IN-DEPTH SURVEY REPORT

RECOMMENDATIONS FOR CONTROL OF EGG CONTAINING DUSTS AND MISTS

AT

Siouxpreme Egg Products
Sioux Center, Iowa

REPORT WRITTEN BY
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PLANT SURVEYED	Siouxpreme Egg Products P O Box 336 Sioux Center, Iowa 51250
SIC CODE	2017 Poultry and Egg Processing
SURVEY DATE	March 23 - 26, 1987
SURVEY CONDUCTED BY	Paul Caplan Thomas Cooper Dennis O'Brien William Todd Kenneth Wallingford
EMPLOYER REPRESENTATIVES CONTACTED	Lloyd Thompson, General Manager
EMPLOYEE REPRESENTATIVES CONTACTED	None (Nonunion)
ANALYTICAL WORK PERFORMED BY	Not Applicable

I INTRODUCTION

The National Institute for Occupational Safety and Health (NIOSH) is the primary Federal agency engaged in occupational safety and health research Located in the Department of Health and Human Services (formerly the Department of Health, Education, and Welfare), it was established by the Occupational Safety and Health Act of 1970 This legislation mandated NIOSH to conduct a number of research and education programs separate from the standard setting and enforcement functions of the Occupational Safety and Health Administration (OSHA) in the Department of Labor An important area of NIOSH research deals with methods for controlling occupational exposure to potential chemical and physical hazards to safe levels The Engineering Control Technology Branch (ECTB) of the Division of Physical Sciences and Engineering has been given the lead within NIOSH to study the engineering aspects of control

The Siouxpreme Egg Products Company is an egg processing plant located in Sioux Center, Iowa, which produces both liquid and dried egg products Cases of asthma related to exposure to egg protein were observed in a Health Hazard Evaluation (HHE) conducted at this plant [1] The purpose of our study was to provide control recommendations and to assist in the conduct of further environmental studies on a follow-up HHE [2]

II PLANT AND PROCESS DESCRIPTION

The layout of the Siouxpreme Egg Products Company egg processing plant is shown in Figure 1 Raw eggs are received in plastic trays stacked on pallets in semitrailer quantities Trailers are unloaded into the raw egg warehouse and the eggs delivered to the transfer area via propane-powered forklift truck The transfer area contains six egg washing machines and six egg candling stations One operator for each machine loads the plastic trays onto a conveyor which automatically removes the eggs from the trays and loads them into the washer A second operator removes the empty trays and keeps the first operator supplied with eggs The empty trays are then taken to the carton wash area, washed, and dried The eggs, before exiting the egg washing machine to the candling table, are sprayed with an iodine-based disinfectant After candling, the eggs are conveyed through a window into the egg breaking room In this room, the eggs are automatically loaded onto one of the six egg breaking machines, broken, inspected, and separated One operator for each machine continuously inspects the egg and the break, and determines if the egg will be rejected, separated into white and yolk, or remain whole egg Shells are conveyed via an auger to the inedible (egg shell and reject eggs) processing area for disposal

Liquid egg may be pasteurized and sold in tank truck quantities or dried in one of two spray dryers In the dryer, liquid egg is sprayed into a hot air stream The dried egg falls to the floor and is transferred by a scraper-type conveyor to one side of the chamber and into an auger-type conveyor The hot air passes through a baffle curtain hanging across the center of the chamber and is exhausted from the chamber through an integral baghouse contained in the ceiling of the back half of the chamber. After spray drying, egg powder is pneumatically transported to a cyclone, screened, then packaged in one of two areas The dryer chamber (approximately 20 feet wide by 30 feet deep by 8 feet high) is cleaned once or twice a month To clean the chamber, it is cooled down and an operator wearing a disposable dust mask and coveralls enters the chamber to dry sweep the walls, ceiling, and baffle curtain Using a chimney-type brush, he cleans the overhead vertical tubes Doors on opposite sides of the front part of the chamber are left open during cleaning

There are two rooms for packaging powdered eggs. The older packaging room (approximately 400 square feet with a 12-foot ceiling) is located west of the old dryer and houses one packer station The newer packaging room (approximately 500 square feet with a 10-foot ceiling) is located south of the old dryer and houses two packing stations Dried whole eggs (blended egg yolk and egg white) and dried egg yolks are packaged at these three packers

The new packaging room contains an automatic packer for filling six ounce (170 gram) packets This machine was not in use during this study The other two packers are similar in operation, manually filling 50 pounds of product into boxes lined with plastic bags The dried egg is sized using a vibrating screen and then flows by gravity through a 6-inch diameter sock into the package The vibrating screen in the old packaging room is located within the room while in the new packaging room, the product is sized on the level above and passes through the ceiling into the room

The general procedure for packing the 50-pound boxes of egg product follows The operator places the empty open boxes on the table, lines the box with a plastic bag, opens the bag and folds the top down over the box, places the lined box under the fill spout, and fills the box with approximately 50 pounds of product The operator then places the fill spout into the next empty box to be filled, carries the filled box to the scales, moves the now filling box directly under the spout, and hand scoops product to adjust the weight of the filled box to 50 pounds This filled box is then manually closed by squeezing entrapped air from the bag, twisting and tying it shut, closing the box, and setting it on the automatic box taping machine The taped box is then manually palletized with 36 boxes (6 per layer and 6 high) to the pallet Each pallet is then manually stretch wrapped

During this study, both of these manual operations were packaging a whole egg product to which was added approximately 2% by weight sodium silicoaluminate, an anticaking ingredient, to make the product free flowing The company reports that this is their dustiest product The moisture content of this free-flowing whole egg product averaged less than 3%

III METHODOLOGY

Aerosol measurements were made in the plant using a GCA Real-Time Aerosol Monitor (RAM) to identify and prioritize potential sources of exposure to egg containing dusts and mists This instrument samples the workroom air and instantaneously measures the concentration of airborne dusts and mists by measuring the amount of light scattered by these materials Although the results of these measurements are reported in mg/m^3, these numbers should be considered as estimates of the true concentration, as the amount of light scattered depends on the optical characteristics of the specific aerosol in addition to its concentration This unit can be operated with a cyclone preseparator to measure respirable aerosol (dusts and mists well below about 10 micrometers in diameter) or can be operated with a plain inlet to nominally measure all sizes of dust and mists

Existing ventilation was measured using a TSI hot wire anemometer. Airflow patterns were determined between process areas using smoke tubes Process activities were recorded on videotape for later replay and analysis, as required Building drawings were reviewed to determine design airflow rates Ventilation air was observed to be supplied to the egg breaking room and the packaging areas via makeup air units Makeup air to other areas of the plant occurred from these "positive pressure" zones, by wall fans, and by infiltration. Space heaters provided temperature control

Preliminary designs for improved control were developed on-site during the study These designs were discussed with the plant to determine process compatibility, the USDA regulations were studied to ensure compliance, and the designs were finalized

IV CONTROL TECHNOLOGY

Occupational exposures can be controlled by the application of a number of well-known principles, including engineering measures, work practices, personal protection, and monitoring These principles may be applied at or near the hazard source, to the general workplace environment, or at the point of occupational exposure to individuals Controls applied at the source of the hazard, including engineering measures (material substitution, process/equipment modification, isolation or automation, local ventilation) and work practices, are generally the preferred and most effective means of control both in terms of occupational and environmental concerns Controls which may be applied to hazards that have escaped into the workplace environment include dilution ventilation, dust suppression, and housekeeping Control measures may also be applied near individual workers, including the use of remote control rooms, isolation booths, fresh-air showers, work practices, and personal protective equipment

In general, a combination of the above control measures is required to provide worker protection Process and workplace monitoring devices, personal exposure monitoring, and medical monitoring are important mechanisms for providing feedback concerning effectiveness of the controls in use Ongoing monitoring and maintenance of controls to insure proper use and operating conditions, and the education and commitment of both workers and management to occupational health are also important ingredients of a complete, effective, and durable control program

These principles of control apply to all situations, but their optimum application varies from case to case A discussion of the probable exposure sources as well as the application of the above principles are discussed in the following sections for each processing area

V RESULTS AND RECOMMENDATIONS

1 Transfer Room

Aerosol Measurements

The RAM was used to estimate approximate aerosol concentration in the areas of potential exposure to airborne egg protein in the transfer area The RAM data are shown in Table 1 and Figure 2 Visible aerosol escaped from the freshly washed eggs, from the conveyor entrance, and exit to the washer Since the wash water is contaminated by broken eggs and is recirculated (with continuous makeup) for the 5-hour production run, this mist may be an important source of exposure to egg protein Since the breaking room is maintained under positive pressure, any mist generated during egg breaking escapes through the transfer/breaking windows into the transfer room Aerosol levels tended to be higher on the exit (clean) side of the washer than on the entrance (dirty) side This may be the result of mist escaping from the washer or may be from aerosol escaping from the transfer/breaking room windows However, aerosol measurements in the breaking room (see next section) indicate that the egg shell ejector area (adjacent to the window) is a major aerosol source

Existing Ventilation

Ventilation for the six egg washers consisted of a system of an approximately 8-inch diameter PVC pipe This constant diameter duct system was not in accord with commonly accepted design practice [3] The exhaust rate did not appear to be capable of adequately containing the wash water mist No indraft

Table 1 Aerosol in Transfer room, (mg/m^3), as measured with a RAM

LOCATION	LINE #1	LINE #2	LINE #3	LINE #4	LINE #5	LINE #6	AVERAGE
Total aerosol							
Load station	1 1	4 2	3 3	1 2	1 2	1 1	2 0
Washer entry	1 3	1 0	1 0	1 1	1 1	1 2	1 1
Washer exit	1 5	5 5	1 5	1 5	0 9	0 8	2 0
Candler	1 9	5 0	2 6	1 5	0 9	0 9	2 1
Respirable aerosol							
Load station	0 8	1 4	2 2	1 1	1 5	1 4	1 4
Washer entry	0 9	0 8	1 0	1 2	1 4	1 3	1 1
Washer exit	0 7	3 1	1 1	1 7	1 2	1 3	1 5
Candler	2 7	2 9	1 1	1 5	1 2	1 1	1 8

