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A DISPERSER FOR DEPOSITING SIMULATED DRY FALLOUT MATERIAL ON LARGE ROOF SURFACES

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ADMINISTRATIVE INFORMATION

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ABSTRACT

A disperser was designed and constructed to disperse simulated dry fallout (graded sand) for roof washdown effectiveness tests continuously and uniformly over a 48 x 72 ft test area at a controllable dispersal rate of 0 to 4 g/min/ft^2.

The major components of the system are: (1) the simulant handling equipment, (2) the individual dispersers, (3) the air system, and (4) the control panel.

The simulant handling equipment transports the simulant from an underground storage hopper to the individual dispersers. The specially designed items of this equipment are the 8 adjustable splitters which divide the simulant falling through each into 11 equal volume streams which in turn feed the individual dispersers.

Each individual disperser consists of a sand blast nozzle located below a deflector plate. Fallout simulant and air are supplied continuously to the nozzle, which blasts it against the deflector plate; thereupon the simulant scatters and falls continuously over the test panels which are surfaced with different roofing materials.

The approximate amount of this dispersed simulant that lands on each panel is determined by the following method. The simulant transported from each test panel by the washdown water during the simultaneous fallout and washdown period is collected in a sieve and weighed. The residual remaining on the test surface after washdown ceases is collected in another sieve and weighed. The total of these two weights is the amount that lands on each panel. The simulant dispersal rate to each test panel and washdown effectiveness for each are then calculated from these weights.

SUMMARY

The Problem

The problem was to design and erect a disperser for depositing simulated dry fallout on large roof test surfaces for roof washdown tests. The general requirements were that the disperser would disperse the simulant continuously and evenly over a 48 by 72 ft test area at a controllable dispersal rate of 0 to 4 grams/min/ft^2. In addition, a method was required for determining the approximate amount of the simulant landing on the test surfaces while washdown water was running over them.

Findings

The disperser was successfully designed and constructed for continuous operation by using 88 individual dispersers, each consisting of a stationary sand blast nozzle located below a deflector plate. This application of the sand blast nozzle as a disperser is the most important feature of this design because it permits continuous dispersal of the simulated fallout.

This disperser was specifically designed and constructed for dispersing simulated fallout for roof washdown effectiveness tests and was satisfactory as a means of providing simulated fallout in realstic manner. The test variables for this series were roof surfaces, roof slopes, water flow rates and simulated fallout particle size.

The disperser is designed to disperse simulated fallout at any rate from 0 to 4 g/min/ft^2 and the time duration of dispersal is limited only by the capacity of the underground storage hopper (which is 4,000 lb but could be refilled during a run).

Graded sand is the simulant used in the present tests, but simulants ranging in size from 44 to 700 micron diameter particles can be used in this system.

To date, this disperser design has been used to provide simulated fallout for roof washdown and fallout shelter entrance ingress studies.

For other applications where continuous fallout is desired, the disperser can be adapted to fit the requirements by using only the number and arrangement of individual dispersers required to cover the test area with continuous fallout.

INTRODUCTION

The need for the deposition of simulated dry fallout* on large roof surfaces evolved from the development of a roof washdown system.

Historically, the feasibility of using a roof washdown system to effectively remove radioactive fallout from building roofs was determined through two series of tests. The first series** was conducted out of doors on an 8 by 50-ft test panel using three different surfaces one at a time. Most of the simulated fallout, which had been dispersed by hand casting from a height of about 2 ft, was transported from the surface by the washdown water.

In the second series of tests,*** one additional surface plus two of the previous surfaces were used. They were on 1-1/2 x 8-ft panels and were enclosed in a 4-ft-high chamber which was just large enough to hold the test panels. Washdown water flowed over them while simulant was dispersed from the ceiling of the chamber at 2-sec intervals. The simulated fallout was tagged with a radioactive tracer for measurement purposes, and the effectiveness of the washdown water was calculated from radiac meter readings for comparable tests with and without the washdown water in operation. The results showed that the washdown water was successful in removing most of the simulant from the test surfaces. However, the compactness of this equipment influenced the reliability of these results inasmuch as corrections were made for the high background radiation coming from the simulant hopper and from simulant that stuck to the walls of the chamber.

Some of the limitations of the two series of tests were: (1) the dispersal of the simulant was intermittent; (2) the distribution of the simulant was not uniform over the test panels; (3) the simulant did not approach terminal velocity because it did not fall from sufficient height; (4) the simulated fallout material was a fine-sieved soil, 50 % was less than 44-μ diameter which is smaller than the

* Since this disperser was designed for use with graded sand as the simulated fallout material, the terms "simulated fallout," "simulant," and "sand" are used interchangeably in this report.

** Kehrer, W. S., Hawkins, M. B, Feasibility and Applicability of Roof Washdown System. U. S. Naval Radiological Defense Laboratory Technical Report, USNRDL-TR-232, May 1958.

***R. H. Heiskell, et al., report in preparation, "Design Criteria for Roof Washdown Systems. 1. Effectiveness in Removing 177 to 590 μ Particles."

present particle size range of interest, and (5) the effectiveness results were obtained on small-scale (1-1/2 x 8 ft) panels which had high background readings and a short roof length.

