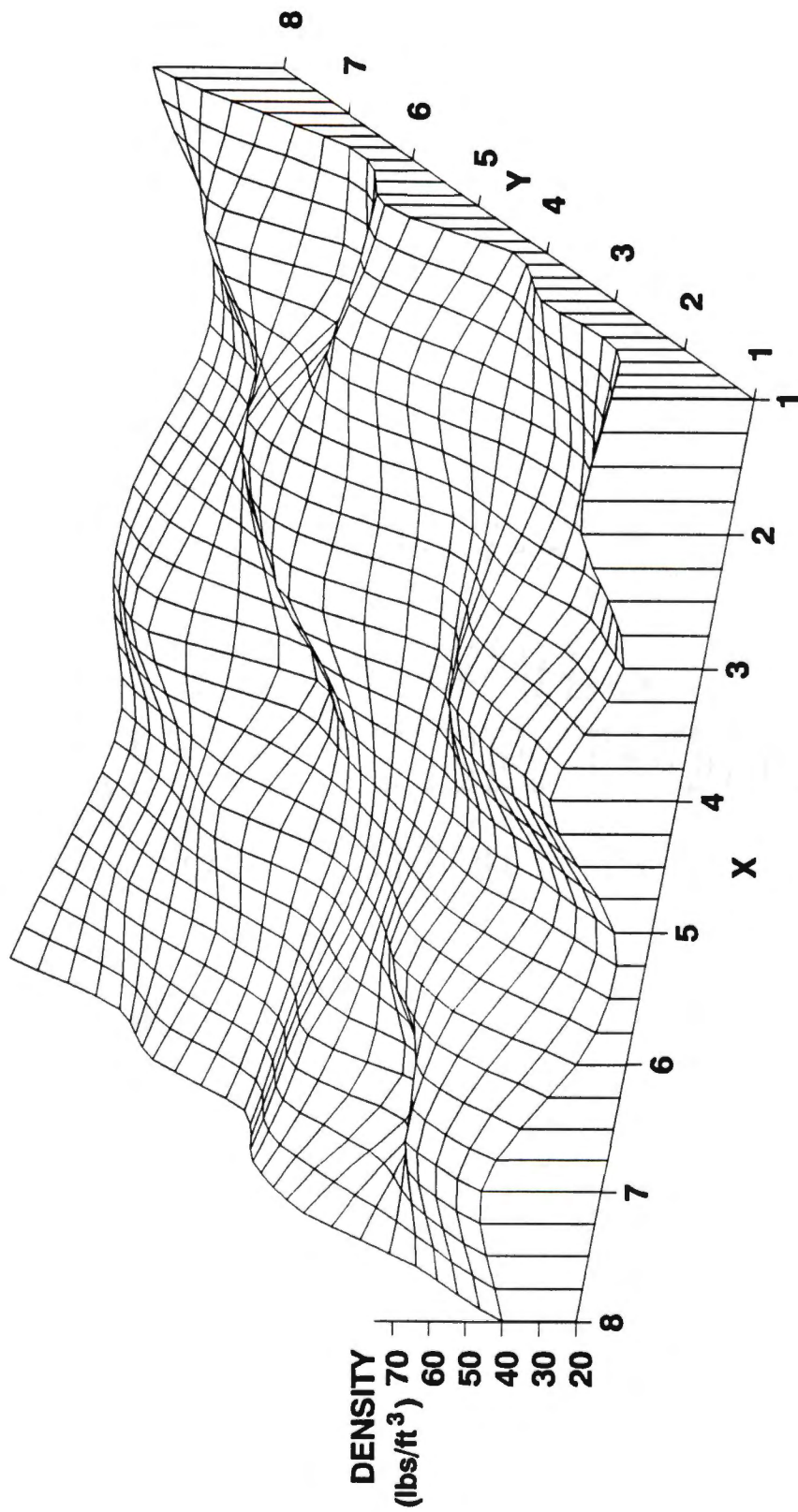
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=16



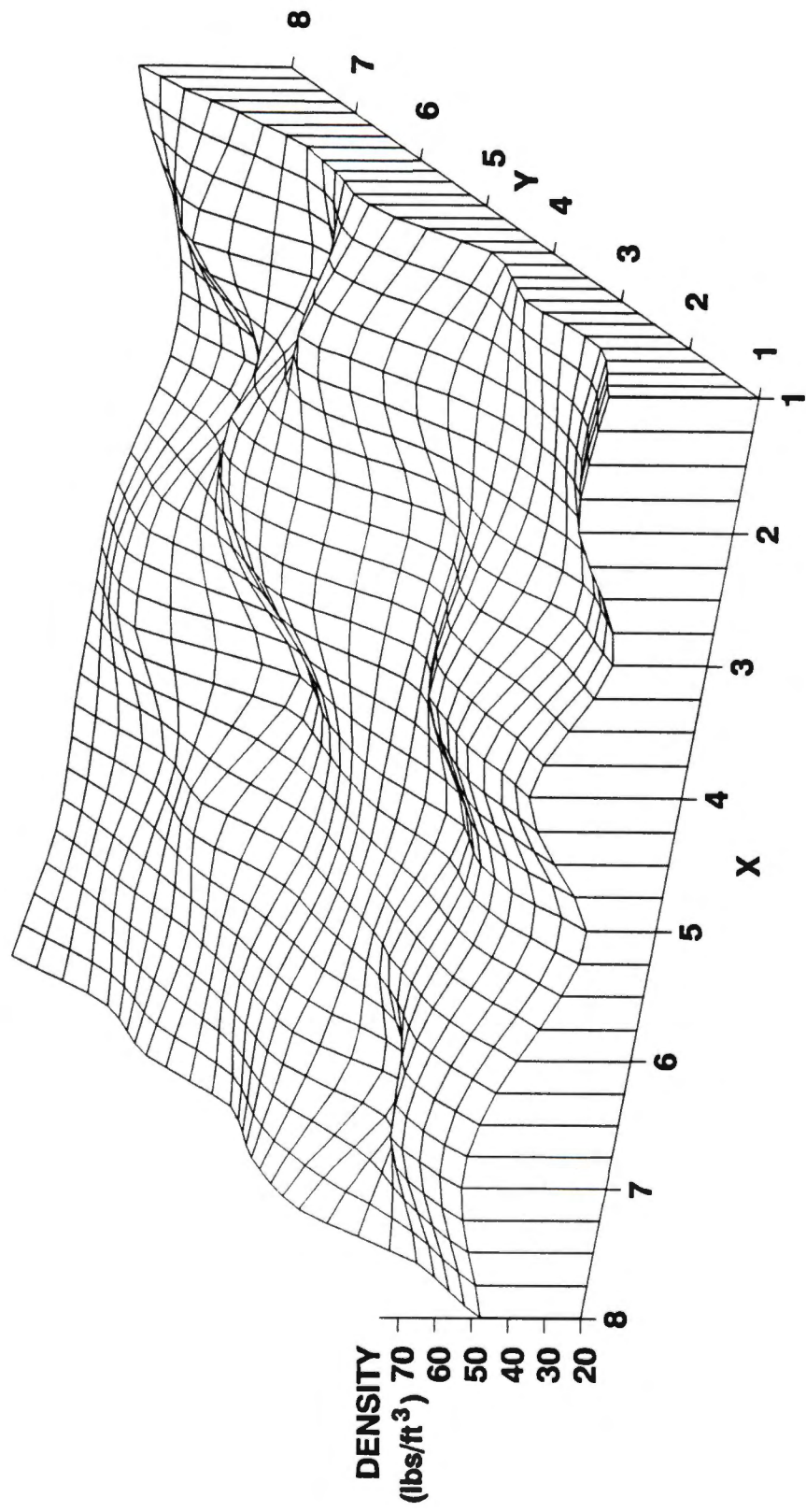
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 2

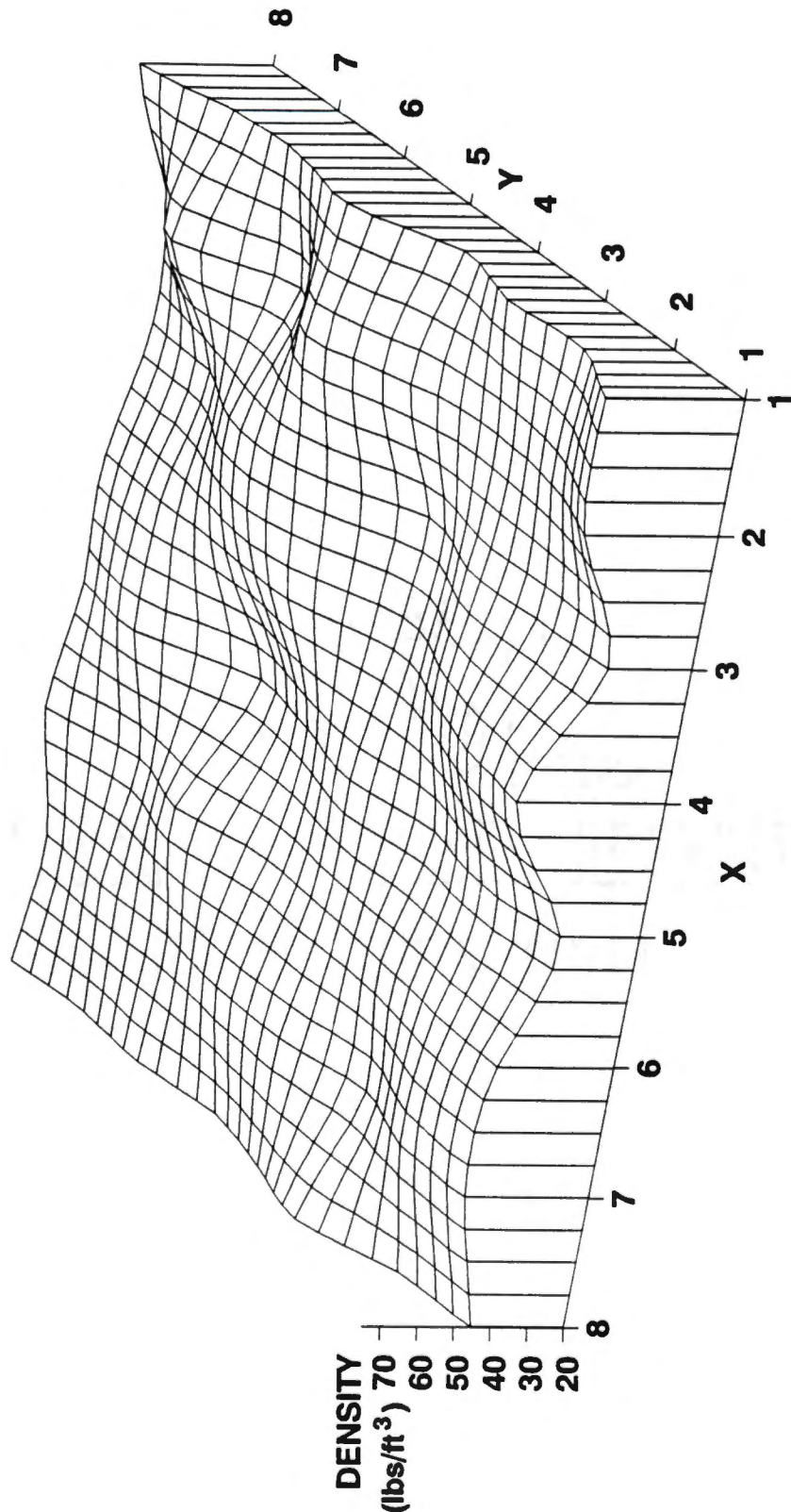
Z = 1



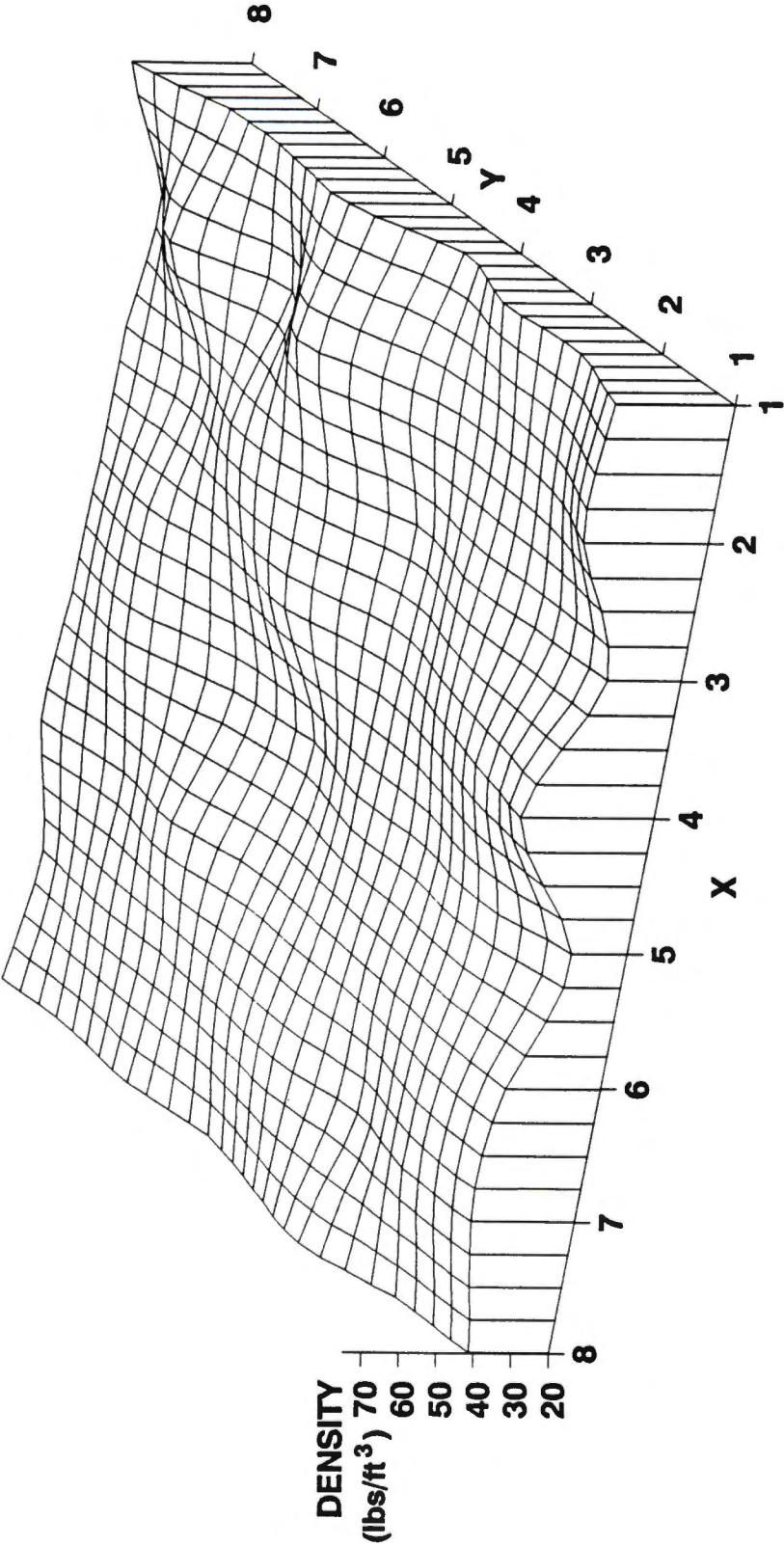
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=2



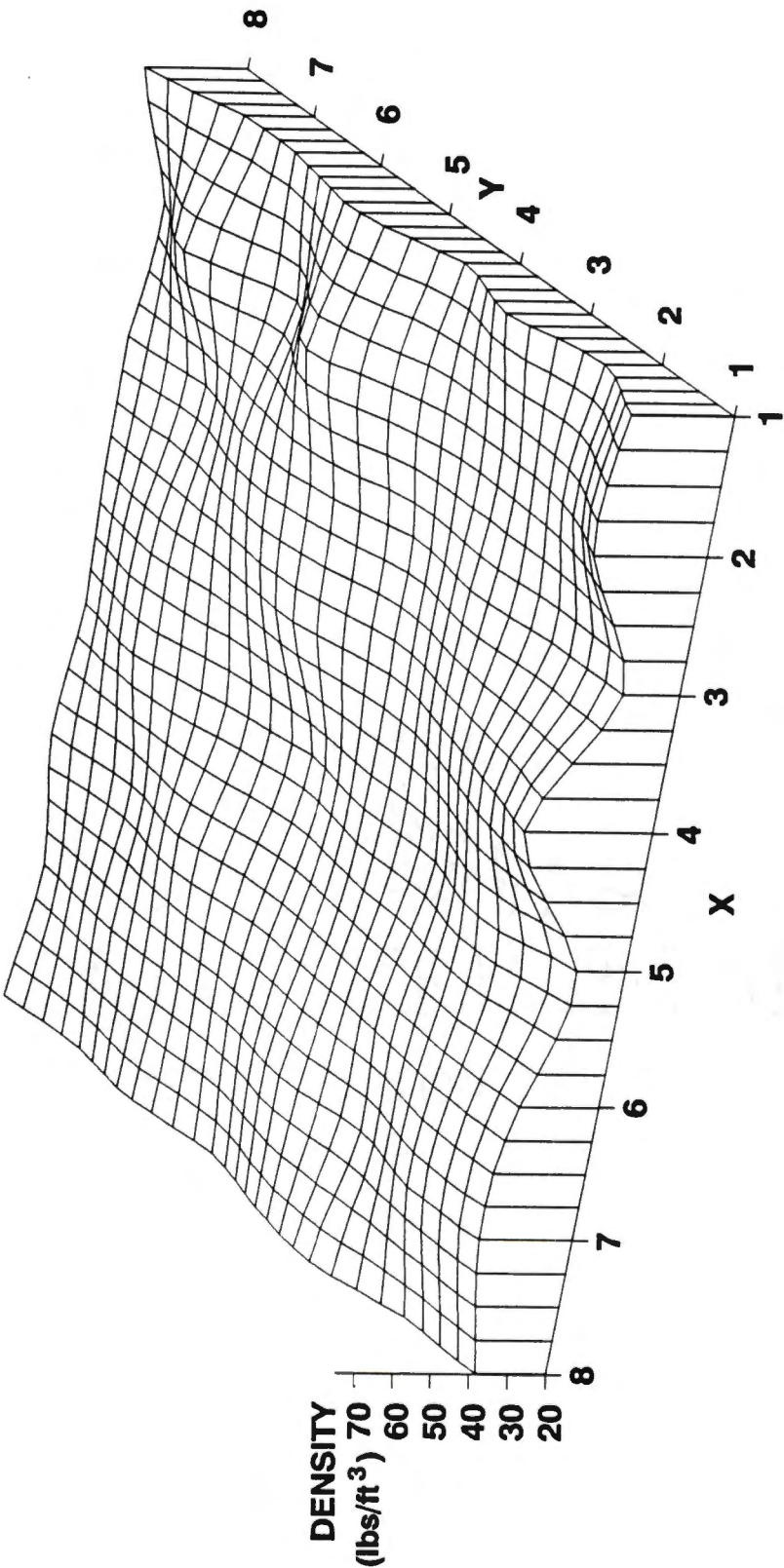
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 3



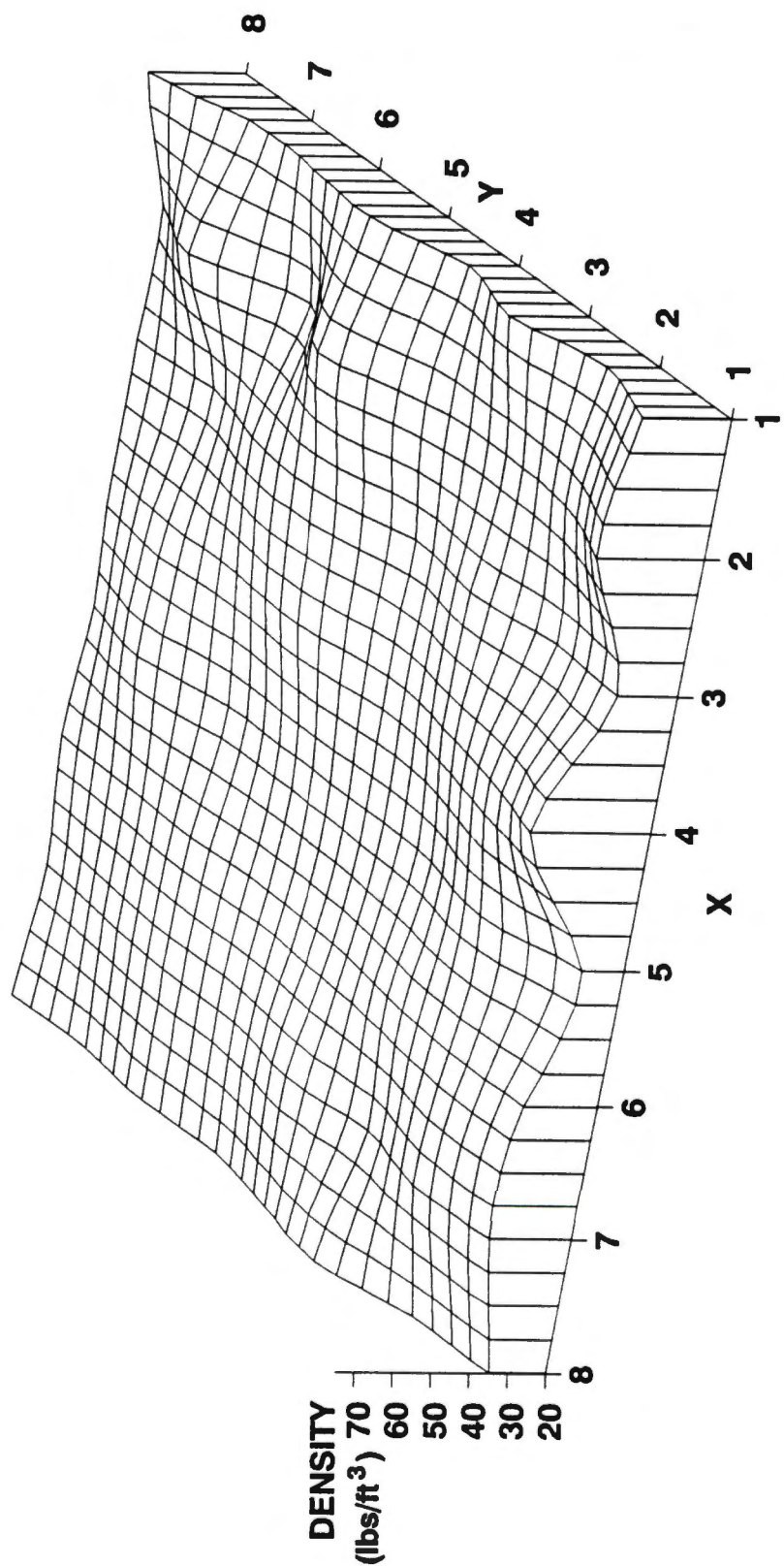
FLAKE MOISTURE CONTENT =4%, PRESS CLOSURE RATE =100 SECONDS
REPLICATION =2
Z=4



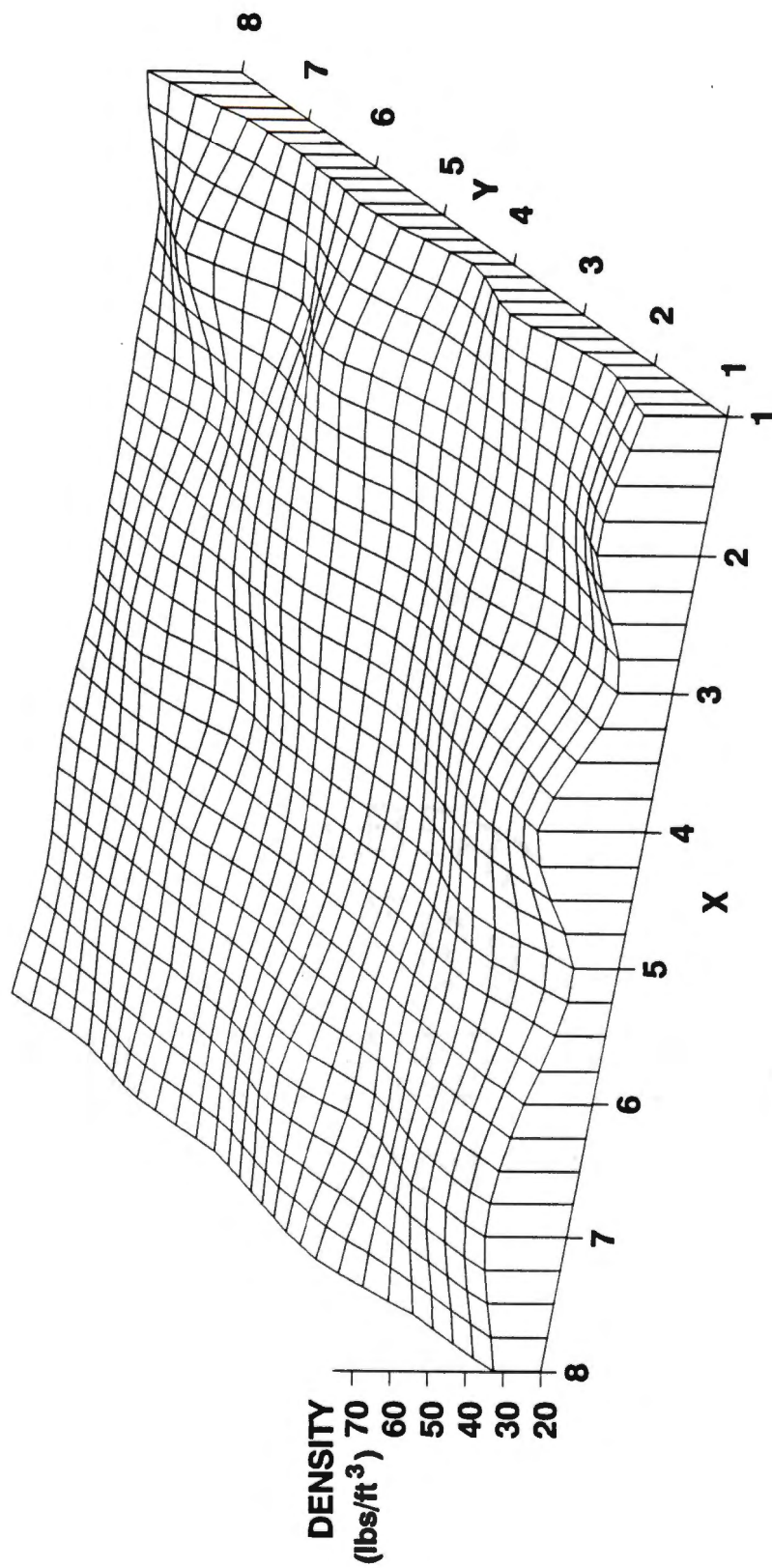
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=5



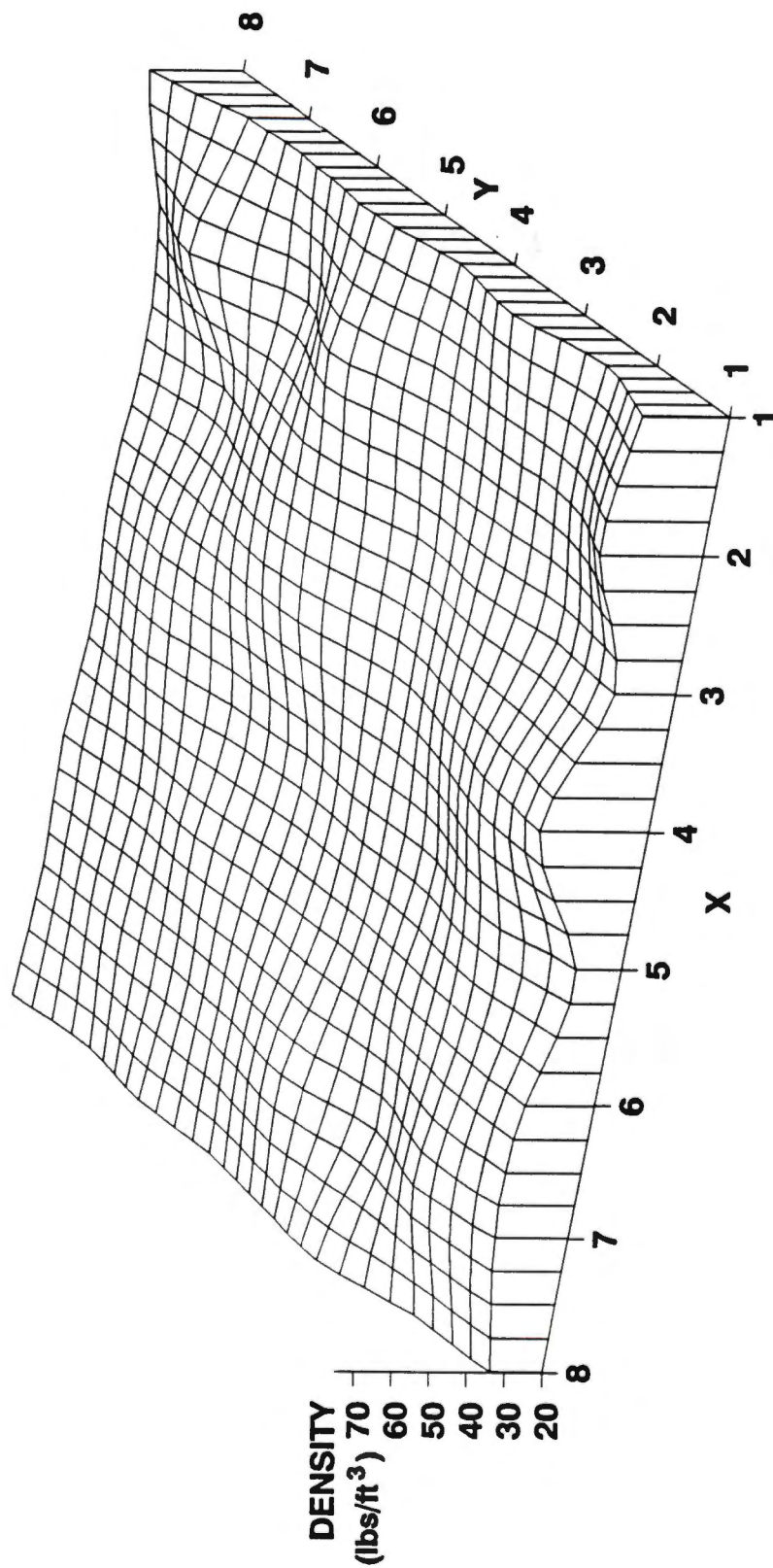
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 6



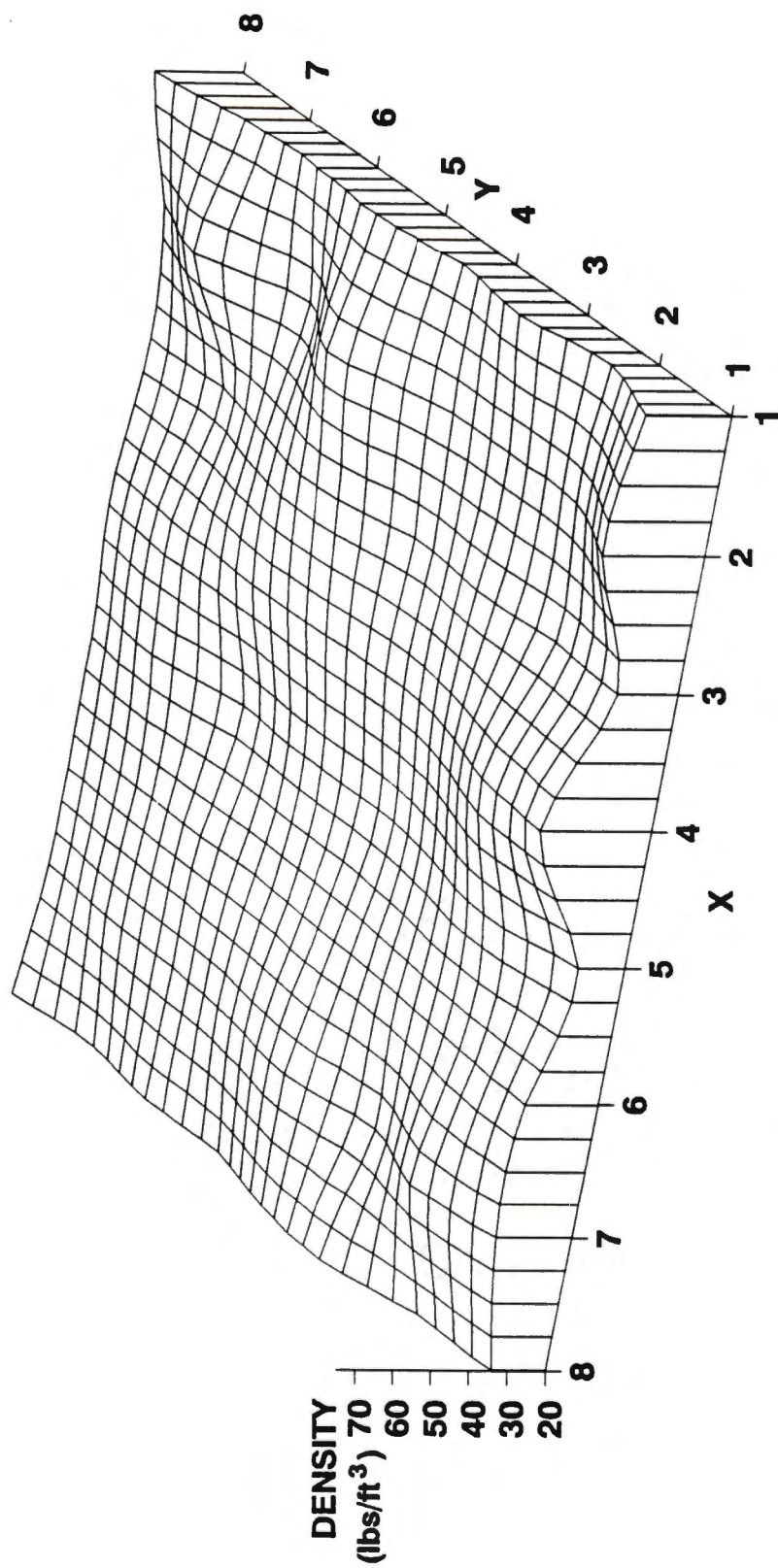
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=7



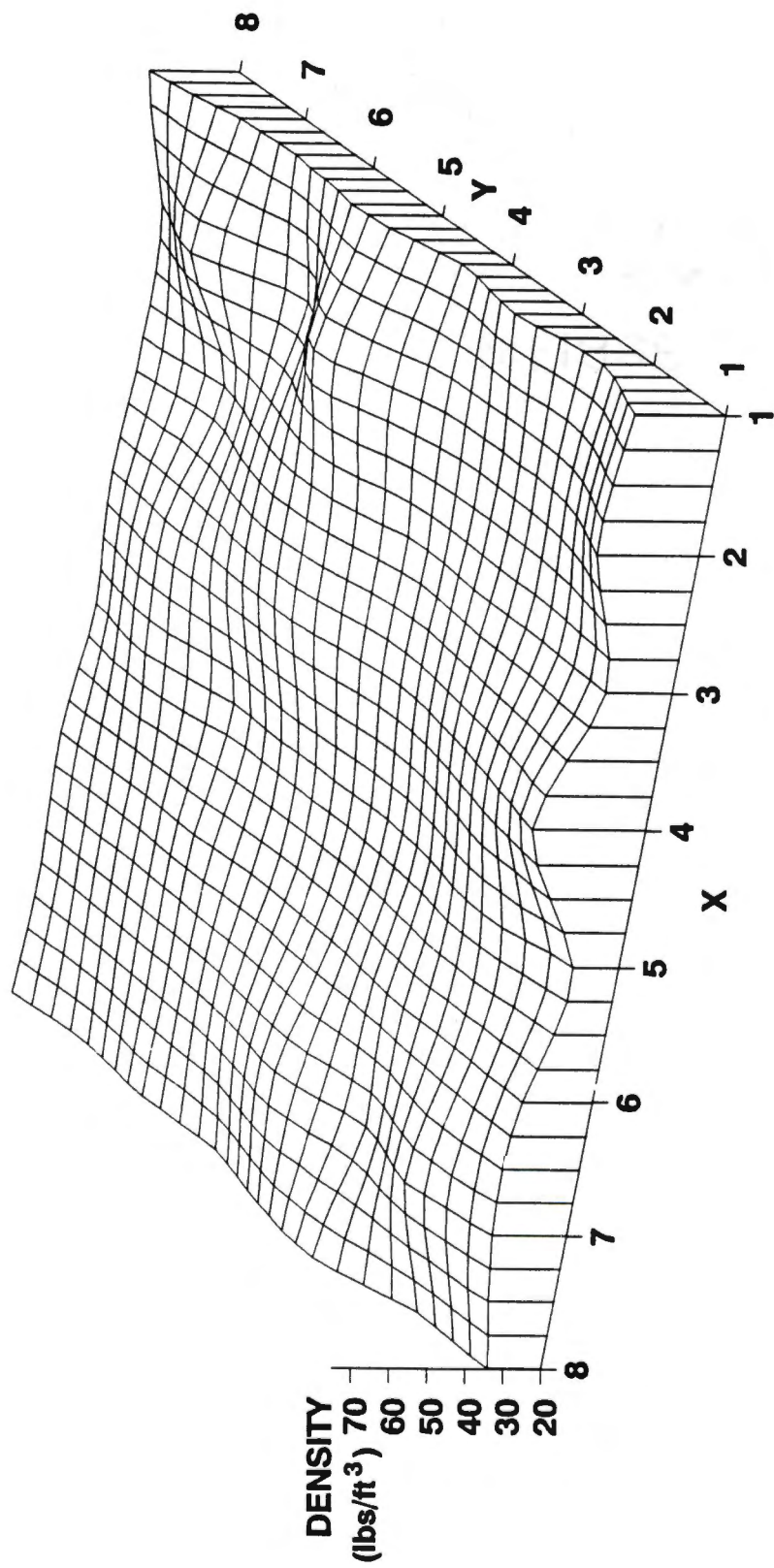
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=8



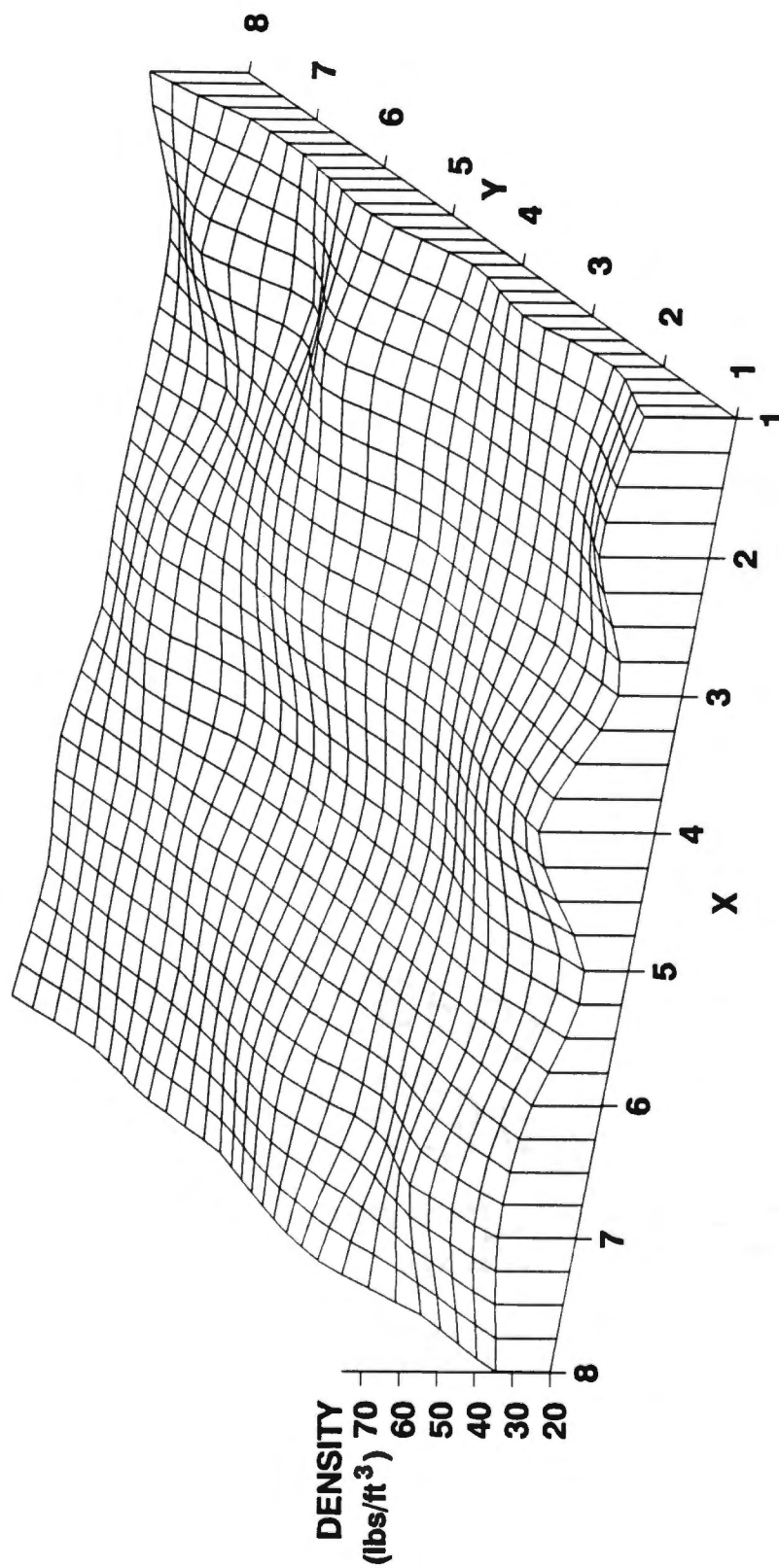
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=9



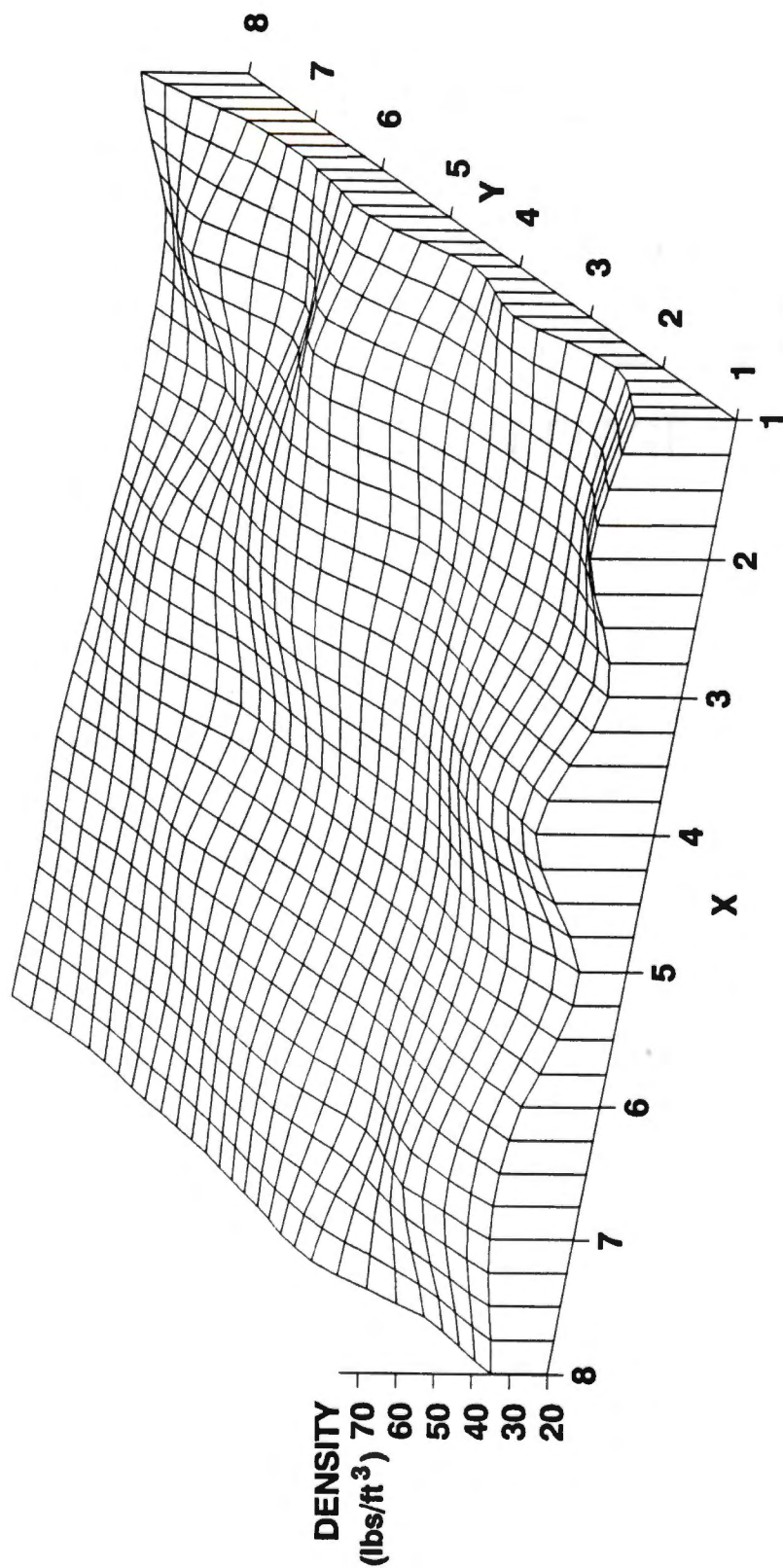
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=10



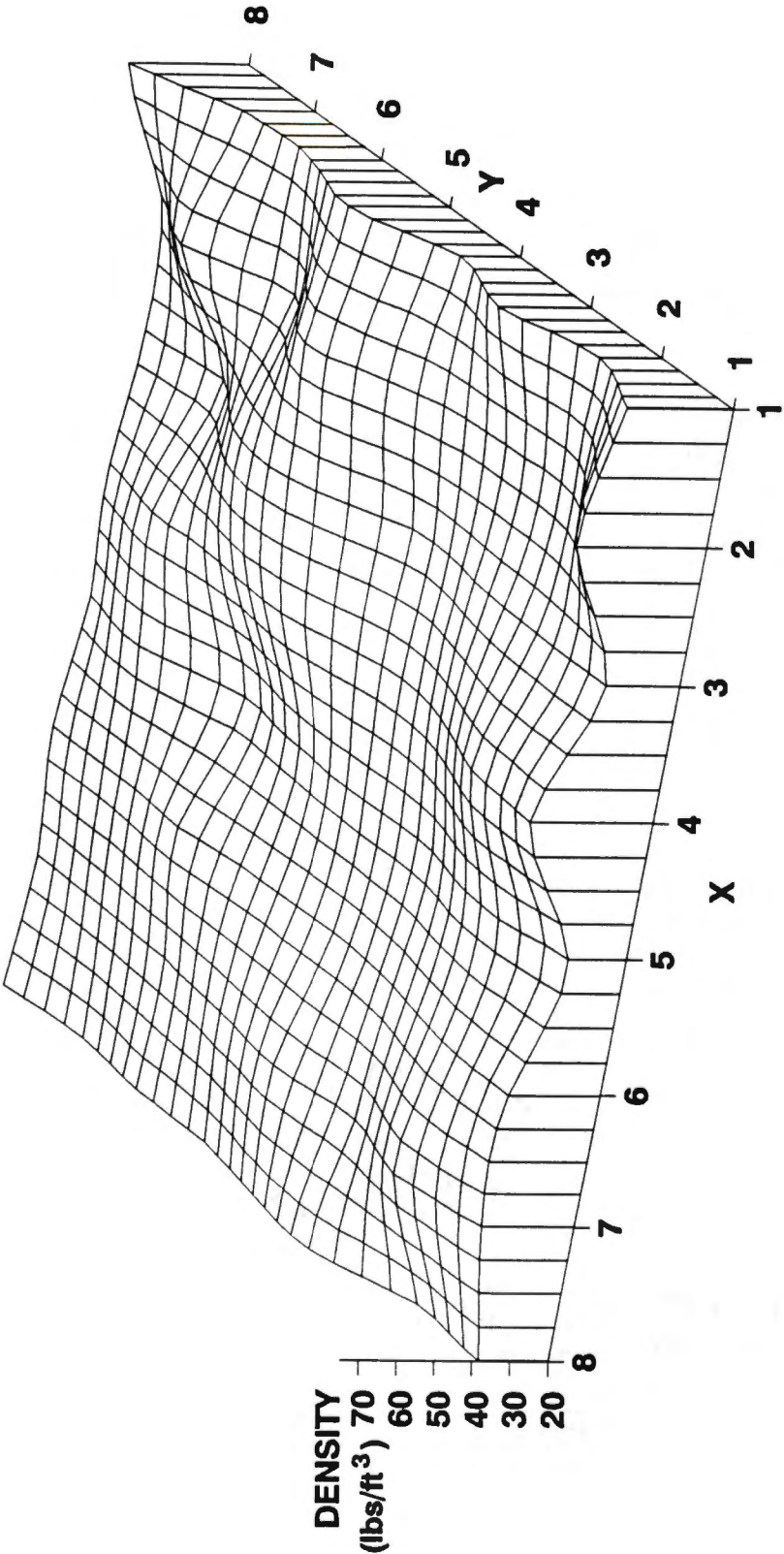
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 11



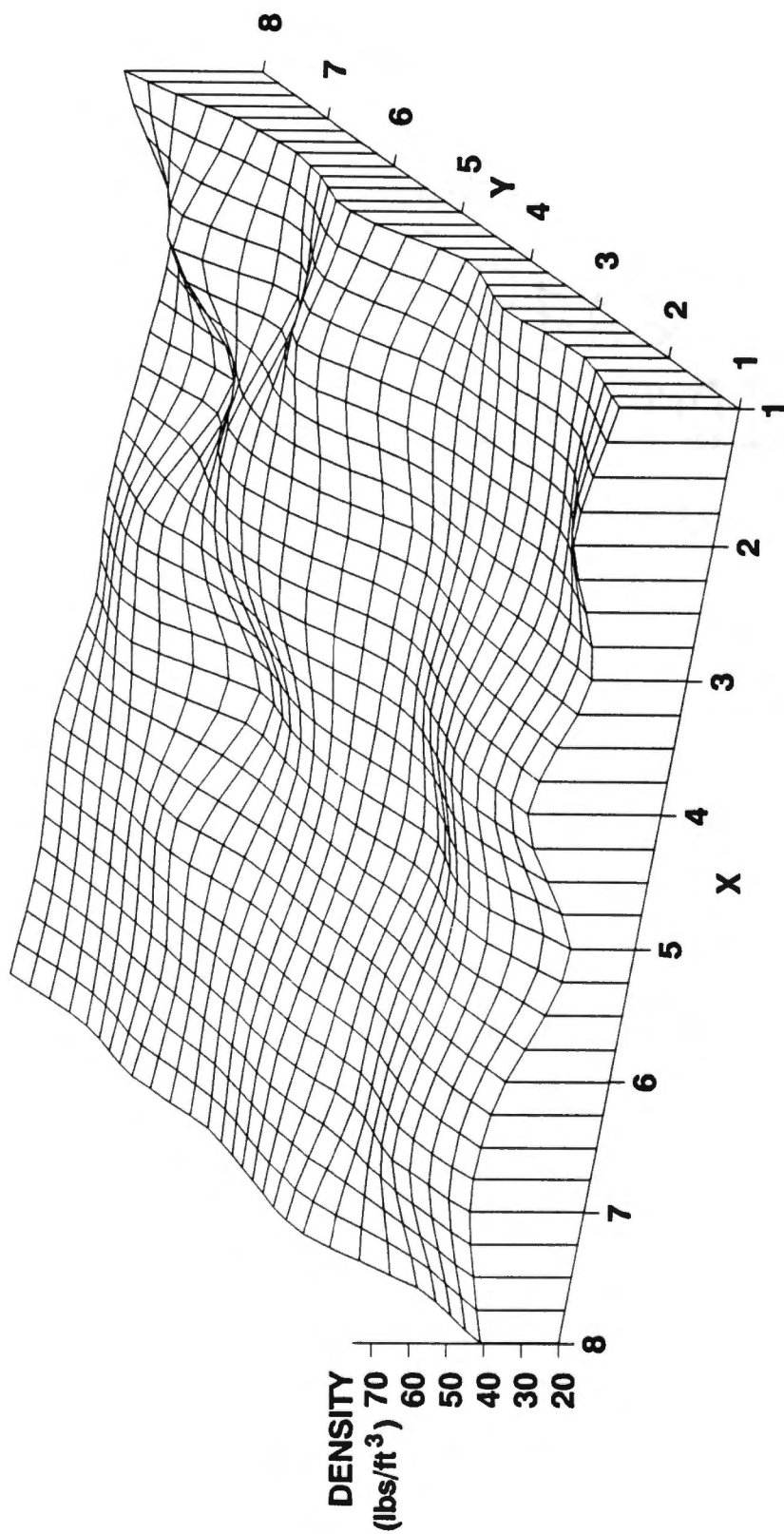
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=12



FLAKE MOISTURE CONTENT =4%, PRESS CLOSURE RATE =100 SECONDS
REPLICATION =2
Z=13



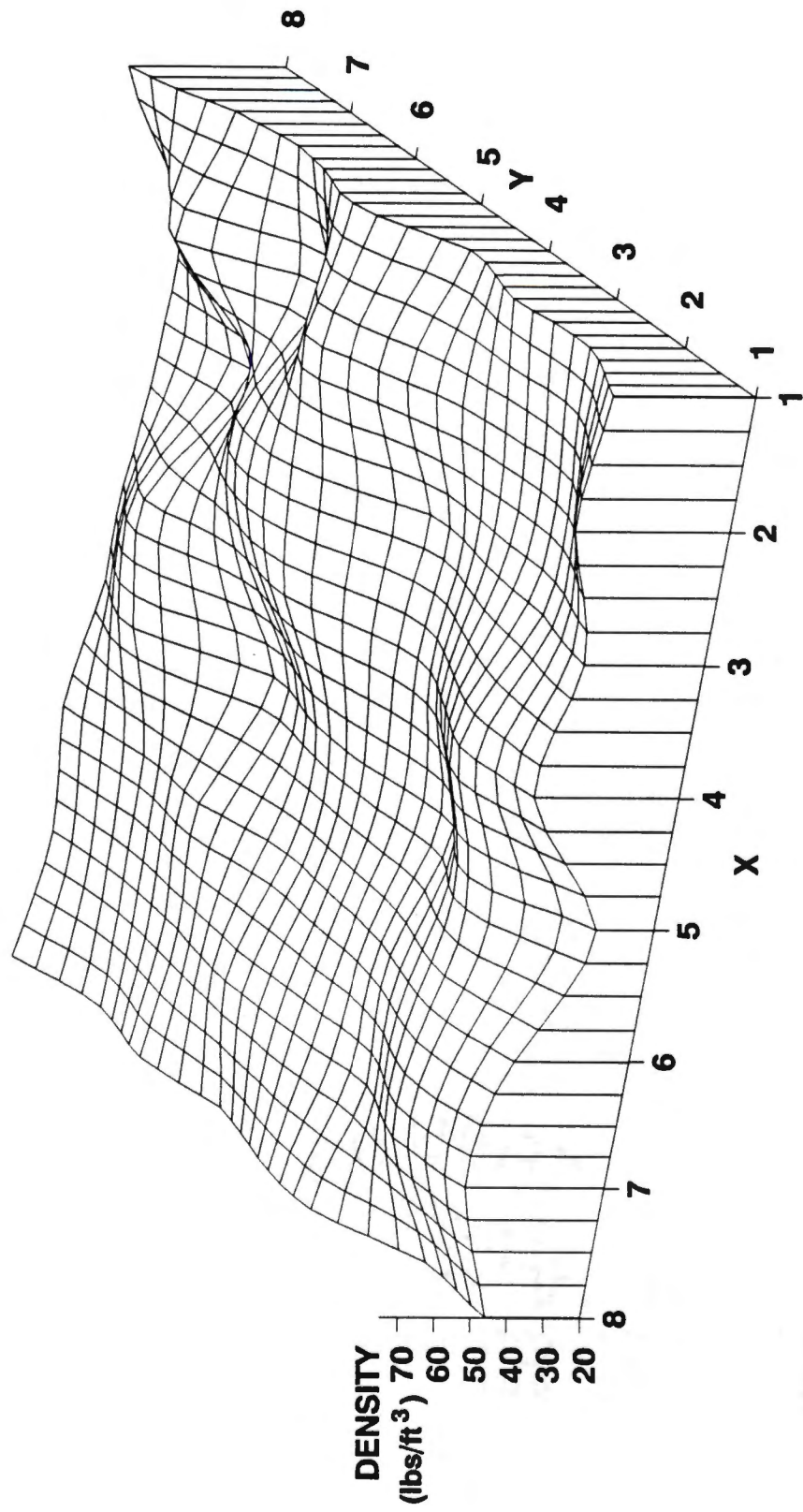
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=14



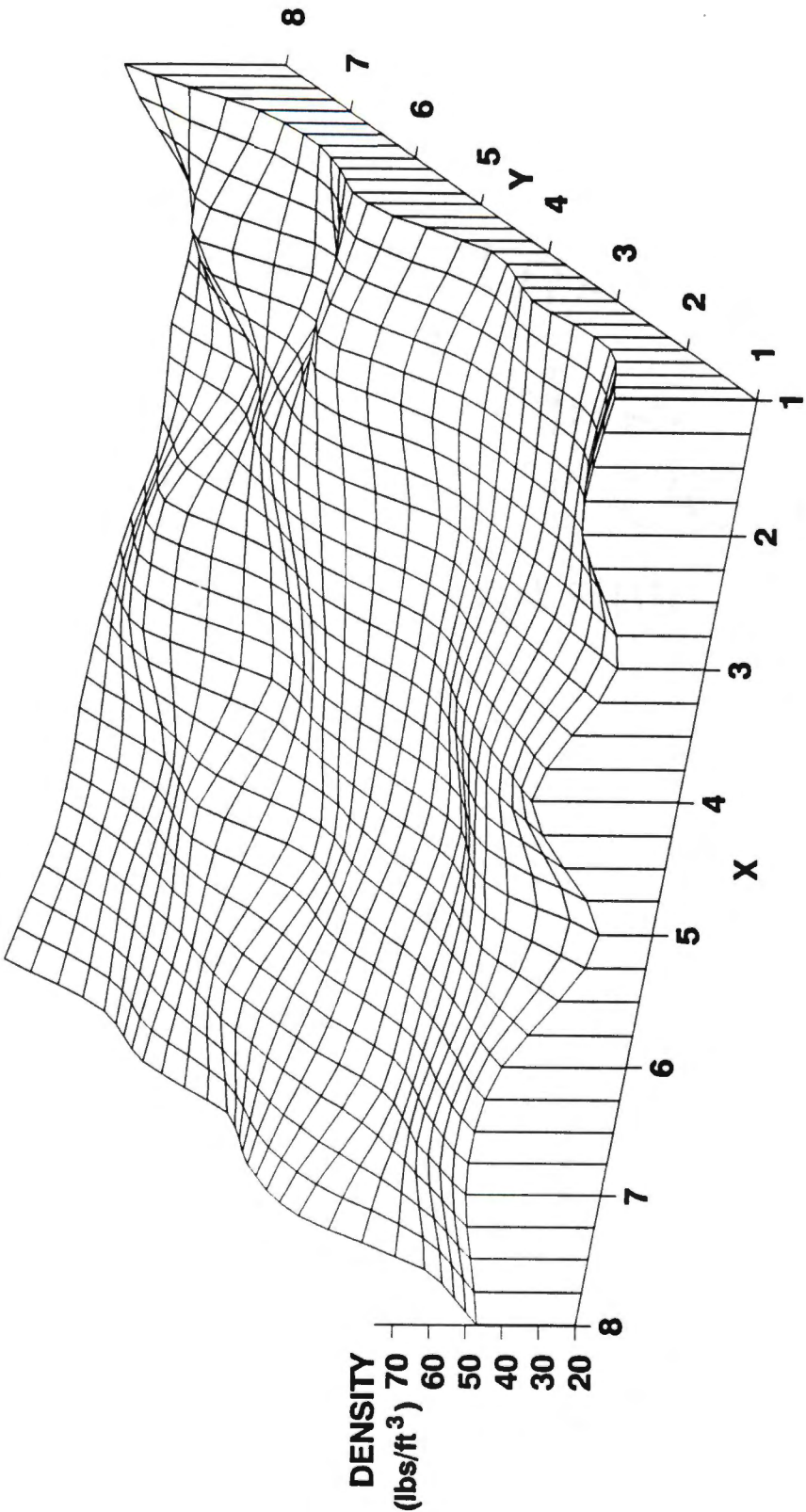
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 2

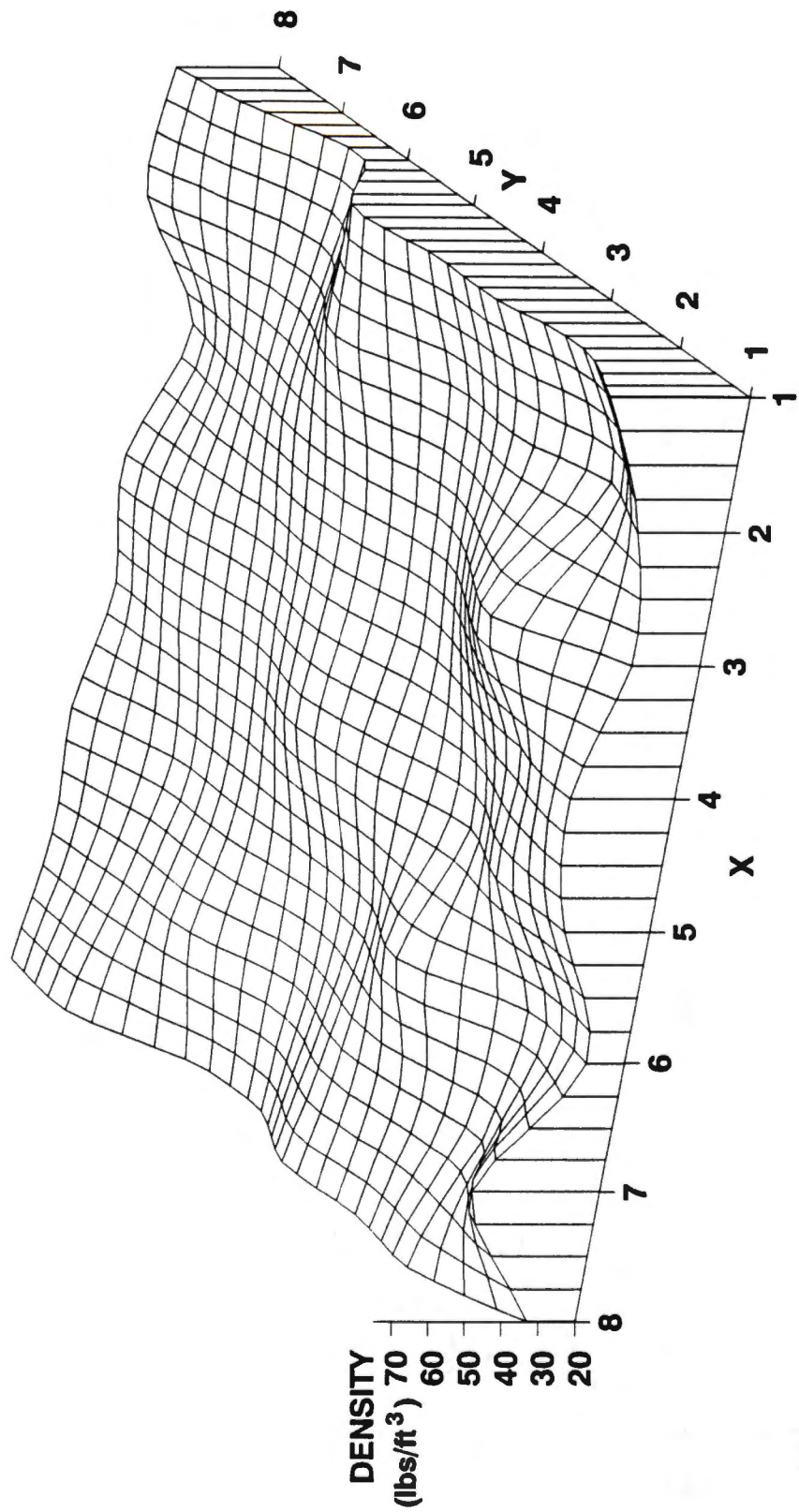
Z = 15



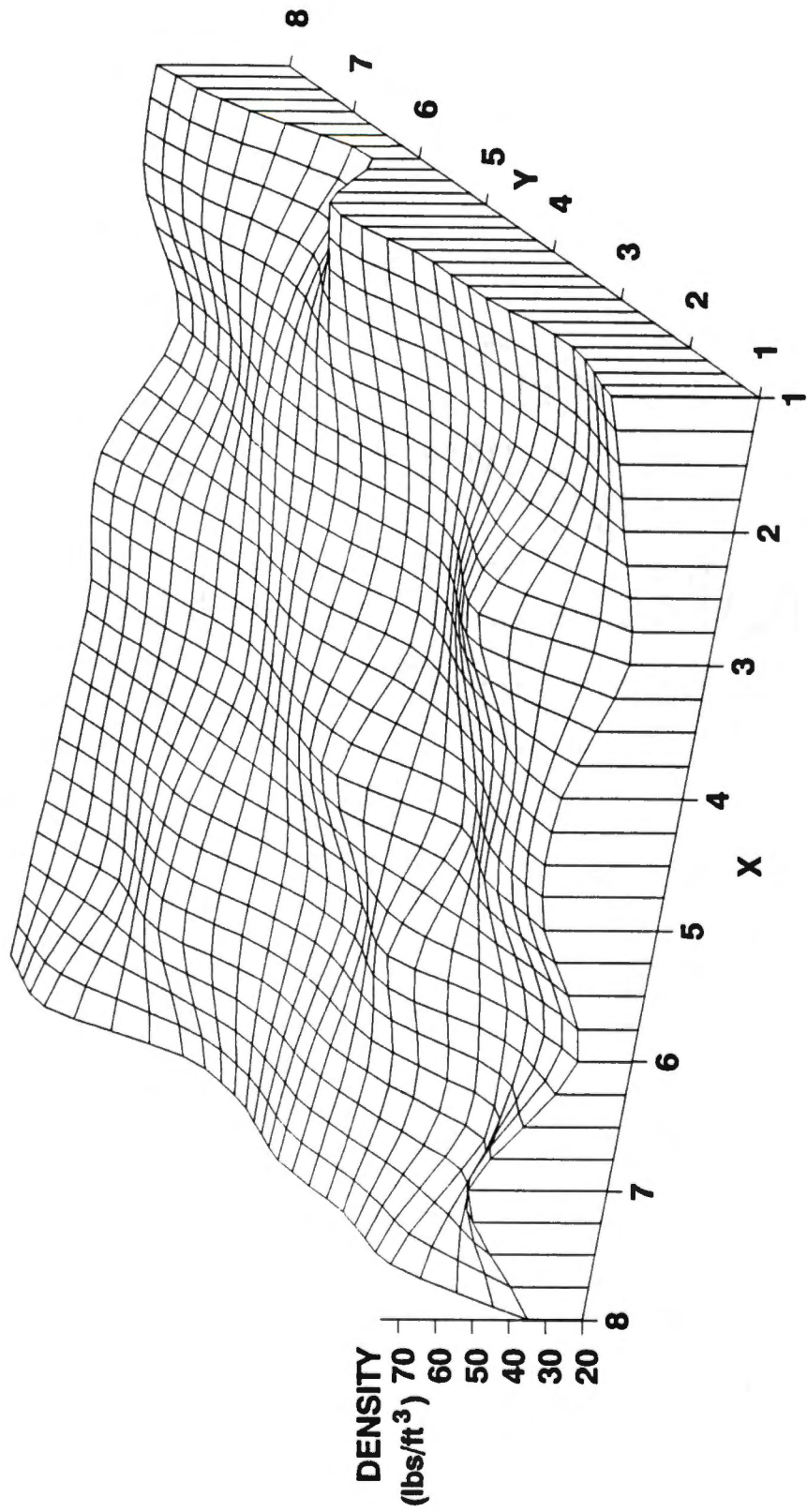
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 16



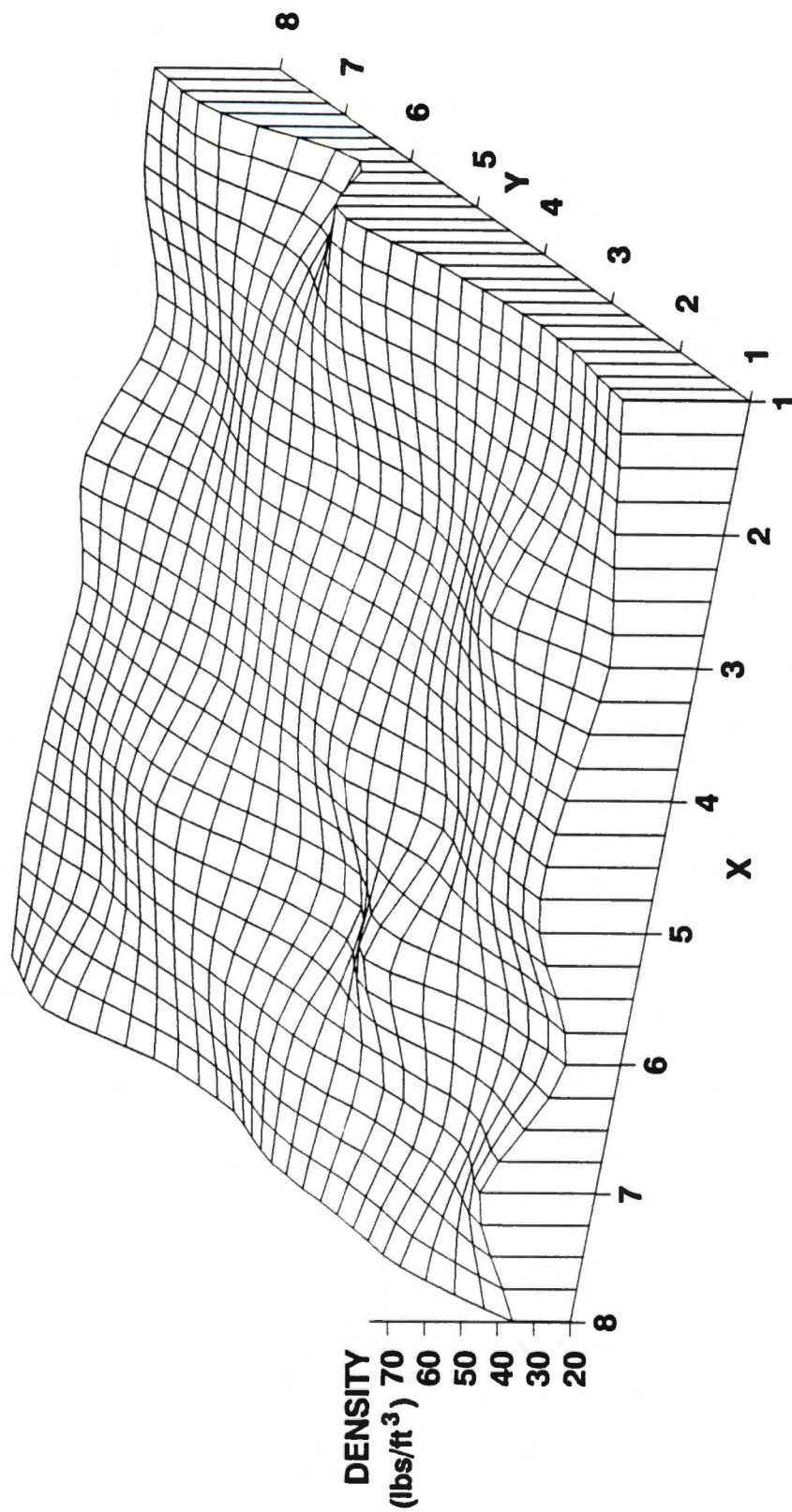
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=1



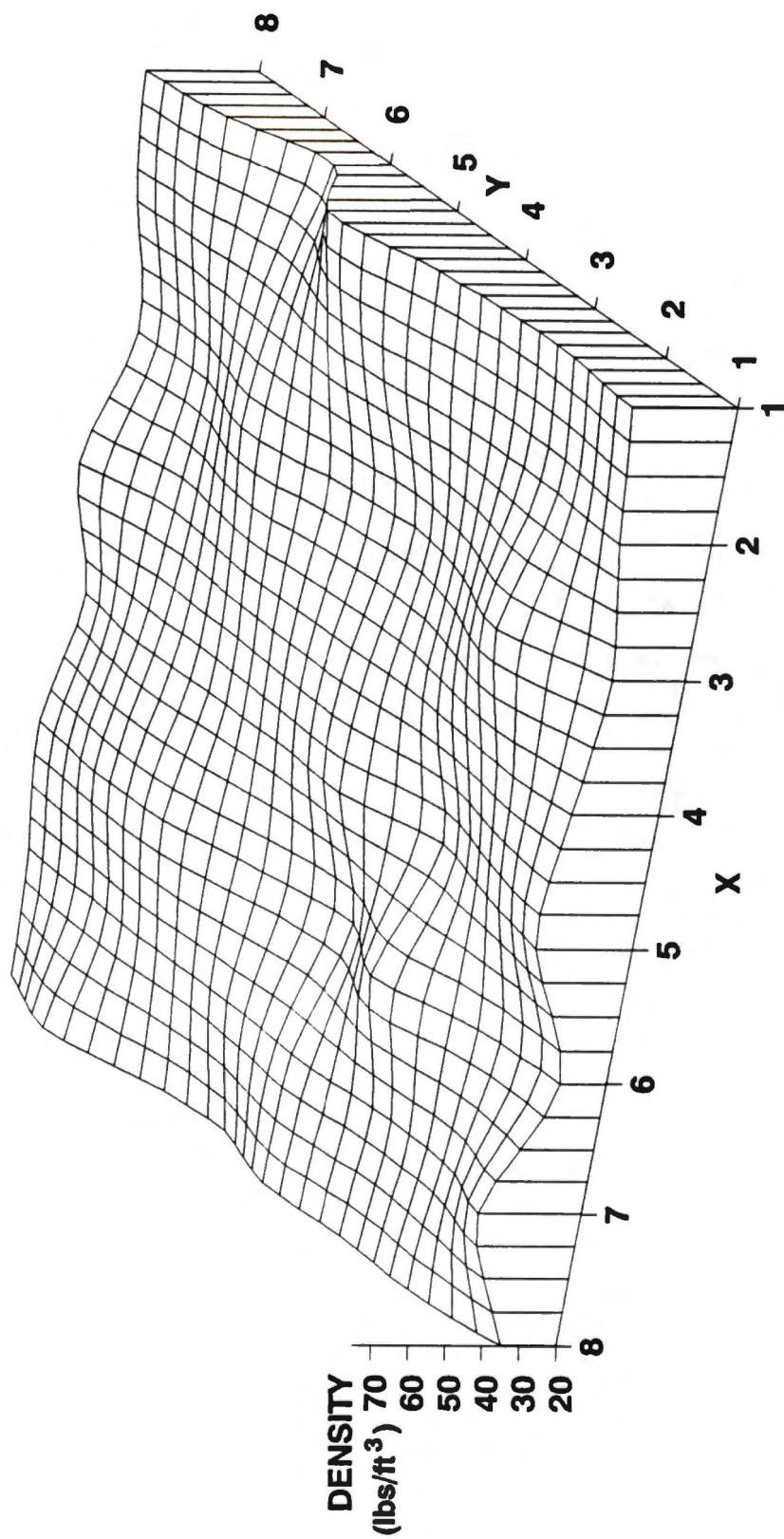
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 2



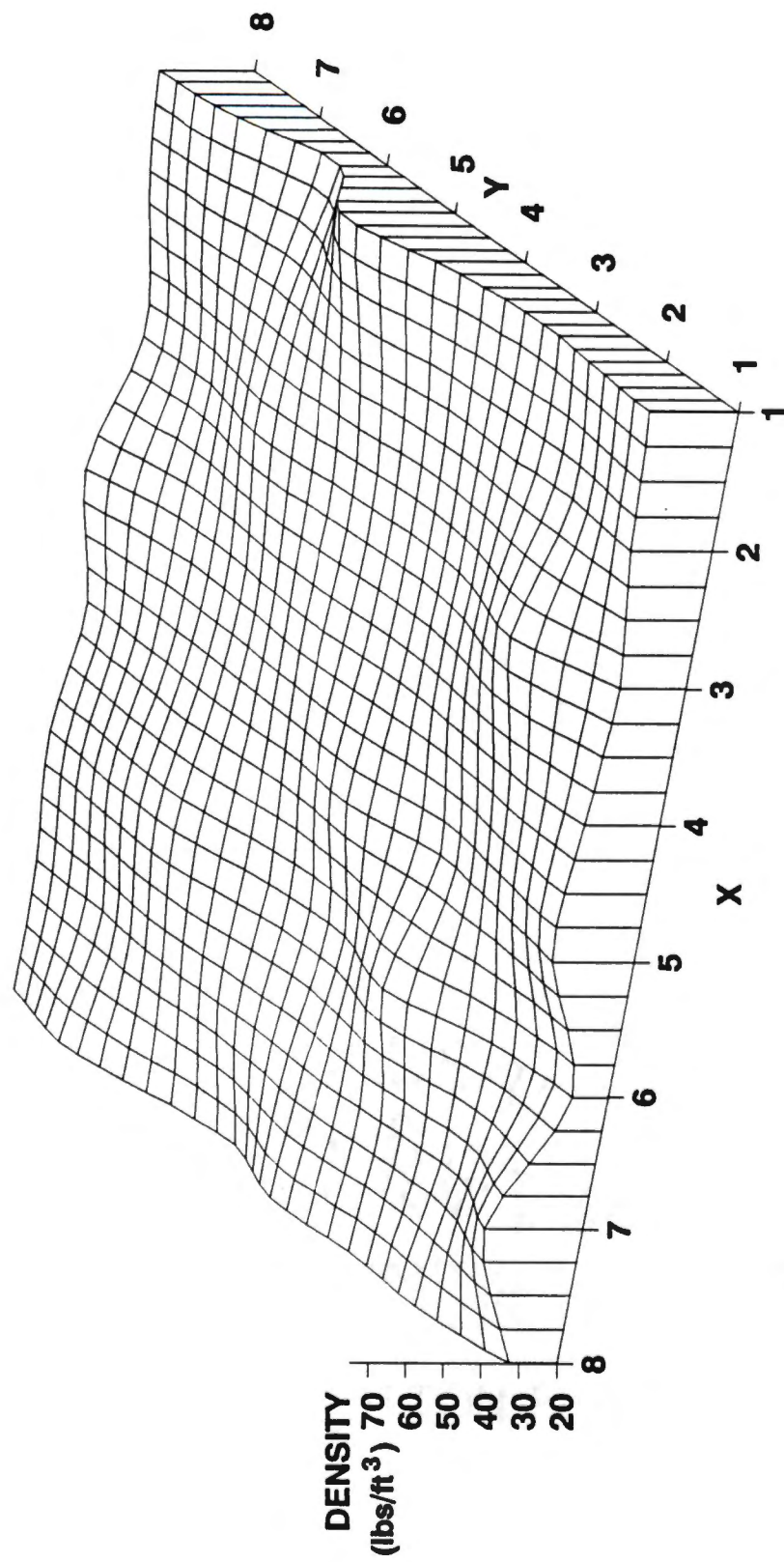
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=3



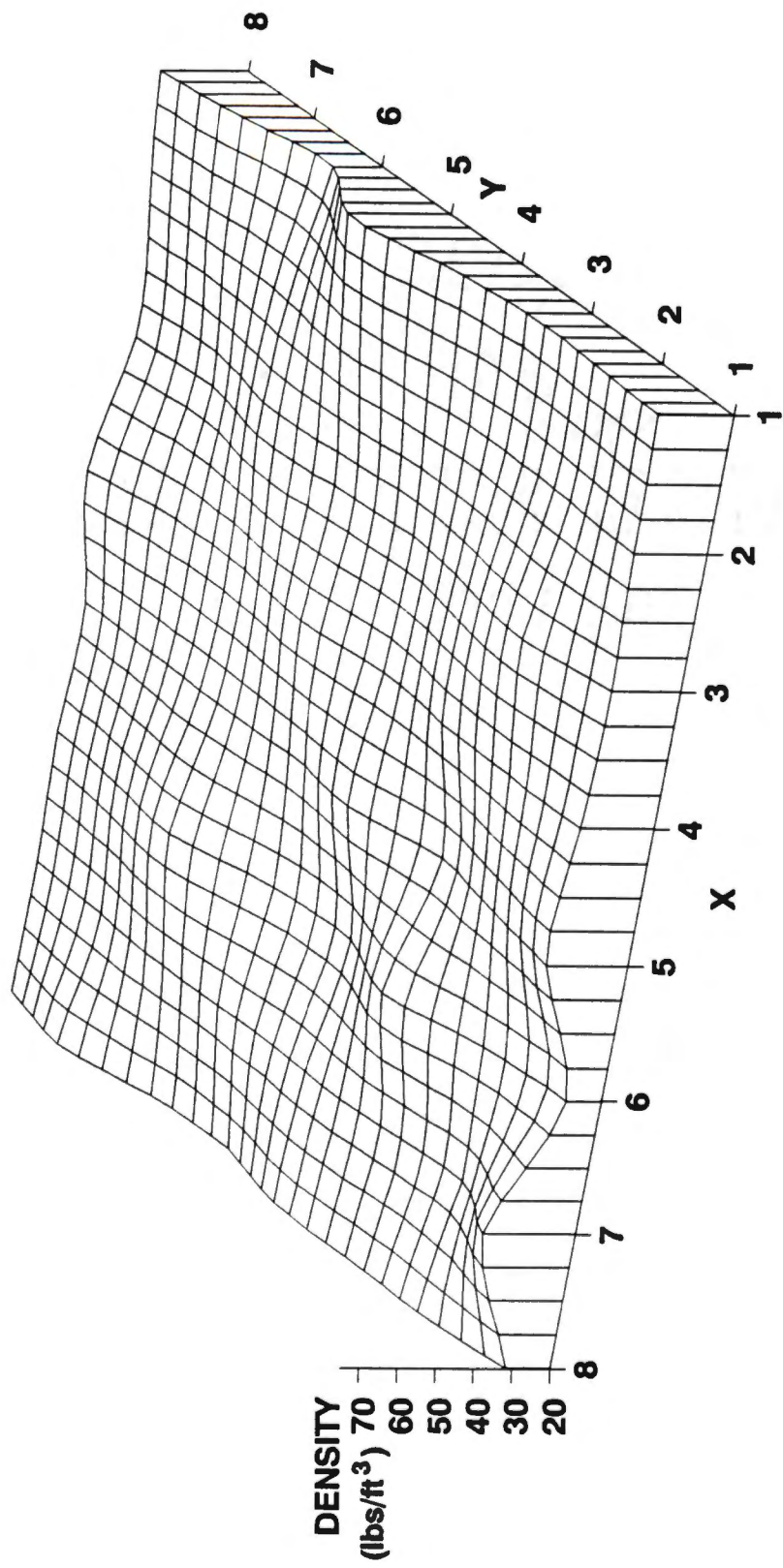
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=4



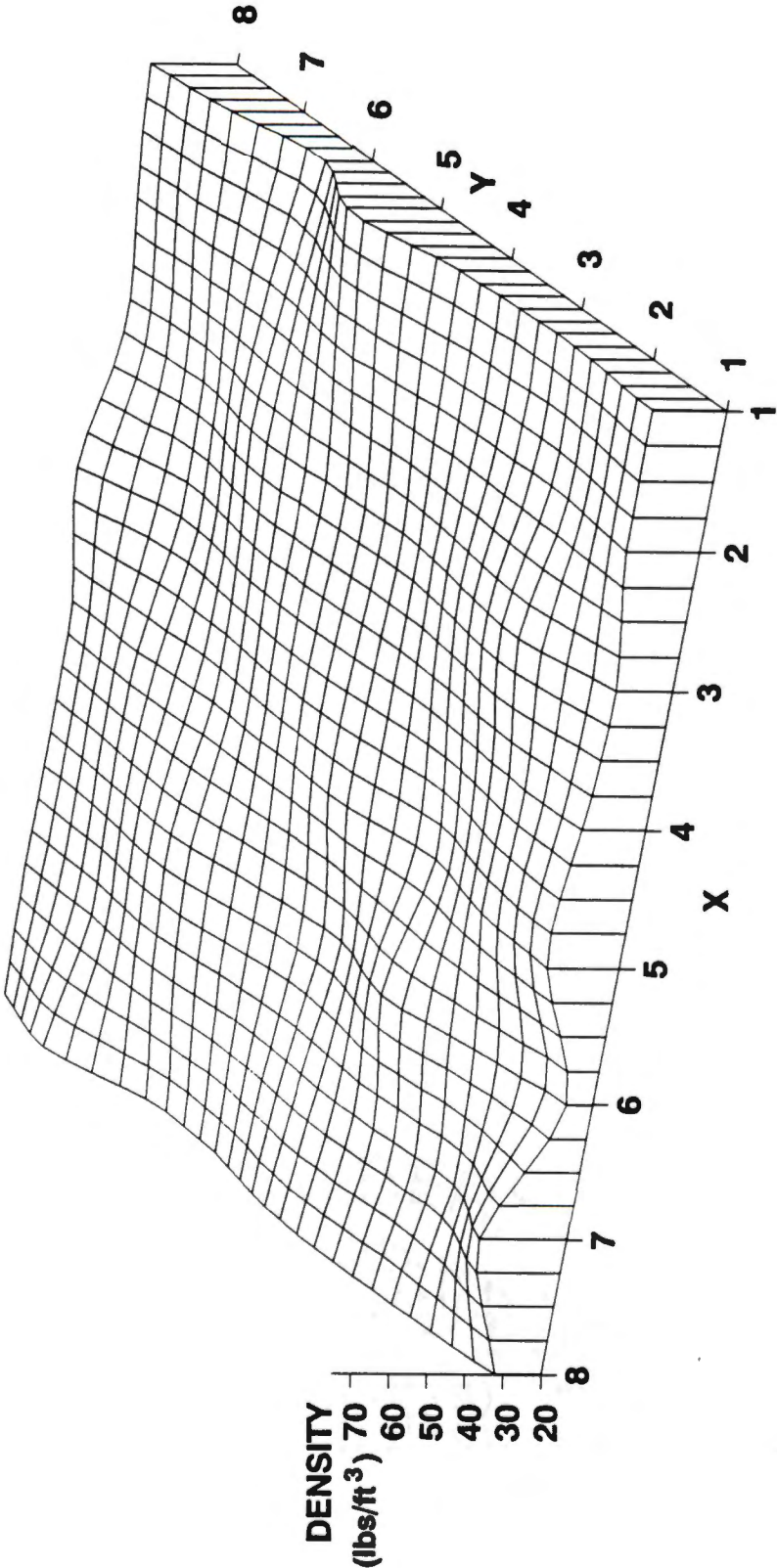
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
 REPLICATION = 3
 Z = 5



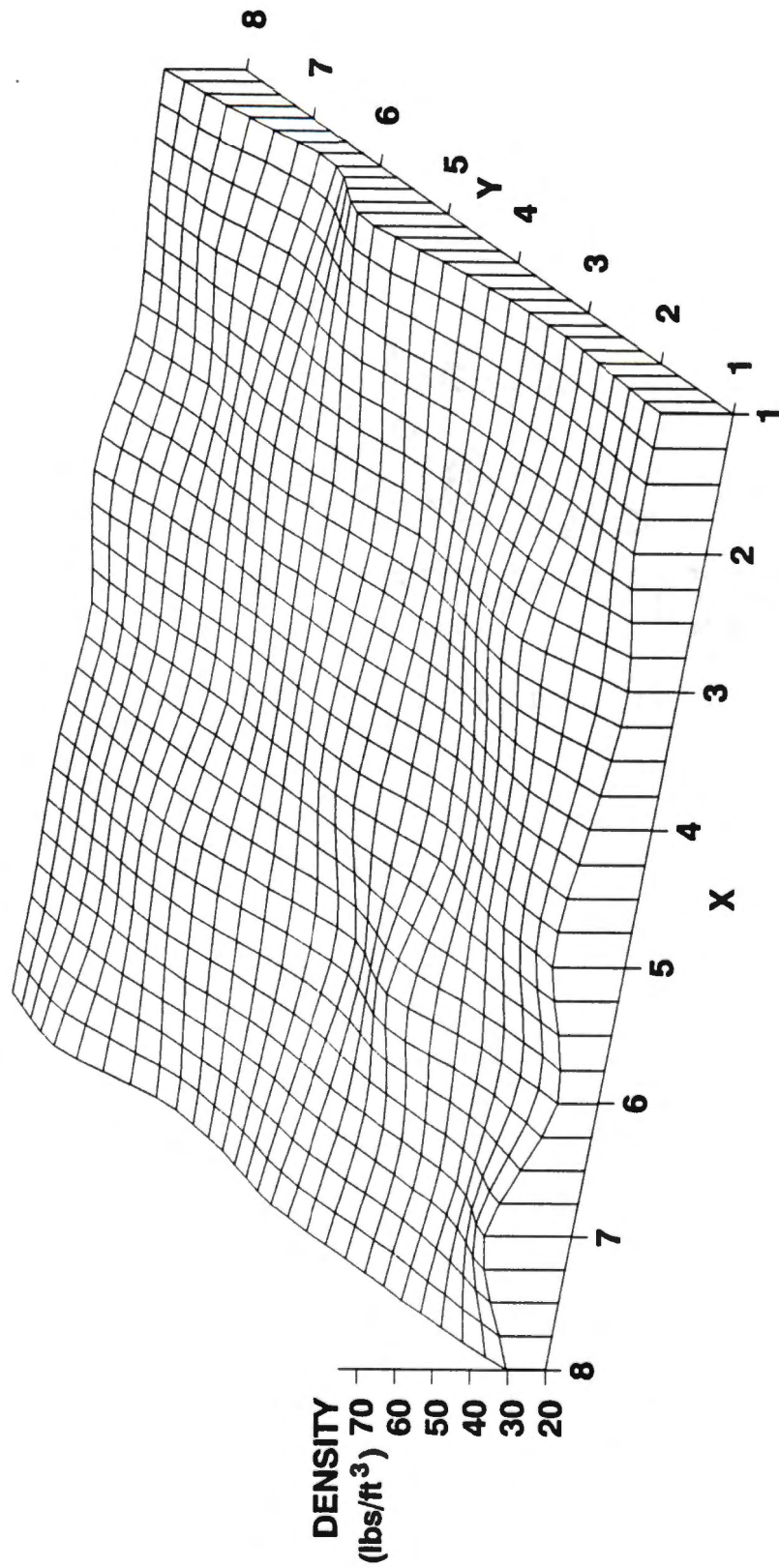
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 6



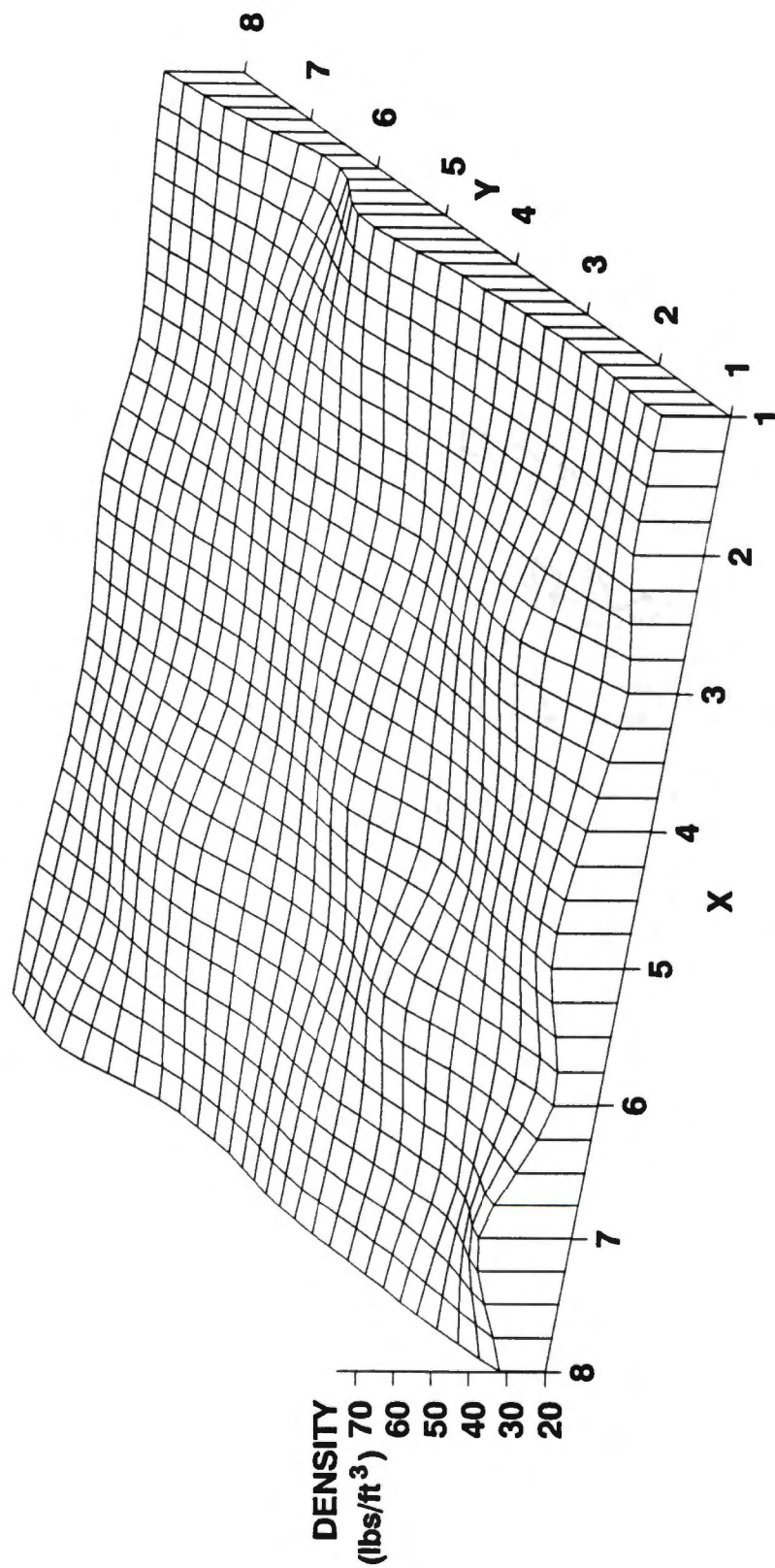
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 7



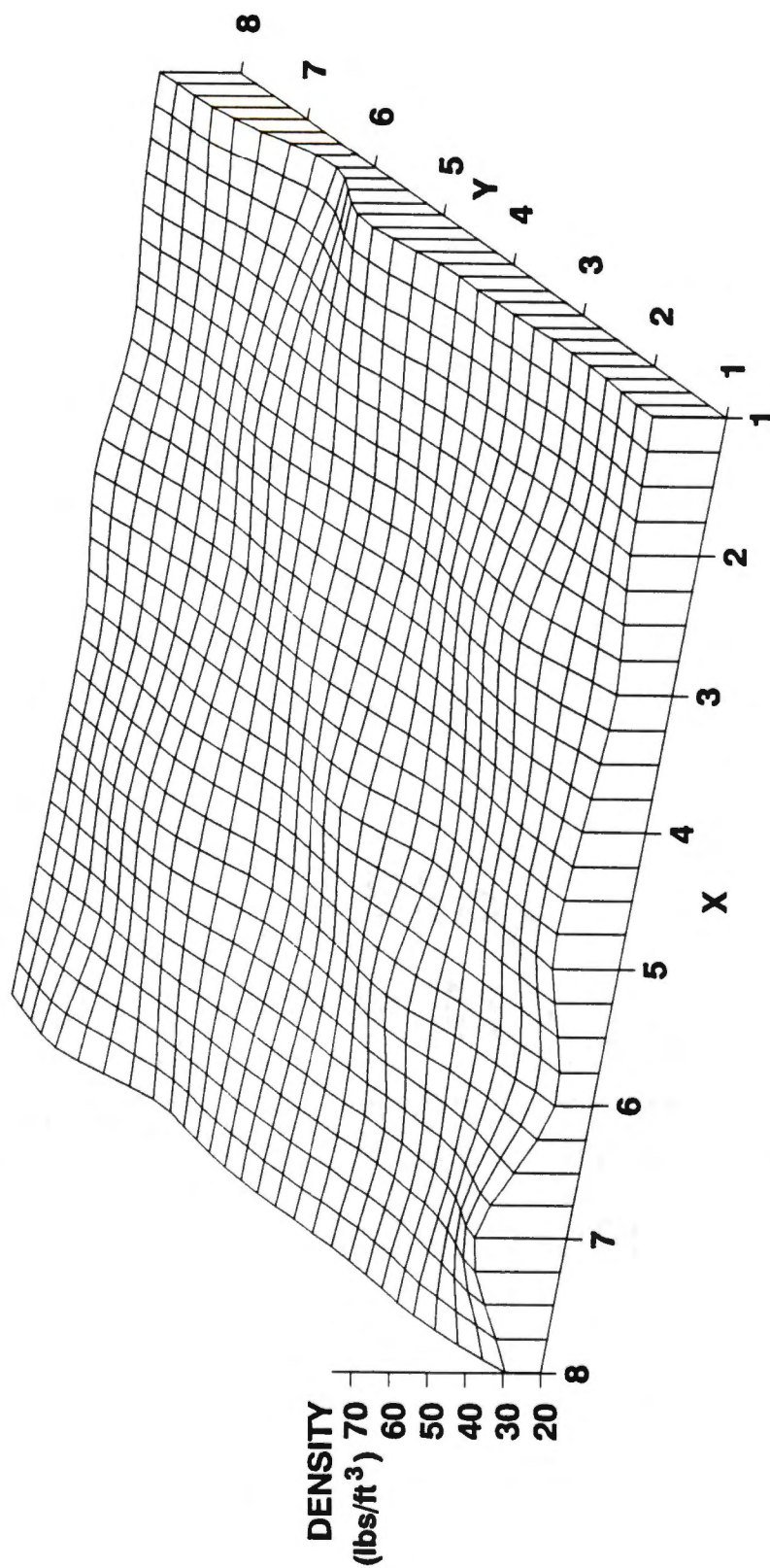
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 8



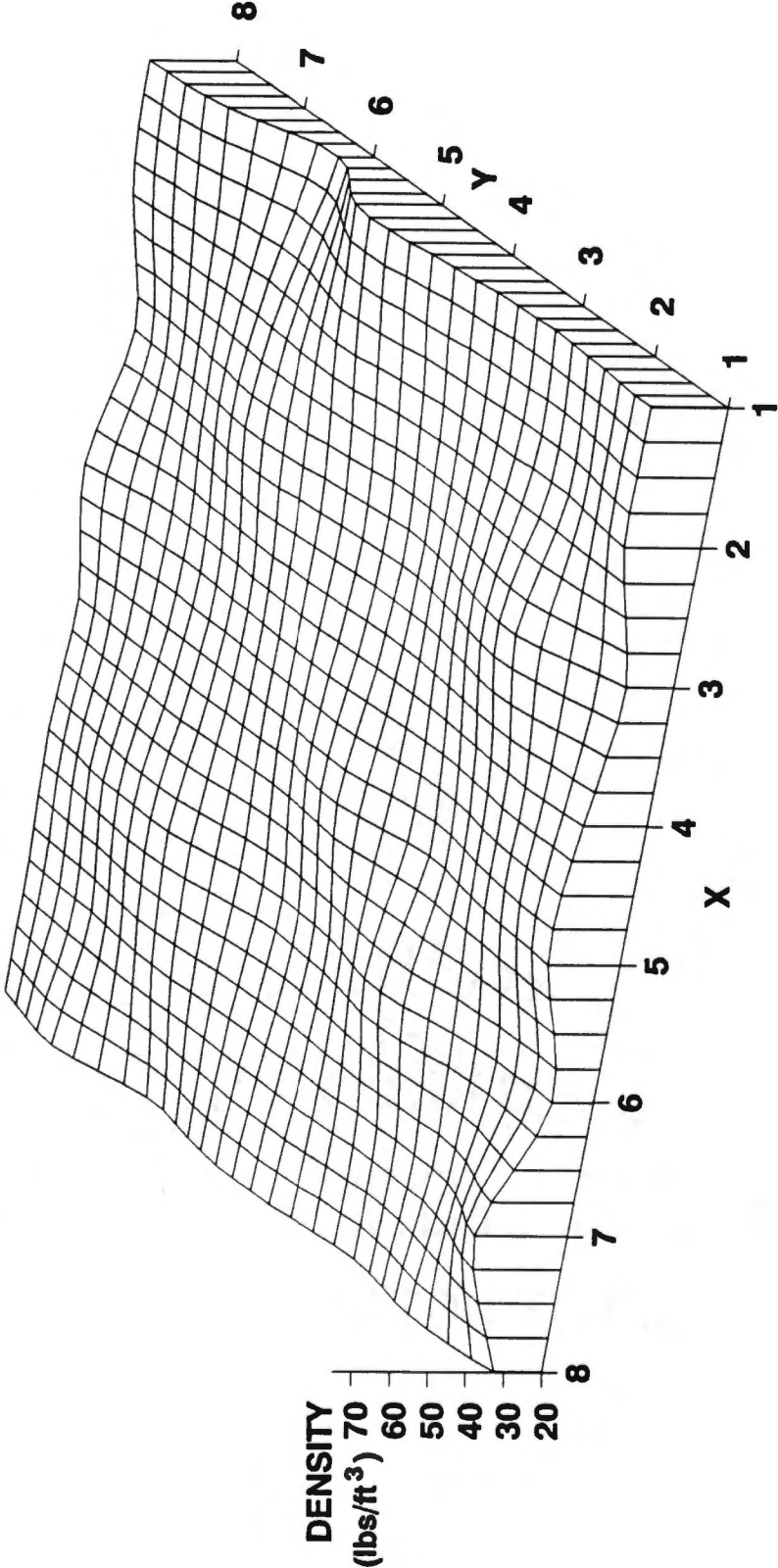
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 9



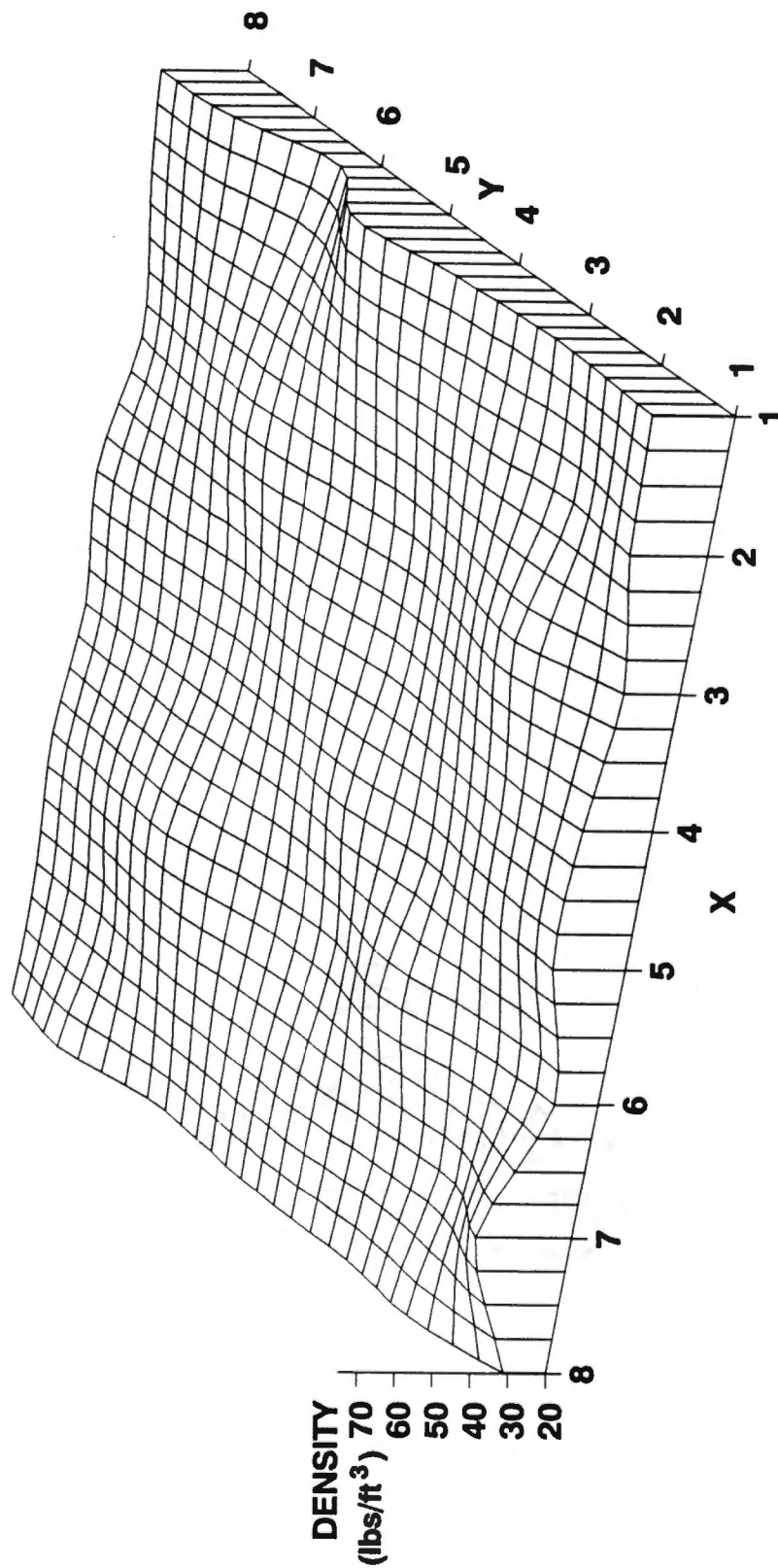
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=10



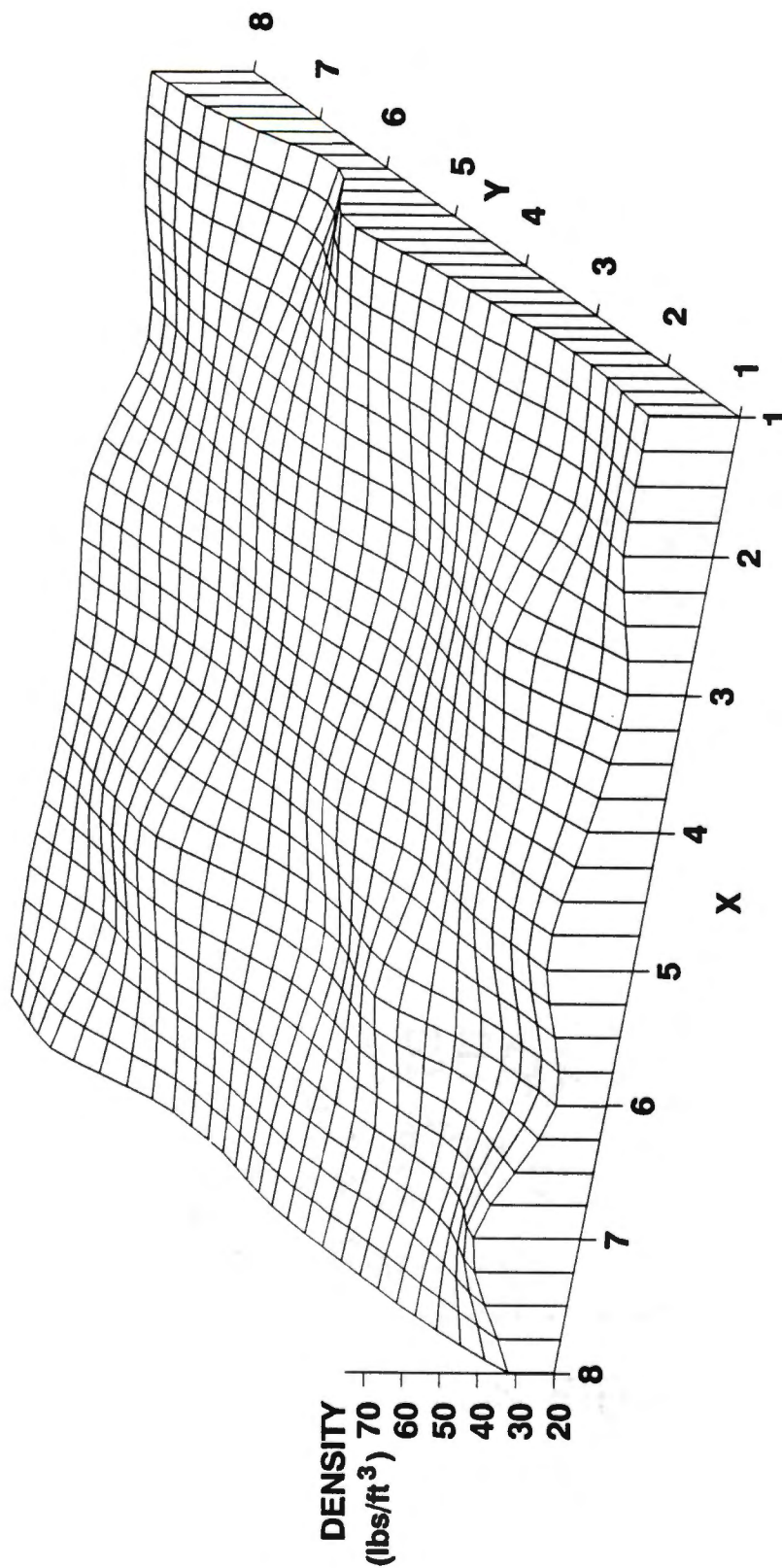
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 11



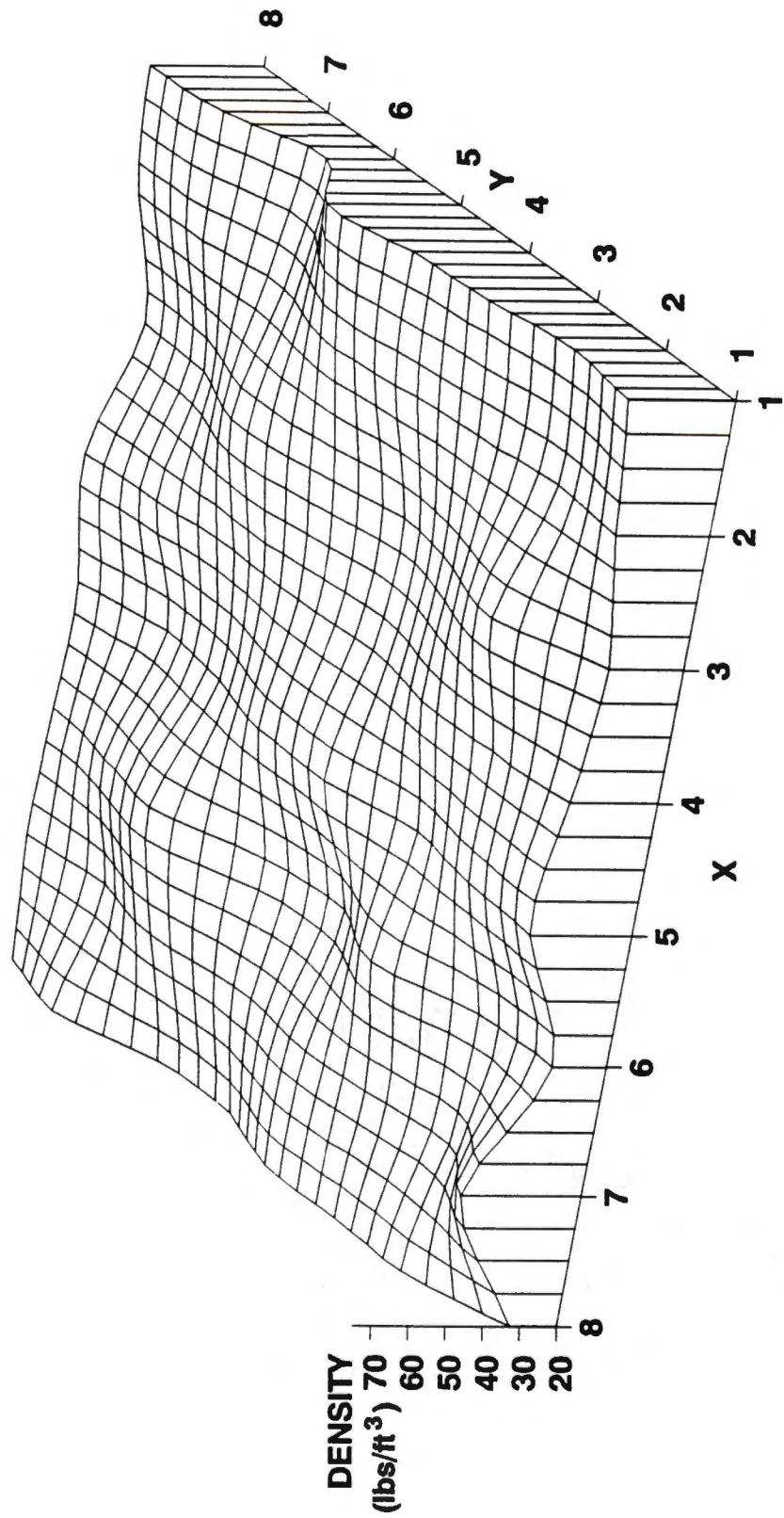
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 12



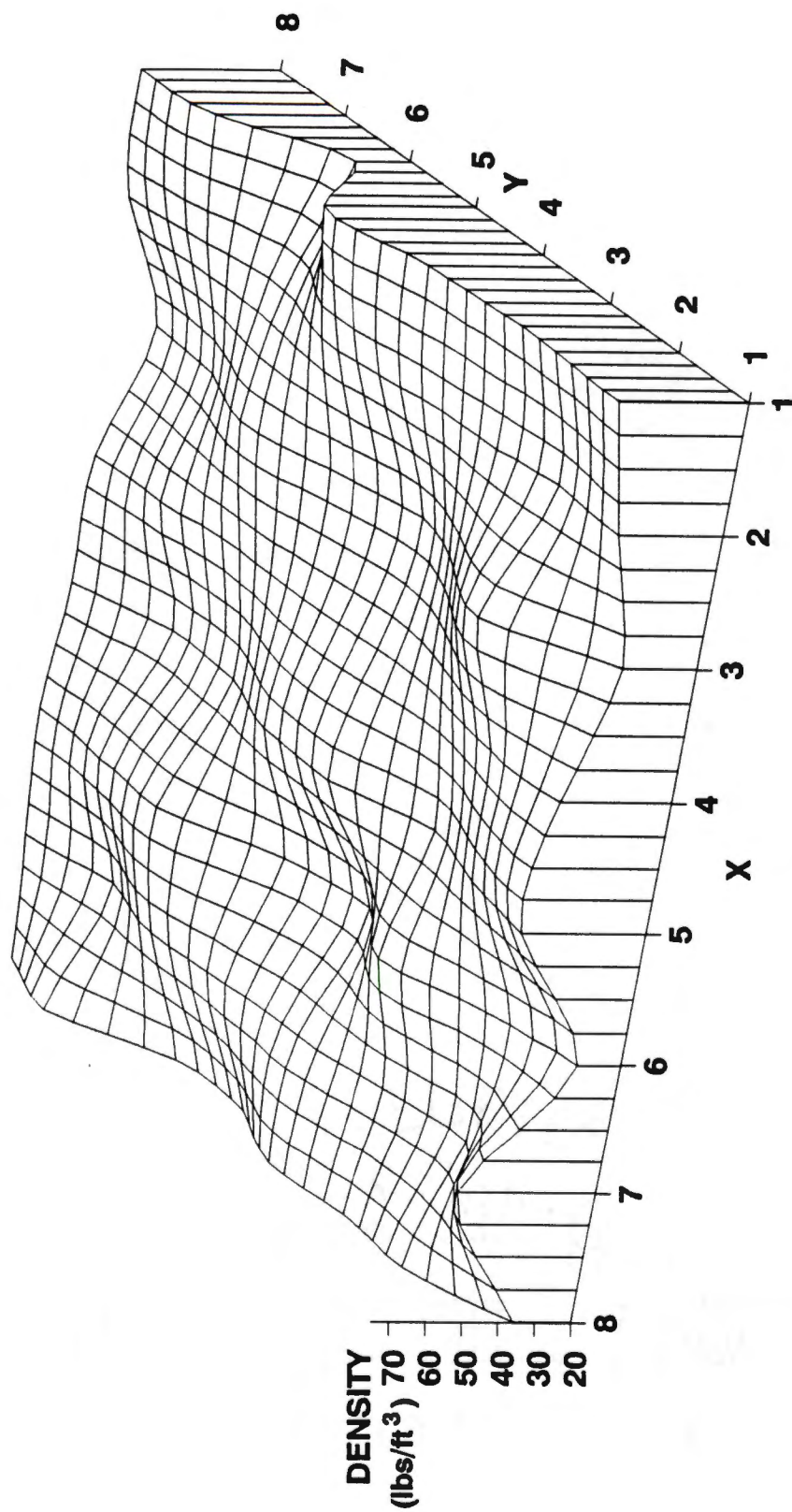
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=13



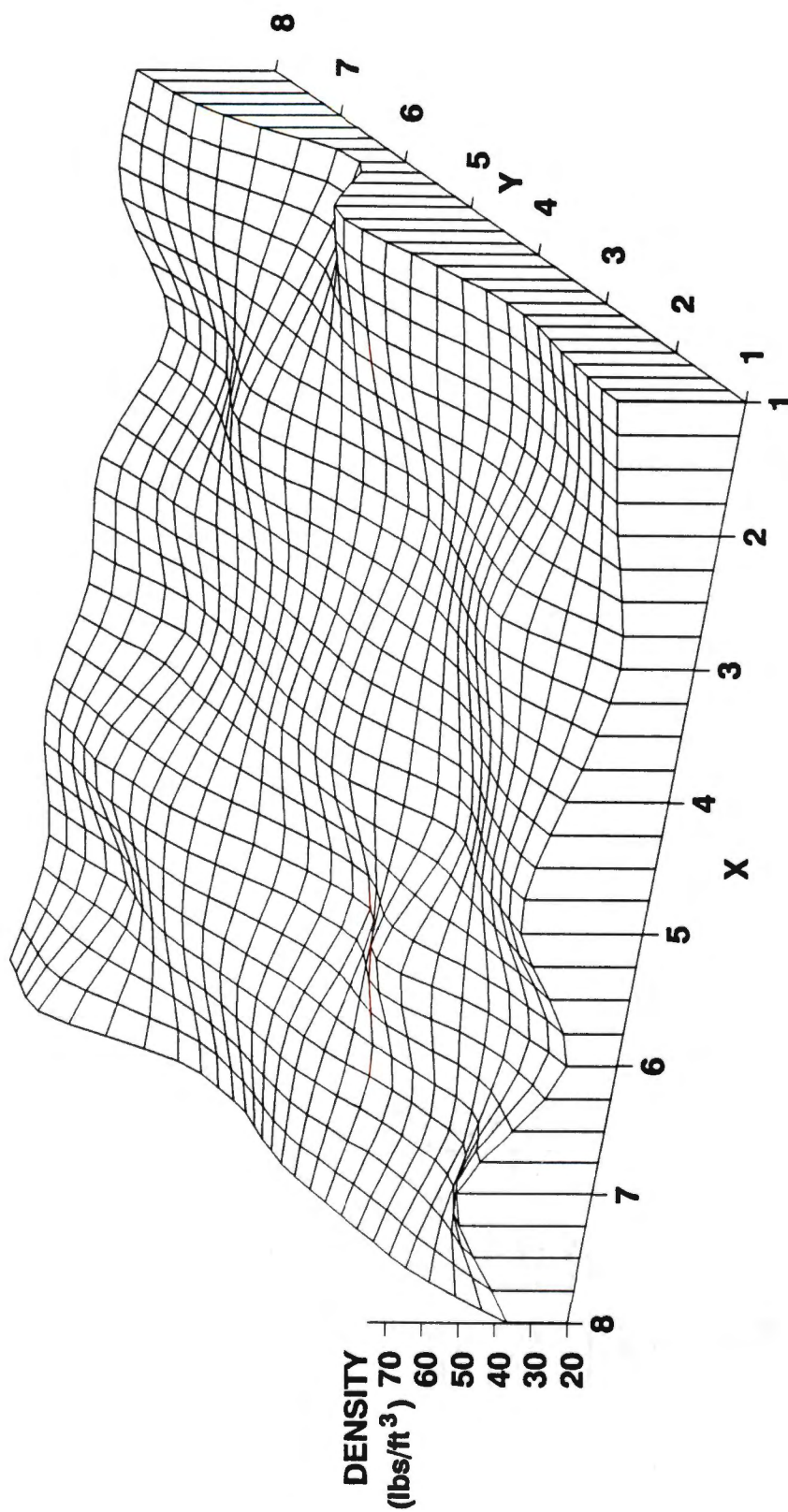
FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 14



FLAKE MOISTURE CONTENT = 4%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 15



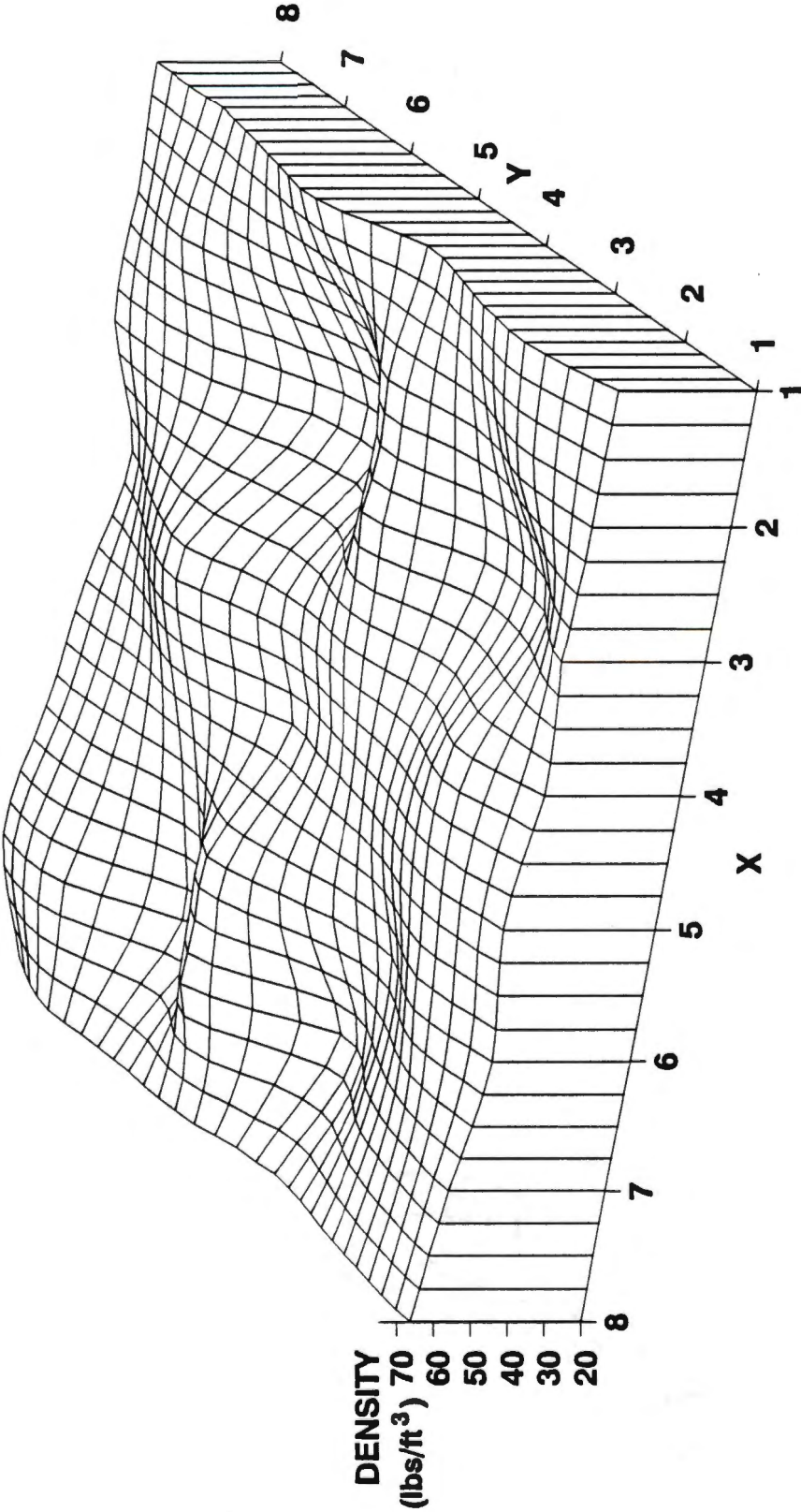
FLAKE MOISTURE CONTENT=4%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=16



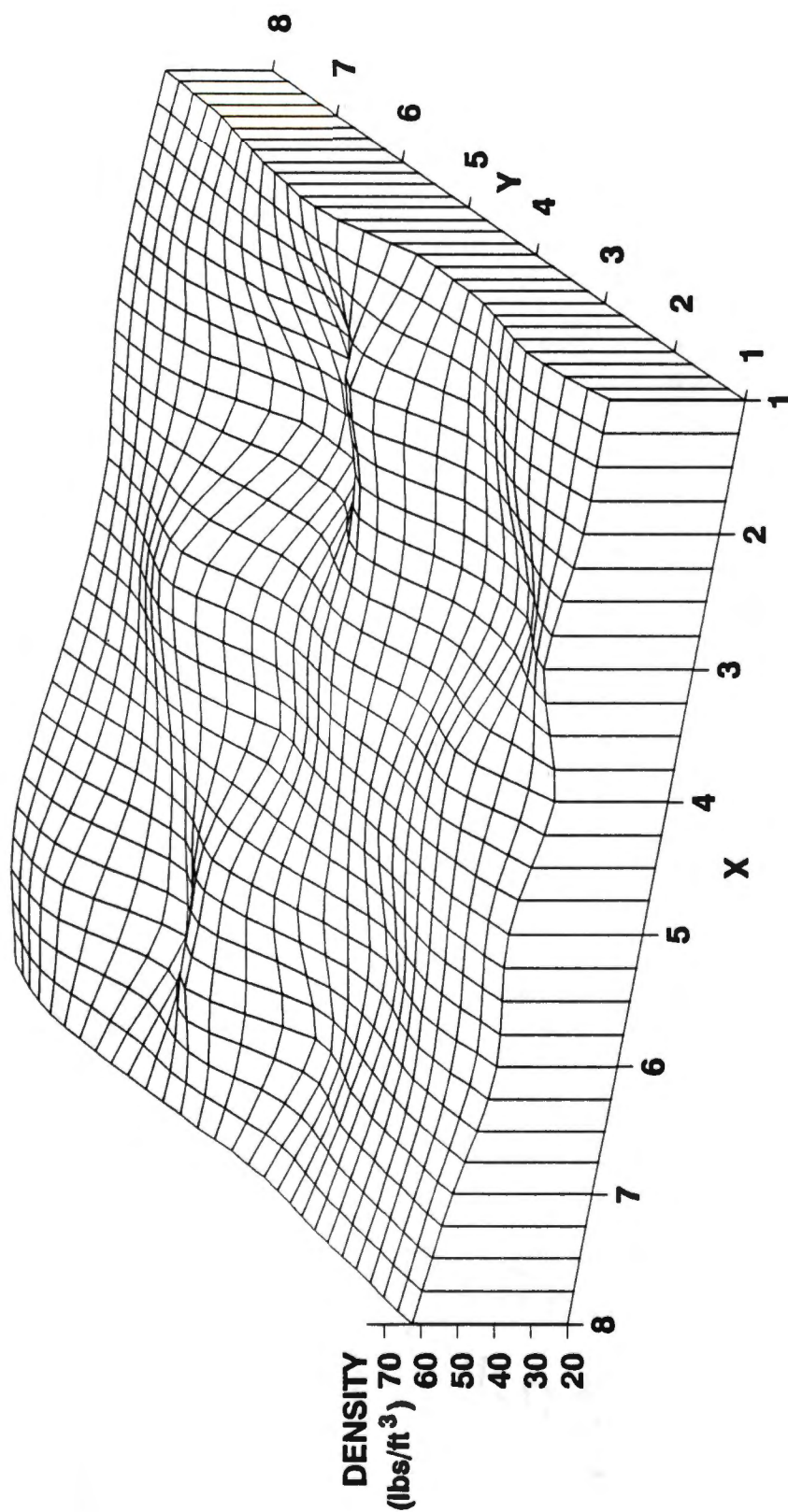
FLAKE MOISTURE CONTENT - 8%

PRESS CLOSURE RATE - 20 SECONDS

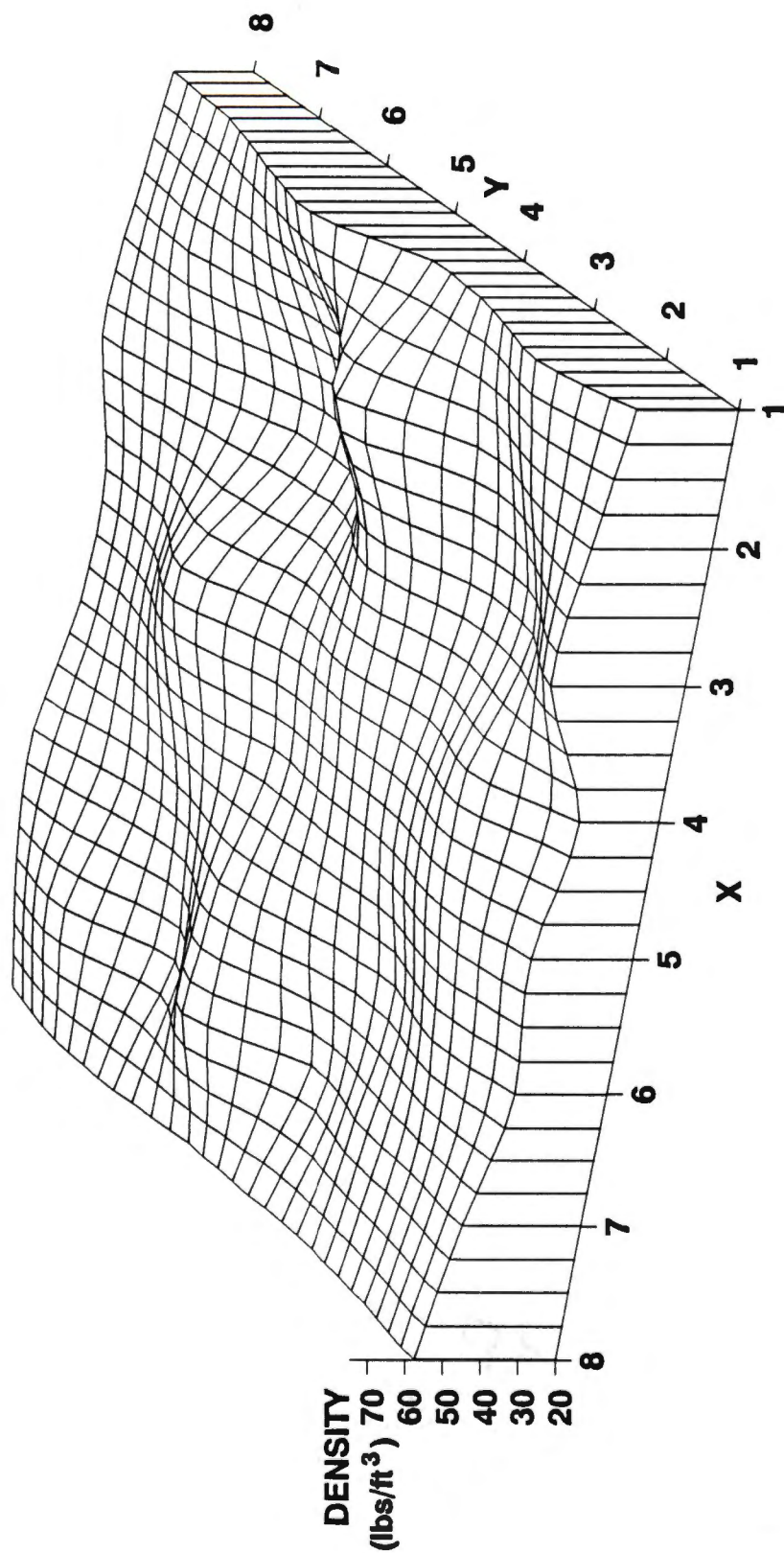
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 1



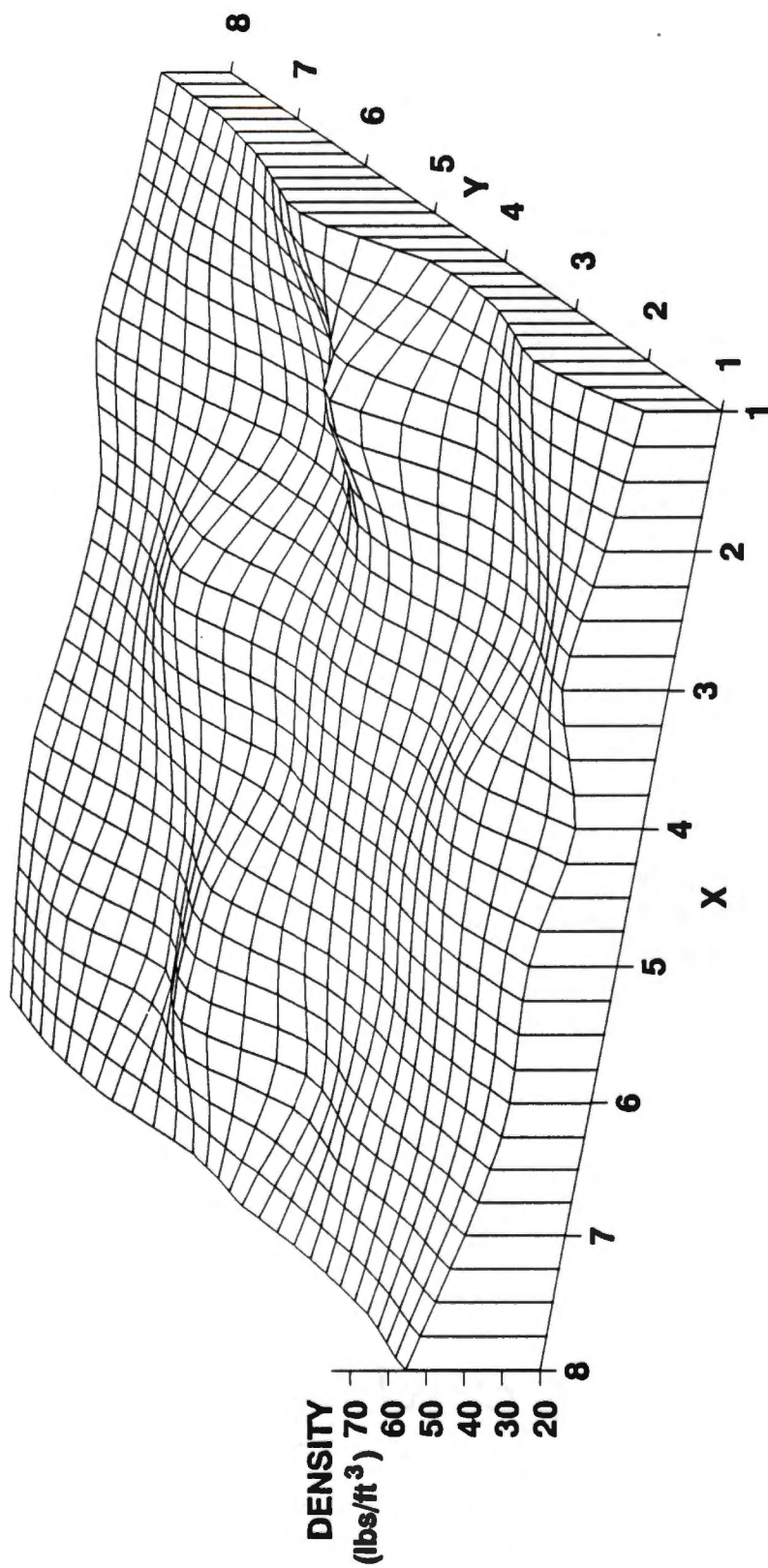
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=2



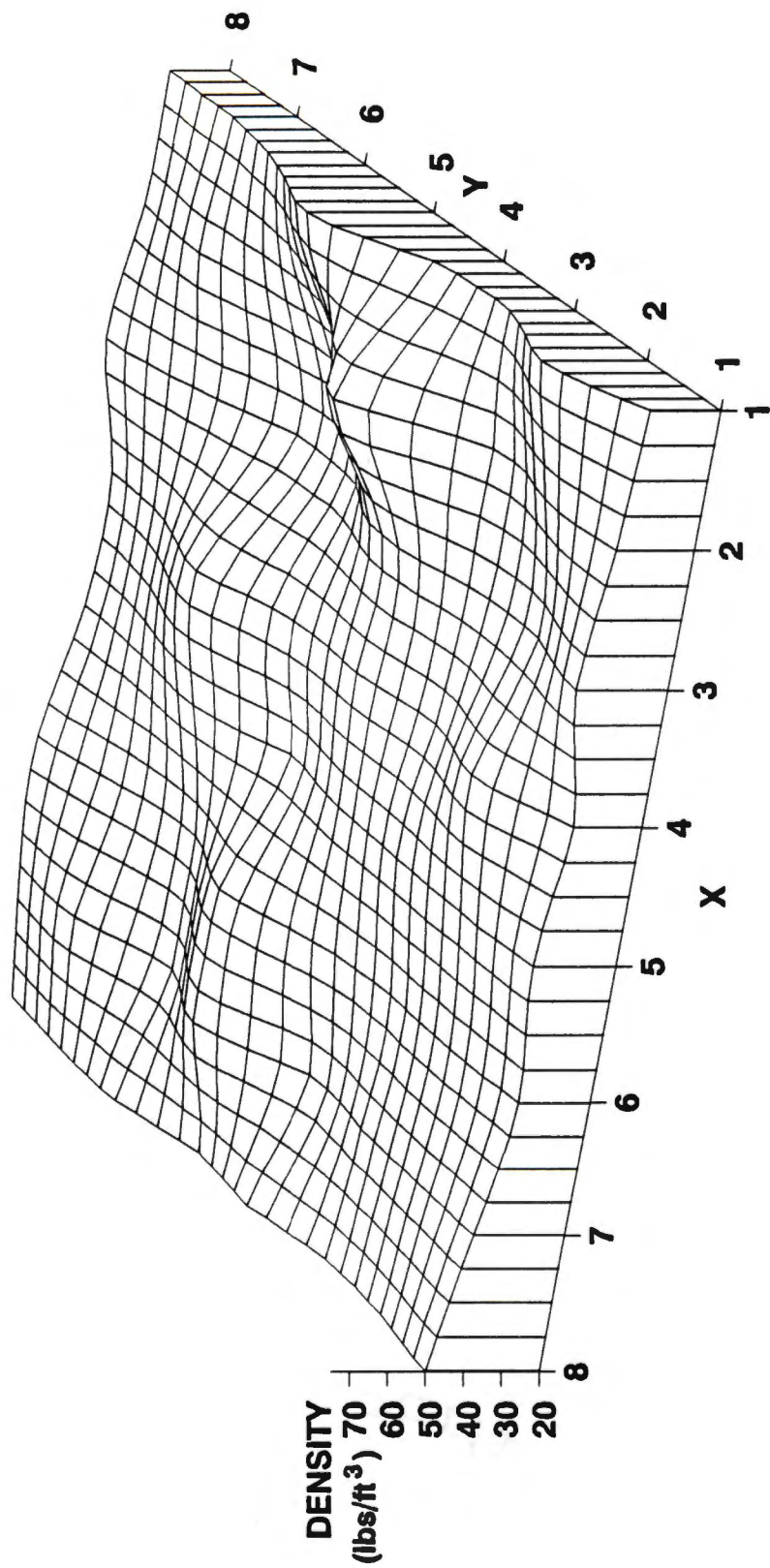
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=3



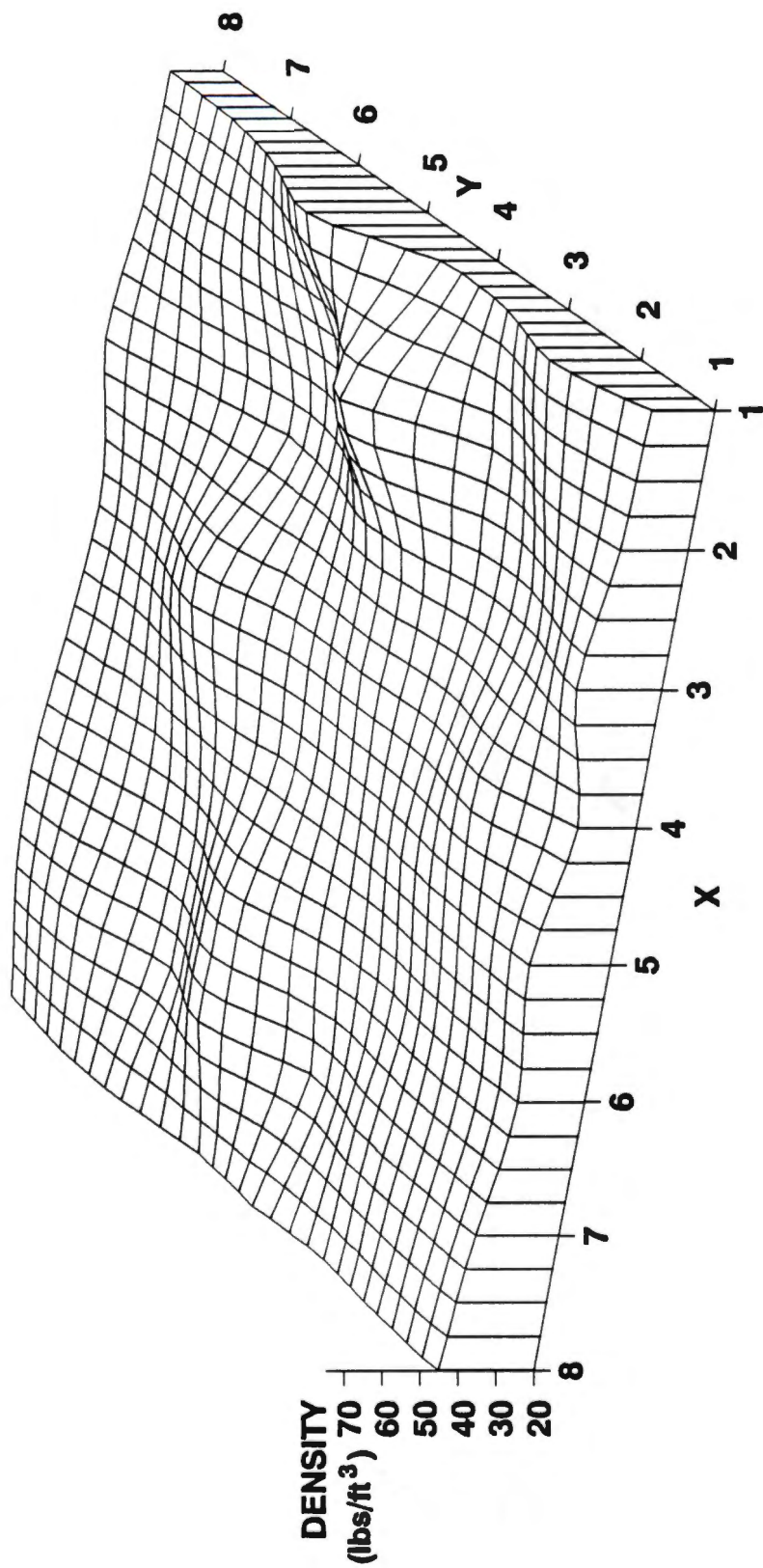
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 4



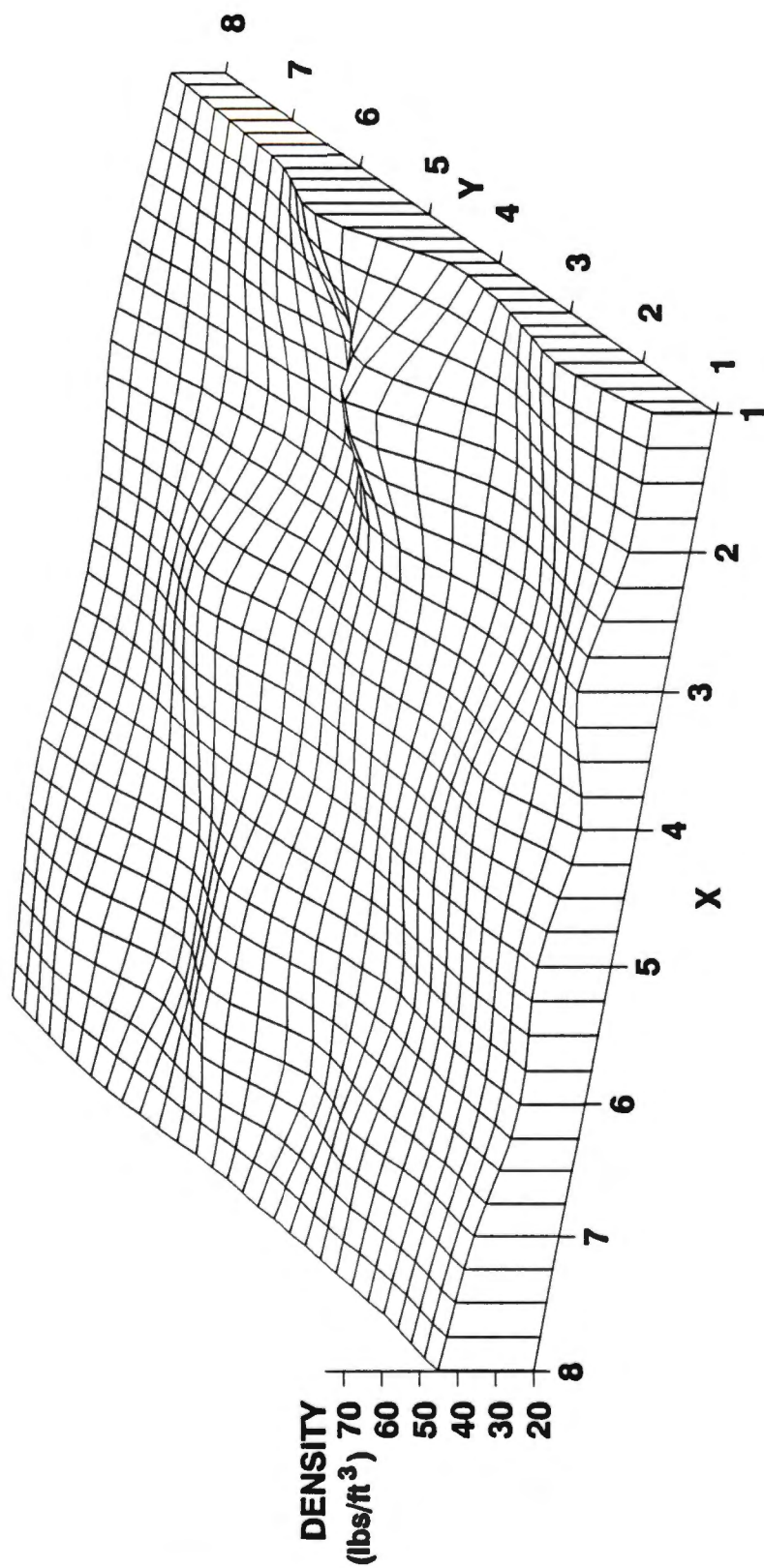
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 5



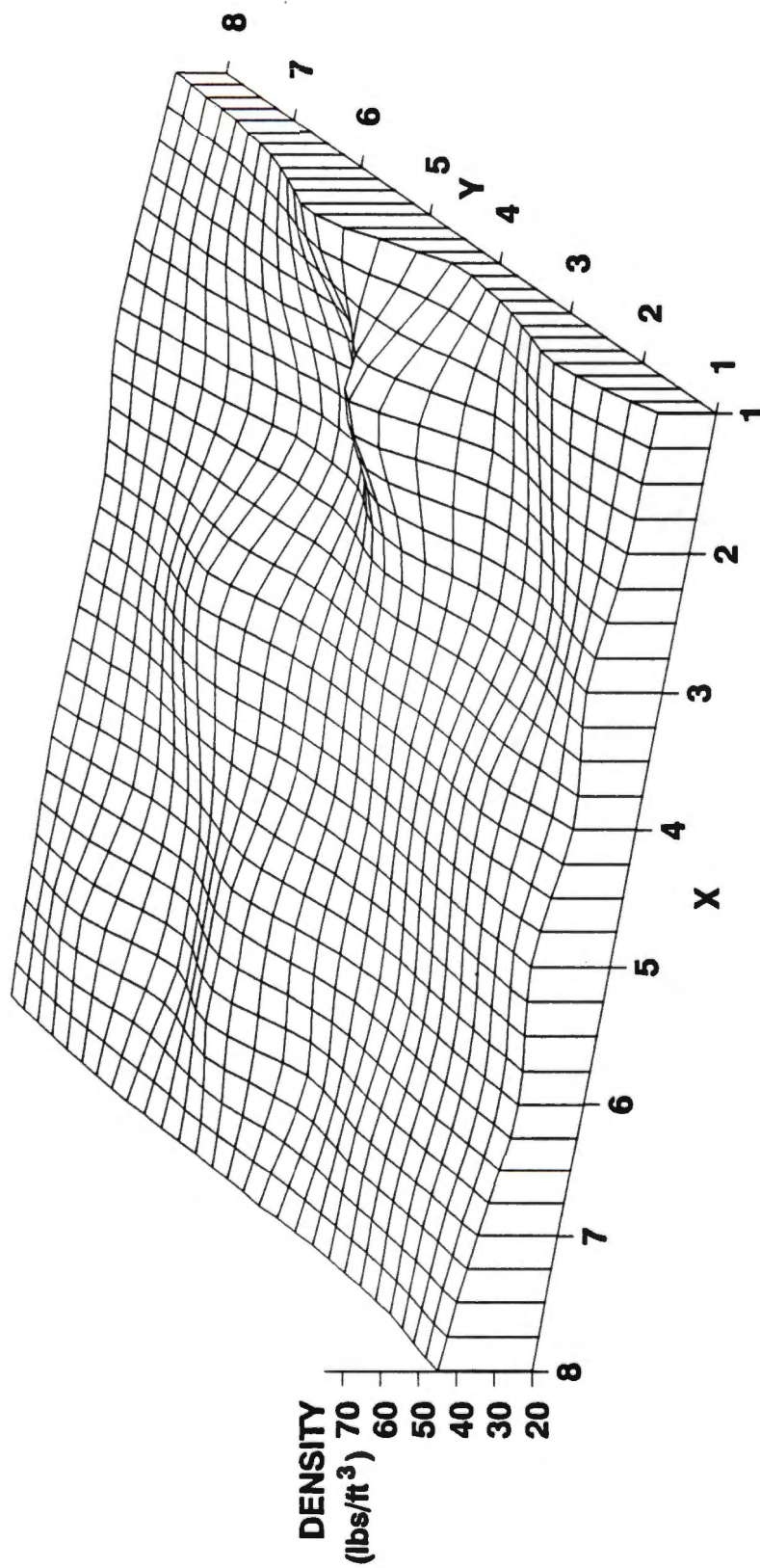
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 6



