Why is API 653 Relevant to APSA?

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Session Code Tu-G2

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26th California Unified Program Annual Training Conference
February 26-29, 2024

API 653 v STI SP001

- API 653: Any container that is not shop built.
- API 653: Can be used for shop built tanks.
- Any tank that is large (focus today)

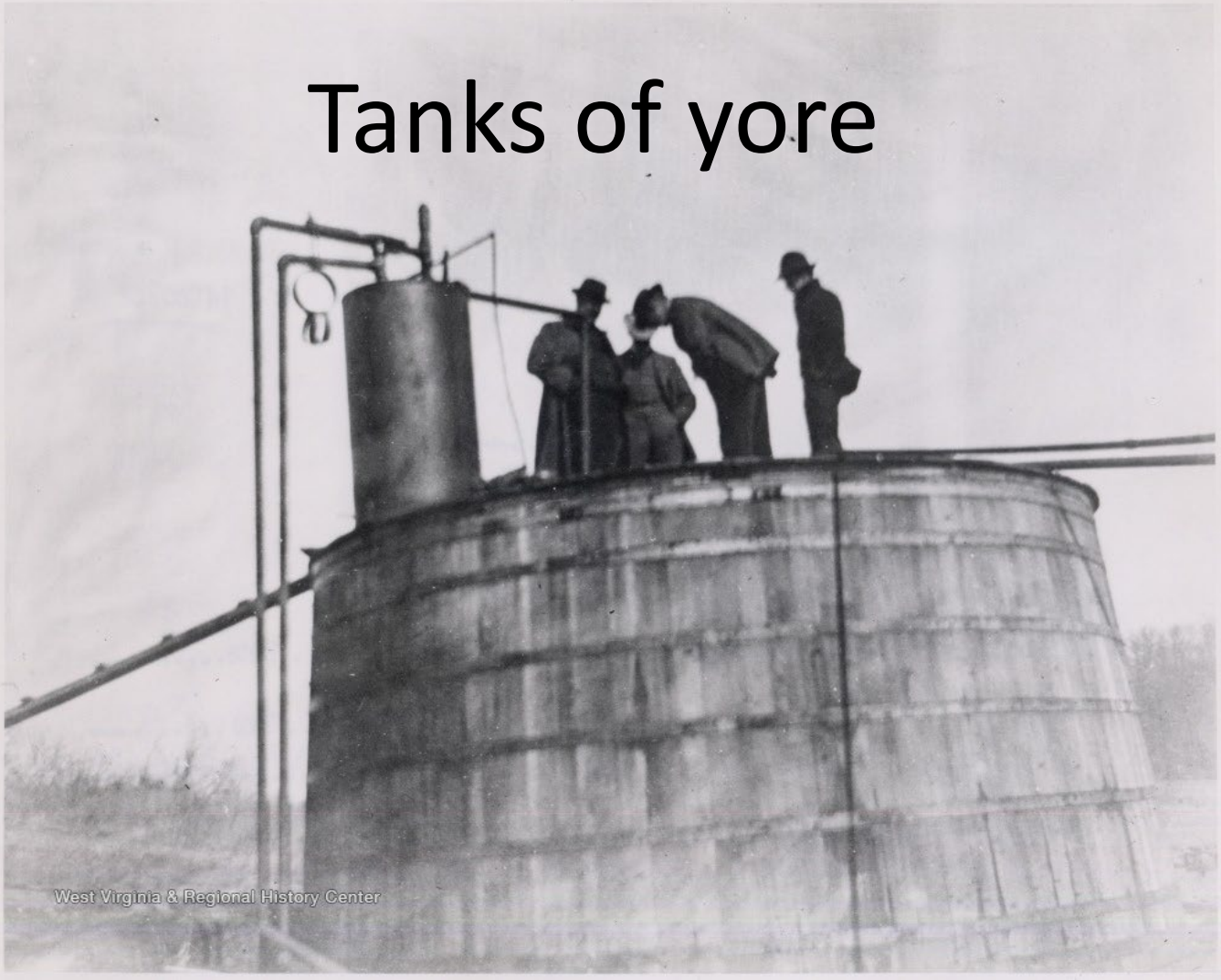
Overview

- Some history
- Tank basics
- Managing tank inspections
- Conclusions

History of oil storage rules

- Rules? What rules?
- 1973 the Oil Pollution regulation set requirements for prevention, preparedness and response to oil spills
- In 1988 EPA formed SPCC Task Force
- 1991 API Publishes API Standard 653
- RAGAGEP/Litigaton tend to regulate corporate behavior

Tanks of yore



Rivets of yore

Welded tanks today


The Ashland Oil Incident
January 2, 1988

A Defining Moment for Tanks

- January 2, 1988
- Recently reconstructed tank was filled completely with diesel. 4M gallons.
- Extreme cold, -12F
- Sudden catastrophic failure of the tank – Brittle Fracture
- All contents released, spilled over dike, and into Monongahela River then to Ohio River.

½ to 1 million gallons spilled into river. $2M fine.

A bad day in Martinez

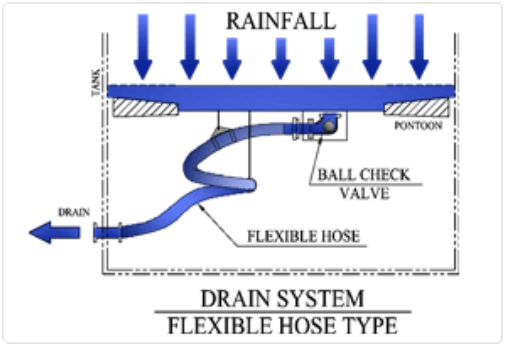
- Martinez Shell Refinery April 23, 1988
- A hose failed
- Tank drain valve opened
- Secondary containment valve opened
- I00-acre marsh covered and oil flowed in and out to the Carquinez Strait downstream into San Pablo Bay.
- 400,000 gallons of heavy crude oil had leaked out into the environment before being noticed from 12.5M gal tank
- This was one important driver for SCPP

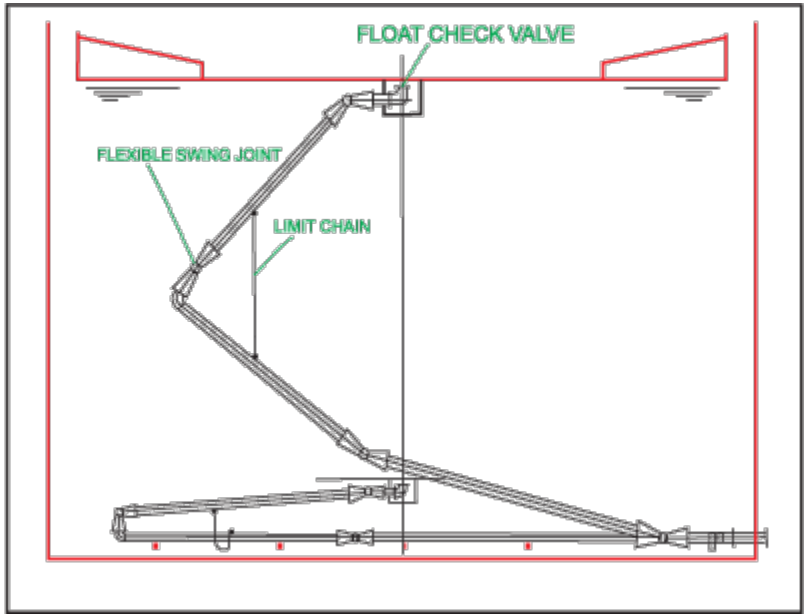
https://www.cerc.usgs.gov/orda_docs/CaseDetails?ID=26

- **Case Description**
- Late in the evening of April 23, 1988, a tank at the Shell Manufacturing complex in Martinez, filled with hundreds of thousands of gallons of San Joaquin crude oil, began to leak. A hose, designed to drain water from the roof of the tank, failed. Oil began siphoning out into the containment area surrounding the tank. Unfortunately, a storm water release valve had been left open, and the oil continued to drain into a nearby creek, under the freeway, and down into a marsh now called McNabney Marsh. Oil filled the l00-acre marsh to a depth of more than four inches before flowing under the railroad tracks, past the refinery and chemical plant, and finally out into the Carquinez Strait, upstream into Suisun Bay, and, on the next tide, downstream into San Pablo Bay.

  Due to darkness, it took a while before anyone noticed the spill and a while longer to figure out where it had come from. Workers at the Shell wharf were the first to recognize and report oil on the water. Before the source of the spill could be located and stopped, about 400,000 gallons of heavy crude oil had leaked out into the environment.