Note These are single, instantaneous measurements used to identify areas or operations causing potential exposure, they may not reflect actual exposures measured by long-term sampling techniques could be measured at the washer entrance or exits Ventilation measurements indicated washer air volumes ranging from approximately 30 cfm to about 150 cfm, with the air flow lowest for the washers farthest from the fan No fresh makeup air was supplied to the transfer room No roof or wall fans were used to provide dilution ventilation Two steam-coil type space heaters provide temperature control

Recommended Controls

The control strategy addresses the two major aerosol sources (the washer and transfer window) and the lack of fresh air supply to the area

The washer ventilation system needs to be redesigned to provide an indraft sufficient to overcome the escaping mist This will require better enclosure of the washer and an increase in exhaust rate to as much as 400 cfm An indraft velocity of from 50 to 200 fpm should prove sufficient The manufacturer of the egg washer (Seymour Foods, Inc , Topeka, Kansas) has proposed[4] extending the washer housing and an exhaust rate of 60 cfm An example duct system designed on the basis of a uniform transport velocity of 3,000 fpm and an exhaust rate of 400 cfm for each is shown in Figure 3, along with an estimate of the required fan capacity - 2,400 cfm at a fan static pressure of 1 0-inch W C

Ideally, all the mist sources in the breaking room could be controlled, thus eliminating the transfer/breaking windows as an exposure source for the workers in the transfer room, Because of the difficulty involved in accomplishing complete control in the breaking room, exhaust hoods should be placed directly above the transfer/breaking windows to contain the air leaving the breaking room An exhaust volume of 1,000 cfm for each of these hoods should be sufficient to remove the approximately 800 cfm discharged from each window As is the case with the washers, a duct system based on a uniform minimum transport velocity of about 3,000/fpm is suggested This system is shown along with that for the washer exhaust in Figure 3 As shown, both systems can be separate or can be combined into a single exhaust system

In order to prevent localized cold/hot spots, and to avoid drafts, the air exhausted from the transfer room should be replaced with clean, tempered air This makeup air should should be distributed within the transfer room In order to receive the maximum benefit from this clean air, it should be introduced directly above the candler and loader work stations in the form of a low velocity air shower The fresh air showers, window hoods, and washer modifications are presented in Figures 4 and 5 An example of a distribution duct system for the fresh air supply is shown in Figure 6 Note that fresh air ducts for the inedible and tray washing areas are also shown on this figure

2 Breaking Room

Real-Time Aerosol Measurements (RAM)

The RAM was used to measure mist about various points of the egg breaking machines Points measured were the operator, the shell ejector, the yolk ejector, and the shell auger (shell ejector chute) The RAM data is shown in Table 2 and Figure 7 The highest aerosol readings were measured at the egg shell ejector chutes near the eggshell auger The auger was at first suspected as the source, but air velocities measured at auger openings appeared too high to have been generated by the slow moving auger This high velocity air was traced to the egg shell ejector chute Compressed air is used to eject the shell and remove residual egg white This air apparently causes the atomization of some egg material and induces an airflow down the egg ejector chute The air leaving the egg shell chute outlet of the number 6 breaking machine was measured as approximately 300 fpm, which corresponds to about 33 cfm

Existing Ventilation

A filtered air makeup unit located on the breaking room roof discharged into a loft The unit had a rated capacity of 10,000 cfm, but was throttled to an estimated 4,000 cfm This estimate was made by measuring the air flow from each of the six windows between the washing room and the breaking room By design, these windows are the only permanent openings from the breaking room

Table 2 Aerosol in Breaking room, (mg/m^3), as measured with a RAM

LOCATION	LINE #1	LINE #2	LINE #3	LINE #4	LINE #5	LINE #6	AVERAGE
Total aerosol							
Operator	0 5	2 0	1 7	0 5	0 7	0 1	1 1
Yolk ejector	6 7	1 3	2 0	1 5	0 4	0 2	2 0
Shell ejector	2 0	4 1	2 1	2 3	0 7	0 5	2 0
Ejector chute	6 0	9 0	2 0	2 1	1 4	2 0	1 4
Respirable aerosol							
Operator	0 4	0 7	1 3	1 1	1 0	0 3	0 8
Yolk ejector	1 4	3 2	2 3	1 4	0 9	0 3	1 6
Shell ejector	1 3	2 2	2 6	0 7	1 1	0 2	1 4
Ejector chute	10 0	8 0	2 0	1 5	1 2	0 5	3 9

Note These are single, instantaneous measurements used to identify areas or operations causing potential exposure, they may not reflect actual exposures measured by long-term sampling techniques

Recommended Controls

The control strategy for the breaking room has three elements minimizing the generation of egg-containing aerosol, containing the escape of the generated aerosol, and diluting any aerosol that may escape

Both the Seymour Model 102 and Seymour Model 104 breaking machines utilize compressed air to remove egg shells The Model 104 also uses compressed air to remove the yolk Pressure gauges on the compressed air lines were either missing or defective Pressure gauges should be installed on each machine and the pressure reduced to the minimum necessary to accomplish the task of shell and/or yolk removal Venturi-type nozzles are available, which use a small quantity of compressed air to induce motion of the ambient air. This type of nozzle operates at much lower pressures, resulting in more air movement at lower air velocity, thereby reduced probability of atomization, and lower noise levels A trial of these nozzles should be conducted

The plant had reduced the amount of supply air to 4,000 cfm to reduce the amount of the aerosol entering the transfer area There is no good rationale for doing this, since the only exit route from the breaking room for exhaust air is through the "windows" to the transfer area Lowering the ventilation rate in the breaking room can only result in increasing the concentration of mist in both the breaking room and in the same air entering the transfer area This emphasizes the need for improved mist control in the breaking room which will contain the mist generated by the machines and/or exhaust hoods over the transfer room windows

The egg shell ejector on the Model 102 egg breaking machines is currently enclosed with a removable housing This housing can be effectively converted to an exhaust hood by providing a connection for an exhaust duct (3 5-inch diameter) A flow rate of approximately 150 cfm should contain the flow of air induced by the compressed air jets and provide a control velocity of about 75 to 100 fpm at the egg conveyor Exhaust connections are shown in Figure 8

Exhaust ventilation of the Model 104 egg breaking machines is much more difficult, since the shell ejecting system is currently not so well enclosed and yolk removal is also accomplished by compressed air Enclosure of these two operations is not feasible, considering the frequent equipment cleaning required Local exhaust of the main sources of egg-containing aerosol should be provided by a canopy hood fitted no farther than about 6 inches above the egg conveyor gear cover, as is shown in Figure 9 The recommended exhaust air flow for this hood would be 900 cfm, based on a desired air velocity of 100 fpm at the hood perimeter The shell breaking operation is enclosed on this machine, although not a major aerosol source, it could be easily controlled by providing a connection for an exhaust duct (3-inch diameter duct - 100 cfm exhaust rate)

An example exhaust duct system for all six machines, designed on the basis of a uniform transport velocity, is shown in Figure 10

The manufacturer of the egg breaking machines (Seymour Foods, Inc , Topeka, Kansas) has introduced an Albumen Recovery Unit (ARU) since this investigation [4]

The ARU is a vacuum system that removes suspended albumen "stringers" that would normally pass into the shell ejection area The manufacturer has conducted tests that indicate that the ARU recovers approximately 240 grams of albumen per minute for each machine, a portion of which could have been atomized The use of the ARU may prove to be a less expensive alternate to local exhaust ventilation of the egg breaking machines

In order to receive the maximum benefit from the clean makeup air, it should be introduced directly above the breaking machine operators as is depicted in Figures 8 and 9 The fresh air showers should be similar to those used for the loaders and candlers in the transfer room If the existing makeup air unit is restored to its 10,000 cfm capacity, the volume of air delivered will be sufficient to keep a positive flow of air out of the breaking room even with the addition of the exhaust hoods A fresh air duct system is shown in Figure 11

3 Packaging Operations

Aerosol Measurement

The packaging operation is labor intensive, requiring several liftings of filled boxes and many extra steps for the completion for each package Several dust sources were observed during the operation (1) the sock fill spout, (2) the open bags during filling at the fill spout and during weighing on the scale, (3) the open surplus container beside the scale, and (4) the bag as air is squeezed out in preparation for tying closed Table 3 shows the dust concentration in the packaging room during normal packaging operations The area between the fill spout and the scales, site (6) on Figure 12, has the highest dust levels Most of this dust is generated during bag filling,

Table 3 Aerosol in packaging areas (mg/m^3), as measured with a RAM

Activity	Aerosol (mg/m^3	
	Total	Respirable
A <u>New Packing Room</u>		
General background	0 1-0 5	0 1-0 2
Filling and weighing bags	0 1-13 0	0 1-0 4
B <u>Old Packing Room</u>		
Filling boxes	0 2-0 3	0 1-0 2
Fill sock dribbling powder	8 1-13 2	2 5-5 0
C <u>Above New Packer Room at Bin Feed Level</u>		
Normal operation	0 1	0 1

Note These are single, instantaneous measurements used to identify areas or operations causing potential exposure, they may not reflect actual exposures measured by long-term sampling techniques scooping, and closing phases of the operation With some revision of the packaging operations, most of the extra lifting, extra steps, and dust sources could be eliminated

