

VINYL CHLORIDE TRAINING PROGRAM

Following the discovery in 1974 that a number of workers engaged in the manufacture of vinyls resins had died of a rare form of liver cancer called angiosarcoma, OSHA issued a standard on October 4, 1974 covering workers exposed to vinyl chloride. Certain facts of this standard that will be covered in detail in this training program require significant changes from past practices.

A medical surveillance program will establish each employees health and his suitability to continue in an area where exposure to vinyl chloride is a possibility.

Monitoring of exposure will be required. Two techniques will be employed, individual personnel monitoring and area monitoring by on-site gas analyzers that will provide continuous reading of the level of vinyl chloride in the work place. Regulated areas will be established where vinyl resin is manufactured or packaged and where vinyl chloride monomer is stored or handled whenever the permissible exposure limit is exceeded. Access to regulated areas shall be limited to authorized persons, and a daily log of persons who enter shall be maintained. These regulated areas will be appropriately marked by barricades and signs. The wearing of respirators will be required where work or exposure may exceed permissible limits. Protective clothing that fits the situation will be required for various levels of potential exposure. Training programs, such as the one being presented here, will be provided. A copy of the full standard as issued by OSHA will be made available to any employer upon request to his supervisor.

Vinyl Chloride is a gas with a sweet, pleasant odor. It is used to make a solid material called Poly Vinyl Chloride. As PVC, it has a multiple of uses in the plastics industry such as pipe, records, insulation, upholstery, kitchen food wraps, shower curtains, floor tiles and many more everyday plastic products. The vinyl chloride gas has been used as an anesthetic agent and as a propellant in spray cans. Vinyl Chloride is a flammable gas at normal atmospheric conditions with a high vapor pressure. It boils at -13 degrees Centrigade. It is more dense than air and tends to concentrate in low lying pockets. The lower explosive limit is 3.6% by volume ¹⁰and air. The upper explosive limit is 33% by volume. It readily ignites by common sources such as sparks, flame, or electrical arks. It has long been recognized that the gas in high concentrations of 6,000 to 80,000 parts per million may cause light headiness or wooziness, symptoms resembling drunkenness and even death. On removal from exposure to fresh air, the symptoms usually clear up quickly.

In January 1974 three deaths due to a rare cancer of the liver, angiosarcoma, were discovered in workers who had had a long-term high level exposure to vinyl chloride. Subsequently, an intensive search of all former vinyl chloride workers and medical testing of active workers uncovered 17 cases out of 6,000 workers since 1961. This is statistically significant since only about 20 cases of this cancer affecting the walls of the blood vessels of the liver are reported each year. Angiosarcoma has also been caused by arsonic and by an X-ray dye called thoriumdioxide. Animal experimentation has also produced this condition in mice by long term exposures of 50 parts per million of vinyl chloride.

As a result of these findings, the government, through OSHA has enacted a standard regulating the exposure of workers to vinyl chloride. As a part of the standard, every employee will be offered an examination prior to being assigned to work in the regulated areas. The examination may be repeated annually for the first 10 years. Following this, it will be offered every 6 months. The examination will consist of a medical history with special attention directed toward drug and chemical exposures, hepatitis or other liver disease, blood transfusions, alcoholic intake and smoking. A blood sample will be drawn for an analysis of five special liver function tests, and finally a clinical examination will be performed with special attention being directed toward detecting enlargement of the liver or spleen. These tests are not for diagnosing a cancer but are intended only as a screening to determine whether or not the employee is at any risk in continuing to work in the regulated area and whether he may safely use a respirator. Each employee will be furnished a statement advising him of the physician's opinion as to a suitability in continuing to work in the regulated area and to wear a respirator. The examination is purely voluntary on your part. If you do not choose to take it, we request you sign a statement to this effect. You will again be offered the examination at the appropriate intervals. As of now, thorough investigation of all past and present vinyl chloride workers in the Texas City Plant has failed to find any cases of angiosarcoma of the liver. The results of the examination are available to you and your personal physician on request. By law, they may also be inspected by an OSHA compliance officer. They will be kept by the medical division indefinitely. Medical divisions will welcome any questions concerning acute or chronic toxicity of vinyl chloride and will be happy to provide you or your physician with any information we have.

