ENVIRONMENTAL REFERENCE MANUAL

Esso Imperial Oil

Products Division
Distribution
Distribution Operations

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ENVIRONMENTAL REFERENCE MANUAL

Esso Imperial Oil
Products Division
Distribution

November 16, 1992

TO: Attached Distribution List
FROM: J. S. Whitelaw
SUBJECT: Environmental Reference Manual

Enclosed is your guide to environmental risk reduction strategies, options and methods concerning these parts of our Distribution facilities/operations: underground piping, underground steel tanks, terminal effluents, tank lot spills, and floating roof vapour suppression.

Regulatory and economic factors continue to influence our risk reduction efforts and given today's business climate, we must continue to be prudent in our environmental plans and strategies.

Please take the time to review the requirements outlined in this guide and contact me if you want any clarification. Thank you.

J. S. Whitelaw
Operating Practices Manager
Distribution Operations

cc: J. D. Lanoue
Enclosure

ENVIRONMENTAL REFERENCE MANUAL
Distribution List

Operating Practices Manager	111-1037 (J.S.Whitelaw)
Environmental Advisor	Dartmouth
Environmental Advisor	MEDU
Environmental Advisor	Finch
Environmental Advisor	Edmonton
Environmental Advisor	Lougheed
Loss Control Advisor	Pipeline Div., EPE-Calgary
Senior Terminal Manager	Dartmouth
Senior Terminal Manager	St. John's, Nfld.
Senior Terminal Manager	Quebec
Senior Terminal Manager	Montreal East
Senior Terminal Manager	MEDU
Senior Terminal Manager	Ottawa
Senior Terminal Manager	Finch
Senior Terminal Manager	Winnipeg
Senior Terminal Manager	Edmonton
Senior Terminal Manager	N.W.T. (Edmonton Terminal)
Senior Terminal Manager	Lougheed
Operations Support Manager	111-1032 (J. D. Lanoue)
Engineering Support	111-1011 (P. Schwanen)

ENVIRONMENTAL REFERENCE MANUAL

Esso Imperial Oil
Products Division
Distribution

July 30, 1993

TO: Attached Distribution List
FROM: J. S. Whitelaw
SUBJECT: **Ozone Depleting Materials, ERM Revision #1**

Compliance with legislative requirements is our priority when it comes to the use of ozone depleting substances, such as fluorocarbons and halon, in our operation. The enclosed ERM updates (Section 8.1, 8.2 and 8.3) outline the strategy and risk reduction options in complying with government regulations, as well as our commitment to do our share to help prevent the destruction of ozone layer.

Please review the requirements in this new ERM section and contact me if any further information is required.

J. S. Whitelaw
Operating Practices Manager
Distribution Operations

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OPTIONS

- **IMPLEMENT** A LEAK DETECTION PROGRAM.
- IF A LEAK OCCURS:
  - **Clamp** the pipe.
  - **Check** associated pipe for corrosion.
  - If warranted, **begin** planning process to resurface piping.
- **CONDUCT** REGULAR INSPECTIONS OF CATHODIC PROTECTION SYSTEM.
- **ASSESS** PIPING CONDITION (IF EXPOSED THROUGH MAINTENANCE ACTIVITIES).

CONCERNS

- UNDETECTED HYDROCARBON RELEASE AND SOIL CONTAMINATION.
- POTENTIAL OF EXTERNAL LIABILITY IF THE HYDROCARBON TRAVEL OFF-SITE.

DRIVING FORCES

- NO LEGISLATIVE REQUIREMENTS.
- MOST TERMINALS ARE 30+ YEARS OLD.
- INSTALLATION TECHNIQUES ROUTINELY DAMAGE PORTIONS OF THE PROTECTIVE COVERINGS.
- UNDERGROUND LEAKS ARE DIFFICULT TO DETECT AND SOIL CONTAMINATION CAN BE EXTENSIVE BEFORE LEAKAGE IS RECOGNIZED.
- SOIL DECONTAMINATION IS EXPENSIVE AND TIME CONSUMING.
- BURIED STEEL PIPING WILL CORRODE OVER TIME.

LEAK DETECTION

- **CONTINUE** ANNUAL HYDRAULIC TESTING OF MARINE LINES.
- **CONTINUE** PRACTICE OF HYDRAULICALLY TESTING SITE EXTERNAL PIPELINES, INCLUDING THE FOLLOWING LINES THROUGH RIGHT-OF-WAY:
  - Every year if the line is more than 30 years old.
  - Every three years if the line is less than 30 years old.
- **IMPLEMENT** A PRACTICE OF LEAK TESTING SITE INTERNAL HYDROCARBON TRANSFER LINES ANNUALLY.

INSPECTIONS

- IF PIPING IS EXPOSED DURING MAINTENANCE/CONSTRUCTION ACTIVITIES, **ARRANGE** FOR A METALLURGICAL ASSESSMENT.

CORROSION MONITORING

- IMPRESSED CURRENT:
  - Monthly Reading
  - Annual System Inspection
- SACRIFICIAL ANODE:
  - **Conduct** System Inspection every two years.
- **INSTALL** CATHODIC PROTECTION ON UNDERGROUND PIPELINES EXTERNAL TO SITE.

CONSIDERATION FOR RESURFACING

- Site environmental sensitivity
- Age of facilities
- Soil corrosivity
- Leak testing
- Other active projects, e.g., vapour recovery

GUIDELINES FOR RESURFACING UNDERGROUND PIPING

Steel in the presence of moisture and air will oxidize quickly. Piping buried in soil will **corrode** over time. The objective of this strategy is to present undetected leakage of hydrocarbon for subsurface piping.

- There is no anticipation that **all** underground hydrocarbon transfer piping will be or can be raised above ground.
- The long term outlook is to plan for the resurfacing of the hydrocarbon transfer lines to our tank truck and tank car loading racks.
- The remaining external pipelines need to be assessed immediately:
  - Consideration should be given to installing a leak detection system.
  - Hydraulic testing to 1-1/2 times the operating pressure is required once every three years until the line is 30 years of age, annually after that.
  - The lines need to be cathodically protected and a documented annual assessment of the cathodic protection provided.

U/G PIPELINE REPLACEMENT RANKING GUIDELINES

OBJECTIVE

Identify U/G pipelines that need to be replaced on a priority basis while maintaining a phased approach to expenditures.

BENEFITS

- Uniform approach available to all
- Efficient management approval process
- Risk reduction
- Long and short term plan (capital/maintenance budget/work allocation)
- Environmental protection

OPTIONS

Follow the steps listed below to develop a prioritized U/G pipeline replacement program:

1. FORM a team with representatives from inspection, technical, process, mechanical and other departments as required.

   Then, the Team will:

2. CONDUCT a site-wide survey to prioritize the risk level of all U/G pipelines on the site.

3. USE Table 1 to rank each pipeline to determine the relative priority for replacement.

OPTIONS (cont'd)

4. DOCUMENT the results, using Table 2.
5. USE the results in Table 2 to develop a long range pipeline replacement program strategy.
6. OBTAIN an endorsement from site management and central planning position capital budget items as required.

RESPONSIBILITY

Responsibility to prepare individual project implementation memoranda (PIM) rests with Refineries/Distribution/Retail.