  Many federal, state and local agency personnel, oil company representatives, cleanup contractors, scientists and others responded to the spill. In an attempt to recover as much oil from the surface of the water as possible, Clean Bay, an oil company cooperative, dispatched skimmers, and Shell and Coast Guard personnel placed oil boom and sorbant materials. After as much floating oil as possible was removed, cleanup of residues on shorelines began. Pump trucks sucked pooled oil from the McNabney Marsh, and a legion of Shell workers spread and retrieved sorbant boom, pom-pom, and pads, Cleanup of waterfront areas in Martinez and Benicia involved the use of high-pressure water washing to mobilize deposited oil and sorbant pads to recover it. This initially had only limited success, but in the end proved to be quite effective. The McNabney Marsh was ultimately drained, and contaminated vegetation was cut and removed by small crews using hand tools.


RAINFALL
TANK
PONTOON
BALL CHECK VALVE
DRAIN
FLEXIBLE HOSE
DRAIN SYSTEM
FLEXIBLE HOSE TYPE


FLOAT CHECK VALVE
FLEXIBLE SWING JOINT
LIMIT CHAIN


Gate Valve

The “Molassacre” of 1919

The Boston Daily Globe EXTRA

VOL XCV—NO. 16 BOSTON, THURSDAY MORNING, JANUARY 16. 1919-SIXTEEN PAGES PRICE TWO CENTS

MOLASSES TANK EXPLOSION INJURES 50 AND KILLS 11

SCENE OF RUIN AND DESOLATION IN NORTH END AFTER DESTRUCTION OF PURITY DISTILLING COMPANY TANK AND NEARBY STRUCTURES

GENERAL VIEW OF THE EXPLOSION, LOOKING NORTH ACROSS NORTH END PARK. THE CROSS WITHIN THE CIRCLE MARKS THE LOCATION OF GREAT MOLASSES TANK WHICH EXPLODED.

Death and Devastation In Wake of North End Disaster

Buildings Demolished, Sticky Mass Floods Streets— Loss $500,000

Red Cross Women, Firemen and Sailors Do Heroic Work In Aiding Victims

A sea of more than 1,500,000 gallons of molasses, freed by the sudden explosion and collapse of a giant iron tank, sent a tidal wave of death and destruction stalking through North End Park and Commercial at shortly after noon yesterday.