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The vinyl chloride regulation also requires monitoring ^{of} vinyl chloride monomer. The purpose is to determine the exposure level of each employee without regard to the use of respirators. Personal monitoring is performed by attaching an activated carbon tube to the collar of the employee. Air is drawn through the tube at a metered rate by a battery-powered pump attached to his belt. Vinyl chloride is absorbed on the carbon and retained for laboratory analysis. The level of exposure is calculated for the total volume of air sampled. Individual exposure records are available to each employee and will be maintained for a period of 30 years. In production areas, multiple sampling points are strategically located. Air is drawn to an automatic central unit which monitors levels at each point by sequentially injecting a controlled air volume directly into the gas chromatograph. Each vinyl chloride level and sampling point is indicated on a chart recorder. The instrument is calibrated once each complete cycle. These recordings indicate upsets, releases, and elevated concentrations which activate an alarm system. Data of controlled room levels indicate personal exposures within the control room and potential exposures outside are indicated before one leaves the control room. The permissible employee exposure levels are one part vinyl chloride per million parts of air by volume averaged over any 8-hour period with a ^{ceiling} ~~ceiling~~ of 5 parts per million averaged over any 15 minute period. No direct liquid contact is permitted. A concentration of vinyl chloride greater than .5 parts per million is considered an action level which requires periodic monitoring and medical surveillance. The periodic monitoring frequency depends on the level of employee exposure. Exposures above the action level but less^{than} ~~than~~ the permissible level of 1 part~~s~~ per million are monitored at least quarterly.

Exposures above permissible levels are monitored at least monthly. Monitoring will also follow changes in control, production, or process that may increase the release of vinyl chloride. Regulated areas are established for production areas with levels greater than the permissible exposure levels. The regulated area is defined by a ^{fence?} ~~sense~~ line in signs. Personnel, other than production personnel assigned to a unit in the area, must check in with the shift production supervisor or his delegate upon entering and leaving the area. This is done by signing the area log kept in the unit control room at Building 114. An instruction book is kept in this location and should be reviewed before entering the area. Also to be observed are: warning signs, such as those placed on waste receptacles which contain VCM or VCM containing material; signs warning of a vinyl chloride release or signs announcing that the regulated area into which unauthorized personnel may not enter. Where vinyl chloride exposures are over the permissible levels, authorized respiratory protection is required to be worn and a respirator program is maintained. Three types of equipment are provided in regulated areas. Air line respirators are used for hazardous operations which have exposure potentials that are known to be ^{less than the} ~~left in a~~ lower explosive limit which is 36,000 parts per million. This equipment is pressure demand type equipped with an auxiliary egress bottle and a full face~~piece~~ piece. It is used for routine work involving elevated exposures. Entering the concentrations above, 3,600 parts per million is authorized only for rescue, fire-fighting, or securing equipment to prevent release. Air purifying cannister respirators are authorized for concentrations known to be no more than 25 parts per million. The cannister is good for 4 hours [?] or to the end of the shift, whichever comes first. When the monitor

