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Compiled by
S. G. Thornton
Environmental Management Division
OAK RIDGE K-25 SITE
for the Health Studies Agreement

October 2, 1995

Oak Ridge K-25 Site
Oak Ridge, Tennessee 37831-7314
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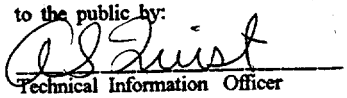

Technical Information Officer
Oak Ridge K-25 Site

11/2/95
Date

OPERATING MANUAL
SURGE AND WASTE SYSTEM
VOLUME XXI

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OPERATING MANUAL

SURGE AND WASTE SYSTEM

VOLUME XXI

FIRST EDITION
June 25, 1945

Compiled and Edited by
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7. Carbon Absorbers

There is a total of eight carbon absorbers in Section 600. They serve as clean up traps removing 616 from gas being vented to the atmosphere, gas being evacuated through vacuum pumps, and dry air from equipment casings being vented.

Carbon Absorbers (F-605)

Carbon Absorber F-605 is the clean up absorber for the vent and relief valve system of Section 600. It is normally used in connection with absorbers F-606 and F-606A. There must always be two absorbers in series for the relief valve service.

The vessel itself shown on Figure IV.7-1 is a 3'-0" in diameter by 12'-9 1/2" overall height steel unit with 5/16" thick straight shell wall, 5/16" thick ellipsoidal top head, and a 5/16" thick conical bottom head. The straight shell is 5'-0" long. The vessel is supported upon four lugs consisting of two gussets and a base plate made from 1/2" steel plate and continuously welded to the shell.

CONNECTIONS

The two inlet connections are 3" pipe welding stubs which are welded into the sides of the wells on the cone. These wells are provided to prevent any particles from getting into the inlet lines. They consist of two sections of 10" standard pipe which extend 19" from the flange face of the cone to the center line of the vessel. The ends are closed by a flanged pipe cap and are sealed by a "Sargol" type joint shown in detail "C" Figure IV.7-1. The edges of both the cap and pipe flanges are seal welded in the field after the slip on flanges are brought up tight. The other end of the well is protected by an 8-1/4" diameter #14 mesh by 0.020" wire diameter monel wire screen welded to a 9 1/2" O.D. by 7 1/4" I.D. by 1/4" thick monel support ring. A 1/4" x 1" monel support bar is welded to the screen and the support ring. The whole assembly is bolted to a 3/8" steel ring which is welded inside the well.

The outlet connection is a 3" 150 lb. nozzle welded into the neck of the 18" manhole and charging connection in the top head of the vessel. This nozzle is also protected by a screen insulated in the manhole. The screen is 16-1/4" O.D. #14 mesh 0.020" wire diameter monel and is welded to a support ring 17-1/4" O.D. by 15-1/4" I.D. by 1/4" thick. There are two support bars 1/4" x 1" welded in the vertical position flush with the bottom of the ring and 2-1/2" off center. The assembly is bolted to a 3/8" ring in the 18" nozzle by means of twelve 3/8" bolts. The thermowell connections are 3/4" pipe size and are shown on detail "E" Figure IV.7-1.

DESIGN DATA

The vessel is designed for pressures between 30 psi and full vacuum at 650°F. The hydrotest pressure is 60 psi and the air

[redacted]

test pressure is 45 psi. The design and fabrication is in accordance with the latest revision of the API-ASME fusion welded vessel code although no code stamp is required. The unit is neither stress relieved nor radiographed.

Carbon Absorbers (F-606 and F-606A)

These units serve for both vent and relief valve service and also for vacuum service. At least one of these absorbers must always be available for relief valve service. Therefore if either F-606 or F-606A is being recharged no carbon absorber is available for evacuation service. They are piped and valved so that several different operating combinations are possible. Either absorber F-606 or F-606A may be in series with F-605 for relief valve and vent services while the remaining absorber is available for vacuum service or down for charging. An alternate procedure would be with F-606 and F-606A in series for relief and vent services and F-605 available for vacuum service or down for recharging.