Table 1
UNDERGROUND PIPELINE REPLACEMENT
RANKING GUIDELINES

Probability of Developing a Leak

		1 (*)	WT %	1*WT%
Age	0-10	1		10
	11-20	2	10	20
	20+	3		30
Routing	Thick Coating/ Maint CP	1		20
	Thick Coating/ Maint CP	2	20	40
	Thin Coating/ No Protection	3		60
Soil	Corrosive	3	10	30
	Non Corrosive	1		10
Service	Corrosive (> 3 mils a year)	3	10	30
	Non Corrosive	1		10

Probability	Sum 1*WT%	Ranking
Very Low	50	1
Low	60 - 80	2
Moderate	90 -110	3
High	120 -140	4
Leaking/Very High	150	5

CONSEQUENCES

Safety	Ranking	Environment	Ranking	Cost Benefit	Ranking
Very Low (Water)	1	Containable Leak On Site	1	HC Loss/Product Downgrade	1
Low Impact (Heavy HC)	2	Containable Leak Off Site	2	HC Loss/Product Downgrade Grouping lines to be replaced Redundant line Oversized line	2
Exposure (Aromatics)	3	Permeable Soil On Site	3	S/D Driven Completion of other project effected. HC Loss/Product Downgrade	3
Fire (Mogas)	4	Permeable Soil Off Site	4	Flow restricted due to repair. HC Loss/Product Downgrade	4
Explosion (C4 Lighte)	5	Leak to Harbour/ River/Community	5	Supply disruption Unit S/D HC Loss/Product Downgrade	5

Ranking:
1 = Very Low
2 = Low
3 = Moderate
4 = High
5 = Very High

*Risk Priority Measure (R) = (Probability*Safety*Environment) + (0.2*Probability*Cost Benefit)
Rank Rank Rank Rank Rank

Interpretation:

R < 22	Minor Risk	Re-evaluate within 4+ years unless the cost benefit is large enough to be justified on its own.
23< R < 64	Moderate Risk	Re-evaluate within 2-4 years unless the cost benefit is large enough to be justified on its own, or consider detection (leak detectors, line thickness sampling methods for uniform and non uniform soil environment)/mitigation methods if environment or safety consequence is high.
65< R < 130	High Risk	Replace within a year.

HOW TO USE TABLE 1

1. Calculate the probability of developing a leak. The age of the pipe, routing, corrosivity of the soil and product have to be considered.

2. Rank the consequences of the leak from the safety, environment, cost benefit points of view.

3. Calculate risk priority measure using the formula in Table 1. Interpret the results using the guidelines in Table 1.

Example:

Date Available:

Age	11 to 20
Routing.....	Underground W Protection
Soil.....	Corrosive
Product.....	Mogas
Soil.....	Permeable Soil
Line Duty...	Transfer Line

Calculation:

1. Calculate the probability of developing a leak.

		Sum 1*WT%
Age	11 to 20	20
Routing.....	Thick Coating/Non Mainted CP	40
Soil.....	Corrosive	30
Product.....	Mogas	10
		100

Probability of developing a leak is moderate.
Ranking..... 3

2. Calculate the consequences of developing the leak.

Safety.....	Mogas is light HC. In the presence of ignition source, it can start a fire.
	Ranking.....4
Environment	Permeable soil off site
	Ranking.....4
Cost Benefit	HC Loss
	Ranking.....1

3. Calculate risk priority measure.
   R=(3*4*4)+3*1 = 51
   Moderate Risk - re-evaluate within 2 to 4 years.

Table 2
PIPELINE REPLACEMENT PLAN

DESCRIPTION					RISK							COST (K$)		
Product	Location	Duty	Length	Size	P	S	E	C	R	Prior	Budget Year	Capital	Approx. Expense	Maint. Expense

Ref. ERM 1.6

MINIMUM REQUIREMENTS FOR VERTICAL MONITORING WELLS

1. Monitoring wells shall be a minimum of 100mm in diameter to facilitate groundwater recovery.

2. If the well is to be used to monitor the water table and eventually as a recovery well, the slotted zone shall extend:

   - at least 1.5m into the water table and,
   - at least 1.5m above the groundwater surface as determined at the time of installation

3. The screened portion of the well shall be:

   - a minimum of 3.0m in length
   - factory slotted with a slot size of 0.25mm or,
   - as approved by the authority having jurisdiction

   Slotted section of pipe shall be wrapped with a geotexile membrane. Upper 0.5 of wells is to be made of solid pipe.

4. Monitoring wells shall be installed with a cap at the bottom of the slotted section of the well.

5. Monitoring wells shall **not** be constructed of Schedule 20 PVC "sewer" or leach field piping.

6. Monitoring wells shall be constructed of flush joint, threaded or bell and spigot Schedule 40 PVC or other brands of PVC which have equivalent or greater wall thickness.

   Glues shall not be used to construct well.

7. If more than one well is necessary to effectively monitor an installation, the monitoring wells shall be numbered such that all monitoring and testing results shall be easily correlated to a specific monitoring location.

STRATEGY OBLIGATION

- **MEET** LEGISLATIVE REQUIREMENTS.
- **REPLACE** UNPROTECTED UNDERGROUND STEEL TANKS PER LEGISLATED TIMING REQUIREMENTS:
  - Replacement underground - Use fibreglass reinforced plastic tanks.
  - * Serious consideration should be given to installing the tankage facility above ground to reduce future environmental liability.

CONCERNS

- UNDETECTED HYDROCARBON RELEASE AND SOIL CONTAMINATION.
- POTENTIAL OF EXTERNAL LIABILITY OF THE HYDROCARBON TANKS OFF-SITE.
- DRAINAGE OF HYDROCARBON TO TANK FARM LOT FLOOR.

RISK REDUCTION OPTIONS

- **INSTALL** PIEZOMETER WELLS AND **ESTABLISH** SAMPLING PROGRAMS AT ALL SITES OVER THE NEXT 5 YEARS TO PROVIDE KNOWLEDGE OF EXISTING SITE CONDITIONS/SUBSURFACE WATER QUALITY.

  THE KNOWLEDGE MAY ALLOW US TO DEFER TO TANKAGE UNTIL WE HAVE A LEAK OR UNTIL LEGISLATED TO IMPROVE THE TANKAGE SYSTEMS.

- **IMPLEMENT** A LEAK DETECTION PROGRAM FOR U/G TANKAGE SYSTEMS.
- **CONDUCT** REGULAR INSPECTION OF CATHODIC PROTECTION SYSTEM.

DRIVING FORCES

- LEGISLATION IS IN PLACE OR PENDING.
- MOST TERMINALS ARE 30+ YEARS OLD.
- INSTALLATION TECHNIQUES ROUTINELY DAMAGE PORTIONS OF THE PROTECTIVE COVERINGS.
- UNDERGROUND LEAKS ARE DIFFICULT TO DETECT AND SOIL CONTAMINATION CAN BE EXTENSIVE BEFORE LEAKAGE IS RECOGNIZED.
- SOIL DECONTAMINATION IS EXPENSIVE AND TIME CONSUMING.

LEAK DETECTION

- **ESTABLISH** AN INVENTORY CONTROL PROGRAM.

CORROSION MONITORING

- **SEE** REQUIREMENTS IN "UNDERGROUND PIPING" (SECTION 1).

PIEZOMETER WELLS

- THESE WELLS (3-4) SHOULD BE STRATEGICALLY INSTALLED TO SAMPLE THE SUBSURFACE STREAM AS IT TRAVELS ACROSS OUR SITES, I.E., IF THE SUBSURFACE TRAVELS NORTH TO SOUTH, THEN ONE WELL SHOULD BE ON THE NORTHERN EXPOSURE OF THE PROPERTY WHILE ONE TO TWO WELLS SHOULD BE INSTALLED ON THE SOUTHERN EXPOSURE, DOWNSTREAM OF BURIED TANKAGE AND PIPING.

  THE DIFFERENCE IN QUALITY MAY PROVIDE RECOGNITION OF AN UNDERGROUND LEAK.

  THERE MAY ALSO BE A QUALITY DELTA BECAUSE OF PAST PRACTICES OR FORMER SPILLS, SO PIPING AND TANK INTEGRITY TESTING PROVIDE ADDITIONAL DATA IN FORMULATING REACTION PLANS.

COST

- $6 - $8K PER SITE.

CURRENT STATUS OF U/G TANK REQUIREMENTS - REPLACEMENT TIMING

NOVA SCOTIA

- UNPROTECTED UNDERGROUND STEEL TANKS TO BE REMOVED PRIOR TO 1993 IF THE TANKS ARE 25 YEARS OLD.
- UNPROTECTED STEEL TANKS LESS THANK 25 YEARS OLD MUST HAVE THEIR CONDITION EVALUATED.

PRINCE EDWARD ISLAND

- UNPROTECTED UNDERGROUND STEEL TANKS TO BE REMOVED PRIOR TO THEIR 15TH YEAR OF AGE.