Since these previous tests were limited in scope, it was not considered advisable to use these same washdown effectiveness results for large scale roof surfaces. Instead, because of the promising results from these test series, the project for which this disperser was constructed was begun. The purpose was to determine the effectiveness of the roof washdown system on large-scale (8 x 48 ft) surfaces of several standard and potential roofing materials at varied roof slopes, water flow rates, and fallout particle sizes. Two tilt-up planes each of which held three 8-ft wide test surfaces were constructed so that tests could be run on several surfaces simultaneously for more efficient operation.

A disperser was required for depositing simulated dry fallout on these large roof areas in such a manner that the test results would be reliable. In general, the disperser designed had to deposit simulated fallout continuously and evenly over the entire test area from at least 20 ft above the surface.

Two basic designs were considered. In one, the simulant is fed into rotating pipes inclined about 5° from horizontal. Slotted holes in the pipes allow small metered amounts of the material to fall at 2-sec intervals onto shallow, dished planchets, where a burst of air disperses the material. (This was the method used to disperse the simulant over the 1-1/2 x 8-ft test panels mentioned previously.) In the other, a continuous metered amount of the simulant is fed to a stationary sand blast nozzle located below a deflector plate. A continuous air supply to the nozzle picks up the sand and blasts it up against the deflector plate, whereupon it scatters and falls. This application of a sand blast nozzle as a disperser is the most important feature of this design because it allows continuous dispersal of the simulated fallout. In addition, the nozzle has no moving parts; therefore maintenance on this item is negligible.

This latter design was selected because it fulfilled the requirement for continuous and even deposition of fallout and was simpler to design and fabricate, allowing construction with standard items.

DESIGN OF DISPERSING SYSTEM

Location Requirements

A gymnasium (Bldg. 880) at this laboratory's radiological recovery field test grounds, Camp Parks, California, was selected to house the experiment because it provides an unobstructed area of 88 by 72 ft and a clear height of 30 ft.

The indoor location permits containment of the simulated fallout which may, in the future, be tagged with a radioactive tracer. It also prevents the introduction of a test variable resulting from uncontrollable winds. The high ceiling allows large roof test panels to be positioned at the steeper slopes, while allowing the falling simulant particles to approach terminal velocity.

Disperser Requirements

The specific requirements for the disperser were that it distribute the simulant (graded sand in the diameter ranges 44 to 177 μ, 177 to 350 μ, and 350 to 510 μ) continuously and evenly over a large-scale (48 by 72 ft) test area, at a controllable dispersal rate of 0 to 4 grams/min/ft^2. The maximum total amount of simulated fallout material dispersed was not to exceed 250 g/ft^2 and the maximum continuous dispersal time would be confined to 6 hours.

Disperser Components

The disperser has four major components: (1) the individual dispersers; (2) the simulant-handling equipment; (3) the air system; and (4) the control panel.

There are a total of 88 individual dispersers (Fig. 1a) located on 8-ft centers, with 8 rows of 11 each. Each individual disperser (Fig. 1b) consists of a stationary sand blast nozzle and a deflector plate. The nozzle (Titan No. Spec. 6T, Victor Equipment Co., Los Angeles, Calif.) is positioned vertically about 4-3/4 in. directly below the plate. The nozzle is connected on the lower, inlet end to an air distribution pipe and a simulant delivery hose. The upper, outlet end of the nozzle has a 3/8-in. diameter opening, and is aimed at the deflector plate. The plate is 4 x 4 x 1/4-in. hardened steel, faced on the lower side with 1/4 in. of rubber. It is mounted in the center of the underside of a 4 x 4-ft piece of 1/2-in. plywood, which is parallel to the floor.

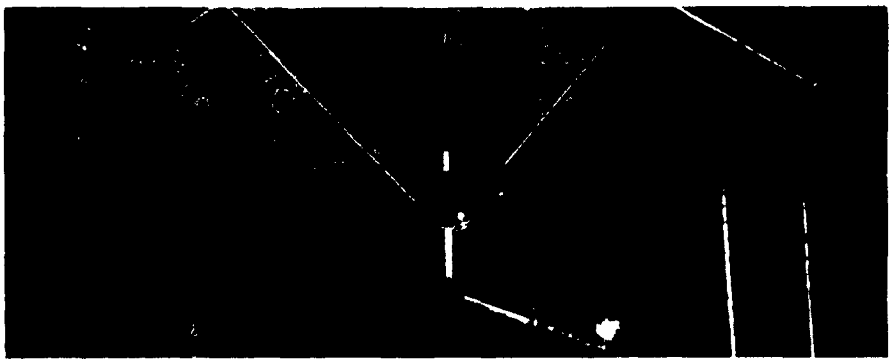

Fig. 1a. View From the Floor Showing the Arrangement of the Dispersers.

Fig. 1b. Individual Disperser Showing Sand Blast Nozzle and Deflector Plate.

