



DOW CHEMICAL U.S.A.

August 1, 1985

TEXAS OPERATIONS
FREEPORT, TEXAS 77541

Mr. George Wirth
Environmental Protection Agency
401 M St. S.W.
Washington, D.C. 20460

RE: AIR TOXIC-SITE GUIDANCE MEETING, JULY 23, 1985

Dear Mr. Wirth:

Attached is the proposed formula for determining the Relative Exposure Risk Potential Index for chemical containment systems I promised last week.

As I understand, EPA is committed to providing community guidance in case of a large, acutely toxic chemical release by listing chemicals of concern. The dedication by you and the other EPA people to establish a very sound scientific basis for this guidance while insisting on simplicity is admirable. Toxicity alone is obviously not definitive enough. This proposed formula incorporates every factor you and the other EPA people brought up and discussed as being important considerations, and yet, is the simplest type formula mathematically possible.

I would propose the EPA work with several chemical companies to determine an index on many of the chemicals proposed to be placed on the Site Review Guidance List. These indexes could be bracketed into Emergency Response Guidance categories (i.e. 1 through 5) with a different level of response for each. A "1" might call for nothing more than general information on the chemical such as making available Material Safety Data Sheets, while a "5" might recommend good communications, evacuation procedures, annual drills, vapor detectors with warning horns, etc. Certainly these different levels would be a positive basis for good rapport between industry and the community. After you formalize any proposal, it would be important to provide a response period for both public and industry to give you their comments.

Hopefully, this type of index can identify those chemicals which can be of great concern to a community and also eliminate those which offer no threat. Probably 95% of chemicals handled in the industry would thus be eliminated from the list.

Once again, I would like to thank you for this opportunity to input during your strategy forming stage. The safety record of the Chemical Industry in the United States is one of the best of all industries and we certainly want to see this record continue.

Sincerely,

Gordon R. Miller
Loss Prevention Engineering
APB

VVV 000017521

bj
attachment

AN OPERATING UNIT OF THE DOW CHEMICAL COMPANY

**Quality
Performance**
Means More At Dow.

CHEMICAL EXPOSURE RISK POTENTIAL INDEX

Scope

Provide a comparable index to measure the relative degree of risk to the public from loss of containment of any chemical.

Introduction

The impact on the public from loss of containment of any chemical is based on: (1) The acute toxicity of the compound, (2) The concentration that reaches the people, and (3) The length of time of exposure.

Even though it is impossible to predict all of the factors that will control concentration and time of exposure (i.e. temperature, humidity, wind speed and direction), these two factors are equally as important as toxicity. The best one can do in determining the degree of risk from any chemical containment is to develop a simple, relative formula of those important parameters that can be measured and hold all other parameters constant. This will allow a Relative Risk Potential number to be generated which can be categorized to determine a level of Emergency Response Preparedness needed. These categories and proper responses will be developed later. Non-linear and logarithmic functions of gas dispersions have been ignored to maintain simplicity.

Formula

$$\frac{R.V. \times Q.F. \times V.D.F. \times P.P.F.}{TOX. \times D.F.} = \text{RISK POTENTIAL INDEX}$$

Factor Identification

1. Tox = Toxicity - Select acute toxicity in ppm by preferred method. Suggest:
IDLH = Immediately Dangerous to Life or Health in ppm; See NIOSH/OSHA Pocket Guide, or LC50 at 4 hour value.
2. R.V. = Relative Volatility - Vapor pressure of substance in mm of Hg at 25°C divided by 760 mm. If above 760 mm, use 1.0.
3. Q.F. = Quantity Factor - Amount of release in thousand lbs., i.e. 500 lbs. = 0.5, 1000 lbs. = 1.0, 10,000 lbs. = 10, etc. Do not use more than one decimal place. Use only amount that will become airborne in 15 minutes of a "worst" case release.
4. D. F. = Distance Factors - Determine distance from point of containment to point of public exposure concern in thousand foot increments; i.e. 500 ft. = 0.5, 1000 ft. = 1.0, 10,000 ft. = 10.0, etc. Do not use more than one decimal and round off to one significant number.
5. V.D.F. = Vapor Dispersion Factor - The vapor density relative to air is proportional to dispersion, i.e. light density = rapid dispersion, heavy = slow. Divide the molecular weight of the substance by 28.8 (molecular weight of air) and round to one decimal place, i.e. Ammonia = $17/28.8 = 0.6$. Chlorine = $71/28.8 = 2.5$, etc.
6. P.P.F. = Process Penalty Factors - Multiply by 2 for each factor: (1) contained above 10 psig; (2) thermally reactive with itself, water, air, or other common on site materials below 100°C. (Includes loss of inhibitors).