NEWFOUNDLAND AND LABRADOR

NEW BRUNSWICK

- UNPROTECTED UNDERGROUND STEEL TANKS TO BE REMOVE PER THE FOLLOWING SCHEDULE (AS OF 1988):
  - Before December 31, 1988 if tank is 23 years old or more.
  - Before December 31, 1989 if tank is 19-22 years old.
  - Before December 31, 1990 if tank is 13-18 years old.
  - Before December 31, 1991 if tank is less than 13 years old.

QUEBEC

- UNPROTECTED UNDERGROUND STEEL TANKS TO BE REMOVED PER THE FOLLOWING SCHEDULE:
  - Before January 1, 1993 if tank is 25 years old or more.
  - Before January 1, 1995 if tank is 20 years old but less than 25 years.
  - Before January 1, 1996 if tank is 17 years old but less than 20 years.
  - Before January 1, 1997 if tank is 15 years old but less than 17 years.
  - Before January 1, 1998 if tank is less than 15 years old.
- PROTECTED UNDEGROUND STEEL TANKS MUST HAVE APPROVED CORROSION PROTECTION SYSTEMS OPERATING.

ONTARIO

- NO LEGISLATED REQUIREMENTS YET.
- NEW ONTARIO GASOLINE HANDLING ACT (DUE 1992) WILL REQUIRE THE UNPROTECTED UNDERGROUND STEEL TANKS TO BE REMOVED PRIOR TO 1995 IF THEY WERE INSTALLED PRIOR TO 1974.
- PROTECTED UNDERGROUND STEEL TANKS MUST HAVE APPROVED CORROSION PROTECTION SYSTEMS OPERATING.

MANITOBA

SASKATCHEWAN

ALBERTA

BRITISH COLUMBIA

- NO LEGISLATION ENACTED.

NORTHWEST TERRITORIES

STRATEGY OBLIGATION

- **MEET** LEGISLATIVE REQUIREMENTS.
  - No change in current practices.

CONCERN

- TERMINAL EFFLUENT QUALITY MAY NOT MEET **FUTURE** LEGISLATION.

RISK REDUCTION OPTIONS

- **LOBBY** GOVERNMENT TO ACCEPT "GOOD OPERATING PRACTICES" VS. EFFLUENT QUALITY CRITERIA-VIA CPPI.
  - Source Control Program
  - Leak Management
  - Tank Water Bottoms Segregation and Disposal
  - Surfactant Control
  - Operating Practices
  - Tank Farm Water Transfer Rate Limitations
  - Yard Maintenance
  - Maintenance Practices
  - Cleanout Standards

OPERATION

- **DETERMINE** REGULATORY STANDARDS.
- **SEGREGATE/ELIMINATE** CONTAMINANTS.
- **IMPLEMENT** SOURCE CONTROL MEASURES.
- **ESTABLISH** GOOD MAINTENANCE PRACTICES.
- **ESTABLISH** ACCEPTABLE OPERATING PRACTICES.
- **TEST** PERFORMANCE - SAMPLING.
- **REACT** TO NON-COMPLIANCE IF NECESSARY:
  - Larger Facilities
  - Treatment System

RESEARCH

- **PUT** A HOLD ON DEVELOPMENT WORK UNTIL THERE IS A CLEARER FOCUS RE COMPLIANCE CRITERIA.

REGULATORY STANDARDS

RATIONALE:

- THERE IS A NEED TO DETERMINE WHICH REGULATORY AGENCY HAS JURISDICTION OVER THE QUALITY OF OUR EFFLUENT AND UNDERSTAND THE QUALITY PARAMETERS WE ARE JUDGED AGAINST.
- AS A GOOD CORPORATE CITIZEN, WE SHOULD HAVE IN PLACE "BEST PRACTICES" WHICH PROVIDES FOR BEST RESULTS WITH CURRENT TECHNOLOGY.

SEGREGATION/ELIMINATION OF CONTAMINANTS: RATIONALE

SEGREGATION OF CONTAMINANTS	IMPACT
Water drawoff material from storage tanks contains the highest degree of containment associated with the water separator system.	- Additional costs, both expense and capital. - Expense for disposal cost capital for water collect and potential storage facilities. - Capital for larger separator system.
Failure to segregate and treat will force all terminals into a treatment process. Segregation will minimize treatment facility and hopefully no treatment facility will be required.	
Garage effluent provides a high level of grease, oil and solvents into the separator system.	- Increases disposal costs. - New procedures to be initiated in the garage.
- Surfactants act as emulsifiers. - Emulsifiers can impede separator performance.	- Elimination of soaps in truck washing. - Increase in external truck washing or alternatives to today's soaps. - Potential exists for an isolated outfall for wash operations.

CONCURRENT SUPPORTING STRATEGIES

- Movement from top loading to bottom loading facilities.
- Movement to resurface underground hydrocarbon transfer lines.
- Refineries and marine to deliver dry product - haze free @ 32°F.

WATER DRAWOFF FACILITY

- Dependent on volume of water, cost of disposal.
- Permanent Facility:
  - Containment tankage for storage and separation above ground.
  - Charge line from each storage tank - connection to tank by flexible hose.
  - One transfer pump with three discharge lines:

    - to regular gasoline

    - to lowest grade distillate

    - to disposal vehicle
- Temporary Facility
  - Vacuum truck
  - Portable hose from storage tank to vacuum truck

STRATEGY OBLIGATION

- **MEET** LEGISLATIVE REQUIREMENTS.
  - No change in current practices.

CONCERNS

- UNDETECTED HYDROCARBON RELEASE FROM ABOVEGROUND STORAGE TANKS FROM LEAKING FLOORS.
- POTENTIAL OVERFLOW OF TANK CONTENTS.
- DRAINAGE OF HYDROCARBON TO TANK FARM LOT FLOOR.

RISK REDUCTION OPTIONS

- **CONTINUE** 10-YEAR INTERNAL TANK INSPECTION PROGRAM - DIVISION STANDARD.
- **LINE** TANK FLOORS PLUS BOTTOM 18" OF SHELL WITH FIBREGLASS REINFORCED PLASTIC.
- **INSTALL** HIGH LEVEL ALARM AND ASSOCIATED MOTOR OPERATED ISOLATION VALVE ON TANK CHARGING LINE.
- **INSTALL** ENCLOSED SAMPLE DRAW SYSTEMS.
- **TEST** TANK LOTS FOR IMPERMEABILITY.

Province/Terr.	INTERNAL INSPECTIONS		TANK LINERS		TANK FARM IMPERMEABILITY		HIGH LEVEL ALARM		Motor Operating Valve Change Line		Enclosed Sample Points	
	Year	Target	Year	Target	Year	Target	Year	Target	Year	Target	Year	Target
B.C.	N/A		N/A		N/A		N/A					
ALBERTA												
SASKATCHEWAN												
MANITOBA												
ONTARIO	1992	Latest	1992	2000	1992	2000	N/A	N/A				
QUEBEC												
NOVA SCOTA												
NEW BRUNSWICK												
NEWFOUNDLAND												
P.E.I.												
N.W.T.												

YR = Year Legislated TARGET = Year targeted for compliance Ref. ERM 4.2-2

TANK LOT SPILL PREVENTION
COSTING TOOL FOR PLANNING TANK INSPECTIONS

NOTE: Dollar values are per square foot, except where noted.
Dollar values are not absolute; use only from approximation.

	CATEGORY A 11.5 - 25 ft.. diameter		CATEGORY B 25 - 60 ft. diameter		CATEGORY C 60 - 100 ft. diameter		CATEGORY D 100 - 160 ft. diameter		
	$/sq. ft.	Fixed	$/sq. ft.	Fixed	$/sq. ft.	Fixed	$/sq. ft.	Fixed	Expense
Work Preparation	12		1		1		0.8		X
Cleaning Tank	12		2		1		0.5		X
Disposing of Sludge	50		5		4		2.0		X
Inspection - Metallurgical	42		5		4.5		3.0		X
Fibreglass Reinforced Plastic Liner	30		15	8K	11		10.0		X
Repairs (Fixed Cost)	-	3K				16K		25K	X
Upgrades (Fixed Cost)		17K		25K		30K		40K	CAPITAL X

Ref. ERM 4.2-3

STRATEGY OBLIGATION

- MEET LEGISLATIVE REQUIREMENTS.
  - No change in current practices.