The simulant-handling equipment transports the simulant from the underground storage hopper and supplies it to the individual dispersers. The sand is moved from the storage hopper (capacity about 4000 lb of sand) to the 8 distribution hoppers on the roof of the building at a continuous rate of about 30 lb/min. This is accomplished by means of a bucket elevator and a series of screw conveyors (Figs. 2 and 3). They keep the distribution hoppers full during a test run, and return the excess sand to the storage hopper, from where it is recycled through the system. Each hopper (Figs. 3 and 4) holds about 35 lbs of sand. Constant flow of sand from these hoppers is assured by a vibrator mounted on the side. Sand feeds from the hopper onto a vibrating feeder pan, from which the sand falls through an adjustable splitter which divides it into 11 equal-volume streams of sand (Fig. 4). Each of the splitters was adjusted and calibrated individually to assure equal distribution of the simulant to all the hoses from that splitter. Ten of the streams then flow, by gravity and suction, through 3/4-in. rubber hoses to the sand blast nozzles; the other stream falls through a hose to a sampling station on the floor, for monitoring the amounts dispersed. This other stream of simulant is the hose sample from the splitter, which is discussed later.

Air is furnished to the nozzles (about 10 cfm each) by the air system, which consists of 2 air compressors, a pressure-regulating valve, and distribution pipes. The compressors, each rated at 440 cfm, are connected in parallel and maintain a pressure of 90-110 psi in the compressor storage tanks. The air line runs to the roof where the regulating valve reduces the pressure and maintains it at 12 psig. The distribution pipes then carry the air to the nozzles.

The vibrating pan feeders, vibrators, screw conveyors, and bucket elevator are operated from the control panel which is about 100 ft from the disperser so that radiation dosage to personnel at the panel would be markedly reduced if radioactive material were used. The screw conveyors and bucket elevator have individual on-off switches, whereas a single switch controls all the vibrators on the hoppers. Regulation of the input ac voltage to the vibrating pan feeders is accomplished with a Sorensen regulator. Each feeder is controlled by a switch and the voltage can be regulated with a trim pot at the control panel. In addition, the incoming power to all the feeders comes through a master voltage control so that the voltages to all the feeders can be changed simultaneously. This master voltage can also be regulated and programmed by the use of a rotating cam.

<u>Disperser and Plane Arrangement</u>

Originally, the disperser was designed for operation of either the full system over 2 test planes or half of the system over one plane.

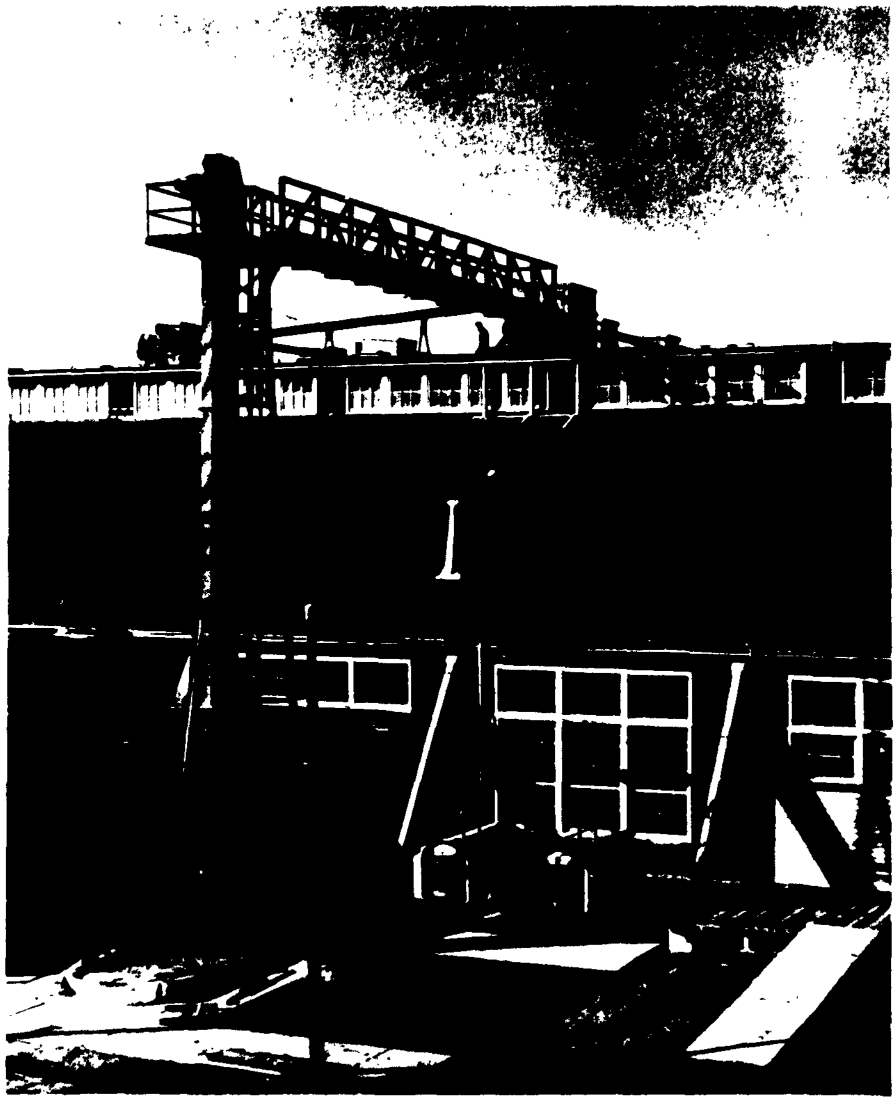

Fig. 2 Exterior of Bldg. 880 Showing Air Compressors and Part of the Simulant Handling Equipment. (The storage hopper is underground.)