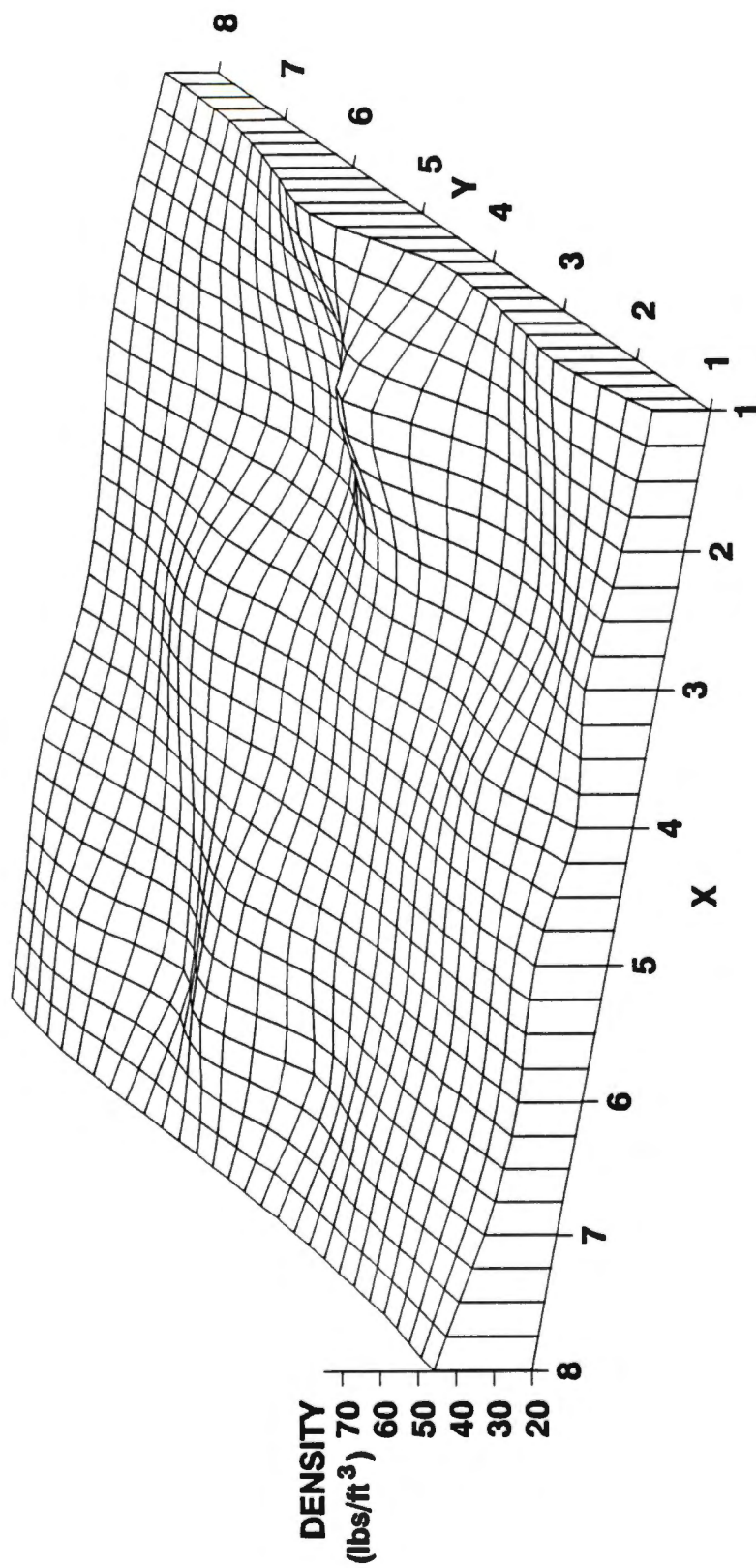
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=7



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=8



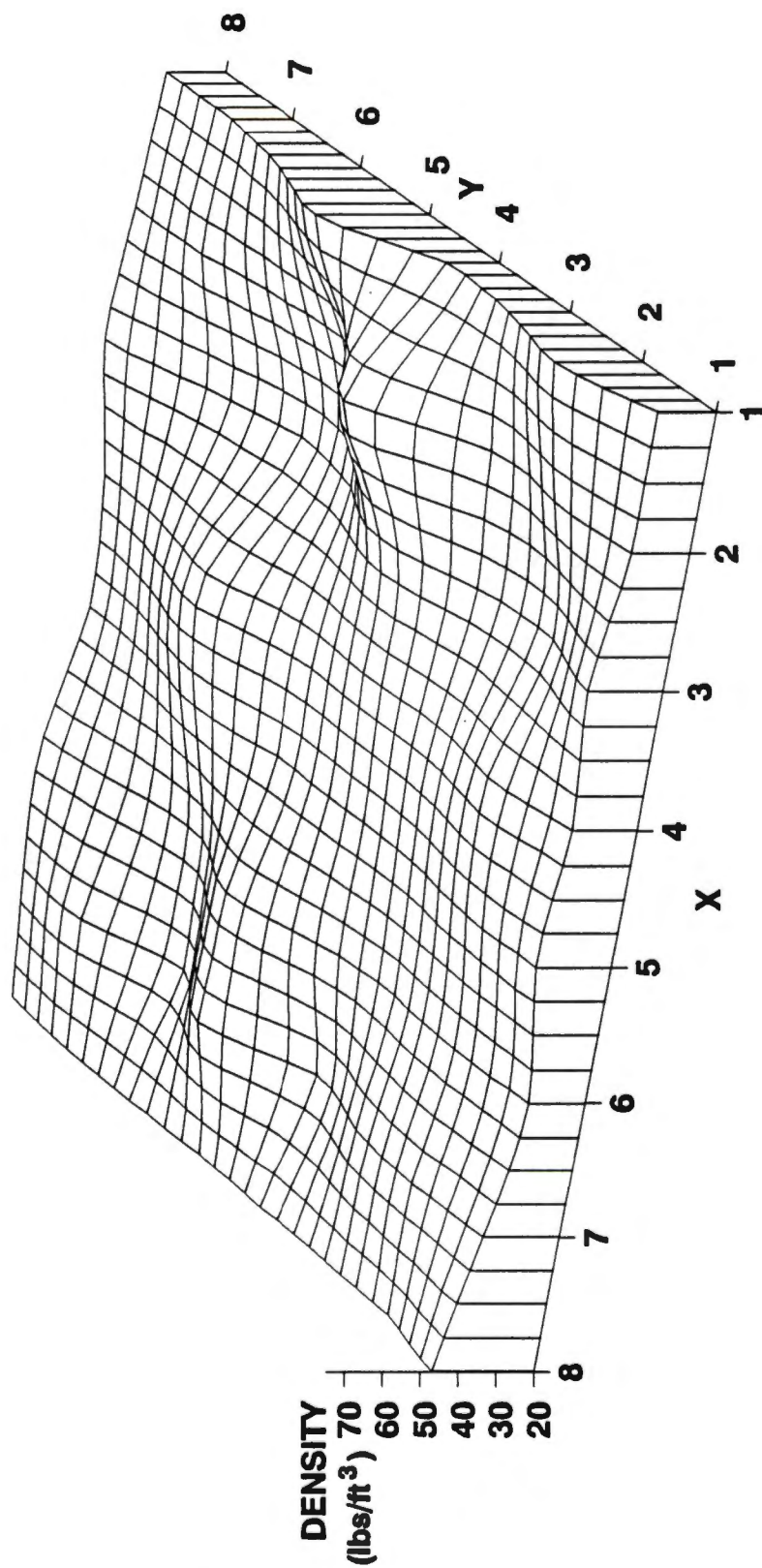
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=9



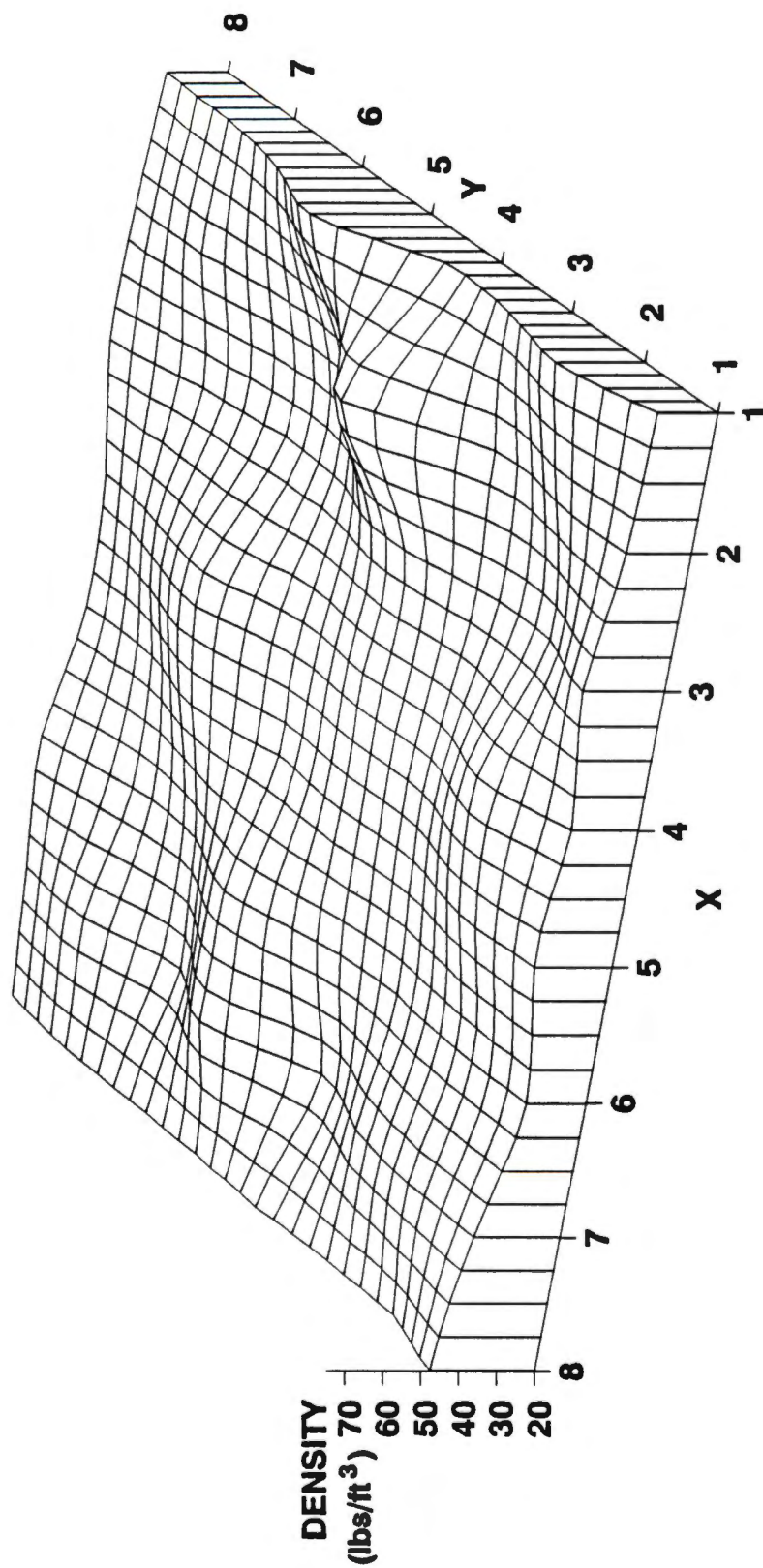
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS

REPLICATION=1

Z=10



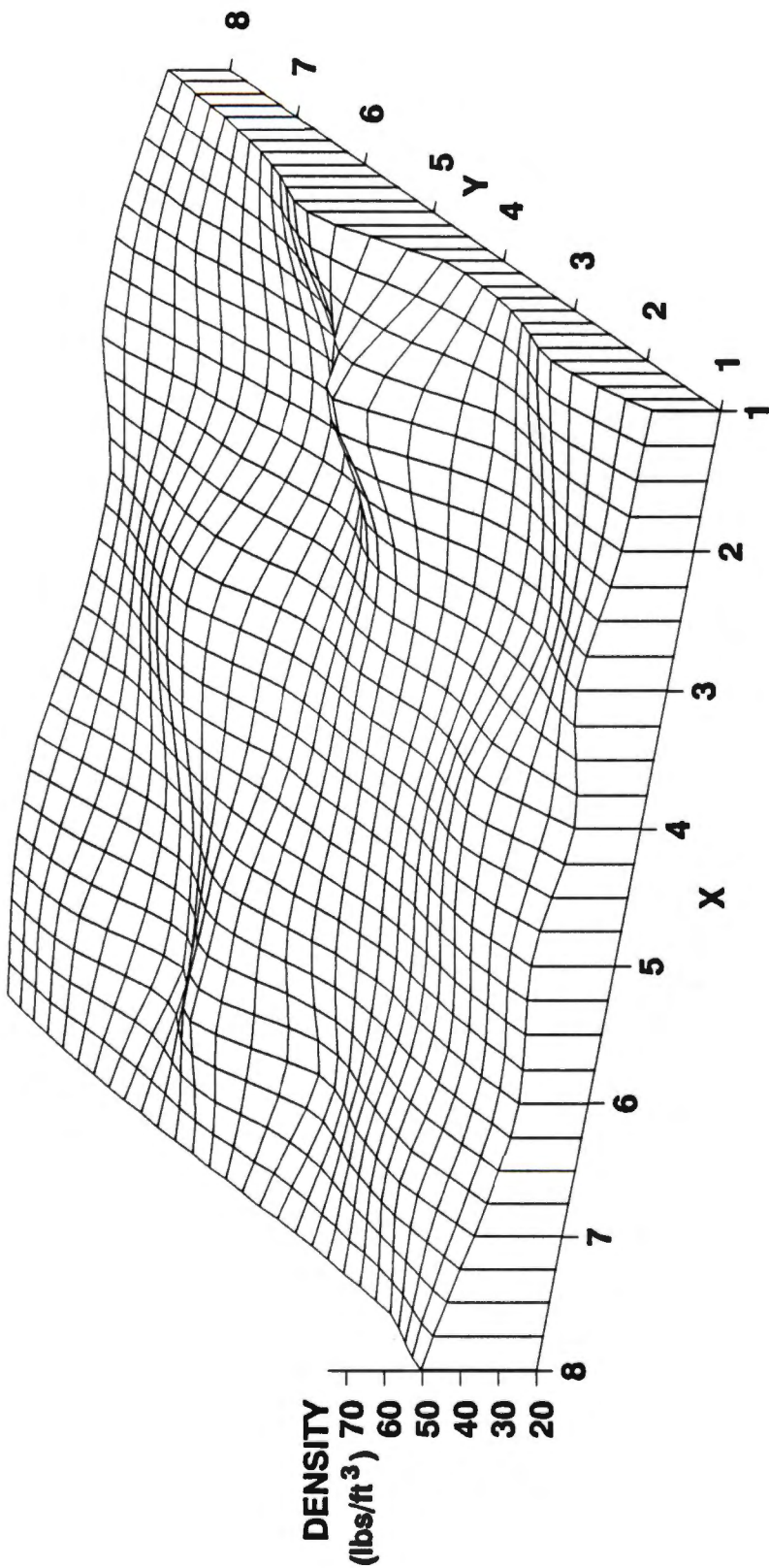
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=11



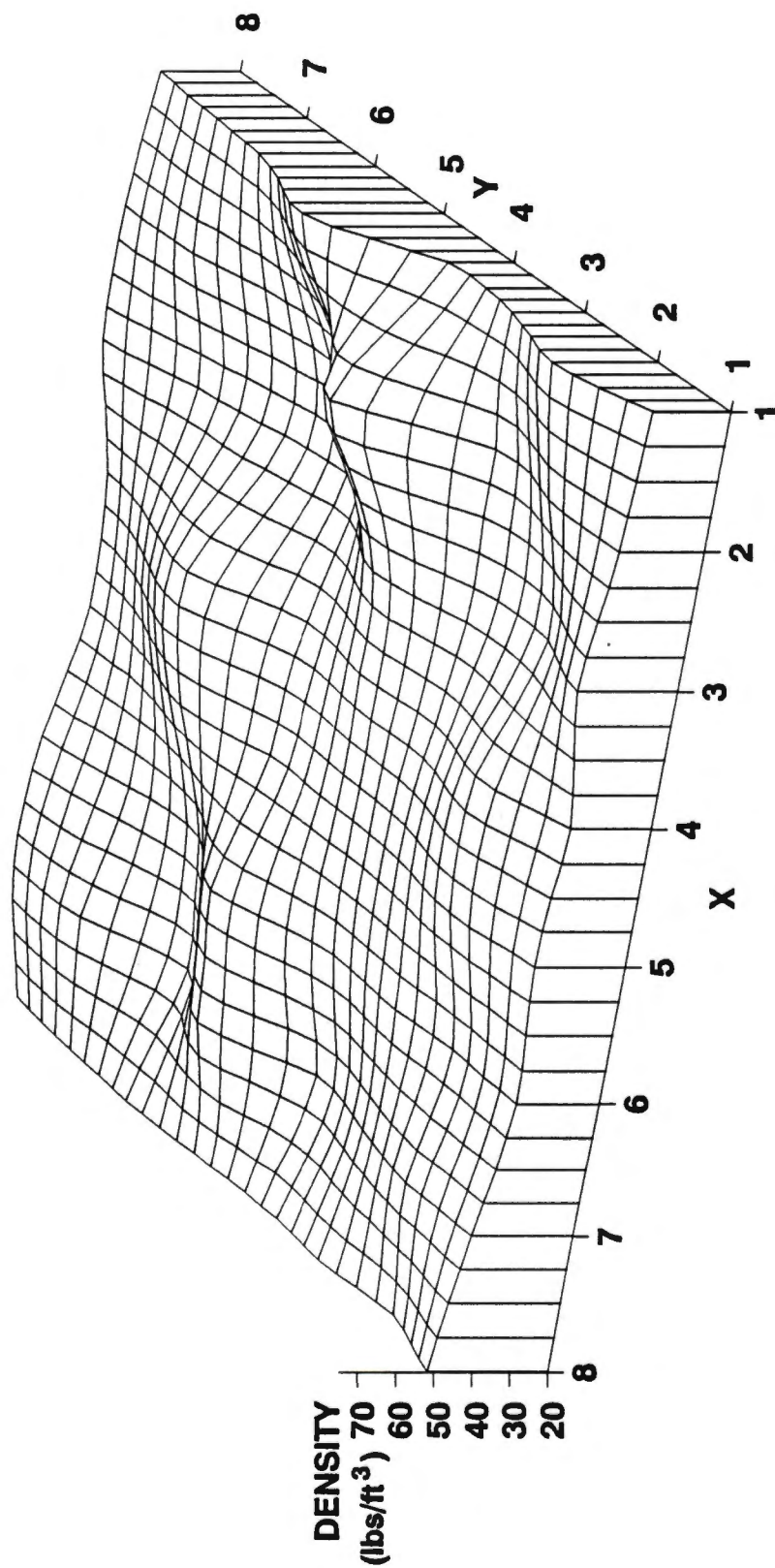
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 1

Z = 12



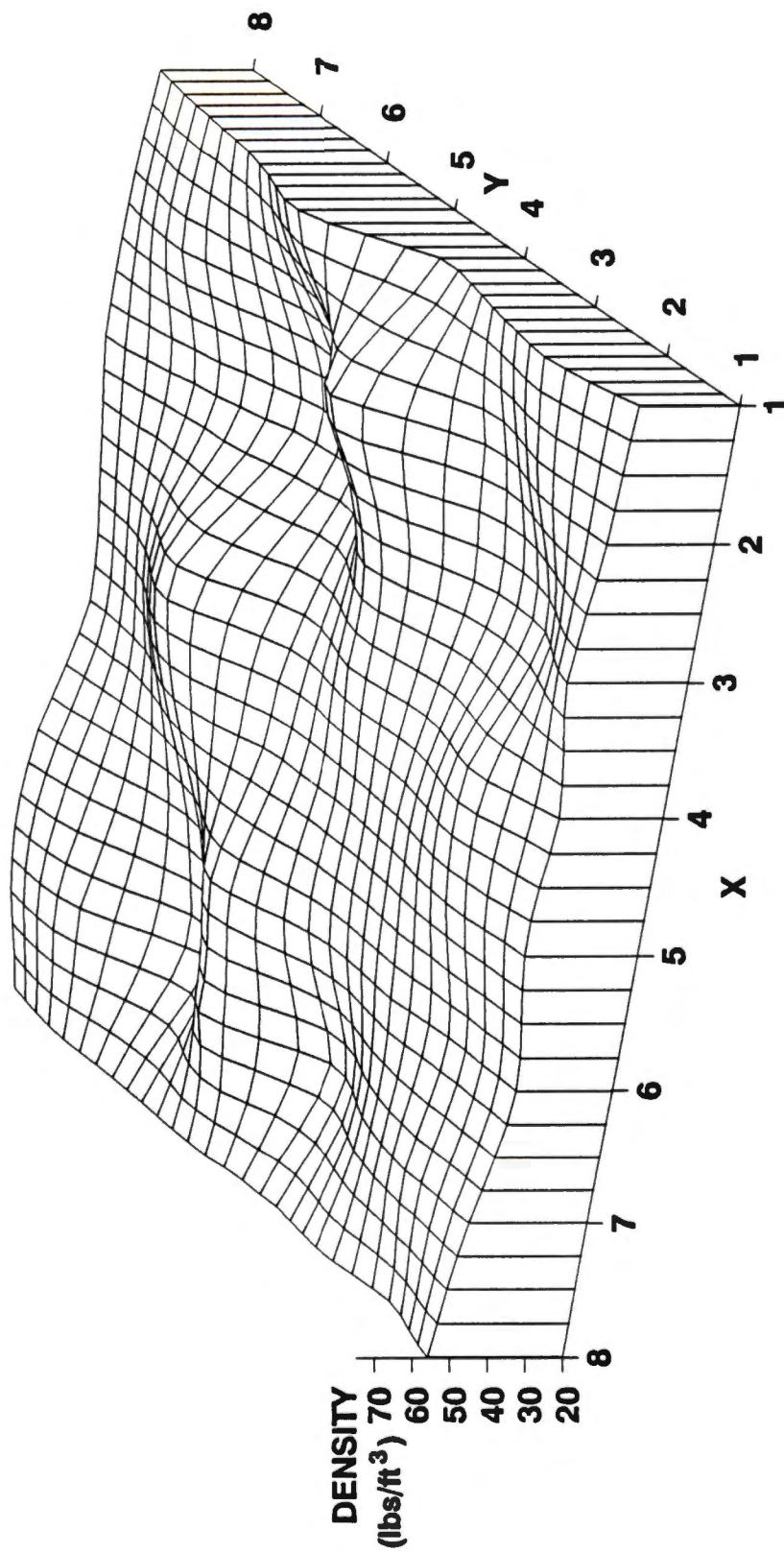
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=13



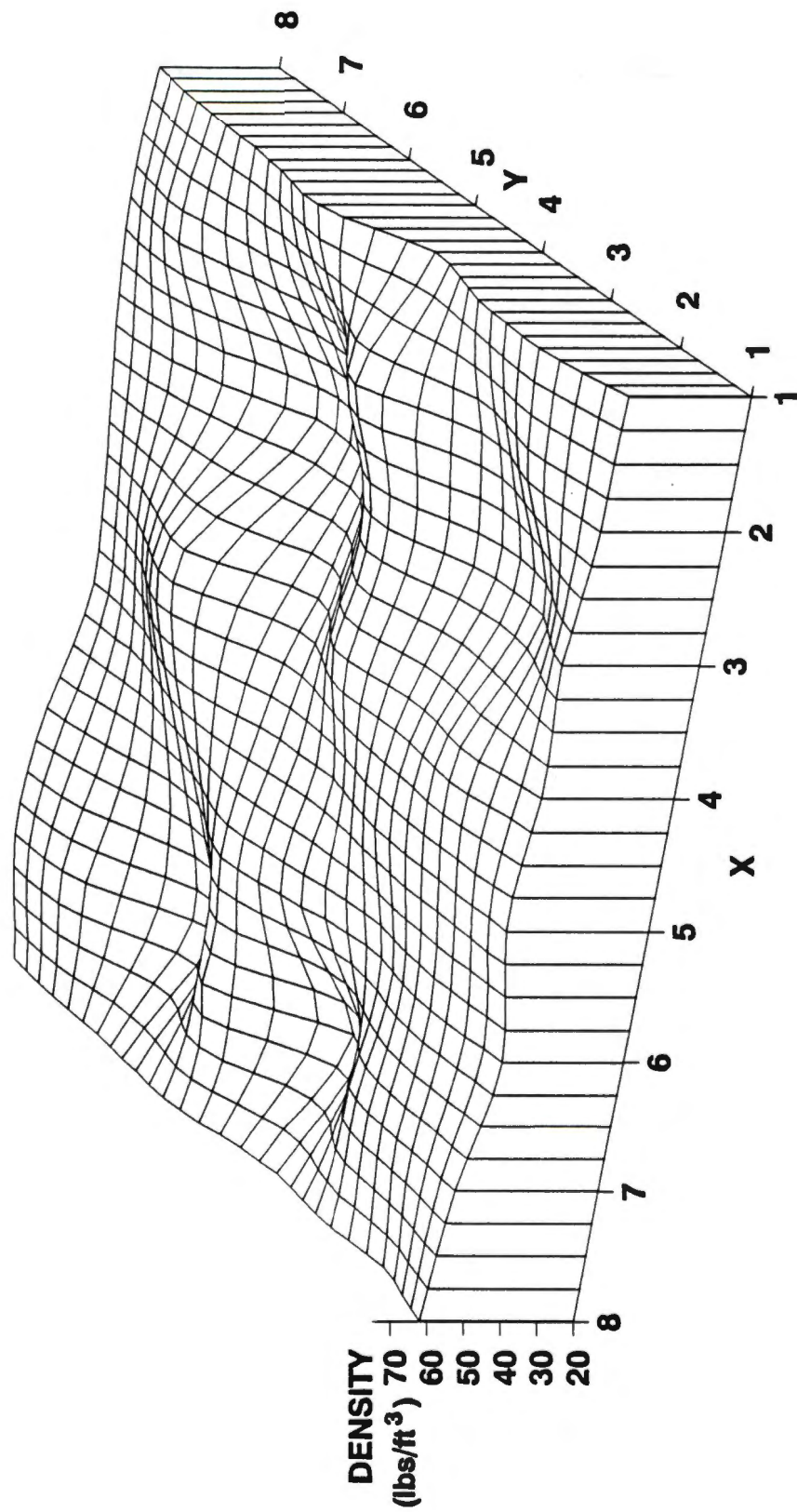
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 1

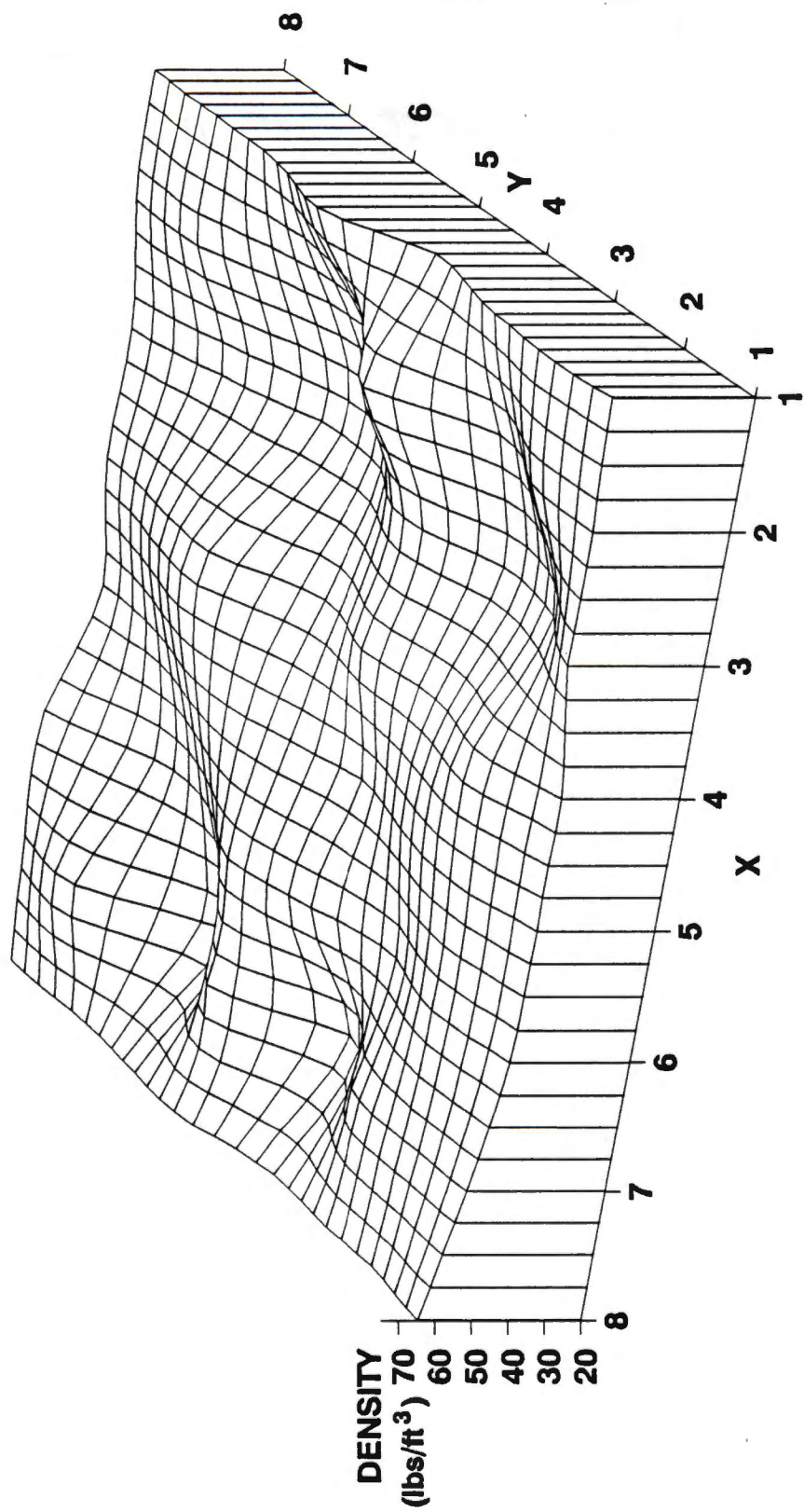
Z = 14



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 15



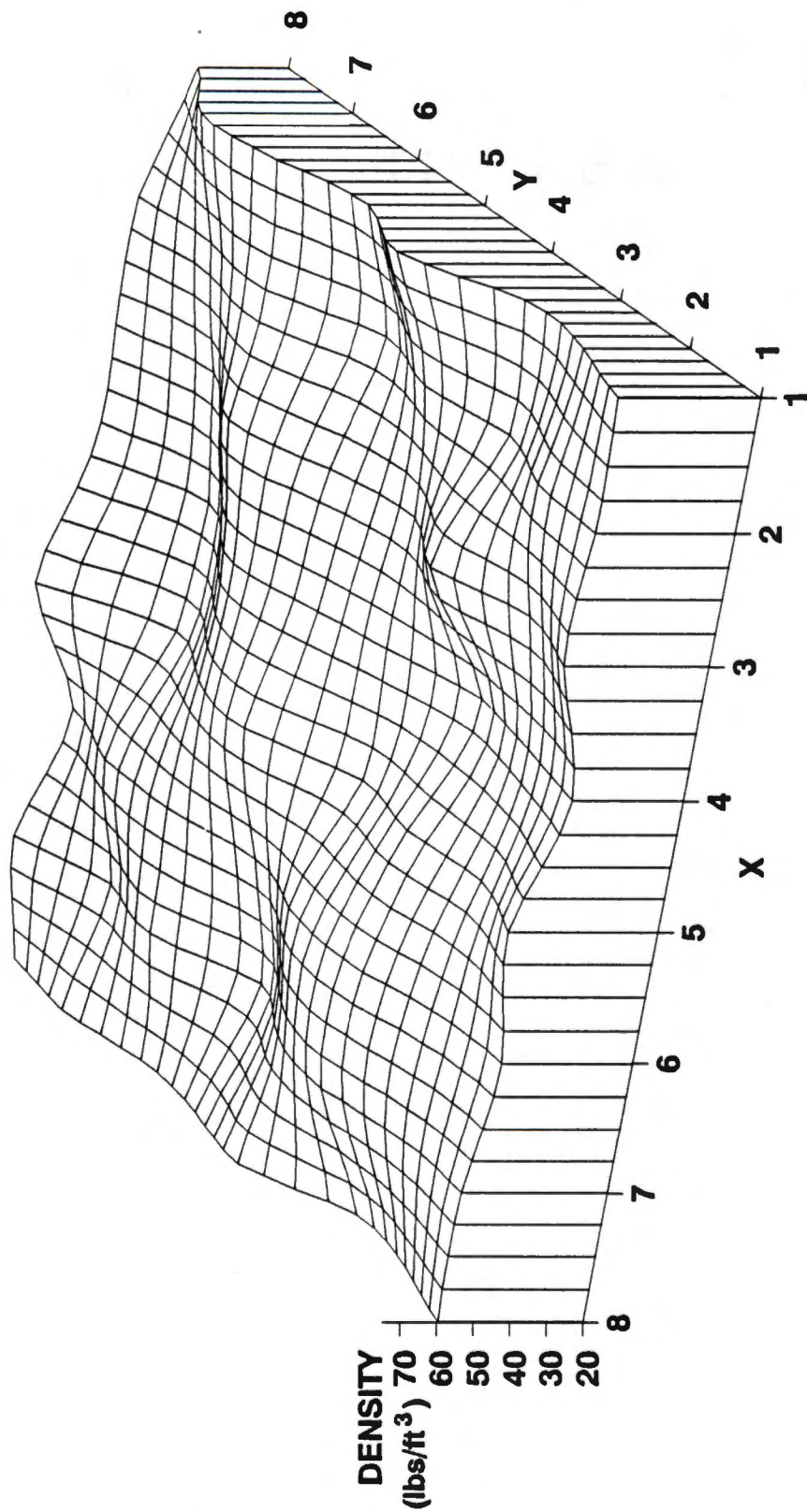
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 16



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS

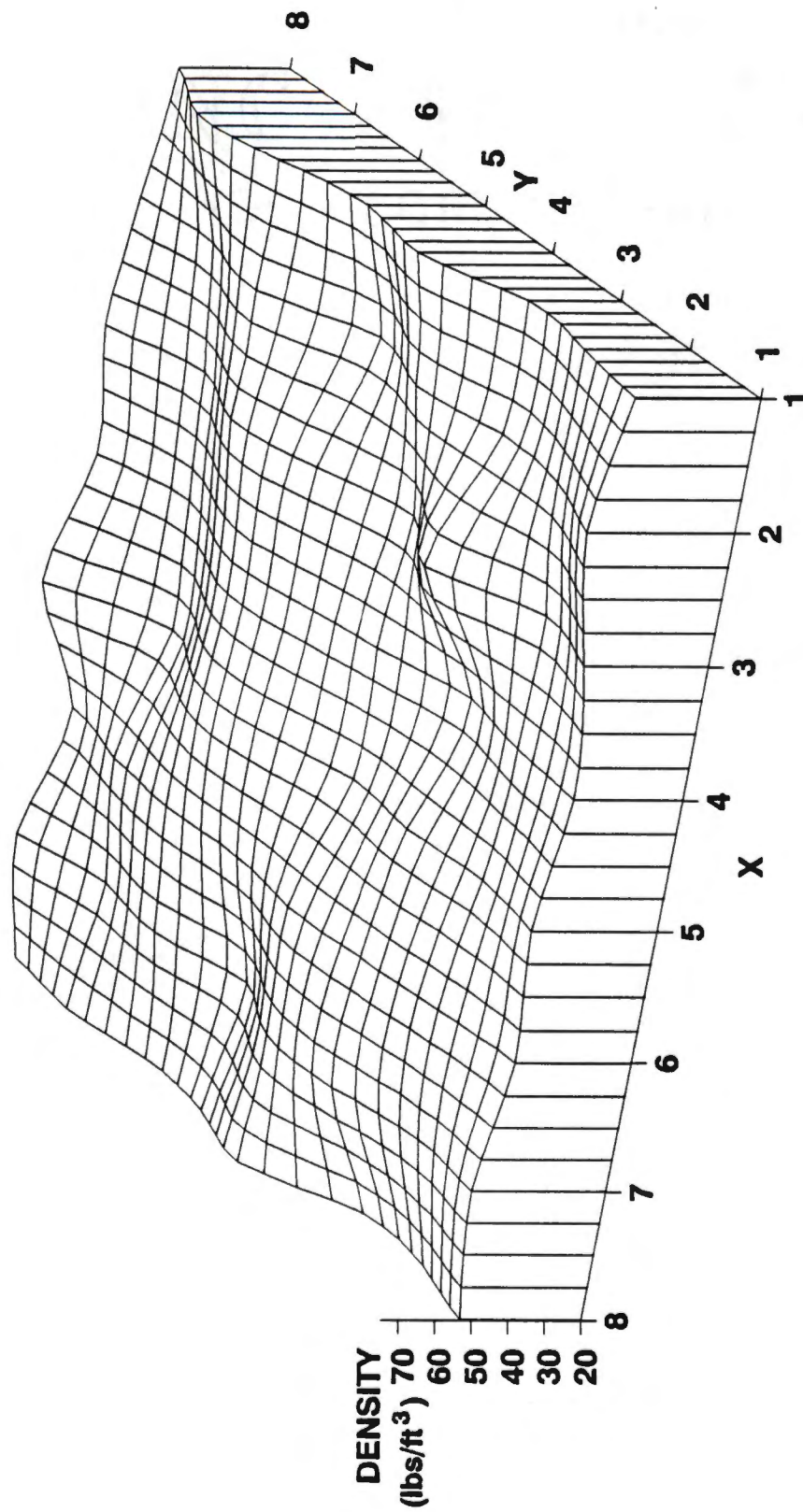
REPLICATION=2

Z=1

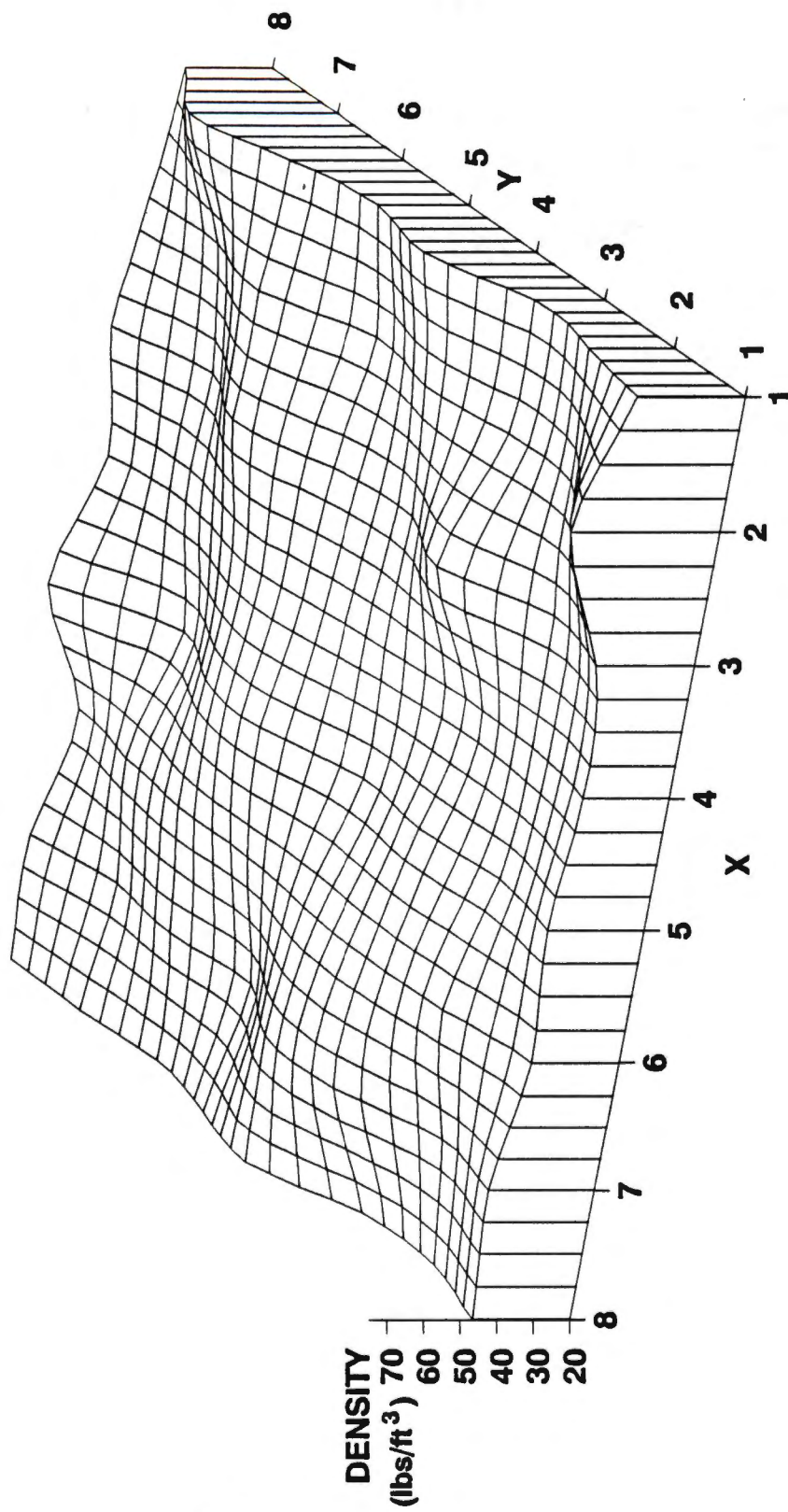


**FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2**

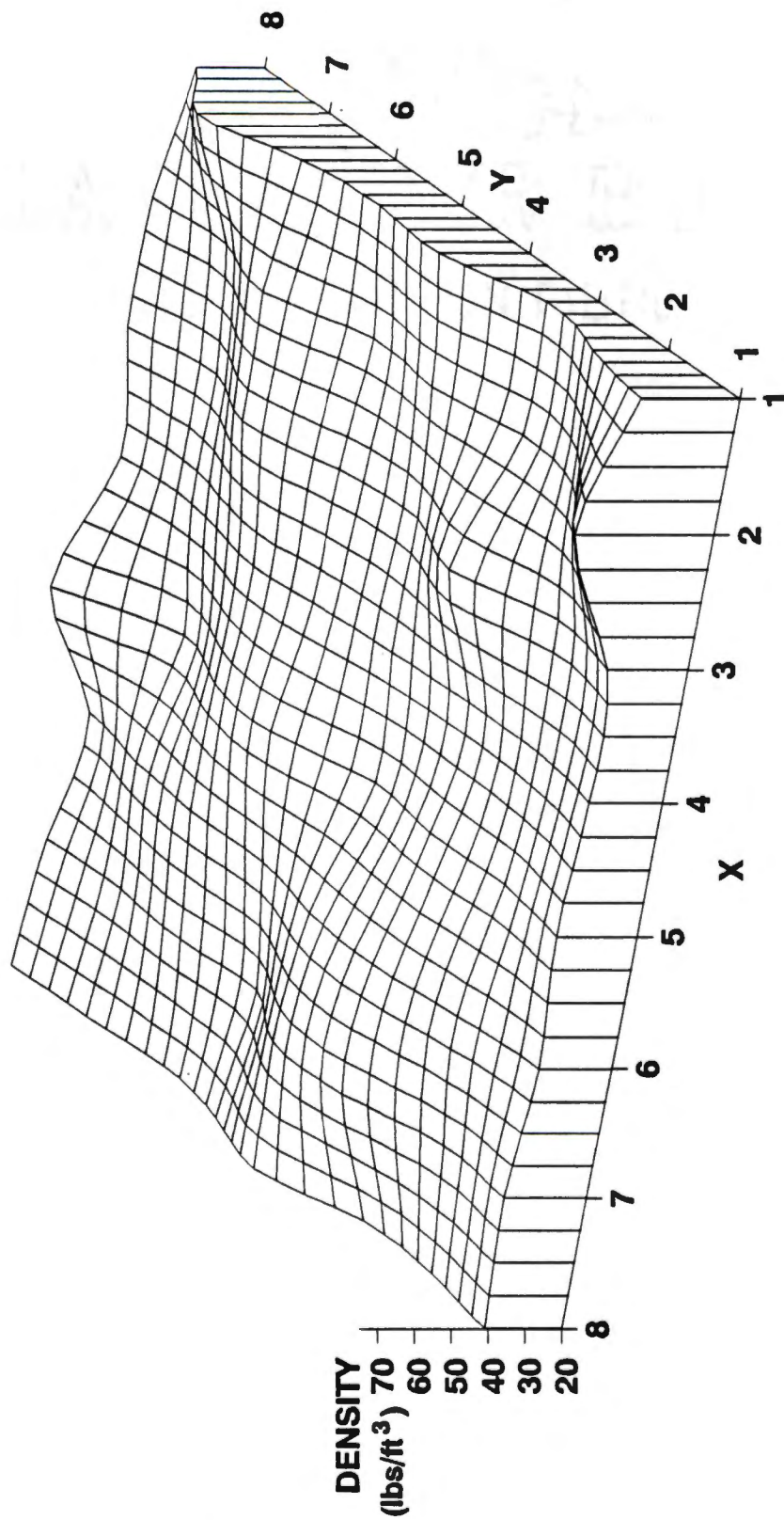
Z=2



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=3



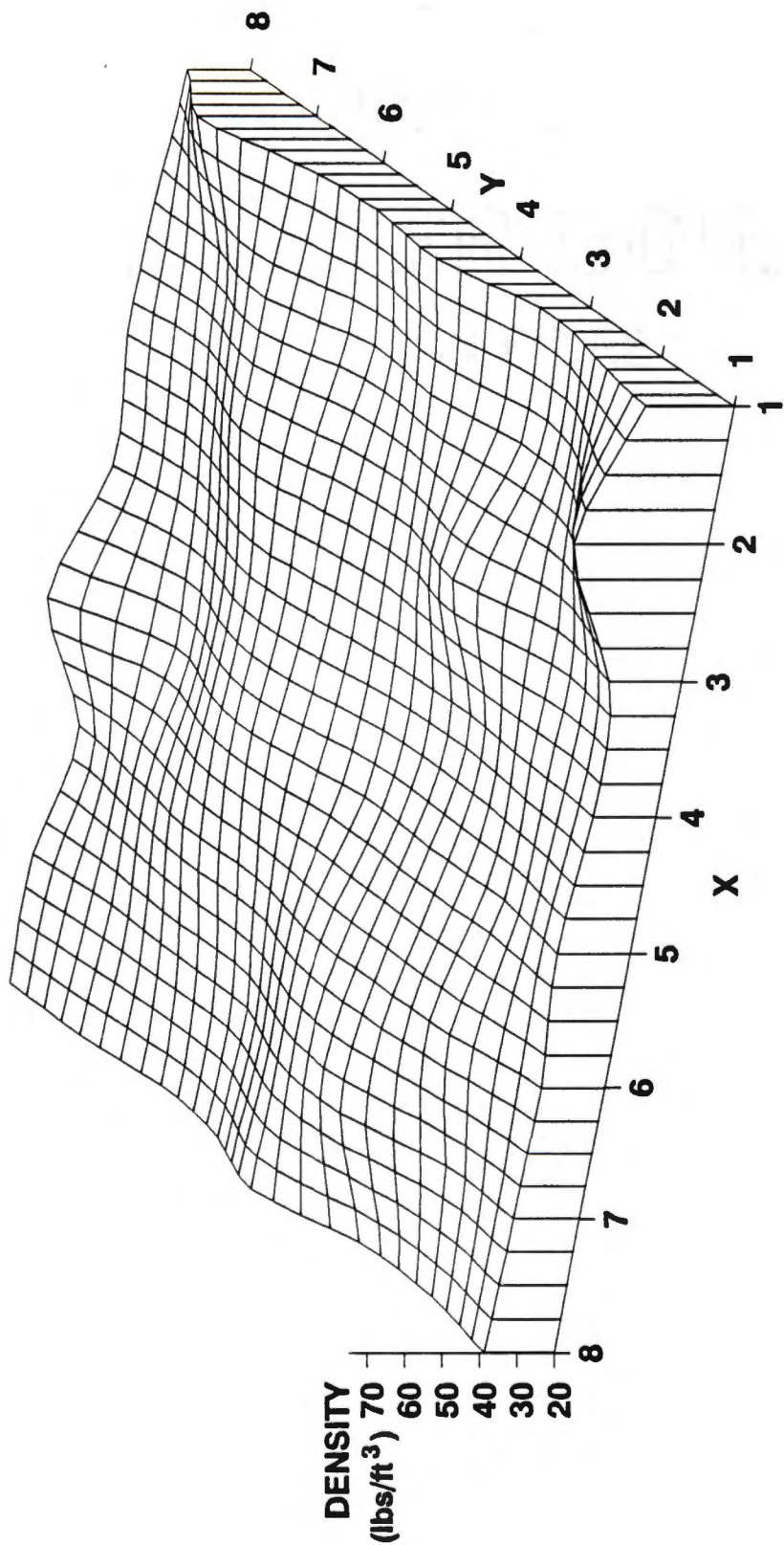
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=4



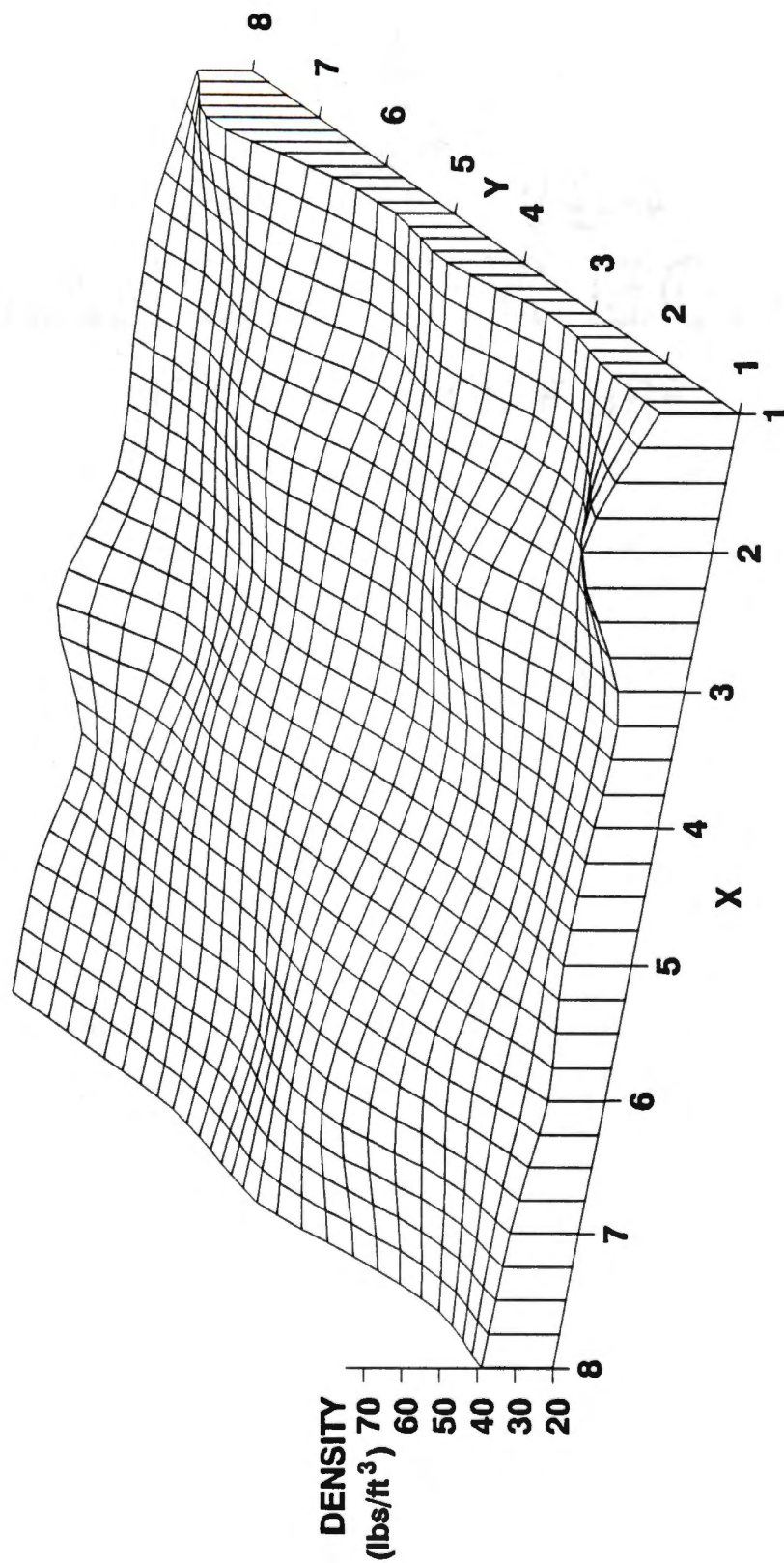
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

Z = 5



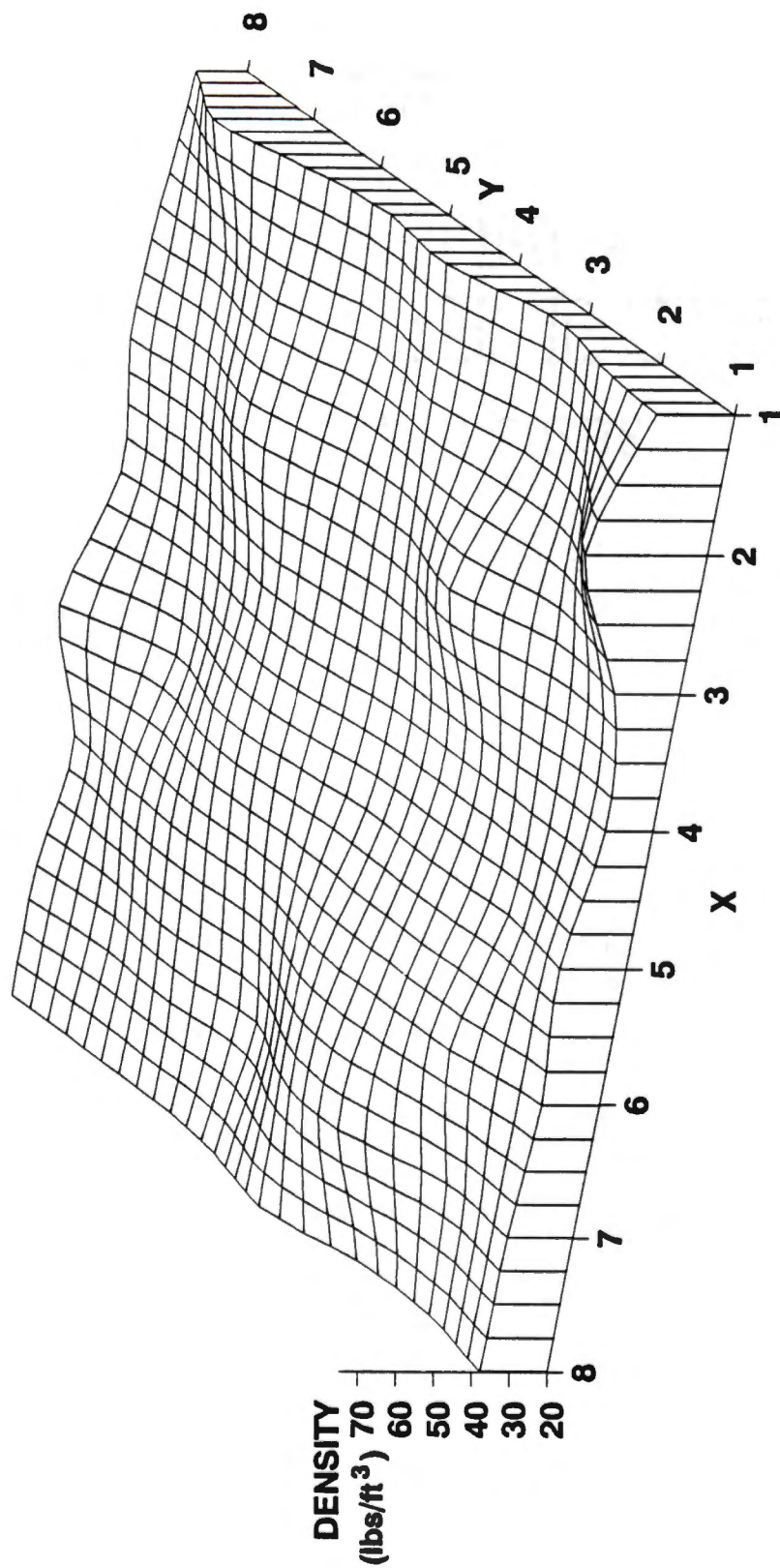
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=6



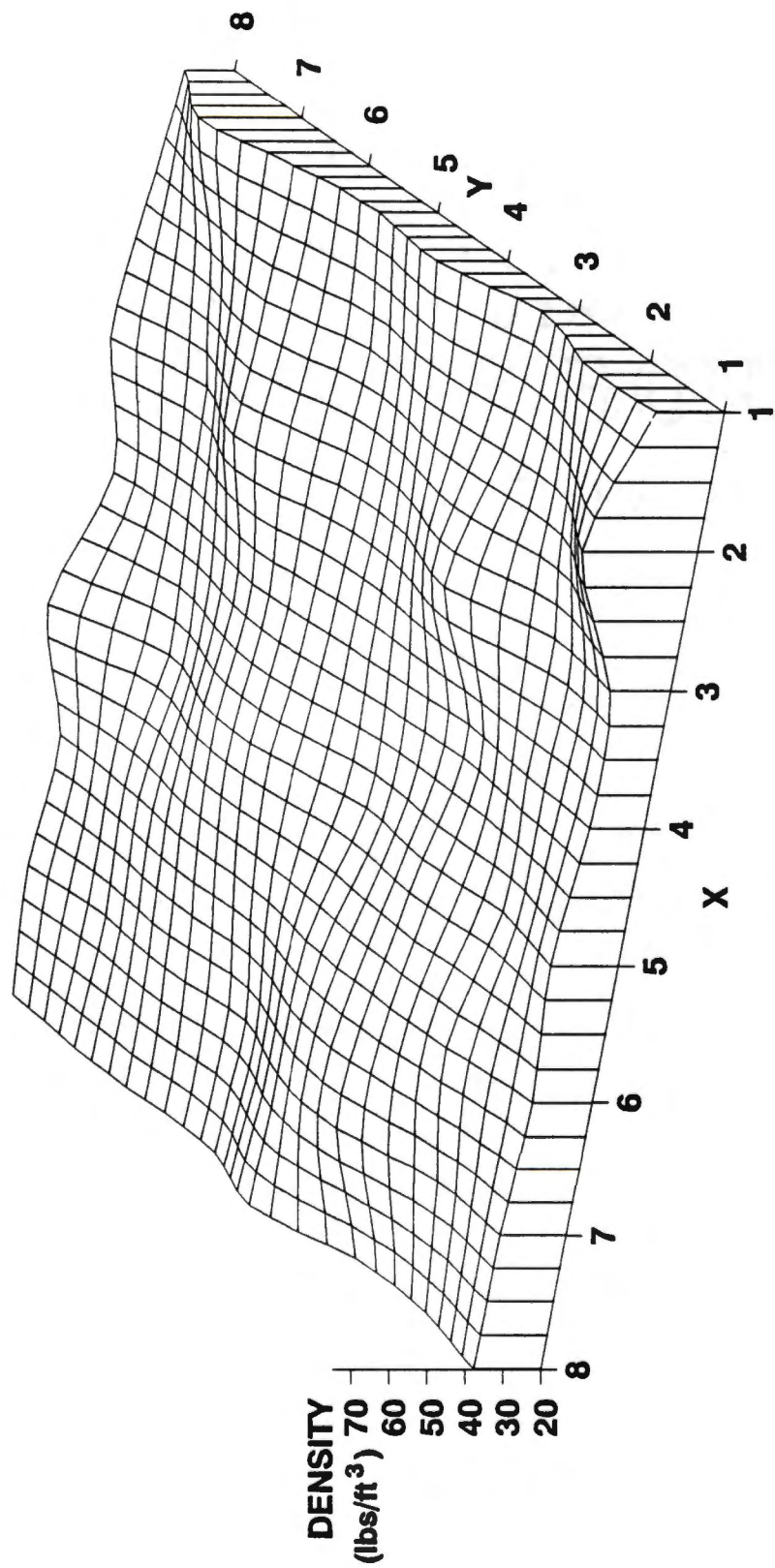
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

Z = 7



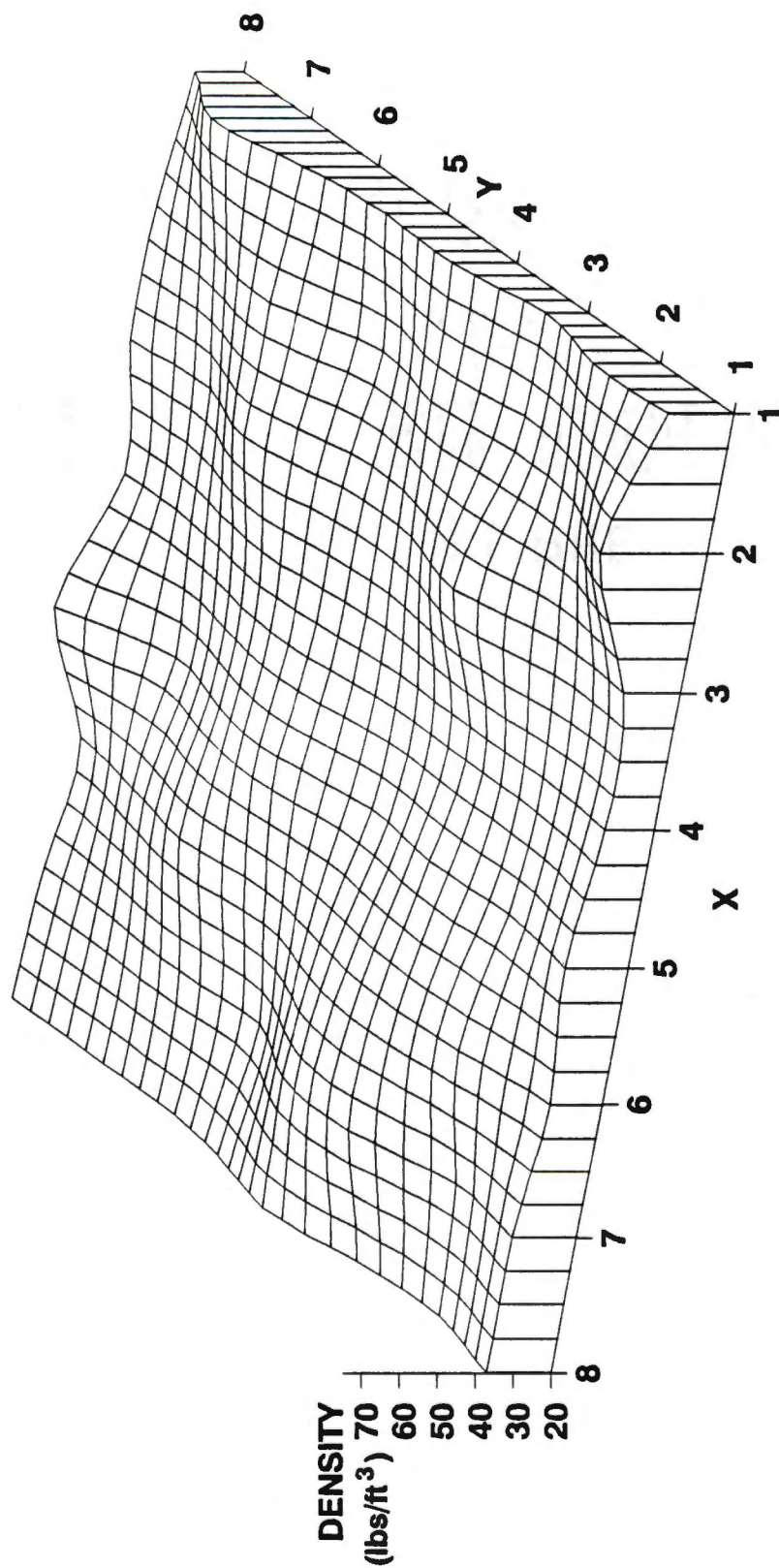
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 8



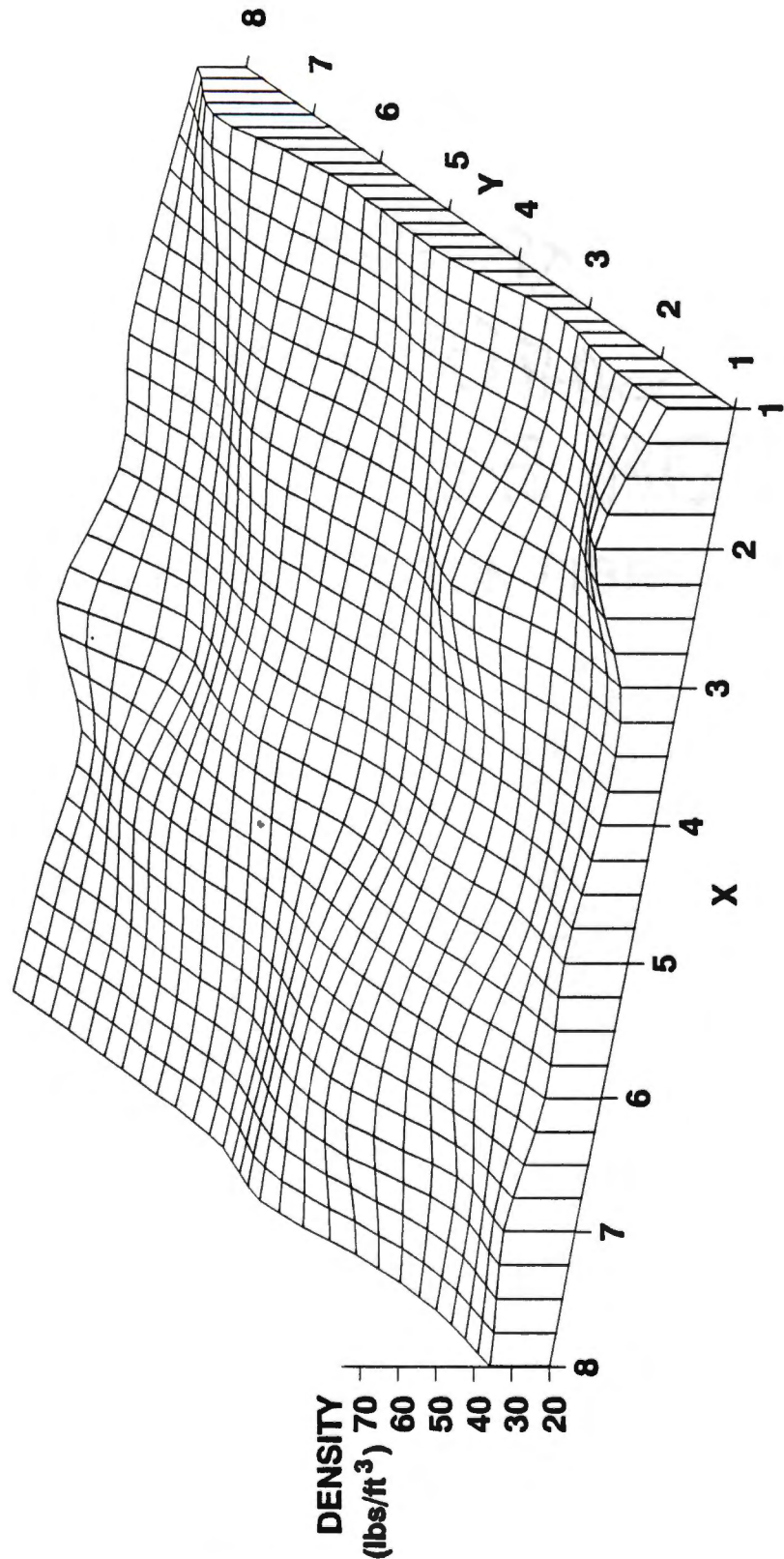
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

Z = 9



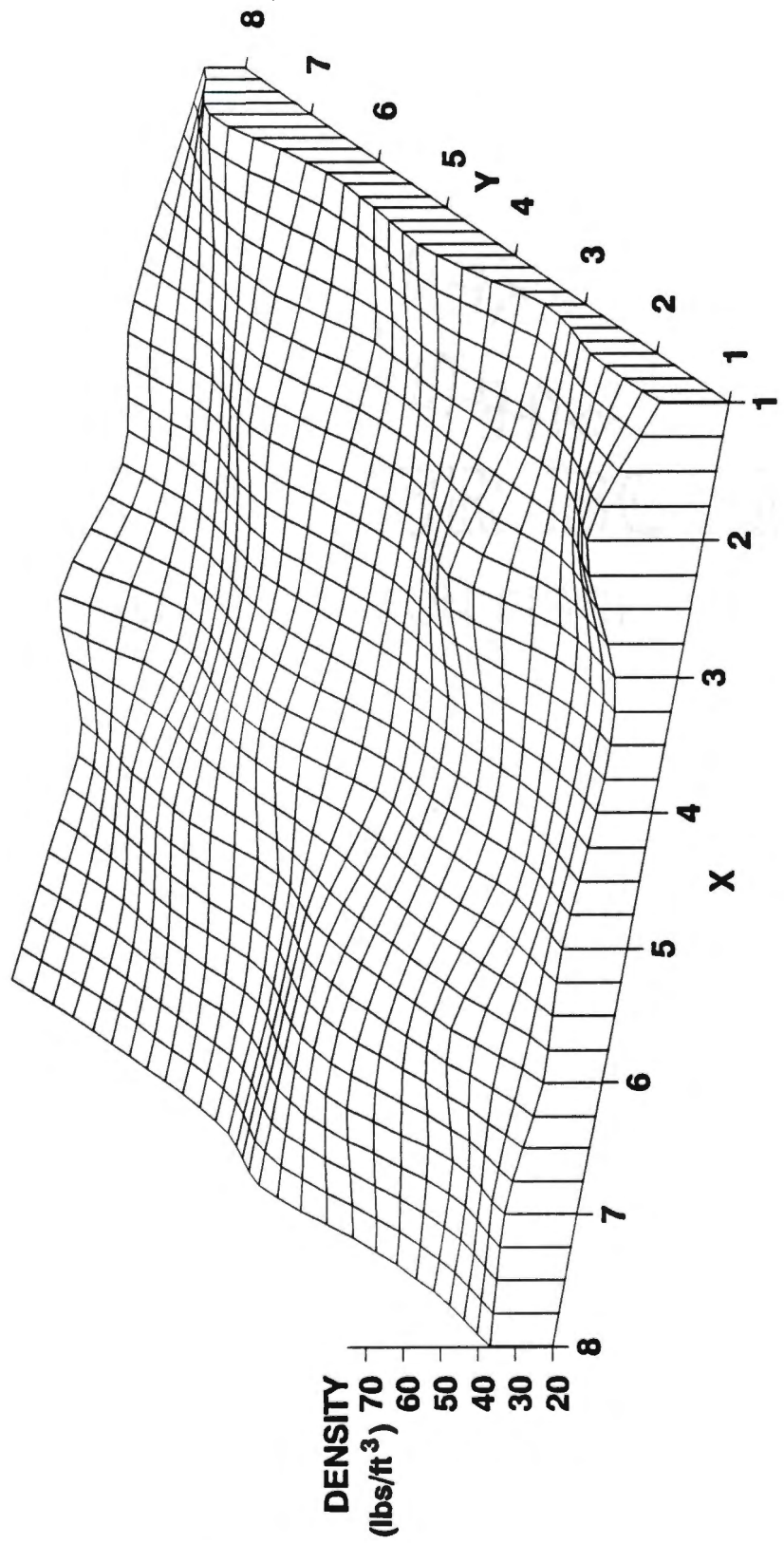
FLAKE MOISTURE CONTENT =8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=10



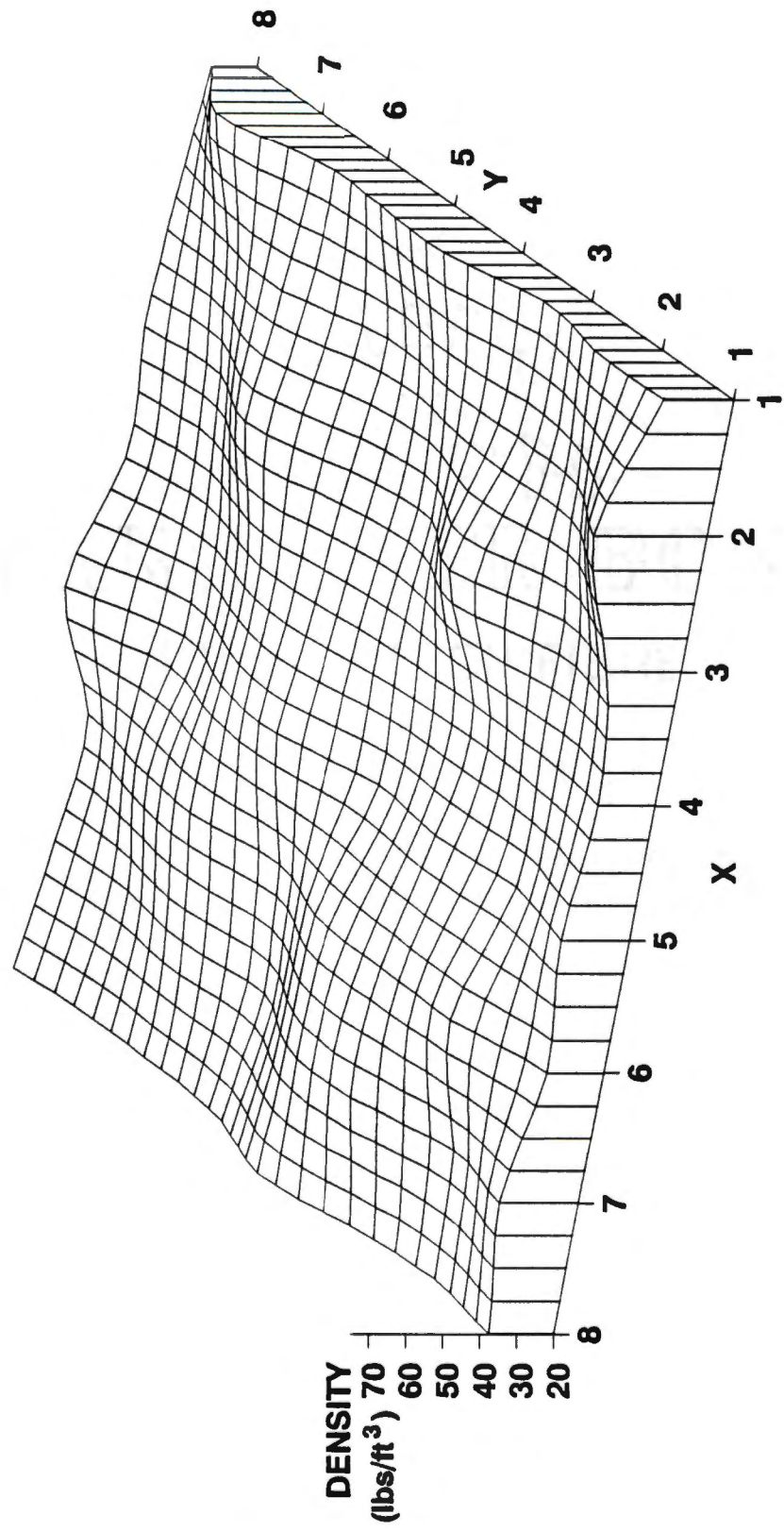
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS

REPLICATION=2

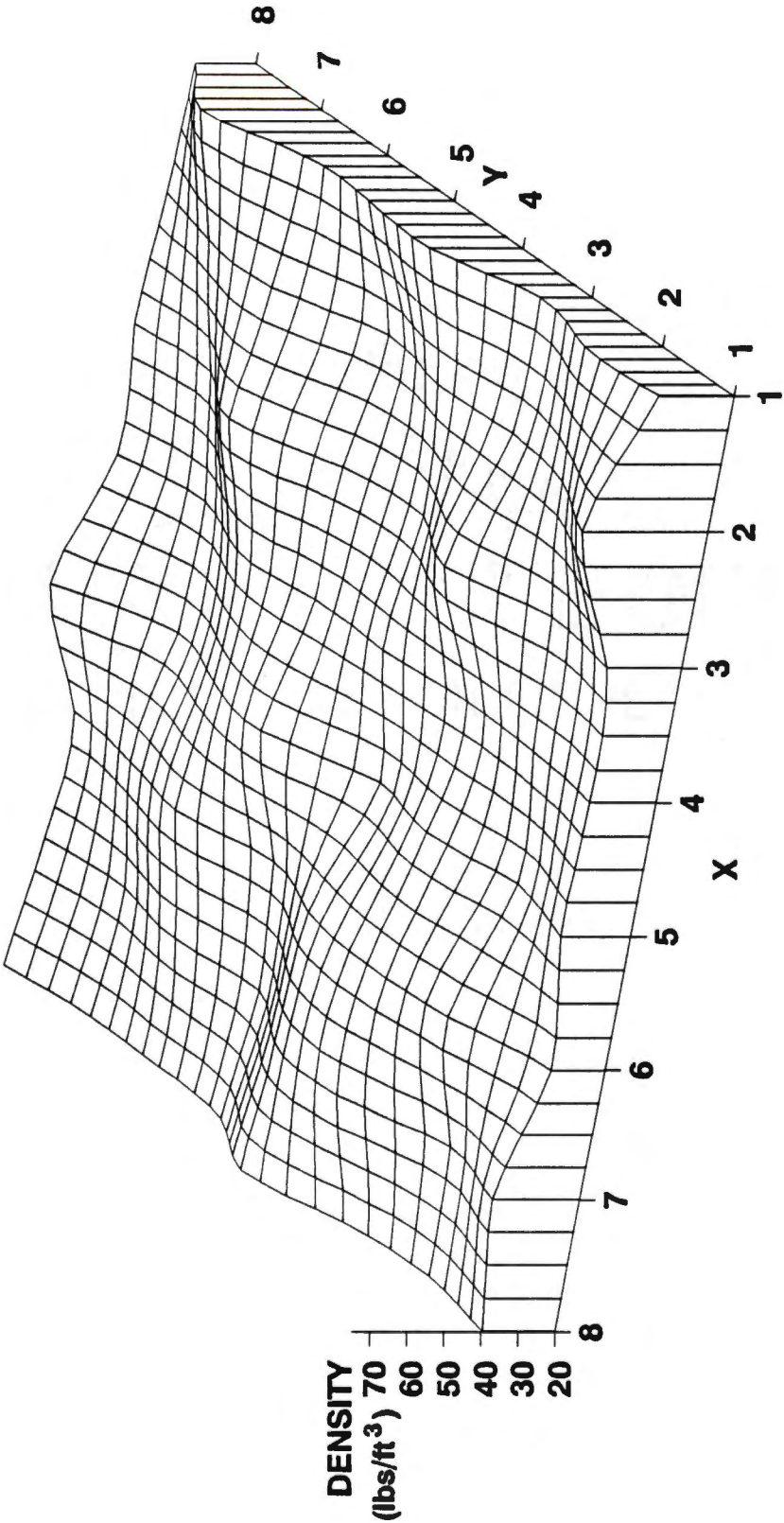
Z=11



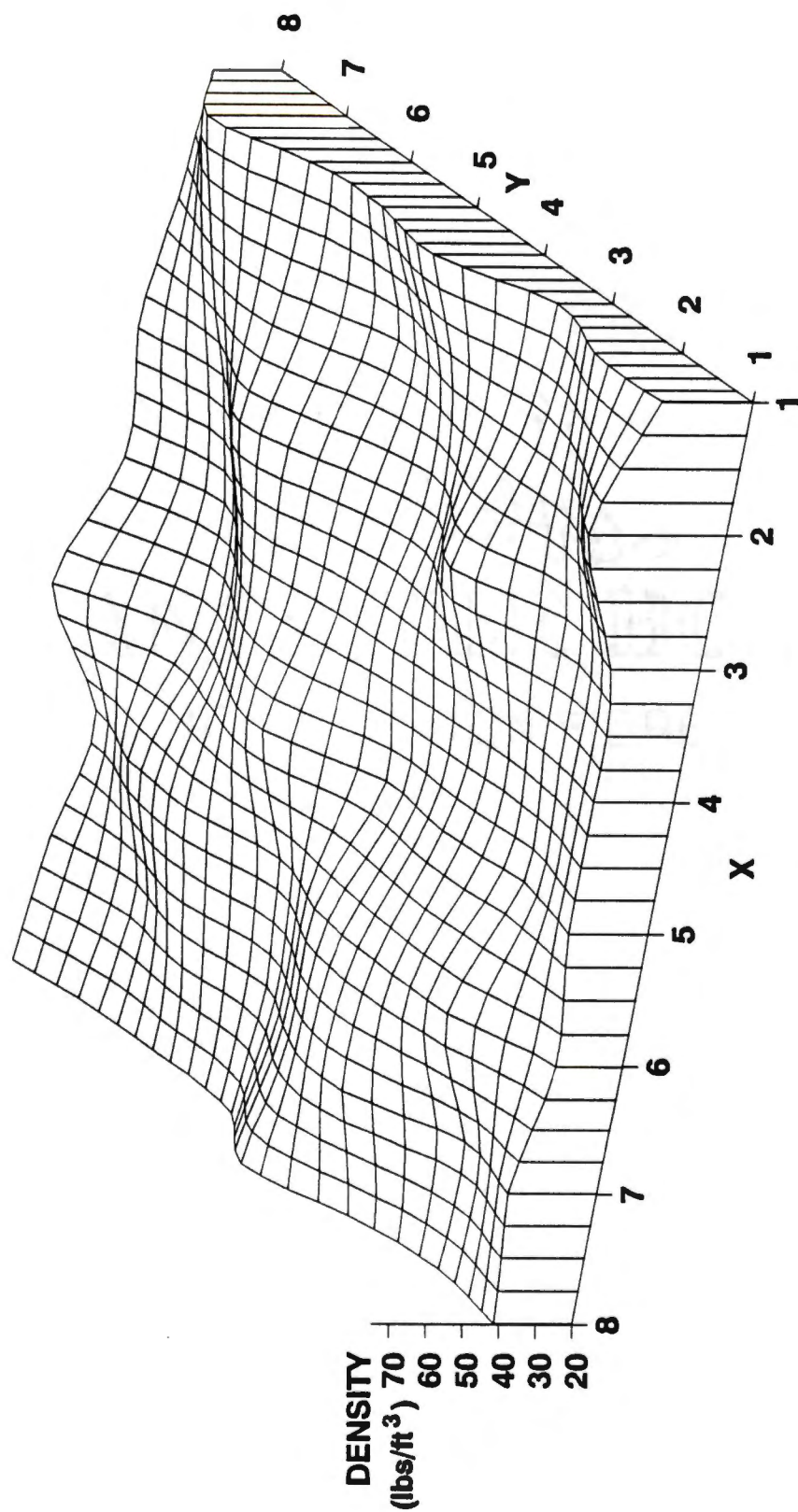
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 12



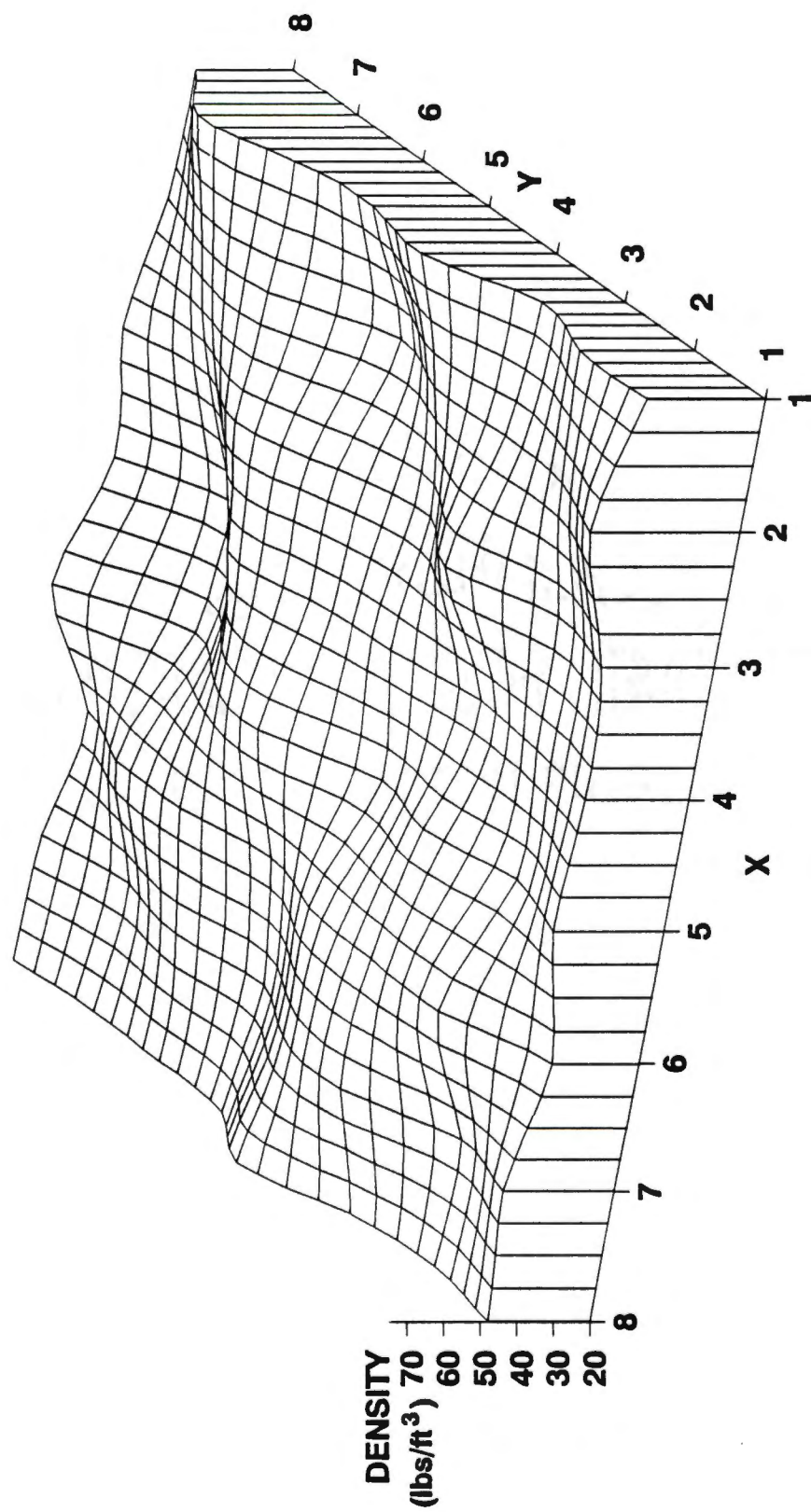
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 13



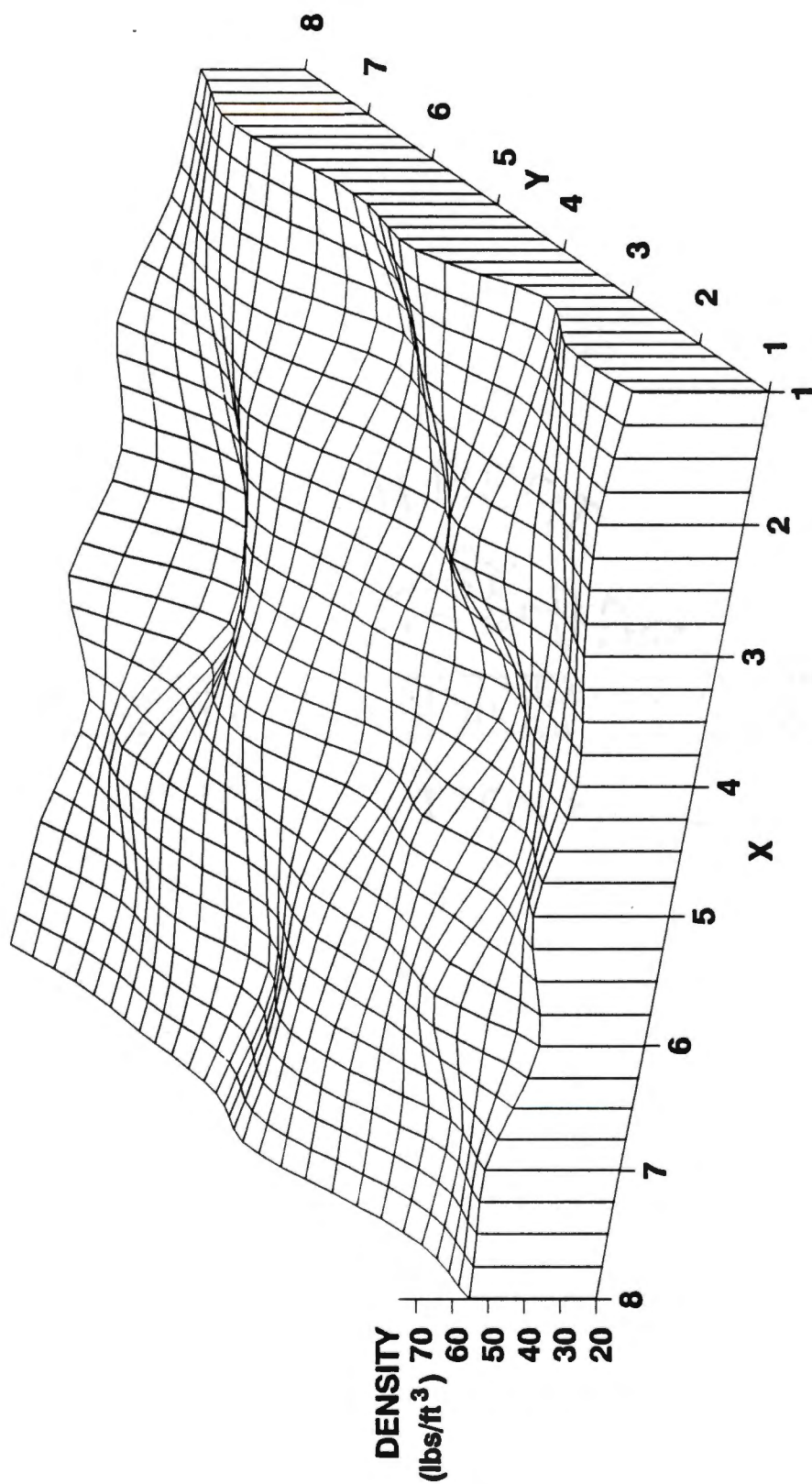
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 14



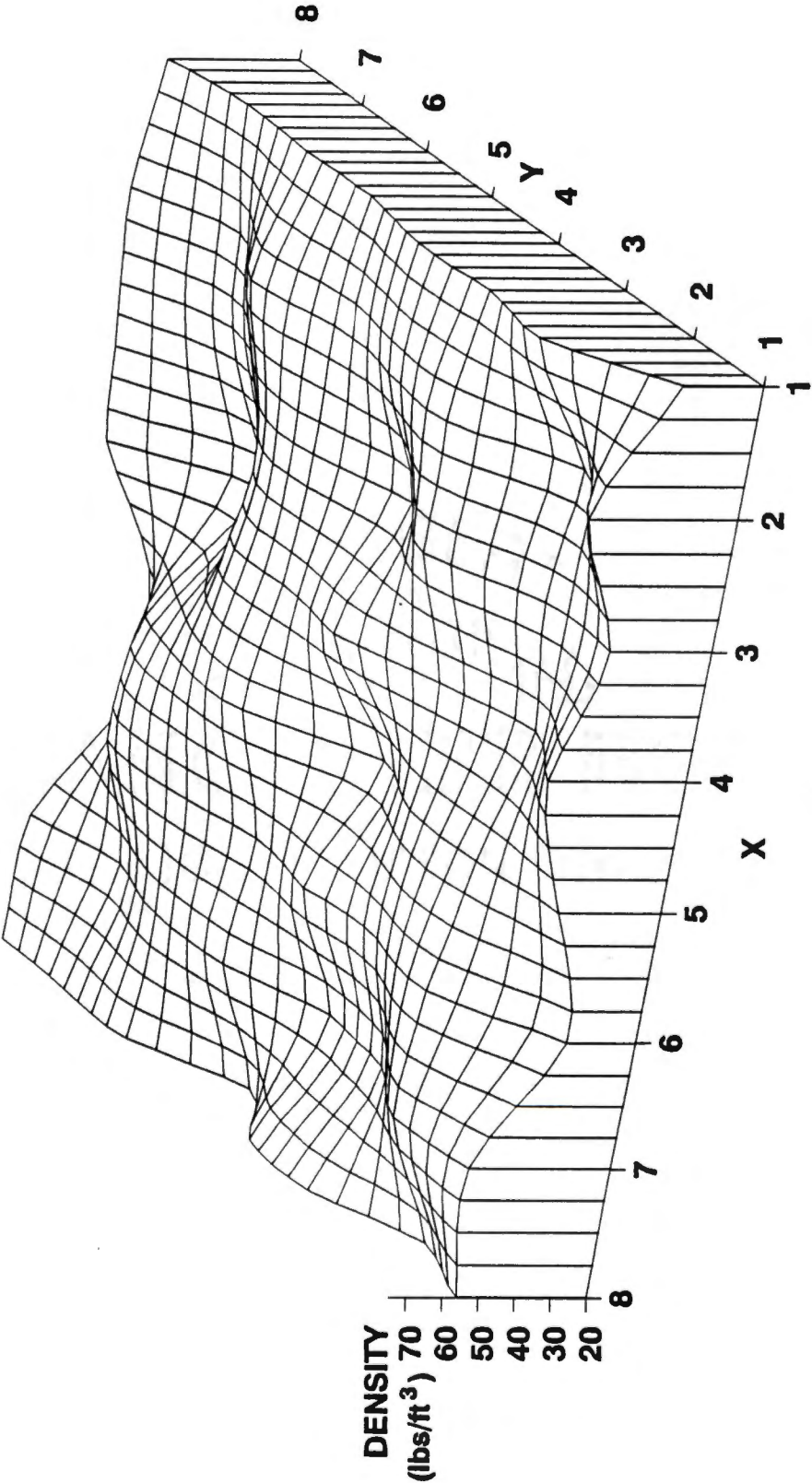
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=15



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=16



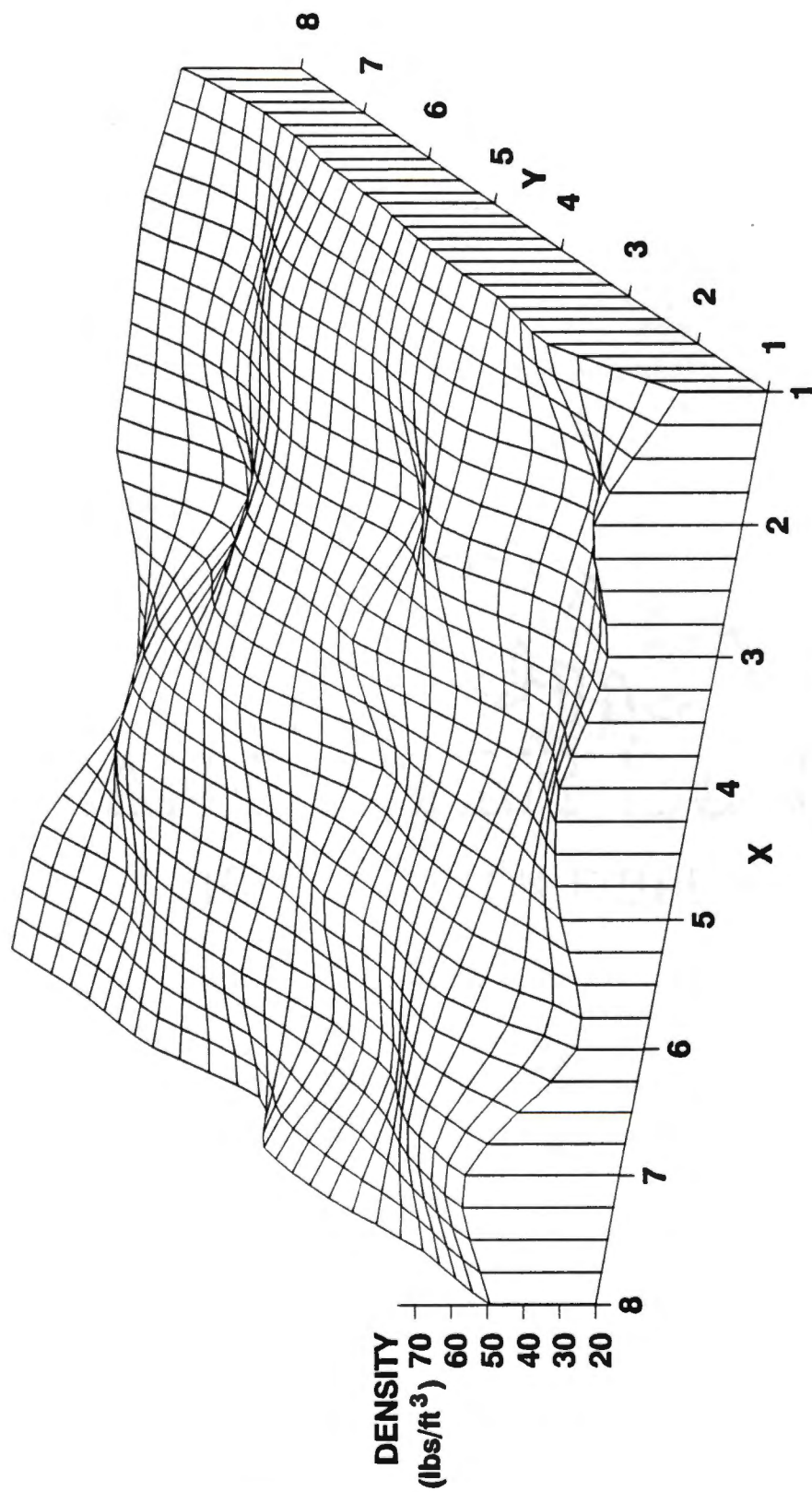
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=1



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS

REPLICATION=3

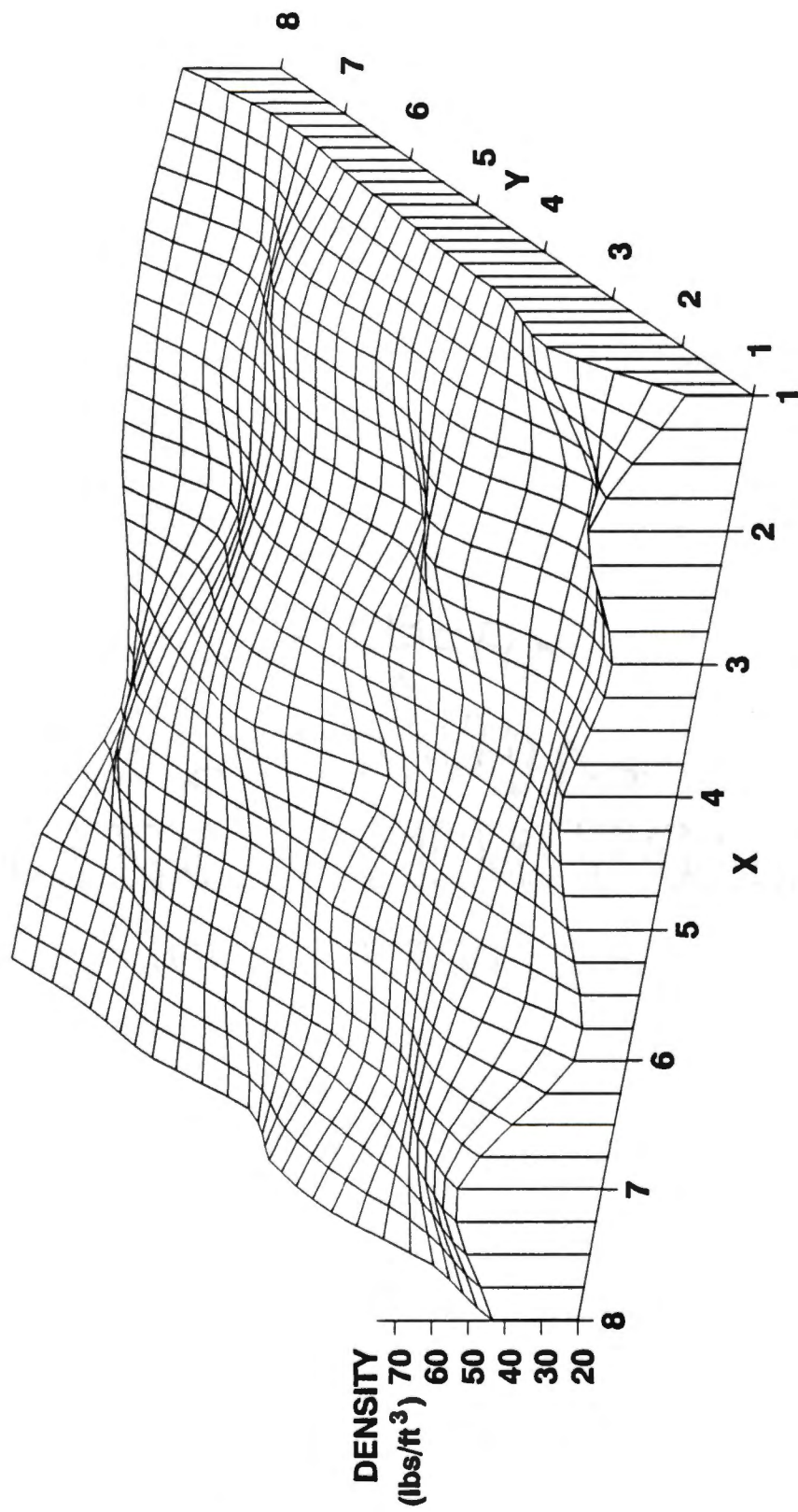
Z=2



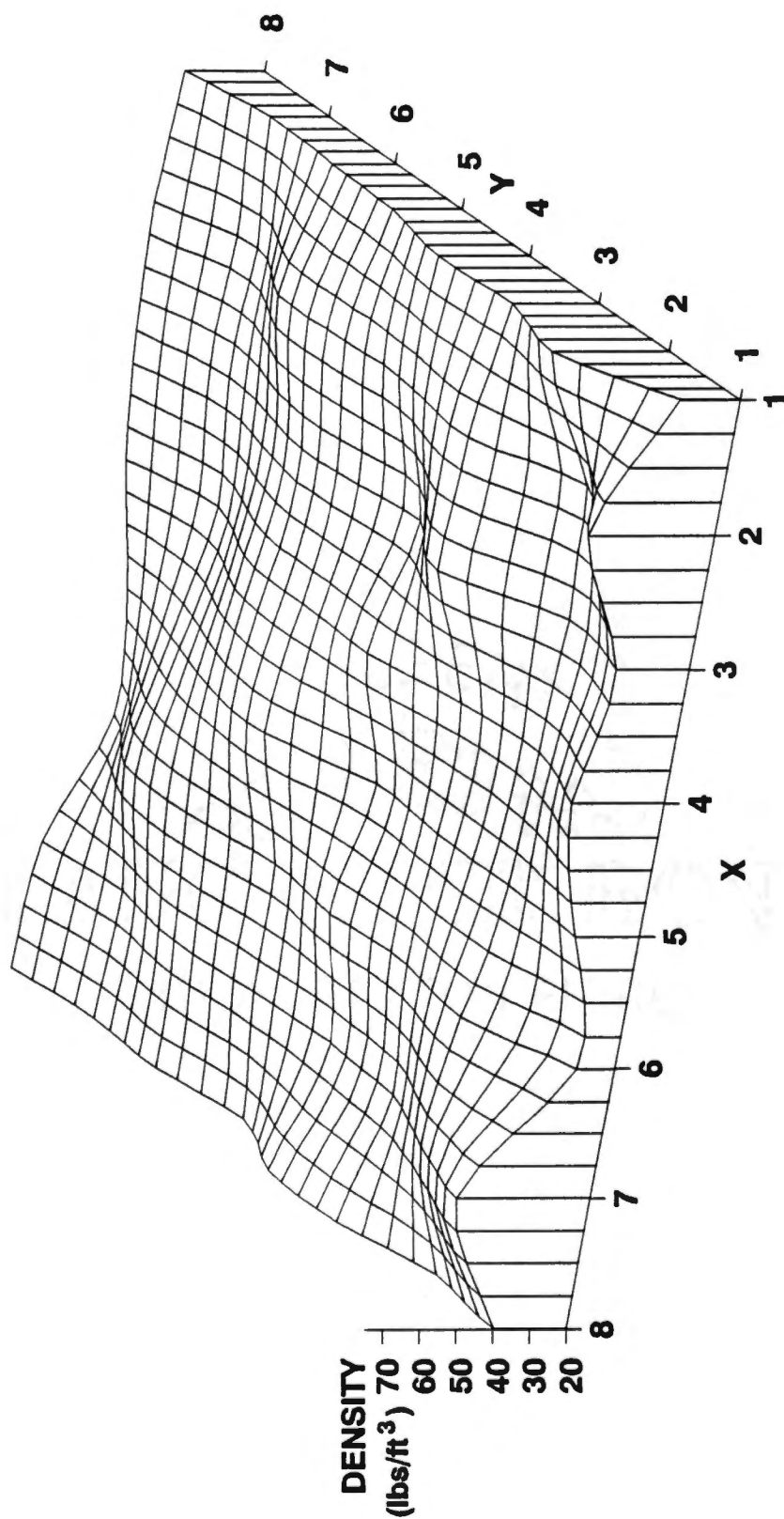
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 3

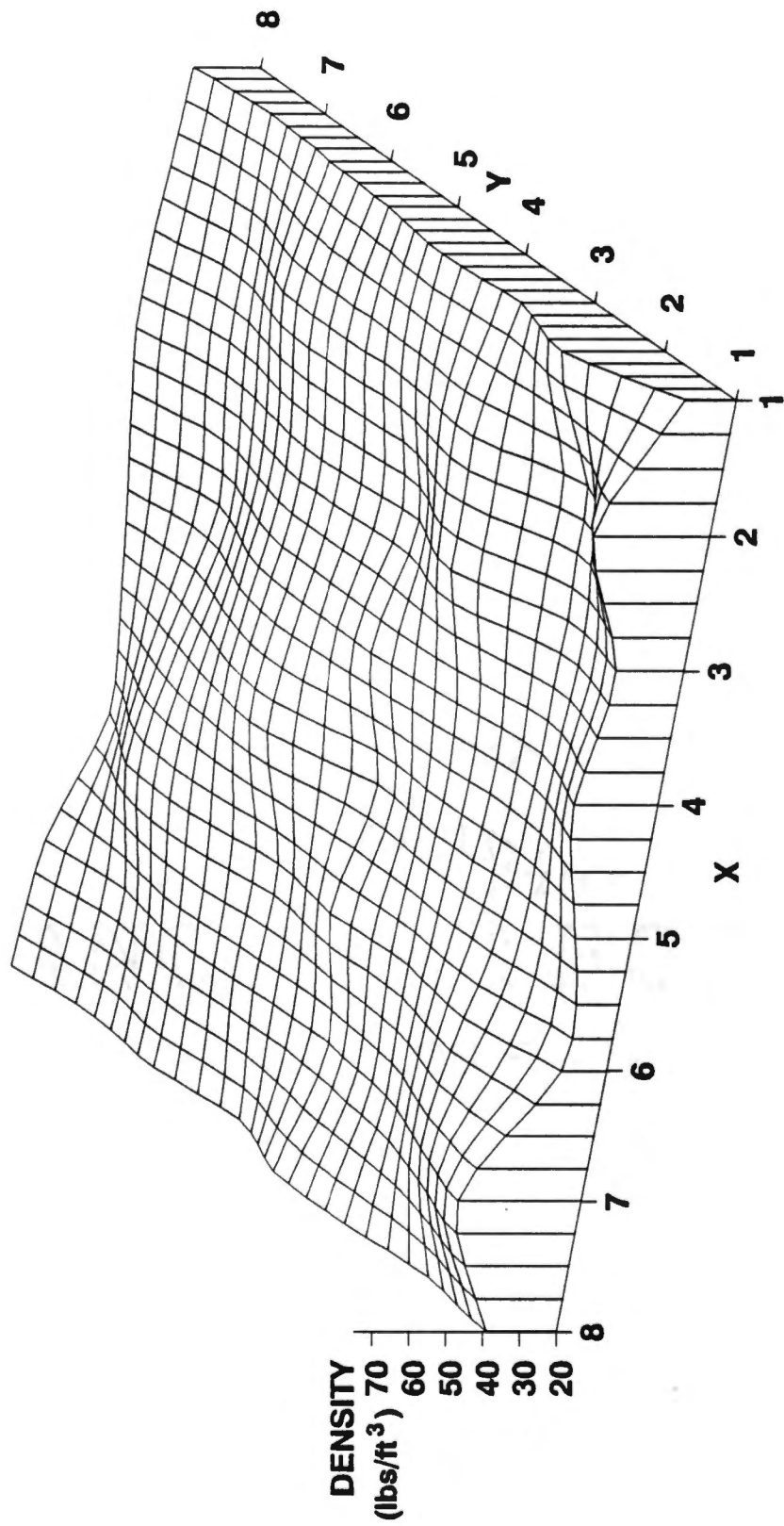
Z = 3



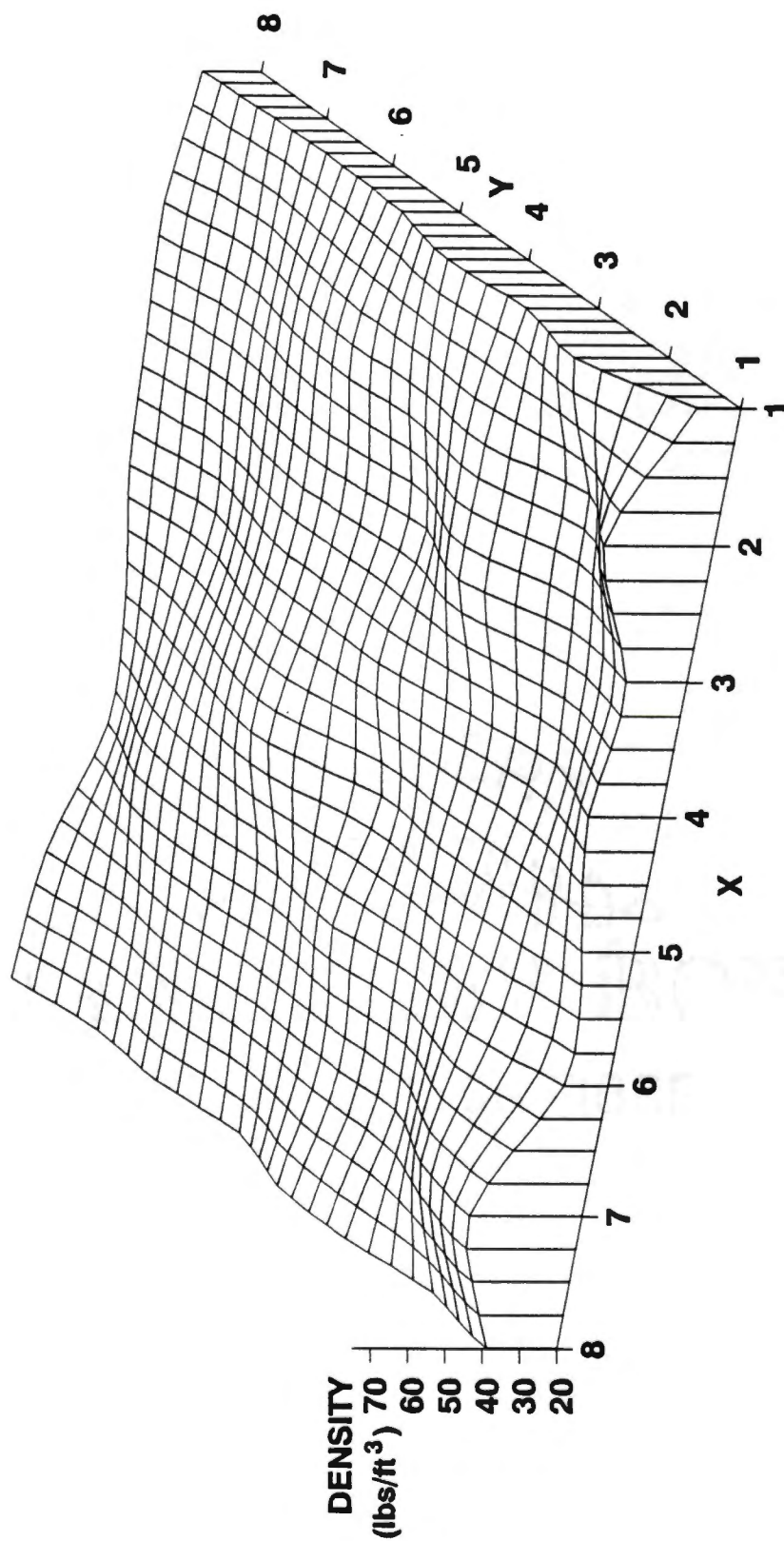
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=4



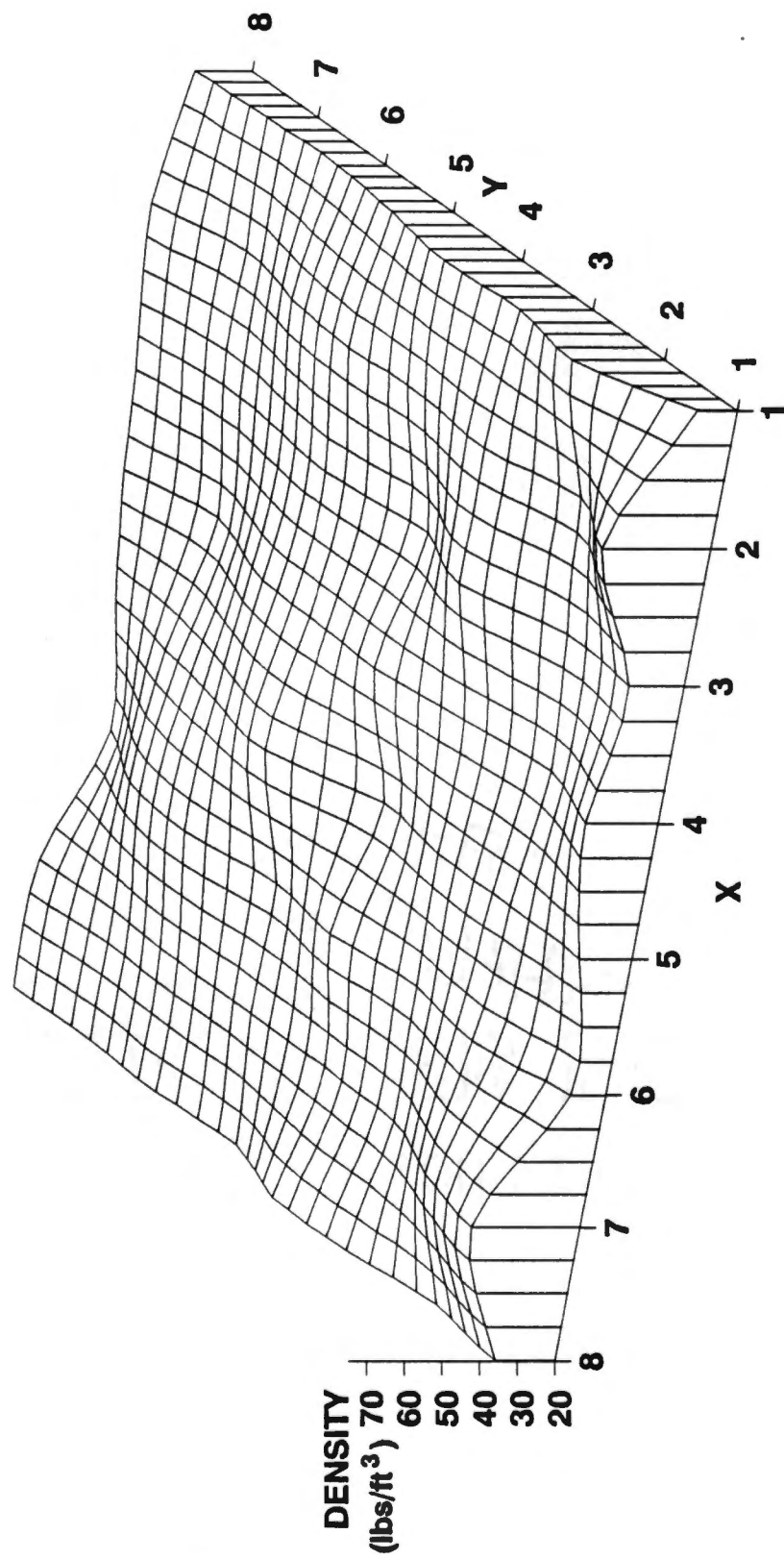
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 5



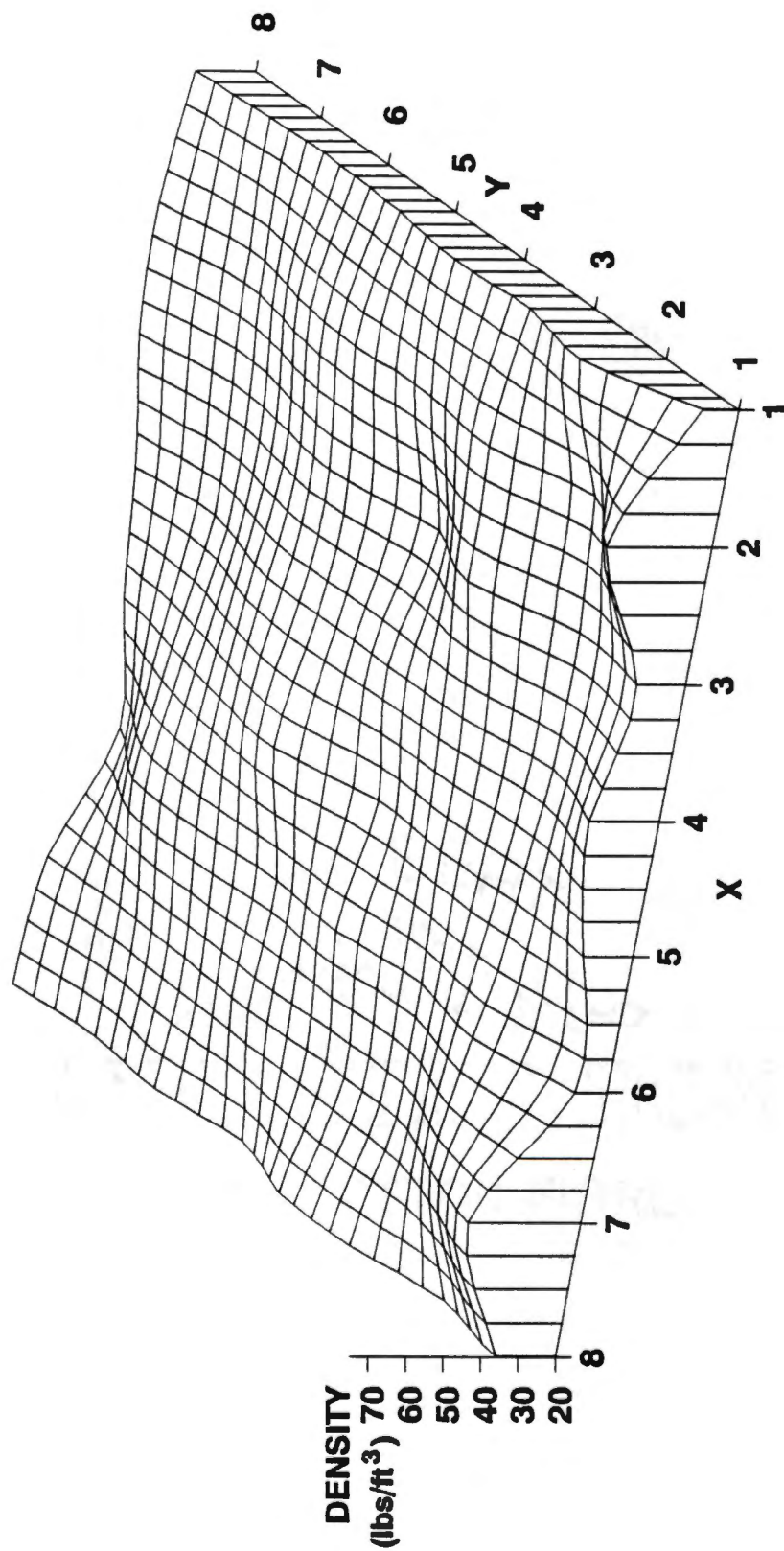
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 6



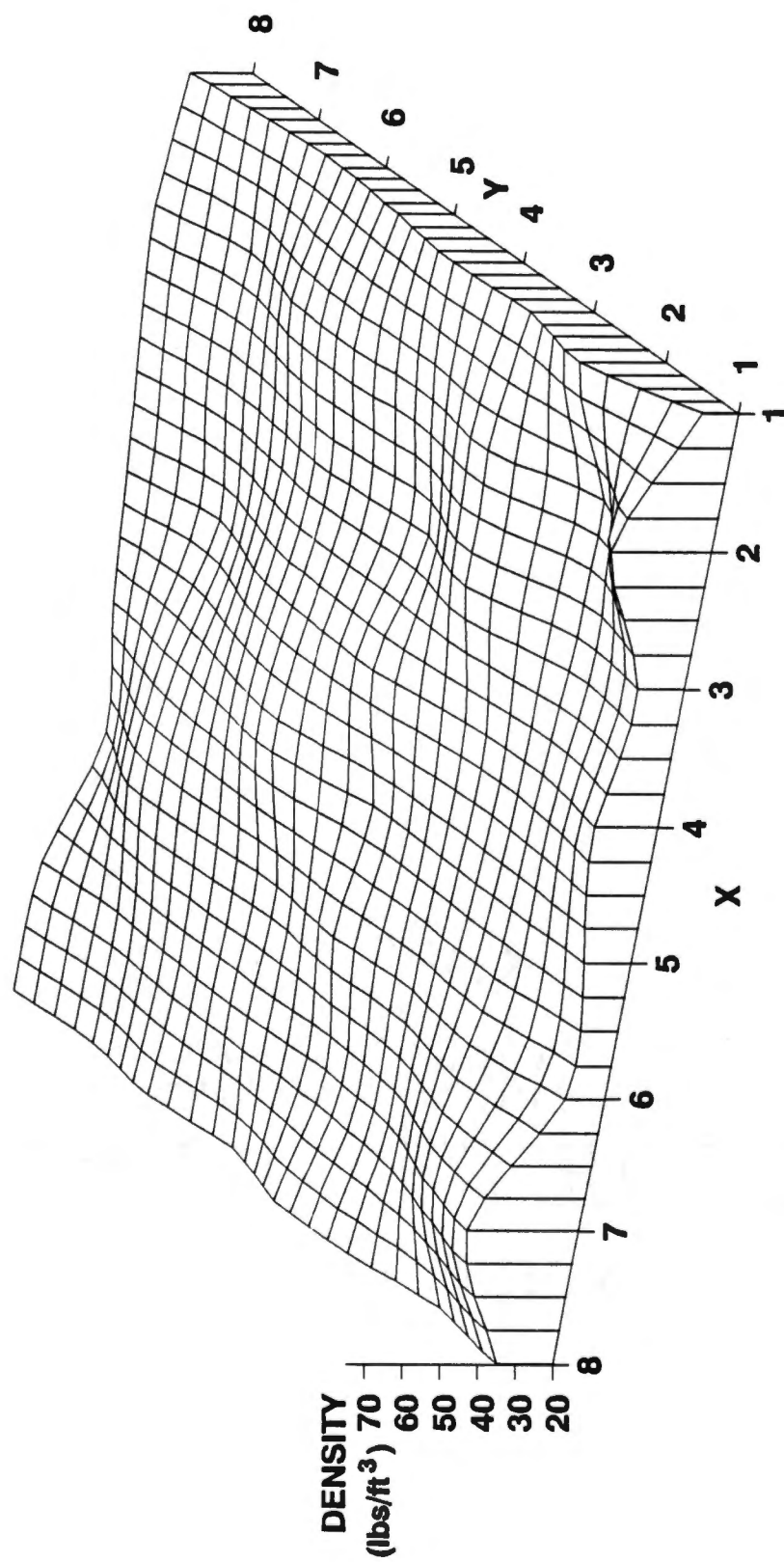
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=7



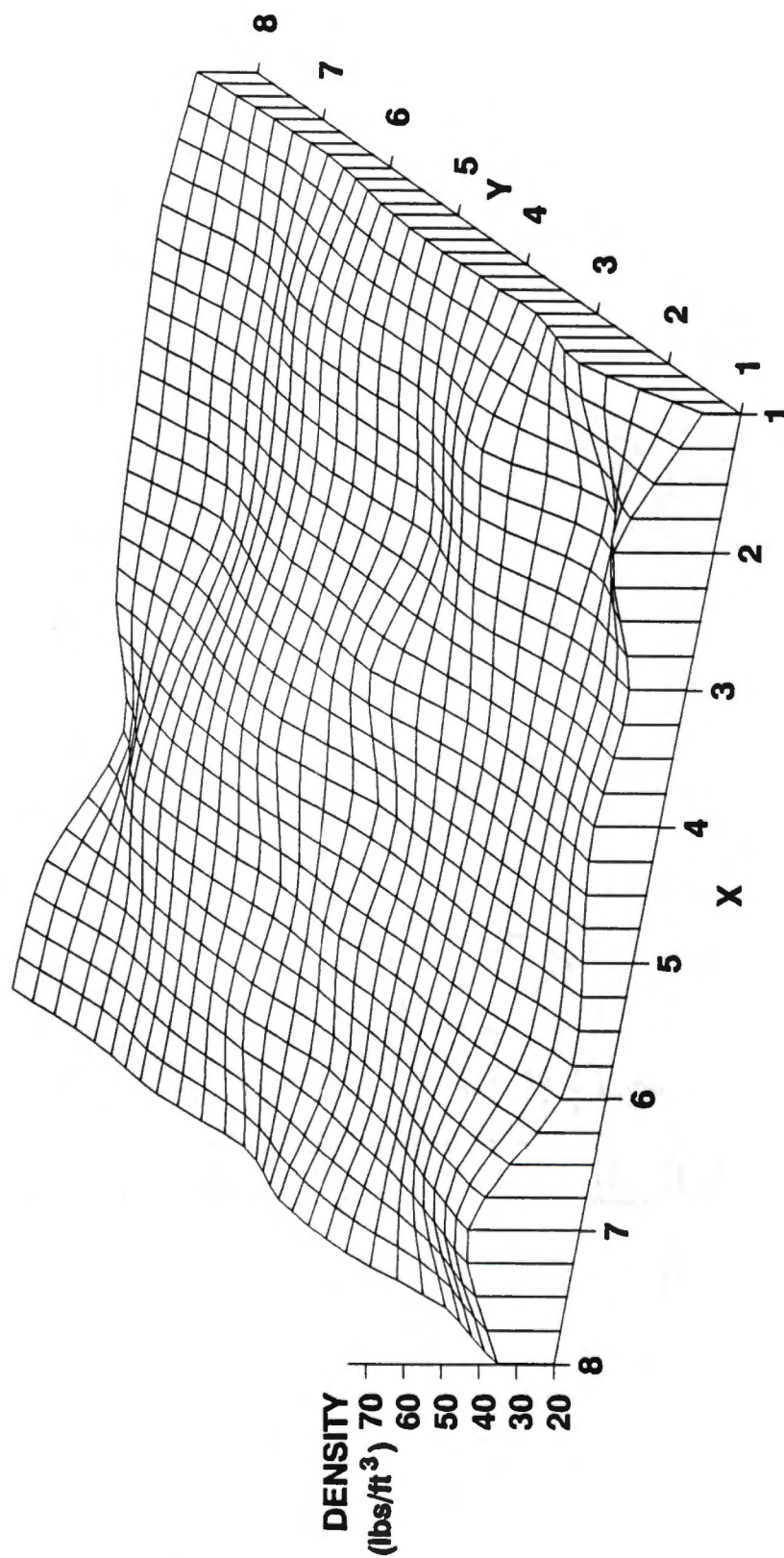
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=8



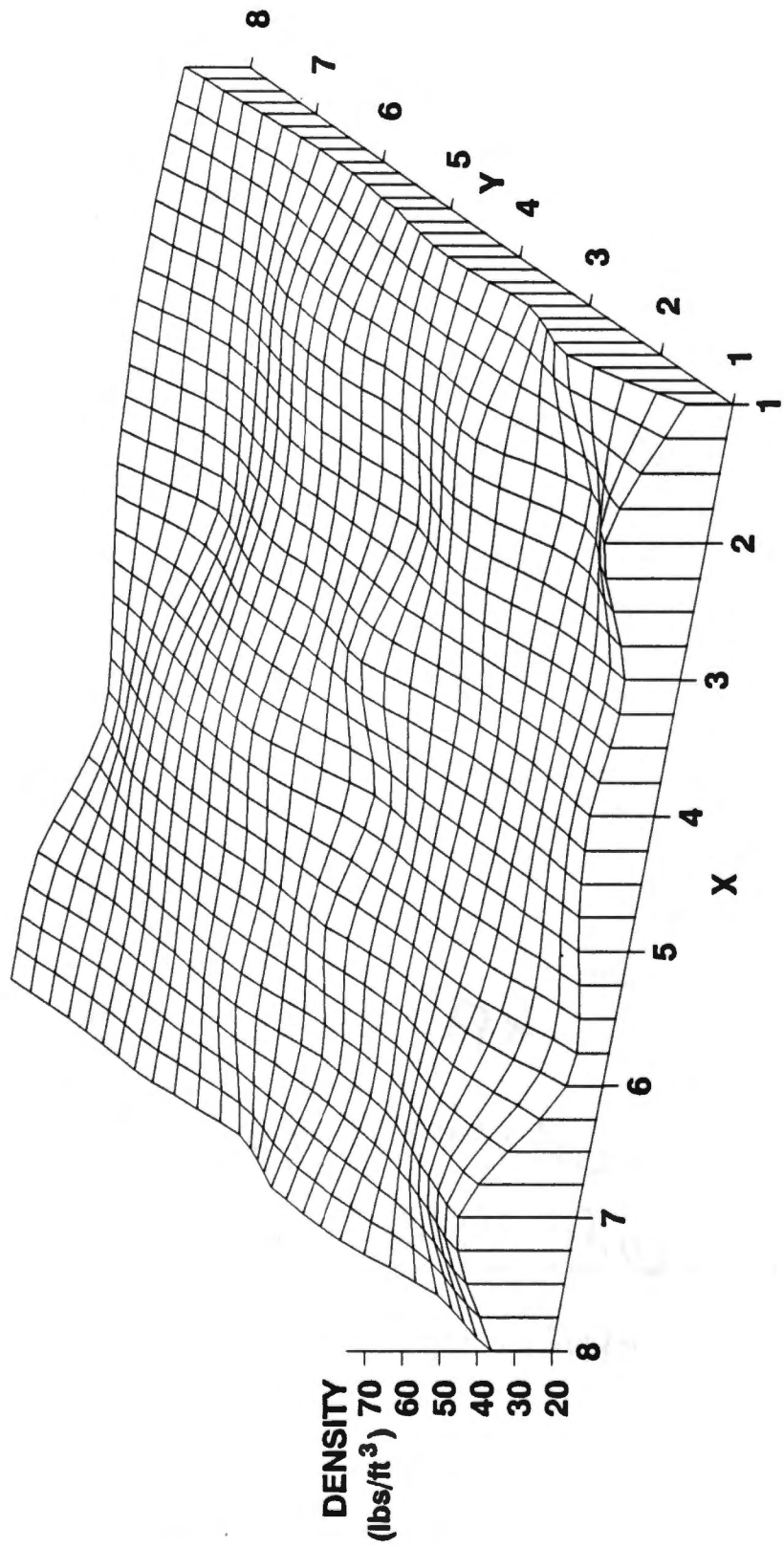
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 9



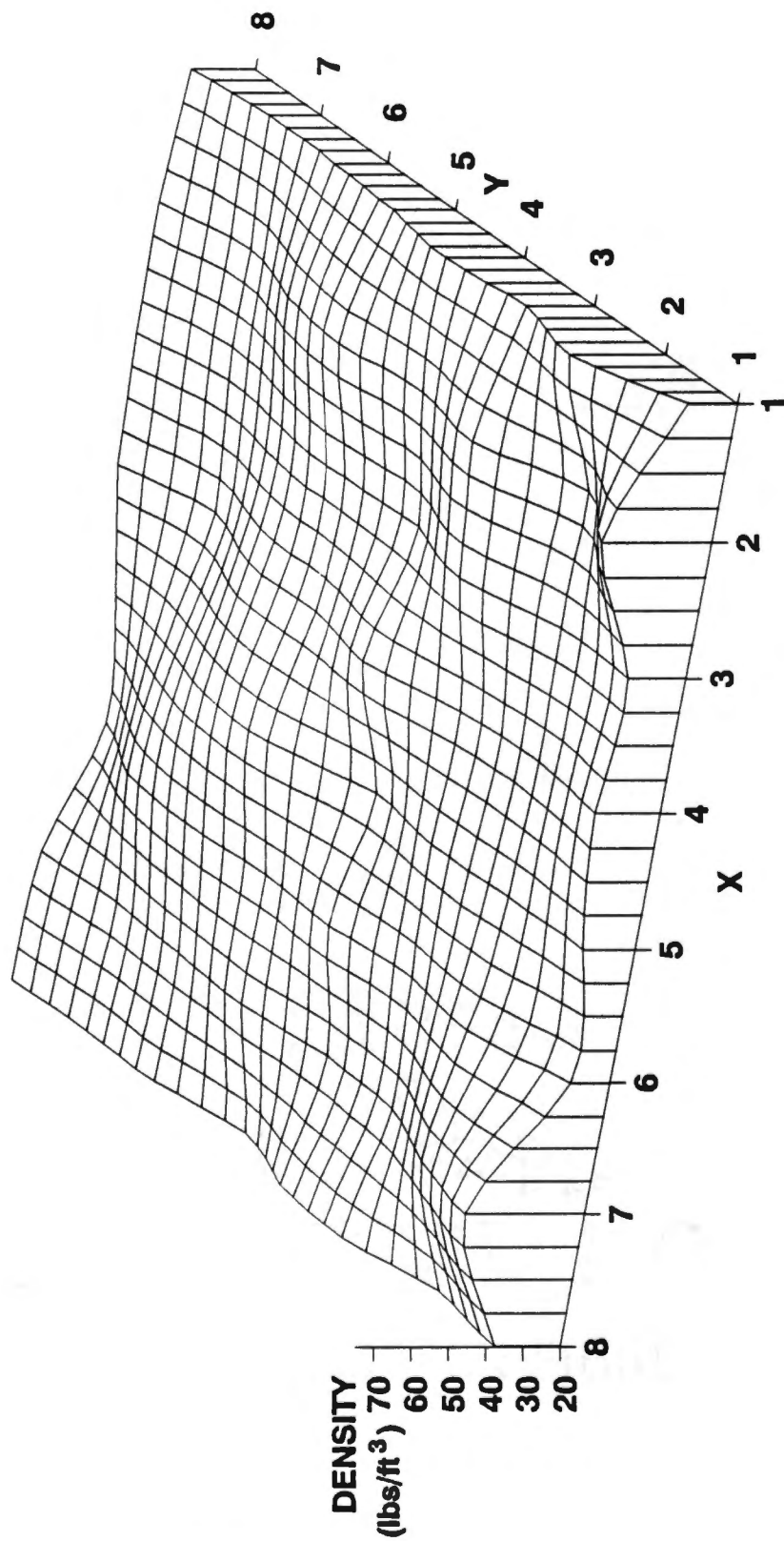
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 10



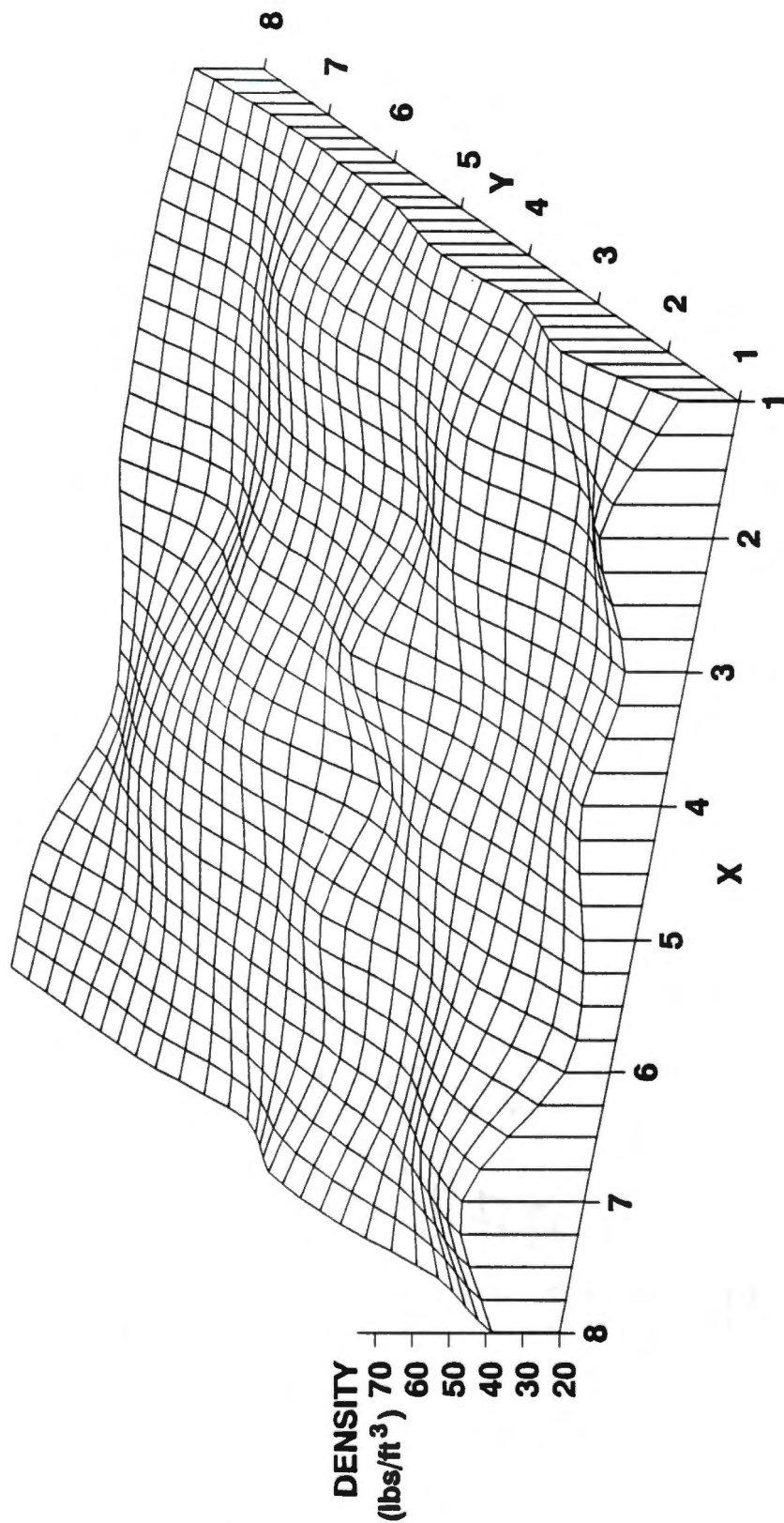
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 11



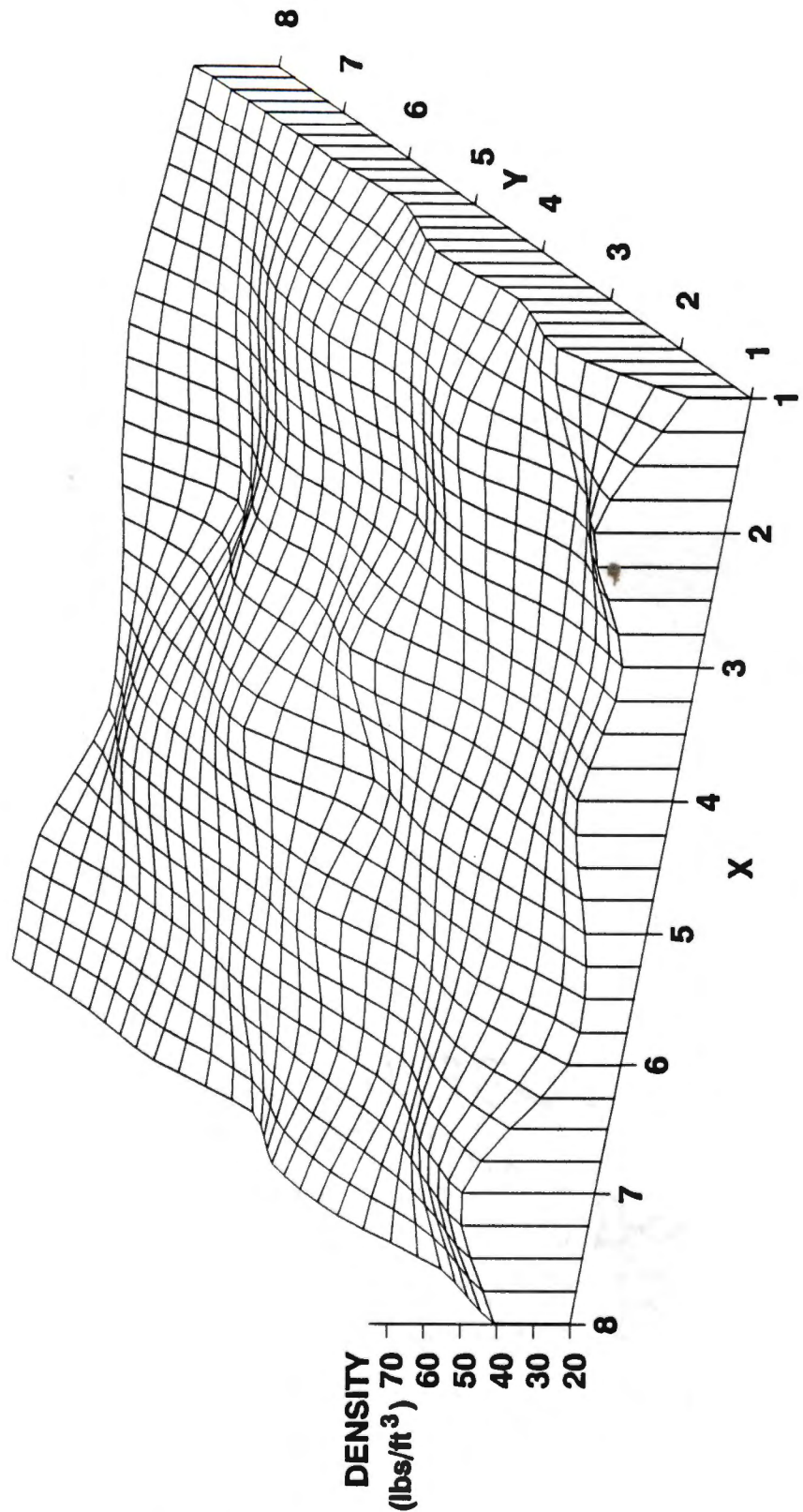
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 12



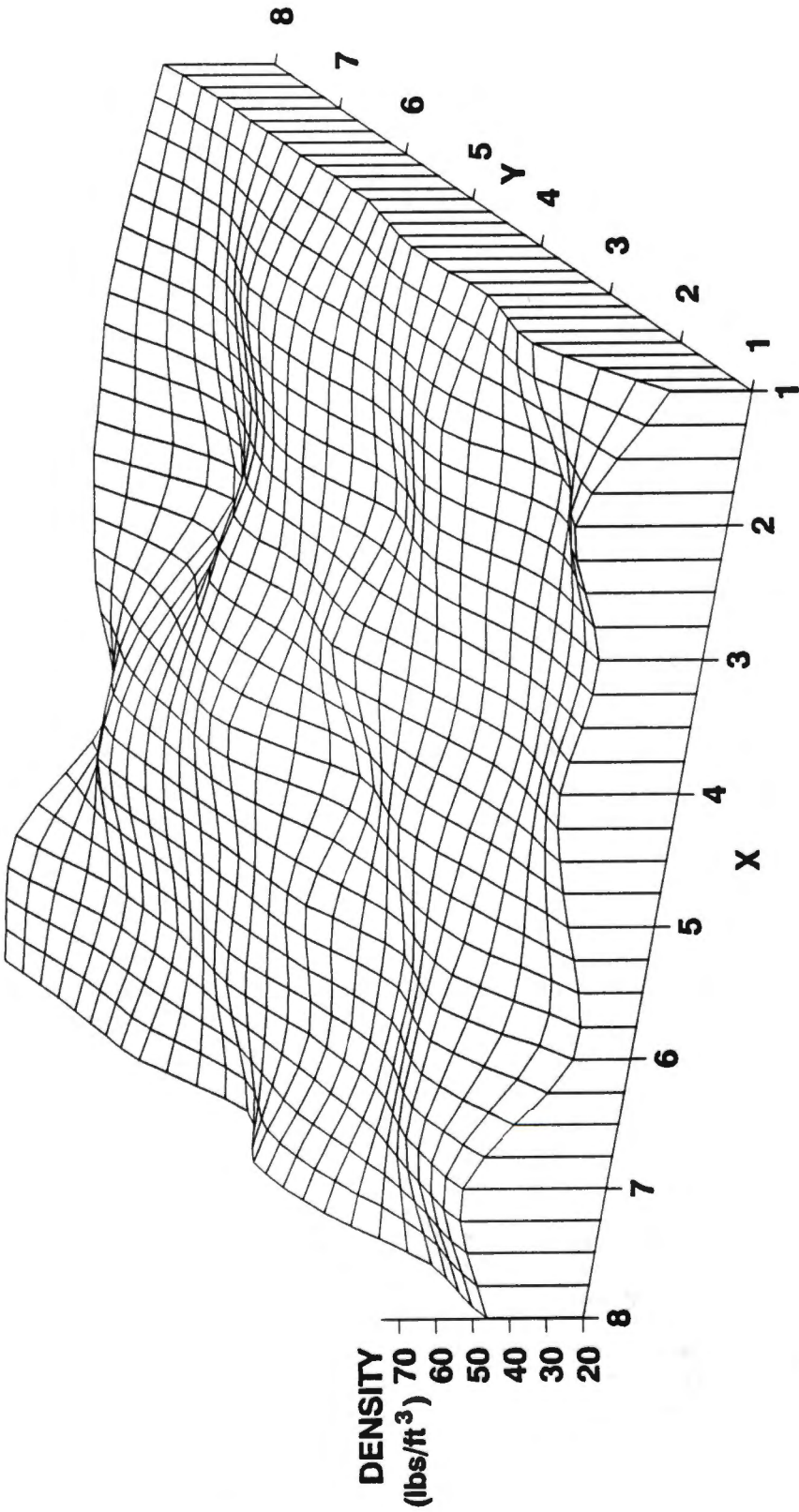
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 13



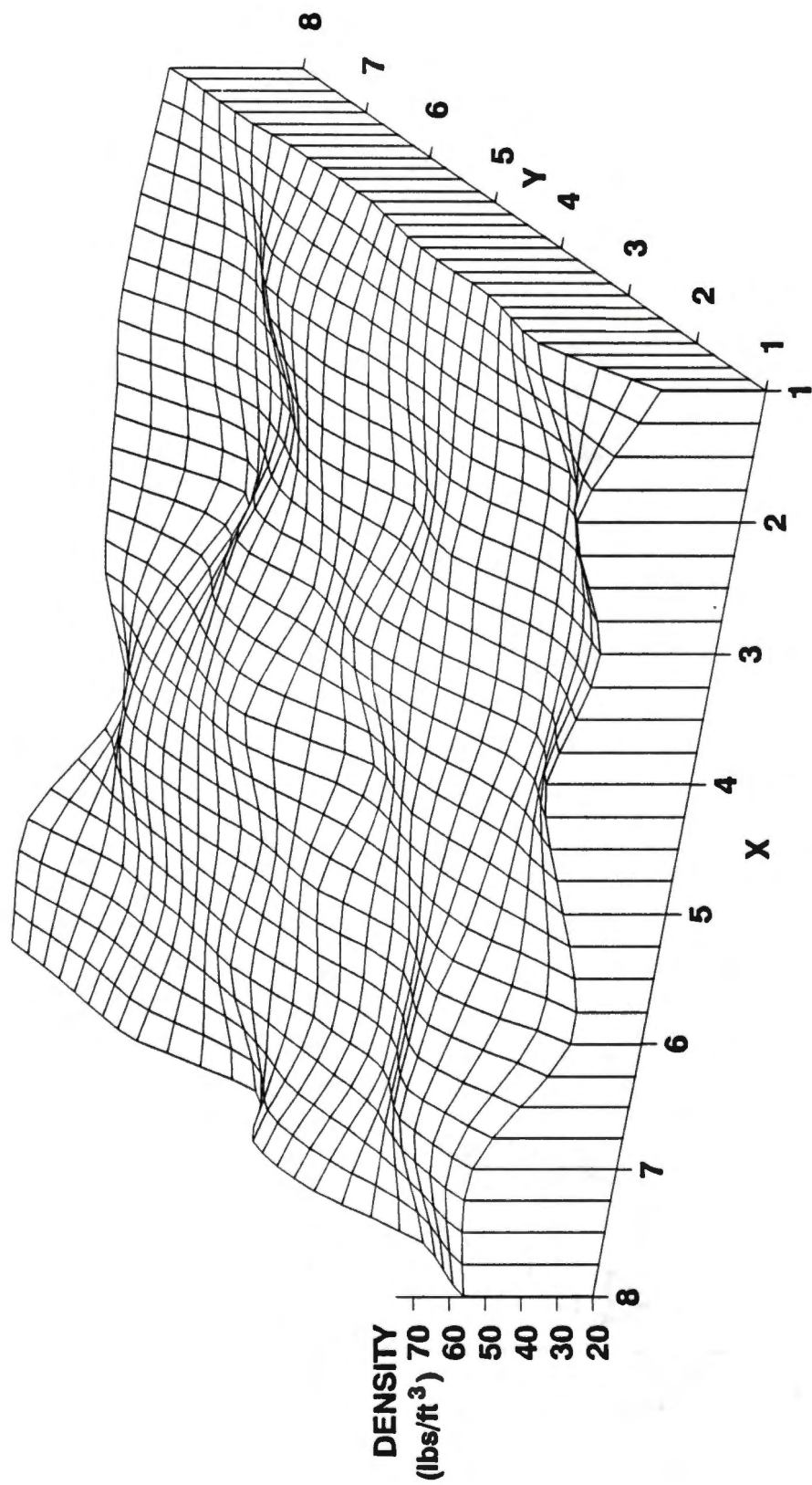
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 14



