A12 32 + 6 Drawings

E. R. Squibb & Sons, Inc.

Georges Road
New Brunswick, N.J. 08903
201-545-1300

SQUIBB
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U.S. NUCLEAR REG
COMMISSION
NMSS MAIL SECTION

March 17, 1982

Vandy L. Miller, Chief
Material Licensing Branch
Division of Fuel Cycle and
Material Safety, NMSS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Miller:

This is in response to your letter of February 18, 1982 in which you requested additional information with respect to Squibb's Radiological Contingency Plan. Each of your comments have been addressed in the enclosure. Also included are additional or replacement pages for the required information.

Should you require any additional information, please contact me.

Sincerely,

Patrick A. Rava

Patrick A. Rava, Director
Environmental Services

/rk
Enclosure

A/12

ENCLOSURE

Response to Comments on Squibb's Radiological Contingency Plan

Section 1.2 General Description of Plant/Licensed Activity

Figure 1., the topographical map which is considered of poor quality has been replaced with one more readable. Also included as part of the site plan is an additional map (Fig. 3a) which depicts the locations of population centers near the site, such as university dormatories or classrooms on the agriculture college.

The Figure 1 replacement and the Figure 3A addition are enclosed.

Section 2.1.2 Alarm Systems and Release Prevention

An Engineering Project Request (EPR) has been submitted to Squibb's Engineering Department to provide a local alarm/trip function to local area monitors in the manufacturing areas and radioactive waste storage building.

This additional equipment will provide a safe margin of assurance that the imparts of the release are migated, e.g., by causing prompt evacuation of the area and/or plant. Plans for scheduling the installation of this equipment will be discussed in a separate letter. "On scale" readings are readily available on the panel located in the health physics office. The instrument ranges are 0.1 mr/hr to 100 mr/hr.

In addition, Squibb Engineering is investigating the feasibility of providing a gaseous effluent monitoring system for the Medotope's stack.

The chart D-13421 referenced in your letter should be replaced with drawing D-15981. The Victoreen Monitor L-C-1 shown on chart D-13421 was purchased, but found to be inadequate for measuring I-131 gaseous effluent concentrations. It was therefore taken out of service and discarded.

Section 2.1.3.1.2 Accidents at Neighboring Facilities

The activities occurring at neighboring facilities have been identified in this section.

A replacement page has been provided.

Section 2.1.3.2 Criteria for Accommodation of Abnormal Conditions by Confinement Barriers and Systems

The amounts of radioactive material that could be released (e.g., escape past closing dampers or be released from a loaded filter that catches fire) have been identified in this section.

An additional page has been provided.

Section 2.1.3.4 Fire and Explosion Resistance and Suppression

A description of process locations supplied with sprinklers have been included in this section.

A replacement and additional page have been provided.

Section 2.1.3.5 Shielding

A description of the expected effectiveness of shielding under the most severe postulated accident conditions have been included in this section.

A replacement page has been provided.

Section 2.2.1 Demonstration of Accommodation of Abnormal Conditions by Process Systems

Schematic drawings showing the relationships among the glove boxes, fume hoods, hot cells and filter banks with associated ducting have been referenced in this section.

These drawings have been added as an addendum to the plan.

Section 2.2.4 Control Operations

The "Routine" monitoring of the plant's control systems have been defined in this section.

A replacement page has been provided.

Section 3.1 Classification System

The procedures for notification of offsite agencies have been included in this section.

An additional and replacement pages have been provided.

Section 3.2 Classification Scheme

Implementing procedures for each emergency class for determining airborne concentrations of radioactive materials have been described or referenced in this section.

A replacement page(s) is enclosed.

Section 3.3 Range of Postulated Accidents

For the Class III "Site Emergency" evaluation, the hypothesized senario was submitted incorrectly. As given, such an accident could not constitute a site emergency, since little airborne radioactivity would be released if the plant's ventilation systems failed completely. It would seem more likely that a major portion of it would be contained in the hot cell, the exhaust ducts and in the charcoal filters.

Therefore, a more suitable set of hypothesized events have been submitted to depict a "Site Emergency" condition.

Section 5.2 Assessment Actions

The methods and parameters for translating concentration information (from Addendum V, Use of Transparent Overlays for Determination of Ground Level Concentration) into doses are referenced in this section and included in Addendum V.

Replacement pages for this change are enclosed.

Section 5.5.1.1 Exposure Guidelines

Exposure guidelines for the thyroid have been included in this section.

A replacement page has been provided.

Date Issued: 3/15/82

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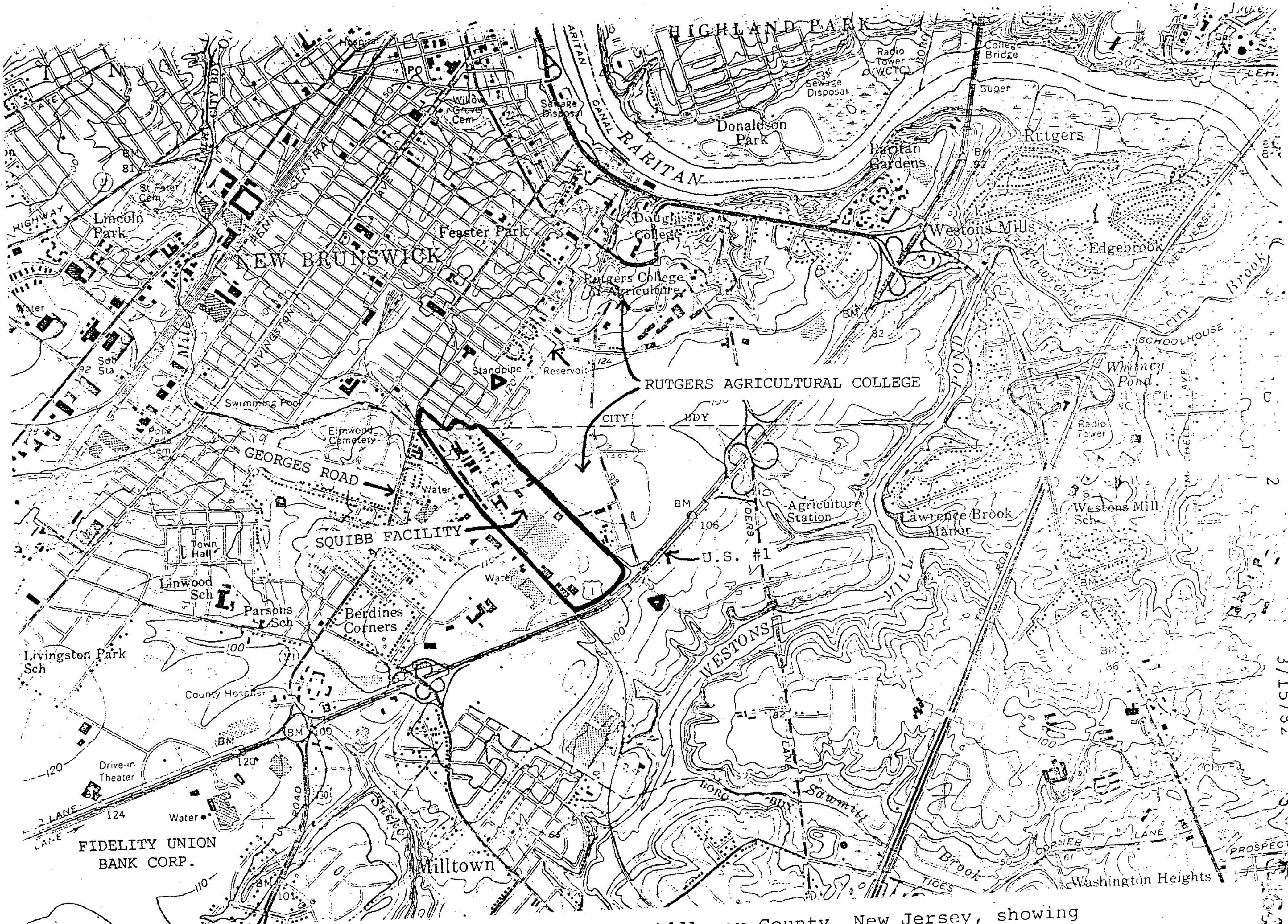

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FIGURE 1. Portion of Middlesex County, New Jersey, showing location of the E. R. Squibb and Sons facility.