Fig. 3 Roof of Bldg. 830 Showing Screw Conveyors and Distribution Hoppers. The side doors of the hopper housings are removed.

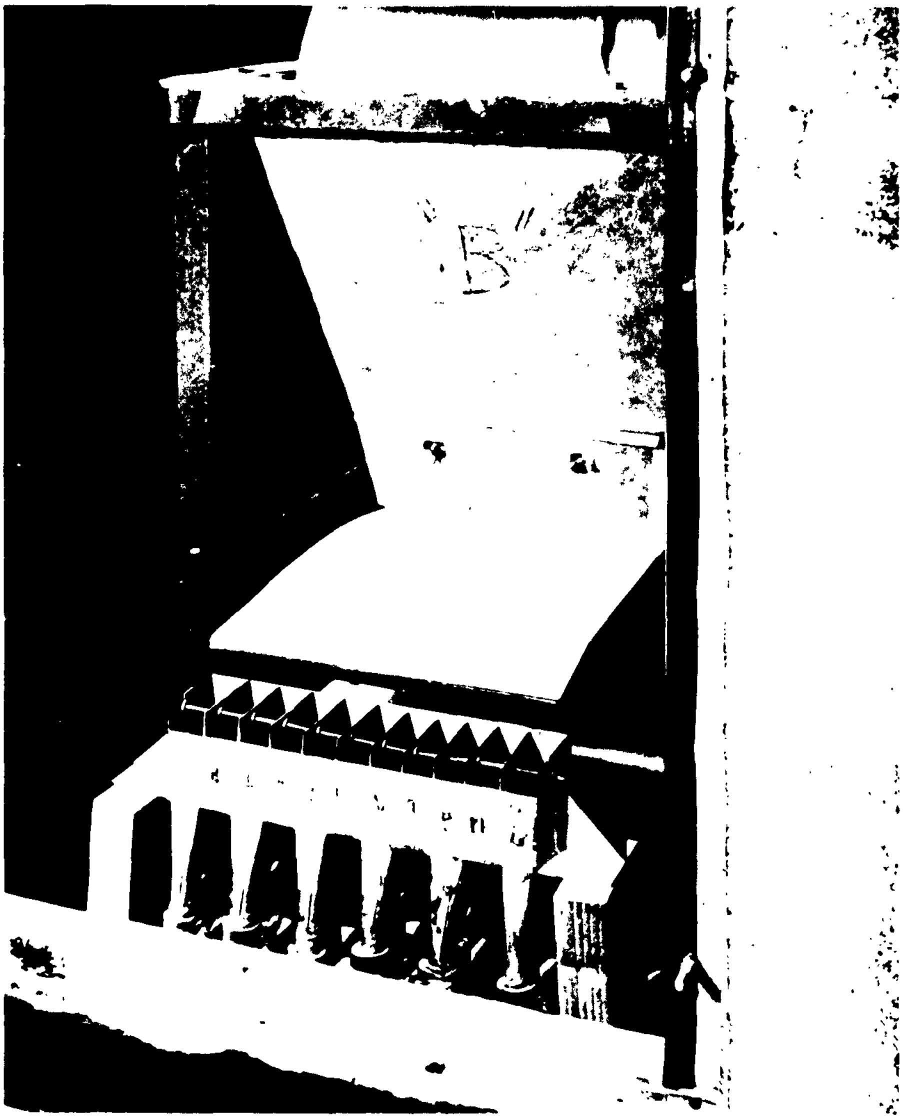

Fig. 4 Interior of a Hopper Housing Showing Distribution Hopper, Vibrating Feeder Pan (covered with sand) and Splitter. (The vibrating pan is a Syntron Feeder, Model F010.)

That is, feeders A, B, C, and D (Fig. 5) and the air to their half of the nozzles could be shut off, while feeders E, F, G, and H and their half of the nozzles were operating over the plane on the left. Each plane is 24 x 48 ft and is divided into three 8-ft wide sections with a different test surface on each. Figure 5 also shows the relation of the planes to the feeders and the dispersers. The row of dispersers around the outside edge of the planes insured uniform deposition of the fallout material to the panel edges.

During operation of the disperser for early tests, the individual dispersers beyond the panel edges were found to be unnecessary. They were disconnected and were no longer used. Also, a third plane, 16 ft wide, was added in the middle. The sand feed hoses were reconnected to the dispersers so that the group of 18 dispersers over each of the 3 planes could be operated separately. The final arrangement is shown in Fig. 6. Vibrating feeder pans F and G now supply sand to the dispersers over test plane A; E and H to the dispersers over plane B; and B and C to the dispersers over plane C.