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SKETCH PAD INFORMATION - FOR PLANNING ONLY

Examples:

- * For a 2,000 lb. chlorine cylinder rupture at 1000 ft. distance:

$$\frac{1 \times 2 \times 2.5 \times 2}{25 \times 1} = \frac{10}{25} = 0.4$$

- * For 50,000 lb. methyl isocyanate at 500 ft.:

$$\frac{0.5 \times 50 \times 2.3 \times 2}{20 \times 0.5} = \frac{115}{10} = 11.5$$

- * For 5,000 lb. ammonia spill at 5000 ft.:

$$\frac{1 \times 5 \times 0.6 \times 2}{500 \times 5} = \frac{6}{2500} = 0.0024$$

GRM
8/01/85

VVV 000017523

PRESENTATION TO THE VINYL CHLORIDE SAFETY ASSOCIATION

BY ROBERT R. OUBRE - DOW CHEMICAL

TAMPA, FLORIDA

SEPTEMBER 13, 1985

VCM QUESTIONNAIRE

SENT COPIES TO 37 COMPANIES

US - 17 13 REPLIED

NON US - 19 16 REPLIED

RECEIVED 67 COMPLETED QUESTIONNAIRES

B. F. GOODRICH	12
ICI	10
ENICHEM POLIMERI	7
LIMBURQSE VINYL	5

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QUESTIONNAIRE TOPICS

STORAGE VESSELS - SIZE

DISTANCE FROM POPULATED AREAS

SAFETY FEATURES

PROCEDURES - EMERGENCY PLAN

INVOLVEMENT OF COMMUNITY

PUMPS, LINES - SAFETY FEATURES

LOCATION - U. S. COMPANY

NON U.S. COMPANY

SLIDE 2

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3. WHAT IS THE DISTANCE FROM TANK TO NEAREST RESIDENCE?

WHAT IS THE DISTANCE TO NEAREST COMMUNITY?

METERS	<u><100</u>	<u>101 200</u>	<u>201 500</u>	<u>501 1000</u>	<u>1001 2000</u>	<u>2001 5000</u>	<u>>5000</u>
RESIDENCE	2	15	14	10	17	6	0
COMMUNITY	0	3	14	12	21	12	3

SLIDE 3

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4. DOES THE PREVAILING WIND BLOW TOWARD A RESIDENTIAL AREA?

YES - 26

NO - 39

OF THE 26 YESES - CLOSEST RESIDENCE = 150 M

CLOSEST COMMUNITY = 150 M

OF THE 26 YESES - AVER. DIST. TO RESIDENCE = 900 M

AVER. DIST. TO COMMUNITY = 1300 M

5. HAVE YOU DONE ANY VAPOR CLOUD DISPERSION MODELING?

YES - 23

NO - 42

35 % have done modeling

OF THE 26 YESES IN "4" - 46 % HAVE DONE MODELING

6. DOES YOUR PLANT HAVE AN EMERGENCY PLAN WHICH INCLUDES NOTIFICATION OR WARNING OF THE LOCAL COMMUNITY?

YES	-	54	}	83% INCLUDE COMMUNITY IN THEIR PLAN
NO	-	11		

OF THE 26 PLANTS WITH PREVAILING WIND TOWARD COMMUNITY

88% INCLUDE COMMUNITY IN PLANS

7. HAVE YOU MADE ANY CHANGES IN YOUR OPERATION OR PROCEDURES SINCE THE BHOPAL INCIDENT?

YES	-	14	}	ONLY 22% HAVE MADE CHANGES
NO	-	63		

8. TANK SAFETY FEATURES:

A. IS TANK DIKED?

YES	-	54	] 83% DIKED
NO	-	11	

B. IF SPILL OCCURS DOES

VCM COLLECT UNDER

UNDER - 40

TANK OR DOES IT DRAIN

AWAY - 23

AWAY TO BASIN?

C. WHAT SPECIAL FEATURES DOES DIKED AREA OR BASIN HAVE?

HARD SURFACE - 32%

COVERED PIT - 8%

FOAM SYSTEM - 15%

WATER SPRINKLER - 44%

PUMP OUT PUMP - 6%

STEAM CURTAINS 4 SIDES - 1 PLANT

D. ARE YOUR TANKS SPRINKLED?

YES	-	60	] 92% SPRINKLED
NO	-	5	

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E. ARE FLAMMABLE VAPOR DETECTORS	YES-39	] 60% HAVE DETECTORS
DETECTORS LOCATED WHERE SPILL COULD OCCUR?	NO-26	

F. ARE VCM AREA MONITORS LOCATED	YES-42	] 65% HAVE PPM DETECTORS
AT TANKS (FOR MEASURING PPM)?	NO-23	

86% HAVE EITHER FLAMMABLE VAPOR DETECTORS OR
PPM DETECTORS OR BOTH

14% HAVE NEITHER

G. DO LEVEL INSTRUMENTS	YES-40	] 62% ARE REDUNDANT
HAVE REDUNDANCY (BACKUP)?	NO-25	

H. DO LEVELS ALARM AT A CONTROL	YES-52	] 79% ARE AROUND THE CLOCK
BUILDING WHICH IS MANNED AROUND THE CLOCK?	NO-13	

I. DOES TANK(S) HAVE DUAL	YES-51	] 78% HAVE DUALS
RELIEF VALVE?	NO-14	

J. IS THERE A RUPTURE DISC	YES-41	] 63% HAVE RUPTURE DISCS
UNDER THE RELIEF VALVE?	NO-24	

OUTSIDE US PLANTS	YES-22	] 50%
	NO-22	

K. HOW IS SPACE MONITORED BETWEEN THE RELIEF VALVE AND THE RUPTURE DISC?

PRESSURE GAUGES	-	61%
PRESSURE SWITCH	-	29%
OPEN VALVES	-	10%
OTHERS	-	12%

L. HAVE YOU ESTABLISHED A MAXIMUM FILL LEVEL FOR YOUR TANK?

YES	-	100%
RANGE	-	65% TO 98%
AVERAGE	-	84.5%

M. HAS TANK(S) BEEN INTERNALLY INSPECTED SINCE ORIGINAL INSTALLATION DATE?

YES - 57

NO - 8 (1 NEW, 2 DUE SOON) 88%

<u>TANK AGE <10 YRS</u>	<u>10-20</u>	<u>20-30</u>	<u>>30</u>	<u>34</u>
11	27	11	2	1