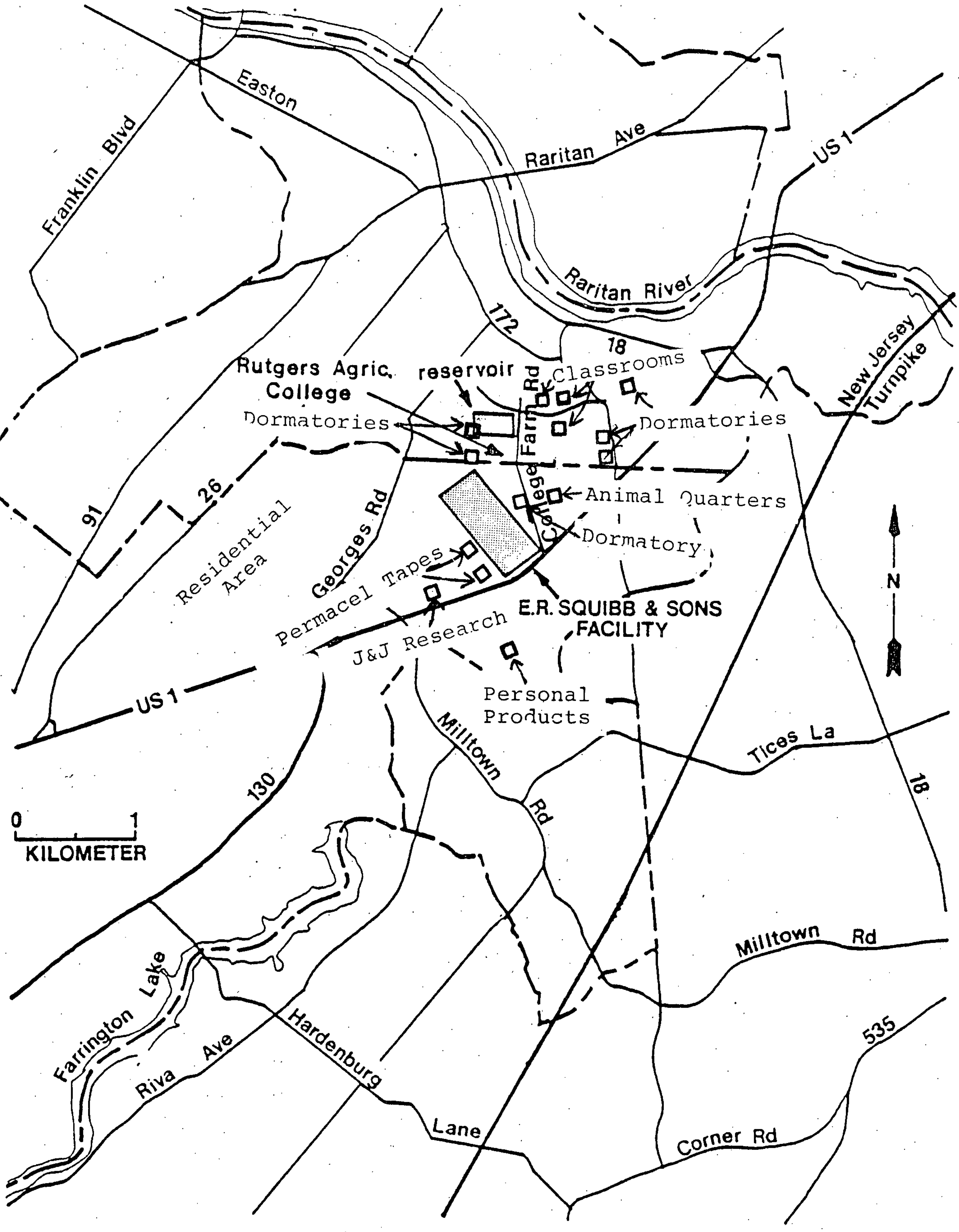

FIGURE 3a. Map of New Brunswick, New Jersey Area Indicating the Location of the Squibb Facility and Nearby Structures.

Holding tanks and storage facilities for the radioactive materials to decay are remotely located, and are not in the normal path of travel of personnel or equipment.

Clean areas, radiation areas and high radiation areas are situated and segregated so that no unnecessary exposure is received by personnel. This layout also provides for contamination control. A personnel monitoring area and a protective clothing change room is located adjacent to the radioactive materials area. Shower and locker room facilities are also provided. The layout of the facility is such that the products progress in sequence of operation from the manufacturing, filling and packaging areas to the final holding area for shipment. The loading dock is adjacent to the holding area. By use of conveyor belts and by judiciously locating the various stations in the complete manufacturing process, contact with and handling of any radioactive material is minimal.

2.1.2 Alarm Systems and Release Prevention

Selected portions of the production and storage areas are monitored by use of a "built in" area monitoring system. An indicating and alarm panel is located in the Health Physics Office, thus assuring access to information regarding any unusual dose rates in the monitored areas and rapid response with corrective actions. The instrument ranges from 0.1 mr/hr to 100 mr/hr. Local alarms provide information to persons entering these areas of any unusual conditions, thereby allowing them to minimize their own exposure. The instrumentation provided has the capability of detecting the hightest anticipated radiation levels with positive readout at the lowest possible levels. To assure optimum coverage of all areas, the detector locations have been chosen with great care.

Each glove box is equipped with a damper which will prevent the spread of a fire through the ventilation system. Any smoke or water vapor released by the fire and not stopped by the local fire damper will be contained in the glove box. In addition, smoke detectors have been encased in the ducts of each filter bank system. When activated, valves located on each side of the filter bank will close automatically, and releases of airborne activity would be contained within the ducts of the ventilation system.

Any smoke released into the rooms will pass through the room filtering system and also be detected by the filter bank fire detectors.

The plant is also equipped with an auxiliary generator which will automatically engage in the event of an electrical failure. The generator is capable of maintaining the air systems and emergency lighting for the plant.

The ventilation equipment not only provides separate filtering capabilities for various processes, but is also equipped with dampers and valves to preclude the spread of fire and automatically engage backup systems in the event of air failures.

In addition there are six auxiliary systems available to service the twelve glove box systems to accommodate filter changes, maintenance or emergency situations. These are activated manually by maintenance personnel under the direction of Health Physics.

Should a fire occur, pyrotronic fire detectors located in each charcoal filter bank system will activate a valve to seal off the ventilation system in a glovebox and thereby contain the fire to the glovebox.

2.1.3 Support Systems

2.1.3.1 Structural Performance vs. Site Environmental Factors

2.1.3.1.1 Severe Natural Phenomena

The plant is a steel structure consisting of cinder block and brick constructed walls and a reinforced concrete floor. The geographical location of the plant is such that it is very unlikely to be subjected to a tornado; nor would it be likely that its structure be seriously degraded by hurricane, flood, heavy snow loading, high winds or lightning.

2.1.3.1.2 Accidents at Neighboring Activities

Because of the types of activities conducted at neighboring facilities, it is highly improbable that our facility structure could be degraded as a result of fire or explosion at neighboring facilities. The facility nearest the Medotopes building is the parenteral filling and packaging facility. This structure, which is directly north of our facility does not use any highly explosive or combustible materials in its operation. Southwest of the Medotopes building is Permacel, a tape manufacturer. Any fire or explosion at this site is not likely to affect our facility.

2.1.3.2 Confinement Barriers and Systems

The extensive use of glove boxes, hot cells and other well ventilated systems in conjunction with the design of the ventilation system itself serve as the prime defense against the intrusion into the air in the work areas of airborne radioactive materials. Alarms which indicate failure of some of these systems serve as a second line of defense in that they warn personnel in a sufficient time that emergency procedures can be put into effect. Special shielding is incorporated where required. Access and viewing ports in ventilated enclosures do not permit escape of radioactive materials.

The amounts of radioactive material that could be released (e.g. escape past closing dampers or be released from a loaded filter that catches fire would depend on the type of containment enclosure that the materials are stored.) For example, the maximum amount of I-131 Iodine processed in a glove box is approximately 2.5 Curies. Assuming that the entire amount has vaporized and 50% plates out before it reaches the charcoal filters, it is possible for the charcoal to contain most of the remaining 1.25 Curies. If the filters caught fire, this amount would most likely be released. Twenty times this amount of activity could be stored in the I-131 Iodine hot cell.

However, in order for these two most severe postulated accidents to occur, a complete failure of the fire damper controls is necessary. And even if this were the case, it is highly improbable that a fire could ignite the charcoal filters since our operations do not utilize signficant amounts of combustible compounds, if any. If this would occur, it would probably be considered a general emergency.

2.1.3.3 Access and Egress of Operating Personnel and Emergency Response Teams

2.1.3.3.1 Onsite

The radiopharmaceutical operations are conducted on the ground floor of the plant making access and egress for the evacuation of personnel an easy task. There are no elevators and the only stairways are those located in the unrestricted office areas and those leading to the second floor machine room.

In addition to the exits used routinely, the plant is also equipped with alarmed emergency exits.

The access control system has been designed to prohibit inadvertent or unauthorized access to high radiation areas and to provide personnel with the knowledge of the presence of radiation or radioactive materials. The access control system eliminates unnecessary exposure and assures exposures are maintained within regulatory limits.

One of the first indications to personnel of a potential hazard is the presence of caution signs at the entrance to radiation areas and labels on the containers of radioactive materials.

2.1.3.3.2 Near Site

Access and egress including the offsite evacuation of personnel as well as for onsite response by offsite based emergency response participants have been established at two site locations; 1) the Georges Road, and 2) the US#1 entrances.

2.1.3.4 Fire and Explosion Resistance and Suppression

All buildings within the site are provided with portable fire extinguishers distributed and maintained in accordance with NFPA 10, as required under the provisions of OSHA 1910 subpart L.