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=15



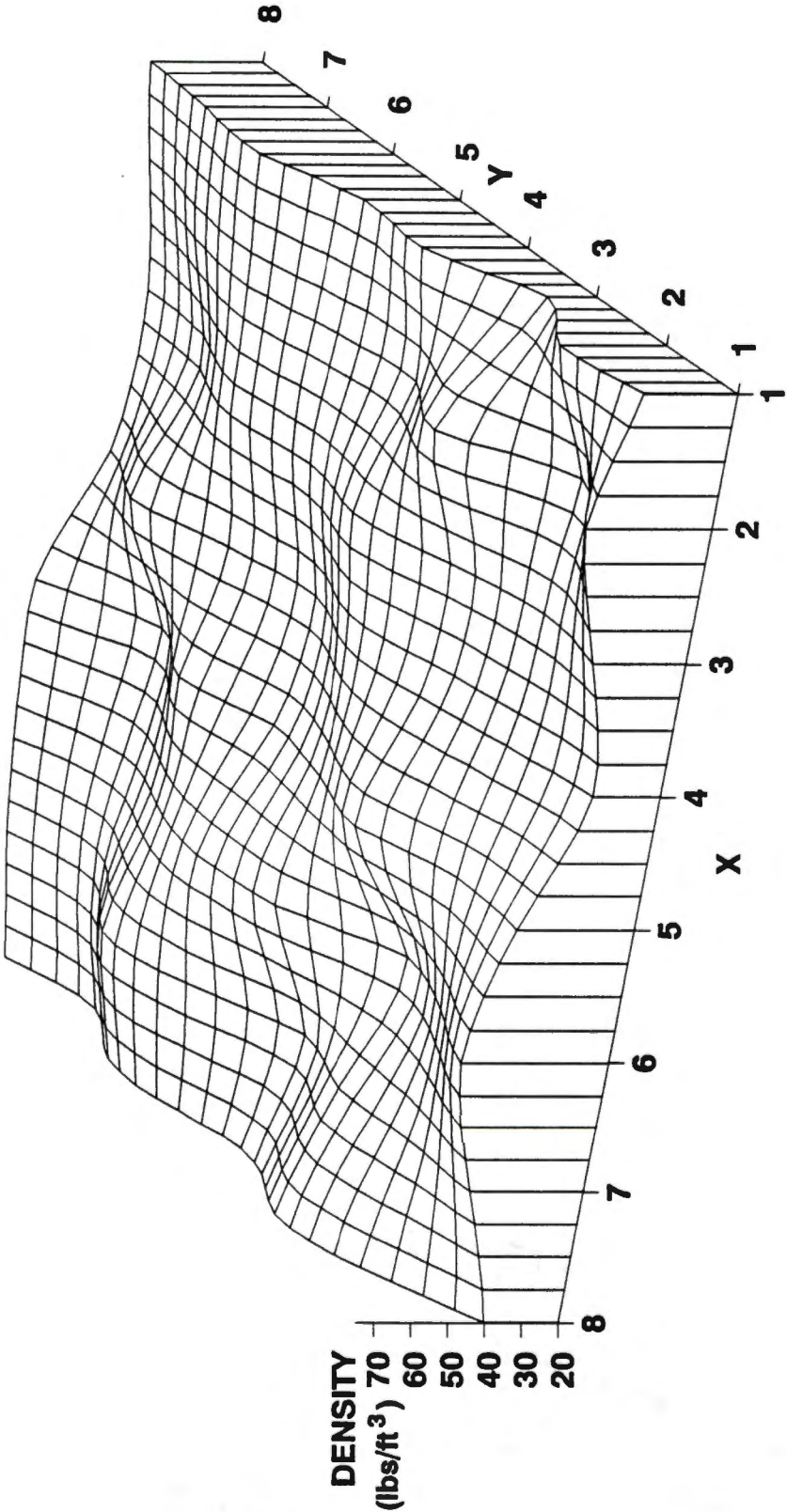
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=16



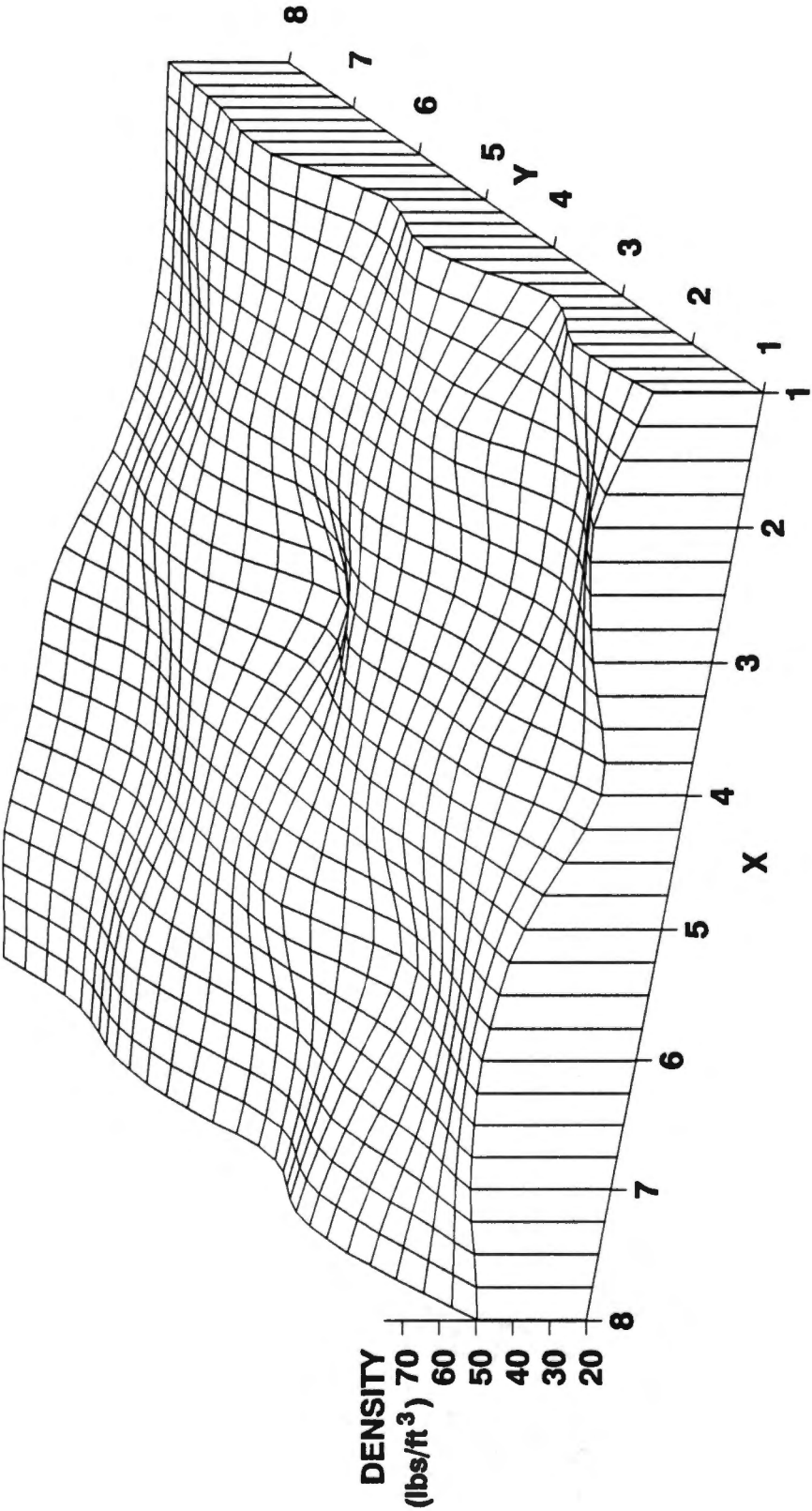
FLAKE MOISTURE CONTENT - 8%

PRESS CLOSURE RATE - 60 SECONDS

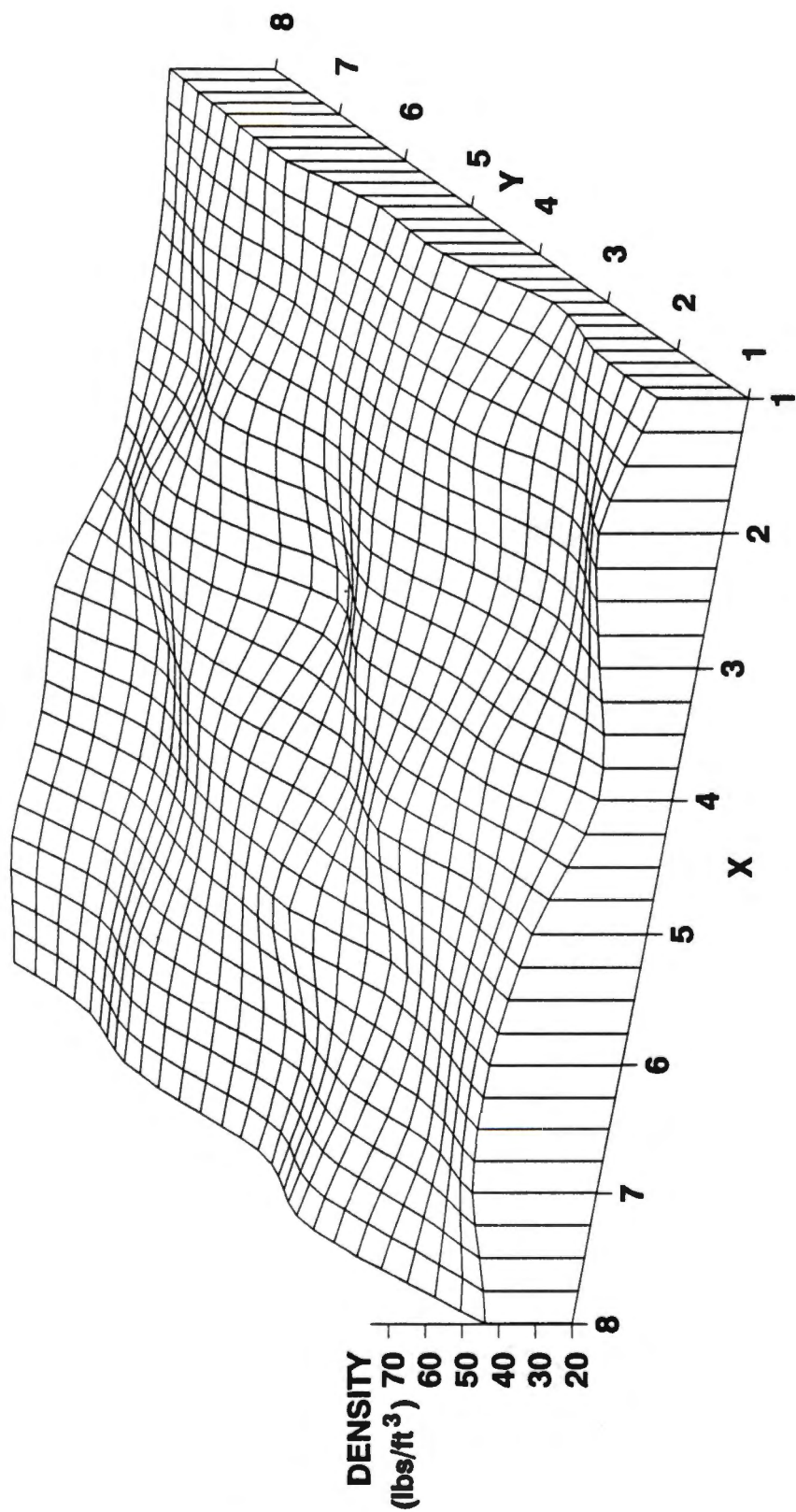
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=1



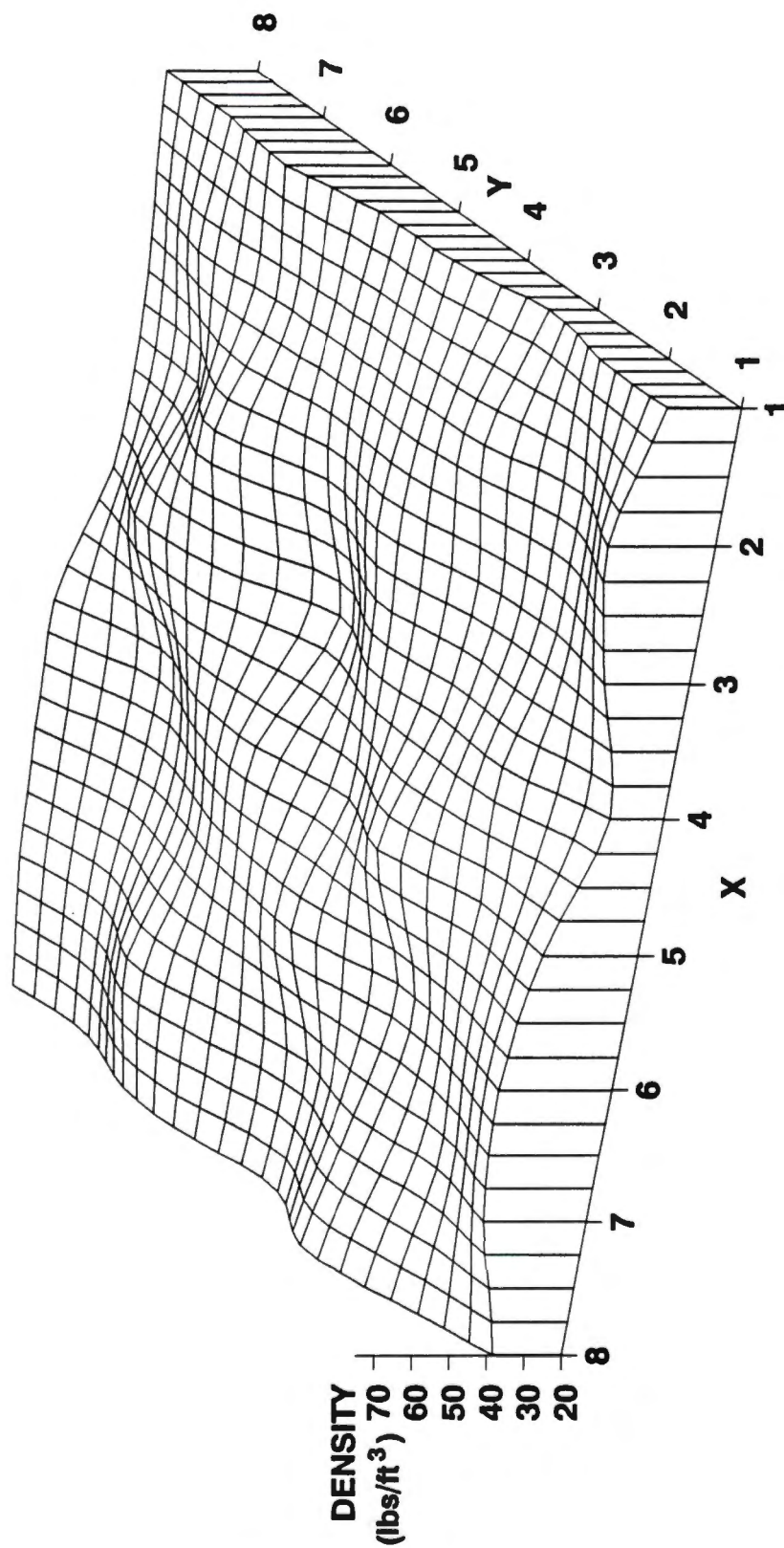
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=2



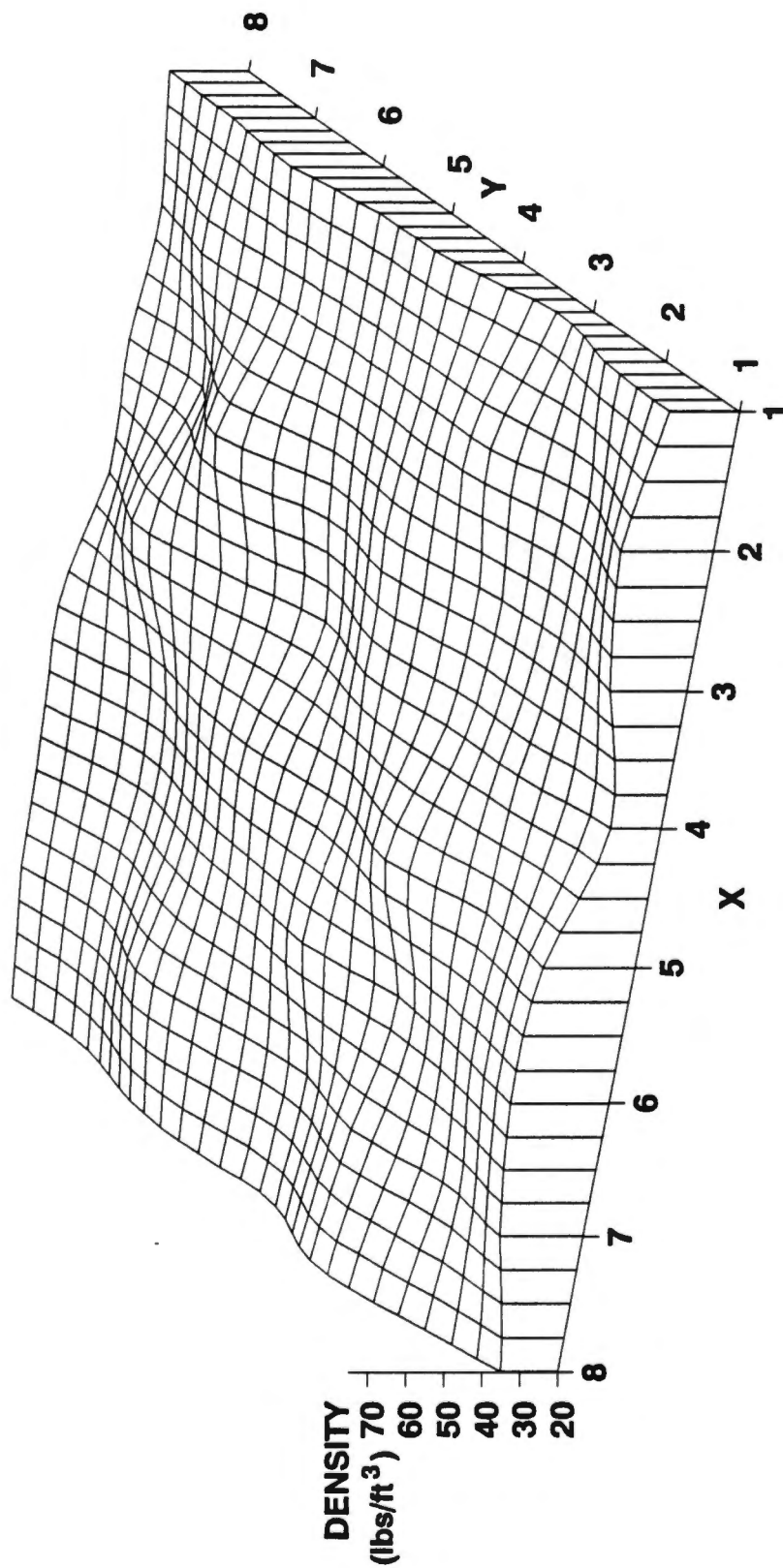
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 3



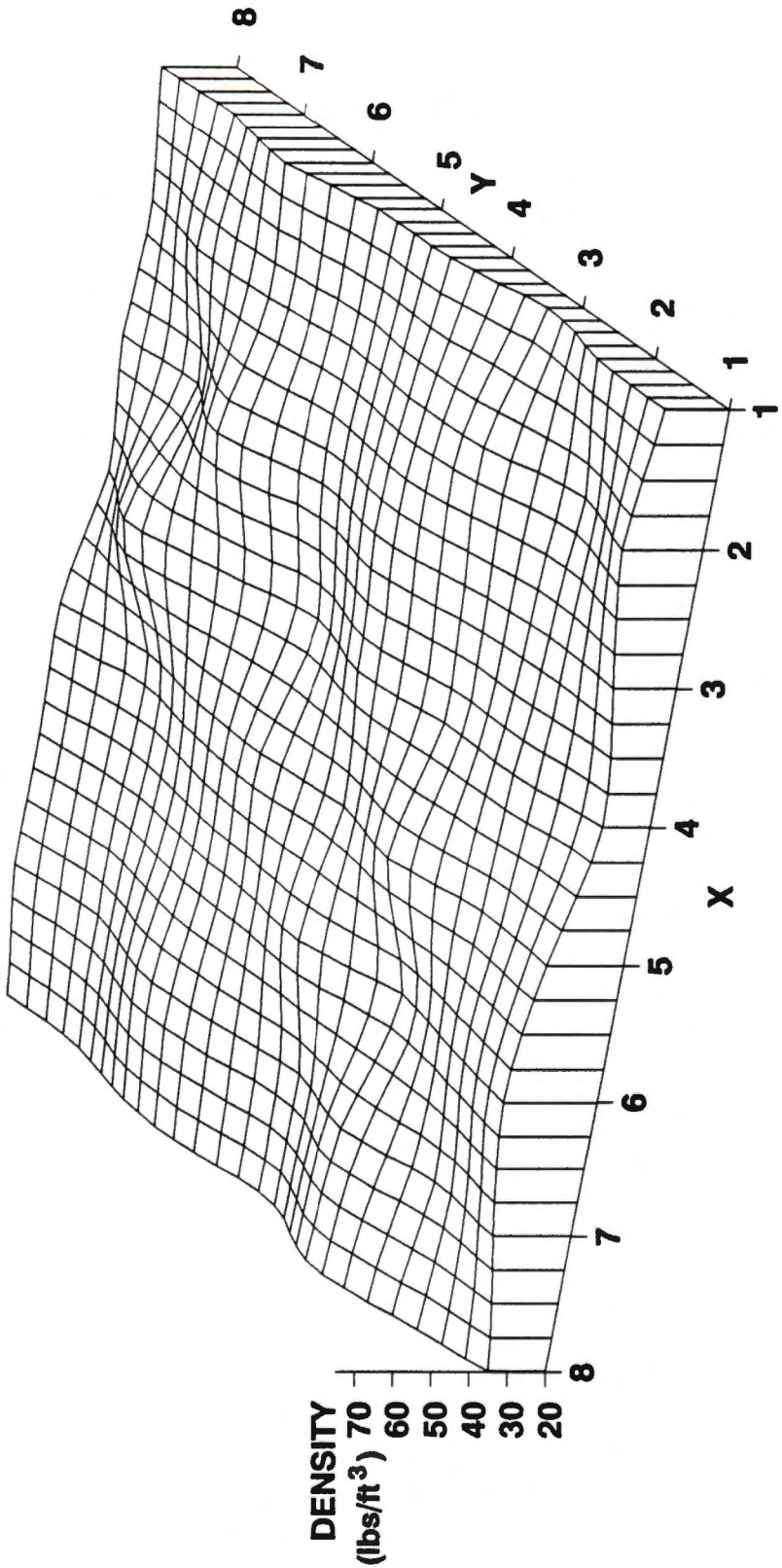
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 4



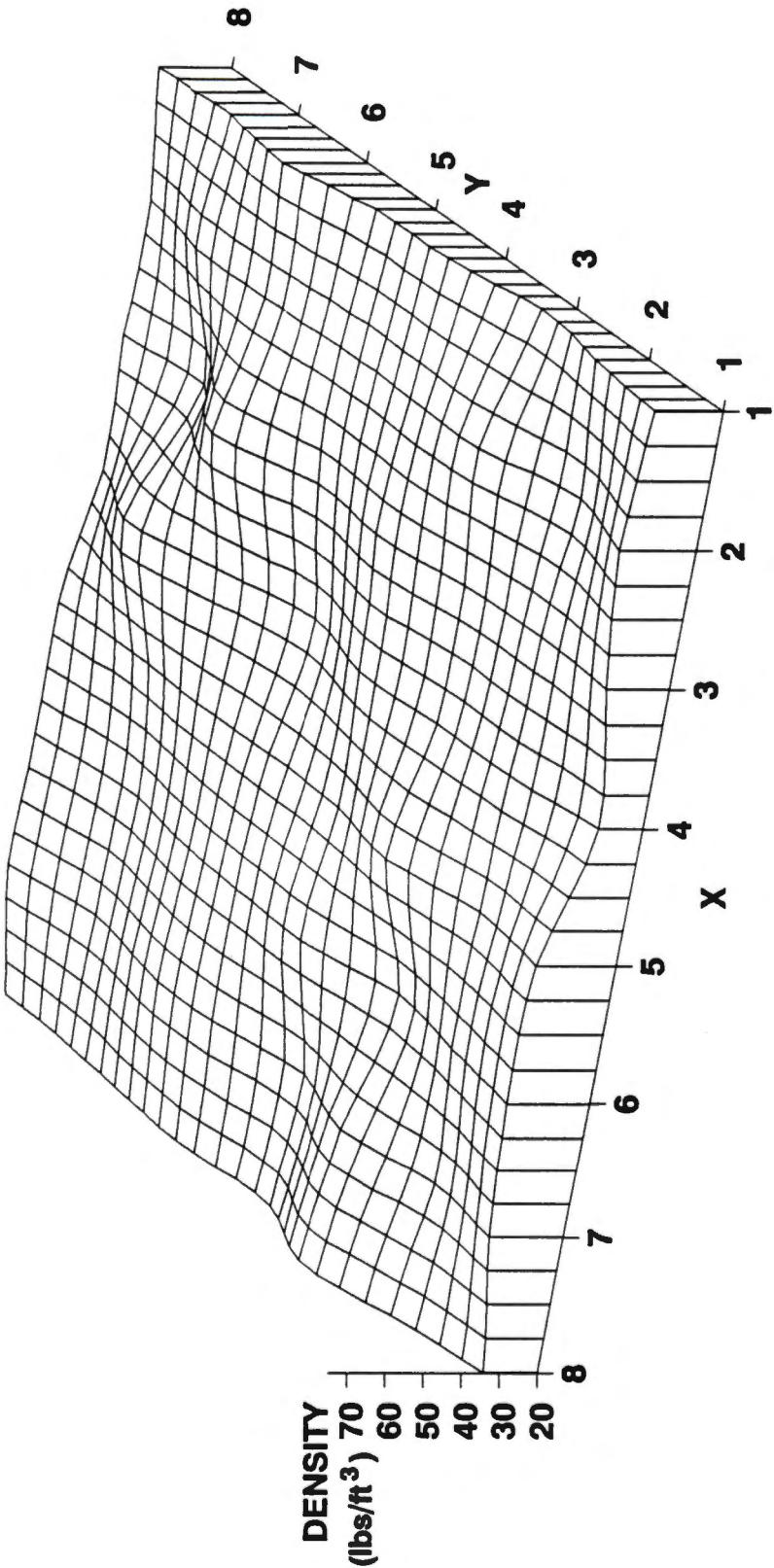
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 5



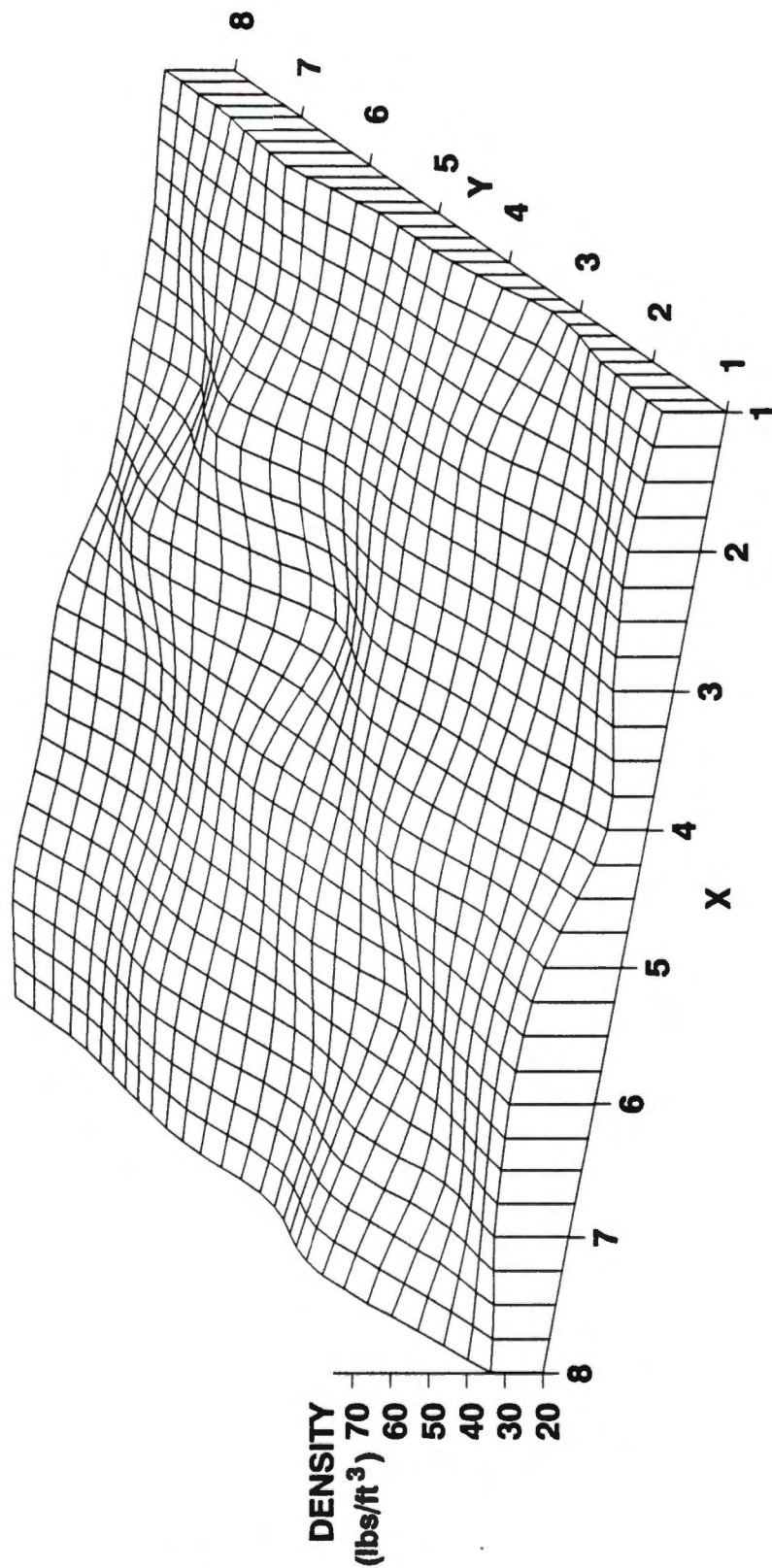
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=6



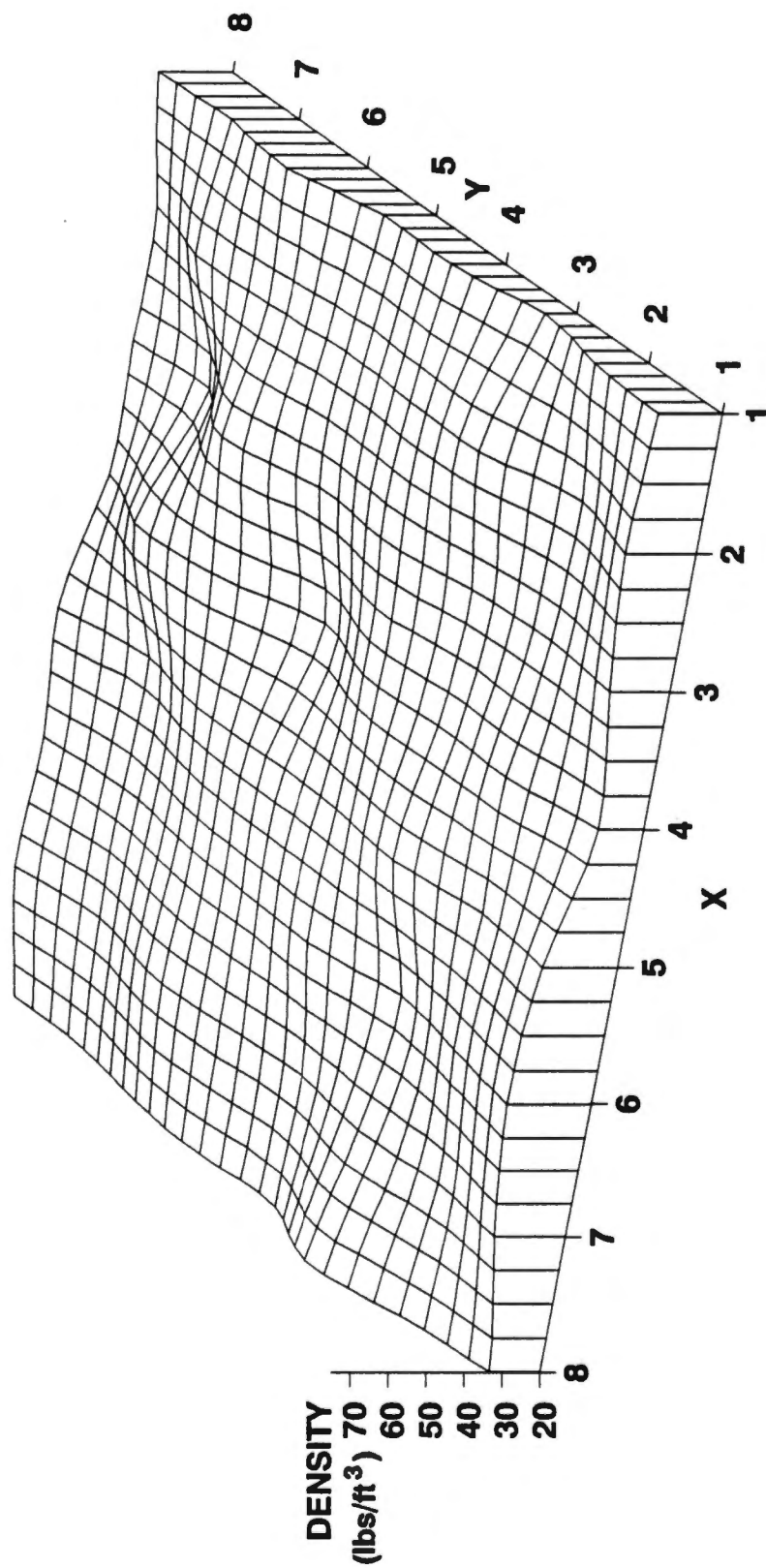
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 7



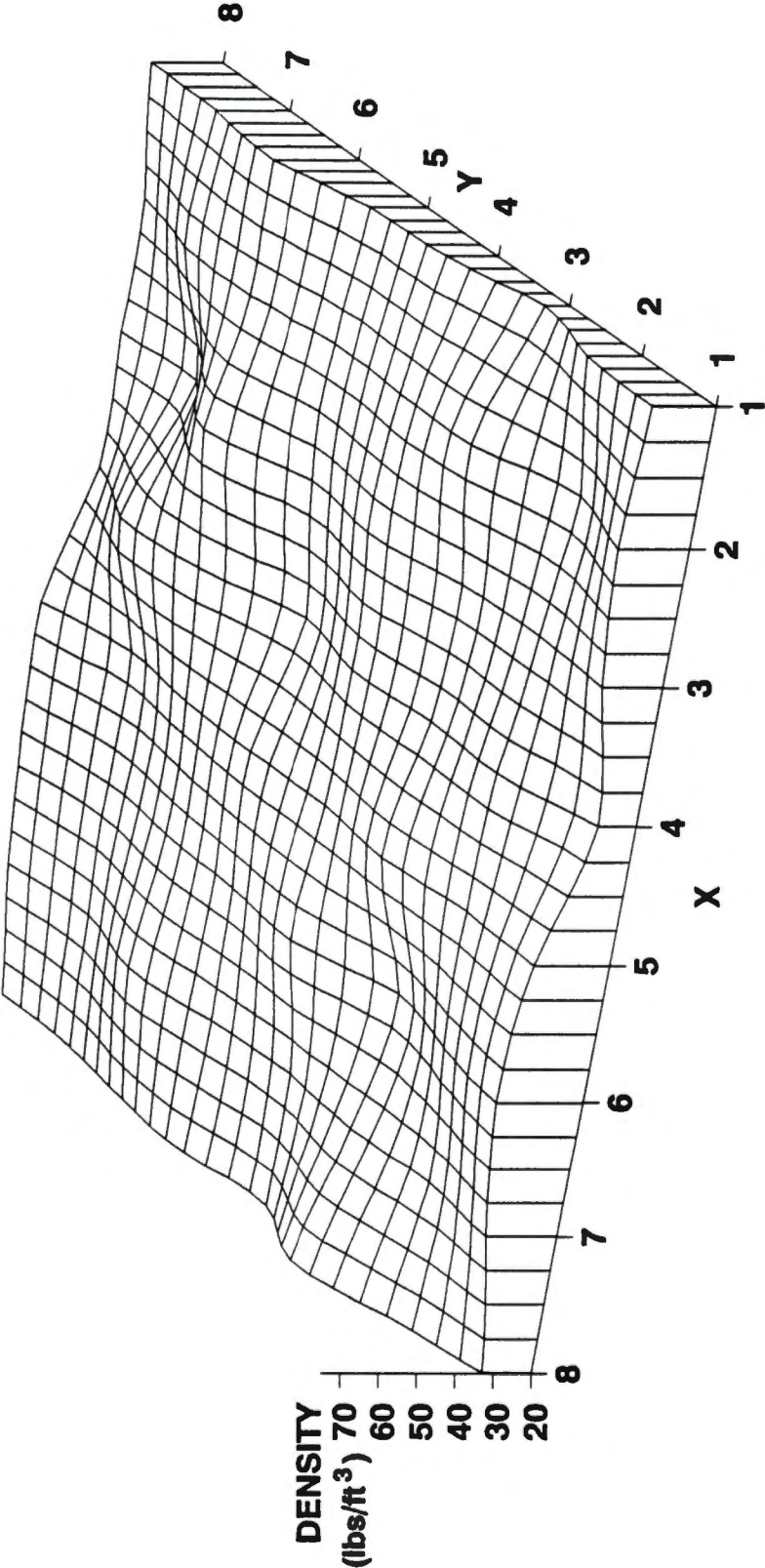
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 8



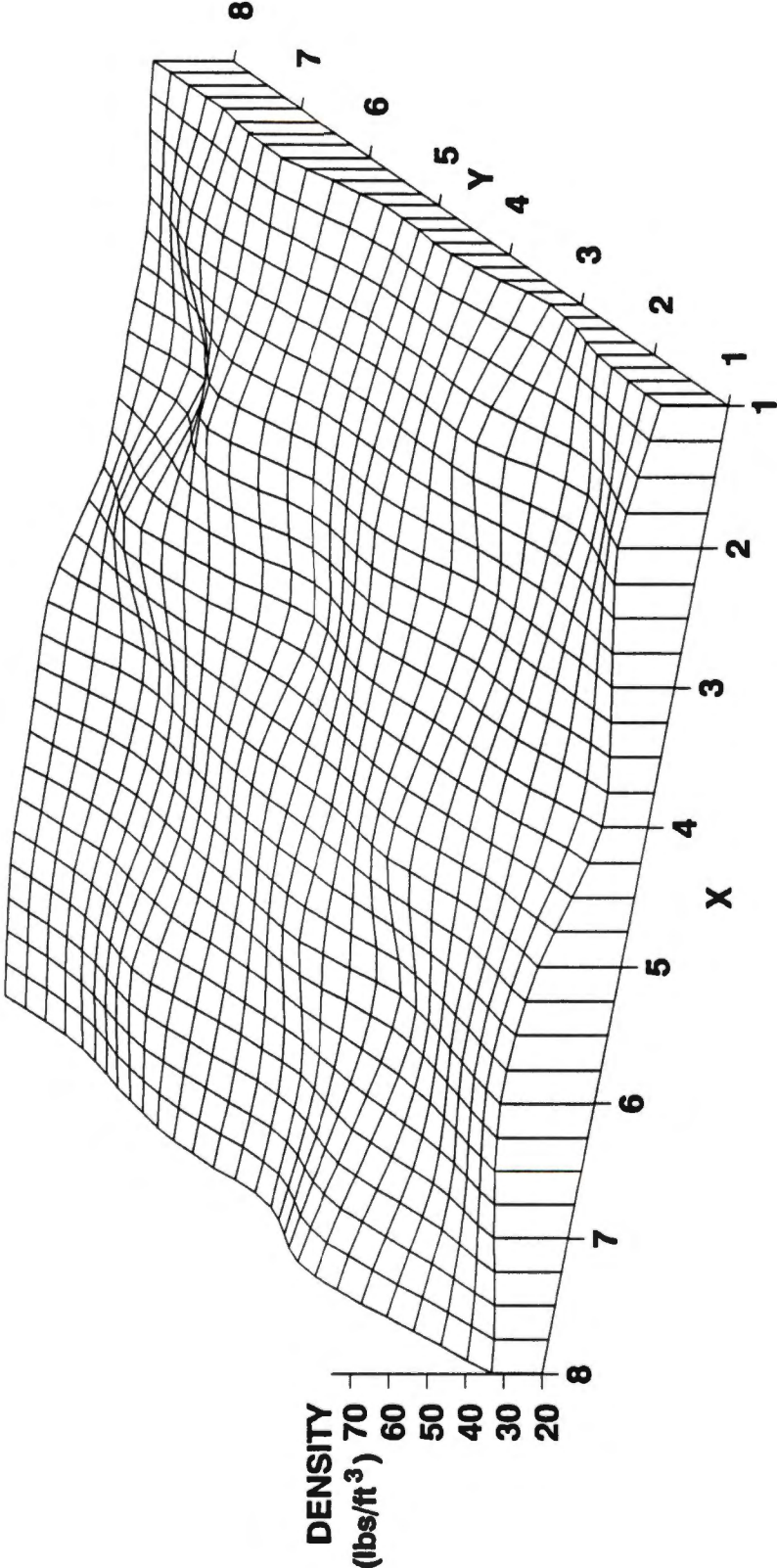
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 9



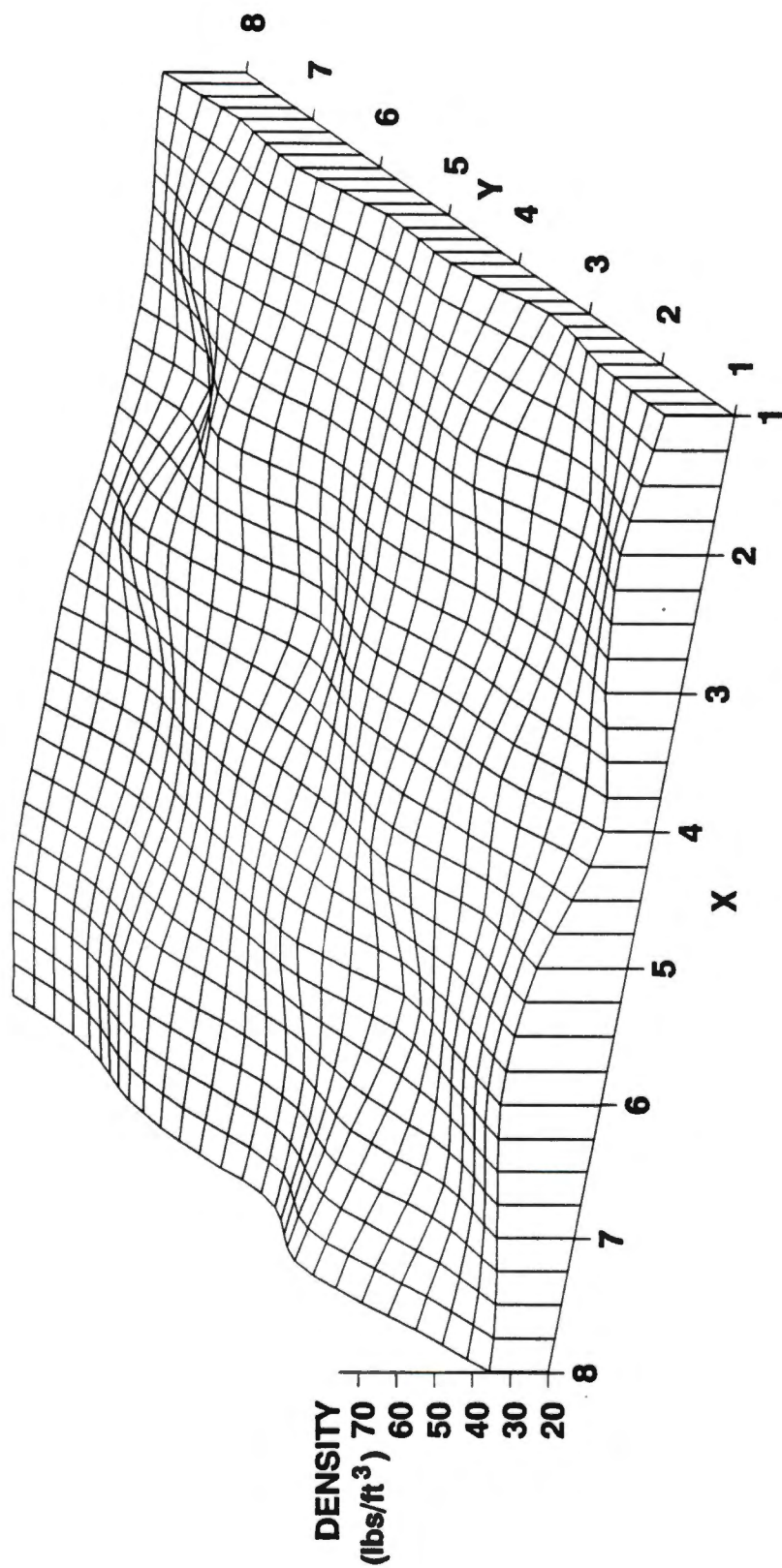
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 10



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 11



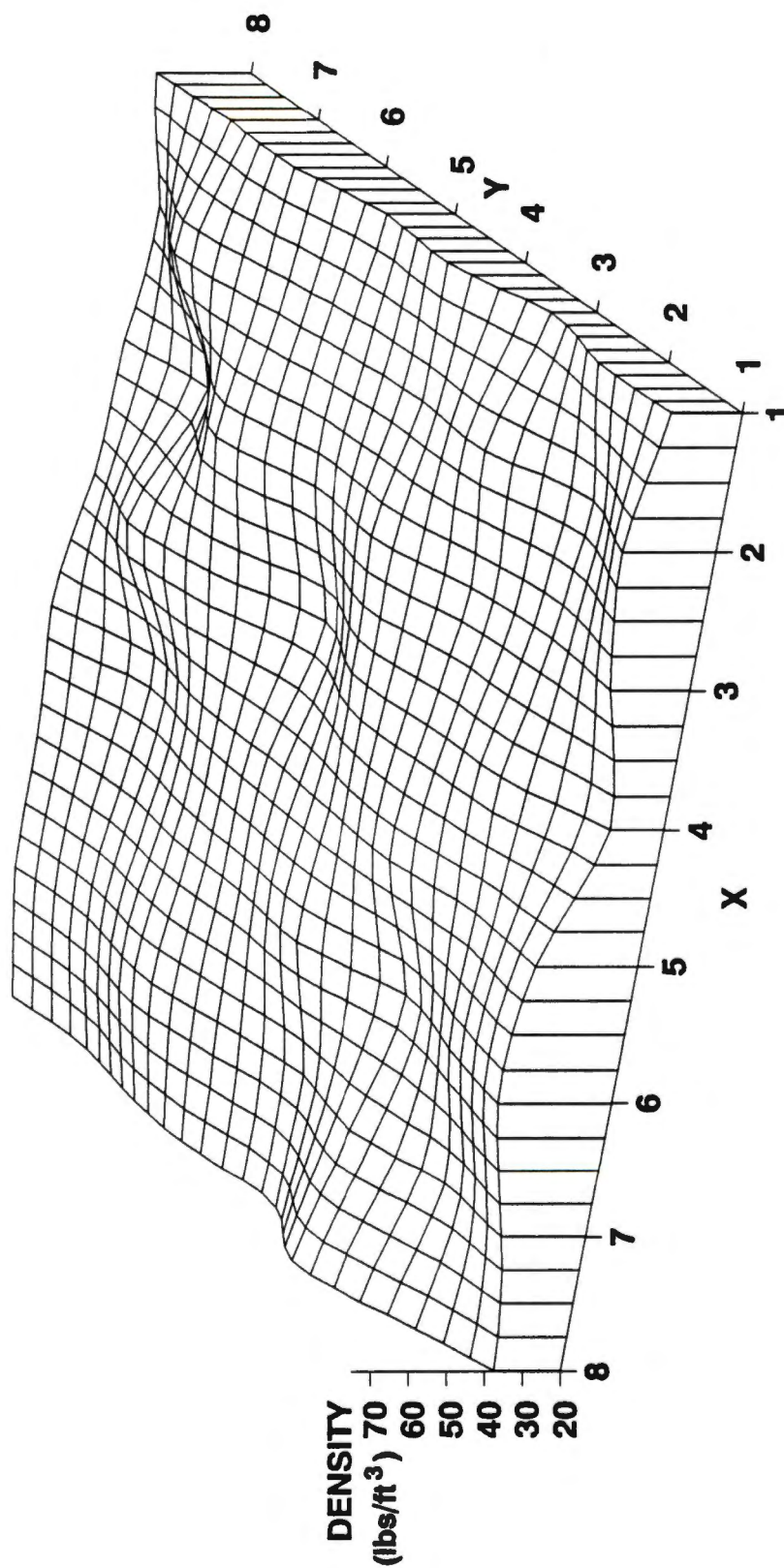
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 12



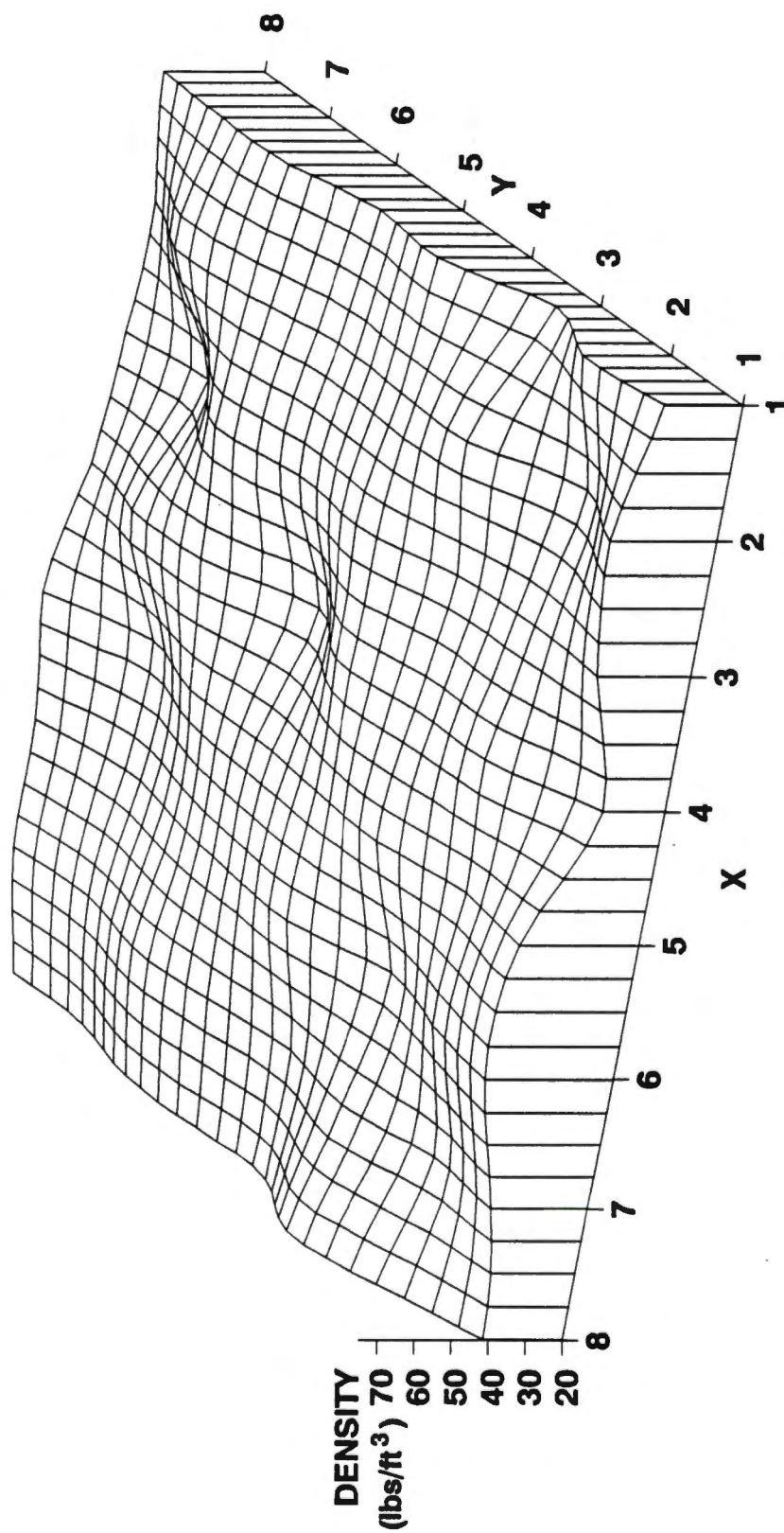
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS

REPLICATION=1

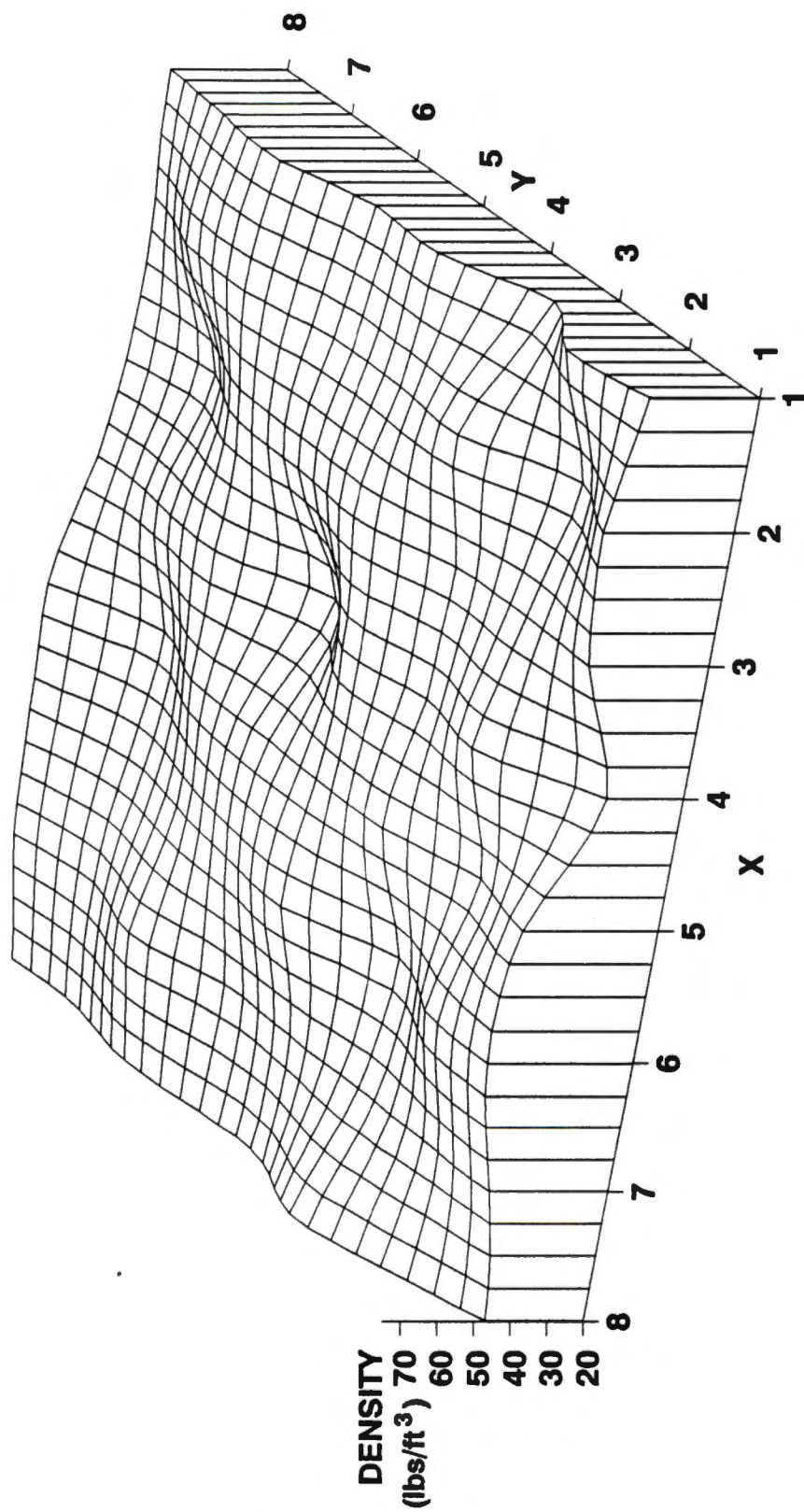
Z=13



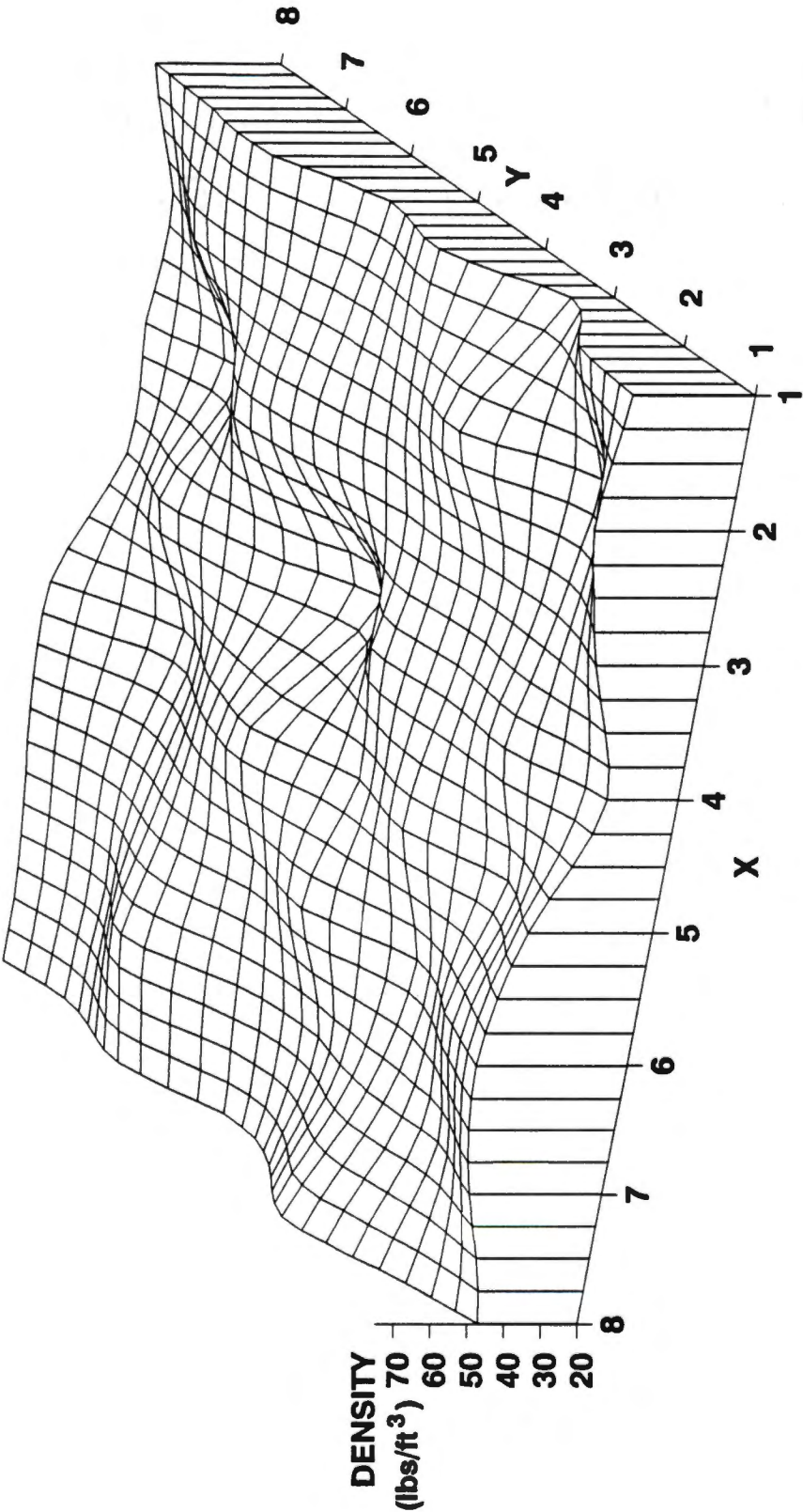
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=14



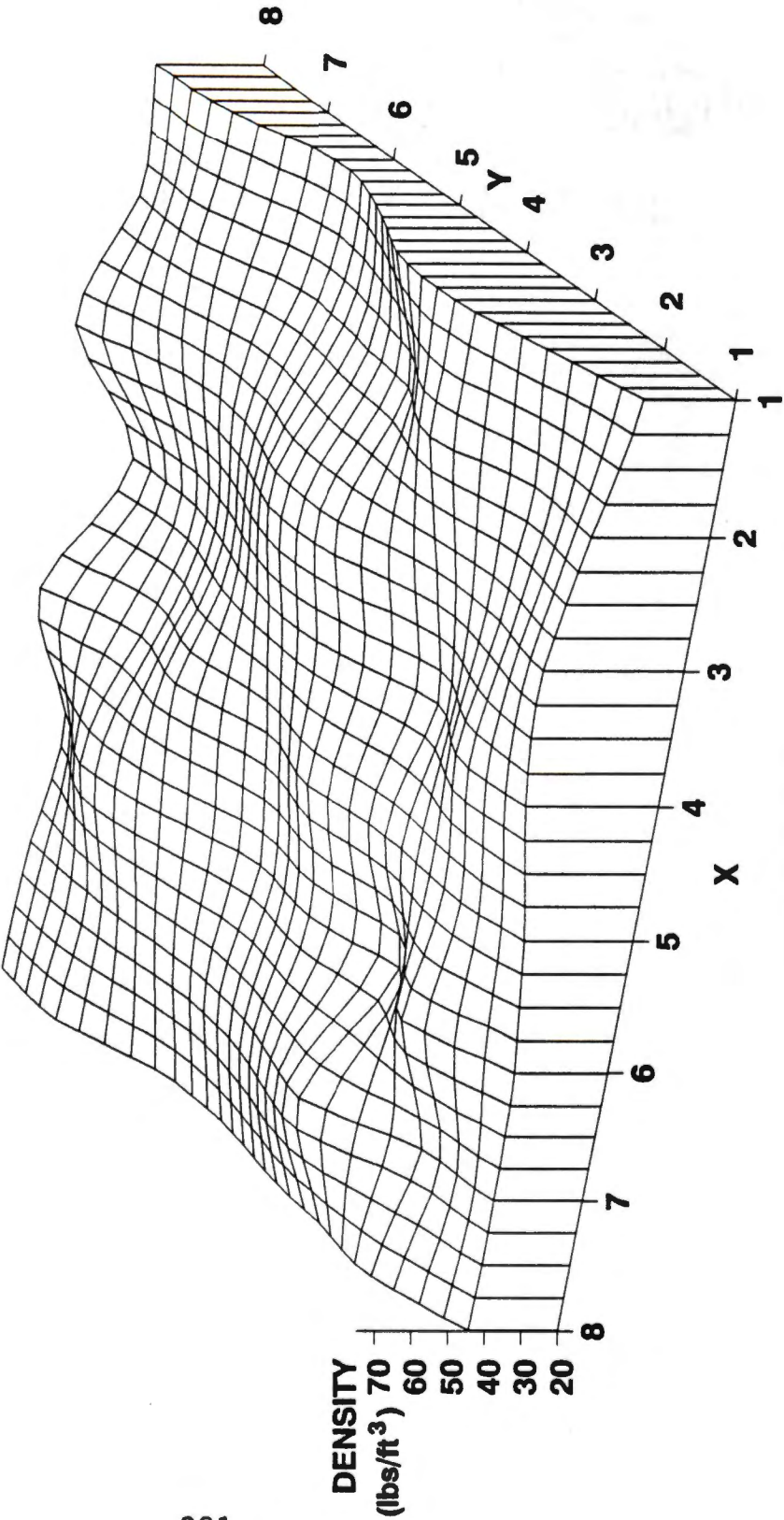
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 15



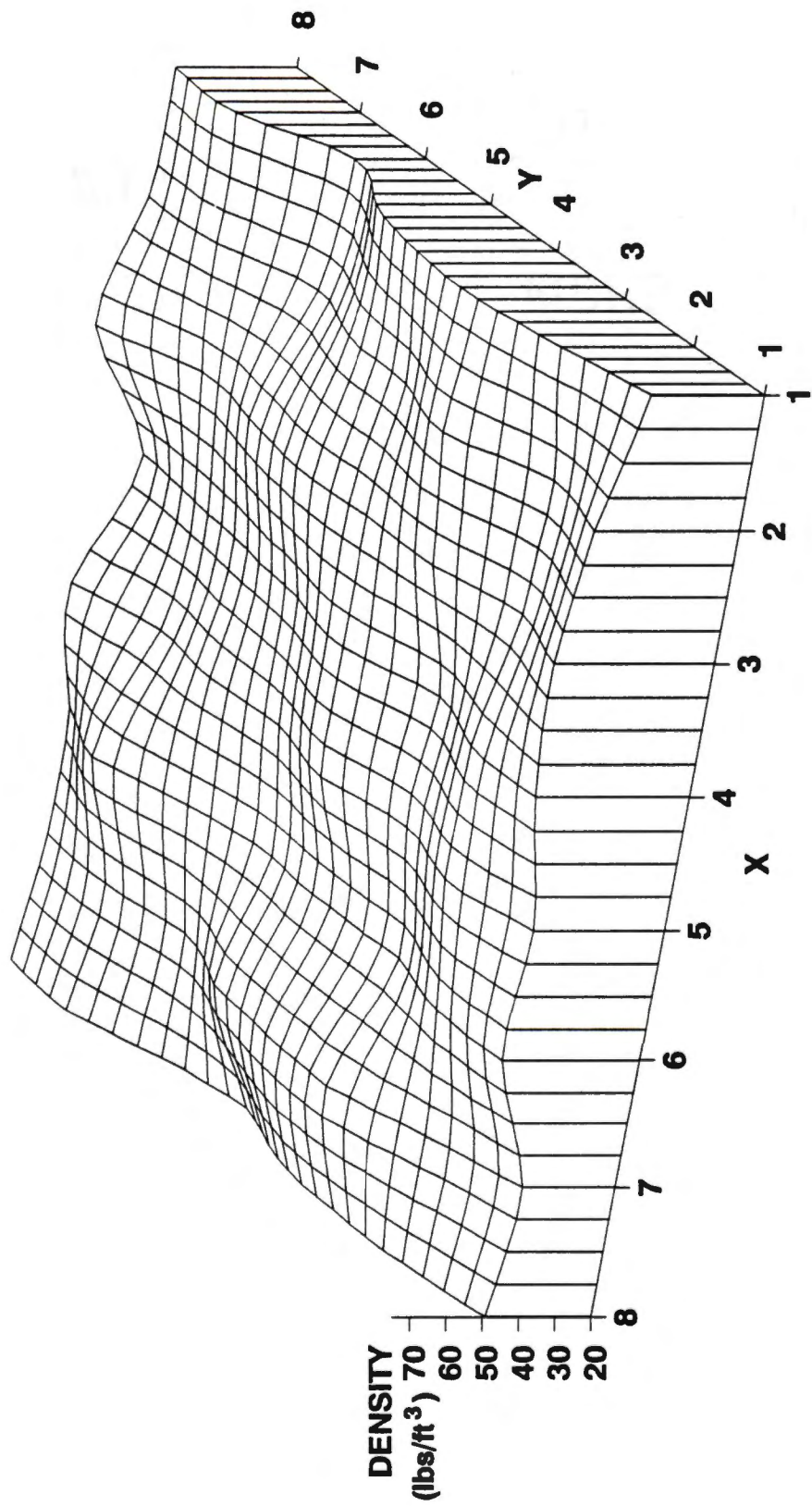
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=16



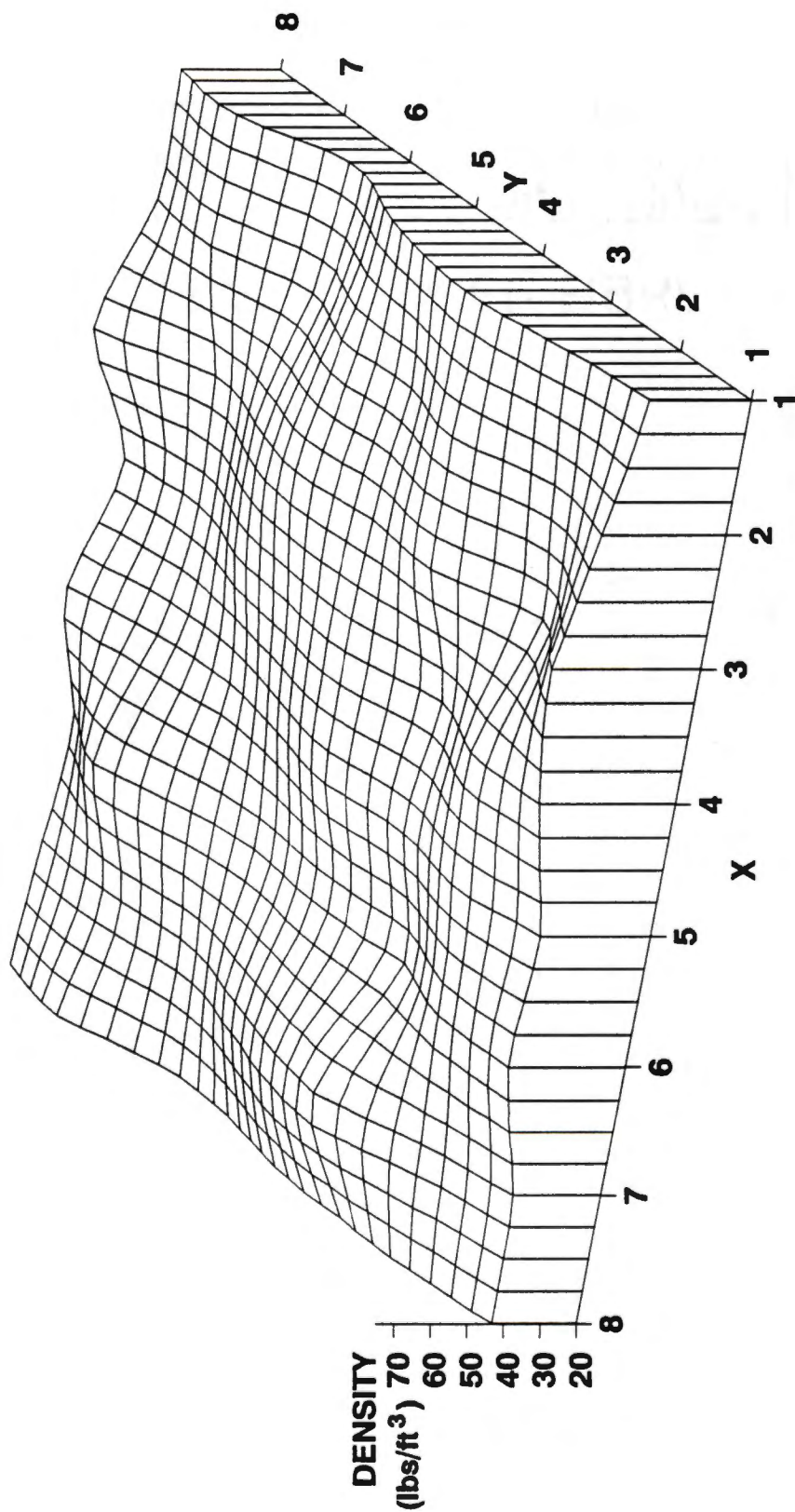
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 1



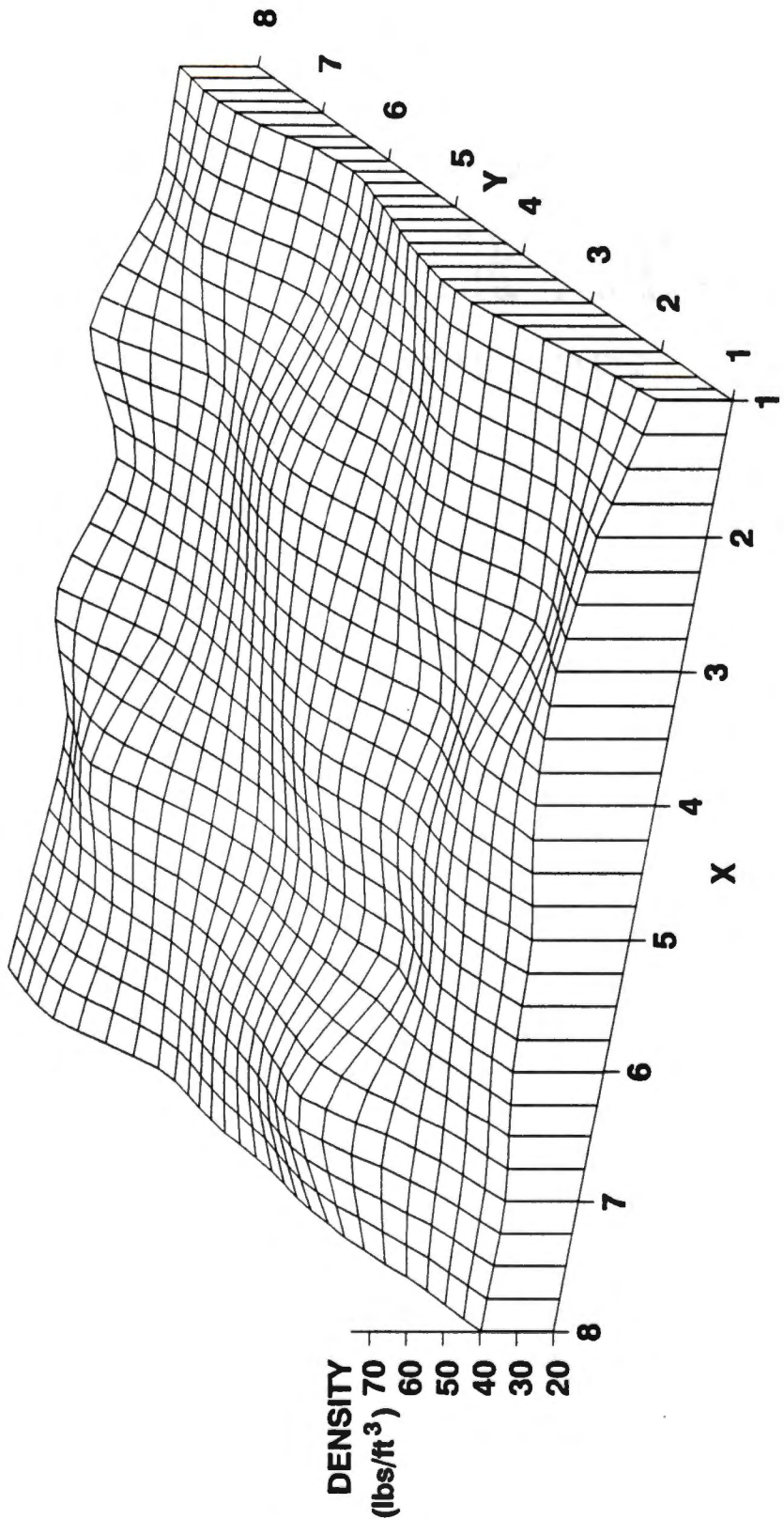
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 2



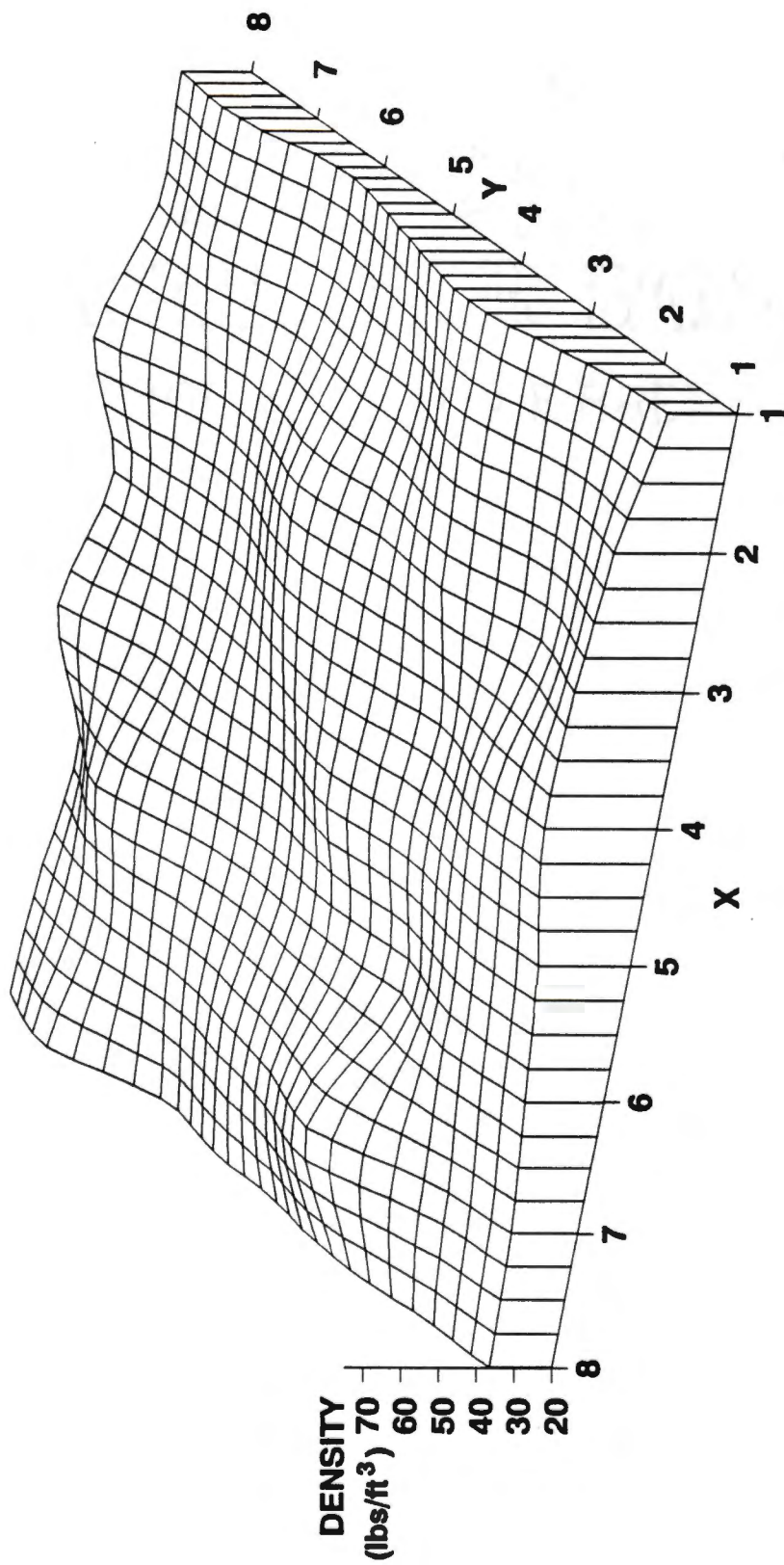
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 3



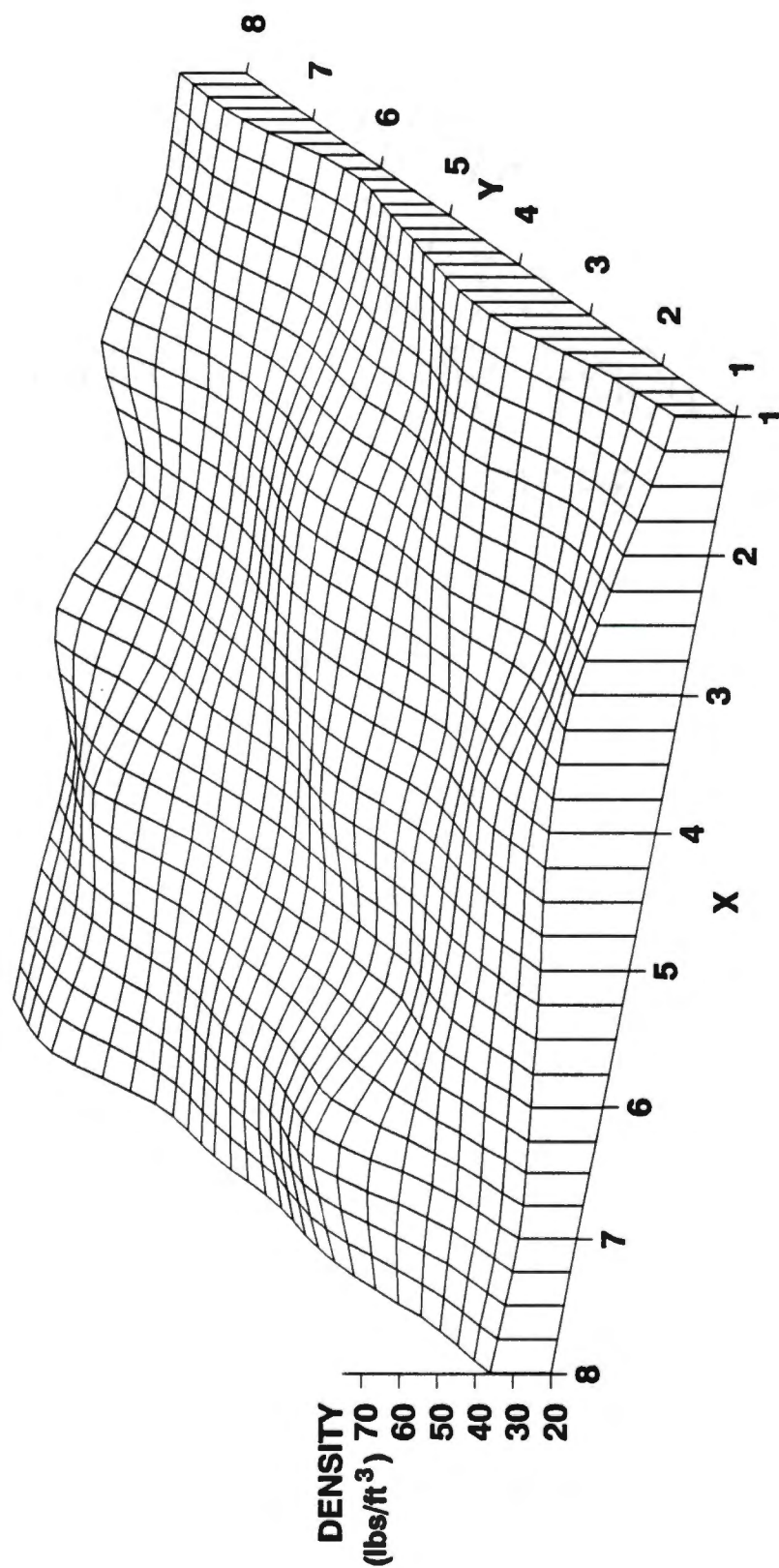
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 4



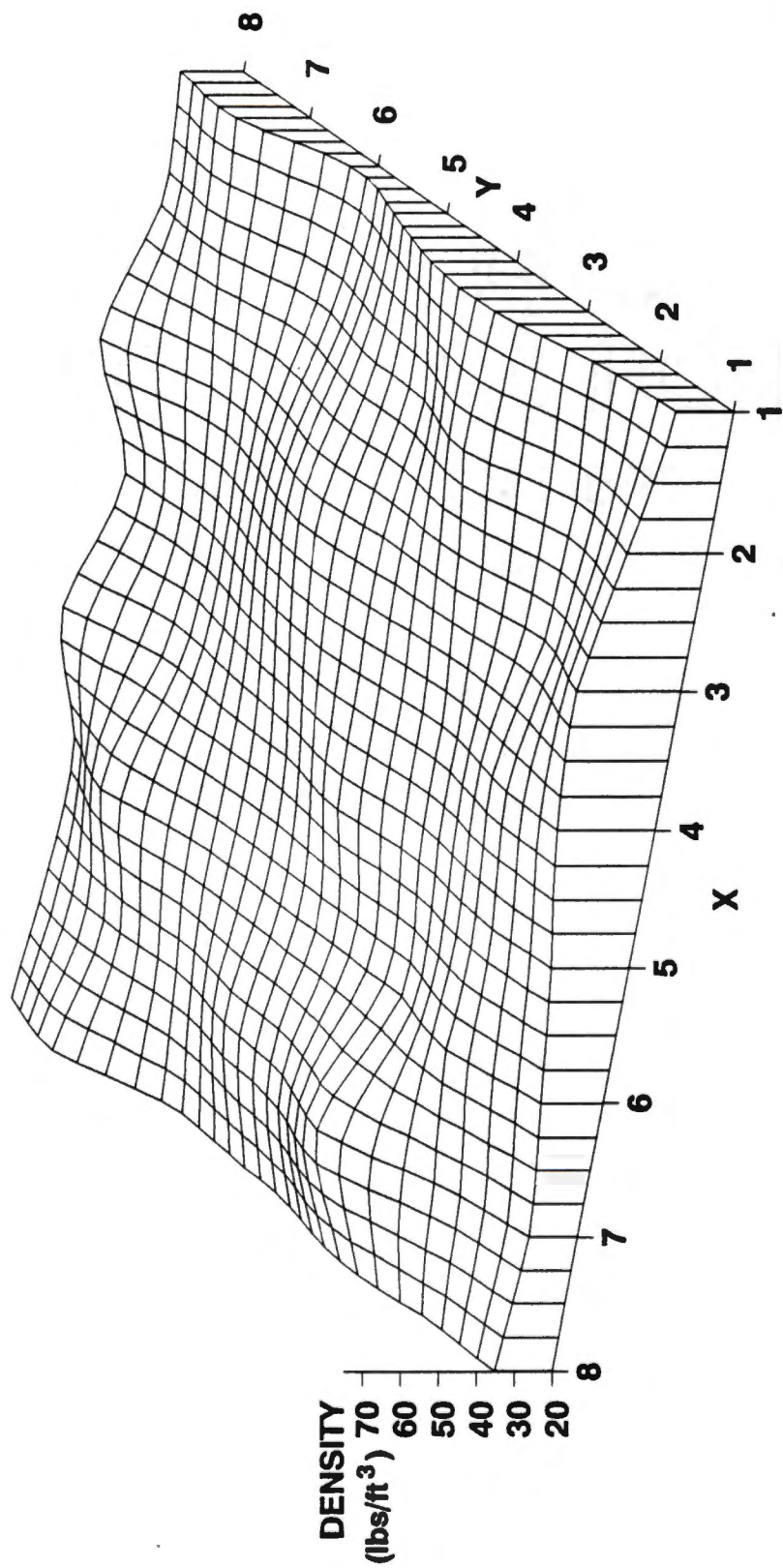
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=5



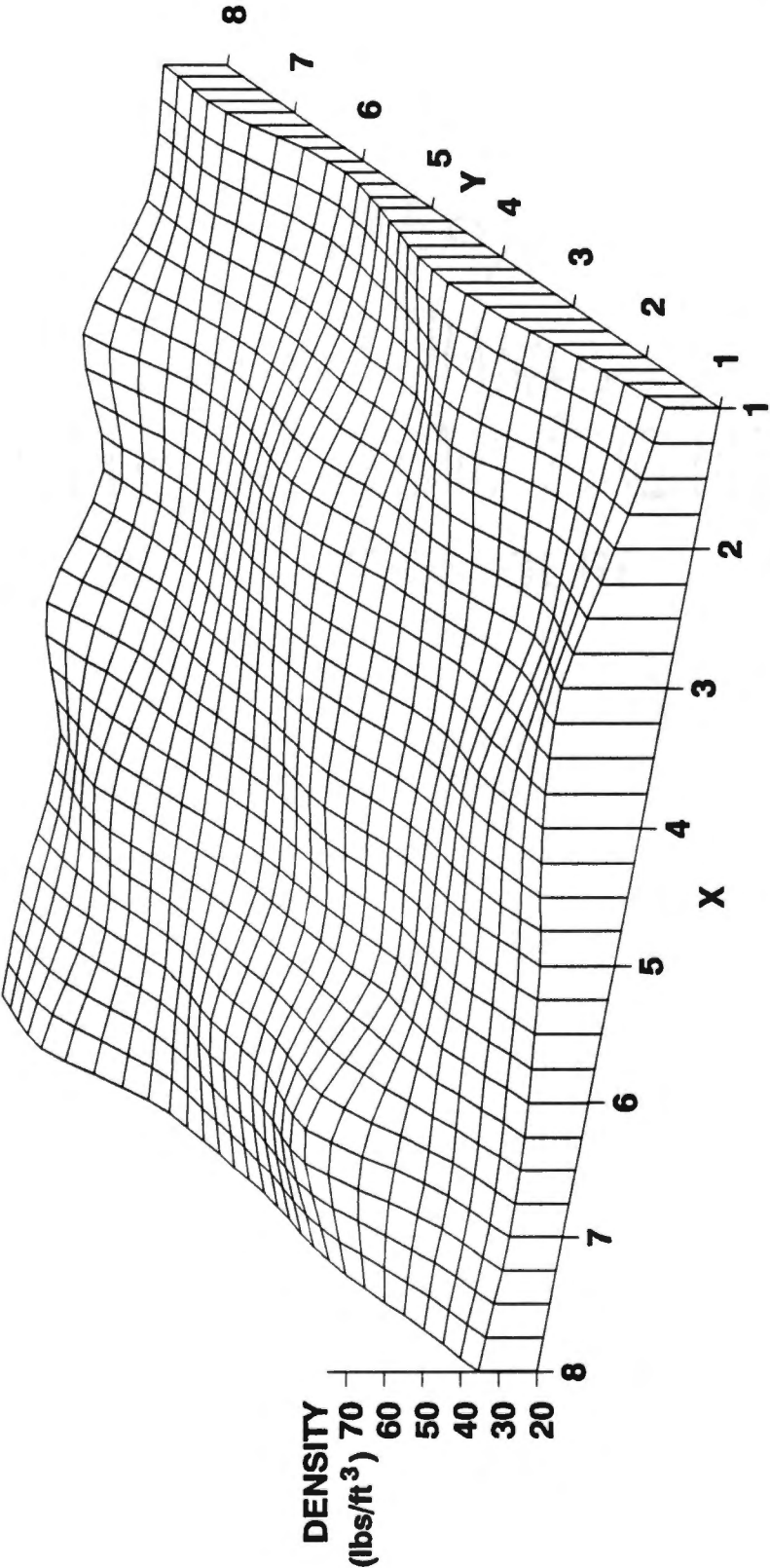
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=6



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 7



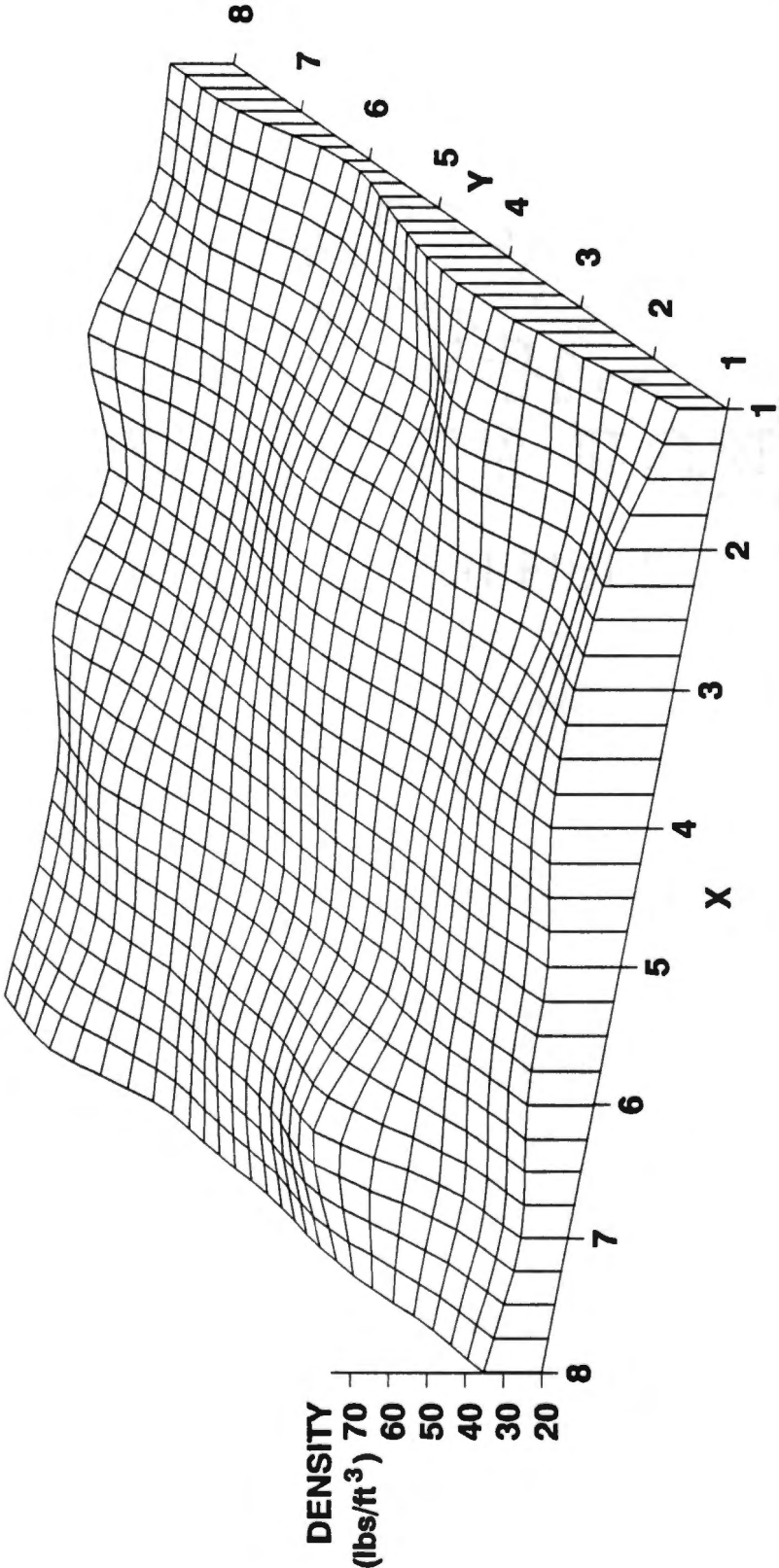
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=8



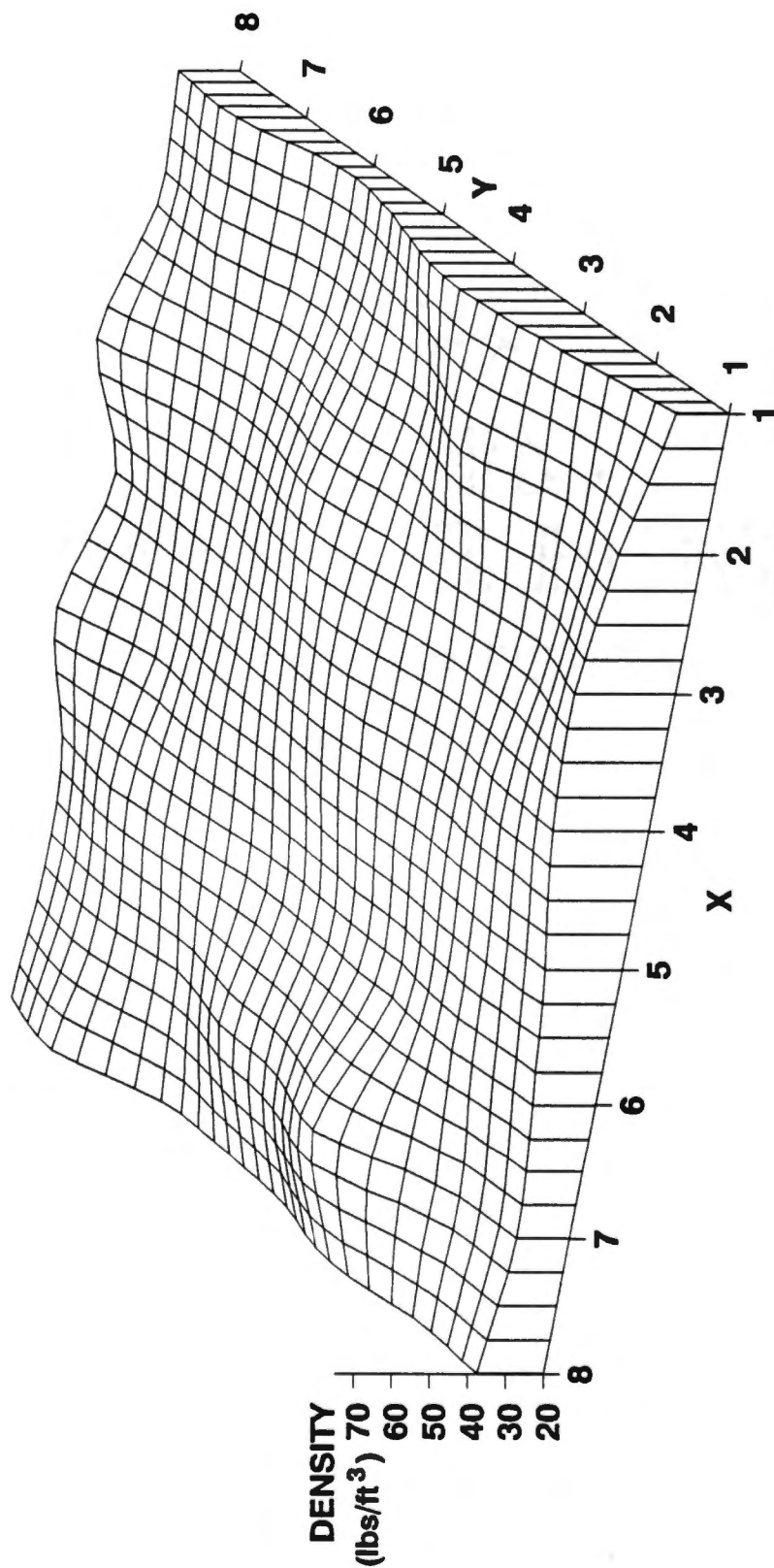
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

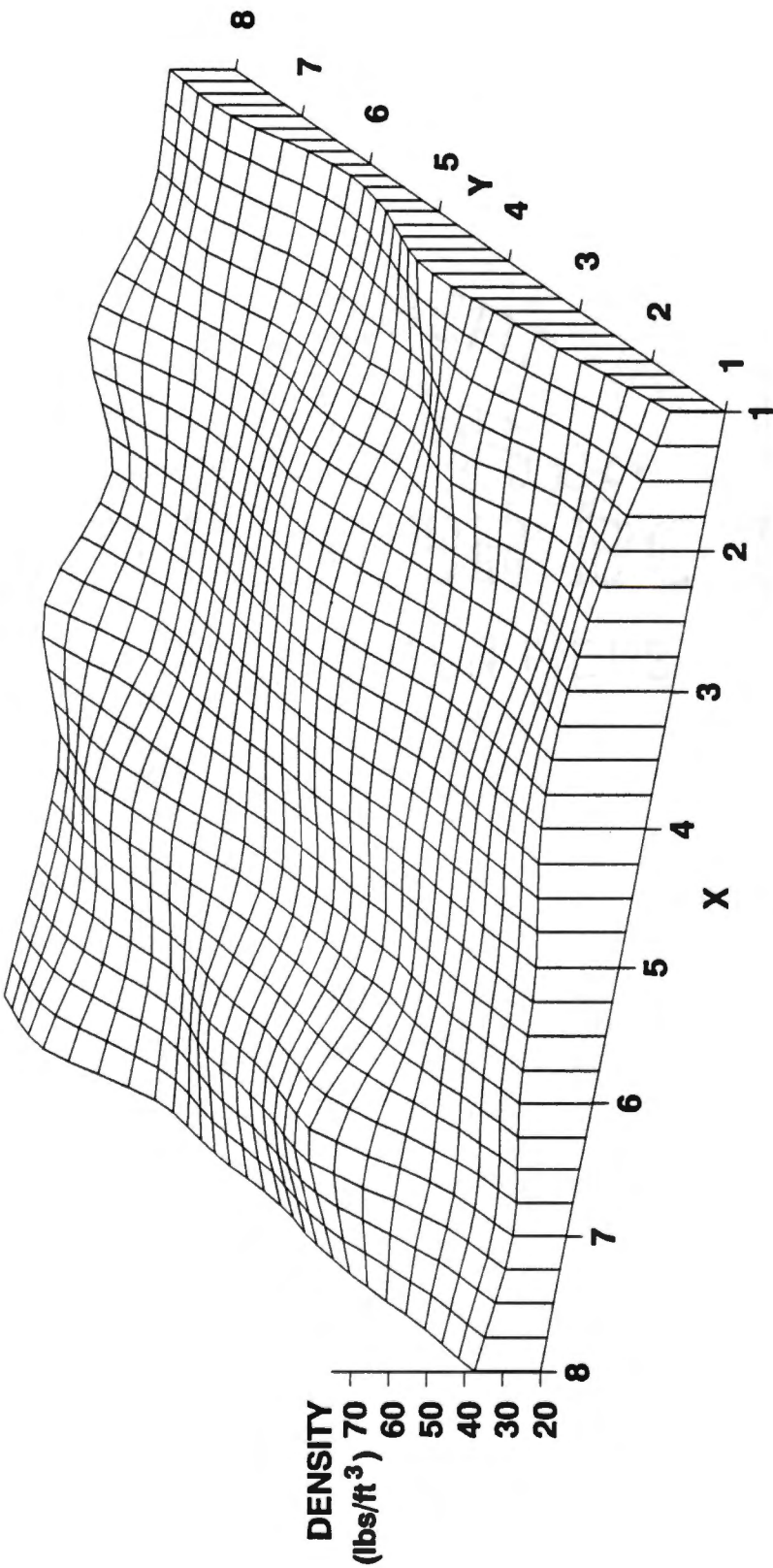
Z = 9



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=10



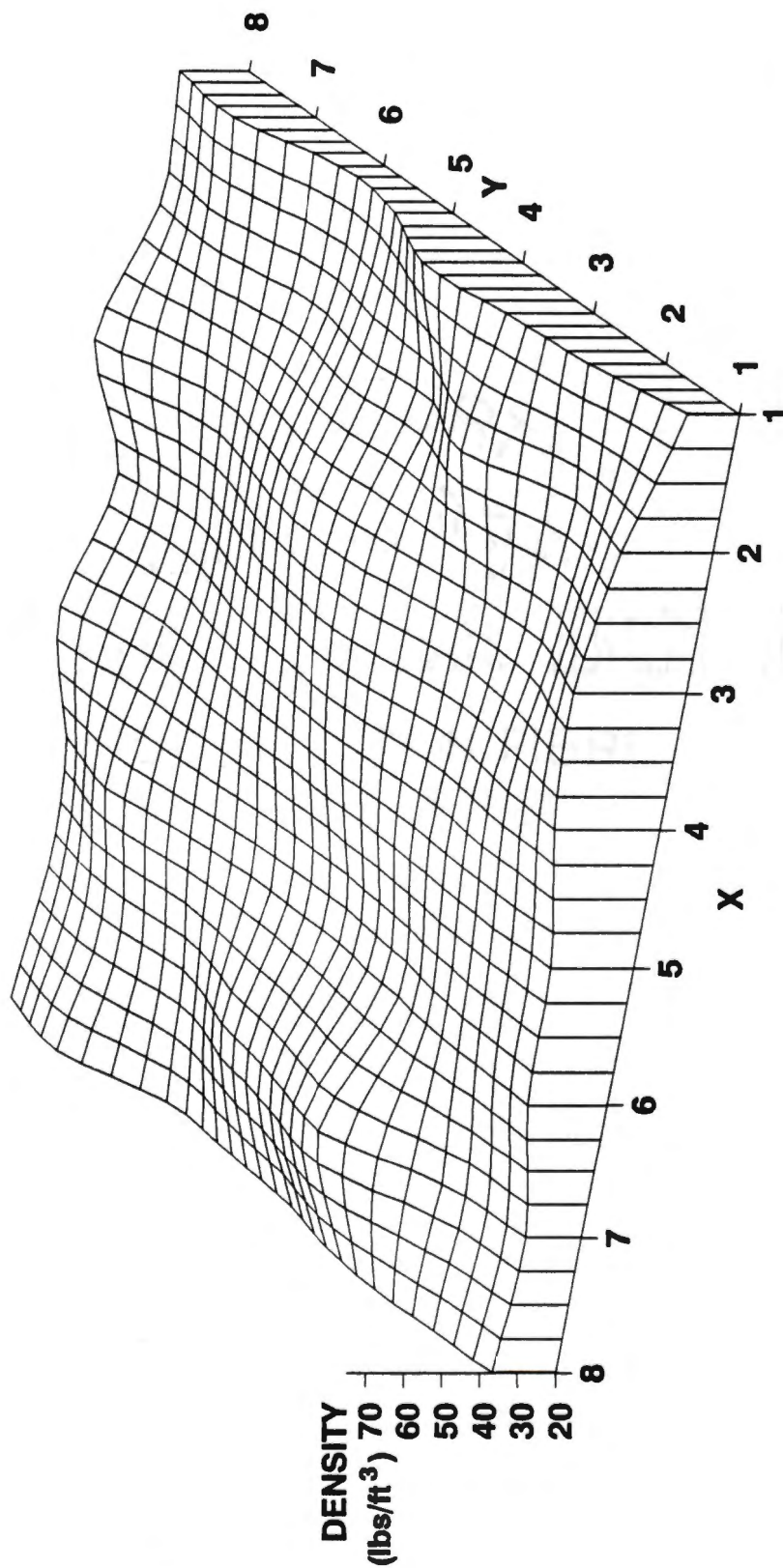
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 11



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

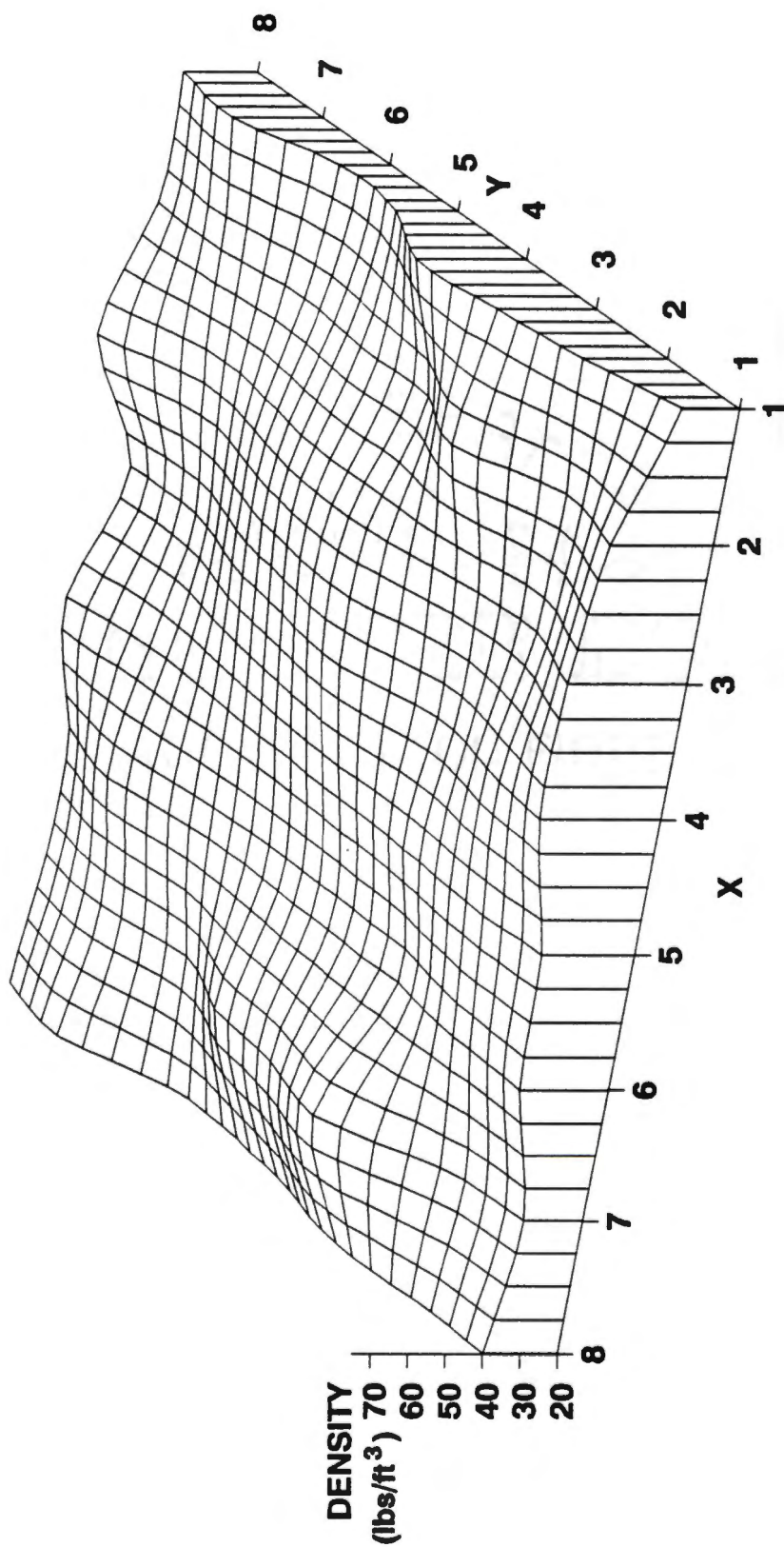
Z = 12



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

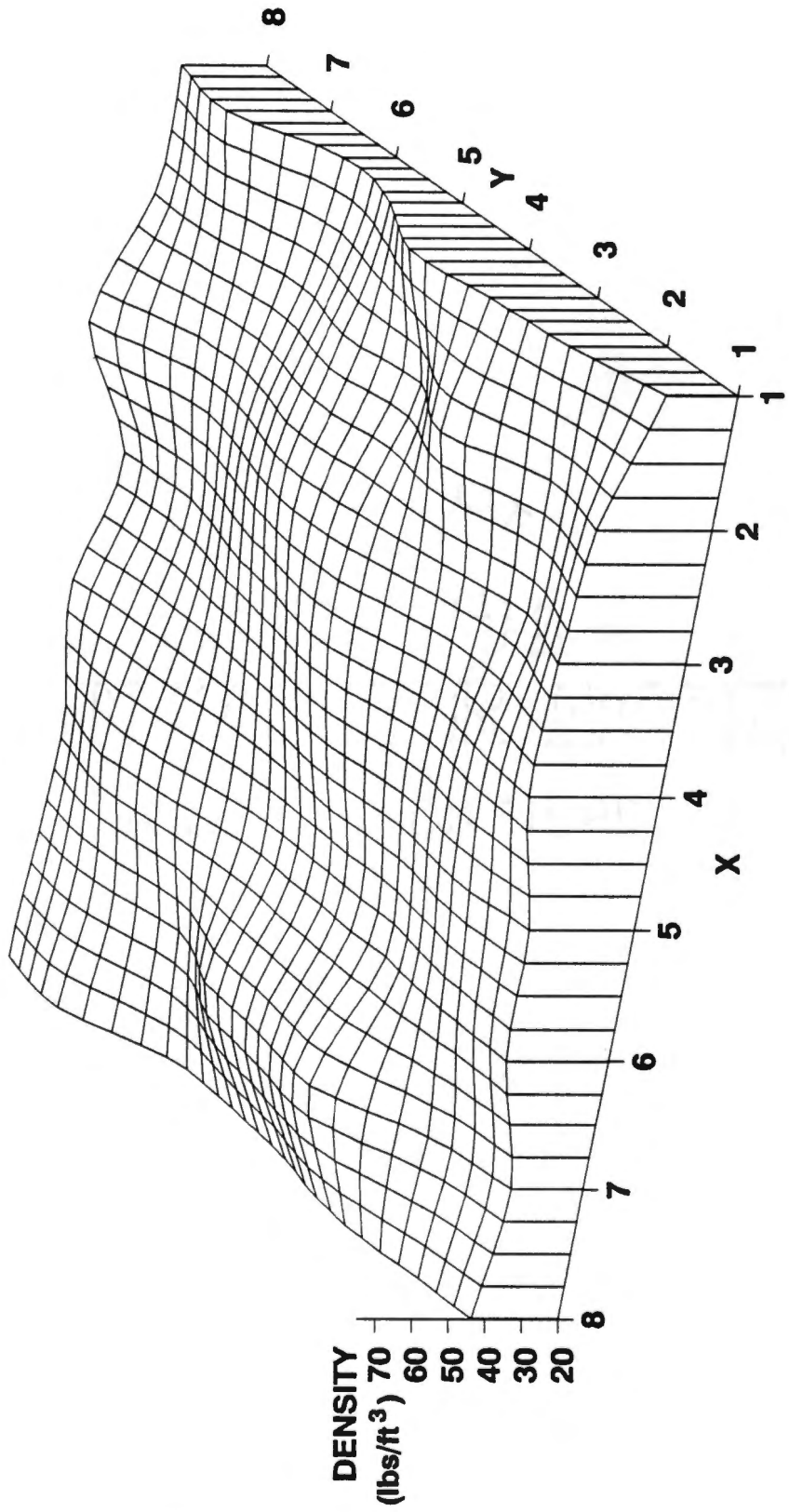
Z = 13



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

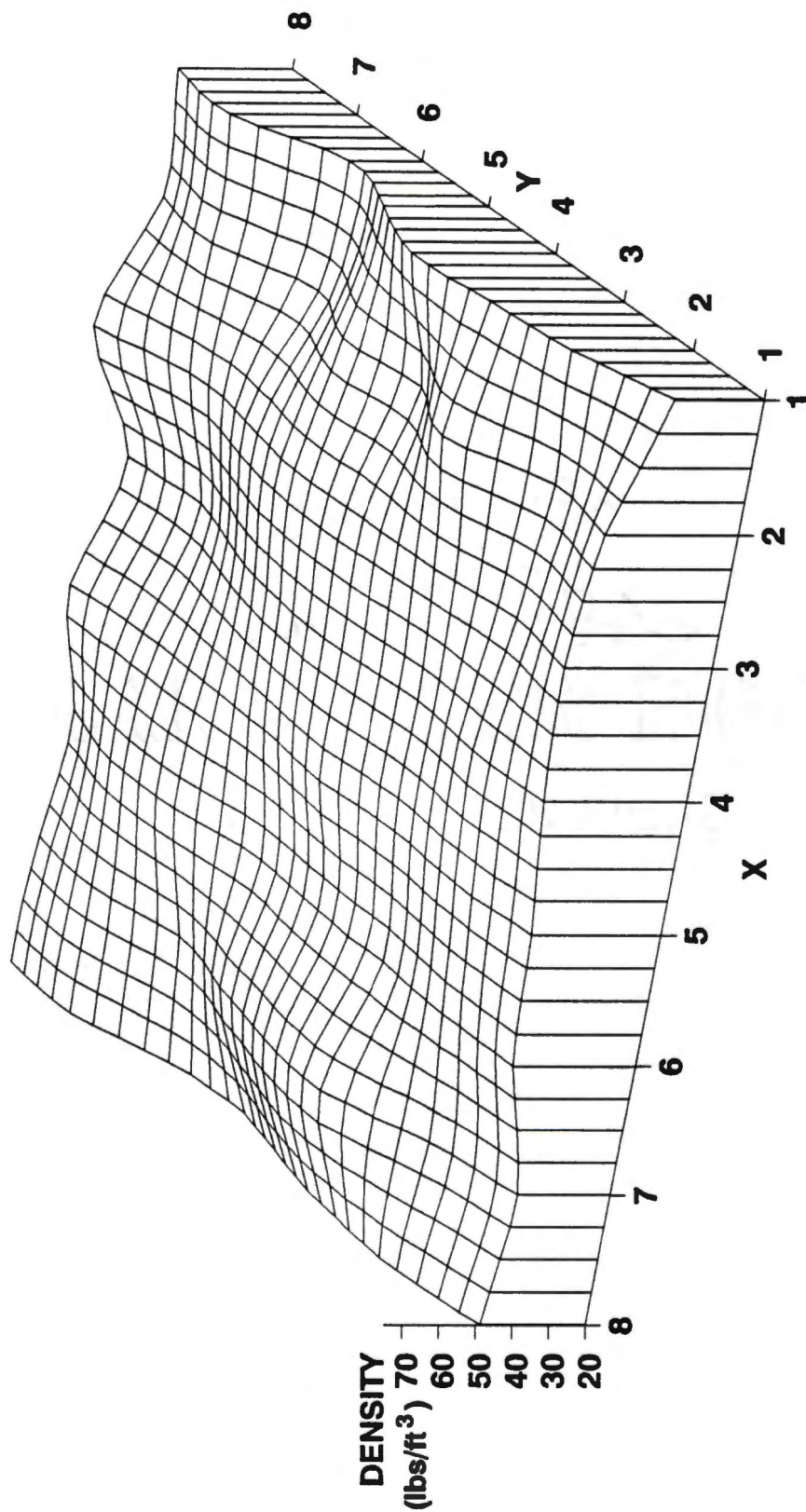
Z = 14



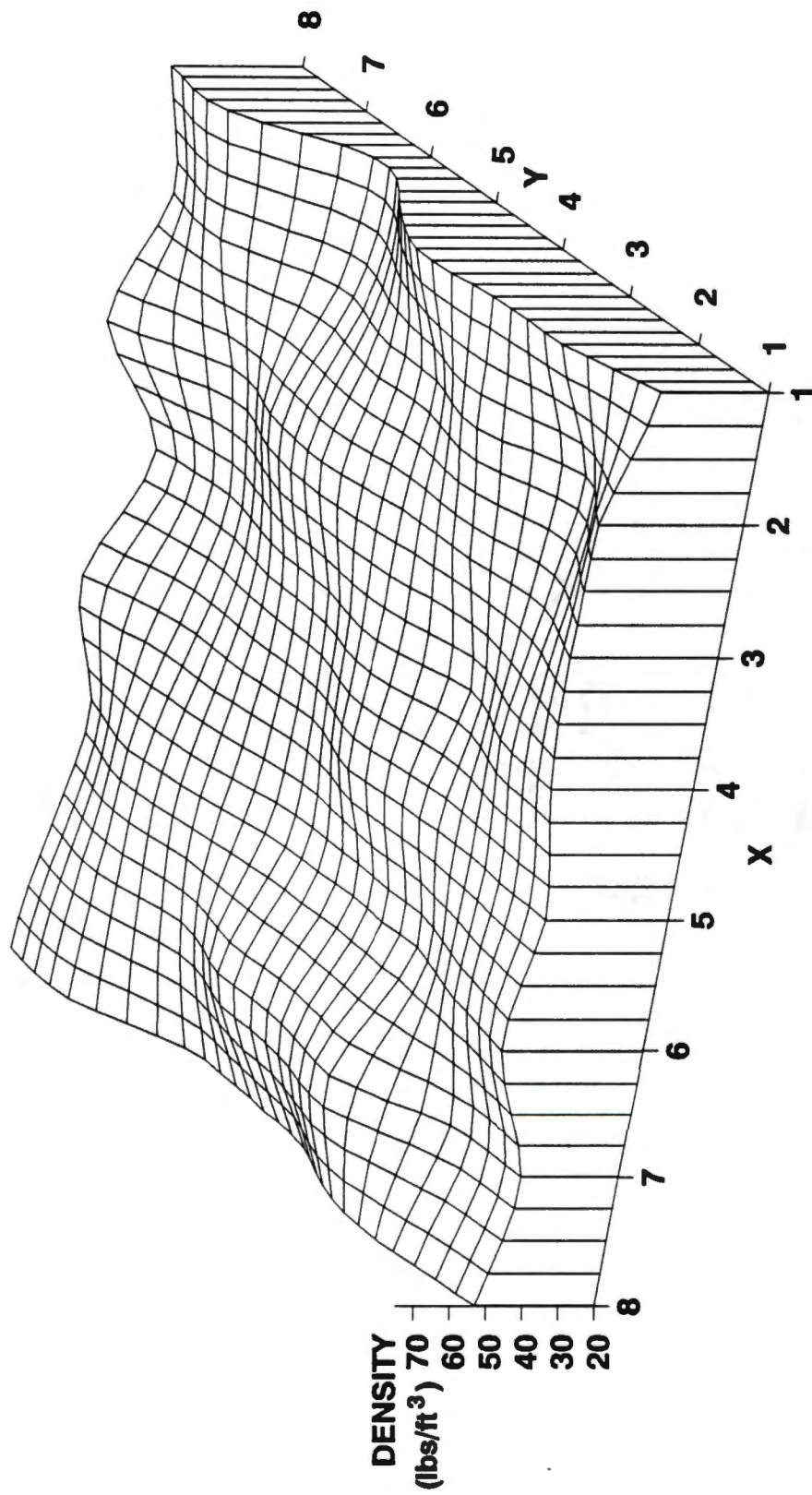
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

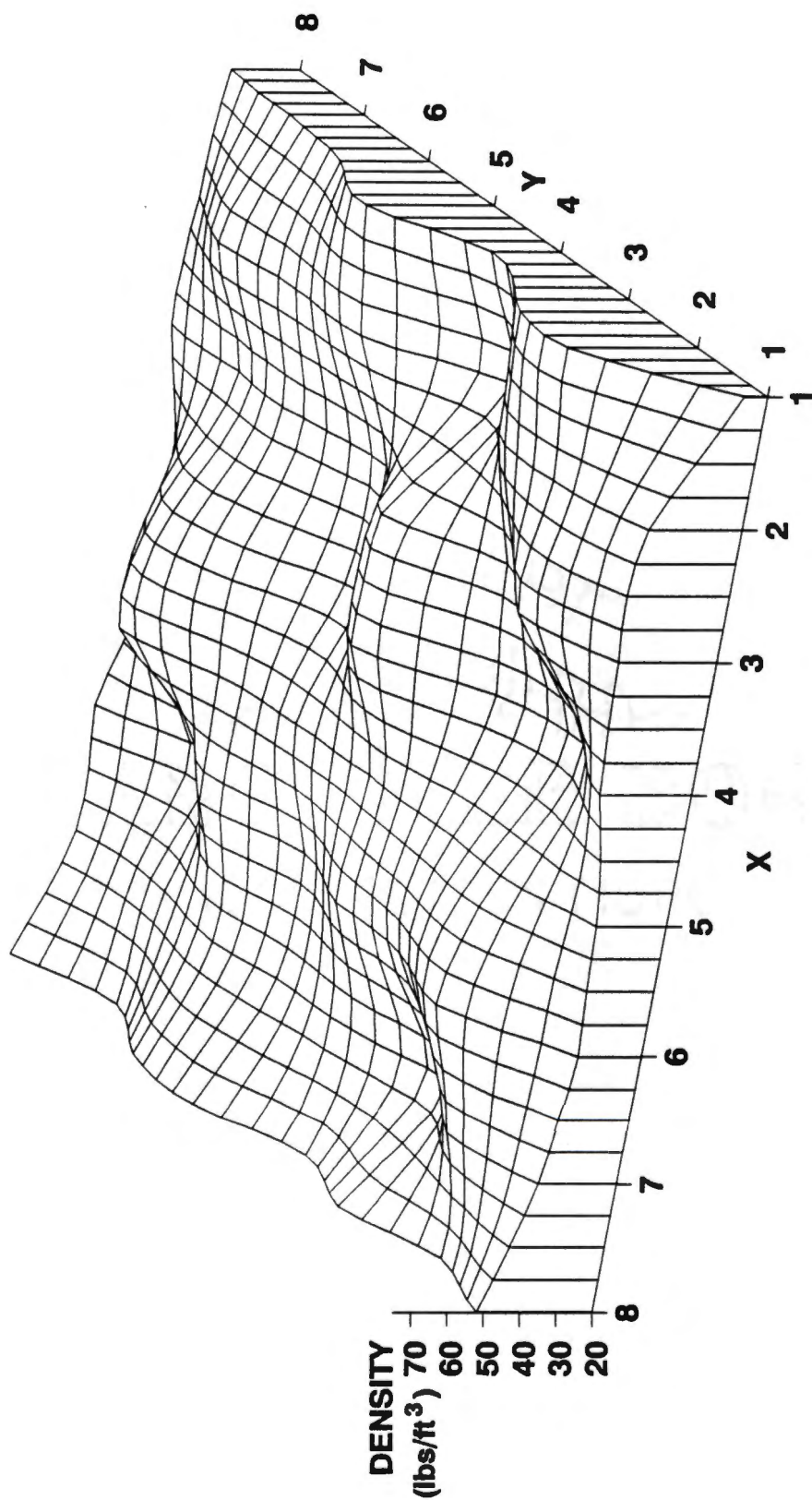
Z = 15



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 16



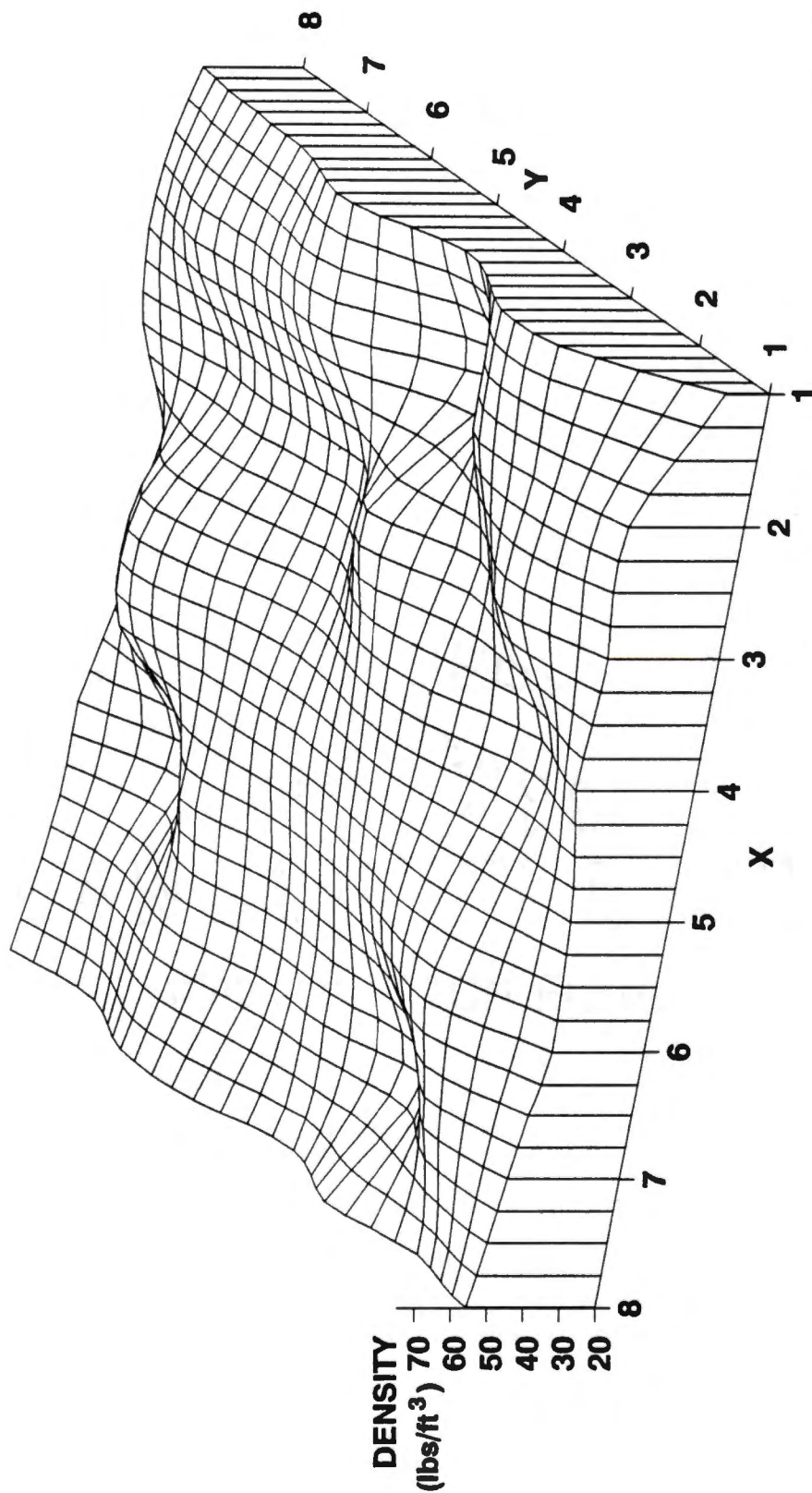
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 1



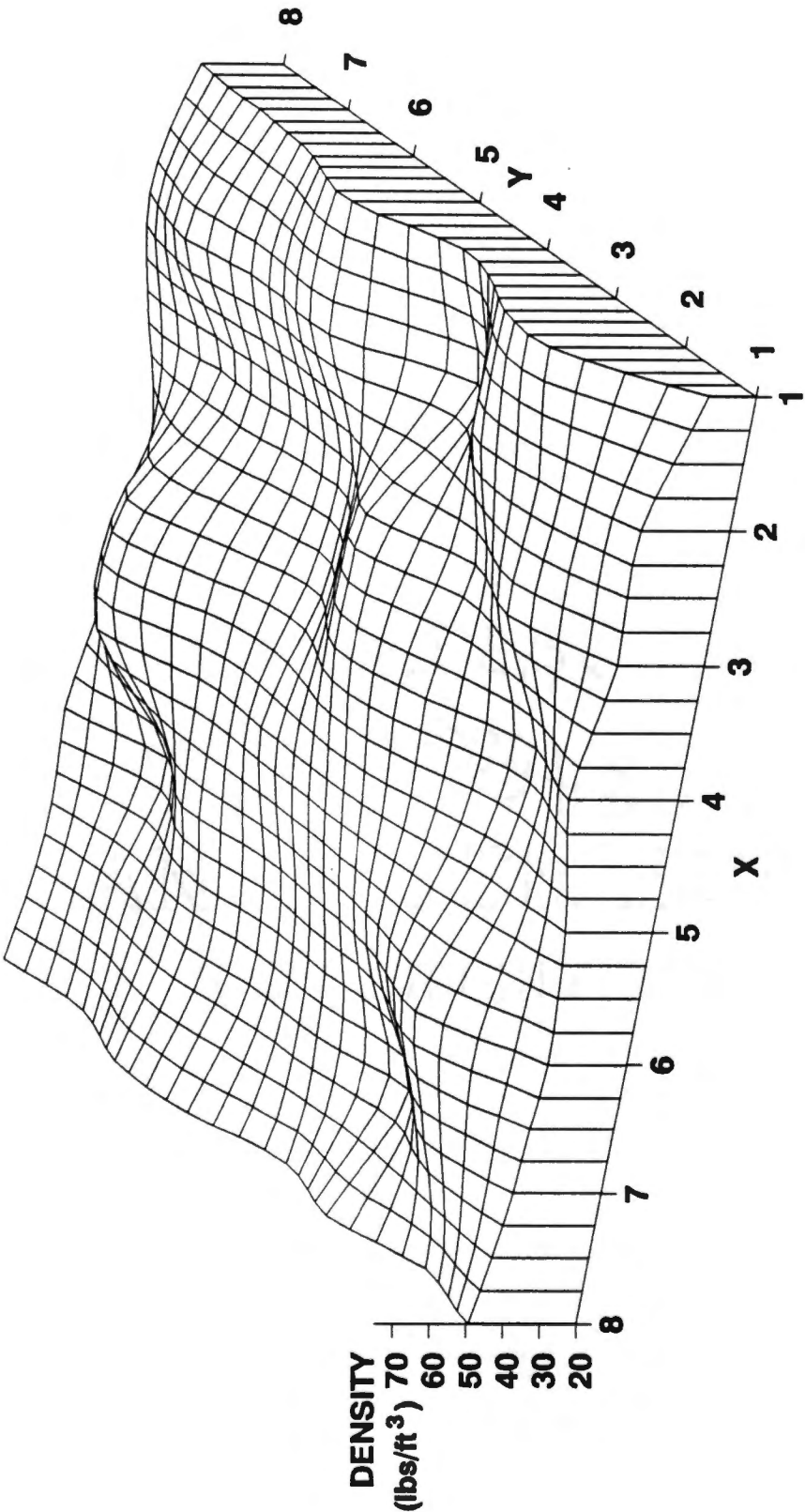
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 3

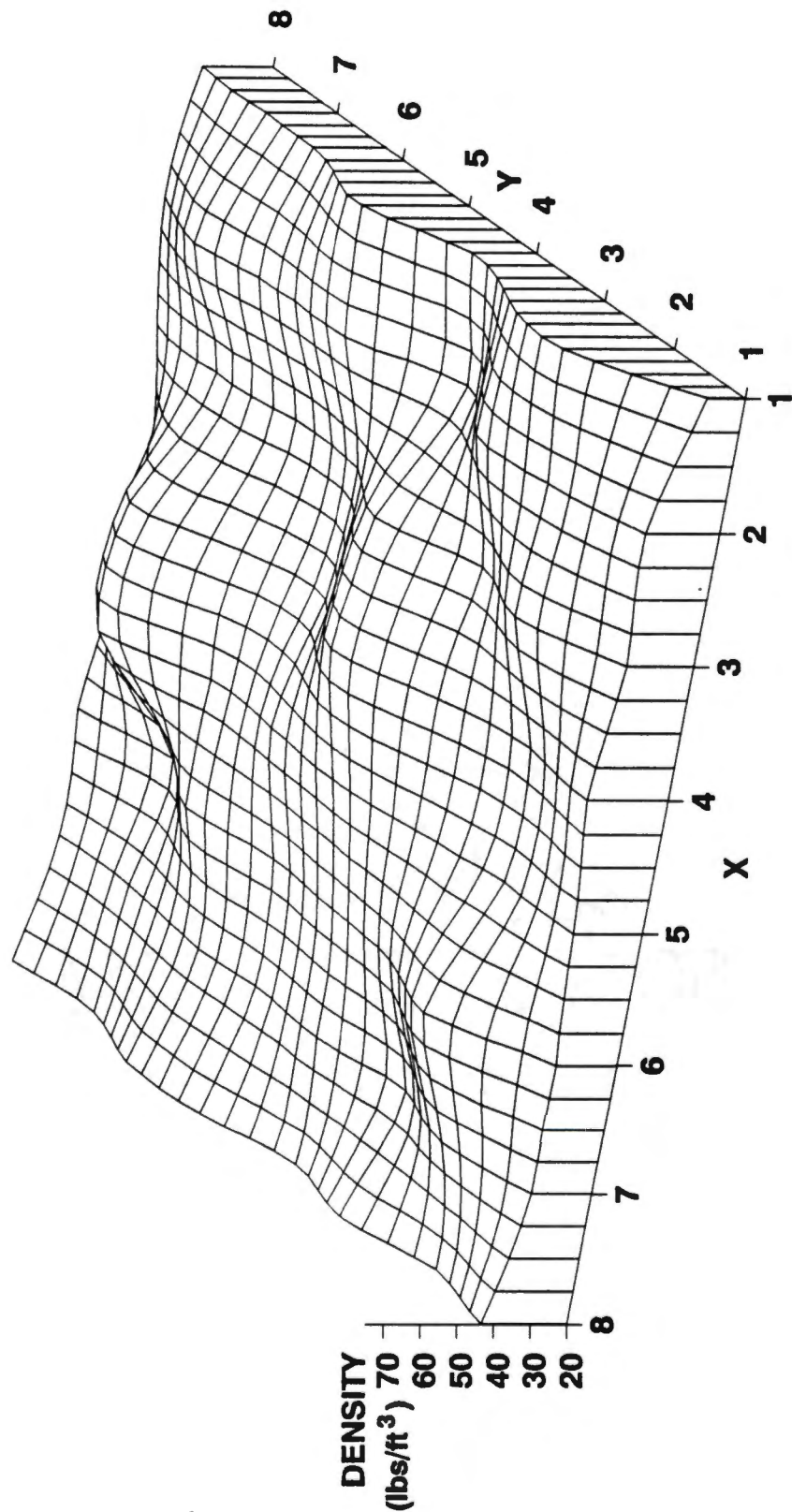
Z = 2



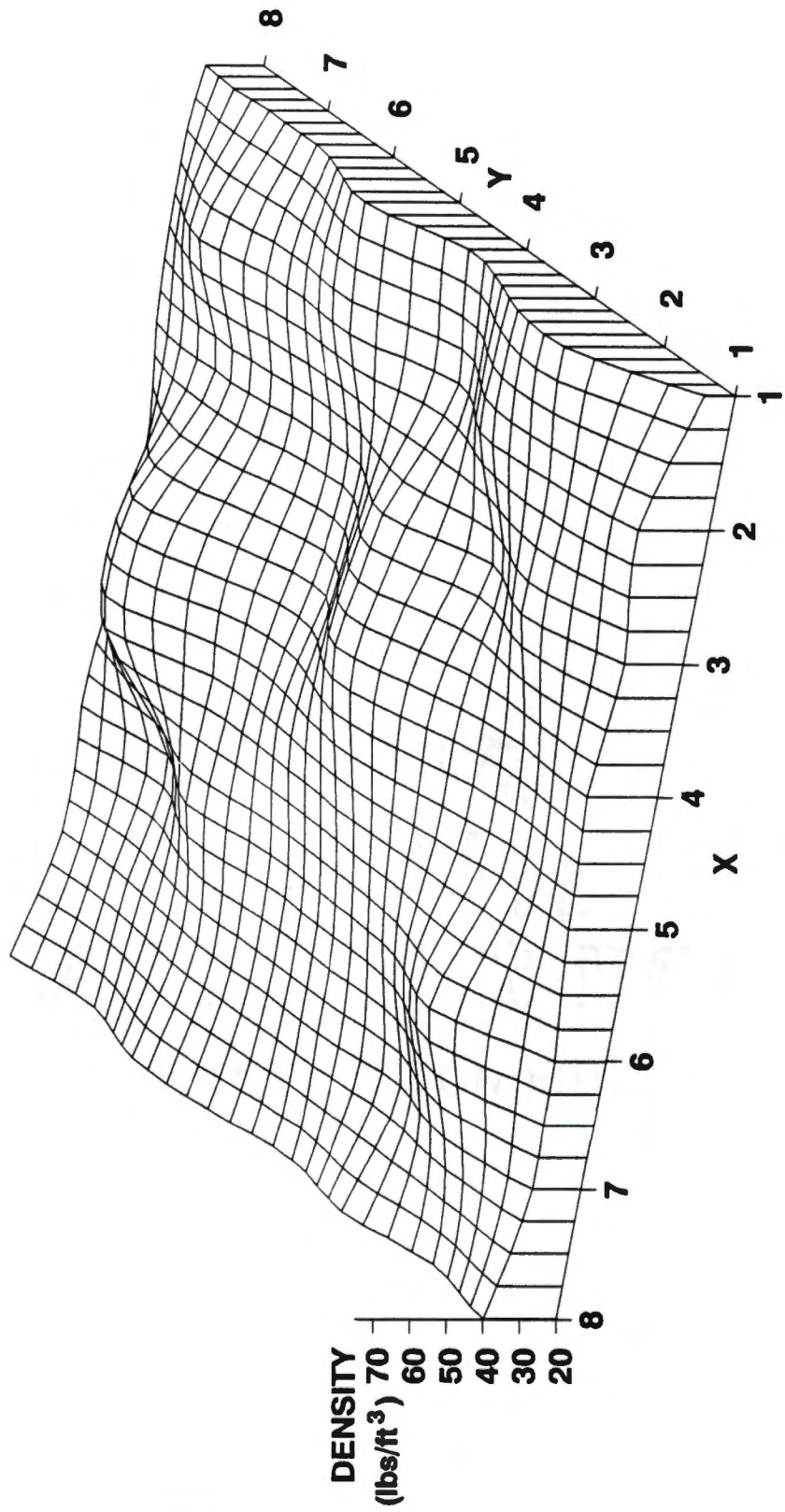
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=3



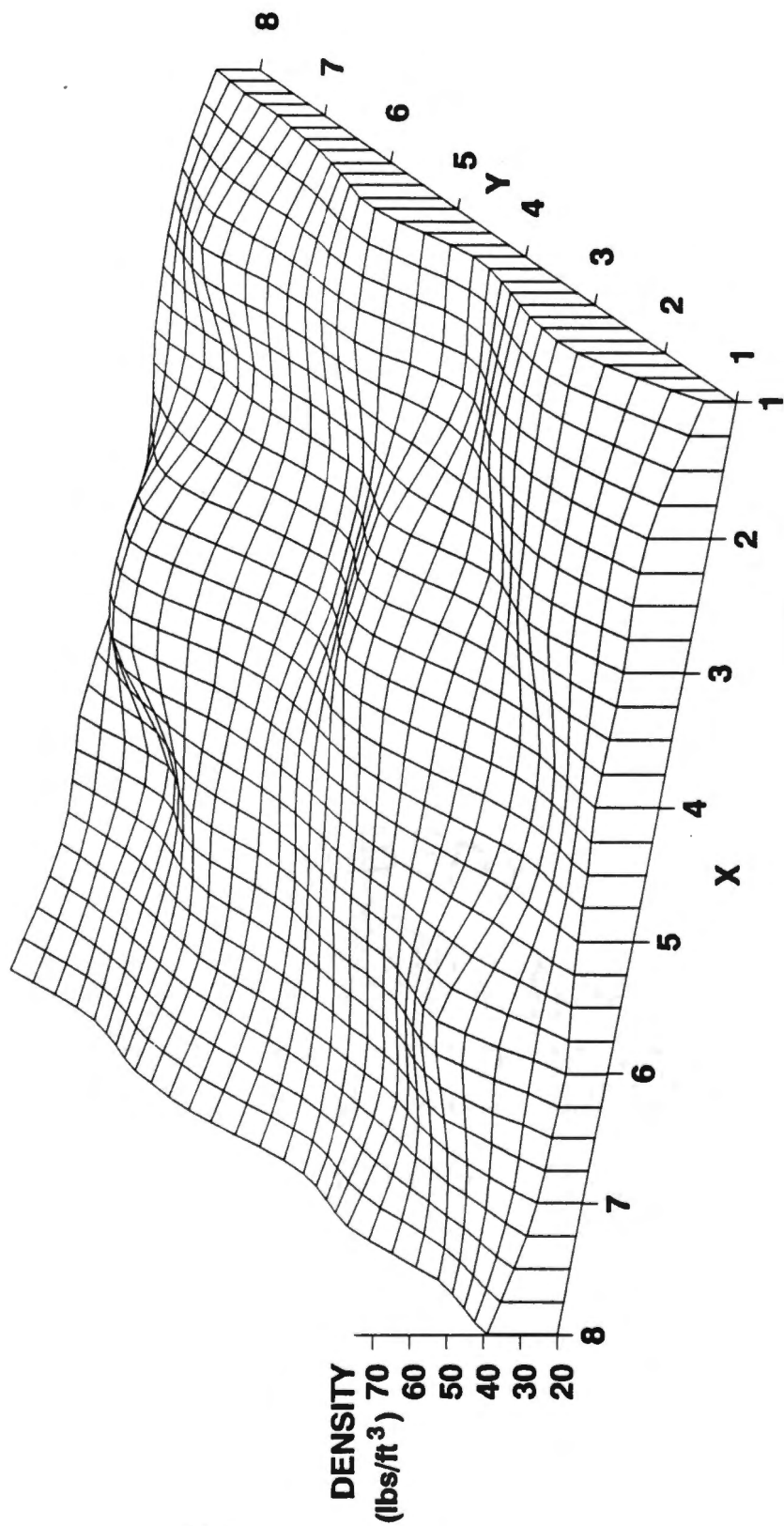
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 4



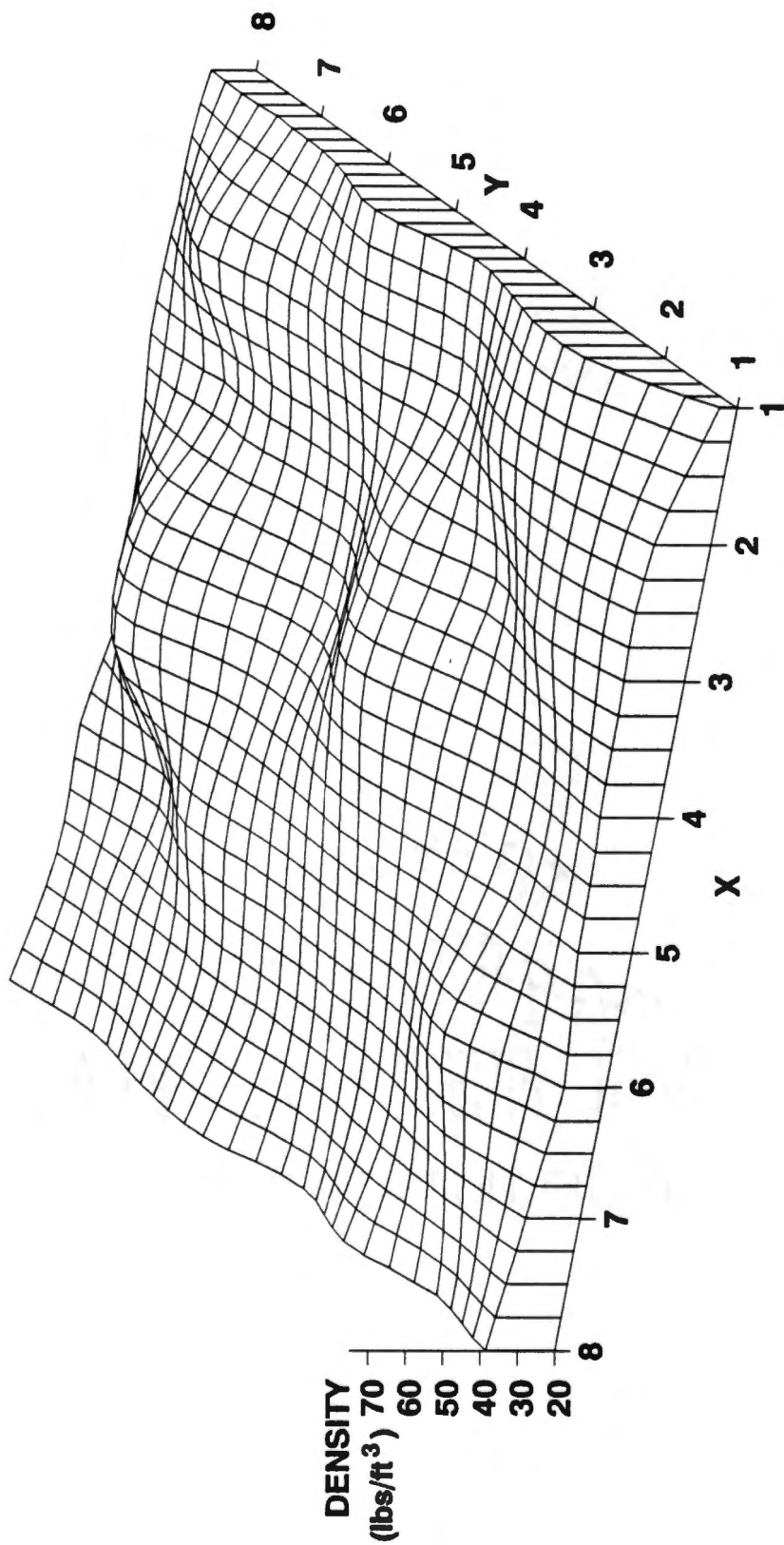
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=5



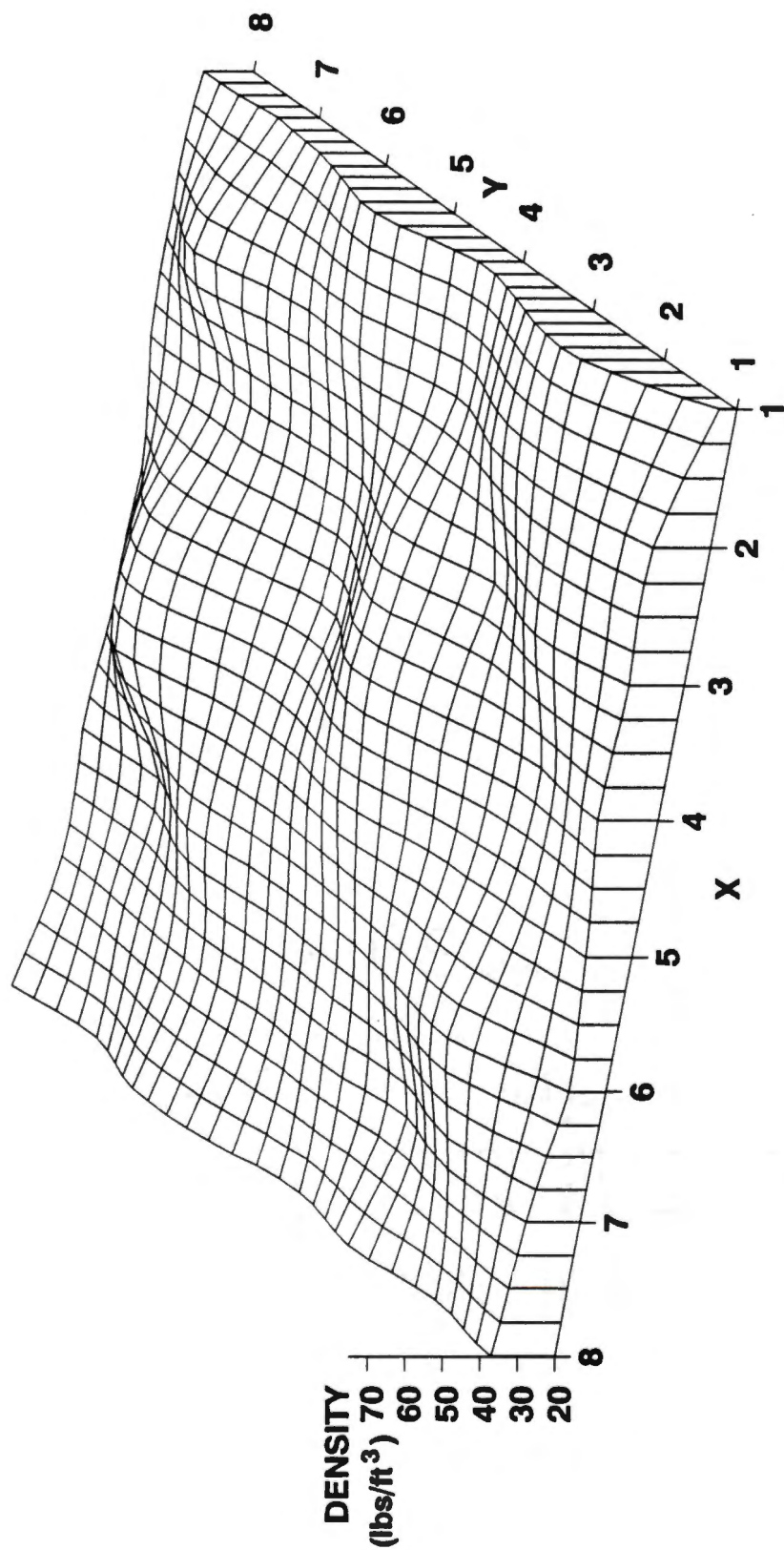
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=6