TITLE	ENVIRONMENTAL REFERENCE MANUAL
SECTION	5: VAPOUR SUPPRESSION - FLOATING ROOF
SUBJECT	2: RISK REDUCTION OPTION

OPTION

- **PLAN** BASED ON PENDING LEGISLATION BUT EXECUTE ONLY WHEN REGULATED (NOT REGULATED YET).

CONCERNS

- VOLATILE ORGANIC COMPOUNDS (EMITTED TO ATMOSPHERE THROUGH EVAPORATION) REACT IN THE ENVIRONMENT TO PRODUCE OZONE.
- PROPOSED LEGISLATION IS BEING DRAFTED.

ALTERNATIVE PLAN

- **DEVELOP** A PLANNING BASIS FOR INSTALLATION OF FLOATING ROOF IN STORAGE TANKS,

  OR

- **HAVE** A FUNCTIONING VAPOUR SUPPRESSION SYSTEM IN PLACE SUCH AS VAPOUR BALANCING WITH V.R.U.

CRITERIA

- AREAS AFFECTED:
  - Terminals in Windsor/Quebec corridor
  - Lower Fraser Valley
  - Saint John area
- TIMING
  - Current timing - "Within eight (8) years of the date the authority having jurisdiction adopts the code."
- LIMITATIONS
  - 160 m^3 (1025 bbls) with true vapour pressure
  - 10 kPa (1.45 psia) and less than 75 kPa (10.9 psia)
  - Products Affected:

    - Motor Gasolines

    - Aviation Gasoline

    - Jet B

TERMINALS IMPACTED BY PLAN

AREA	TERMINAL
Saint John area - N.B.	Saint John
Lower Fraser Valley, B.C.	Lougheed
Windsor/Quebec corridor	Sarnia* Belleville Hamilton Port Hope Finch Prescott Nanticoke* Ottawa MEDU Boucherville Quebec*
*No tankage	

DRIVING FORCE

- THE CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT (CCME) PLAN FOR NITROGEN OXIDES AND VOLATILE ORGANIC COMPOUNDS - PHASE I.

  "GROUND LEVEL OZONE IS CAUSED BY TWO PRECURSOR POLLUTANTS, NITROGEN OXIDES (NO_x) AND VOLATILE ORGANIC COMPOUND (VOC_d), REACTING IN THE ATMOSPHERE IN THE PRESENCE OF SUNLIGHT.

  "IN RECOGNITION OF THE SERIOUSNESS OF THE GROUND-LEVEL OZONE PROBLEM, CCME DECIDED TO DEVELOP A MANAGEMENT PLAN FOR THE CONTROL OF NO_x AND $VOC_{d's}$."

- PHASE I AREAS:
  - LOWER FRASER VALLEY (LFV)
  - WINDSOR, QUEBEC CORRIDOR (WQC)
  - SAINT JOHN AREA (SJA)

COST IMPACT - FLOATING ROOF INSTALLATION

SITE	TANK	TOTAL (K$) CAPITAL	EXPENSE
Hamilton	6*	200	
Belleville	4	100	
Ottawa	1	20	
Campbell River	3	120	
Nanaimo	1	40	
Prince George	1	40	
Prince Rupert	3	135	

*Do with VRU if terminal stays open.

INSTALLATION CONSIDERATION

SAFETY SOURCE

- Repinning floating roof legs
  - Confined space entry
  - Roof floating on hydrocarbon

OPERATIONAL SOURCE

- Sites where ice is a concern (never completely melts).
- Landing roof may cause structural failure due to uneven floor surface.

OPPORTUNITY

- INSTALL CABLE SUSPENDED ROOF.
- FOR ALUMINUM ROOFS, RETRO FITS.

Approximate Costs:

40' diameter..... 9K$

100' diameter..... 20K$

150' diameter..... 45K$

LOCATION OF TANKS

NOTE: The data on this chart may not be completely accurate. Site reviews are required for planning purposes.

AREA	TANK NO.	SERVICE	BBLS.	CONSERVATION DEVICE
Hamilton	1	RUL-US 87	36000	LIFT ROOF
	2	RUL-US 87	35000	
	4	DOM.DSL	2800	
	5	MUL	1000	
	6	US DSL	13900	
	7	RUL-US 87	6700	FLOATING ROOF
	3	US DSL		
	10	PUL US 92	2400	
Port Hope	1	PUL	6625	
	2	RUL	20460	FLOATING ROOF
	3	MUL	2932	
	6	RUL	13607	
Belleville	3	MUL	1933	
	4	MUL	1269	
	9	PUL	14809	
	10	RUL	32500	FLOATING ROOF
Prescott	1	PUL	3000	
	9	RUL	15000	
	10	MUL	5000	
Sudbury	4	MUL	420	
	5	MUL	420	
	6	MUL	420	
	7	PUL	3000	
	8	RUL	11200	
Sault Ste Marie	819	PUL	27600	FLOATING ROOF
	558	RUL	93266	FLOATING ROOF
	822	MUL	13999	FLOATING ROOF
	695	AVGAS LL	364	
	696	AVGAS LL	364	
	817	DSL		FLOATING ROOF

LOCATION OF TANKS (cont'd)

AREA	TANK NO.	SERVICE	BBLS.	CONSERVATION DEVICE
Finch	150	PUL	154236	FLOATING ROOF
	13	RUL	24019	FLOATING ROOF
	151	RUL	153832	FLOATING ROOF
	676	MUL	67104	FLOATING ROOF
	250	JET A	98028	VAPOUR SPHERE
	580	JET A	98042	FLOATING ROOF
	822	AVGAS LL	573	
	823	AVGAS LL	573	
	824	AVGAS LL	573	
	825	AVGAS LL	573	
St. George	688	MUL	2932	FLOATING ROOF
	590	RUL	13607	FLOATING ROOF
	20	MUL	1933	FLOATING ROOF
	689	MUL	1269	FLOATING ROOF
Ottawa	840	RUL	100000	FLOATING ROOF
	841	PUL	37172	FLOATING ROOF
	845	MUL	19239	FLOATING ROOF
Winnipeg		ESSO 3000		FLOATING ROOF
		RUL		FLOATING ROOF
		MUL		FLOATING ROOF
		MUL		FLOATING ROOF
		TURBO B		FLOATING ROOF
		TURBO B		FLOATING ROOF
		TURBO B		FLOATING ROOF
		TURBO B		FLOATING ROOF
		PUL		FLOATING ROOF
		RUL		FLOATING ROOF
		100LL		FLOATING ROOF
		100LL		FLOATING ROOF
		RUL		FLOATING ROOF
Thunder Bay	23	MUL	66503	
	24	RUL	99913	
	25	PUL	12722	

LOCATION OF TANKS (cont'd)

AREA	TANK NO.	SERVICE	BBLS.	CONSERVATION DEVICE
Regina	110	MUL	52668	FLOATING ROOF
	111	PUL	52668	FLOATING ROOF
	112	JET B	52668	FLOATING ROOF
	114	JET B	52668	FLOATING ROOF
	115	PUL	52668	FLOATING ROOF
	116	RUL	93631	FLOATING ROOF
	117	RUL	93631	FLOATING ROOF
	118	RUL	93631	FLOATING ROOF
	128	JET B	23404	FLOATING ROOF
	129	JET B	23404	FLOATING ROOF
Calgary	5	PUL	23404	FLOATING ROOF
	6	MUL	41447	FLOATING ROOF
	7	PUL	23404	FLOATING ROOF
	8	RUL	52668	FLOATING ROOF
	9	RUL	93631	FLOATING ROOF
	10	MUL	41447	FLOATING ROOF
Fort Simpson	4	AVGAS	360	P.V. VENT
	5	AVGAS	360	P.V. VENT
	6	AVGAS	360	P.V. VENT
	7	JET B	2926	P.V. VENT
	9	RUL	2926	P.V. VENT
Inuvik	20	RUL	19507	P.V. VENT
	21	COMINGLE	551	P.V. VENT
	23	MUL	551	P.V. VENT
	24	MUL	551	P.V. VENT
	25	MUL	551	P.V. VENT
	27	RUL	9753	P.V. VENT
	28	JET B	39014	P.V. VENT
	29	AVGAS	4876	P.V. VENT
	31	JET B	65348	P.V. VENT
Aklavik	2	MUL	5852	P.V. VENT
Hay River	4	RUL	6339	P.V. VENT
	6	TURBO B	6339	P.V. VENT
	12	AVGAS	4876	P.V. VENT
	19	COMINGLE	551	P.V. VENT
	22	PUL	551	P.V. VENT
	23	PUL	551	P.V. VENT
	24	PUL	551	P.V. VENT

