EMERGENCY RESPONSE

REFERENCE MATERIAL

CONCERNING RAILCAR

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EMERGENCY RESPONSE

INTRODUCTION

THIS TRAINING PROGRAM HAS BEEN PREPARED BY DOW CHEMICAL CANADA, INC. FOR THE PURPOSE OF ASSISTING EMERGENCY RESPONSE PERSONNEL IN THE RECOGNITION OF HAZARDS PRESENTED BY CHEMICALS GENERALLY AT EMERGENCY SCENES, AND IN PARTICULAR BY CHEMICALS MANUFACTURED BY DOW CANADA.

IT REPRESENTS ONE PHASE OF A LARGER COOPERATIVE PROGRAM BETWEEN CCPA MEMBERS TO IMPROVE OUR MUTUAL COMPANY KNOWLEDGE AND CAPABILITIES TO RESPOND TO EMERGENCY SCENES INVOLVING CHEMICALS IN THE RAIL MODE.

THROUGHOUT THIS PROGRAM AND WHEN DEALING WITH EMERGENCIES OF ANY KIND IT IS IMPORTANT TO KEEP THE FOLLOWING BASIC PRIORITIES IN MIND:

(1) THE PRESERVATION AND PROTECTION OF HUMAN LIFE
(2) THE MINIMIZATION OF PROPERTY DAMAGE
(3) THE MINIMIZATION OF DAMAGE TO THE ENVIRONMENT

INTRODUCTION (CON'T)

WHEN DEALING WITH CHEMICALS AT TRANSPORTATION EMERGENCY SCENES THESE BASIC PRIORITIES TRANSLATE INTO THE FOLLOWING PRIMARY CONCERNS:

(1) THE NEED TO PREVENT/CONTROL FIRES AND EXPLOSIONS AND TO MINIMIZE THEIR POTENTIAL DAMAGE TO BOTH LIFE AND PROPERTY.

(2) THE NEED TO BE ALWAYS CONSCIOUS OF THE POSSIBILITY OF A VIOLENT REACTION WHEN CHEMICALS ARE INADVERTENTLY MIXED TOGETHER.

(3) THE NEED TO BE CONSTANTLY CONSCIOUS OF THE POTENTIAL HEALTH AND TOXIC EFFECTS OF CHEMICALS AND THEIR PRODUCTS OF COMBUSTION.

(4) THE NEED TO MINIMIZE THE SPREADING OR DILUTION OF POTENTIAL POLLUTANTS INTO THE ENVIRONMENT IN ORDER TO PREVENT UNNECESSARY DAMAGE AND COMPLICATED CLEANUP PROCEDURES.

INTRODUCTION (CON'T)

THIS PROGRAM WILL HIGHLIGHT THE NEED TO BECOME FAMILIAR WITH:

(1) HAZARDS OF CHEMICALS AS DEFINED BY THE CANADIAN DANGEROUS GOODS TRANSPORTATION REGULATIONS

(2) FIRE/PROBLEMS/CONCERNS

(3) INDUSTRIAL HEALTH CONSIDERATIONS

(4) PROTECTIVE EQUIPMENT

(5) CONCERNS AT DERAILMENT SITES

(6) RAIL EQUIPMENT USED BY DOW CANADA

(7) SOURCES OF LEAKS IN TANK CARS

(8) PATCHING

(9) TRANSFERRING

HAZARDS OF CHEMICALS

THE STANDARD OF LIVING WE ENJOY TODAY IS LARGELY DUE TO ADVANCES MADE IN THE FIELD OF CHEMISTRY OVER THE PAST 50 YEARS. MANY NEW PRODUCTS HAVE BEEN SYNTHESIZED DURING THIS PERIOD WHICH HAVE LED TO SIGNIFICANT ADVANCES IN THE FIELDS OF MEDICINE, PHARMACEUTICALS, FOOD PRODUCTION, PEST CONTROL, PROTECTIVE COATINGS AND A HOST OF OTHERS.

THESE ADVANCES HAVE RESULTED FROM APPLYING THE NATURAL CHEMICAL AND PHYSICAL PROPERTIES OF CHEMICALS TO A WIDE VARIETY OF HEALTH AND TECHNOLOGICAL PROBLEMS FACED BY THE WORLD'S HUMAN POPULATION.

IN MANY CASES, THE CHEMICAL AND PHYSICAL PROPERTIES OF A CHEMICAL WHICH MAKE IT "DANGEROUS", ARE THE PROPERTIES WHICH IN TURN MAKE IT MOST USEFUL TO MANKIND WHEN USED UNDER PROPERLY CONTROLLED CONDITIONS BY KNOWLEDGEABLE PEOPLE.

AS THE CHEMICAL INDUSTRY HAS GROWN IN NORTH AMERICA AND THE NUMBER OF CHEMICALS BEING PRODUCED COMMERCIALLY AND TRANSPORTED HAS INCREASED, IT HAS BECOME INCREASINGLY IMPORTANT TO DEVELOP A SYSTEM TO PROPERLY DESCRIBE THE HAZARDS OF DANGEROUS MATERIALS.

HAZARDS OF CHEMICALS (CON'T)

THIS NEED, COUPLED WITH THE GROWTH IN INTERNATIONAL TRADE AND OF MULTIMODAL SHIPMENTS (I.E. PIGGBACK, CONTAINERS) HAS RESULTED IN THE NEED FOR A REGULATORY SYSTEM UNIFORM IN ALL MODES AND IN ALL COUNTRIES.

THE NEW CANADIAN DANGEROUS GOODS REGULATIONS WHICH WILL COME INTO EFFECT IN 1982, REPRESENT A MAJOR STEP IN THIS DIRECTION.

UNDER THE NEW CANADIAN CODE, WHICH ADOPTS THE UNITED NATIONS CLASSIFICATION SYSTEM, DANGEROUS GOODS ARE GROUPED INTO THE FOLLOWING EIGHT BROAD HAZARD CLASSES WITH A NINTH CLASS IDENTIFIED FOR THOSE SUBSTANCES WHICH DO NOT FALL INTO THE FIRST EIGHT BUT NEVERTHELESS PRESENT RISKS TO PUBLIC SAFETY:

1. EXPLOSIVES

2. GASES

3. FLAMMABLE AND COMBUSTIBLE LIQUIDS

4. FLAMMABLE SOLIDS, SPONTANEOUSLY COMBUSTIBLE, DANGEROUS WHEN WET

5. OXIDIZING SUBSTANCES AND ORGANIC PEROXIDES

6. POISONOUS AND INFECTIOUS SUBSTANCES

7. RADIOACTIVE MATERIALS

8. CORROSIVES

9. MISCELLANEOUS DANGEROUS SUBSTANCES

HAZARDS OF CHEMICALS (CON'T)

EACH OF THE NINE CLASSES IS IN TURN BROKEN DOWN INTO "DIVISIONS" TO FURTHER DEFINE THE DANGER PRESENT.

LABELS AND PLACARDS, UTILIZING SYMBOLS RATHER THAN WORDS TO DESIGNATE THE PRINCIPLE HAZARDS, ARE ASSIGNED TO EACH "CLASS" OR "DIVISION" WITHIN A CLASS.

FOR BULK SHIPMENTS, A SERIAL NUMBER (I.E. UNITED NATIONS NUMBER) SPECIFIC TO THE PRODUCT OR FAMILY OF PRODUCTS WILL BE REQUIRED IN THE CENTRE OF THE PLACARD OR ON A SEPARATE ORANGE RECTANGULAR PANEL LOCATED CLOSE TO THE PLACARD.

IN ADDITION TO THE CLASS PLACARDS, THERE ARE ALSO "EMPTY" AND "DANGER" PLACARDS. THE "EMPTY" PLACARD IS REQUIRED FOR TANK CARS FOLLOWING UNLOADING AND UNTIL THEY HAVE BEEN CLEANED OR RELOADED. THE "DANGER" PLACARD IS REQUIRED WHERE A VARIETY OF DANGEROUS GOODS ARE BEING CARRIED IN A CONTAINER BUT NONE OF THEM IN INDIVIDUALLY PLACARDABLE QUANTITITES.

FOR A MORE THOROUGH KNOWLEDGE OF THE CLASSIFICATION AND IDENTIFICATION SYSTEM PROPOSED, PERSON'S INVOLVED IN TRANSPORTATION EMERGENCY RESPONSE NEED TO BE FAMILIAR WITH UNIT 3 OF TRANSPORT CANADA'S "TRANSPORTATION OF DANGEROUS GOODS EMERGENCY RESPONSE", TRAINING PROGRAM.

FIRE PROBLEMS

OBJECTIVE

FOLLOWING THE NEXT FEW PAGES YOU SHOULD BE ABLE TO:

1. LIST THE ELEMENTS OF THE FIRE TRIANGLE
2. LIST THE CLASSES OF FIRE
3. DISCUSS FLASH POINT
4. DISCUSS FLAMMABLE LIMITS
5. KNOW ABOUT VAPOUR CLOUDS
6. KNOW ABOUT B.L.E.V.E.S.

UNDERSTANDING FIRE

RAIL TRANSPORTATION, BECAUSE OF ITS VAST DIVERSITY OF CARGO CARRIED, CAN BE CONSIDERED AS HAVING THE POTENTIAL FOR LARGE DANGEROUS FIRES. IN SOME CASES, IF A DERAILMENT HAPPENS, FIRES WILL START INSTANTLY, AT OTHER TIMES, WITH A LITTLE KNOWLEDGE, A SERIOUS FIRE COULD BE PREVENTED OR EXTINGUISHED WHEN THE BASIC CHARACTERISTICS OF FIRE BEHAVIOUR IS UNDERSTOOD.

CHEMISTRY OF FIRE

FIRE, SIMPLY STATED IS THE COMBINING OF THREE ELEMENTS TO CREATE WHAT WE VISIBLY SEE AS FLAMES AND THE EFFECT WE FEEL WHICH IS HEAT.