The vessel is shown on Figure IV.7-2. It is 5'-0" I.D., 6'-0" on the straight shell, and 15'-0" overall height. The shell, top ellipsoidal head and the bottom cone are made of 3/8" steel plate. The vessel is supported on four steel lugs consisting of 1/2" thick gussets and a base plate. The top head has four stiffeners 4" deep and 3/4" thick to help support the gate dumping mechanism in the top head manhole.

CONNECTIONS

The inlet connections are 3" welding stubs welded into wells welded into the cone of the vessel. The details of these are similar to the wells on F-605, and are shown in detail on Figure IV.7-2. The outlet connection is a 3" 150 lb. nozzle which is welded into the neck of the manhole. The thermowells are 3/4" special couplings welded to a section of internal piping, these are shown on Detail "D" of Figure IV.7-2.

BED SUPPORT

The absorber charge is held in place on a pivoted gate of wire mesh supported by steel bar. This gate may be lowered to dump the charge. Figure IV.7-6.

The gate consists of 1" by 3/8" bar band around the outside of a screen frame of Kerlow flooring Type "CBR" 1" by 3/16" bars. A screen of #14 mesh by 0.020" wire diameter monel is placed upon this flooring and silver soldered at the edges. The gate is assembled in two halves and each half is welded to a section of 1-1/2" square which is turned to 1-3/8" diameter pivot and fits through a bearing which is welded to the shell and the shield angle. This permits rotation of the gate during opening and closing of the gates. In order to seal the gate to prevent charge materials from falling through, there is a 3" x 3" x 3/8" angle rolled to the shape of the vessel with the leg in against which the shields on the gate fit.

[redacted]

The part of the gate that rotates down to open fits under the #10 gage sheet metal shield while the other part has the shield attached to it and it fits against the angle. The details of this are shown on Figure IV.7-6. There is an angle across the center of the absorber under which both gate halves fit when the gate is closed. This seals the joint of the two halves.

The gates are held shut by two 3/8" crane chains, one connected to each half, which are connected to a spreader. The spreader is bolted to a standard #2-1/2 clevis. A section of 3/4" standard rod end is threaded full length and screwed into the clevis through a yoke. The yoke is 17-1/2" long, 3" deep and 1" wide and is supported by two 1" x 1-1/2" x 6" long bars welded into the manhole neck 180 degrees apart. By loosening the nuts on the rod end, turning the yoke 90 degrees and releasing the chains the gate may be lowered. The reverse procedure will pull the gate shut.

DESIGN DATA

The vessels are designed for a maximum pressure of 30 psi to full vacuum at 650°F. The hydrotest pressure is 60 psi and the air test pressure is 45 psi. The design and fabrication is in accordance with the API-ASME fusion welded pressure vessel code although no code stamp is required. The units are neither stress relieved nor radiographed.

Carbon Absorbers (F-607 & F-607A)

These units, shown on Figure IV.7-3, are provided to handle normal circulation of humidity conditioning air in the air humidity conditioning system. All air discharged from the air conditioned cells and casings when they are on normal circulation, is discharged to the atmosphere through F-607 or F-607A. These units also handle any air used for purging the small casings or discharged by relief valves on these casings. There is a cross connection equipped with a relief valve between absorbers F-607 and F-607A and F-608 so that in the event both F-607 and F-607A are out of service, the air will automatically discharge through F-608.

The vessels are 3'-0" I.D. and 21" on the straight shell. The overall length is 7'-3". The shell, as well as the top ellipsoidal head, and the bottom cone are all made of 5/16" steel. They are supported on two lugs consisting of 1/2" thick steel gussets and a base plate.