ONE PLANT REPORTED EXTERNAL CORROSION

TWO REPORTED INTERNAL PITTING (RECOVERED MONOMER)

TWO REPORTED NEGLIGIBLE TO LIGHT CORROSION

REMAINDER FAIR TO GOOD TO EXCELLENT CONDITION

N. ANY OTHER TANK SAFETY FEATURES?

MANY REPORTED REMOTE OPERATED VALVES.

TOTALIZING METER BACKS UP LEVEL.

EXCESS FLOW CHECKS IN LIQUID LINES.

2 HLA'S SET AT 72% -85% - 95% (2 INST).

HLS TRIPS PUMP, CLOSES VALVE. SAME FOR VAPOR ALARM.

HLS OR HPS CLOSES FEED. LPS CLOSES PUMP SUCTION.

INTERNAL BILLET VALVE. ALL VALVES CLOSE ON ABNORMAL CONDITION.

AUTO CLOSE INLET WITH HLS.

OVERPRESSURE OF TANK VENTED TO INCINERATOR.

AUTO VALVE CLOSE WITH XS FLOW OR DELUGE TRIP OR HL.

BOTTOM HALF OF SPHERE IN CONCRETE CUP.

STEAM CURTAIN ON 4 SIDES.

WATER INJECTION CAPABILITY FOR LEAK.

VAPOR DETECTOR TRIPS SPRINKLER.

REPEATERS ON LEVEL TRANSMITTER MAKE Dp CELL MORE RELIABLE BY ELIMINATING VCM FILLED LEG.

9. PUMPS AND AND LINES:

A. ARE BOTTOM TANK VALVES
EQUIPPED WITH REMOTE
OPERATED VALVES?

YES	-54	] 83% HAVE REMOTE VALVES
NO	-11	

B. DO PUMPS HAVE
DOUBLE SEALS?

YES	-44	] 81% HAVE DOUBLE SEALS
NO	-10	

NON-U.S.

YES	-23	] 68% HAVE DOUBLE SEALS
NO	-11	

C. ARE PUMPS SEALLESS?

YES - 11

NON U.S. - 10

U.S. - 1

D. ARE PUMPS STEEL OR
WROUGHT IRON
CONSTRUCTION?

YES	-60	] 92% HAVE STEEL OR WROUGHT IRON.
NO	-5	

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E. ARE PUMPS PROTECTED FROM DEAD-
HEADED CONDITION (RUNNING WITH
DISCHARGE BLOCKED)?

YES	-	38	] 58%	
			] PROTECTED	PSV- 14
NO	-	27		TS, FS, PS- 11
				RECYCLE- 7
				ELECT OVERLOAD- 1
				OTHER - COMPUTER CONTROL
				PUMP START W/FLOW AND
				RECYCLE

F. ARE PUMPS PROTECTED FROM BLOCKED IN CONDITION?

YES	-	27	] 41%	
			] PROTECTED	PSV -17
NO	-	38		S - 3

G. ARE PIPELINES PROTECTED FROM LIQUID BLOCKED IN
CONDITION?

YES	-	49	] 75% ARE	
			] PROTECTED	PSV -48
NO	-	16		BY-PASS - 1

H. ARE PIPELINES PROTECTED FROM HYDRAULIC SHOCK OF
SUDDEN VALVE CLOSURE?

YES - 21	] 32% ARE PROTECTED
NO - 44	

I. WHAT TYPE GASKETS ARE USED IN PIPING?

FLAT RING ASBESTOS - 56

RETAINED TYPE (FLEXITALLIC) - 9

ONE PLANT USES- FLAT ASBESTOS ON 150 LB
RETAINED ON 300 LB

10. TANK CAR LOADING/UNLOADING : 50 PLANTS

A. IS THE T/C AREA PROTECTED BY SPRINKLER?	YES - 22	] 44% PROTECTED
	NO - 28	

B. ARE MONITOR NOZZLES INSTALLED?	YES - 34	] 70% HAD MONITORS
	NO - 16	

90% HAD EITHER SPRINKLERS OR MONITORS OR BOTH.

C. ARE FLEXIBLE HOSES USED
IN THE OPERATION?

YES - 39

NO - 11

78% USE
HOSES

TEST PROGRAM USED?

YES - 24

FREQUENCY - VARIES FROM EACH USE INITIALLY
QUARTERLY
YEARLY

OTHER COMMENTS - ONE REQUIRED BY LAW TO TEST
YEARLY AND WHENEVER DISCONNECTED
TO 1.5 X MWP FOR 15 MIN. HOSE
HAS TEST DATE TAG AND NUMBER.

ONE HAS DOUBLE WALL HOSE WITH
GAUGE ON OUTSIDE HOSE.