THE THREE ELEMENTS ARE:

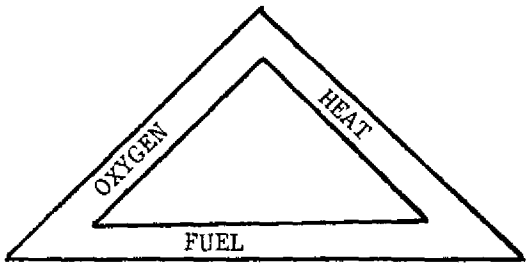
FUEL - THEORETICALLY, EVERYTHING CAN BE CONSUMED (BURNED) IN A FIRE; OF GREATER IMPORTANCE IS TO KNOW THAT FUEL, WHILE IT CAN BE ANY SUBSTANCE, MUST FIRST BE VAPOURIZED BEFORE IT CAN COMBINE WITH THE OTHER ELEMENTS TO PRODUCE COMBUSTION (BURNING).

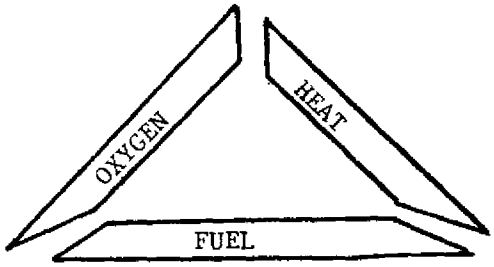
OXYGEN - ATMOSPHERE CONTAINS 21% OXYGEN. FIRE MUST HAVE AN ADEQUATE SUPPLY OF OXYGEN TO SUSTAIN THE PROCESS OF COMBUSTION. (AT LEAST 16%)

HEAT - HEAT IS THE ENERGY NEEDED TO INITIATE AND SUSTAIN THE CHEMICAL REACTION PROCESS CALLED FIRE. THE IGNITION TEMPERATURE VARIES FROM FUEL TO FUEL, AS WILL THE AMOUNT OF HEAT REQUIRED TO CAUSE VAPOURIZATION.

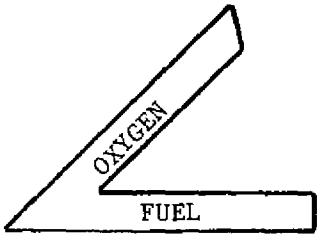
FIRE TRIANGLE

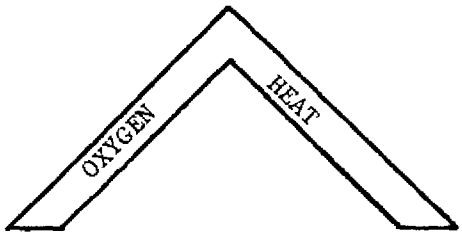
THE THREE ELEMENTS CAN BE PICTORIALLY DESCRIBED AS A TRIANGLE SHOWING THEIR FORMING TOGETHER TO PRODUCE COMBUSTION.

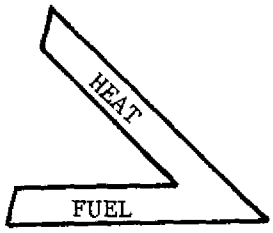




IF THE THREE ELEMENTS JOINED TOGETHER CAN CAUSE FIRE, THEN THE CONTROL OR THE BREAKING APART OF THE ELEMENTS CAN CONTROL OR EXTINGUISH A FIRE.







1. REMOVAL OF HEAT BY ELIMINATING IGNITION SOURCES OR COOLING MATERIAL (WATER, FOAM).

2. REMOVAL OF FUEL - PLUGGING, CLOSING VALVE, DYKING, ETC.

3. REMOVAL OF OXYGEN BY SMOTHERING (FOAM) OR BY DILUTION (CO_2 - NITROGEN).

CLASSES OF FIRES

TO BETTER UNDERSTAND WHAT'S BURNING, FIRES ARE PUT TOGETHER IN CLASSES WITH COMMON BURNING AND EXTINGUISHING CHARACTERISTICS.

"A" CLASS - WOOD, PAPER, TEXTILES, PLASTICS, RUBBER - ORDINARY COMBUSTIBLES, (EXTINGUISHED BY COOLING - WATER).

"B" CLASS - OILS, GREASE, VARSOL, GASOLINE, ALCOHOL - FLAMMABLE LIQUIDS (EXTINGUISHED BEST BY EXCLUDING OXYGEN, SMOTHERING - CO_2 FOAM, DRY CHEMICAL).

"C" CLASS - CHARGED ELECTRICAL EQUIPMENT; ONCE POWER HAS BEEN SHUT OFF, THE FIRE BECOMES ANOTHER CLASSIFICATION. MAIN CONCERN IS TO USE EXTINGUISHING AGENT WHICH IS A NON-CONDUCTOR OF ELECTRICITY - CO_2, DRY CHEMICAL.

"D" CLASS - METAL FIRES SUCH AS MAGNESIUM, ALUMINUM, SODIUM, ETC. - SPECIAL EXTINGUISHING AGENTS ARE REQUIRED.

FLASH POINTS

FLASH POINT IS A TERM USED IN CONJUNCTION WITH FLAMMABLE LIQUIDS.

THE DEFINITION OF "FLASH POINT" IS: "THE LOWEST TEMPERATURE AT WHICH A FLAMMABLE LIQUID GIVES OFF VAPOURS IN AIR TO FORM AN IGNITABLE MIXTURE". THE LOWER THE FLASH POINT, THE MORE HAZARDOUS THE LIQUID I.E. GASOLINE, -45°F, KEROSENE +100°F, MOTOR OIL +450°F.

LIQUIFIED GASES SUCH AS PROPANE, BUTANE, ETC. ARE NOT THOUGHT OF AS HAVING A FLASH POINT SINCE THEY ARE NEARLY ALWAYS IN A VAPOUR STATE WHEN RELEASED FROM THEIR CONTAINER AT NORMAL ATMOSPHERIC TEMPERATURES AND PRESSURES.

FLAMMABLE LIMITS

A DIRECT RELATIONSHIP BETWEEN FLASH POINT AND FLAMMABLE LIMITS EXISTS FROM THIS POINT OF VIEW; FLAMMABLE LIMITS IS A MIXTURE OF FLAMMABLE VAPOURS IN AIR, THE MIXTURE CAN BE "TOO LEAN" TO BURN OR SUPPORT COMBUSTION. THIS IS THE EXTREME END OF THE LOWER FLAMMABLE LIMIT, OR THE MIXTURE CAN BE "TOO RICH" TO BURN WHERE THE FLAMMABLE VAPOURS OF THE PRODUCT ARE IN SUCH MASSIVE CONCENTRATION IT DISPLACES THE AIR NEEDED FOR BURNING. BETWEEN THESE TWO EXTREMES EXISTS THE FLAMMABLE RANGE WHERE THE CONCENTRATION OF VAPOURS, ON FINDING AN IGNITION SOURCE WILL EITHER BURN WITH GREAT INTENSITY OR EXPLODE VIOLENTLY. FLAMMABLE LIMITS ARE ALSO KNOWN AS "THE EXPLOSIVE RANGE". FOR EXAMPLE, GASOLINE HAS AN "EXPLOSIVE RANGE" OF 1.4% (LOWER) TO 7.6% (UPPER). AT 2.5% GASOLINE EXPLODES VIOLENTLY. OTHERWISE, YOUR CAR WOULD NOT RUN PROPERLY.

VAPOUR CLOUDS

VAPOUR CLOUDS ARE USUALLY ASSOCIATED WITH LIQUIFIED GASES (PROPANE, NATURAL GAS, CHLORINE ETC.). VAPOUR CAN ALSO BE ASSOCIATED WITH VOLATILE LIQUIDS. MOST ORGANIC CHEMICALS ARE HEAVIER THAN AIR, CAN FORM POCKETS OF HIGH CONCENTRATION IN LOW AREAS, AND MOVE EASILY WITH AIR CURRENTS TO FIND AN IGNITION SOURCE.

LIQUIFIED GAS, AT THE MOMENT OF RELEASE, EXPAND MANY TIMES THEIR VOLUME (I.E. PROPANE 270 TIMES), WHICH RISES UPWARD AND OUTWARD, SEARCHING FOR AN IGNITION SOURCE. ONCE AN IGNITION SOURCE IS ENCOUNTERED THE GAS WILL FLASH BACK VIOLENTLY TO THE POINT OF RELEASE. THE OUTER EDGE OF A CLOUD IS NEARLY ALWAYS WITHIN THE FLAMMABLE RANGE. VAPOUR CLOUDS ARE EXTREMELY DANGEROUS AND ARE MANIPULATED BY WEATHER CONDITIONS.

B.L.E.V.E.

THE WORD B.L.E.V.E. IS AN ACRONYM FOR "BOILING LIQUID EXPANDING VAPOUR EXPLOSION" AND HAS BECOME WIDELY KNOWN AS A RESULT OF THE SPECTACULAR EXPLOSIONS OFTEN ASSOCIATED WITH TRAIN DERAILMENTS INVOLVING FLAMMABLE GASES.

A B.L.E.V.E. CAN OCCUR WHEN A CONTAINER, TANK, TANKCAR IS INVOLVED WITH FIRE, OTHER FORMS OF HEAT OR MECHANICAL INJURY. IF THE VESSEL IS INVOLVED IN A FIRE AND THE FIRE IMPINGES ON THE VAPOUR SPACE WHICH HAS NO MEANS TO ABSORB OR DISSIPATE THE HEAT, THE STEEL WALL OF THE VESSEL HEATS UP RAPIDLY, WEAKENING AND CAUSING SUDDDEN FAILURE. AT THAT MOMENT THE CONTAINER IS TORN APART BY THE HIGH INTERNAL PRESSURES, THE LIQUID RAPIDLY FLASHES TO A VAPOUR EXPANDING AT HIGH SPEED, PROPELLING CONTAINER PIECES, CREATING SHOCK WAVES AND AT THE SAME TIME, ENVELOPING THE AREA IN A MASS OF FLAMES THAT RISES IN A HUGE FIREBALL. THIS SHORT LIVED EFFECT CAN HAVE DESTRUCTIVE CAPABILITIES UP TO ONE MILE.