Recommended Controls

Suggested revisions to the packaging operation in the new packaging room are presented in Figures 13 and 14 These revisions could also be adapted to the old packaging operation By changing the layout of the packaging operation, much of the lifting and many excessive steps can be eliminated. The empty box table, scales, taping machine should be placed end-to-end, in a straight line with their work surface waist high The pallet should be located at the end of the line by the taping machine The filled pallet may need to be moved to a more spacious area before it can be stretch wrapped The scale readout should remain on the wall where it is easily visible to the operator as he stands in front of the scale The cloth sock should be replaced with a rigid (metal or other suitable material) "Y" spout having a short length of cloth sock on the end of each spout extending a few inches into the boxes as they fill This short sock will help reduce dusting during filling A deflector valve at the "Y" would direct the flow of the product to either the primary or finish fill spout. A hopper, with an open roller-type conveyor over its top, should be located beneath the primary fill spout to recover any spillage during filling The scale should be located directly under the finish fill spout By underfilling the box on the primary spout, the box can be slid onto the scale and the deflector valve opened slightly to allow a trickle feed to bring the box up to weight If the box is overfilled, the excess can be scooped either into the box filling under the primary spout or into the hopper To reduce dusting during bag closing, an evacuation lance can be used to remove the entrapped air from the bag [5] The boxes currently being used to package 50 pounds of product are too small, making it difficult to close when filled A slight increase in the box dimensions would eliminate this difficulty

The operator's potential dust exposures can be further reduced by better utilizing the fresh air supply into the packaging room The existing fresh air duct should be redirected to an air shower located above the operator's primary work station in front of the fill spouts The existing 750 cfm of makeup air should be directed into a plenum above the air shower, which will result in a uniform flow of 50 to 75 fpm of air over the operator's head The plenum and air shower should measure approximately 1 5 feet wide by 5 feet long by 1 5 feet high When the automatic pouch packer is in use, a blast gate in the air line, see Figure 13, could be opened to provide air in the area of this packer

4 Dryers

Aerosol Measurement

The RAM was used to estimate total dust concentrations in the chamber during an unscheduled, partial cleaning of the dryer While sweeping the front portion of the chamber, dust levels ranged from 0 05 to 1 0 mg/m^3. While cleaning the tubes in the back portion of the chamber behind the baffle curtain, dust levels ranged from 2 0 to 10 0 mg/m^3

Recommended Controls

The operator currently wears disposable clothing and a nonapproved, disposable respirator during cleaning It is recommended that as a minimum, the operator wear a NIOSH-approved dust and mist respirator In light of the unknown sensitization potential of the egg dust, a supplied-air type respirator (either air-line or self-contained) would be preferable

5 Forklift Trucks

Observations

Two propane-powered forklift trucks transfer raw eggs, dried egg products, and cardboard box material within the plant An electric powered lift truck is used primarily in the finished product warehouse There is no general dilution ventilation, other than open doors, provided in the areas where the trucks are used Both trucks, each over 60 horsepower, are reported to undergo regular maintenance However, neither has been analyzed for carbon monoxide (CO) emissions There was no air sampling of forklift truck operations

Recommended Controls

In the raw egg warehouse, general dilution ventilation is needed to maintain CO concentrations below acceptable levels The American Conference of Governmental Industrial Hygienists (ACGIH) recommends dilution ventilation rates based on lift truck type, horsepower, room volume, and maintenance procedures [3] The warehouse (175,000 cubic feet) ventilation system should have a 5,000 cfm fresh air supply and a 5,000 cfm exhaust system for each propane-powered forklift truck used in the area A CO-analyzer should be used to monitor the truck exhaust, so that it does not exceed a concentration of 1% If the egg aerosol control measures are adopted in the transfer room, no additional ventilation should be required in that area as long as only one truck is in use The finished product warehouse (130,000 cubic feet total) is segregated into five smaller rooms The design of these rooms precludes effective dilution ventilation Therefore, only the electric-powered forklift truck should be used in this area

VI SUMMARY

Aerosol concentrations were highest in the transfer and egg breaking rooms and in the two powdered egg packaging areas The aerosol in the transfer rooms consisted of an egg mist or a water mist that may be contaminated with egg products In the transfer area, this aerosol arises from a poorly ventilated egg washer Recycle of the wash water (which was observed to be heavily contaminated with broken eggs) could result in high exposure to egg protein Improved washer ventilation should minimize the escape of this aerosol In the egg breaking area, the mist arises from the use of compressed air to remove egg yolks, egg shells, and egg debris from the egg breaking machines

A program of minimizing compressed air pressure and installation of local exhaust of the egg breaking machines will minimize the release of egg-containing aerosols Installation of albumen recovery devices may eliminate the need for local exhaust of the breaking machines The dried egg processing areas (spray dryer, sifter, auger, hopper) appeared relatively dust free Poor process layout, package selection, and job design resulted in potentially high egg dust exposures in the packaging of the powdered egg product Improving the packaging process should reduce exposure to egg dust as well as increase employee productivity

The greatest number of workers potentially exposed to the egg-containing aerosols are located in the transfer and egg breaking rooms Immediate improvement in working conditions in these areas can be achieved by increasing the fresh air supply in the egg breaking room from the present 4,000 cfm to the design condition of 10,000 cfm This in effect will halve the aerosol concentrations in the egg breaking room and (since the only air supply is through the transfer windows) the transfer room

VII REFERENCES

1 Smith, A B , and G A Carson Health Hazard Evaluation Report, 84-163-1657, Siouxpreme Egg Products, Sioux Center, Iowa 1986

2 Smith, A B , and M A Newman Health Hazard Evaluation Report, 86-446, Siouxpreme Egg Products, Sioux Center, Iowa 1988

3 American Conference of Governmental Industrial Hygienists ACGIH industrial ventilation a manual of recommended practice ACGIH Committee on Industrial Ventilation Lansing, Michigan, 1982

4 Personal communication (letter), O R Anderson, Seymour Foods, Inc , April 13, 1988

5 Brochure No 7607 "E-VAC Lance Bagging System," Howe Richardson Scale Company, Clifton, New Jersey

APPENDIX A

Excerpts from "Regulations Governing the Inspection of Eggs and Egg Products" (7 CFR Part 59)

59.506 Candling and transfer-room facilities and equipment

(c) An approved exhaust system shall be provided for the continuous removal directly to the outside of any steam, vapors, odors, or dust in the room The room shall be maintained at reasonable working temperatures during operations

59 508 Candling and transfer-room operations

(a) Candling and transfer rooms and equipment shall be kept clean, free from cobwebs, dust, objectionable odors, and excess packing materials

59 520 Breaking room facilities

(d) Ventilation shall provide for

(1) A positive flow of outside filtered air through the room,

(2) Air of suitable working temperature during operations

59 548 Drying, blending, packaging, and heat treatment rooms and facilities

(1) Blending and packaging rooms for pasteurized products shall be provided with and adequate positive flow of approved outside filtered air

(5) Automatic container fillers shall be of a type that will accurately fill given quantities of product into the containers Scales shall be provided to accurately check the weight of the filled containers All equipment used in mechanically packaging dried egg products shall be vacuum cleaned daily