ONE DOES ELONGATION TEST DURING
PRESSURE TEST AND ELECTRICAL
CONDUCTIVITY TEST. EVERY 6
MONTHS OR 1600 HOURS USE.

MOST USE WATER PRESSURE TEST.

D. HAVE YOU HAD A HOSE FAIL UNDER
VCM PRESSURE?

YES- 9

NO- 41

18% HAD
FAILURES

E. HOW IS OVERFILLING OF T/C PREVENTED?

THERE WERE 41 WHO LOAD T/C'S

MAGNETIC FLOAT GAUGES - 15

TOTALIZING METER AUTO STOP
(3 REPORTED TWIN METERS) - 10

COMBINATION OF LEVEL SWITCH
AND DP CELL - 9

LOAD SCALE - 7

OUTAGE GAUGES - 4

NON - U.S. PLANTS MAGNETIC GAUGE - 6 OF 26

F. IS T/C AREA DIKED FOR SPILL
CONTAINMENT?

YES - 7
NO - 41
14%
HAVE

11. DO YOU RECEIVE OR SHIP VCM BY T/T?

YES - 18

NON U.S. - 16

U.S. - 2

12. TOTAL RETURNS 65

NON U.S. - 44

U.S. - 21

SLIDE 14

VVV 000017537

BFGOODRICH CHEMICAL GROUP
SAFETY STANDARD

Hazardous Material Storage Tank Standard

Vinyl Chloride, Butadiene, Isobutylene
Propane/Propylene/Butane, Ethylene, C-4

Vinyl Chloride Storage Tanks
(Non-Process)

Tank Valves and Nozzles

- I. All tank nozzles must have one of the following:
 1. If Not In Use - Blank on the tank nozzle flange.
 2. Vapor Service Nozzles - Ball valve mounted on tank nozzle flange. Valves in conjunction with relief valves will be covered in the relief valve section.
 3. Liquid Service Nozzles (usually on bottom of tank, but would also include top entering dip pipes) - Remote air actuated ball valve mounted on tank nozzle flange. The following exceptions apply:
 - (a) Tank nozzles with thermowells. Thermowells must be welded to the tank flange.
 - (b) A manually operated ball valve that meets criteria in Appendix I, mounted between the tank nozzle flange and the air actuated ball valve is optional.
 - (c) Fill lines into the VCM spheres at the VCM plants. These lines require a check valve that is inspected annually and an air actuated valve that is activated only by a remote air switch.
- Air actuators must include the following features:
- (a) Air to open, spring to close.
 - (b) Contain section of burn-through tubing.
 - (c) Valve, with air actuators mounted on them, bench tested for leaks before installed on tank and during vessel turnaround.

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4. All tank nozzles must be a minimum of 1-1/2" pipe size.
5. No threaded connections should be attached to the tank.
- II. Valve requirements for Section I and a list of valves that meet these requirements are in Appendix I.
- III. Air actuated valves are required to have two local and one remote manual air switch. The two local air switches will be 180° apart and located just outside the tank containment system. A LEL vapor detector, discussed later, will also operate these valves.
- IV. It is required that all air actuated valves be cycled every two weeks.
- V. Excess flow valves may be used in conjunction with air actuated valves.

Vapor Detectors

- I. LEL type vapor monitor with continuous sampling that alarms at a maximum of 25% and closes air valves and activates deluge system at 50% are required.
- II. Three LEL detectors will be located below tank and one at pump. It is not required that the LEL detector at the pump activate the deluge system.
- III. Vapor detectors should be tested and calibrated every four months.

Fire Protection

- I. An automatic deluge fire water system is required for each tank.
- II. Vessel supports need either a deluge system or fire proofing with a 3 HR rating.

Relief Valves

- I. One of the following two, (a) or (b), may be used for vessel pressure relieving systems:

(a) A three-way valve with two relief valves.

- (b) Two-way valves, multi-nozzle with "Castell" locking system.

See Engineering Standard #ST-528 for relief valve design and installation requirements.

- II. Manual valves below relief valves must be mounted on tank nozzle flange. Valves for this service must meet the requirements in Appendix I.
- III. Each relief valve will be bench tested every three years.
- IV. Rupture discs will continue to be used per the EPA Regulations.
- V. Sizing of relief valves must adhere to BFG Policy ST-1317.

Tank Internal Inspection

- I. Storage tanks will be inspected a minimum of once in five years; tanks in rework VCM service every two years.
- II. The minimum inspection requirements are:
 - (a) Visually inspect for internal corrosion, especially around flange welds, thermowells, level indicators, etc.
 - (b) Ultrasonically test wall thickness in several representative locations.
 - (c) Record results of each inspection and thickness measurement and compare with previous inspections.
- III. Connecting piping will be inspected at the same time tank is inspected.

ADDENDUM

HAZARDOUS MATERIALS STORAGE TANKS SAFETY STANDARD SA-132

To be used for existing installations and specific applications only.

- (1) Existing high performance butterfly valves, manufactured by Posi-Seal, may be used in vinyl chloride service at Calvert City in place of the ball valves required by the standard. When these valves are replaced, however, they must conform to the standard. (11/15/82)
- (2) Existing six inch pipe elbows may remain between the tank nozzle flange and the air actuated valve on the butadiene tanks at Port Neches. These elbows must be inspected every year, however. (11/15/82)
- (3) Existing "Tuflin" plug valves may be used in vinyl chloride service at LaPorte. The valve bonnet bolts and nuts must be drilled and a wire seal attached in such a manner that the bonnet bolts cannot be inadvertently removed. When these valves are replaced, however, they must conform to the standard (11/21/83).