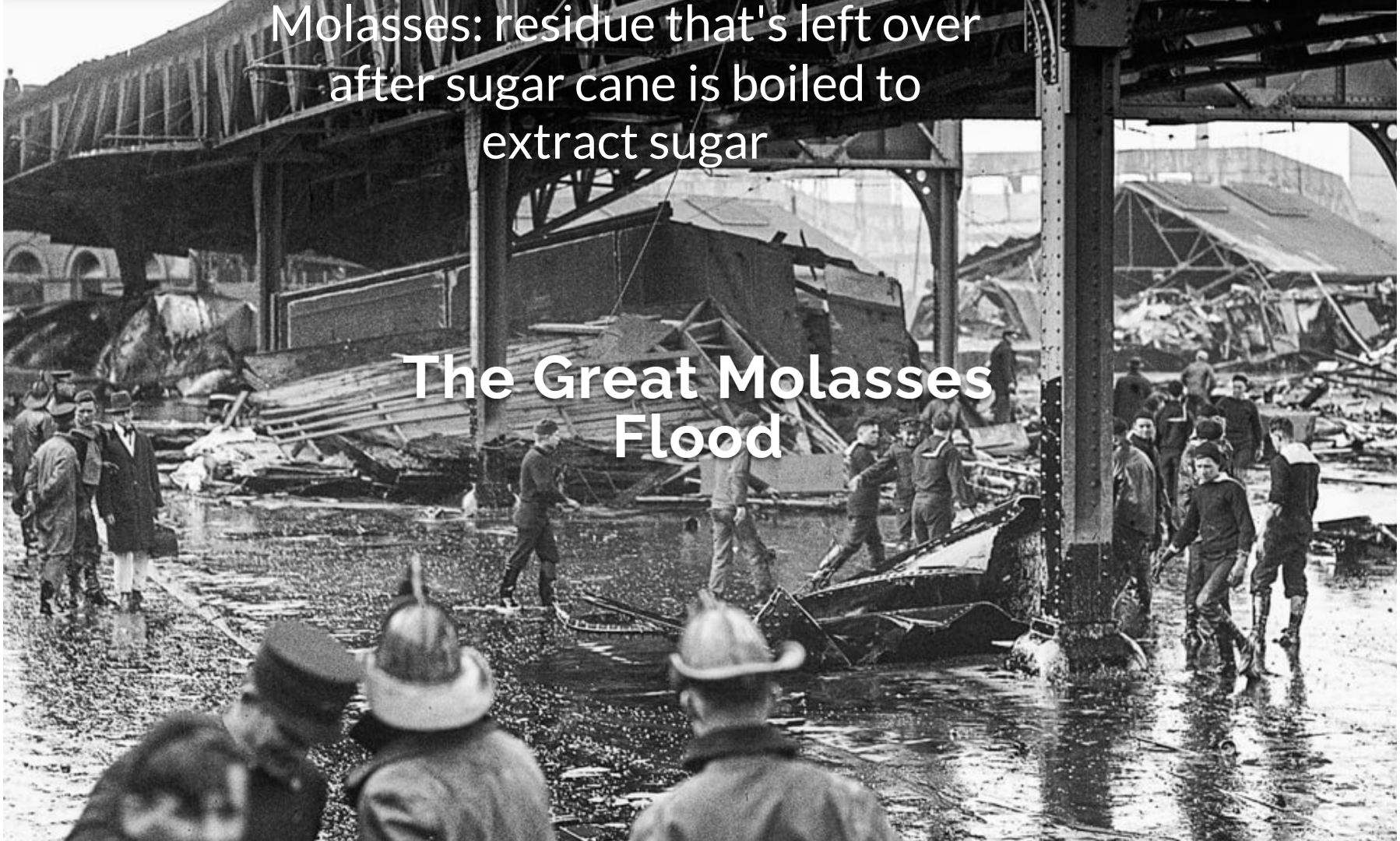
Casualty lists furnished by the

LIST OF DEAD

DEAD AT NORTH GROVE STREET MORGUE—

Mrs Bridget Clougherty, 6 Copps Hill terrace, identified by her son

Molasses: residue that's left over after sugar cane is boiled to extract sugar

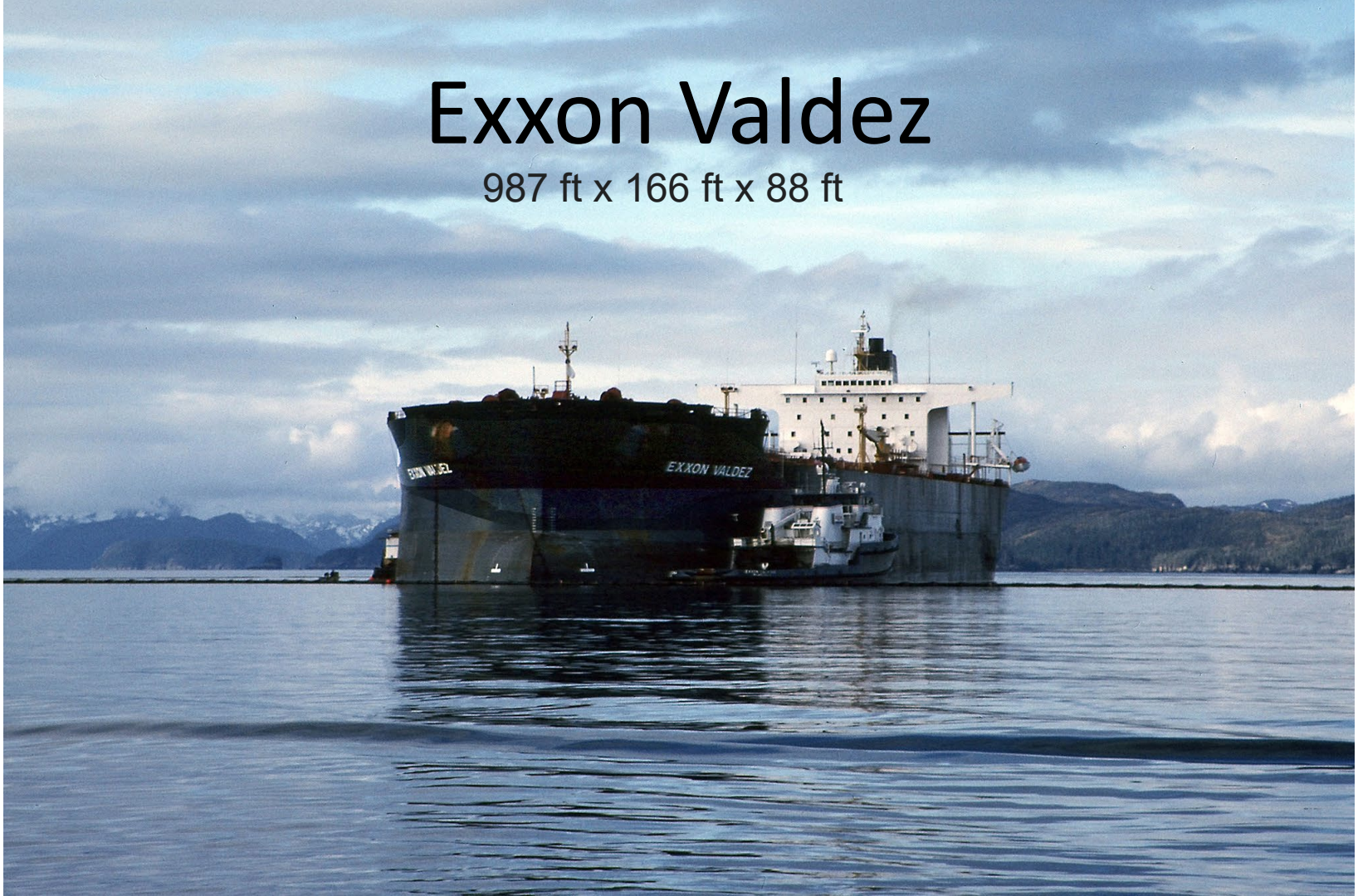


The Great Molasses Flood

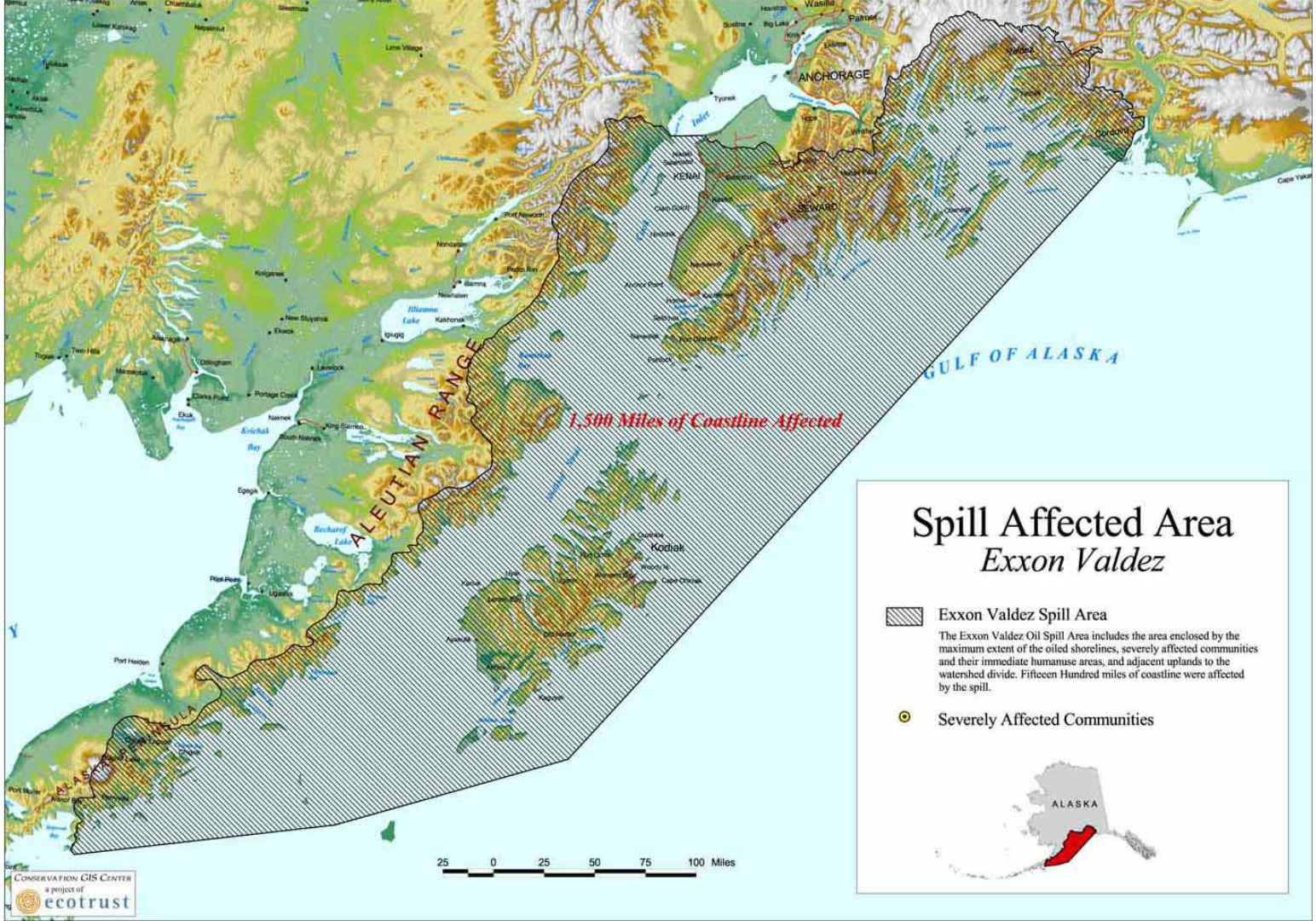
15 Jan 1919
2 million gallons released
40 foot wave
21 fatalities
150 injuries
Significance: Impacts the beginnings of regulations on industry activities which can pose risk to the public.

Exxon Valdez

987 ft x 166 ft x 88 ft




1989
11 M gallons


ANCHORAGE
KENAI
SEWARD
GULF OF ALASKA
ALEUTIAN RANGE
1,500 Miles of Coastline Affected
Kodiak
Spill Affected Area
Exxon Valdez
Exxon Valdez Spill Area
The Exxon Valdez Oil Spill Area includes the area enclosed by the maximum extent of the oiled shorelines, severely affected communities and their immediate humanuse areas, and adjacent uplands to the watershed divide. Fifteen Hundred miles of coastline were affected by the spill.
Severely Affected Communities
ALASKA
25 0 25 50 75 100 Miles
Conservation GIS Center
a project of
ecotrust

March 24, 1989
oil tanker *Exxon Valdez* ran aground in Prince William Sound, Alaska, spilling 11 million gallons of oil
One of largest environmental disasters in U.S. history
affected more than 1,300 miles of shoreline
Disastrous to wildlife
Let to passage of the Oil Pollution Act of 1990 as Amendment to the Clean Water Act of 1972