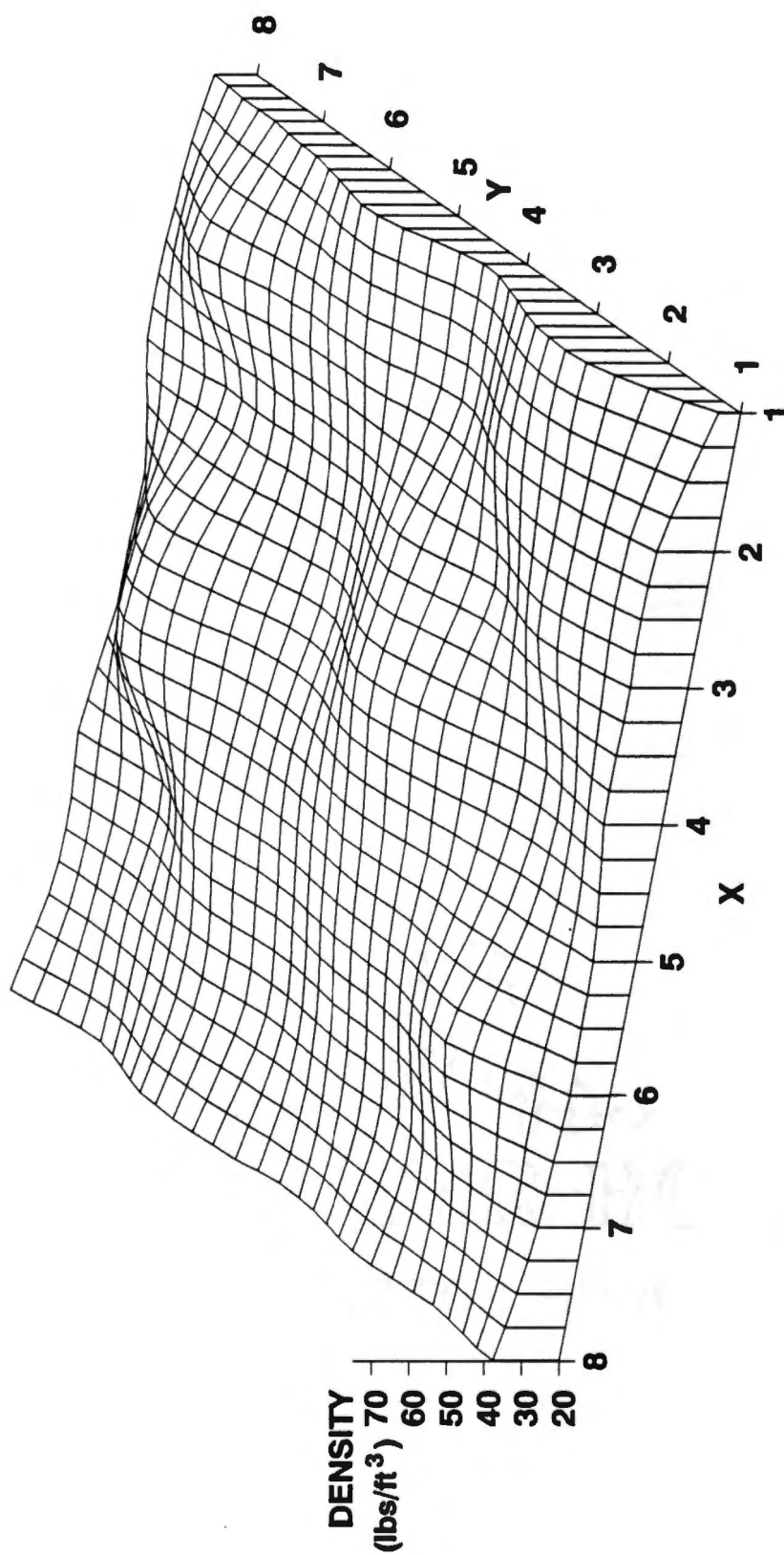
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 7



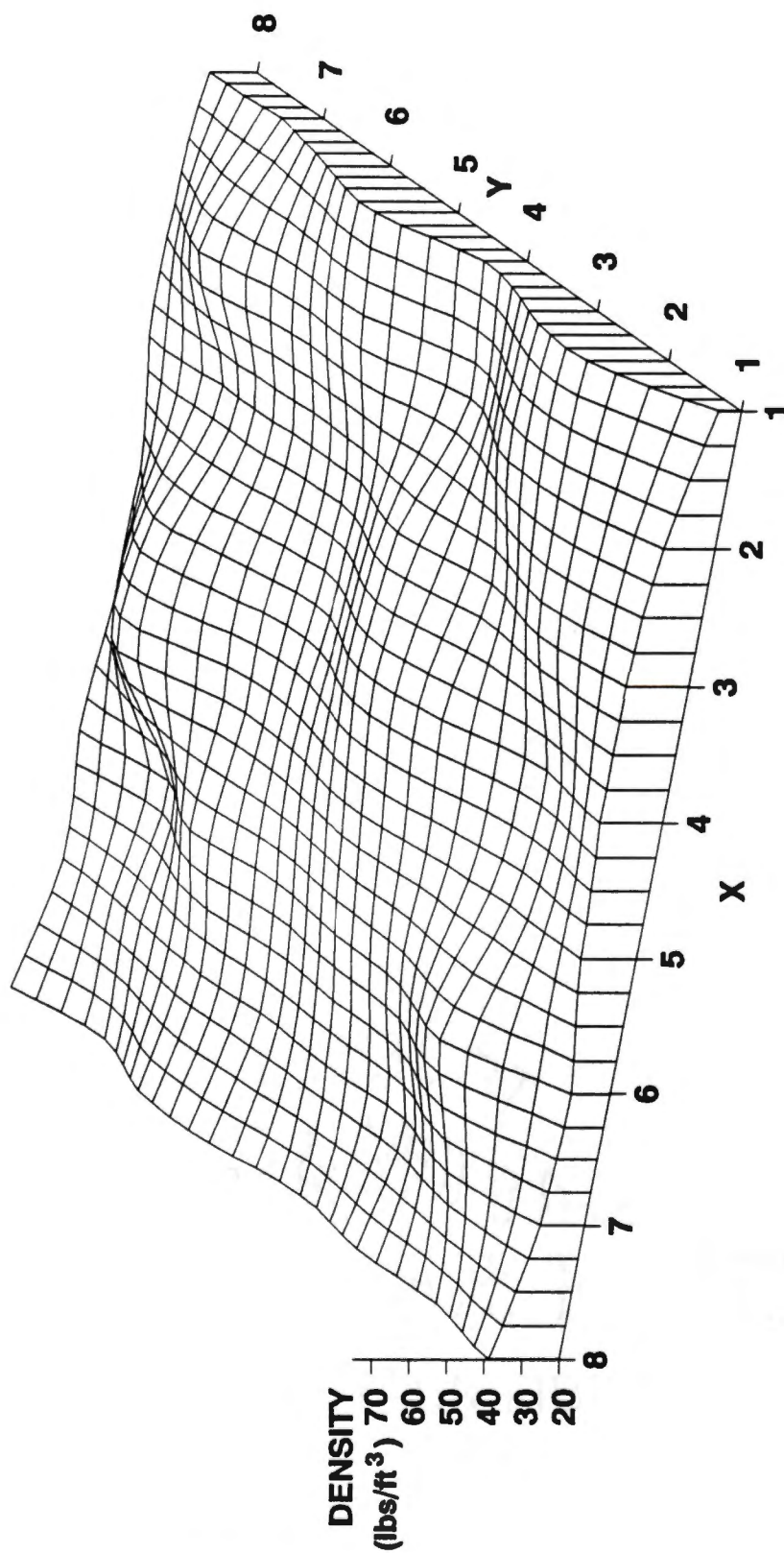
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=8



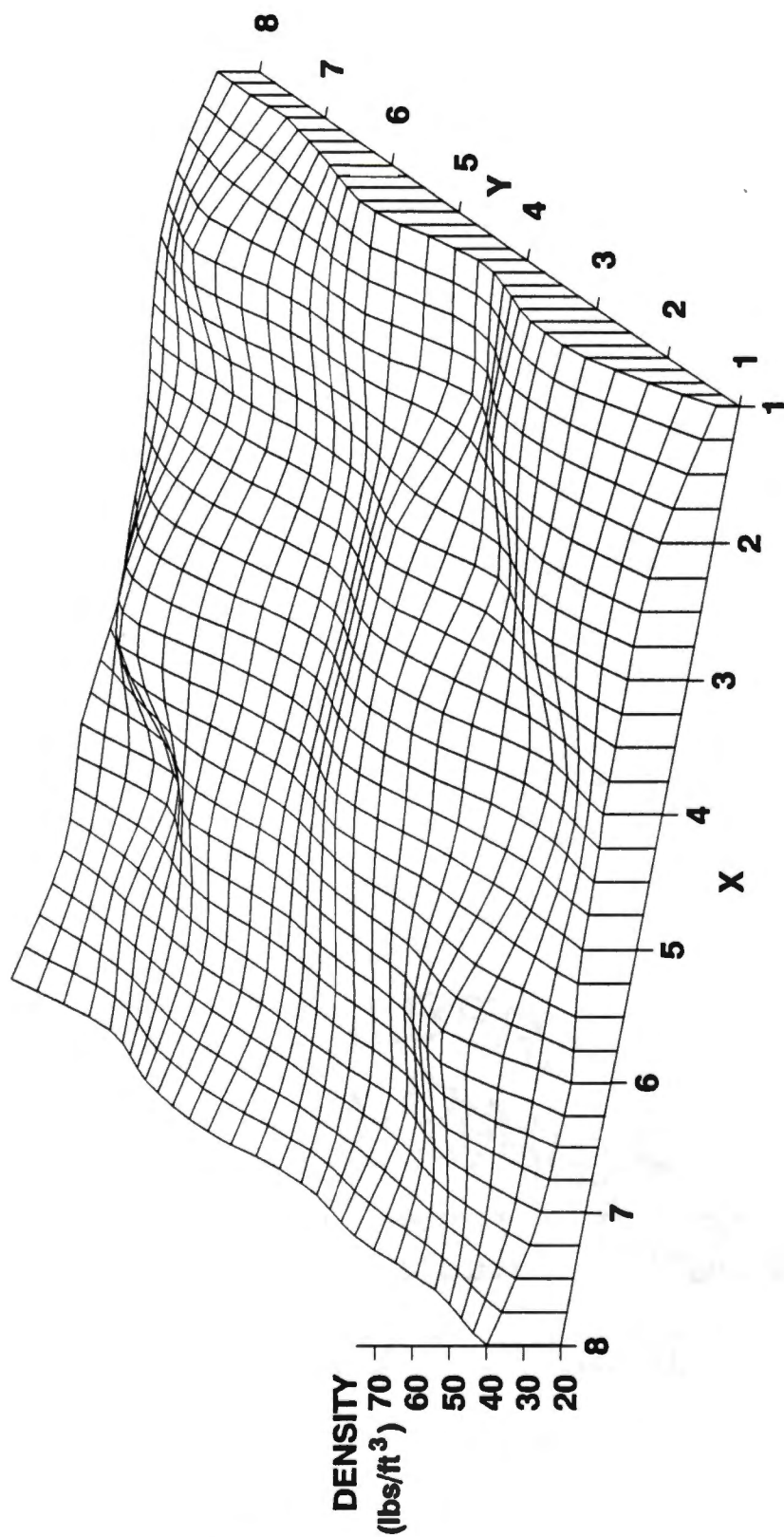
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=9



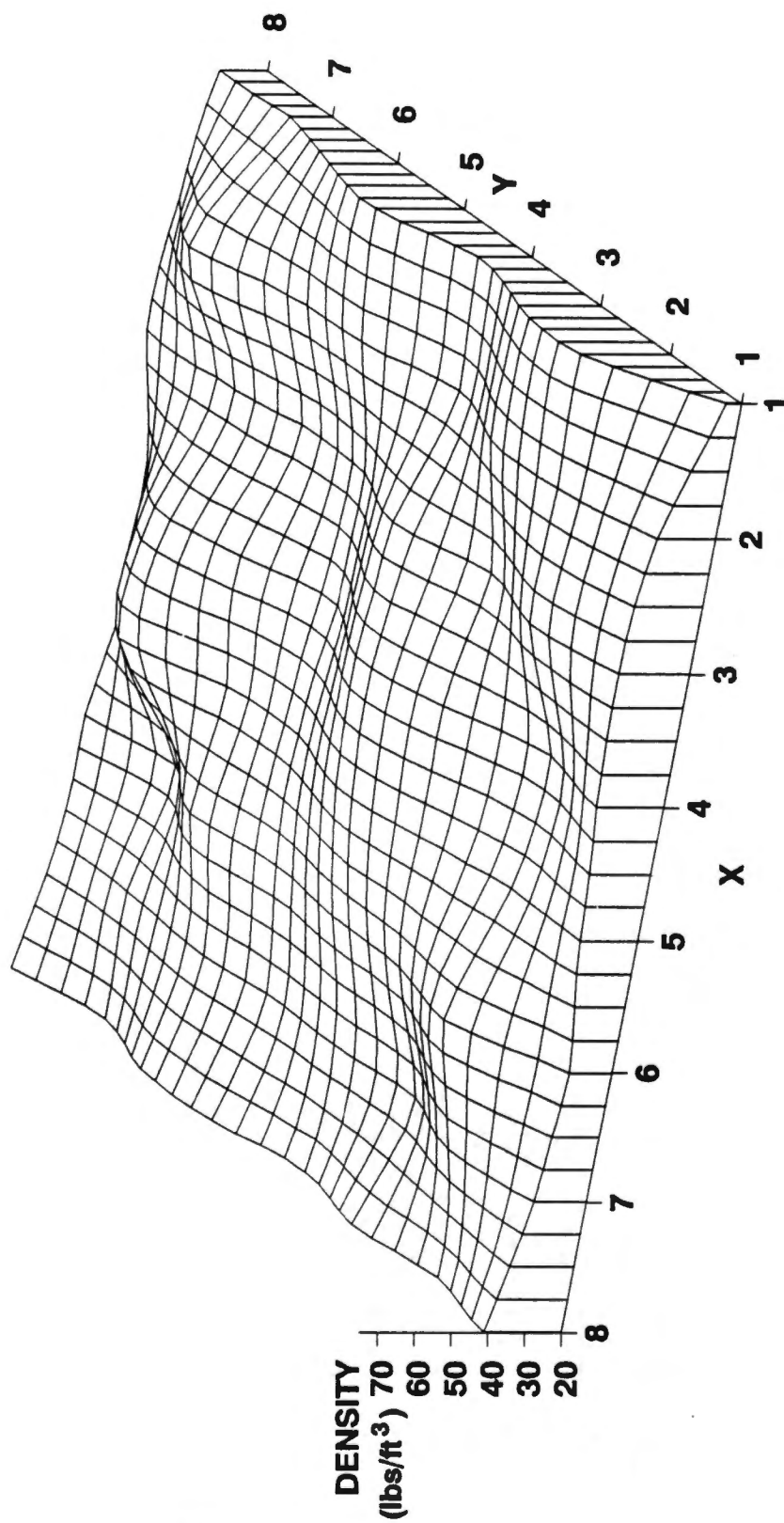
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 10



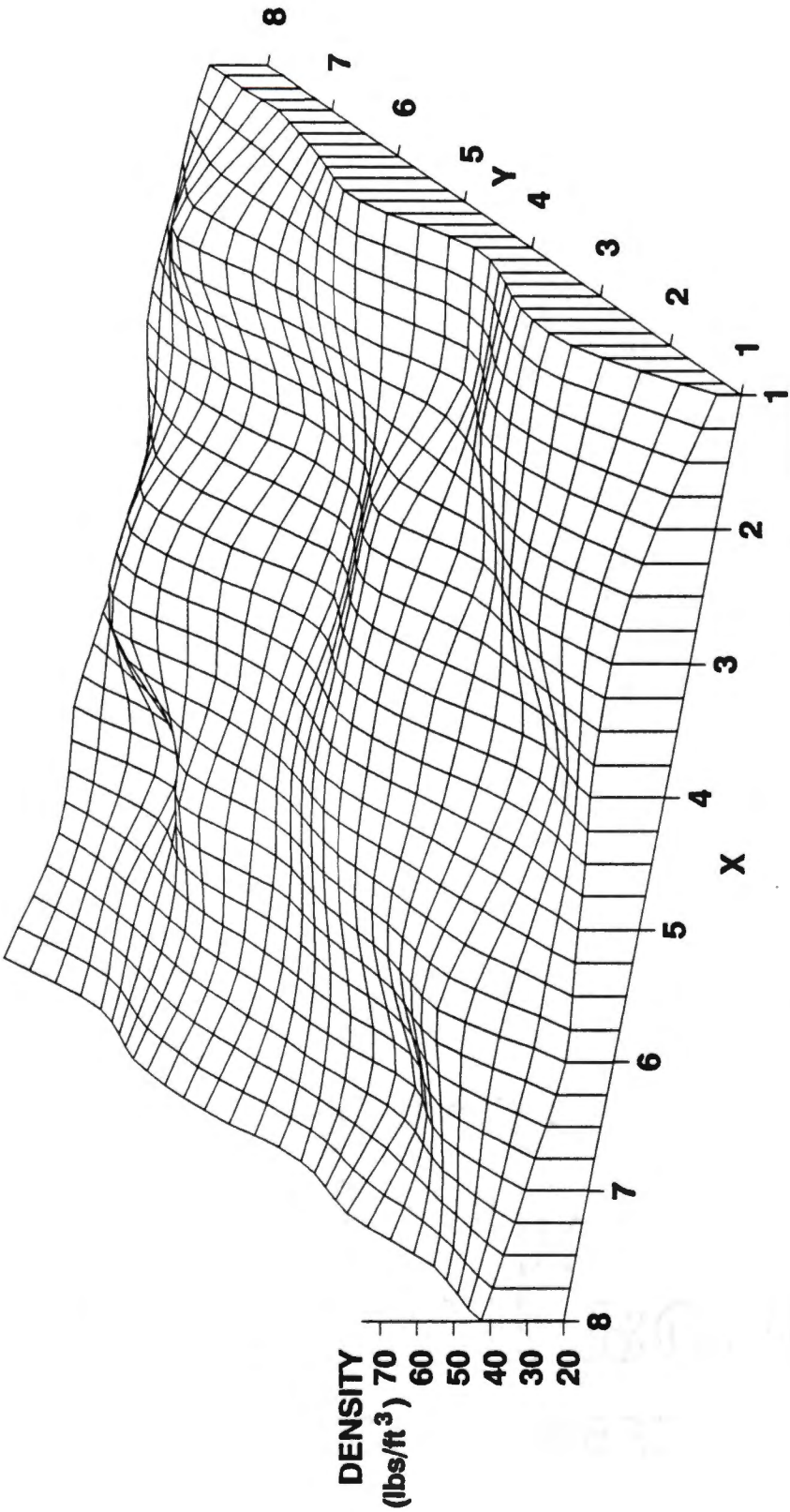
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 11



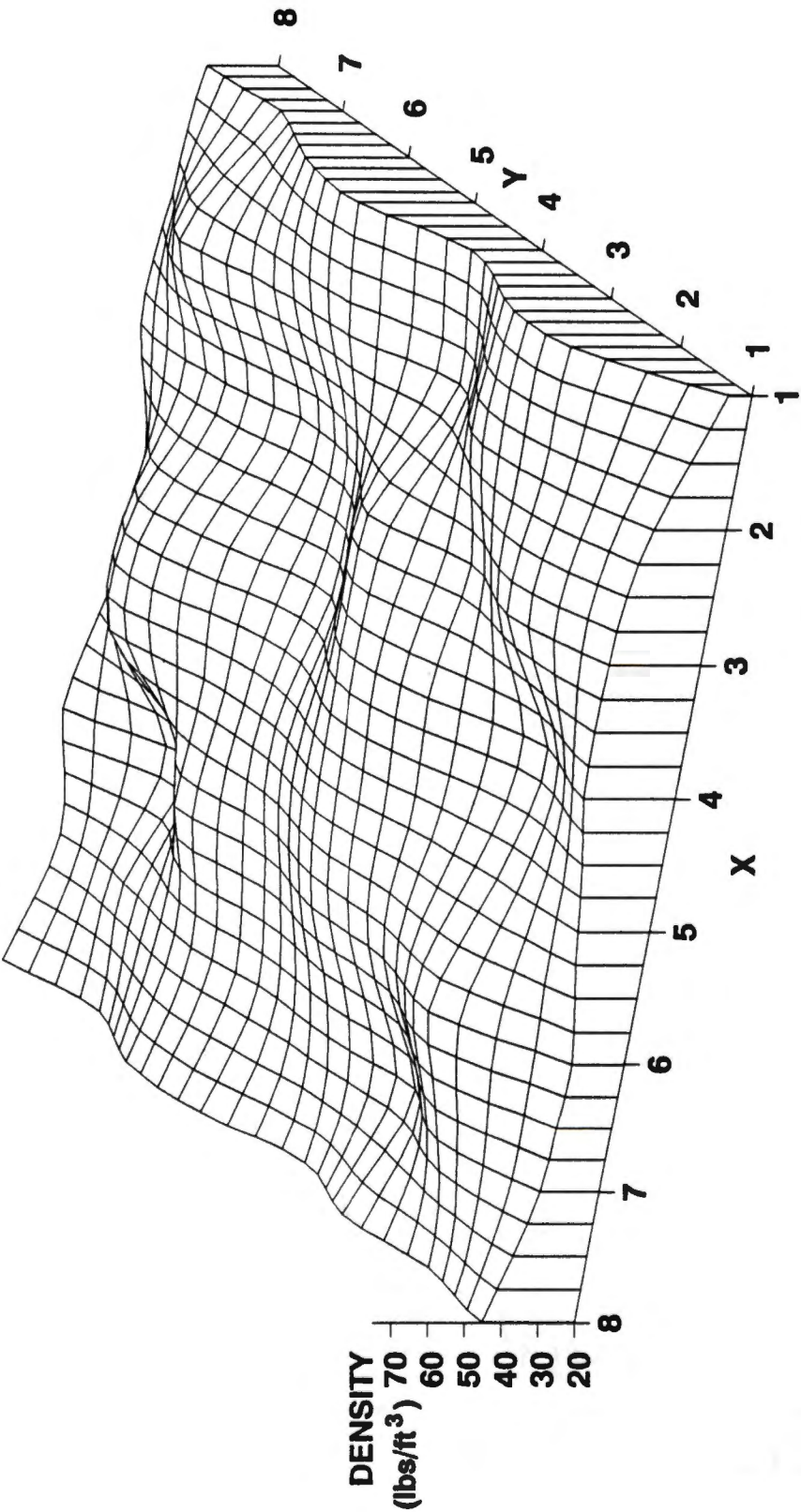
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 12



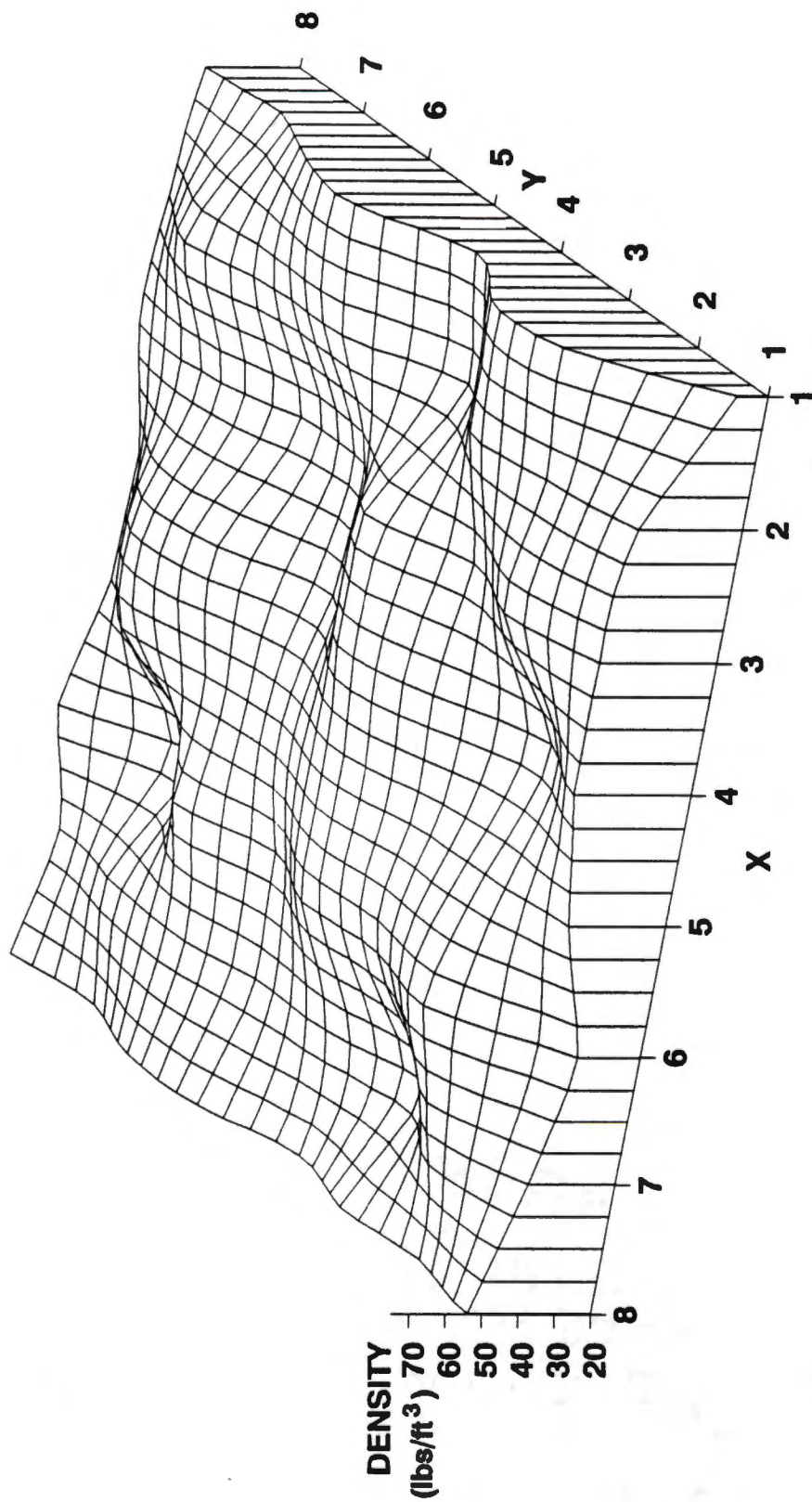
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 13



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 14



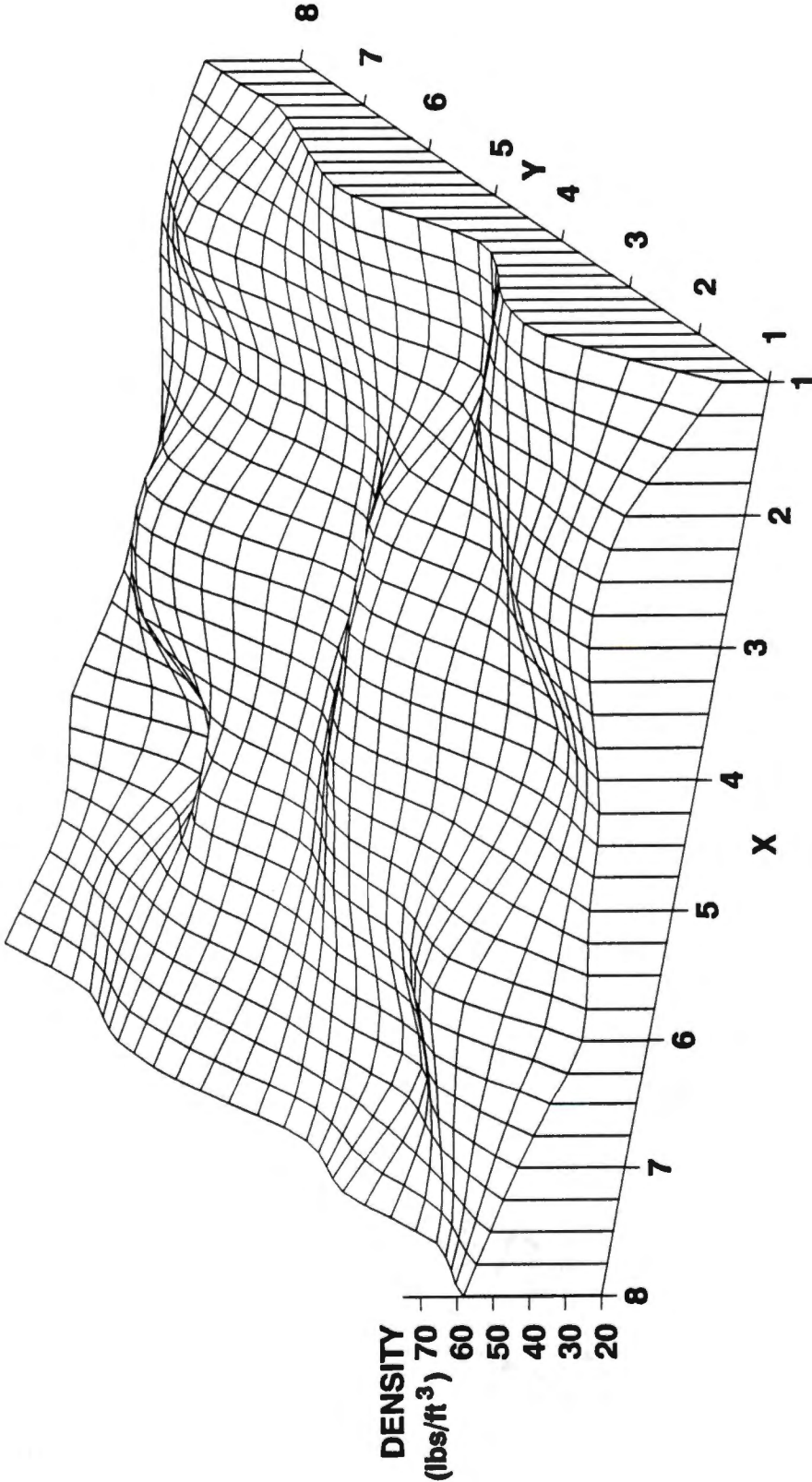
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 15



FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=60 SECONDS

REPLICATION=3

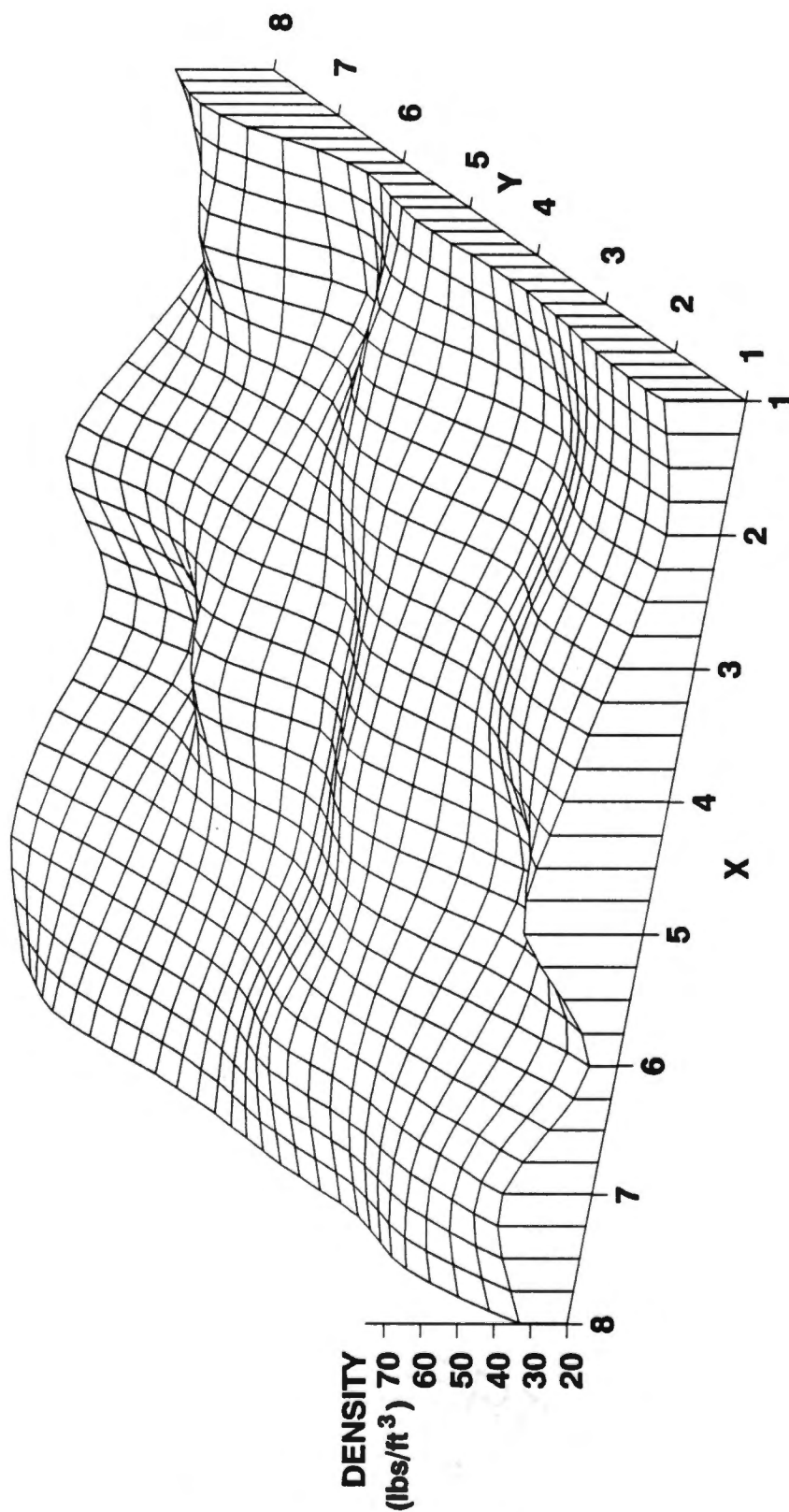
Z=16



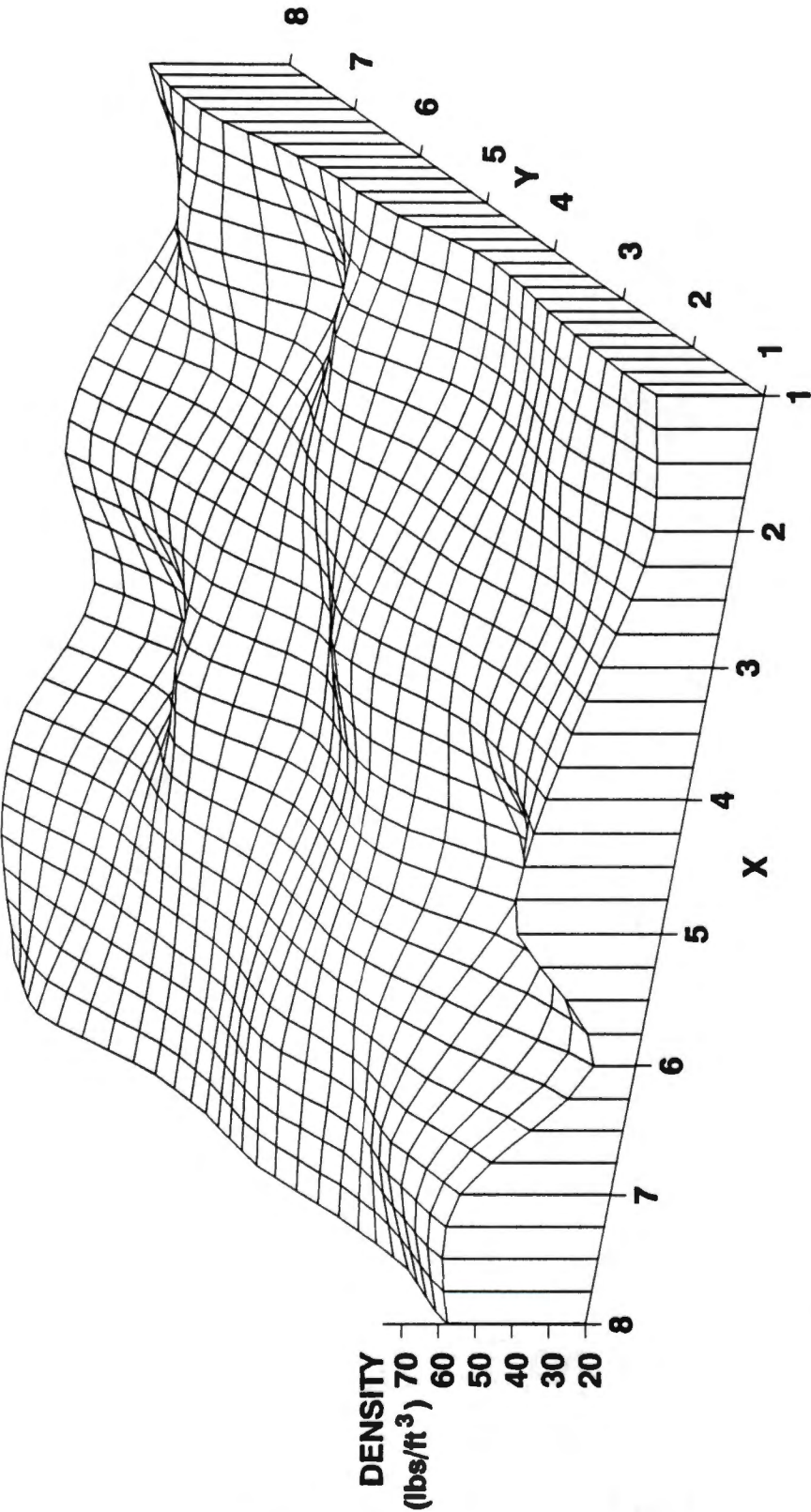
FLAKE MOISTURE CONTENT - 8%

PRESS CLOSURE RATE - 100 SECONDS

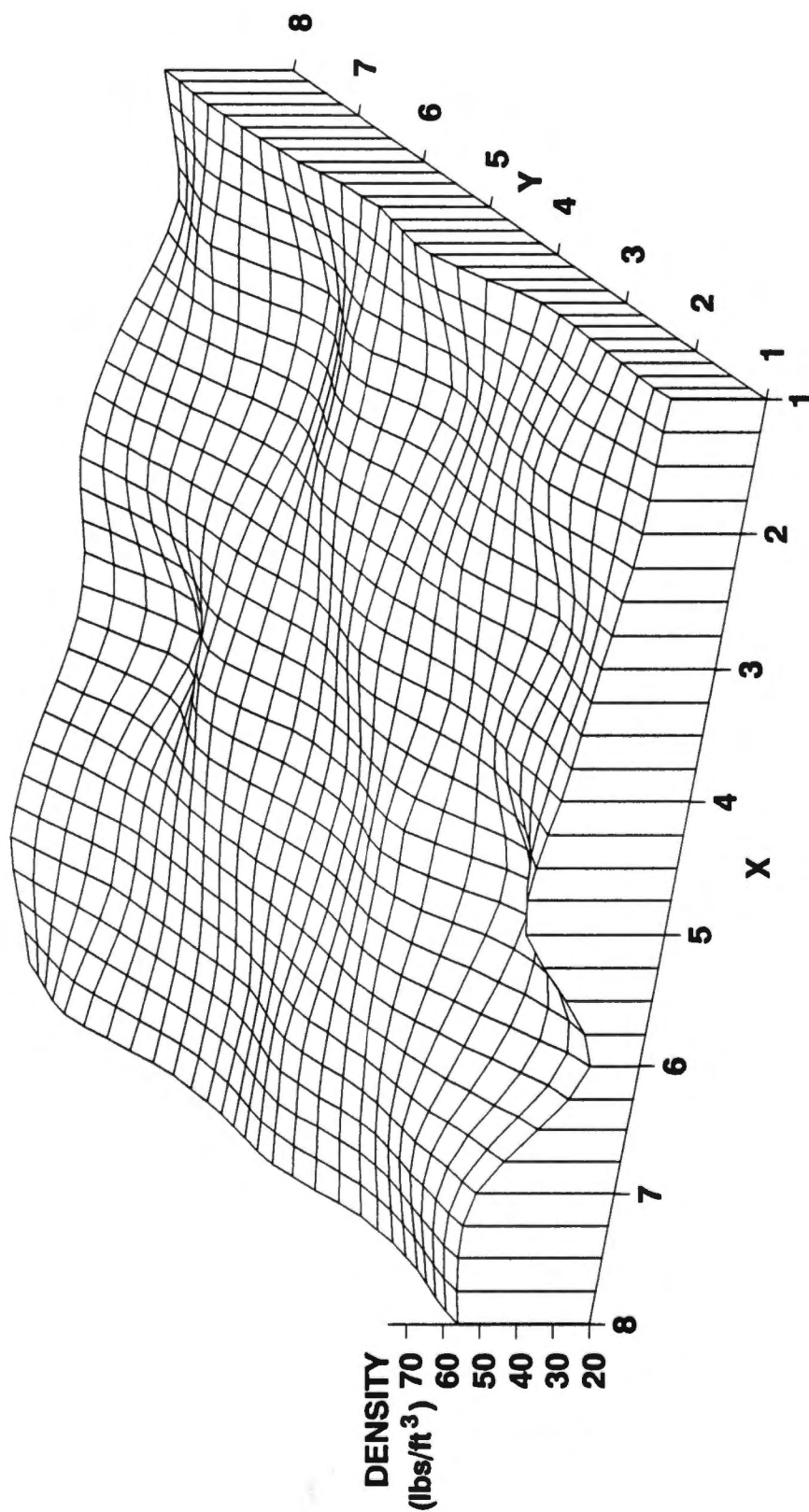
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 1



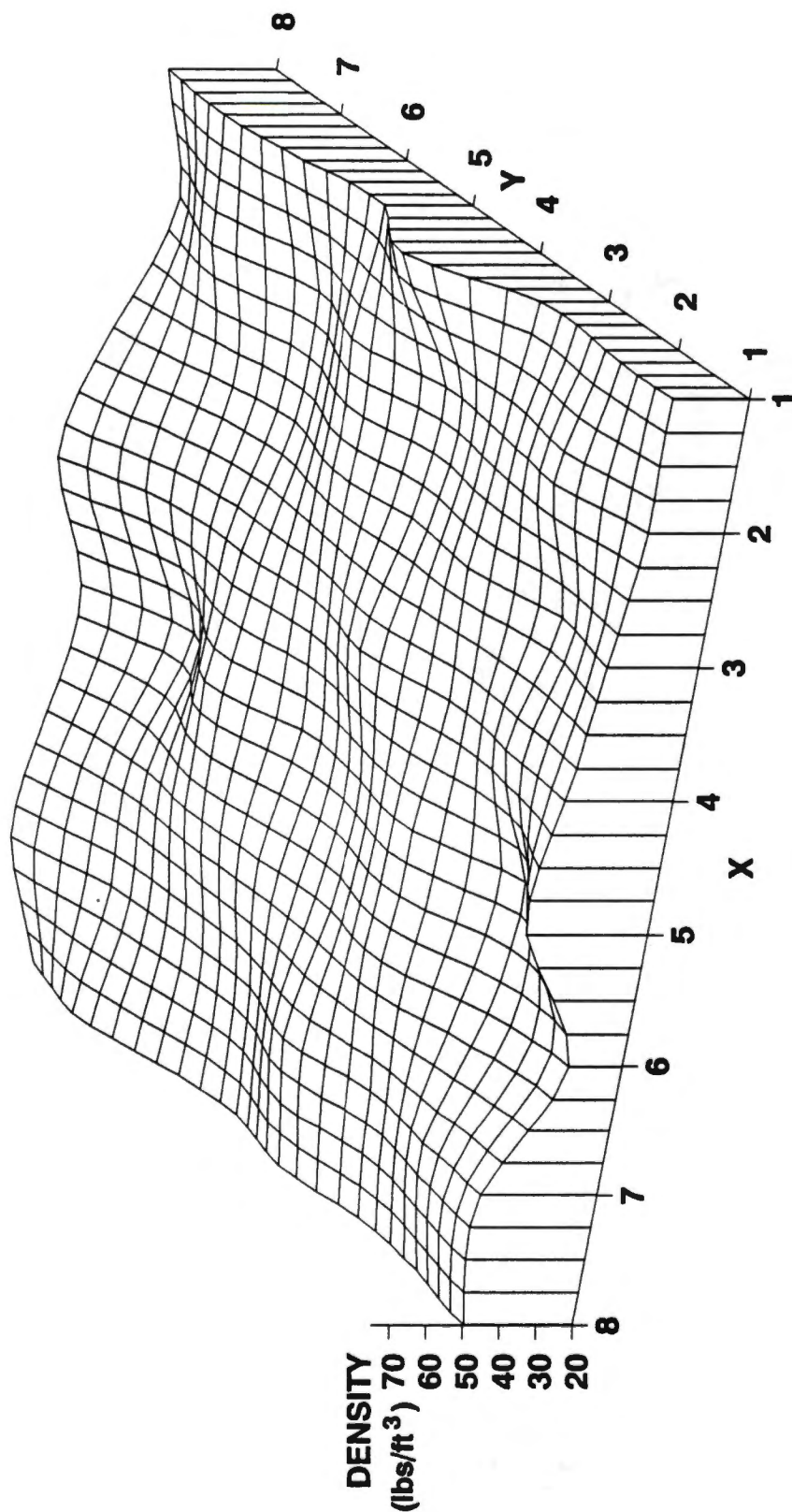
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 2



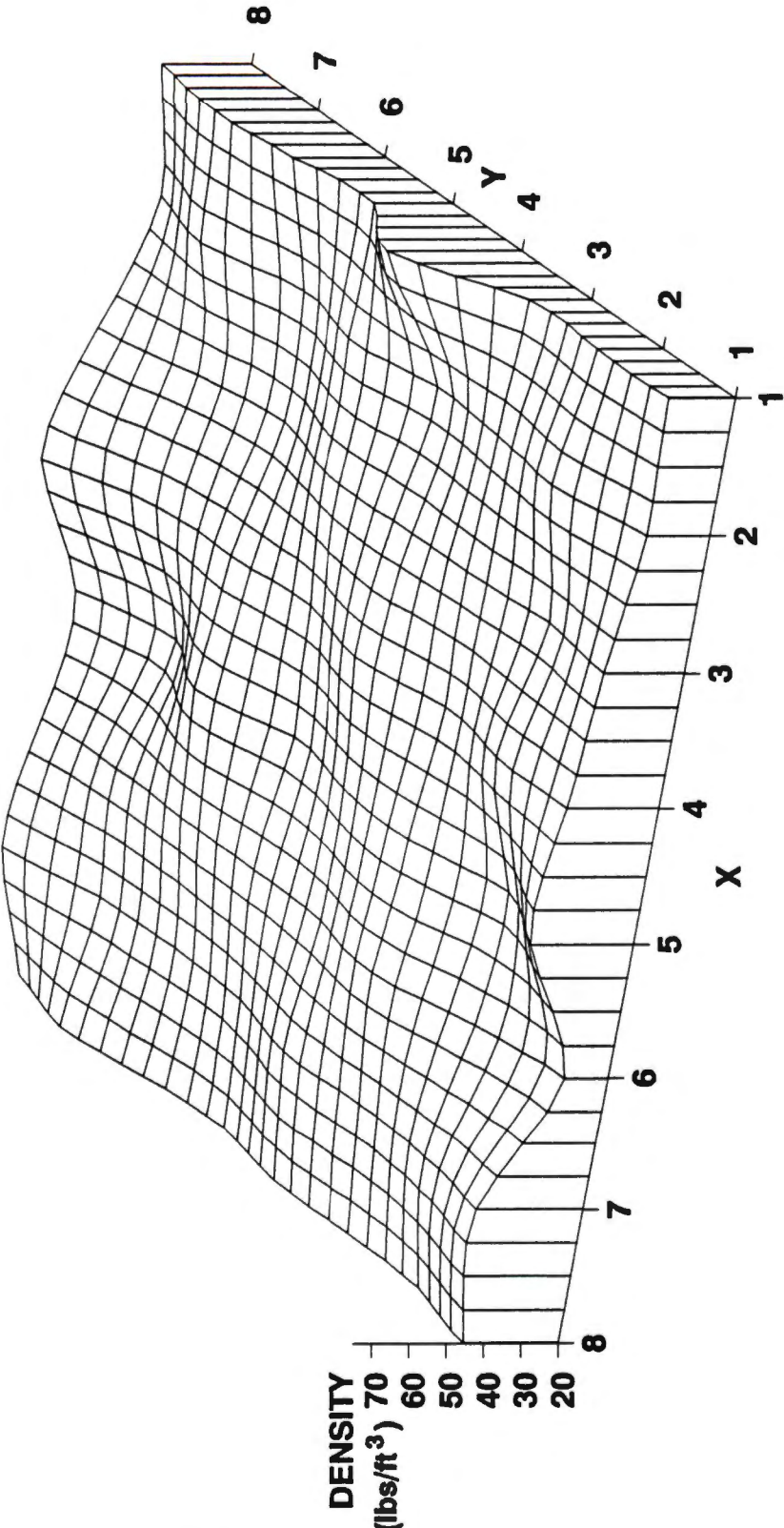
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 3



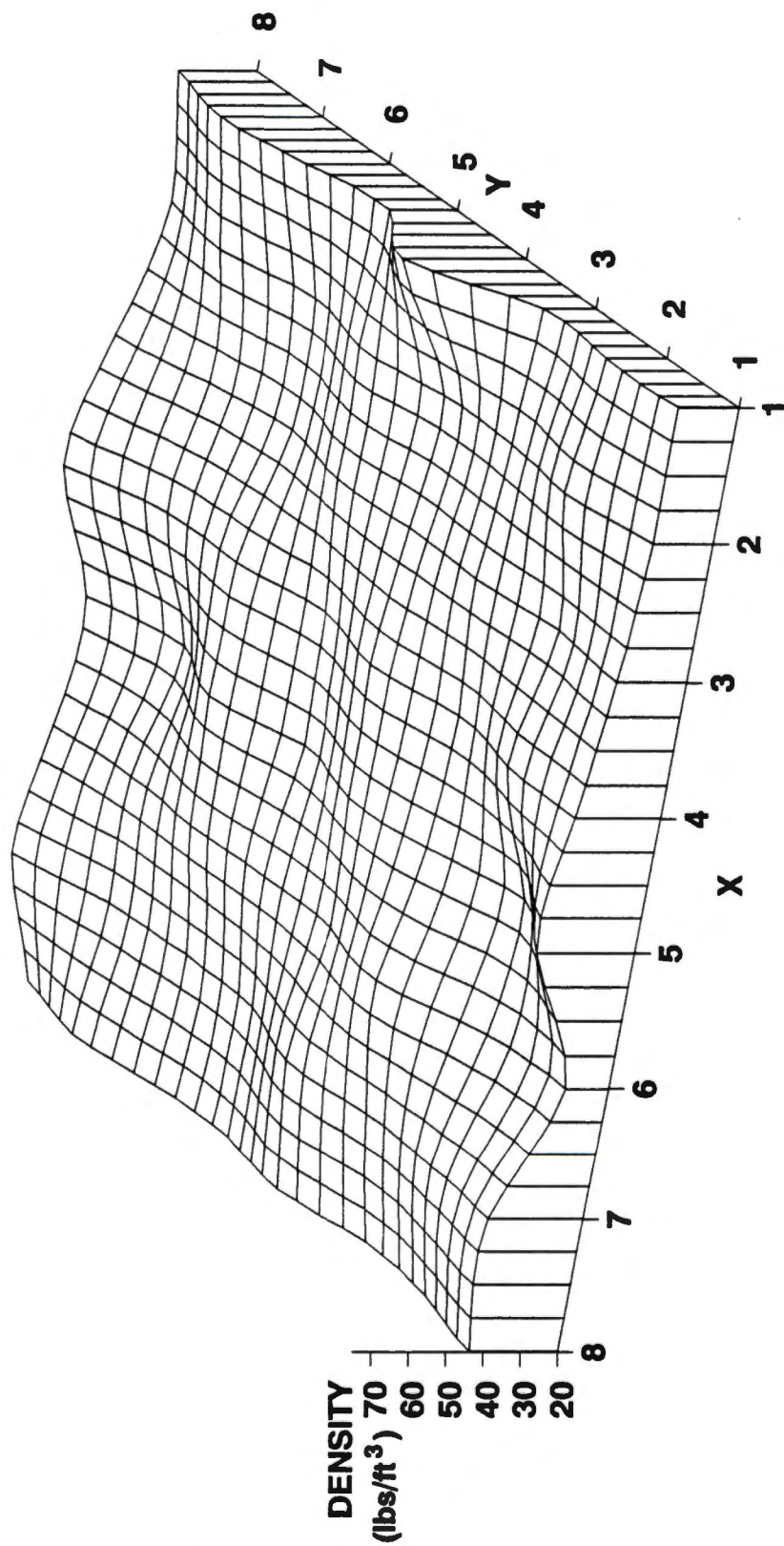
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 4



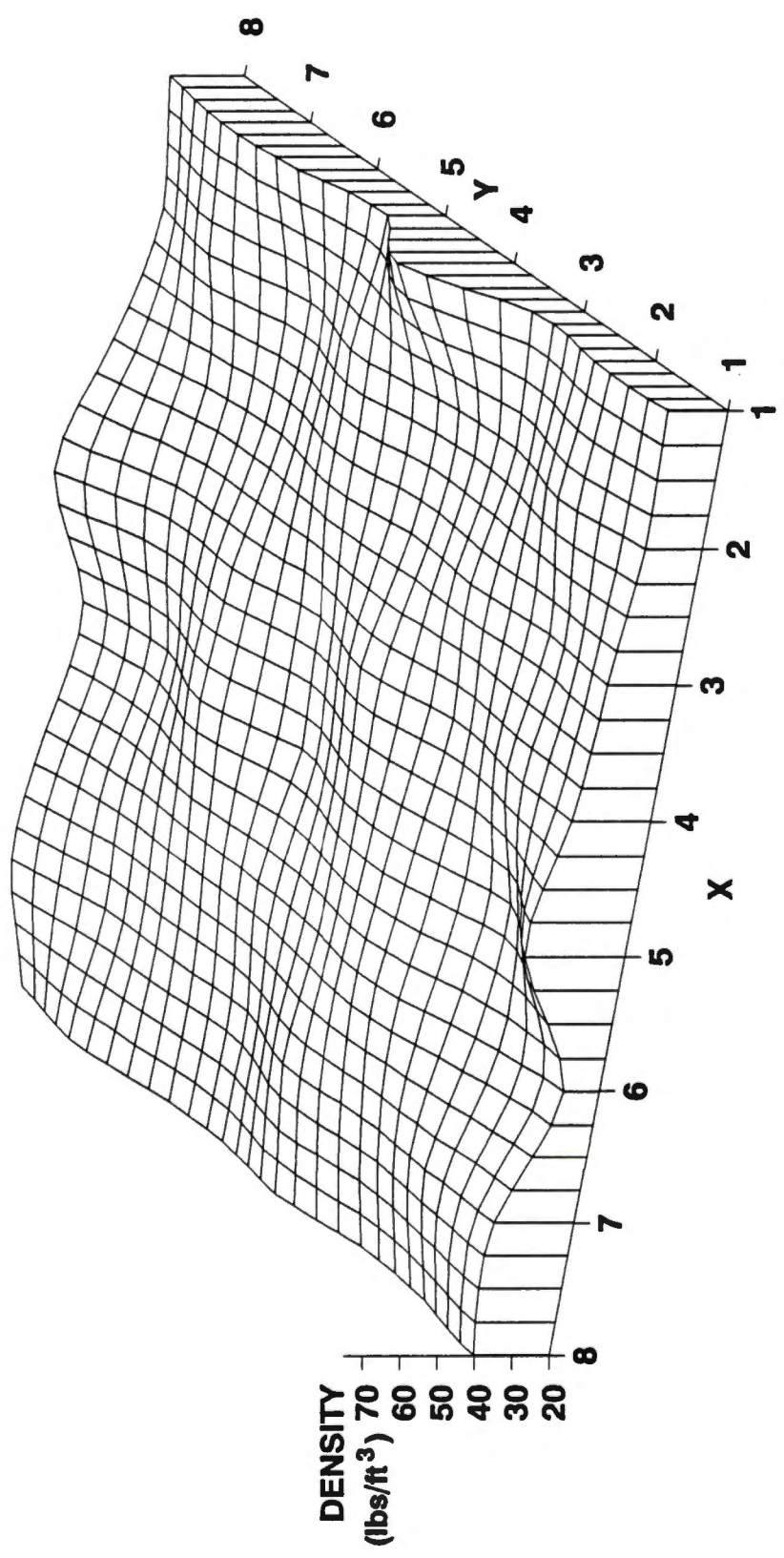
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=5



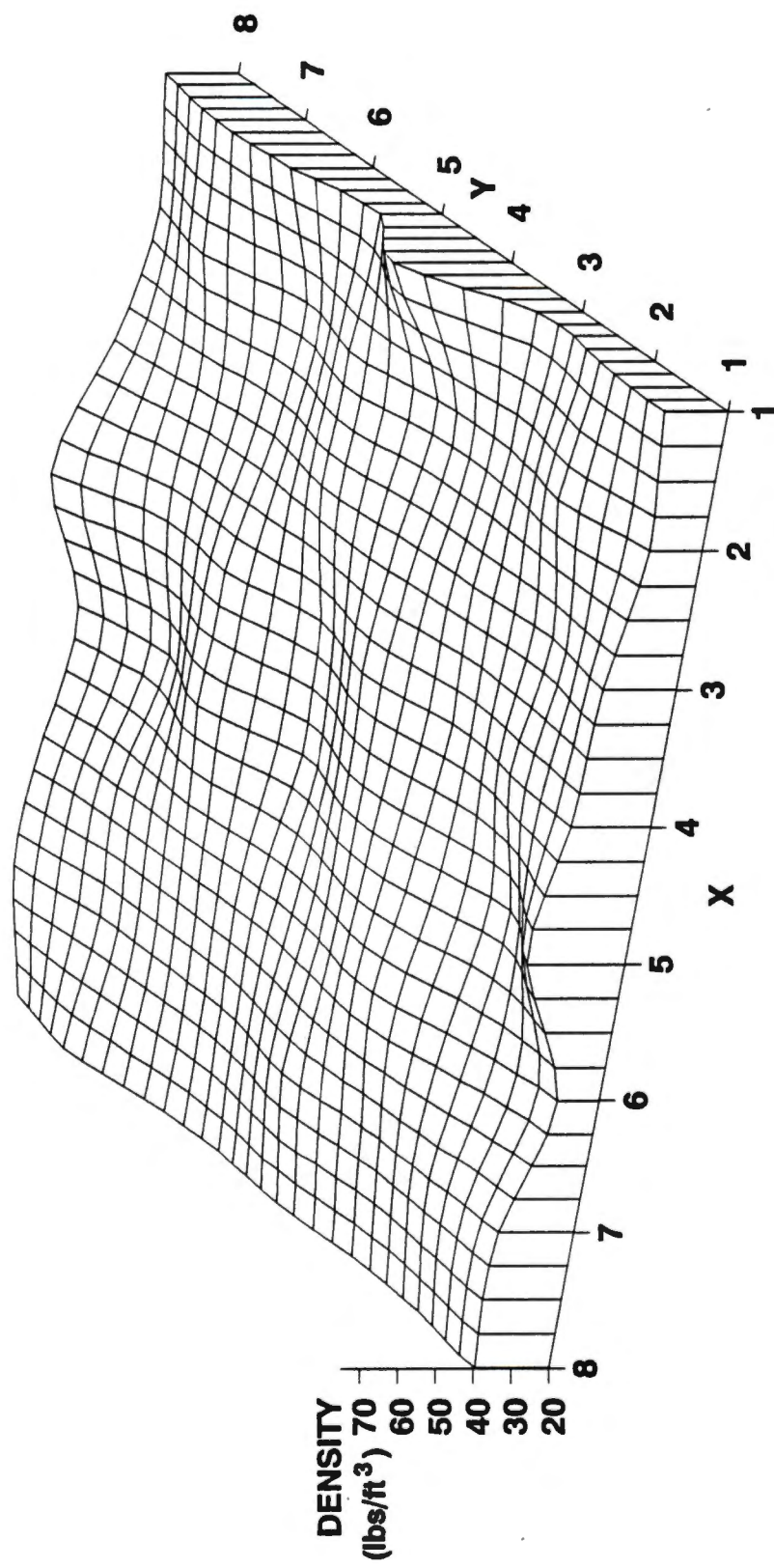
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 6



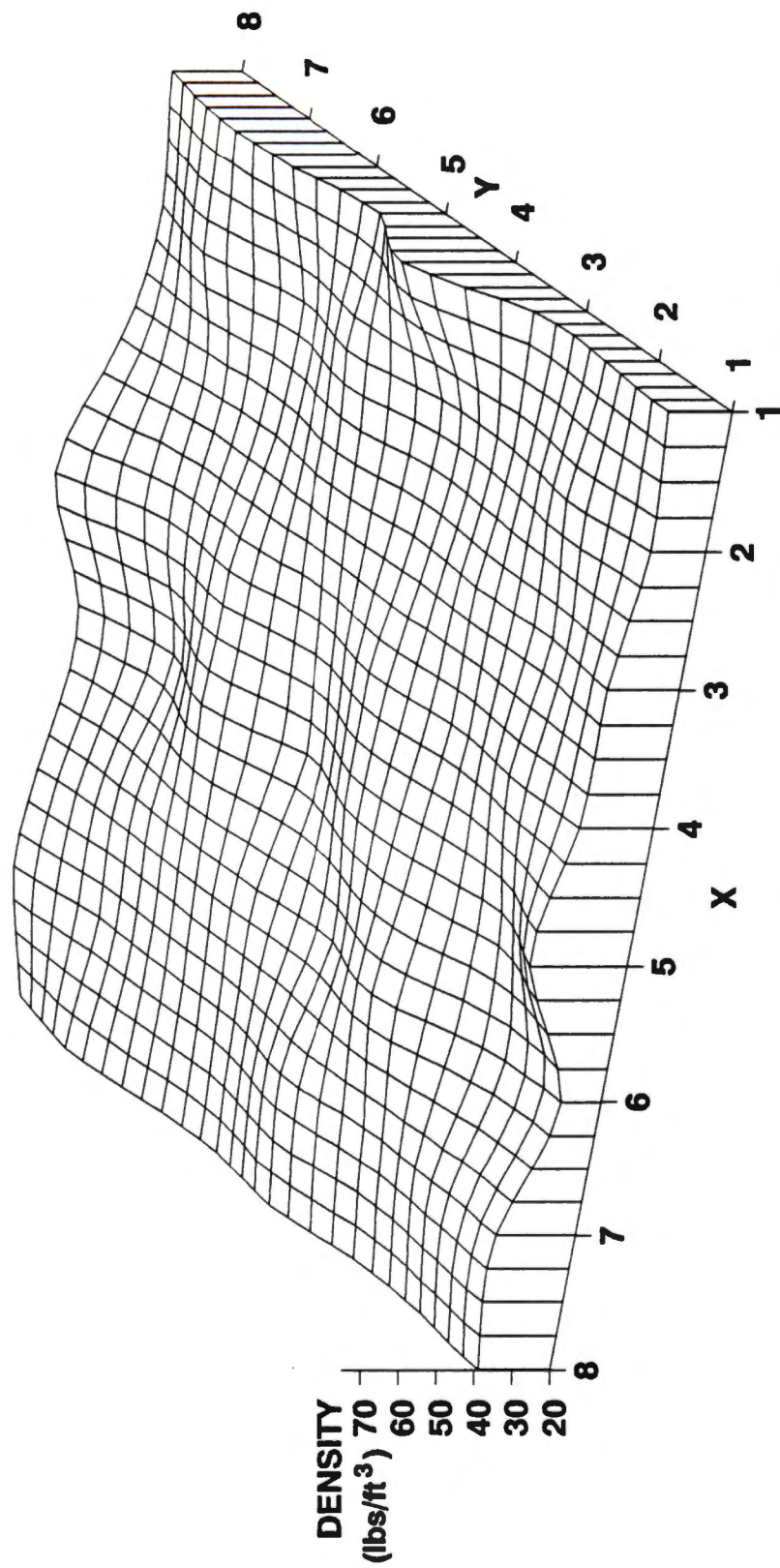
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 7



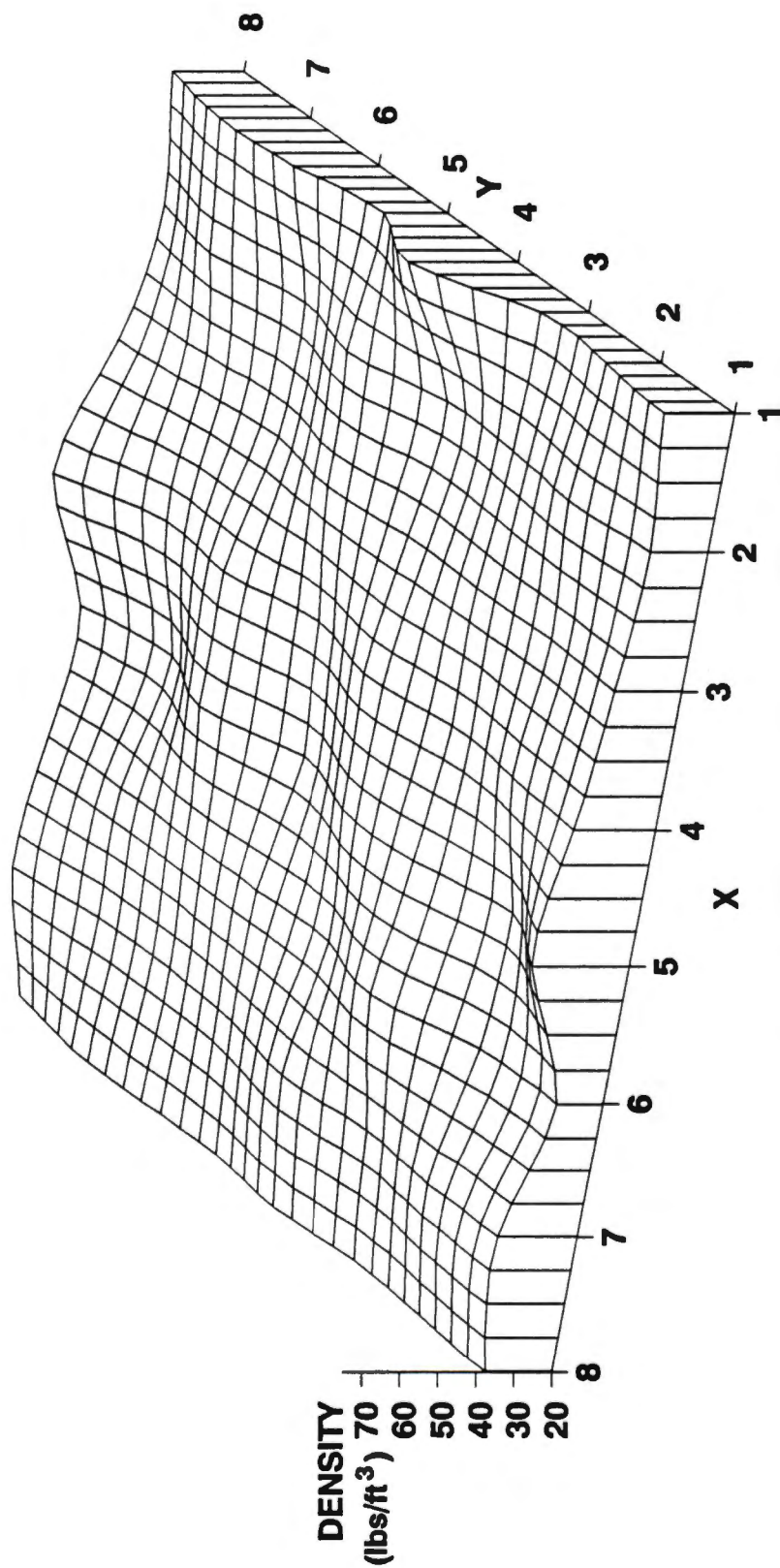
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 8



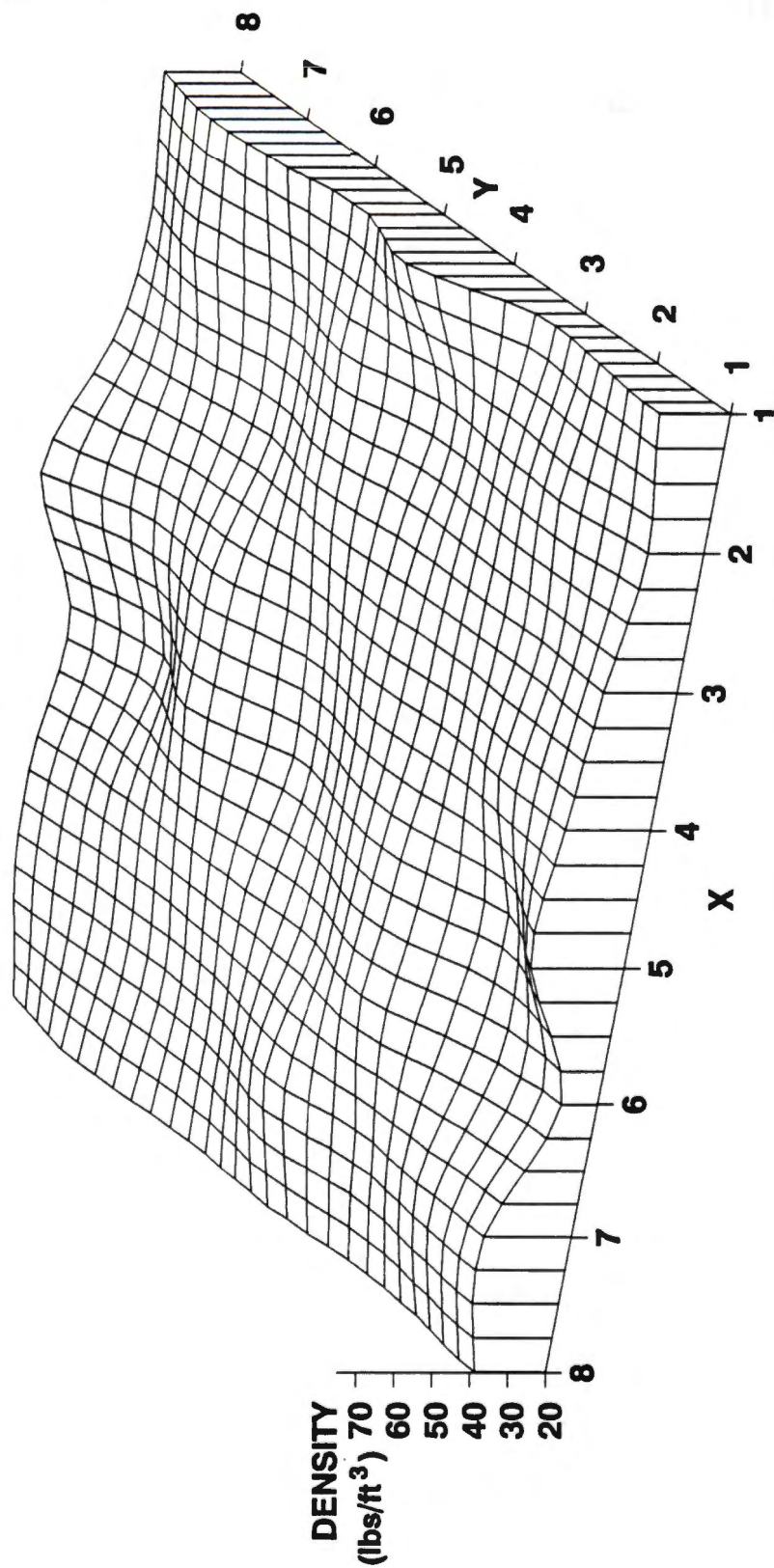
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=9



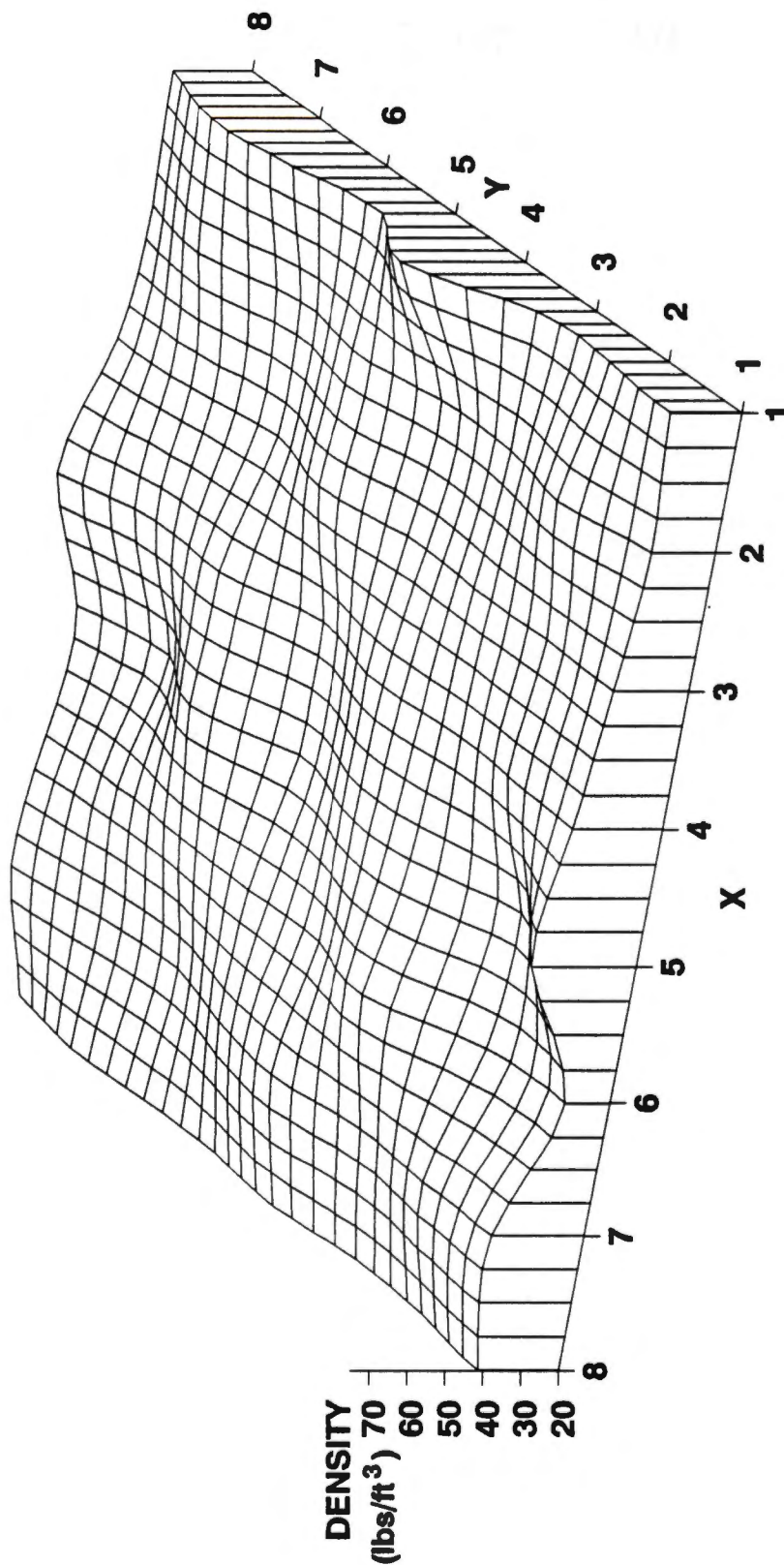
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 10



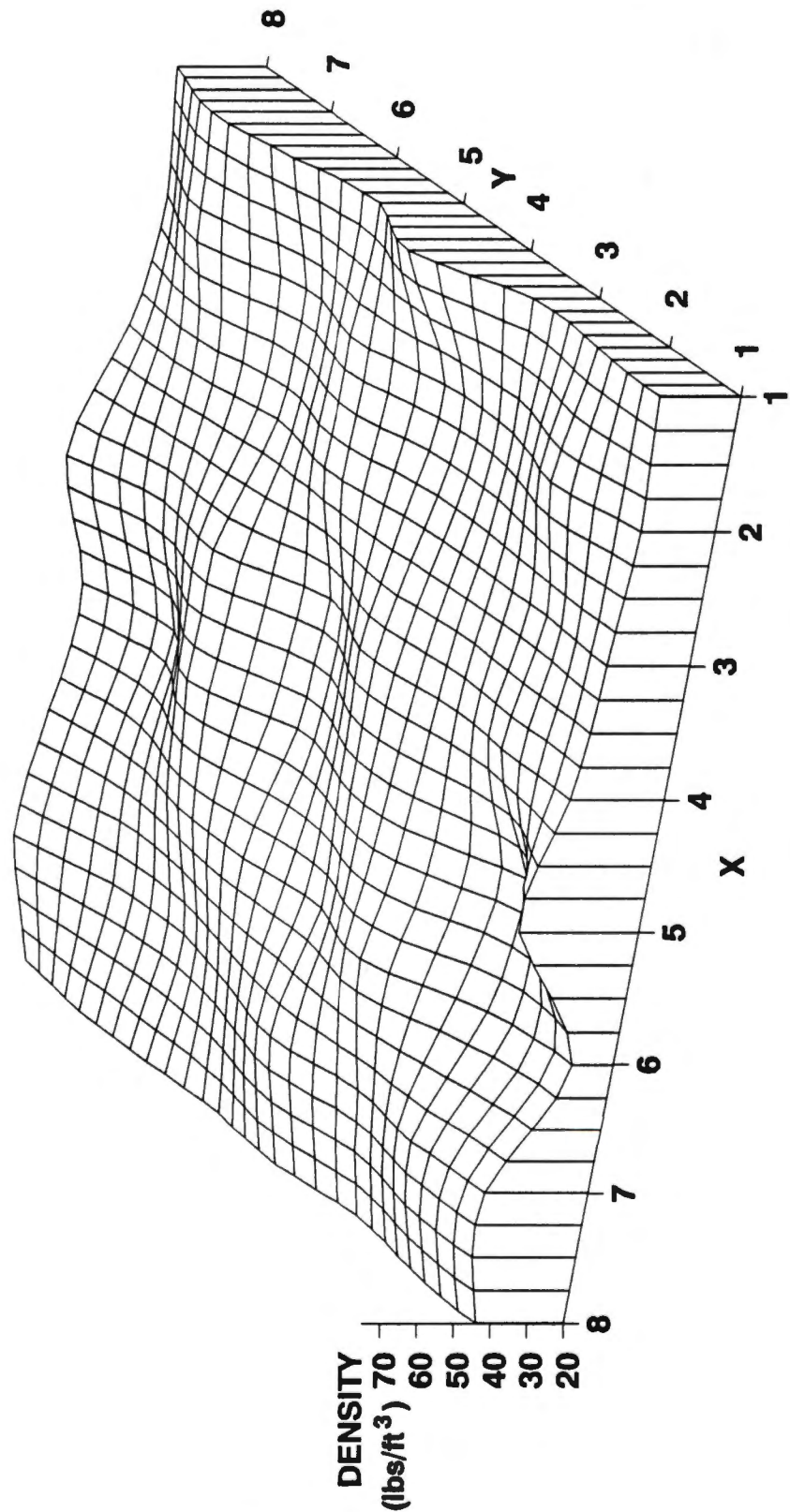
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 11



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 12



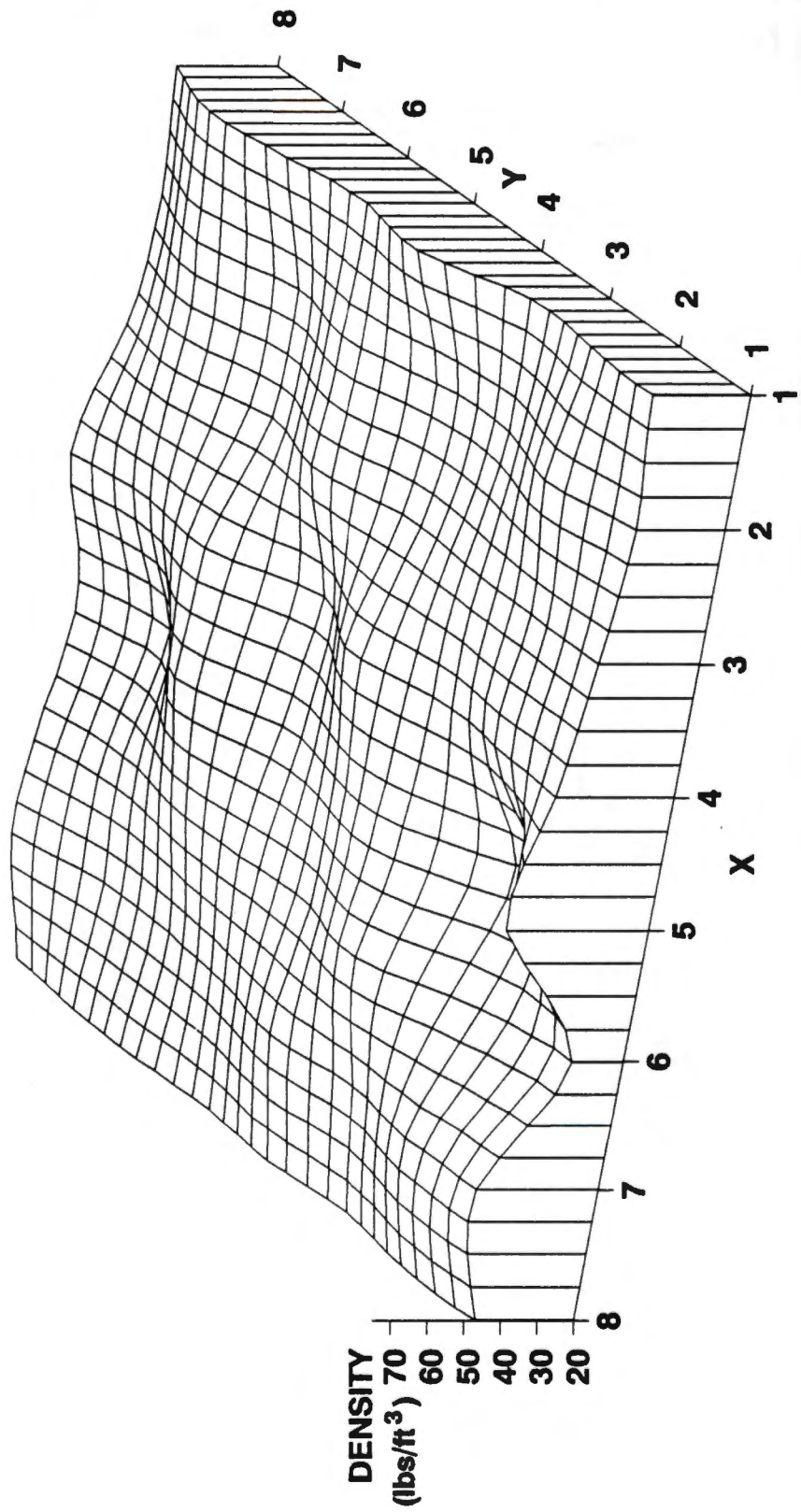
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 13



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 1

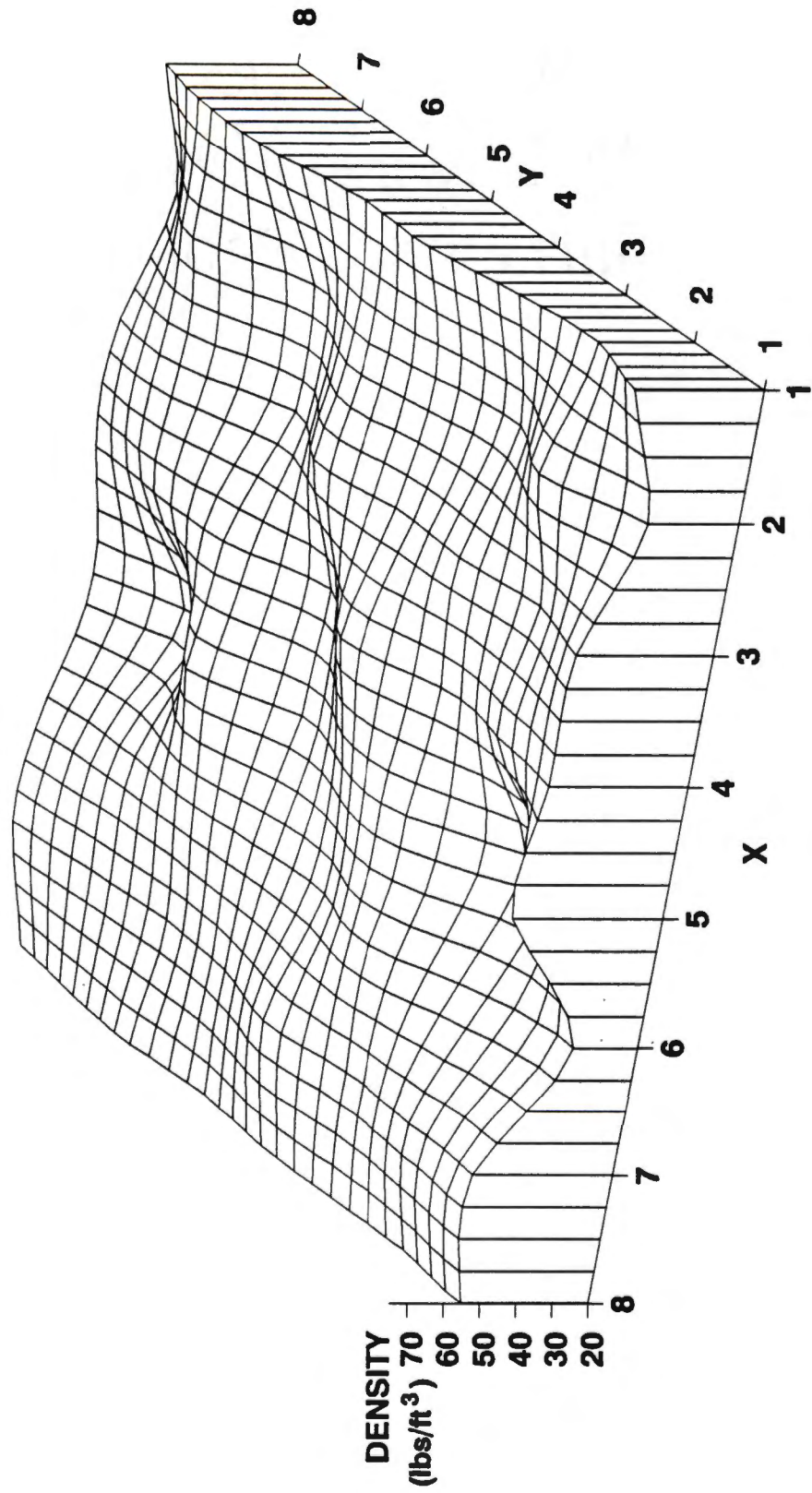
Z = 14



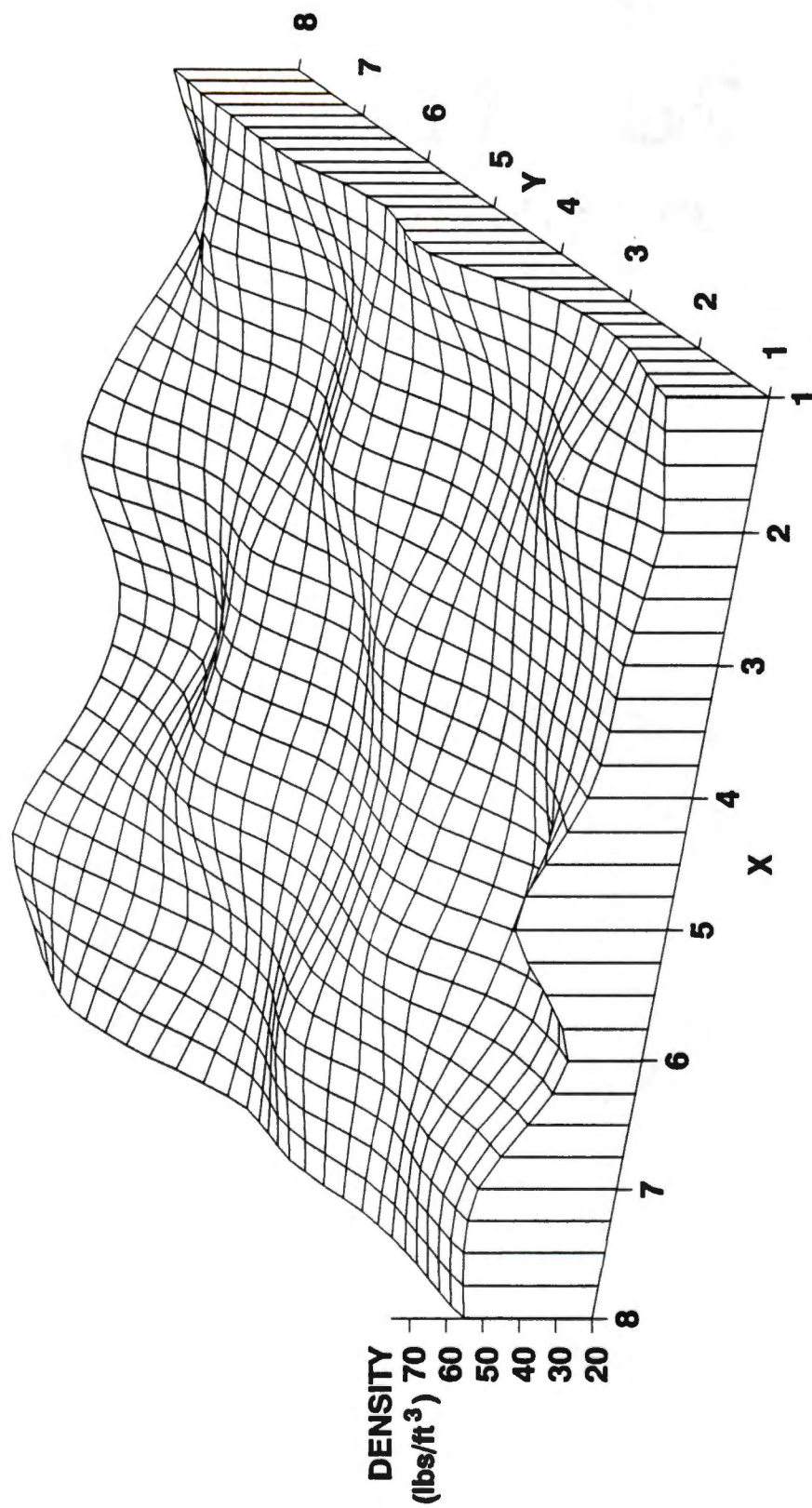
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 1

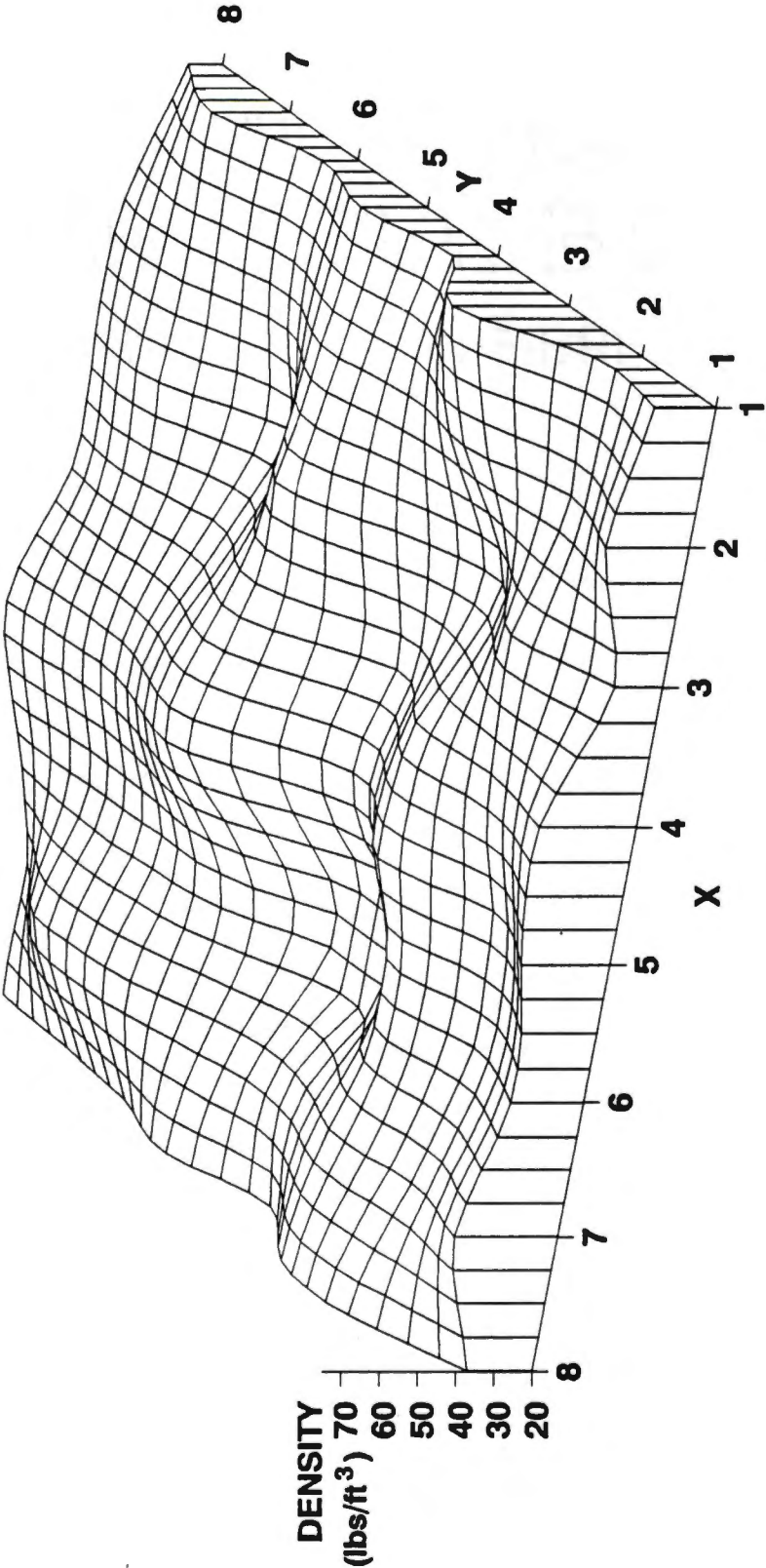
Z = 15



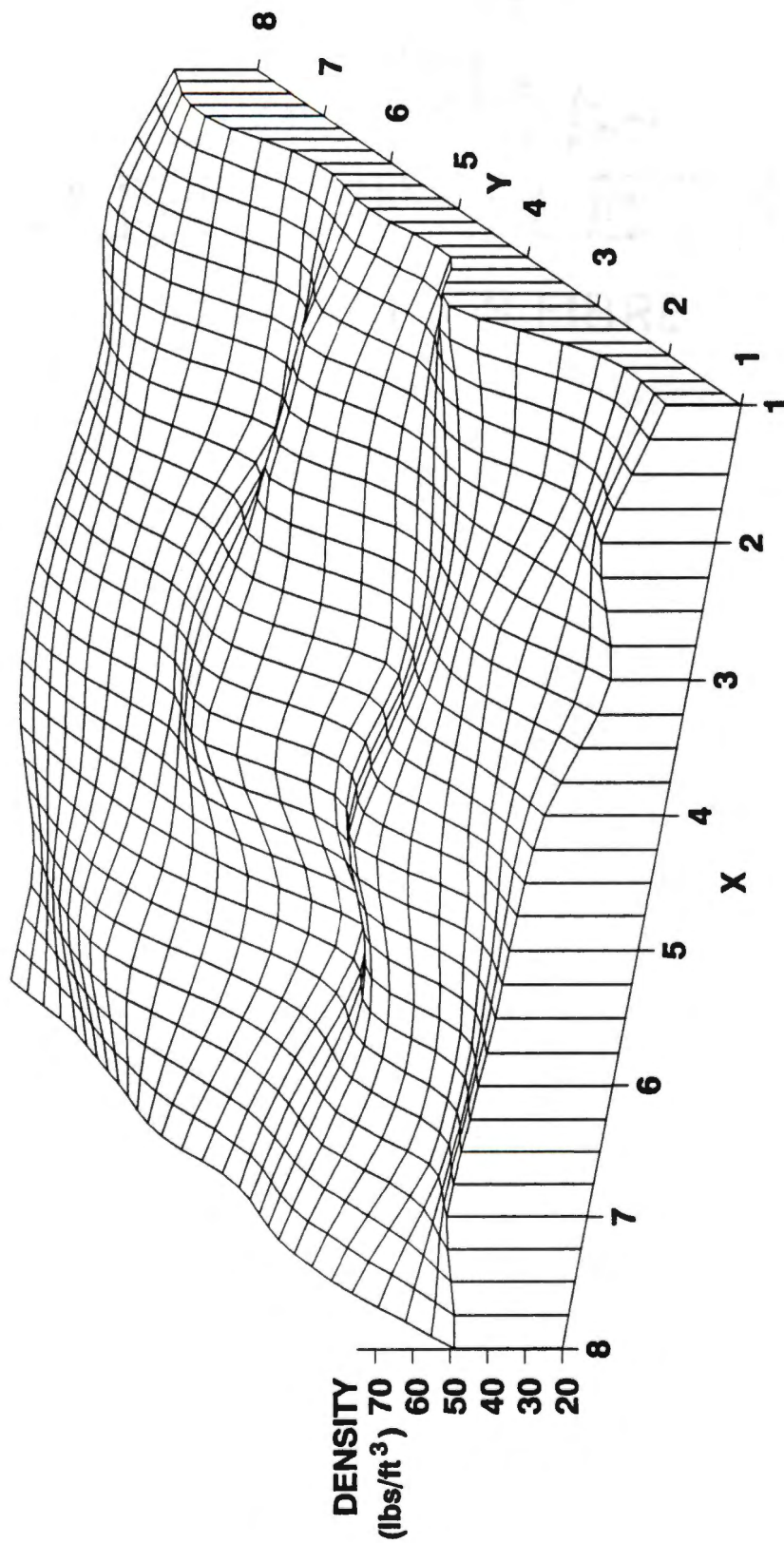
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 16



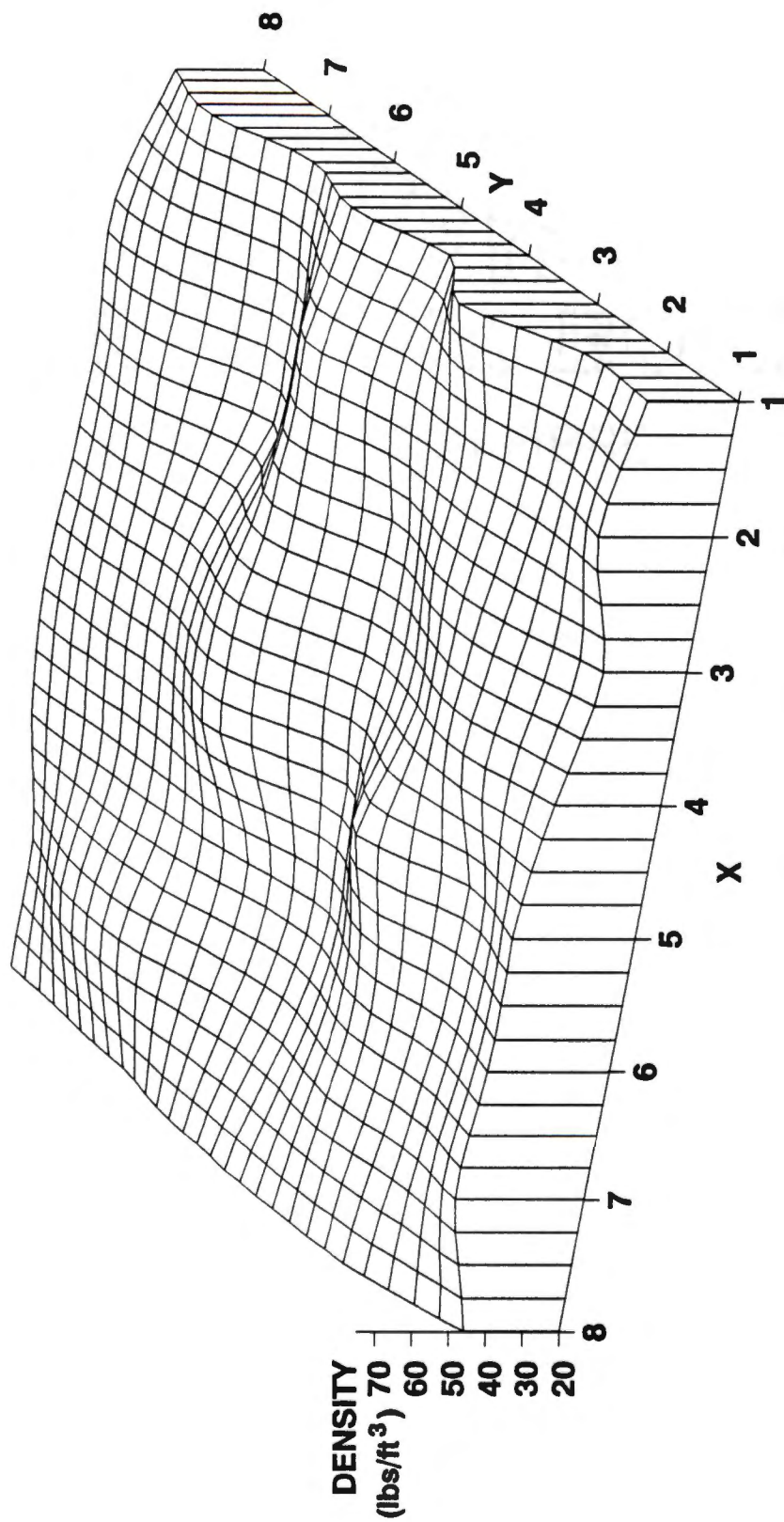
FLAKE MOISTURE CONTENT =8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=1



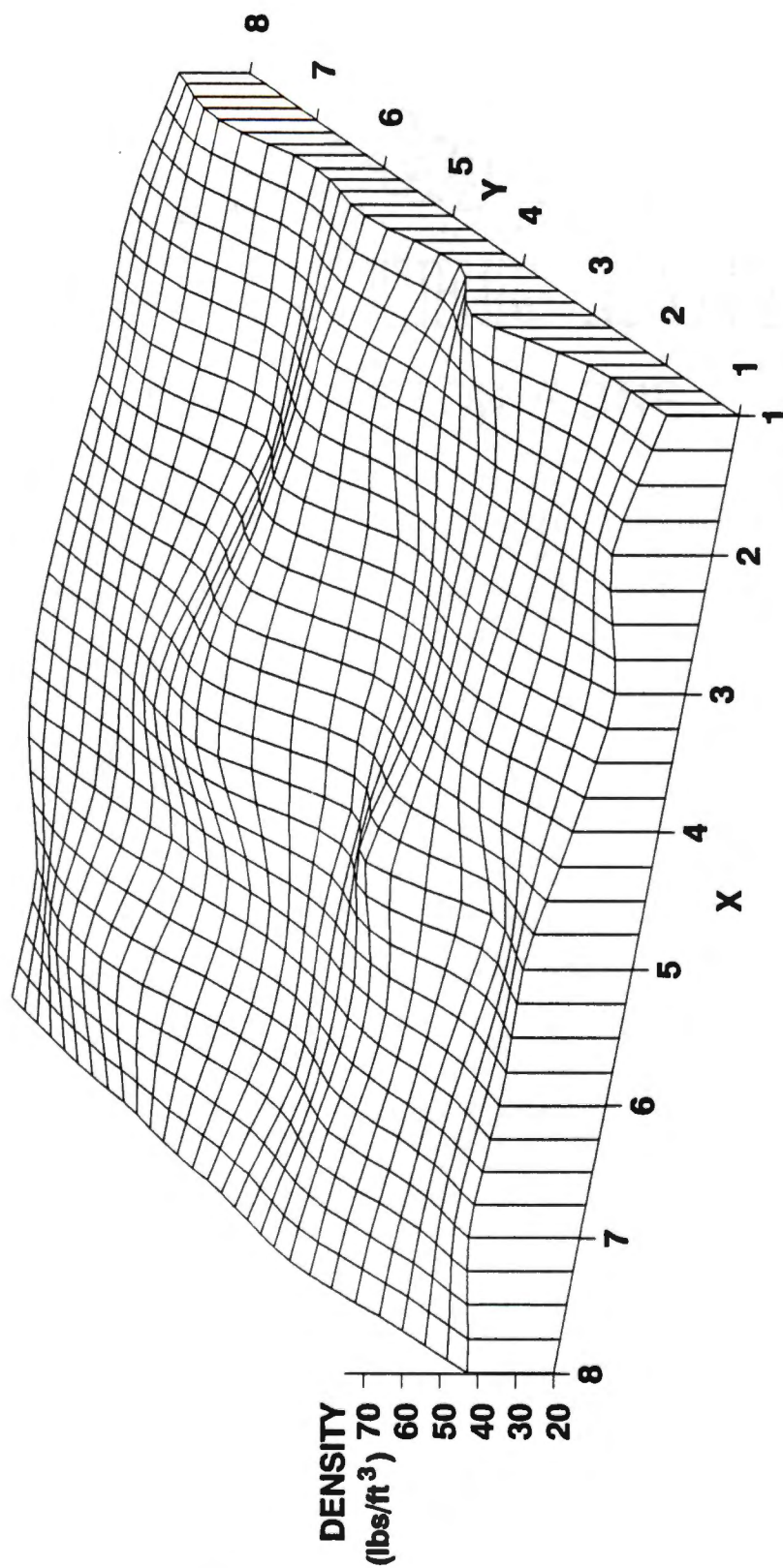
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=2



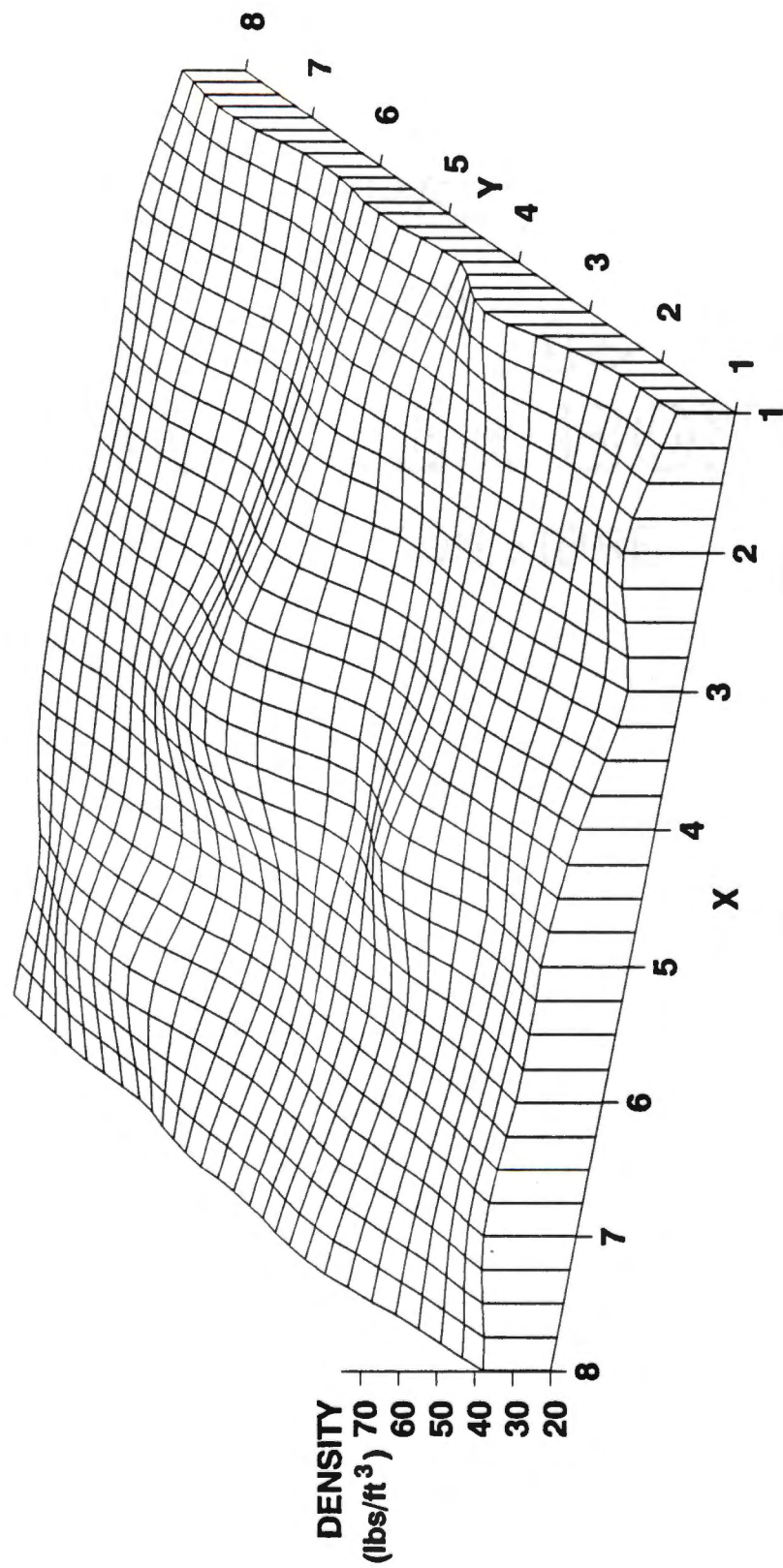
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 3



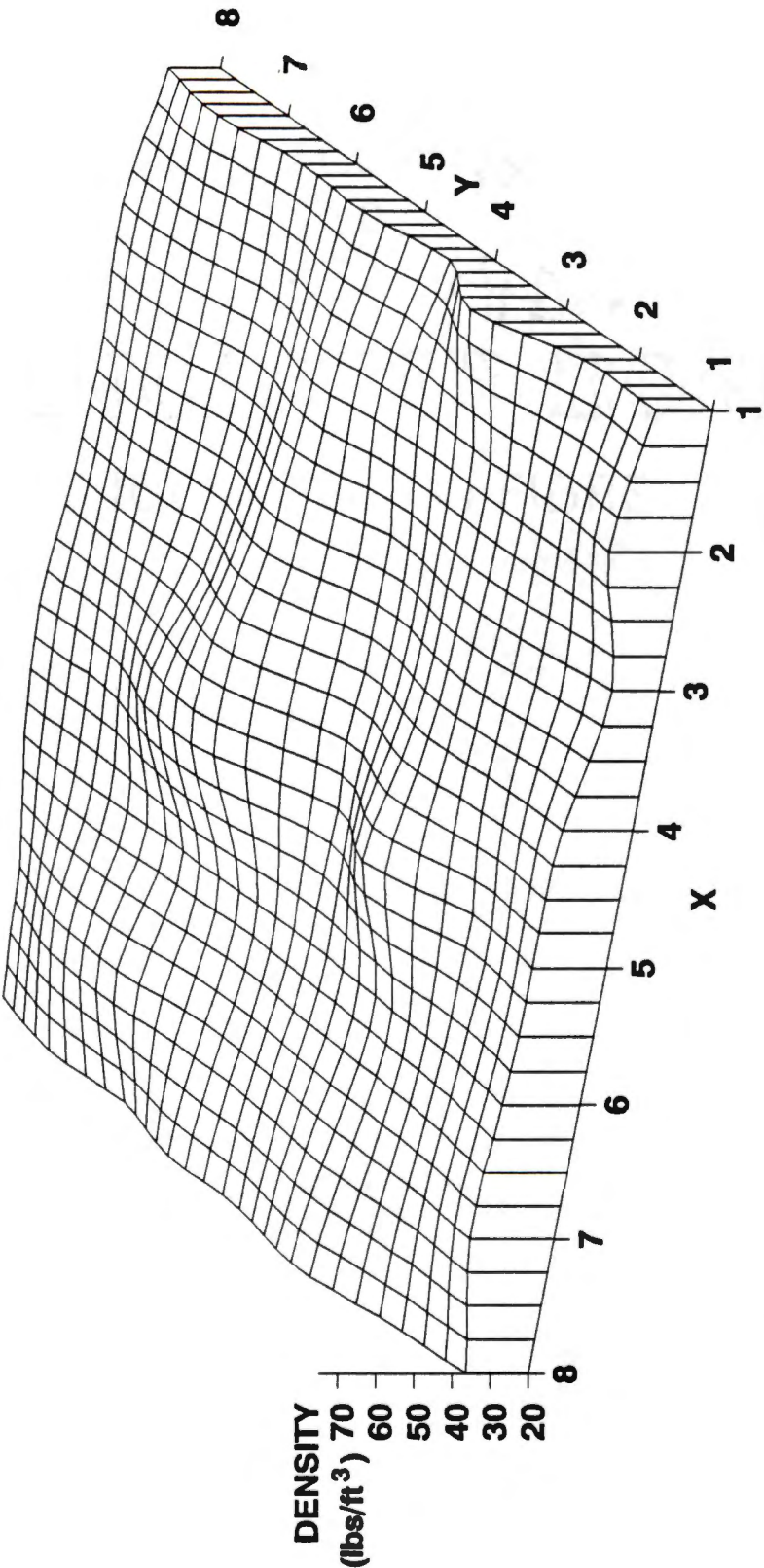
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=4



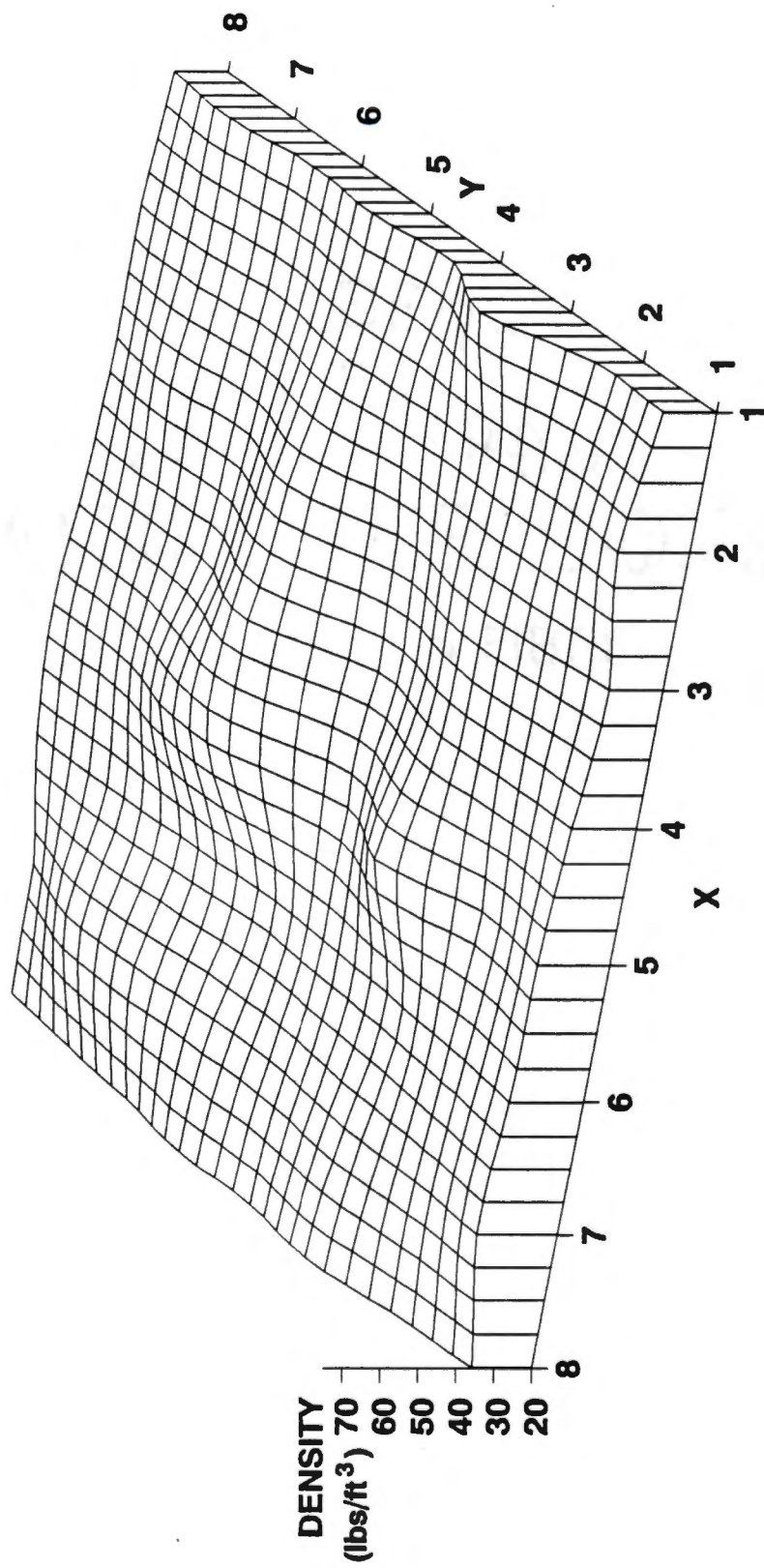
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 5



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 6



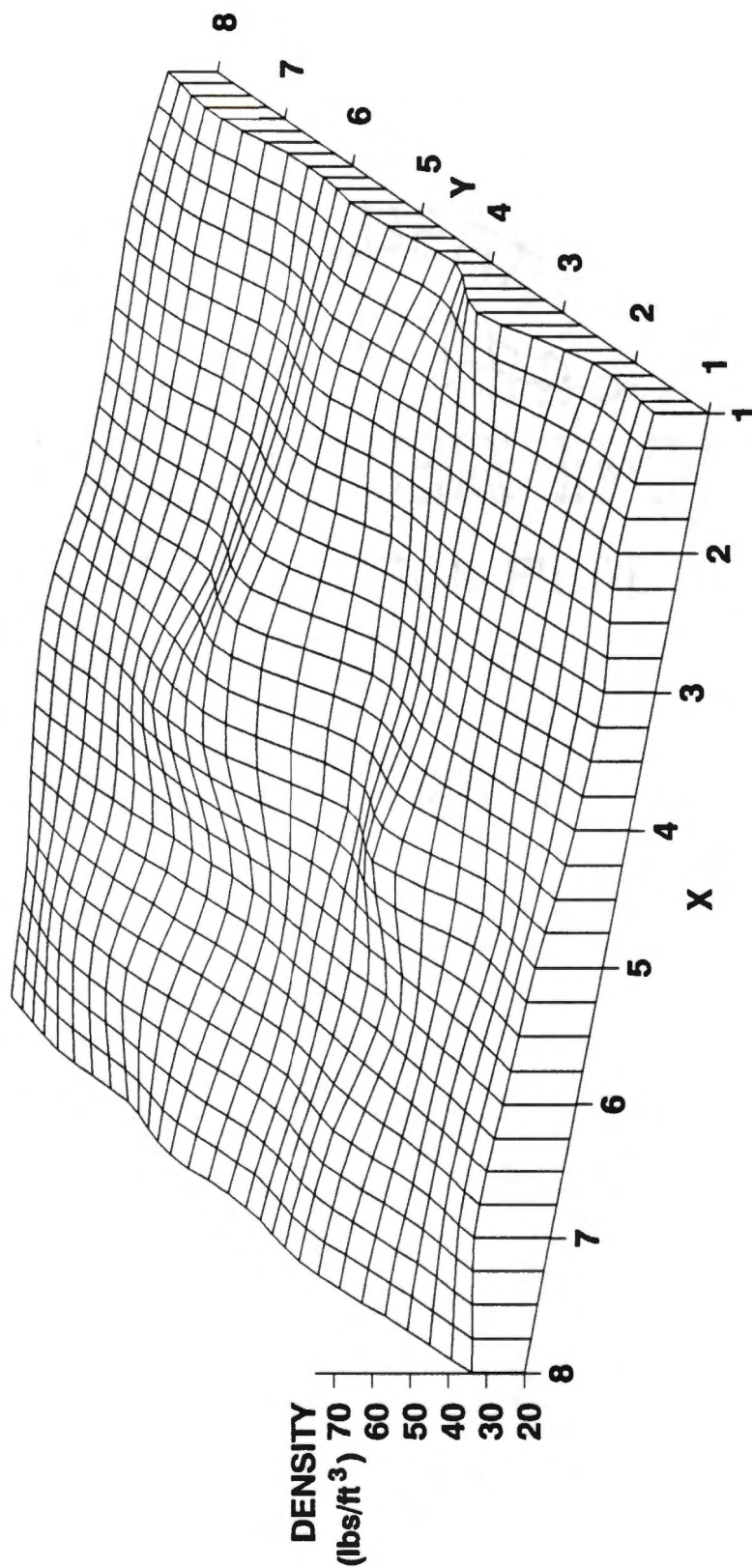
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 7



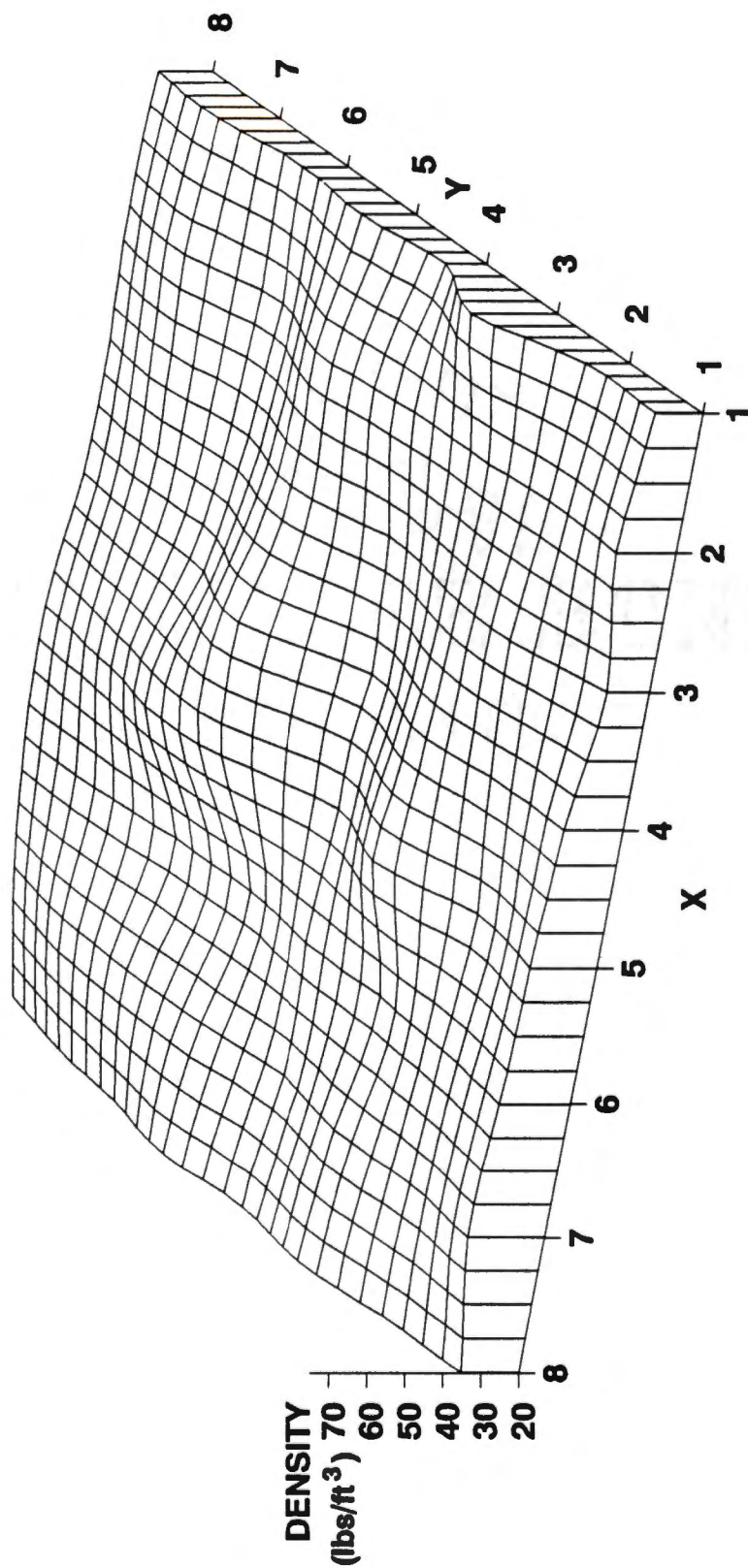
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS

REPLICATION=2

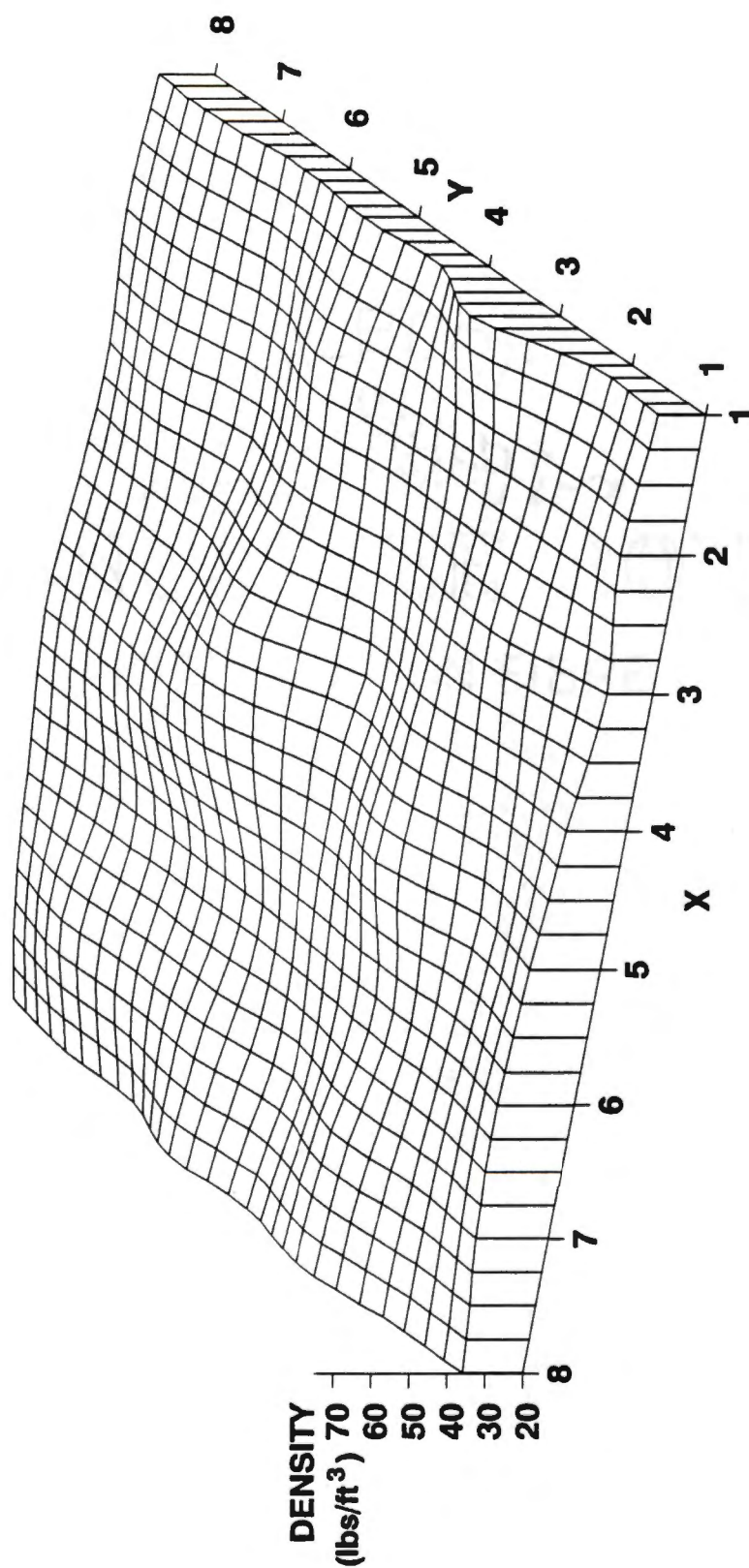
Z=8



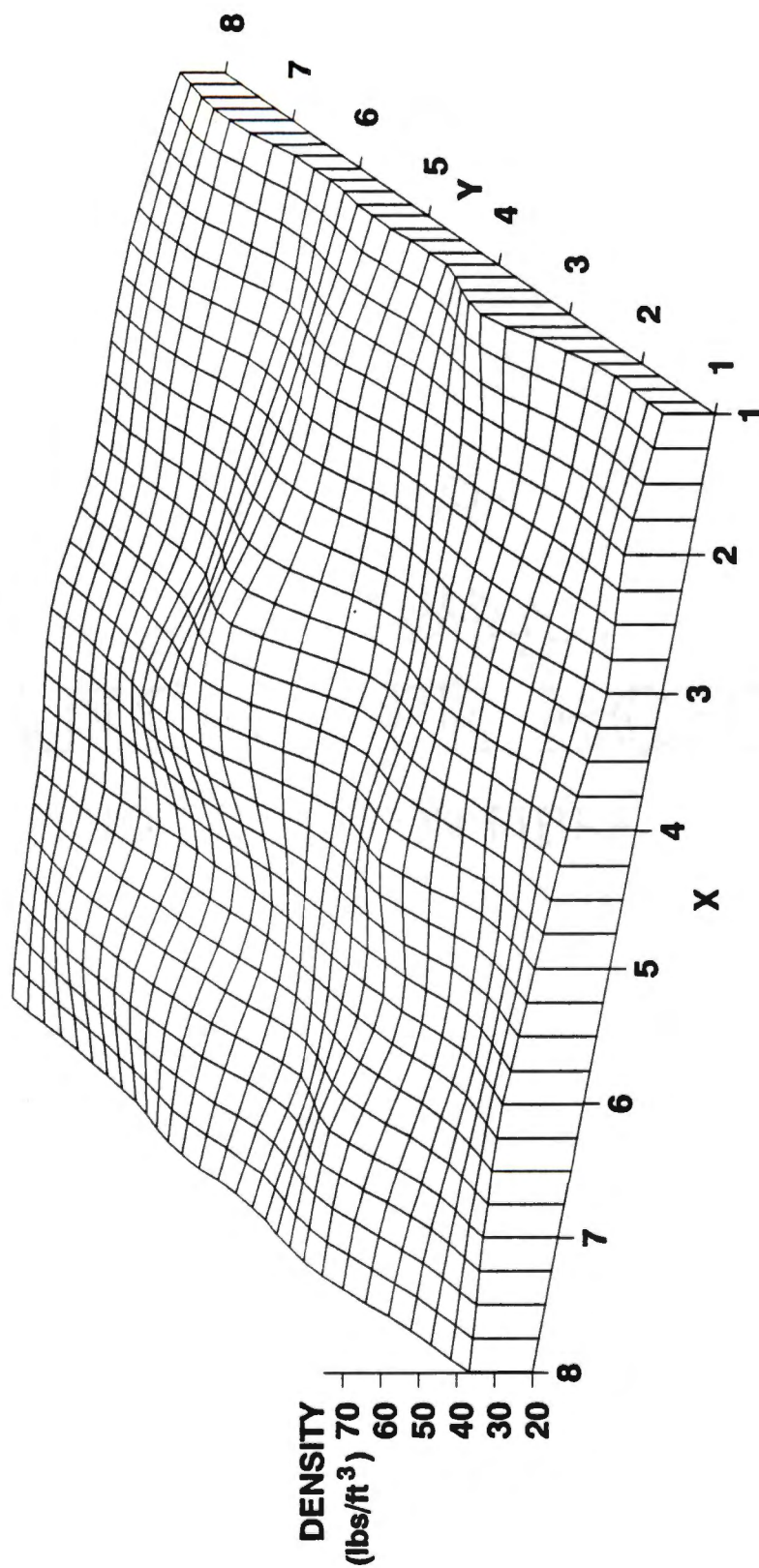
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 9



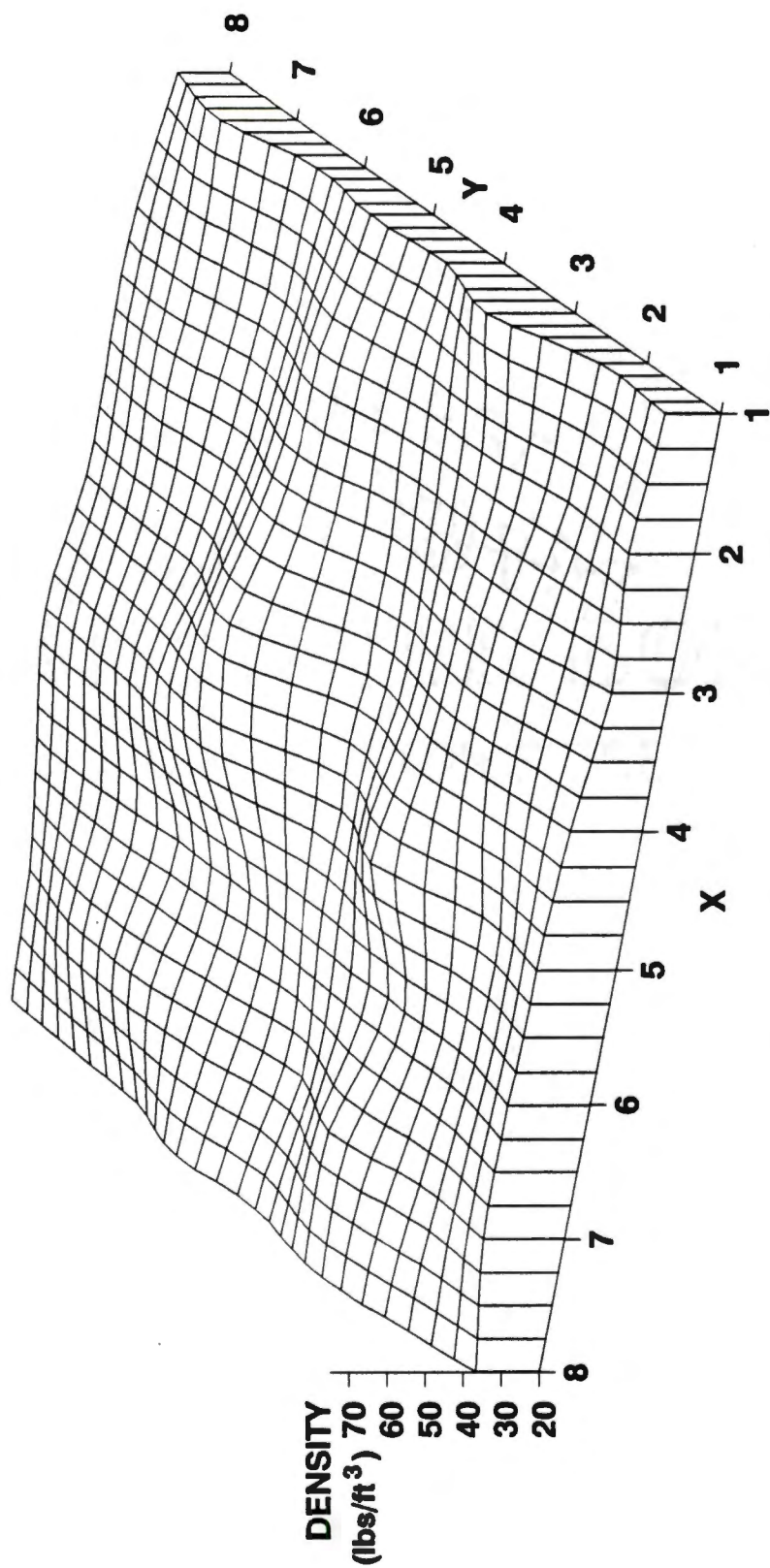
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 10



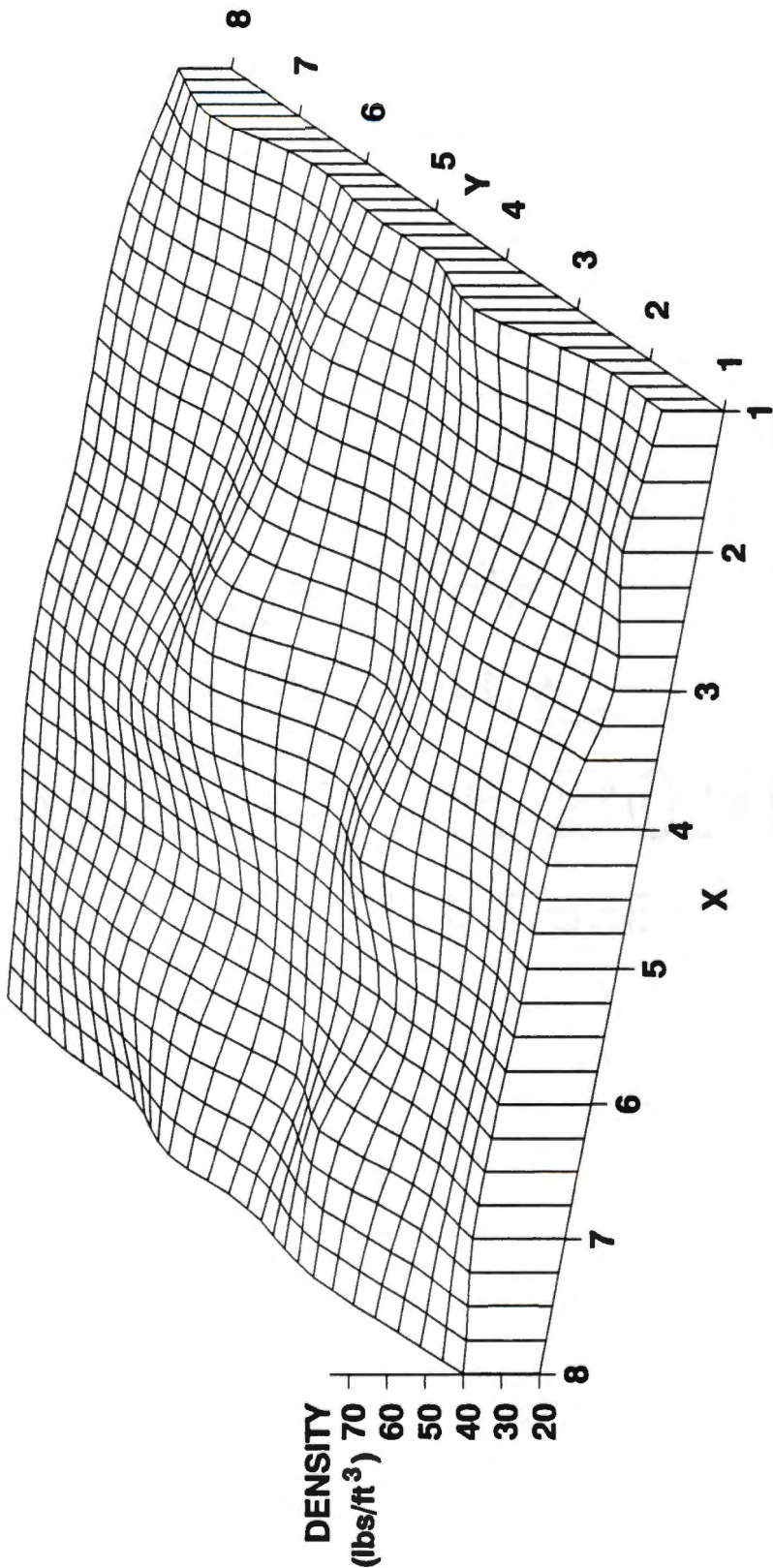
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 11



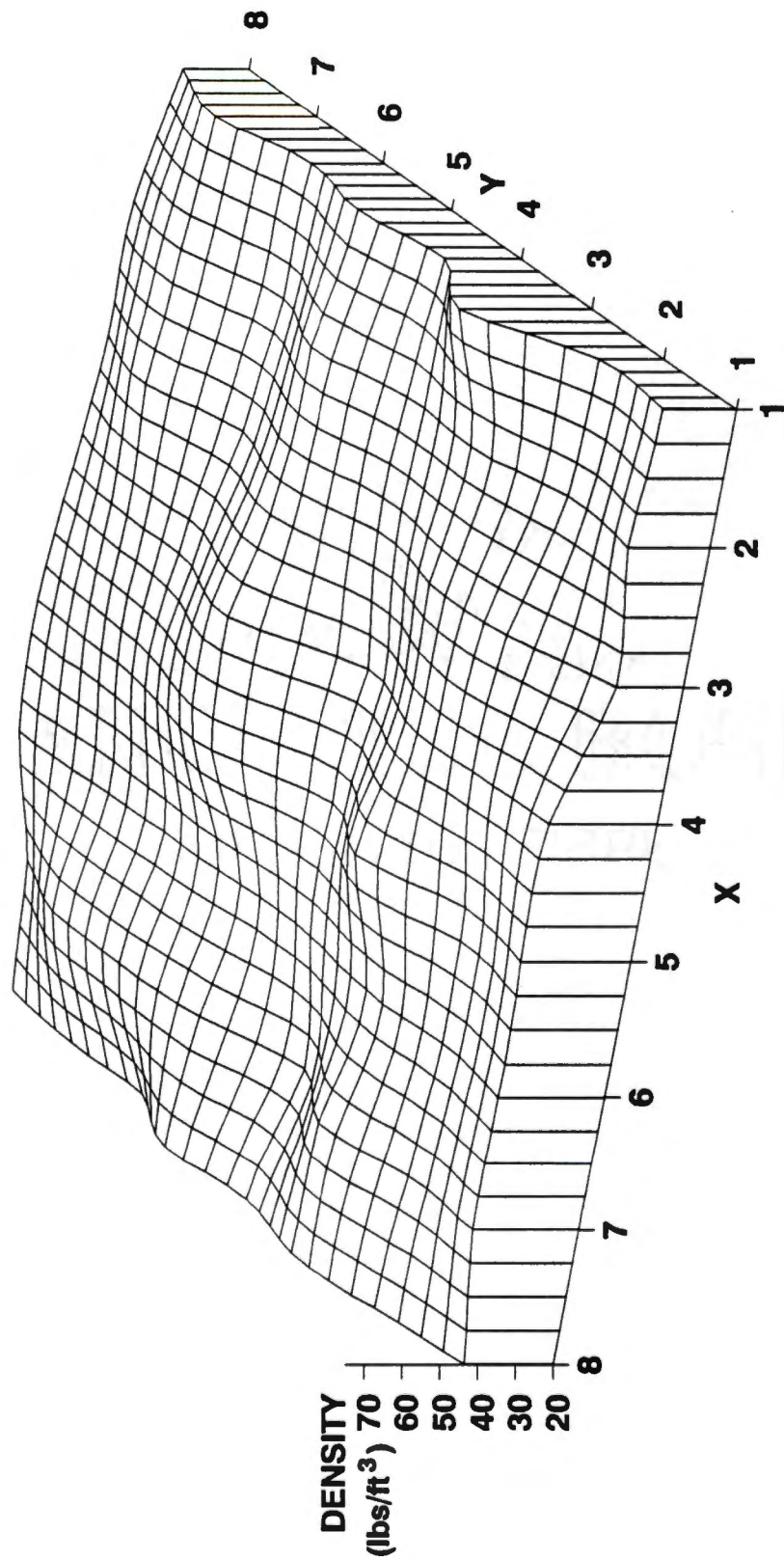
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 12



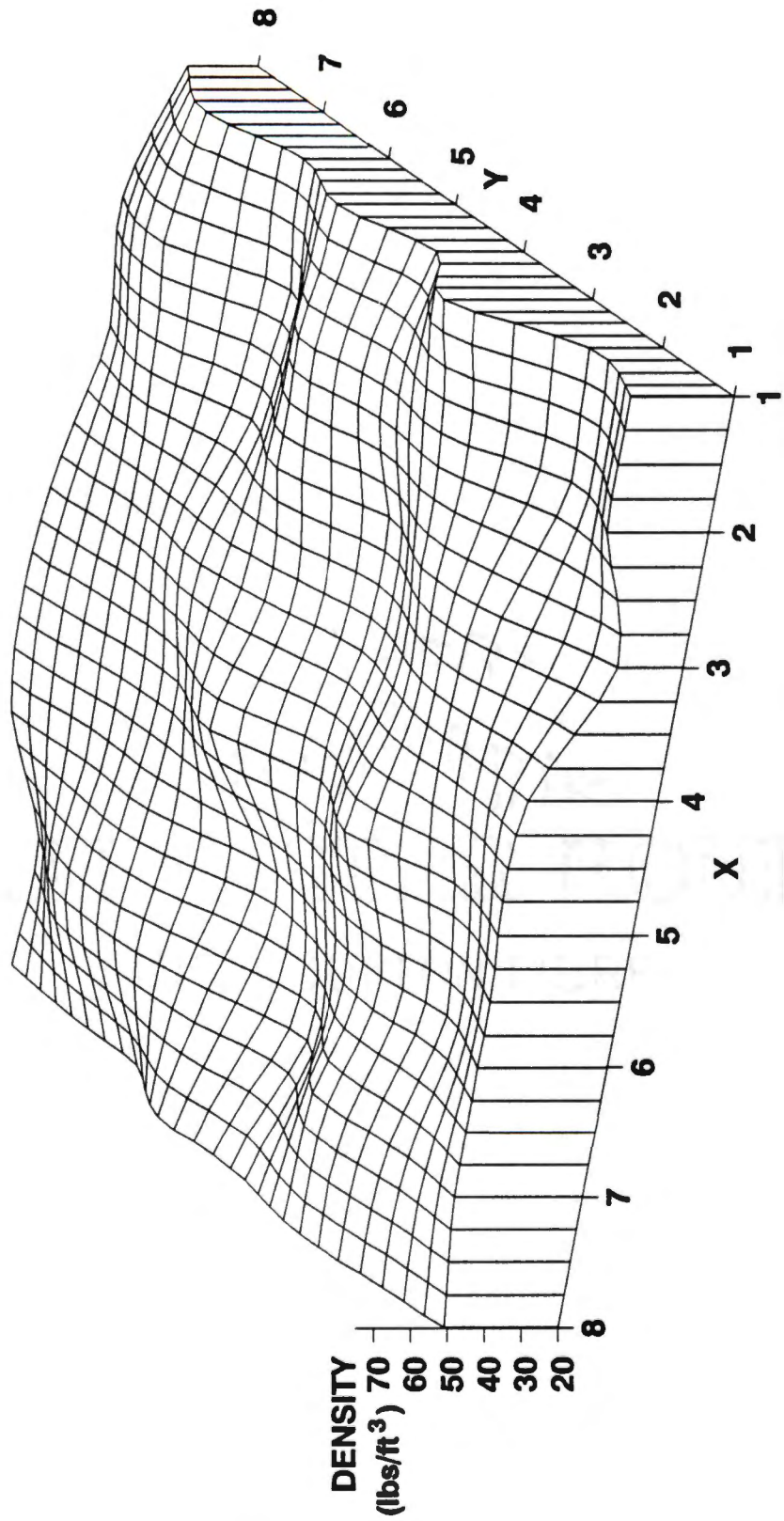
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 13



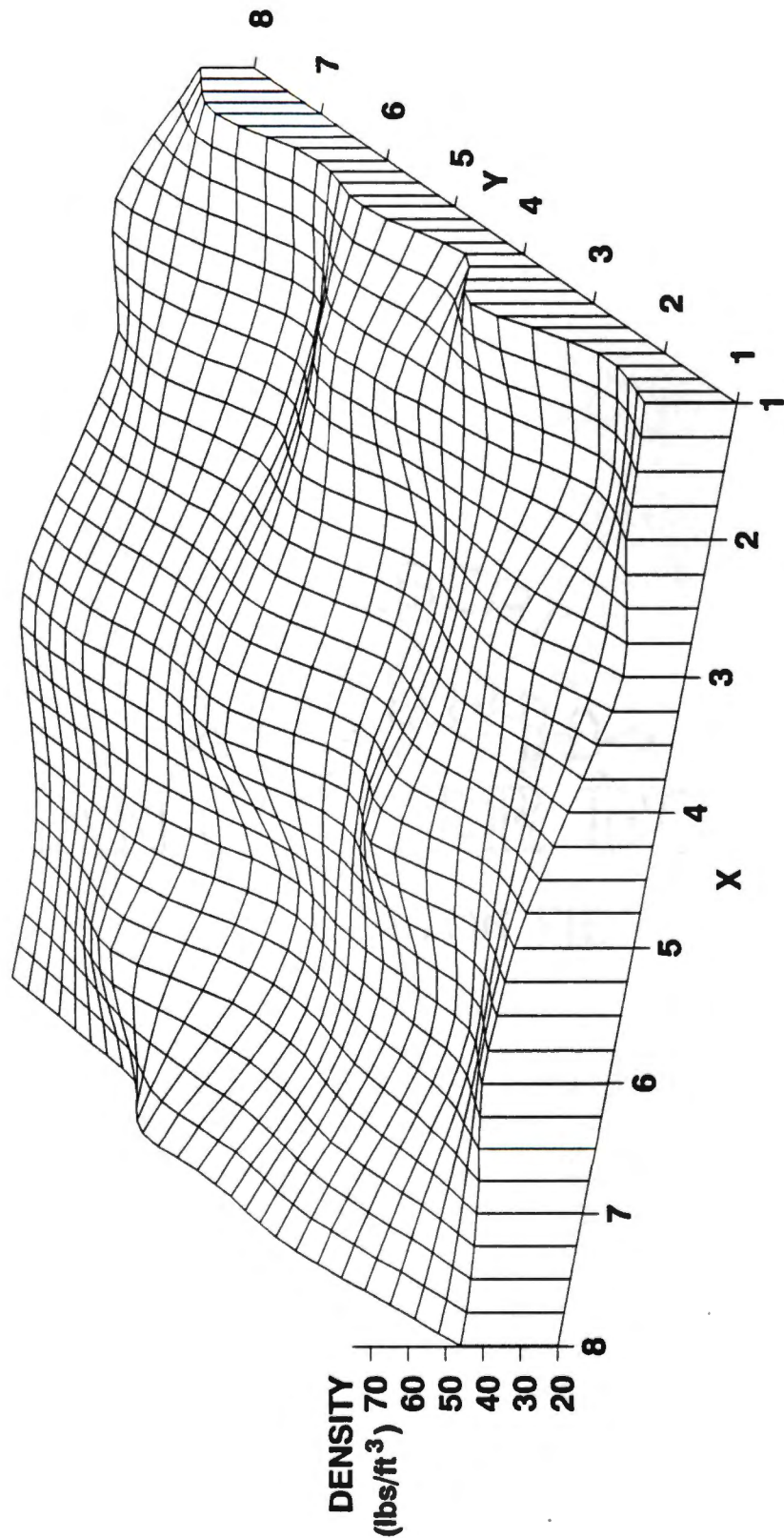
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 14