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alarm signifies levels above 25 parts per million, airline equipment must be used. The cannister respirator is used within regulated areas generally for mobility. It will not normally be required within control rooms. A 30-minute bottled air system is provided for emergency use only. It is a pressure demand type self-contained breathing apparatus with full-faced piece. It is approved for unknown or even explosive levels for purposes of life rescue. It should not be used for routine work. Every effort is being made to lower vinyl chloride to less^{than} one part per million in the vinyl area and to maintain it at that level. On occasion, the possible exposure will rise above one part per million due primarily to leaking valves, seals, flanges, and to release through ruptured^{discs}ness or safety valves. The vapor fraction analyzers located in Buildings 115, ~~120~~, and ~~174~~ should be checked at regular intervals and especially before entering a questionable area to determine vinyl chloride exposure level. Based on the level, the need for respiratory equipment can be determined. ~~Red lights are located at each individual pick-up point around the suspension non-solvent area. When the vinyl chloride concentration in the area requires the use of respiratory equipment, these red lights will flash. A flashing red light means that you must wear respiratory equipment or leave the area. Normal operations requiring precautions are: auto place sampling which normally requires wearing of a fresh air mask. Compressor checks may require respirators based on the VFA reading. Connecting or disconnecting hoses to unload vinyl chloride tank cars, requires fresh air respiratory equipment. Sampling of these cars also requires fresh air equipment. Vessel or confined space entry is covered by plant procedure 1D3. This procedure calls for proper isolation, emptying, electrical lock-out, cleaning, purging, ventilating, and testing of the vessel before entry is allowed. Testing may be performed by either operations or industrial hygiene personnel.~~

Entry is not allowed until the test shows a safe atmosphere and a hazardous work permit has been filled out and approved. The opening of a pump, compressor or piping that normally contains vinyl chloride, should follow the same general procedure. No equipment whose contents include vinyl chloride should be emptied directly into the atmosphere without proper authorization to insure all necessary precautions have been taken. If possible, the equipment should be emptied to a part of the process where it will not enter the atmosphere. When cleaning vessels that contain polyvinyl chloride residues, protective clothing is to be worn to prevent skin contact with PVC residues on vessel walls. In the laboratory, samples containing high levels of vinyl chloride should be opened and handled under a ventilating hood. The use of respirators during ~~the~~ ~~use~~ sampling of liquid or vent streams containing vinyl chloride, should be based on VFA readings. The distribution area is also affected by the vinyl chloride regulation since the PVC resins, which are handled in vinyl shipping, contains some residual vinyl chloride monomer. ~~Although vinyl shipping is not a regulated area, there are some actual areas between 1 and 5 parts per millions lasting less than 15 minutes. These areas apply to suspension and non-solvent vinyl resins and include work operations such as opening and closing hatches on loaded hopper cars, opening and closing hatches on van boxes, sampling hopper cars, sampling van boxes, and opening van boxes to be washed. One particular area of concern is the entering of van boxes. Van boxes should not be entered until after they've been washed. Entering a van box prior to washing could result in a VCM exposure over the permissible limits. Also, all vans should be checked for VCM levels before entering in order to avoid exposure over the permissible limits.~~ ^{of exposure} Conditions which may result in a release of vinyl chloride fall into two general categories: process upset and equipment failure.

Each unit operating manual contains a description of normal operating conditions. Every operator should be familiar enough with his unit to recognize abnormal operating conditions. Some key points to watch are: level gages of vessels containing VCM or other materials with the VCM content, pressure indicators for VCM containing vessels, the temperature recorders for the out of since an uncontrolled reaction might lead to venting and the rectifying column reflex recorders at the solvent unit since loss of reflex might cause an indirect loss of VCM at the compressor traps. Decanting of water from VCM tanks to the #3 stripping tank at the suspension unit requires careful operator attention to be sure that VCM is not released to the atmosphere. Equipment failures are easy to spot but not so easy to predict. The best remedy is a thorough inspection of all processing equipment at least once each shift. Areas to especially watch for are improperly sealed safety valves, process valves which have been left partly opened or leaking, pump compressor or agitator seals which are leaking or any other condition which is out of the ordinary. In the event of a massive release of vinyl chloride the standard operating procedures will be implemented at once. Key steps in these procedures are:

1. Activate the daily system in the infected area.
2. Alert all personnel to clear the area using the PA system if available. Clear the endangered area of personnel at least 25 feet upwind and 50 feet downwind of the visible vinyl chloride cloud. Personnel should exit crosswind. If the wind direction indicates the endangered area may extend beyond the confines of the particular unit, the chief operator should notify the affected personnel of the danger.
3. Sound the plant fire alarm and toxic gas alarm.
4. Isolate the affected area. If possible, rope the area off and post warning signs. Road blocks should be set up if required.
5. Isolate the relief source by remote valves or pumping arrangements outlined in unit procedures.