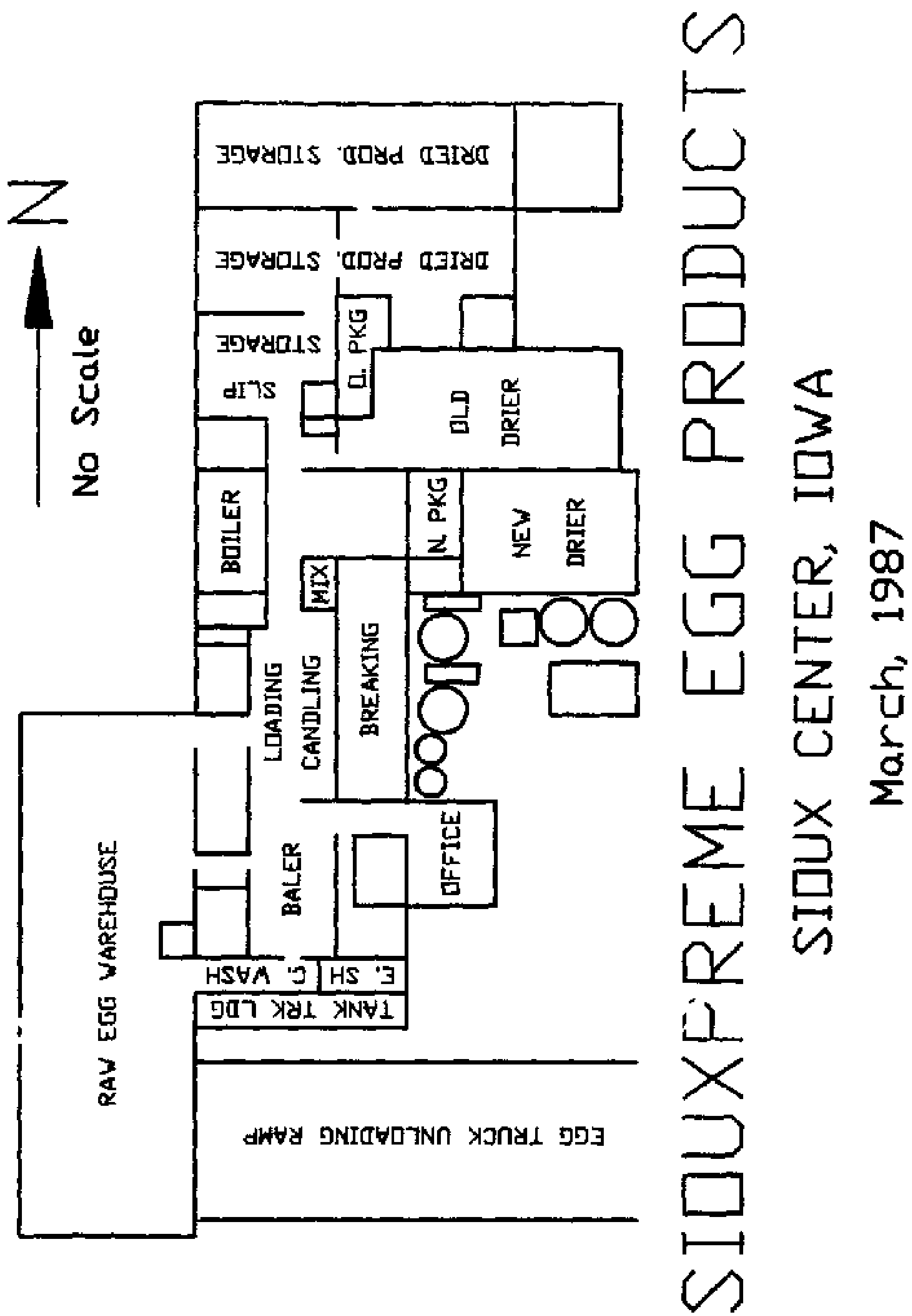
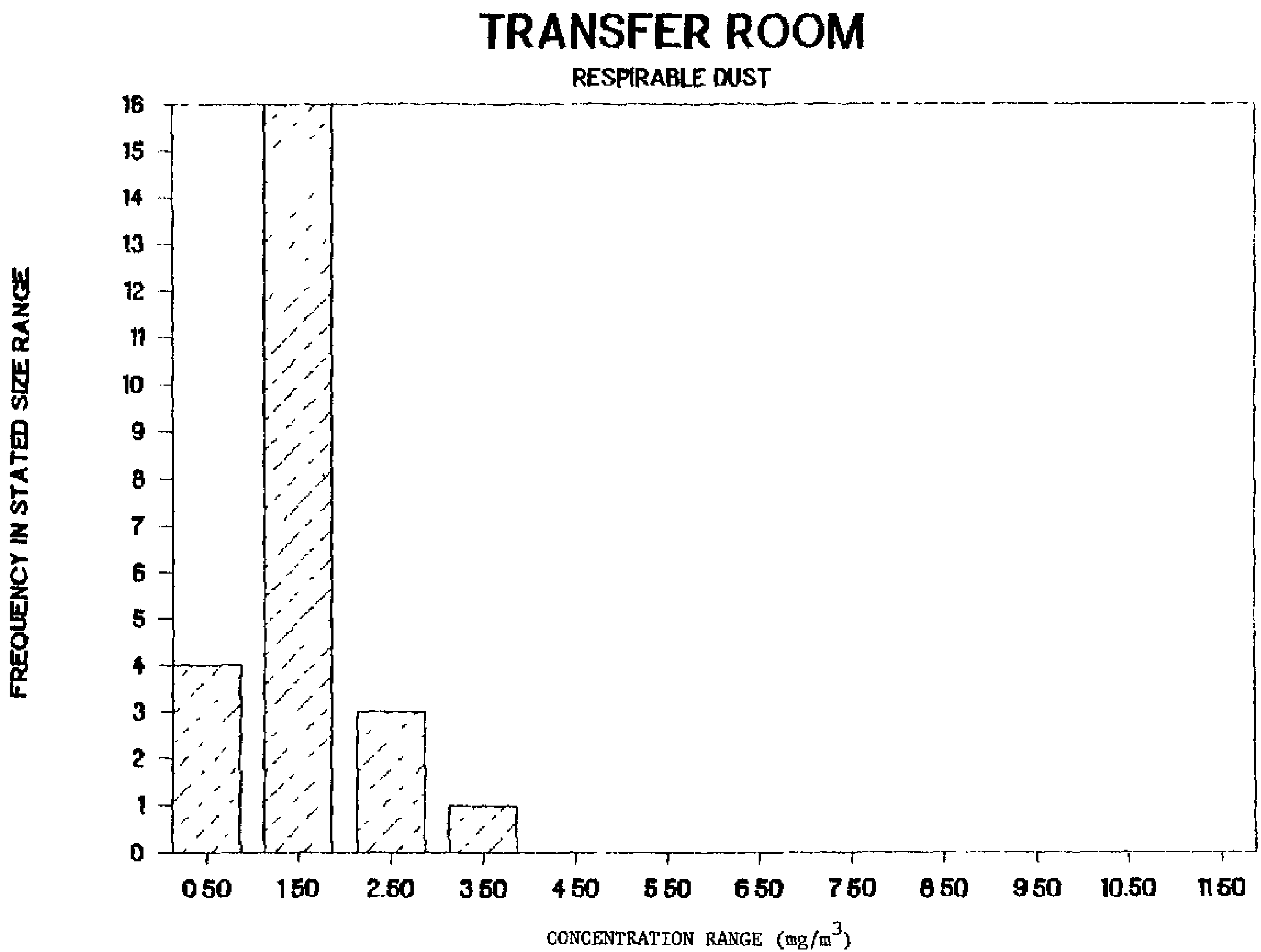
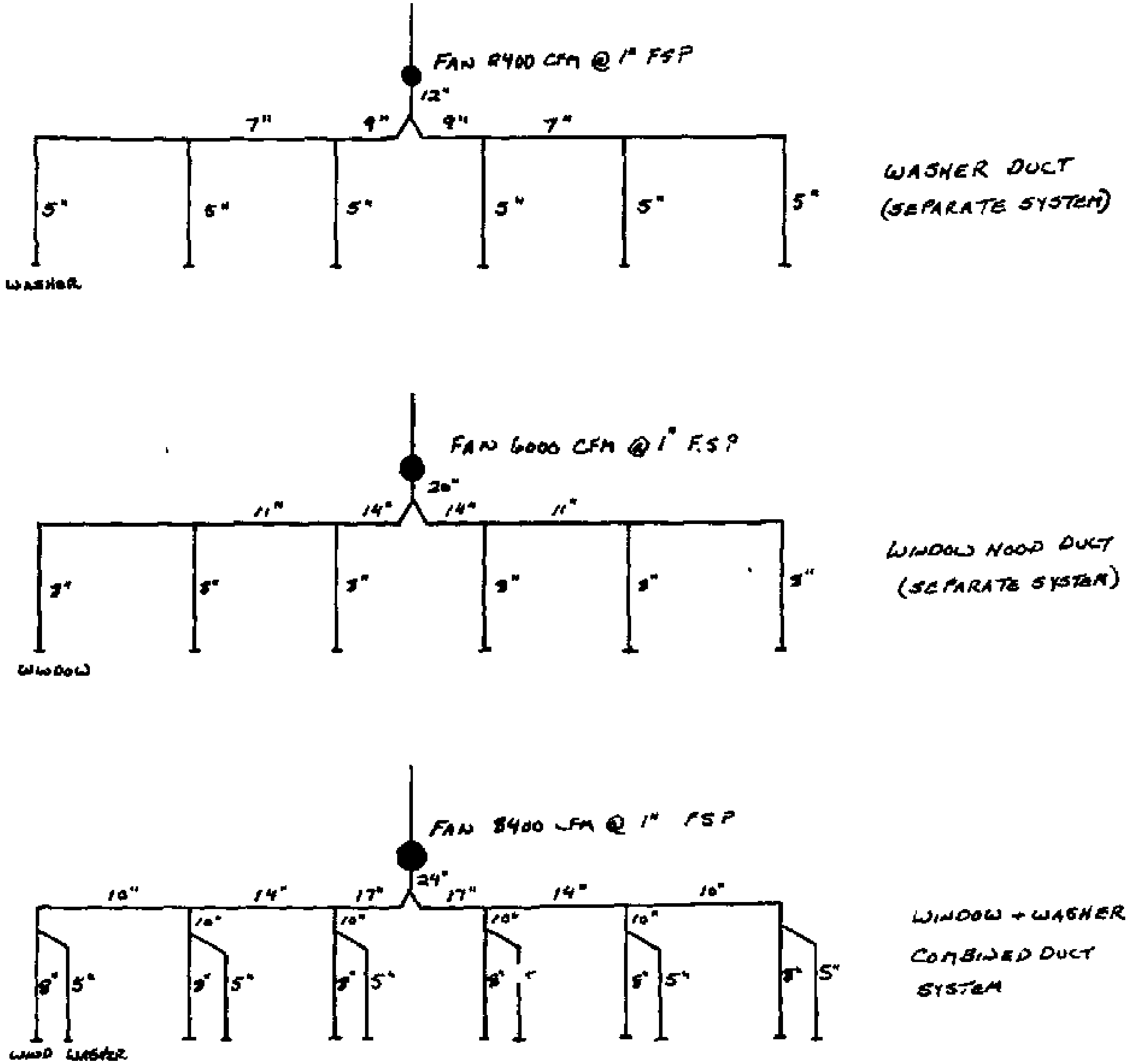


Figure 1 Plant layout

Figure 2 Aerosol concentration in the transfer room





NOTES

1. DUCTWORK STAINLESS STEEL OR PLASTIC
2. DUCT VELOCITY = 3000 FPM.
3. ELBOW CENTERLINE RADIUS = 2 x DUCT DIAMETER
4. ALL ENTRIES 30°.
5. USE BLAST GATES TO BALANCE SYSTEM.