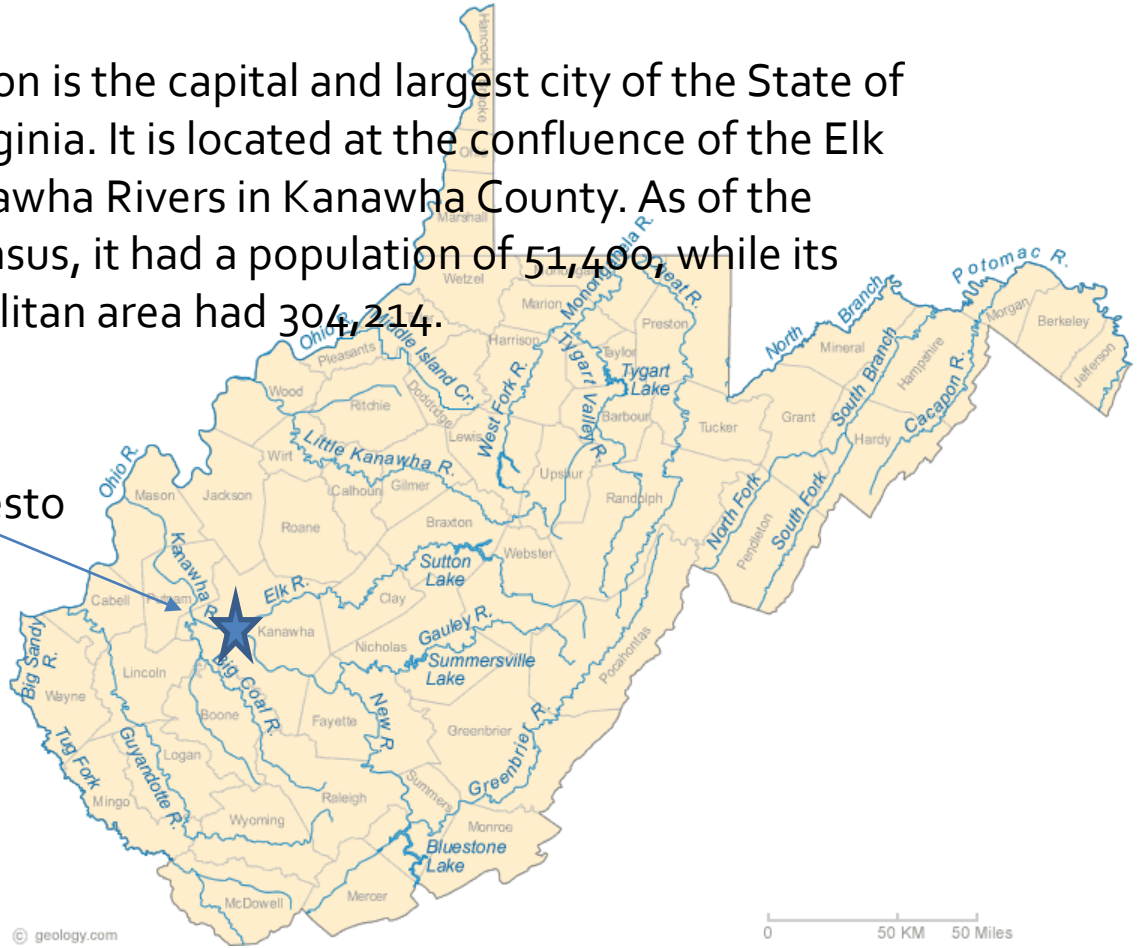
Freedom Chemical Incident

Goals and Concepts Related to this Safety Moment:

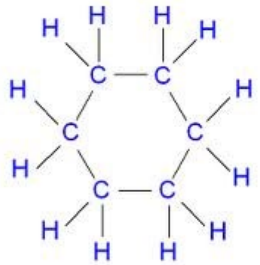
- Illustrate what can happen in a tank incident
- What is API 653
- GIS applicability
- What is secondary containment
- Some terminology: Fixed roof, center column and rafters
- Bottom hole leak rate
- Management systems
- Why you don’t always need 20/20 hind sight
- Idea of risk and evolving risk: initiating event, receptors, consequences and impacts

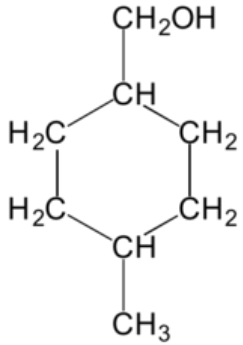
Charleston is the capital and largest city of the State of West Virginia. It is located at the confluence of the Elk and Kanawha Rivers in Kanawha County. As of the 2010 Census, it had a population of 51,400, while its metropolitan area had 304,214.

Charlesto
n



Cyclohexane, Cyclooctane
Methylcyclohexanemethanol (mchm)



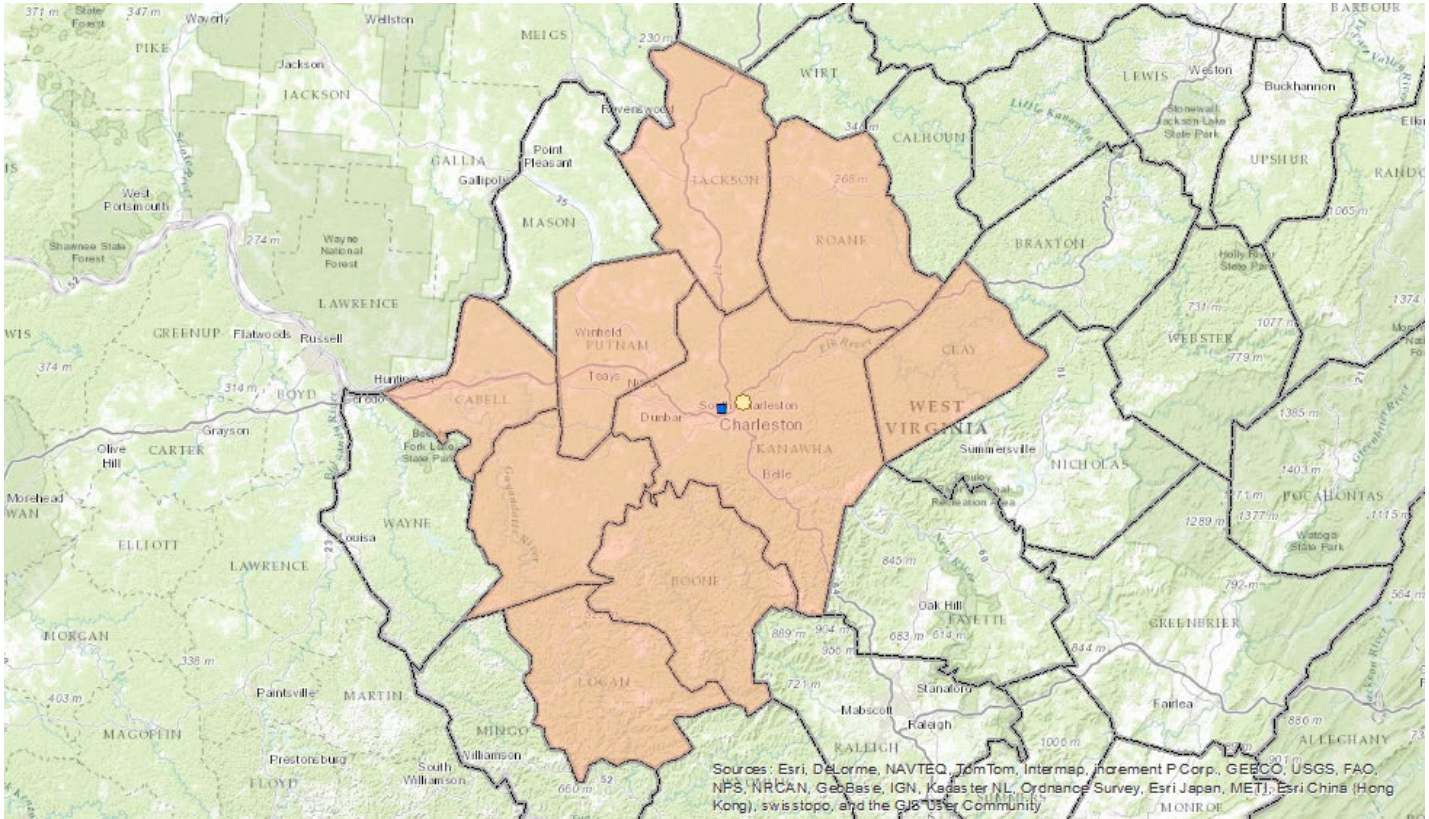


API 653 Inspections?

What is the risk if a spill escapes secondary containment?

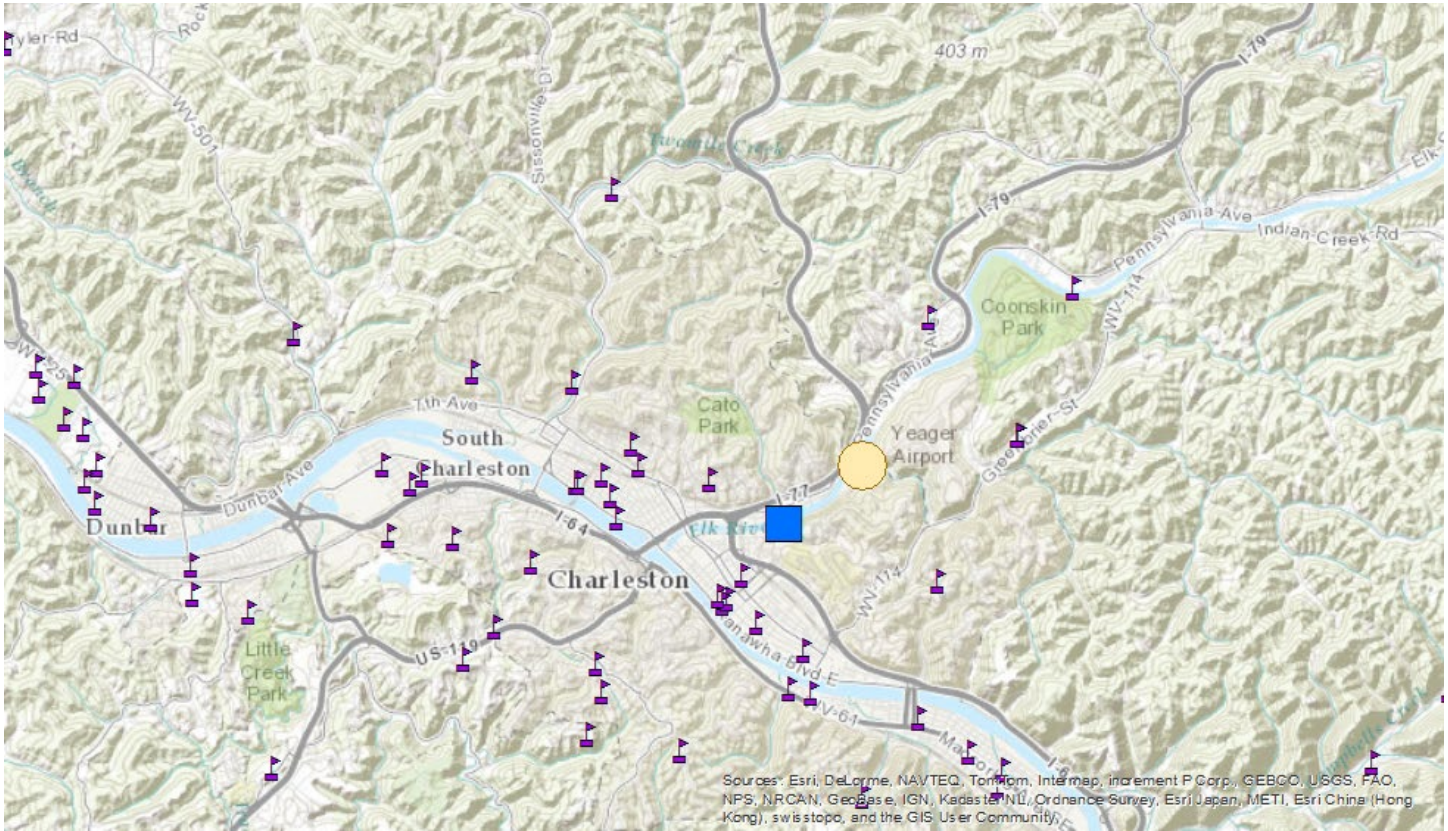
Spill ultimately affected approximately 300,000 people in 9 counties around the original spill.