The plant is provided with Class II interior 1½" hose lines installed in accordance with NFPA 14 and maintained as specified under subpart L of OSHA 1910.

Every work area where radioactive materials are stored, processed or tested is equipped with automatic sprinklers. It is expected that the hot cells which are constructed of steel, concrete and lead, equivalent to 4 to 8 inches of lead will serve as primary containment following an exposion. The building and the building's charcoal filtration systems are considered secondary containments.

It should be noted, however, that it is highly improbable that an explosion of any magnitude could occur since no explosive or combustible compounds or reagents are used in the hot cells during the manufacture of I-131 Therapeutic Oral Solutions or ^{99}Mo-^{99m}Tc generators.

The building and processes within the site are protected by a looped and gridded fire protection water distributory system, fed by independent pumped water sources with make up from city supply. Two 1000 G.P.M. automatic fire pumps drawing suction from a 250,000 gal. pond located in the north section of the site (Bldg. 42) and two automatic 1500 gal. pumps supplied by a 300,000 gal. above ground tank located on the south section of the site

(Bldg. 123) provide water supply for building sprinkler systems and yard hydrants at a design pressure of 90 psi. All fire protection systems are maintained, tested and inspected in conformance with Factory Mutual Engineering requirements for secure properties, and the applicable provisions of subpart L of OSHA 1910.

Potable water is received on site through a 16" pipe from the New Brunswick water supply system and distributed via a looped and gridded system throughout the plant. The city water system in addition to domestic water supply, provides fire protection makeup water, and feeds a system of low pressure (60 psi) yard hydrants.

2.1.3.5 Shielding

The leaded glove boxes and hoods are used to manufacture and fill radiopharmaceuticals of different radioconcentrations. The shielding used varies from one to two inches of lead depending on the radionuclide and activity. The lead is encased in stainless steel which is expected to maintain its effectiveness under the most severe postulated accident conditions. In many cases, additional shielding is provided in the glove boxes and fume hoods to shield the bulk radioactive material as required to maintain radiation levels on the outside of the enclosure as low as practicable.

The hot cells are constructed of steel and concrete equivalent to four inches of lead for ^{131}I iodine and eight inches of lead for the ^{99}Mo Molybdenum operations.

The steel and concrete used in the walls, flooring and ceiling of the hot cell's range from 14 inches to more than three feet in thickness.

It is very unlikely that a fire or exposion would occur within these hot cells. Therefore, it is highly improbable that an accident would occur which would reduce the effectiveness of the shielding.

2.1.4 <u>Control Operations</u>

Plant engineered systems are monitored routinely by plant engineers and the Health Physics group to ensure proper performance.

2.2 <u>Demonstration of Engineered Provisions for Abnormal Operation</u>

2.2.1 <u>Process Systems</u>

The manufacturing areas are served by a nonrecirculating air conditioned supply system utilizing all outside air introduced through a prefilter and a high efficiency particulate filter. A general system exhausts the various spaces through filtration equal to that of the supply system. Fume hoods, wherein particulate matter is the expected contaminant, are exhausted through an F-85 and a HEPA filter followed by a 1" high efficiency carbon filter to arrest any possible gaseous contaminant. The ^{99}Mo-^{99m}TC cave is exhausted through an F-85 and a HEPA filter and three 1" charcoal filters. Certain manufacturing glove boxes are also exhausted through an F-85, a HEPA and 3 one inch high efficiency carbon filters. Other manufacturing glove boxes where less volatile radionuclides are processed are exhausted through an F-85 and a HEPA filter followed by 2 one inch high efficiency carbon filters.

Each of the twelve fume hood system filter banks service from one to five fume hoods or other ancillary equipment. Each fume hood system has a manual air bypass to be used during filter changes.

Each glove box filter bank services up to five glove box units or similar equipment. Each glove box system has access to an auxiliary system offering identical filtration. There are no bypasses to allow passage of unfiltered exit air. There are eleven glove box systems and six auxiliary systems available for use during filter changes or maintenance.

Filtration for three hot cells is accomplished by employing two identical exhaust systems. One is in continuous operation, while the other exhaust system serves as an auxiliary system when the primary is shut down for decay prior to filter changes or maintenance. Each system is filtered by three Flanders roughing, three Flanders HEPA and nine one-inch equivalent MSA activated charcoal filters. There are no bypasses to allow passage of unfiltered cave system air. (See Addendum VII for schematic drawing showing the relationships among the glove boxes, fume hoods, hot cells and filter banks.)

Each filter bank is equipped with before and after continuous sample tubes used to check charcoal filter efficiencies. They are changed on a weekly basis. The sample tubes are counted and an evaluation is made as to which bank should be changed, if applicable. There is no definite filter change criterion. Each system is examined individually to provide the most effective reduction in effluent.

The combination of particulate and gaseous filters described serves to reduce the effluent of other radionuclides such as ^{75}Se, ^{99}Mo, etc. to the lowest practicable level.

All exhaust systems are discharged to the effluent exhaust stack. The system used for sampling exit air from the stack is comprised of six one-inch lines within the exit duct. Each of these hold six pitot tubes facing upstream. The one-inch lines connect to two two-inch lines that pass through the main exhaust duct, then combine into a six-inch line. The system is drawn by a fan that exhausts to another exit duct prior to entry back to the main duct exhaust. The effluent air sample drawn from the six-inch line post fan, runs continuously at 10 liters per minute and is changed daily.

The sample cartridge is a 1/2" I.D. tube packed with a glass fiber filter, followed by 1" of activated charcoal and a sponge holder. The sampling system has been designed to assure isokinetic sampling in the main duct.

2.2.2 Alarm Systems and Release Prevention Capability

An "Indicating and Alarm" panel in the health physics office provides the following:

Alarm and indicating lights for supply systems,

Running indication for all systems,

"Air failure" alarm and indication for all critical systems, and

Indicating lights showing status of critical filtration systems (i.e., lights will indicate which filter banks are in use and those that are on "standby.")

Air balance is maintained by means of constant volume regulators in each branch duct connection to glove boxes, fume hoods, etc.

2.2.3 Support Systems

Fire protection is provided at each branch connection to glove boxes and fume hoods, etc. by means of a spring-loaded fusible link fire damper. Carbon filters are protected by means of ionization-type detectors in the duct work. Generally, detectors will isolate a filter fire from the air stream by closing metal-seated shutoff valves and transfer the effluent to the standby filters, or stop the fan, depending on the type system involved.

The plant is also equipped with an auxiliary generator which will automatically engage in the event of an electrical power failure. The generator is capable of maintaining the air systems and emergency lighting for the plant.

Should the air system which supplies automatic controls fail, all filter intake and exhaust valves are designed to fail safe.

2.2.4 Control Operations

Verification that the filter bank systems are performing their intended functions at their maximum efficiencies is accomplished by continuously sampling air flow and collecting radioactivity. Each filter bank is equipped with samplers to analyze filter efficiencies. The samplers are checked on a weekly basis and assayed. Each of these filter banks are exhausted into a main duct which lends to the breach of the Medotopes stack. The combined effluents are sampled in the breach before being discharged to the stack. The releases from the facility are sampled continuously and analyzed at least once a day, except over the weekend. The weekend sampler is run from Friday to Monday. The measured radioactivity is averaged over this period of time.

Air velocity measurements in ventilated enclosures are conducted at least quarterly to ensure regulatory requirements are satisfied.

In addition, plant engineers routinely monitor the plant's control systems located in the machine room area to ensure they are functioning properly.

3.0 CLASSES OF RADIOLOGICAL CONTINGENCIES

3.1 Classification System

The Squibb Radiological Contingency Plan is designed to handle emergency situations ranging from unusual events to general emergencies. These conditions have been categorized into four classes.

Class I

Unusual Event

Class I includes only those unusual events which indicate a potential degradation of the level of safety of the plant. The unusual event is confined to a specific area within the plant and would not require the evacuation of personnel from other areas of the plant unless further degradation of safety systems occur.

However, should an unusual event occur the Health Physics Department Head or his designee shall promptly inform State, Federal and/or local offsite authorities of the nature of the unusual event.

The appropriate offices to be contacted are:

U.S. Nuclear Regulatory Commission	215-337-5000
N.J. State Department of Environmental Protection	609-882-4200 609-882-2000 609-292-5586,7,8 609-292-7372

Class II

Alert

Radioactive releases that are contained within the plant, but require evacuation of the plant because of the possibility of widespread contamination. This alert condition involves an actual or potential substantial degradation of the level of safety of the plant.

The State, Federal and/or local authorities must be informed of an alert condition and the reason for the alert as soon as it is discovered.

The following authorities must be notified immediately by the Health Physics Department Head or his designee:

U.S. Nuclear Regulatory Commission	215-337-5000
N.J. State Department of Environmental Protection	609-882-4200 609-882-2000 609-292-5586,7,8 609-292-7372

Class III

Site Emergency

Radioactive releases that are not contained within the plant and require evacuation of areas within the site. This site emergency involves actual or likely major failures of plant functions needed for portection of the public. Offsite releases are not expected to exceed EPA Protective Action Guidelines.