Figure 3 Suggested duct sizes for transfer room

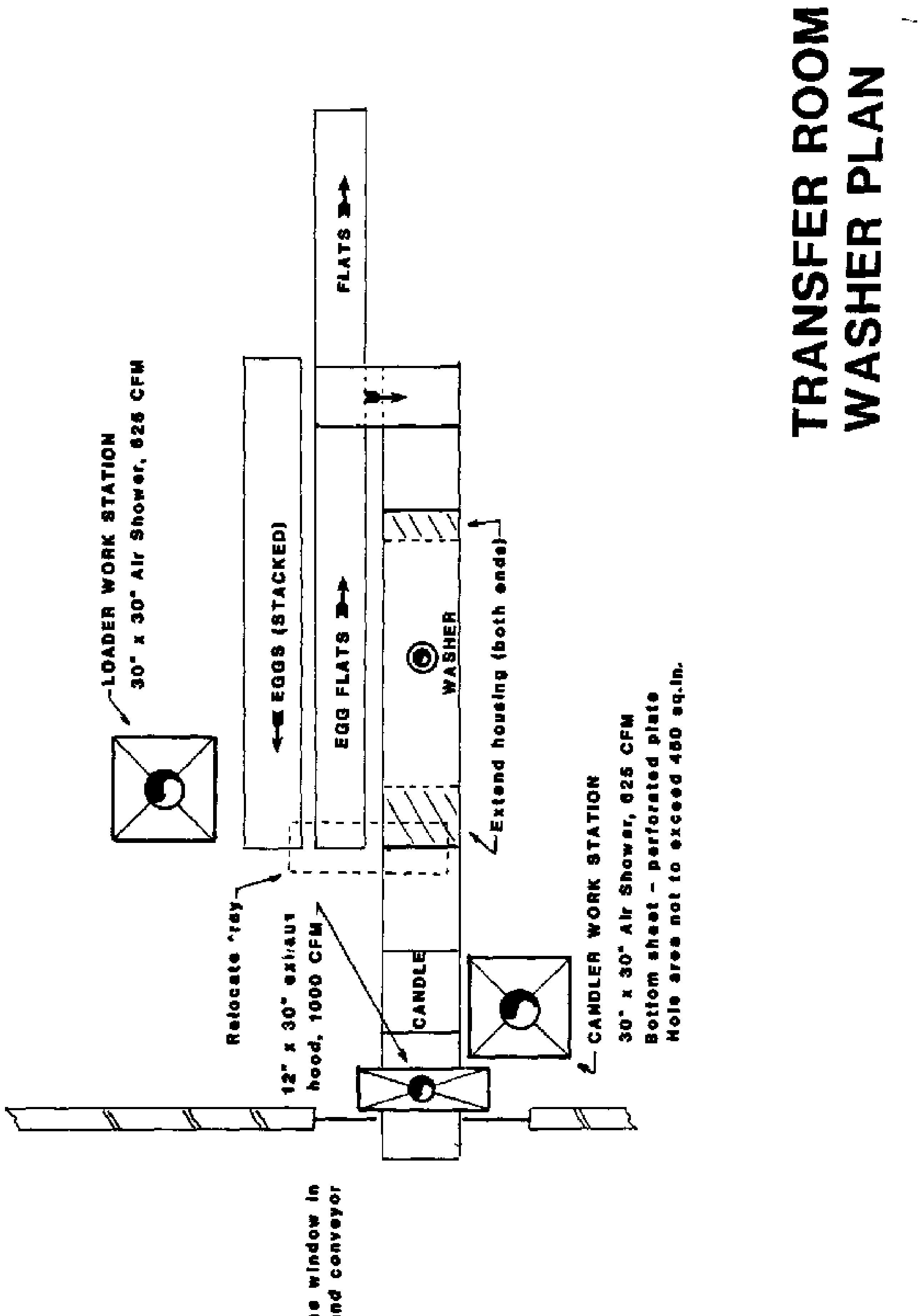


Figure 4 Suggested controls for transfer room

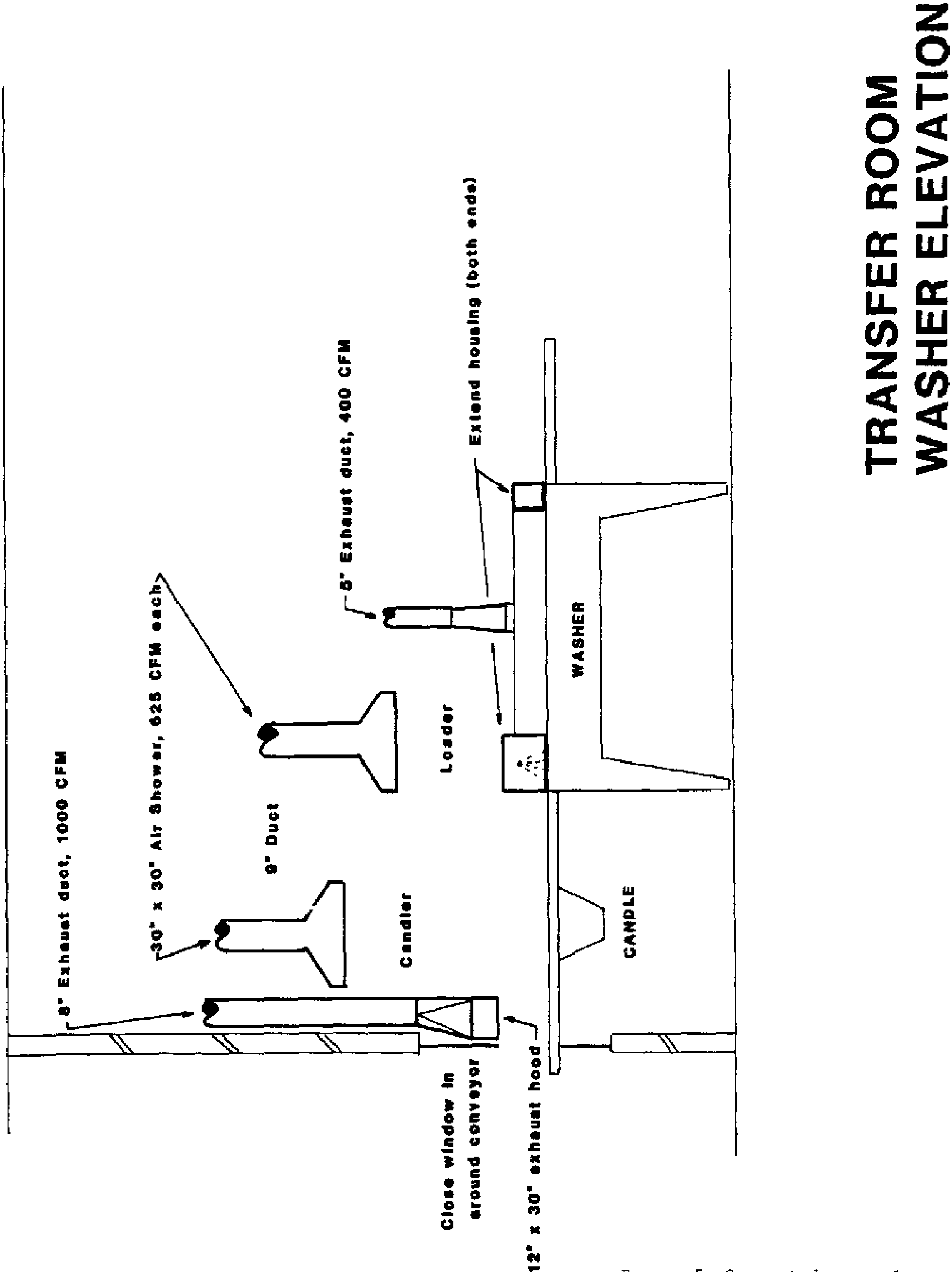
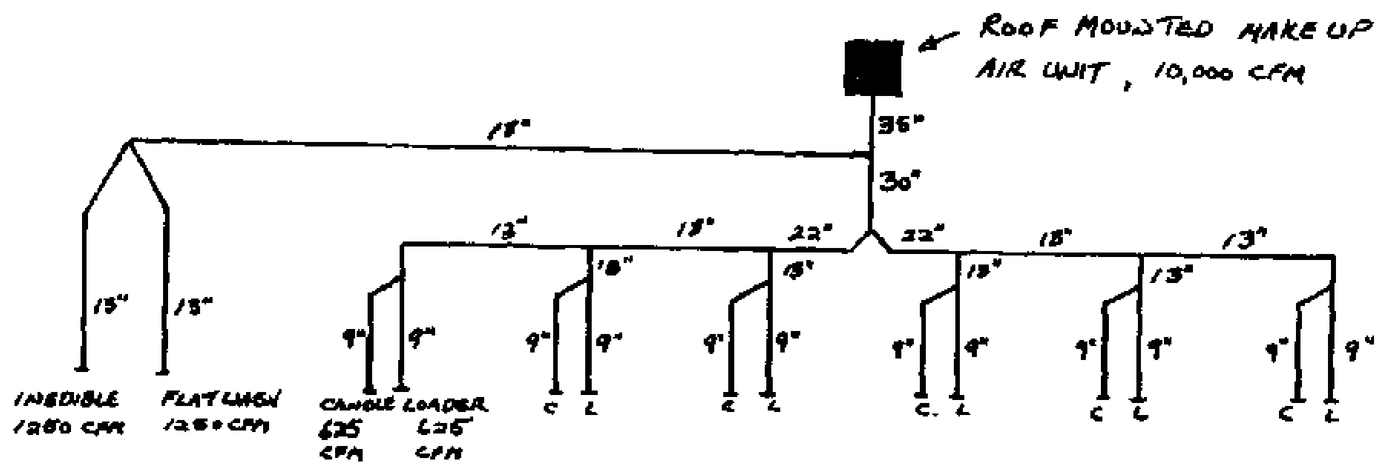


Figure 5 Suggested controls for transfer room.