LOCATION OF TANKS (cont'd)

AREA	TANK NO.	SERVICE	BBLS.	CONSERVATION DEVICE
Hay River (cont'd)	25	PUL	551	P.V. VENT
	28	MUL	551	P.V. VENT
	29	MUL	551	P.V. VENT
	30	MUL	551	P.V. VENT
	31	MUL	551	P.V. VENT
Yellowknife	8	AVGAS	4878	P.V. VENT
	9	PUL	4876	P.V. VENT
	22	RUL	9753	P. V. VENT
	23	JET B	19507	P.V. VENT
	24	JET B	9753	P.V. VENT
	25	JET B	19507	P.V. VENT
	19	COMINGLE	360	P.V. VENT
	20	COMINGLE	360	P.V. VENT
Churchill (leased)	5	RUL	9000	P.V. VENT
	9	RUL	9000	P.V. VENT
	10	AVGAS	360	P.V. VENT
	11	AVGAS	360	P.V. VENT
Rimouski	5	RUL	6748	FLOATING ROOF
	6	RUL	13496	FLOATING ROOF
	7	AVGAS	362	
	8	AVGAS	362	
	12	MUL	14705	FLOATING ROOF
	14	RUL	66288	VAPOUR SPHERE
	15	RUL	29644	VAPOUR SPHERE
Sept Iles	1	JET B	1233	FLOATING ROOF
	5	MUL	1257	FLOATING ROOF
	6	PUL	2619	FLOATING ROOF
	14	AVGAS	1263	FLOATING ROOF
	15	RUL	4748	FLOATING ROOF
	17	JET B	7361	
Labrador City	1	MUL	362	
	3	MUL	362	
	12	RUL	362	
	13	RUL	362	
	14	RUL	362	
	15	PUL	362	
	17	PUL	362	
Drummondville	1	RUL	23650	FLOATING ROOF
	3	MUL	5018	FLOATING ROOF
	4	RUL	14809	FLOATING ROOF

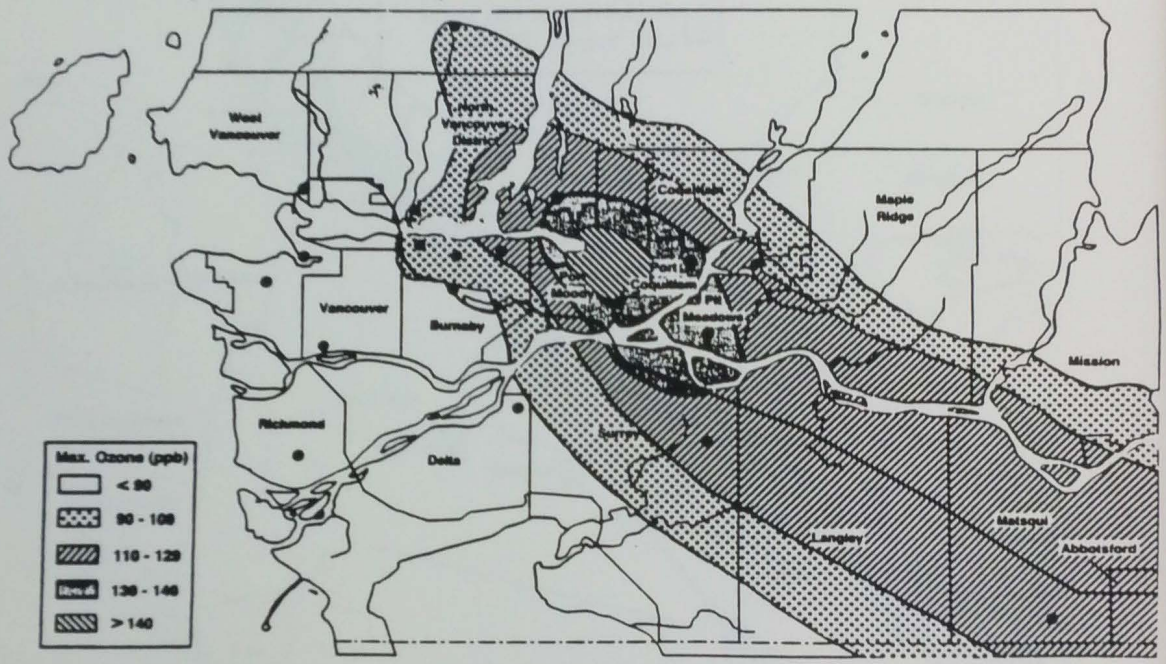
LOCATION OF TANKS (cont'd).

AREA	TANK NO.	SERVICE	BBLS.	CONSERVATION DEVICE
Matagami	1	RUL	362	
	2	RUL	362	
	3	RUL	279	
	4	AVGAS	279	
	11	MUL	362	
	12	MUL	362	
	14	AVGAS	362	
St. John's	1	RUL	29650	VAPOUR SPHERE
	2	PUL	15116	VAPOUR SPHERE
	3	RUL	22490	VAPOUR SPHERE
	5	MUL	9147	FLOATING ROOF
	13	PUL	546	P.V. VENT
	15	MUL	546	P.V. VENT
	16	RUL	546	P.V. VENT
	17	RUL	546	P.V. VENT
	21	PUL	546	P.V. VENT
	22	RUL	546	P.V. VENT
	23	RUL	546	P.V. VENT
	24	RUL	546	P.V. VENT
Cornerbrook	2	MUL	29656	P.V. VENT
	4	RUL	28306	FLOATING ROOF
	7	PUL	4981	P.V. VENT
	8	PUL	3963	P.V. VENT
Sydney	146	MUL	40282	
	151	PUL	18404	
	155	RUL	14981	
Charlottetown	544	MUL	29865	
	545	RUL	53693	
	546	PUL	23766	
Lewisporte	10	JET B	29607	P.V. VENT
	11	MUL	50840	P.V. VENT
	13	MUL	29650	P.V. VENT
Newcastle	607	PUL	29570	FLOATING ROOF
	609	RUL	66257	FLOATING ROOF
	610	RUL	53374	FLOATING ROOF
	613	MUL	552	
	614	MUL	552	
Saint John	80	RUL	39877	FLOATING ROOF
	81	RUL	17791	FLOATING ROOF
	20	PUL	23926	FLOATING ROOF
	10	MUL	11656	FLOATING ROOF