CONNECTIONS

The inlet connections are 6"-150 lb. nozzles, welded into 10" wells which are welded into the cone. The details of these cones are discussed under absorber F-605. The outlet is an 8" 150 lb. nozzle welded into the neck of the manhole. The entrance to this 8" connection is protected by a screen consisting of #14 mesh monel wire supported on a ring 1/4" or 1". The carbon charge is dumped by means of a dump gate attached to the nozzle at the bottom of the cone. This is discussed below under "Loading and Emptying Carbon Traps".

DESIGN DATA

These vessels are designed for a maximum pressure of full vacuum to 30 psi at 310°F. The hydrotest pressure is 60 psi and the air test pressure is 40 psi. The corrosion allowance is 1/18" and the joint efficiency 80%. The design and fabrication is in accordance with the latest revision of the API-ASME fusion welded vessel code although no code stamp is required. The vessels are neither stress relieved or radiographed.

Carbon Absorber (F-608)

Carbon Absorber, shown on Figure IV.7-4, is provided in the air humidity conditioning system to handle air used for purging of the large cells and discharged by relief valves on these same cells. There is a cross-connection with a relief valve between F-608, and F-607 and F-607A so that in the event of failure of F-608 the air will automatically discharge through F-607 and F-607A.

The vessel is vertically mounted steel unit, 5'-0" I.D., 4'-3" on the straight shell, and 11'-8" overall. The shell wall top ellipsoidal head, and bottom cone are all 3/8" steel plate. There are four stiffener supports on the top head to reinforce the manhole neck. These are 4" deep, 3/4" thick, and follow the contour of the head. The support lugs for the vessel are attached to these stiffeners.

CONNECTIONS

The inlet nozzle is a 10"-150 lb. flanged fitting. There is a screen on the inside of the nozzle to prevent particles from getting into the inlet line. The screen is 14 mesh 0.020" wire diameter monel and is silver soldered to a 1/4" x 1" ring and bolted in place in the nozzle. The outlet is a 12"-150 lb. flanged fitting welded into the neck of the 18" manhole in the top head. It too is protected by a monel wire screen. Both screens are detailed on Figure IV.7-4. The discharge nozzle for the carbon bed is a 6" connection at the bottom of the cone. A dump gate arrangement similar to F-606 is used to hold the bed in place and dump the charge.

DESIGN DATA

The unit is designed to operate at a maximum of 30 psi to full vacuum at 310°F. The hydrotest pressure is 60 psi and the air pressure is 45 psi. The corrosion allowance is 1/8" and the weld efficiency 80%. The design and fabrication is in accordance with the latest revision of the API-ASME code for fusion welded vessels although no code stamp is required. The vessel is neither stress relieved or radiographed.

Carbon Absorbers (F-612 and F-612A)

Carbon Absorbers F-612 and F-612A shown on Figure IV.7-5 are provided to strip 616 from the gas leaving the sealant system of the pumping units, J-601, J-601A, J-602-3, and J-602-3A. There is one installed in the suction line of each of the seal systems vacuum pumps J-607 and J-607A.

These vessels consist of a 16" length of 8" standard weight steel pipe with a 1/2" thick flat plate welded into the bottom and a 8" by 4" standard pipe reducer with a 150 lb. welding neck flange and cover for the top. The units are supported on three 2"x 2"x 1/4" angle legs welded to the shell.

The inlet and outlet connections are special 1/2" couplings. These are detailed on Figure IV.7-5. The inlet is protected by a screen on which the carbon bed sits.

Dumping Gate and Chute

The dumping gate, shown on Figure IV.7-8 is typical for all the carbon absorbers except the F-612 series. An adapter connection, shown on Figure IV.7-7, is bolted on to the bed discharge nozzle and the 12" connection of the dump gate attached to it.