Butadiene Storage Tanks
(Non-Process)

Tank Valves and Nozzles

I. All tank nozzles must have one of the following:

1. If Not In Use - Blank on the tank nozzle flange.
2. Vapor Service Nozzles - Ball valve mounted on tank nozzle flange. Valves in conjunction with relief valves will be covered in the relief valve section.
3. Liquid Service Nozzles (usually on bottom of tank, but would also include top entering dip pipes) - Remote air actuated ball valve mounted on tank nozzle flange. The following exceptions apply:
 - (a) Tank nozzles with thermowells. Thermowells must be welded to the tank flange.
 - (b) A manually operated ball valve that meets criteria in Appendix I, mounted between the tank nozzle flange and the air actuated ball valve is optional.

Air actuators must include the following features:

- (a) Air to open, spring to close.
- (b) Contain section of burn-through tubing.
- (c) Valve, with air actuators mounted on them, bench tested for leaks before installed on tank and during vessel turnaround.

4. All tank nozzles must be a minimum of 1-1/2" pipe size.

5. No threaded connections should be attached to the tank.

II. Valve requirements for Section I and a list of valves that meet these requirements are in Appendix I.

III. Air actuated valves are required to have two local and one remote manual air switch. The two local air switches will be 180° apart and located just outside the tank containment system. A LEL vapor detector, discussed later, will also operate these valves.

- IV. It is required that all air actuated valves be cycled weekly.
- V. Excess flow valves may be used in conjunction with air actuated valves.

Vapor Detectors

- I. LEL type vapor monitor with continuous sampling that alarms at a maximum of 25% and closes air valves and activates deluge system at 50% are required.
- II. Three LEL detectors will be located below tank and one at pump. It is not required that the LEL detector at the pump activate the deluge system.
- III. Vapor detectors should be tested and calibrated every four months.

Fire Protection

- I. A monitor fire water system is required for horizontal tank installations. A deluge system is required for spherical tank installations.
- II. Vessel supports need either a deluge system or fire proofing with a 3 HR rating.

Relief Valves

- I. One of the following two, (a) or (b), may be used for vessel pressure relieving systems:
 - (a) A three-way valve with two relief valves.
 - (b) Two-way valves, multi-nozzle with "Castell" locking system.

See Engineering Standard #ST-528 for relief valve design and installation requirements.
- II. Manual valves below relief valves must be mounted on tank nozzle flange. Valves for this service must meet the requirements in Appendix I.
- III. Each relief valve will be bench tested every three years.

- IV. Rupture discs will continue to be used per the EPA Regulations.
- V. Sizing of relief valves must adhere to BFG Policy ST-1317.

Tank Internal Inspection

- I. Storage tanks will be inspected a minimum of once in three years; tanks in recycle service every year.
- II. The minimum inspection requirements are:
 - (a) Visually inspect for internal corrosion, especially around flange welds, thermowells, level indicators, etc.
 - (b) Ultrasonically test wall thickness in several representative locations.
 - (c) Record results of each inspection and thickness measurement and compare with previous inspections.
- III. Connecting piping will be inspected at the same time tank is inspected.

Isobutylene Storage Tanks
(Non-Process)

Tank Valves and Nozzles

- I. All tank nozzles must have one of the following:
 1. If Not In Use - Blank on the tank nozzle flange.
 2. Vapor Service Nozzles - Ball valve mounted on tank nozzle flange. Valves in conjunction with relief valves will be covered in the relief valve section.
 3. Liquid Service Nozzles (usually on bottom of tank, but would also include top entering dip pipes) - Remote air actuated ball valve mounted on tank nozzle flange. The following exceptions apply:
 - (a) Tank nozzles with thermowells. Thermowells must be welded to the tank flange.
 - (b) A manually operated ball valve that meets criteria in Appendix I, mounted between the tank nozzle flange and the air actuated ball valve is optional.Air actuators must include the following features:
 - (a) Air to open, spring to close.
 - (b) Contain section of burn-through tubing.
 - (c) Valve, with air actuators mounted on them, bench tested for leaks before installed on tank and during vessel turnaround.
 4. All tank nozzles must be a minimum of 1-1/2" pipe size.
 5. No threaded connections should be attached to the tank.
- II. Valve requirements for Section I and a list of valves that meet these requirements are in Appendix I.
- III. Air actuated valves are required to have two local and one remote manual air switch. The two local air switches will be 180° apart and located just outside the tank containment system. A LEL vapor detector, discussed later, will also operate these valves.

- IV. It is required that all air actuated valves be cycled weekly.
- V. Excess flow valves may be used in conjunction with air actuated valves.

Vapor Detectors

- I. LEL type vapor monitor with continuous sampling that alarms at a maximum of 25% and closes air valves and activates deluge system at 50% are required.
- II. Three LEL detectors will be located below tank and one at pump. It is not required that the LEL detector at the pump activate the deluge system.
- III. Vapor detectors should be tested and calibrated every four months.

