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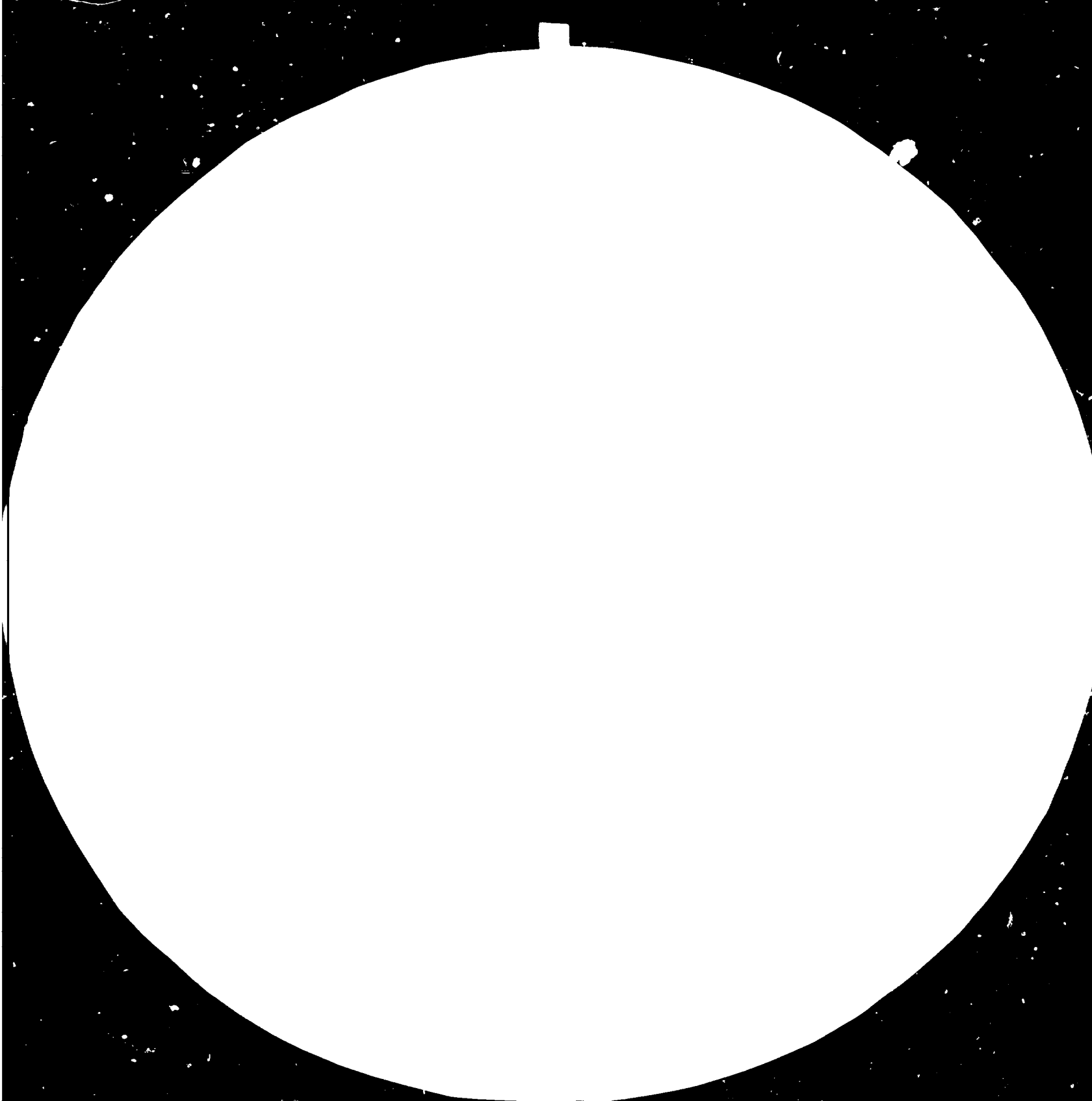