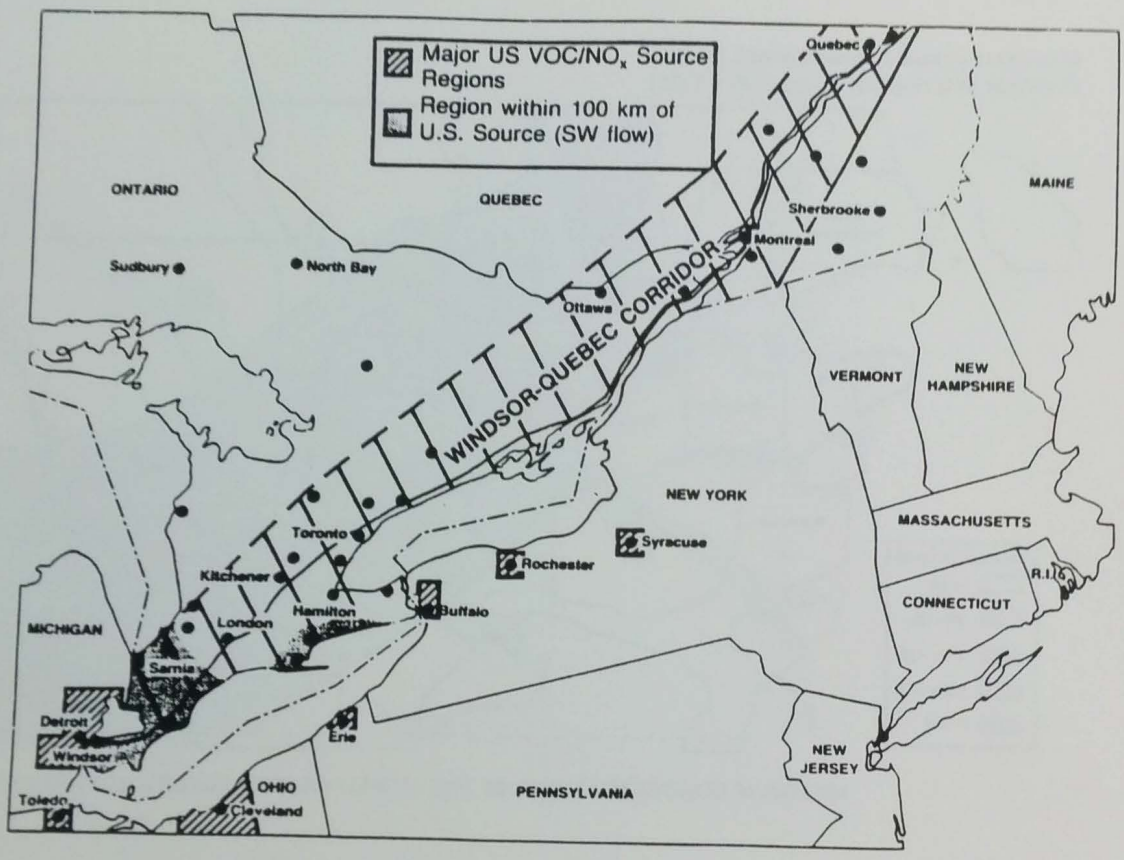
LOCATION OF TANKS (cont'd)

AREA	TANK NO.	SERVICE	BBLS.	CONSERVATION DEVICE
Victoria	1	MUL	10797	FLOATING ROOF
	2	RUL	11196	FLOATING ROOF
	5	PUL	3159	FLOATING ROOF
	11	AVGAS	521	FLOATING ROOF
	12	AVGAS	521	
	17	RUL	7374	FLOATING ROOF
	18	JET B	699	FLOATING ROOF
	19	AVGAS	521	
Prince Rupert	4	RUL	9104	
	15	MUL	3300	
	16	MUL	3300	
	20	PUL	10122	
	21	AVGAS	509	
Prince George	3	MUL	4705	FLOATING ROOF
	4	RUL	527	
	5	RUL	527	
	7	RUL	527	
	8	RUL	527	
Nanaimo	1	RUL	9085	FLOATING ROOF
	3	PUL	9085	FLOATING ROOF
	5	MUL	1484	
	12	AVGAS	337	
	13	PUL	337	
Lougheed	1	MUL	38957	FLOATING ROOF
	3	RUL	19662	FLOATING ROOF
	10	JET A	15815	FLOATING ROOF
	12	PUL	8509	FLOATING ROOF
Kamloops	1	MUL	37098	FLOATING ROOF
	2	RUL	56024	FLOATING ROOF
	10	COMINGLE		FLOATING ROOF
	11	MUL	13190	FLOATING ROOF
	12	RUL	22085	FLOATING ROOF
	14	PUL	2576	FLOATING ROOF
Campbell River	2	RUL	2815	
	3	MUL	3773	
	4	PUL	3773	
	6	PUL	306	
	7	PUL	306	
	8	PUL	319	

Maximum Ozone Concentrations (ppb)
(Average of 3 Highest Years 1983 - 1989)



MAXIMUM CONCENTRATIONS IN THE LOWER FRASER VALLEY (LFV) REGION



WINDSOR-QUEBEC CORRIDOR AND LOCATION OF MAJOR U.S. VOC/NO_x SOURCE REGIONS NEAR THE GREAT LAKES

STRATEGY

- MEET LEGISLATIVE REQUIREMENTS.
  - No change in current practices.

STATUS

- OPERATING UNITS FUNCTIONING AT:
  - Finch Terminal
  - Lougheed Terminal
- CONSTRUCTION COMPLETE AT ST. GEORGE IN Q3 1992.

TITLE ENVIRONMENTAL REFERENCE MANUAL
SECTION 7: P.C.B.
SUBJECT 1: STRATEGY

STRATEGY

STATUS

ENVIRONMENTAL REFERENCE MANUAL

Esso Imperial Oil
Products Division
Distribution

July 30, 1993

TO: Attached Distribution List
FROM: J. S. Whitelaw
SUBJECT: **Ozone Depleting Materials, ERM Revision #1**

Compliance with legislative requirements is our priority when it comes to the use of ozone depleting substances, such as fluorocarbons and halon, in our operation. The enclosed ERM updates (Section 8.1, 8.2 and 8.3) outline the strategy and risk reduction options in complying with government regulations, as well as our commitment to do our share to help prevent the destruction of ozone layer.

Please review the requirements in this new ERM section and contact me if any further information is required.

J. S. Whitelaw
Operating Practices Manager
Distribution Operations

ENVIRONMENTAL REFERENCE MANUAL
Distribution List

Operating Practices Manager	111-1037 (J.S.Whitelaw)
Environmental Advisor	Dartmouth
Environmental Advisor	MEDU
Environmental Advisor	Finch
Environmental Advisor	Edmonton
Environmental Advisor	Lougheed
Loss Control Advisor	Pipeline Div., EPE-Calgary
Senior Terminal Manager	Dartmouth
Senior Terminal Manager	St. John's, Nfld.
Senior Terminal Manager	Quebec
Senior Terminal Manager	Montreal East
Senior Terminal Manager	MEDU
Senior Terminal Manager	Ottawa
Senior Terminal Manager	Finch
Senior Terminal Manager	Winnipeg
Senior Terminal Manager	Edmonton
Senior Terminal Manager	N.W.T. (Edmonton Terminal)
Senior Terminal Manager	Lougheed
Operations Support Manager	111-1032 (J. D. Lanoue)
Engineering Support	111-1011 (P. Schwanen)

ENVIRONMENTAL REFERENCE MANUAL

TABLE OF CONTENTS

STRATEGY

- We will meet legislative requirements.
- Ozone depleting substances should be removed from our operations where practical.
- Ozone depleting substances should **not** be used except where there are no practical alternatives.
- Where ozone depleting substances are used, discharges to the environment during maintenance or testing are **not permitted**.
- Equipment containing ozone depleting substances should be labelled and maintained so as to minimize discharges and fugitive emissions.

CONCERNS

- Fluorocarbons are commonly used as a cooling agent in refrigerant equipment; Halon is used as a fire suppressant.
- When fluorocarbons and Halon (also referred to as ozone depleting substances or ODS) are released into the environment, they rise to the upper atmosphere where they destroy the ozone layer.

  The ozone layer acts as a shield that protects the earth against ultraviolet radiation that can cause skin cancer and vegetation damage.

RISK REDUCTION OPTIONS

- Only certified technicians will be allowed to handle, service and repair refrigeration equipment.
- Venting of refrigerant CFCs (chlorofluorocarbons), HCFCs (hydro-chlorofluorocarbons) and HFCs (hydrofluorocarbons) will be prohibited, i.e., office airconditioners, refrigerators, vehicle air conditioners, Halon fire suppression systems.
- Replace Halon 1211 hand extinguishers with hand CO_2 extinguishers.
- Existing fixed Halon fire suppression systems should be set to trigger on ***manual only***, not automatic. Fire detection and alarm systems should be reviewed to ensure adequate notification of alarm.

DISPOSAL

- Disposal of equipment containing ozone depleting substances (ODS) must be undertaken to meet legislative requirements or through accepted industry practices.