What is the risk to the company if that happens?



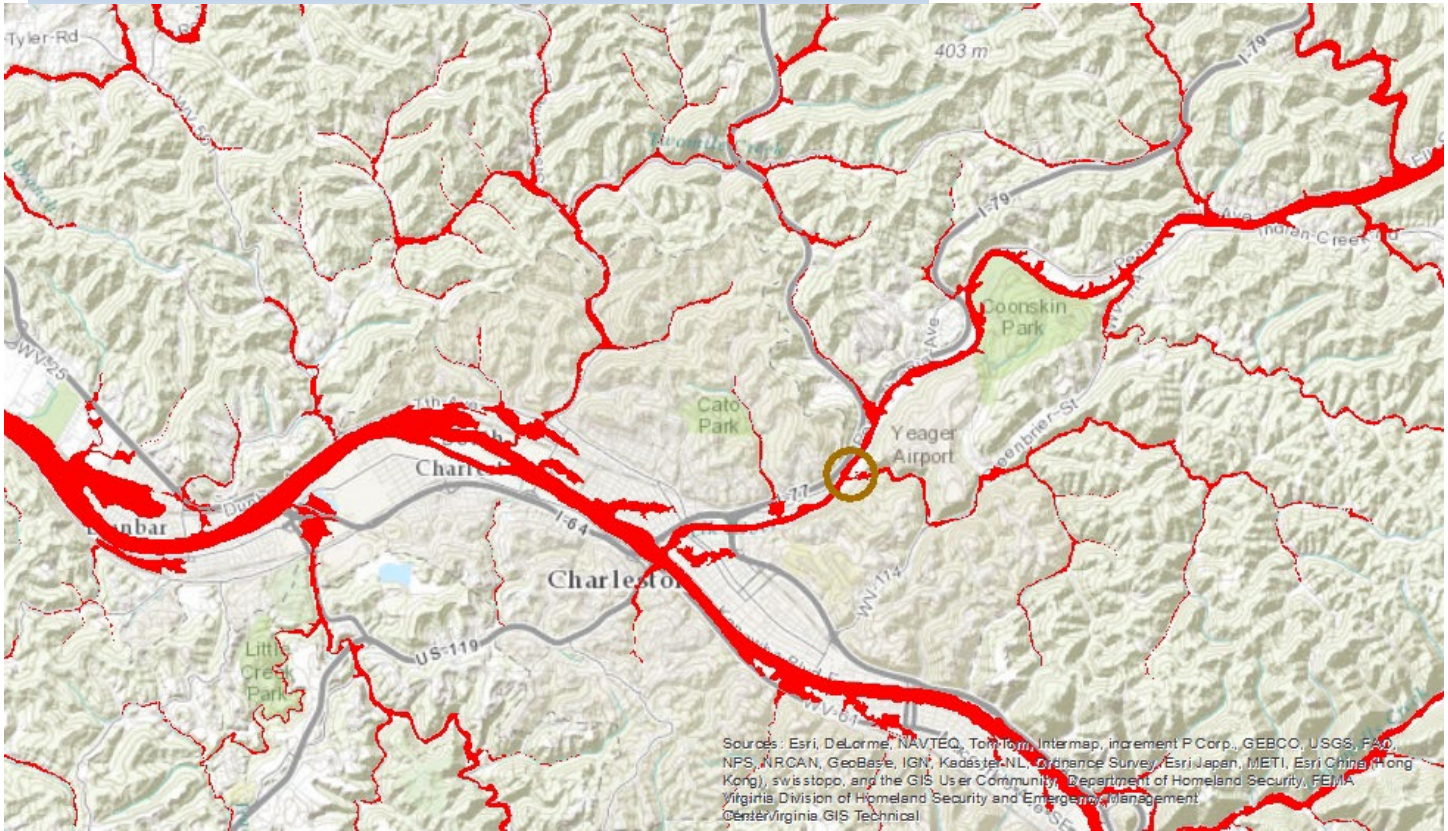
What else is around the facility? What is the risk to them/ the company if a spill occurs?

How far away are schools, hospitals, daycare facilities?



What is the risk of flood, landslide or fault areas around the facility? How close are those risk areas?

Will any of these risks trigger an incident?

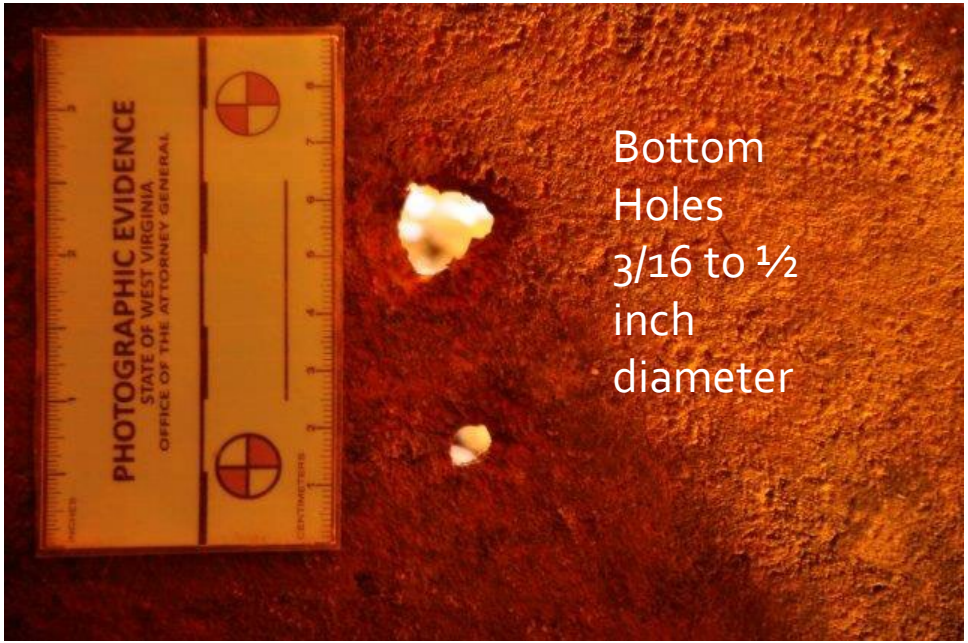


Safeguards

- What is the purpose of secondary containment?
- Did Freedom know the purpose?
- As a new employee would you ask your boss why the hole is there? Would you exercise stop work authority if your company allowed it?
- What would you do?