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6. Use all available water to disperse the cloud and form a water curtain.
7. Only specially trained personnel equipped with properly protective equipment including skin and respiratory should reenter the area. Obvious sources of ignition such as internal combustion engines, welding machines and so forth should be shut down.
8. If a fire occurs, do not extinguish until the source of fuel is shut off.

Union Carbide is extremely concerned about the health of its employees and has participated actively in the investigation of the vinyl chloride health hazard. There is little dispute that vinyl chloride is carcinogenic to man, but the level of exposure which is hazardous, can now be definitely established with present evidence. Workers who've developed angiosarcoma have all had many years of high level exposures to vinyl chloride. It is well known that exposure levels have been dramatically reduced since the 40's. Further, there has been no evidence that man or animals have developed cancer at exposure levels of less than 50 parts per million. We urge that you protect your health by learning and following the work procedures and practices that have been set forth. Please cooperate with the Industrial Hygiene Monitoring and Medical Surveillance Programs that have been outlined.

Frank,
This is Peri's update
on the VC training program.

Kirk

UCC 093628

VINYL CHLORIDE TRAINING PROGRAM

Sorry about the unintentional delay. Please contact me at x 5123 if you have any questions or if you cannot read my writing.

Following the discovery in 1974 that a number of workers engaged in the manufacture of vinyl resins had died of a rare form of liver cancer called angiosarcoma, OSHA issued a standard on October 4, 1974 ^{addressing} ~~covering~~ *vinyl chloride exposure* ~~workers exposed to vinyl chloride~~. Certain facts of this standard that will be covered in detail in this training program require significant changes from past practices.

*Thanks,
Perr*

A medical surveillance program will establish each employees health and his suitability to continue in an area where exposure to vinyl chloride is a possibility.

Monitoring of exposure ^{is} ~~will be~~ required. Two techniques ^{are} ~~will~~ be employed, individual personnel monitoring and area monitoring by on-site gas analyzers that ~~will~~ provide continuous reading of the level of vinyl chloride in the work place. Regulated areas ^{are to be} ~~will be~~ established where vinyl resin is manufactured or packaged and where vinyl chloride monomer is stored or handled whenever the permissible exposure limit is exceeded. Access to regulated areas ^{are} ~~shall be~~ limited to authorized persons, and a daily log of persons who enter ^{the regulated area is} ~~shall~~ be maintained. These regulated areas ~~will~~ ^{are} be appropriately marked by barricades and signs. The wearing of respirators ^{is} ~~will be~~ required where work or exposure may exceed permissible limits. Protective clothing that fits the situation ^{is} ~~will be~~ required for various levels of potential exposure. Training programs, such as the one being presented here, ^{are to be} ~~will be~~ provided. A copy of the full standard as issued by OSHA ^{is} ~~will be made~~ available to any employee upon request ^{from} his supervisor.

UCC 093629

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Vinyl Chloride is a gas with a sweet, pleasant odor. It is used to make a solid material called Poly Vinyl Chloride. As PVC, it has a multiple ~~of~~ uses in the plastics industry such as pipe, records, insulation, upholstery, kitchen food wraps, shower curtains, floor tiles and many more everyday plastic products. The vinyl chloride gas has been used as an anesthetic agent and as a propellant in spray cans. Vinyl Chloride is a flammable gas at normal atmospheric conditions with a high vapor pressure. It boils at -13 degrees Centrigade. It is more dense than air and tends to concentrate in low lying pockets. The lower explosive limit is 3.6% by volume and air. The upper explosive limit is 33% by volume. It readily ignites by common sources such as sparks, flame, or electrical arks. It has long been recognized that the gas in high concentrations of 6,000 to 80,000 parts per million may cause light headiness or wooziness, symptoms resembling drunkenness and even death. On removal from exposure to fresh air, the symptoms usually clear up quickly.