ENVIRONMENTAL ENGINEERING & OPERATING PRACTICE (EEOP) REPORTS ON CFCs AND HALON

The following documents are provided here primarily as a reference to ozone depleting substances used in our own Distribution terminals but demonstrates the alignment being achieved among Exxon affiliates in environmental area:

- Update to EEOP-8 (pages 1 to 8) - produced by Exxon Chemical Company, Environmental Technical Services, Baytown, Texas.
- Interim Report (pages 1 to 3) - produced by ER&E specific to Halons.

EXXON CHEMICAL COMPANY

ENVIRONMENT
HEALTH & SAFETY DEPT.
MAR 9 1993
RECEIVED

EXXON CHEMICAL

Environmental Technical Services
Baytown, Texas

February 11, 1993

Halon and CFCs

Distribution:

Enclosed are an update to EEOP-8 and an Interim Report produced by ER&E specific to Halons. EEOP-8 has been revised to incorporate the recommendations of the Interim Report. Please note that during replacement, all CFC and related compounds are to be handled or removed by appropriate vendors so as not to be released to the atmosphere.

As members of the ECOIC Technology Subcommittee, we believe the recommendations of the Interim Report are supportable. Because CFC refrigerants do not have safety implications, we have not reviewed any suggested alternatives for recommendation. Environmental Technical Services (ETS) does have several papers on refrigerant alternatives which are available upon request.

Although specific recommendations have not been made on refrigerants, sites are urged to discuss alternatives with their suppliers. We are willing to help if needed. If you have any questions or comments, please don't hesitate to contact your OIC representative, Ray (713) 425-2593 PROFS ID BCBREO (HOUECA) or Dick (713) 425-2358 PROFS ID BTCRPH (BAYTOWNC).

Sincerely,

Dick

R. P. Herbst

Ray

R. E. Olsen

rph/pdp
Enclosure
EVRPHP025

P.O. Box 400, Baytown, Texas 77522-0400
Fax: (713) 425-2802

A Division of Exxon Corporation

PROPRIETARY INFORMATION
For Authorized Company Use Only

1.0 APPLICABILITY

This Environmental Engineering & Operating Practice (EEOP) sets a minimum for Exxon Chemical facilities. A more stringent standard may be required by local regulations or risk considerations.

The DESIGN requirements contained in Section 6 of this EEOP are to be followed for all new firefighting, air conditioning and refrigeration equipment. The OPERATIONS AND MAINTENANCE requirements in Section 7 apply to all sites using ozone depleting materials. Any exceptions must be approved by the appropriate Operations Integrity Committee (OIC).

In accordance with the Operations Integrity Management Practices (OIMPs), site management must decide when existing firefighting, air conditioning and refrigeration equipment should be upgraded to meet this EEOP. Maximum benefit should be taken of opportunities arising from maintenance, revamp, retrofit and "turnaround" activities.

2.0 SCOPE

2.1 This Environmental Engineering & Operating Practice covers the use of chlorofluorocarbons (CFCs), halons and other ozone depleting materials (ODMs), and materials manufactured using them, specifically:

- Halon in firefighting equipment,
- CFCs in refrigeration and air-conditioning equipment,
- Hydrofluoroalkanes (HCFCs) as substitutes for CFCs or halons,
- Carbon tetrachloride,
- Methyl chloride,
- Methyl chloroform,
- Aerosols using ODMs as propellants, and
- Foamed materials manufactured using ODMs.

3.0 REFERENCES

Below is a list of Exxon standards which overlap with this EEOP. Where a conflict exists, the more stringent and/or recently revised standard shall apply.

3.1 Basic Practices

4.3.1 Plant Buildings for Operation and Storage
14.2.2 Cold Service Thermal Insulation - Materials and Application
17.2.1 Portable and Ancillary Firefighting Equipment

3.2 Environmental Engineering & Operating Practices

EEOP-1 Valves, Flanges and Screwed Connections
EEOP-7 Vents and Drains

3.3 Other

ER&E Reports - Halon Phase Down Study, Interim Report, R. F. Murphy, December 11, 1992

4.0 DEFINITIONS

4.1 Ozone Depleting Materials (ODMs) - facilitate the conversion of ozone to oxygen, which results in a thinning of the ozone layer which protects the earth from harmful radiation.

The main materials of concern are:

- CFCs (chlorofluorocarbons) used as refrigerants, aerosol propellants and in the production of foamed materials,
- Halons, similar materials developed for use as fire suppressants, containing bromine in addition to, or instead of chlorine, and
- HCFCs developed as replacements for the above. The incorporation of hydrogen ions encourages breakdown in the lower atmosphere below the ozone layer.

(The above three categories are sometimes collectively referred to as halocarbons).

- Chlorinated solvents; particularly carbon tetrachloride and methyl chloroform, used for cleaning and in adhesives.

4.2 HFCs (hydrofluorocarbons) - are halocarbons, but contain no bromine or chlorine.

4.3 Ozone Depleting Potential (ODP) - is the capacity of a compound to destroy ozone. The depleting potential of the molecule/compound depends on the amount of chlorine or bromine it contains and on its lifetime in the atmosphere. The ODP is a measure of the ozone destruction capability of a molecule/compound relative to CFC-11, which is given an ODP of 100. Typical ODPs are:

CFC-11	100
CFCs	50 - 100
Halons	300 - 900
HCFCs	2 - 10
HFCs	0
Methyl chloride	2

4.4 NFPA - is the National Fire Prevention Association of the United States.

5.0 PRINCIPLES

5.1 Ozone depleting materials should not be used except where there are no practical alternatives.

5.2 Where ODMs are used, discharges to the environment during maintenance or testing are not permitted.

5.3 Equipment containing ODMs should be labeled and maintained so as to minimize discharges and fugitive emissions.

6.0 DESIGN

6.1 Firefighting

6.1.1 Halon or other ozone depleting materials shall not be used in new systems.

6.1.2 Recommended protection for Control Room subfloors and similar areas is fast response fire detectors and hand-held CO_2 extinguishers.

6.1.3 If for any reason the OIC agrees to waive 6.1.1 and install an ODM-based system, the following design requirements shall apply:

- The volume of the space to be flooded shall be minimized.
- Halon discharges during acceptance testing, routine checks, maintenance or decommissioning shall not be permitted.
- Actuation systems shall be designed and maintained to minimize the risk of accidental release.
- Enclosures shall be designed to permit Enclosure Integrity Acceptance Testing to NFPA 12A 1989 Edition, Appendix B.

6.2 Air Conditioning and Refrigeration

6.2.1 Ozone depleting materials shall not be used in new air conditioning or refrigeration systems.

6.2.2 Systems containing ODMs shall have sealless pumps, bellows valves and welded connections, or equivalent leak-proof design to eliminate fugitive emissions.

6.2.3 Filling connections shall be designed to minimize releases to the atmosphere.

6.2.4 Equipment shall be designed to permit incondensible purges without release of ODMs to the atmosphere.

6.2.5 A sensitive system of monitoring ODM inventory or supply lines shall be provided to detect losses.

6.2.6 Domestic air conditioners and refrigerators in eating or changing clothes locations and office use should comply with the above requirements as far as possible. When non-ODM alternatives are available these must be specified, otherwise lowest ODP commercial standard is acceptable.

6.3 Low Temperature Simulation and Test

6.3.1 The provisions of 6.2 shall apply.

6.4 Solvents

6.4.1 Ozone depleting materials shall not be used.

6.4.2 When ODMs must be used, emissions shall be reduced to the absolute minimum by the use of low leak equipment (see 6.2.2 above) and the use of appropriate vapor recovery systems (see EEOP-7, Vents and Drains).

7.0 OPERATIONS AND MAINTENANCE

7.1 Maintenance

7.1.1 All equipment containing ODMs with an ODP greater than 20 shall be clearly labelled as follows:

> WARNING
> OZONE DEPLETING MATERIAL
> DO NOT DISCHARGE TO ATMOSPHERE

7.1.2 When equipment is depressurized for maintenance or being replaced, all ODMs must be recovered into closed containers and sent for recycling or destruction.

7.1.3 All equipment containing ODMs shall be subject to a Monitoring and Maintenance program to minimize fugitive emissions (see EEOP-1).

7.1.4 When equipment containing an ODM is emptied for maintenance, it shall be refilled with the material of lowest ozone depleting potential compatible with the duty.