Unfilled, non reinforced hollow block wall

A look inside

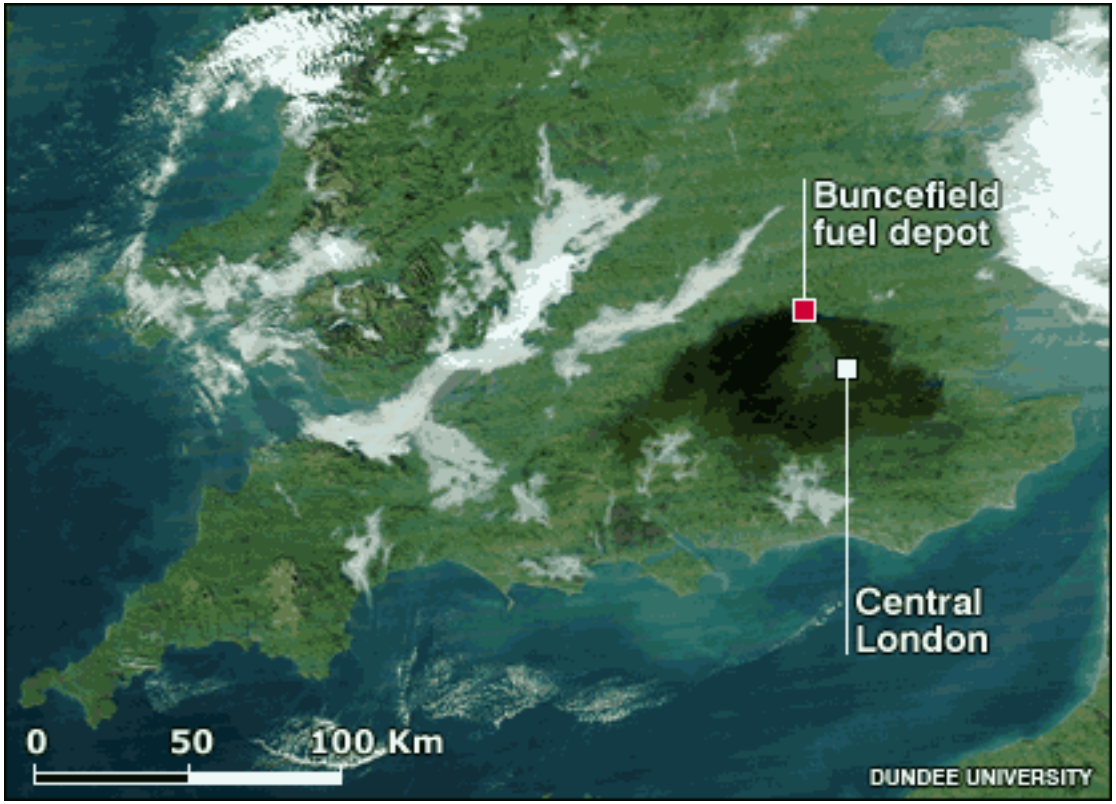

PHOTOGRAPHIC EVIDENCE
STATE OF WEST VIRGINIA
OFFICE OF THE ATTORNEY GENERAL
Bottom Holes 3/16 to ½ inch diameter

Any credible safety/environmental management system could have prevented this

- The company went out of business and the owners were levied financial and criminal penalties.
- If anyone had asked a few simple questions or done a what-if analysis they could have foreseen the potential problem.
- This incident triggered calls for annual internal inspections and other over-the-top responses.

Buncefield December 2005


GETTY IMAGES


Buncefield
fuel depot
Central
London
0
50
100 Km
DUNDEE UNIVERSITY

The Incident

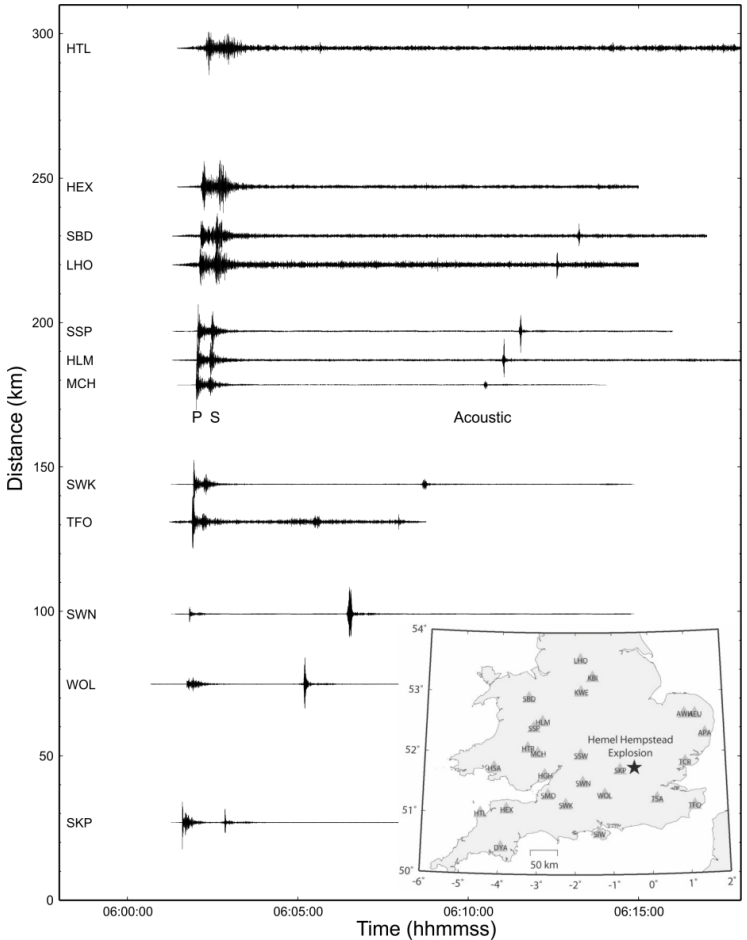
- The incident occurred on December 10, 2005
- The final HSE report of the Major Incident Investigation Board (MIIB) was written in 2008 and released in February 2011.[42]
- The investigation found that Tank 912 at the Buncefield oil storage depot was being filled with petrol (gasoline).
- The tank had a level gauge that employees used to monitor the level manually, and an independent high-level switch which would shut off inflow if the level got above a certain setpoint.
- On the day of the incident Tank 912, the manual gauge was stuck and the independent shut-off switch was inoperative, meaning that the tank was being "filled blind". The petrol overflowed through vents at the top, and formed a vapour cloud near ground level, which ignited and exploded. The fires from the explosion then lasted for five days.[42]

The Buncefield Incident was a Gasoline Tank Overfill

- The terminal was the fifth largest oil-products storage depot in the United Kingdom, with a fuel distribution facility supplied fuel across the region including Heathrow and Luton airports.
- On Saturday the December 10th, 2005 a part of the Buncefield oil storage depot was filling with gasoline.
- About 68,000 gals overflowed during 23 minutes. A vapor cloud formed and was ignited causing a massive explosion and a fire that lasted for five days.