Fire Protection

- I. A monitor fire water system is required for horizontal tank installations. A deluge system is required for spherical tank installations.
- II. Vessel supports need either a deluge system or fire proofing with a 3 HR rating.

Relief Valves

- I. One of the following two, (a) or (b), may be used for vessel pressure relieving systems:
 - (a) A three-way valve with two relief valves.
 - (b) Two-way valves, multi-nozzle with "Castell" locking system.See Engineering Standard #ST-528 for relief valve design and installation requirements.
- II. Manual valves below relief valves must be mounted on tank nozzle flange. Valves for this service must meet the requirements in Appendix I.
- III. Each relief valve will be bench tested every three years.

- IV. Rupture discs will continue to be used per the EPA Regulations.
- V. Sizing of relief valves must adhere to BFG Policy ST-1317.

Tank Internal Inspection

- I. Storage tanks will be inspected a minimum of once in three years; tanks in recycle service every year.
- II. The minimum inspection requirements are:
 - (a) Visually inspect for internal corrosion, especially around flange welds, thermowells, level indicators, etc.
 - (b) Ultrasonically test wall thickness in several representative locations.
 - (c) Record results of each inspection and thickness measurement and compare with previous inspections.
- III. Connecting piping will be inspected at the same time tank is inspected.

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Propane/Propylene/Butane Storage Tanks
(Non-Process)

Tank Valves and Nozzles

- I. All tank nozzles must have one of the following:
 1. If Not In Use - Blank on the tank nozzle flange.
 2. Vapor Service Nozzles - A ball valve mounted on tank nozzle flange. Valves in conjunction with relief valves will be covered in the relief valve section. The following exception apply:
 - (a) The 1-1/2", 150 pound "Varec," soft seated pinch valves for the Varec level indicators may be used provided that a separate deluge firewater sprinkler be installed and directed at the valve and that the drain valve at the bottom of the level indicator complies with Appendix I.
 3. Liquid Service Nozzles - Remote air actuated ball valve mounted on tank nozzle flange. The following exceptions apply:
 - (a) Tank nozzles with thermowells.
 - (b) A manually operated ball valve that meets criteria in Appendix I, mounted between the tank nozzle flange and the air actuated ball valve is optional.
 - (c) The screwed piping between the 1", 6,000 pound tank coupling and the level alarm valve must be a 1/4" maximum opening on the present propane/propylene/butane storage tanks at Calvert City.
- Air actuators must include the following features:
- (a) Air to open, spring to close.
 - (b) Contain section of burn-through tubing.
 - (c) Valve, with air actuators mounted on them, bench tested for leaks before installed on tank and during vessel turnaround.

- II. Valve requirements for Section I and a list of valves that meet these requirements are in Appendix I.
- III. Air actuated valves are required to have two local and one remote manual air switch. The two local air switches shall be located a sufficient distance away from the vessel(s) to allow operation in the event of an emergency and shall be a minimum of 90° apart.
- IV. It is required that all air actuated valves be cycled every two weeks.
- V. Excess flow valves may be used in conjunction with air actuated valves.

Vapor Detectors

- I. LEL type vapor monitor with continuous sampling that alarms at a maximum of 25% and activates deluge system at 50% are required.
- II. There will be four LEL detectors located such that the tankage area periphery is covered in four directions 90° apart.
- III. Vapor detectors should be tested and calibrated every four months.

Fire Protection

- I. An automatic deluge fire water system is required for each tank.
- II. Vessel supports need either a deluge system or fire proofing with a 3 HR rating.

Relief Valves

- I. One of the following three, (a), (b) or (c), may be used for vessel pressure relieving systems:
 - (a) A three-way valve with two relief valves.
 - (b) Two-way valves, multi-nozzle with "Castell" locking system.
 - (c) A relief valve with no block valve between it and the vessel.

See Appendix I for recommended three-way valves and relief valves.

See Engineering Standard #ST-528 for relief valve design and installation requirements.

Block valve mounted on first flange.

- II. Each relief valve will be bench tested every four years.
- III. Sizing of relief valves must adhere to BFG Policy ST-1317.

Tank Internal Inspection

- I. Storage tanks will be inspected internally a minimum of once in 12 years.
- II. The minimum inspection requirements are:
 - (a) Visually inspect for internal corrosion, especially around flange welds, thermowells, level indicators, etc.
 - (b) Ultrasonically test wall thickness in several representative locations.
 - (c) Record results of each inspection and thickness measurement and compare with previous inspections.
- III. A visual external inspection of storage tanks shall be performed yearly to detect external corrosion. Specifically, all vapor nozzles and structural attachments shall be closely examined.
- IV. Connecting piping will be inspected at the same time tank is externally inspected.

Ethylene Storage Tanks
(Non-Process)

Tank Valves and Nozzles

- I. All tank nozzles must have one of the following:
 1. If Not In Use - Blank on the tank nozzle flange.
 2. Vapor Service Nozzles - Ball valve mounted on tank nozzle flange. Valves in conjunction with relief valves will be covered in the relief valve section.
 3. Liquid Service Nozzles - Remote air actuated ball valve mounted on tank nozzle flange. The following exceptions apply:
 - (a) Tank nozzles with thermowells. Thermowells must be welded to the tank flange.
 - (b) A manually operated ball valve that meets criteria in Appendix I, mounted between the tank nozzle flange and the air actuated ball valve is optional.