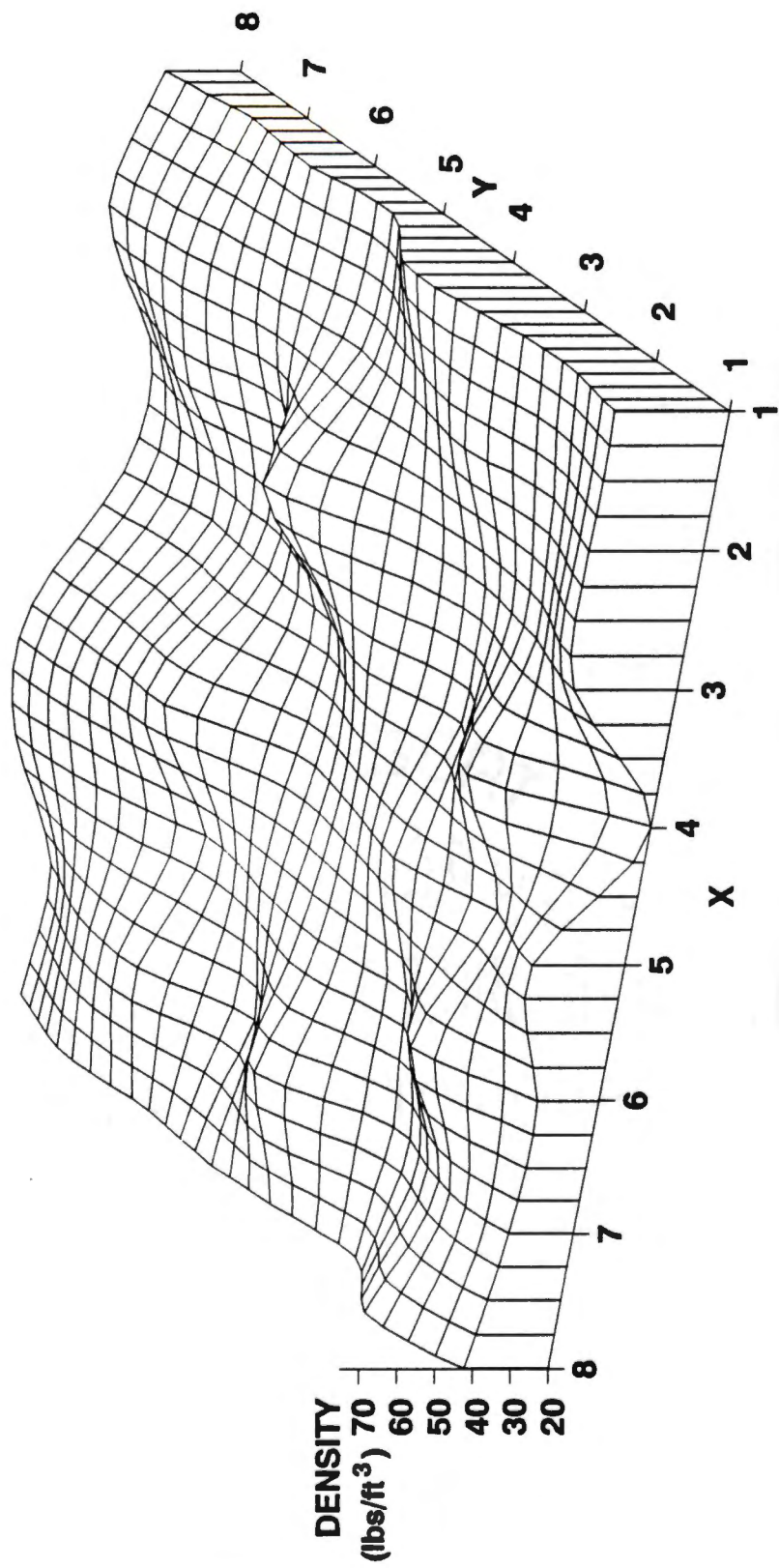
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 15



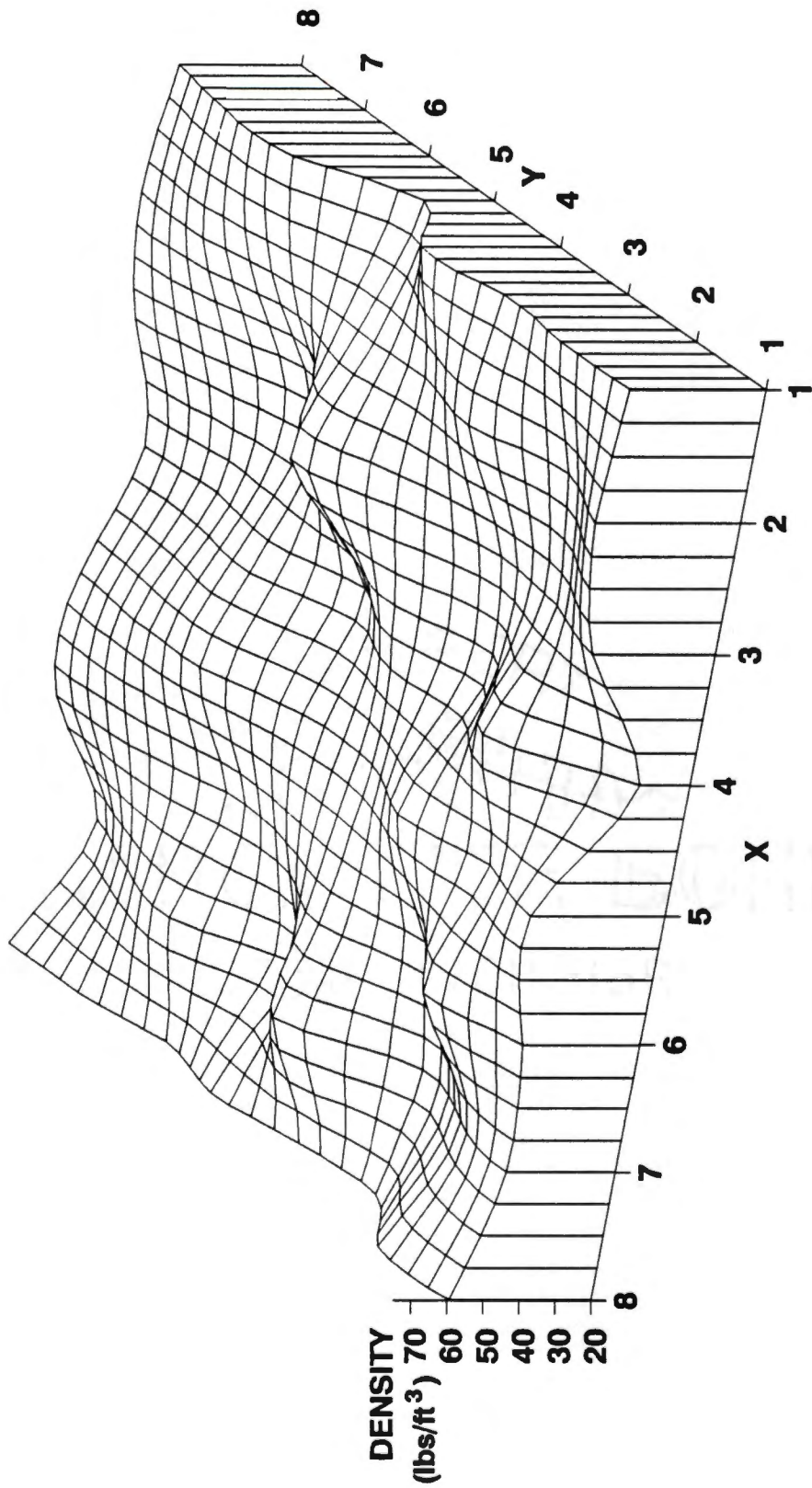
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 16



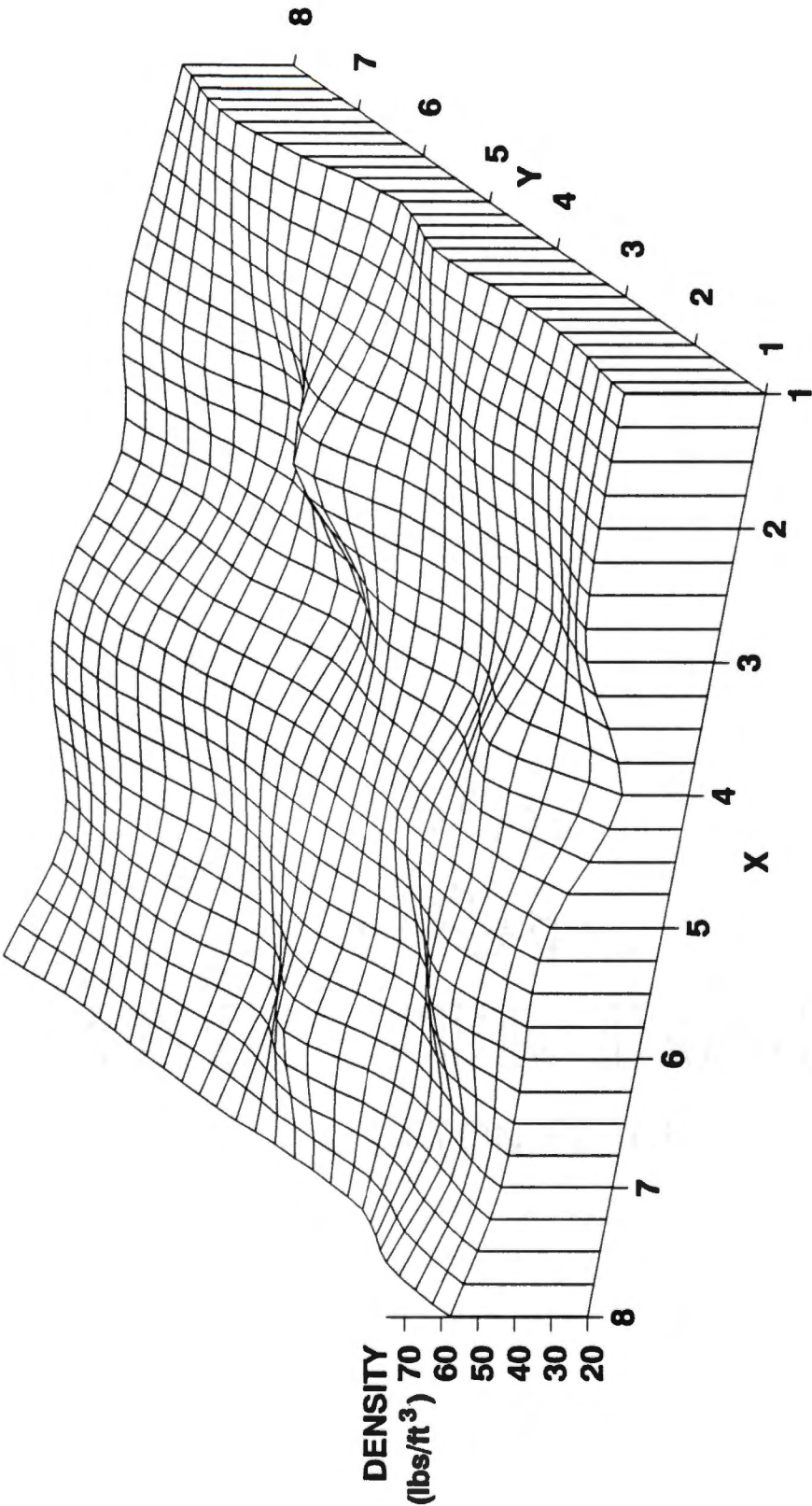
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 1



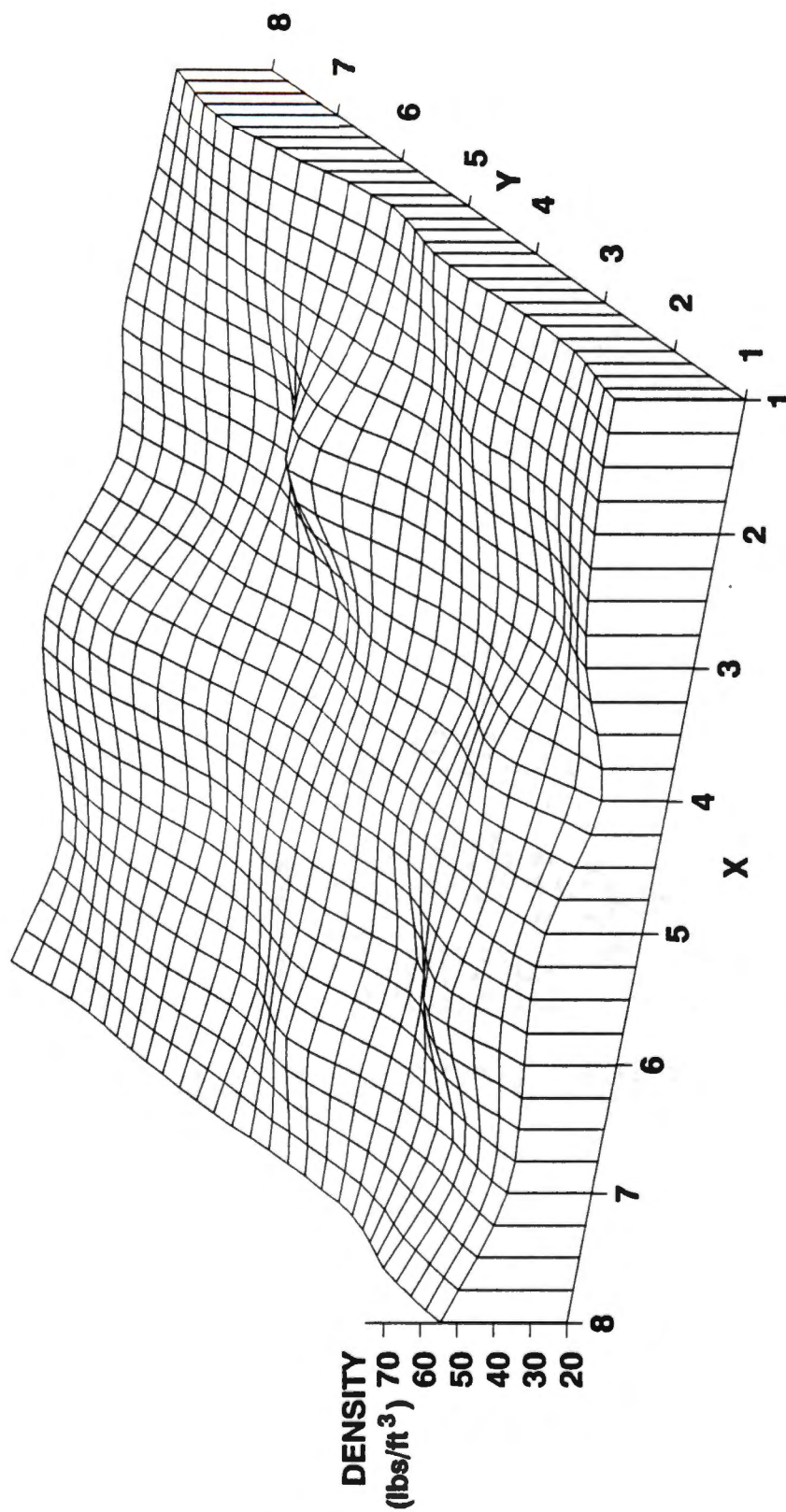
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 2



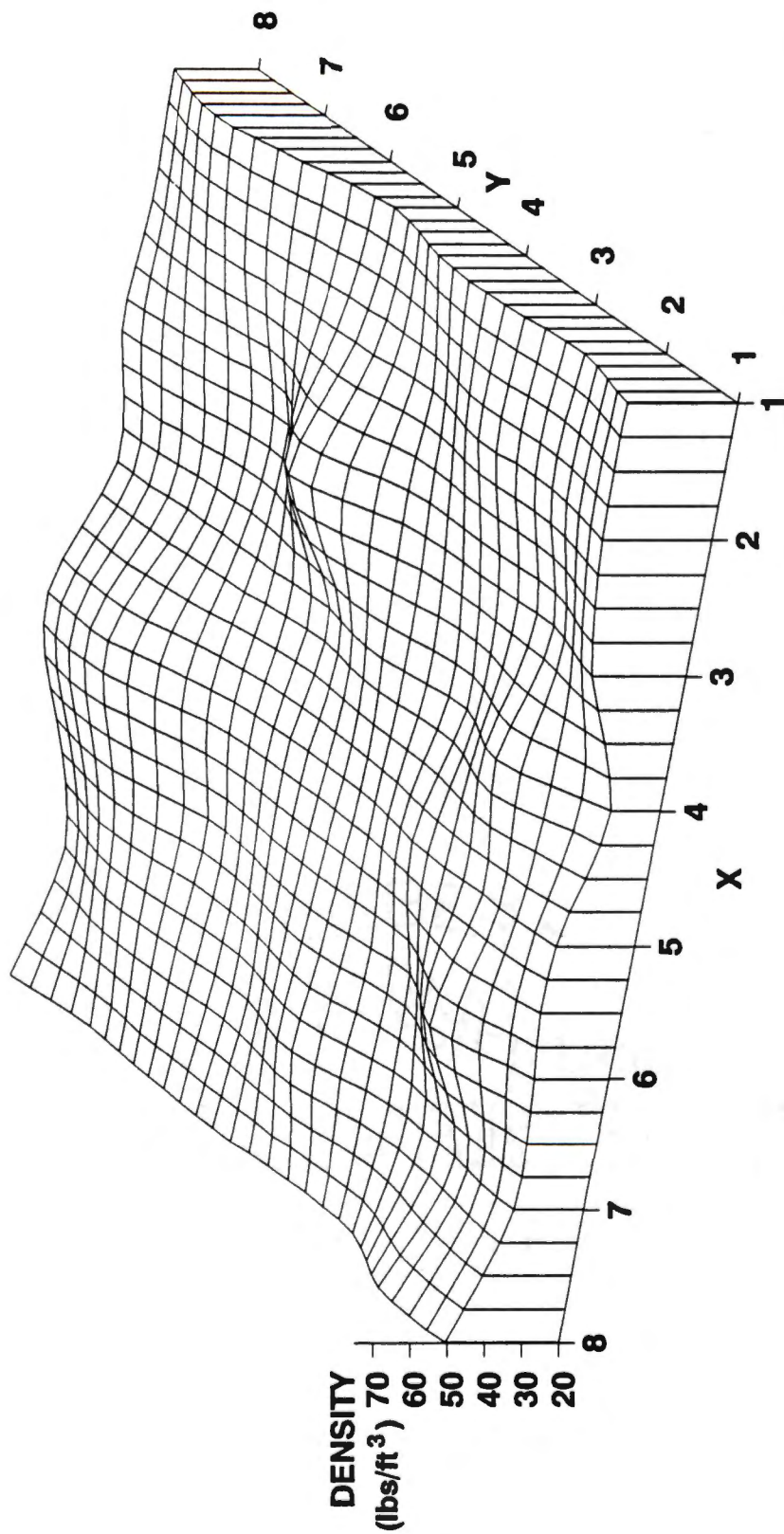
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 3



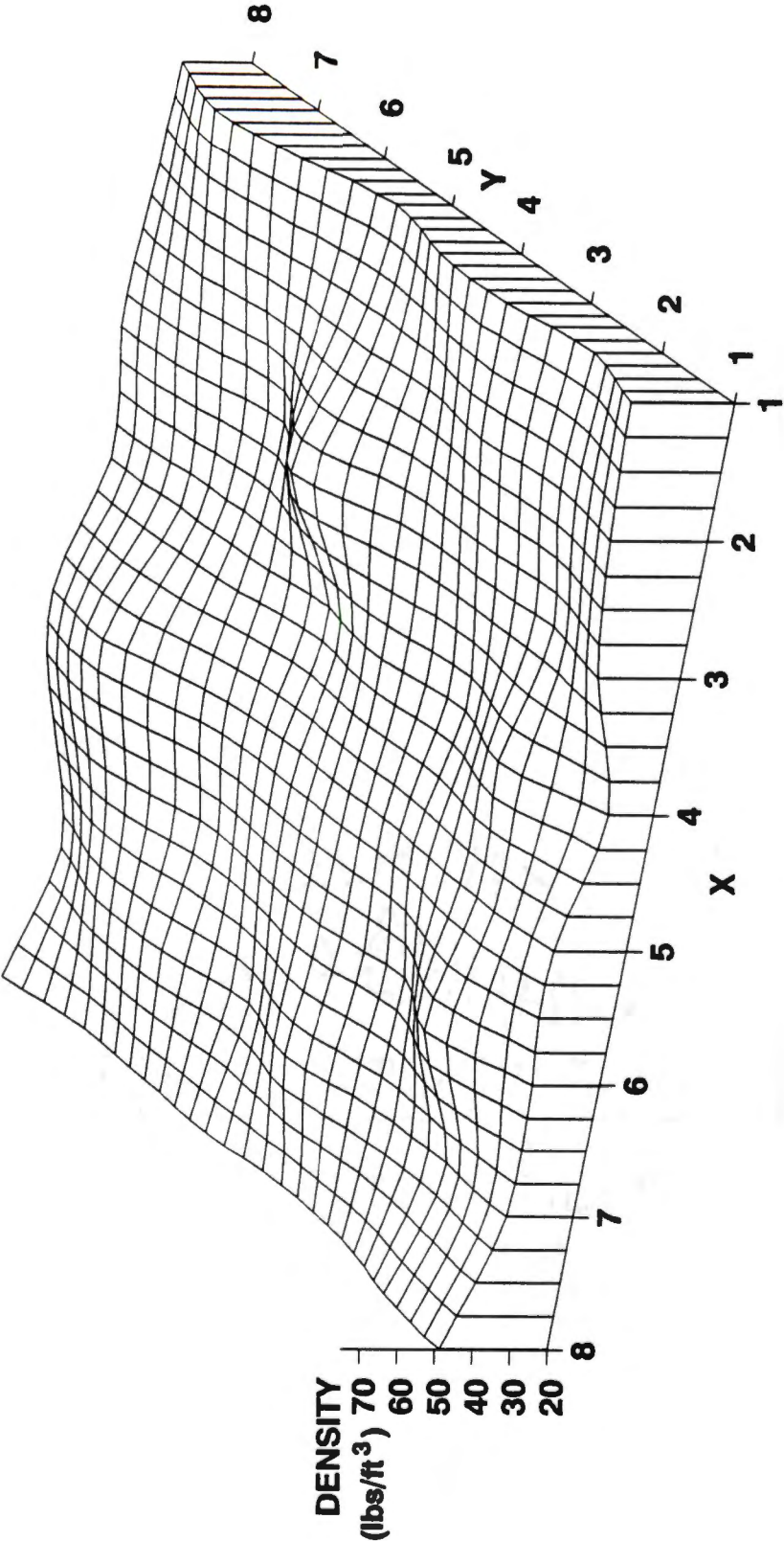
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 4



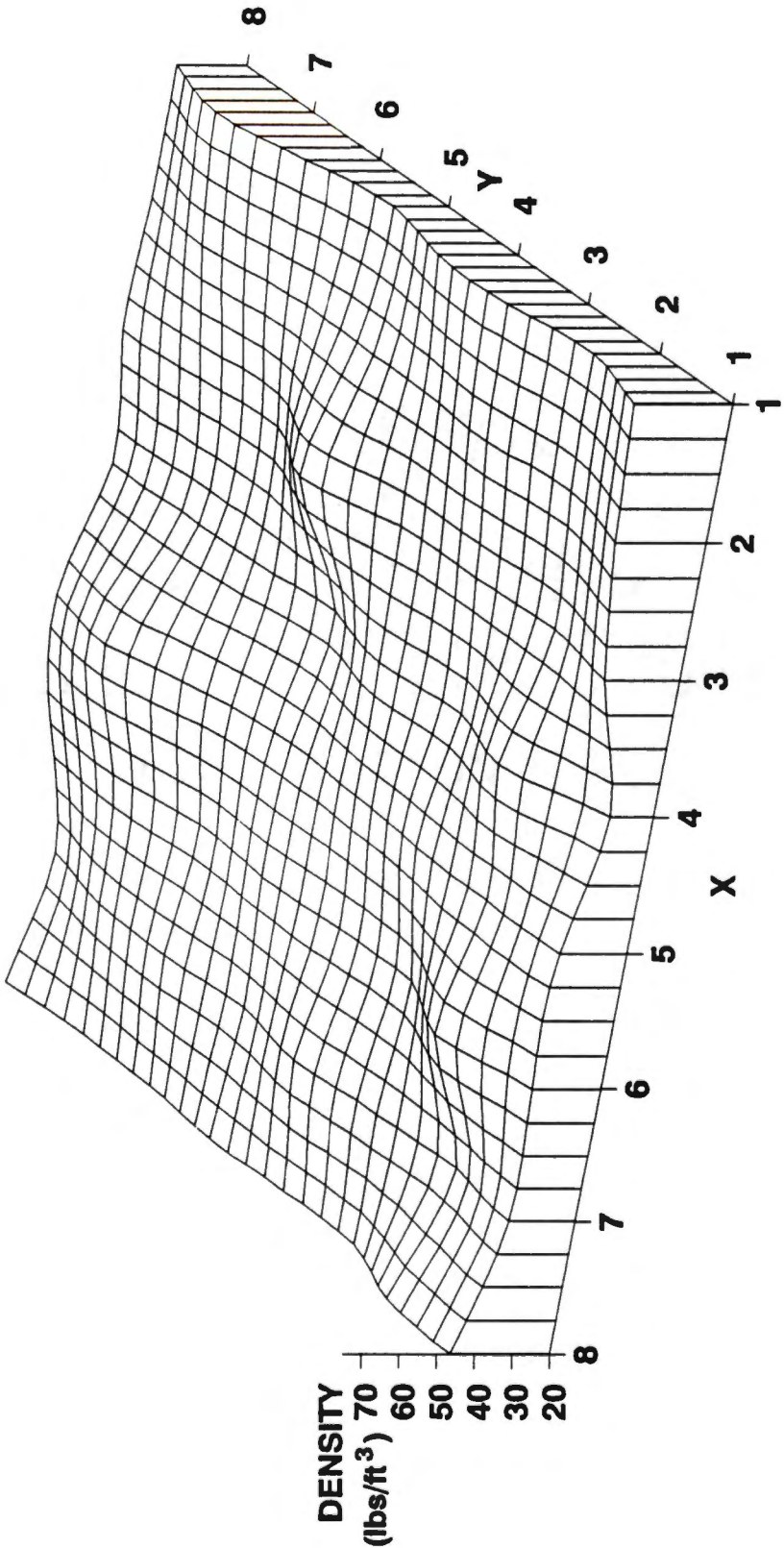
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 5



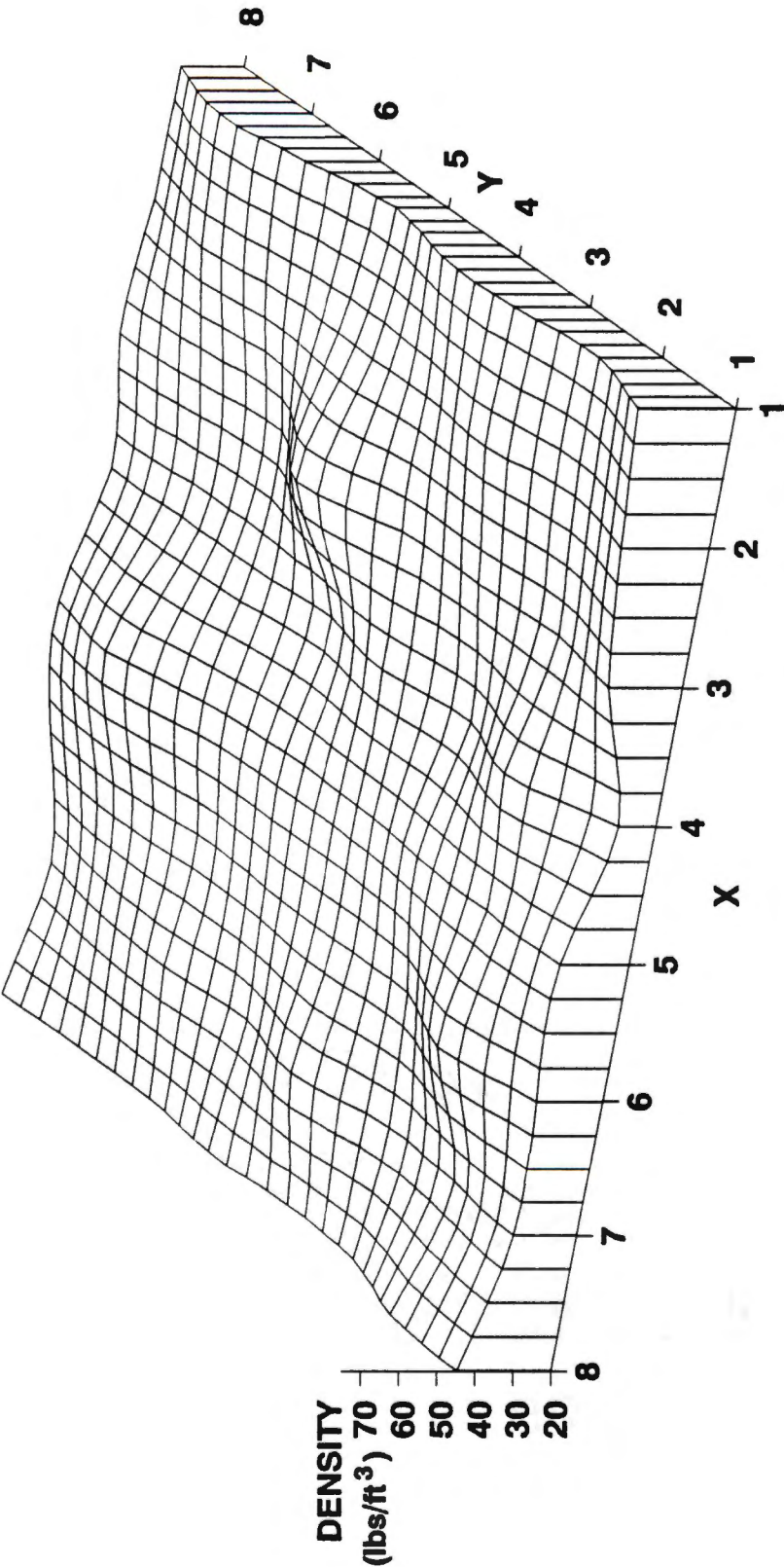
FLAKE MOISTURE CONTENT =8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=6



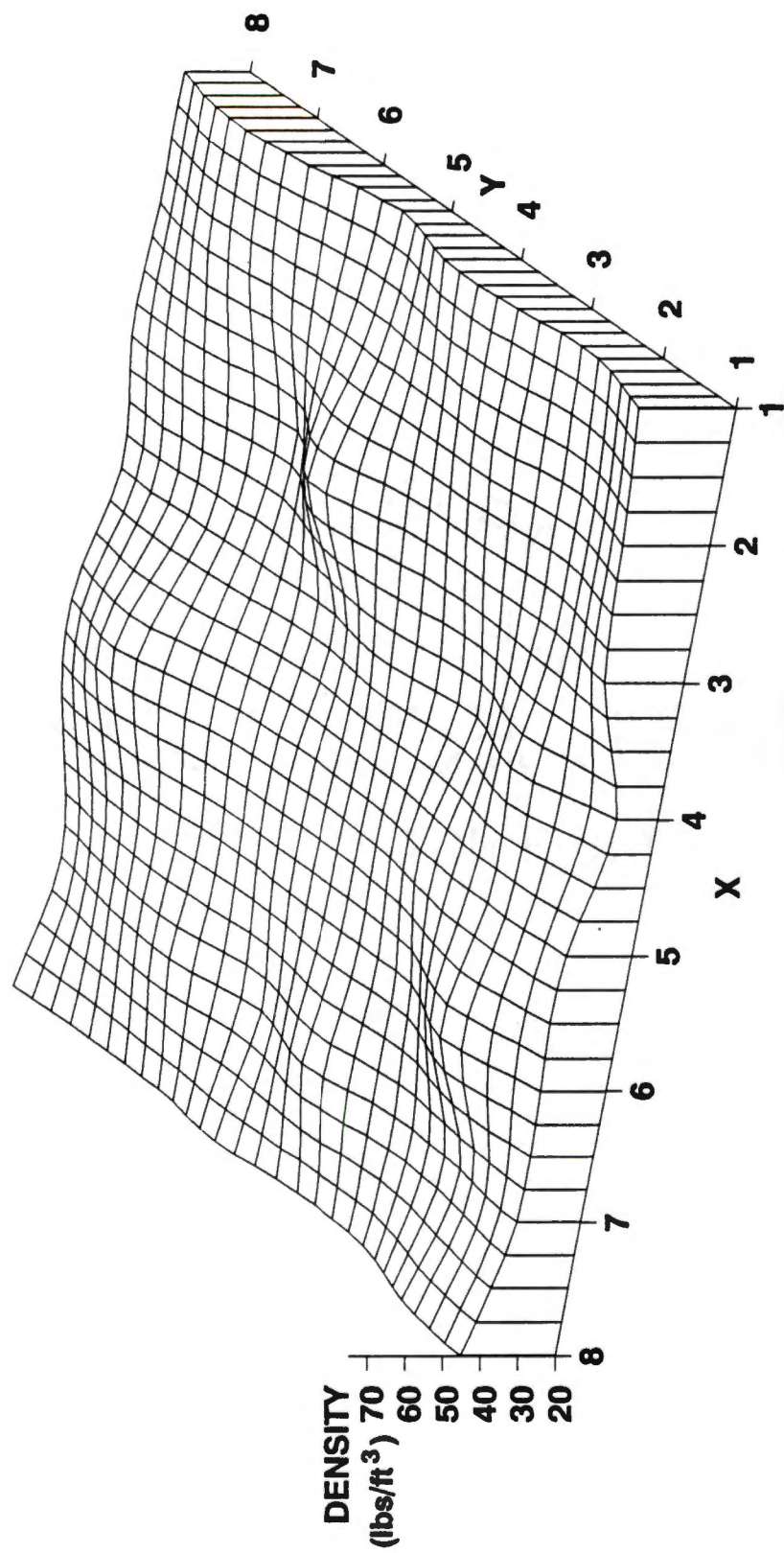
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=7



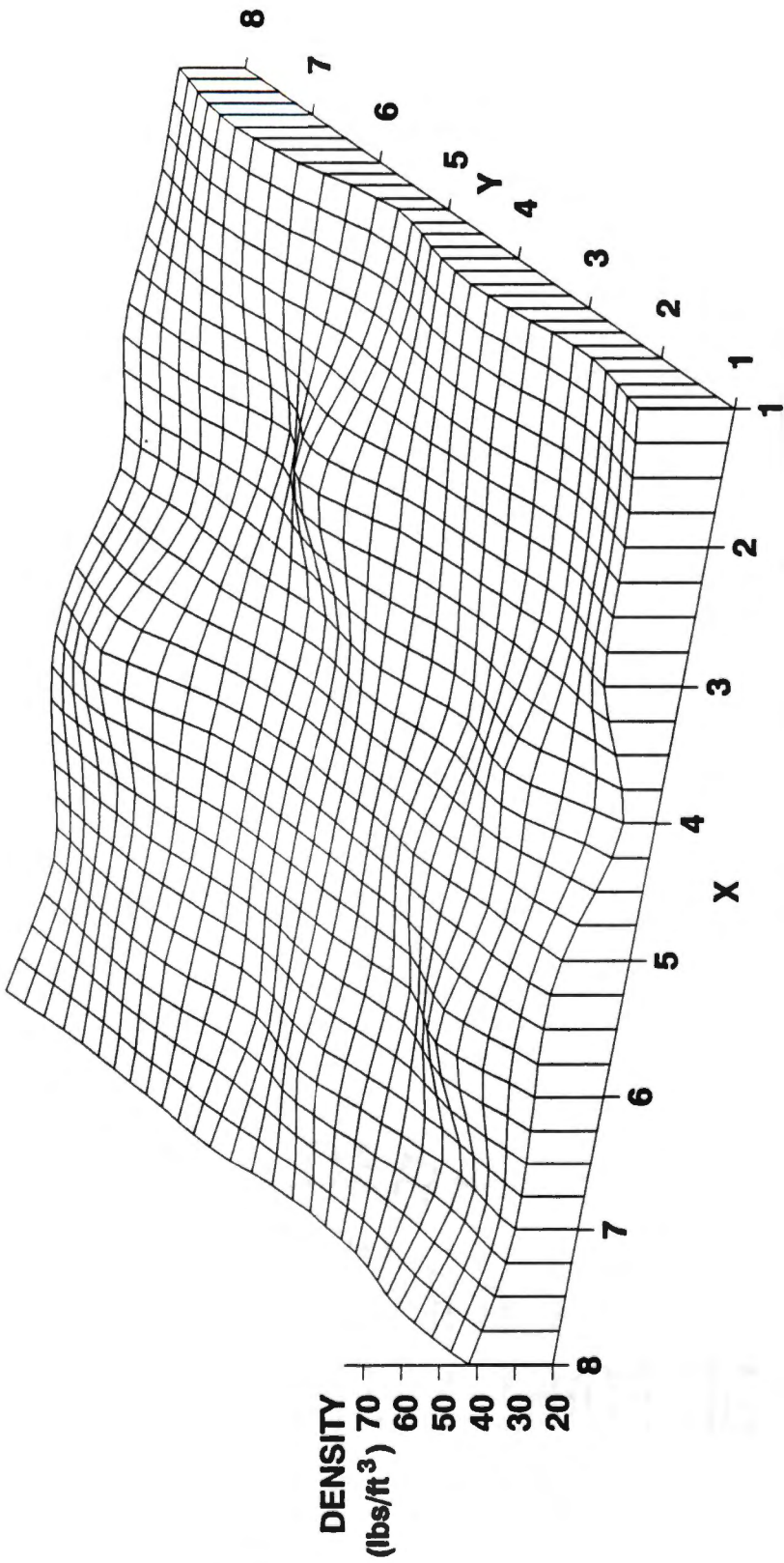
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=8



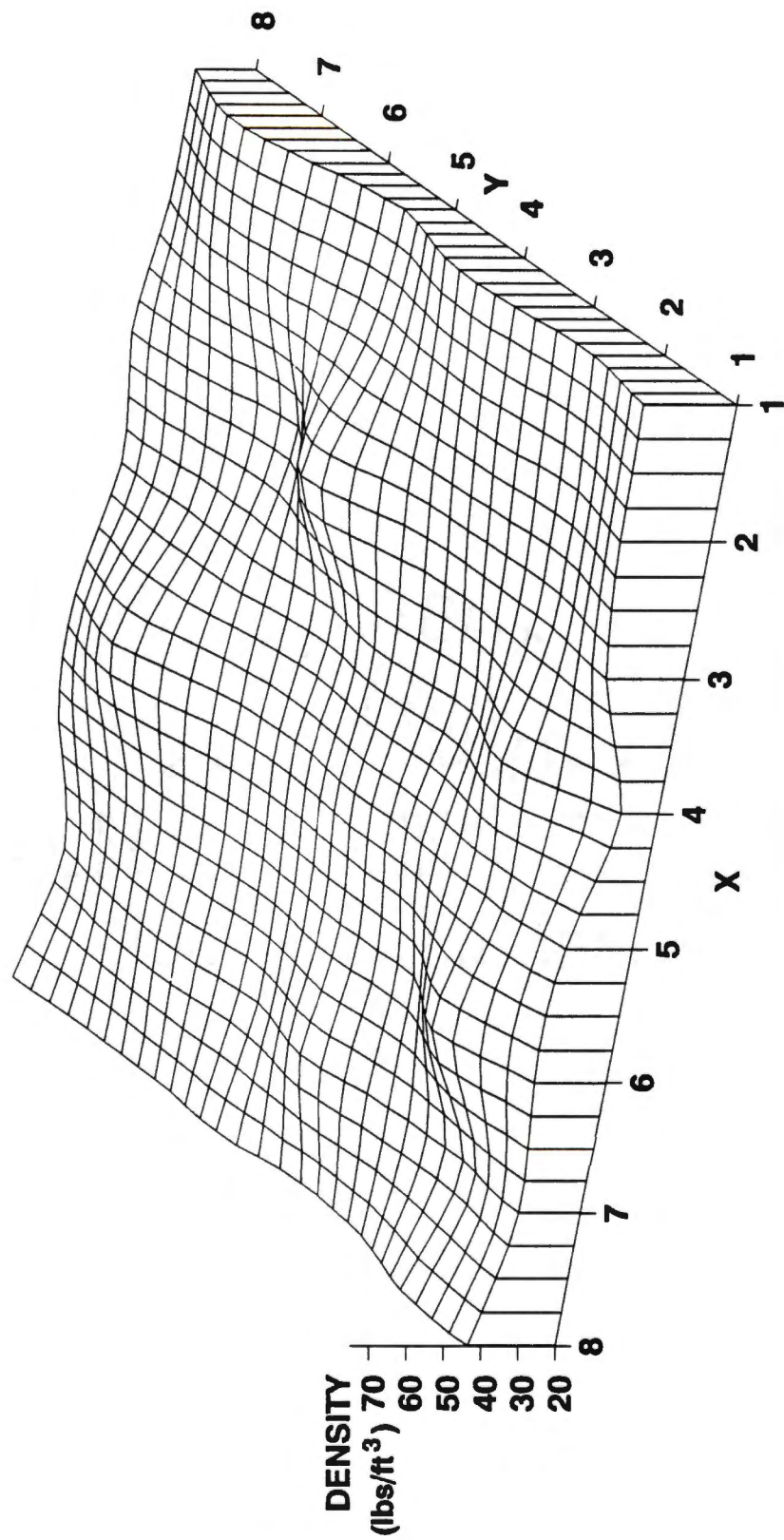
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 9



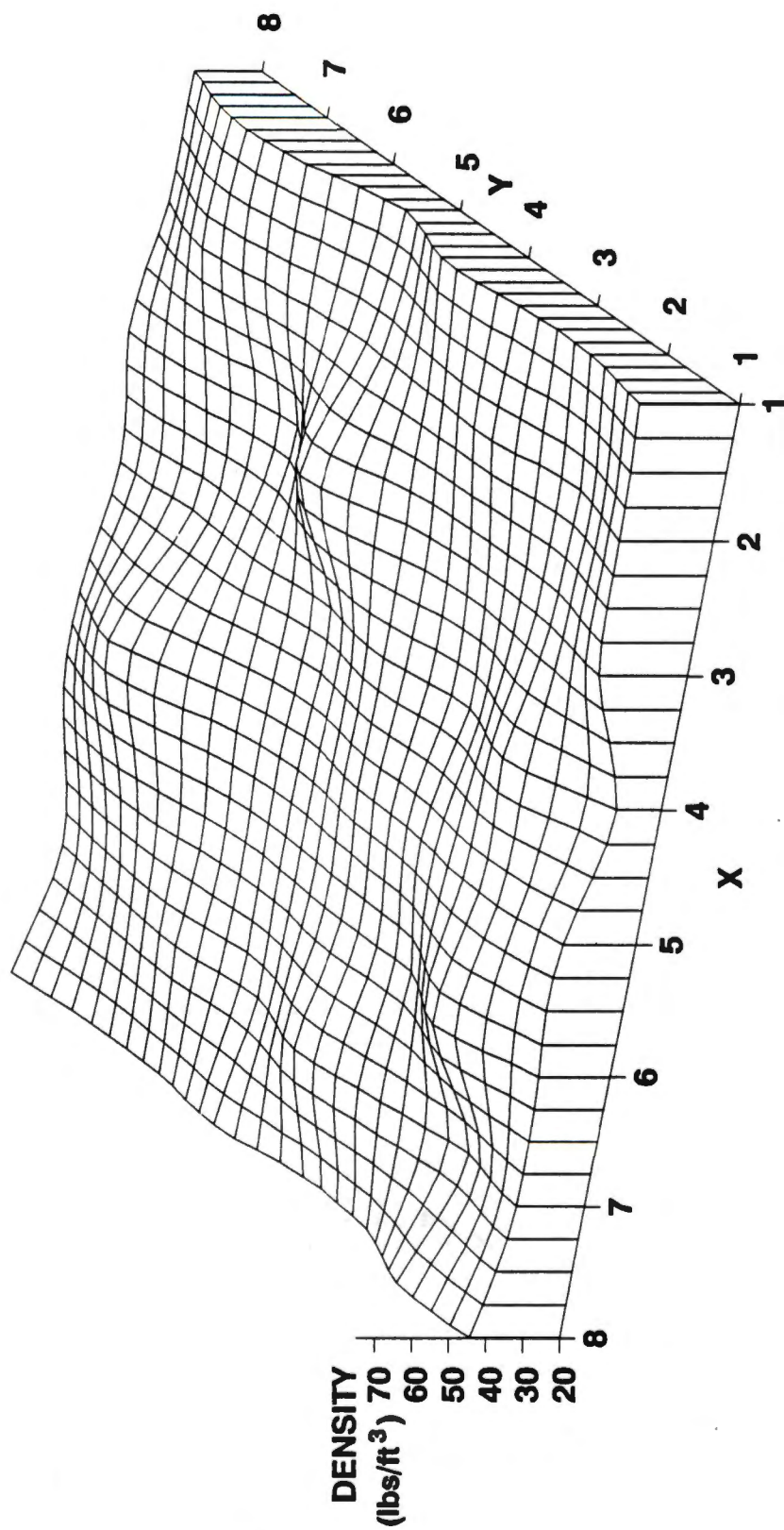
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 10



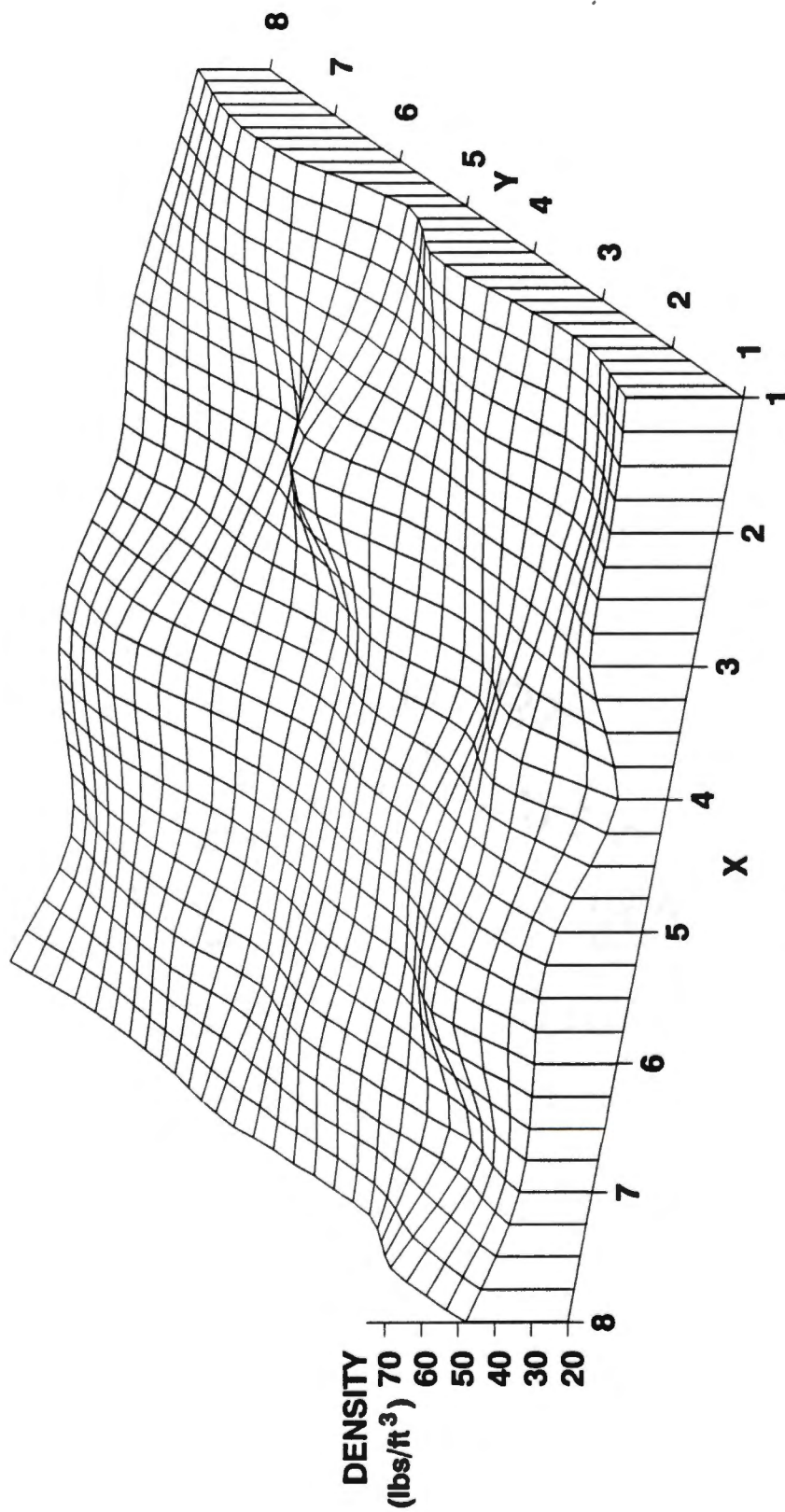
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 11



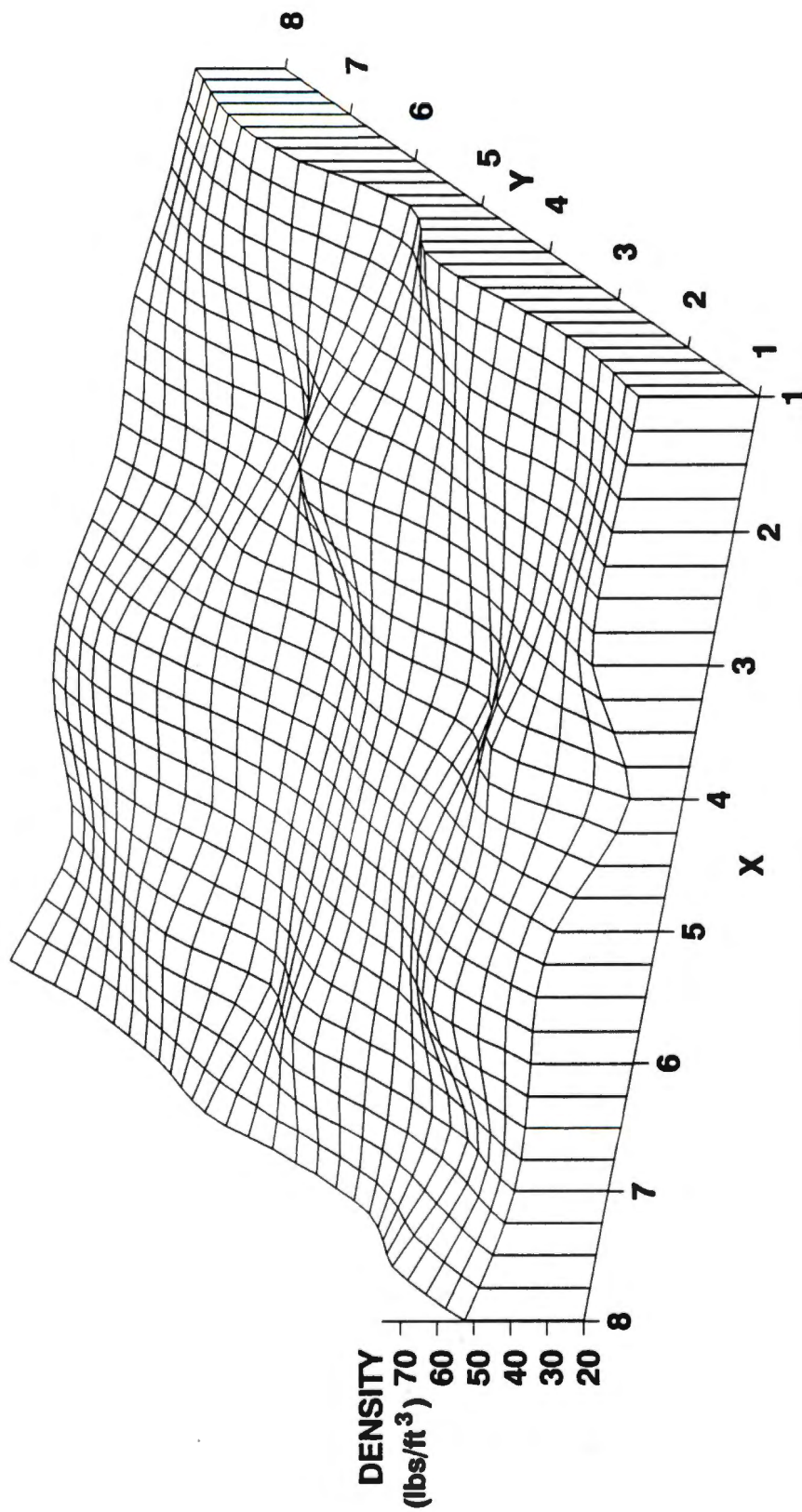
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=12



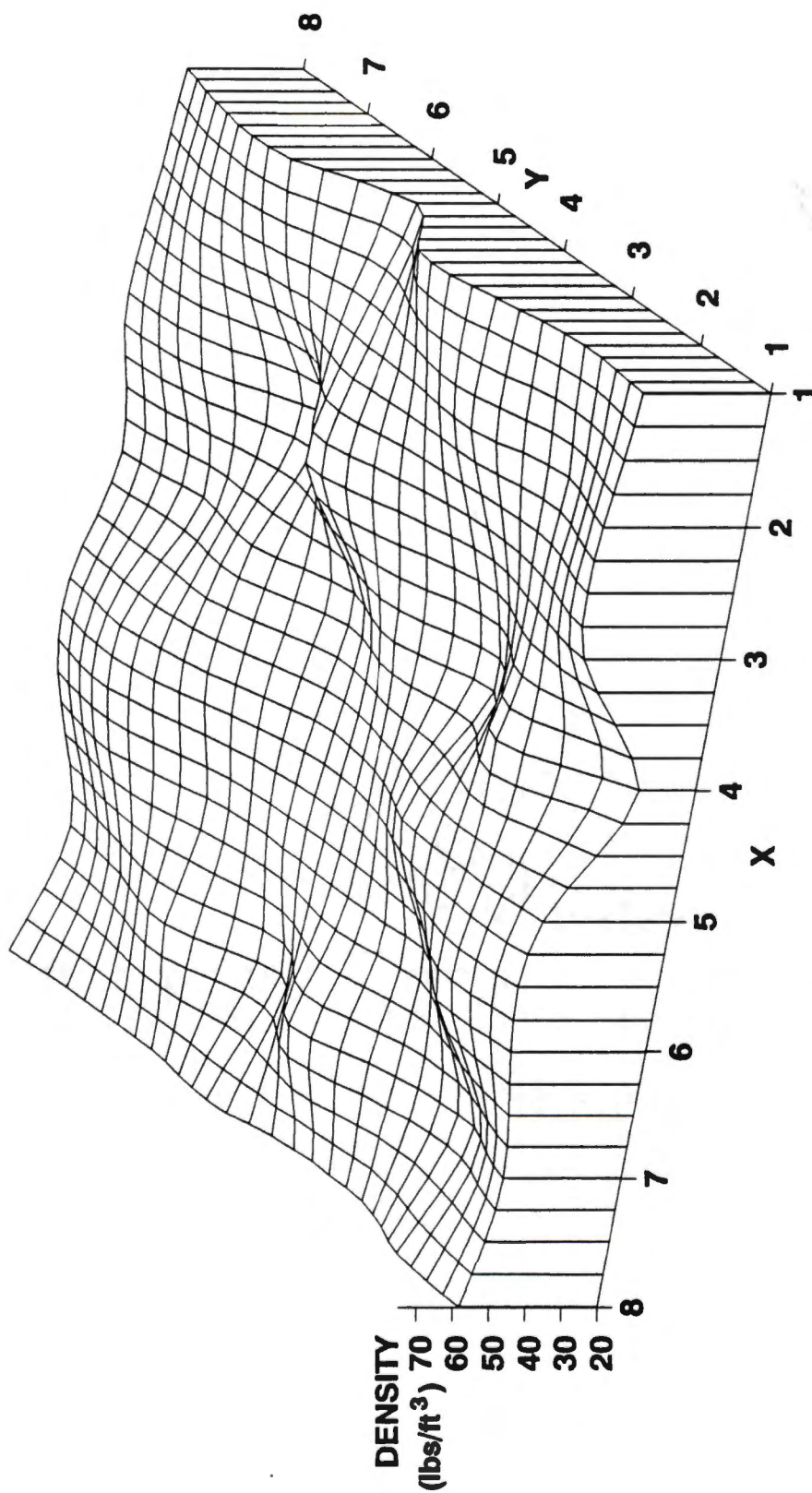
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 13



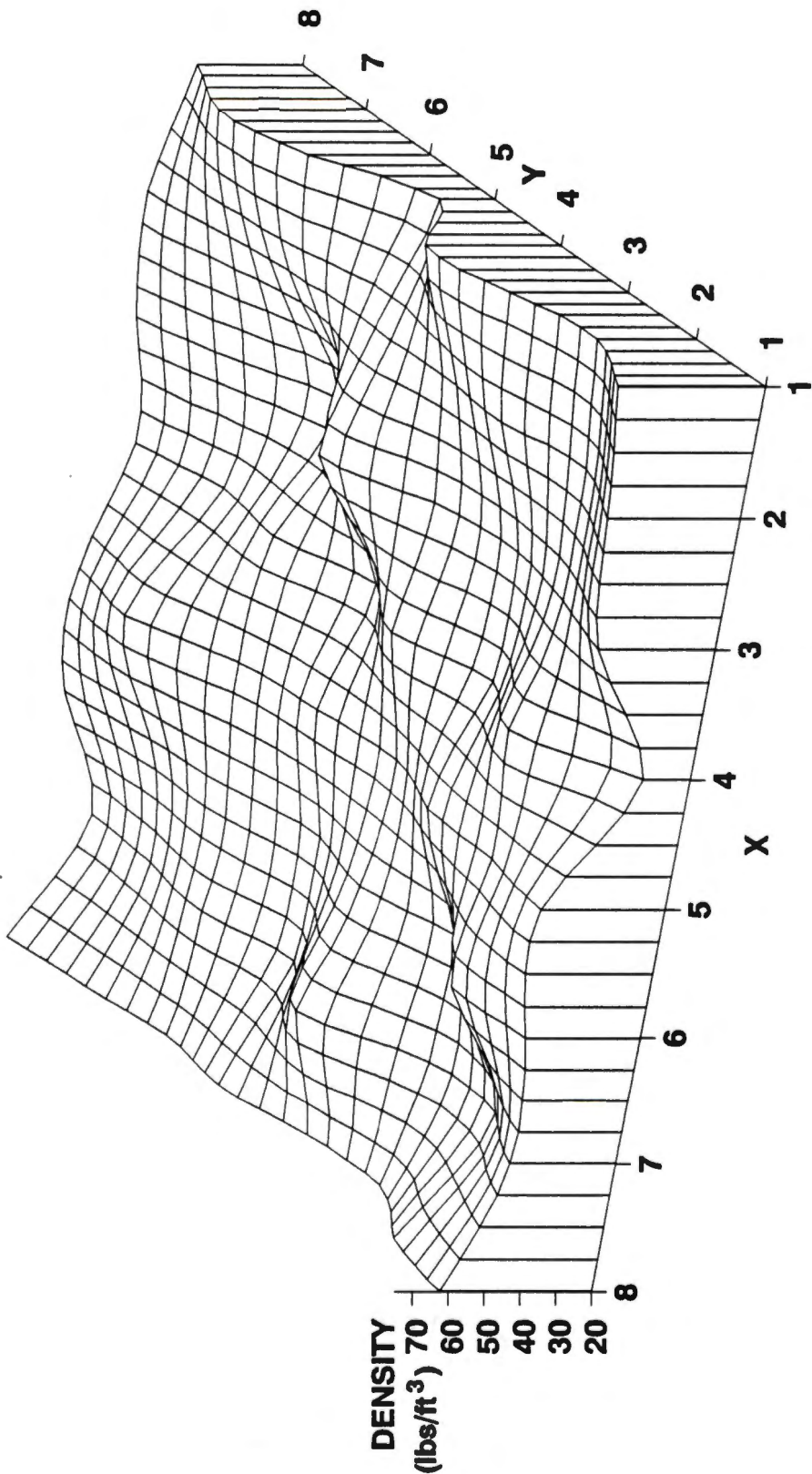
FLAKE MOISTURE CONTENT=8%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=14



FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 15



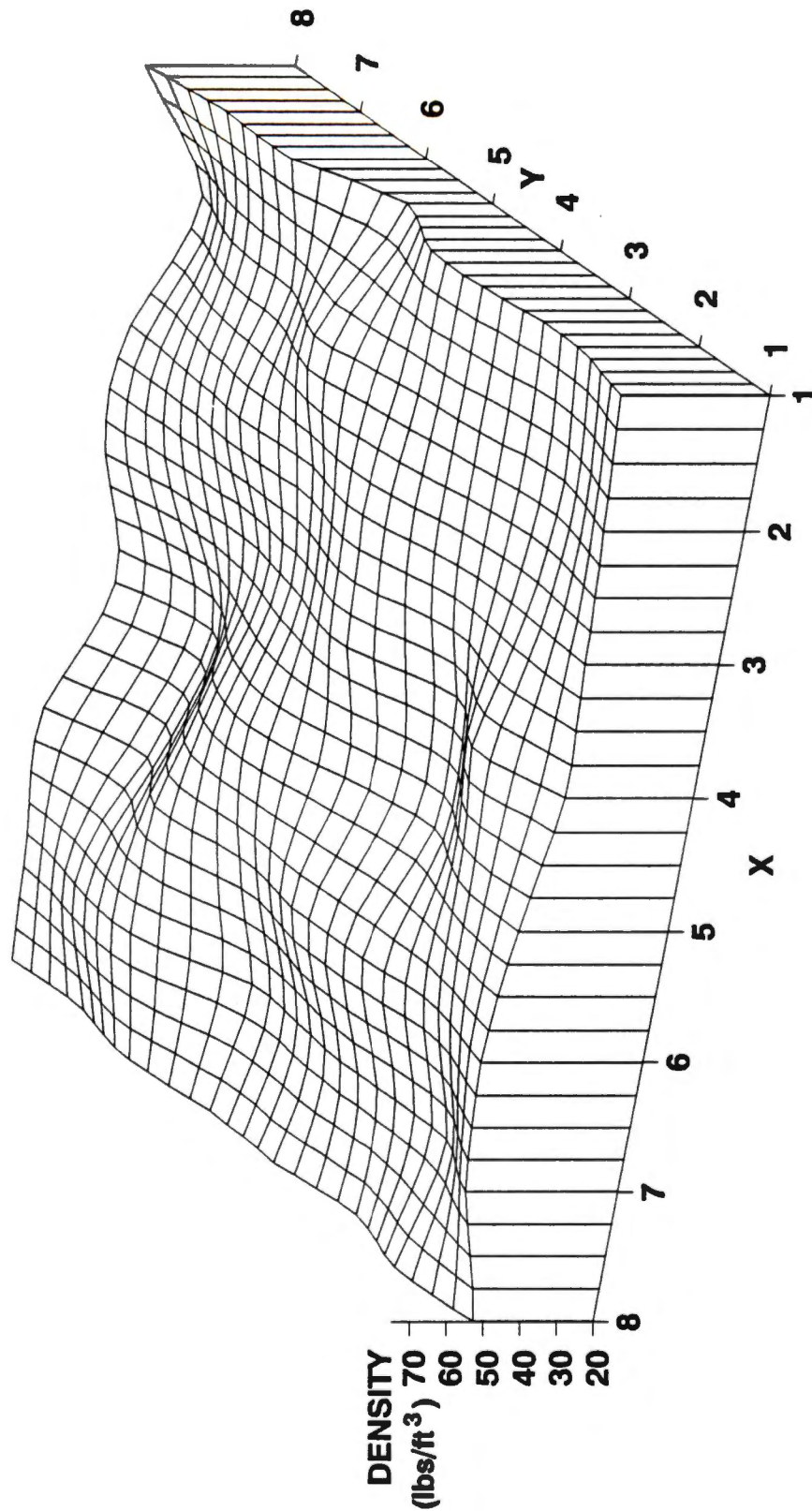
FLAKE MOISTURE CONTENT = 8%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 16



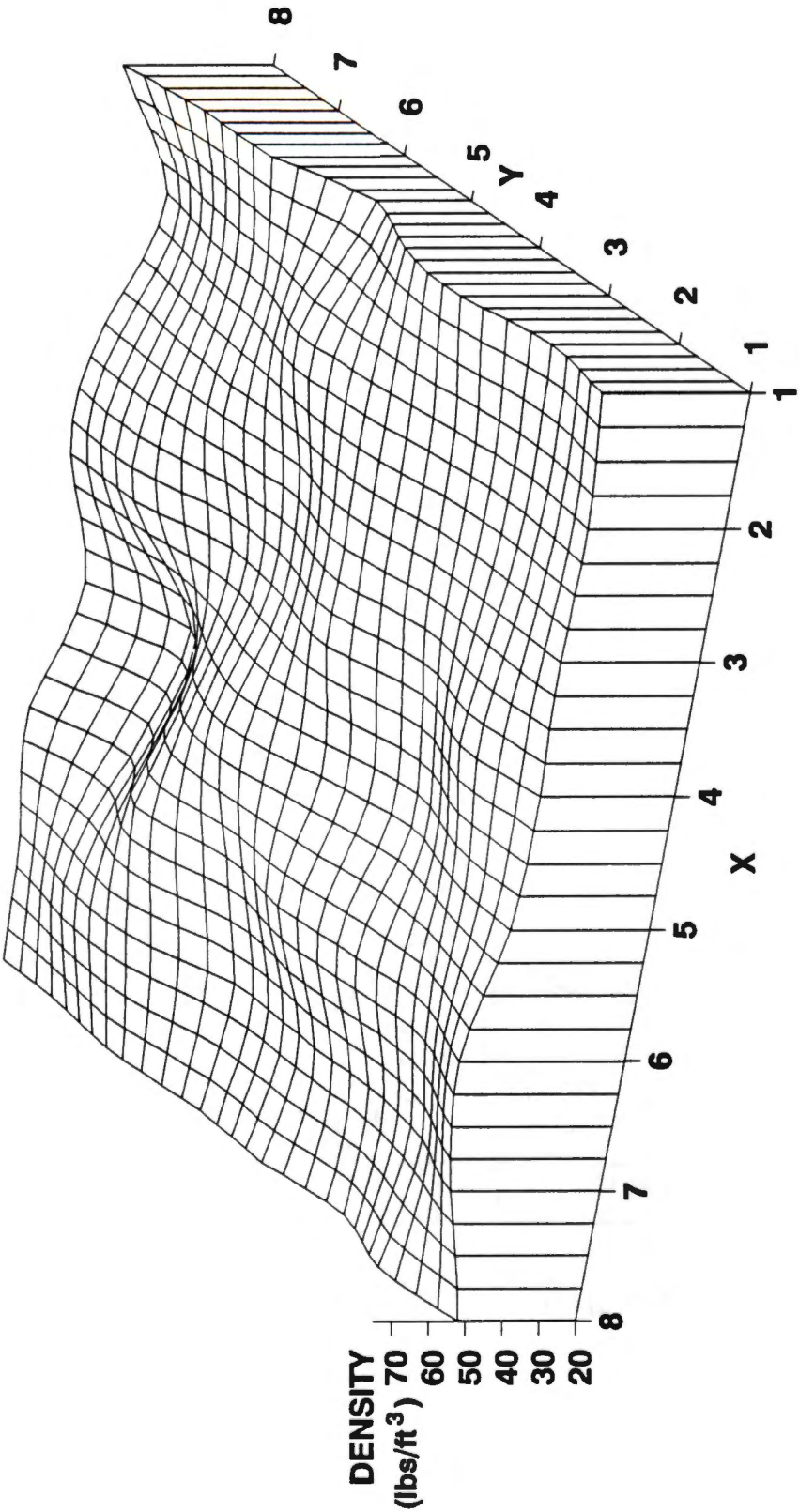
FLAKE MOISTURE CONTENT - 12%

PRESS CLOSURE RATE - 20 SECONDS

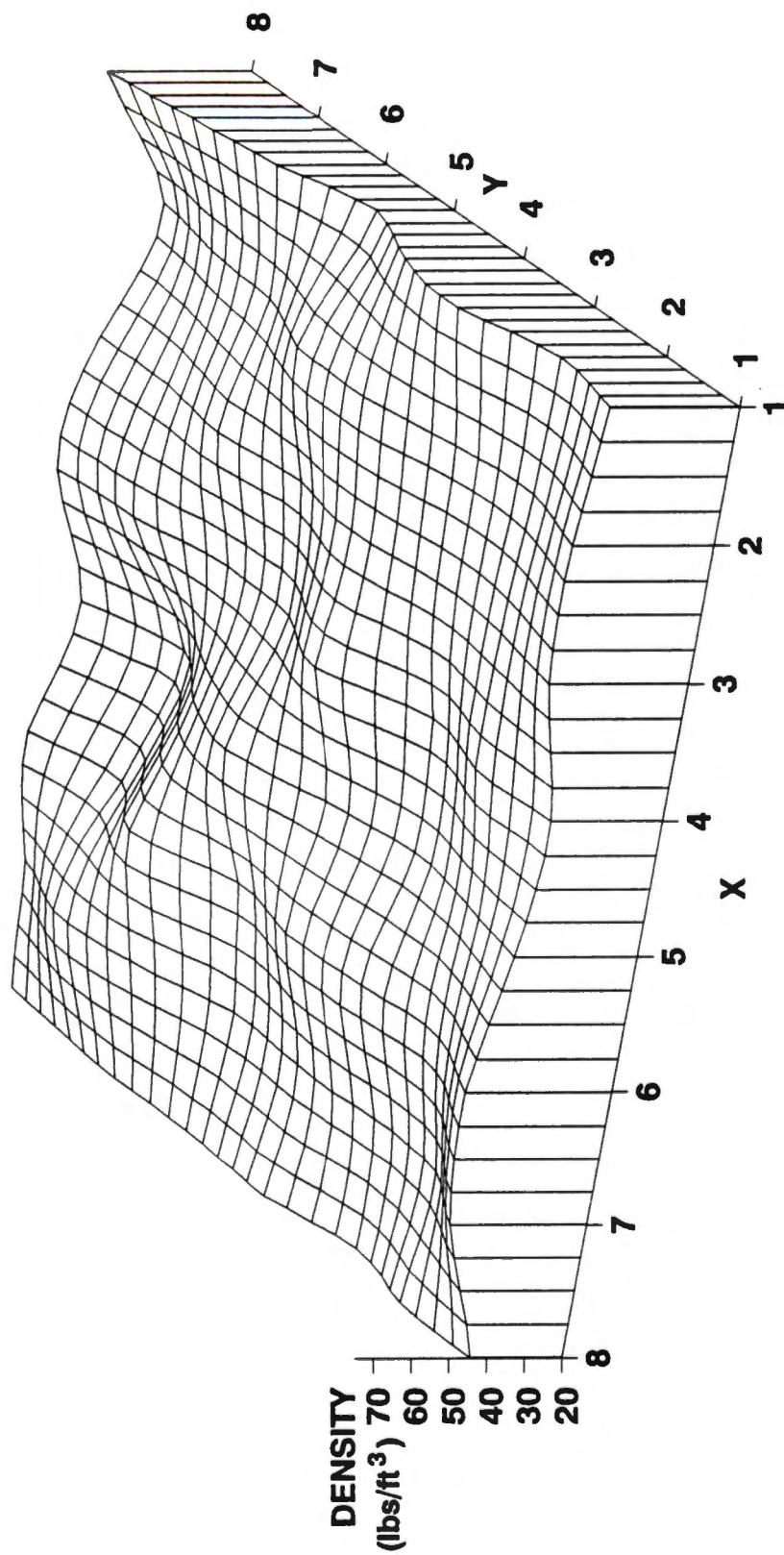
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 1



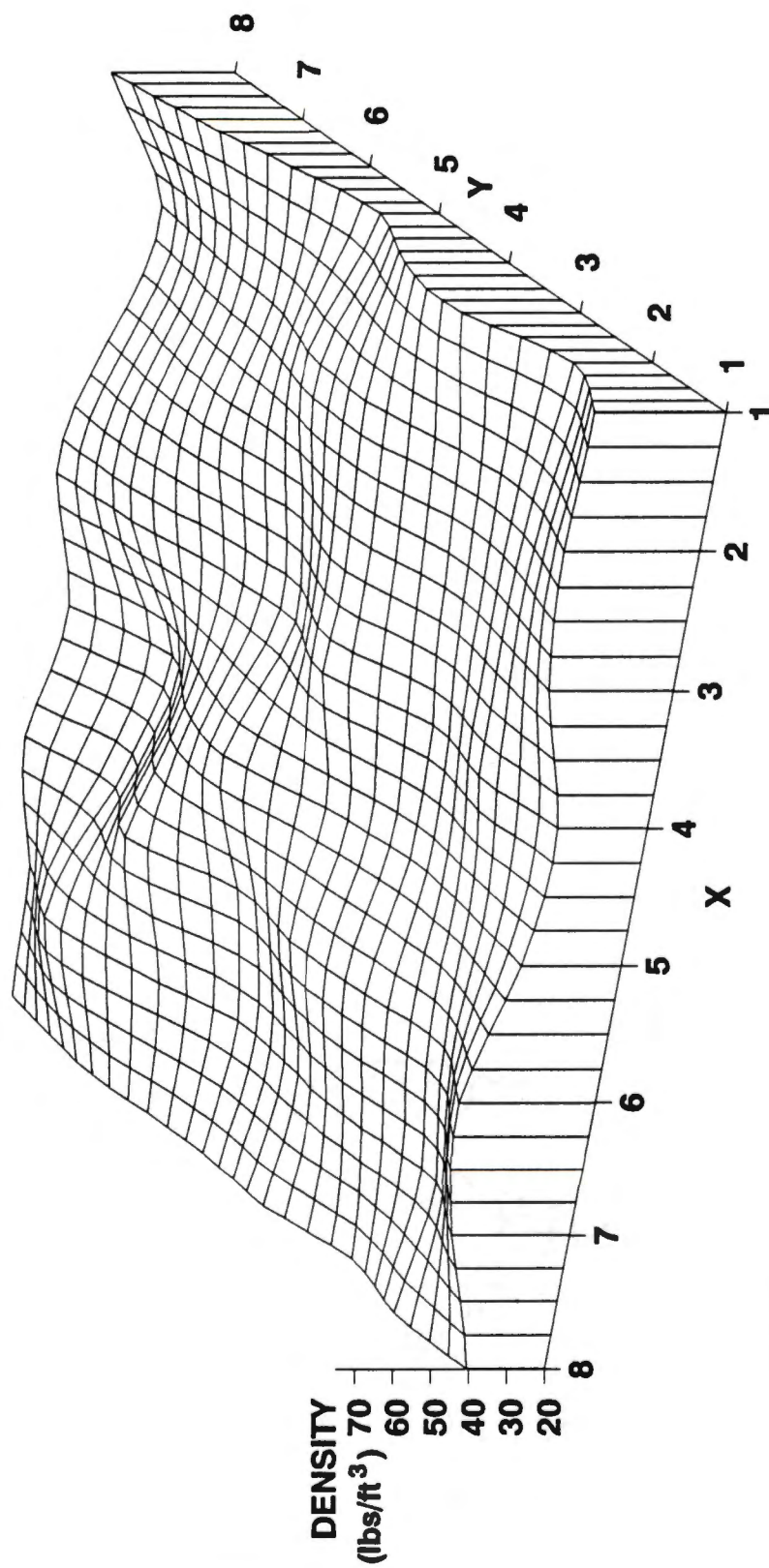
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 2



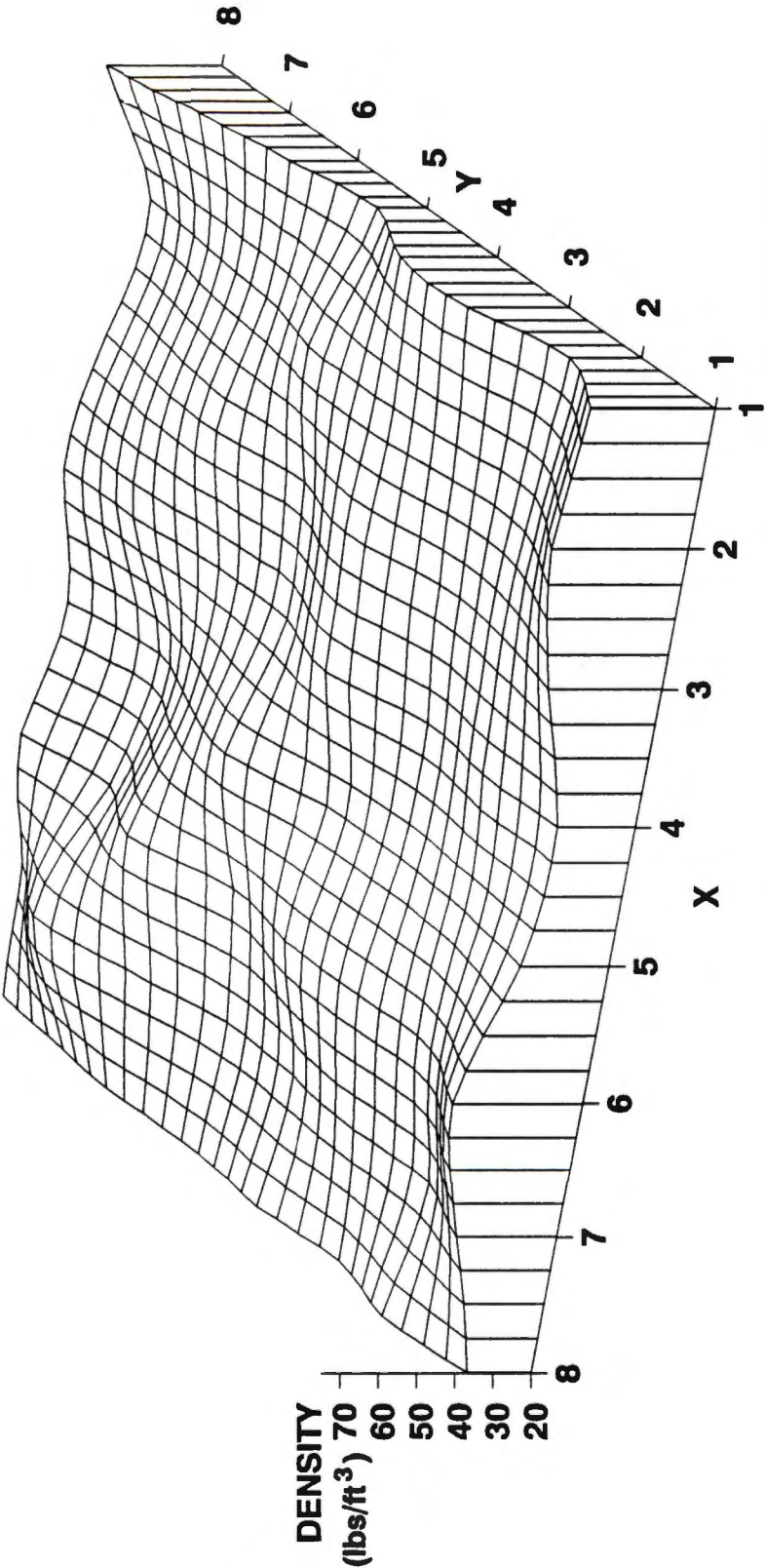
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=3



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 4



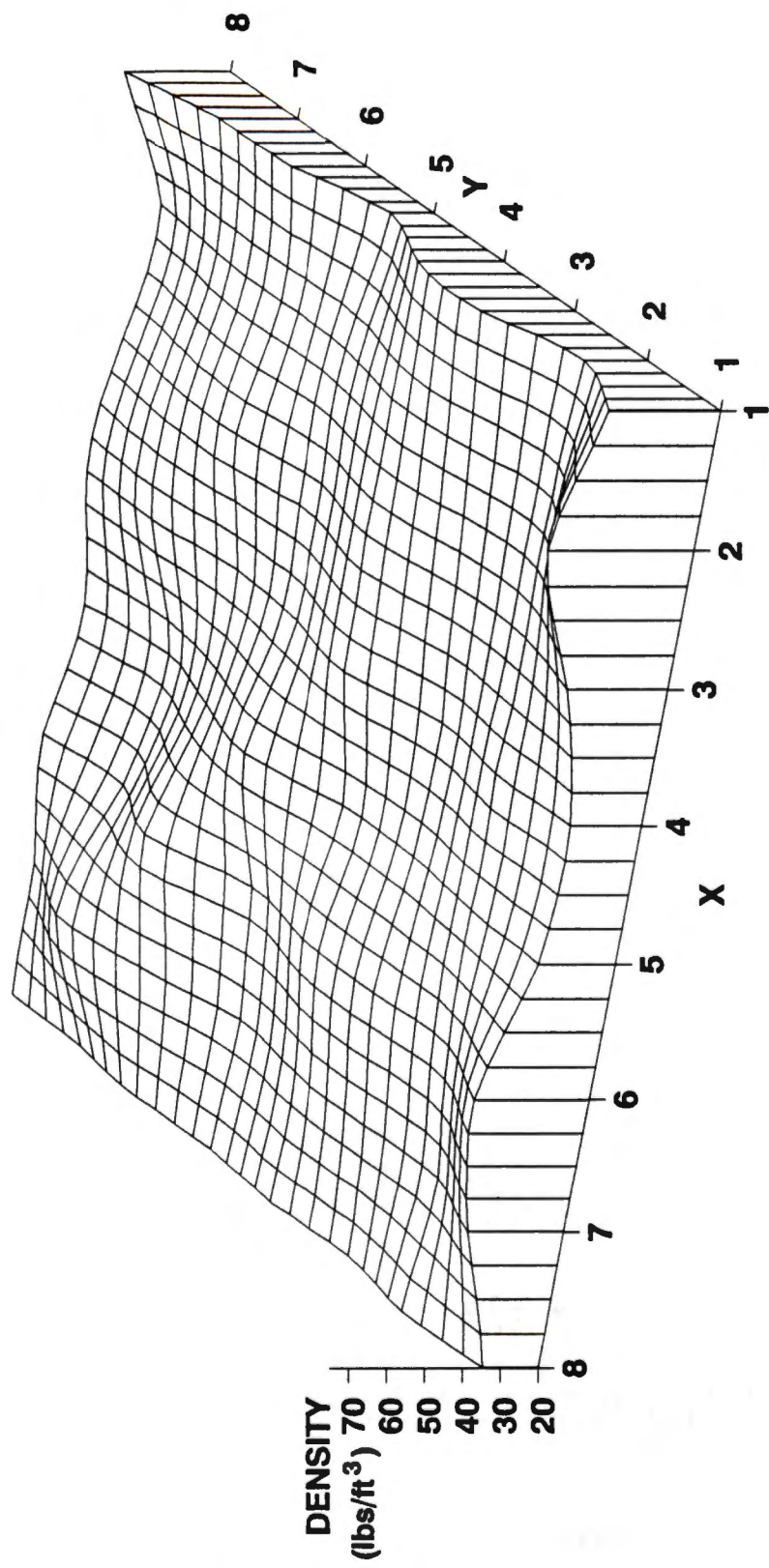
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=5



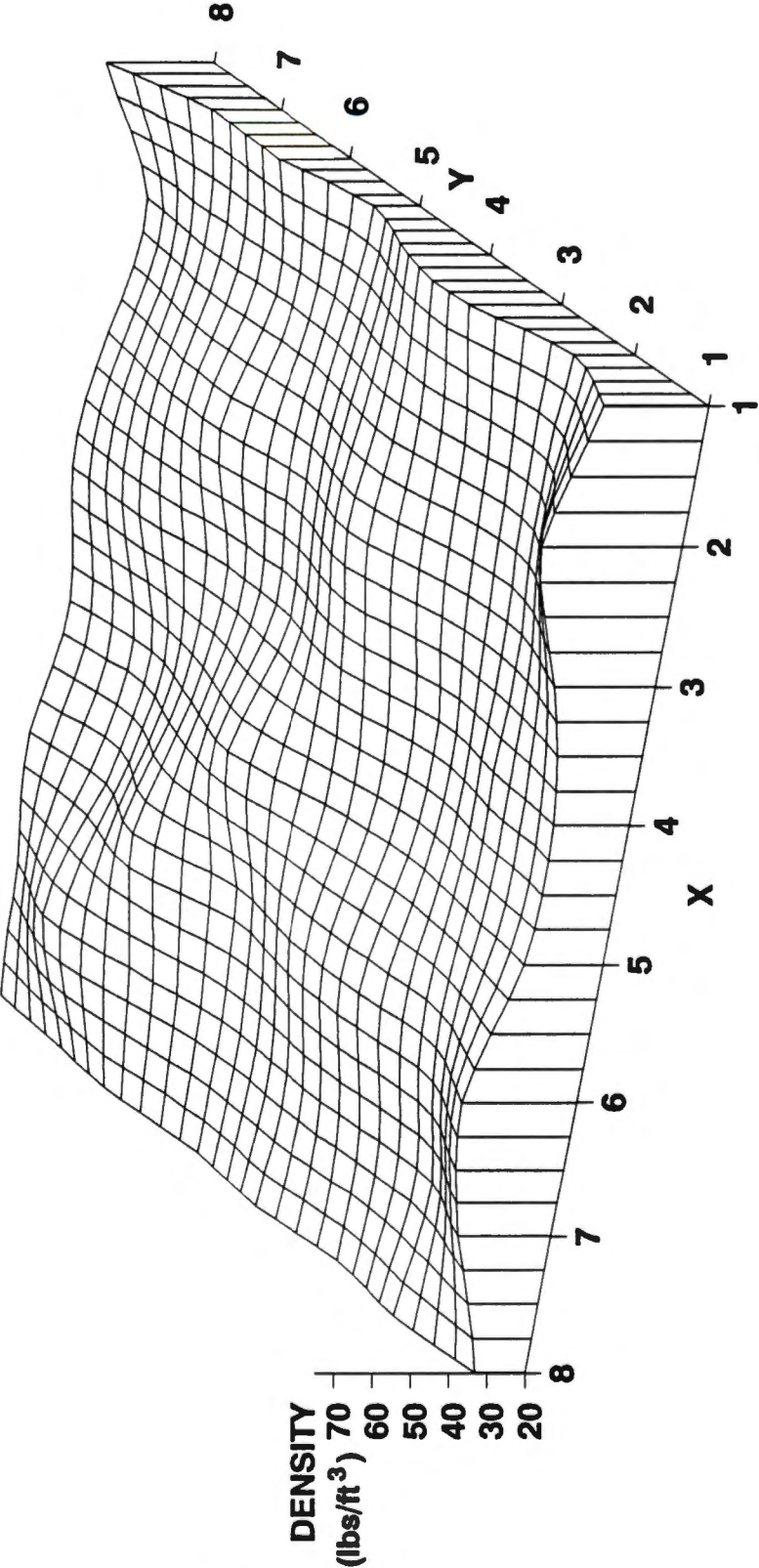
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE=20 SECONDS

REPLICATION=1

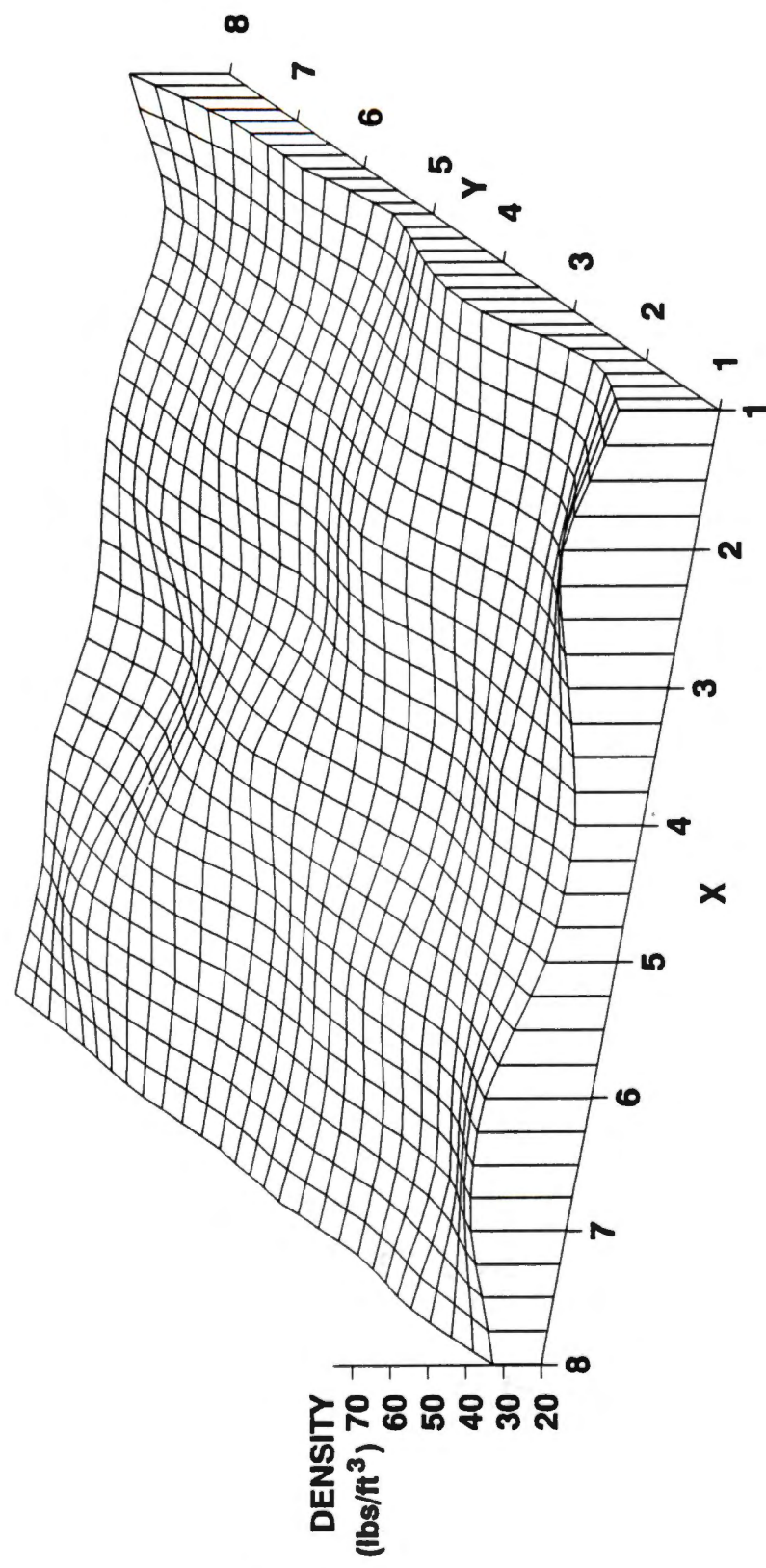
Z=6



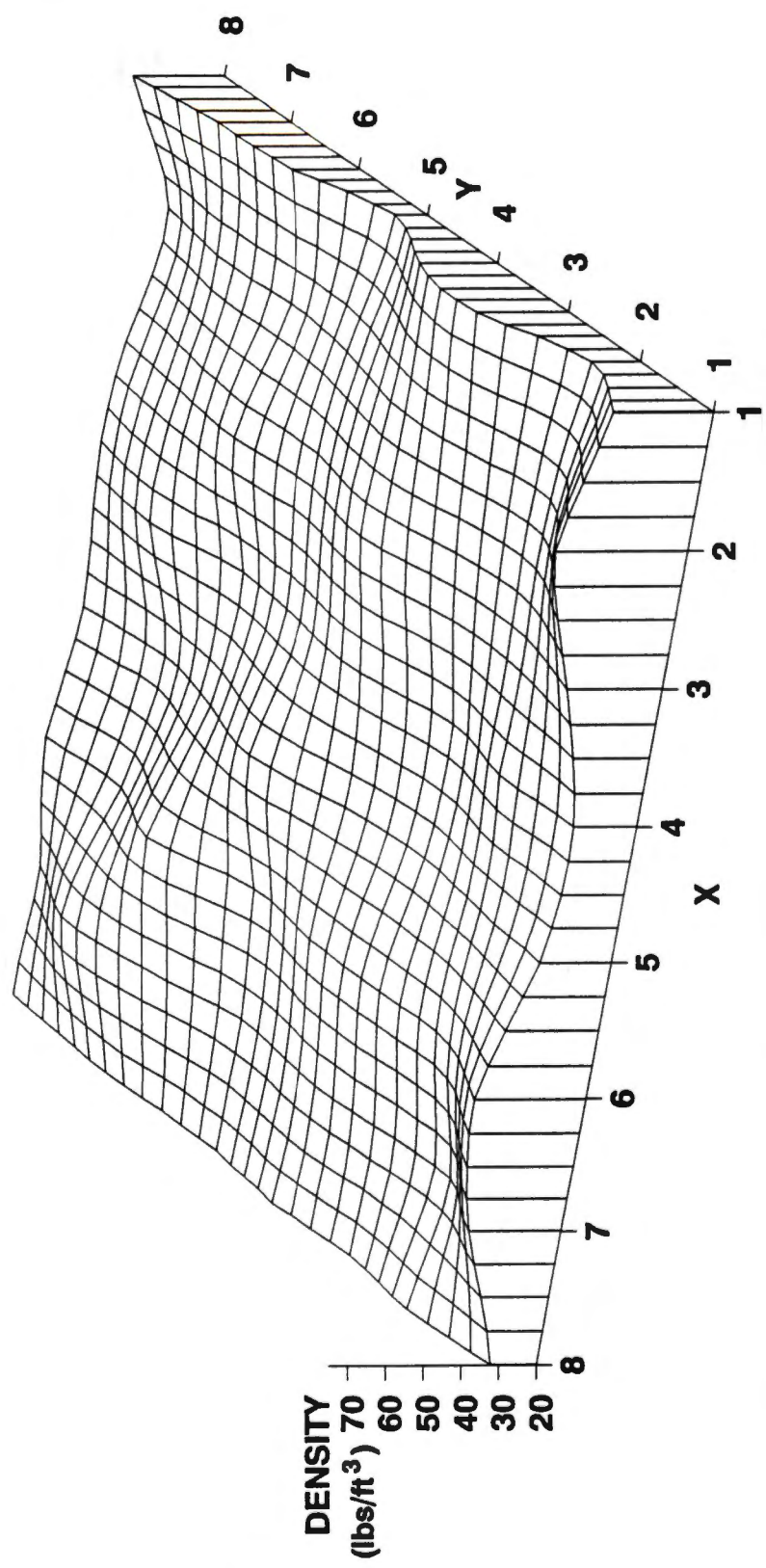
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS
REPLICATION =1
Z=7



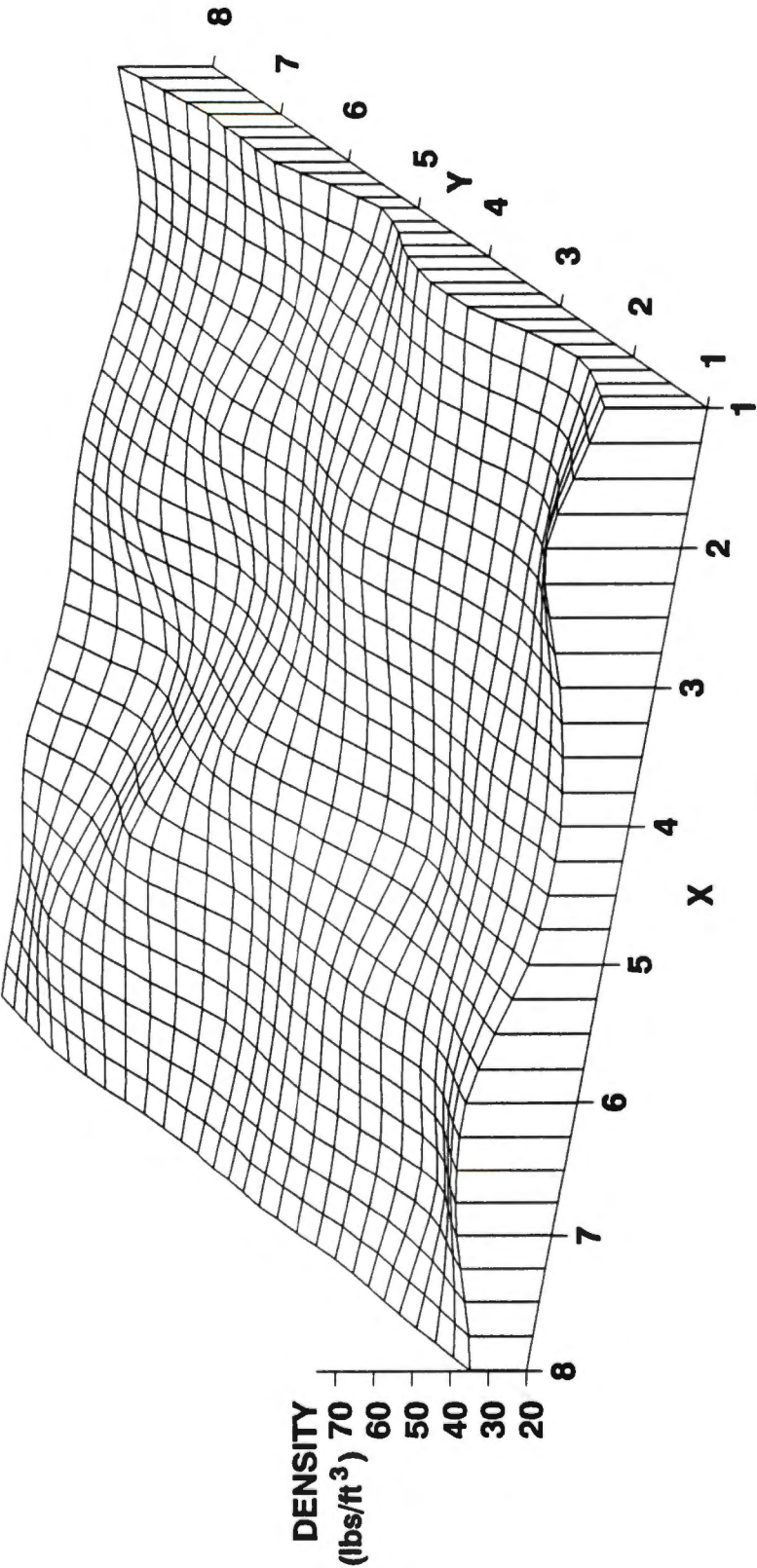
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS
REPLICATION =1
Z=8



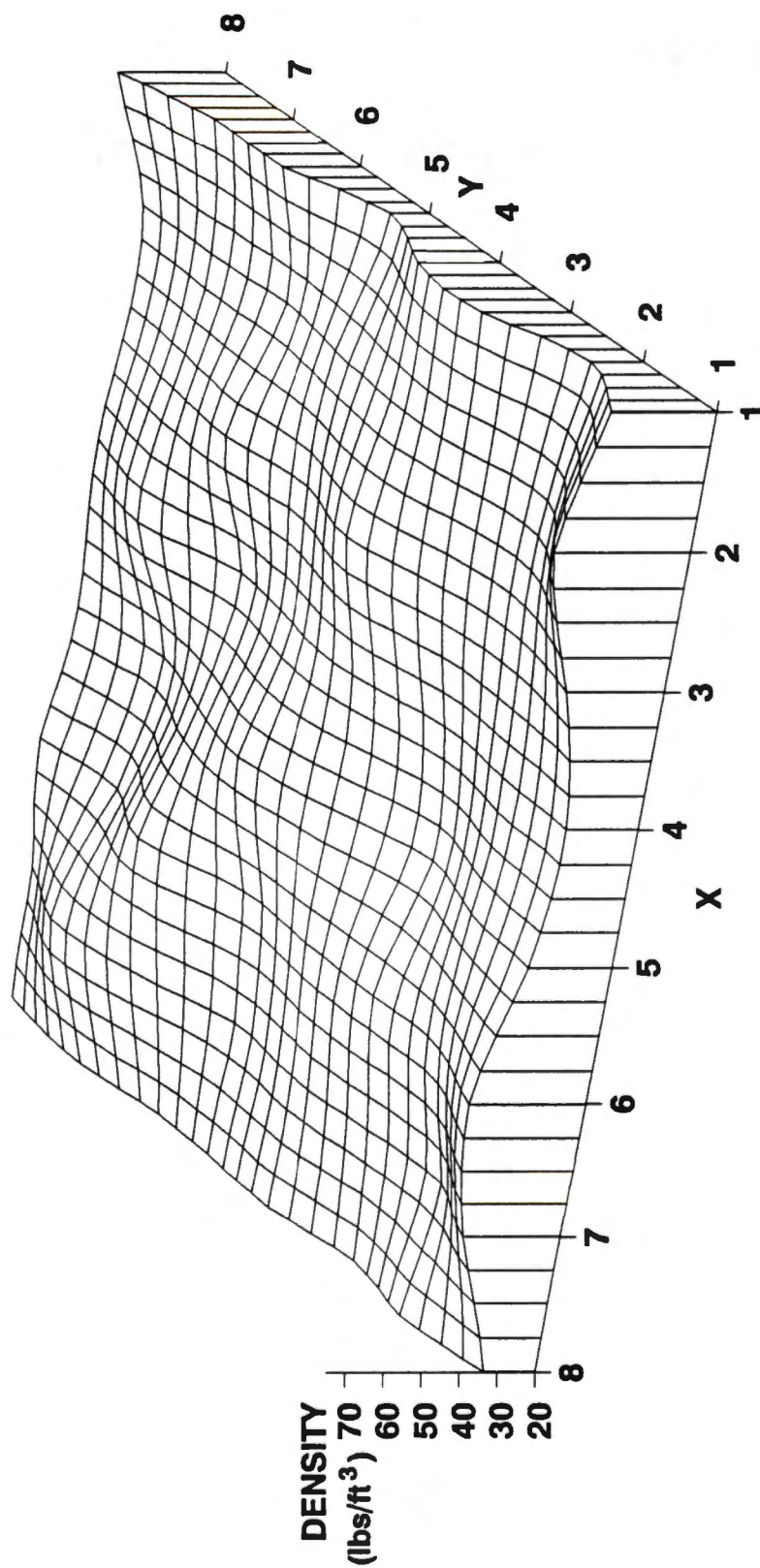
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 9



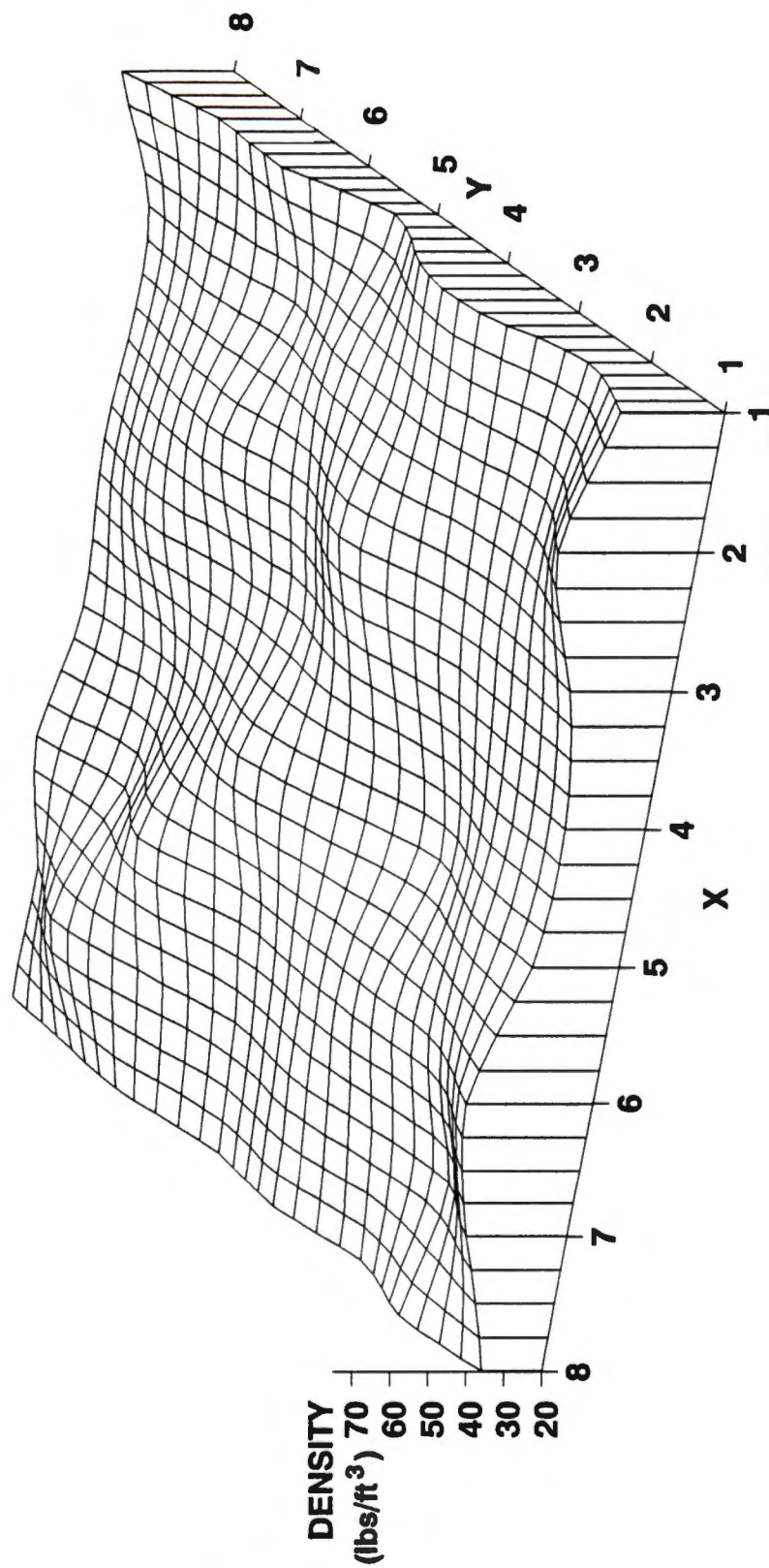
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 10



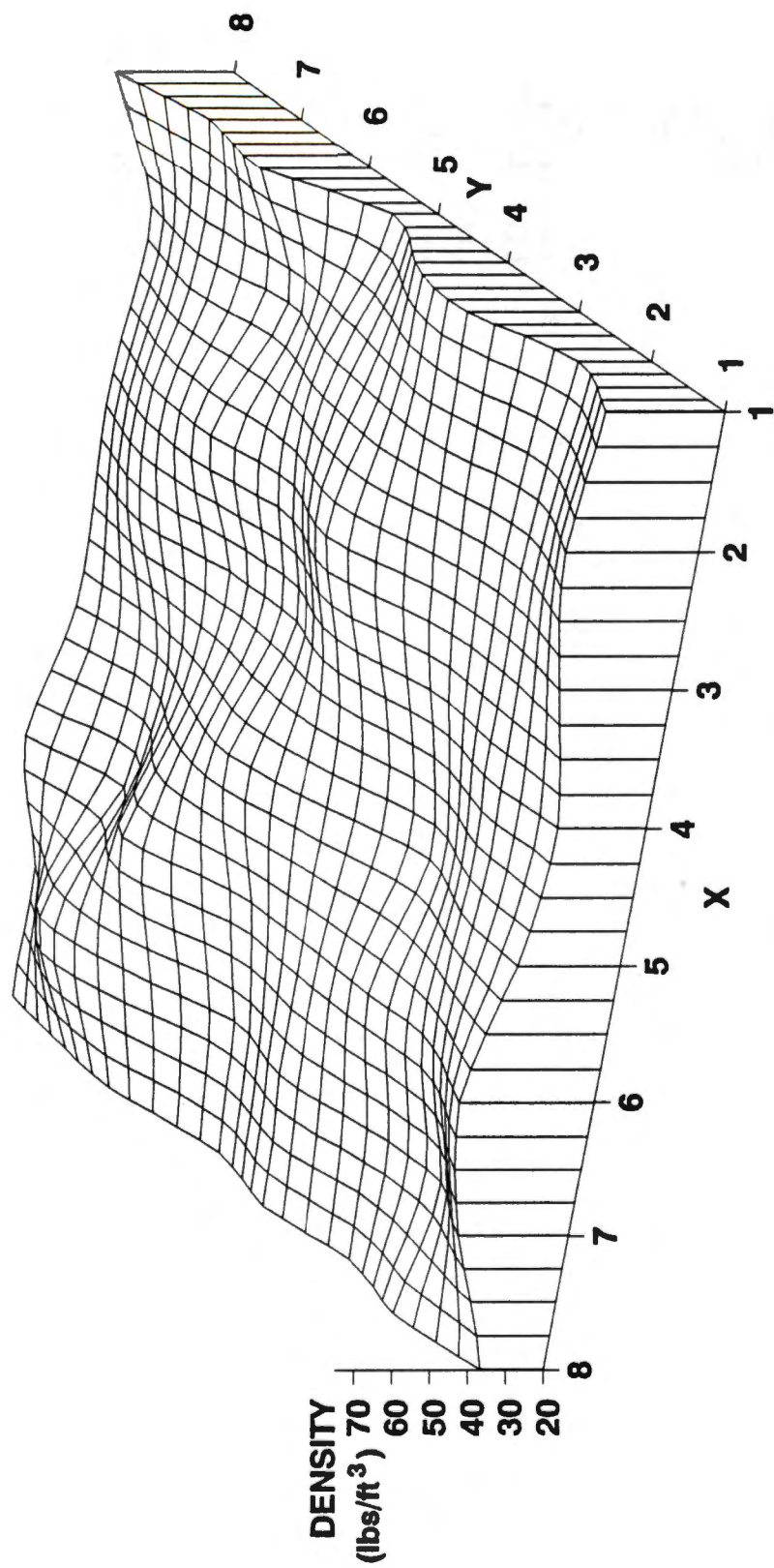
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 11



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 12



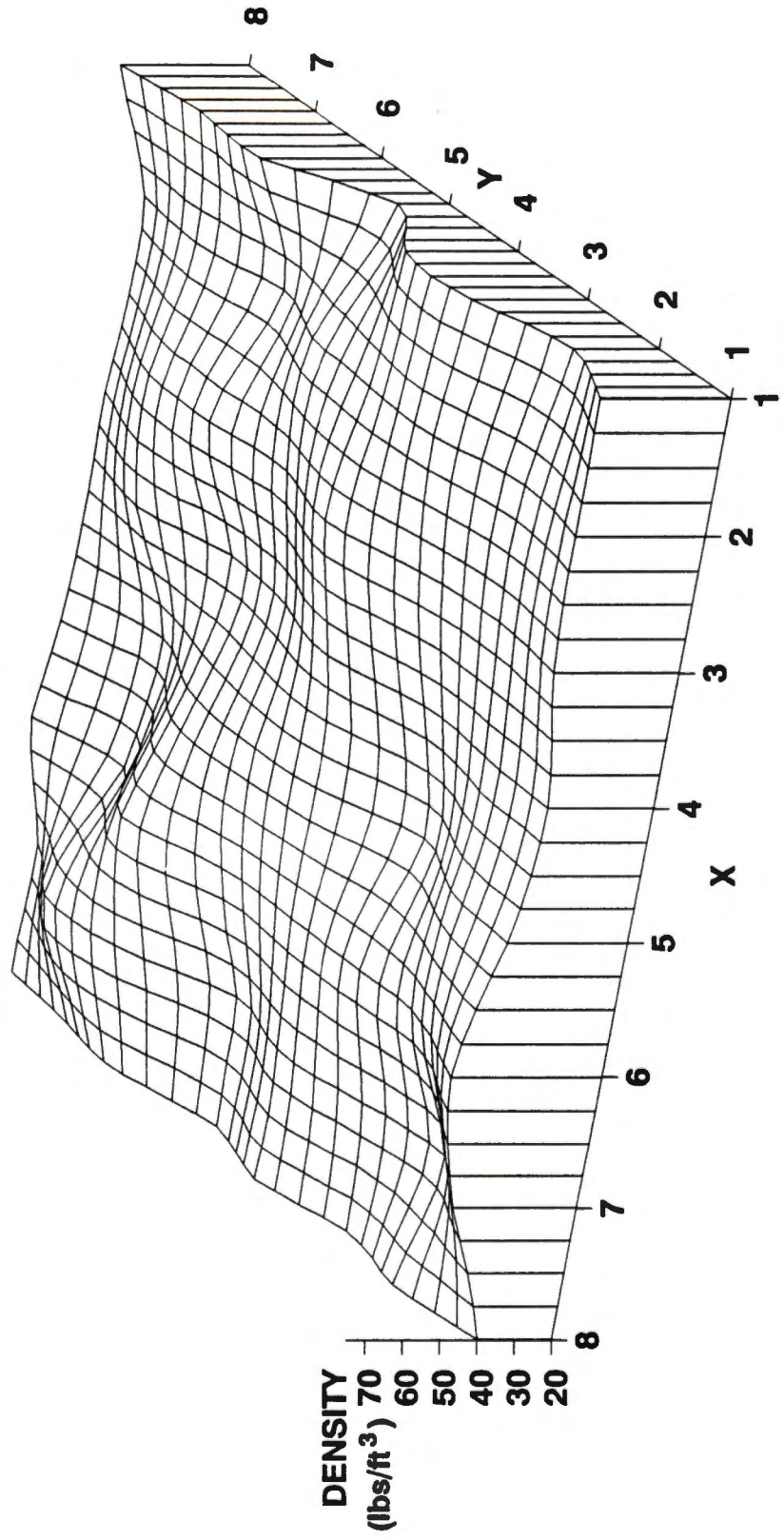
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 13



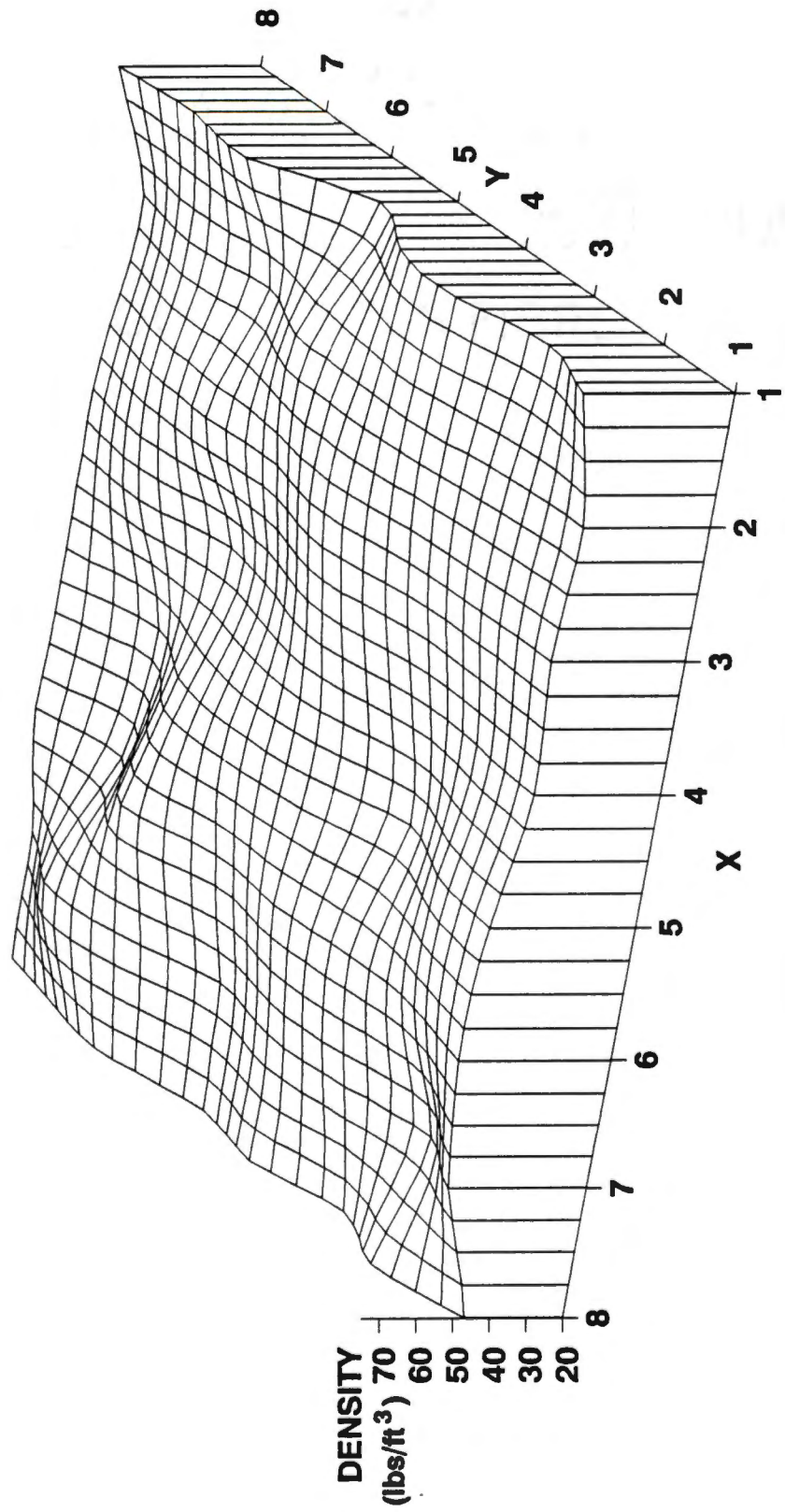
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 1

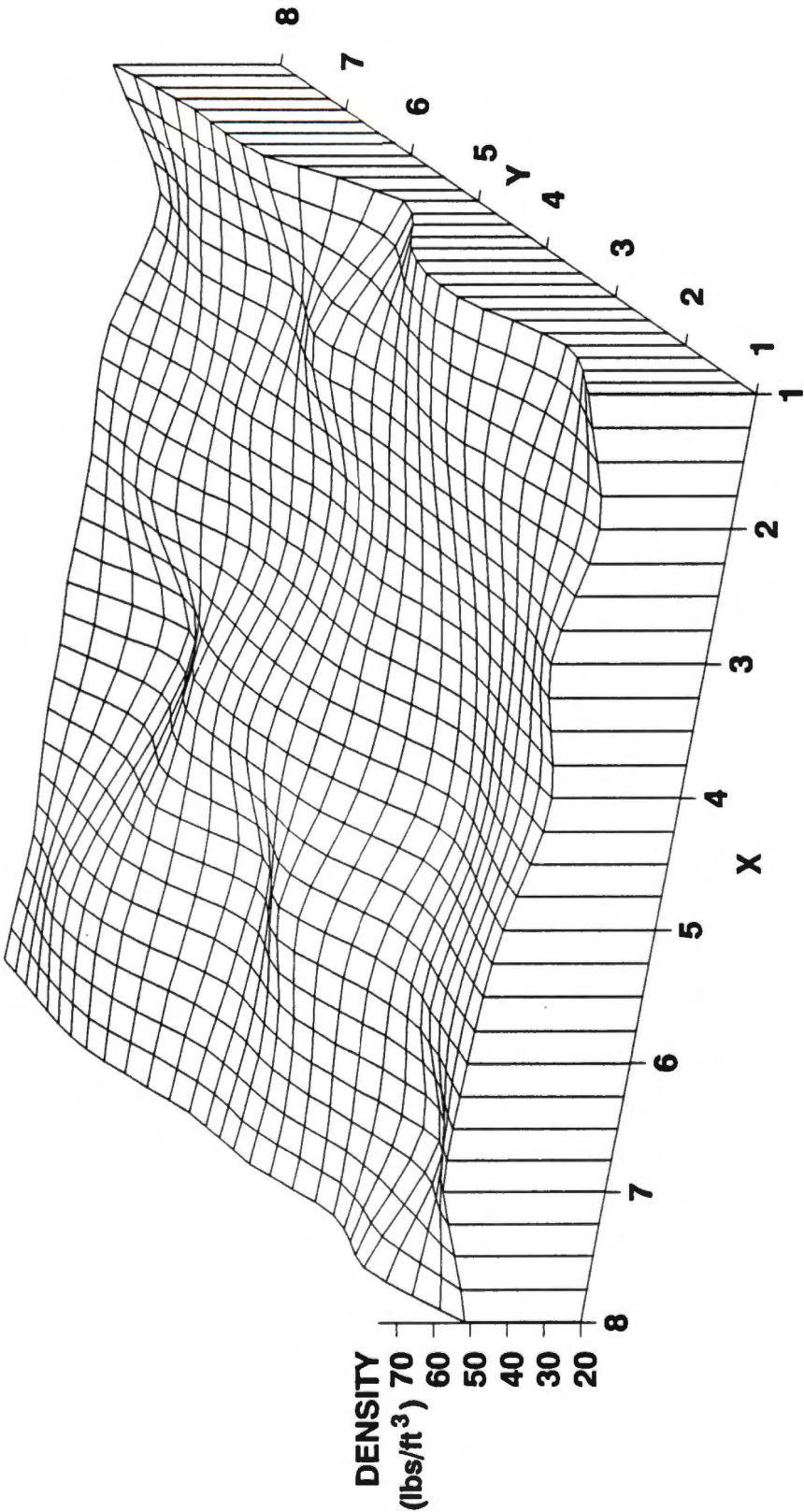
Z = 14



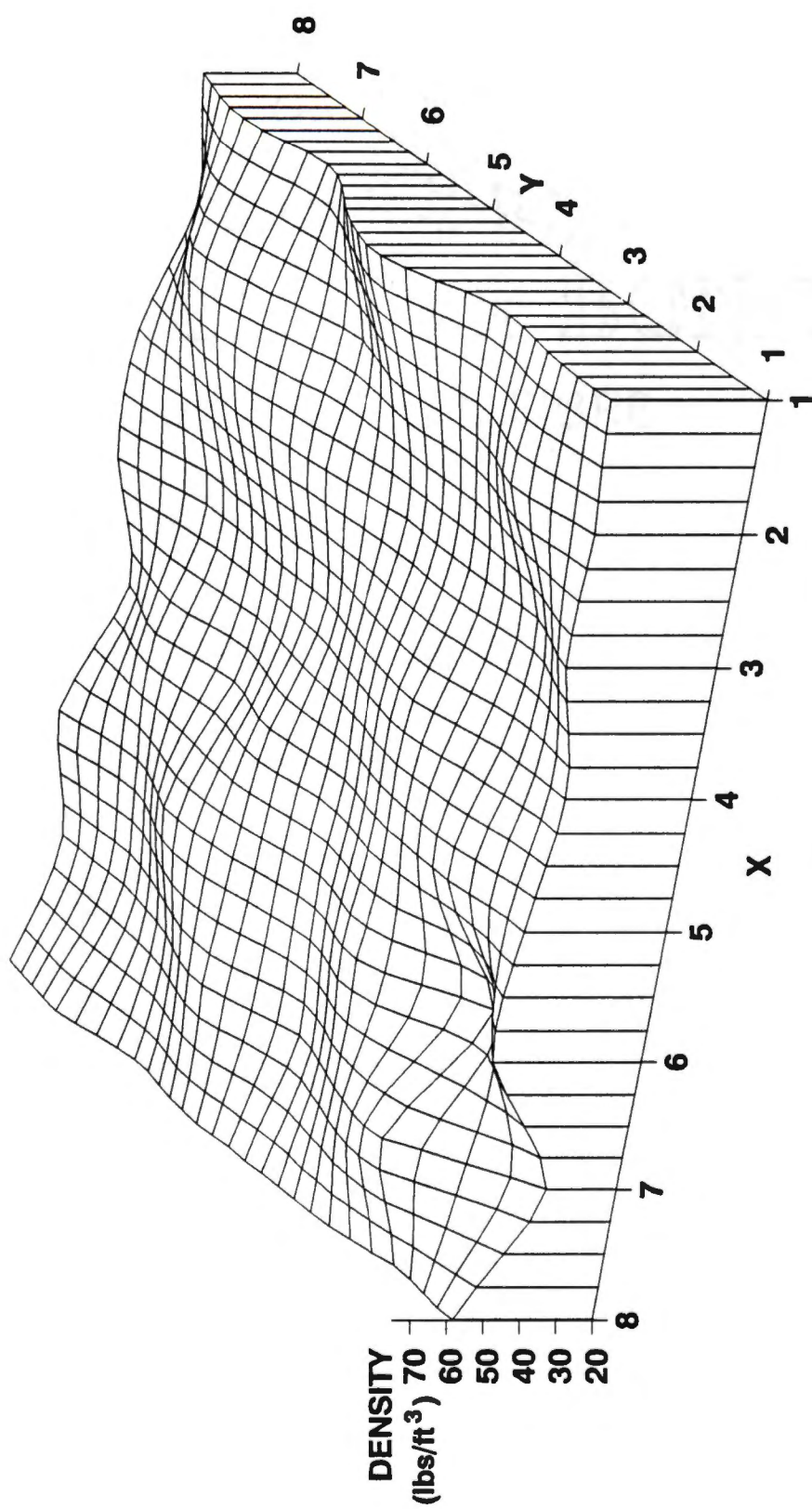
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 1
Z = 15



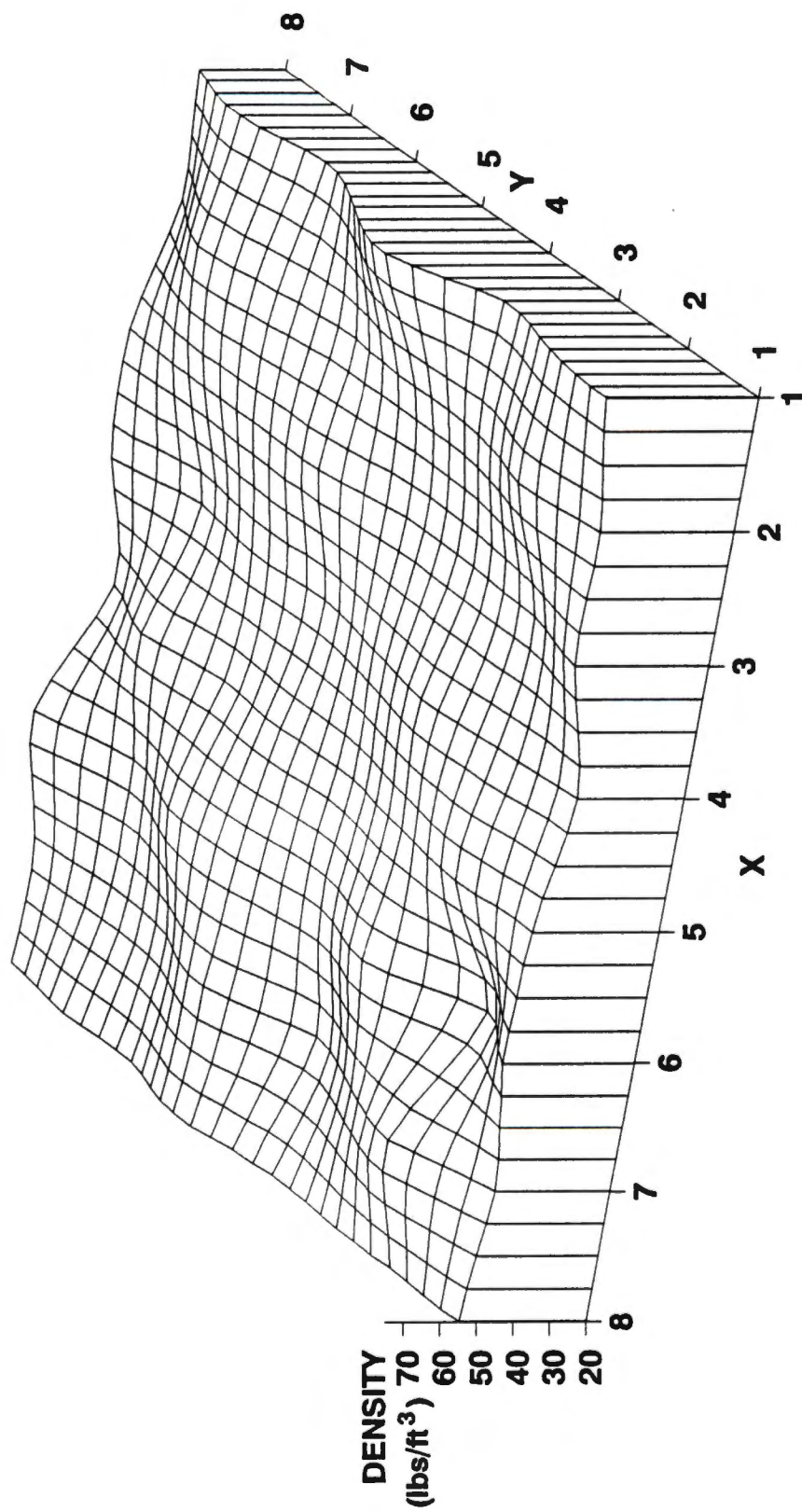
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=1
Z=16



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 1



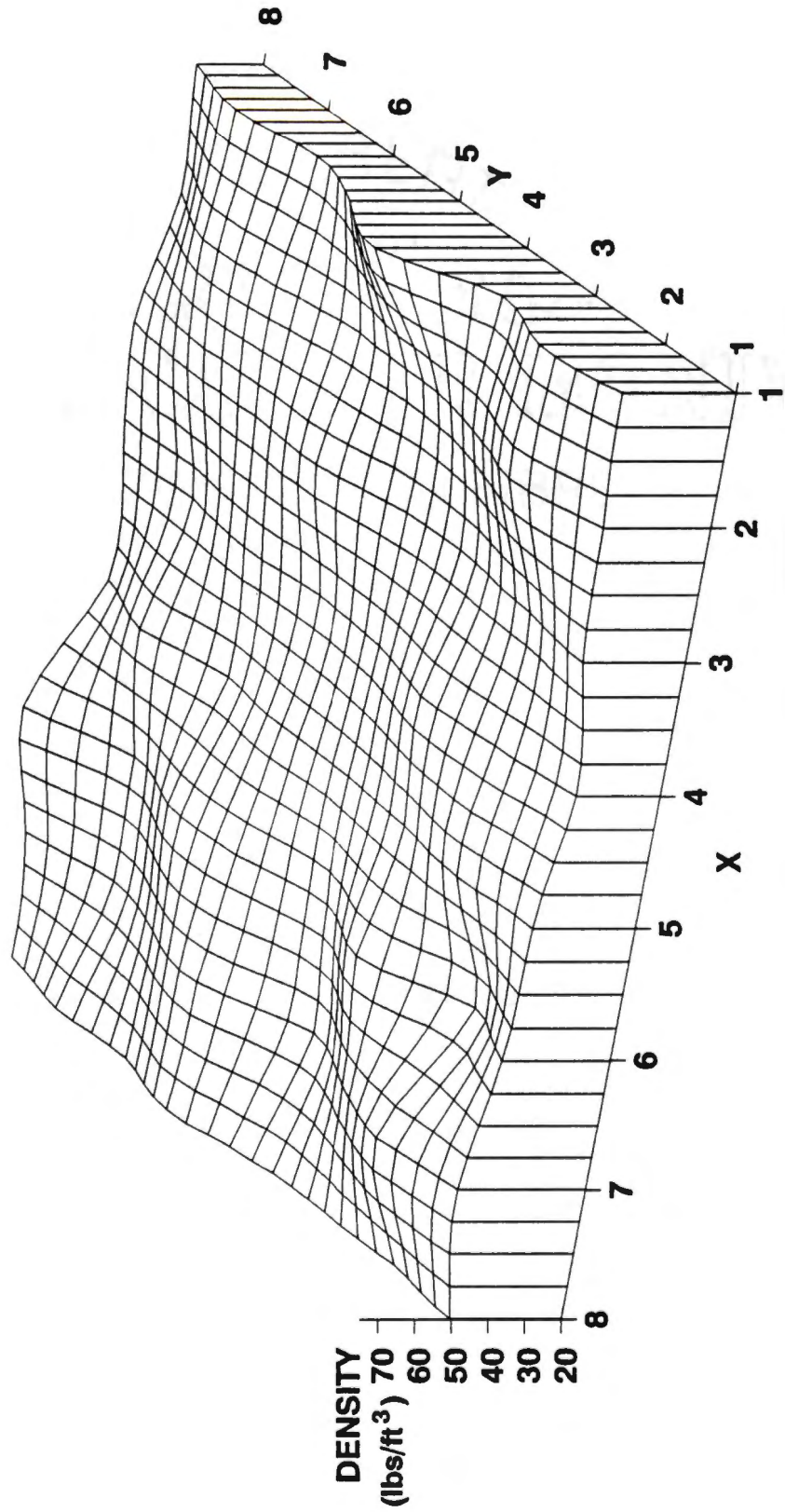
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS
REPLICATION =2
Z=2



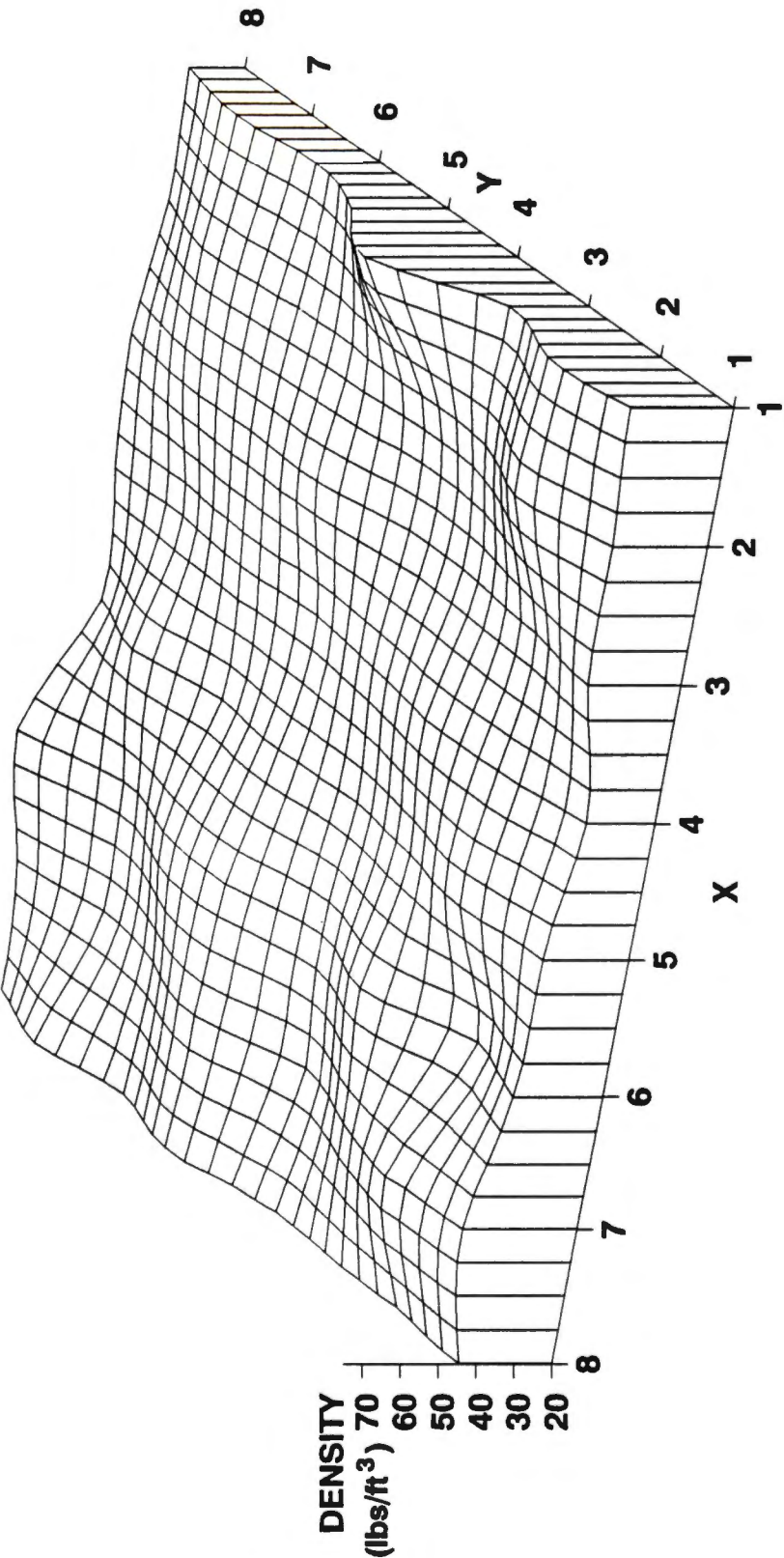
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

Z = 3



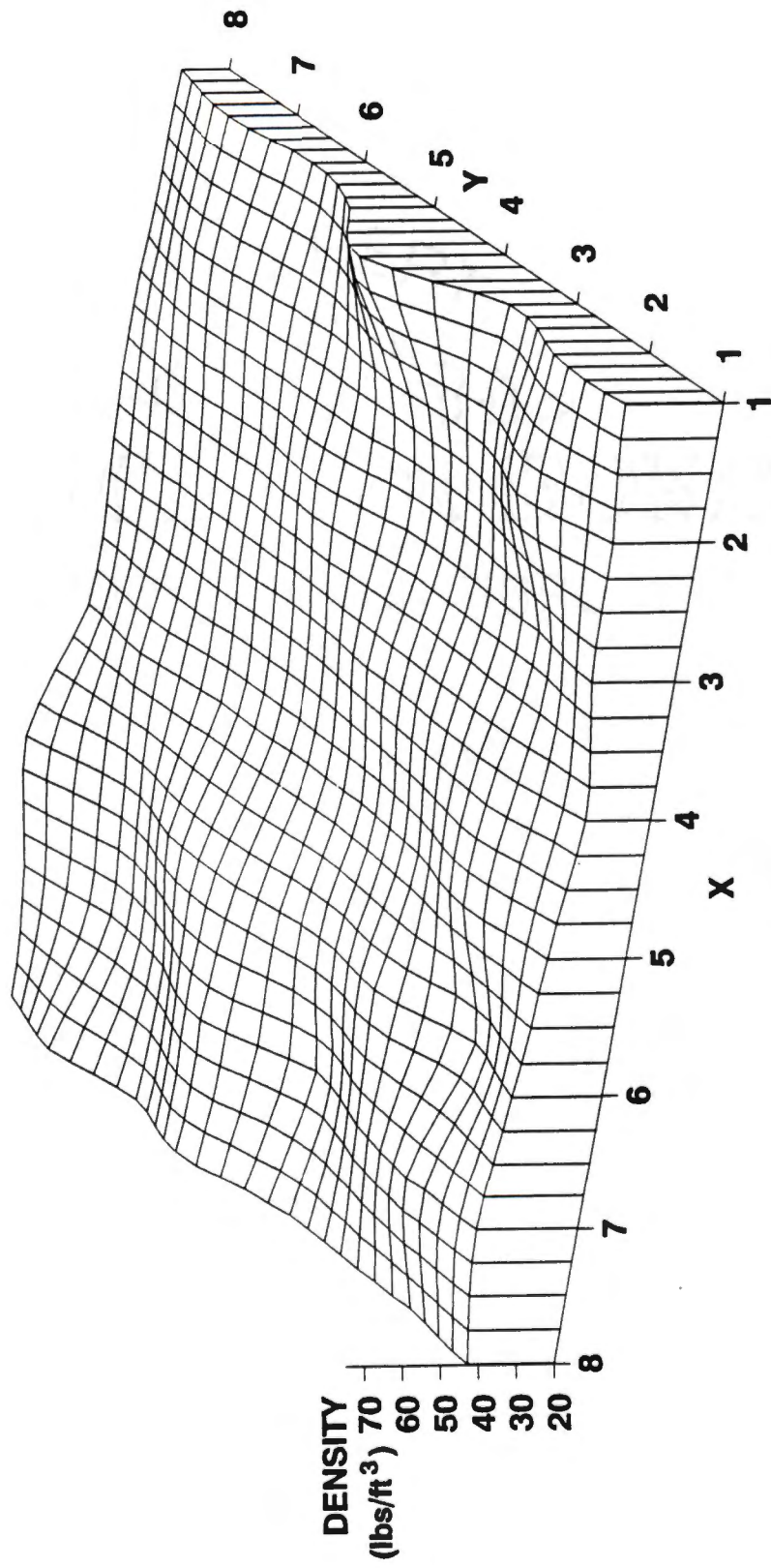
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS
REPLICATION=2
Z=4



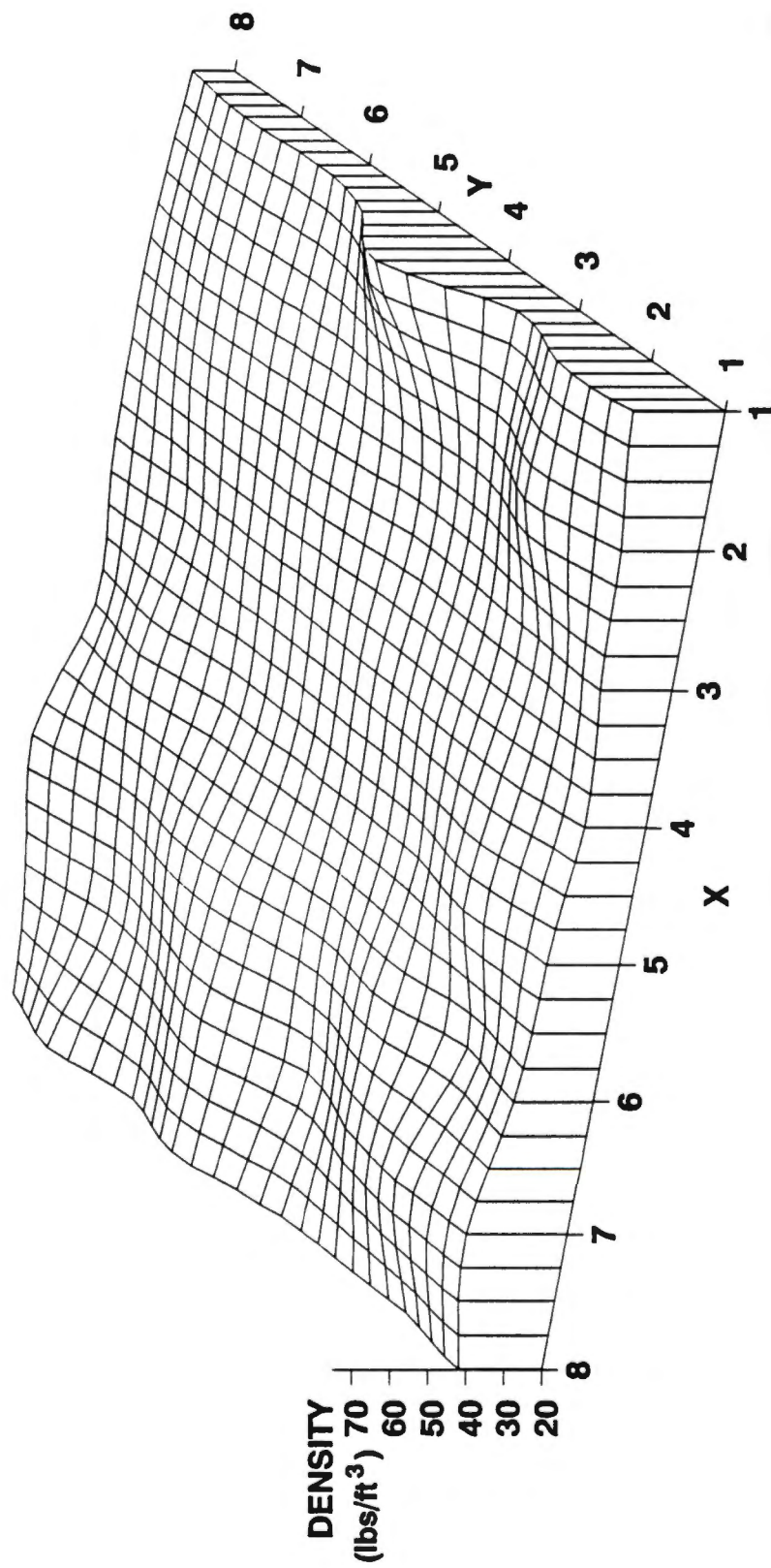
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

Z = 5



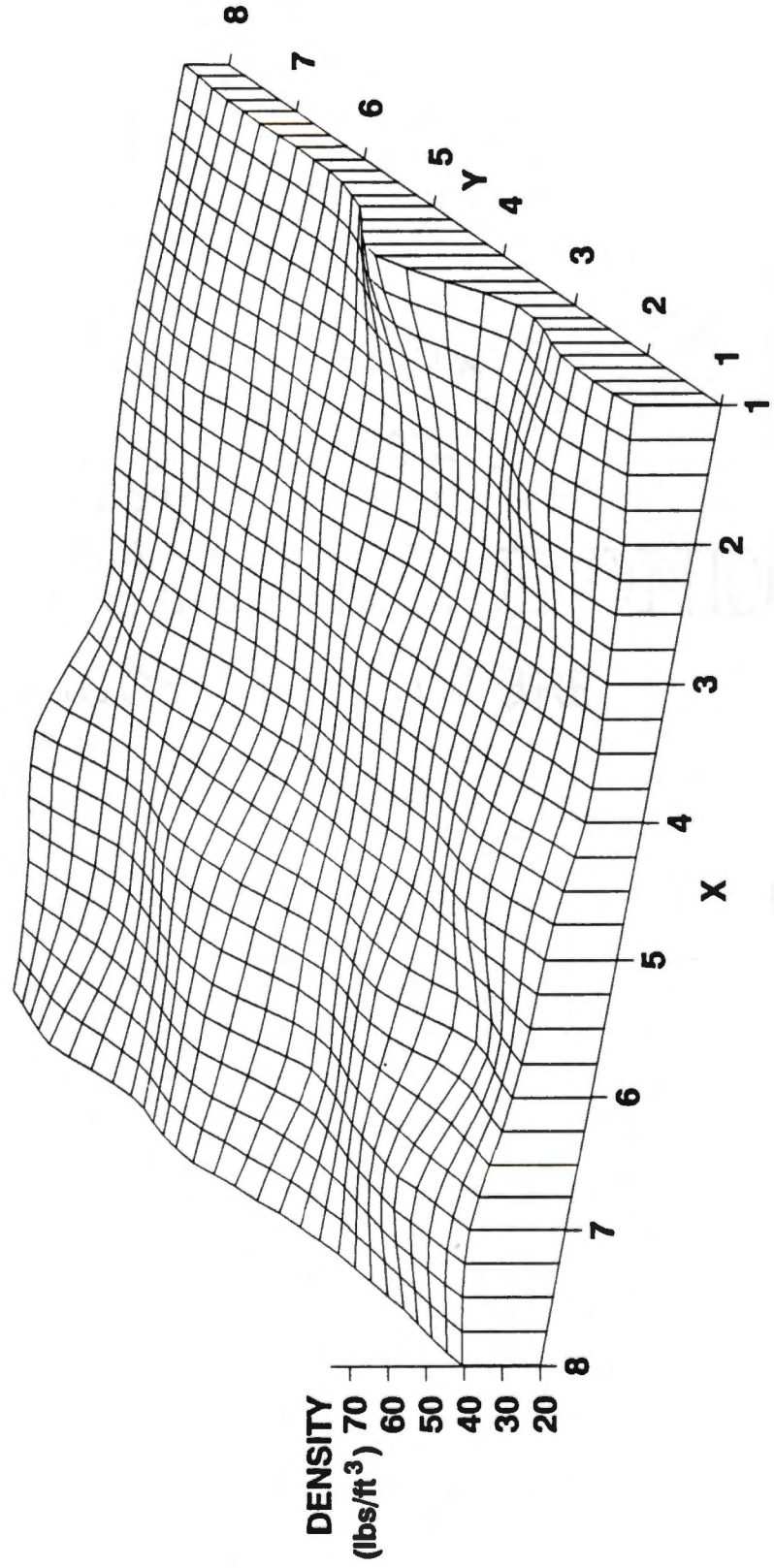
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=2
Z=6