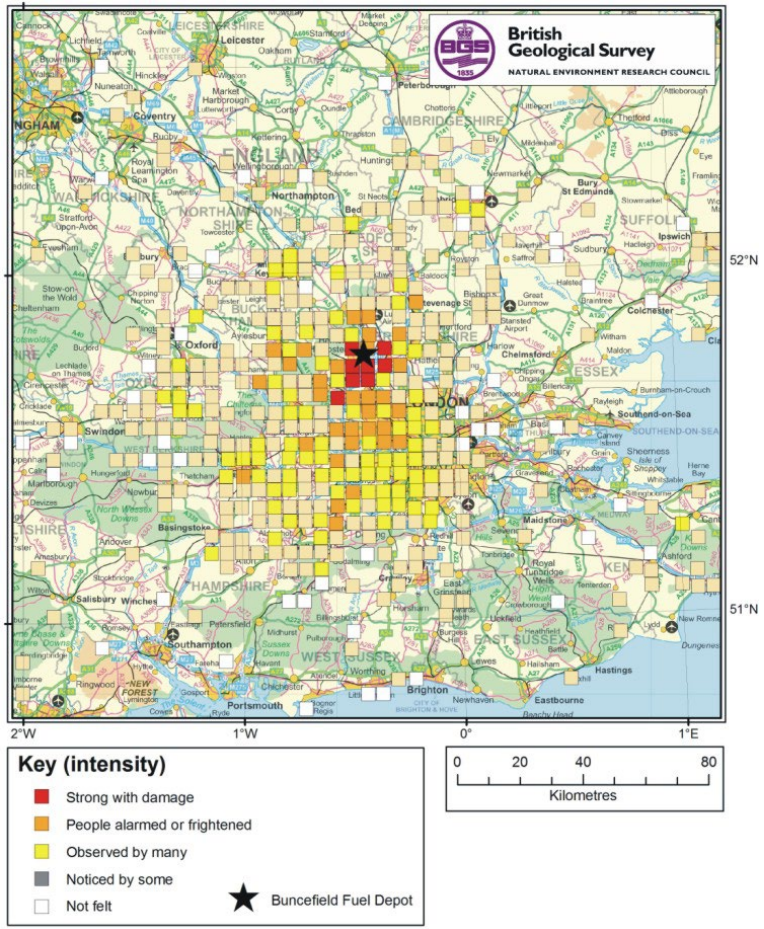
Seismograms

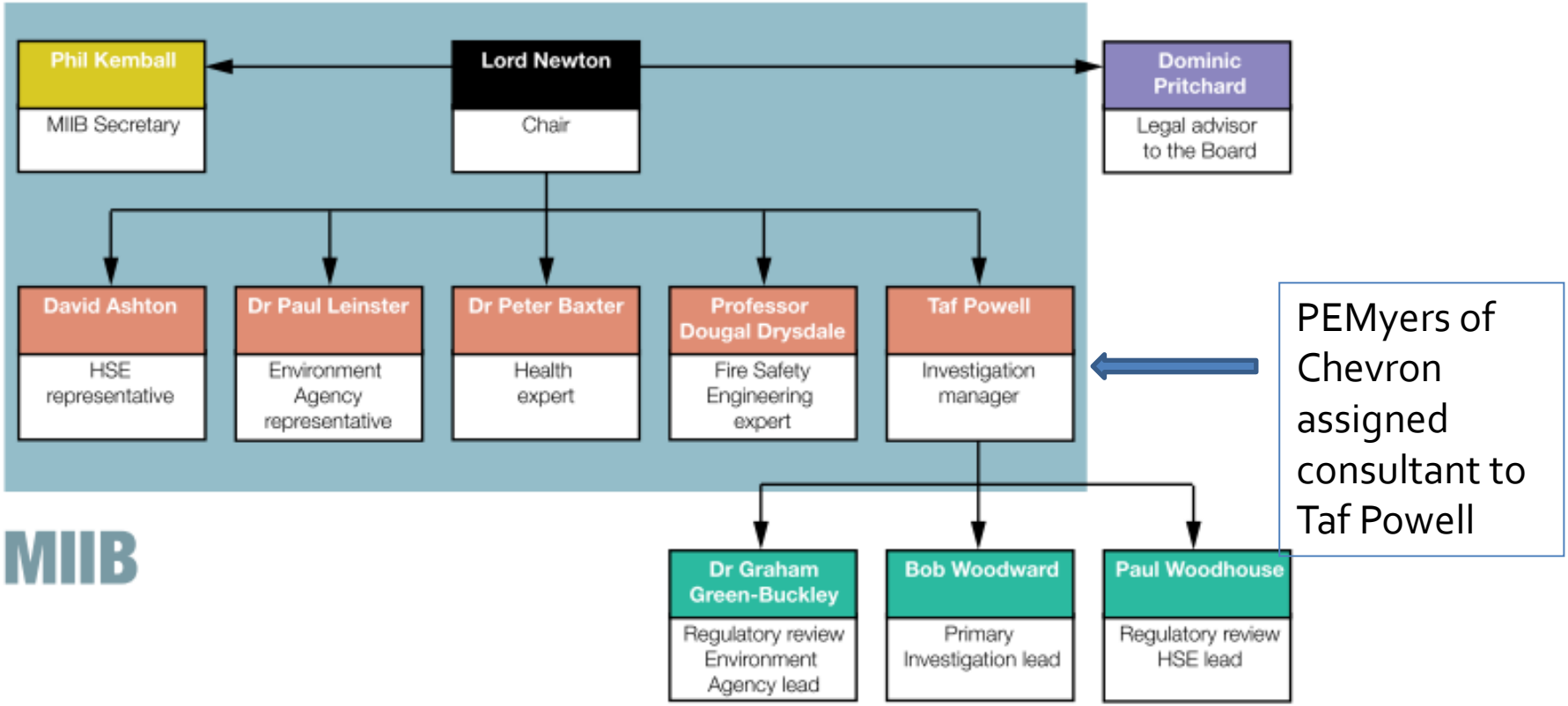
- The explosion was detected on seismograph stations in the UK and the Netherlands
- Largest explosion in peacetime Europe
- Rough estimate 29.5 tons TNT equivalent



Public Impact Survey

- 43 injuries
- Damages ~ $1 billion USD





PEMyers of Chevron assigned consultant to Taf Powell

Before

After

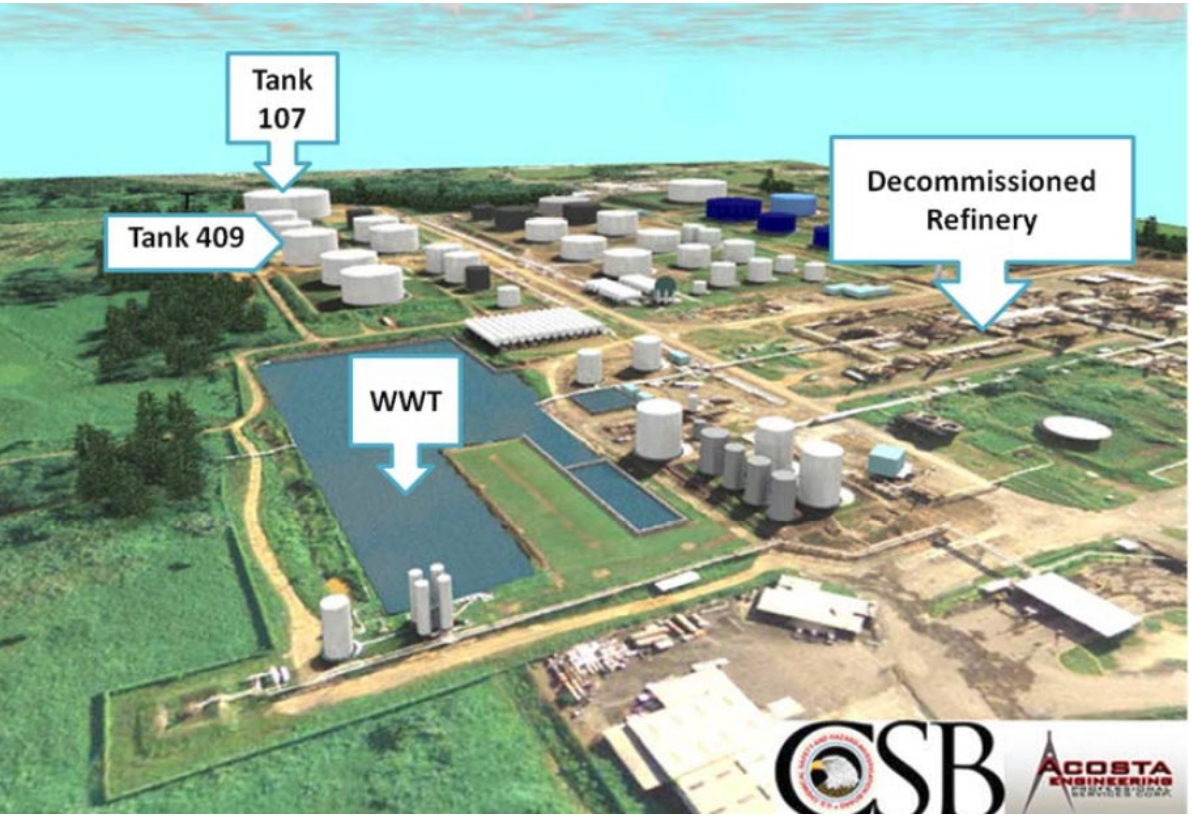
Key Ideas

- Buncefield caused by failures in management systems, a failure to understand possibility of VCEs, procedures, human factors, management of change, training, equipment, etc.
- API 2350 4th edition triggered and energized by Buncefield, then again by the CAPECO tank overfill and explosion.
- Today, if you follow the principles of API 2350-4 or –5 then you are assured of not having a Buncefield type event.