The dump gate consists of a section of 12" standard pipe with a standard 300 lb. slip-on flange at each end. The gate device is a semi-circular disc, welded to a pipe which is in turn fixed to a 1-1/2" diameter shaft by split taper pins. The semi-circular gate acts as a butterfly valve. There is another section of 3/8" plate welded to the inside of the pipe and extending across the open half of the pipe over to the center of the semi-circular gate. The shaft extends out through a 3" pipe which is flanged to accommodate a cover plate to protect the end of the shaft. This extension is machined to a hexagon form which accommodates a wrench to operate the gate. Inside the 3" pipe extension there is a collar which guides the rotation by stopping the locking key when the gate is in either the open or shut position preventing the positioning of the gate 180° out of position and therefore wide open. It also is notched in the closed position so that inserting the key into this notch locks the gate closed.

DUMPING CHUTE

During the dumping of absorbers it is necessary to avoid allowing dust to enter the room, therefore, a special enclosed chute, shown on Figure IV.7-9, is bolted to the dumping gate flange and set over the drum for spent charge.

There are two types of chute, the bolted type used for F-607 and F-607A and the welded type used for F-605, 606, 606A and 608.

The welded type chute consists of three main parts. The top position consists of a 6" length of 12-3/4" O.D. steel pipe to which a 12" x 1/2" thick plate flange is welded. The bottom section consists of a 5" length of the same pipe, and a section of 12 gauge sheet metal formed to fit the drum to make a snug fit. A piece of 1/2" pipe size capped pipe is added to the cover section in the field. Between the top and bottom steel portions is a section of 12-3/4" I.D. by 3/32" seamless rubber sleeve. It is clamped with a steel band and sealed and cemented in place with synthetic rubber cement.

The bolted type is the rubber section flared and bolted against the dumping gate flange and flared and bolted to the formed drum cover by means of a 3/8" thick steel ring.

Charge to the Absorbers

CONICAL PORTION

The conical portion of the absorbers, except those equipped with bed supporting screens (e.g. F-606, F-606A, F-608, F-612, and F-612A) are charged with a 4 mesh, type 38 alumina, furnished by the Norton Co. Data on the weight of alumina required in the individual absorbers is tabulated in Table IV.7-1.

CYLINDRICAL PORTION OF ABSORBERS

Those absorbers not normally handling 616, e.g. F-612 and F-612A, are charged with 6 to 8 mesh activated carbon type 4 SX, high activity, furnished by the National Carbon Company.

Those absorbers handling low concentrations of 616, e.g. F-607, F-607A and F-608, are charged with 3/8" pelleted high activity, activated carbon.

The remaining absorbers which handle gases containing appreciable concentrations of 616 are charged with a mixture of 2 volume of 4 mesh crushed alumina and 1 volume of 3/8" pelleted high activity, activated carbon. Laboratory tests indicate that this mixture contains the highest proportion of carbon which can safely be used without running a risk of bed caking.

The weight and the other data on the carbon and alumina to charge to the individual absorbers is tabulated on Table IV.7-1.

TABLE IV.7-1

Absorber No.	Charge for Cone	Charge for Cylindrical Portion		
	Alumina	Alumina	Carbon	Total Mixture
F-605	536 lbs.	2117 lbs.	353 lbs.	2470 lbs.
F-606	--	5644 lbs.	830 lbs.	6474 lbs.
F-606A	--	5644 lbs.	830 lbs.	6474 lbs.
F-607	536 lbs.	--	536 lbs.	536 lbs.
F-607A	536 lbs.	--	536 lbs.	536 lbs.
F-608	--	--	1180 lbs.	1180 lbs.
F-612	--	--	13.1 lbs.	13.1 lbs.
F-612A	--	--	13.1 lbs.	13.1 lbs.

Charging of Absorbers

It is very essential where carbon absorbers are charged with a carbon-alumina mixture, that great care be taken to prevent crushing of the carbon and to avoid segregation of carbon and alumina when charging. Due to the abrasive nature of the alumina and the great difference in density between the materials, the mixture should not be subjected to excessive handling, tumbling, or allowed to fall freely through any great distance. There is provided, therefore, special equipment for charging the absorbers and its use is discussed below.