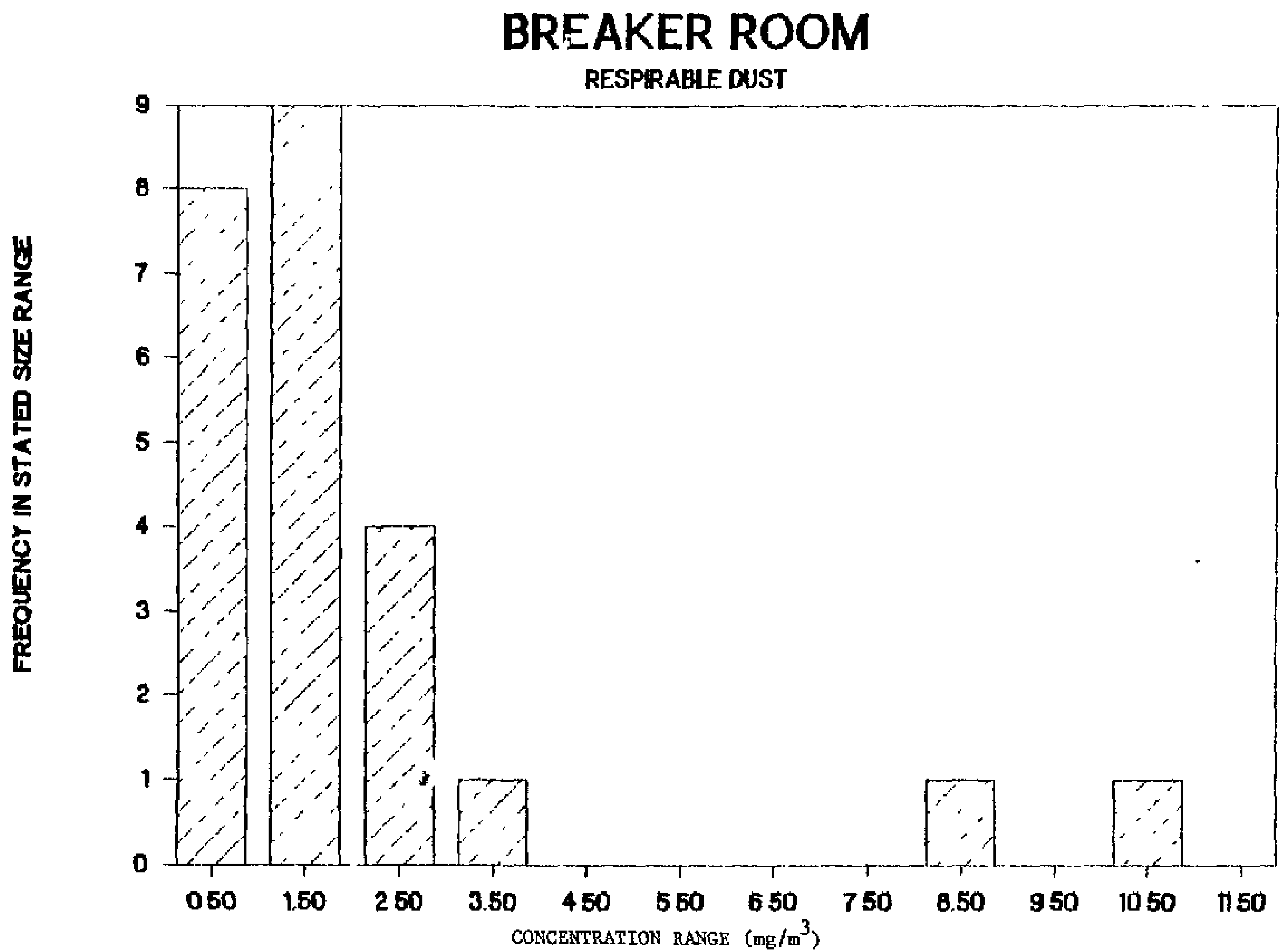
NOTES ① SPIRAL WOUND, GALVANIZED STEEL DUCTWORK

② DUCT VELOCITY = 1500 FPM

③ MAKE UP AIR UNIT, DIRECT FIRED NATURAL GAS OR STEAM COIL

Figure 6 Suggested make-up air supply for transfer room

Figure 7 Aerosol concentration in the egg breaking room.



SEYMOUR EGG BREAKER - MODEL 102

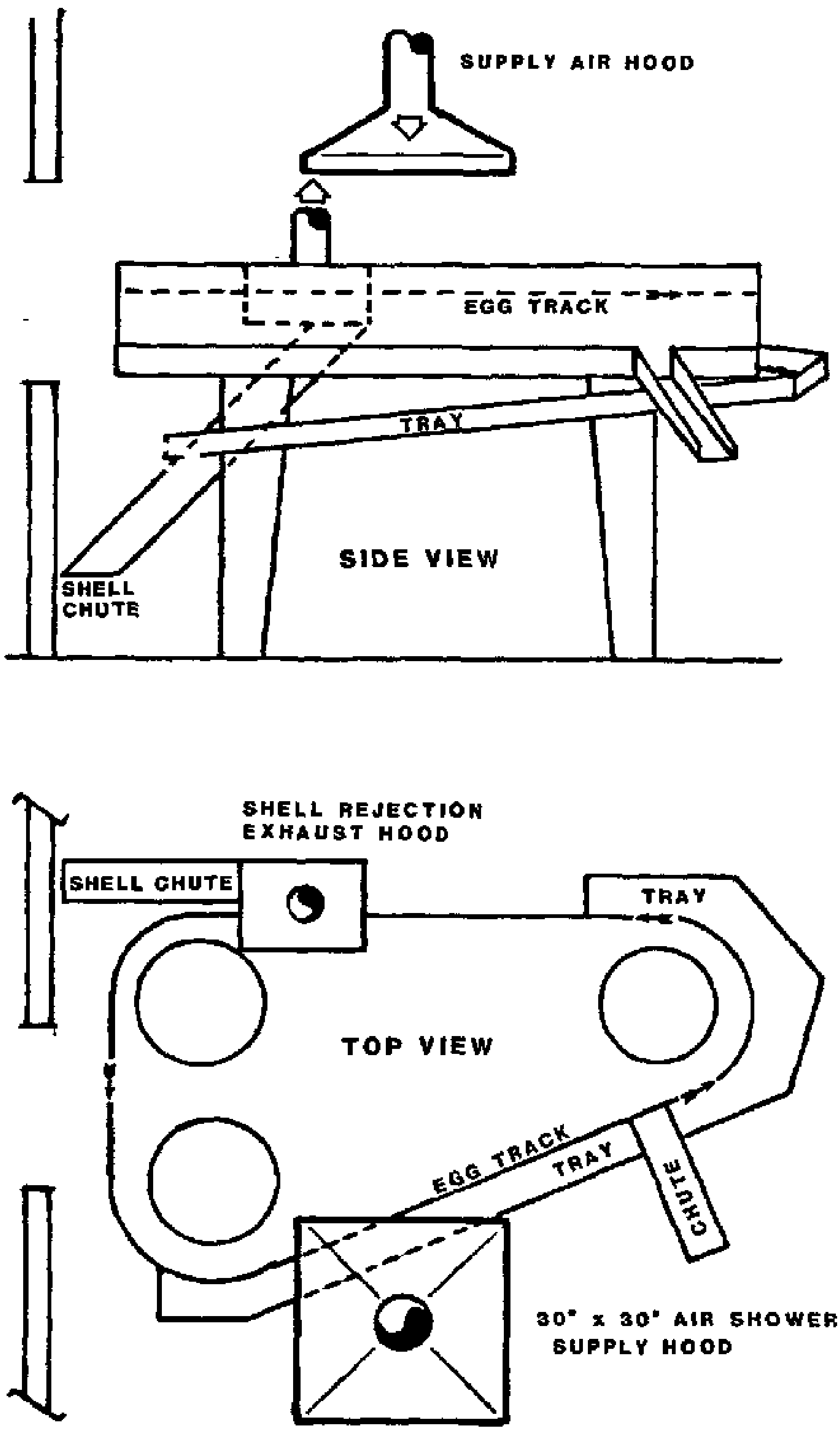


Figure 8 Supply and exhaust arrangement for Model 102 egg breaker.

SEYMOUR EGG BREAKER - MODEL 104

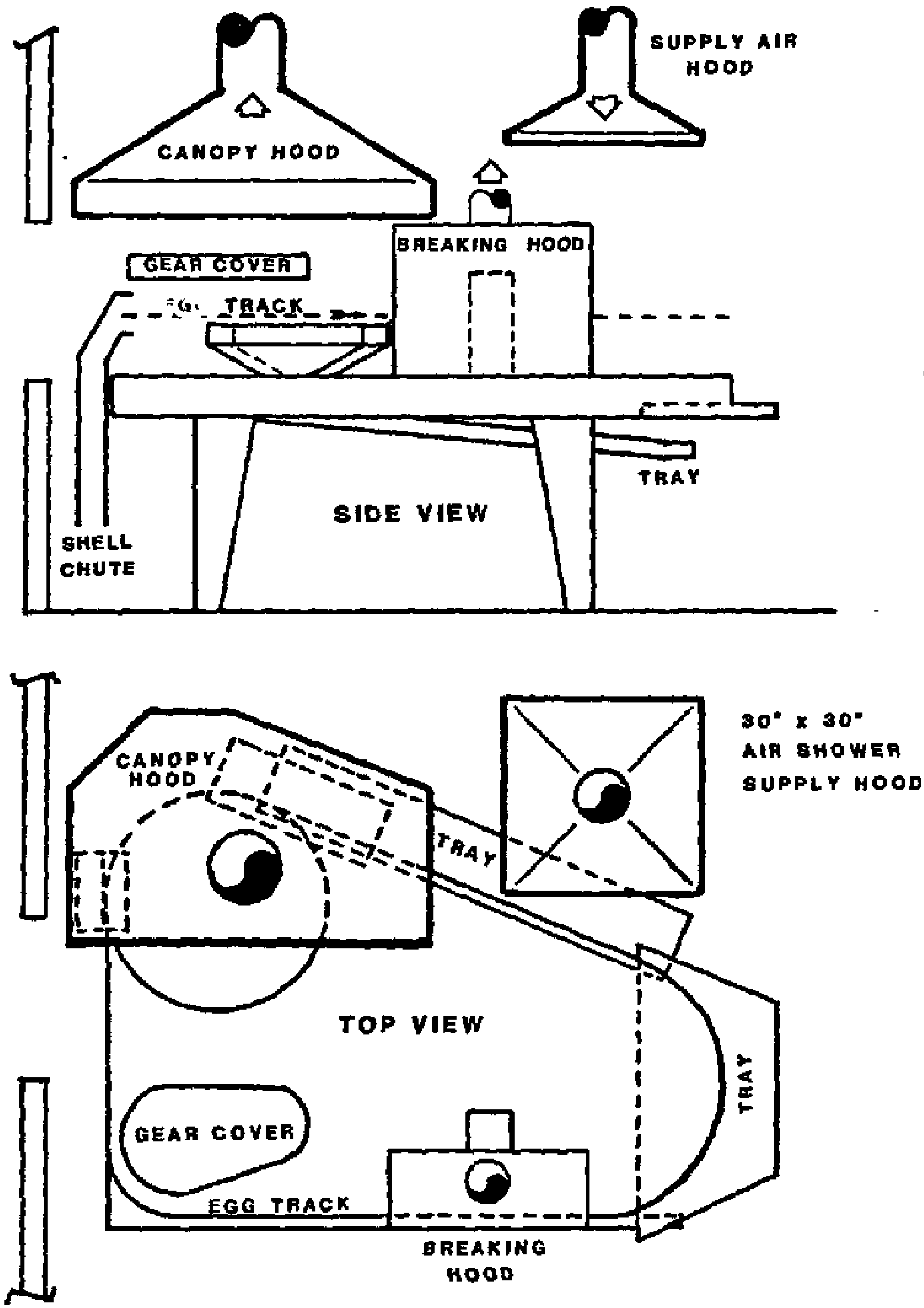


Figure 9 Supply and exhaust arrangement for Model 104 egg breaker.