The State, Federal and/or local authorities must be informed of a site emergency condition and the reason for the site emergency as soon as it is discovered.

The following authorities must be notified immediately by the Health Physics Department Head or his designee:

U.S. Nuclear Regulatory Commission	215-337-5000
N.J. State Department of Environmental Protection	609-882-4200 609-882-2000 609-292-5586,7,8 609-292-7372

Class IV

General

Radioactive releases beyond the site boundary. This condition will be considered a General Emergency which involves actual or imminent loss of confinement integrity. Releases can be expected to exceed EPA Protective Action Guidelines.

The State, Federal and/or local authorities must be informed of a general emergency condition and the reason for the general emergency as soon as it is discovered.

The following authorities must be notified immediately by the Health Physics Department Head or his designee:

U.S. Nuclear Regulatory Commission	215-337-5000
N.J. State Department of Environmental Protection	609-882-4200 609-882-2000 609-292-5586,7,8 609-292-7372

3.2 Classification Scheme

Class I

NOTIFICATION OF UNUSUAL EVENT

Class Description

Unusual events are in process or have occurred which indicate a potential degradation of the level of safety of the plant. No releases of radioactive material requiring offsite response or monitoring are expected unless further degradation of safety systems occurs.

Purpose

Purpose of offsite notification is to (1) assure that the first step in any response later found to be necessary has been carried out, (2) bring the operating staff to a state of readiness, and (3) provide systematic handling of unusual events, information and decision making.

Actions

Promptly inform State and/or local offsite authorities of nature of unusual condition as soon as discovered.

Augment on shift resources as needed.

Assess and respond. (See Addendum V, Use of Transparent Overlays for Determination of Ground Level Concentrations and Radiation Doses.)

Escalate to a more severe class, if appropriate.

or

Close out with verbal summary to offsite authorities, followed by written summary within 24 hours.

Class II

ALERT

Class Description

Events are in process or have occurred which involve an actual or potential substantial degradation of the level of safety of the plant. Any releases are expected to be limited to small fractions of the EPA Protective Action Guideline exposure levels.

Purpose

Purpose of offsite alert is to (1) assure that emergency personnel are readily available to respond if situation becomes more serious or to perform confimatory radiation monitoring if required and (2) provide offsite authorities current status information.

Actions

Promptly inform State and/or local authorities of alert status and reason for alert as soon as discovered.

Augment resources and activate onsite operational support emergency facilities and equipment. Bring key emergency personnel to standby status.

Assess and respond. (See Addendum V., Use of Transparent Overlays for Determination of Ground Level Concentrations and Radiation Doses.)

Dispatch onsite monitoring teams and associated communications.

Provide periodic plant status updates to offsite authorities.

Provide periodic meteorological assessments to offsite authorities and, if any releases are occurring, dose estimates for actual releases.

Escalate to a more severe class, if appropriate.

or

Close out or recommend reduction in emergency class by verbal summary to offsite authorities followed by written summary within 8 hours.

Class III

SITE AREA EMERGENCY

Class Desription

Events are in process or have occurred which involve actual or likely major failures of plant functions needed for protection of the public. Offsite releases are not expected to exceed EPA Protective Action Guideline exposure levels except near site boundary.

Purpose

Purpose of the site area emergency declaration is to (1) assure that response centers are manned, (2) assure that monitoring teams are dispatched, (3) assure that personnel required for evacuation of site areas are at duty stations if situation becomes more serious. (4) provide consultation with offsite authorities, and (5) provide updates for the public through offsite authorities.

Actions

Promptly inform State and/or local offsite authorities of site area emergency status and reason for emergency as soon as discovered.

Augment resources by activating onsite emergency response organization.

Assess and respond. (See Addendum V, Use of Transparent Overlays for Determination of Ground Level Concentrations and Radiation Doses.)

Dispatch onsite and offsite monitoring teams and associated communications.

Dedicate an individual for plant status updates to offsite authorities.

Make senior technical and management staff available onsite for consultation with NRC and State on a periodic basis.

Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission.

Provide release and dose projections based on available plant condition information and foreseeable contingencies.

Class IV

GENERAL EMERGENCY

Class Description

Events are in process or have occurred which involve actual or imminent loss of confinement integrity. Releases can be reasonably expected to exceed EPA Protective Action Guideline exposure levels offsite for more than the immediate site area.

Purpose

Purpose of the general emergency declaration is to (1) initiate predetermined protective actions for the public, (2) provide continuous assessment of information from licensee and offsite organization measurements, (3) initiate additional measures as indicated by actual or potential releases, (4) provide consultation with offsite authorities, and (5) provide updates for the public through offsite authorities.

Actions

Promptly inform State and local offsite authorities of general emergency status and reason for emergency as soon as discovered (Parallel notification of State/local).

Augment resources by activating onsite emergency response organization.

Assess and respond. (See Addendum V , Use of Transparent Overlays for Determination of Ground Level Concentrations and Radiation Doses.)

Dispatch onsite and offsite monitoring teams and associated communications.

Dedicate an individual for plant status updates to offsite authorities.

Make senior technical and management staff available onsite for consultation with NRC and State personnel on a periodic basis.

Provide meteorological and dose estimates to offsite authorities for actual releases via a dedicated individual or automated data transmission.

Class III

SITE EMERGENCY

In this accident, it is postulated that an unlikely series of disasters has occurred which could result in the release of radioactive material beyond the plant.

In order to consider this type of accident, we must assume that the disaster involves the largest single shipment of radio-iodine ^{131}I that exists in the radiopharmaceutical production facility at any one point in time. Therefore, it is presumed that the high level hot cell contains 45 curies of iodine ^{131}I.

If we assume that the 45 curies of iodine ^{131}I is somehow ignited, the aqueous solution of sodium iodide ^{131}I would have to be evaporated to become airborne. It is also assumed, that the automatic dampers which close off the ventilation system for the hot cell fail and the fire is confined to the hot cell alone. The vaporized iodine I-131 would then seep along with the smoke from the fire, up into the ducts of the ventilation system. Fifty (50) percent of the 45 Curies is assumed to plate out before reaching the charcoal filters.

Since the smoke from the fire will not activate the pyrotronic smoke detectors and shut off the valves around the filters, the gas would therefore pass through the charcoal filters.

Of the 22.5 curies that remain, 0.1% of this amount, 22.5 millicuries will leave the plant through the radiopharmaceutical building stack (exhaust filter efficiency 99.9%.)

Probability Considerations

The radioactive material ^{131}I is an aqueous solution of sodium iodide. This batch is housed within a glass flask and is contained in a "hot" cell made of concrete and steel. This hot cell does not contain any volatile solvents that are used in the processing of the materials.

The only possible source of combustion is a failure in the flourescent lights that are housed in glass shields approximately 8 feet above the iodine ^{131}I in the ceiling of the cell.

In order to create the circumstances postulated in the accident described above, we would require a fire in an area that contains no combustibles, a failure in the site electrical power supply and a failure in the radiopharmaceutical auxiliary electrical power supply.

The probability of each event occurring simultaneously is highly unlikely.

- Plant Medical Department Head
- Other personnel as required

g. Set up necessary auxiliary communications (walkie-talkie), if necessary.

h. Establish barricades with Plant Security force at the site boundary gate houses to restrict access to the site.

i. Evaluate the emergency and, as quickly as possible, and determine the release of radioactivity. Refer to Addendum V for methodology and parameters used in calculating atmospheric dispersion and dose rates to individuals.

j. If there are injured personnel, notify the senior Medical representative.

k. Provide a health physics representative to accompany the patient to the hospital with the ambulance emergency kit, to maintain radiological controls in the hospital.

l. Supervise collection of emergency data in the Contingency Monitoring Log.

m. Notify Plant Security to institute site industrial emergency and disaster control plan, if necessary.

5.3.4 General Emergency

Plant Emergency Director

a. Note the wind direction, instruct security to evacuate onsite personnel, if necessary, through the upwind exits of the site and sound the evacuation alarms.

b. Notify the following members of Squibb Management:

- Radiopharmaceutical Department Head
- Squibb Plant Manager
- Radiopharmaceutical Quality Control Department Head
- Plant Security Head
- Plant Medical Department Head
- Vice President, Operation
- Quality Control Director
- Other personnel as required

c. Determine if the Emergency Coordination Center is in a safe condition through the use of protable survey instruments.

d. Proceed to take charge of the Emergency Coordination Center.

e. Dispatch a monitoring team to scene of the emergency to evaluate the extent and magnitude of the emergency.

f. Evaluate the emergency and, as quickly as possible, using meteorological data, overlay and area maps, determine the extent of the offsite release of radioactivity. See Addendum V for methodology and parameters used in calculating atmospheric dispersion and dose rates to individuals.

g. If there are any injured personnel, assign the Senior Medical Representative to administer first aid and prepare the patient(s) for transfer to the hospital.

h. Provide a health physics representative to accompany the patient(s) to the hospital with the ambulance emergency kit, to maintain radiological control in the hospital.

i. Evaluate monitoring data from survey teams as it becomes available.

j. Provide monitoring team for State Department of Environmental Protection.

k. Inform company management, State Department of Environmental Protection and Nuclear Regulatory Commission of offsite radiological conditions.