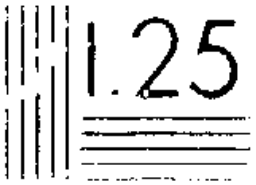

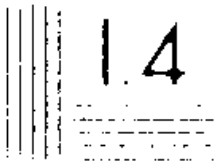

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1984

RESEARCH AND DEVELOPMENT FOR FLY ASH UTILIZATION

DP/CPR/81/026

CHINA

Technical Report*

Prepared for the Government of the People's Republic of China
by the United Nations Industrial Development Organization
acting as executing agency for the United Nations Development Programme

Based on the work of [redacted] Popovics

United Nations Industrial Development Organization
Vienna

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S. Popovics

REPORT

On the Mission to Shanghai Research Institute of Building Sciences
75 Wan Ping Road, South, Shanghai, China

Introduction

The mission of Post Code: DP/CPR/81/026/11-51/32.1.K called for a four week trip to China for a lecture series in cooperation with the Shanghai Research Institute of Building Sciences on the utilization of fly ash in concrete.

Background Information

Although fly ash has been used in concrete in China for more than twenty years, and pertinent research work has also been performed, for instance in the Shanghai Research Institute, there is a need there to expand the fly ash utilization significantly. This need originates partly from the ever increasing excess quantity of fly ash, partly from the shortage of portland cement clinker in China and partly from special problems of the concrete industry, such as the lack of suitable concrete aggregate in the Shanghai area. Therefore the assignment was given to the Shanghai Research Institute to find ways and means for the increased utilization of fly ash in concrete. A step of this activity was the invitation of foreign experts to present the state-of-the-art of fly ash utilization in concrete in the West with a special emphasis on recent development. One of the invited experts was the writer of this report. Details of the mission are presented below.

Travel and Briefing

I left my home early morning of the 29th of November, 1983, took the 8:15 flight out of Philadelphia and arrived in Singapore of December 1, 1983, via New York and San Francisco. I left Singapore on December 2 and

arrived in Beijing in the afternoon of December 3 via Tokyo. Government officials took me to my hotel and, subsequently, in the morning of December 5 to the office of UNDP in Beijing for briefing.

The briefing was done by Mr. A. W. Sissingh, SIDFA. As in the past, Mr. Sissingh's assistance was again very useful both from technical and administrative points of view yet concise. Consequently, I was able to leave Beijing next morning and arrive in Shanghai in the afternoon of the same day. I stayed in Shanghai until the afternoon of December 27 when I returned to Philadelphia via Tokyo (stop over) and New York.

Program

The actual work started on December 7 when the program of my mission was discussed for the first time with the officials of the Shanghai Research Institute. Due to the lack of any previous instructions, I prepared tentatively ten lectures covering the various aspects of fly ash utilization in concrete in a comprehensive manner. When I presented this plan to the officials of the Institute, the director, Mr. Jiang Dian-cheng informed me that a similar lecture series had been delivered by another foreign expert, Mr. Owens of the United Kingdom, shortly before my arrival, therefore they needed different activities. He then proposed four topics, one formal lecture for each, ten seminars for special topics for informal discussions, and four sessions for guidance in research on fly ash. Visits to a precast plant and a harbor construction were also included. In addition, the host made great efforts to show me Shanghai and vicinity, primarily during the weekends, which was not only pleasant but also helped me in the discussions with Chinese engineers through a better understanding of the present way of life and construction in China.

The formal lectures were to be held in the Center of Scientific Research in Shanghai for persons invited from the concrete and construction industries,

academy, and research organizations of the area. The discussions and guidance sessions were to be held in the Shanghai Research Institute of Building Sciences for the workers of the Institute. After a brief discussion, I accepted the proposed program the details of which are presented in Enclosure No. 1.