Air actuators must include the following features:

 - (a) Air to open, spring to close.
 - (b) Contain section of burn-through tubing.
 - (c) Valve, with air actuators mounted on them, bench tested for leaks before installed on tank and during vessel turnaround.
4. All tank nozzles must be a minimum of 1" pipe size.
5. No threaded connections should be attached to the tank.
- II. Valve requirements for Section I and a list of valves that meet these requirements are in Appendix I. For ethylene service, only stainless valves will be used.
- III. Air actuated valves are required to have two local and one remote manual air switch. The two local air switches shall be located a sufficient distance away from the vessel(s) to allow operation in the event of an emergency and shall be a minimum of 90° apart.

- IV. It is required that all air actuated valves be cycled every two weeks.
- V. Excess flow valves may be used in conjunction with air actuated valves.

Vapor Detectors

- I. LEL type vapor monitor with continuous sampling that alerts at a maximum of 25% and alarms at 50% LEL.
- II. There will be four LEL detectors located such that the tankage area periphery is covered in four directions 90° apart.
- III. Vapor detectors should be tested and calibrated every four months.

Fire Protection

- I. An automatic deluge fire water system or a fire water monitor system is required for each tank.
- II. Vessel supports need either a deluge system or fire proofing with a 3 HR rating.

Relief Valves

- I. One of the following two, (a) or (b), may be used for vessel pressure relieving systems:
 - (a) A three-way valve with two relief valves.
 - (b) Two-way valves, multi-nozzle with "Castell" locking system.

See Engineering Standard #ST-528 for relief valve design and installation requirements.
- II. Manual valves below relief valves must be mounted on tank nozzle flange. Valves for this service must meet the requirements in Appendix I.
- III. Each relief valve will be bench tested every four years.
- IV. Sizing of relief valves must adhere to BFG Policy ST-1317.

Tank Internal Inspection

- I. Storage tanks will be inspected internally each time the vessel is taken out of service and completely emptied and prepared for vessel entry.
- II. The minimum internal inspection requirements are:
 - (a) Visually inspect for internal corrosion, especially around flange welds, thermowells, level indicators, etc.
 - (b) Ultrasonically test wall thickness in several representative locations.
 - (c) Record results of each inspection and thickness measurement and compare with previous inspections.
- III. A visual external inspection of storage tanks shall be performed yearly to detect loose or separated insulation, and to spot external corrosion at those locations. Specifically, all vapor nozzles and structural attachments shall be closely examined.
- IV. Connecting piping will be inspected at the same time tank is externally inspected.

VVV 000017553

C-4 Storage Tanks
(Non-Process)

Tank Valves and Nozzles

- I. All tank nozzles must have one of the following:
1. If Not In Use - Blank on the tank nozzle flange.
 2. Vapor Service Nozzles - A ball valve mounted on tank nozzle flange. Valves in conjunction with relief valves will be covered in the relief valve section. The following exceptions apply:
 - (a) The 1-1/2", 150 pound "Varec," soft seated pinch valves for the Varec level indicators may be used provided that a separate deluge firewater sprinkler be installed and directed at the valve and that the drain valve at the bottom of the level indicator complies with Appendix I.
 3. Liquid Service Nozzles - Remote air actuated ball valve mounted on tank nozzle flange. The following exceptions apply:
 - (a) Tank nozzles with thermowells. Thermowells must be welded to the tank flange.
 - (b) A manually operated ball valve that meets criteria in Appendix I, mounted between the tank nozzle flange and the air actuated ball valve is optional.Air actuators must include the following features:
 - (a) Air to open, spring to close.
 - (b) Contain section of burn-through tubing.
 - (c) Valve, with air actuators mounted on them, bench tested for leaks before installed on tank and during vessel turnaround.
 4. All tank nozzles must be a minimum of 1" pipe size.
 5. No threaded connections should be attached to the tank.

- II. Valve requirements for Section I and a list of valves that meet these requirements are in Appendix I.
- III. Air actuated valves are required to have two local and one remote manual air switch. The two local air switches shall be located a sufficient distance away from the vessel(s) to allow operation in the event of an emergency and shall be a minimum of 90° apart.
- IV. It is required that all air actuated valves be cycled every two weeks.
- V. Excess flow valves may be used in conjunction with air actuated valves.

Vapor Detectors

- I. LEL type vapor monitor with continuous sampling that alarms at a maximum of 25% and activates deluge system at 50% are required.
- II. There will be four LEL detectors located such that the tankage area periphery is covered in four directions 90° apart.
- III. Vapor detectors should be tested and calibrated every four months.

Fire Protection

- I. An automatic deluge fire water system is required for each tank.
- II. Vessel supports need either a deluge system or fire proofing with a 3 HR rating.

Relief Valves

- I. One of the following three, (a), (b) or (c), may be used for vessel pressure relieving systems:
 - (a) A three-way valve with two relief valves.
 - (b) Two-way valves, multi-nozzle with "Castell" locking system.
 - (c) A relief valve with no block valve between it and the vessel.

See Appendix I for recommended three-way valves and relief valves.

See Engineering Standard #ST-528 for relief valve design and installation requirements.

- II. Each relief valve will be bench tested every four years.
- III. Sizing of relief valves must adhere to BFG Policy ST-1317.