5.4 Protective Actions

Unusual Event

a. If an unusual event should occur, an individual's first responsibility is his own safety. All persons shall evacuate the emergency area immediately, holding their breath, if possible.

The Plant Emergency Director must review all available radiation surveillance data for a view of emergency actions required to bring the emergency under control and to determine any items requiring followup.

The Plant Emergency Director must insure that:

- All re-entry and recovery teams have dosimeter and dose measuring instruments.
- Respiratory protection devices are worn by all personnel within areas where air concentrations exceed MPC.
- In the recovery phase, all actions are carefully planned and reviewed.
- Comprehensive radiation surveys of site facilities have been conducted. All radiological problem areas defined.
- Radiation exposures of personnel who participate in recovery operations have been reviewed and additional personnel are used, if necessary.

5.5 Exposure Control in Radiological Contingencies

The radiation exposures to individuals during a radiological emergency shall be less than EPA Emergency Worker and Lifesaving Activity Protective Action Guides, EPA 520/1-75/001, viz. less than 75 rems planned whole body exposures for lifesaving actions and less than 25 rems where it is desirable to enter a hazardous area in order to protect facilities, eliminate further escape of effluents, or to control fires.

5.5.1 Emergency Exposure Control Program

5.5.1.1 Exposure Guidelines

The exposure guidelines for onsite emergency teams, fire fighters, first aiders, medical doctors, nurses and rescue squad teams shall be limited to 5.0 rem whole body exposure for each emergency. The exposure guidelines for thyroid dose due to inhalation from a passing plume is as follows:

General population - 5 rem

Emergency workers - 100 rem

Life saving activities - No specific upper limit is given for thyroid exposure since in the extreme case complete thyroid loss might be an acceptable penalty for a life saved. However, every effort will be made to use respiratory equipment to maintain the dose to the thyroid as low as reasonable achievable.

5.5.1.2 Radiation Protection Program

The onsite radiation protection program outlines the procedures and equipment to be employed to maintain radiation exposures received by emergency personnel within the exposure guidelines. It provides for personnel monitoring equipment, full face respirators and protective apparel to be used exclusively during radiation emergency conditions. The Plant Emergency Director and/or alternate will ensure that all emergency personnel stay below the exposure guidelines by continuously monitoring pocket dosimeters. In addition, all emergency personnel will be surveyed for external and internal contamination upon leaving the restricted areas or as instructed by the Plant Emergency Director or his alternate.

The Plant Emergency Director or alternate shall have the authority to allow greater doses to volunteers carrying out lifesaving and other emergency activities. These exposures, however, shall not exceed the guidelines recommended in EPA 520/1-75/001.

5.5.1.3 Monitoring

All emergency personnel and volunteers involved in any nuclear accident shall be required to submit to urinalysis testing and thyroid uptake measurements as directed by the Plant Emergency Director or his alternate. These tests will be performed as specified by the Plant Emergency Director or his alternate to determine if individuals have internally ingested radionuclides as a result of the incident.

If internally deposited radioisotopes are detected, the total activity to the organ and whole body shall be determined.

The individual will be removed from the restricted areas if it is determined that he might receive additional exposure which could cause him to exceed the limits as specified in 10CFR Part 20.

Permanent records will be kept on all individuals involved in a radiological emergency.

5.5.2 <u>Decontamination of Personnel</u>

Every effort will be made to ensure that all personnel are free of external contamination before being released into an unrestricted area. Decontamination of injured personnel will be performed in a nuclear accident carrier, which is equipped with a bottle to collect radioactive waste liquids.

Sinks and showers are provided in the plant for decontaminating emergency personnel and volunteers.

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ADDENDUM II

Supplement #I

Diagrams and Blueprints of control systems and process equipment in building 124:

D-15992 Mechanical Equipment Room

D-18909 HVAC System - As Built

D-15986 HV, AC Units

D-13400 HVAC - Exhaust Fans and Service Equipment

D-12464 Exhaust Duct Tie-ins

D-11377 Laboratory Air - Piping

D-11094 AC Schematic

D-18908 Glovebox Exhaust Revisions

D-11099 Compress & Instrument Air Systems

D-19655 Steam Generators & Autoclaves

D-12873 Air Balance Points

D-11330 Laboratory Area - Duct Layout

D-11331 Laboratory Area - Duct Layout

D-11332 Laboratory Area - Duct Layout

D-11333 Laboratory Area - Duct Layout

D-15994 Control System

D-15984 1st Floor Duct Work

D-15983 1st Floor North End Duct Work

D-15989 Filter Room

D-15988 Filter Room & Fan Room

D-15987 Filter Room

ADDENDUM V

Isopleths of External Dose Rate and Dose (R)

Since for Iodine (^{131}I) the dose rate (rads/sec) is equal to:

$$_{\beta}D_{\infty} = .042X$$

$$_{\gamma}D_{\infty} = 0.1X$$

where: X = concentrations (Ci/M^3)

Then the ground-level concentration isopleths (Ci/M^3) can be converted to ground-level dose rate isopleths (Rads/sec) using the same relationship (i.e., $1x10^{-6}$ Ci/M^3 line X .042 = $4.2x10^{-4}$ Rads/sec beta dose rate isopleth, $1x10^{-6}$ Ci/M^3 line x 0.1 = $1x10^{-7}$ Rads/sec gamma dose rate isopleth)

Then dose rate beta and gamma equals .042X + .1X = .142X

Therefore, in order to calculate the total external dose received along the ground-level concentration isopleths, each dose rate (Rads/sec) must be multiplied by the length of time (sec) spent by the receptor in the area.

Isopleths of Man Thyroid Dose Rate

Since total man thyroid dose for Iodine (^{131}I) equals:

$$D = (B)(t)(X)(R)$$

where:

D = Thyroid Dose (Rads)

B = Breathing rate = 3.47×10^{-4} M^3/sec

t = Time in cloud (sec)

X = Air Concentration (Ci/M^3)

R = Thyroid conversion factor ($1.48x10^6$ Rads/Ci)

ADDENDUM V

Then:

$$D = (3.47\text{x}10^{-4}\ M^3/\text{sec})(1.48\text{x}10^6\ \text{Rads/Ci})(t)(X)$$

$$D = (5.13 \text{ x } 10^2\ \text{Rads/Ci}/M^3/\text{sec})(t)(X)$$

Therefore, ground-level man thyroid dose rates (D^1) equal:

$$D^1 = (513\ \text{Rads/Ci}/M^3/\text{sec})(X\text{Ci}/M^3)$$

Calculation of $\frac{UX}{Q}$, M^{-2} values

$$X = \frac{Q}{\pi\sigma y\sigma zu}$$

$$\therefore\quad (X)(\pi\sigma y\sigma z)u = Q$$

$$ux/Q = \frac{1}{\pi\sigma y\sigma z}$$

The distance of the isopleths from the X-axis at downwind distances is calculated using the same manner as described previously:

$$(e^{-\frac{1}{2}\left(\frac{y}{\sigma y}\right)^2}\ \text{solve for } y)$$

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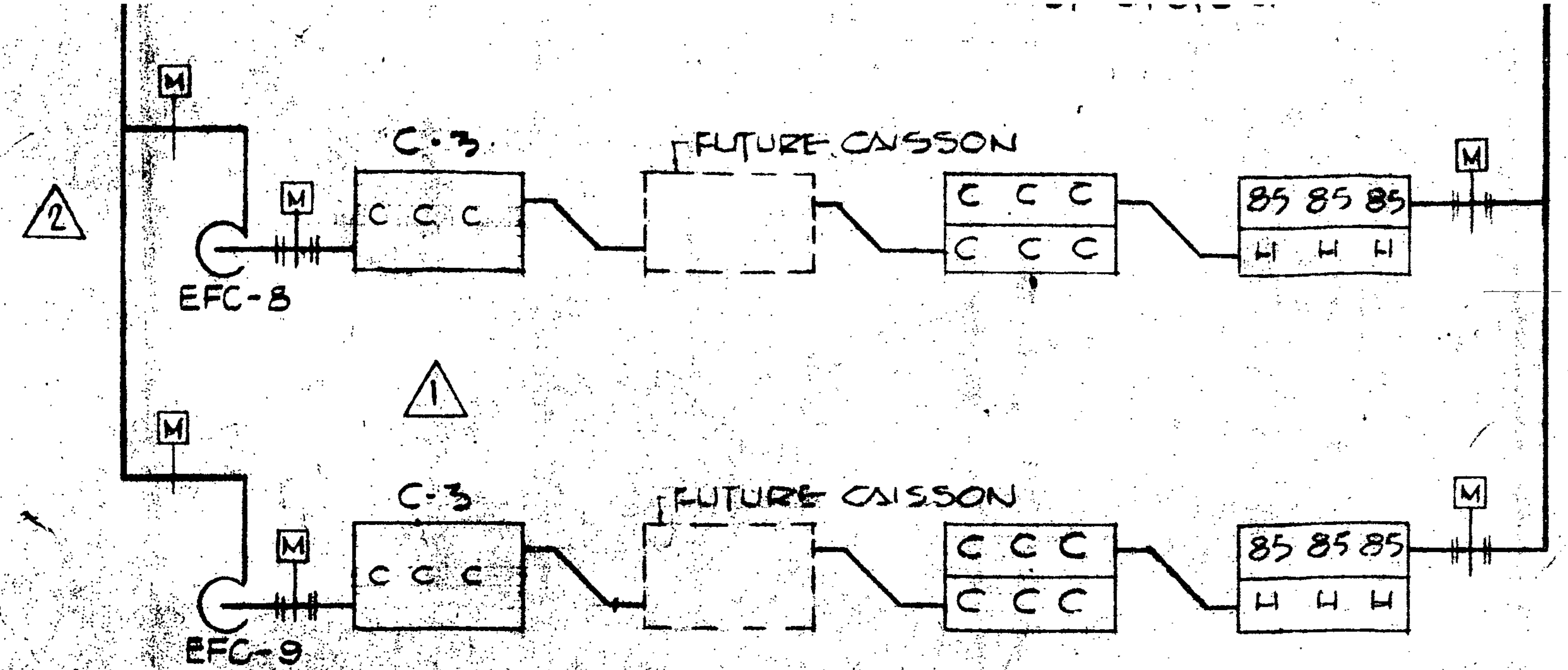
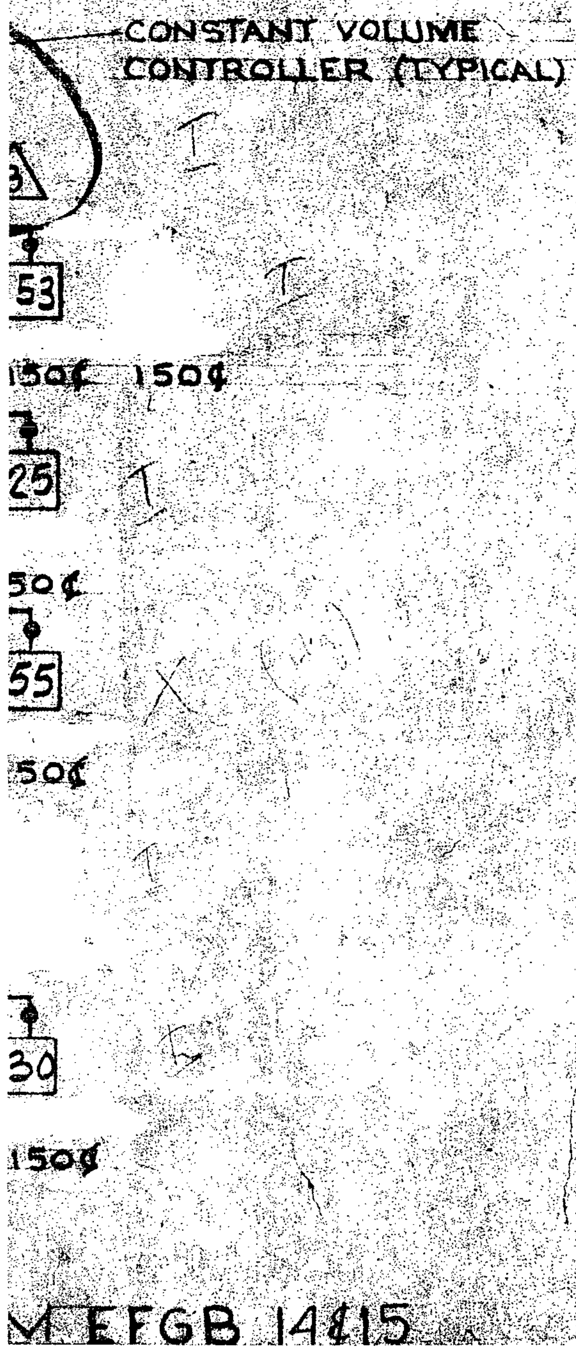
ADDENDUM VII





EXISTING CAVES VENTILATION SYSTEM

* = INFILTRATION

NO.	REVISION DESCRIPTION	BULL.	DATE
5	CHANGED: GB9; Nº 69 WAS 62 ADDED: TO GB-8; Nº 62		JB 3/11/82
4	CHANGED; NUMBER'G SYSTEM FOR GLOVE BOX SYSTEMS - 12, 13, 14 AND 15		3/16/82 JB
3	REVISED GB 5B3 CFM & CORRECTED DAMPER ARRANGEMENT IN EXIST. CAVE AREA		6-25-71
2	ADDED EQUIPMENT TO SYSTEMS GB1 & 2 & CORRECTED VALVE & DAMPER ARRANGEMENT		5-5-71
1	REVISED GLOVE BOXES & ADDED NOTES		2-26-71

CONSTANT VOLUME CONTROLLER SCHEDULE

CFM	SIZE
1000	12"
240	6"
150	5"
50	4"
25	4"

NOTES:

1) FOR ADDITIONAL SCHEMATIC FLOW DIAGRAMS SEE DWG HV-...