Calibration and Sampling Techniques

The accuracy of the washdown effectiveness experiments conducted with this disperser depends upon knowledge of the amount and distribution of the simulant that lands on the test surfaces during a given period of time. Since it is difficult to weigh the amount deposited while the washdown system is operating, the amount dispersed was determined instead.

The total amount of the simulant dispersed depends upon the feed rate from each vibrating pan feeder, which in turn is controlled by the voltage to the feeder. Therefore the initial effort was directed towards calibrating the feed rate from the feeders at various voltage control settings. However, the results were not reproducible with constant voltage settings, so this method of determining the total amount of dispersed simulant was rejected. The suspected reasons for the lack of reproducibility of results, which are discussed briefly later, is "temperature-dependence" of the pan feeder or "humidity-dependence" of the sand.

The next method was devised as follows: The sand was weighed that was collected at the hose sampling station for each of the 4 feeders over test plane A (Fig. 5) during a 30-min calibration run. Then the total weight of simulant dispersed from all the nozzles was:

$$W_{disp} = 10\,W_E + 10\,W_F + 10\,W_G + 10\,W_H \quad \text{or}$$
$$= 10\,(W_E + W_F + W_G + W_H)$$

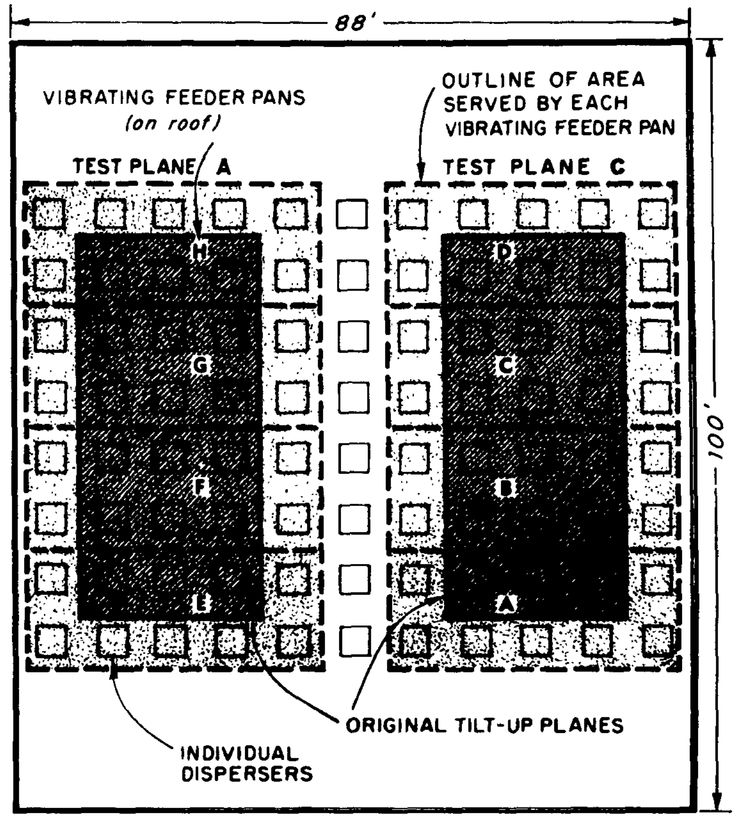

Fig. 5 Original Arrangement of Dispersers in Relation to Test Plane

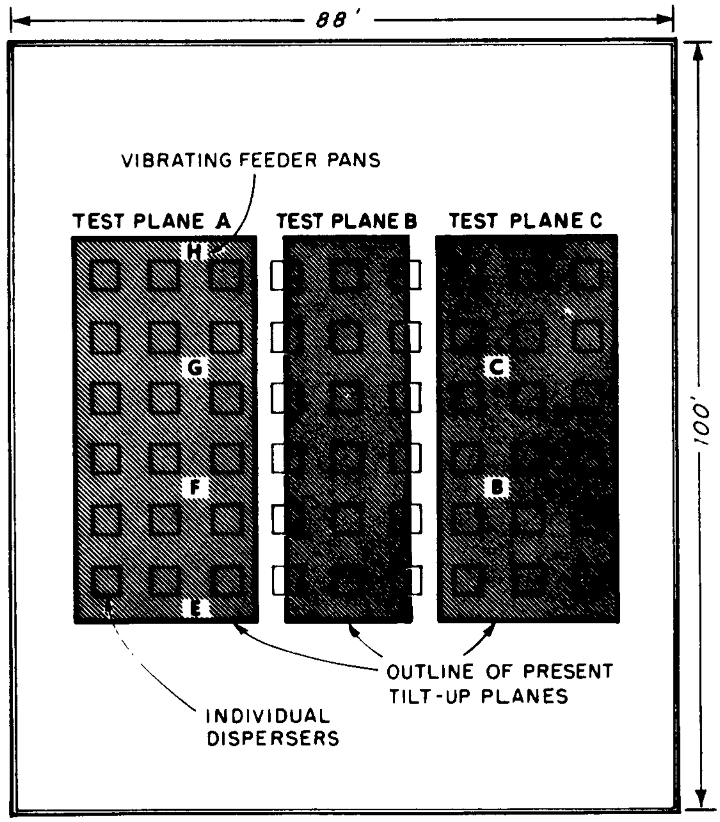

Fig. 6 Final Arrangement of Dispersers in Relation to Test Planes

where $W_{E, F, G, \text{ and } H}$ is the weight of the hose samples from splitters E, F, G and H respectively, and 10 is the number of individual dispersers (or nozzles) supplied by each splitter.