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

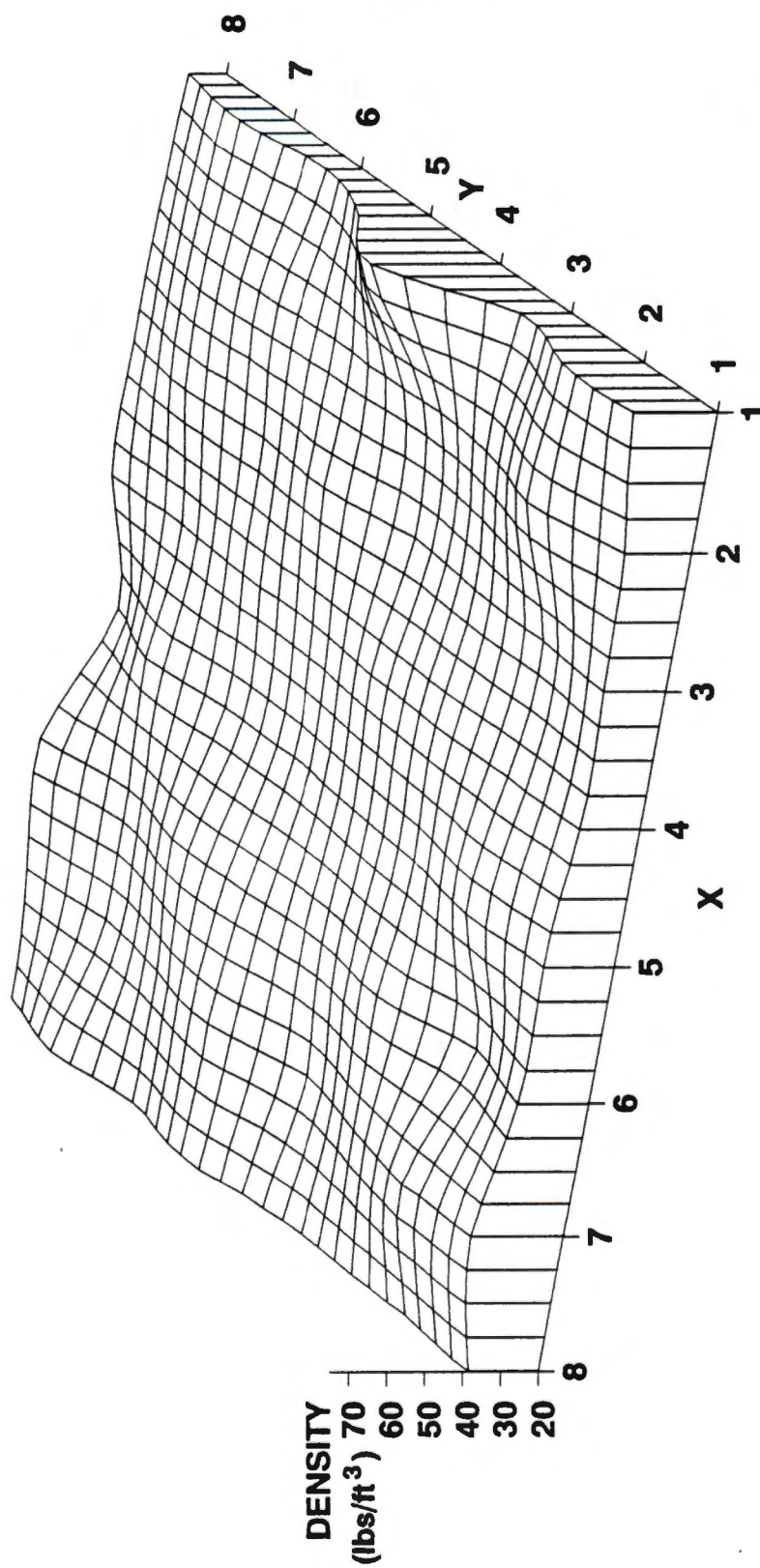
Z = 7



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

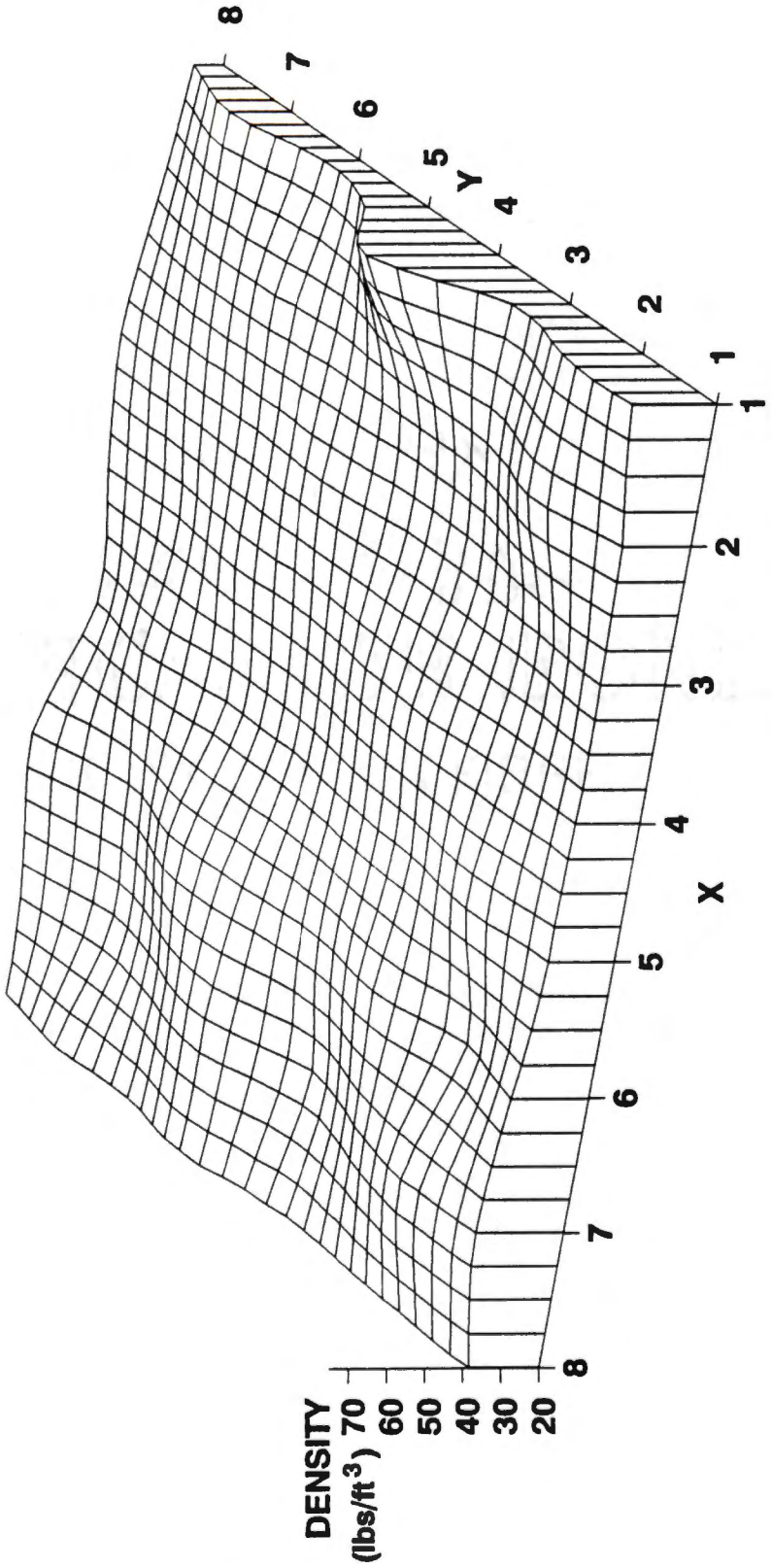
Z = 8



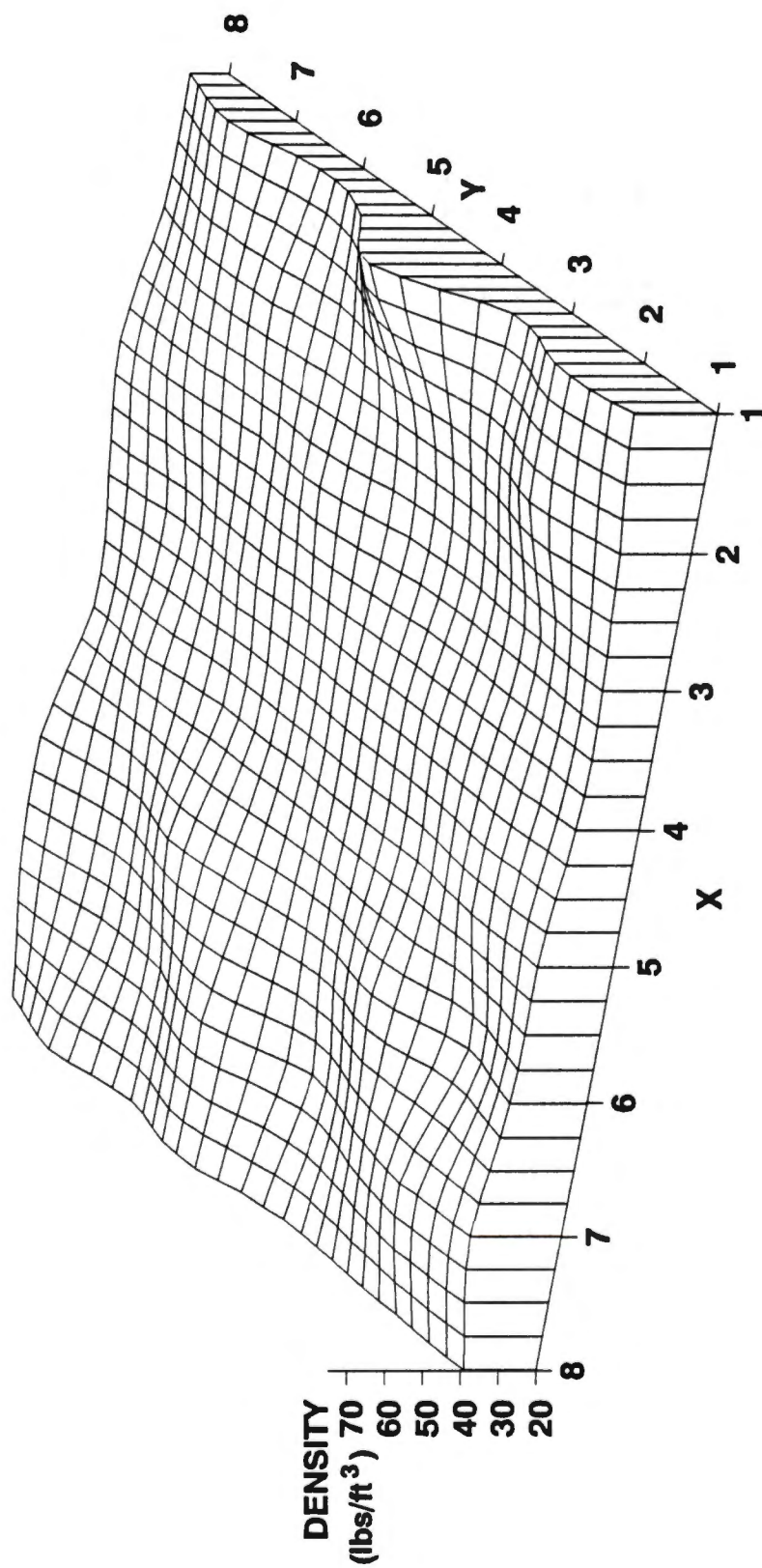
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 2

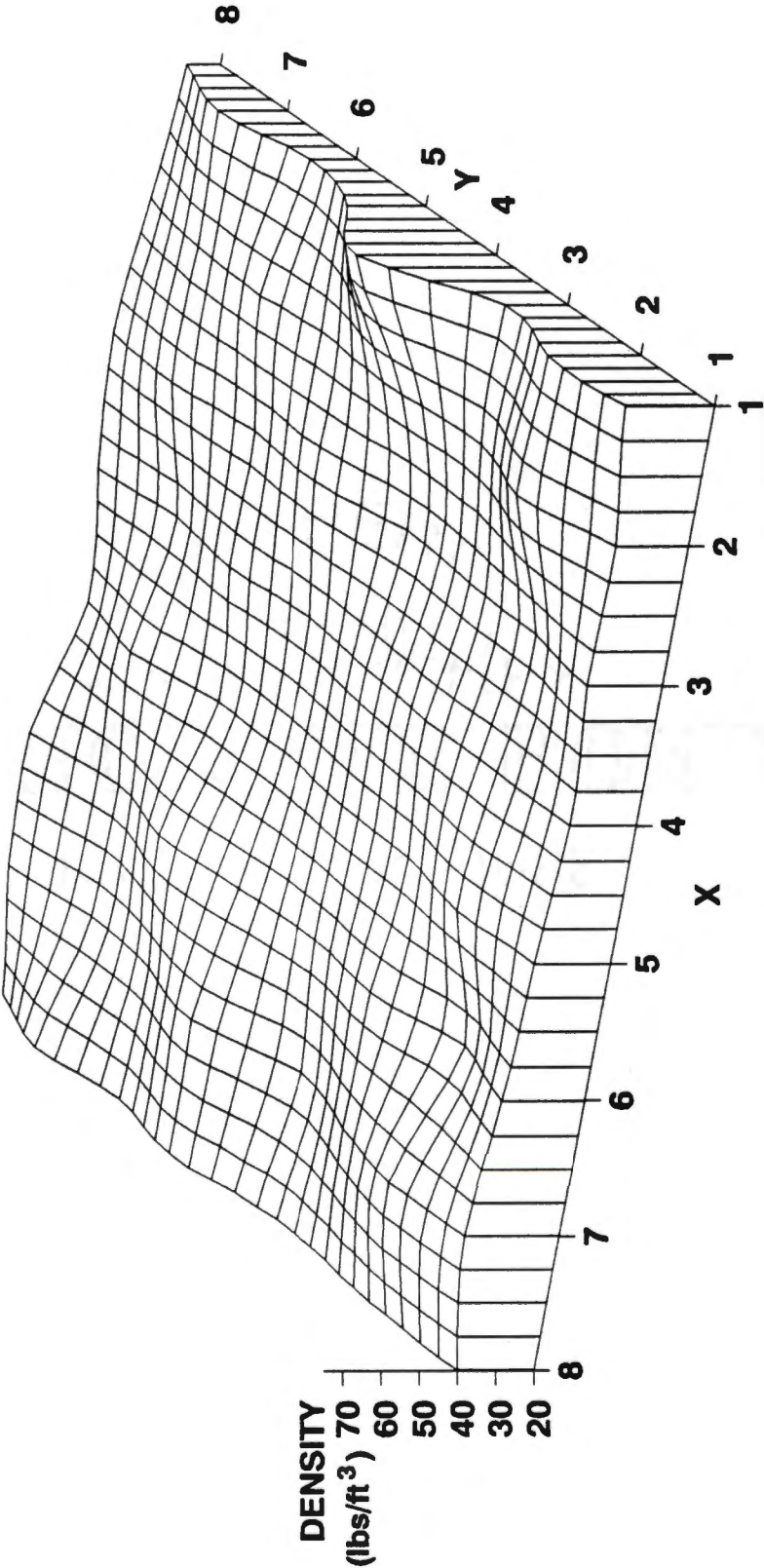
Z = 9



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 10



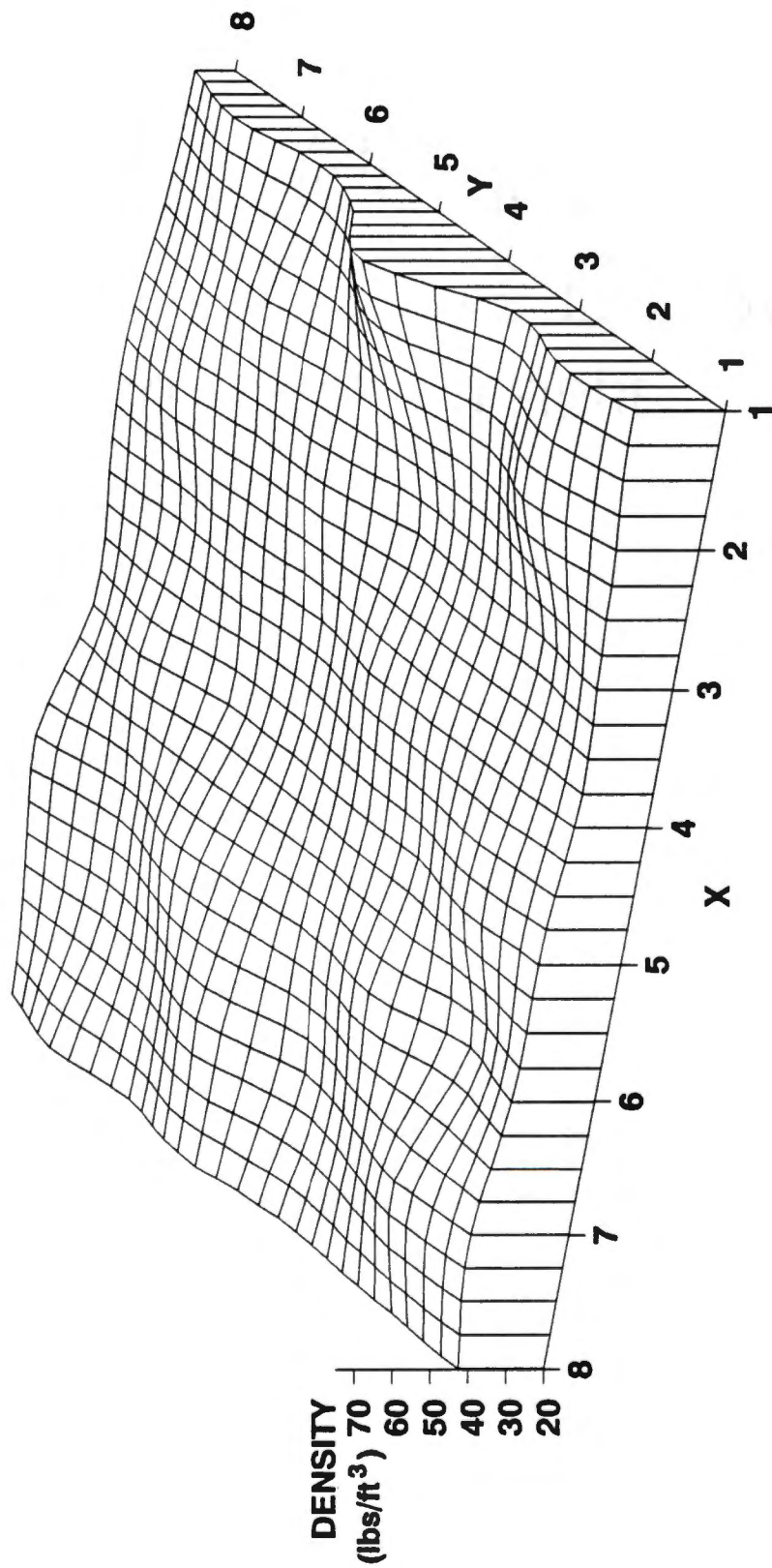
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS
REPLICATION =2
Z=11



FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS

REPLICATION =2

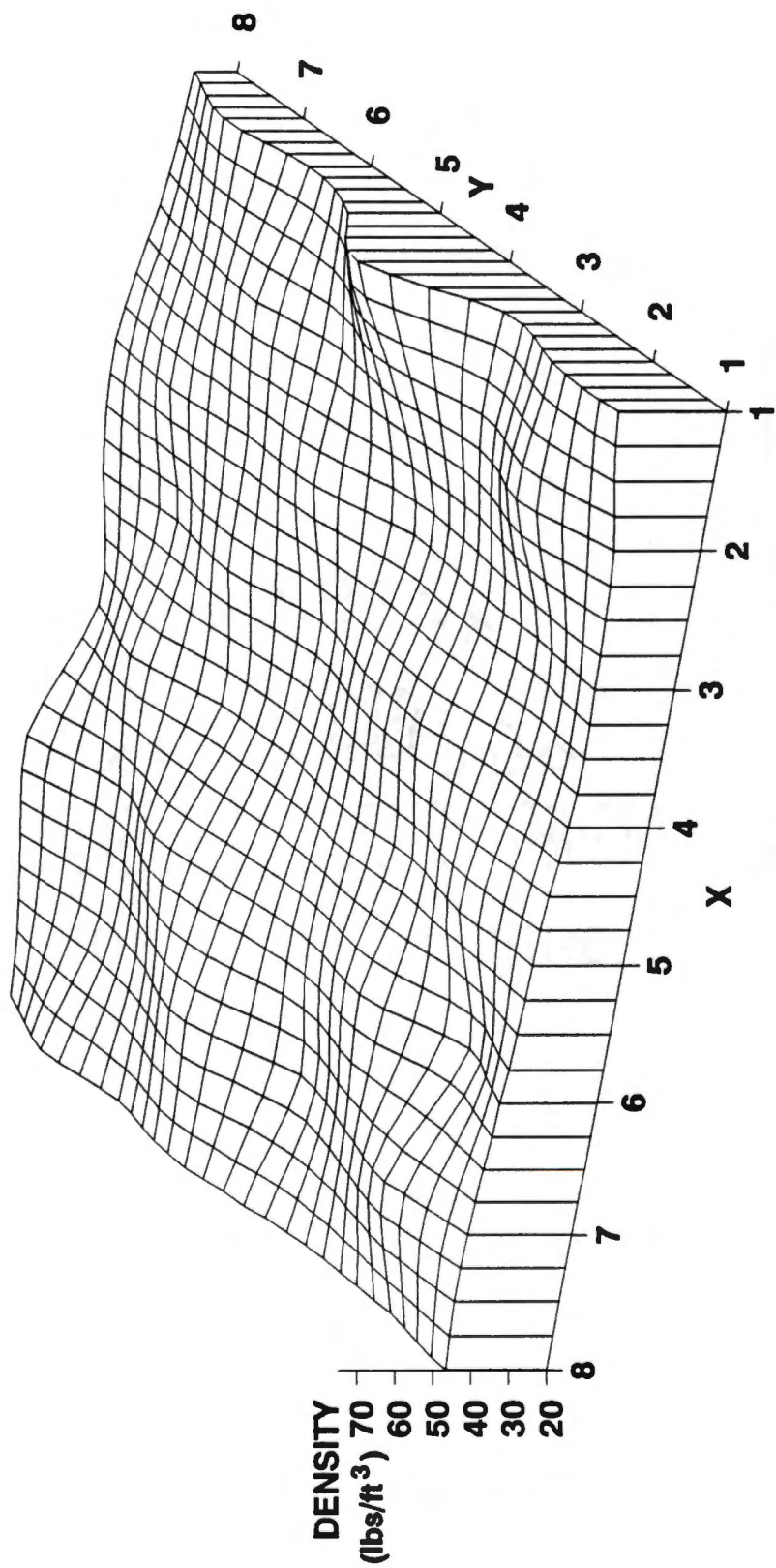
Z=12



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

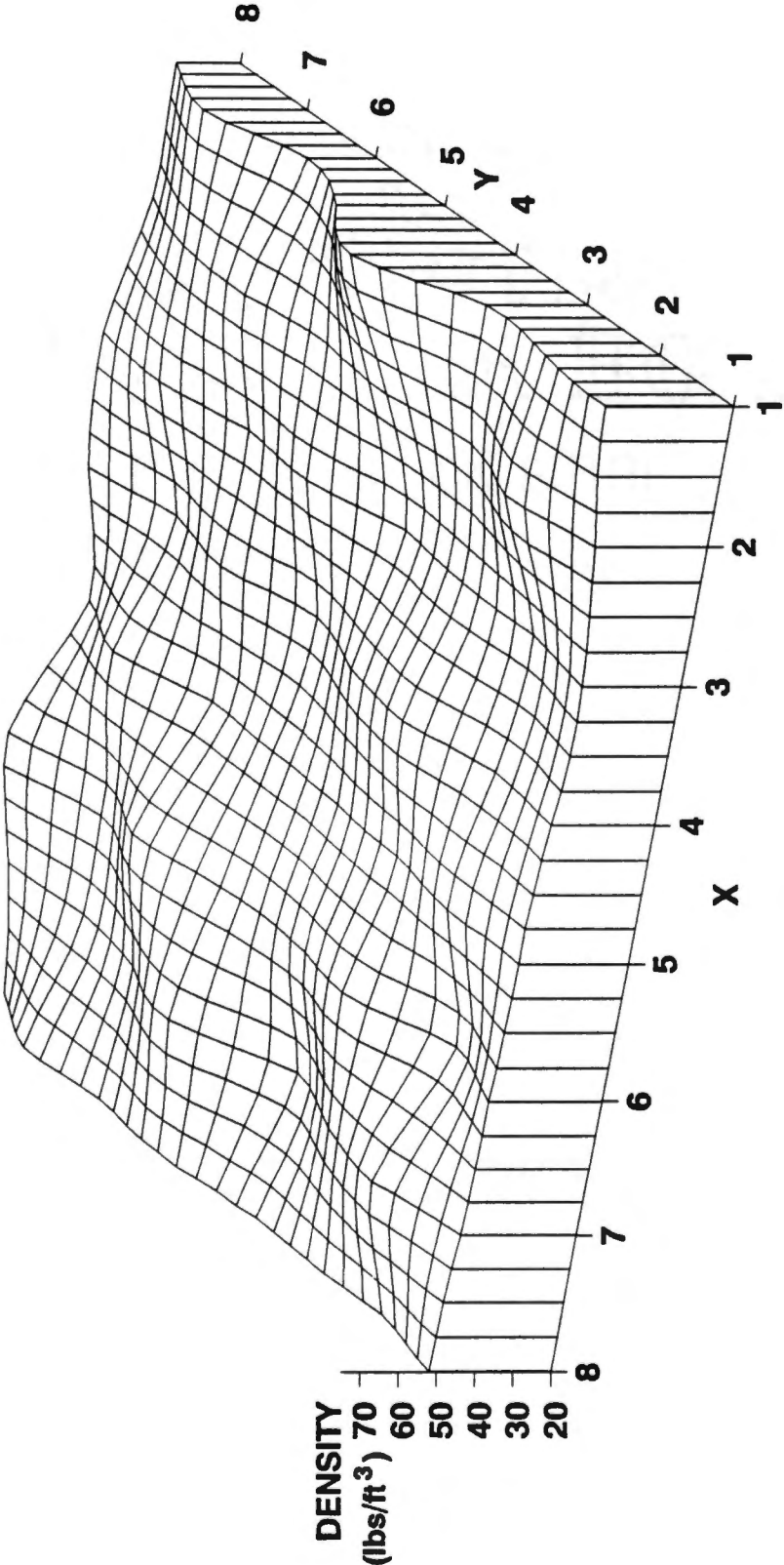
REPLICATION = 2

Z = 13

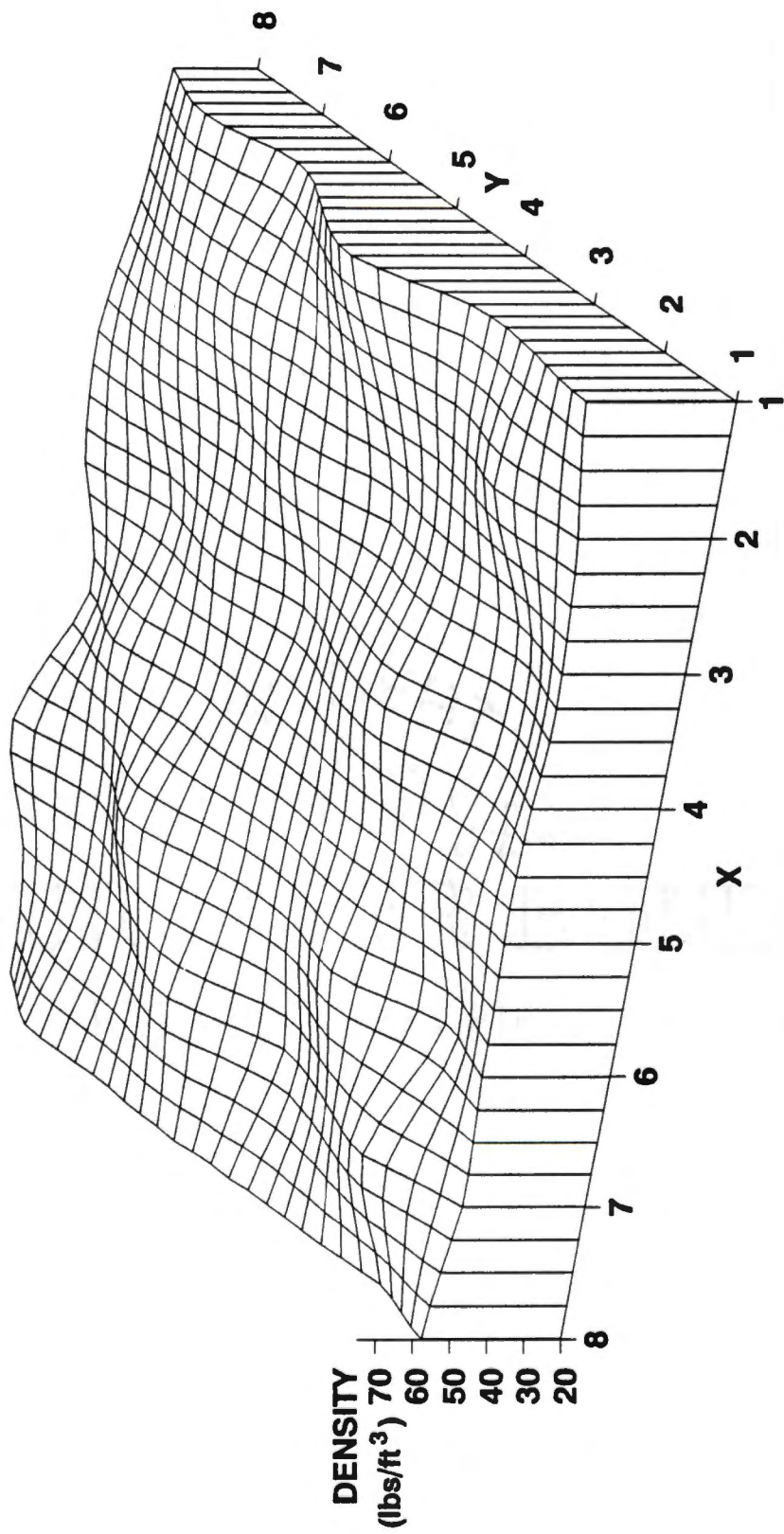


FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2

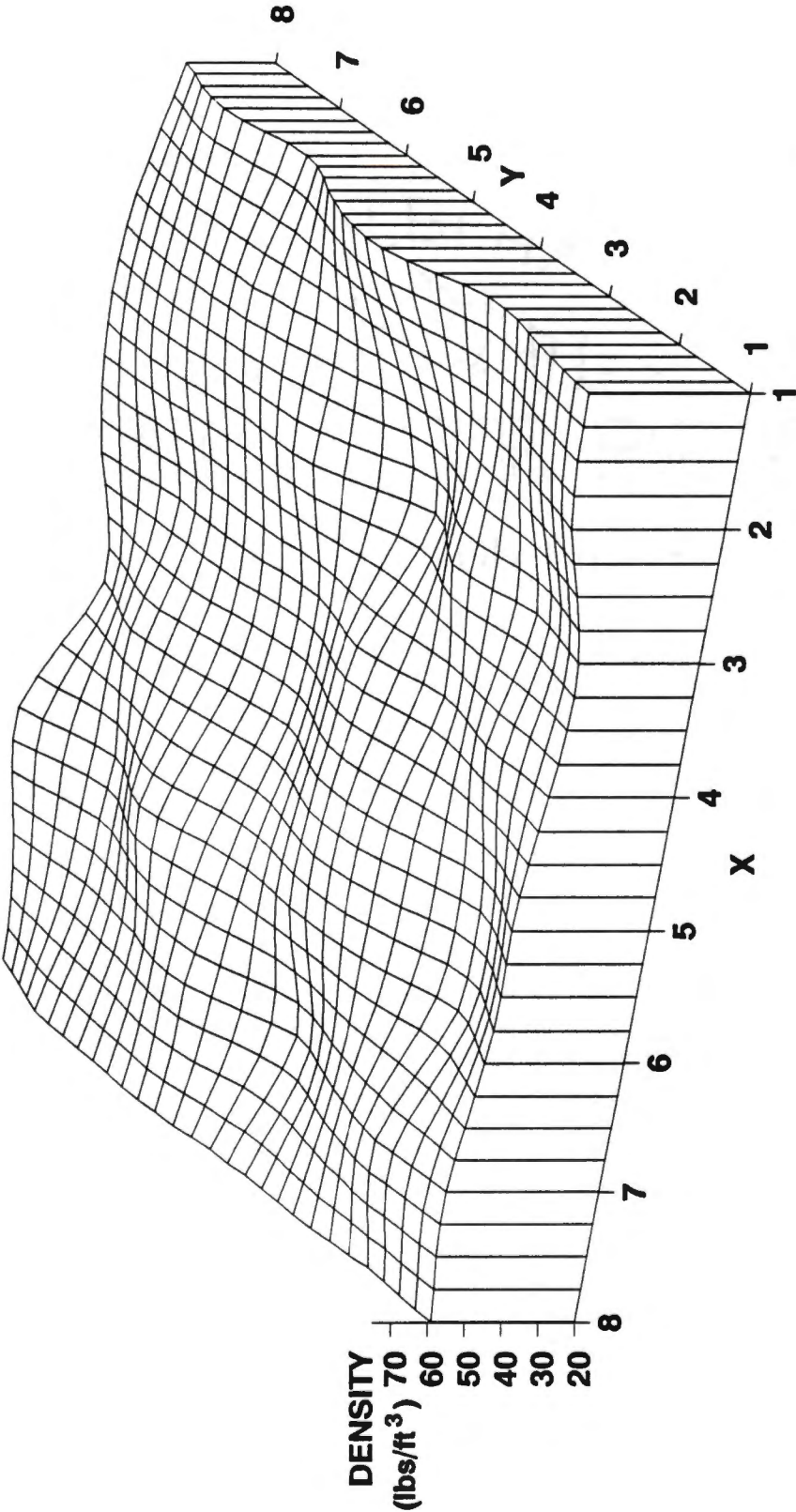
Z = 14



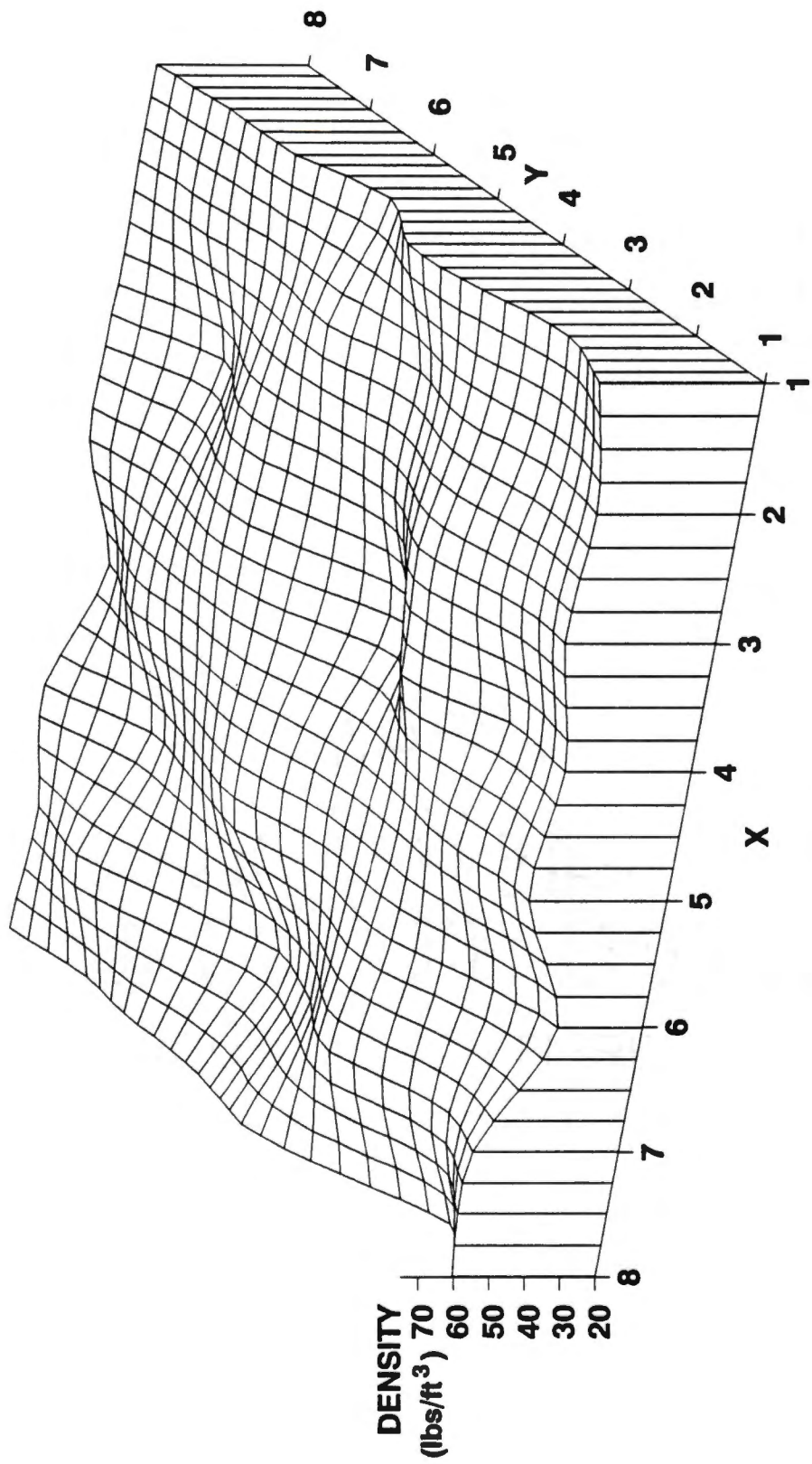
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 15



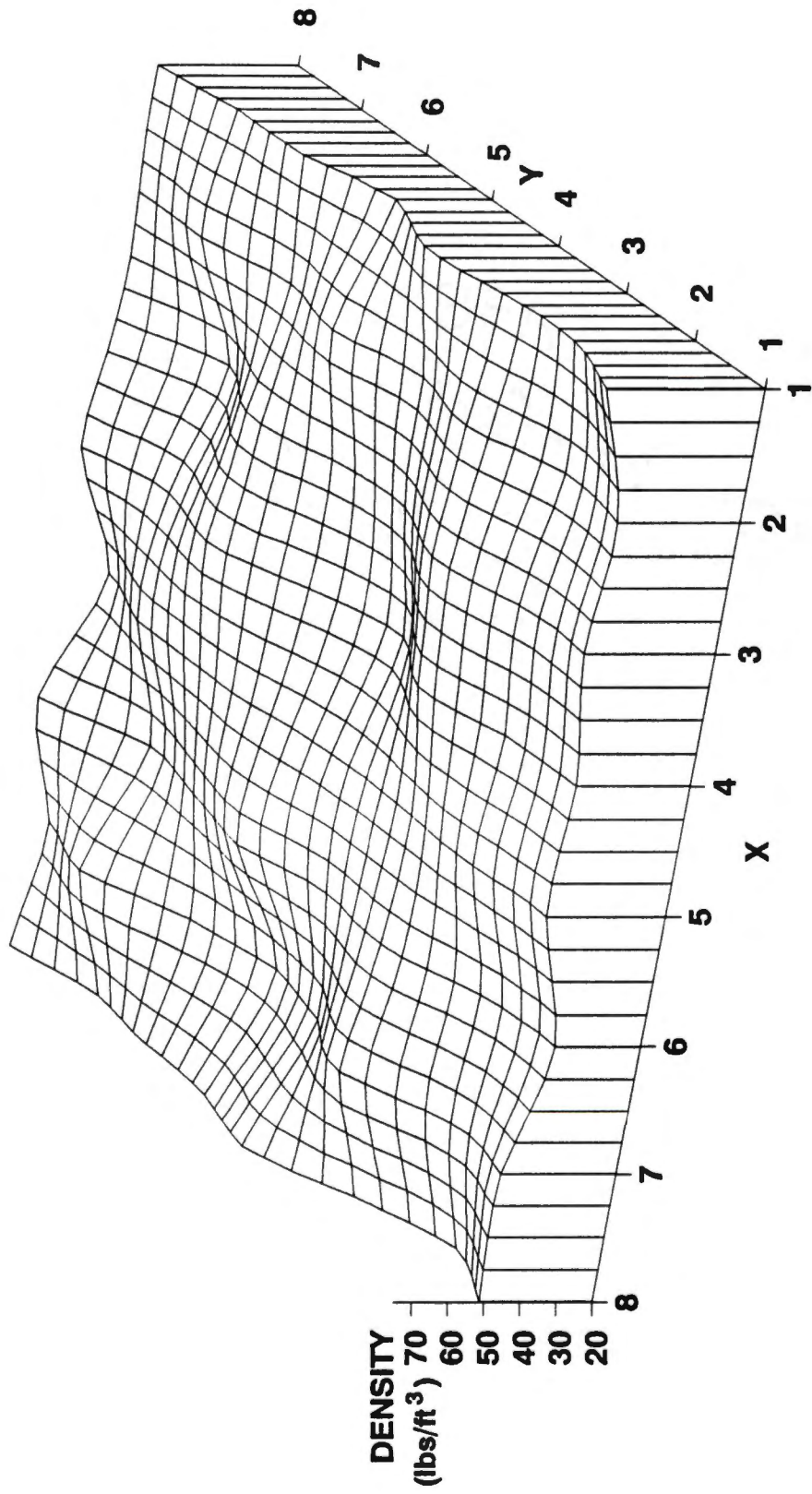
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 2
Z = 16



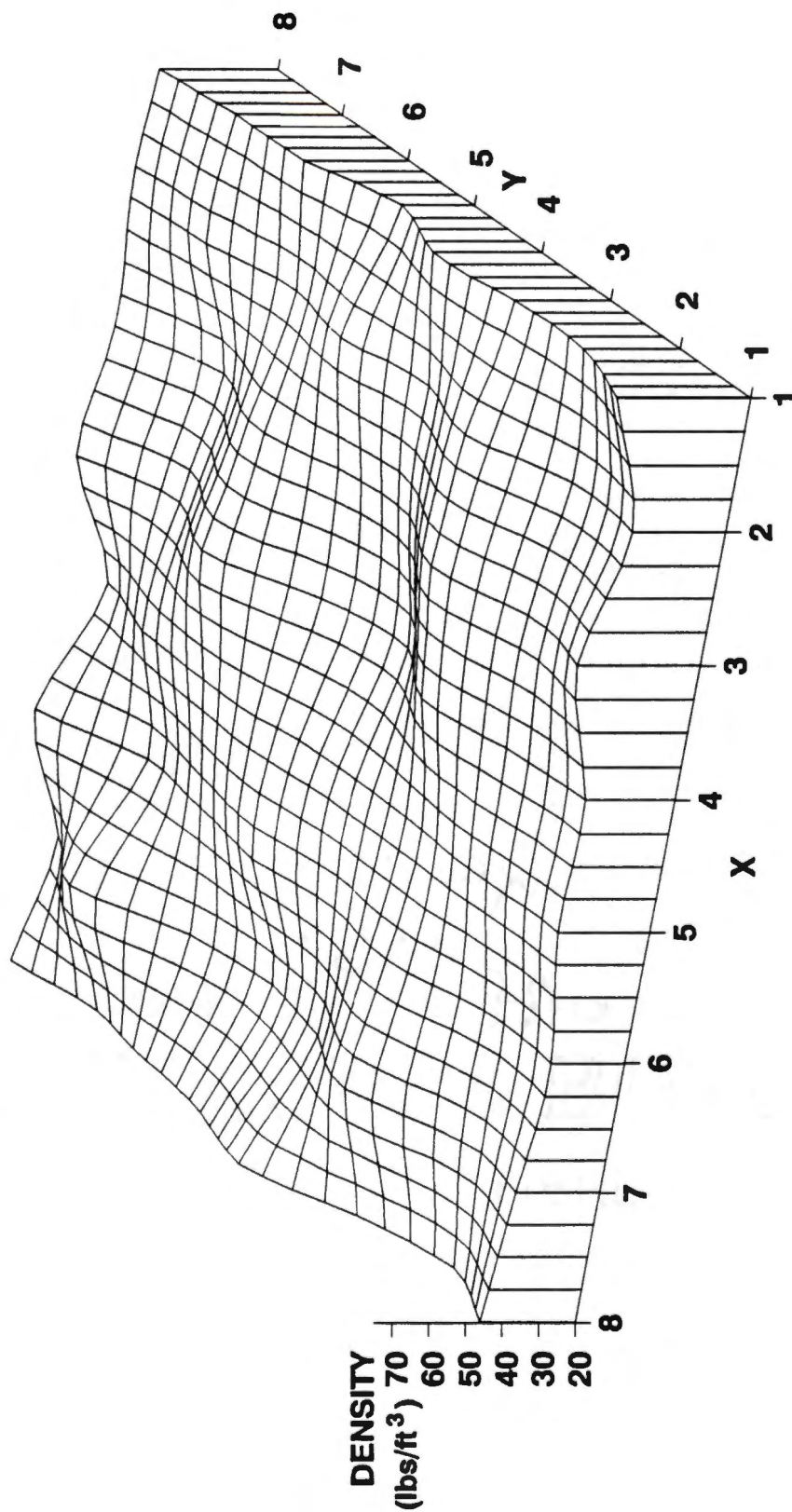
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 1



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 2



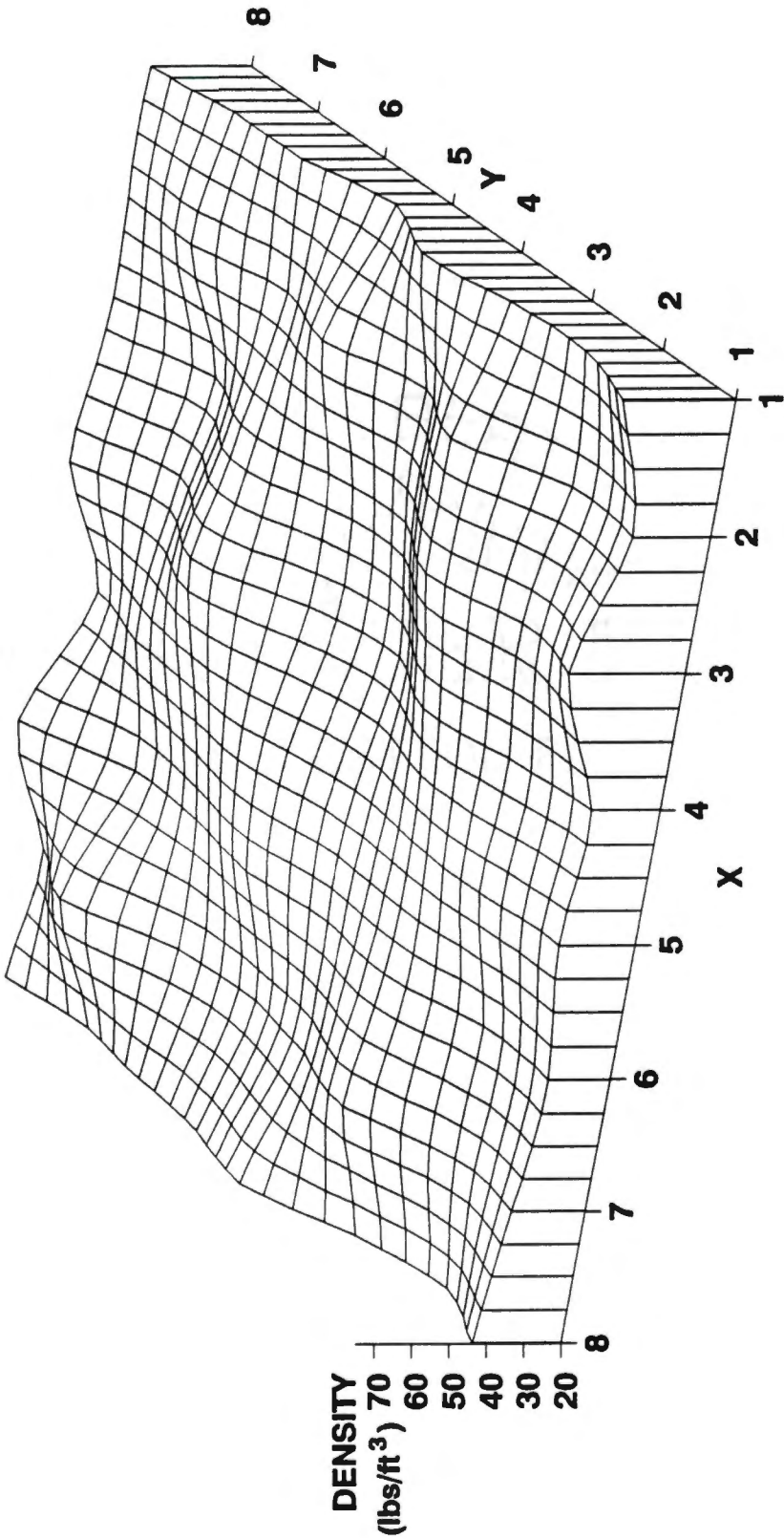
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 3



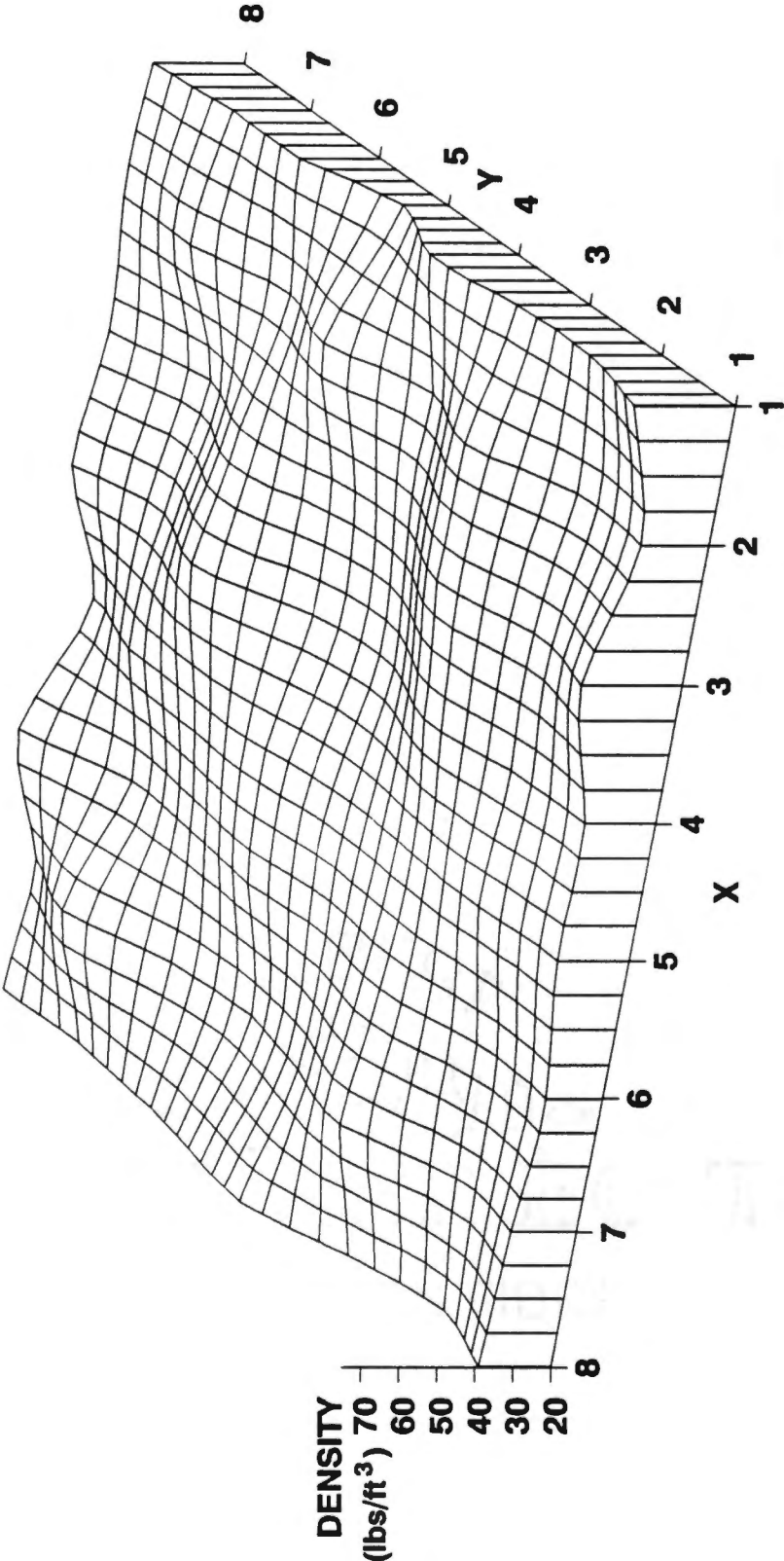
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 3

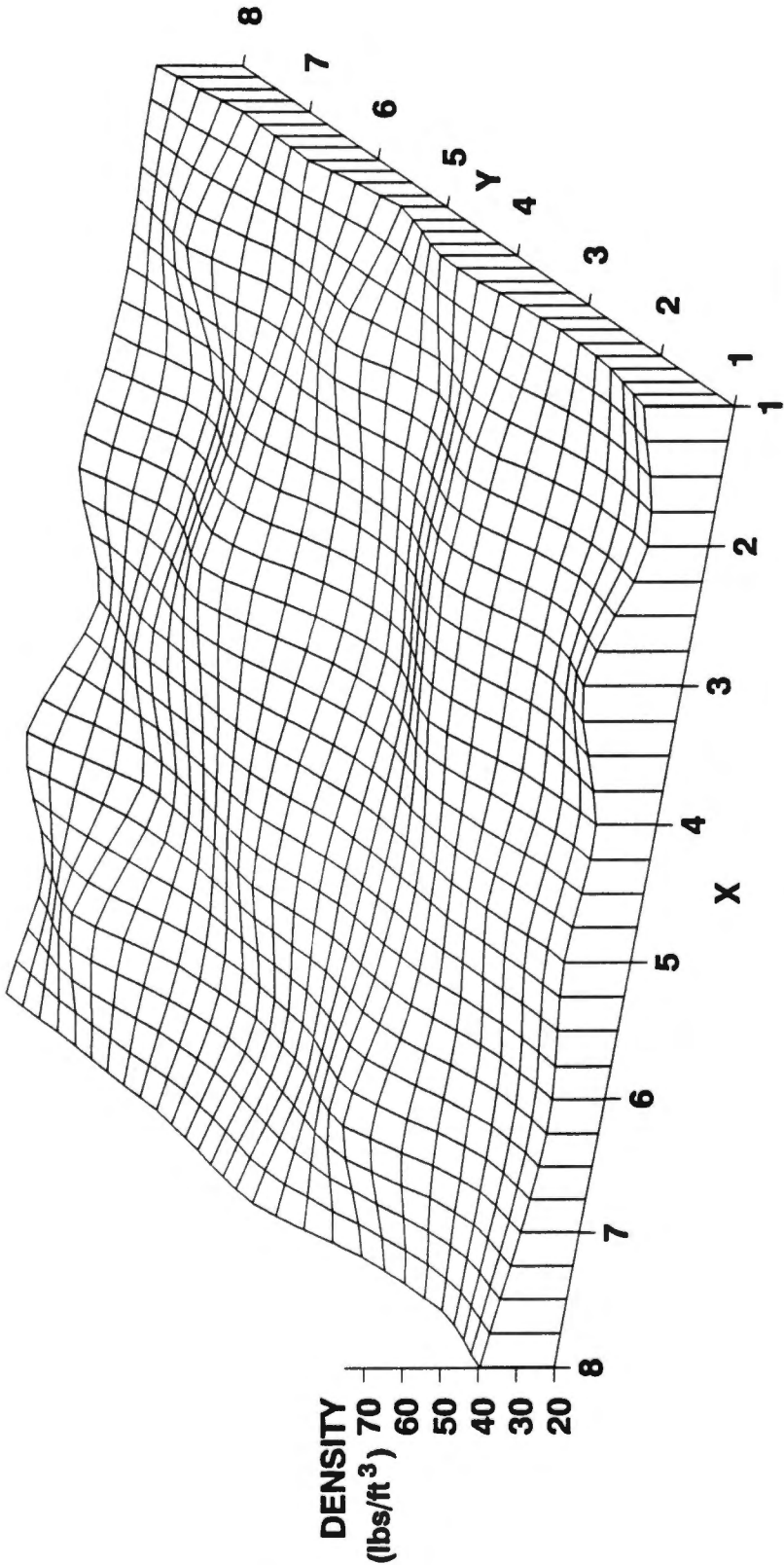
Z = 4



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 5



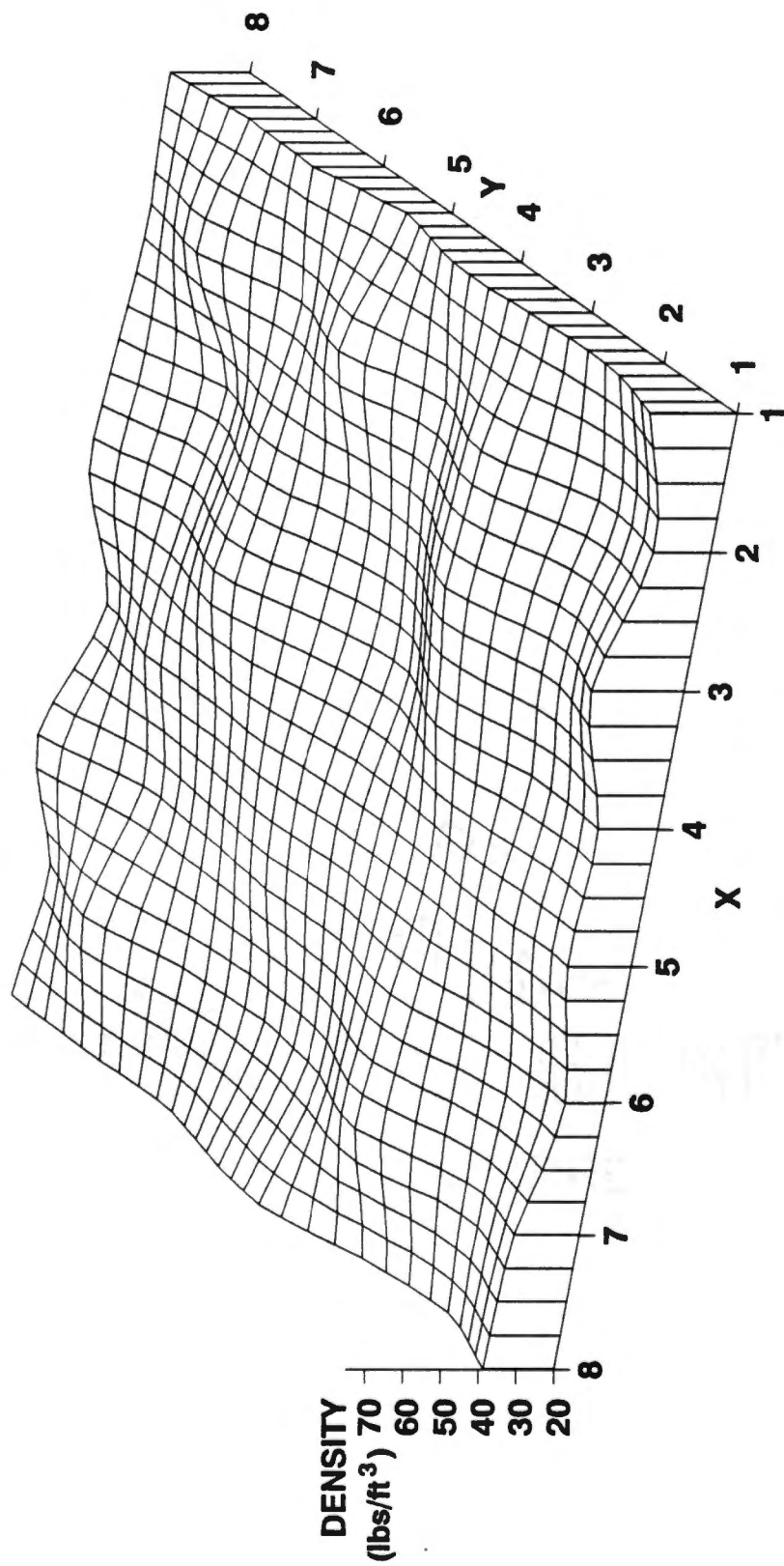
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 6



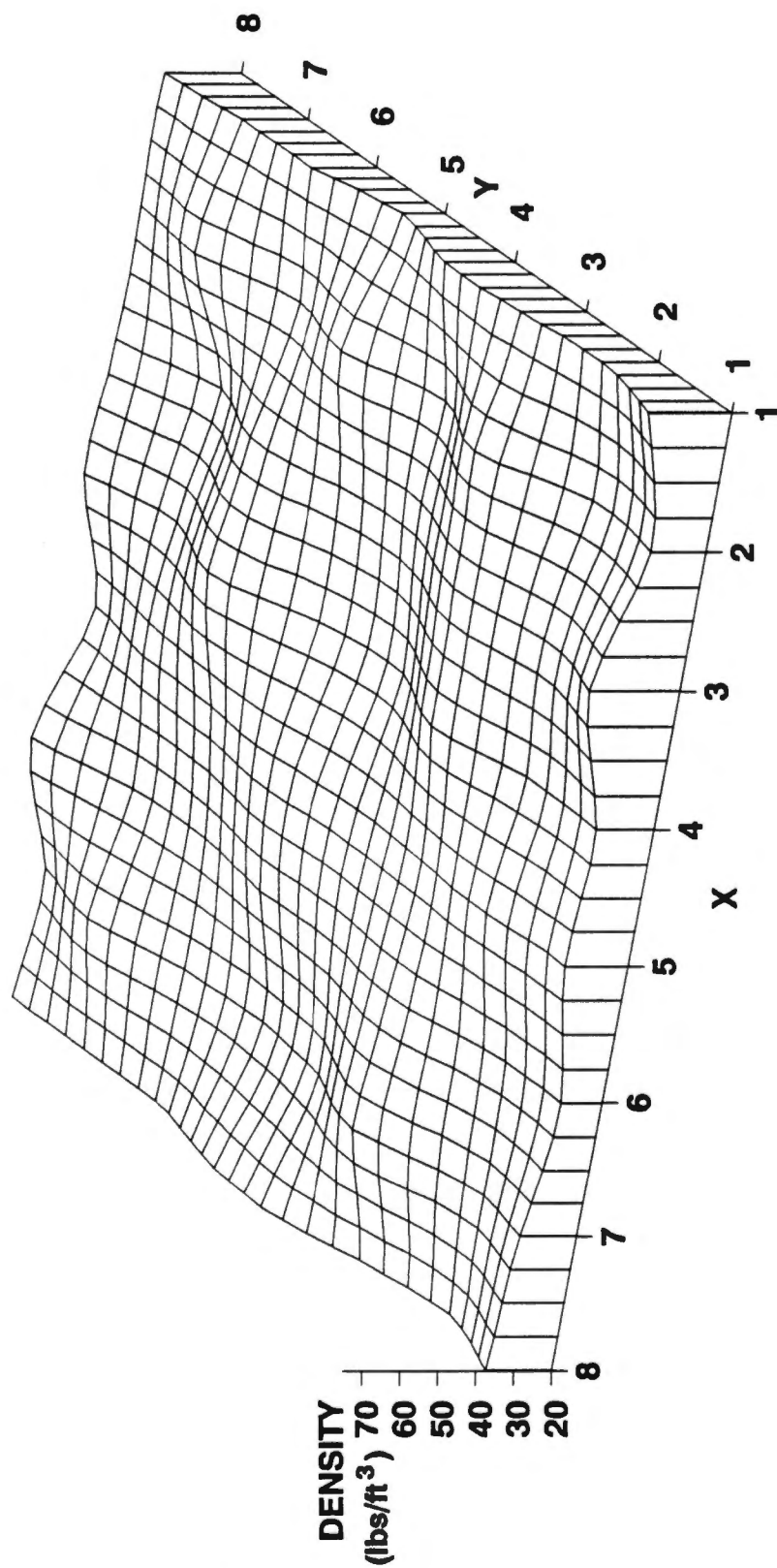
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 3

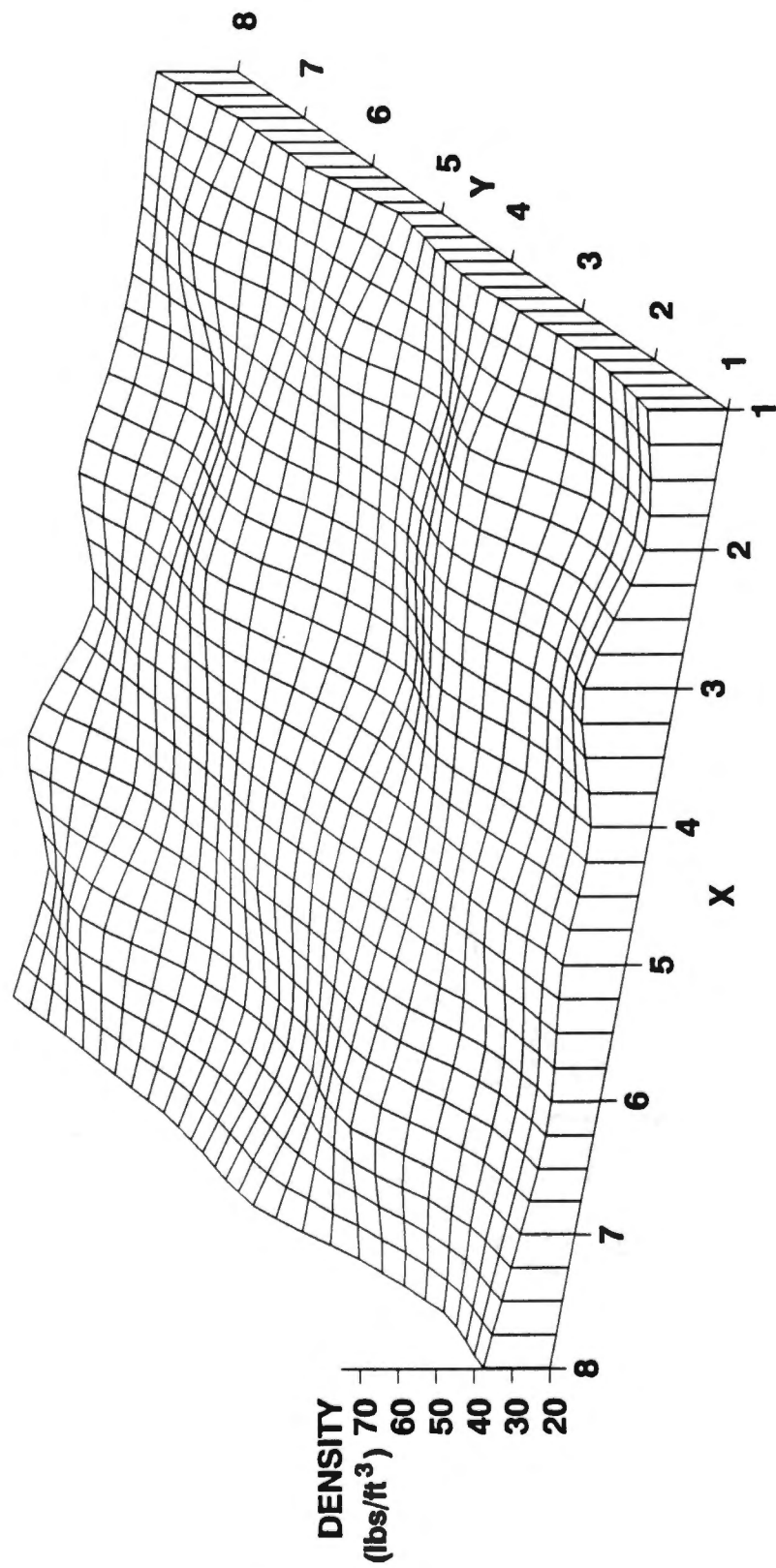
Z = 7



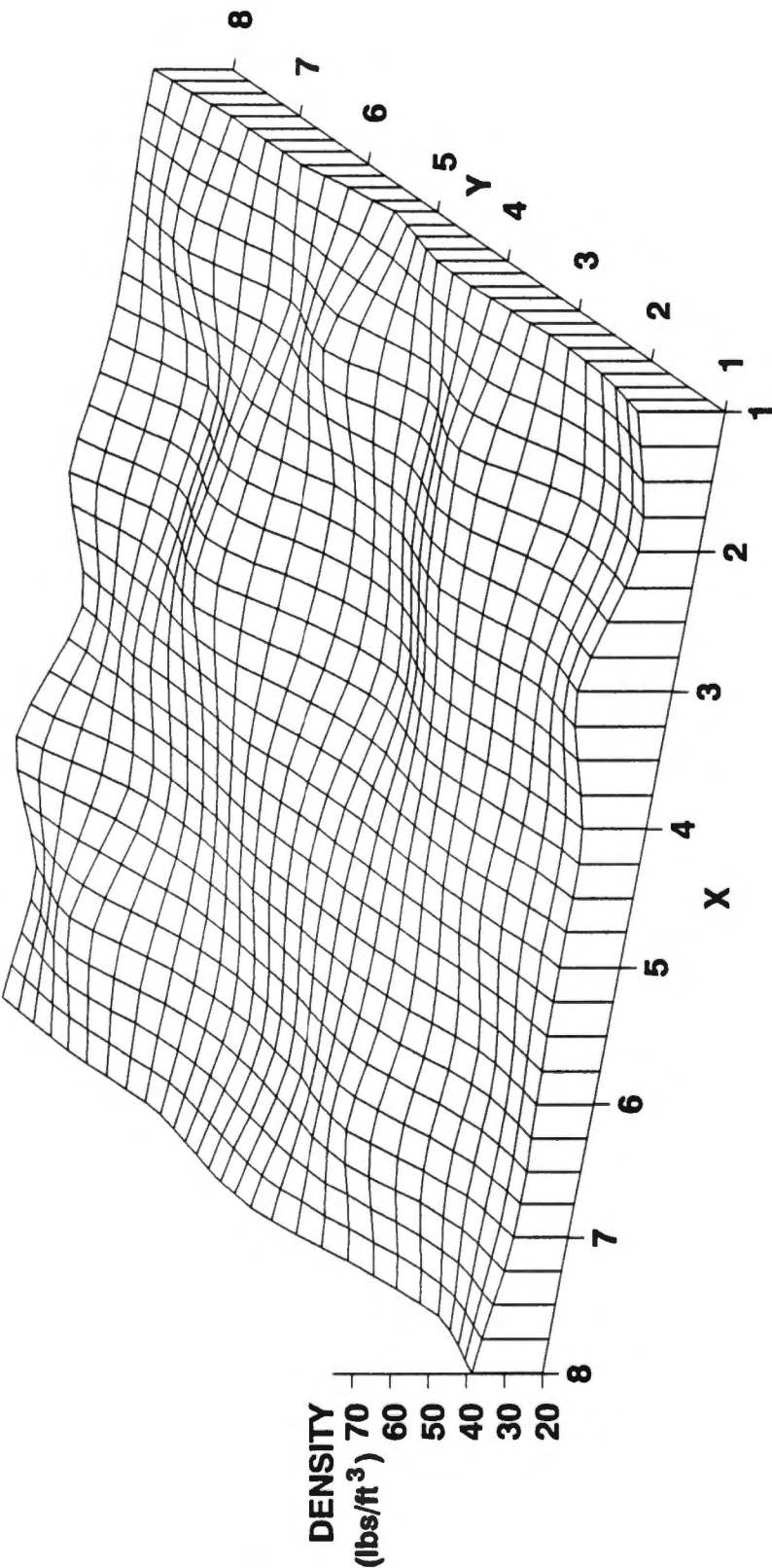
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=8



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 9



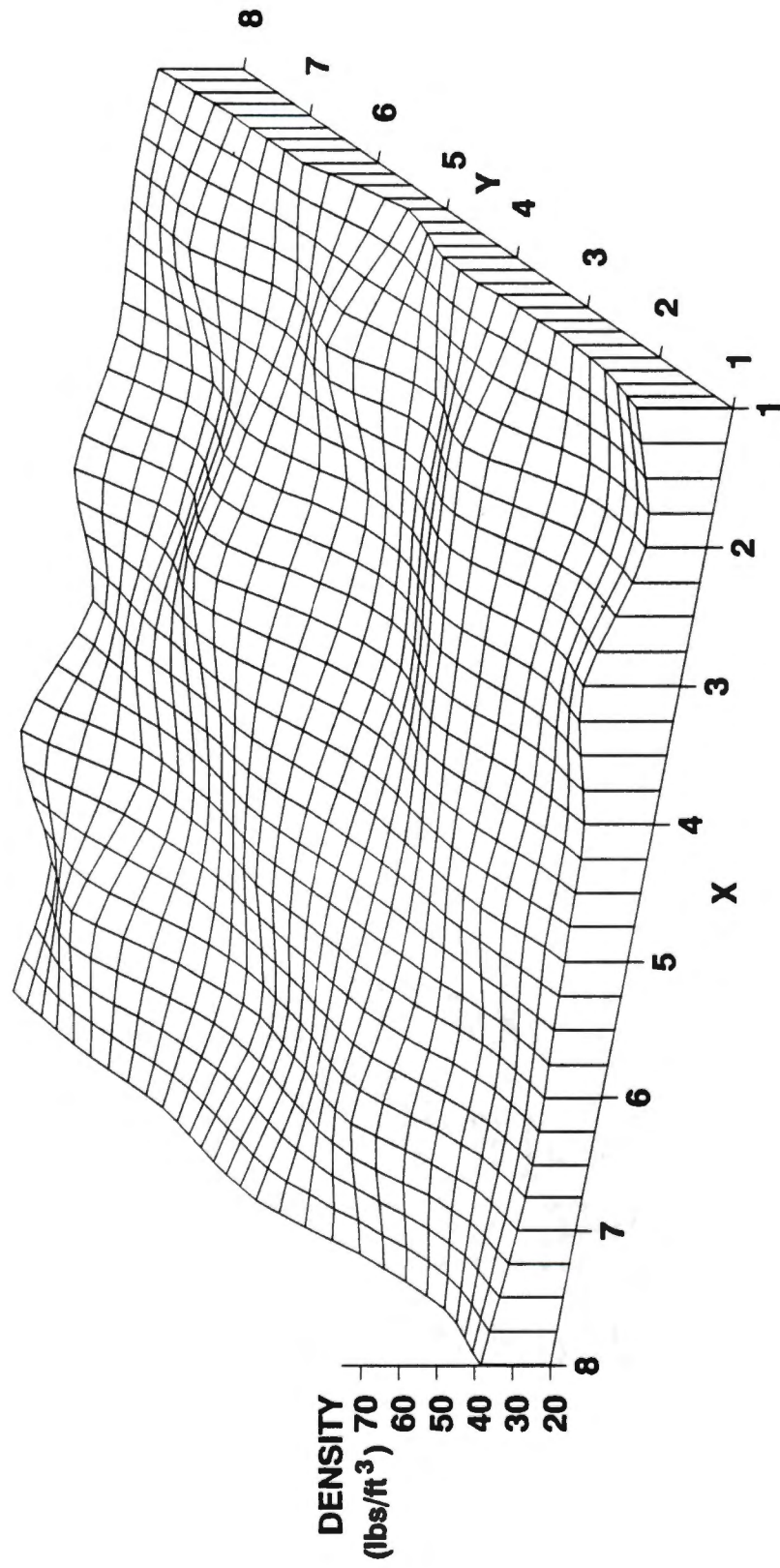
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =20 SECONDS
REPLICATION =3
Z =10



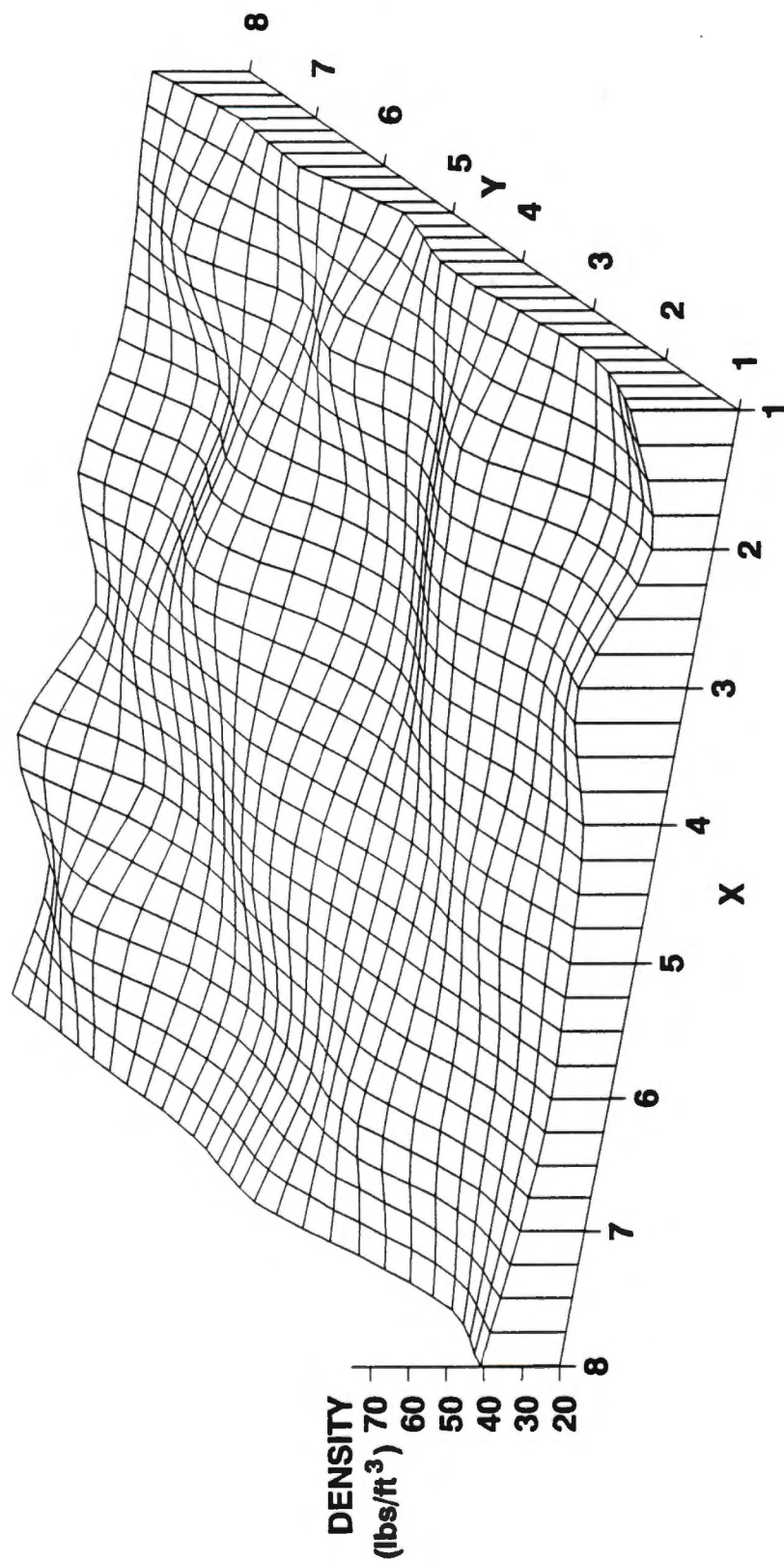
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS

REPLICATION = 3

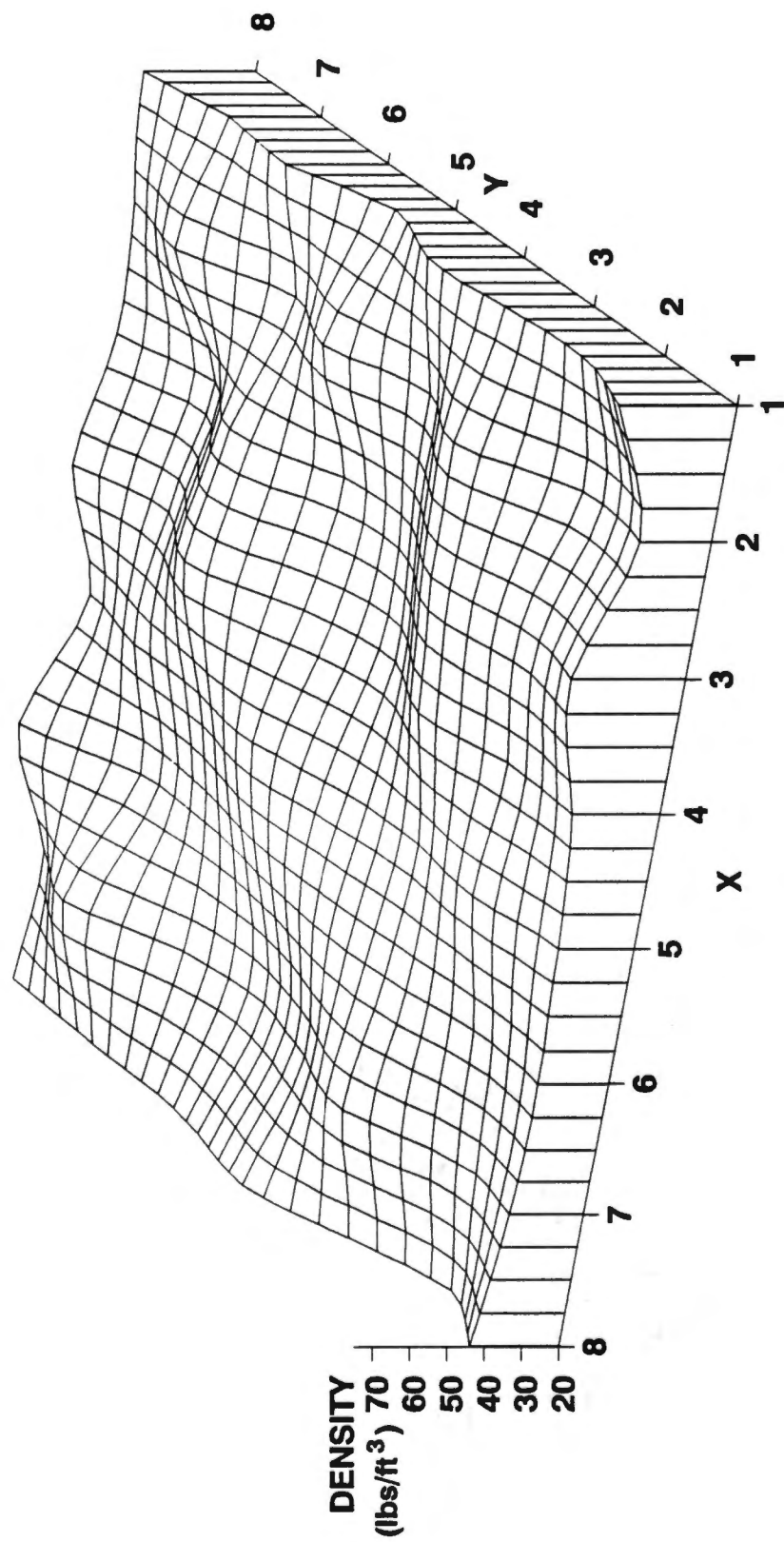
Z = 11



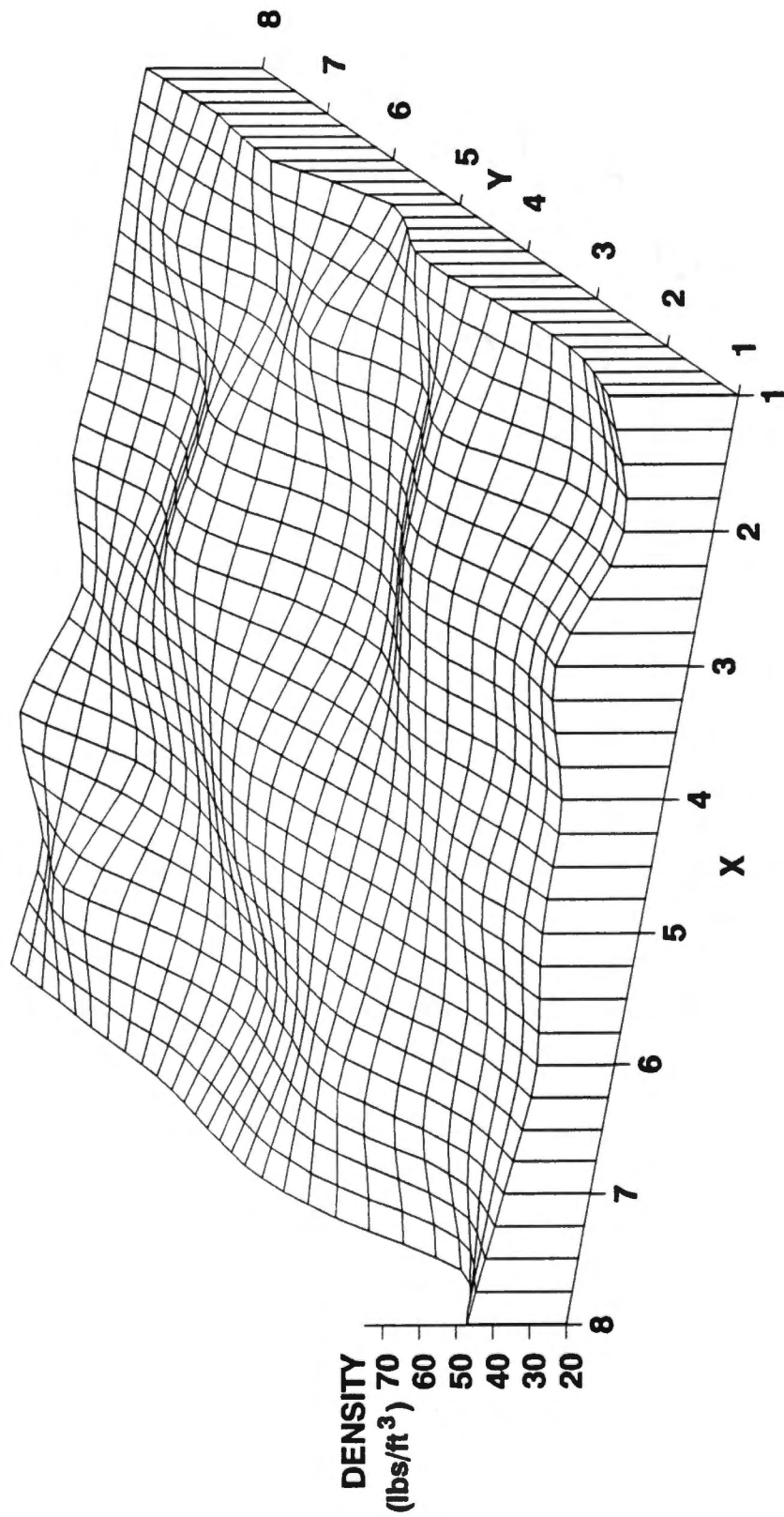
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 12



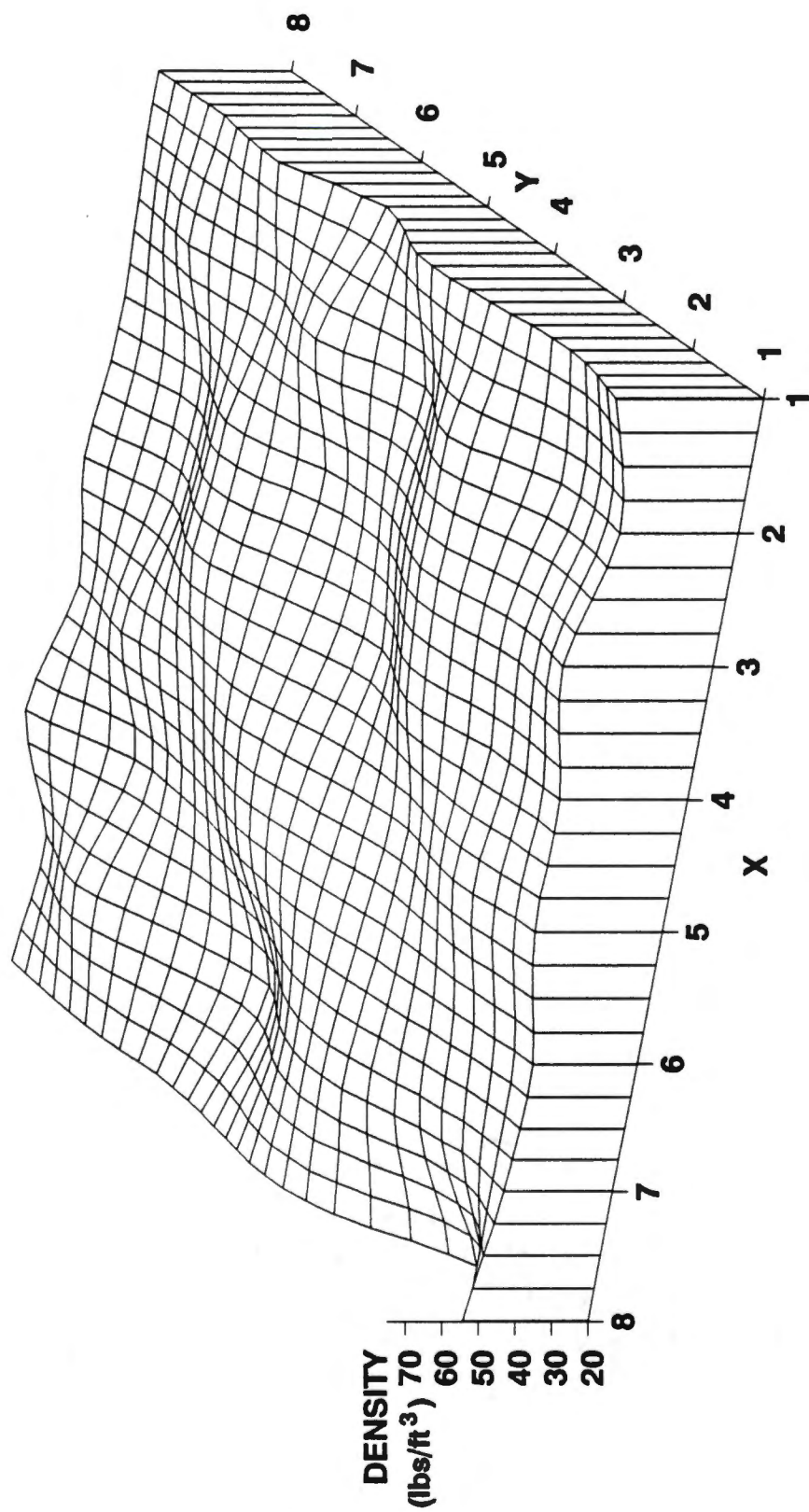
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=20 SECONDS
REPLICATION=3
Z=13



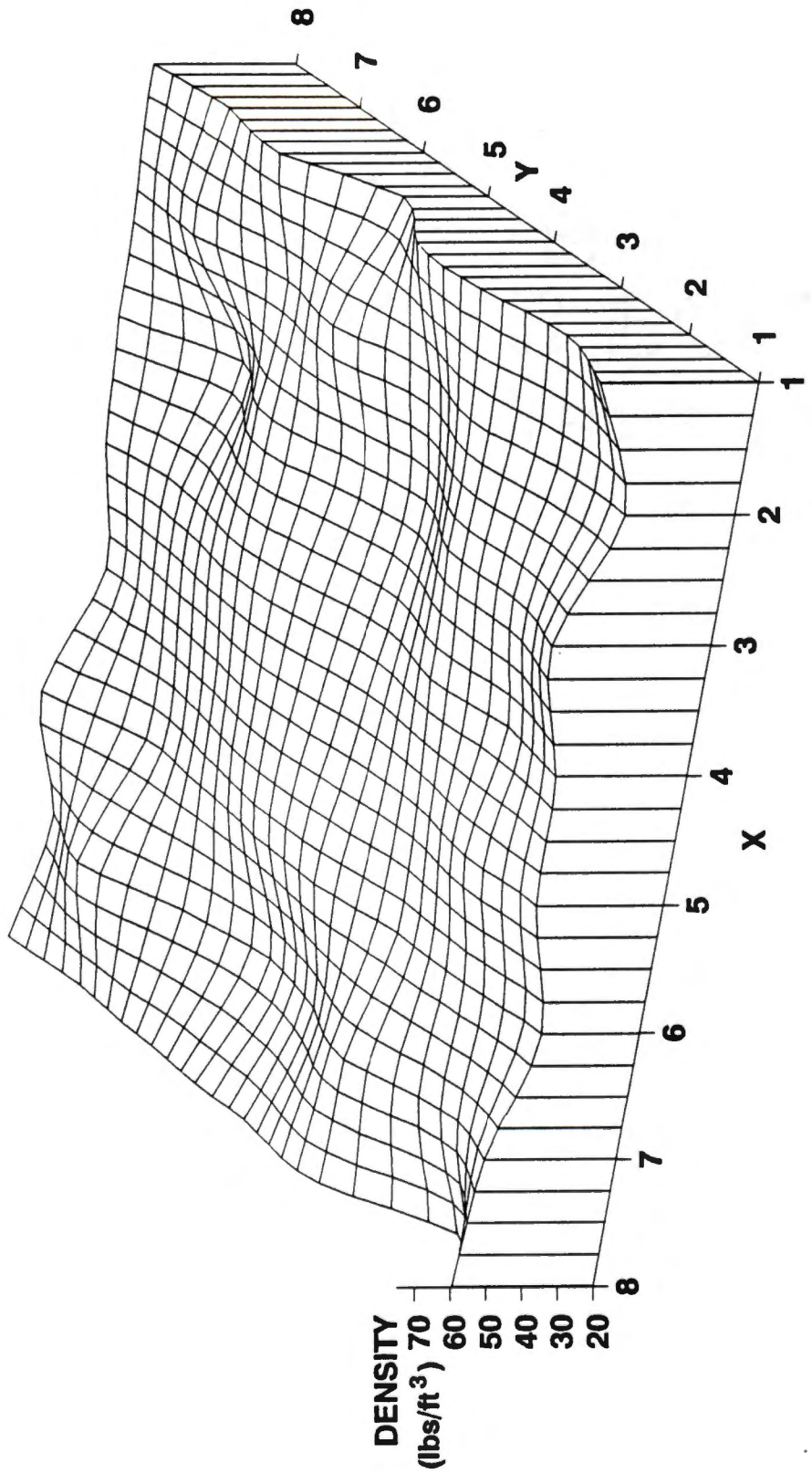
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 14



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 15



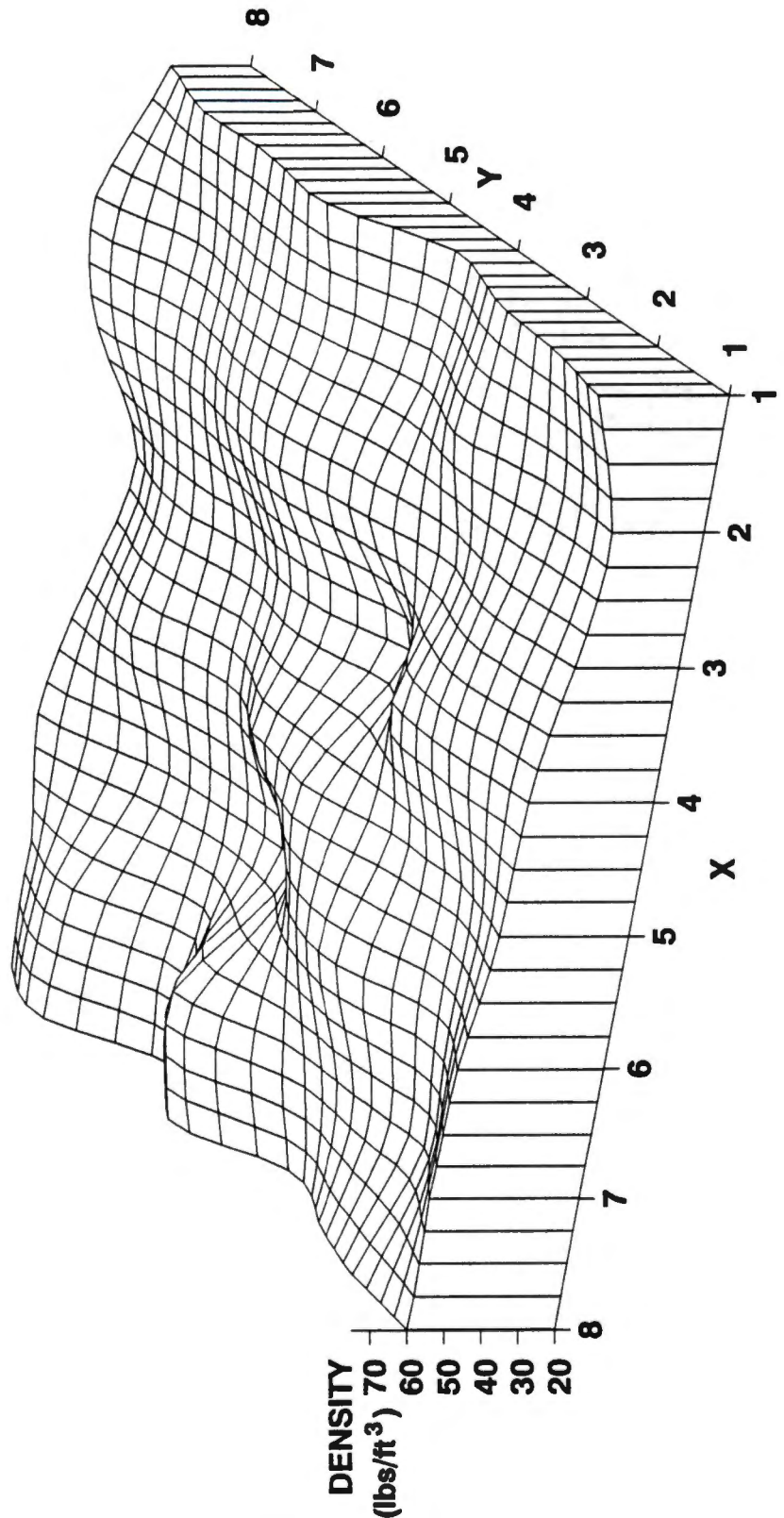
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 20 SECONDS
REPLICATION = 3
Z = 16



FLAKE MOISTURE CONTENT - 12%

PRESS CLOSURE RATE - 60 SECONDS

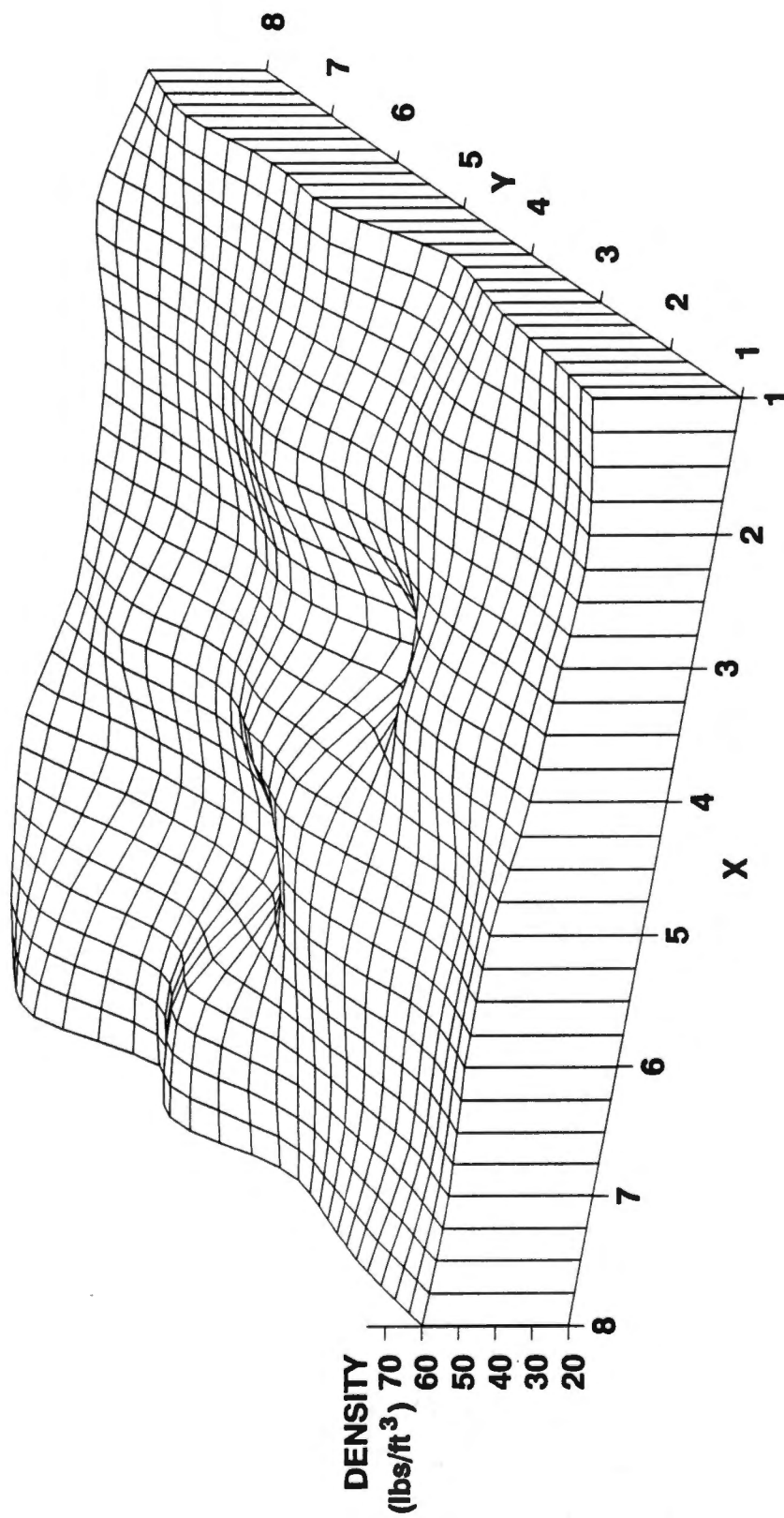
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 1



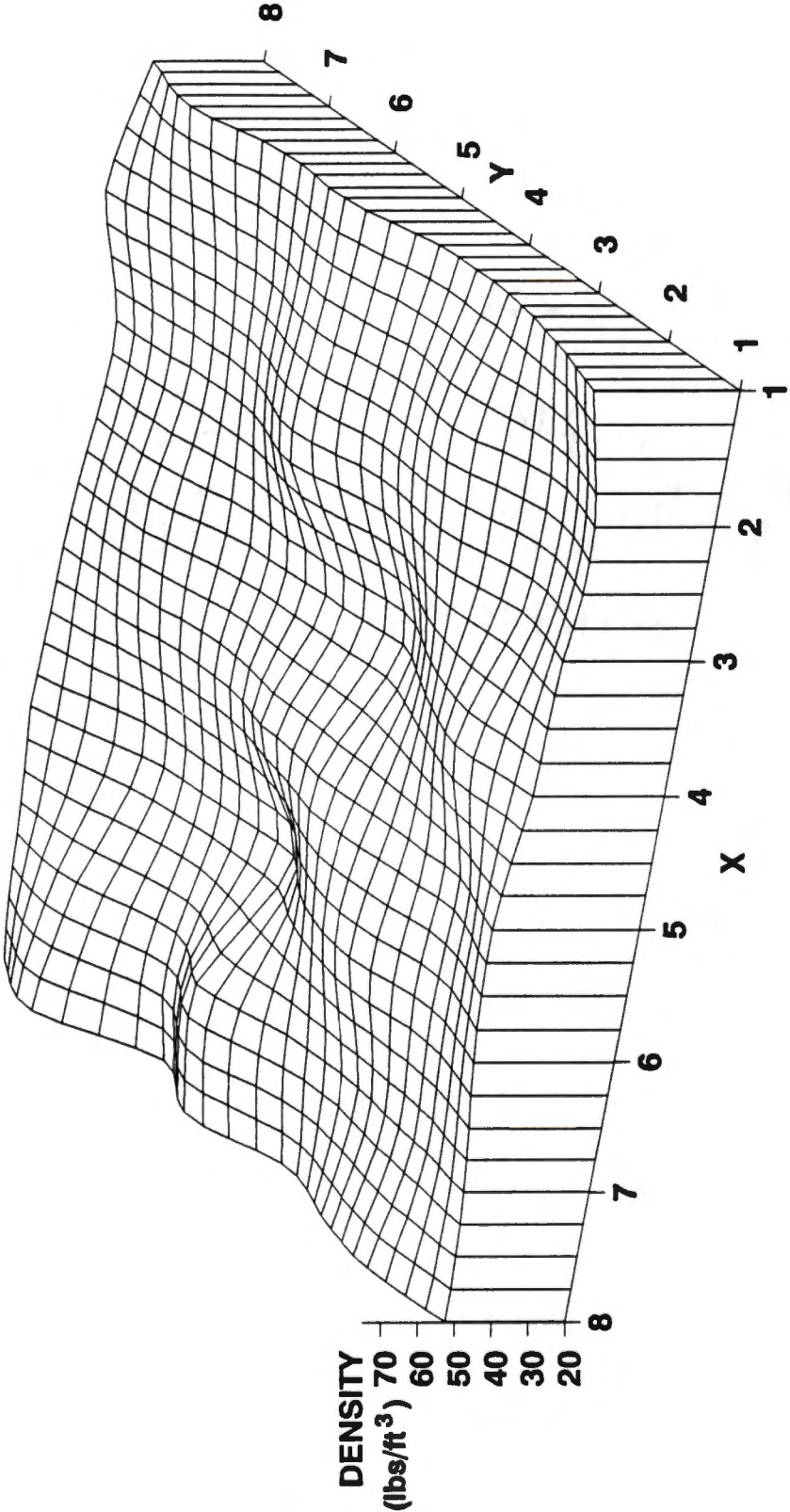
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 1

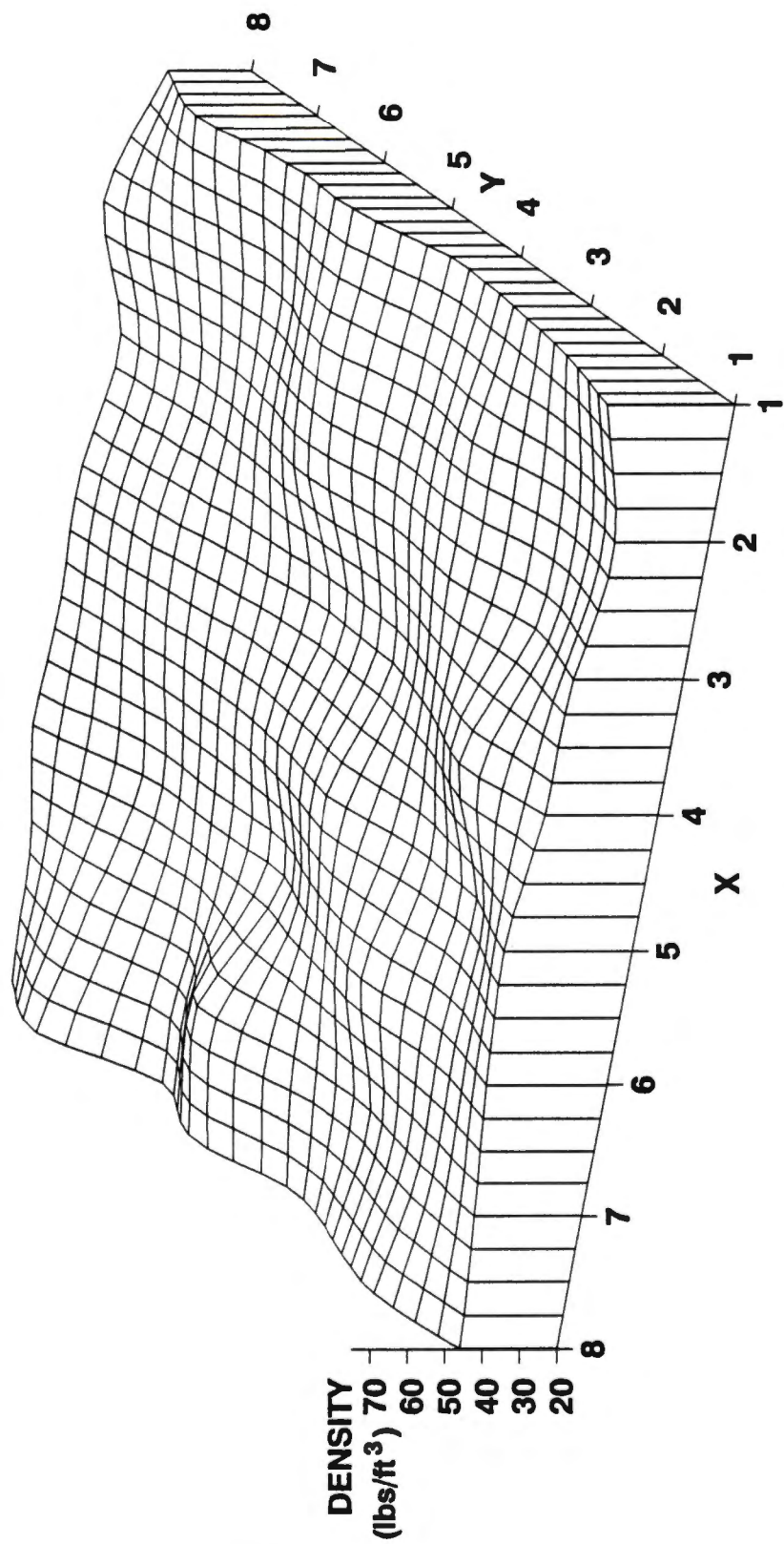
Z = 2



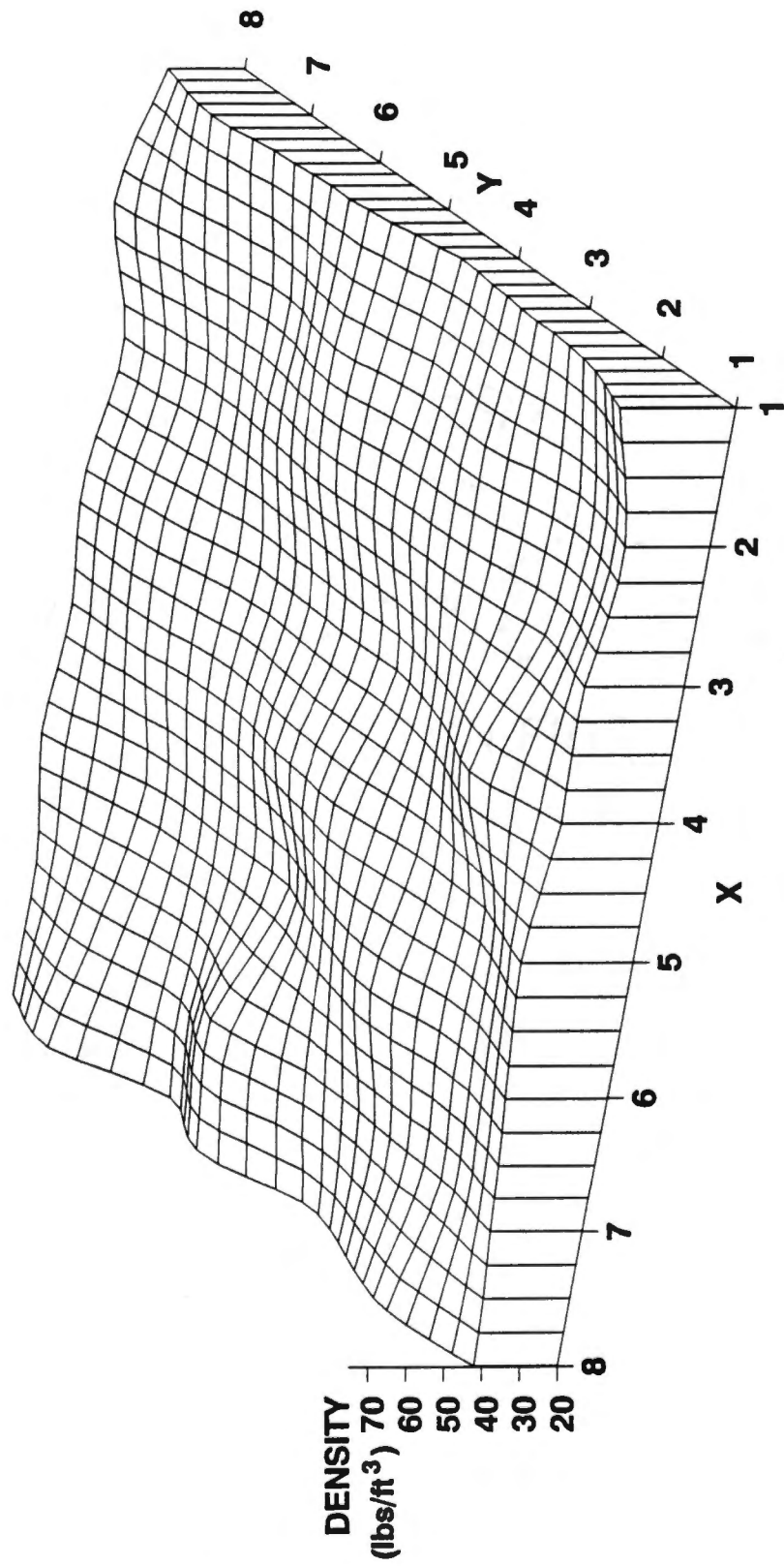
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 3



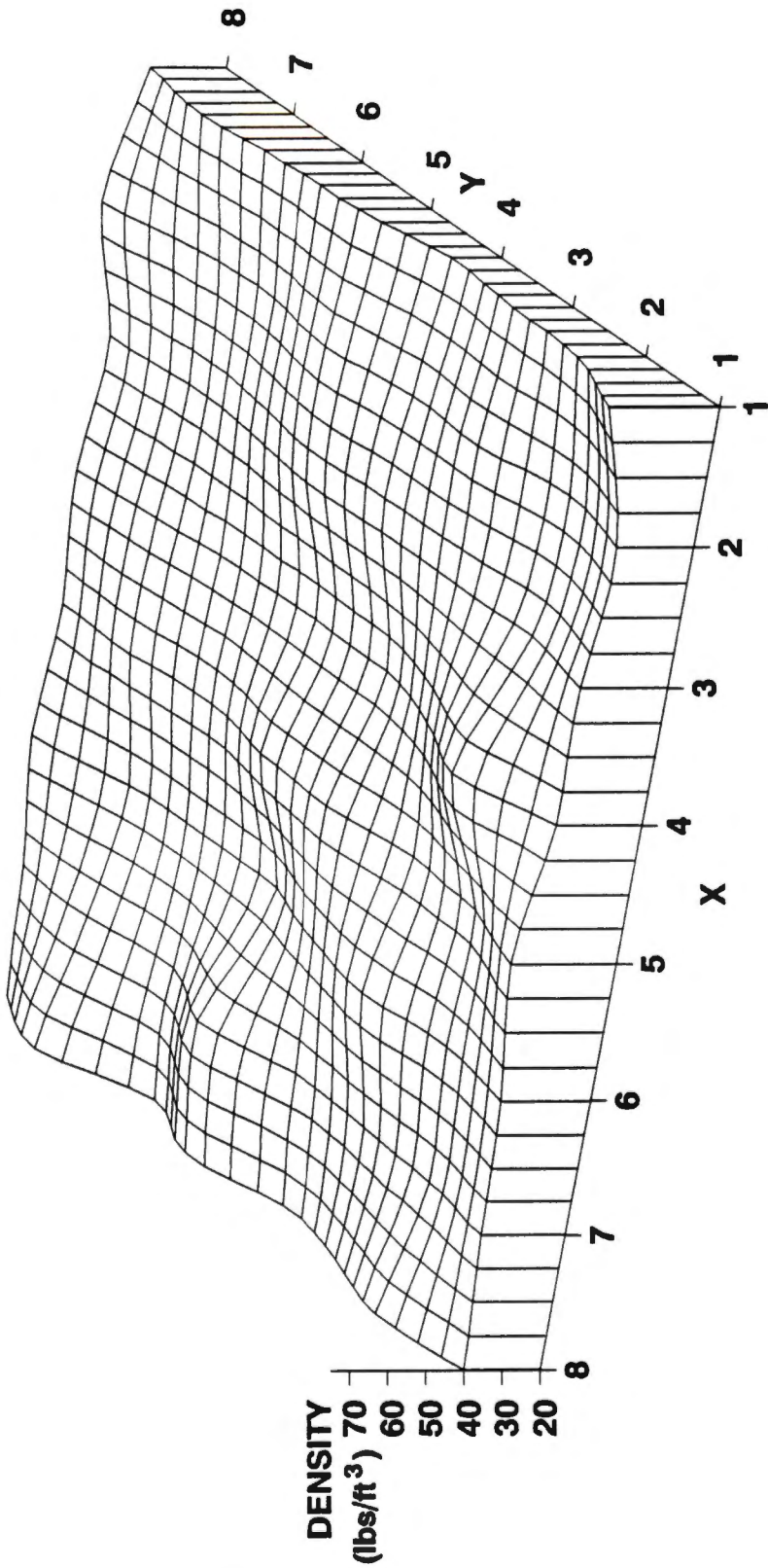
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=4



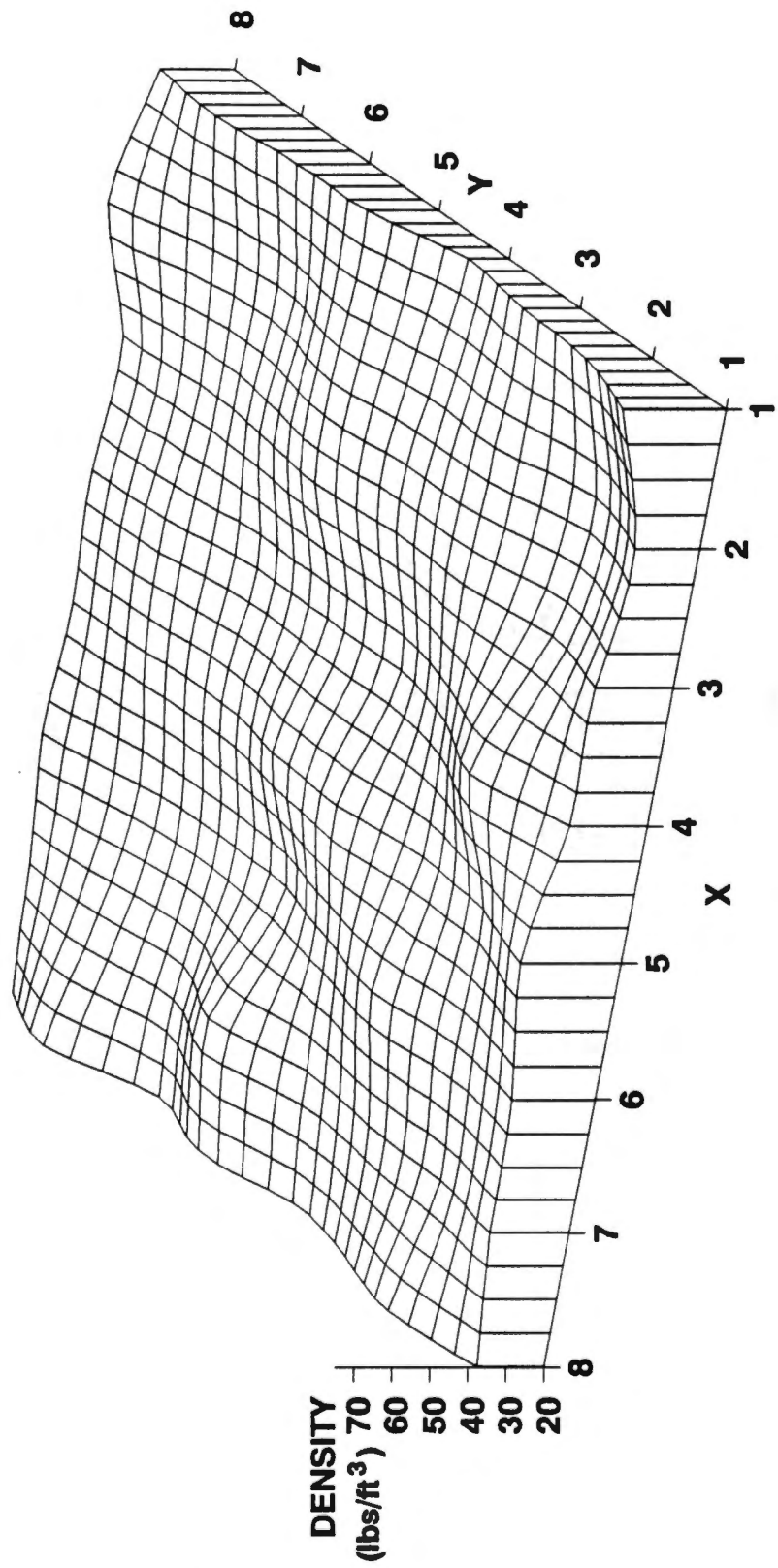
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=5



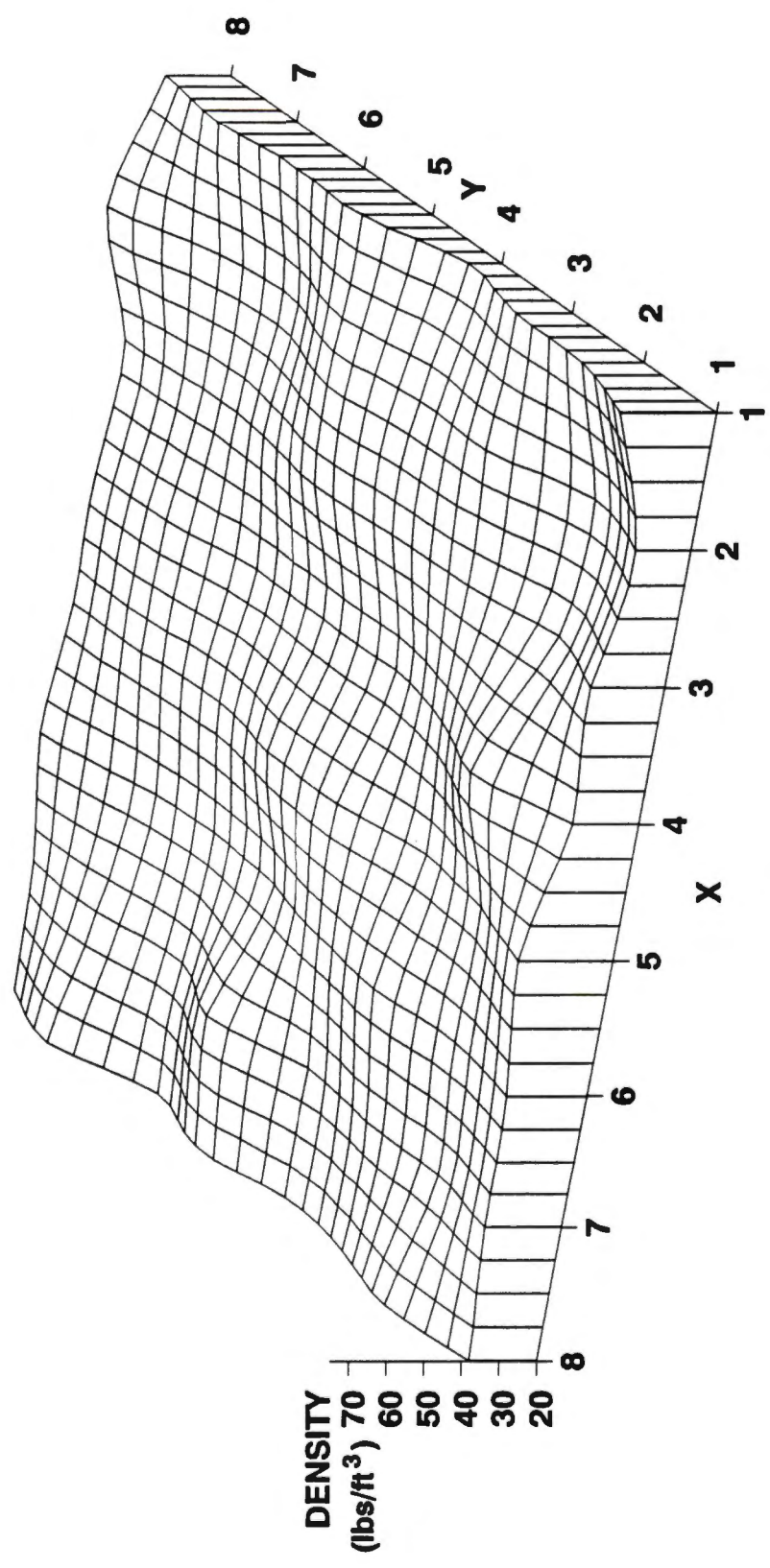
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 6



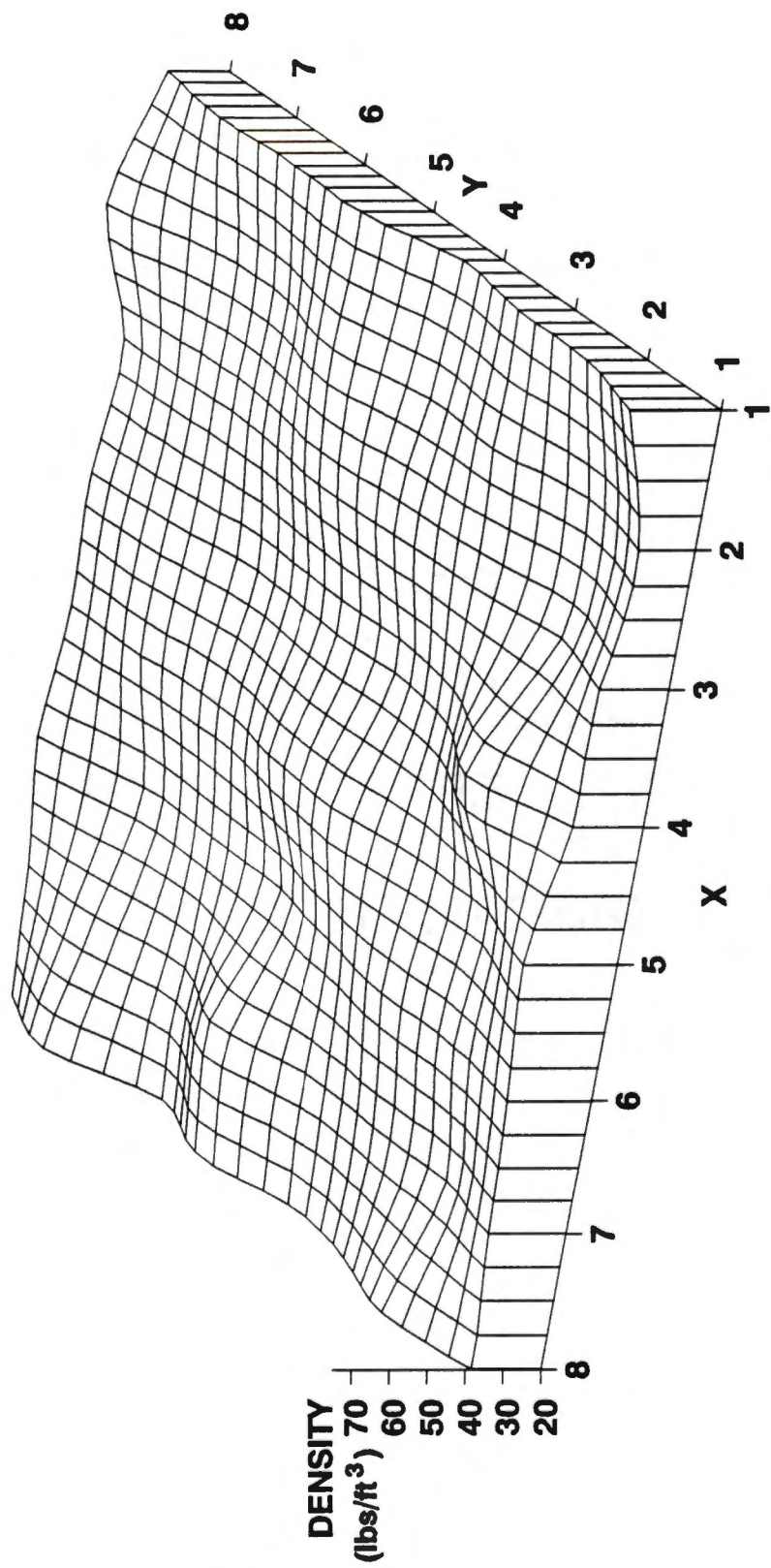
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 7



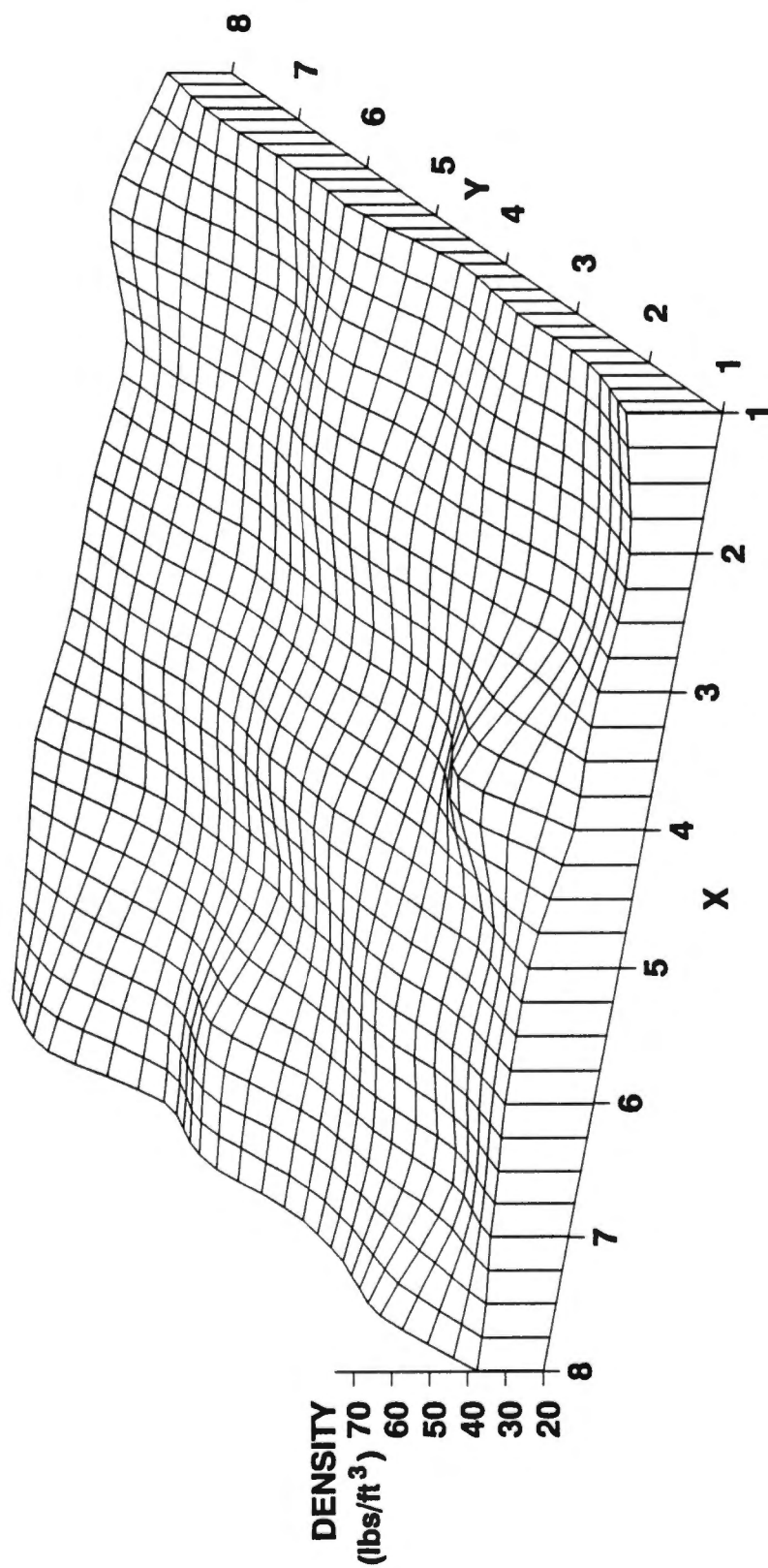
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 8



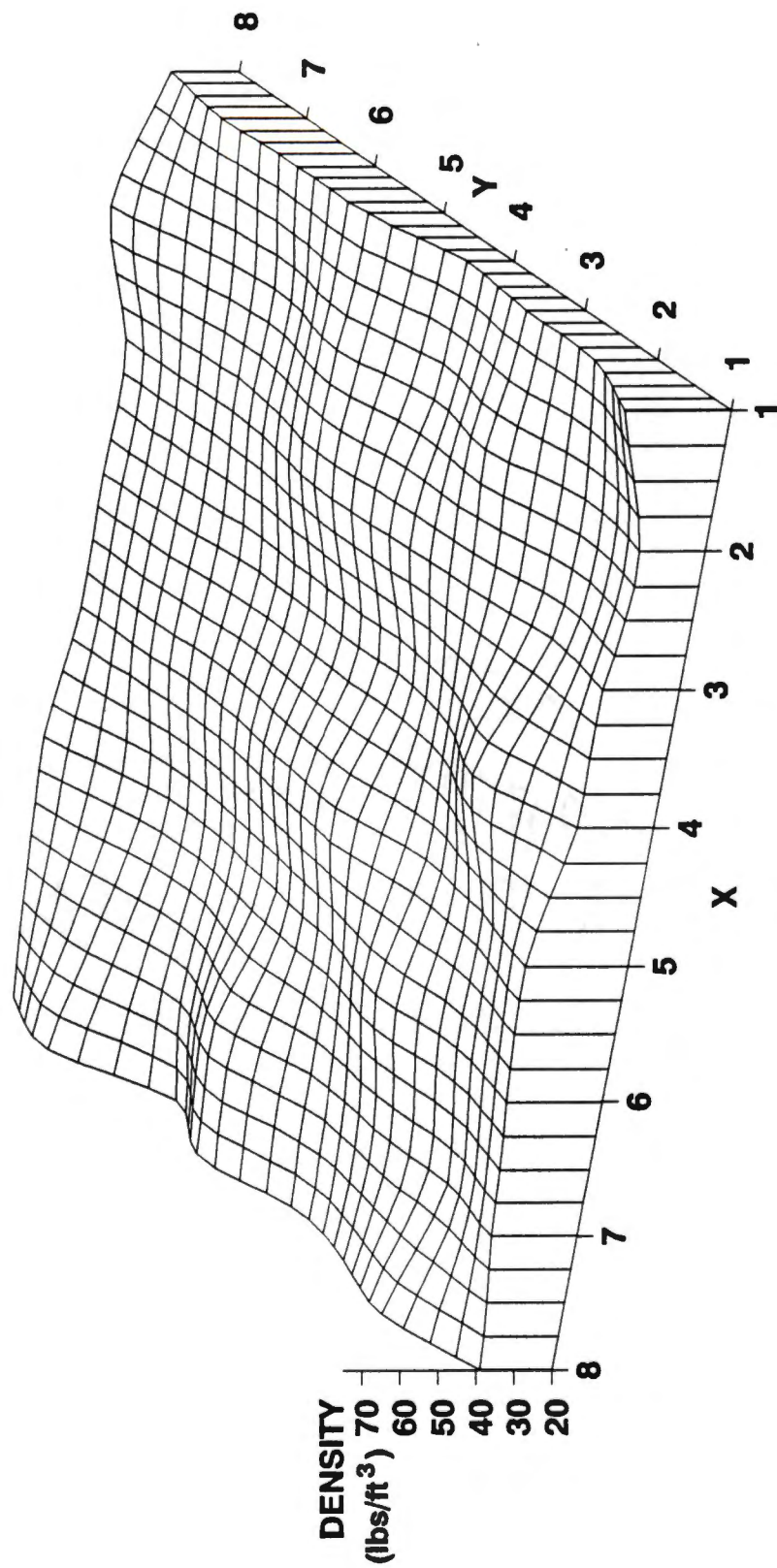
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=9



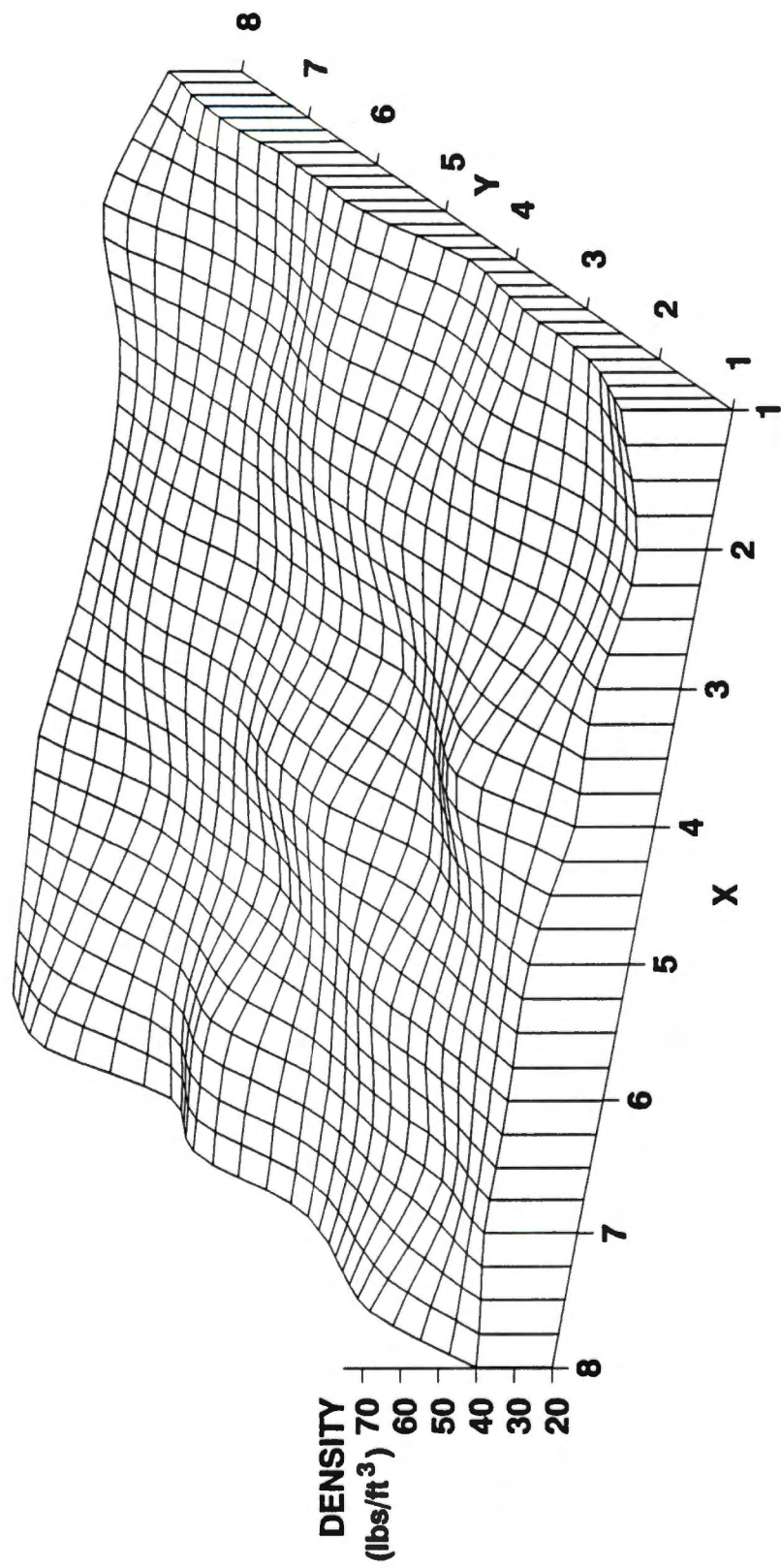
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 10



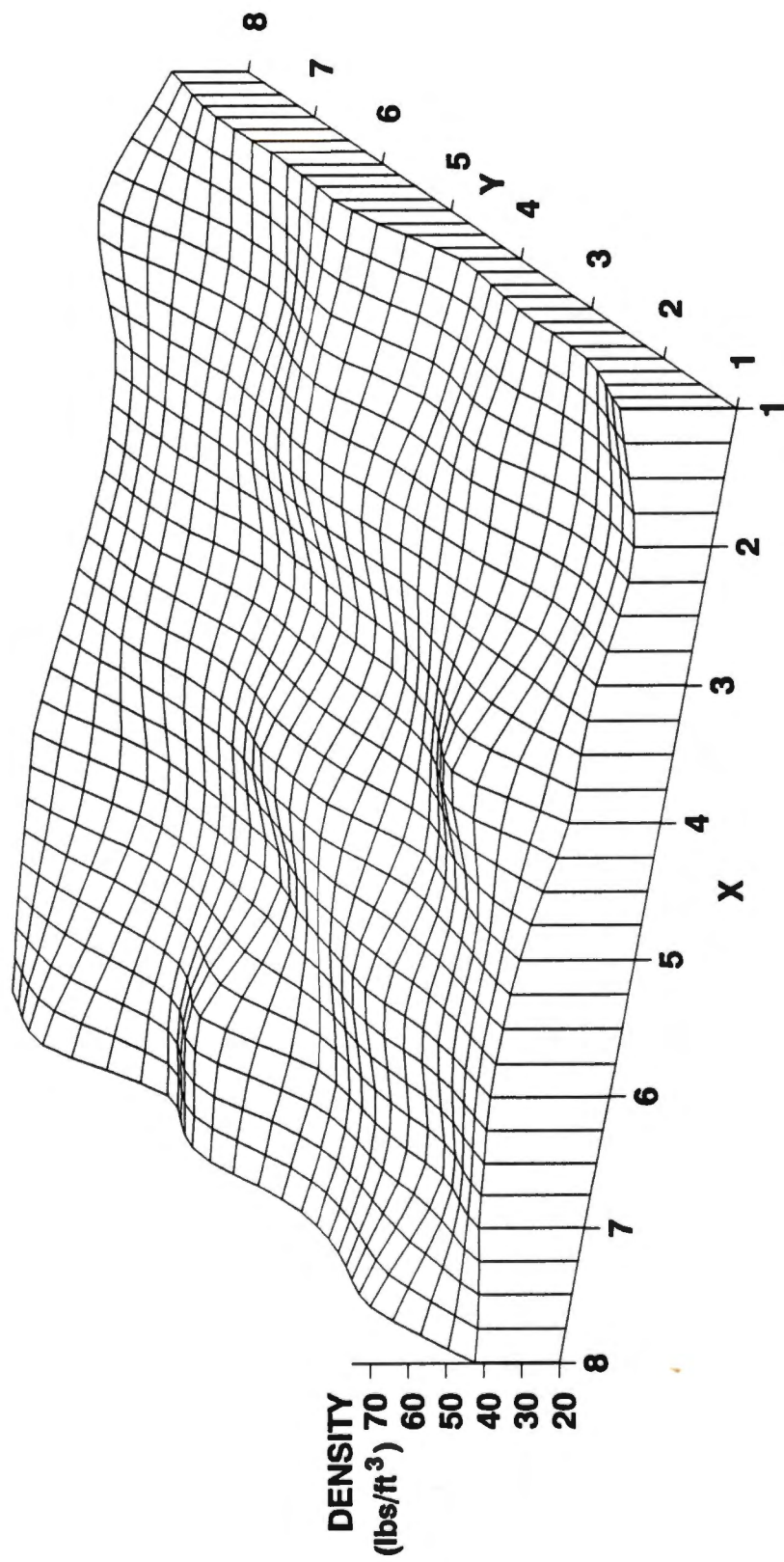
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 11



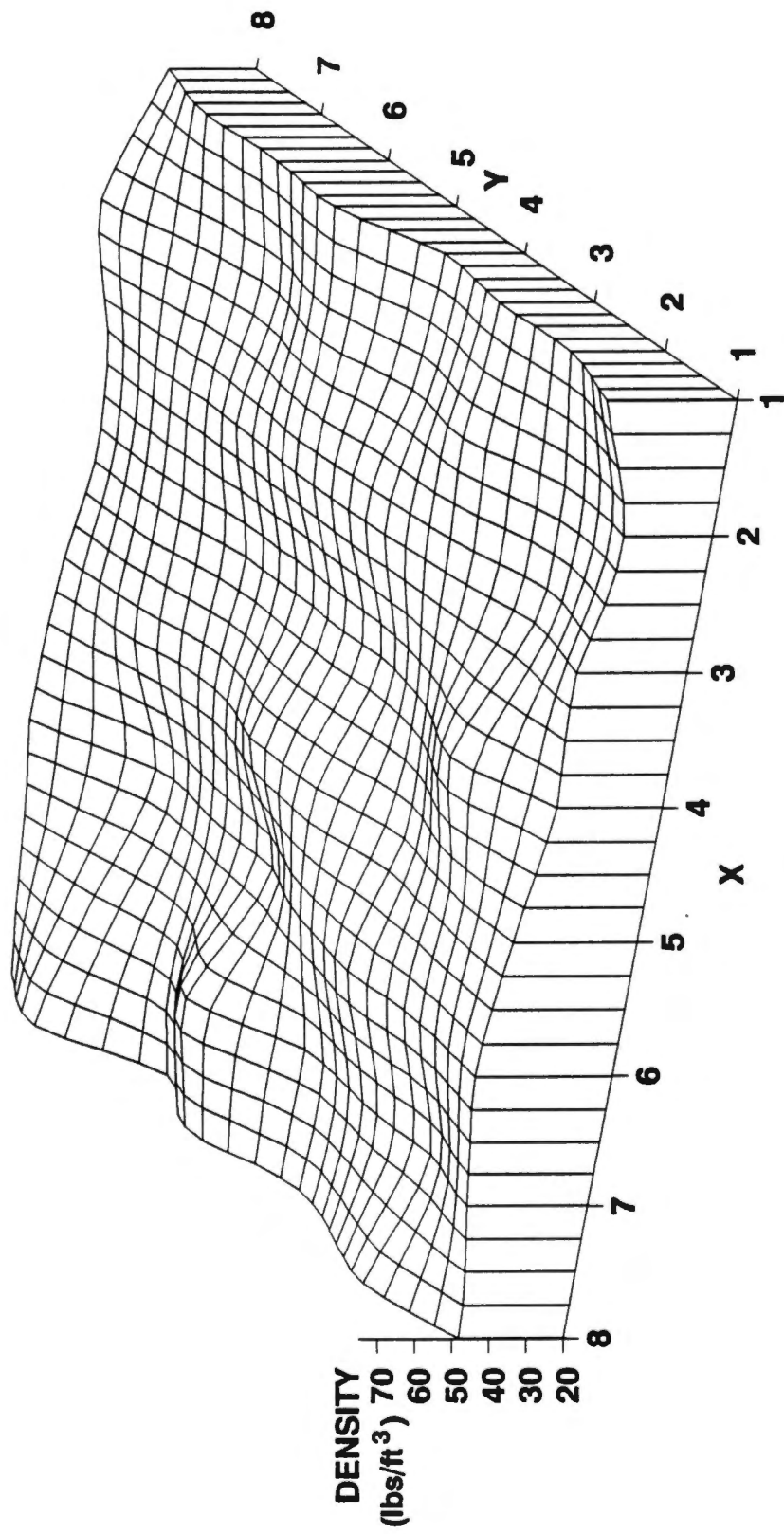
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 12



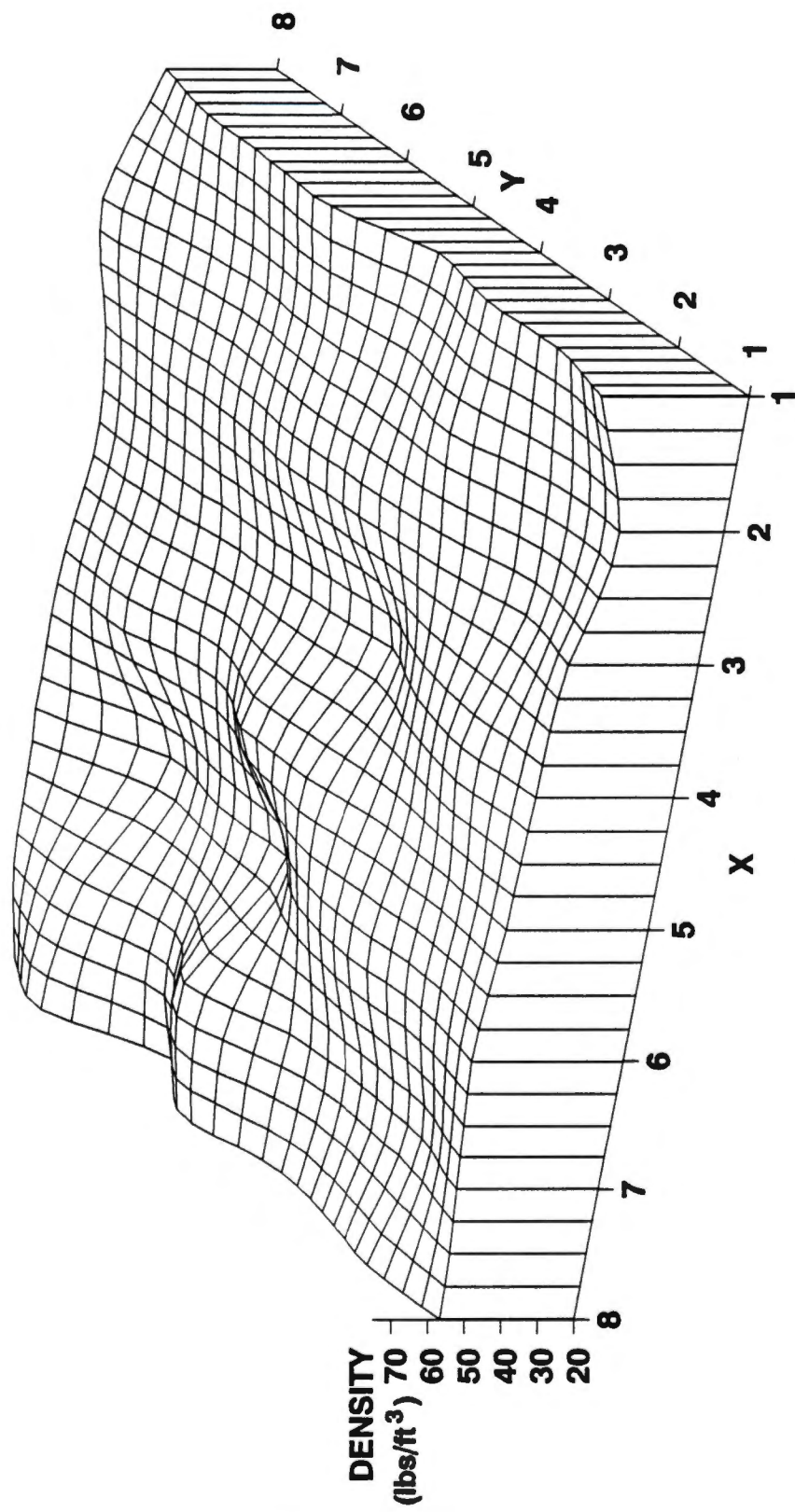
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=13