In January 1974 three deaths due to a rare cancer of the liver, angiosarcoma, were discovered in workers who had had a long-term high level exposure to vinyl chloride. Subsequently, an intensive search of all former vinyl chloride workers and medical testing of active workers uncovered 17 cases out of 6,000 workers since 1961. This is statistically significant since only about 20 cases of this cancer affecting the walls of the blood vessels of the liver are reported each year. Angiosarcoma has also been caused by arsenic and by an X-ray dye called thoriumdioxide. Animal experimentation has also produced this condition in mice by long term exposures of 50 parts per million of vinyl chloride.

UCC 093630

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As a result of these findings, the government, through OSHA has enacted a standard regulating the exposure of workers to vinyl chloride. As a part of the standard, every employee ^{is} ~~will~~ be offered an examination prior to being assigned to work in the regulated areas. The examination may be repeated annually for the first 10 years. Following this, it will be offered every 6 months. The examination ~~will~~ consist of a medical history with special attention directed toward drug and chemical exposures, hepatitis or other liver disease, blood transfusions, alcoholic intake and smoking. A blood sample ~~will~~ ^{is} be drawn for an analysis of five special liver function tests, and finally a clinical examination ~~will~~ ^{is} be performed with special attention ~~being~~ directed toward detecting enlargement of the liver or spleen. These tests are not for diagnosing a cancer but are intended only as a screening to determine whether or not the employee is at any risk in continuing to work in the regulated area and whether he may safely use a respirator. Each employee ~~will~~ ^{is} be furnished a statement advising him of the physician's opinion as to a suitability in continuing to work in the regulated area and to wear a respirator. The examination is purely voluntary on your part. If you do not choose to take it, we request you sign a statement to this effect. You will again be offered the examination at the appropriate intervals. As of now, thorough investigation of all past and present vinyl chloride workers in the Texas City Plant has failed to find any cases of angiosarcoma of the liver. The results of the examination are available to you and your personal physician on request. By law, they may also be inspected by an OSHA compliance officer. They will be kept by the medical division indefinitely. Medical divisions will welcome any questions concerning acute or chronic toxicity of vinyl chloride and will be happy to provide you or your physician with any information we have.

UCC 093631

The vinyl chloride regulation also requires monitoring ^{of personnel exposure to the} vinyl chloride monomer. The purpose is to determine the exposure level of each employee without regard to the use of respirators. Personal monitoring is performed by attaching an activated carbon tube to the collar of the employee. Air is drawn through the tube at a metered rate by a battery-powered ^{operated} pump attached to ^{the person's} his belt. Vinyl chloride is ^{adsorbed} absorbed on the carbon, ^{desorbed, and analyzed for vinyl chloride by gas chromatography} and ~~retained for laboratory analysis~~. The level of exposure is calculated ^{in the laboratory} for the total volume of air sampled. ^{In order for the concentration of the individual's exposure, the} Individual ^{tube must be worn} exposure records are available to each employee and will be maintained ^{to the person's collar during sampling period.} for a period of 30 years. In production areas, multiple sampling points are strategically located. Air is drawn to an automatic central unit which monitors levels at each point by sequentially injecting a controlled air volume directly into the gas chromatograph. Each vinyl chloride level and sampling point is indicated on a chart recorder. The instrument is calibrated once each complete cycle.

These recordings indicate upsets, releases, and elevated concentrations which activate an alarm system. [?] ~~Data of controlled room levels indicate personal exposures within the control room and potential exposures outside are indicated before one leaves the control room.~~

The permissible employee exposure levels are one part vinyl chloride per million parts of air by volume averaged over any 8-hour period with a ^{ceiling concentration} ~~peaking~~ of 5 parts per million averaged over any 15 minute period. No direct liquid contact is permitted. A concentration of vinyl chloride greater than ^{one half} ~~5~~ parts per million is considered an action level which requires periodic monitoring and medical surveillance.