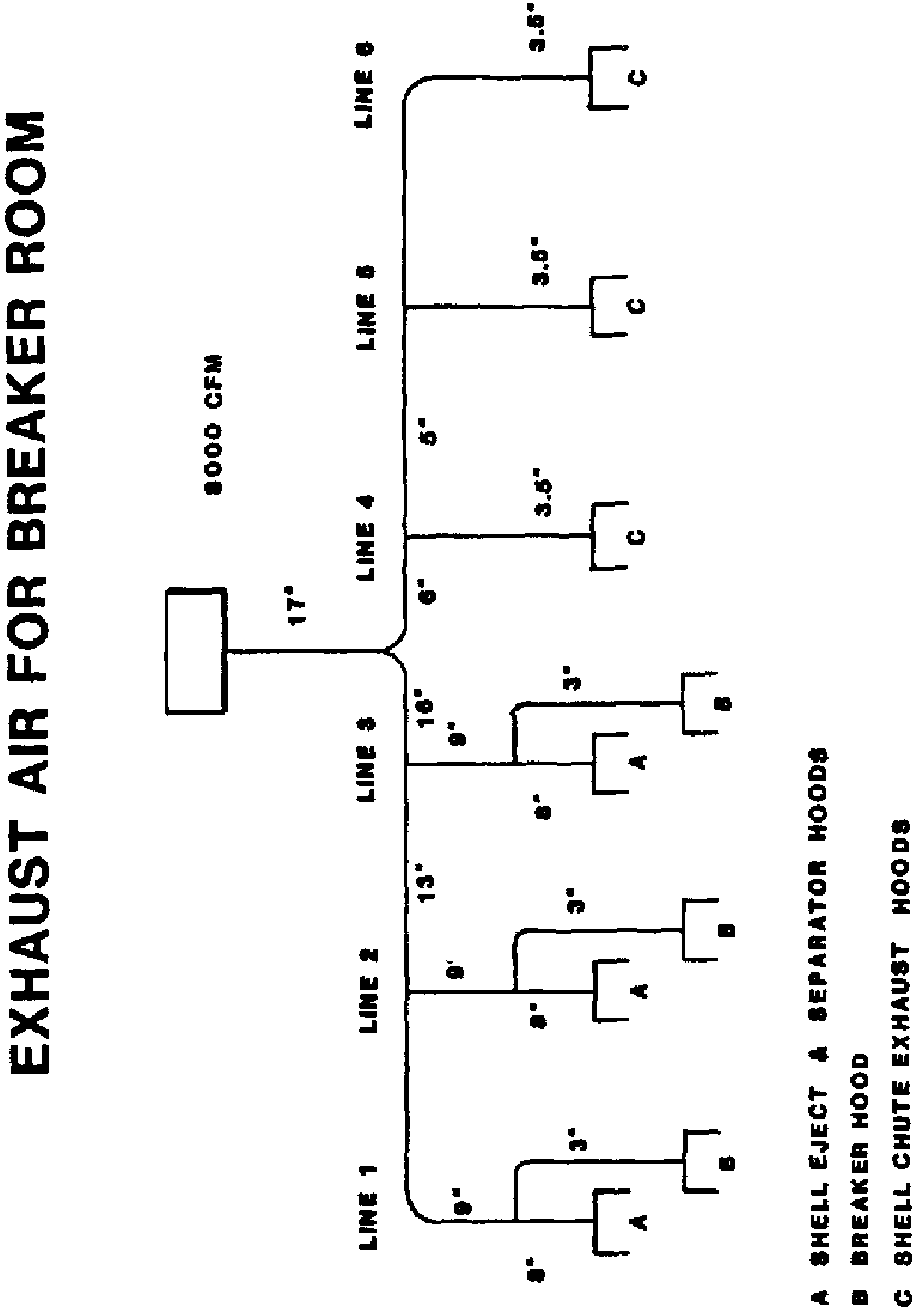


Figure 10 Suggested exhaust duct sizes for the breaking room.

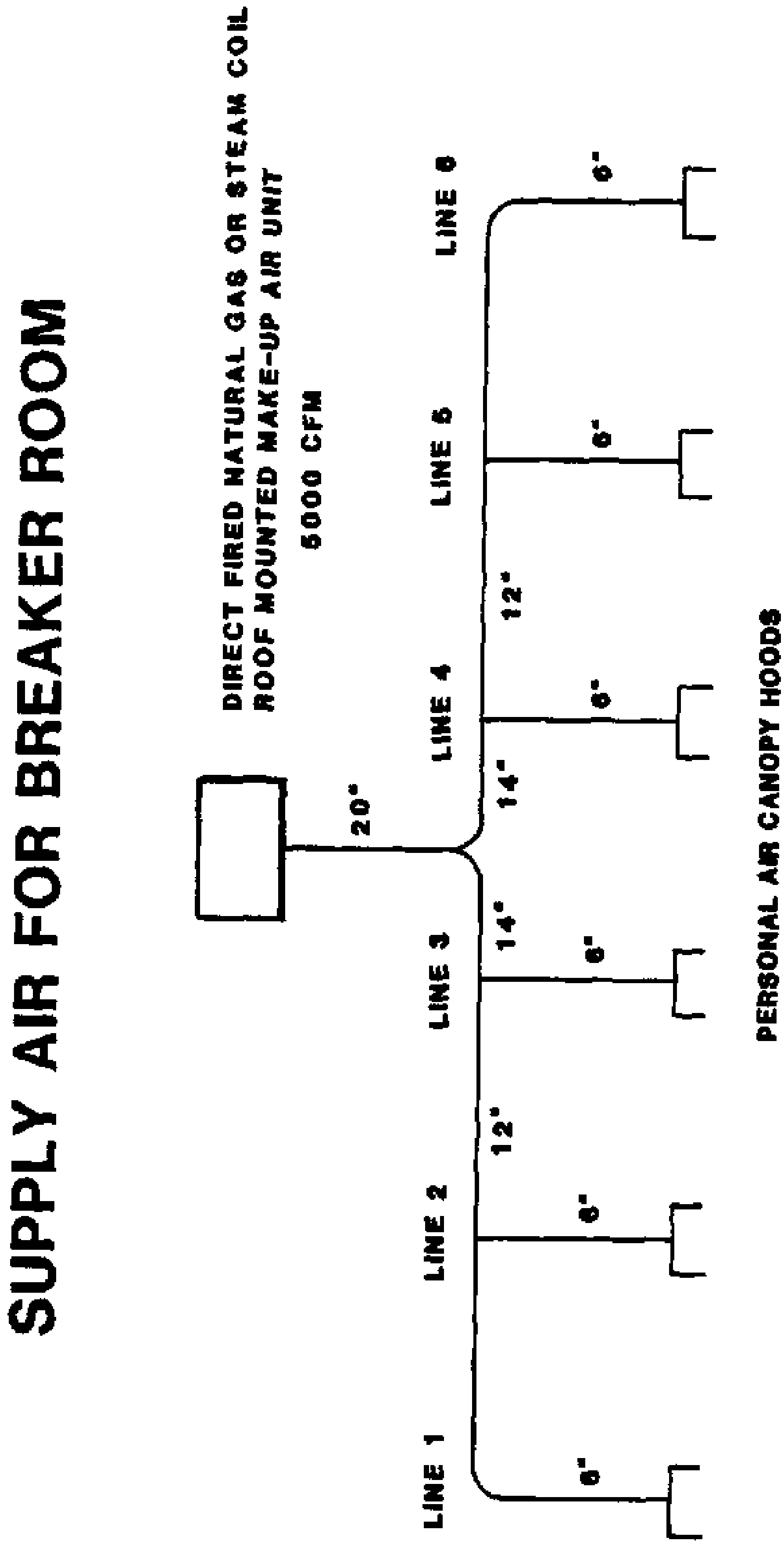


Figure 11 Suggested supply duct sizes for the breaking room.