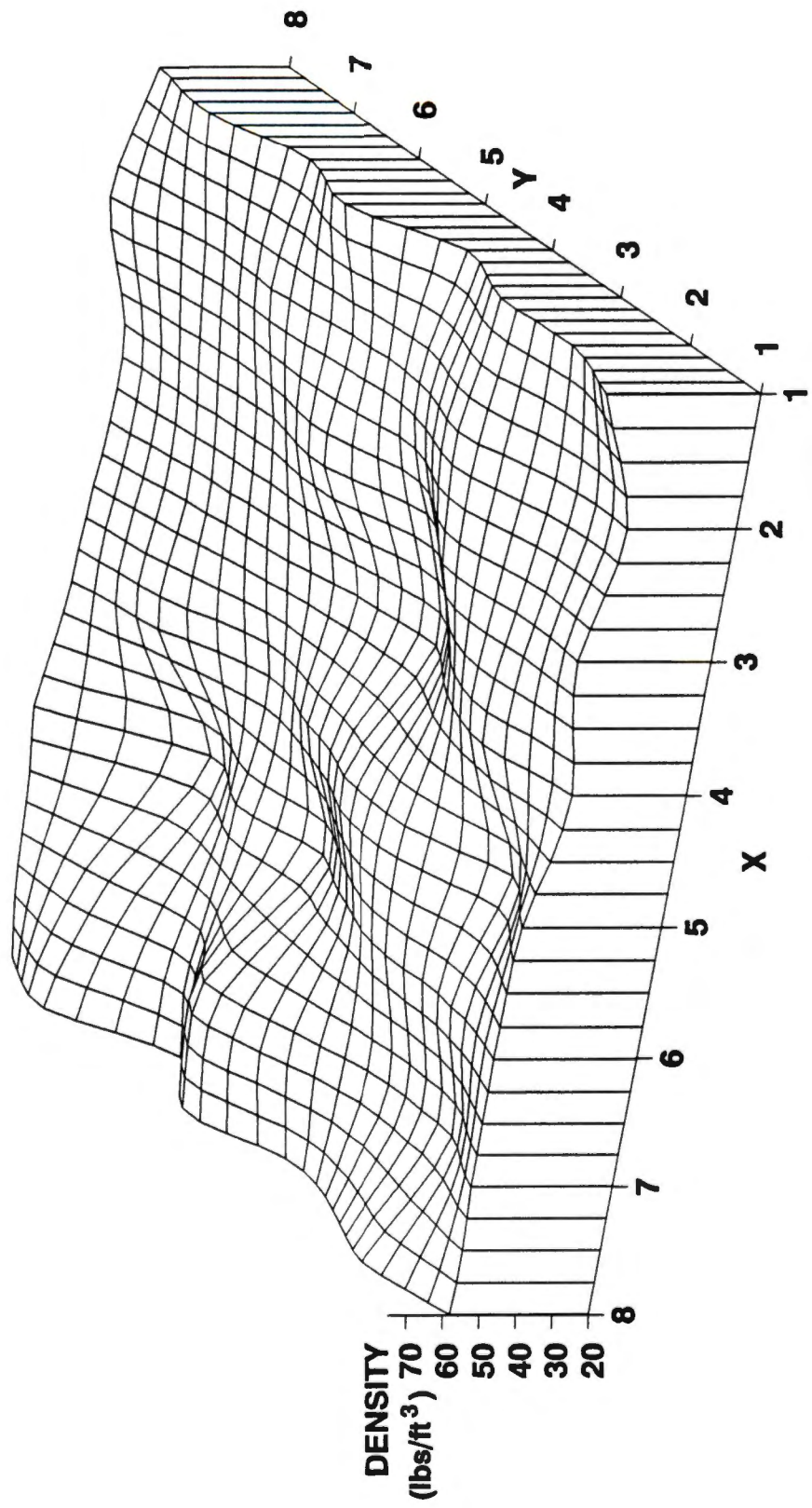
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 14



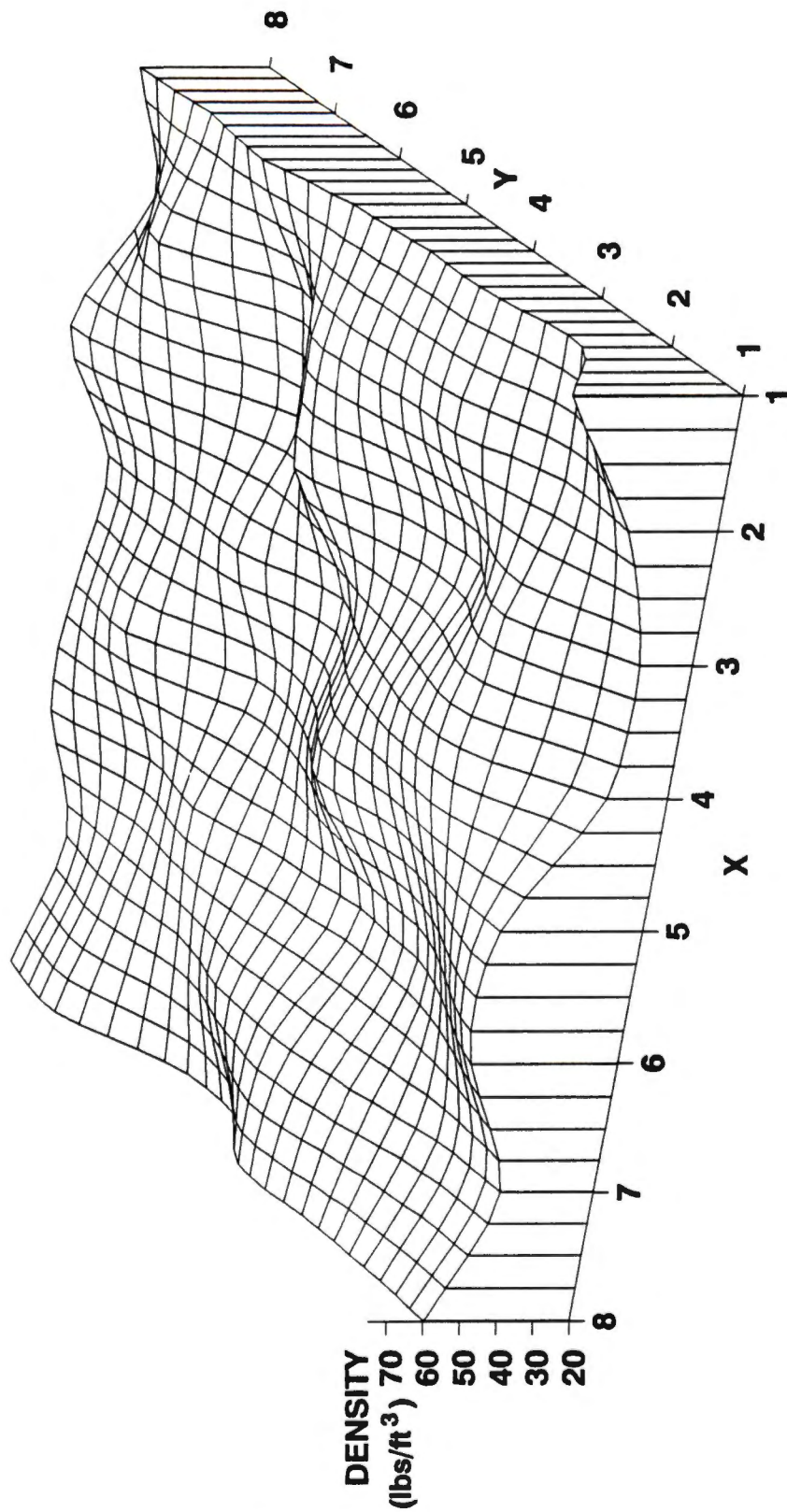
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=1
Z=15



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 1
Z = 16



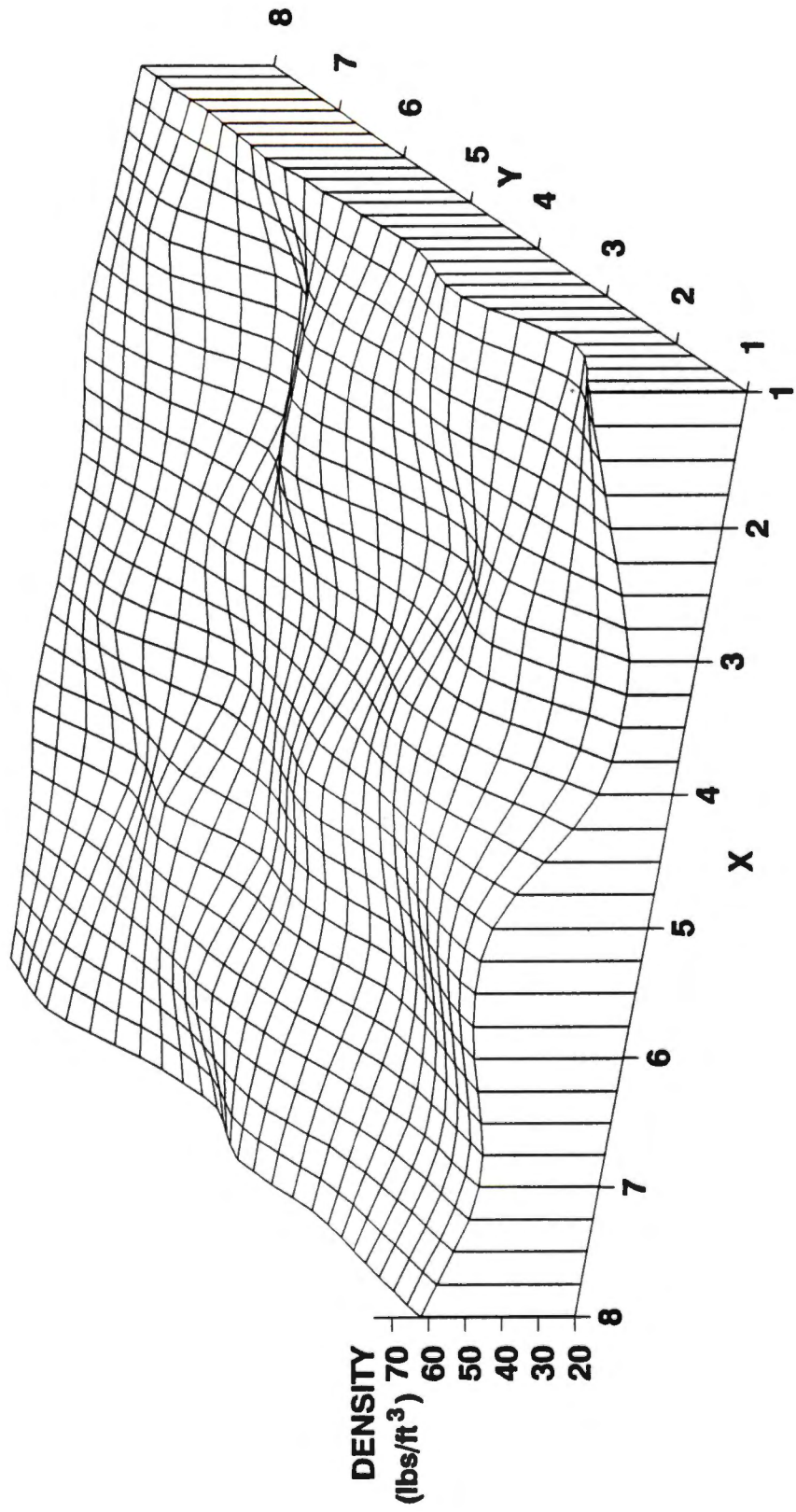
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 1



FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =60 SECONDS

REPLICATION =2

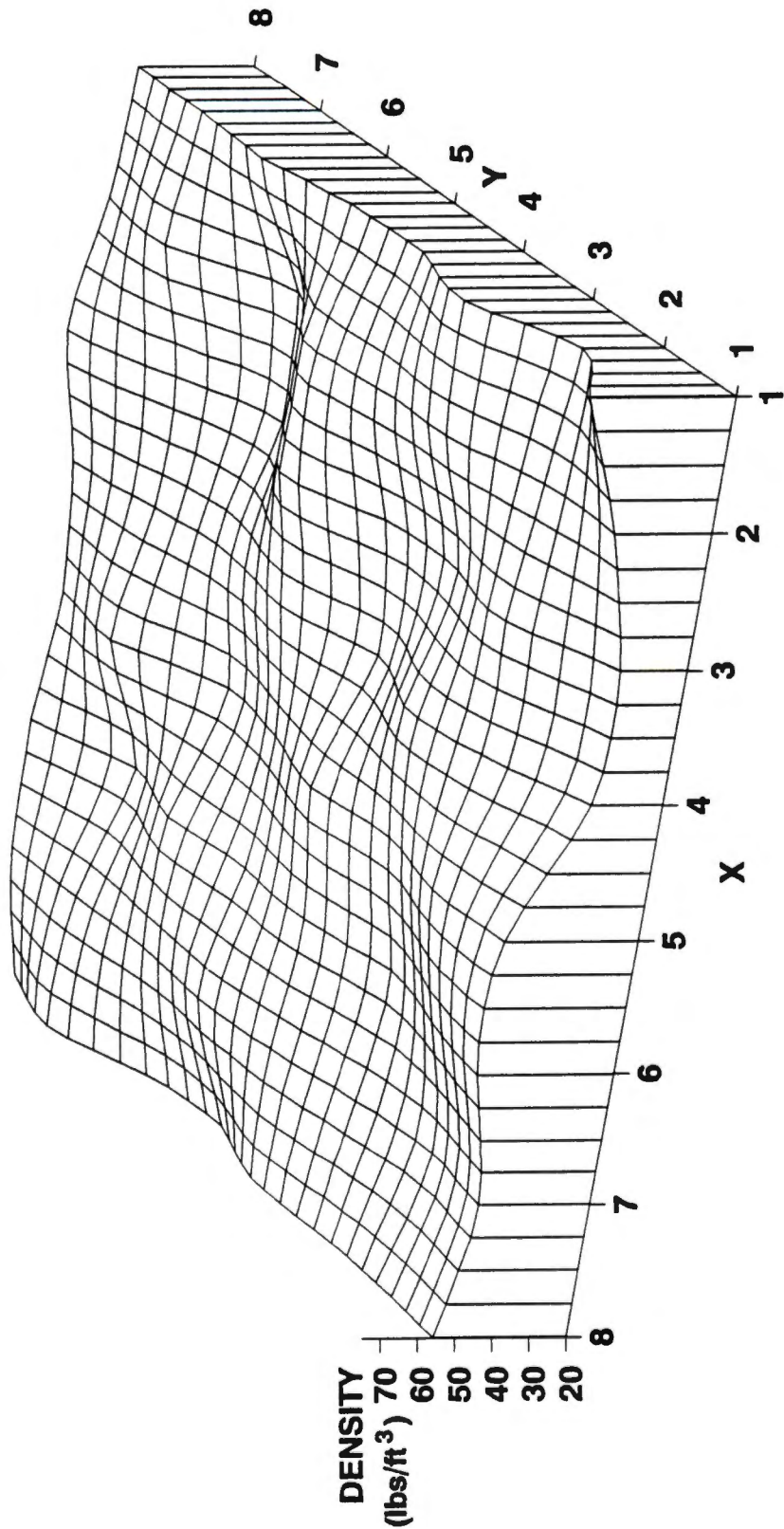
Z=2



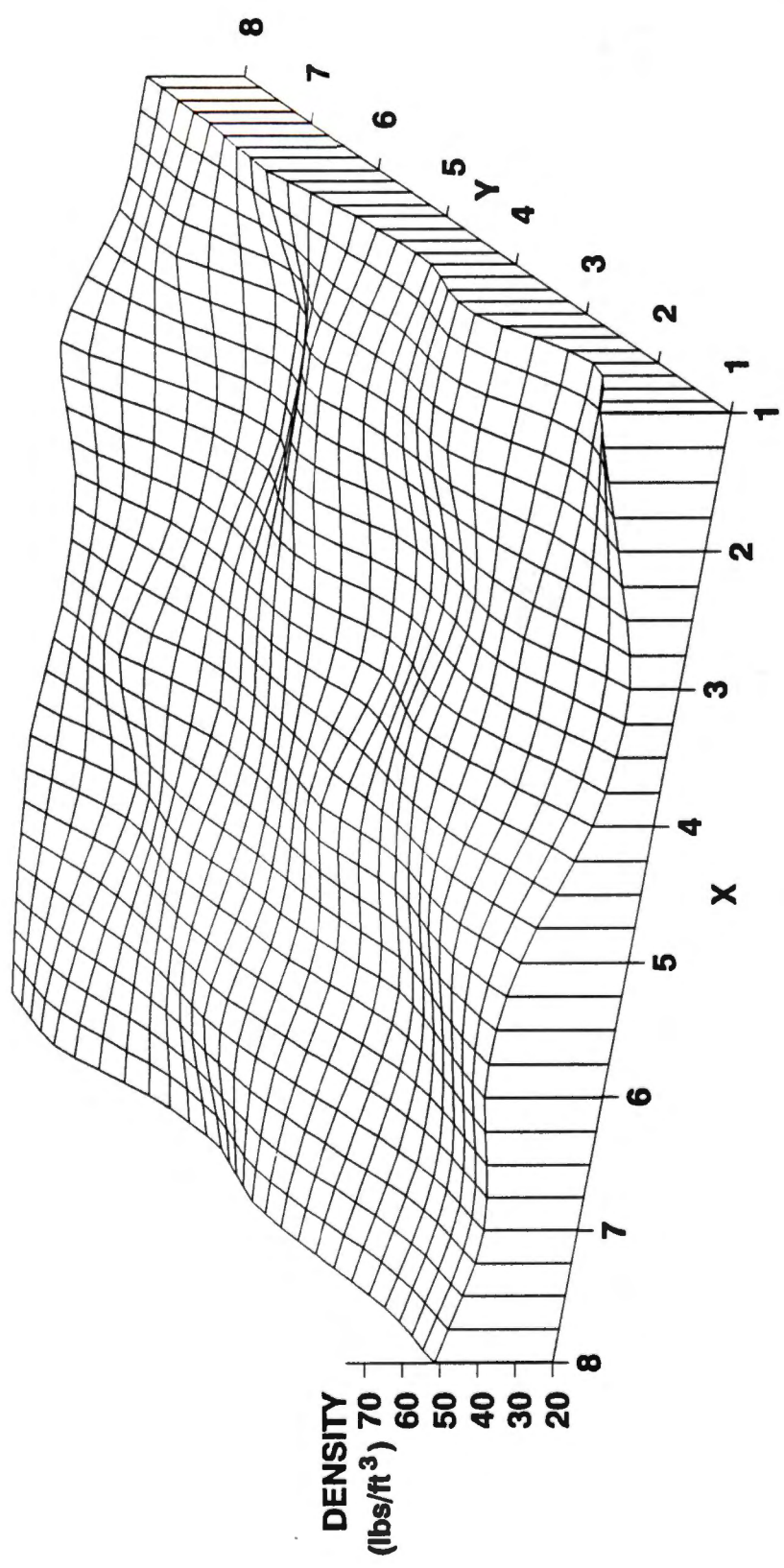
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

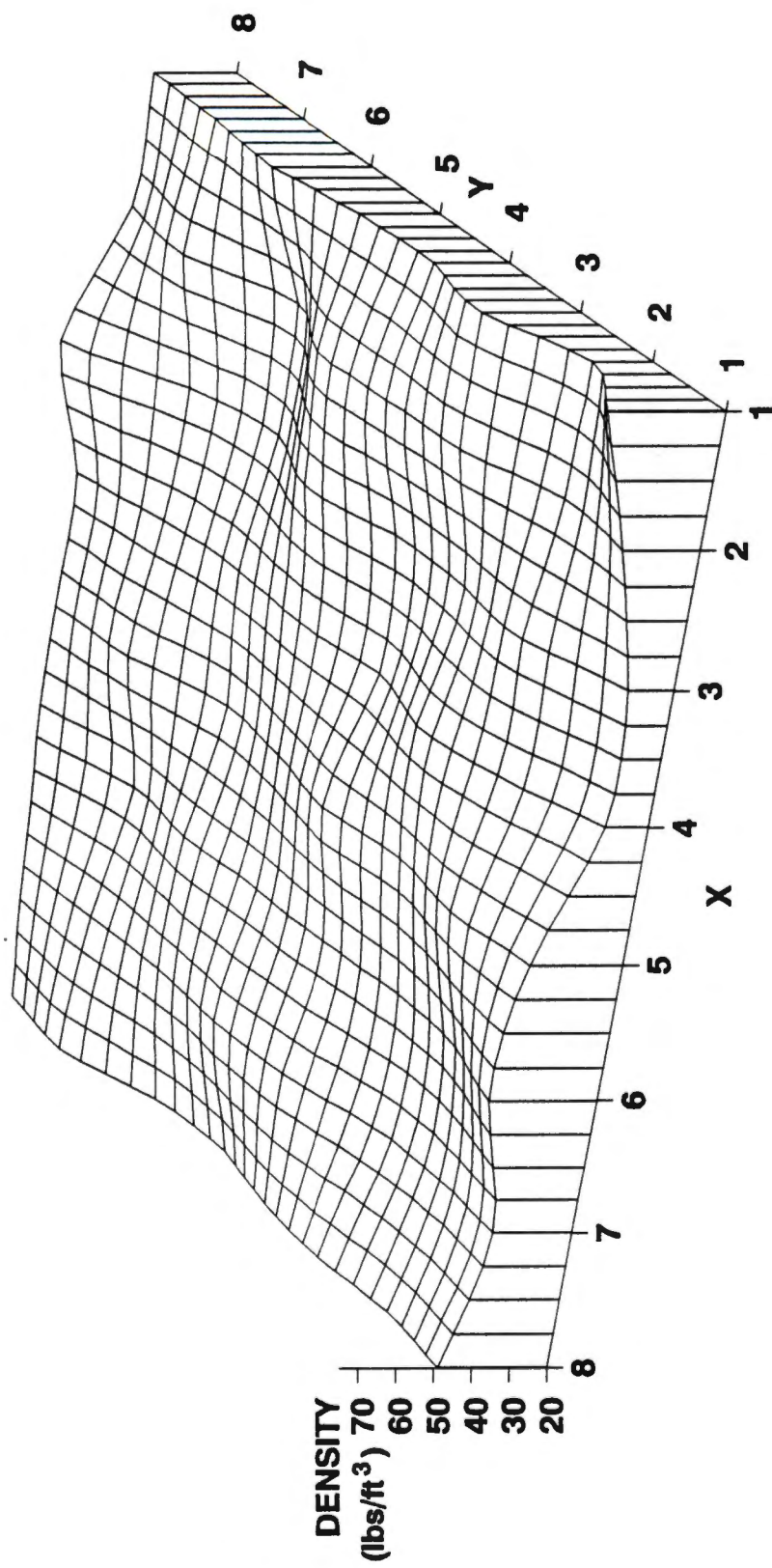
Z = 3



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 4



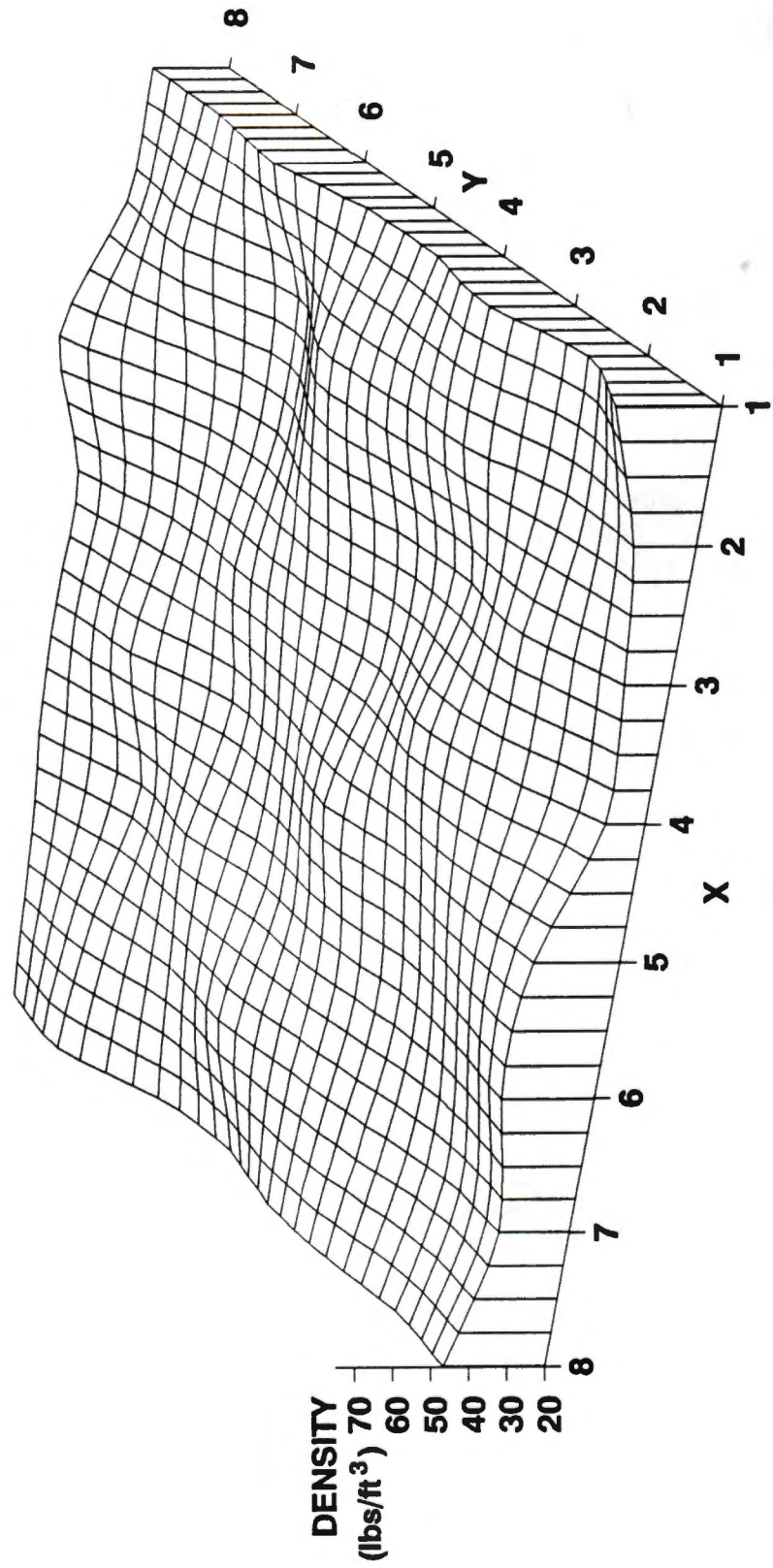
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 5



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

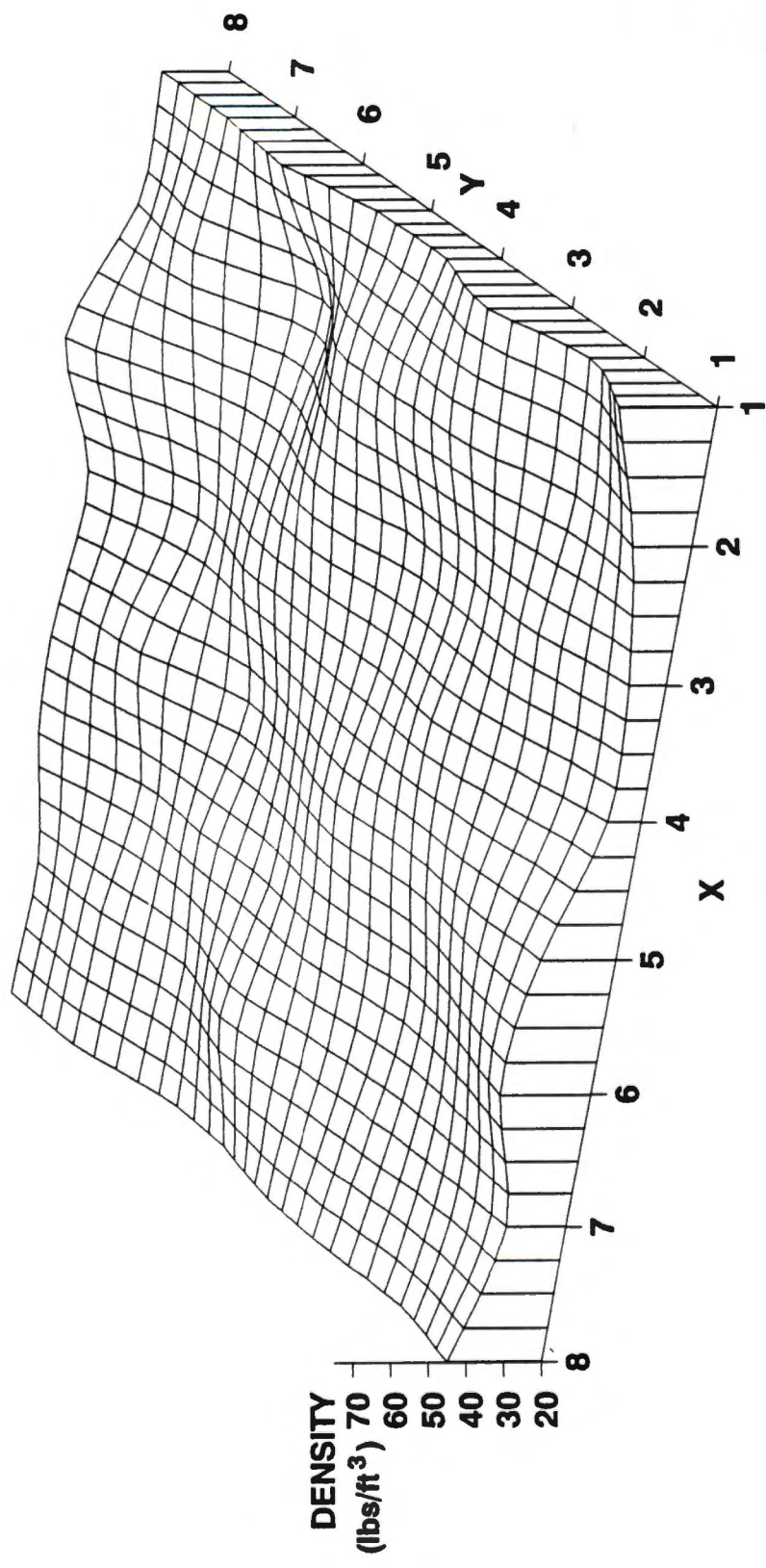
Z = 6



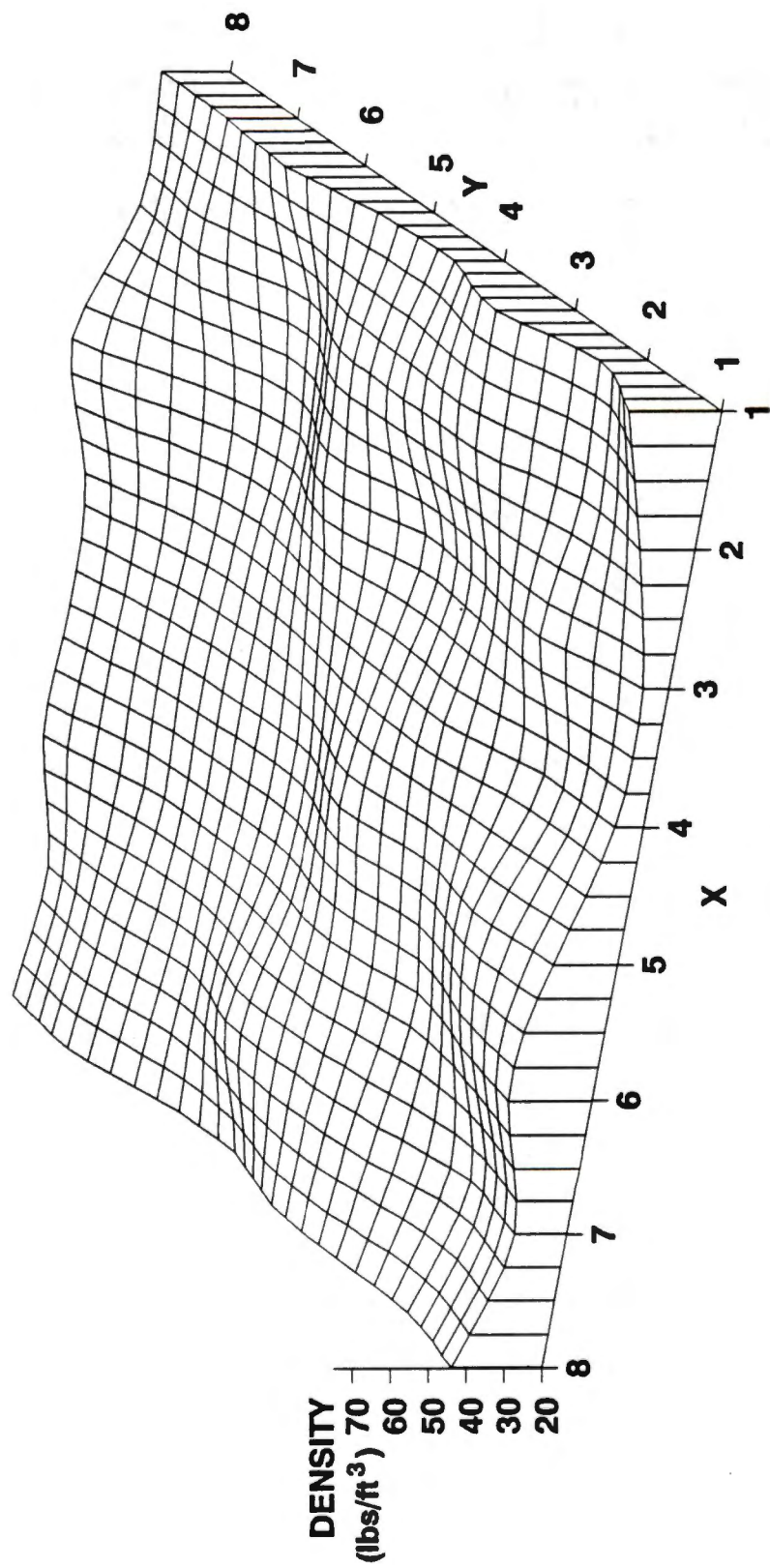
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

Z = 7



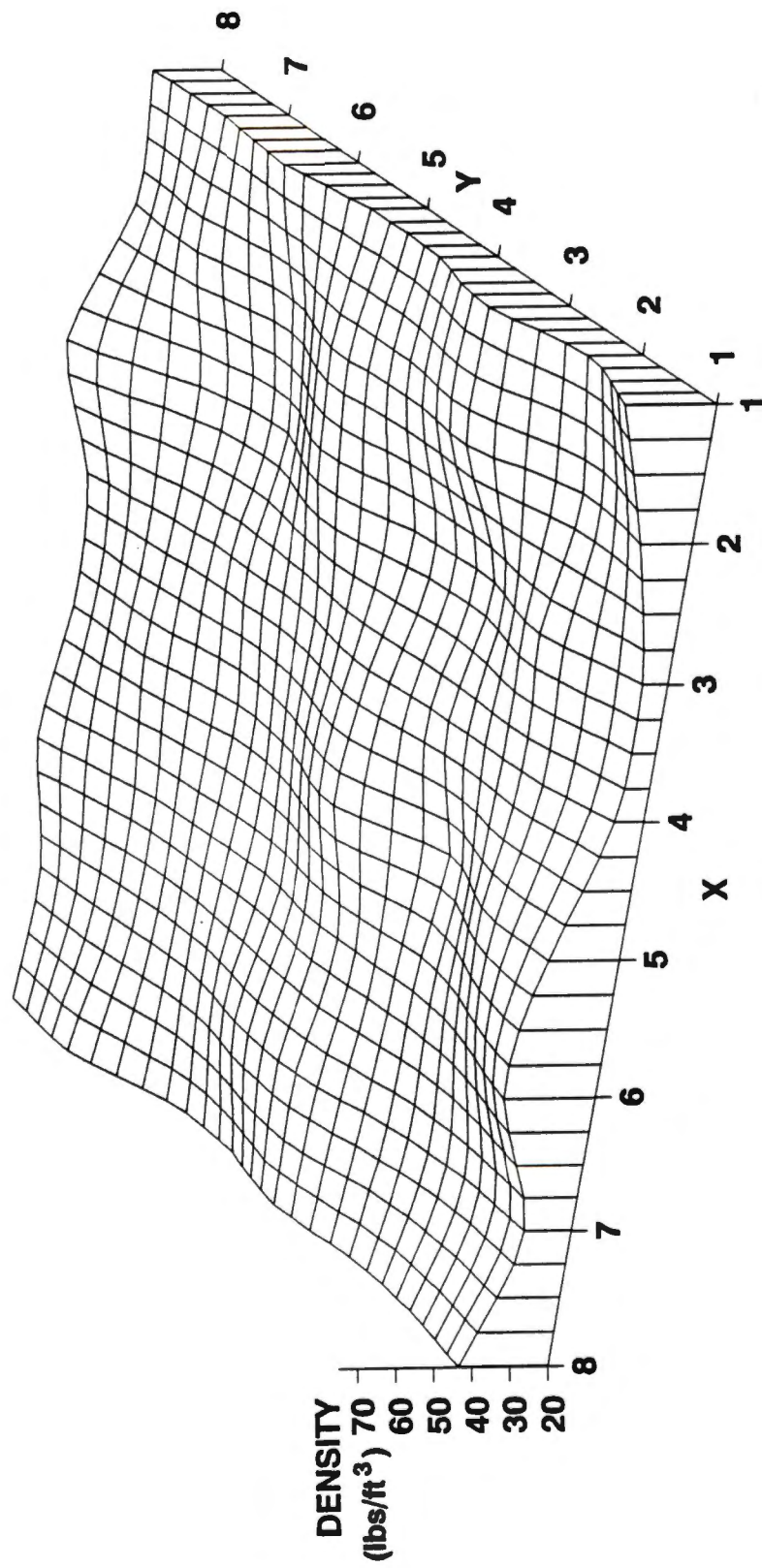
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=2
Z=8



FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE=60 SECONDS

REPLICATION=2

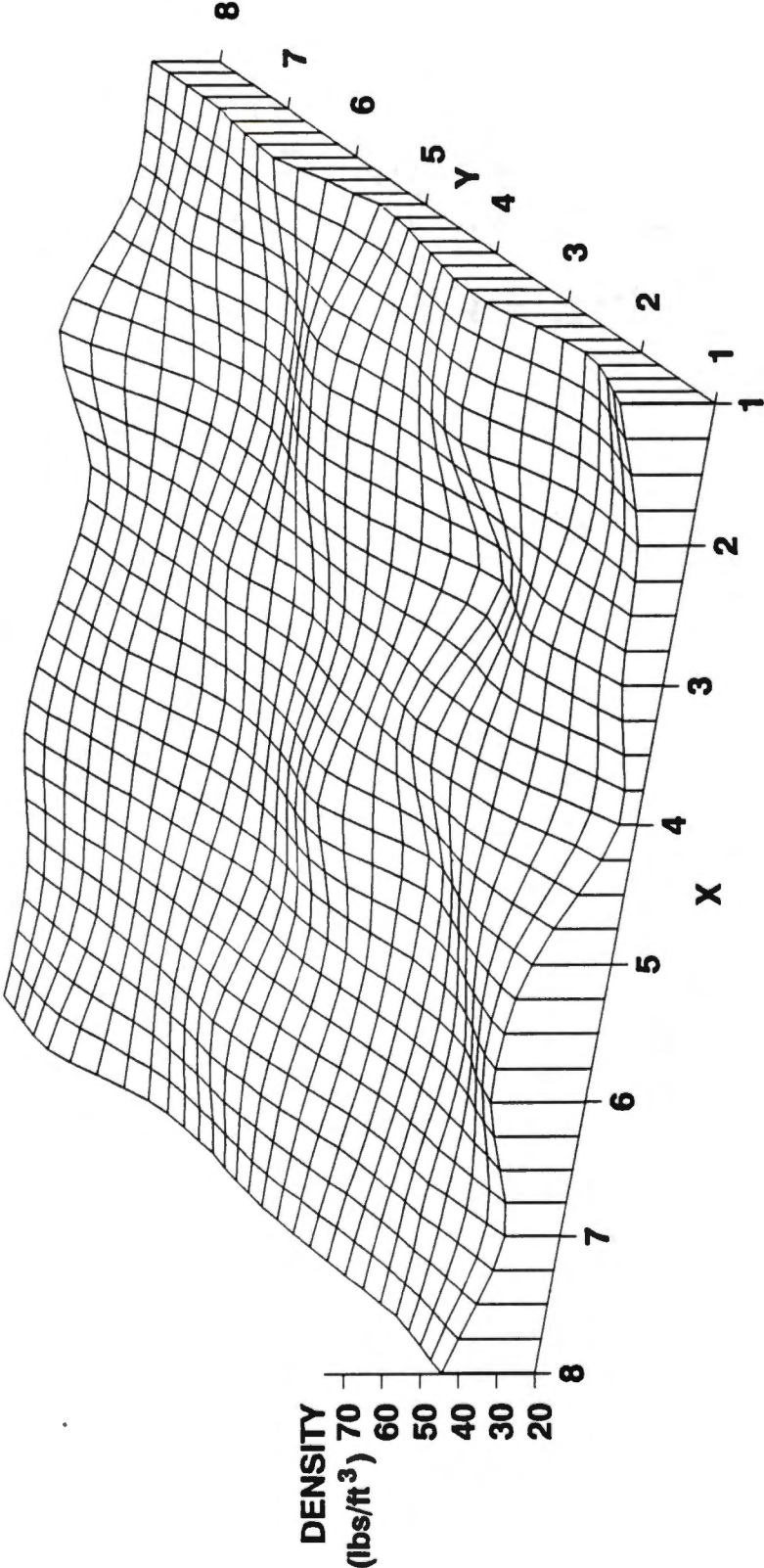
Z=9



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

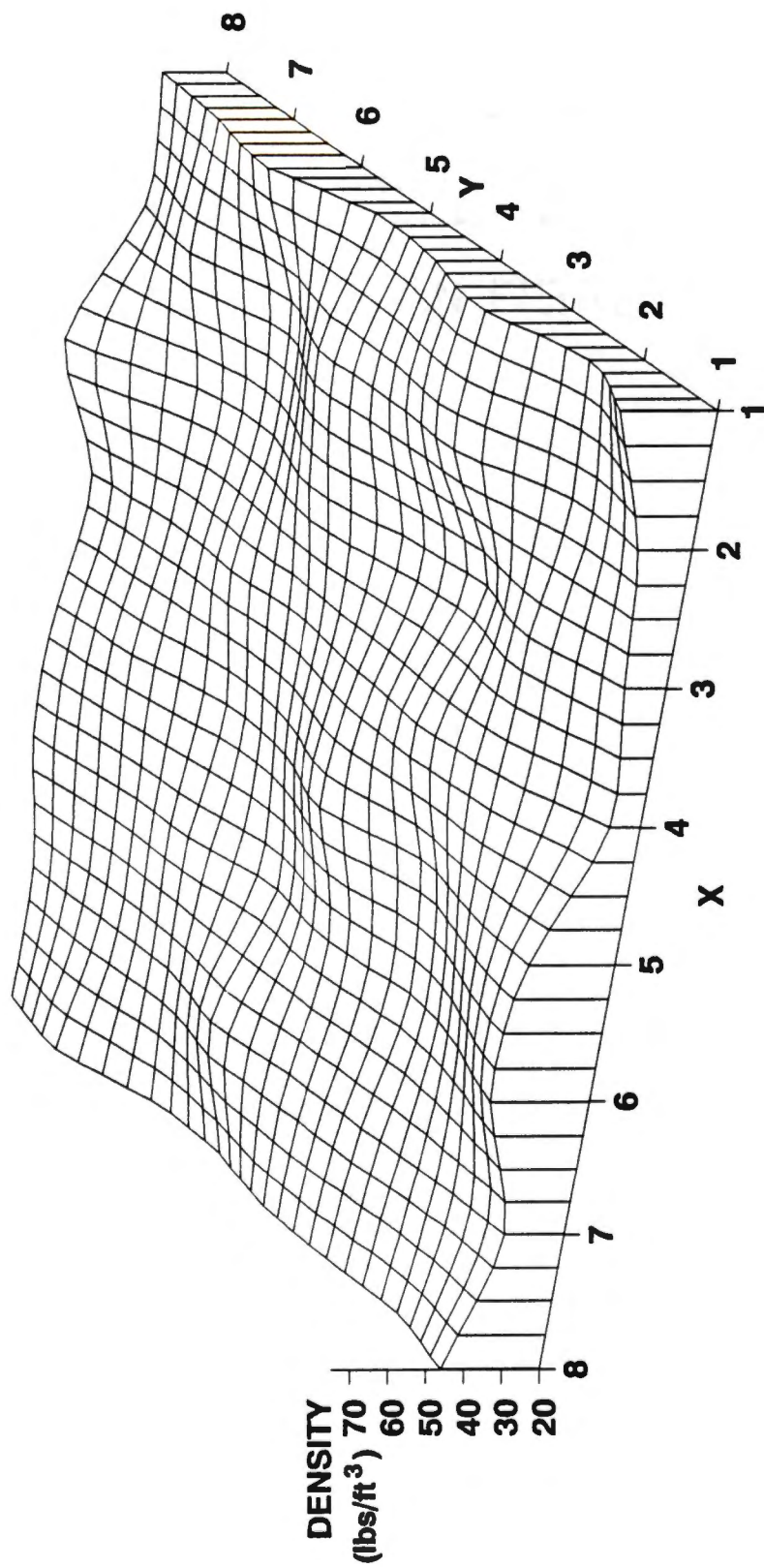
Z = 10



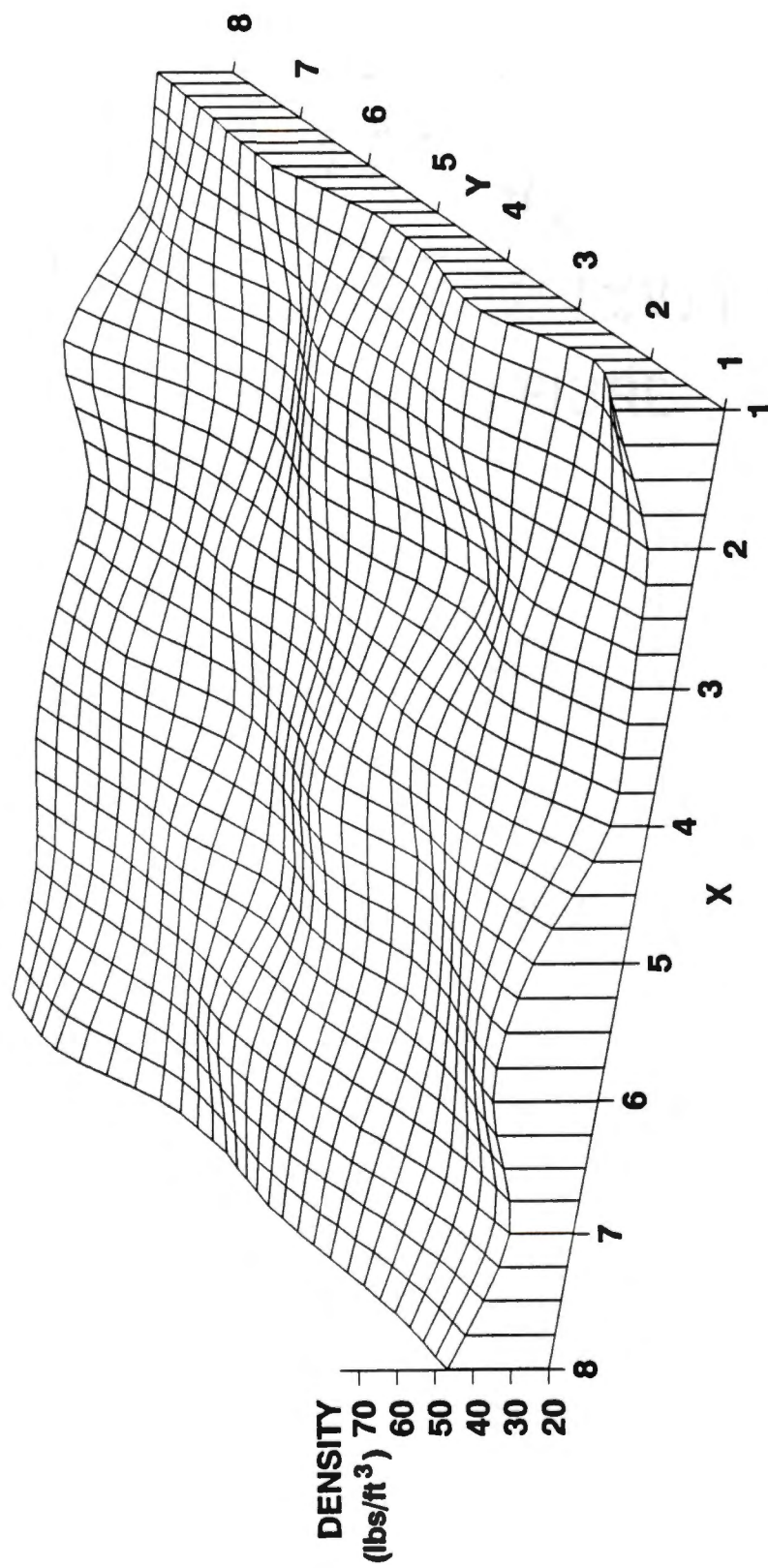
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

Z = 11



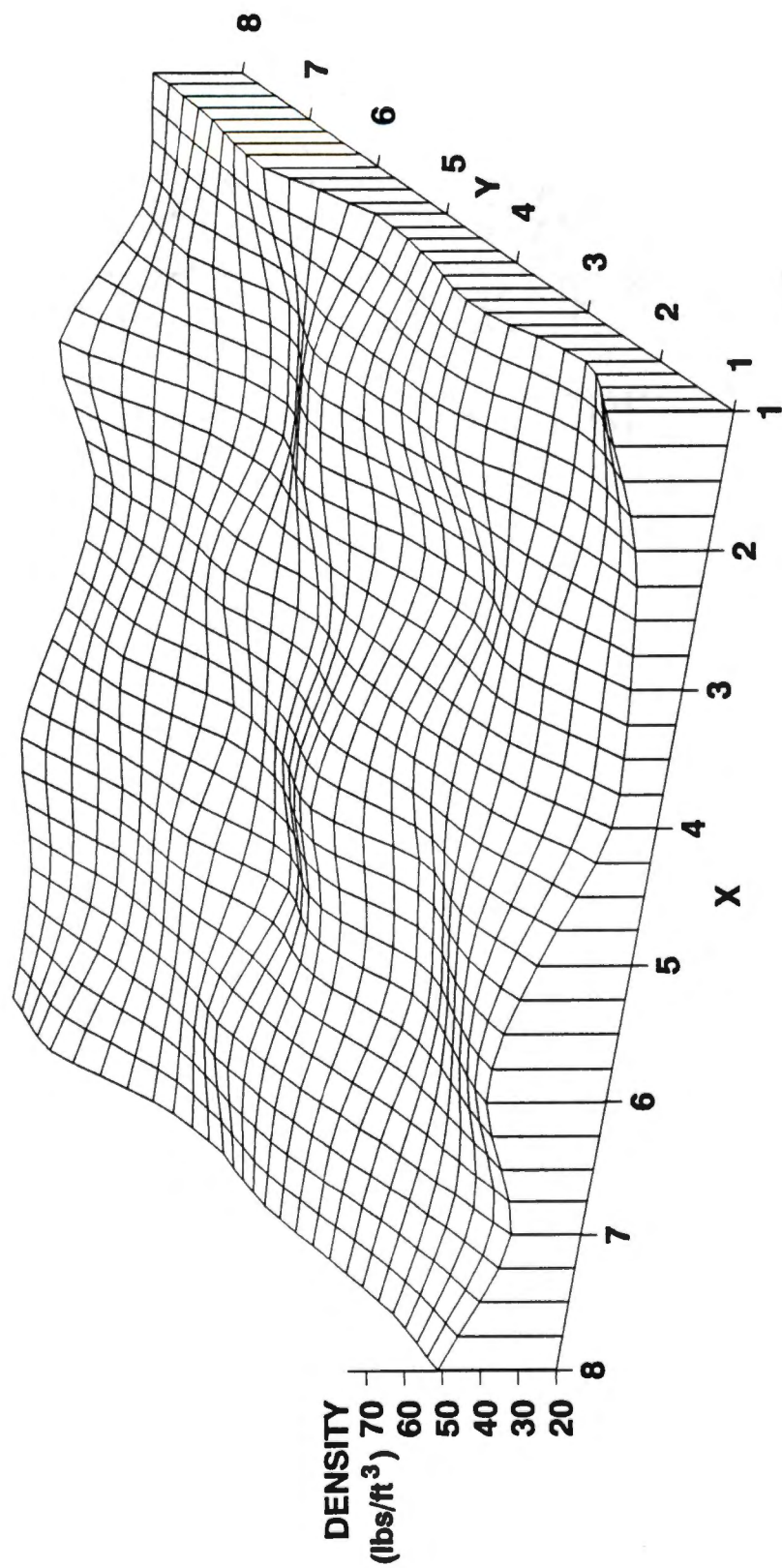
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 12



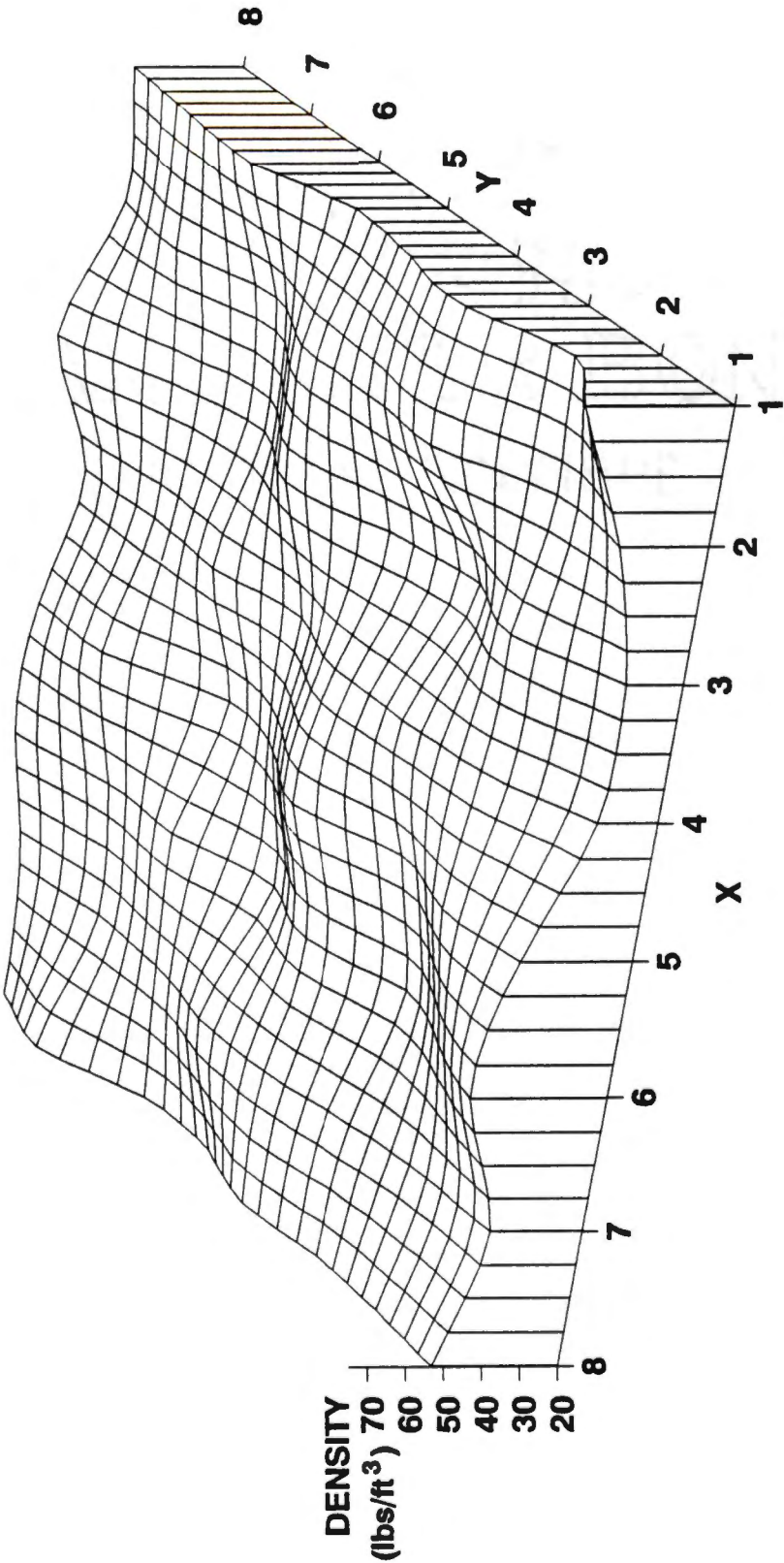
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 2

Z = 13

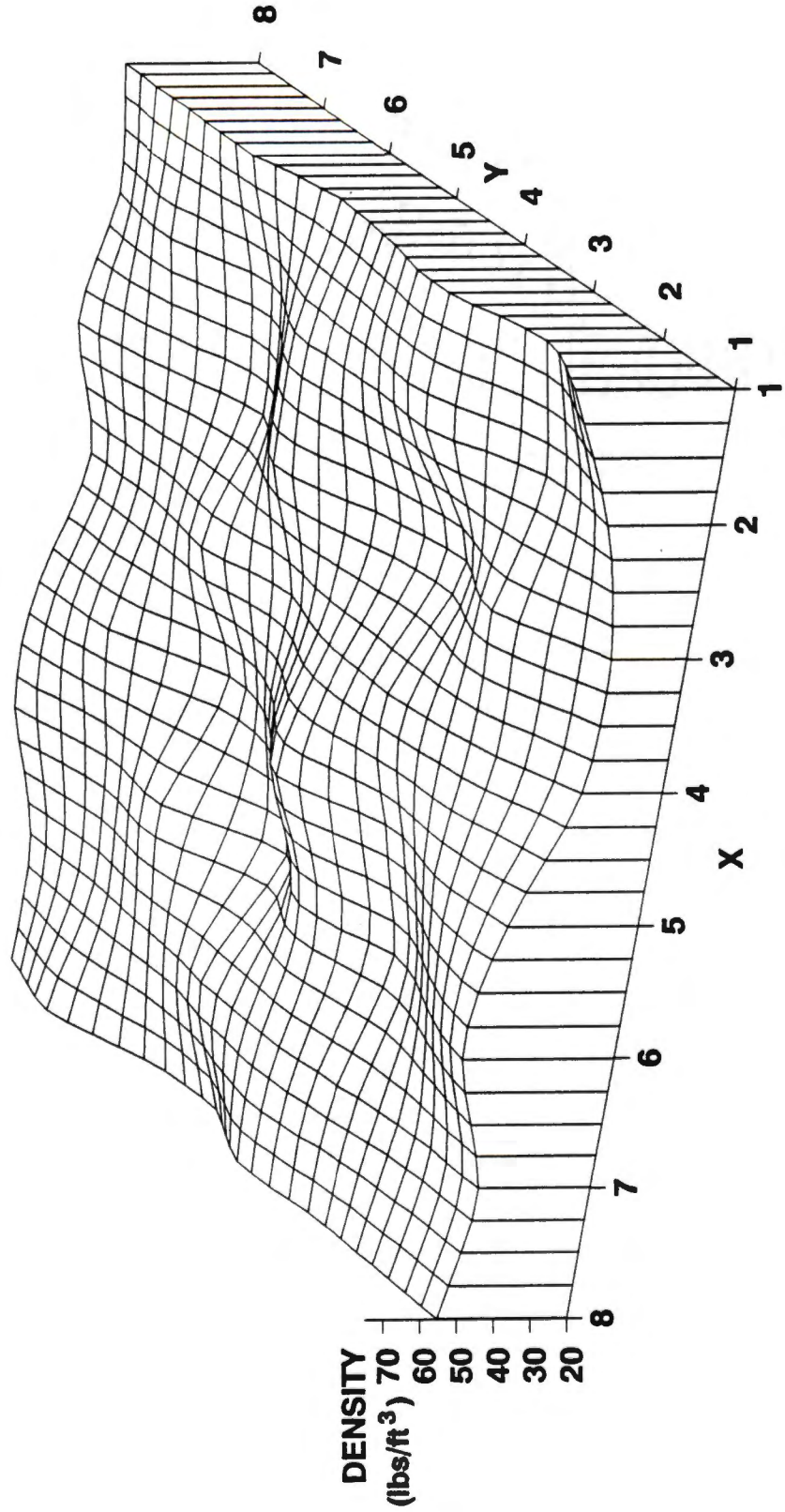


FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 14

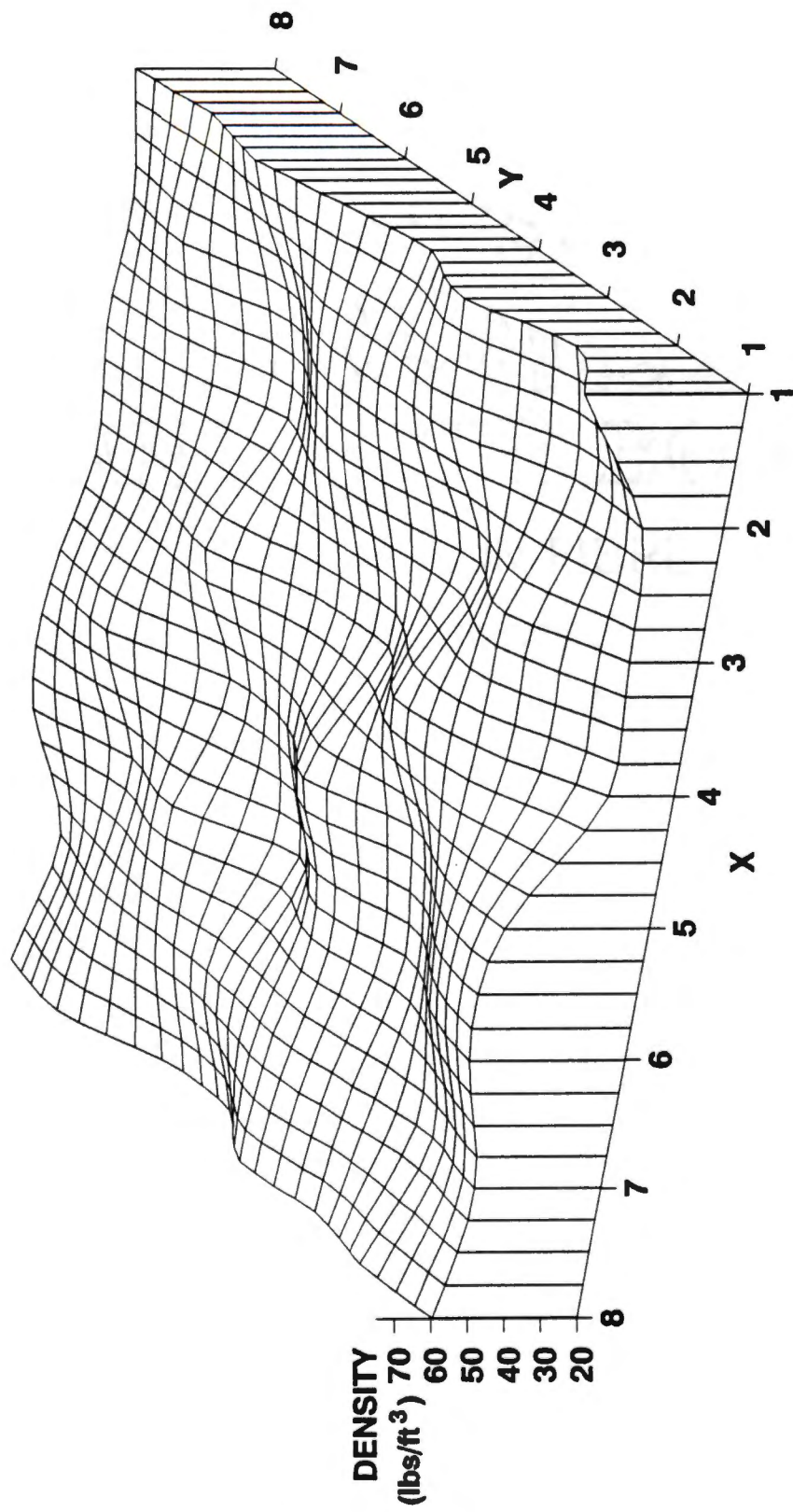


FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2

Z = 15



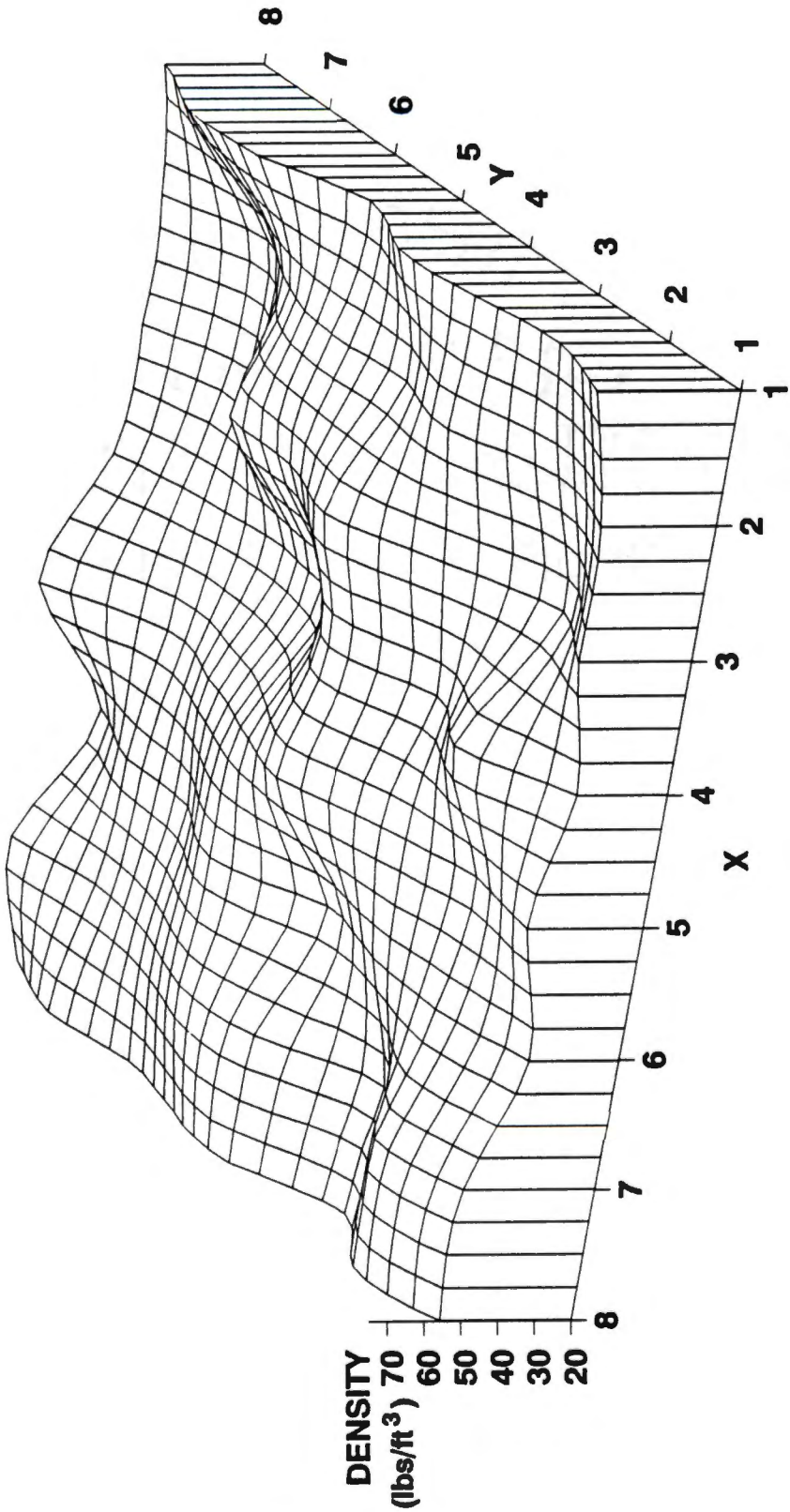
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 2
Z = 16



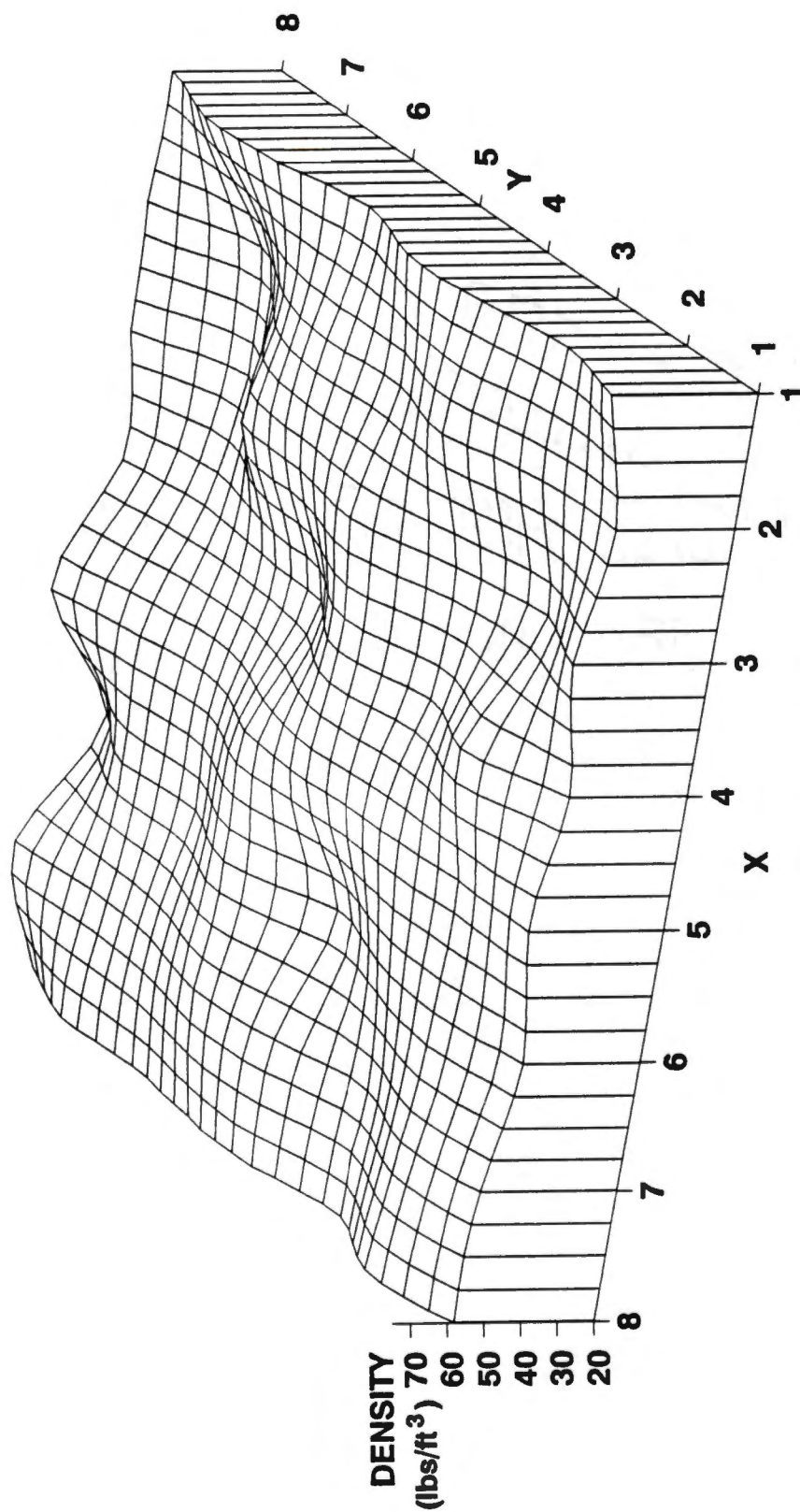
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 3

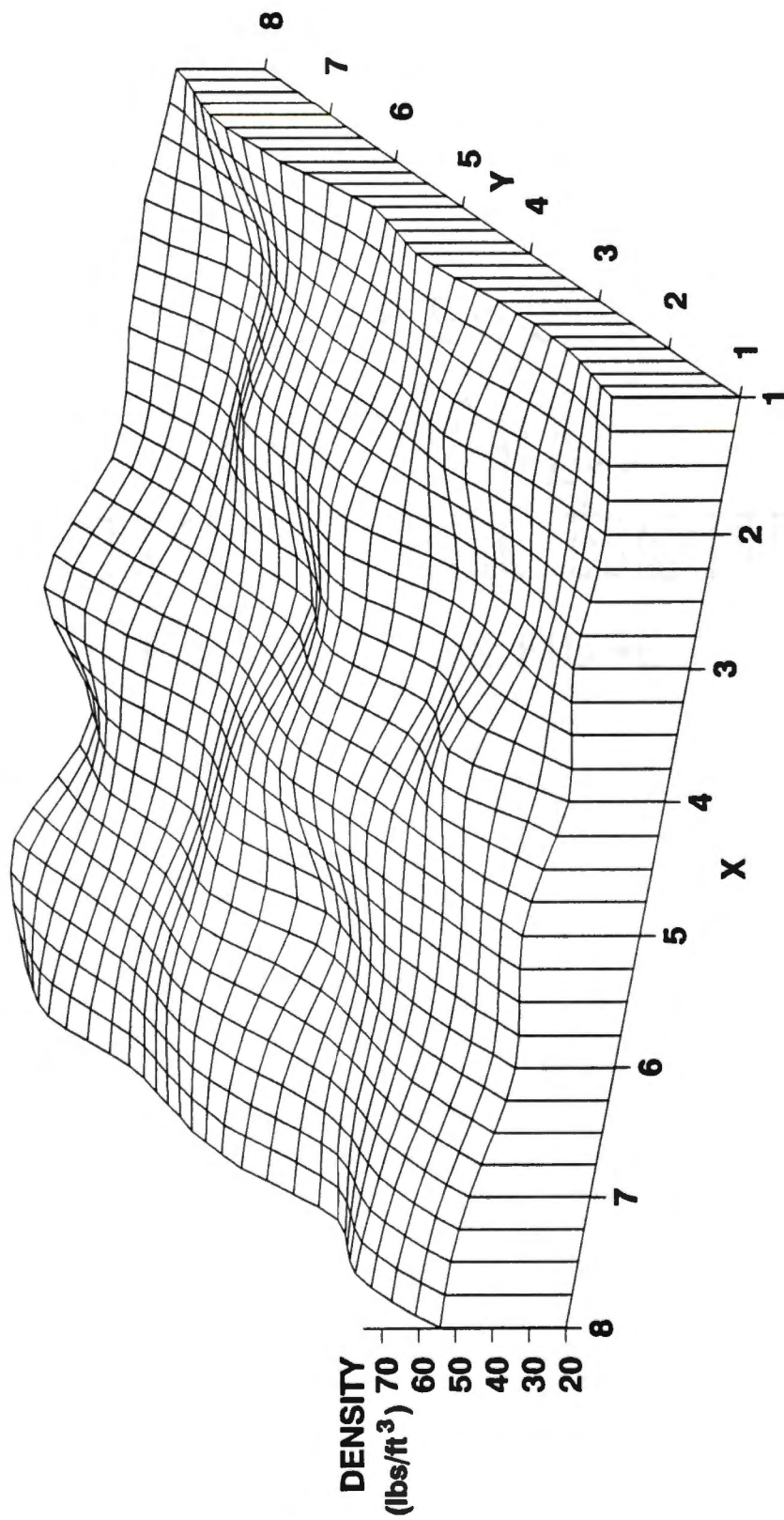
Z = 1



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 2



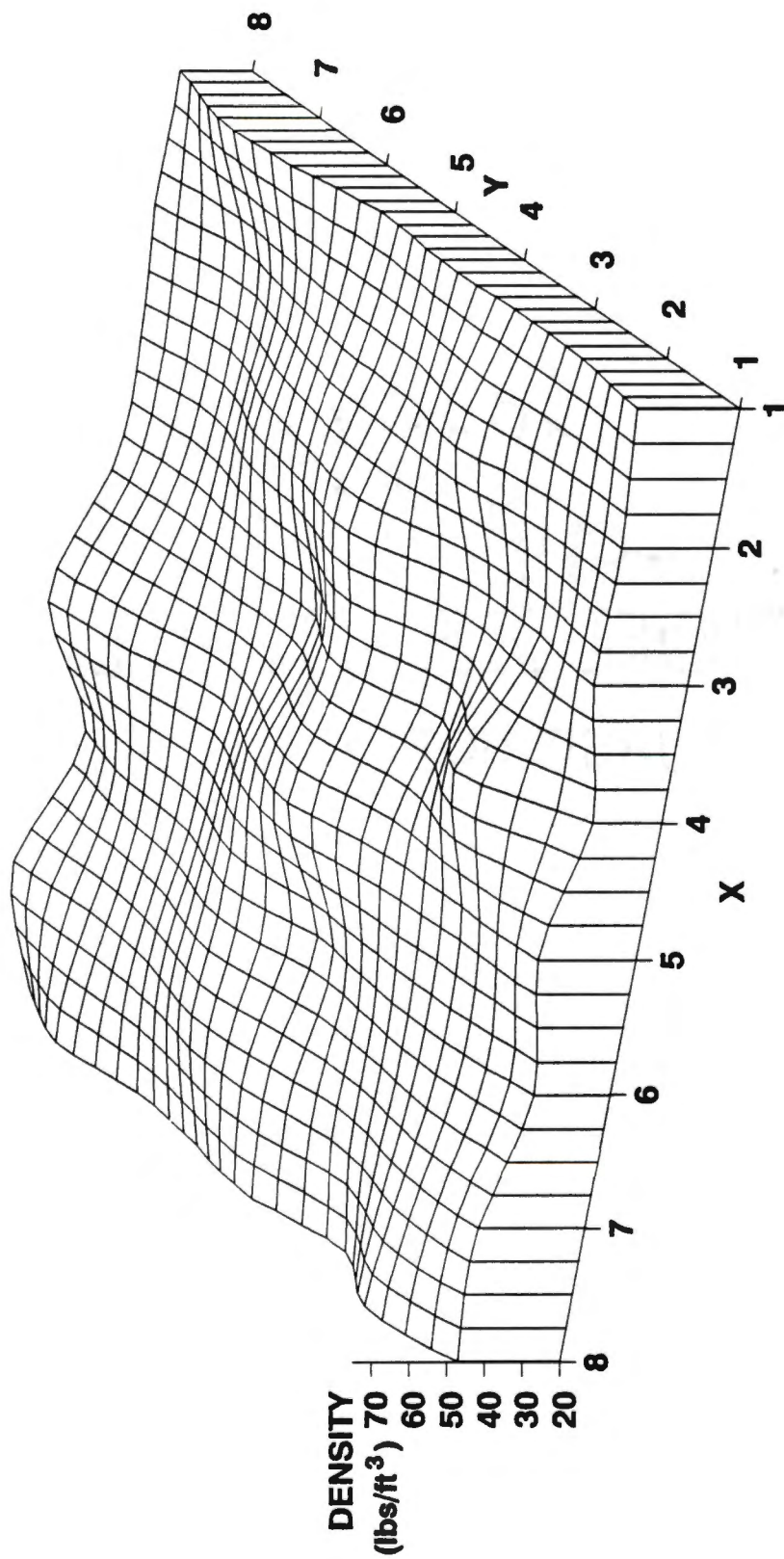
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 3



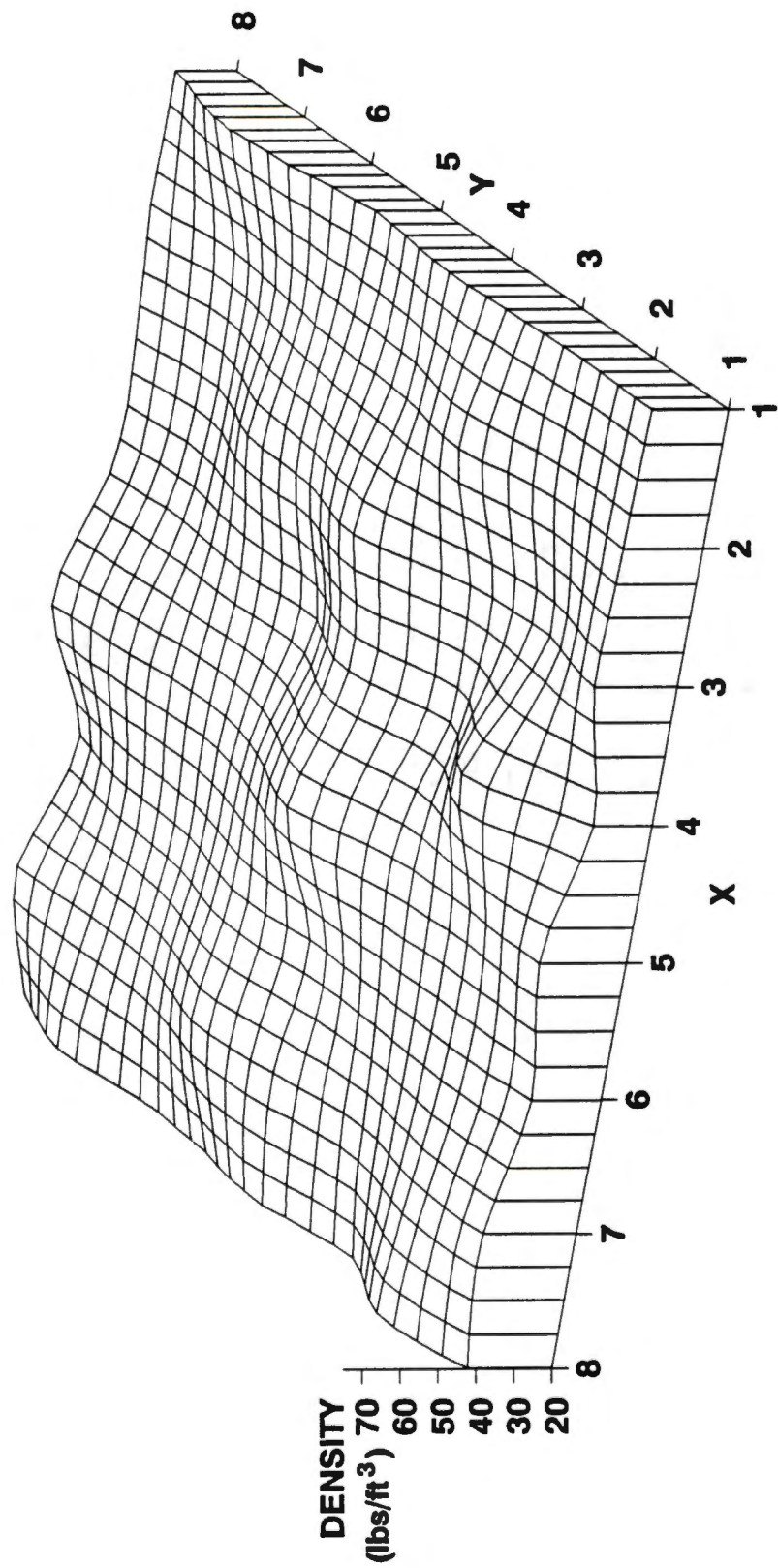
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 3

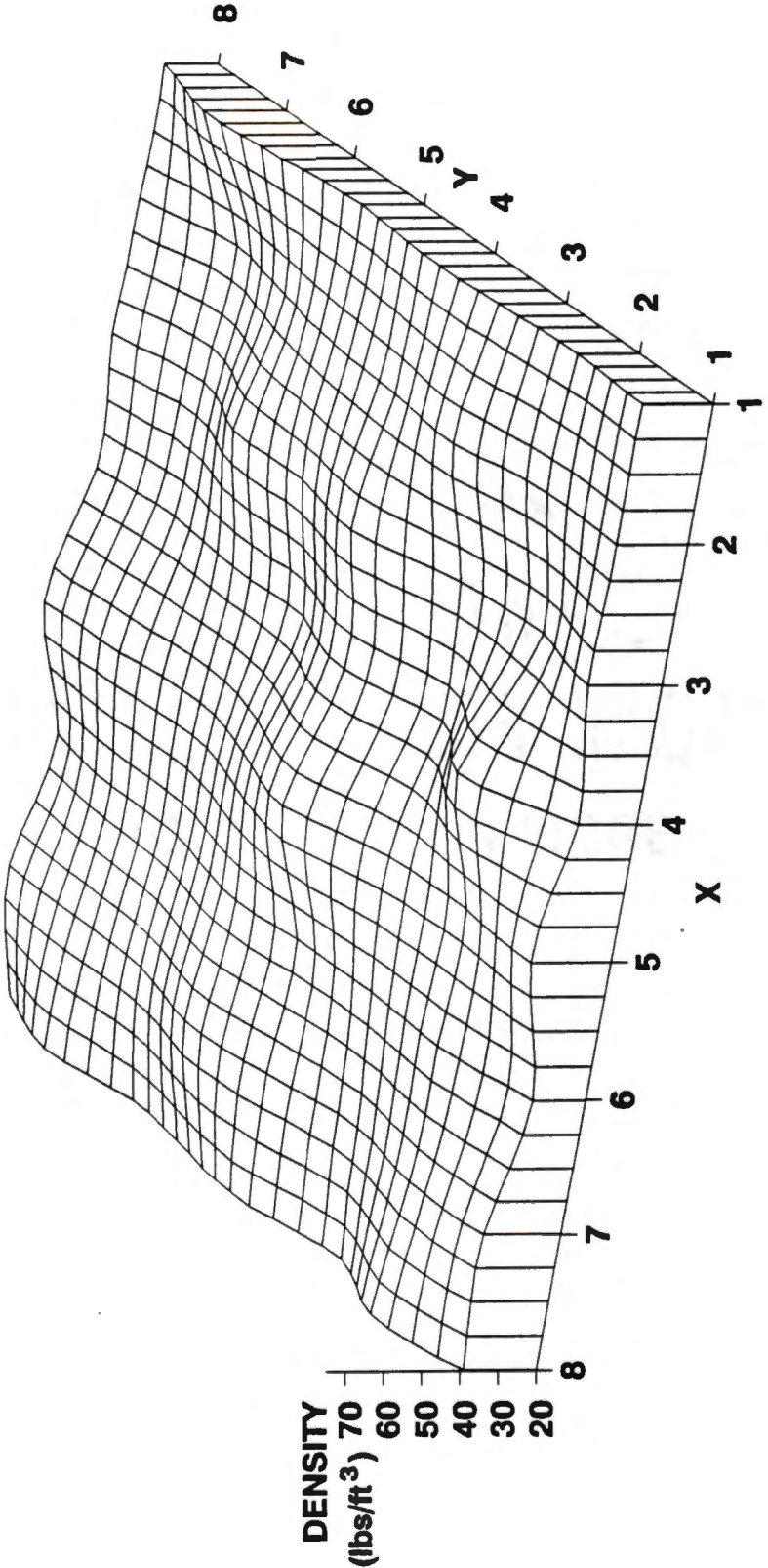
Z = 4



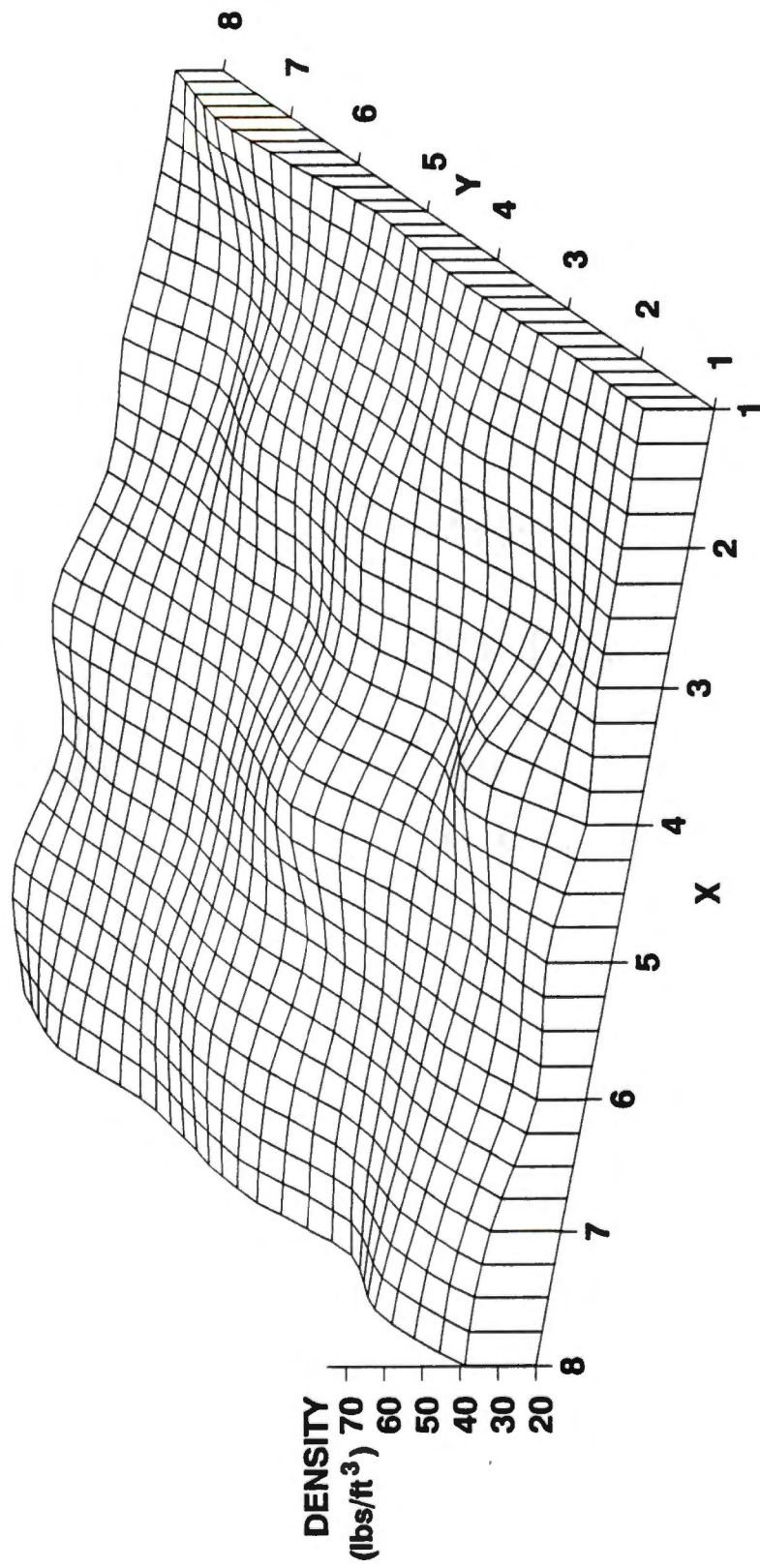
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 5



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 6



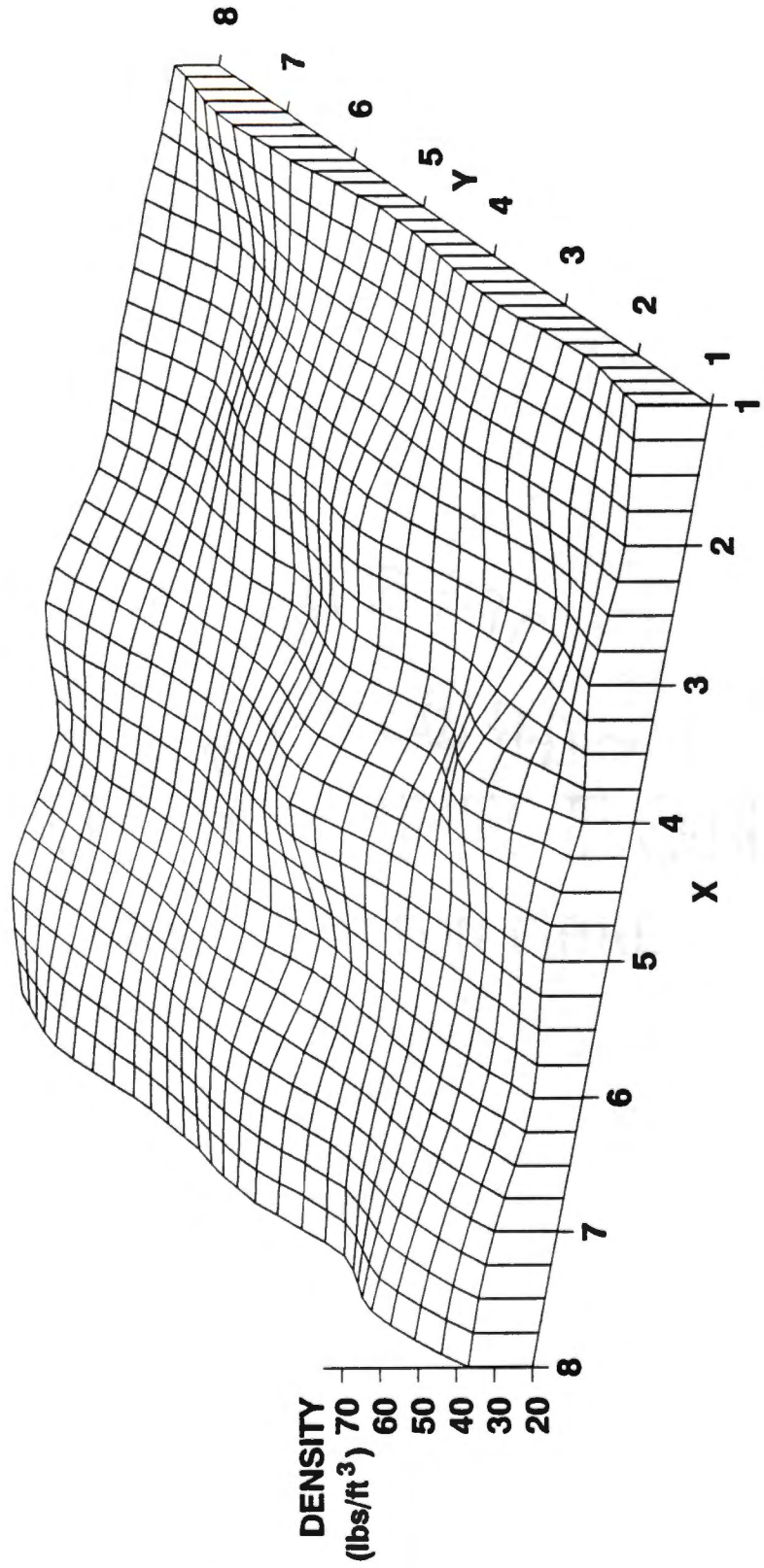
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 7



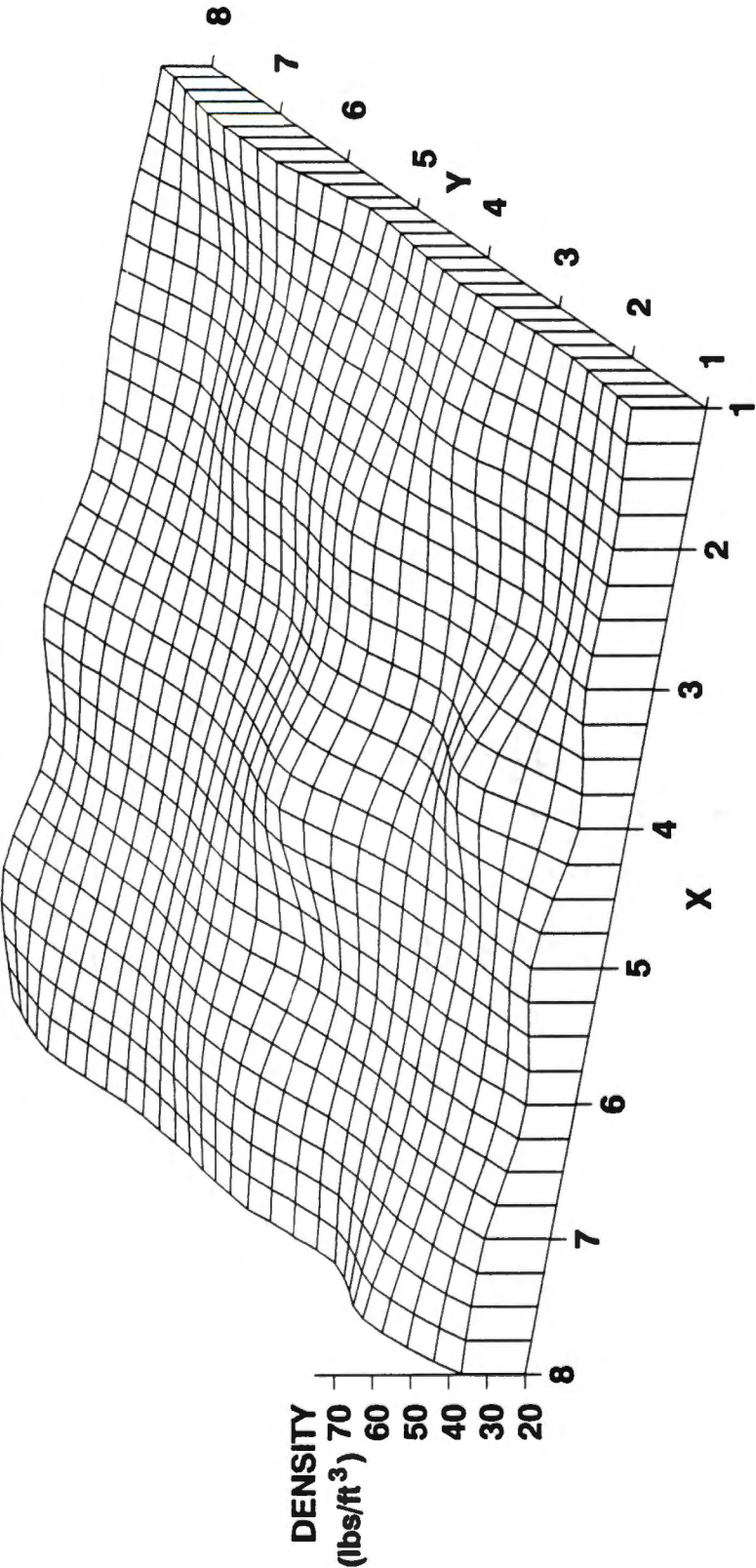
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 3

Z = 8



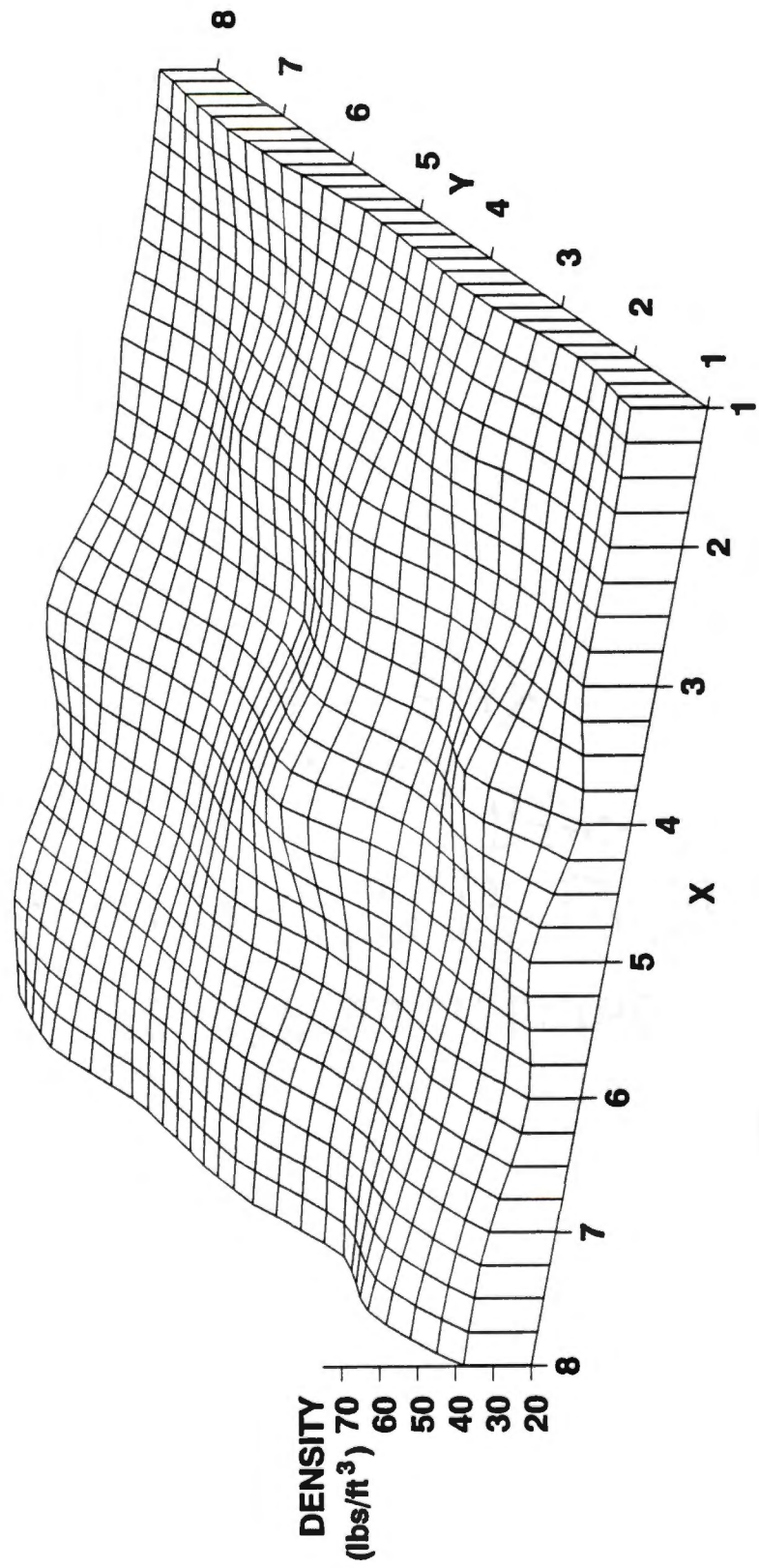
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =60 SECONDS
REPLICATION =3
Z=9



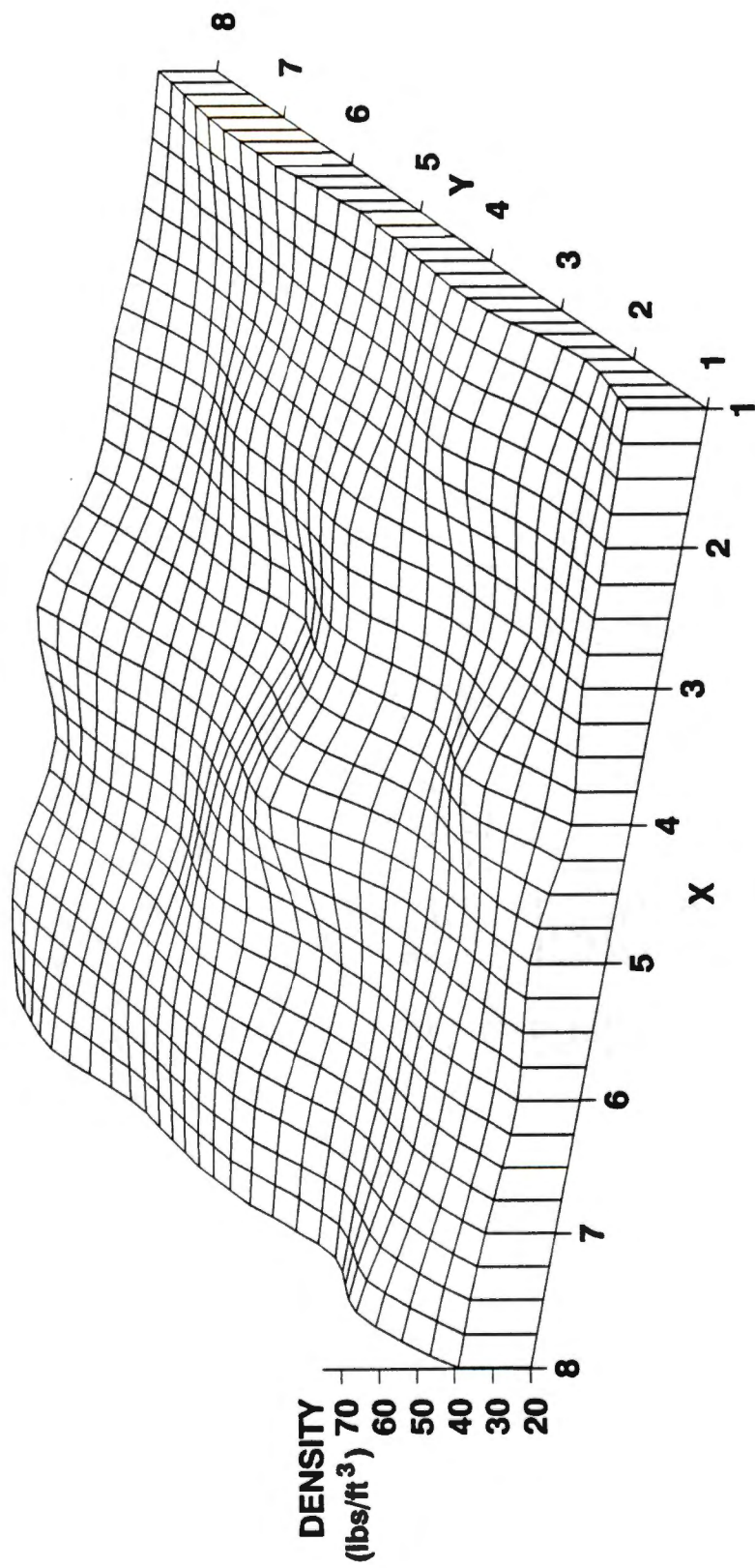
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 3

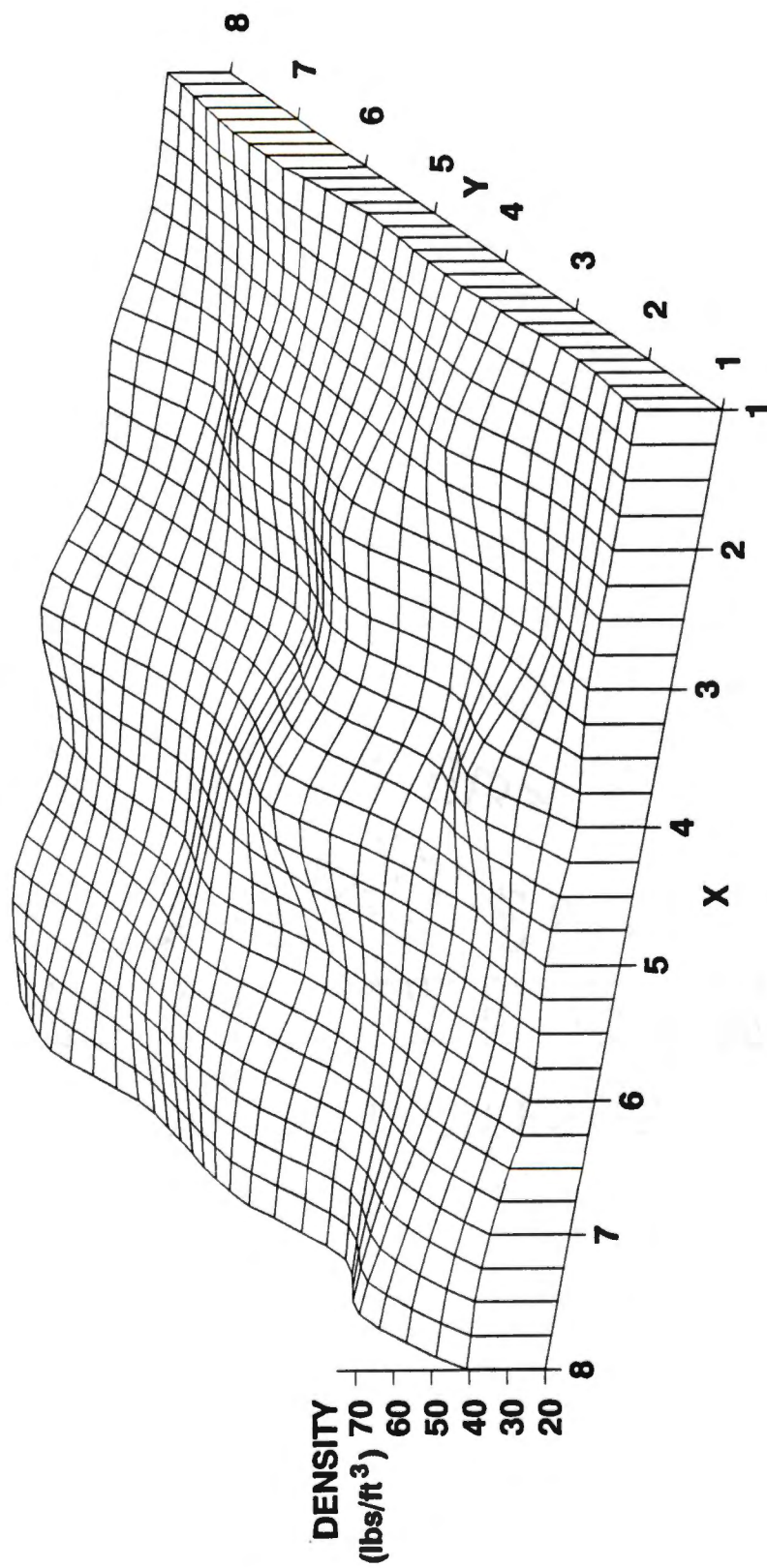
Z = 10



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 11



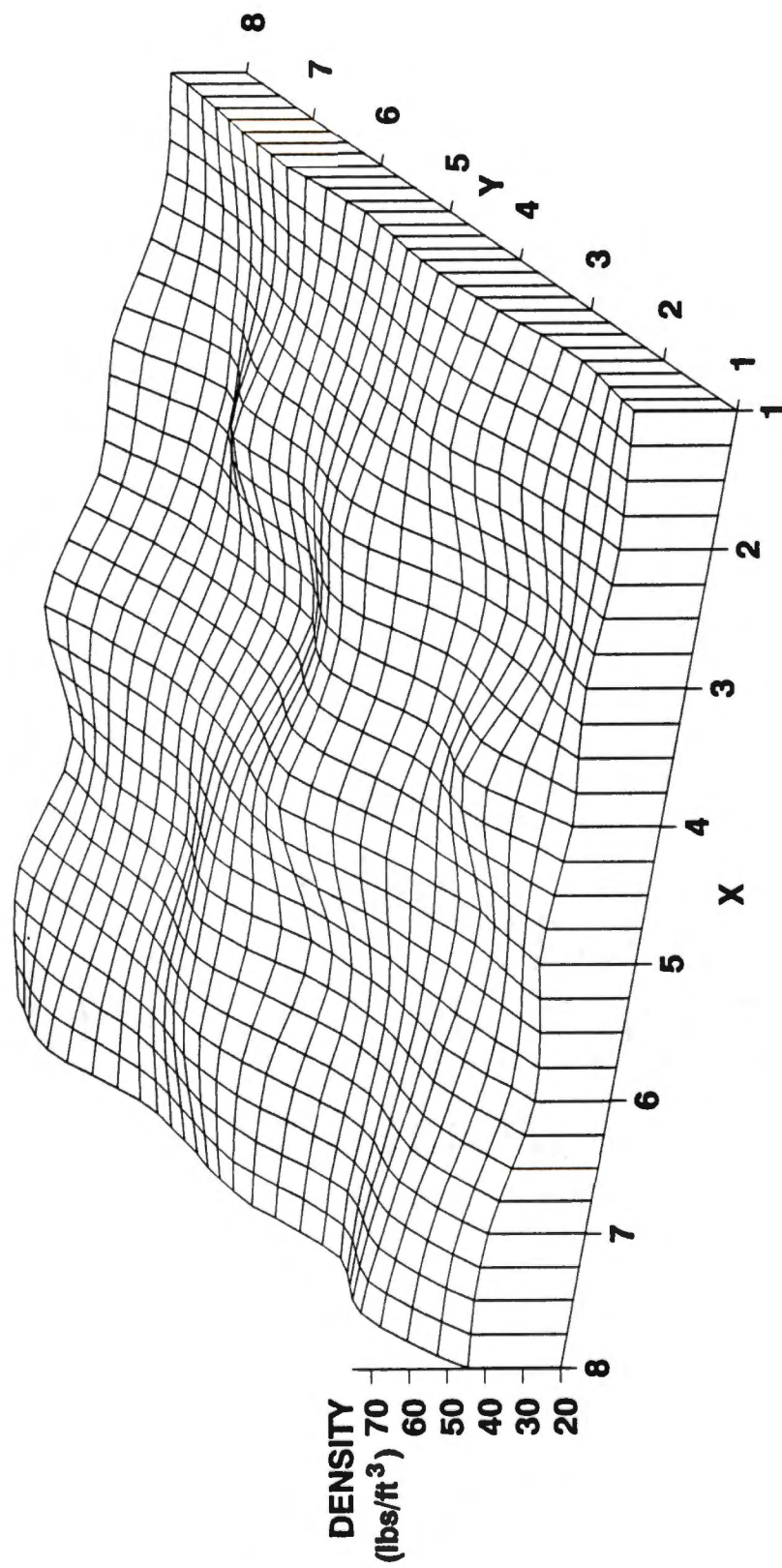
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 12



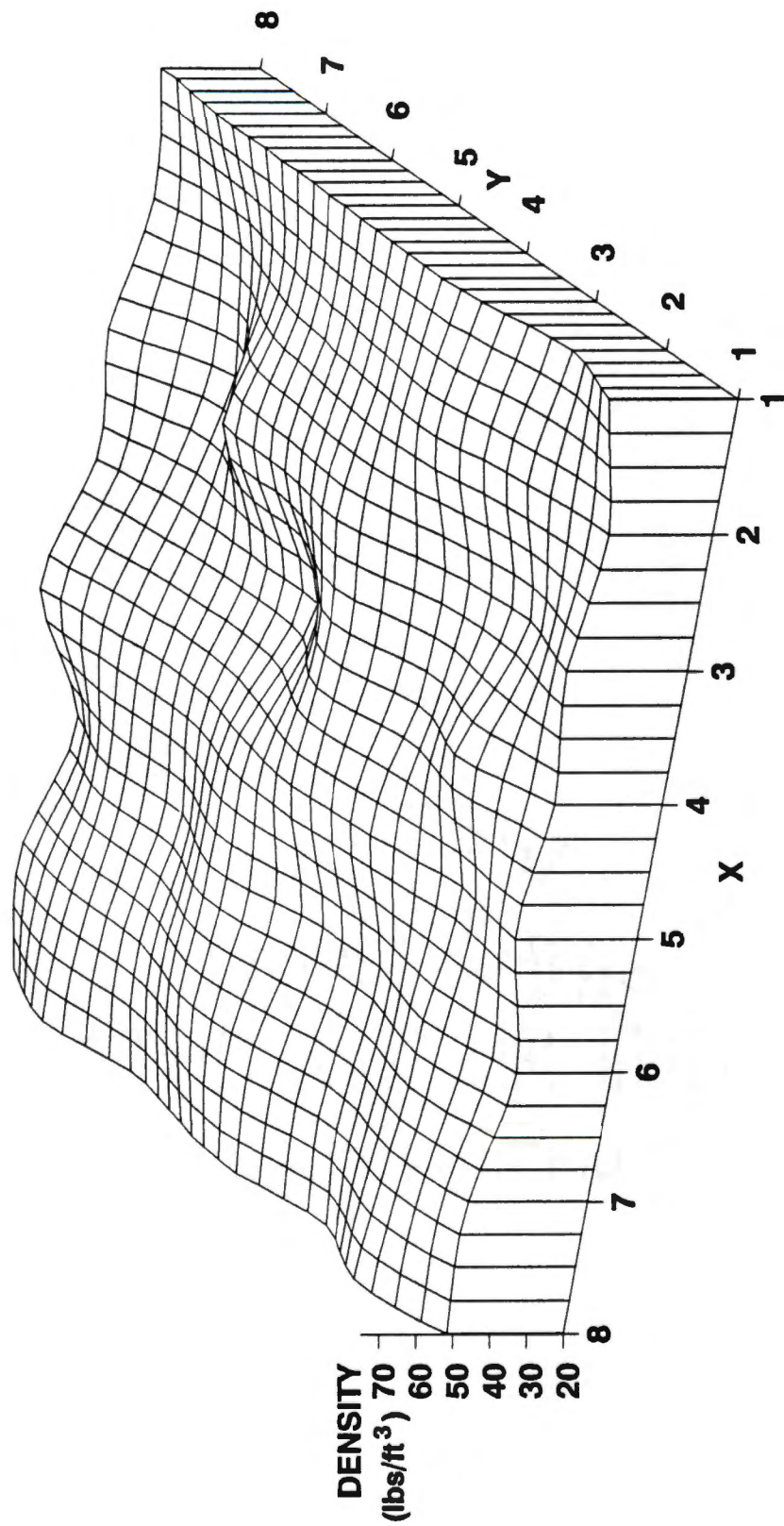
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS

REPLICATION = 3

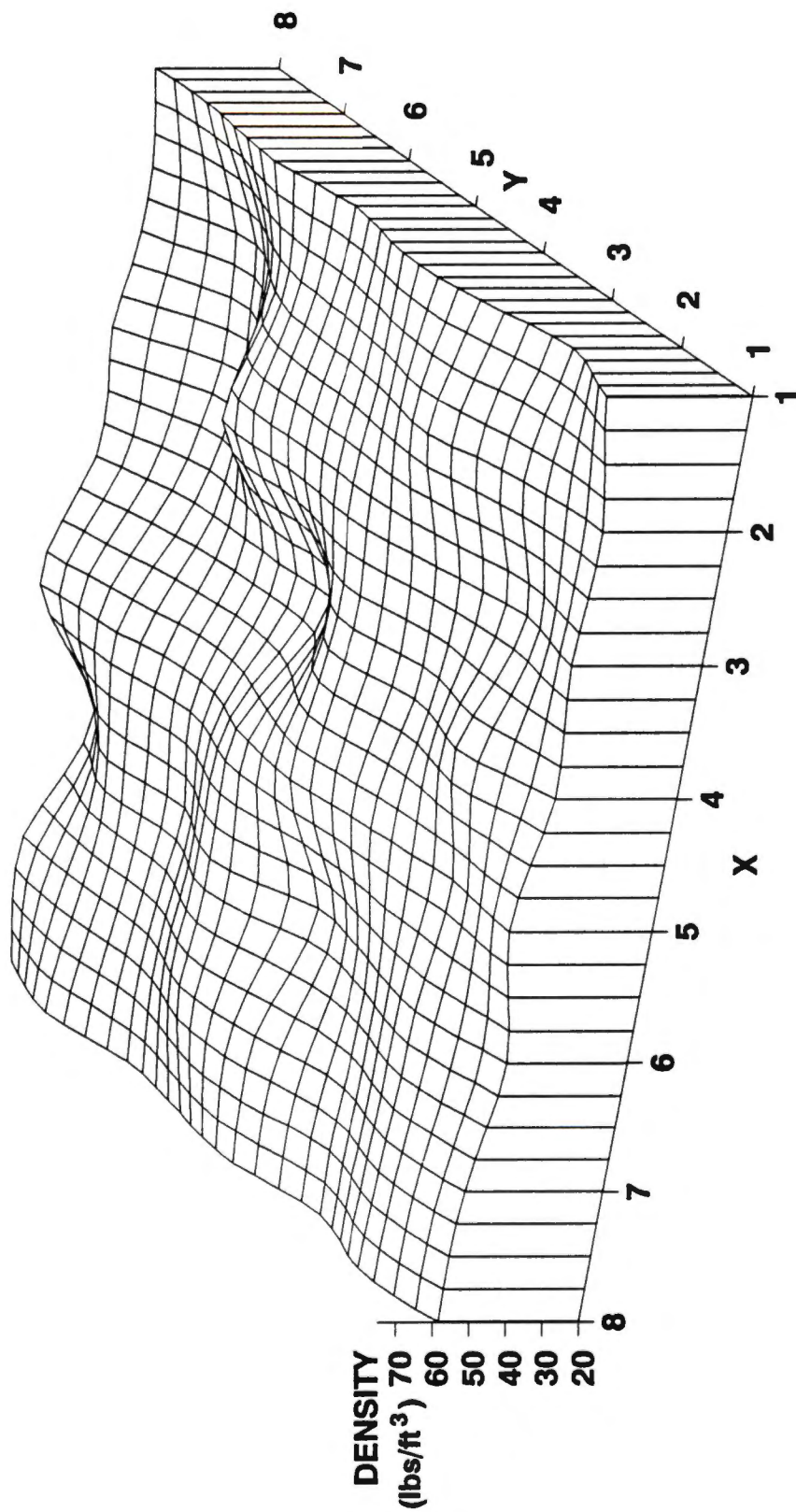
Z = 13



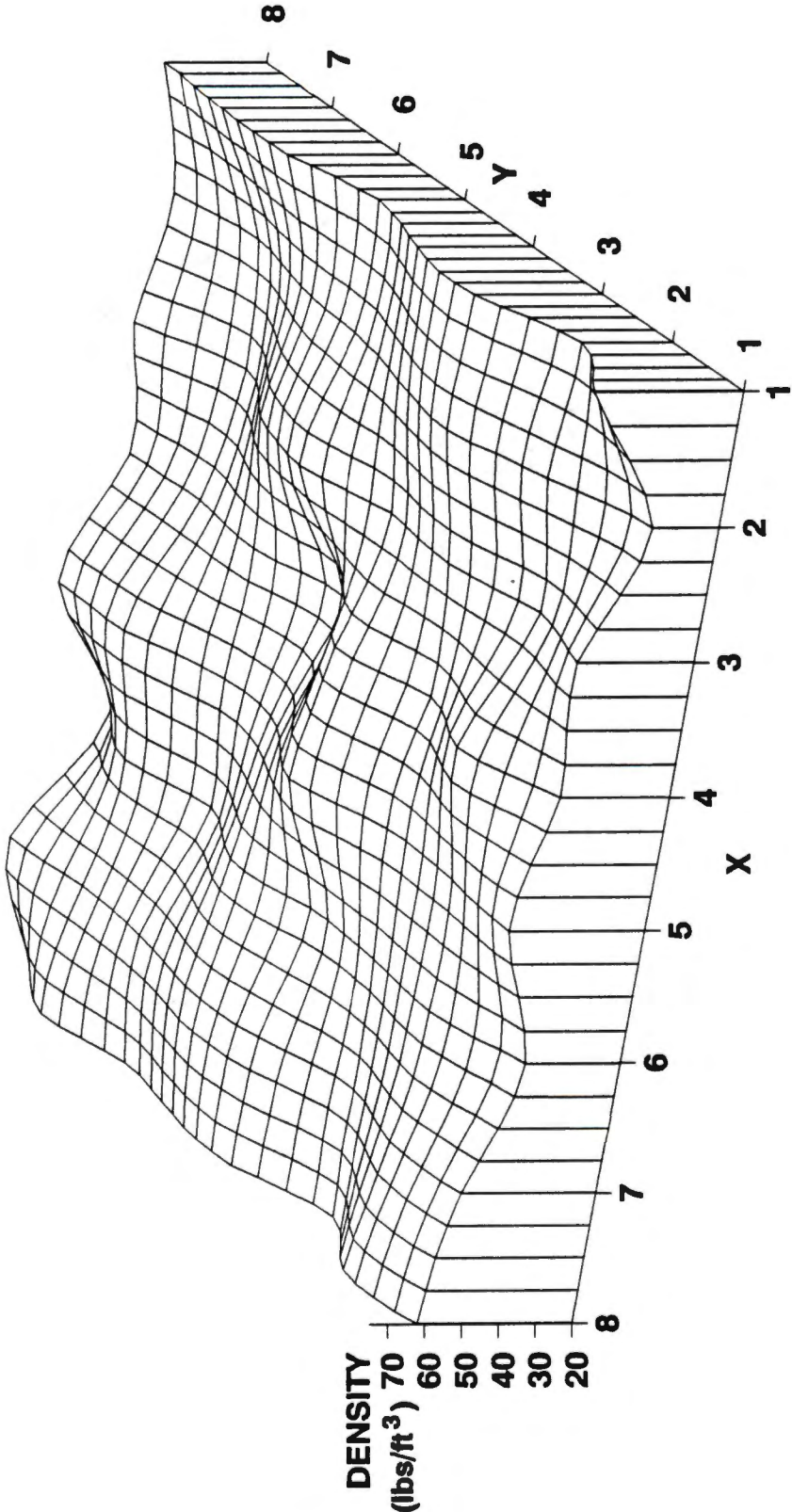
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 14



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 60 SECONDS
REPLICATION = 3
Z = 15



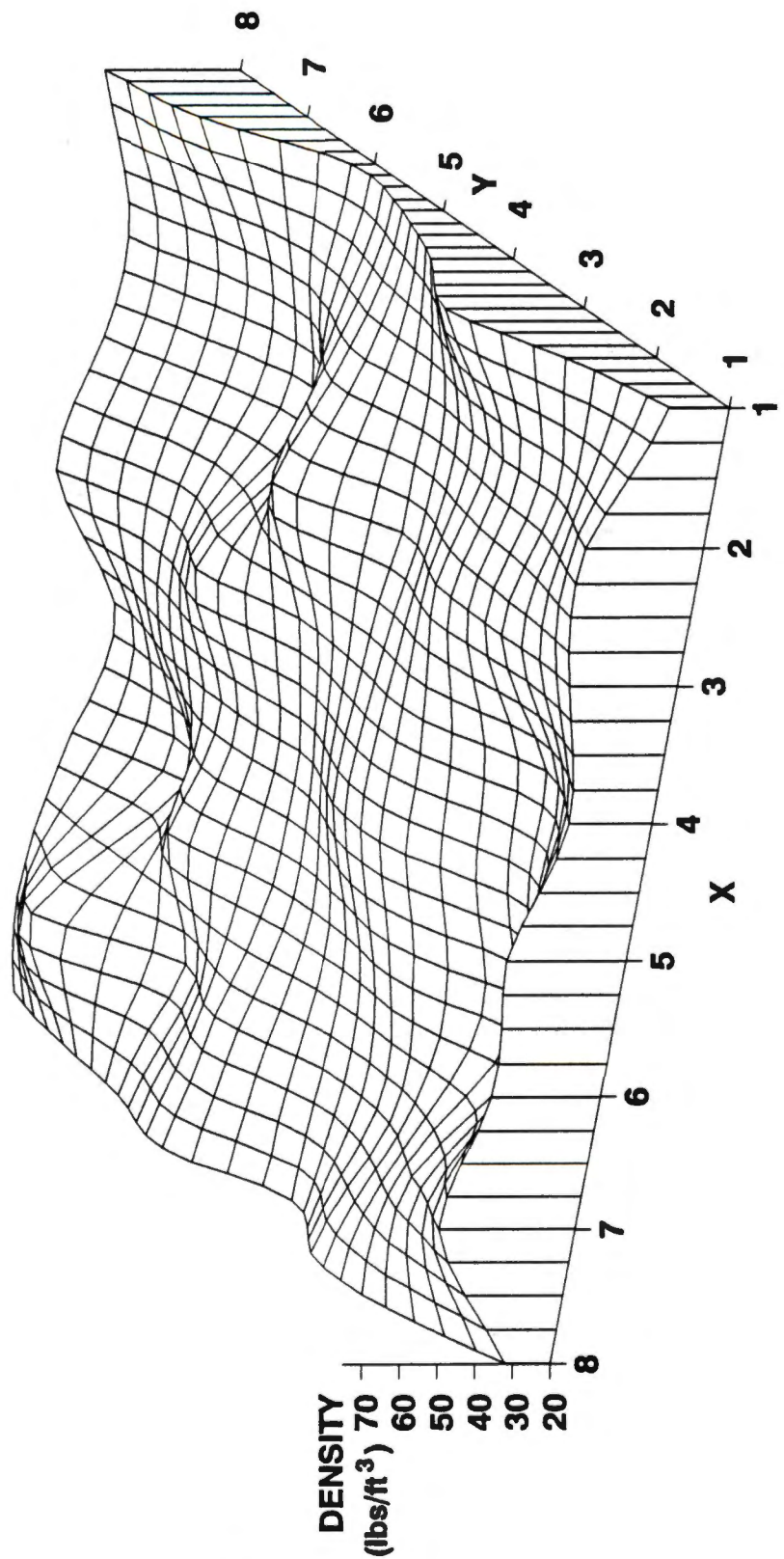
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=60 SECONDS
REPLICATION=3
Z=16



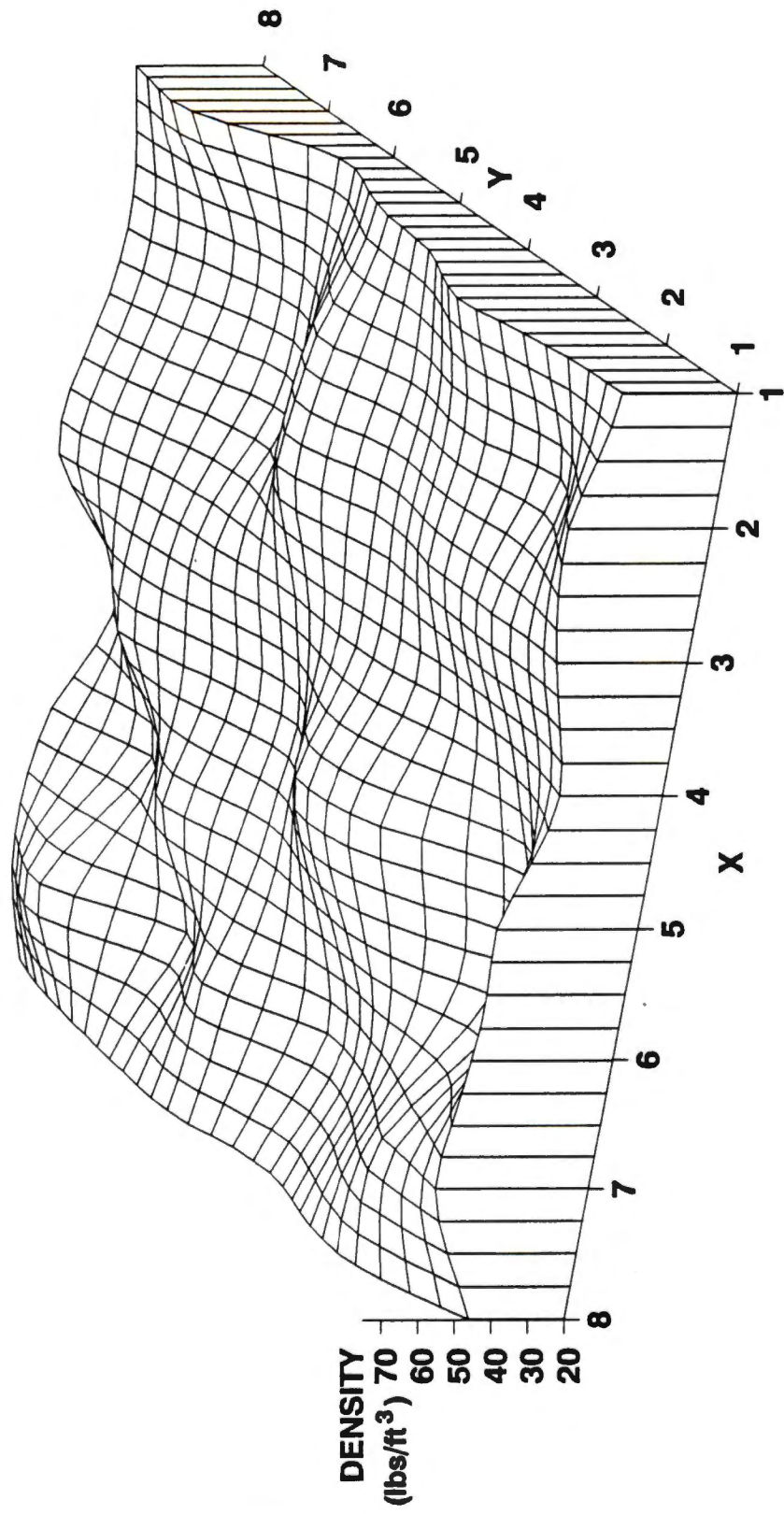
FLAKE MOISTURE CONTENT - 12%

PRESS CLOSURE RATE - 100 SECONDS

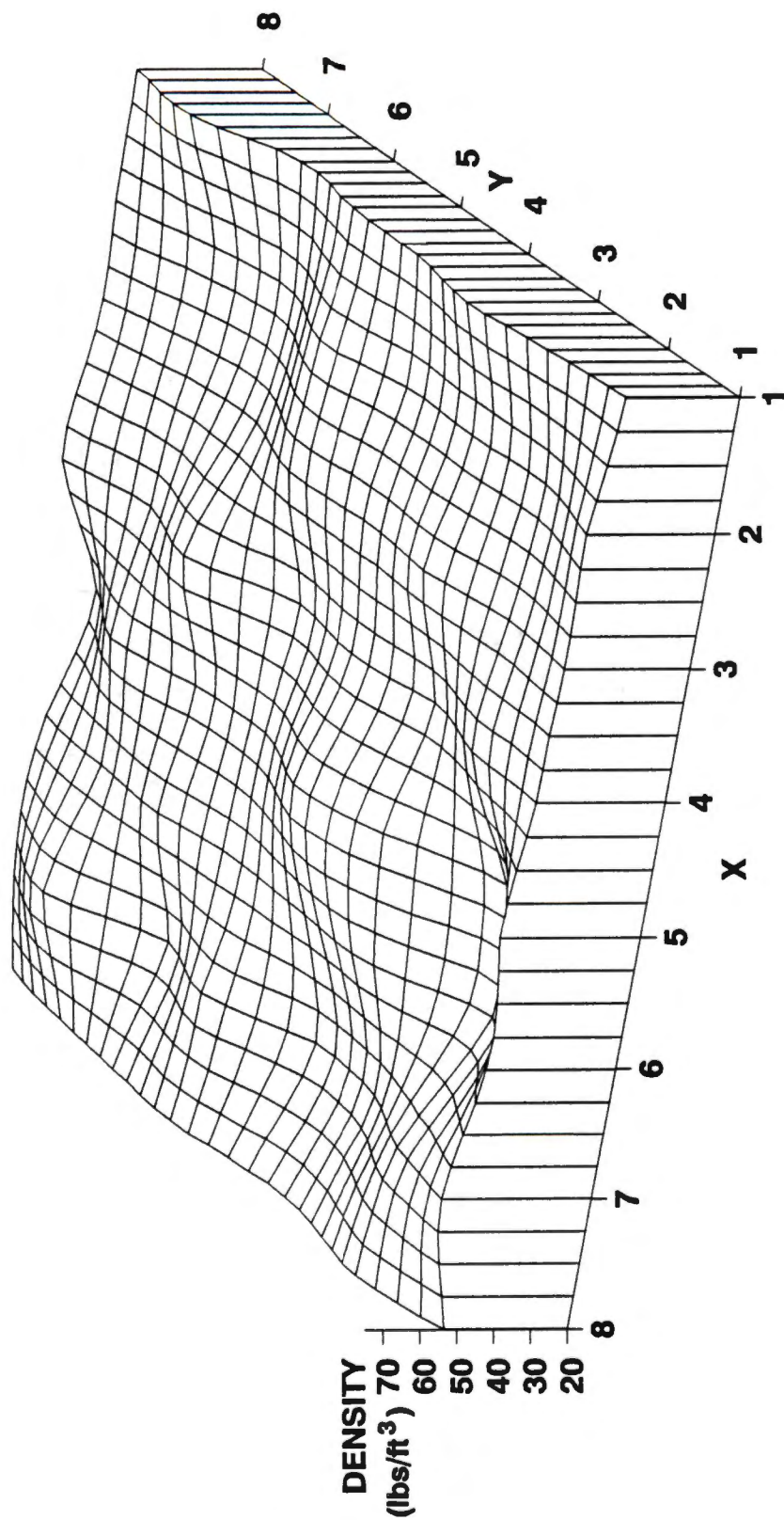
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=1



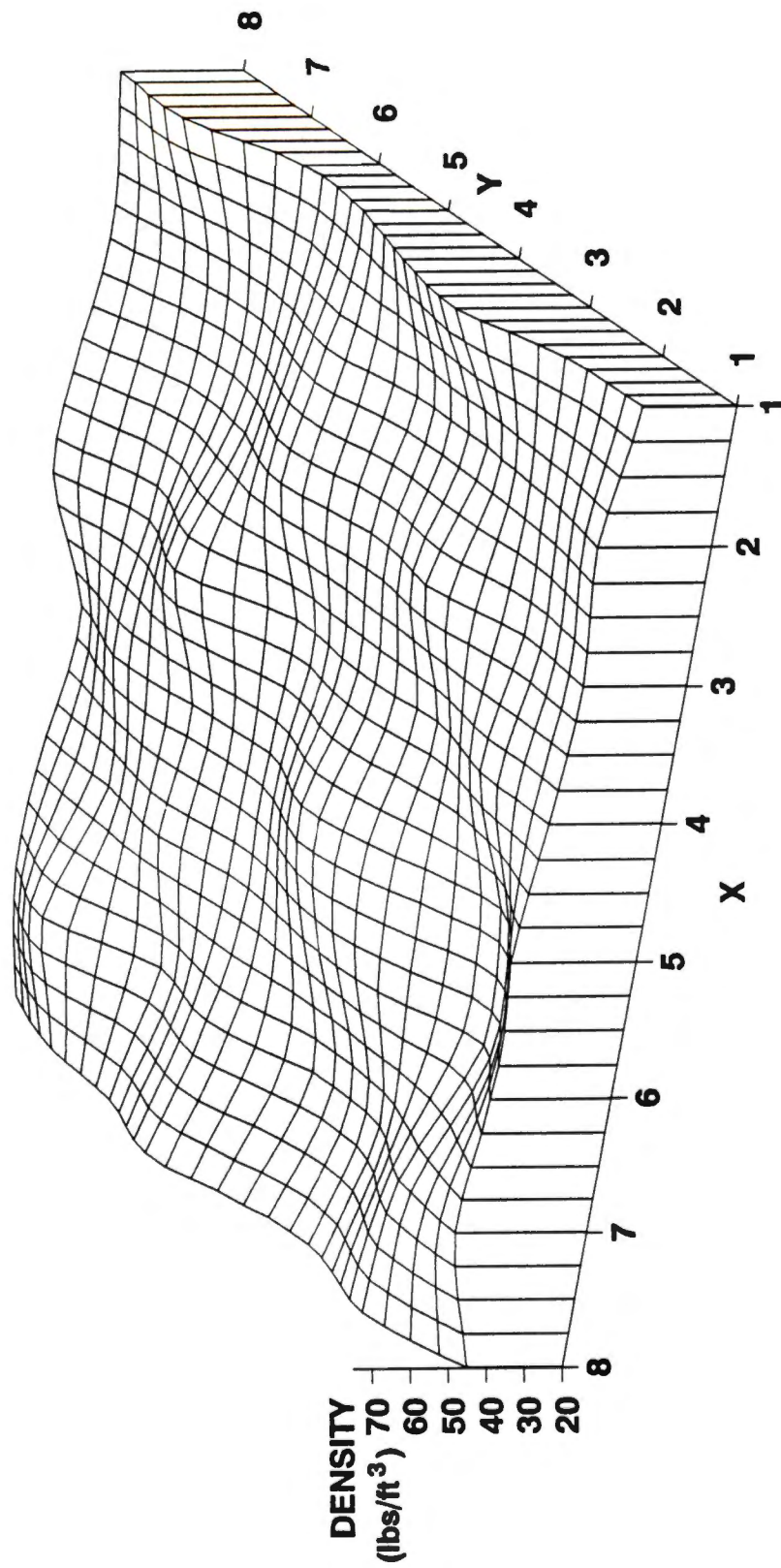
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 2



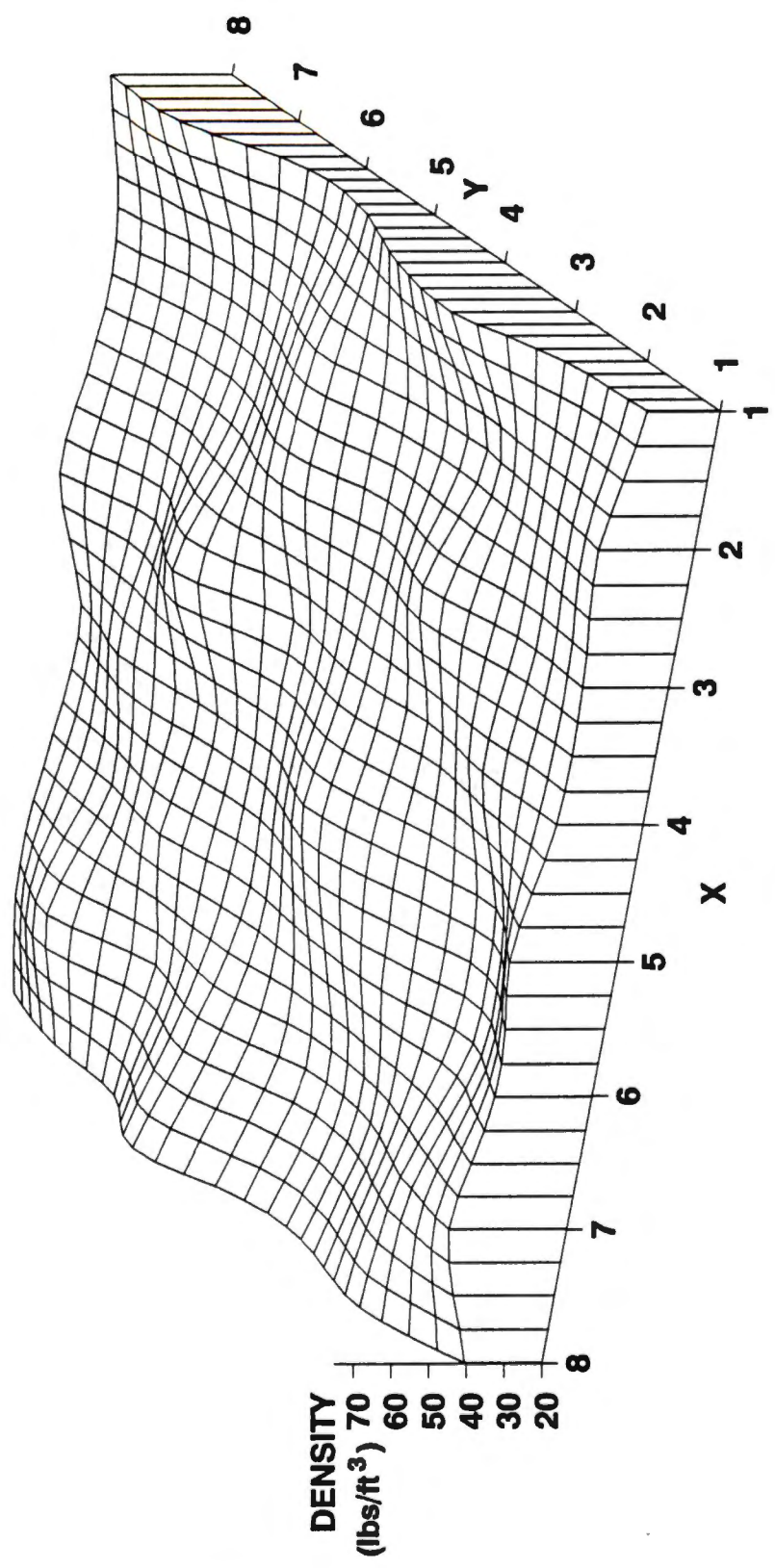
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 3



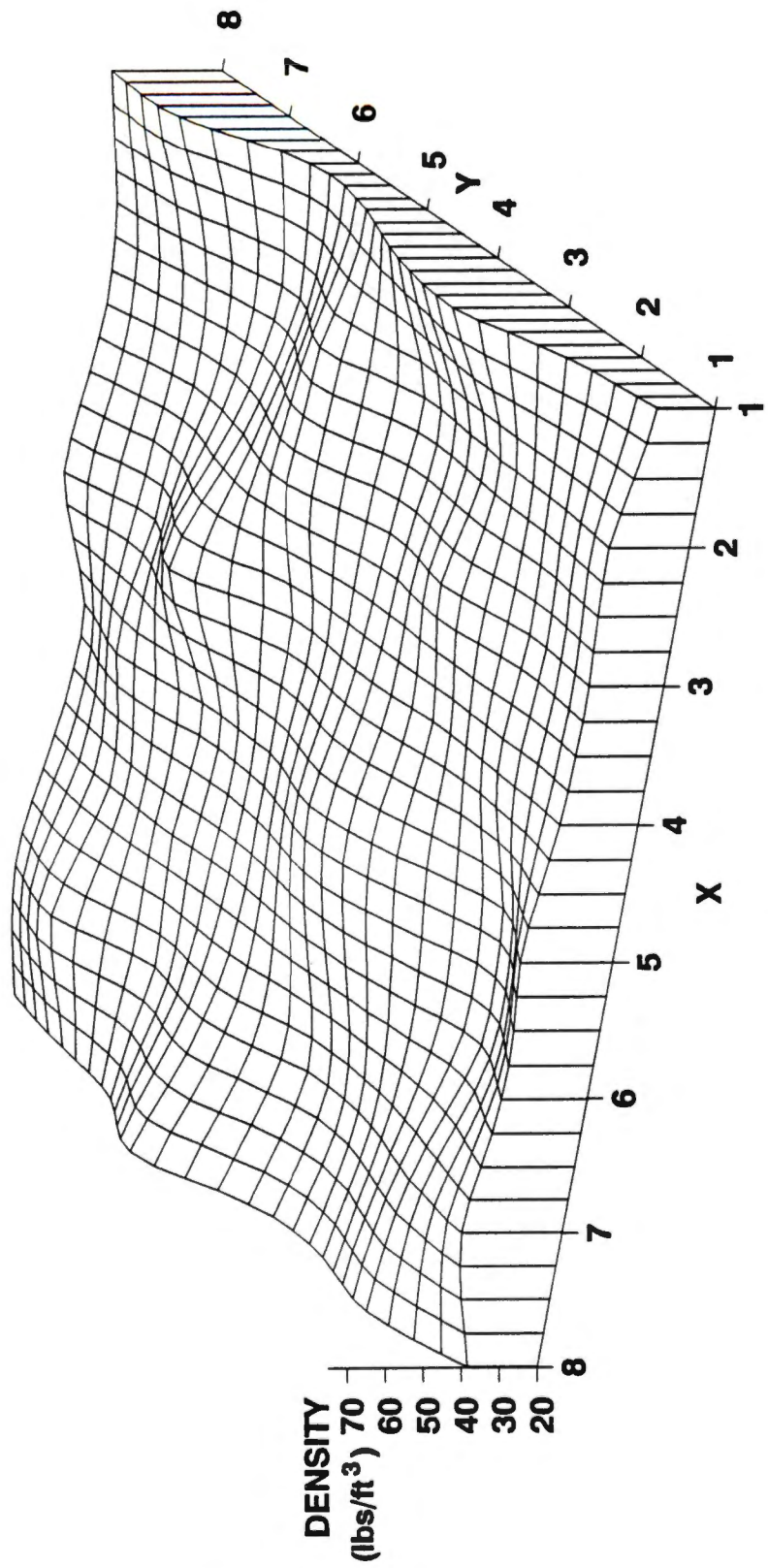
FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =100 SECONDS
REPLICATION =1
Z=4



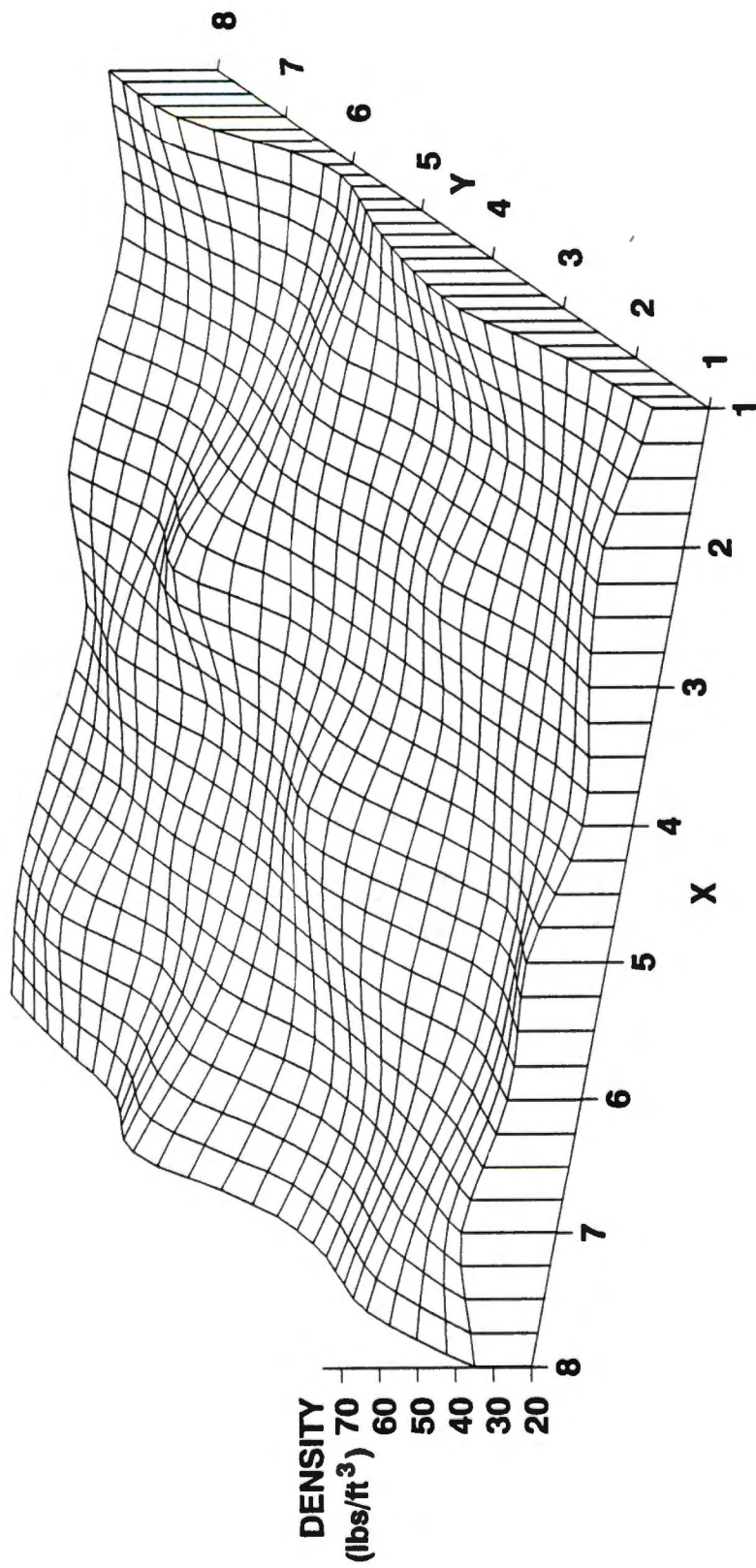
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 5