SQUIBB

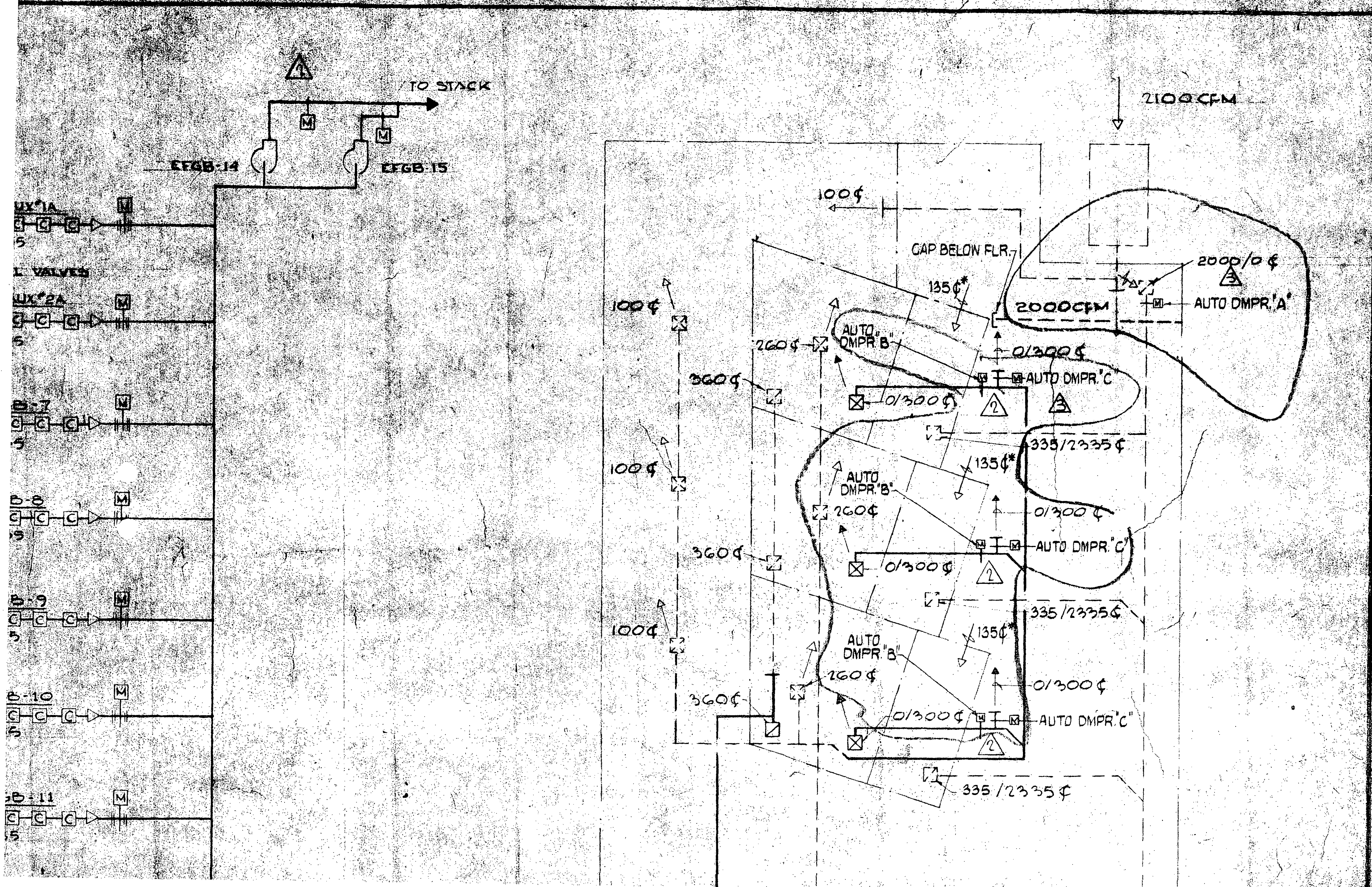
MEDOTOPE FACILITY EXPANSION

NEW BRUNSWICK, NEW JERSEY

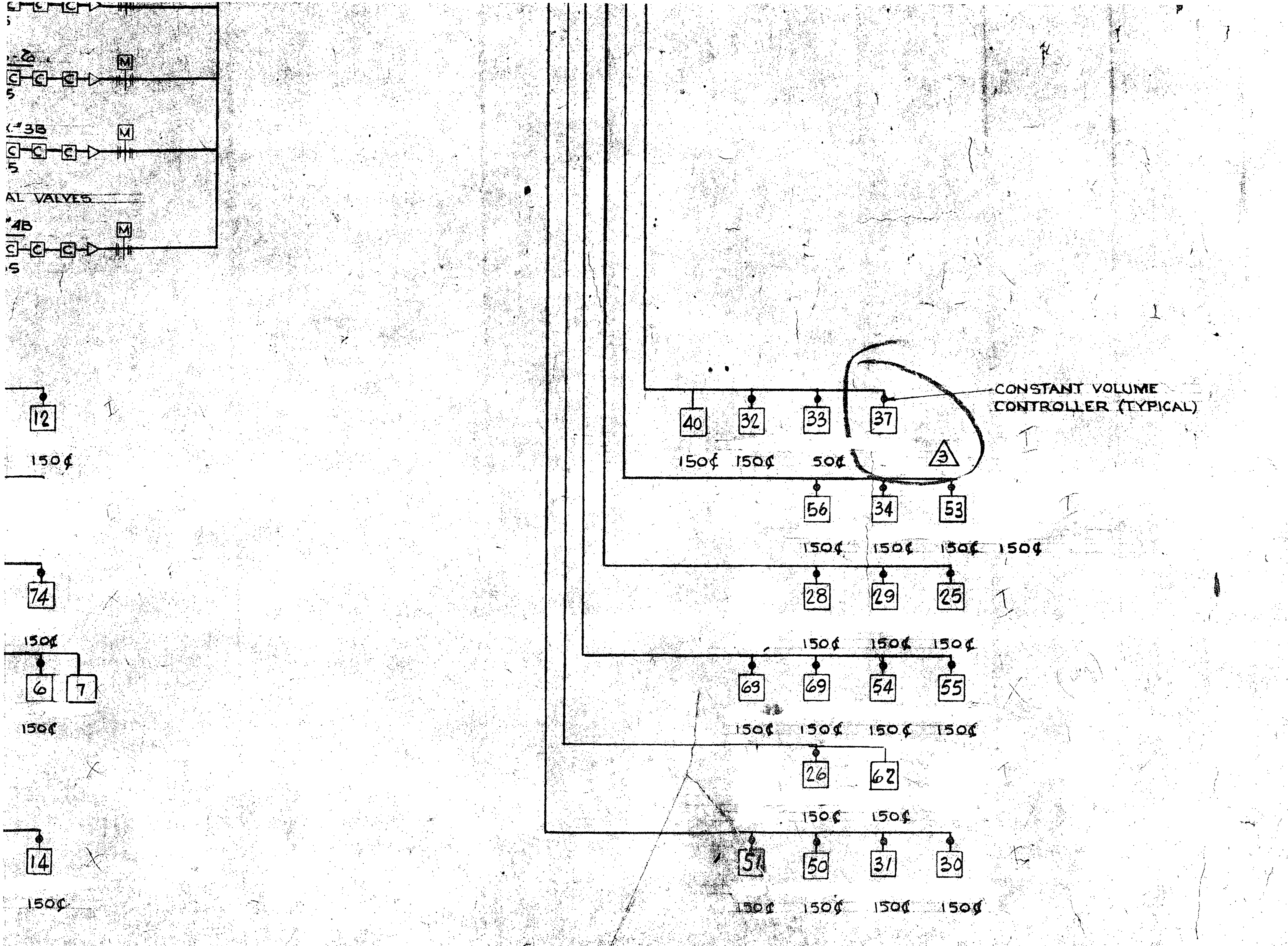
SEELYE STEVENSON VALUE & KNECHT INC.
CONSULTING ENGINEERS
99 PARK AVENUE N.Y. N.Y.

MANFRED HANSJOACHIM RIEDEL AIA
CONSULTING ARCHITECT
147 EAST 37 STREET N.Y. N.Y.

DRAWING TITLE:
SCHEMATIC FLOW DIAGRAMS

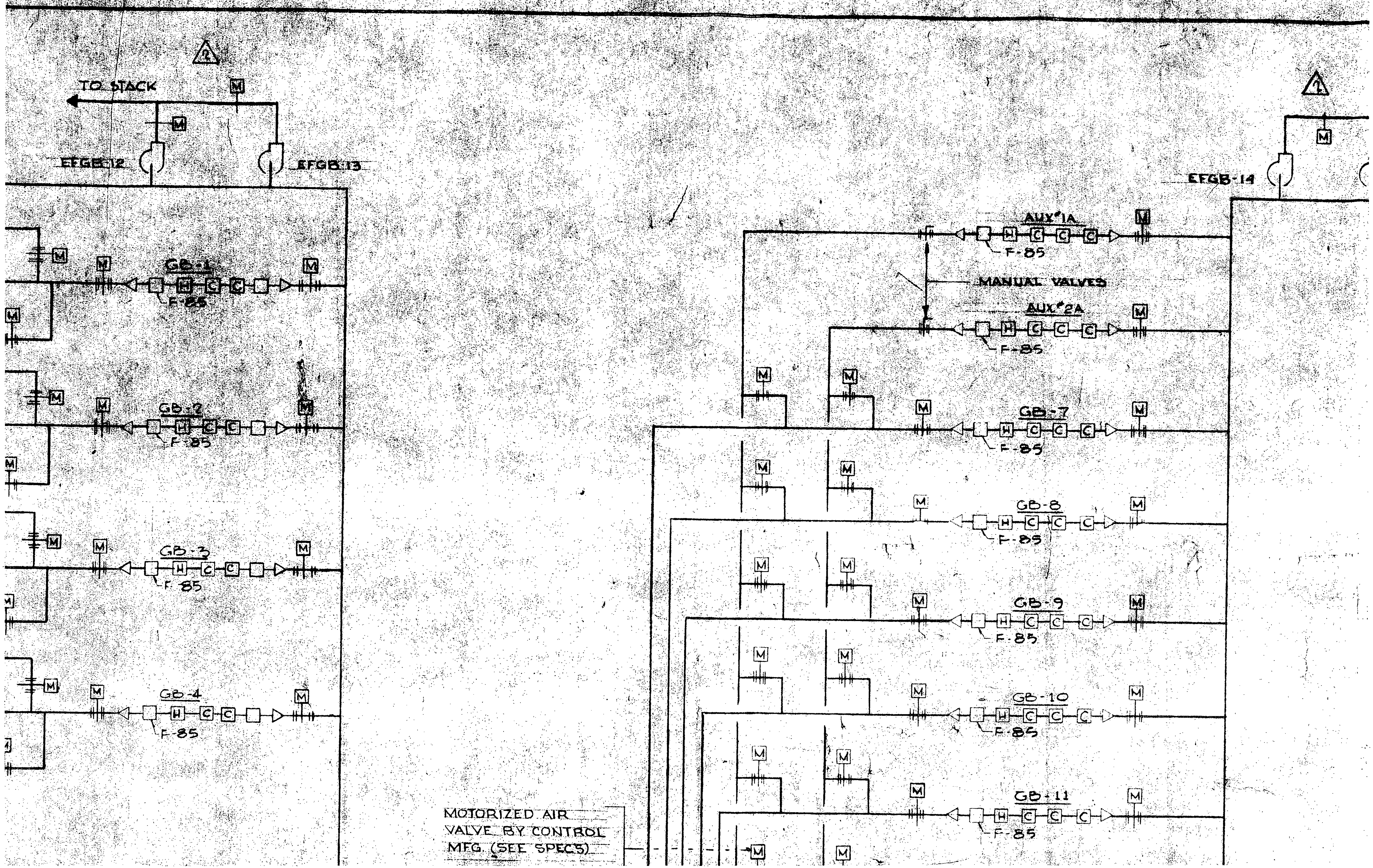


TO STACK
EFGB-14
EFGB-15
AUX#1A
VALVES
AUX#2A
B-7
B-8
B-9
B-10
GB-11
2100 CFM
100¢
CAP BELOW FLR.
2000/0¢
135¢*
2000CFM
AUTO DMPR."A"
100¢
AUTO DMPR."B"
260¢
0/300¢
AUTO DMPR."C"
360¢
0/300¢
335/2335¢
100¢
135¢*
AUTO DMPR."B"
260¢
0/300¢
AUTO DMPR."C"
360¢
0/300¢
335/2335¢
100¢
135¢*
AUTO DMPR."B"
260¢
0/300¢
360¢
0/300¢
AUTO DMPR."C"
335/2335¢

