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FROM: R. Buckminster Fuller BOSTON ARCHITECTURAL CENTER DATE: October 28, 1958

The following remarks are in response to your questions regarding geodesic domes and the possible use of one or more on your campus.

1. I learned decades ago that my work in research and development can prosper only when I am completely independent of any promotional activities. That is how I discovered geodesic domes. Having no particular structural system to "sell", I was free to explore for generalized principles governing nature's most economical structural systems.

To insure the integrity of my non-promotional environment, I neither solicit patrons myself nor permit any of my colleagues to do so. When, however, government, corporations, or individuals come to me, I then make available whatever I have discovered and developed within the specific area of consultation.

In order to free myself both practically and economically for further anticipatory search, I have taken out patents and have subsequently licensed industrial establishments in respect to discoveries and inventions accruing to my past research. As of this date, and acting only upon their respective unsolicited applications, I have licensed 81 industrial corporations to carry on geodesic dome work.

2. Now, in direct response to your particular unsolicited inquiry, as a potential user of a specific geodesic dome, I recommend three of the licensed corporations who have particular experience in the manufacture and installation of our larger size of domes - that is, domes over 200 feet in diameter. I think all three of these corporations should be brought into your preliminary inquiries, as their respective systems are of alternate geodesic stratagems and are healthily competitive.

A. The Kaiser Aluminum Company, Geodesic Dome Division, The Builders' Building, Wacker Drive and No. LaSalle St., Chicago, Illinois, attention Don I. Richter.

The Kaiser Aluminum Company will have completed the installation of 25 geodesic domes, each of 145 feet in diameter or greater, before the end of their present fiscal year. These large Kaiser geodesics are used for municipal auditoriums, theaters, field houses, banks, etc. - and they are now marketing domes of 400 feet diameter and up. I understand that the architectural firm of Perkins and Will were retained over a year ago by the Kaiser Aluminum Company to resolve the complex problems in regard to the modification of the Kaiser domes to the direct satisfaction of Educational Buildings requirements.

B. Mr. Edwin Locke, president, The Union Tank Car Company, 228 North LaSalle St., Chicago, Illinois.

The Union Tank Car Company has completed the world's largest clear-span enclosure, a 384 feet in diameter geodesic dome, equivalent in unimpeded volume to 23 Domes of St. Peter in Rome, Italy. This "Union Dome" would enclose S.I.U.'s present football stadium and 1/4 mile running track. The Union Tank Car Company's Graver Tank Co. Division is now building a second dome approximately 400 feet in diameter 80 miles from Carbondale at Woodriver, Illinois, and are taking on manufacturing and installation of these and larger domes for other clientele.

C. North American Aviation Corporation, 5601 Imperial Highway, Los Angeles, California, attention Ohio Regions Geodesic Domes Division.

North American Aviation has manufactured and is installing the American Society for Metals national headquarters at Cleveland, Ohio, housed in a 250 feet in



diameter geodesic dome and have entered the general manufacture and installation of geodesic domes for public clientele.

3. The technical questions which you specifically phrased to me regarding heat transmissions, sound behavior and cost, can all be handled by the above three corporations and depend on the materials employed which range through the whole spectrum of the building materials: steel, aluminum, plastic, concrete, glass, wood and paper.

Heat transmissions and sound behaviors are governed not as much by the chemistry of the materials as by the shape of the structures. An aluminum finned motor block makes an excellent air cooled motor - i.e. gets rid of its heat. The same domical shaped motor cylinder block, without fins, cannot be made to get rid of its heat and therefore must be heat scavenged by water cooling. The same local surface shaping of the comprehensive geodesic domes may be designed to produce whatever range, degree and quality of acoustical controlling may be desired.

4. If consultation work with me is desired either by your architects, contractors, or others, I maintain a research and development office, Synergetics Incorporated, 3013 Hillsboro Street, Raleigh, North Carolina, James Fitzgibbon, Executive Vice-President. My office has completed the engineering work on 400', 750', 1800' and 5000' diameter domes.

Synergetics Incorporated has established the mathematical treatment of geodesic domes of any particular diameter, or of any given spherical segmentation, or of any specific secondary trussing frequencies, or of any given primary structural material's modulus of elasticity in such a manner as to be able to incorporate all these factors in simultaneous equations thus to derive the entire engineering and dimensioning data directly from the large electronic computers in the form of parts-coded and printed book leaves to be bound in suitable numbers of volumes. Though the cost of such original computation is far from negligible, it is a means of reducing error and subsequent costs of fabrication and installation in dollar amounts at least ten-fold the original cost. We may even state that without our accomplishment of this unique mathematical facility, these historically unprecedented giant diameter domes would be entirely impossible of realization.

Where plastics (polyester resins or epoxy resins reinforced with glass fibres) are to be employed in geodesic structures, as the primary structural members, our Geodesics, Inc. office at 23 Arrow St., Cambridge, Massachusetts, who designed, engineered, and contracted the production of the entire D.E.W. Line Radomes Program, are extraordinarily well equipped to act as consultants or prototypers.

Should development of your problem indicate partial or complete reinforced concrete structuring, it will be an equally facile matter for you to obtain this in geodesic structuring. A geodesic reinforced concrete dome consisting of prefabricated components provides a weight reduction, in relation to non-geodesic concrete domes in the same multifold ratio as that provided by the geodesic dome in respect to radial arch domes, independent of material used. Should you be interested in the reinforced concrete, I will advise you of the appropriate engineering sources and preferred contractors. This prestressed concrete geodesic has been under intensive study during the past two years and is now ready for application. While the licensee firms may also provide such preliminary services, Synergetics, Inc. of Raleigh could be retained for the preparation of the primary drawings, mathematics and recommendation of the particular engineering strategy of this particular concrete dome.