The periodic monitoring frequency depends on the level of employee ~~exposure~~ ^{exposure}. ~~Exposures~~ ^{Exposures} above the action level but ^{less than} ~~less than~~ the permissible level of 1 parts per million are monitored at least quarterly.

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Exposures

Exposures above permissible levels are monitored at least monthly.

Monitoring will also follow changes in control, production, or process

that may increase the ^{potential} ~~release~~ of vinyl chloride, ^{exposure.} Regulated areas

are established for production areas with levels greater than the

permissible exposure levels. The regulated area is defined by a ^{fence} ~~sense~~

Buildings in the regulated area are B-115, 117, 121...etc.
line in signs. Personnel, other than production personnel assigned *(This information must be included to make it clear to people being trained)*

to a unit in the area, must check in with the shift production super-

visor or his delegate upon entering and leaving the area. This is

done by signing the area log kept in the unit control room at Building

114. An instruction book is ^{also} kept in this location and should be re-

viewed before entering the area. Also to be observed are: warning

signs, such as those placed on waste receptacles which contain VCM or

VCM containing material; signs warning of a vinyl chloride release or

signs announcing that the regulated area into which unauthorized per-

sonnel may not enter. Where vinyl chloride exposures are over the

permissible levels, authorized respiratory protection is required to

be worn and a respirator program is maintained. Three types of

equipment are provided in regulated areas. Air line respirators are

used for hazardous operations which have exposure potentials that are

~~known to be left in a lower explosive limit which is 36,000 parts per~~

~~million.~~ This equipment is pressure demand type, equipped with an

auxiliary egress bottle and a full faced piece. It is used for

routine work involving elevated exposures. Entering the concentrations

above, 3,600 parts per million is authorized only for rescue, fire-

fighting, or securing equipment to prevent release. Air purifying

cannister respirators are authorized for concentrations known to be

no more than 25 parts per million. The cannister is good for 4 hours

or to the end of the shift, whichever comes first. When the monitor

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alarm signifies levels above 25 parts per million, airline equipment must be used. The cannister respirator is used within regulated areas generally for mobility. It will not normally be required within control rooms. A 30-minute bottled air system is provided for emergency use only. It is a pressure demand type self-contained breathing apparatus with full-faced piece. It is approved for unknown or even explosive levels for purposes of life rescue. It should not be used for routine work. Every effort is being made to lower vinyl chloride ^{concentrations} to less ^{than} one part per million in the vinyl area and to maintain it ^{below} that level. On occasion, the possible ^{level} exposure ^{may} rise above one part per million due primarily to leaking valves, seals, flanges, and to release through ruptured ^{disks} or safety valves. The vapor fraction analyzers located in Buildings 115, 120, ~~and~~ should be checked at regular intervals and especially before entering a questionable area to determine vinyl chloride exposure level. Based on the level, the need for respiratory equipment can be determined. Red } lights are located at each individual pick-up point ~~around the suspension~~ ~~non-solvent area~~. When the vinyl chloride concentration in the area requires the use of respiratory equipment, these red lights will flash. A flashing red light means that you must wear respiratory equipment or leave the area. Normal operations requiring precautions are: auto ~~plate~~ sampling which normally requires wearing of a fresh air mask. Compressor checks may require respirators based on the VFA reading. Connecting or disconnecting hoses to unload vinyl chloride tank cars, requires fresh air respiratory equipment. Sampling of these cars also requires fresh air equipment. Vessel or confined space entry is covered by plant procedure 103. This procedure calls for proper isolation, emptying, electrical lock-out, cleaning, purging, ventilating, and testing of the vessel before entry is allowed. Testing may be performed by either operations or industrial hygiene personnel.