7.1.5 All Exxon employees or contractors working on equipment containing ODMs shall be trained in the safe and environmentally satisfactory handling of these materials.

7.2 Hand-Held Extinguishers

7.2.1 Existing hand-held halon extinguishers shall be replaced. Recommended replacements are CO_2 for indoor use and dry chemical for outdoor use. .

7.2.2 When equipment is depressurized for maintenance or being replaced, all ODMs must be recovered into closed containers and sent for recycling or destruction.

7.3 Purchased Supplies

7.3.1 Items containing ozone depleting materials or manufactured using ODMs shall not be purchased except where no substitute is available.

7.3.2 Aerosols using ODM propellants shall not be purchased.

7.3.3 Foamed materials manufactured using ODMs shall not be purchased.

7.3.4 ODMs shall not be used for cleaning or degreasing equipment.

7.4 Releases

7.4.1 An unplanned release of one pound or more of any ODM shall be considered an environmental incident and shall be recorded and investigated accordingly.

7.5 Replacement Materials

7.5.1 Materials of lower ozone depleting potential and equivalent fire extinguishing or heat transfer properties are being developed. As these become commercially available we should consider changing the materials in existing systems. Points to consider include:

- Fugitive or other losses from existing system. When these are significant, change to a lower ODP material is encouraged.
- Anticipated further improvement. If a non-depleting material is expected to be available soon, the change to an intermediate material may not be justified.
- The cost of hardware modifications required.

7.5.2 When equipment is depressurized for maintenance or being replaced, a[illegible] ODMs must be recovered into closed containers and sent for recycling [illegible] destruction.

INTERIM REPORT
HALON PHASE DOWN STUDY

We were requested by ECI to assist them in the resolution to the Halon replacement program. Gerry Ungerleider organized a program to study the overall Halon picture and develop a company position. Others involved in the program were EPRCo and EBSI. Briefly, EPRCo would gather data in the upstream area and ER&E would review the downstream functions. This report is basically an interim report describing where ER&E is today. Also, we have a 1993 R&D budget item to further define the Halon replacement developments.

Review of Others Positions

We reviewed a number of position papers furnished by ECI from the United Kingdom Offshore Operators Assoc. (UKOOA), Arco, Shell Expro, Shell International Petroleum Maatschappij (SIPM), Esso UK, and some miscellaneous papers. Most of these papers have taken a strong position of no new Halon installations. Shell believes that they can live without Halon on new facilities.

In addition to the above reviews, we have also discussed this subject with other companies at API safety meetings and some insurance representatives. Some of the contacts were Larry McKenna of AT&T, John Easterbrook of Dow Chemical, John Birtwistle of Monsanto, Dave Kirby of Union Carbide and Bob Ormsby of Air Products. Industrial Risk Insurers (IRI) believes the risk of fire with the currently used more fire resistant cabling and the lower power requirement in the subflooring area of control rooms has resulted in a significantly lower fire risk today than it was about 5 to 10 years ago. There was quite a degree of variation on how the various contacts plan to phase out Halons and what, if any, fixed systems would be used. However,the growing industry trend today is not to install fixed extinguishing systems in the subflooring of manned control rooms.

Low Frequency of Fire in Control Houses

We have also reviewed our Hazard Loss Information System (HLIS) 8021 Reports since 1951 to see if we could establish how high our fire risk has been in control rooms, some of which may have installed fixed Halon systems. We were able to locate three relatively minor fires that were associated with control rooms. Actually two were in the electrical equipment substation/switch equipment room of the control house and in another case, an oily rag caused a minor fire. In all cases, the fires were minor and capable of being extinguished with portable extinguishers. Considering the number of control houses Exxon has in operation and the total number of years of operation, this appears to be an excellent fire record and does not justify the cost of fixed extinguishing systems.

Over-Use of Halons

As a general statement, it appears that we have over-used Halon 1301 in the past. Halon is a very clean and effective extinguishing system that does not have any toxic problems if people were exposed during a discharge at a 6% concentration. Many insurance inspectors recommended total flooding systems where previously only hand extinguishers were provided.

However, in retrospect, some fixed systems were installed that could have been adequately protected with hand extinguishers.

As a case in point, Marsh & McLennan Protection Consultants previously conducted the insurance surveys for Exxon Risk Management. They consistently recommended total flooding Halon systems for the complete control house whereas we only recommended fire detectors and portable fire extinguishers. After many confrontations and some prodding by Risk Management, we reluctantly agreed to a compromise position of installing fixed Halon in only the subflooring area. Not all affiliates agreed with this approach. Exxon Chemical-Central Engineering Department (CED) were especially vocal in their objections to using fixed Halon systems so we made this an asterisk item in BP4-3-1 which means that each affiliate has an option to accept or reject the Halon requirement. The actual minimum BP requirement has been hand extinguishers with the fixed system an individual option. Many people overlook this and believe the basic minimum is a fixed system in the control room subflooring area when, in fact, it is not our minimum.

Current Recommendation For Control Room Subfloor

Based primarily on our excellent (very low) fire loss experience of three minor fires in control rooms going back to 1951 and also the lower risk today due to fire retardant cabling coupled with lower power requirements, our current recommendation remains the same. That is, to install fast response fire detectors in the subfloor area with reliance on hand extinguishers instead of fixed systems. There is also a growing trend in the industry to reduce the number of fixed extinguishing systems as many realize that Halons have been over-used. The use of a fixed extinguishing system should be judged on the risks involved including fire history, if it can be established.

Halon Hand Extinguisher Replacement

We recommend that existing Halon 1211 hand extinguishers be replaced with currently available agents. For indoor use, we recommend CO2 extinguishers based on the ease of clean up as dry chemical extinguishers create a severe clean up problem indoors. On the other hand, dry chemical extinguishers are much more effective as compared to CO2 and we recommend that dry chem be used outdoors where clean up is not a problem. We also recommend that fire training with Halon extinguishers be stopped.

Leave Existing Fixed Halon Systems As Is For Now

For downstream operations, the most common place where Halon is currently used is in the subflooring area of control rooms. We believe it is acceptable to leave these existing units in place. However, each location should develop plans to implement a phase down strategy recognizing environment, regulatory and price/supply considerations. Existing fixed systems should be on manual release and not automatic. Also, no actual discharge tests should be conducted.

INERGEN Potential Halon Replacement

One potential replacement for Halon that is currently marketed is an inert gas mixture called INERGEN. The name is derived from INERt gas and nitroGEN and is a mixture of approximately 52% nitrogen, 40% argon and 8% carbon dioxide. The distributors of this gas claim it is safe to breath when the oxygen concentration in a flammable mixture is reduced to about 12.5% which is required for extinguishment. We have issued SOC Communication 2-92 dated March 30, 1992 questioning this safety claim. Exxon Biomedical Sciences, Inc. stated, "There is no evidence that INERGEN is safer than other asphyxiant gases (such as CO2)." The communication goes on to state that if INERGEN is proposed to protect an occupied space by flooding, it should be handled like CO2: that is, evacuation before release with positive pressure supplied air respiratory protection required before re-entry.

Conclusion and Recommendations

- From an overall standpoint, we recommend following the Shell position which essentially says they will not use Halons. We recommend not installing any new Halon fixed systems except for essential use as defined by Exploration and Production Forum.

- Install fire/smoke detectors with alarms in subfloor areas in manned control rooms and use hand portable CO2 extinguishers.

- Replace Halon 1211 extinguishers with CO2 indoors and dry chemical outdoors.

- For high fire risk areas such as gas turbine enclosures (and other areas not open to personnel), use CO2 or maybe high velocity water sprays (the latter needs more review).

- Continue to evaluate Halon replacement alternatives as part of our 1993 R&D program. Some of the areas we have talked about investigating include:

  + Acceptability of alternate extinguishing agent to Halon.
  + The effectiveness of high velocity and high pressure water sprays.
  + Use of passive protection (fire resistant materials, fire walls, fireproofing).
  + Very early hydrocarbon leak/smoke/fire detection sensors.
  + Water damage protection for electrical/electronic equipment enclosures if water sprays used.

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