Care must also be taken in charging straight carbon because of its friability. No special precautions are necessary, however when loading straight alumina into the cones of some of the absorbers.

ABSORBERS F-605

Check before charging that the bottom dump gate is closed and that the bottom inlet screens are installed and are in a clean and undamaged condition.

Fill the absorber with straight alumina (536 lbs.) up to the top of the conical portion. Level the surface off.

The charging of the cylindrical portion is by means of a canvas bag, roughly 8" x 13" x 16" high, which holds approximately 60 lbs of mixture. The bag is filled with material by scoop or shovel from the drums in which it is received from the Carbon Mixing Plant, see Operating Manual "Carbon Mixing Plant" Volume XXIV. Using an overhead hoist or block and tackle attached to the two top handles, the bag is lowered into the absorber. With the bag properly positioned in the absorber, it is dumped by pulling with a wire attached to the bottom handle. Use of the bottom handle will also aid in positioning the bag before dumping so as to avoid coning in the absorber with its accompanying segregation.

In this manner the cylindrical portion of the absorber is charged with 2470 lbs. of a mixture of carbon and alumina comprised of 2 volumes of alumina (2117 lbs) to 1 volume of carbon (373 lbs). After charging, level off the top surface and install the top screen.

ABSORBERS F-606 and F-60

Check before charging that the bottom dump gate is closed, that the bottom inlet screens are installed and are in a clean and undamaged condition, and that the dumping screens are closed and properly supported.

Charging of this absorber is also by means of a canvas bag, see above, but in this case the bag, supported by an overhead hoist or block and tackle, is lowered into the absorber empty. This is done by collapsing the bag which is necessary to get it by the dumping screen support mechanism. With the bag in the absorber it is filled with carbon and alumina blend, using a metal funnel shown on Figure IV.7-10. The funnel should be moved during the

filling of bag, so as to prevent segregation resulting from coning. The filled bag is then lowered to position in the absorber and dumped in the same manner as for loading F-605. When the carbon and alumina blend level nears the top of the absorber the bag should be collapsed and withdrawn. Filling is then completed by using the funnel alone.

In this manner the cylindrical position of each of these absorbers is charged with 6474 lbs. of a mixture of carbon and alumina comprised of 2 volumes of alumina (5644 lbs.) to 1 volume of carbon (830 lbs.), after charging level off the top surface.

ABSORBERS F-607 AND F-607

Check before charging that the bottom dump gate is closed and that the bottom inlet screens are installed and are in a clean and undamaged condition.

Fill the absorbers with 536 lbs. of alumina up to the top of the conical position and level the surface off.

Charge the cylindrical position with 536 lbs. of straight carbon using a metal funnel shown on Figure IV.7-10. The funnel should be moved during filling of the absorber so as to maintain a nearly level surface and thus avoid segregation due to coning. After charging, level off the top surface and install the outlet screen.

ABSORBER F-608

Charging of this unit is identical with charging of absorbers F-606 or F-606A except that the charge is straight carbon (1180 lbs.)

ABSORBERS F-612 AND F-612A

These absorbers are charged with straight carbon using hand scoops to transfer the carbon to the absorber.

Dumping of Absorbers

Dumping of the absorbers, with the exception of F-612, and F-612A, is through a bottom dumping gate and a flexible chute into 30 gallon drums. The gate permits controlling and shutting off the flow of material into the drums. Figure IV.7-9 shows details of the dumping chutes provided to make a dust and gas tight connection between the gate and the 30 gallon drum. Both the gate and the chute are provided with 74 connections to allow blowing them free of dust and/or gas before breaking connections.

The following general procedure is outlined for discharging the absorbers.