INDUSTRIAL HEALTH CONSIDERATIONS OF CHEMICALS

IN THIS SECTION WE WILL REVIEW THE RELEVANT HFALTH CONSIDERATIONS OF INDUSTRIAL CHEMICALS SHIPPED BY RAIL WITH PARTICULAR EMPHASIS ON THOSE INDUSTRIAL HYGIENE ASPECTS OF CONCERN FOR PERSONNEL RESPONDING TO AND DEALING WITH TRANSPORTATION EMERGENCIES INVOLVING THESE MATERIALS.

TO BETTER UNDERSTAND THE HEALTH CONSIDERATIONS ASSOCIATED WITH THESE MATERIALS, IT IS NECESSARY TO SPEND A FEW MINUTES DEFINING SOME IMPORTANT TERMINOLOGY THAT WILL BE USED OVER AND OVER AGAIN. I'D FIRST LIKE TO SPEND A FEW MINUTES TALKING ABOUT TWO TERMS, TOXICITY AND HAZARD. THESE TERMS ARE FINDING THEIR WAY INTO EVERYDAY LANGUAGE, HOWEVER, THEY ARE VERY OFTEN MISUSED AND MISUNDERSTOOD.

FIRST, WHAT'S TOXICITY? THE DEFINITION OF TOXICITY IS THAT IT IS THE ABILITY OF A MATERIAL OR CHEMICAL TO PRODUCE INJURY TO A LIVING ORGANISM. THERE ARE TWO IMPORTANT FEATURES TO REMEMBER ABOUT TOXICITY.

FIRST IS THAT EVERY CHEMICAL IS TOXIC. THE TOXICITY OF A CHEMICAL IS AS MUCH PROPERTY OF THAT MATERIAL AS ITS BOILING POINT, MELTING POINT, VAPOUR PRESSURE AND SO ON. TOXICITY IS AN INTRINSIC PROPERTY OF A CHEMICAL - MEANING IT CANNOT BE CHANGED OR ALTERED. HOWEVER THERF ARE RELATIVE DEGREES OF TOXCITY. ONE CHEMICAL MAY BE MORE TOXIC THAN ANOTHER.

THE SECOND POINT TO REMEMBER WAS APTLY DEFINED BY A SWISS SCIENTIST, PARACELCUS, BACK IN THE 16TH CENTURY WHO SAID, "ONLY THE DOSE CREATES THE POISON". THAT IS, IN ORDER FOR A MATERIAL TO PRODUCE A TOXIC EFFECT, IT MUST GET INTO THE BODY IN SUFFICIENT QUANTITITES. EVEN CHEMICALS WE GENERALLY TAKE FOR GRANTED AS BEING ESSENTIAL FOR LIFE SUCH AS SALT AND VITAMINS ARE TOXIC AT HIGH DOSES. PRESCRIPTION OR THERAPEUTIC DRUGS HAVE A TOXIC POTENTIAL - IN APPROPRIATE DOSAGE THEY

PRODUCE THE DESIRED EFFECTS - IN LARGER EXCESSIVE DOSES THEY ARE TOXIC - CAPABLE OF PRODUCING UNDESIRABLE, AND POTENTIALLY VERY SERIOUS ADVERSE EFFECTS.

TO REVIEW THEN, ALL CHEMICALS HAVE THE ABILITY TO PRODUCE TOXIC EFFECTS, PROVIDED THEY ENTER A LIVING SYSTEM IN SUFFICIENT QUANTITITES. ITS APPROPRIATE HERE TO ALSO DEFINE TWO ADDITIONAL TERMS. ACUTE AND CHRONIC.

ACUTE TOXIC EFFECTS RESULT FROM EXPOSURE TO A CHEMICAL WHICH IS OF RELATIVELY SHORT DURATION. THIS LENGTH OF EXPOSURE MAY BE A MATTER OF MINUTES, HOURS OR EVEN DAYS. ACUTE EFFECTS ARE USUALLY CHARACTERIZED AS BEING RELATIVELY IMMEDIATE, IN OTHER WORDS, THEY OCCUR WITHIN A SHORT TIME OF THE EXPOSURE. EXAMPLES OF THIS TYPE OF EFFECT INCLUDE EYE IRRITATION, SKIN BURNS, RESPIRATORY IRRITATION AND SO ON. IT IS THE ACUTE AFFECTS, THE ACUTE-TYPE (SHORT-TERM) EXPOSURES WHICH ARE OF CONCERN IN A TRANSPORTATION EMERGENCY INVOLVING A CHEMICAL SPILL.

CHRONIC TOXIC EFFECTS ARE THE RESULT OF LONG-TERM CONTINUOUS EXPOSURE. IN THIS CASE WE ARE TALKING ABOUT REPEATED CONTINUOUS EXPOSURE OVER PERIODS OF DAYS, WEEKS, MONTHS, YEARS AND EVEN WORKING LIFETIMES. THE EFFECTS DEVELOP MORE SLOWLY OVER A LONG PERIOD OF TIME, AND ARE THE CONSEQUENCE OF CERTAIN BODY SYSTEMS BREAKING DOWN OR BEING UNABLE TO EFFECTIVELY METABOLIZE THE REPEATED EXCESSIVE DOSES. IT IS THIS LONG-TERM, CHRONIC EXPOSURE WHICH IS OF PRINCIPLE CONCERN IN A PETRO-CHEMICAL PLANT ENVIRONMENT.

ITS PERHAPS APPROPRIATE HERE TO ILLUSTRATE THE DIFFERENCE BETWEEN THESE TWO TYPES OF EFFECTS WITH AN EXAMPLE USING ONE OF THE MATERIALS SHIPPED BY RAIL BY DOW CHEMICAL. VINYL CHLORIDE MONOMER. IN THE OCCUPATIONAL ENVIRONMENT THE PRIME ROUTE ENTRY INTO THE BODY FOR VINYL CHLORIDE MONOMER IS THROUGH INHALATION, THAT IS BREATHING IN THE VAPOURS.

THE ACUTE EFFECT OF OVER EXPOSURE TO VINYL CHLORIDE MONOMER IS CHARACTERIZED BY ITS ANESTHETIC EFFECT. IN OTHER WORDS, IF AN INDIVIDUAL IS EXPOSED EVEN FOR RELATIVELY SHORT PERIODS OF TIME, 30 MINUTES TO AN HOUR TO VERY HIGH CONCENTRATIONS OF THE MATERIAL, FOR EXAMPLE GREATER THAN 4 TO 5 THOUSAND PARTS PER MILLION, THE EFFECTS OBSERVED MIGHT BE DIZZINESS, DROWSINESS AND, IF EXPOSURE WAS PROLONGED AND THE CONCENTRATION INCREASED, ULTIMATELY UNCONCIOUSNESS. THESE EFFECTS, HOWEVER, ARE TEMPORARY AND REVERSIBLE IN THAT IF THE INDIVIDUAL WAS REMOVED FROM EXPOSURE, THE EFFECTS WOULD ULTIMATELY DISAPPEAR WITH NO PERMANENT LASTING DAMAGE.

THE MOST WIDELY KNOWN CHRONIC TOXIC EFFECTS OF VINYL CHLORIDE ARE ITS POTENTIAL TO AFFECT LIVER FUNCTION, AND IN SOME CASES OF PROLONGED EXCESSIVE EXPOSURE, PRODUCE A PARTICULAR FORM OF LIVER CANCER CALLED ANGIOSARCOMA. THE HISTORY OF THIS DISEASE IS PRIMARILY ASSOCIATED WITH POLYVINYL CHLORIDE INDUSTRY. TWENTY TO THIRTY YEARS AGO IN THE POLYVINYL CHLORIDE INDUSTRY, WORKERS WERE REQUIRED TO MANUALLY CLEAN OUT REACTING KETTLES WHERE VINYL CHLORIDE MONOMER WAS REACTED TO PRODUCE POLYVINYL CHLORIDE RESIN. AS A RESULT OF THIS REPEATED EXCESSIVE EXPOSURE WHICH TOOK PLACE OVER MANY YEARS, SOME WORKERS CONTRACTED ANGIOSARCOMA.

I'D LIKE TO TAKE A FEW MOMENTS HERE TO DEAL WITH SOME IMPORTANT CONSIDERATIONS REGARDING CARCINOGENS - THE NAME GIVEN TO THOSE AGENTS WHICH CAN PRODUCE CANCER. WHILE THERE IS NO DISPUTING THE FACT THAT CANCER IS A VERY SERIOUS TOXIC EFFECT, IT IS JUST ONE OF A NUMBER OF POTENTIAL TOXIC EFFECTS WHICH CAN RESULT FROM OVER-EXPOSURE TO A CARCINOGEN, WHICH ALSO NEED TO BE CONSIDERED.

THE SECOND AND PERHAPS MOST IMPORTANT POINT IS THAT THE SCIENTIFIC EVIDENCE ON CARCINOGENS DEMONSTRATES THAT CANCER RESULTS FROM LONG TERM, THAT IS, CHRONIC OVER-EXPOSURE. THE AVAILABLE EVIDENCE DOES NOT SUPPORT THE NOTION THAT SINGLE OR EVEN REPEATED EXPOSURES OF SHORT DURATION, THAT IS TO SAY ACUTE EXPOSURES, ARE RESPONSIBLE FOR CANCER INDUCTION.

TO SUMMARIZE, IN THE CASE OF TRANSPORTATION EMERGENCY INVOLVING ANY INDUSTRIAL CHEMICAL THE PRINCIPAL TOXIC EFFECTS OF CONCERN BOTH FOR WORKERS RESPONDING TO THE EMERGENCY, AS WELL AS THE RESIDENTS NEARBY THE SCENE OF A DERAILMENT ARE WITHOUT DOUBT, THE ACUTE EFFECTS. THIS IS, THOSE EFFECTS THAT CAN RESULT FROM SHORT TERM EXPOSURE.