A plastic sheet was placed over the test plane during the calibration runs and only the simulant landing on this sheet was collected and weighed to obtain W_{plane}. Then the ratio of dispersed sand that lands on the test plane is $C_1 = W_{plane}/W_{disp}$. The weight of dispersed simulant that lands on the test plane is then calculated from the hose sample weights using the equation:

$$W_{plane} = 10 \ (W_E + W_F + W_G + W_H) \ C_1$$

where C_1 is the constant for this particular simulant with a particle size range of 177-350 μ diameter. Three calibration runs gave an average value of 0.496 for C_1 (line C, Table 1).

However, F and G feeders each supply simulant to 6 dispersers over the test plane as compared to 3 each for the F and G feeders (Fig. 5). Since the simulant feed rate is different from each feeder, the equation was empirically revised, based on the number of nozzles over the test plane, to more accurately determine the amount landing on the test planes. It is:

$$W_{disp} = (3 \ W_E + 6 \ W_F + 3 \ W_G + 3 \ WH) \ C_2$$

$$= \left[3 \ (W_E + W_H) + 6 \ (W_F + W_G)\right] C_2$$

where C_2 is the ratio of simulant land on the test plane to the simulant dispersed from nozzles over the test plane for this particular simulant and particle size diameter. Three calibration runs gave an average ratio of 1.09 (line D, Table 1).

Even this method of determining the amount of simulant deposited on the test surfaces was considered too inaccurate, so a materials weight balance method was finally adopted. The sand transported from the surface during the fallout and washdown period is caught in a sieve and weighed. The residual on the test surface after washdown is washed into another sieve and weighed. The total of the two weights is the amount deposited on the test surface. The sieves used to collect the simulated fallout have smaller mesh openings than the diameter of the simulant particles being used.

TABLE 1

Determination of Disperser Calibration Constants for Graded Sand With a Particle Size Range of 177-350 μ Diameter

	Splitter and Hose Sample Identification	Simulant From all Nozzles: No. of Nozzles Fed From This Splitter	Wt of Simulant From Each Splitter (lb), Run 21: Fed to Hose Sample Station	Run 21: Fed to all Nozzles (2) x (3)	Run 22: Fed to Hose Sample Station	Run 22: Fed to all Nozzles (2) x (5)	Run 23: Fed to Hose Sample Station	Run 23: Fed to all Nozzles (2) x (7)	Average	Simulant From Nozzles Over Plane: No. of Nozzles Over Plane Fed From This Splitter	Wt. of Simulant From Each Splitter Fed to Nozzles Over Plane: Run 21 (3) x (10)	Run 22 (5) x (10)	Run 23 (7) x (10)	Average
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	E	10	7.34	73.4	7.25	72.5	7.59	75.9		3	22.0	21.8	22.8	
	F	10	6.50	65.0	7.22	72.2	7.94	79.4		6	39.0	43.3	47.6	
	G	10	7.70	77.0	6.75	67.5	6.69	66.9		6	46.2	40.5	40.1	
	H	10	6.92	69.2	6.69	66.9	7.25	72.5		3	23.5	20.1	21.8	
A. Total Wt lb			28.46	284.6	27.91	279.1	29.47	294.7			130.7	125.7	132.3	
B. Wt of simulant from all dispersers landing on plane				142.4		138.9		144.4			142.4	138.9	144.4	
C. Constant C_1, $\frac{\text{line B}}{\text{line A}}$				0.500		0.498		0.489	0.496					
D. Constant C_2, $\frac{\text{line B}}{\text{line A}}$											1.09	1.10	1.09	1.09

The distribution of the fallout material was also determined during some of the runs by placing sample pans on the test panels on 4-ft centers directly under and midway between the individual dispersers. The sand that was collected in these pans was weighed. The results from a representative test are shown in Fig. 7.

PERFORMANCE

The performance of the simulant-handling equipment in transporting the sand from the storage hopper to the distribution hoppers was satisfactory. However the screw conveyors do grind down and reduce the size of some of the sand particles as they are moved through the system. Repeated cycling of the sand through the system further decreases the particle size, as shown in Table 2. During these runs the simulant was not blasted against the deflector plates, therefore no added factor for blasting was involved. However, since the average total recycling time on a given batch of simulant is approximately 8 hours, the percentage of the sand is small that is reduced in size, and the change during a single test is not significant.

Breakdown of the sand particles also occurred when the particles were blasted against the original steel deflector plates by the sand blast nozzles (Table 3). The original deflector plates were 4 x 4 x 1/4-in. thick hardened steel that were eroded by the impacting sand. They were replaced with the same thickness plate faced with 1/4-in. of rubber in an attempt to decrease the erosion. The breakdown of the sand particles as a result of blasting against the deflector plates is now negligible (Table 4).