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Entry is not allowed until the test shows a safe atmosphere and a hazardous work permit has been filled out and approved. The opening of a pump, compressor or piping that normally contains vinyl chloride, should follow the same general procedure. No equipment whose contents include vinyl chloride should be emptied directly into the atmosphere without proper authorization to insure all necessary precautions have been taken. If possible, the equipment should be emptied to a part of the process where

it will not enter the atmosphere. When cleaning vessels that contain polyvinyl chloride residues, protective clothing is to be worn to prevent skin contact with PVC residues on vessel walls. In the laboratory,

(Is there any other protective equipment to be worn? respiratory?)

samples containing high levels of vinyl chloride should be opened and handled under a ventilating hood. The use of respirators during fuel

field?

sampling of liquid or vent streams containing vinyl chloride, should be based on VFA readings. The distribution area is also affected by the vinyl chloride regulation since the PVC resins, which are handled in vinyl

shipping, contains some residual vinyl chloride monomer. ~~Although vinyl shipping is not a regulated area, there are some actual areas between~~

of upsets

~~1 and 5 parts per millions lasting less than 15 minutes. These areas apply to suspension and non-solvent vinyl resins and include work~~

~~operations such as opening and closing hatches on loaded hopper cars,~~

~~opening and closing hatches on van boxes, sampling hopper cars, sampling~~

~~van boxes, and opening van boxes to be washed. One particular area of~~

~~concern is the entering of van boxes.~~ Van boxes should not be entered

until after they've been washed. Entering a van box prior to washing

could result in a VCM exposure over the permissible limits. Also, all

? yes
vans should be checked for VCM levels before entering in order to avoid

exposure over the permissible limits. Conditions which may result in a

release of vinyl chloride fall into two general categories: process

upset and equipment failure.

UCC 093635

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Each unit operating manual contains a description of normal operating conditions. Every operator should be familiar enough with his unit to recognize abnormal operating conditions. Some key points to watch are: level gages of vessels containing VCM or other materials with the VCM content, pressure indicators for VCM containing vessels, the temperature recorders for the out of since an uncontrolled reaction might lead to venting and the rectifying column reflex recorders at the solvent unit since loss of reflex might cause an indirect loss of VCM at the compressor traps. Decanting of water from VCM tanks to the #3 stripping tank at the suspension unit requires careful operator attention to be sure that VCM is not released to the atmosphere. Equipment failures are easy to spot but not so easy to predict. The best remedy is a thorough inspection of all processing equipment at least once each shift. Areas to especially watch for are improperly sealed safety valves, process valves which have been left partly opened or leaking, pump compressor or agitator seals which are leaking or any other ^{equipment} condition which is out of the ordinary. In the event of a massive release of vinyl chloride the standard operating procedures will be implemented at once. Key steps in these procedures are:

1. Activate the daily system in the infected area.
2. Alert all personnel to clear the area using the PA system if available. Clear the endangered area of personnel at least 25 feet upwind and 50 feet downwind of the visible vinyl chloride cloud. Personnel should exit crosswind. If the wind direction indicates the endangered area may extend beyond the confines of the particular unit, the chief operator should notify the affected personnel of the danger.
3. Sound the plant fire alarm and toxic gas alarm.
4. Isolate the affected area. If possible, rope the area off and post warning signs. Road blocks should be set up if required.
5. Isolate the relief source by remote valves or pumping arrangements outlined in unit procedures.

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6. Use all available water to disperse the cloud and form a water curtain.
7. Only specially trained personnel equipped with properly protective equipment including skin and respiratory should reenter the area. Obvious sources of ignition such as internal combustion engines, welding machines and so forth should be shut down.
8. If a fire occurs, do not extinguish until the source of fuel is shut off.

Union Carbide is extremely concerned about the health of its employees and has participated actively in the investigation of the vinyl chloride health hazard. There is little dispute that vinyl chloride is carcinogenic to man, but the level of exposure which is hazardous, can now be definitely established with present evidence. Workers who've developed angiosarcoma have all had many years of high level exposures to vinyl chloride. It is well known that exposure levels have been dramatically reduced since the 40's. Further, there has been no evidence that man or animals have developed cancer at exposure levels of less than 50 parts per million. We urge that you protect your health by learning and following the work procedures and practices that have been set forth. Please cooperate with the Industrial Hygiene Monitoring and Medical Surveillance Programs that have been outlined.

UCC 093637