I'D LIKE TO TURN TO DISCUSSING THE TERM "HAZARD". THE FIRST THING I SHOULD LIKE TO POINT OUT IS THAT TOXICITY AND HAZARD ARE NOT SYNONYMOUS, THAT IS, THEY DO NOT MEAN THE SAME THING.

SIMPLY PUT, THE HEALTH HAZARD OR THE RISK POSED BY EXPOSURE TO A CHEMICAL, IS THE PRODUCT OF EXPOSURE AND TOXICITY. TO ASSESS THE HEALTH HAZARD WE MUST CONSIDER THREE DISTINCT, BUT RELATED FACTORS.

FIRST IS THE TOXICITY OF THE CHEMICAL, SECOND IS THE CHEMICAL OR PHYSICAL PROPERTIES OF THAT MATERIAL WHICH WILL INFLUENCE HOW READILY IT CAN GET INTO LIVING ORGANISMS. AND THIRD IS THE POTENTIAL FOR EXPOSURE TO THE MATERIAL. NOTE THAT WHILE TOXICITY IS ONE OF THE FACTORS TO BE CONSIDERED, IT IS ONLY ONE AND NOT **THE** ONLY ONE!

LETS SPEND A FEW MINUTES TALKING ABOUT THE OTHER TWO. THE WAY IN WHICH THESE TWO FACTORS INFLUENCE THE DEGREE OF HAZARD POSED BY A CHEMICAL IN ANY GIVEN SITUATION IS PROBABLY BEST ILLUSTRATED BY WAY OF EXAMPLE.

IF WE TAKE A MATERIAL WHICH IS A SOLID AT NORMAL TEMPERATURES AND PRESSURES, IN THIS CASE **PHENOL** IS A GOOD EXAMPLE, AND IF WE ALSO ASSUME THE PRINCIPAL TOXIC EFFECTS ASSOCIATED WITH THAT CHEMICAL RESULT FROM EXPOSURE TO THE VAPOURS OF THE MOLTEN MATERIAL, THEN IN A SITUATION INVOLVING A SPILL OF THE SOLID, THE POTENTIAL HEALTH HAZARD IS MINIMIZED. WHY? - BECAUSE THE MATERIAL IS IN A SOLID STATE WITH LITTLE POTENTIAL FOR INHALATION OF THE VAPOURS, PROVIDED ATTENTION IS PAID TO MINIMIZING DIRECT SKIN CONTACT AND EXPOSURE TO THE DUST.

IF ON THE OTHER HAND, WE TAKE THE EXAMPLE OF A MATERIAL SUCH AS A COMPRESSED GAS, FOR EXAMPLE **ANHYDROUS AMMONIA**, WHERE THE PRIMARY TOXIC EFFECTS RESULT FROM INHALATION OF VAPOURS, THEN IN THE CASE OF A TRANSPORTATION EMERGENCY INVOLVING A SPILL OF THIS GAS THE POTENTIAL HEALTH HAZARD IS MUCH GREATER. WHY? - BECAUSE THE OPPORTUNITY FOR EXPOSURE EXISTS.

MINIMIZING THE HEALTH HAZARD POSED BY THIS SITUATION, WOULD REQUIRE THE REMOVAL OF ALL UNNECESSARY PERSONNEL UP WIND OF THE SPILL AND EQUIPPING PERSONNEL WHO HAD TO WORK IN THE AREA WITH APPROPRIATE PRESSURE DEMAND SELF-CONTAINED BREATHING APPARATUS.

YOU NOTICE THAT WE HAVE DONE NOTHING TO REDUCE THE TOXICITY OF THE MATERIAL, THE TOXIC POTENTIAL STILL EXISTS. HOWEVER, WE HAVE REDUCED THE HEALTH HAZARD POSED BY PROTECTING THE WORKERS INVOLVED.

THIS IS THE FUNDAMENTAL PRINCIPLE THAT IS USED IN ALL INDUSTRIAL HYGIENE CONTROL SYSTEMS. THAT IS, THAT THE POTENTIAL HEALTH HAZARD IS MINIMIZED BY CONTROLLING HOW THE CHEMICAL IS USED, TAKING ADVANTAGE OF ITS CHEMICAL AND PHYSICAL PROPERTIES IF POSSIBLE, AND MINIMIZING THE POTENTIAL FOR EXPOSURE.

WE WILL REVIEW SOME SYMPTONS OF EXPOSURE TO TOXIC QUANTITIES OF VARIOUS CLASSES OF CHEMICALS IN A FEW MOMENTS.

PROTECTIVE EQUIPMENT

LET'S NOW SPEND A FEW MOMENTS DISCUSSING THE TYPES AND USE OF PROTECTIVE EQUIPMENT WHICH MIGHT BE REQUIRED AT A TRANSPORTATION EMERGENCY INVOLVING CHEMICALS. THERE ARE TWO BASIC TYPES OF PROTECTIVE EQUIPMENT REQUIRED:

1) CLOTHING AND EQUIPMENT TO PREVENT THE MATERIAL FROM DIRECTLY CONTACTING SKIN AND EYES,

AND 2) EQUIPMENT TO PROTECT AGAINST INHALATION OF AIRBORNE MATERIALS.

BEFORE DISCUSSING EACH TYPE IN MORE DETAIL I WOULD LIKE TO MENTION A FEW POINTS REGARDING PROTECTIVE EQUIPMENT IN GENERAL.

FIRST THE EQUIPMENT USED MUST BE APPROPRIATE FOR THE CHEMICALS OF CONCERN. THIS IS ESPECIALLY IMPORTANT WHEN SELECTING PROTECTIVE CLOTHING, GLOVES, BOOTS, ETC., SINCE THE MATERIALS OF CONSTRUCTION MUST BE RESISTANT TO THE CHEMICALS INVOLVED. IN THE CASE OF CARTRIDGE TYPE RESPIRATORS IT IS IMPORTANT THAT THE CARTRIDGE BE APPROVED FOR THE AGENT IN QUESTION. INFORMATION REGARDING THE SPECIFIC TYPE OF EQUIPMENT TO BE USED, IS BEST OBTAINED FROM THE EMERGENCY RESPONSE DATA SHEETS OR MATERIAL SAFETY DATA SHEETS AVAILABLE FOR THE CHEMICALS OR BY CONTACTING THE MANUFACTURER DIRECTLY.

THE SECOND POINT IS THAT TO EFFECTIVELY USE ANY TYPE OF PROTECTIVE EQUIPMENT REQUIRES SOME DEGREE OF TRAINING AND EXPERIENCE. THE EFFECTIVE USE OF SELF-CONTAINED BREATHING APPARATUS, (SCOTT PAKS) FOR EXAMPLE, REQUIRES A HIGH LEVEL OF TRAINING IN PROPER FIT, USE, KNOWLEDGE OF ITS LIMITATIONS, AND PRACTICE IN ITS USE. THIS TRAINING NEEDS TO BE REGULARLY REPEATED FOR THOSE PEOPLE WHO DO NOT FREQUENTLY HAVE TO USE IT.

THE THIRD GENERAL POINT TO MENTION HERE IS THAT MOST PROTECTIVE EQUIPMENT CAN INTRODUCE RESTRICTIONS IN MOVEMENT, VISIBILITY AND SO ON. THE EFFECT OF THIS IS GREATER FOR THOSE PEOPLE WHO ARE NOT USED TO WEARING IT. THIS IS A VERY IMPORTANT SAFETY CONSIDERATION IN AND AROUND THE SITE OF A DERAILMENT.

THE LAST POINT I'D LIKE TO STRESS IS THAT NO MATTER HOW APPROPRIATE THE EQUIPMENT ITSELF IS TO THE PARTICULAR SITUATION, NO MATTER HOW SKILLED OR EXPERIENCED THE WEARERS, NO AMOUNT OF PROTECTIVE EQUIPMENT CAN REDUCE THE NEED FOR COMMON SENSE IN WORKING WHEN WEARING IT. IT SHOULD BE REGARDED AS SUPPLEMENTAL PROTECTION, AND EFFORTS SHOULD FOCUS ON DOING EVERYTHING THAT CAN PRACTICALLY BE DONE TO MINIMIZE THE POSSIBILITY OF EXPOSURE.

PROTECTIVE CLOTHING CAN RANGE FROM SIMPLE BODY COVERING WORK CLOTHING SUCH AS COVERALLS TO IMPERIABLE, CHEMICAL-RESISTANT "ACID SUITS". ITS PRINCIPLE FUNCTION IS TO SERVE AS A BARRIER BETWEEN THE WEARER AND THE MATERIALS HE MAY BE WORKING WITH. IT SHOULD BE CONSTRUCTED OF MATERIALS WHICH ARE RESISTANT TO THE AGENT IN QUESTION - FOR EXAMPLE PVC RAIN SUITS ARE SUITABLE FOR ACIDS AND CAUSTICS. HOWEVER THEY ARE NOT SUITABLE FOR ETHYLENE DICHLORIDE. FOR THE LATTER, NEOPRENE OR POLYVINYL ALCOHOL CONSTRUCTION IS RECOMMENDED. THE CLOTHING SHOULD FIT WELL AND NOT RESTRICT MOVEMENT. HOWEVER, CARE MUST BE TAKEN TO MINIMIZE THE POTENTIAL FOR LEAKAGE. THIS CAN OCCUR BETWEEN GLOVES AND SLEEVES OR BOOTS AND LEGS. IN THE CASE OF GLOVES, PLASTIC GAUNTLET INSERTS ARE AVAILABLE TO PREVENT LIQUID FROM ENTERING THE TOP OF THE GLOVES. CUFFS OF SLEEVES CAN ALSO BE TAPED TO THE GLOVES AS AN ADDITIONAL PRECAUTION. IN THE CASE OF BOOTS, PANT LEGS SHOULD EXTEND OVER THE BOOT TOP - AND AGAIN THEY CAN BE TAPED. THE WEARING OF LEATHER BOOTS IN AREAS OF A CHEMICAL SPILL SHOULD BE AVOIDED. WHENEVER CLOTHING BECOMES CONTAMINATED IT SHOULD BE REMOVED THEN WASHED OR CLEANED PRIOR TO RE-USE.