(1) In the case of the absorbers containing internal charge-supporting screens (F-606, F-606A, and F-608), it is first necessary to dump these screens. After

removing the top manhole cover, slip the load hook of the overhead hoist or block and tackle through the eye of the lifting rod. Raise carefully the screen a slight amount, just sufficient to take the weight off the yoke support and to permit turning of the yoke. With the yoke turned enough to pass the supports, the screen is slowly lowered, using the hoist, until it is dumped. The hoist hook should then be removed from the absorber and the top flange replaced. It is absolutely essential that the operators doing the above and subsequent work wear protective clothing and acid cannister gas masks.

With the supporting screens dumped, subsequent discharging steps are the same for all absorbers.

(2) After removing the bottom flange cover from the dumping gate, the proper chute, discussed above under "Dumping Chutes" and shown on Figure IV.7-9, is bolted to the bottom of the gate. A 30 gallon drum is then placed under and connected to the chute.

(3) Remove the cover at the side of the gate and place the crank like handle on the end of the gate shaft. Holding the gate in the closed position, remove the locking key. The gate can now be opened, dumping the material from the absorber into the drum.

It is recommended that the rate of dumping be controlled by alternately opening and closing of the gate, so as to avoid "flooding" the drum, and overflowing up into the chute. To maintain the gate closed the operator must either manually hold it in that position or he must insert the lock key. The amount of material dumped in the drum must be determined either by "sounding" the drum or by using a feeler rod inserted through the top drum lid. To do the latter a small hole will have to be cut in the lid. It is preferred to underfill rather than overfill the drums.

(4) When a drum has been filled and it is desired to remove it, blow with a small amount of 74 up through the chute, using the 74 connection on the drum lid.

(5) Break the connection between the drum and the chute remove the drum and immediately cover. The drum should then be stenciled so that the contents are completely identified.

(6) After the absorber has been discharged, the chute is removed and the bottom flange cover replaced on the dump gate.

(7) The absorber should be blown through to atmosphere with 74 to flush away obnoxious gaseous reaction products, HF, or any 616 which may still remain in the absorber. The recommended flushing procedure is listed on Table IV.7-2.

TABLE IV.7-2

Flushing Rates for Carbon Absorbers

Absorber No.	Rate of 74 Flow	Duration of Flow
F-605	10 CFM	15 min.
F-606	25 CFM	15 min.
F-606A	25 CFM	15 min.
F-607	4 CFM	15 min.
F-607A	4 CFM	15 min.
F-608	12 CFM	15 min.
F-612	2 CFM	15 min.
F-612A	2 CFM	15 min.

(8) It is recommended that the protective clothing be also worn by those opening the absorber after discharging a spent charge. Later experience may show this to be unnecessary if the absorbers are flushed as indicated above, but protective clothing should be used at least at first.

(9) To discharge the small absorbers F-612 and F-612A, they are removed from the building and dumped by tipping them. Operators should wear protective clothing and acid cannister gas masks when doing this.

Heaters for F-605, F-606, and F-606A

To prevent condensation of 616 vapor to the solid phase in the conical bottoms of absorbers F-605, F-606, and F-606A, electric strip heaters are provided. Condensation in the cone not only defeats the function of the absorbers but may cause channeling or plug the flow in the absorbers. Unabsorbed 616 in the discharge from the absorbers or during dumping is very undesirable.

Once the absorbtion starts to take place between the carbon and the 616 the heat of the reaction is large and the problem is to

avoid fusing and caking of the bed. To help reduce the effect of the high exothermic reaction was the reason for diluting the carbon with alumina in setting up the absorber charger.

The electric heaters on the conical portions of F-605, F-606 and F-606A are set to maintain a maximum metal temperature of 200°F. and a maximum temperature of 150°F. at the vertical center-line of the absorber where the conical portion meets the cylindrical portion of the absorbers. For heat economy the conical portion of the absorber is insulated but the cylindrical portion is left uninsulated to allow for dissipation of the heat of reaction. The arrangement of the heaters and wiring details are shown on Figure IV.7-11.