Tank Internal Inspection

- I. Storage tanks will be inspected internally a minimum of once in 12 years.
- II. The minimum inspection requirements are:
 - (a) Visually inspect for internal corrosion, especially around flange welds, thermowells, level indicators, etc.
 - (b) Ultrasonically test wall thickness in several representative locations.
 - (c) Record results of each inspection and thickness measurement and compare with previous inspections.
- III. A visual external inspection of storage tanks shall be performed yearly to detect external corrosion. Specifically, all vapor nozzles and structural attachments shall be closely examined.
- III. Connecting piping will be inspected at the same time tank is externally inspected.

VVV 000017556

APPENDIX I

RECOMMEND VALVES FOR STORAGE SPHERES AND BULLETS

SPECIFICATION: Ball Valves - Split Body
150 Pound Flanged, Fire Test, Blowout Proof Stem
Grounded Ball

<u>Manufacturer and Model Number</u>	<u>Port Size</u>	<u>Available Material*</u>	<u>Available Sizes</u>	<u>Actuator Mounting Pad Prov.</u>
<u>KITZ</u>				
K-150-UTBM-FS	Full	SS	1/2"-10"	Yes
K-150-SCTB-FS	Full	CS	1/2"-10"	Yes
<u>KT OMNI</u>				
E0132-32GT-15L	Full	SS	1/2"-8"	Yes
E0832-32GT-15L	Std.	SS	3"-10"	Yes
E0162-32GT-15L	Full	CS	1/2"-8"	Yes
E0862-32GT-15L	Std.	CS	3"-10"	Yes
<u>JAMESBURY</u>				
6150-31-3600	Full	SS	2"-20"	Yes
6150-31-2236	Full	CS	2"-20"	Yes
5150-31-3600	Std.	SS	6"-20"	Yes
5150-31-2236	Std.	CS	6"-20"	Yes
<u>WATTS</u>				
SF-2800-150	Full	SS	1-1/2"-6"	Yes
CF-1800-150	Full	CS	1-1/2"-6"	Yes
<u>COOPER</u>				
FIG 415	Full	Alloys Only	1/2"-12"	Yes
<u>KAMYR</u>				
PC	Full	CS	1-1/2"-24"	Yes
PC	Full	SS	1-1/2"-24"	Yes

*Stainless steel must be used for ethylene service.

APPENDIX I

RECOMMEND VALVES FOR STORAGE SPHERES AND BULLETS

SPECIFICATION: Ball Valves - End Entering
150 Pound Flanged, Fire Test, Blowout Proof
Stem - Grounded Ball

<u>Manufacturer and Model Number</u>	<u>Port Size</u>	<u>Available Material*</u>	<u>Available Sizes</u>	<u>Actuator Mounting Pad Prov.</u>
<u>MARPAC</u>				
SS-C470-RF	Std.	SS	1-1/2"-4"	Yes
CS-470-RF	Std.	CS	1/2"-4"	Yes
<u>WORCESTER</u>				
AF51-66	Std.	SS	1/2"-8"	
AF51-46	Std.	CS	1/2"-8"	Yes
AF-55-66	Full	SS	1/2"-8"	Yes
AF-55-46	Full	CS	1/2"-8"	Yes
<u>JAMESBURY</u>				
5150-31-3600	Std.	SS	1/2"-4"	Yes
5150-31-2236	Std.	CS	1/2"-4"	Yes
6150-31-3600	Full	SS	1/2"-1-1/2"	Yes
6150-31-2236	Full	CS	1/2"-1-1/2"	Yes
<u>HILLS MCCANNA</u>				
McCannafllo F151	Std.	SS	1/2"-12"	Yes
McCannafllo F151CS	Std.	CS	1/2"-12"	Yes
<u>MARWIN</u>				
5233R	Std.	CS	1/2"-12"	Yes
5333R	Std.	SS	1/2"-12"	Yes
5233F	Full	CS	1/2"-12"	Yes
5333F	Full	SS	1/2"-12"	Yes
<u>WKM</u>				
310C-B136-CS-02-S1	Std.	CS	1/2"-4"	Yes
310C-B136-S1-02-S1	Std.	SS	1/2"-4"	Yes
310C-B138-CS-02-S1	Full	CS	1/4"-4"	Yes
310C-B138-S1-02-S1	Full	SS	1/4"-4"	Yes

*Stainless steel must be used for ethylene service.

APPENDIX I

RECOMMEND VALVES FOR STORAGE SPHERES AND BULLETS UNDER RELIEF VALVES ONLY

SPECIFICATION: Three-way - 150 Pound Flanged Valves
Full Port

<u>Manufacturer and Model Number</u>	<u>Port Size</u>	<u>Available Material*</u>	<u>Available Sizes</u>	<u>Actuator Mounting Pad Prov.</u>
<u>COOPER (BALL)</u>				
3 Piece T Port	Full	Alloys Only	1/2"-12"	
<u>KAMYR (BALL)(Y)</u>				
Y2	Full	CS	3"-12"	
Y2	Full	SS	3"-12"	
<u>KTM (BALL)</u>				
E03132-32GT-1SL	Full	SS	3"-8"	
E031-62-32-15-GFS	Full	CS	3"-8"	

*Stainless steel must be used for ethylene service.