Description of Activities

The formal lectures were well attended. The lecture hall was filled up each time. The seminar-discussion sessions were lively and mutually informative. Many questions related to fly ash were asked, problems discussed and experiences exchanged. Even when there was a general agreement that the solution of a problem did not exist, the discussions frequently helped us see the problem more clearly and suggested possible ways of solving the problem. The Chinese participants were particularly interested in the possibility of increased corrosion danger of reinforcement in fly ash concrete. An intensive discussion followed my statement that in my knowledge no scientific evidence or practical observation of old fly ash concrete structures indicated any such danger. The guidance sessions dealt with exploratory laboratory experiments concerning the behavior of fresh and hardened fly ash concrete made with materials of the Shanghai area.

Comments and Recommendations

My general impression, and I use the word impression intentionally instead of knowledge, is that both the present utilization of fly ash in concrete and the pertinent research have reached a level in Shanghai on which further development can be built. The Shanghai Research Institute appears to be suitable for the performance of a portion of the needed research and coordination of pertinent activities performed elsewhere. The Institute has enough space, has many of the needed pieces of equipment,

the Director and the Vice Director are well informed about recent American and European literature on fly ash, and the rest of the personnel appears to be qualified for the performance of the major portion of the needed research.

Despite the favorable circumstances, the Shanghai Research Institute needs further help to solve the special problems of fly ash utilization in China and solve these quickly. Therefore I submit the following recommendations:

1. A visit of two senior officials of the Shanghai Research Institute to a few Western countries is recommended to obtain firsthand experience about present research on fly ash in concrete.

2. Subsequently the existing equipment of the Institute should be supplemented according to the need.

3. The Institute should develop new methods for quality control of concrete in general and specifically for fly ash concrete. Subsequently effort should be made for the implementation and/or reinforcement of these methods in the industry. Not only is the improved quality control necessary for the proper utilization of fly ash concrete but also it would result in additional savings in cement clinker.

4. A comprehensive review of the technical literature on corrosion of reinforcement embedded in fly ash concrete should be performed.

5. Foreign experts should be invited for helping in the solution of special research problems and assignments.

Prepared by

Sandor Popovics

Philadelphia
January 20, 1984

上海市建筑科学研究所

SHANGHAI RESEARCH INSTITUTE OF BUILDING SCIENCES

PROGRAMME FOR PROF. S. POPOVICS

Dec.13 Tues.

8:30-11:30 AM Lecture One: the Present and Developing Tendency for Comprehensive Utilization

1:30-4:30 PM Guidance in Scientific Research

Dec.14 Wedn.

1:30-4:30 PM Seminar on PFA substituting for Sand 1

Dec.15 Thur.

8:30-11:30 AM Lecture Two: Deformation and Steel Corrosion of Concrete with pfa

1:30-4:30 PM Visit to No. 1 Precast Concrete Plant and a harbour construction project

Dec.16 Fri.

1:30-4:30 PM Seminar on Lecture Two 2

Dec. 17 Sat.

8:30-11:30 AM Lecture Three: Improvement of Concrete Durability

1:30-4:30 PM Seminar on Lecture Three 3

Dec.18 Sun.

Dec.19 Mon.

1:30-4:30 PM Seminar on Quick Assessment of pfa activity 4

Dec.20 Tues.

8:30-11:30 AM Lecture Four: Mix Proportioning for Concrete with pfa

1:30-4:30 PM Seminar on Lecture Four 5

Dec.21 Wedn.

8:30-11:30 AM Seminar on Bleeding and Early Strength of Concrete with pfa 6

Shanghai, China Tel. 380803 Cable, 3295

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1:30-4:30 PM Seminar on Microsphere of pfa 7

Sep.22 Thu.
8:30-11:30 AM Seminar on Mix Proportioning for Concrete with pfa 8
1:30-4:30 PM Seminar on Deformation and Steel Corrosion of Concrete with pfa 9

Sep.23 Fri.
8:30-11:30 AM Seminar on Lightweight Aggregate and Light-weight Concrete 10
1:30-4:30 PM Guidance in Scientific Research

Sep.24 Sat.
8:30-11:30 AM Guidance in Scientific Research
1:30-4:30 PM Farewell meeting

Sep.25 Sun.

Sep.26 Mon.
8:30-11:30 AM Guidance in Scientific Research

Sep.27 Tue. Departure