The air system and sand blast nozzles have all performed satisfactorily with no plugging or stoppages.

The vibrating pan feeders have been reliable as a means of moving the simulant from the distribution hopper to the splitters, but not at a predetermined rate. As mentioned previously, the feed rate of simulant from the feeders for any particular voltage setting is not necessarily reproducible or constant, nor is it possible to accurately predict the feed rate from the voltage setting to each feeder. Although the reason is not known, two unsupported theories are suggested. One is that the vibrating feeders are temperature-dependent and the characteristics of the metal springs that vibrate the pans are affected by changes in temperature with resulting variations in the simulant feed rate. The other theory is that the flow characteristics of the simulant are affected by changes in the humidity, also causing variations in the simulant feed rate.

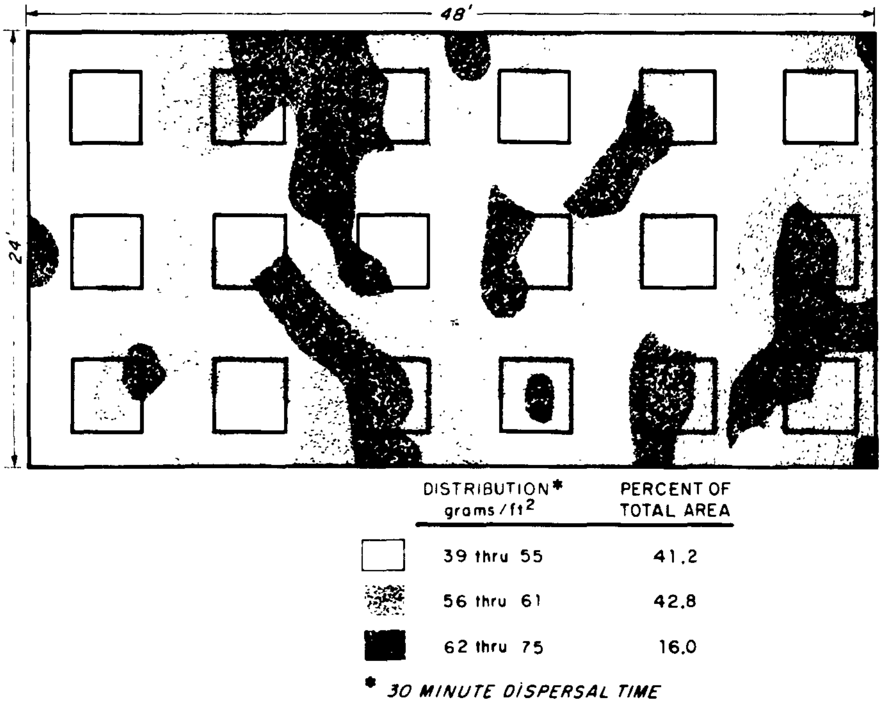

Fig. 7 Distribution of Fallout Material on Test Plane. The nozzles are located in the center of the squares.

TABLE 2

Size Reduction of 60 Mesh Monterey Sand Due to Grinding by Screw Conveyor

Retained on		Percent by Weight of Sample					
U.S. Sieve No.	Openings in Microns	Original Sample	Recycling Time - (hr)				
			4	8	12	16	18
30	590	0.1	0.1	0.1	0.1	0.1	0.1
35	500	1.7	1.2	1.0	0.8	0.9	1.1
50	297	45.8	40.7	38.4	40.6	36.7	35.0
60	250	34.8	36.2	36.7	34.7	37.0	36.6
100	149	16.4	19.4	20.0	21.1	22.1	24.1
120	125	0.5	0.9	1.2	1.1	1.3	1.5
200	74	0.2	0.9	1.2	0.9	1.2	1.1
230	62	0.1	0.1	0.2	0.2	0.2	0.1
Pan	Pan	0.1	0.2	0.3	0.2	0.2	0.2

TABLE 3

Size Reduction of 60 Mesh Monterey Sand Due to Blasting Against Steel Deflector Plate

Retained on		Percent by Weight of Sample			
		Run #18		Run #28	
U. S. Sieve No.	Openings in Microns	Not Blasted	Blasted Against Deflector Plate	Not Blasted	Blasted Against Deflector Plate
30	590	0.1	0.1	0.3	0.1
35	500	1.9	1.1	1.6	1.5
50	297	47.0	38.6	49.3	38.0
60	250	31.9	26.7	30.7	25.3
100	149	18.6	26.4	16.6	27.0
120	125	0.4	2.9	0.3	4.0
200	74	0.1	2.3	0.2	3.0
230	62	Trace	0.5	0.1	0.2
Pan	Pan	Trace	1.5	Trace	0.5
	Total	100.0	100.1	99.1	100.0

TABLE 4

Size Reduction of 177-350 μ Diameter* Monterey Sand
Due to Blasting Against Rubber-faced Deflector Plate

Retained on		Percent by Weight of Sample			
		Run #29		Run #30	
U. S. Sieve No.	Openings in Microns	Not Blasted	Blasted Against Deflector Plate	Not Blasted	Blasted Against Deflector Plate
30	590	0.0	0.0	0.0	0.0
35	500	0.1	0.1	0.1	0.8
40	420	0.3	0.3	0.3	0.4
50	297	12.7	12.8	13.7	12.4
60	250	38.3	36.4	38.1	37.3
100	149	47.7	48.5	47.1	47.7
120	125	0.6	1.0	0.5	1.0
Pan	Pan	0.3	1.1	0.1	0.6
	Total	100.0	100.2	99.9	100.2

*177 and 350 μ openings correspond to U. S. Sieve No. 80 and 45 respectively. These sieves were not available when these tests were run.