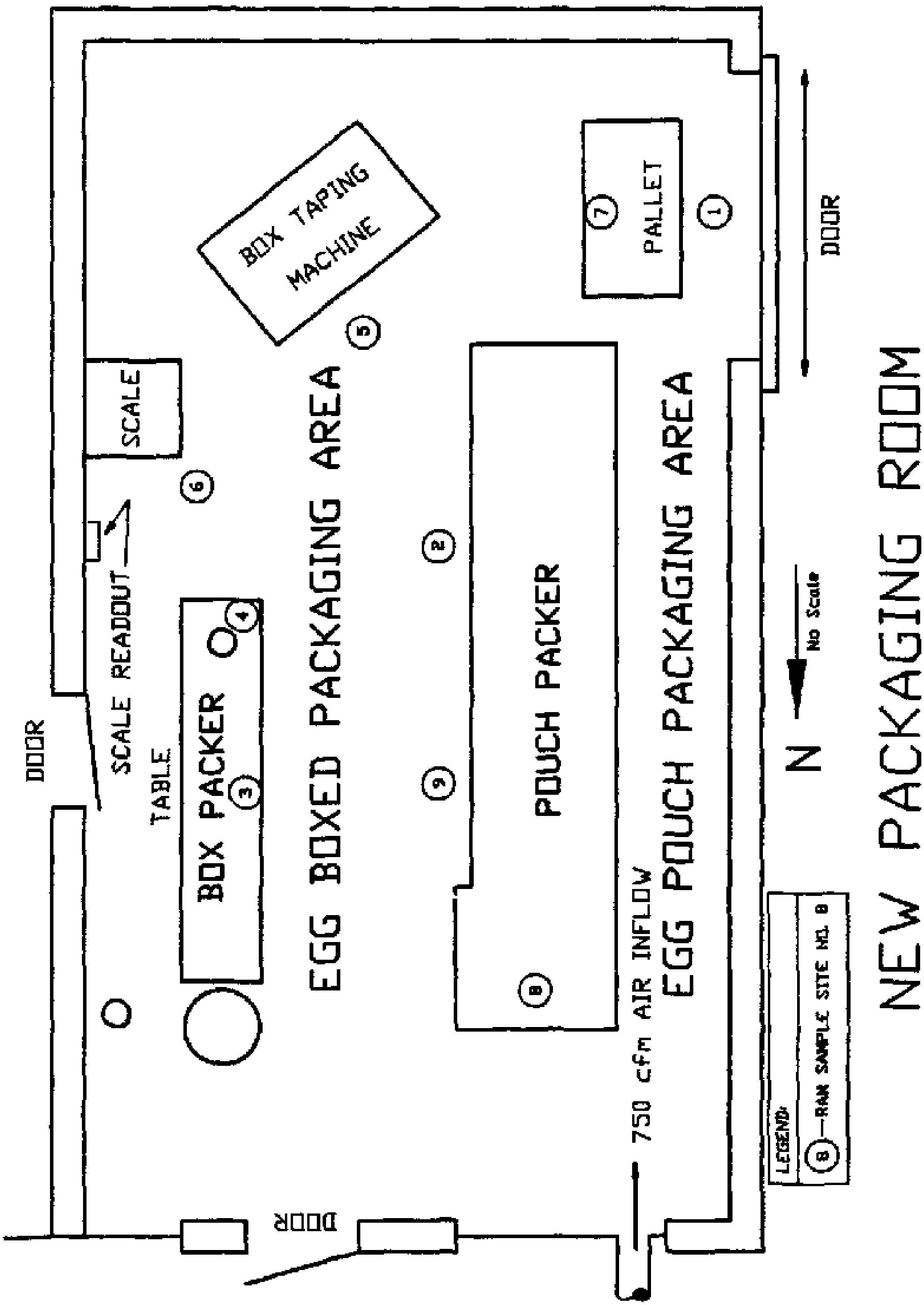


Figure 12 Sampling locations in the new packaging room.

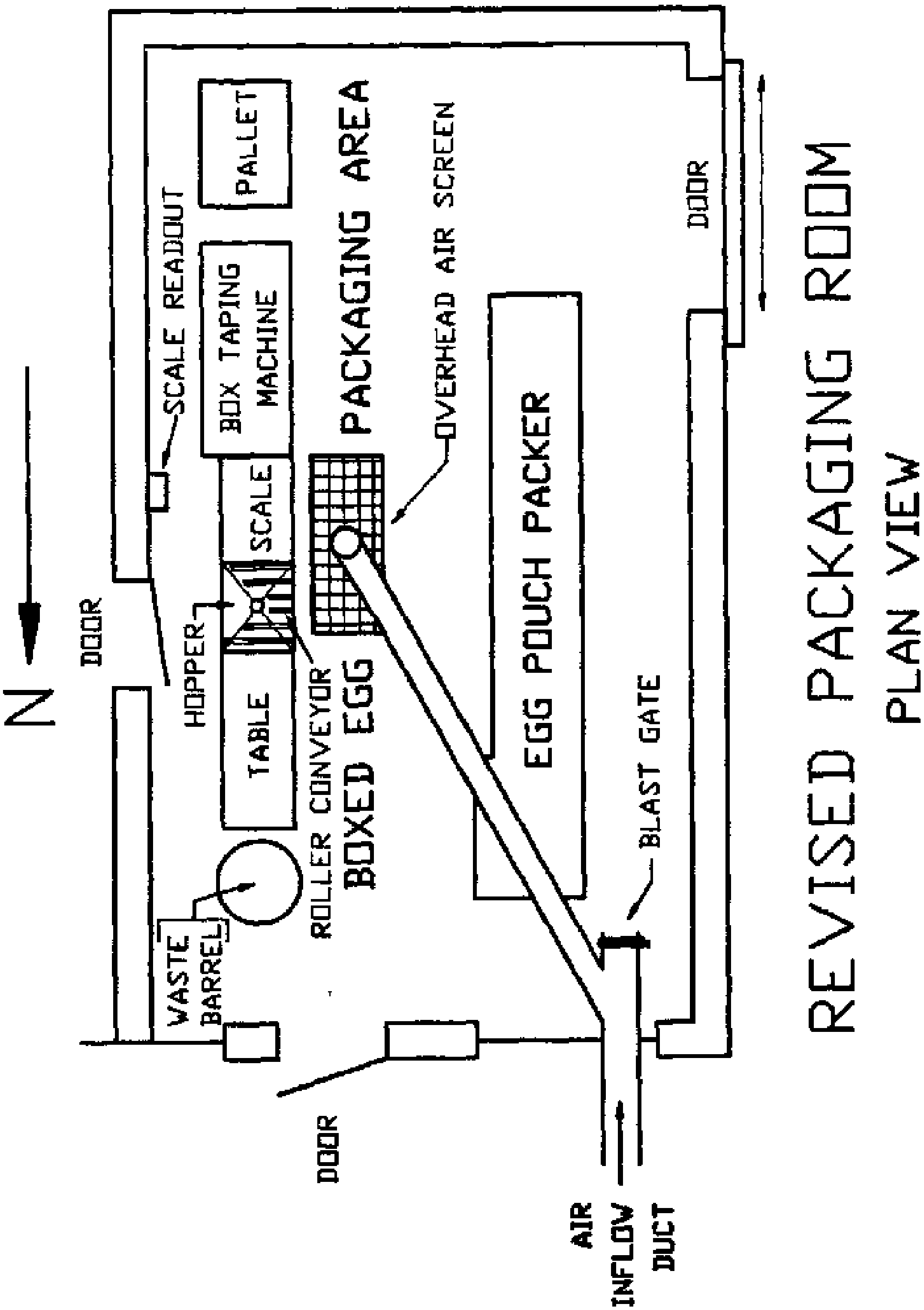


Figure 13 Suggested controls for the new packaging room.

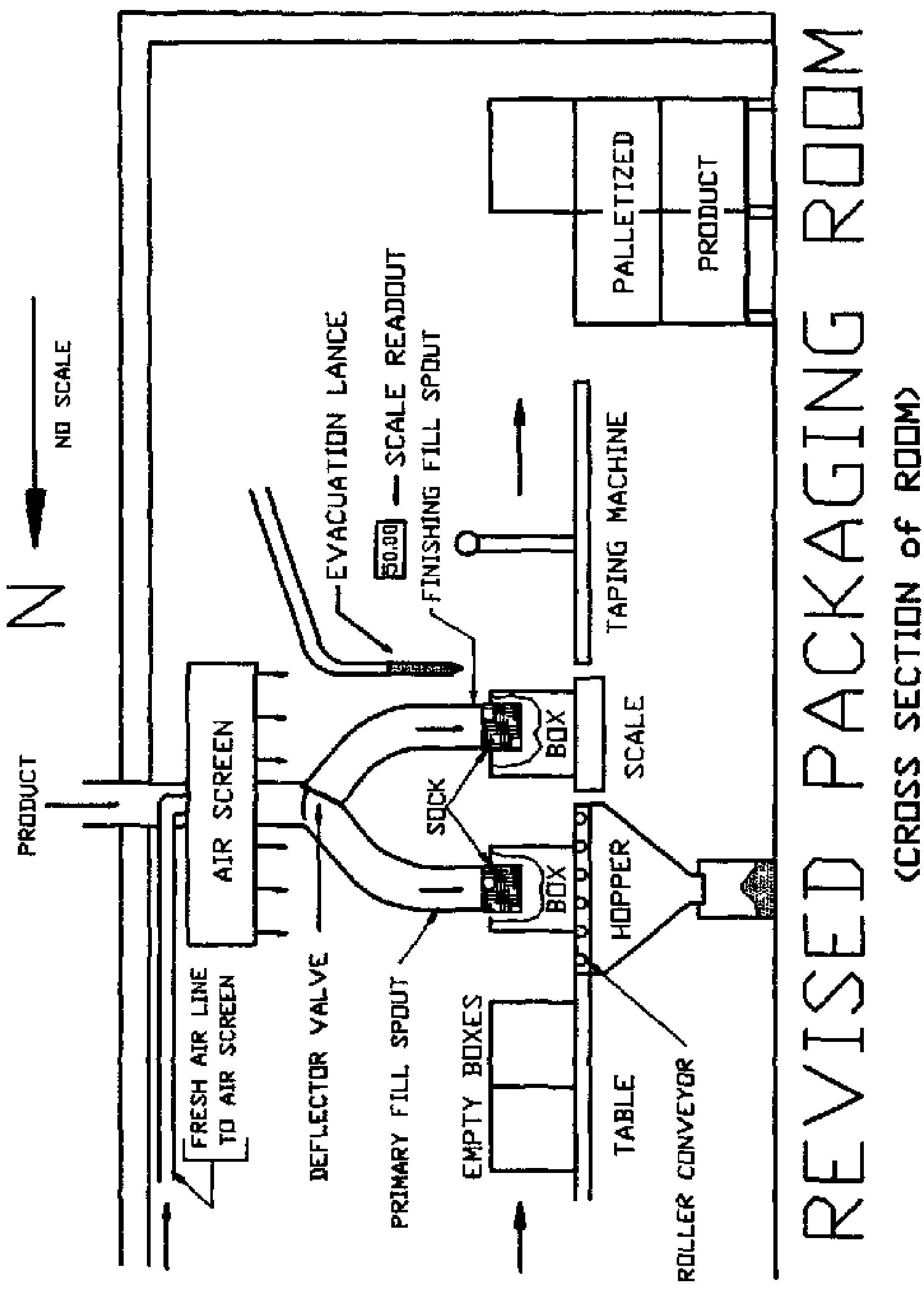


Figure 14 Suggested controls for the new packaging room.