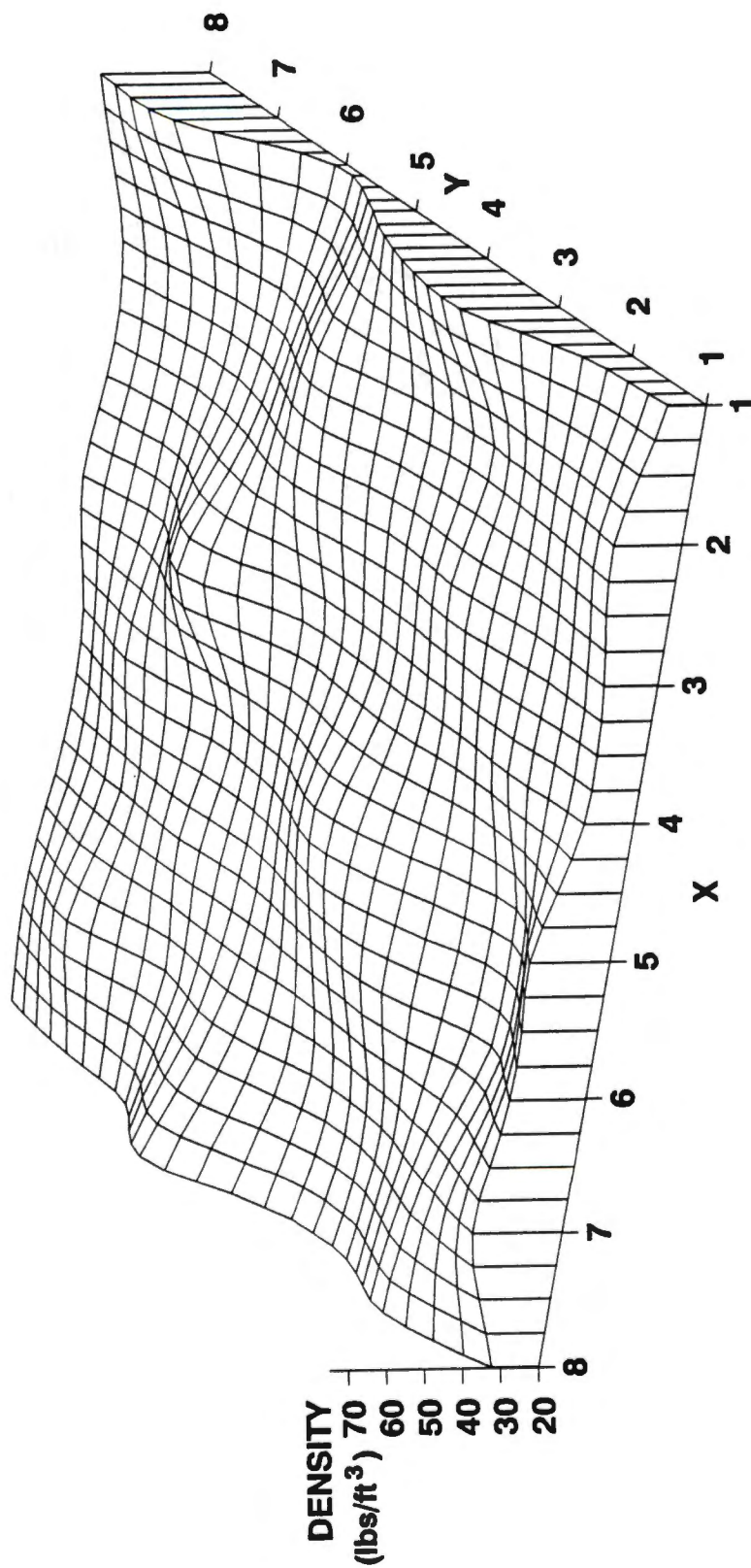
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=6



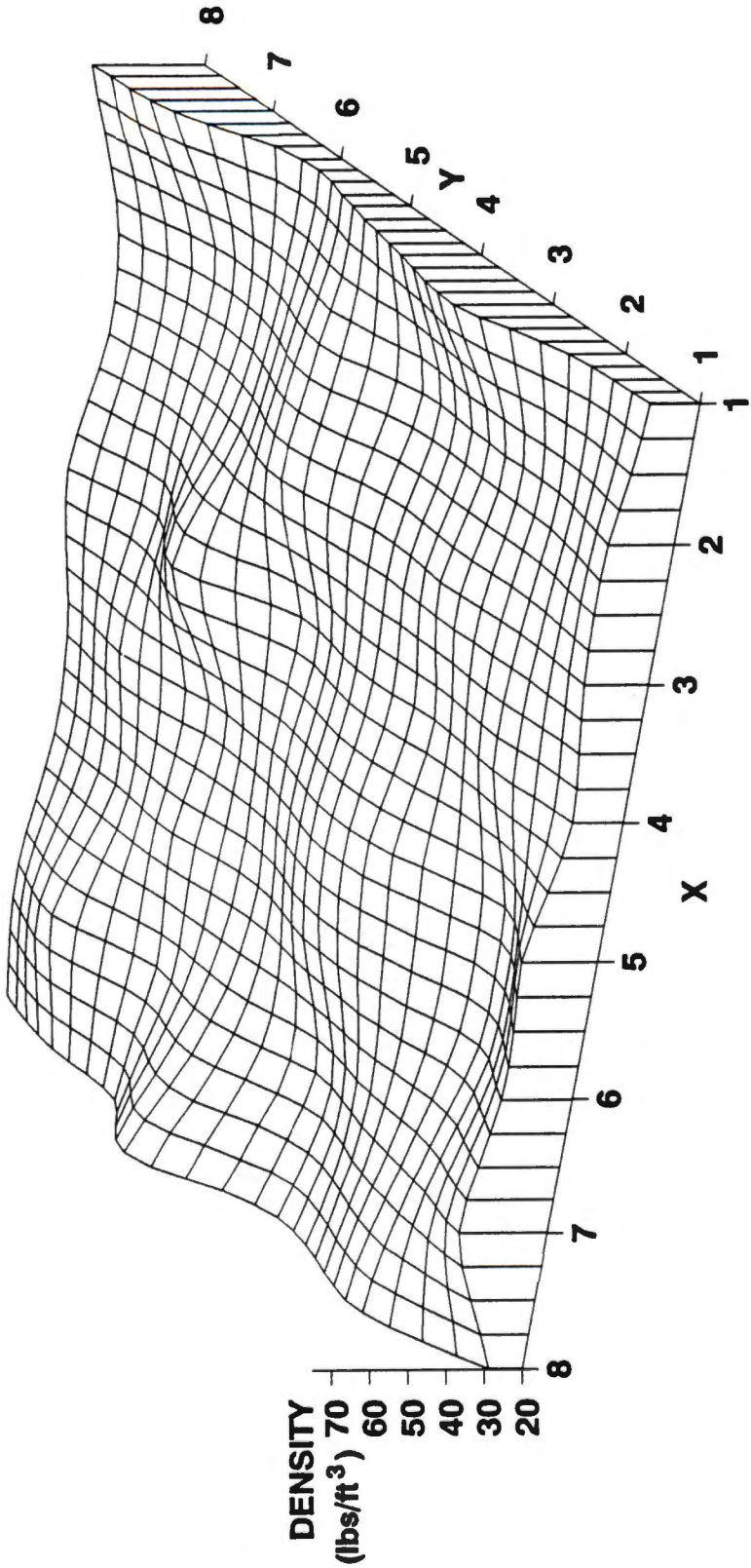
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 7



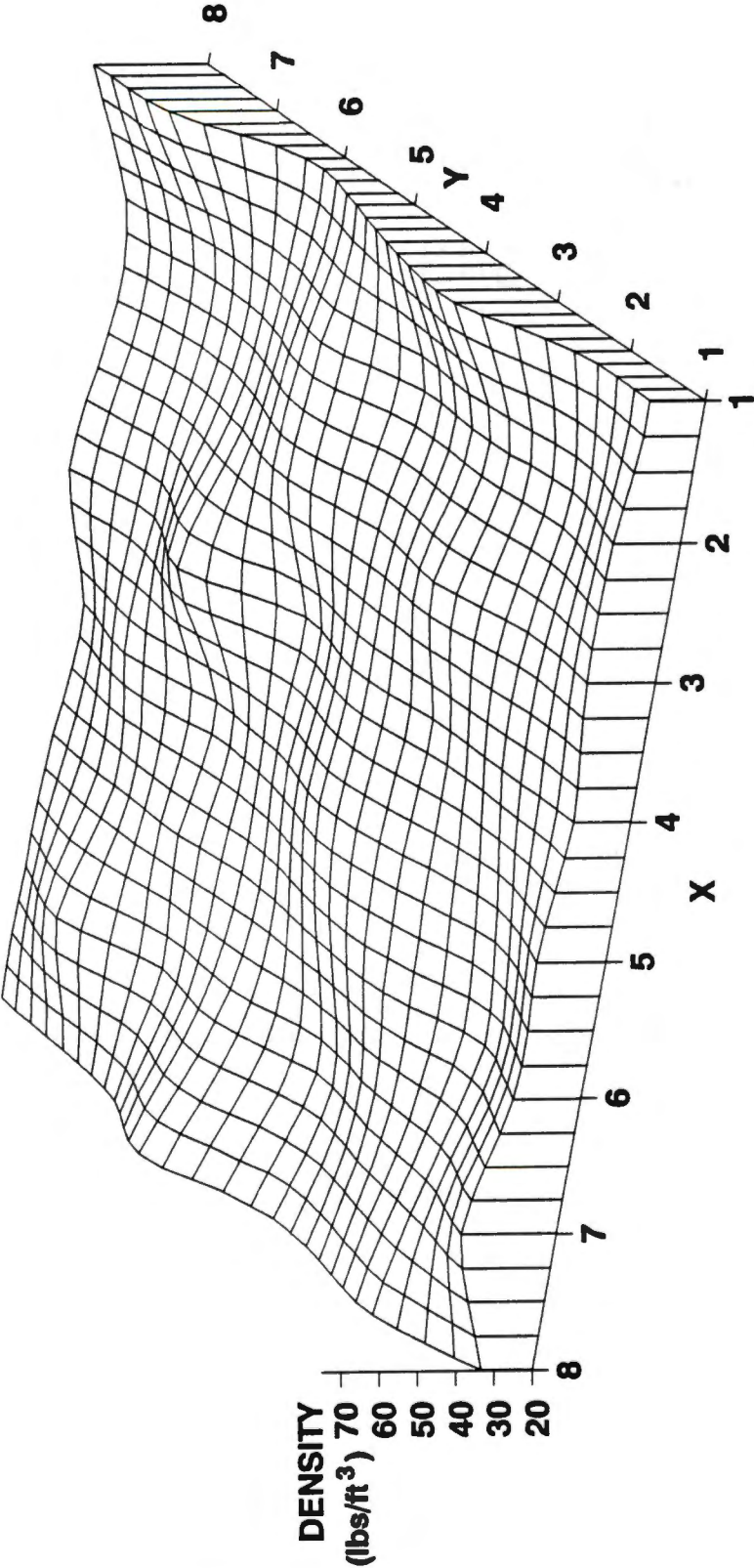
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=8



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 9



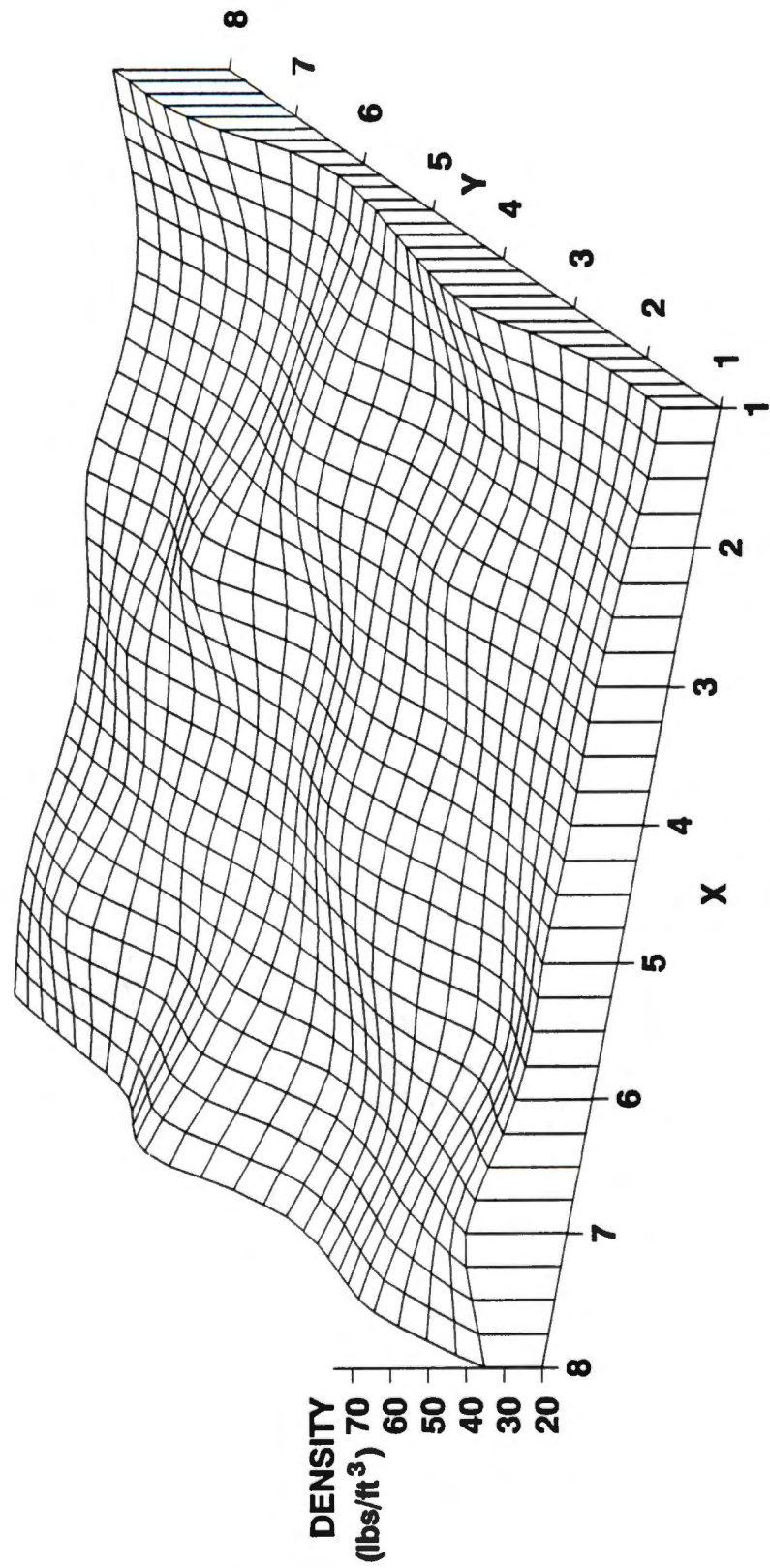
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 10



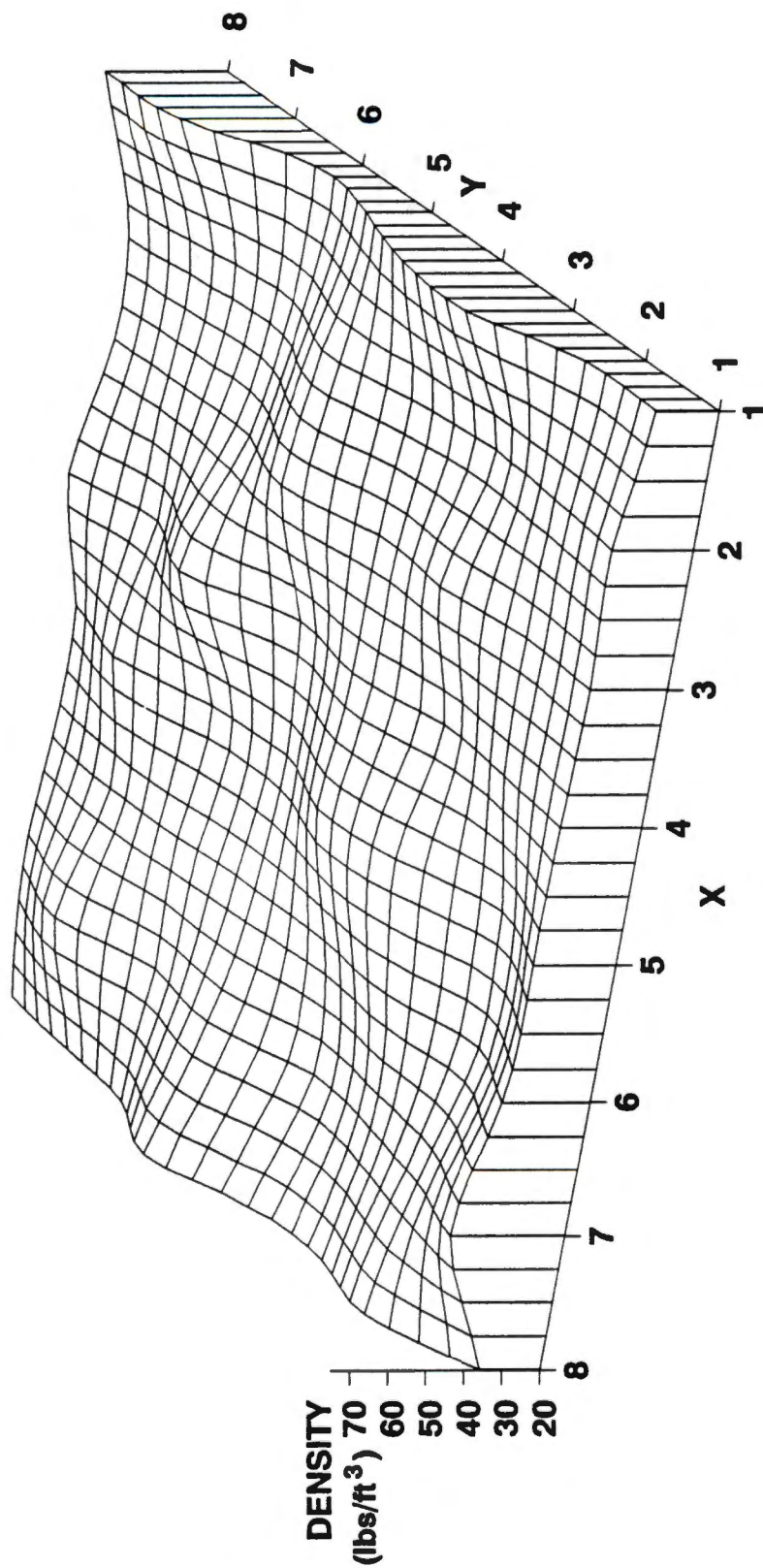
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS

REPLICATION=1

Z=11



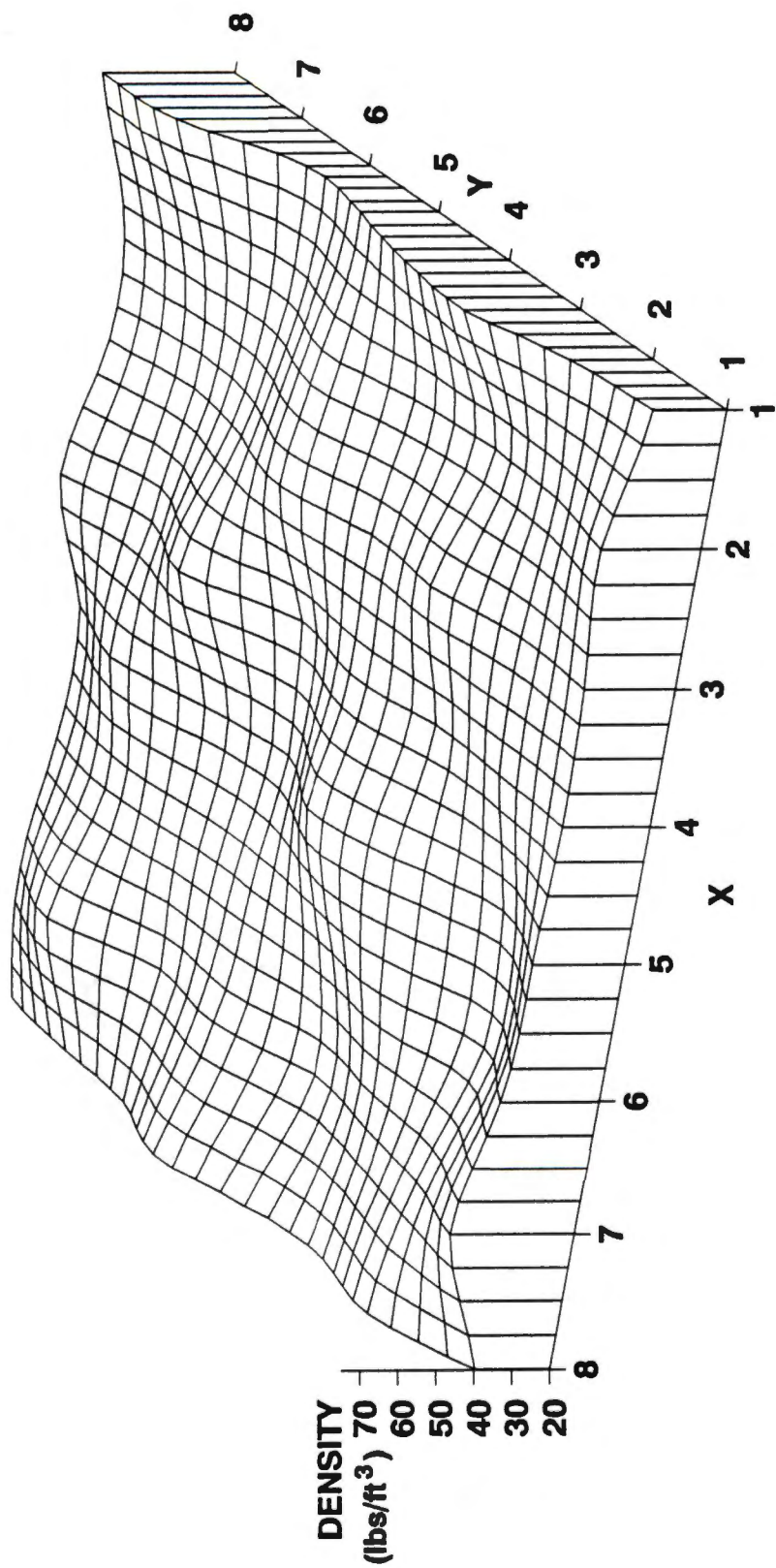
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=1
Z=12



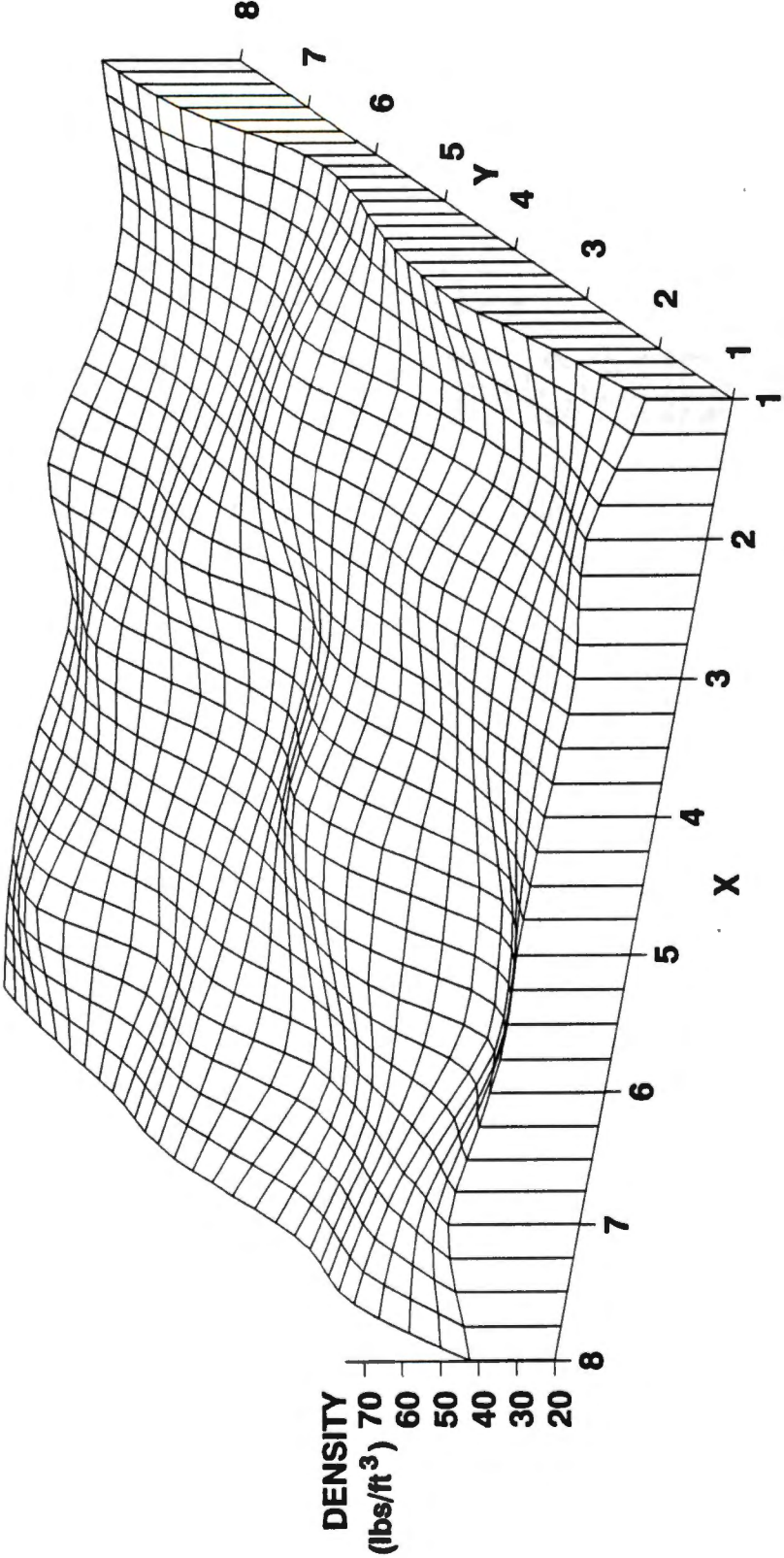
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 1

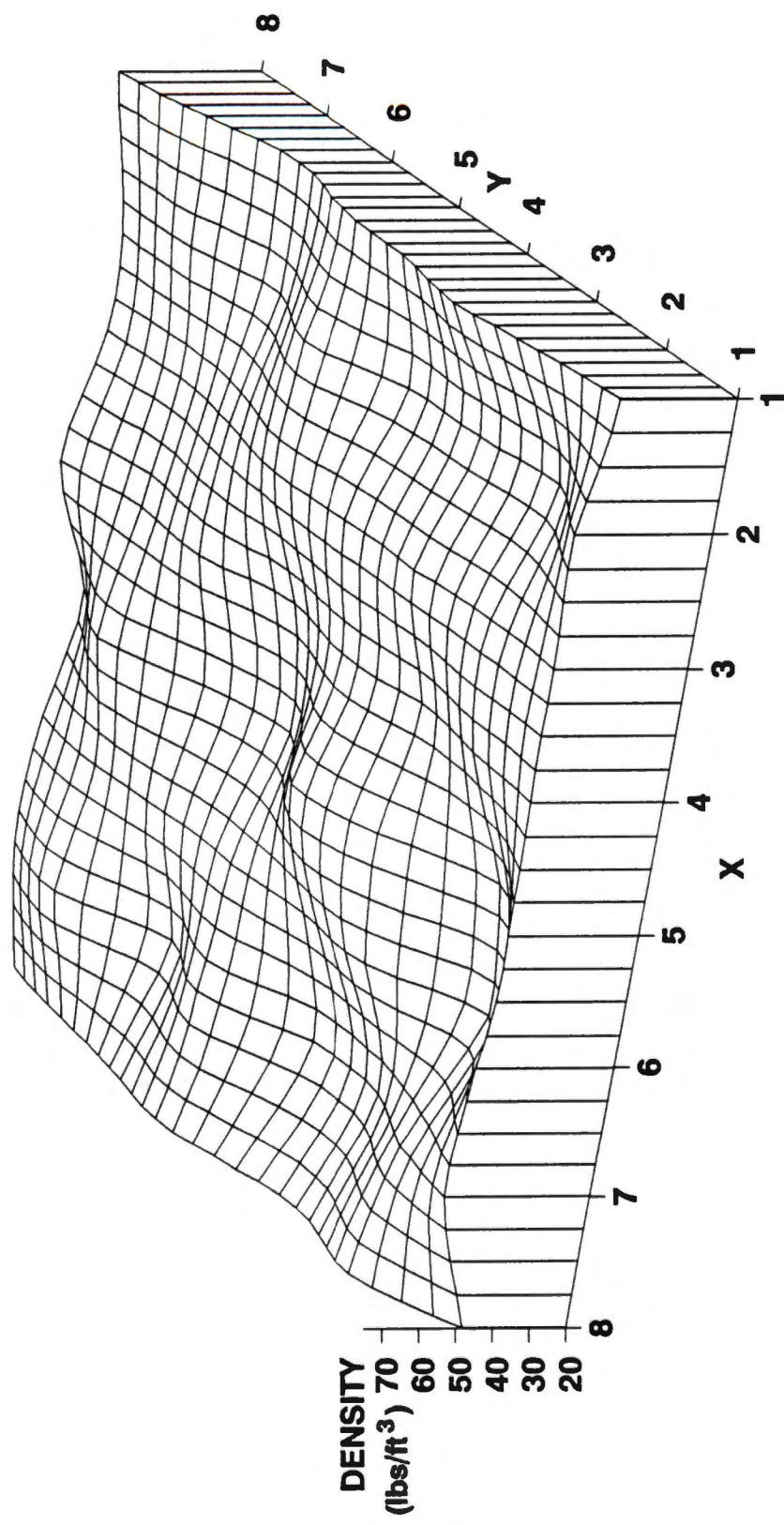
Z = 13



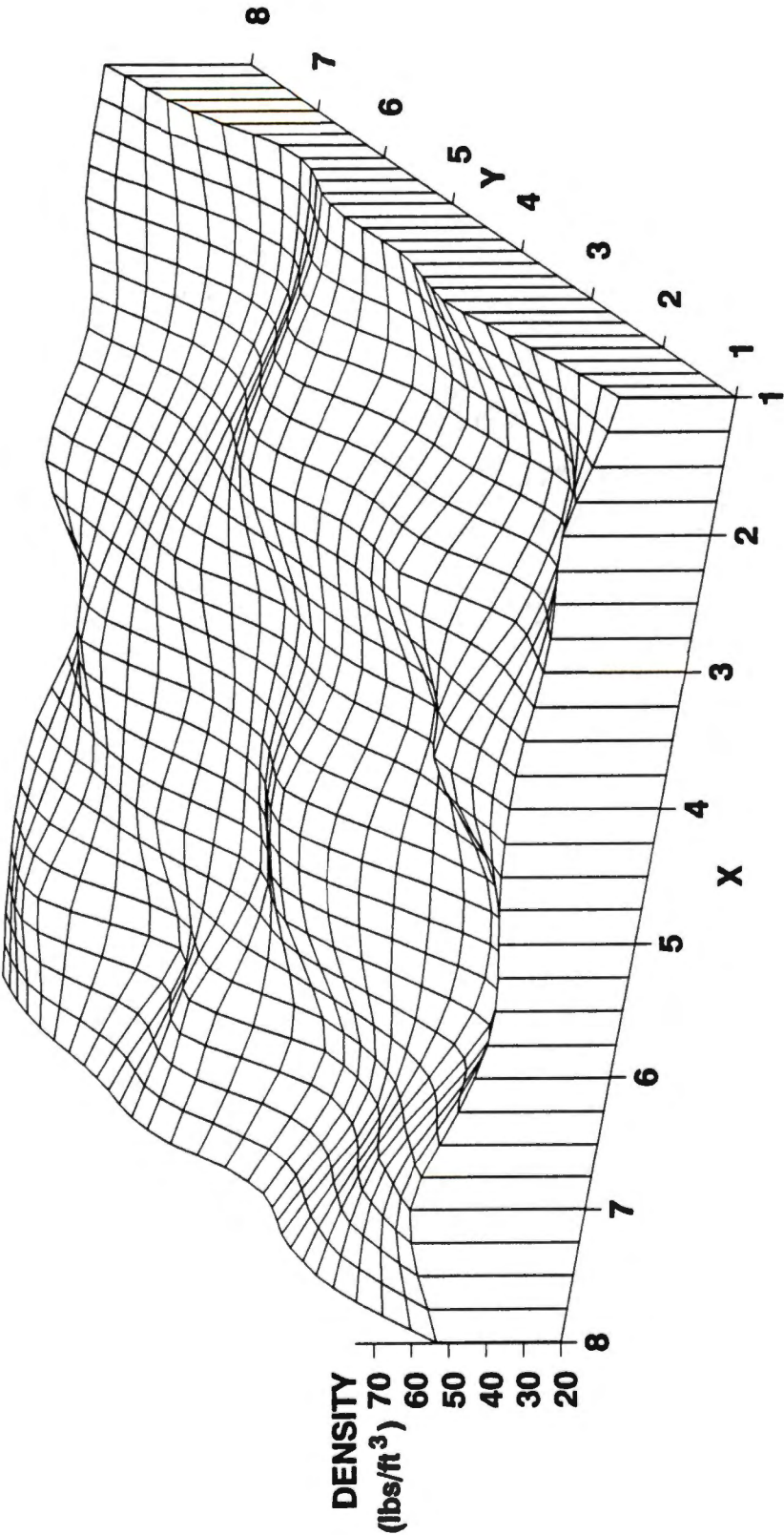
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 14



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 15



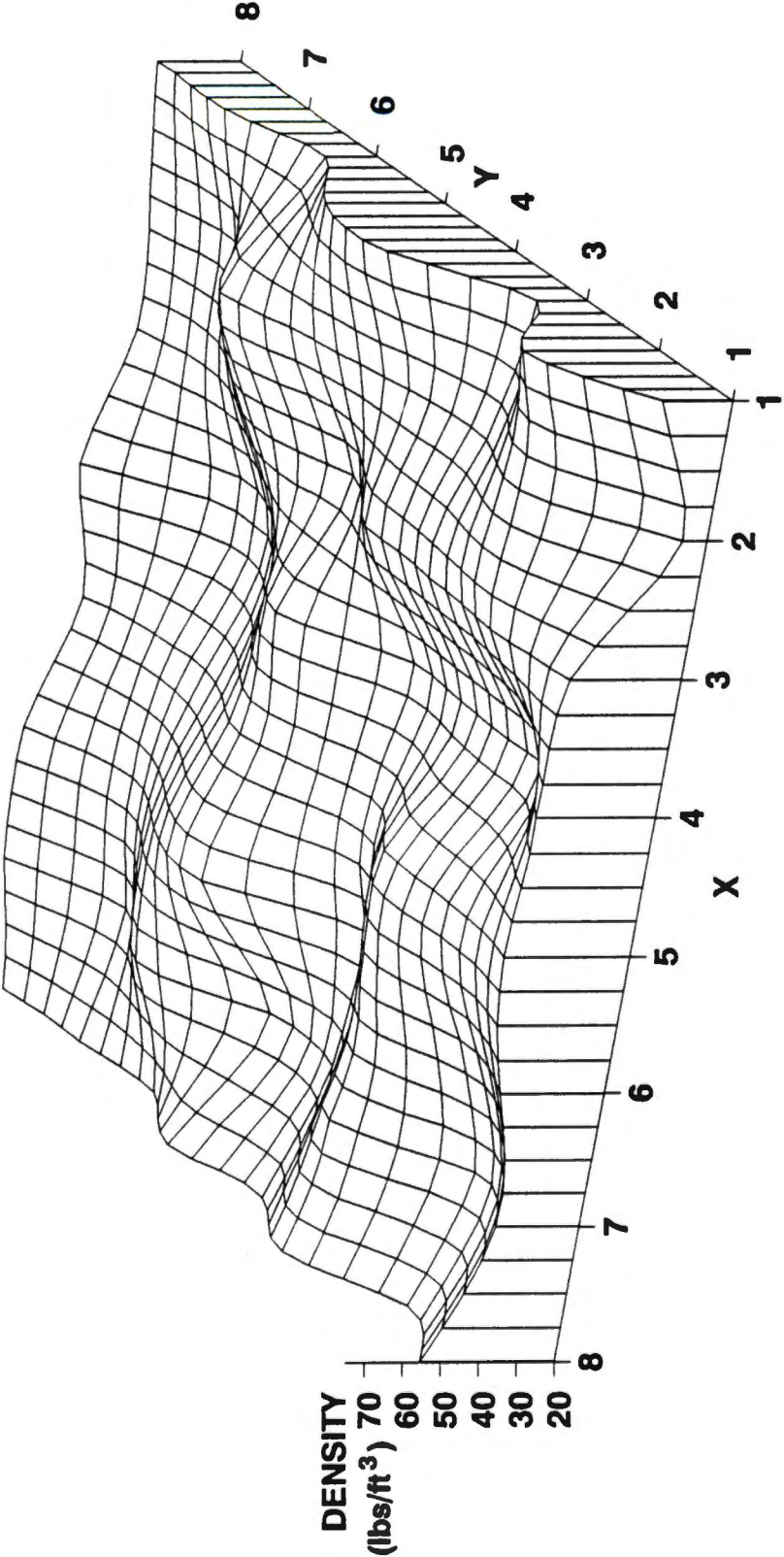
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 1
Z = 16



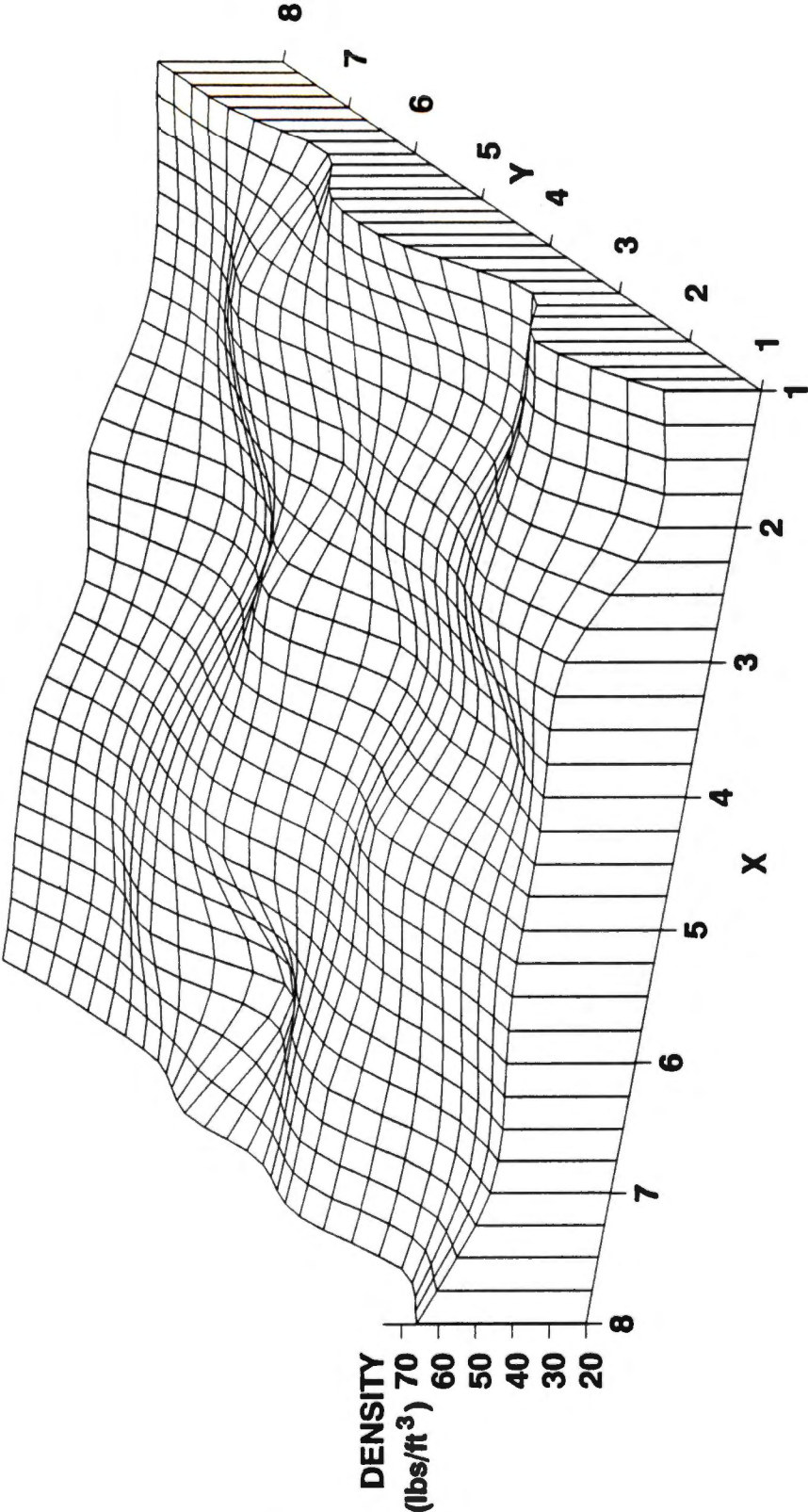
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 2

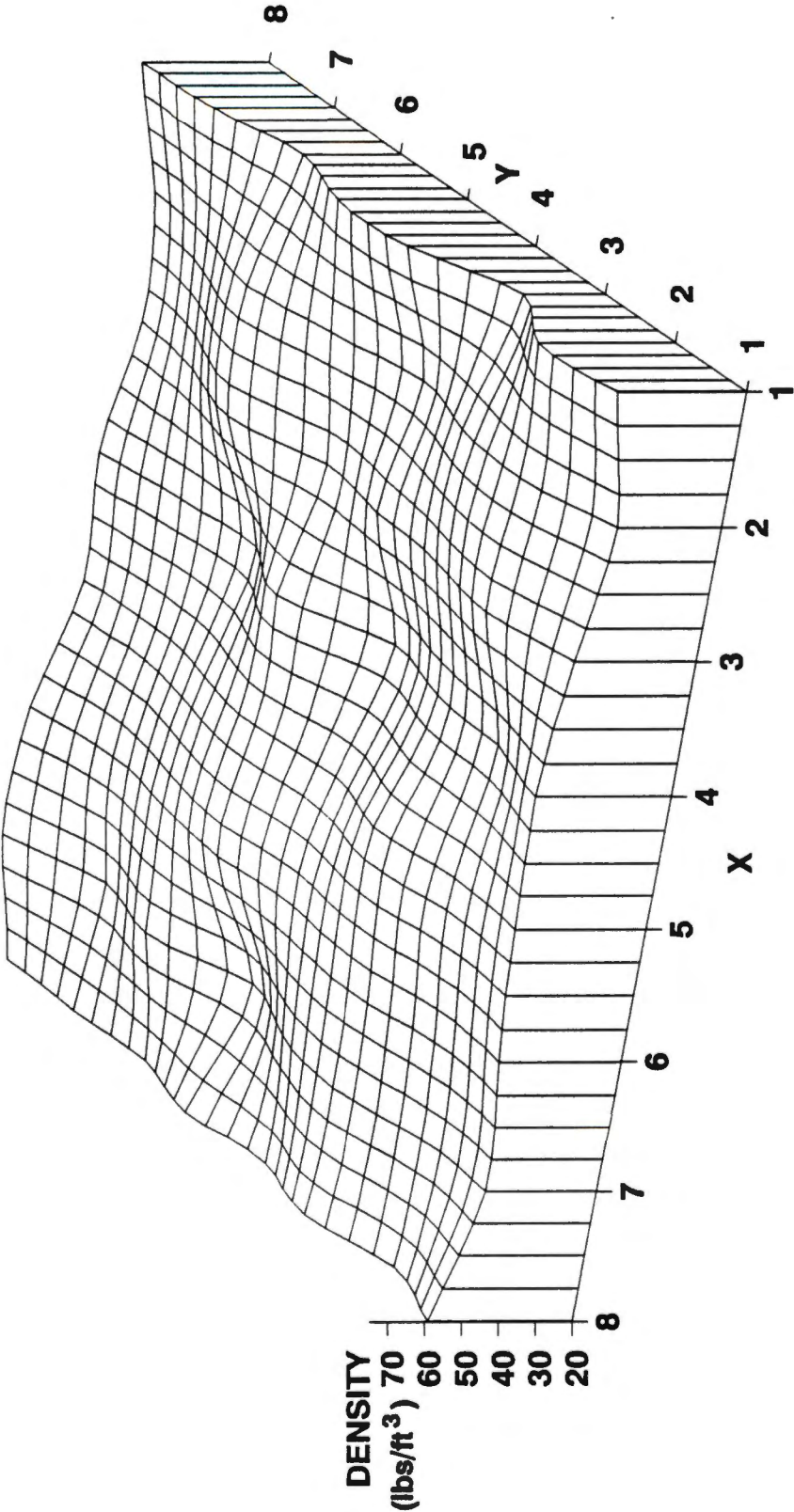
Z = 1



FLAKE MOISTURE CONTENT =12%, PRESS CLOSURE RATE =100 SECONDS
REPLICATION =2
Z=2



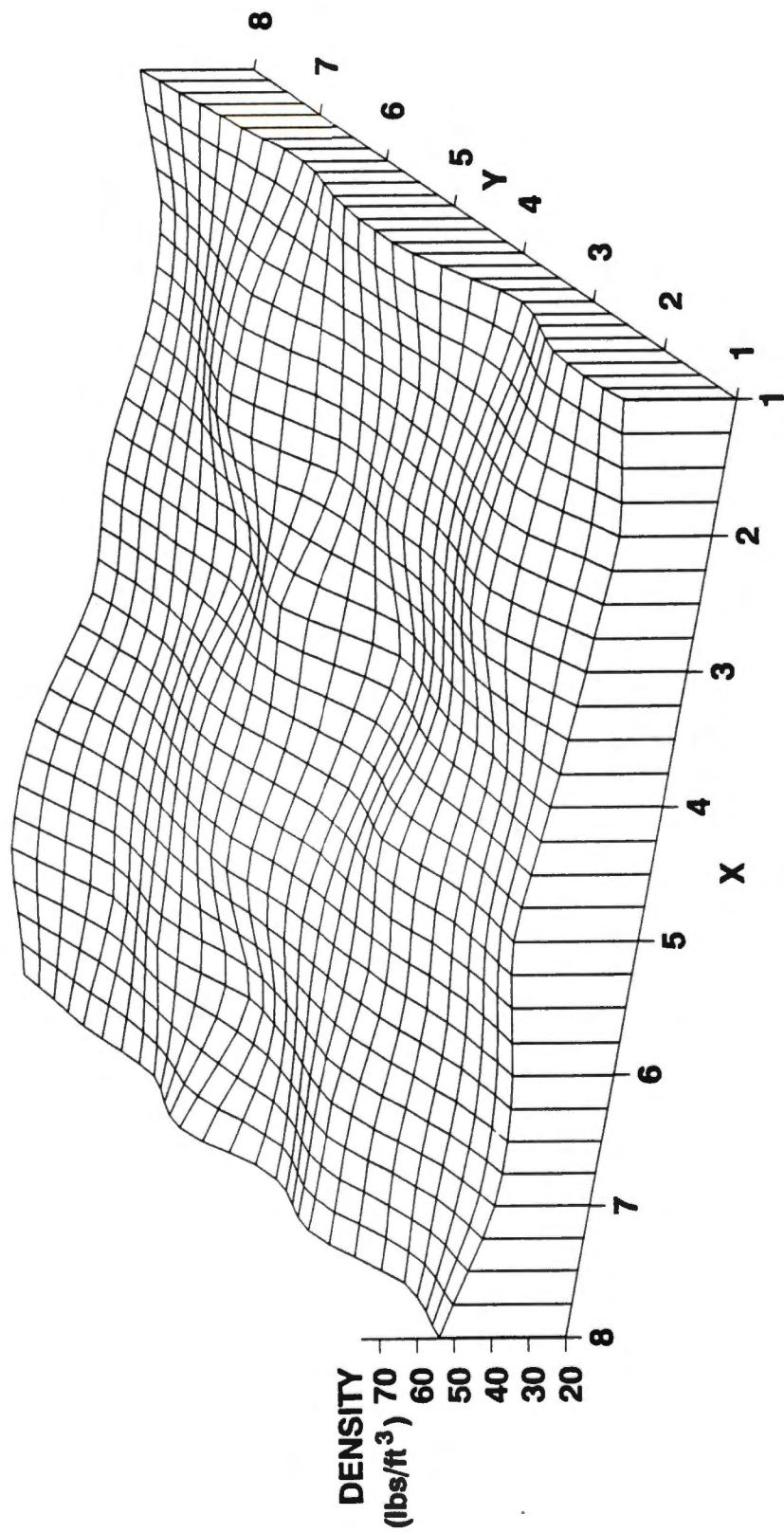
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 3



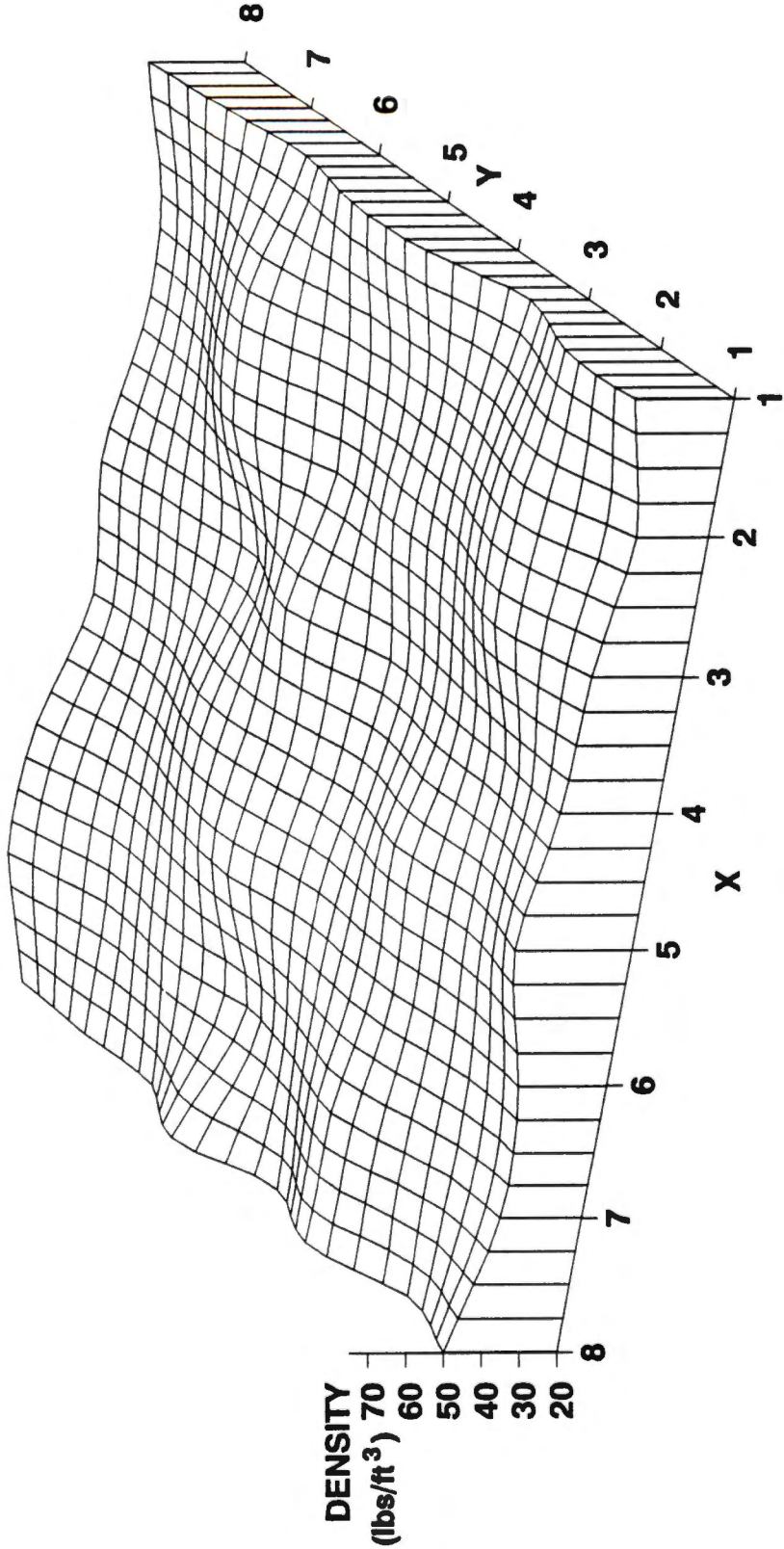
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS

REPLICATION=2

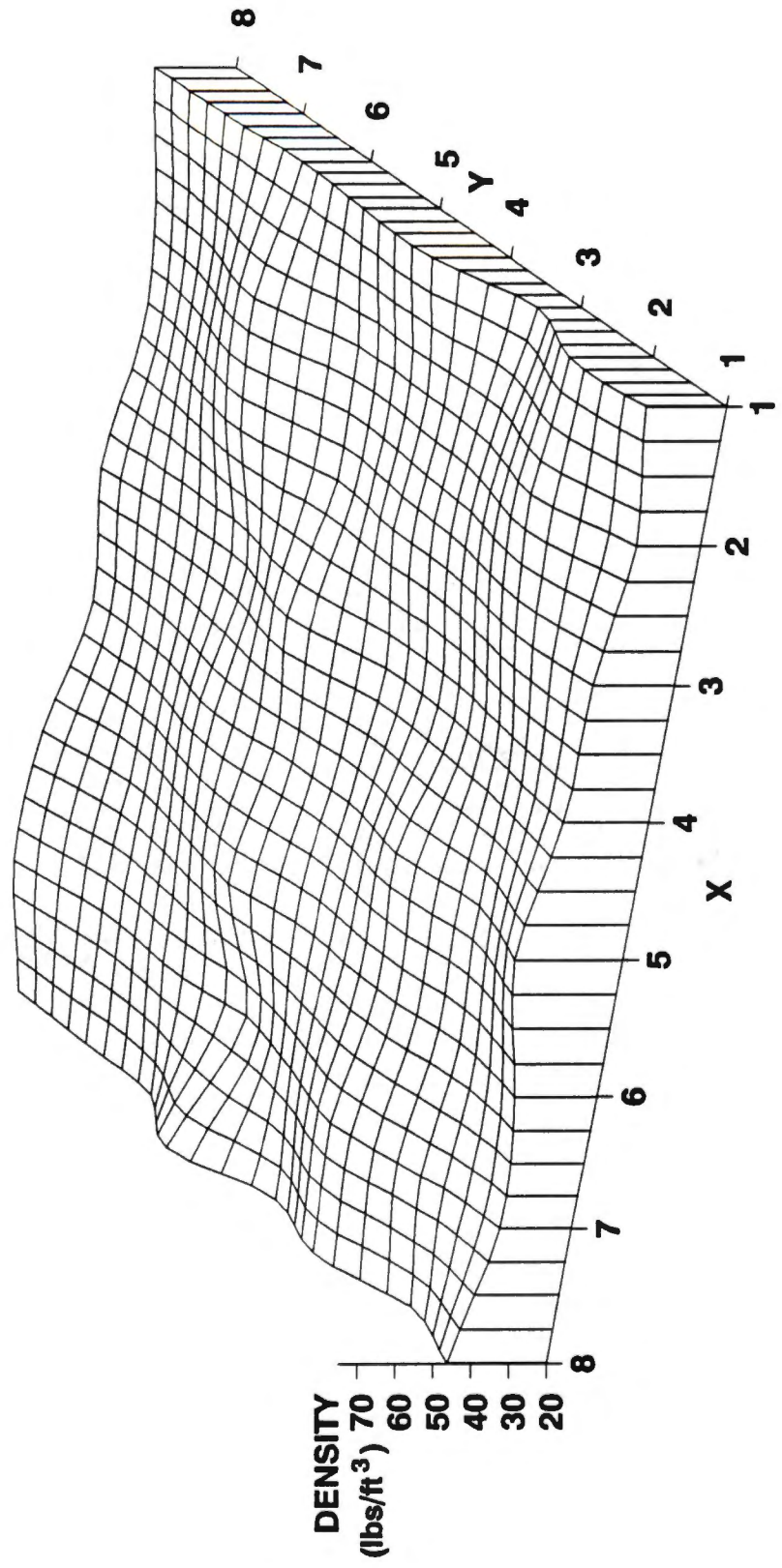
Z=4



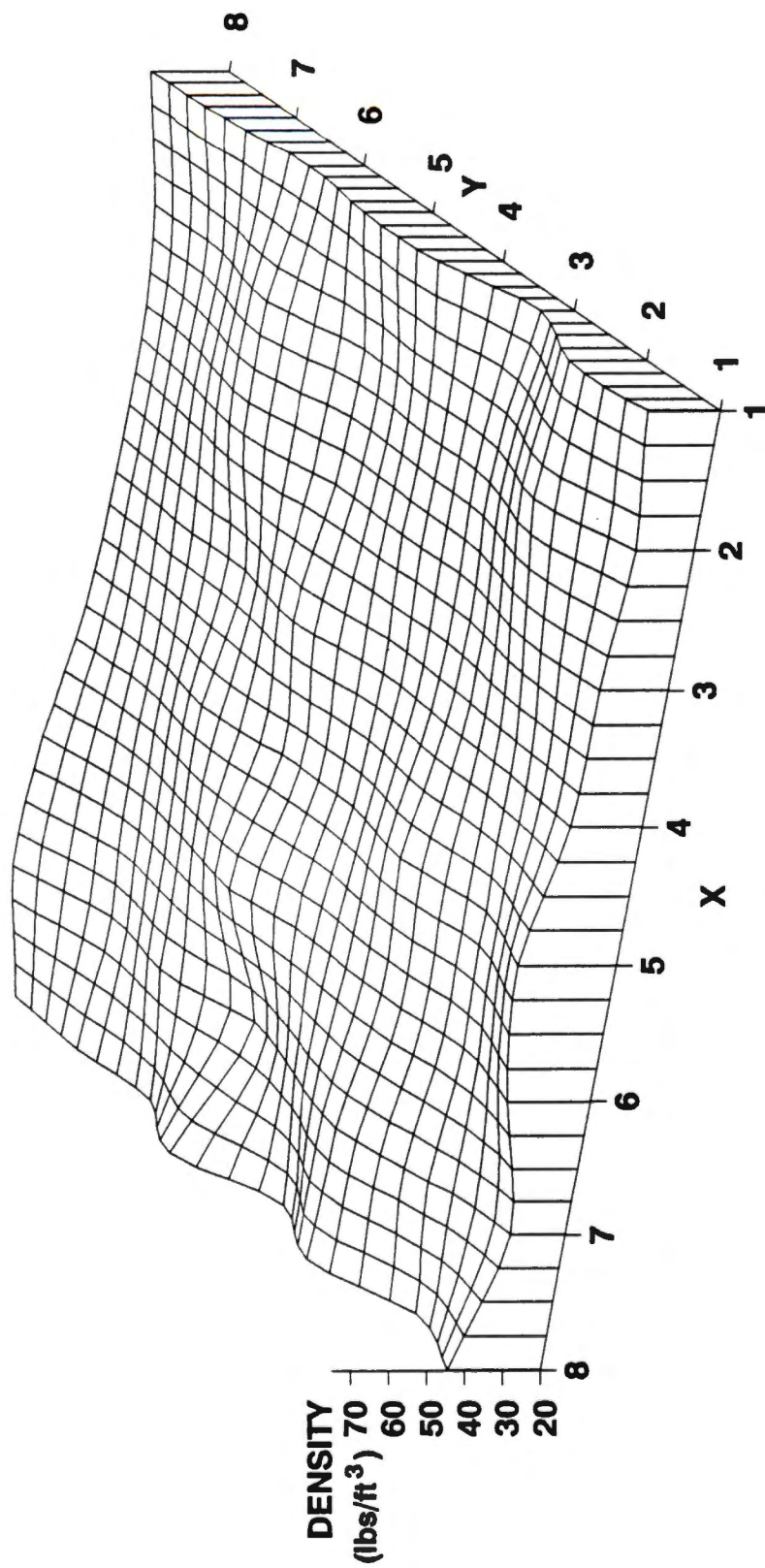
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=5



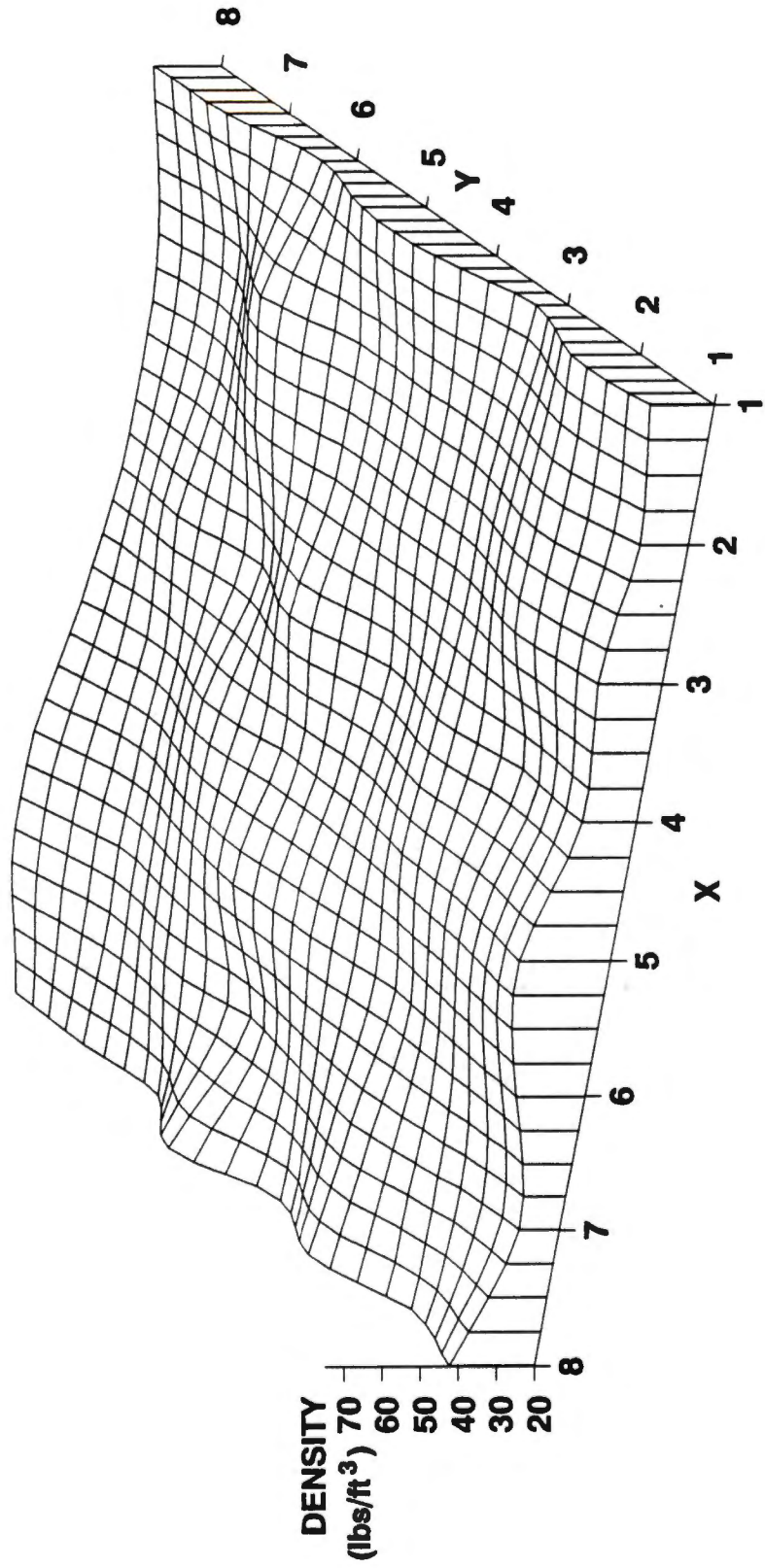
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 6



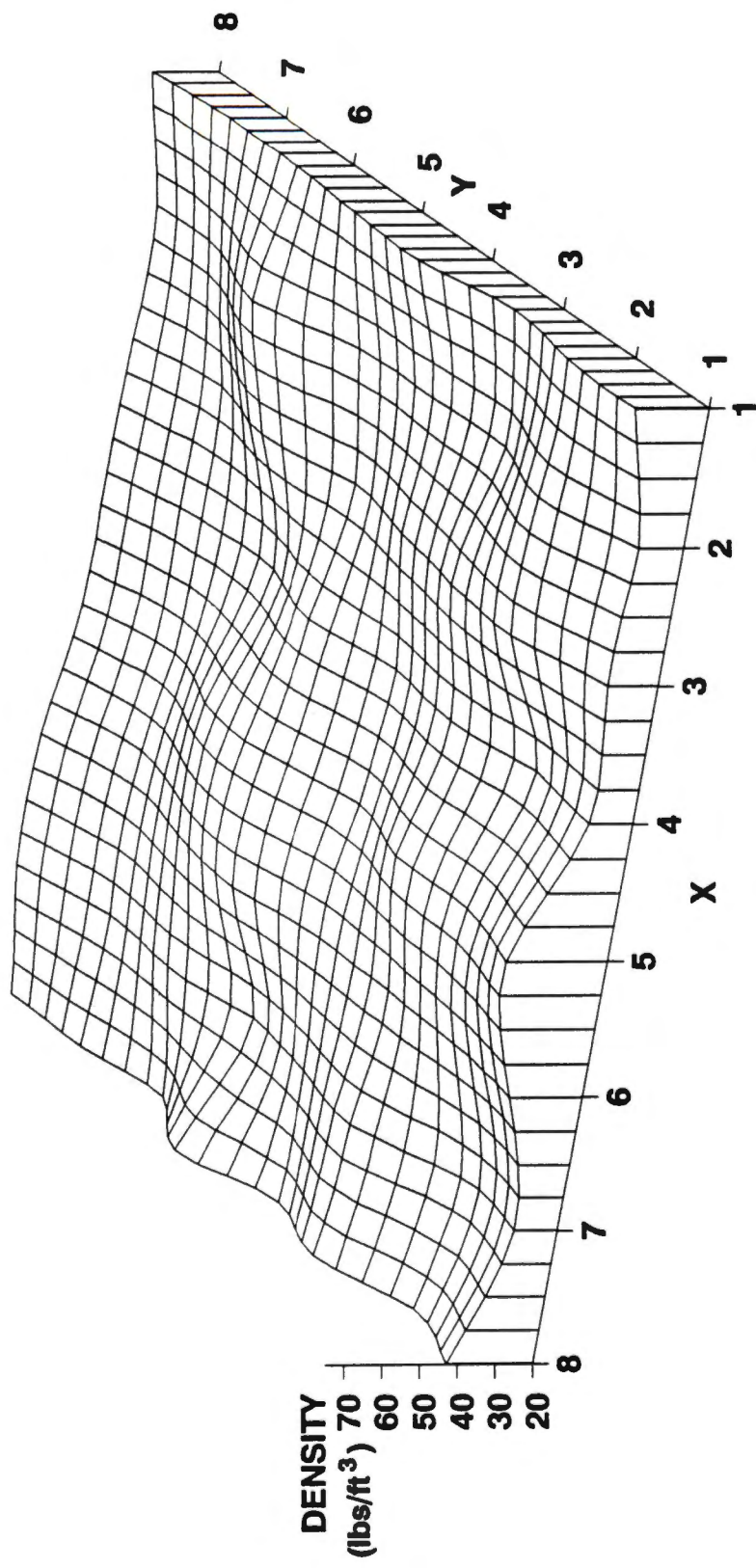
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 7



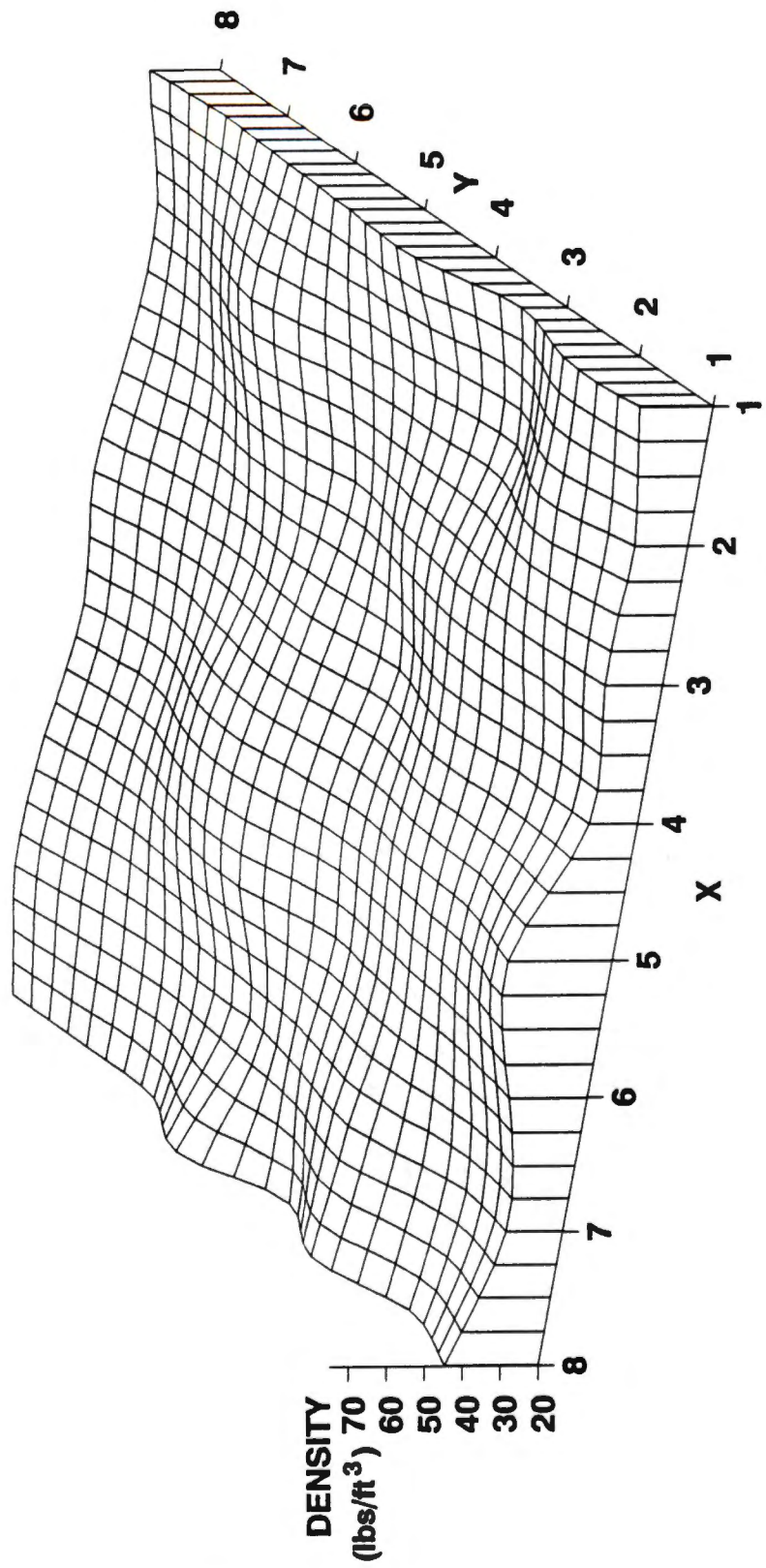
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 8



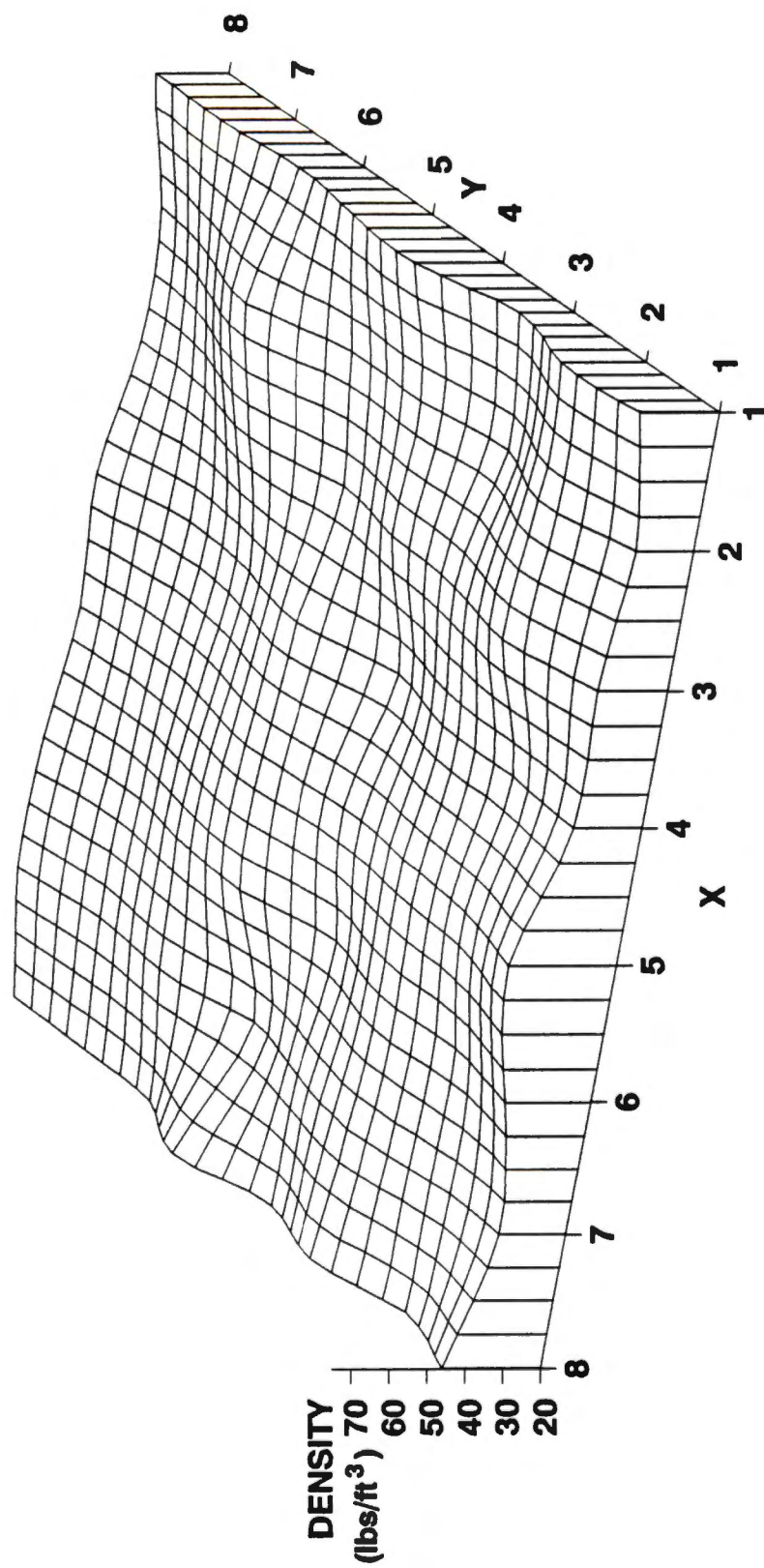
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 9



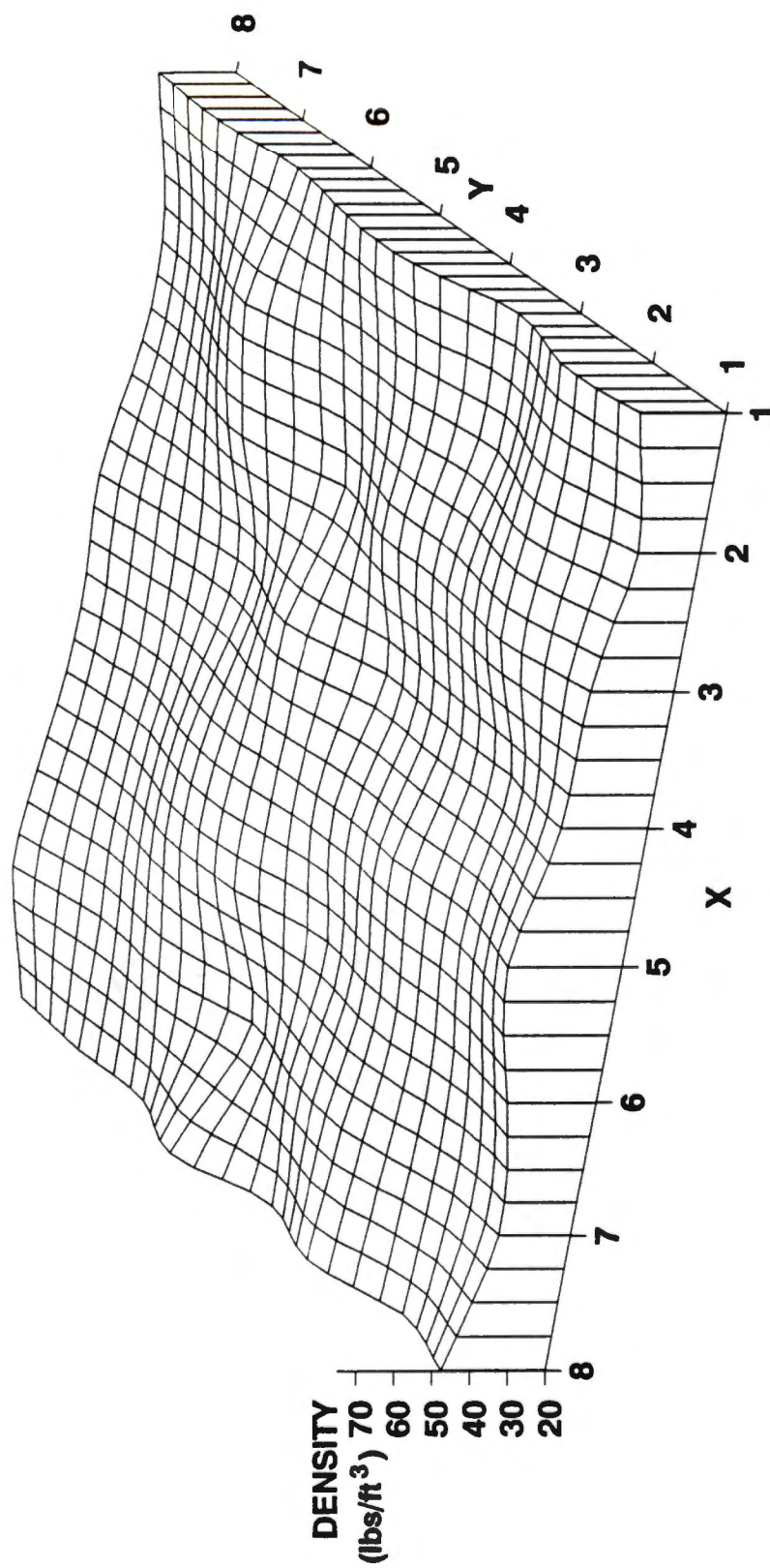
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=10



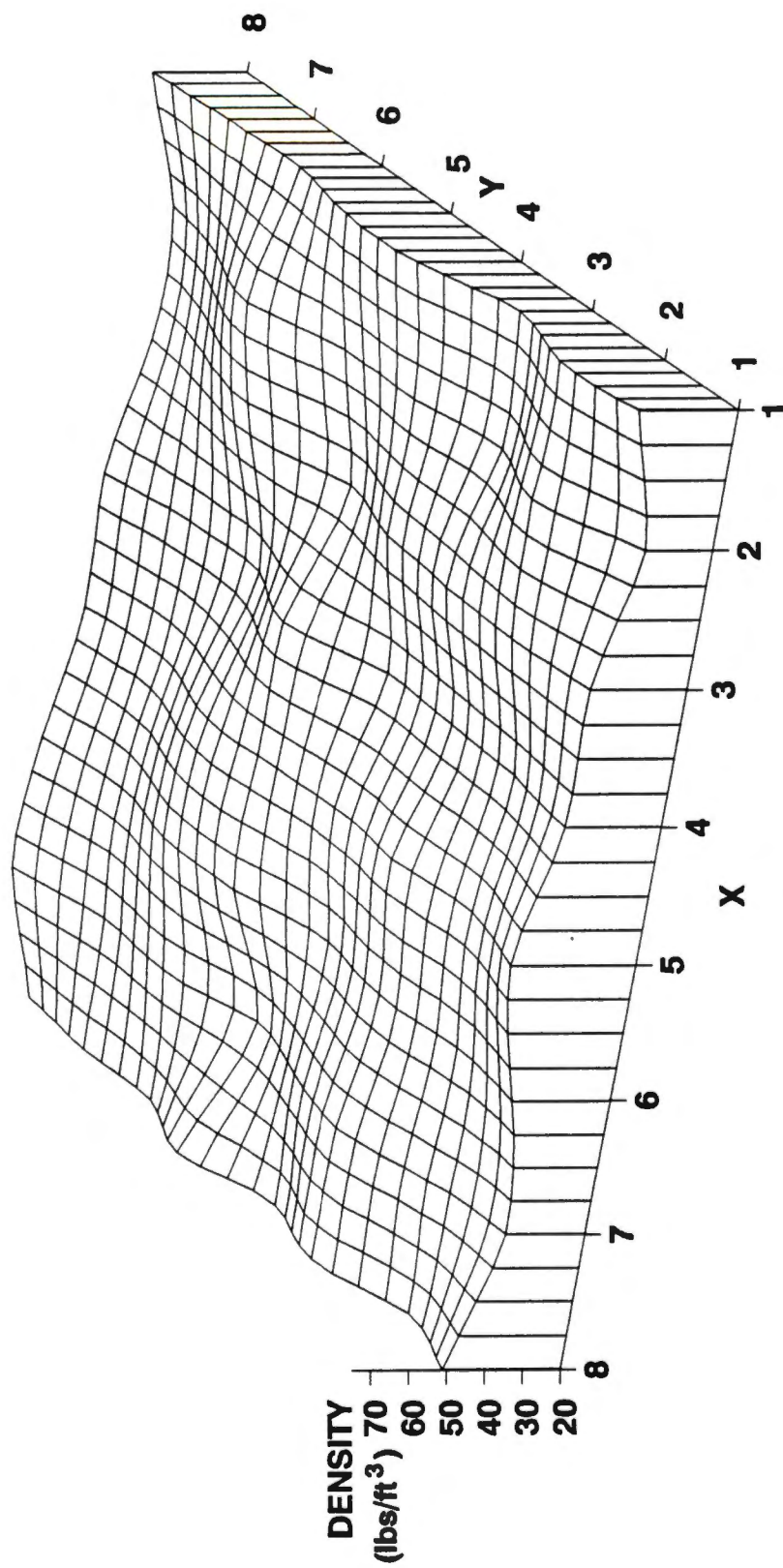
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 11



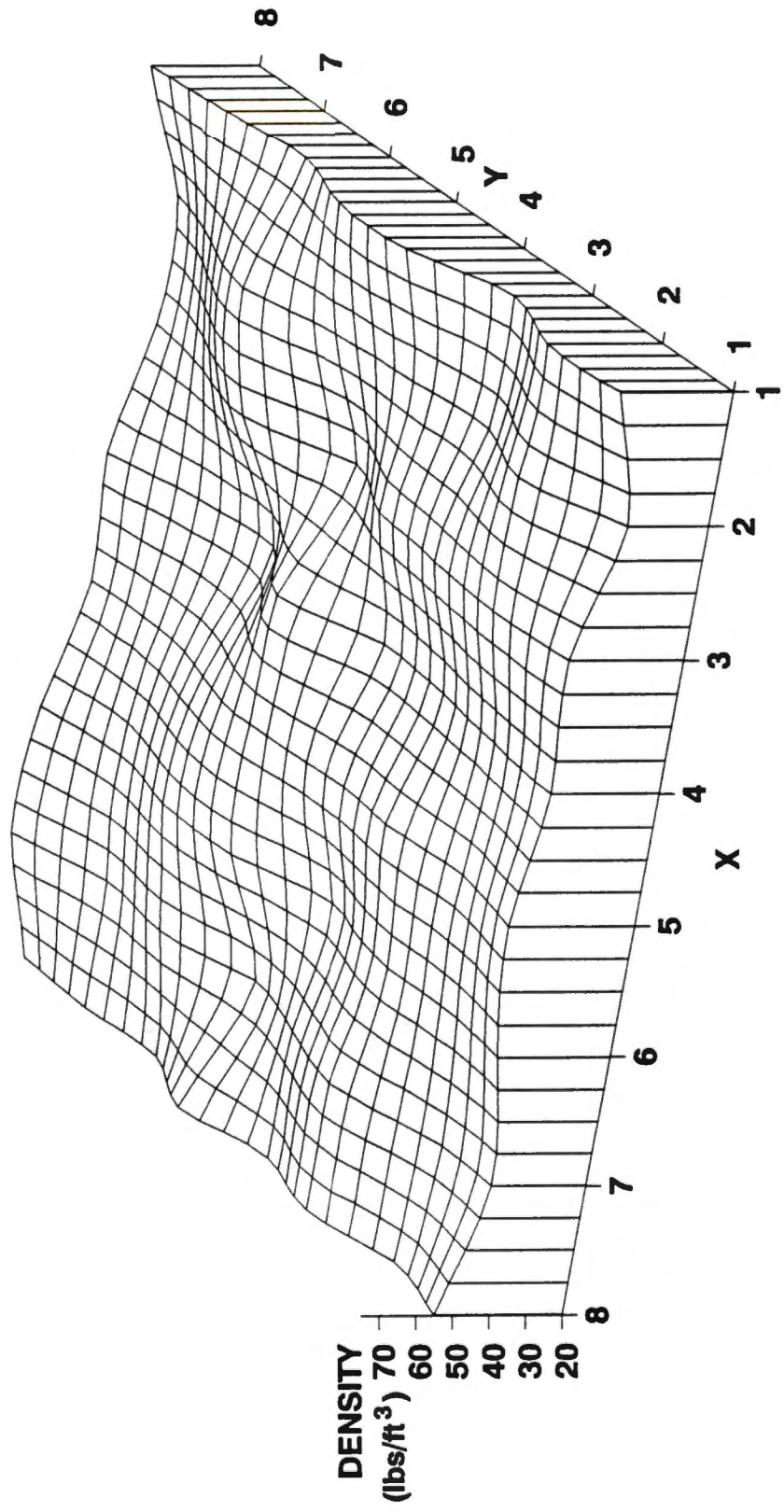
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 2
Z = 12



FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=13



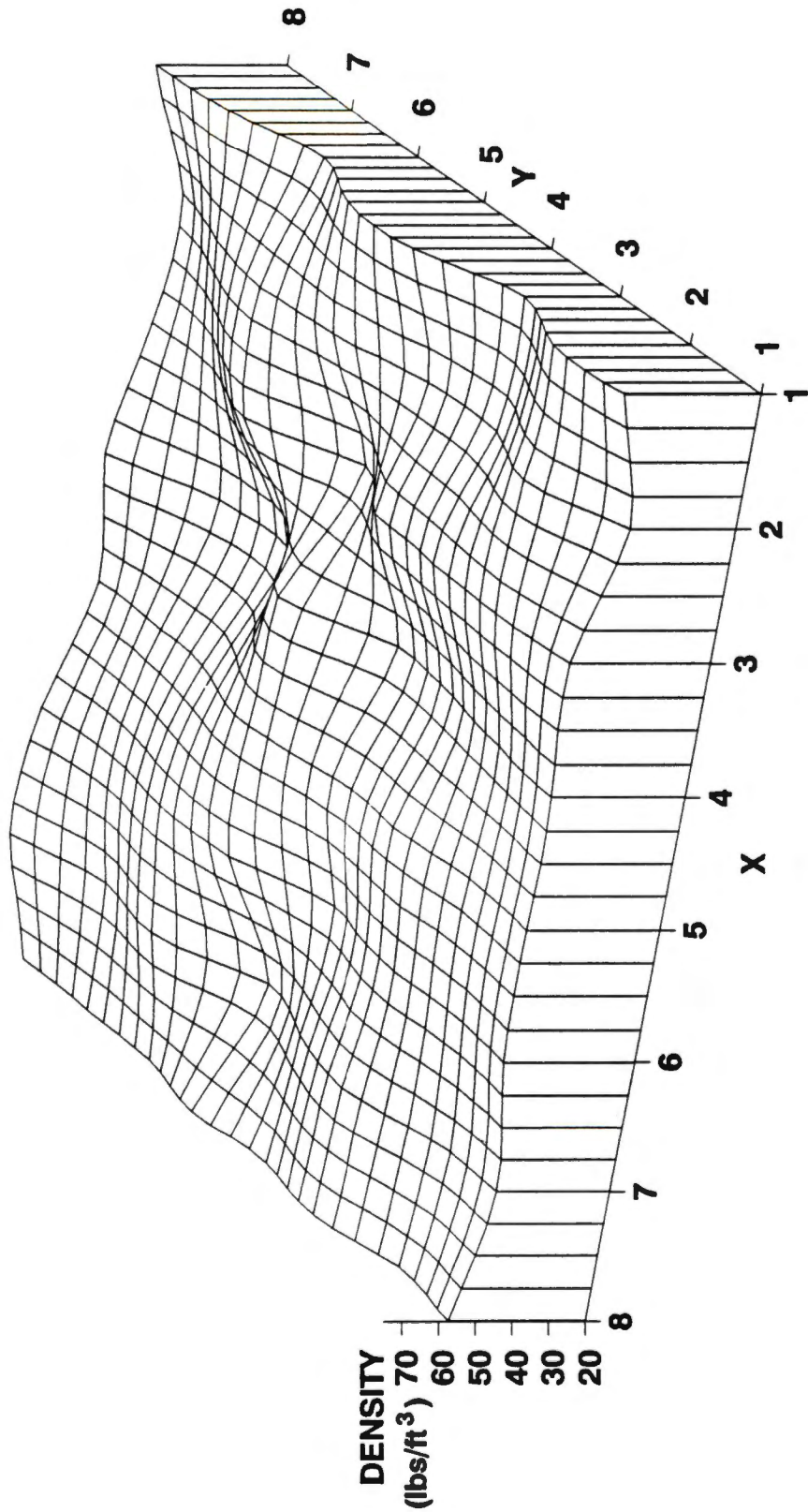
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=14



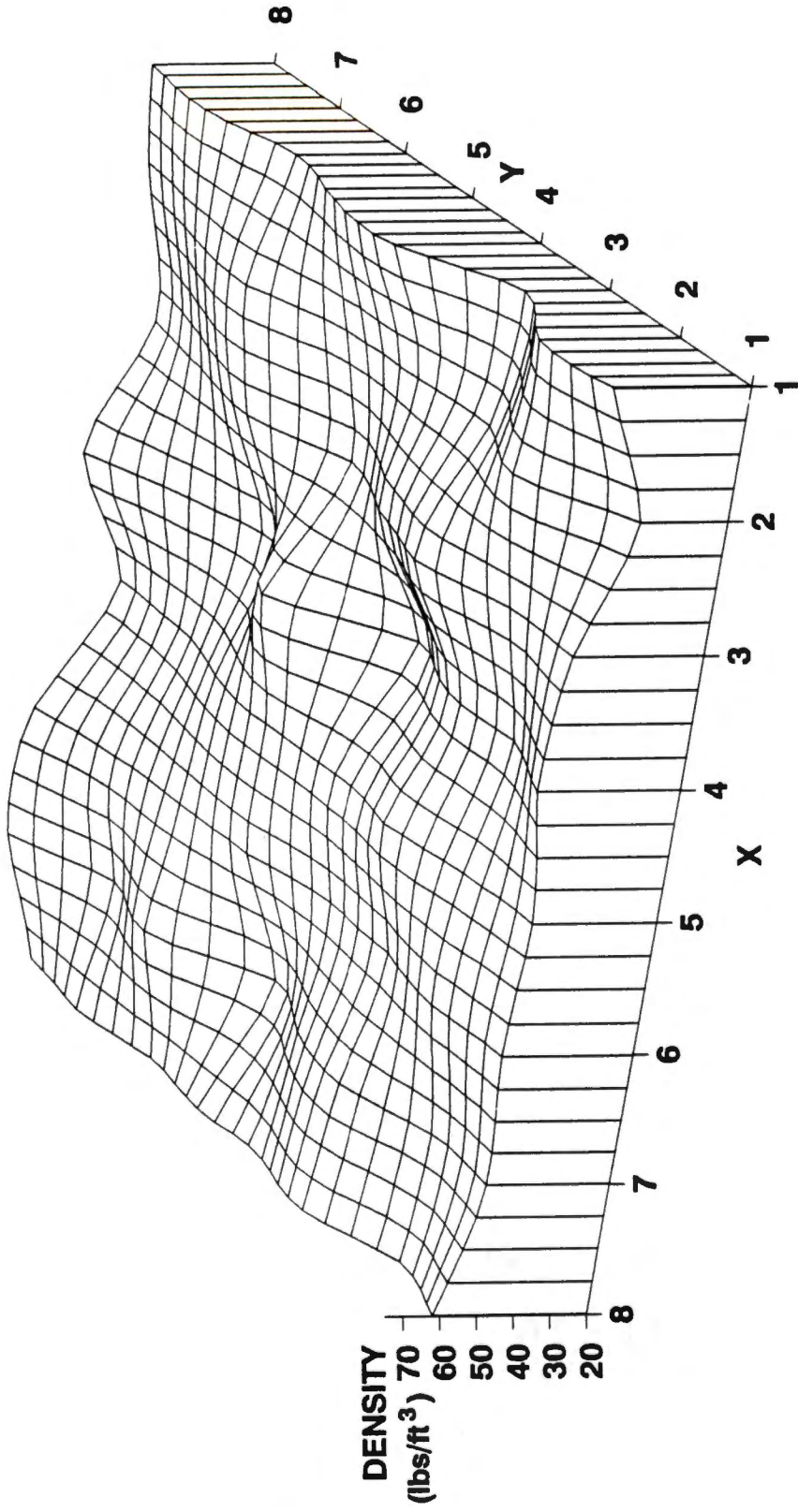
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 2

Z = 15



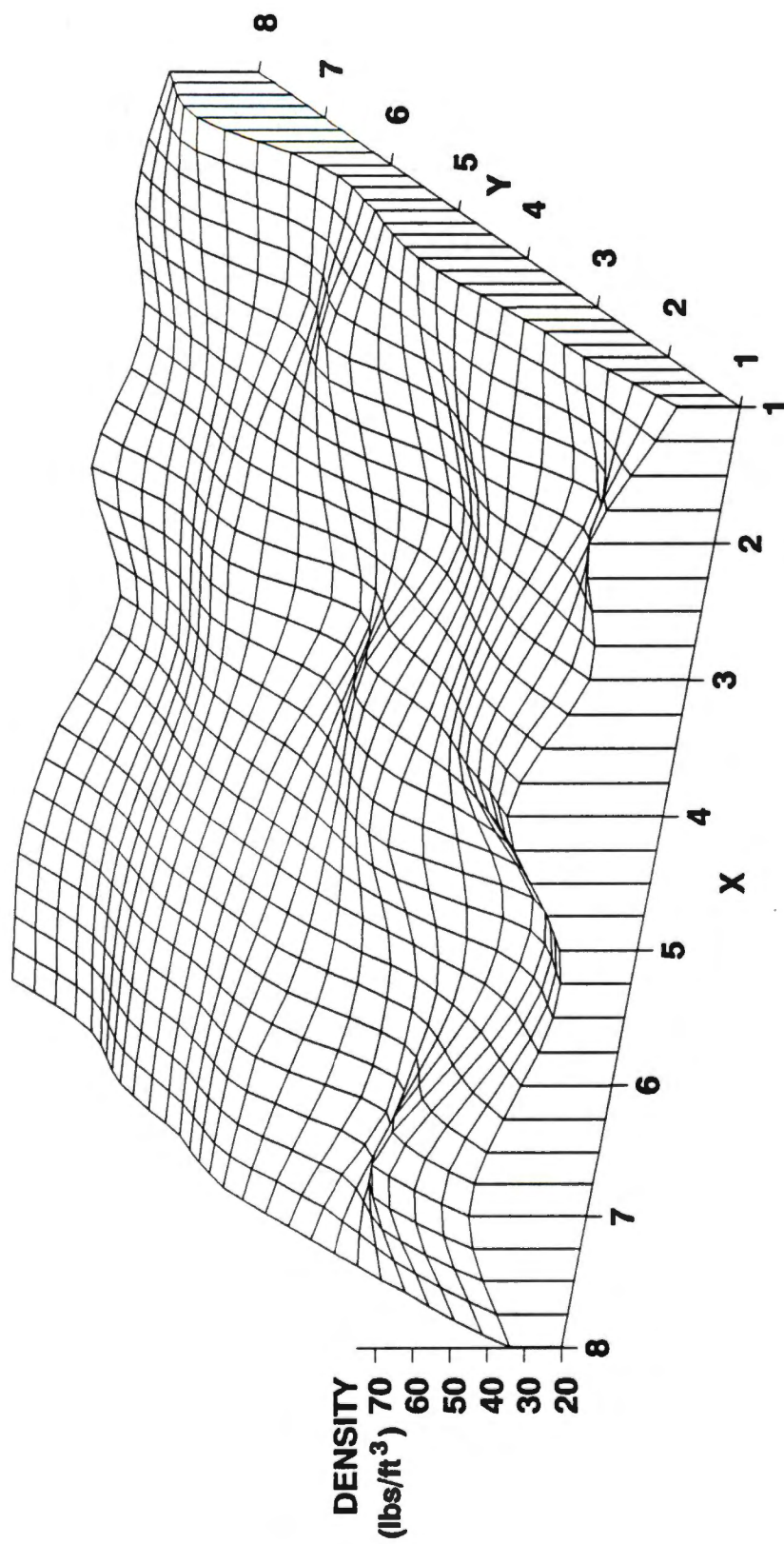
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=2
Z=16



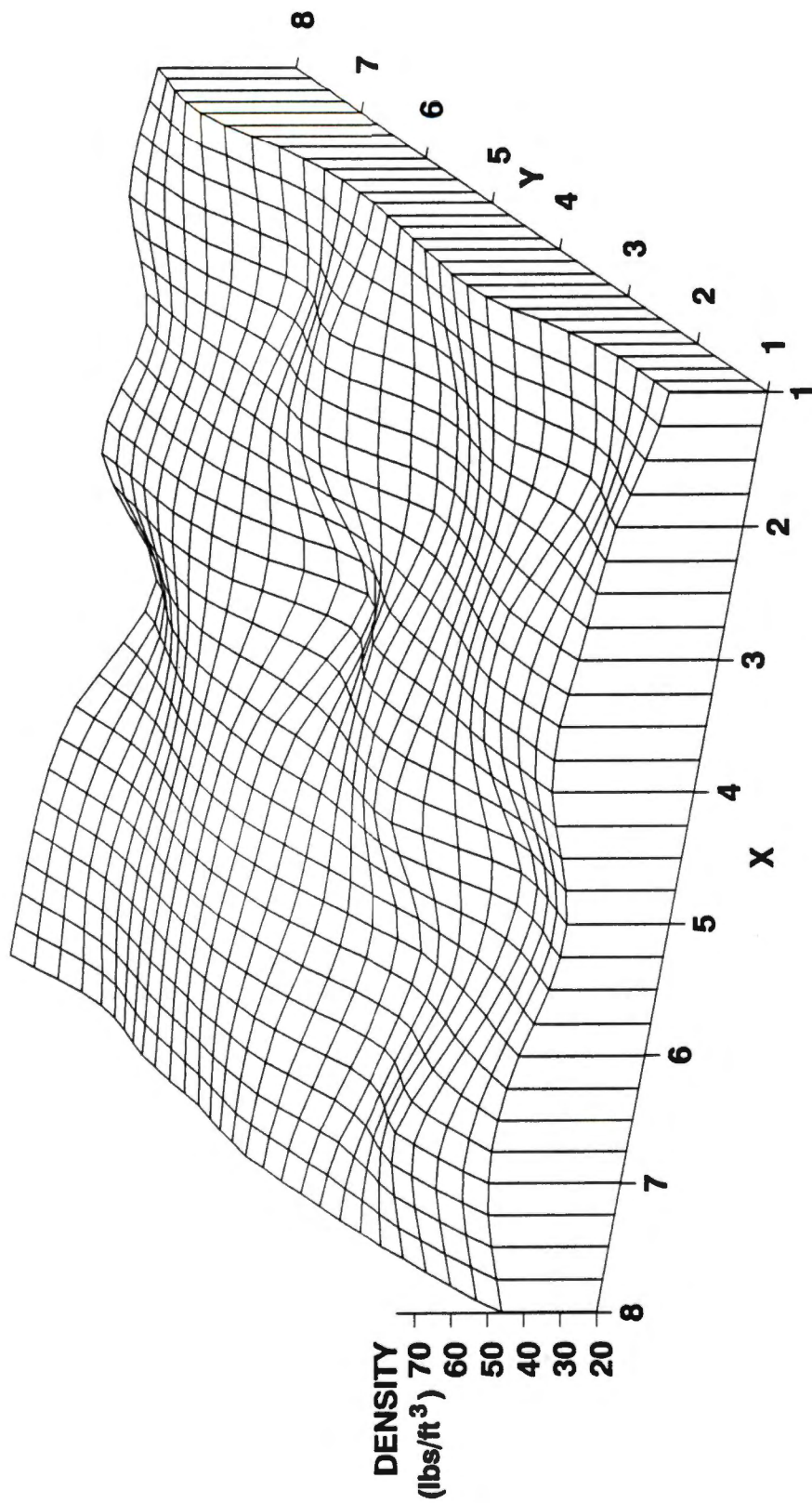
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS

REPLICATION=3

Z=1



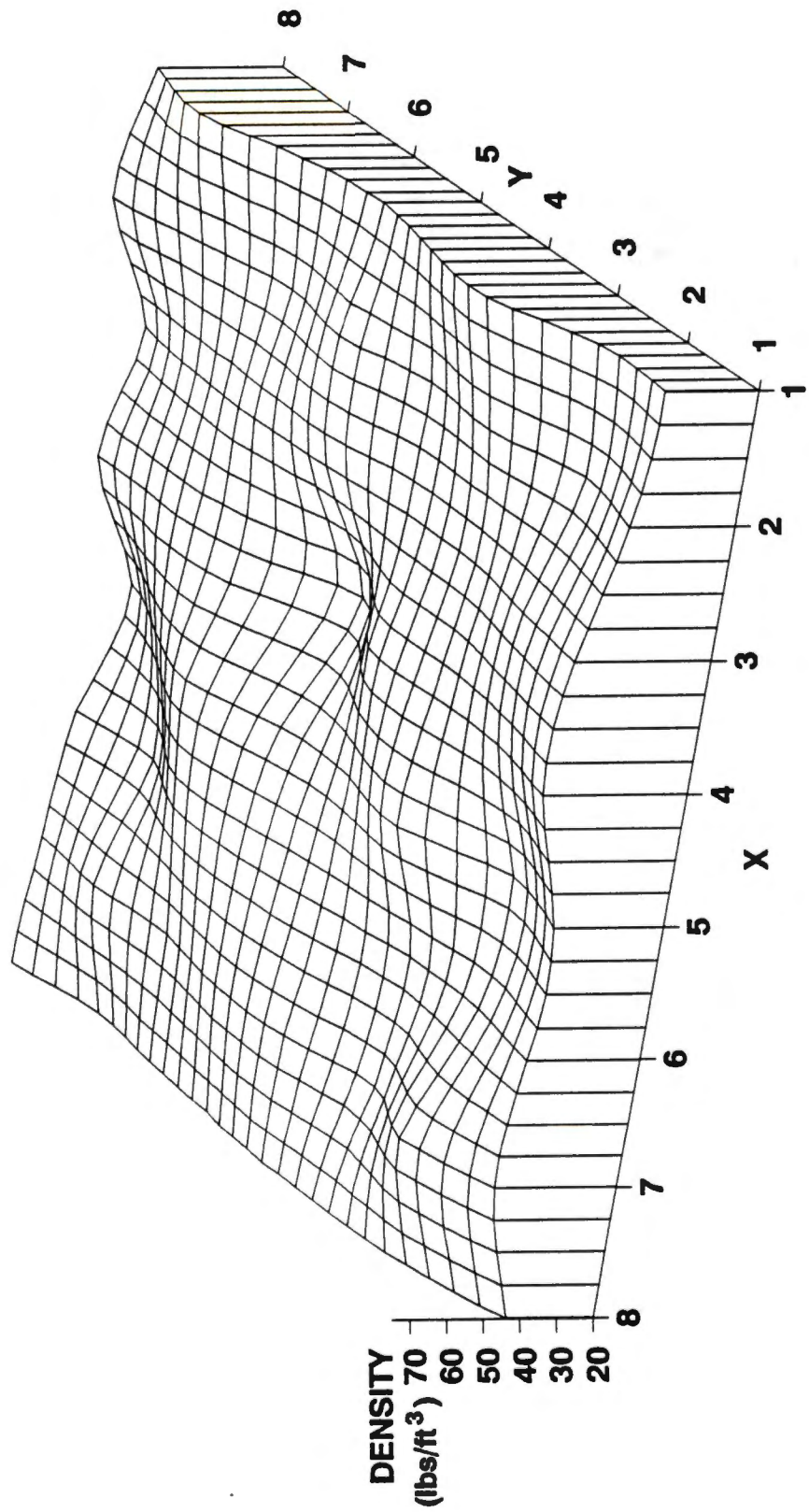
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 2



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 3

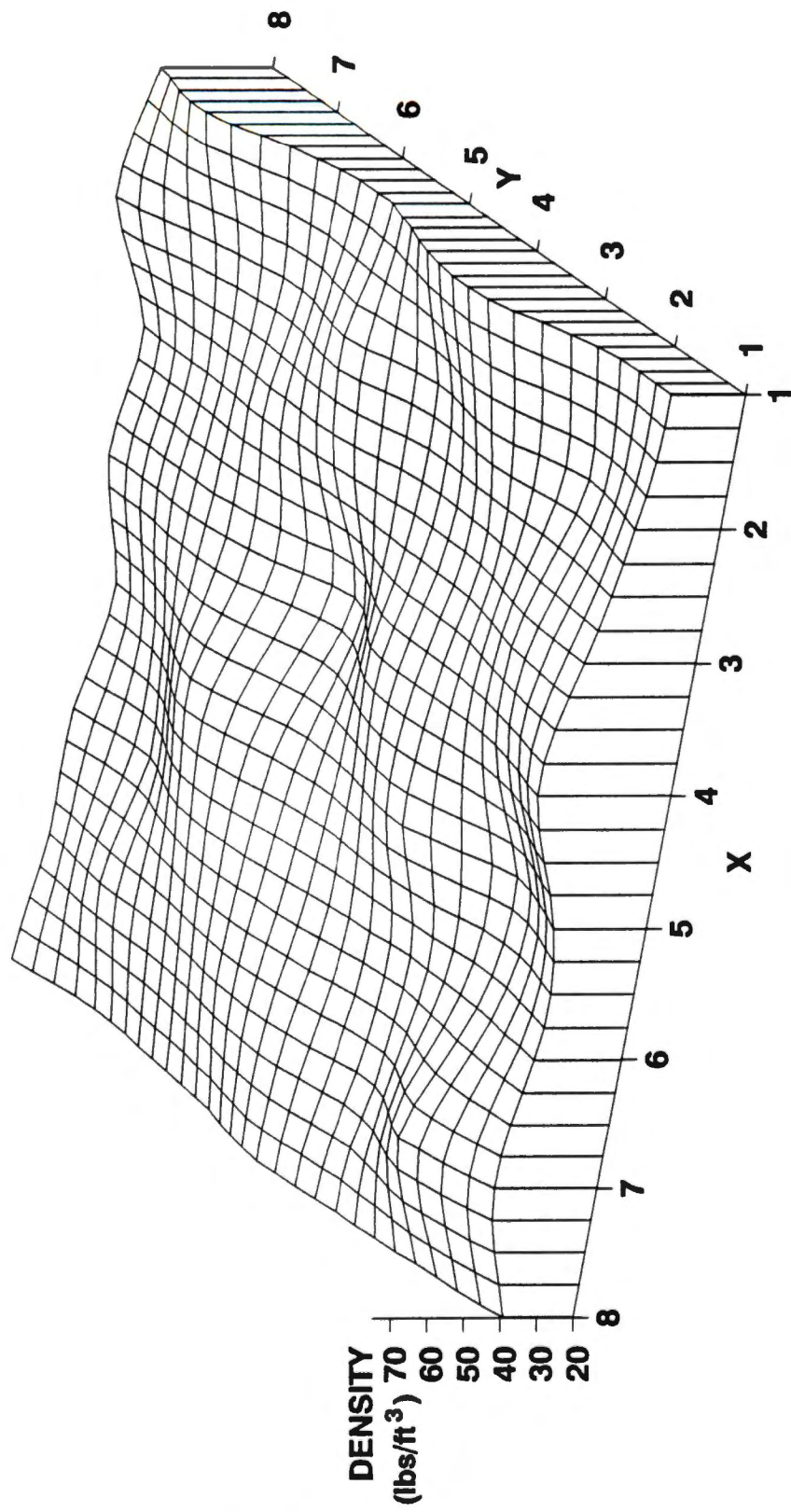
Z = 3



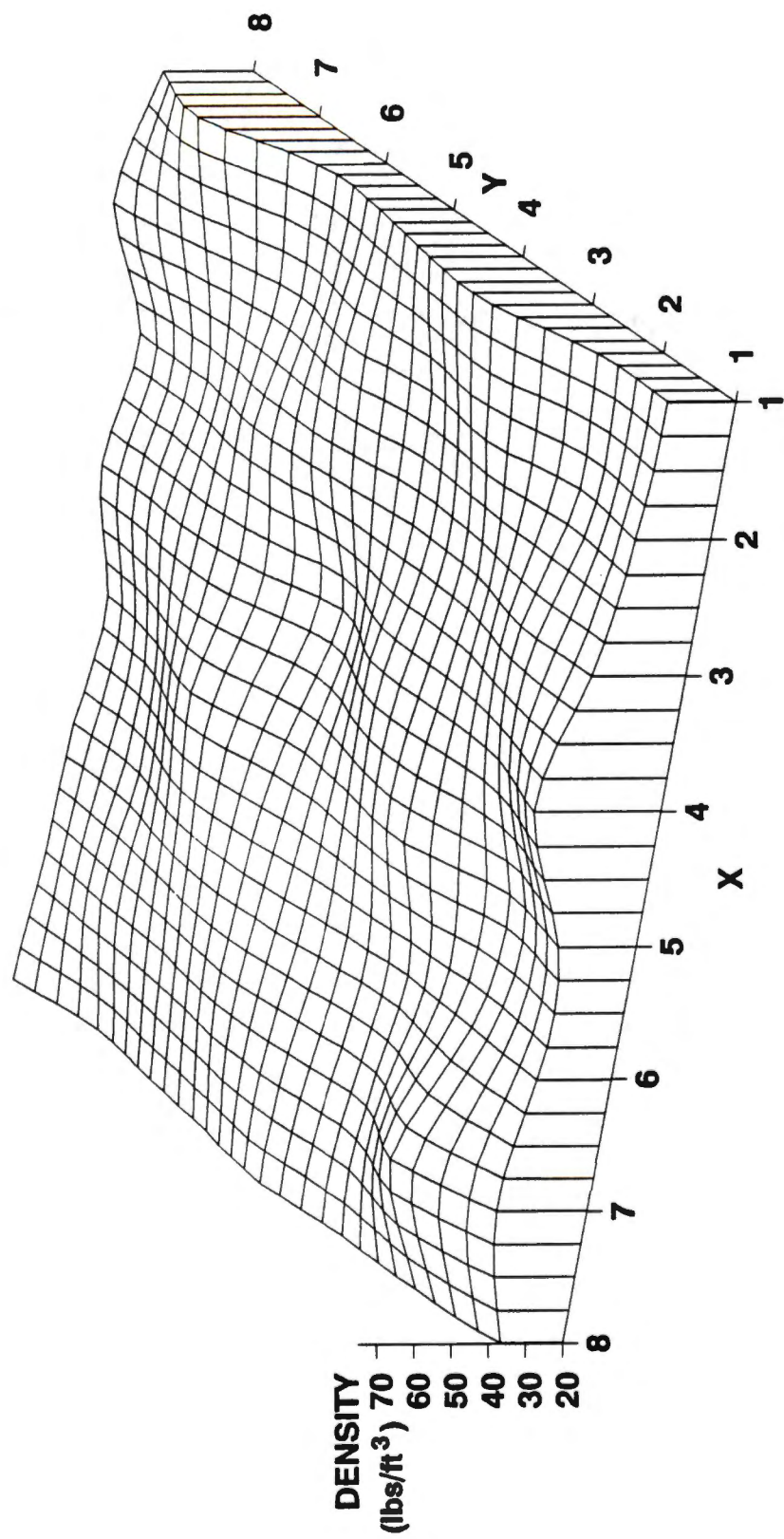
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 3

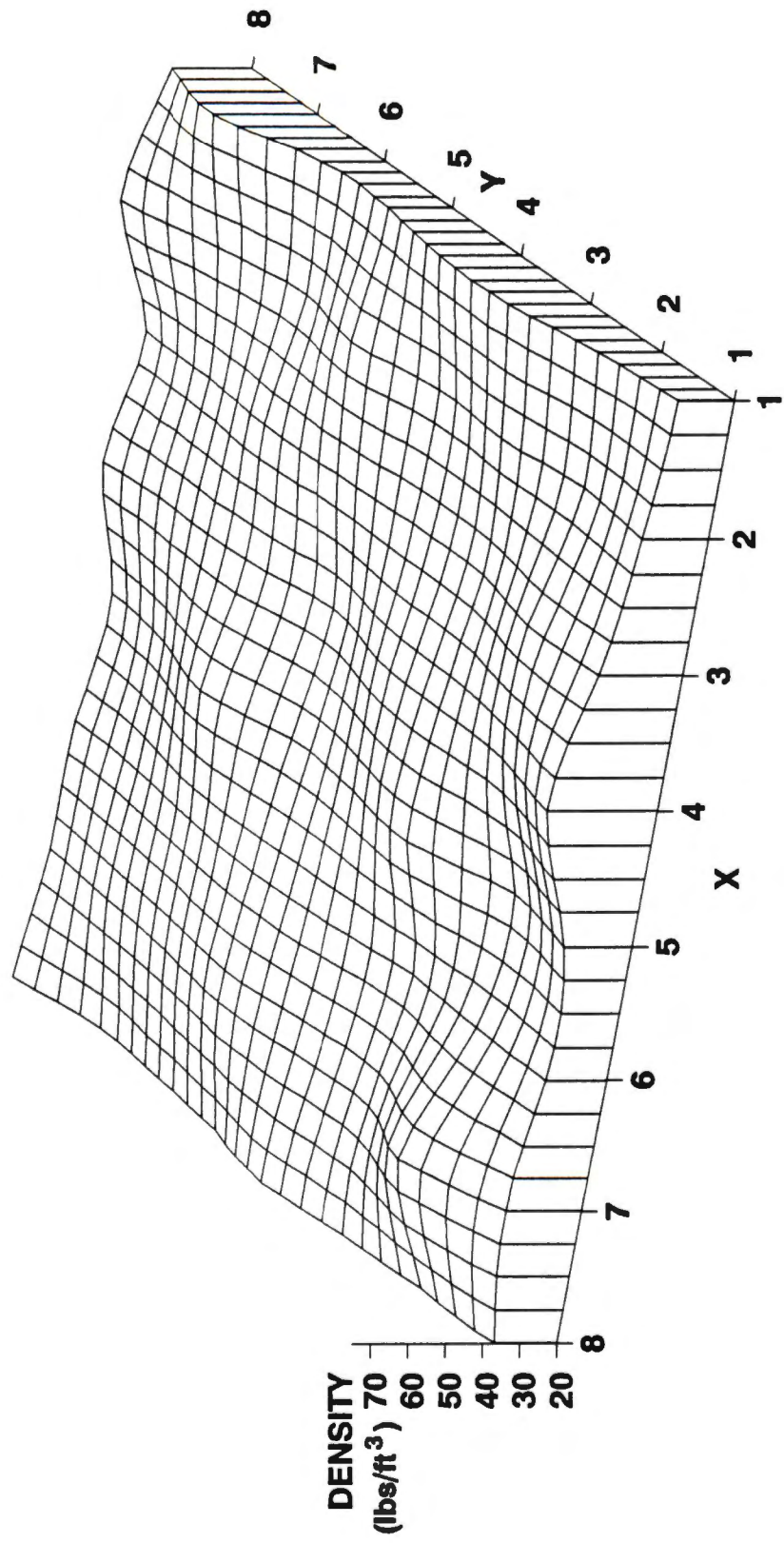
Z = 4



FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=5



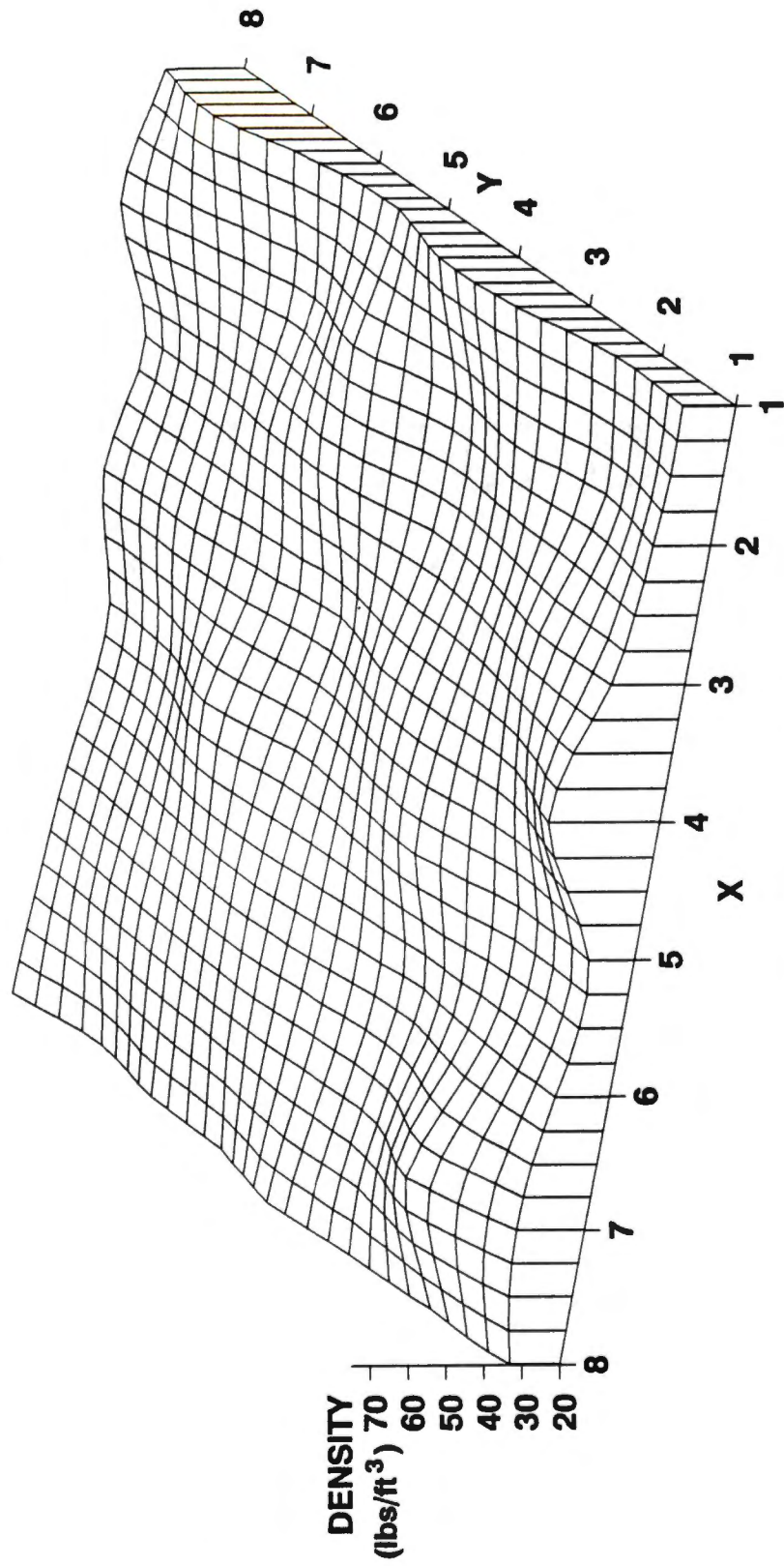
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=6



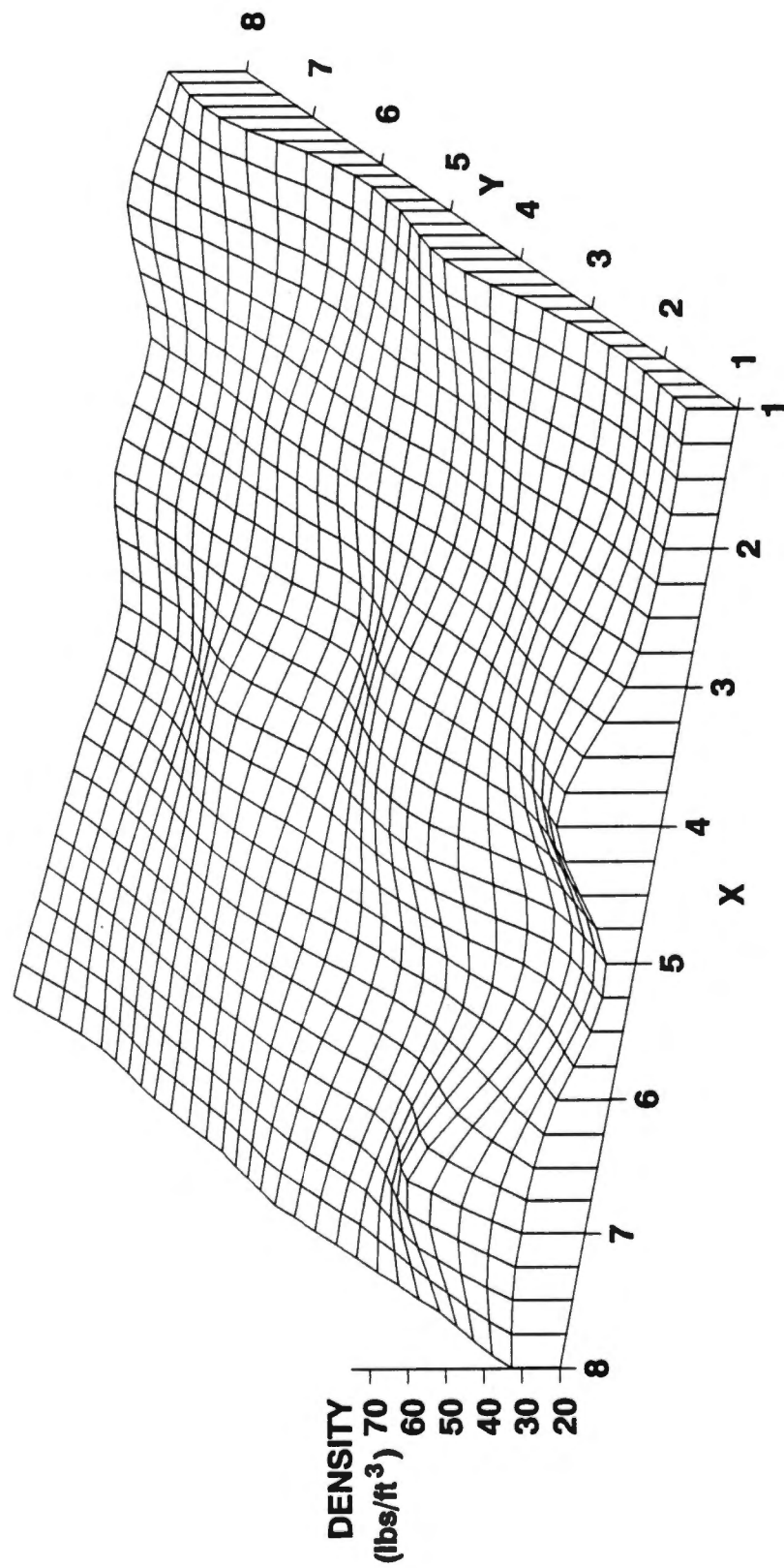
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 3

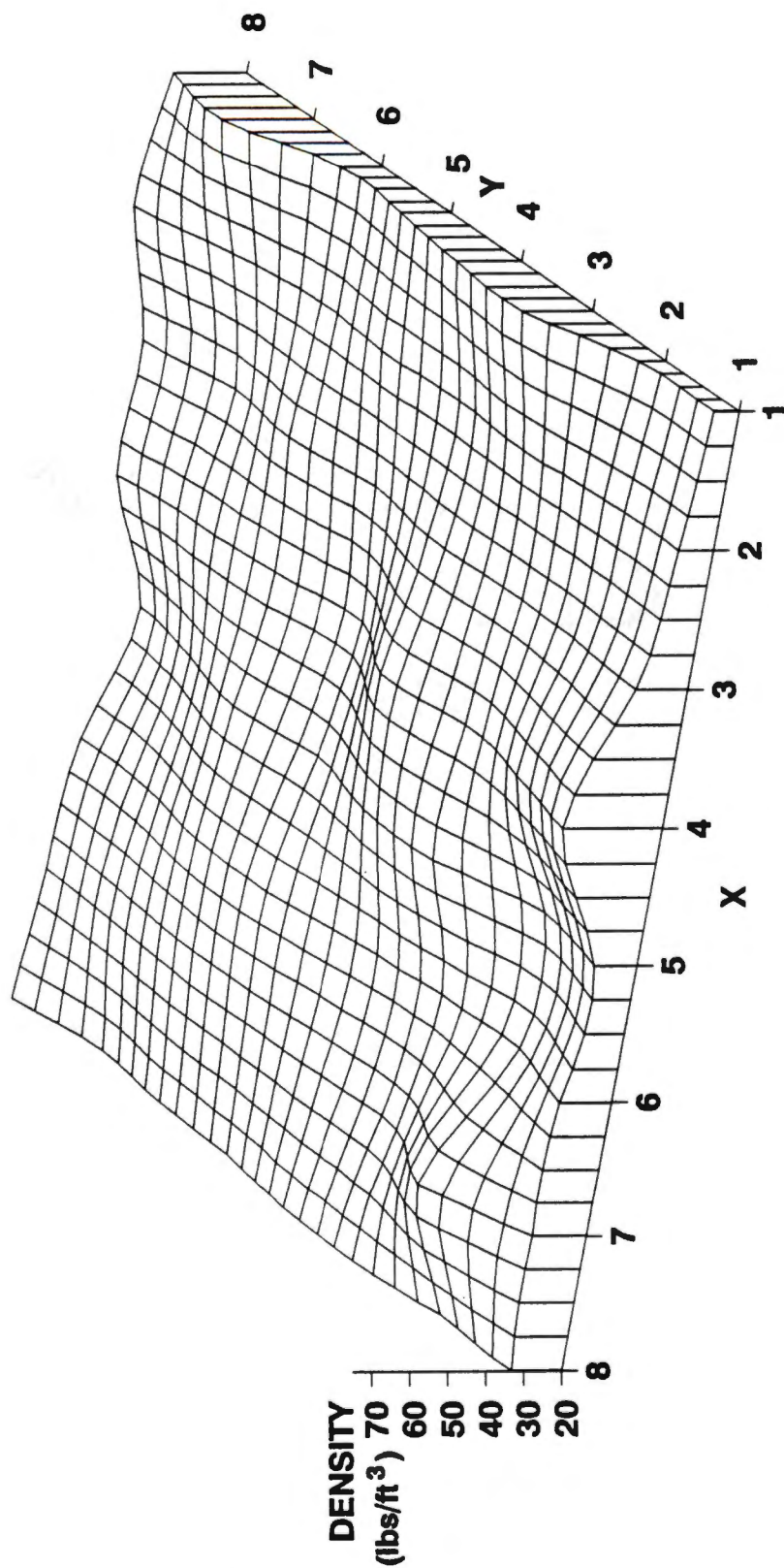
Z = 7



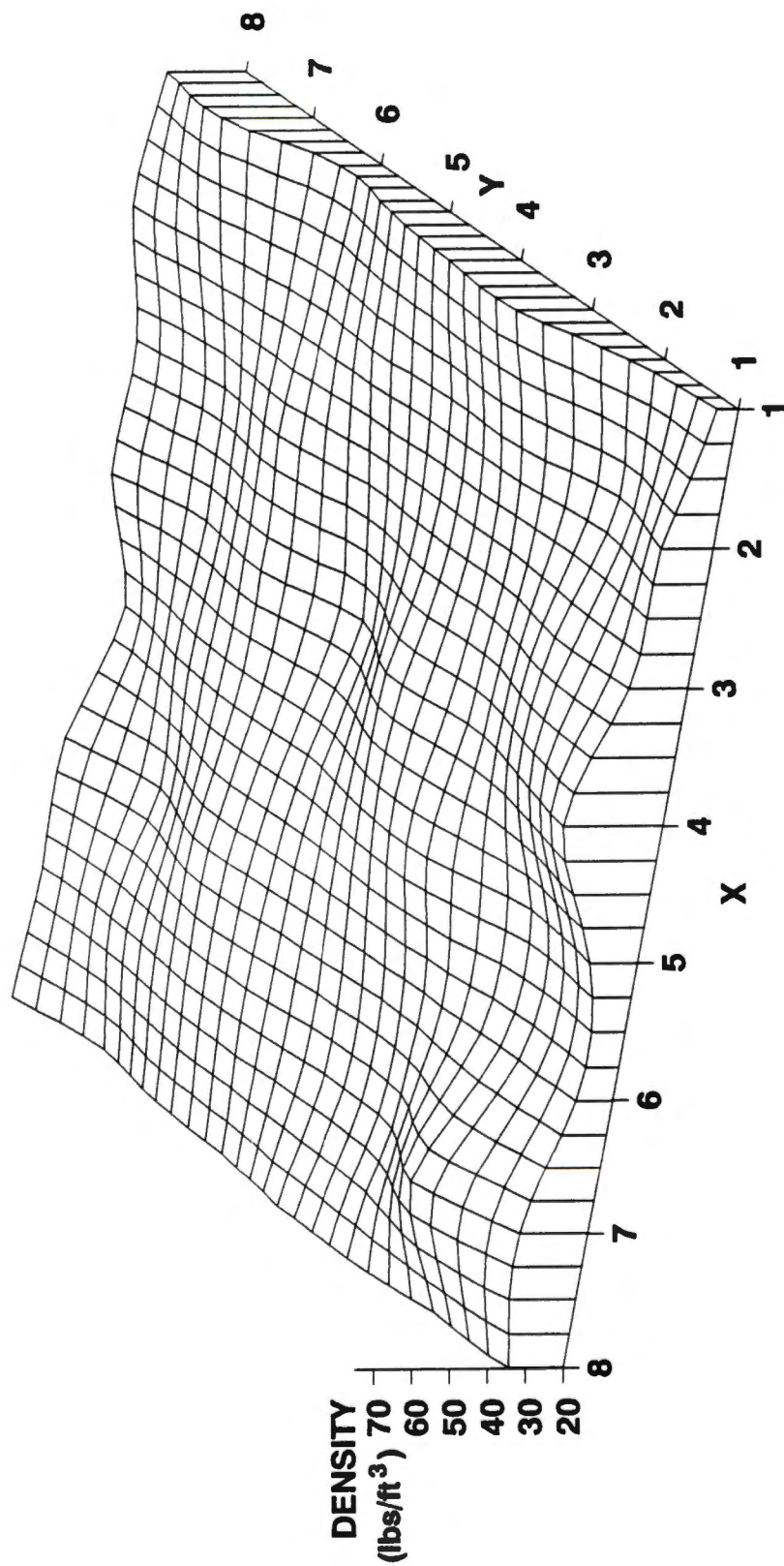
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 8



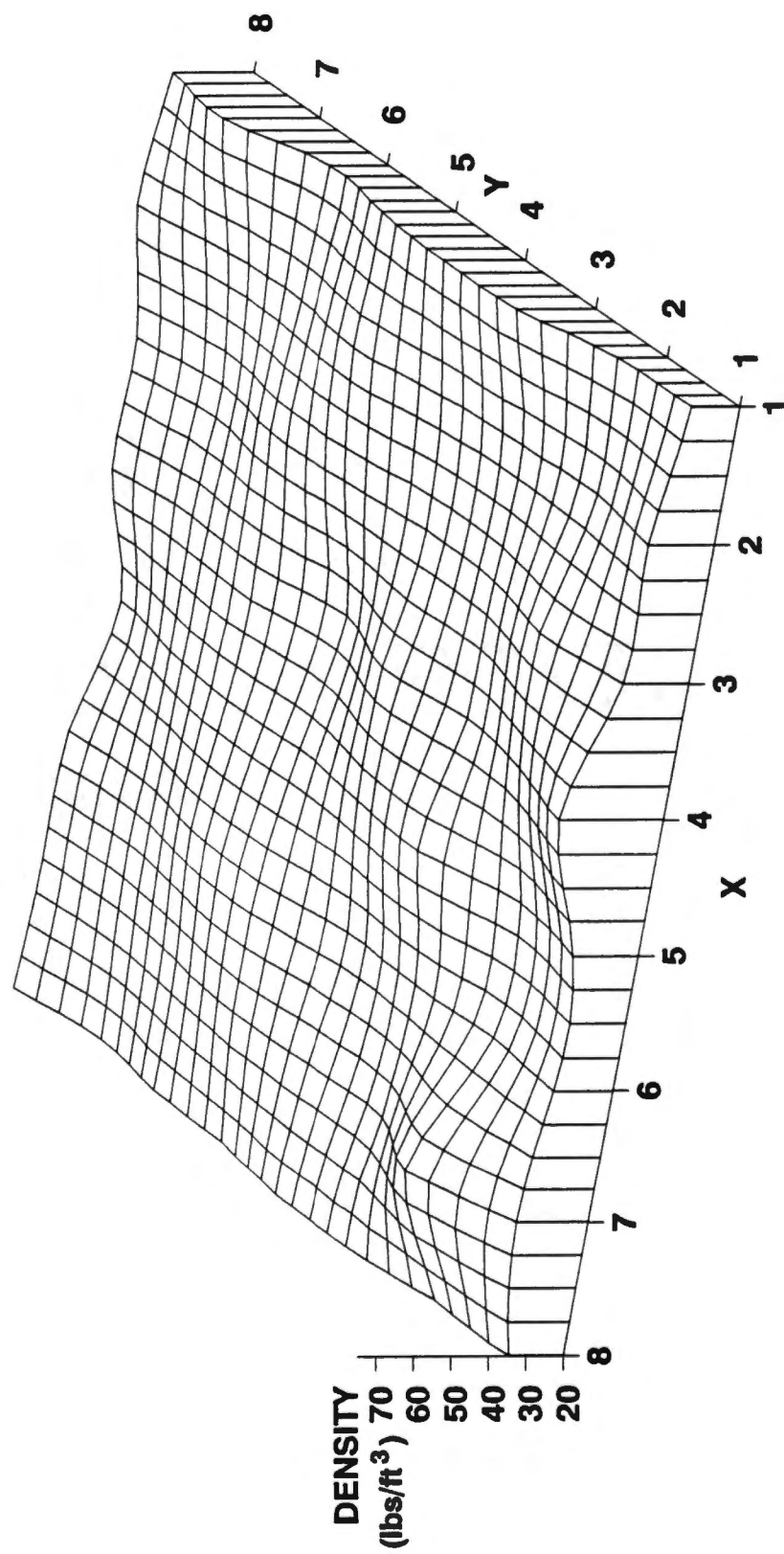
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=9



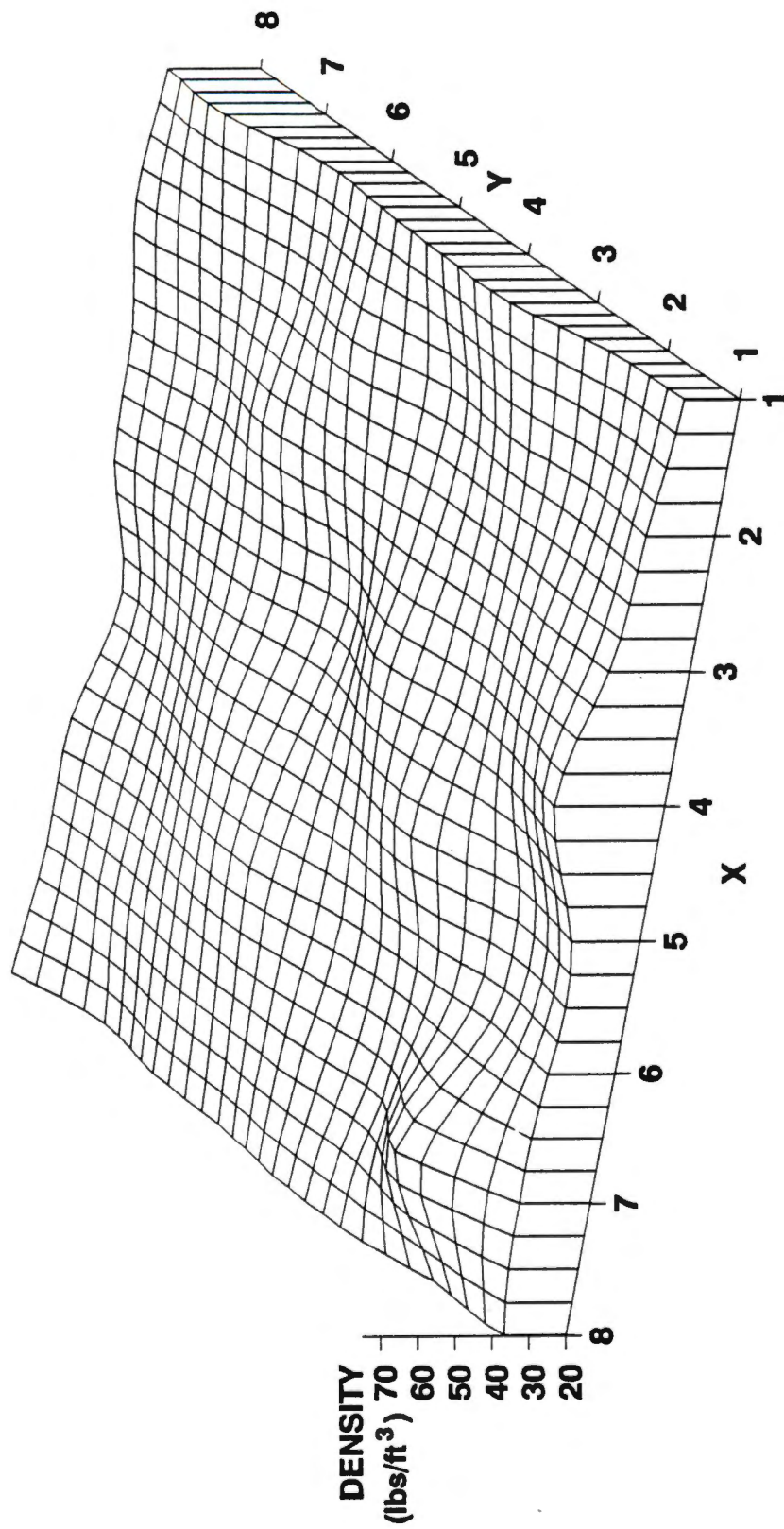
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 10



FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=11



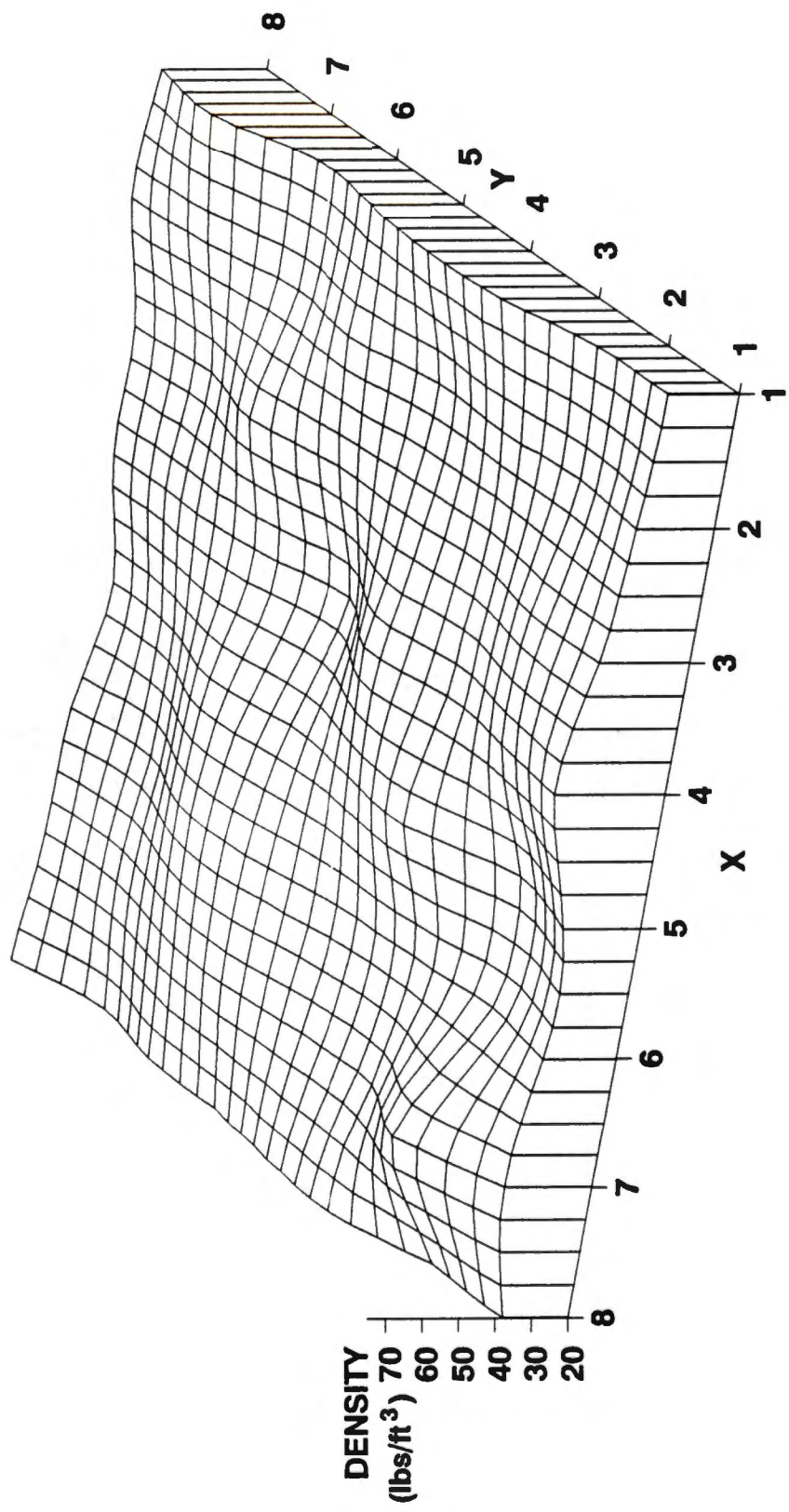
FLAKE MOISTURE CONTENT=12%, PRESS CLOSURE RATE=100 SECONDS
REPLICATION=3
Z=12



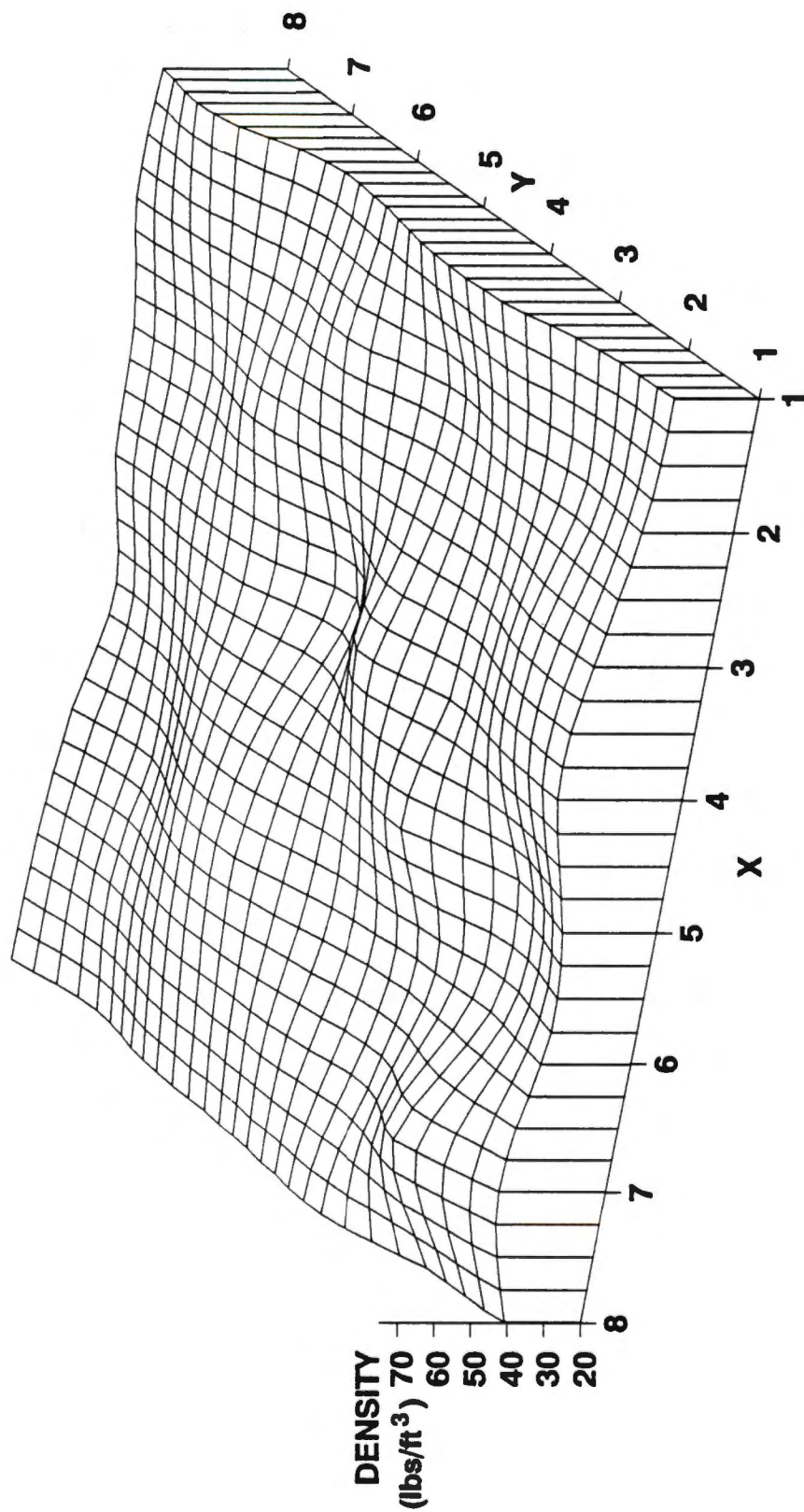
FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS

REPLICATION = 3

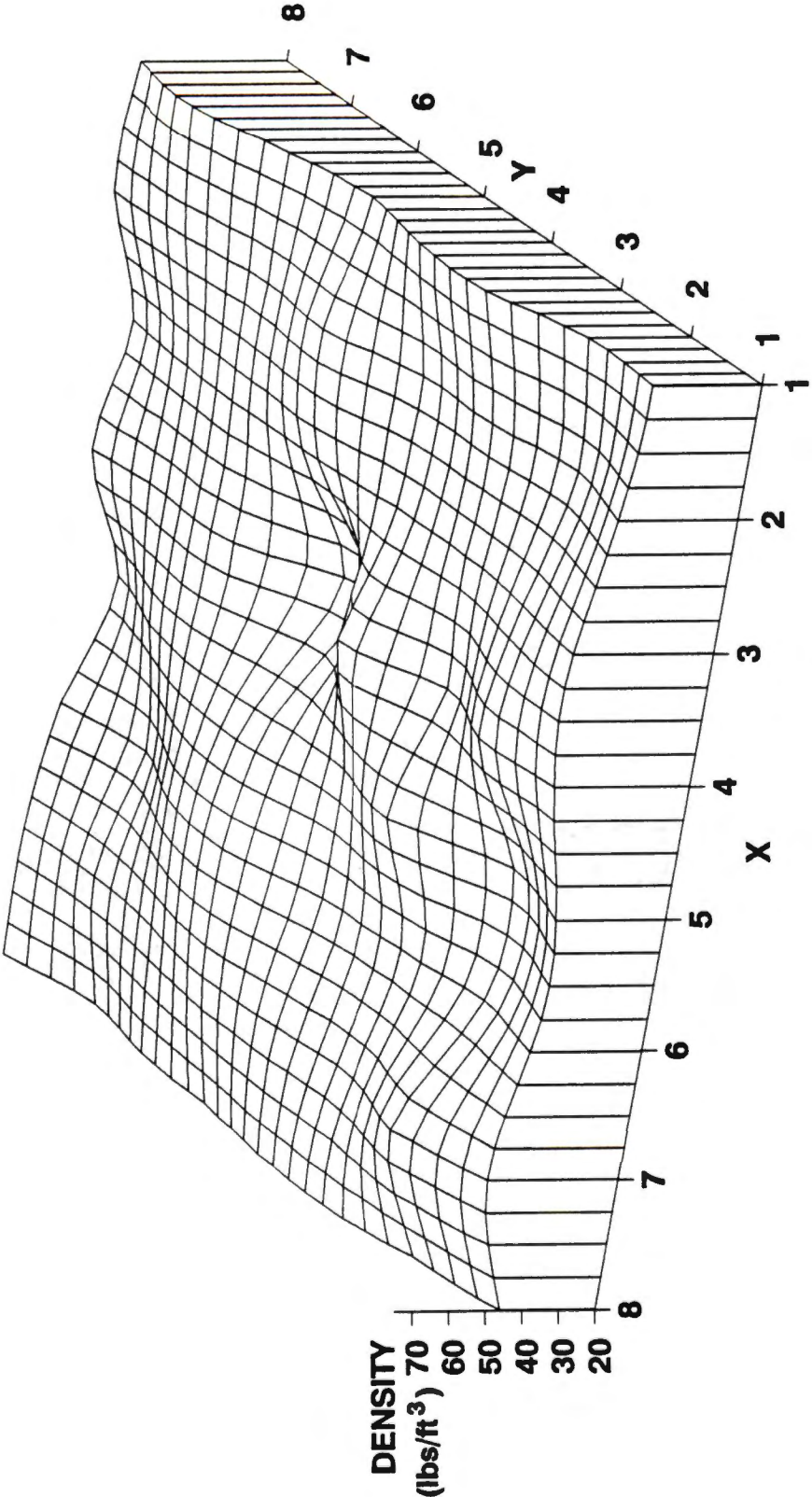
Z = 13



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 14



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 15



FLAKE MOISTURE CONTENT = 12%, PRESS CLOSURE RATE = 100 SECONDS
REPLICATION = 3
Z = 16