The other theory is that the flow characteristics of the simulant are affected by changes in the humidity, also causing variations in the simulant feed rate. However, the feed rate can be determined at the hose sampling station, and adjustments can be made in the voltage and rate at any time during a run in order to produce the desired feed rate.

DISCUSSION

The simulated fallout disperser described in this report is the first of its type ever constructed, as confirmed by the negative results from a literature search and inquiries to vendors of equipment that might have been used for this purpose. Because of the limited time allotted for its design and construction, the step from small-scale to full-scale was made with no intermediate design or testing. In addition, the disperser was designed on the basis of limited previous experience with fallout dispersers. As a result it does not fulfill all of the established general requirements. That is, the original intent was to be able to program the feed rate of sand to the nozzles so that the feed rate could be increased from zero to a maximum and then decreased to zero at a controlled rate of change, over several hours. This would have enabled realistic simulation of the deposition of fallout from a nuclear detonation. However this is not easily accomplished with the present equipment. Nevertheless, if desired, a "programmed" run could still be accomplished by manually changing the control voltage to the vibrating pan feeders, determining the fallout feed rate at the hose sampling stations, and then correcting the voltage until the desired feed rate was obtained. So far, no programmed runs have been made. Instead, the tests have been run with a constant feed rate for a shorter period of time at the maximum realistic fallout rate. This procedure reduced the time interval for each test, while still accomplishing the test objectives.

The probable reason why the vibrating pan feeders cannot be automatically operated at a "programmed" varied feed rate is because they are designed to operate at a constant feed rate (and voltage) over long periods of time and for this purpose an accurate control of the feed rate by the voltage to the feeders is not required.

A second criticism of the disperser is the lack of uniformity in the deposition of simulant on the test panels. There were extreme cases where the variation in the amount on the test panels was up to 30 % of the average - although most of the variation was much less. Although ideal dispersal conditions would require uniform distribution, practical considerations dictate the acceptance of less than ideal distribution as long as it does not interfere with the satisfactory completion of the test program. For this reason, even though more complete uniformity was desired and could have been obtained by using more individual dispersers with a closer spacing, the dispersal pattern obtained was acceptable because it was apparently quite reproducible. That is, the percentage of dispersed sand deposited on the test panels was almost the same for the 3 tests described in Table 1, which leads to the assumption that the dispersal pattern on the panels also remained quite reproducible.

Consequently if these two limitations of the disperser as to variation in the constant feed rate and variation in the dispersal pattern on the test panels are recognized and understood, the disperser will satisfactorily provide fallout material in approximately the desired amounts.

SUGGESTED MODIFICATIONS

On the basis of the performance of this disperser to date, certain improvements could be suggested. The most important modification would be the inclusion of a variable, controllable positive feed to the splitters. This could be accomplished by the insertion of a screw feeder with a synchronous motor between the individual feed hoppers and the vibrating pan feeders. These screw feeders could then be controlled by a master voltage regulator at the control panel to give any desired simulant feed rate.

Another modification would be to increase the number of individual dispersers, thus decreasing the distance between them, and then run a lesser amount of fallout material through each one. This should provide a more uniform distribution of the fallout material on the test surfaces.

Another refinement that could be included are varidrive motors on the sand-handling equipment. By controlling the speed of the conveyors, the amount of overflow sand that is recycled through the system could be kept to a minimum, thus reducing the grinding of the sand in the conveyors.

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The major components of the system are: (1) the simulant handling equipment, (2) the individual dispersers, (3) the air system, and (4) the control panel.

(over)

1. Radioactive fallout - Simulation
2. Radiological contamination - Simulation.

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The simulant handling equipment transports the simulant from an underground storage hopper to the individual dispersers. The specially designed items of this equipment are the 8 adjustable splitters which divide the simulant falling through each into 11 equal volume streams which in turn feed the individual dispersers.

Each individual disperser consists of a sand blast nozzle located below a deflector plate. Fallout simulant and air are supplied continuously to the nozzle, which blasts it against the deflector plate; thereupon the simulant scatters and falls continuously over the test panels which are surfaced with different roofing materials.

The approximate amount of this dispersed simulant that lands on each panel is determined by the following method. The simulant transported from each test panel by the washdown water during the simultaneous fallout and washdown period is collected in a sieve and weighed. The residual remaining on the test surface after washdown ceases is collected in another sieve and weighed. The total of these two weights is the amount that lands on each panel. The simulant dispersal rate to each test panel and washdown effectiveness for each are then calculated from these weights.

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