EYE AND FACE PROTECTION INCLUDES CHEMICAL WORKERS' GOGGLES AND FACESHIELDS. THESE SHOULD BE WORN WHENEVER THE POTENTIAL FOR CONTACT WITH MISTS OR LIQUIDS EXIST. GAS-TIGHT GOGGLES OR FULL FACE RESPIRATORY PROTECTION IS THE MINIMUM REQUIREMENT WHEN DEALING WITH IRRITATING OR CORROSIVE GASES OR VAPOURS SUCH AS ANHYDROUS HCL OR CHLORINE.

SHOWN HERE ARE THE VARIOUS TYPES OF RESPIRATORY PROTECTION - FROM THE LEFT THEY ARE THE ORI-NASAL CARTRIDGE RESPIRATOR; IN THE LEFT FOREGROUND, A MOUTHBIT CARTRIDGE RESPIRATOR, A FULL-FACE CARTRIDGE RESPIRATOR AND A SELF-CONTAINED BREATHING APPARATUS (SCOTT PAK). MOUTHBIT RESPIRATORS, WHILE COMPARATIVELY EASY TO USE, ARE LEAST APPROPRIATE IN AN EMERGENCY EXCEPT AS AN ESCAPE DEVICE.

ORI-NASAL CARTRIDGE MASKS ARE NEXT UP THE SCALE IN THE DEGREE OF PROTECTION OFFERED. THEIR EFFECTIVE USE AS A PROTECTIVE DEVICE DEPENDS ON HOW GOOD A FIT THE WEARER ACHIEVES. ANY AMOUNT OF FACIAL HAIR AFFECTS THE INTEGRITY OF THE SEAL. IN ADDITION THEY HAVE A LIMITED LIFE WHICH VARIES FROM A FEW MINUTES TO A FEW HOURS DEPENDING ON THE CONCENTRATIONS THEY ARE USED IN. THE TYPE OF CARTRIDGE IS EXTREMELY IMPORTANT - AND ONLY THOSE CARTRIDGE APPROVED FOR THE PARTICULAR AGENT MUST BE USED.

THE NEXT ORDER OF RESPIRATORY PROTECTION IS THE SELF-CONTAINED AIR SUPPLIED BREATHING APPARATUS OR SCOTT PAK. THESE OFFER THE HIGHEST DEGREE OF PROTECTION - BUT AGAIN, THEIR EFFECTIVENESS DEPENDS UPON PROPER FIT AND EXPERIENCE IN THEIR USE. THEY DO OFFER MOBILITY COUPLED WITH INTEGRATED EYE AND FACE PROTECTION. THEY ARE HOWEVER HEAVY AND HAVE A LIMITED AIR SUPPLY. IF USED IN THE DEMAND MODE THEY MAY LAST 30 - 35 MINUTES DEPENDING ON THE LEVEL OF EXERTION. IF USED IN THE PRESSURE-DEMAND MODE (I.E. A CONSTANT FLOW OF AIR TO MASK WHICH PREVENTS ENTRAINMENT OF GASES IN THE CASE OF POOR FIT EG. BEARDS), THEIR USEFUL LIFETIME CAN BE REDUCED BY <u>50%</u> <u>OR</u> <u>MORE!!</u>

AIR-SUPPLIED FULL-FACE RESPIRATORS OR "HOSE-LINE" UNITS EXTEND THE LENGTH OF TIME THE RESPIRATOR CAN BE USED (BECAUSE OF LARGER AIR SUPPLY) BUT THE HOSE ITSELF CAN BE AWKWARD AND INTRODUCE SAFETY HAZARDS.

I'D NOW LIKE TO SPEND A FEW MOMENTS GENERALLY DISCUSSING MEDICAL AID AND TREATMENT. IN THE EVENT OF A DERAILMENT AND SPILL INVOLVING CHEMICALS, ONE OF THE FIRST ORDERS OF BUSINESS SHOULD BE TO IDENTIFY THE NEAREST AVAILABLE MEDICAL CLINIC OR HOSPITAL. HAVING DONE THIS, ADDITIONAL INFORMATION REGARDING THE PROPER TREATMENT AND CARE OF PEOPLE WHO HAVE BEEN EXPOSED TO THESE AGENTS IS AVAILABLE TO THE TREATING PHYSICIAN FROM DOW MEDICAL STAFF. THIS INFORMATION IS ALSO INCLUDED IN THE MATERIAL SAFETY DATA SHEETS DOW CHEMICAL HAS PREPARED FOR EACH OF ITS PRODUCTS.

SOME ON THE SPOT ACTIONS CAN OF COURSE BE TAKEN TO MINIMIZE THE EFFECTS OF CHEMICAL EXPOSURE.

IN CASES WHERE LIQUID OR MISTS HAVE CONTACTED THE EYES OR SKIN THE BEST COURSE OF ACTION IS TO PROMPTLY AND THOROUGHLY WASH OR FLUSH THE AREA WITH COPIOUS AMOUNTS OF PLAIN, TEPID WATER. THIS WASHING SHOULD LAST 15 - 30 MINUTES MINIMUM - FOLLOWED BY TAKING THE INDIVIDUAL IMMEDIATELY TO OBTAIN EXPERT MEDICAL ATTENTION.

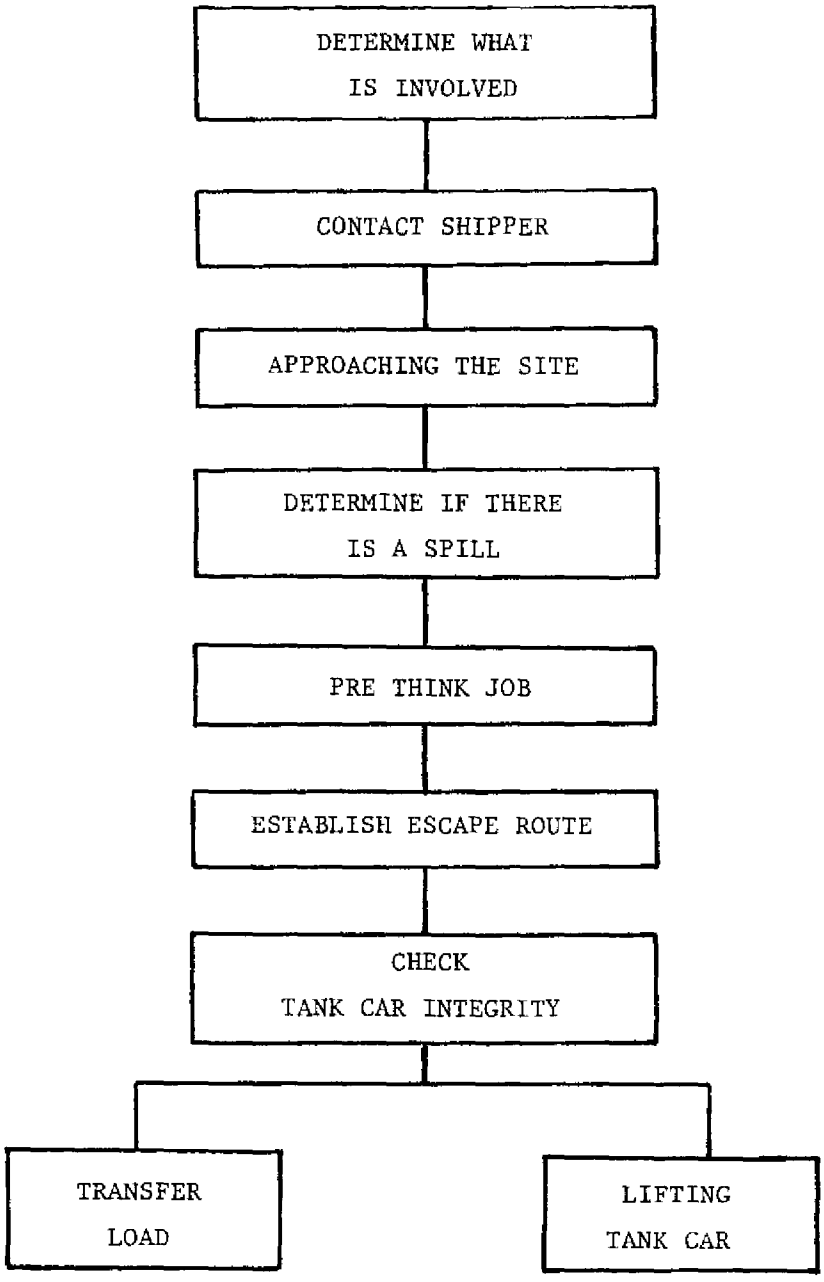
IN THE CASE OF AN OVER-EXPOSURE DUE TO INHALATION THE INITIAL TREATMENT SHOULD INCLUDE REMOVAL TO FRESH AIR, ADMINISTRATION OF OXYGEN IF AVAILABLE AND THEN SEEK MEDICAL ATTENTION.

CONCERNS AT

DERAILMENT SITES

DERAILMENT SITE

FLOWCHART



DETERMINE WHAT IS INVOLVED

NEED

IDENTIFY PRODUCTS INVOLVED

METHOD

TRAIN CONSIST
TRAIN PROFILE (C & O)
H.I.E.R. FORM
COMMODITY STENCIL
PLACARDS
COMMODITY CARDS
CALL SHIPPER
CAR CONFIGURATION

NOTE

TRAIN PROFILE GIVES CAR LOCATION AND SPECIAL HANDLING INSTRUCTIONS.