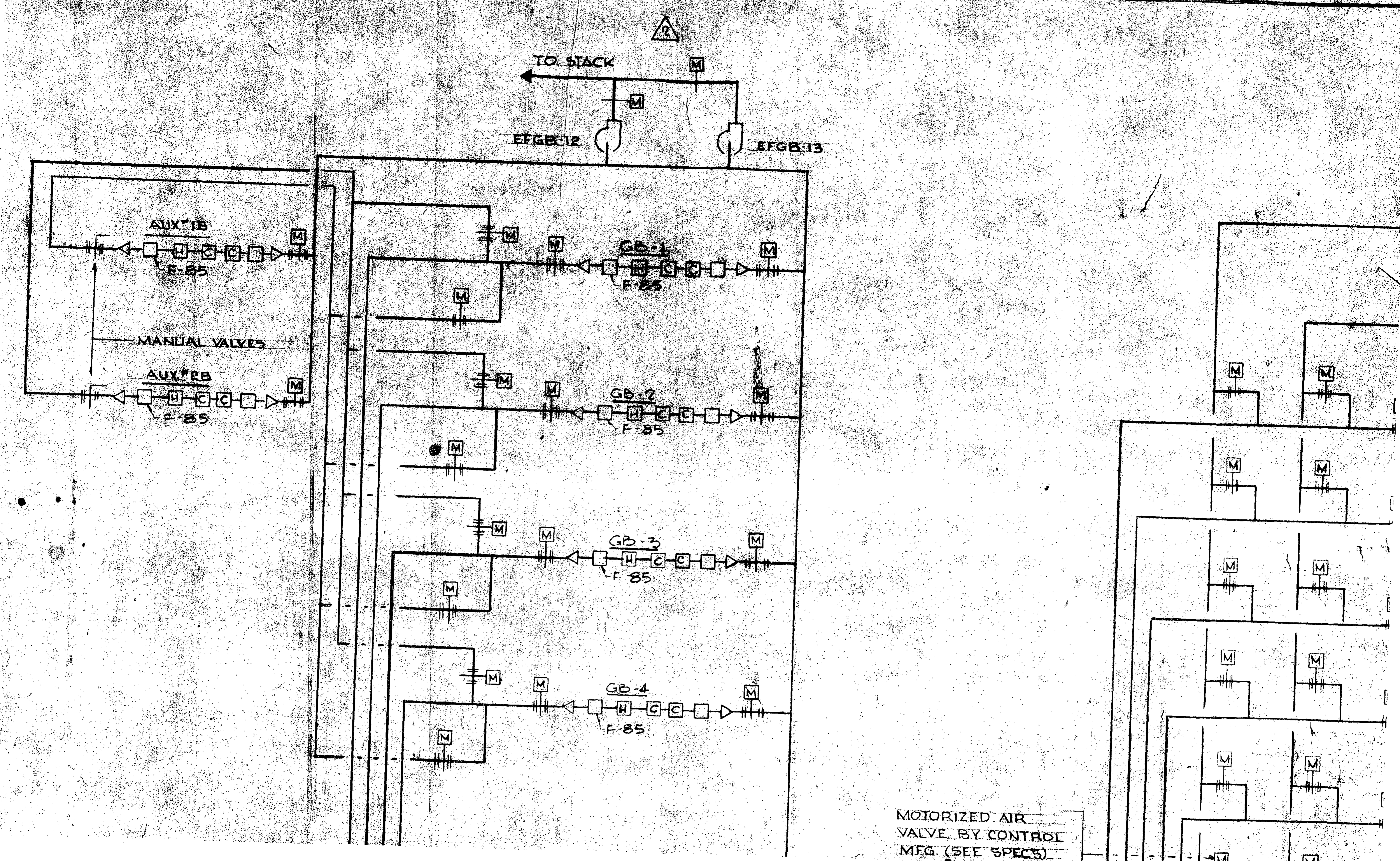


CONSTANT CONTROLLE
CFM
1000
240
150
50
25

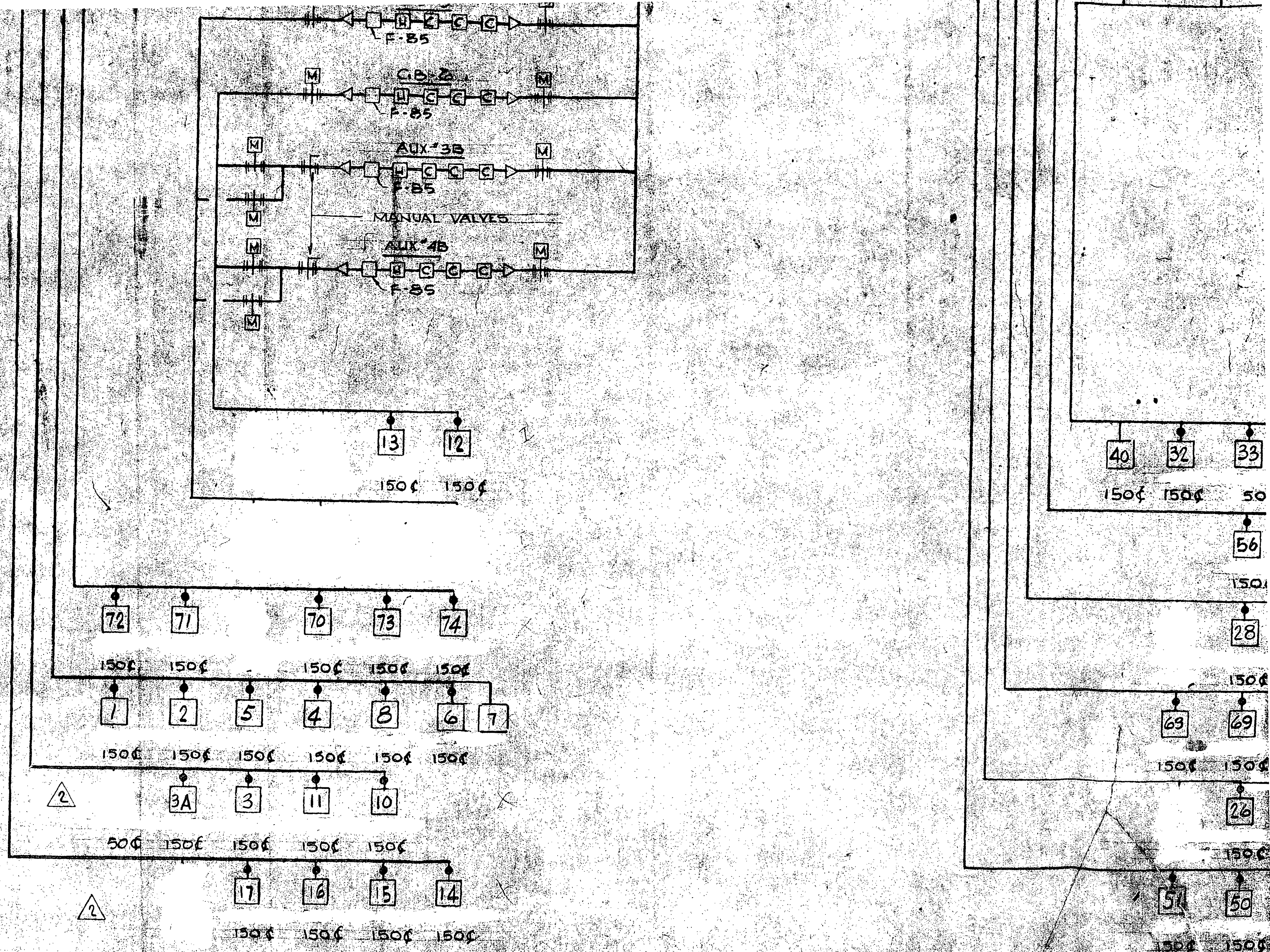
NOTES:



TO STACK
EFGB-12
EFGB-13
EFGB-14
GB-1
GB-2
GB-3
GB-4
AUX#1A
MANUAL VALVES
AUX#2A
GB-7
GB-8
GB-9
GB-10
GB-11
F-85
M
H
C
MOTORIZED AIR VALVE BY CONTROL MFG. (SEE SPECS)



MOTORIZED AIR
VALVE BY CONTROL
MFG. (SEE SPECS)



F-85
C.B.-2B
AUX #3B
MANUAL VALVES
AUX #4B
13
12
150¢ 150¢
72
71
70
73
74
150¢ 150¢ 150¢ 150¢ 150¢
1
2
5
4
8
6
7
150¢ 150¢ 150¢ 150¢ 150¢ 150¢
2
3A
3
11
10
50¢ 150¢ 150¢ 150¢ 150¢
2
17
16
15
14
150¢ 150¢ 150¢ 150¢
40
32
33
150¢ 150¢
56
28
69
69
26
50
150¢ 150¢