All the heaters used are rated at 230 volts but are used at 115 volts thereby derating them to 1/4 the listed rating. The heater ratings and wiring diagram are shown on Figure IV.7-11.

[redacted]

[redacted]

4. Heating & Ventilating

The heating and ventilation system plan and details is shown on Figure V.4-1. This drawing shows typical views of the roof ventilators, fan duct work, unit heaters, steam and steam trap piping and a plan view of each floor showing the location of the heating and ventilating equipment.

Ventilating Fans

FIRST FLOOR

There are three ventilating fans on the first floor of K-601. Two of the fans are in the steel portion of the building, and are located in the walls. They serve to draw air out of the room. Both of these fans are size 24 propeller type units which are direct-connected to a constant speed, 1 horsepower, 440 volt, 3 phase, 60 cycle motor. They draw about 6750 cfm at a suction pressure of 1/8" of water.

The other fan on the first floor is connected to the ventilating duct in the concrete portion of the building. The duct is connected to three 20" x 36" inlet registers which are installed flush with concrete wall. Each register is sized to draw 5000 cfm. The fan is type CD-36M8 with a direct connected, 2 horsepower, constant speed, 440 volt, 60 cycle, 3 phase motor. The fan will draw 15000 cfm at a suction pressure of 1/4" water.

SECOND FLOOR

There are five fans on the second floor, two in the steel section and three in the concrete section. The two fans in the steel section are exhaust fans while two in the concrete section are supply units, and one is an exhaust fan.

The supply fans are located in the north and west walls of the concrete section of the building. They are both size 24 propeller type fans directly connected to a 1 horsepower constant speed, 440 volt, 3 phase, 60 cycle motor. They are capable of delivering 6750 cfm at a suction pressure of 1/8" of water. The outside extremity is protected by a rain hood and a safety shield.

The exhaust fans in the steel section are located in the west and east walls of the building. They are size 20 propeller type venturi units, direct-connected to a 1/3 horsepower constant speed, 110 volt single phase, 60 cycle motor. They are capable of drawing 3300 cfm at a suction pressure of 1/8" of water. The exhaust fan in the concrete section is similar to those in the steel section except that it is size 17, is powered by a 1/4 horsepower motor, and will only draw 2200 cfm.

Roof Ventilators

There are three ventilators in the roof. Two of them are

[redacted]

located in the concrete portion of the building and two are located in the steel section. A typical fan ventilator detail in shown on Figure V.4-1. They are all manufactured by HH Robertson Co.

The larger of the two units in the concrete section is a 36" ventilator. It is equipped with a fan driven by 1 horsepower, 440 volt, 3 phase, 60 cycle motor which when rotating at 1150 rpm will draw 12,200 cfm. The ventilator has a square damper 44" x 44" with a counterbalance and an 8'-0" long operating chain. The smaller of the two is a 20" ventilator equipped with a fan driven by a 1/4 horsepower, 220 volt, 3 phase, 60 cycle motor, which when rotating at 1725 rpm will draw 3200 cfm. This ventilator has a damper 27" x 27" with a counterbalance and a 1/2" diameter rod and has 8'-0" of operating chain.

The ventilator for the steel section is a 24" unit. The fan is driven by a 3/4 horsepower motor drawing 440 volts, 3 phase, 60 cycle power. When the fan rotates at 1725 rpm it draws 6100 cfm. The damper 31" x 31" and is counterbalanced. It is open and shut by means of an 8'-0" chain.

Heating Equipment

In order to heat the building "Unit Heaters" have been installed. The location of these is shown on Figure V.4-1. A table showing the sizes and "Equivalent Direct Radiation" is also shown on this drawing.

The unit heaters are McQuay type and are steam heated. Provisions have been made to remove dirt from the bottom of each unit. There is also a steam strainer and a drip trap to the return main. The piping is also shown on Figure V.4-1.

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