CONTACT SHIPPER

NEED

PHONE NUMBER

METHOD

EMERGENCY NUMBER IS ON
WAYBILLS
H.I.E.R. FORM
E/R TAG (DOW)
RAIL CAR (DOW)

NOTE

LISTEN CAREFULLY TO SAFETY INSTRUCTION.

ASK LEADING QUESTIONS.

A. IS IT FLAMMABLE?
B. IS IT TOXIC?
C. IS IT REACTIVE?
D. WHAT IS ODOUR THESHOLD? PPM
E. WHAT DOES ODOUR SMELL LIKE? SWEET, ETHERIAL, PUNGENT.
F. WHAT SPECIFIC PRECAUTIONS?

APPROACHING THE SITE

NEED

TO SAFELY REACH AND RETURN FROM THE SITE

METHOD

A. ALWAYS WEAR PROTECTIVE EQUIPMENT
B. NEVER ENTER DANGER AREA ALONE, WORK IN PAIRS
C. ALWAYS APPROACH IN PAIRS
D. DO NOT STEP IN PUDDLES - IT MAY NOT BE WATER!

NOTE

SOME CHEMICALS HAVE SUCH A LOW T.L.V. THAT BY THE TIME YOU CAN SMELL IT YOU ARE OVER EXPOSED.

I.E. TOLUENE DIISOCYANATE (T.D.I.)
T.L.V. 0.02 PPM
ODOUR THRESHOLD 0.4 PPM

SOME ARE FLAMMABLE.

DETERMINE IF THERE IS A SPILL

NEEDS

1. TO DETERMINE IF THERE IS A SPILL

METHOD

A. EXPLOSIMETER READINGS FOR FLAMMABLES.

B. H.N.U. PHOTOIONIZATION ANALYZER FOR VOLATILE CHEMICALS IN AIR.

C. P.H. METER (STRENGTH OF ACID CONCENTRATION). LITMUS PAPER FOR CORROSIVES.

D. DRAGER TUBES FOR VOLATILE LIQUIDS.

PRE-THINK JOB

CONSIDER

ESCAPE ROUTES
DYKING
CONTINUOUS MONITORING
WATER SPRAY
PROTECTIVE EQUIPMENT
TRANSFERRING LOAD
LIFTING CARS

ESCAPE ROUTES

NEEDS

WIND SOCK
BALLOON

METHODS

OBSERVE WIND INDICATOR
TRAVEL CROSSWIND

CAR INTEGRITY CHECKS - DAMAGED TANK CARS

CRACKS

1. VISUALLY INSPECT FOR CRACKS
2. GREATEST POTENTIAL IS AT SUPPORT AND NOZZLE CONNECTIONS
3. SUSPECT CRACKS CAN BE CONFIRMED BY DYE CHECK
4. ALL CRACKING MUST BE CONSIDERED SERIOUS
5. DYE CHECK

DENTS

1. ALL DENTS SHOULD BE CONSIDERED POTENTIAL AREAS FOR CRACK DEVELOPMENT
2. POTENTIAL FOR CRACKS GREATER WHEN METAL TEMPERATURE IS LOW
3. OR WHEN EDGES OF DENTS ARE SHARP
4. DYE CHECK SHOULD BE CONSIDERED FOR SUSPECT CRACKS
5. ALL CRACKING SHOULD BE CONSIDERED SERIOUS WITH THE POTENTIAL TO PROPAGATE WITH MOVEMENT OF THE CAR

NOTE

METAL CAN BE COLDER THAN AMBIENT TEMPERATURE DEPENDING ON PRODUCT AND PRESSURE.

SCAPES & GOUGES

1. THE SHARPNESS OF THE GOUGE MAY INDICATE GREATEST POTENTIAL FOR CRACKING
2. THE GOUGE ITSELF MAY BE MORE SERIOUS THAN A DENTED AREA WITH ROUNDED EDGES.
3. THE DEPTH SIZE AND LOCATION OF THE GOUGE SHOULD BE CONSIDERED AS A CRITICAL STRESS RISER.

CAR INTEGRITY CHECKS - CRITICAL STRESS RISER

GOUGES

1. ANY DEVIATION IN THICKNESS AFFECTS THE PRESSURE RATING OF THE CAR AND BECOMES A STRESS RISER.

2. THE PRESSURE ON A CAR IS NEAR EQUALLY DISTRIBUTED AROUND THE CIRCUMFERENCE (THE HEAD PRESSURE FROM THE PRODUCT WILL INCREASE THE PRESSURE ON THE CAR BOTTOM).

3. IF GOUGE IS LONGITUDINALLY ALONG THE CAR, THIS SHOULD BE LOOKED AT AS A MORE SERIOUS CONDITION THAN A CIRCUMFERENTIAL GOUGE, IF THE CAR IS UNDER PRESSURE.

CAR INTEGRITY CHECKS

HOOP STRESS TENSION IN THE CIRCULAR DIRECTION

GOUGES

IMAGINE THE CAR AS BEING MADE UP OF MANY HOOPS, ONE ON TOP OF THE OTHER. WHEN YOU HAVE A LONGITUDINAL GOUGE, YOU ARE GOUGED ACROSS THE GRAIN OF THE STEEL AND BREAK MANY OF THE HOOPS, WHERE A CIRCUMFERENTIAL GOUGE WILL AFFECT ONLY A MINOR NUMBER OF HOOPS.

CAR INTEGRITY CHECKS - DAMAGED TANK CARS

METAL LOSS

1. WHERE INTERNAL METAL LOSS IS SUSPECT, CHECK WITH SIMPLE ULTRASONIC DEVICES (SUCH AS THE KRAUTHAMER D-METER).

2. THIS METHOD REQUIRES ACCESS TO THE SURFACE OF THE VESSEL AND WOULD REQUIRE REMOVAL OF JACKET AND INSULATION.

3. THE SURFACE SHOULD BE SEARCHED THOROUGHLY FROM TOP TO BOTTOM AS CORROSION MAY BE VERY LOCALIZED ALONG A LIQUID LEVEL.

CAR INTEGRITY CHECKS - ASSESSMENT OF DEFECTS/DAMAGE

BEFORE ATTEMPTING TO MOVE CAR

1. THE DEPTH SIZE ORIENTATION AND LOCATION OF CRACKS, GOUGES, SCRAPES MUST BE ASSESSED.

2. LONGITUDINAL CRACKS, GOUGES, SCRAPES IN THE SHELL WILL BE MORE DETRIMENTAL AND WEAKEN THE PRESSURE CONTAINING ABILITY OF THE TANK.

3. TRANSVERSE AND CIRCUMFERENTIAL DEFECTS WILL WEAKEN THE TANK SHELL ABILITY TO WITHSTAND EXTERNAL DEFLECTION AND BENDING FORCES WHICH CAN ARISE DURING LIFTING OR MOVING A CAR.

CAR INTEGRITY CHECKS - ASSESSMENT OF DEFECTS/DAMAGE BEFORE ATTEMPTING TO MOVE CAR

REASONED ASSESSMENT BY A KNOWLEDGEABLE PERSON IS REQUIRED TO JUDGE THE SIGNIFICANCE AND POTENTIAL WEAKENING EFFECTS OF PHYSICAL DEFECTS AND DAMAGE TO THE SHELL -- PARTICULARLY SHARP ANGULAR FORMS OF DEFECT.

TRANSFERRING LOAD

NEEDS

SECOND VESSEL
PUMPS
COMPRESSOR
FITTINGS/HOSES
GROUNDING METHOD

METHODS

WORK WITH SHIPPER

NOTE

KEEP PEOPLE IN AREA AT A MINIMUM

LIFTING CAR

NEEDS

THOROUGHT INSPECTION OF CAR

METHOD

AS FOLLOWS:
ALSO BE ALERT FOR "SWEATING" OR CONDENSATE ON CAR

NOTE

KEEP PEOPLE IN AREA AT A MINIMUM
AVOID SPARKING
DOW RECOMMENDS - 1. NYLON SLINGS
2. WRAP WIRE WITH WET BURLAP
3. WATER SPRAY

LIFTING CAR

NEEDS

PROPER WELL MAINTAINED AND SIZED EQUIPMENT, CABLES, AND CRIBBING.

METHOD

USING 2 SEPERATE CABLES FASTENED TO BODY BOLSTERS OR CENTER SILL.
CRIBBING/BLOCKING OF CAR SHOULD BE DONE AFTER EVERY LIFTING SEQUENCE.

NOTE

CARS SHOULD NOT BE LIFTED BY ONE SLING IN COUPLER AREA OR STUB SILL.
CABLES SHOULD BE WRAPPED AND SHOULD NOT BE ALLOWED TO COME IN CONTACT WITH SHARP EDGES.

LIFTING/HOISTING

CHECK CABLES, SLINGS AND HOOKS FOR FLAWS.

FOLLOW RECOMMENDATIONS IN "WRECKING FOREMAN'S MANUAL" AND "CRANE OPERATORS MANUAL".

DO NOT LIFT CARS BY ONE SLING IN THE COUPLER AREA.

LIFT BY USING 2 SEPARATE CABLES FASTENED TO BODY BOLSTERS OR CENTRE SILL.

PLACE CABLES IN CONTOURED AREA.

AVOID SHARP EDGES AGAINST CABLES.

USE WRAPPED OR PROTECTIVE CABLES.

USE 3 POINT SUSPENSION TO PREVENT ROLLING.

CRIB CARS AFTER EACH LIFTING SEQUENCE.

LIFT SLOWLY AND AVOID JARRING MOTIONS.

LIFTING/ROLLING CAR

ITEMS OF CONCERN:

A. LIFTING BY STUB SILL OR DRAWBAR

B. MATERIAL SURGE IN CAR.

C. PROTECTION OF DOME HOUSING SUPPORTS & NOZZLE CONNECTIONS

D. TEMPERATURE

JACKING

ENSURE A GOOD LEVEL, SOLID JACKING BASE.

ENSURE OPPOSITE END OF CAR IS FREE AND CLEAR.

BLOCK/CHOCK WHEELS.

USE HARDWOOD BLOCK BETWEEN JACK HEAD AND STEEL.

BUILD CRIB UNDER CENTRE SILL AS JACKING PROGRESSES.

WRAP UP

CONTACT THE SHIPPER

KNOW THE PRODUCT

APPROACH FROM UPWIND

WEAR PROPER PROTECTIVE EQUIPMENT

AVOID VAPOUR CLOUDS AND PUDDLES

USE PROPER INSTRUMENTS TO DETECT CHEMICAL

CHECK CARS FOR LEAKS OR SPILLAGE

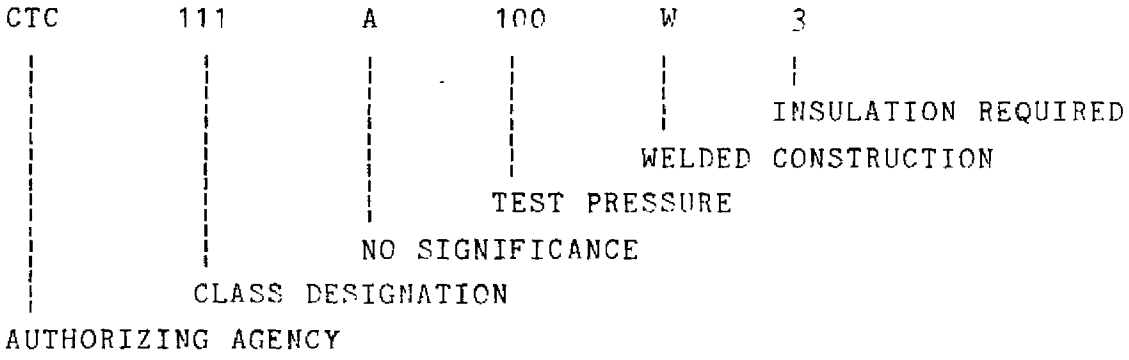
KEEP IGNITION SOURCES AWAY

RAIL EQUIPMENT USED BY DOW CANADA

BEFORE WE BEGIN DISCUSSING EQUIPMENT, WE WOULD LIKE TO DISCUSS HOW TO INTERPRET RAIL CAR SPECIFICATIONS.

C.T.C. TANK CAR SPECIFICATION

C.T.C. TANK CAR SPECIFICATION NUMBERS CONSIST OF A CLASS DESIGNATION FOLLOWED BY IDENTIFYING LETTERS AND NUMBERS:



TANK CAR SPECIFICATION NUMBER CAN HAVE MORE THAN ONE SUFFIX AND EACH SUFFIX HAS A SPECIAL SIGNIFICANCE. THE SUFFIX CAN BE A LETTER/NUMBER OR BOTH.

NOTE 1: AUTHORIZING AGENCY COULD BE:

D.O.T.

A.A.R.

I.C.C.

A.R.A.

U.S.G.

NOTE 2: TEST PRESSURE

THE CLASSIFICATION STENCILLED ON THE RAIL CAR MAY DISAGREE WITH THE TANK TEST PRESSURE.

(I.E.) A 105A 300W RAIL CAR MAY BE STENCILLED 105A 100W BUT SHOW TANK TEST PRESSURE AS 300LBS. THIS INDICATES A 300W CAR HAS BEEN DOWNGRADED TO A 100W.

THE SAFETY VALVE ON RAIL CARS SHOULD ALWAYS BE SET AT 75% OF THE CLASSIFICATION STENCIL.

(I.E.) 105A 100W = 75 LB. P.S.V. 105A 300W = 225 LB. P.S.V.

C.T.C. SPECIFICATION SUFFIX SIGNIFCANCE

THE FOLLOWING FOUR PAGES WILL EXPLAIN THE C.T.C. TANK CAR SPECIFICATION STENCIL AND HOW YOU INTERPRET THEM.

W - DENOTES FUSION WELDED TANK
F - DENOTES FORGED WELDED TANK
T - RETROFIT - THERMAL PROTECTION NON-JACKETED 112/114 TANKS
J - RETROFIT - THERMAL PROTECTION AND JACKETED 112/114 TANKS
S - RETROFIT - HEADSHIELDS 112/114 TANKS
A - RETROFIT - DOUBLE SHELF COUPLERS 112/114 TANKS

CHECK AAR SPECIFICATION: FOR TANK CARS FOR COMPLETE EXPLANATION OF SUFFIX LETTERS AND NUMBERS

C.T.C. CLASS DESIGNATION

103XXXW	INSULATED OR UNINSULATED CARBON STEEL. NON PRESSURE CARS WITH AN EXPANSION DOME. BOTTOM OUTLETS OPTIONAL.
105AXXXW	INSULATED CARBON STEEL PRESSURE CAR. TOP LOADING AND UNLOADING. BOTTOM OUTLETS OR WASHOUTS PROHIBITED.
111AXXXW	INSULATED OR UNINSULATED CARBON STEEL. NON PRESSURE CAR WITHOUT AN EXPANSION DOME. BOTTOM OUTLETS OPTIONAL.
112AXXXW(1)	UNINSULATED CARBON STEEL PRESSURE CAR. TOP LOADING AND UNLOADING. BOTTOM OUTLETS PROHIBITED.

(1) CARS MUST BE RETROFITTED WITH THERMO INSULATION, AND HEAD PROTECTION.

RAIL EQUIPMENT USED BY DOW CANADA

BY ADDING NUMBERALS THE SUFFIX WILL GIVE YOU MORE INFORMATION.

1. INDICATES 2% MIN. EXPANSION
2. INDICATES 1% MIN. EXPANSION
   NO BOTTOM OUTLET
3. INDICATES 2% MIN. EXPANSION
   INSULATION REQUIRED
4. INDICATES NO BOTTOM OUTLET OR WASHOUT AND INSULATION
   REQUIRED.

FOR EXAMPLE:

111A 100W4 WOULD INDICATE THAT THIS CAR IS FUSION WELDED AND THERE IS NO BOTTOM OUTLET OR WASHOUT AND INSULATED.

RAIL EQUIPMENT USED BY DOW CANADA

AS YOU HAVE SEEN BY THE SPECIFICATIONS, TANK CARS ARE BROKEN DOWN INTO PRESSURE CARS AND NON-PRESSURE CARS. WE WILL DEAL FIRST WITH PRESSURE TYPE CARS.

LETS LOOK AT A TYPICAL DOW T.E.D. SHEET AND WHAT IT TELLS YOU. THE FOLLOWING PAGE SHOWS THE T.E.D. SHEET FOR PROPYLENE OXIDE.

NOTE:

DOW CALLS FOR A 105A 300W WITH A 75 LB., P.S.V.

THIS WOULD REQUIRE THE STENCILLED CLASSIFICATION TO READ 105A 100W AND TANK TEST PRESSURE TO READ 300 LB.

THE 105A 300W CAR CAN BE USED FOR A VARIETY OF PRODUCTS INCLUDING METHYL CHLORIDE, VINYL CHLORIDE, ANHYDROUS AMMONIA, ETHYLENE OXIDE AND L.P.G.S.

PRODUCT	CODE NO	DATE ISSUED OR REVISED
PROPYLENE OXIDE	70557	04-15-81

SYNONYM: Propylene Oxide, 1,2-Epoxypropane, Metnyl Oxirane			TYPE COMMODITY: Organic chemical	
CHARACTERISTICS	DOT SHIPPING NAME: RQ/PROPYLENE OXIDE		DOT HAZARD CLASS: FLAMMABLE LIQUID	
	FLASH POINT: -35°F	FLAMMABLE LIMITS: 2.3-36.0%	BOILING POINT: 93.6°F	VAPOR DENSITY (AIR = 1): 2.0
	FREEZING POINT: -112°F	LOADING TEMP.: Ambient	MAX. PRODUCT TEMP: --	MAX. STEAM PRESSURE: --
	WT GAL @ 77°F (25°C): 7.0	CONCENTRATION SHIPPED: Full strength	SOLUBILITY IN WATER: Mixes	PHYSICAL STATE: Liquid

APPROVED EQUIPMENT:

	TANK TRUCK	TANK CAR
TANK TYPE	MC 330, 331 NON-ALUMINUM*	DOT 105A300W with 75# safety valve; 111A100W4(1), 105A100W(1).
TANK MATERIALS	Stainless steel, carbon steel	Steel, lined steel
INSULATION	Not required	Required
STEAMCOILS	Do not use steamcoils	Do not use steamcoils
METHOD USED TO CLEAN TANK	Drain, steam, wash with water and dry.	Drain, fill with hot water, dump, steam, wash with water and dry. Test with 25# air.
PUMP TYPES	Stainless steel, steel, or Ductile iron. Rotary or centrifugal	
HOSE TYPES	Seamless stainless steel or seamless steel	
GASKETS	Spiral-wound Teflon	
OTHER	*Shipments are padded with Nitrogen. Maintain N_2 pad. Prevent contact with aluminum and copper alloys. (1) Customer cars only.	

HANDLING

HOW UNLOADED	Pump, maintain 10-15 psig Nitrogen gas pad.
PROBLEMS	FLAMMABLE. PREVENT IGNITION. GROUND AND BOND EQUIPMENT. NO SMOKING, FLARES, OR OPEN FLAMES. VAPOR TOXIC, IRRITATING. DO NOT BREATHE VAPORS. LIQUID CAN CAUSE FROSTBITE-TYPE BURN. DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
PRECAUTIONS	USE PROTECTIVE EQUIPMENT - MINIMUM OF CHEMICAL WORKER'S GOGGLES, HARD HAT, RUBBER GLOVES, RUBBER BOOTS. HAVE SLICKER SUIT AND RESPIRATOR AVAILABLE.
OTHER	

PRODUCT	SELF EXPLANATORY
CODE	DOW CHEMICAL PRODUCT CODE
C.T.C. SHIPPING NAME	PROPER SHIPPING NAME AS GIVEN IN C.T.C. 72.5
HAZARD CLASS	AS GIVEN IN C.T.C. 72.5
FLASH POINT	THE LOWEST TEMPERATURE AT WHICH VAPOURS IN AIR WILL IGNITE
FLAMMABLE LIMITS	THE LOWER AND UPPER PERCENTAGE OF PRODUCT IN AIR THAT WILL IGNITE
BOILING POINT	TEMPERATURE AT WHICH PRODUCT BOILS
VAPOUR DENSITY	THE WEIGHT OF VAPOUR VERSUS AIR AIR = 1
FREEZING POINT	TEMPERATURE AT WHICH PRODUCT FREEZES
LOADING TEMPERATURE	TEMPERATURE AT WHICH PRODUCT IS LOADED
MAXIMUM PRODUCT TEMPERATURE	MAXIMUM TEMPERATURE YOU CAN HEAT PRODUCT TO
WT/GAL.	POUNDS OF PRODUCT PER GALLON
CONCENTRATION SHIPPED	PERCENT PRODUCT (I.E.) 50% CAUSTIC
SOLUBILITY IN WATER	THE AMOUNT OF PRODUCT THAT WILL DISOLVE IN WATER
PHYSICAL STATE	SOLID, LIQUID, GAS

RAIL EQUIPMENT USED BY DOW CANADA

THE FOLLOWING PAGE SHOWS THE T.E.D. SHEET FOR 50% CAUSTIC.

IT IS IMPORTANT TO NOTE THAT 111A AND 103 TANK CARS ARE VERY SIMILAR IN DESIGN. THE MAIN DIFFERENCE BEING THE EXPANSION DOME ON THE 103 TANK CAR VERSUS THE 111A TANK CAR HAVING NO EXPANSION DOME.

THE NON-PRESSURE FLEET IS VERY VERSATILE AND CAN BE SAFELY USED IN A VARIETY OF PRODUCTS RANGING FROM 50% CAUSTIC, 73% CAUSTIC, MONOETHANOLAMINE, PHENOL OR CARBOLIC ACID, ETHYL BENZENE, STYRENE, TOLUENE, ETHYL DICHLORIDE AND HYDROCHLORIC ACID.

ONE MAJOR REQUIREMENT FOR HYDROCHLORIC ACID IS IT MUST BE RUBBER LINED.

ANOTHER MAJOR DIFFERENCE IN NON-PRESSURE CARS IS RUPTURE DISCS VERSUS SAFETY VALVES.

VALVES MUST BE USED ON FLAMMABLE MATERIALS. WE WILL TALK MORE ABOUT THIS IN A MINUTE.

BEFORE WE LEAVE THE T.E.D. SHEET I WOULD LIKE TO POINT TO A VERY IMPORTANT SECTION ENTITLED **HANDLING.** THIS SECTION COVERS "HOW UNLOADED", PUMP, AIR, NITROGEN, ETC.

"PROBLEMS", FLAMMABLE, TOXIC, CORROSIVE, ETC.

IT ALSO GIVES YOU A LIST OF RECOMMENDED PROTECTIVE EQUIPMENT.

IT IS IMPORTANT TO WEAR THIS EQUIPMENT TO PREVENT PERSONAL INJURY.

EMERGENCY RESPONSE INFORMATION SHEET

DOT | CORROSIVE MATERIAL ~~UN1824~~ RQ*

CAUSTIC SODA SOLUTION - 50%

(SODIUM HYDROXIDE, SODA LYE, SODIUM HYDRATE)

COMPOSITION: SODIUM HYDROXIDE - 50%

PHYSICAL PROPERTIES:

FORM: LIQUID, COLORLESS
SPECIFIC GRAVITY: 1.52
SOLUBILITY IN WATER: MIXES COMPLETELY
FREEZING POINT: 58°F
BOILING POINT: 293°F
FLASH POINT: NONE
FLAMMABLE LIMITS: NONE
VAPOR HAZARD: VERY IRRITATING. CORROSIVE.
REACTS WITH: ALUMINUM, ZINC, TIN, COPPER TO RELEASE FLAMMABLE HYDROGEN GAS. DILUTION WITH WATER CAUSES BOILING AND SPLATTERING. VIOLENT WITH MANY ORGANICS.

HAZARDS

ENVIRONMENT:
ANIMAL: TOXIC. CORROSIVE. KEEP ANIMALS AWAY.
FISH: TOXIC. PREVENT ENTRY INTO NATURAL WATERS. WILL CAUSE FISH KILL.

EXPOSURE:
EYES: SEVERE BURNS. POSSIBLE BLINDNESS.
SKIN: SEVERE BURNS.
INHALATION: MISTS SEVERELY IRRITATING. CAN CAUSE INJURY TO UPPER BREATHING PASSAGE.
~~INGESTION: CORROSIVE--CAUSES BURNS.~~

IN CASE OF ACCIDENT

SPILL or LEAK

CORROSIVE. KEEP UPWIND. ISOLATE AREA AND DENY ENTRY. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE MIST IF ANY. SHUT OFF LEAK IF WITHOUT RISK. MAY BE SLIPPING HAZARD. PREVENT ENTRY INTO SEWERS OR NATURAL WATERS. USE ABSORBENT ON SMALL SPILLS AND RECOVER. DIKE LARGER SPILLS AND RECOVER.
CAUTION: APPLYING WATER TO CAUSTIC MAY CAUSE SPLATTERING.
CLOTHING: WEAR FULL PROTECTIVE CLOTHING AND SELF-CONTAINED BREATHING APPARATUS, IF MIST IS PRESENT.
DISPOSAL: CONTACT MANUFACTURER AND AUTHORITIES.
*RQ: SPILL OF REPORTABLE QUANTITY MUST BE REPORTED.

FIRE

CORROSIVE. WILL NOT BURN.
COOL CONTAINERS WITH WATER IF EXPOSED TO FIRE TO PREVENT BURSTING.
APPLYING WATER TO CAUSTIC MAY CAUSE SPLATTERING OF HOT CORROSIVE LIQUID.
FIRE: IN CONTACT WITH FIRE, USE FIRE EXTINGUISHING MEDIA SUITABLE FOR THE MATERIAL WHICH IS ACTUALLY BURNING. DIKE LIQUID RUN-OFF. PREVENT ENTRY INTO SEWERS AND/OR NATURAL WATERS.
CLOTHING: WEAR FULL PROTECTIVE CLOTHING AND SELF-CONTAINED BREATHING APPARATUS.

FIRST AID

~~EYES: IMMEDIATE AND CONTINUOUS IRRIGATION WITH FLOWING WATER FOR AT LEAST~~ 30 MINUTES IS IMPERATIVE. PROMPT MEDICAL CONSULTATION IS ESSENTIAL.
SKIN: IMMEDIATE CONTINUED AND THOROUGH WASHING IN FLOWING WATER FOR 30 MINUTES IS IMPERATIVE WHILE REMOVING CONTAMINATED CLOTHING. PROMPT MEDICAL CONSULTATION IS ESSENTIAL.
CLOTHING: REMOVE CONTAMINATED CLOTHING IMMEDIATELY AND WASH BEFORE REUSE. DESTROY CONTAMINATED SHOES AND LEATHER ITEMS.
INHALATION: REMOVE TO FRESH AIR IF EFFECTS OCCUR. CONSULT MEDICAL PERSONNEL.

DOW CHEMICAL CANADA INC.

– EMERGENCY DATA ON OTHER SIDE –

TRANSPORTATION EQUIPMENT DATA

PRODUCT	CODE NO.	DATE ISSUED OR REVISED
CAUSTIC SODA 50%	15216	R-05-20-81

SYNONYM: Sodium Hydroxide, Lye			TYPE COMMODITY: Alkali-Corrosive	
CHARACTERISTICS	DOT SHIPPING NAME: RQ/Sodium Hydroxide, Solution		DOT HAZARD CLASS: Corrosive Material	
	FLASH POINT: None	FLAMMABLE LIMITS:	BOILING POINT: 293°F	VAPOR DENSITY (AIR = 1):
	FREEZING POINT: 58°F	LOADING TEMP: 100°F	MAX. PRODUCT TEMP: 110°F	MAX. STEAM PRESSURE: 150 psig
	WT/GAL @ 77°F (25°C): 12.8	CONCENTRATION SHIPPED: 50%	SOLUBILITY IN WATER: Mixes completely	PHYSICAL STATE: Liquid

APPROVED EQUIPMENT:

	TANK TRUCK	TANK CAR
TANK TYPE.	MC 304, 307, 311, 312 NON-ALUMINUM	DOT 103W, 111A60W-1, 111A100W-1
TANK MATERIALS.	Nickel clad, stainless steel, lined carbon steel	Nickel clad, lined carbon steel
INSULATION	Required to prevent freezing (1)	Required
STEAMCOILS	Required on overnight or longer hauls	Required
METHOD USED TO CLEAN TANK	Drain, flush with water, steam if not lined, wash with water and drain dry.	Drain, butterworth with hot water, rinse until cool and drain dry. Do not dr steam cars lined with sprayed linings.
PUMP TYPES.	Air pressure, stainless steel, Ni-resist, alloy 20. Centrifugal or positive displacement.	
HOSE TYPES.	Teflon, Chem-Solv, Hypalon, Neoprene, reinforced rubber (Use only stainless, nickel or nickel alloy fittings)	
GASKETS	Asbestos, Teflon, Neoprene, Rubber	
OTHER	Corrosive, Prevent contact with aluminum, steel, copper & copper alloys. (1) Not required when ambient temperature exceeds 60°F	

HANDLING:

HOW UNLOADED.	Pump, air pressure
PROBLEMS	CORROSOVE. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE SPRAY OR MIST. MAY BE SLIPPING HAZARD.
PRECAUTIONS.	USE PROTECTIVE EQUIPMENT - MINIMUM OF FACE SHIELD, CHEMICAL WORKERS GOGGLES, HARD HAT, RUBBER GLOVES, BOOTS AND SLICKER SUIT.
OTHER	

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