CAPECO What Happened

- October 23, 2009
- 5mm gal tank receiving gasoline overflowed
- Vapor cloud explosion (VCE) escalating fire to 17 other tanks
- Burn 60 hours
- Massive community impacts, environmental damage, surrounding areas
- No fatalities
- US CSB investigated
- Full report: http://www.csb.gov/caribbean-petroleum-refining-tank-explosion-and-fire/

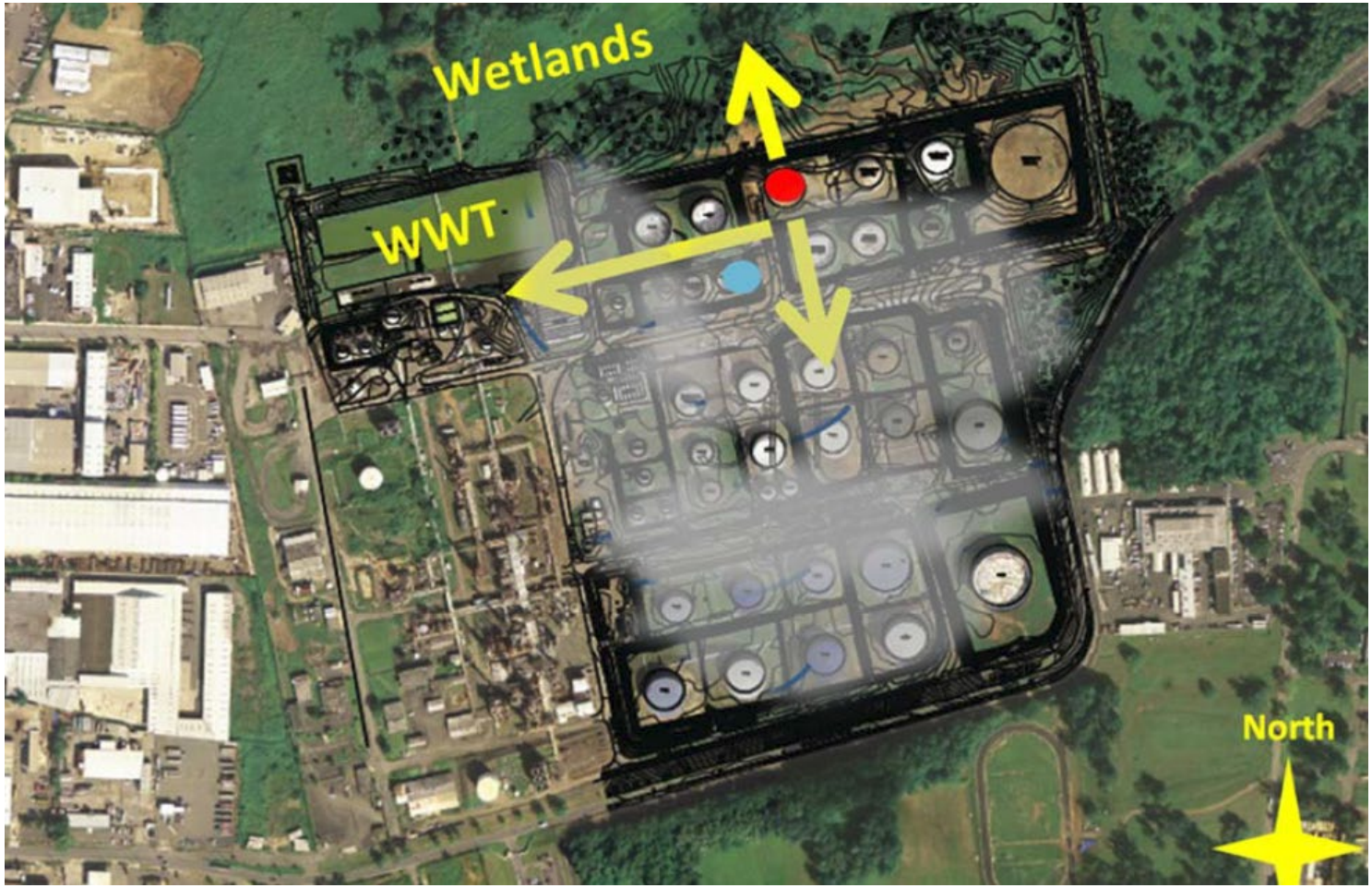
Refinery operation discontinued and facility used as a gasoline, fuel oil, and diesel terminal with a 90 million gallon capacity.



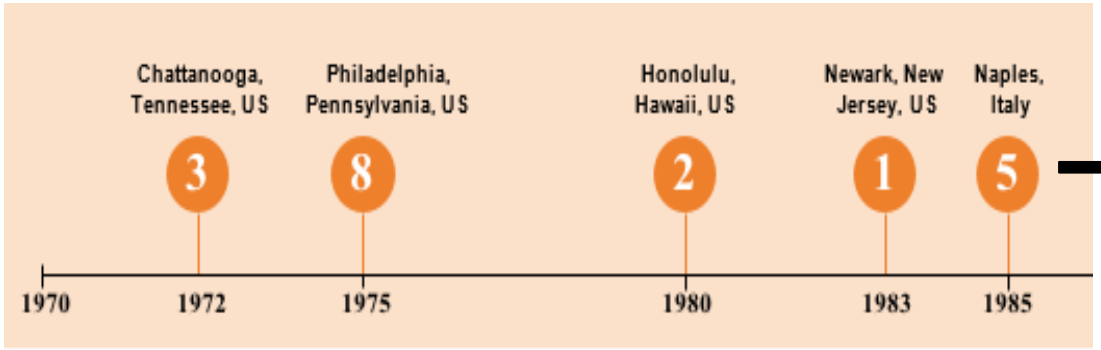
Wed Oct 21, 2009 Cape Bruny ship to deliver 11.5 MM gal unleaded gasoline. Plan to pump into T405, T504, T409, and T411 with balance to T107 over a 24 hour period.

One operator at dock while another monitoring at terminal. At 10 pm T411 reached max level and T409 was opened to the 7000 gpm flow. Operator estimated T409 filled at 1am. At 11 pm operator confirmed from the side gauge that T411 would be filled at 1am. But it started to overflow between 11pm and midnight.

Overflow went on for 26 minutes dumping about 200,000 gallons of gasoline on the ground before the VCE

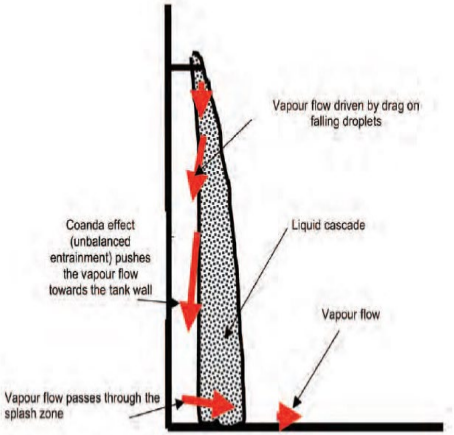

Wetlands
WWT
North

Past Landmark Overfill Cases and Fatalities



API 2350 4th Edition (2012) is a major edition that will address future overfills with new technology, management practices and lower tolerance for error.

API 2350 4th ed. is **RAGAGEP**



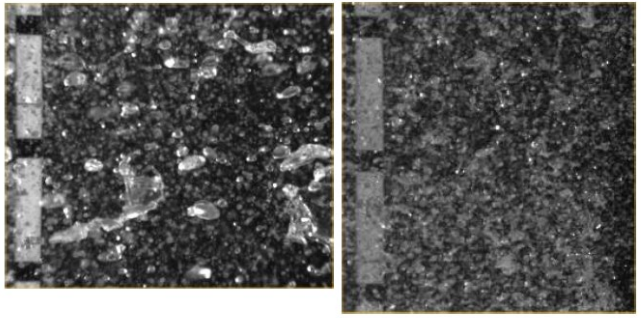
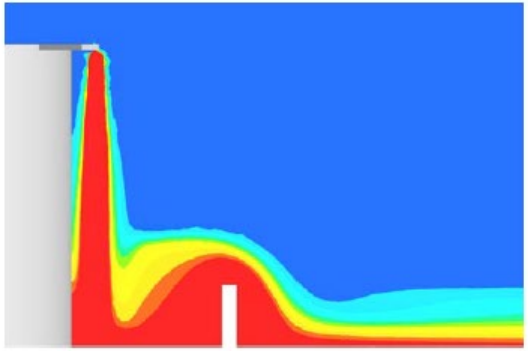
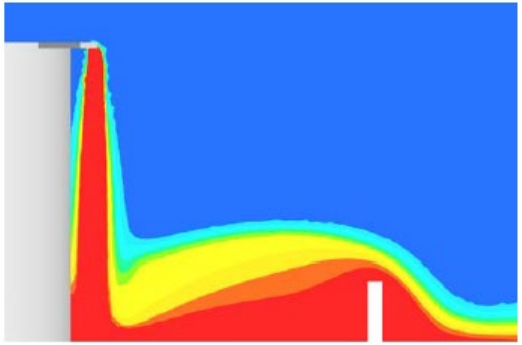


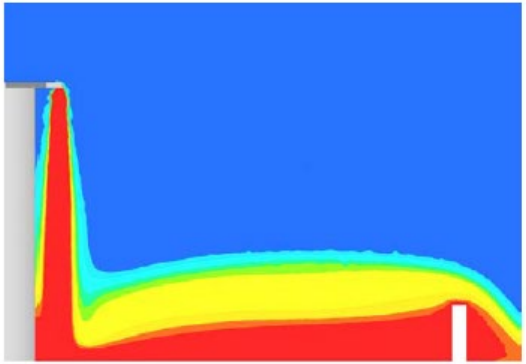
Figure 14b: Comparison between cascade droplet structure in water (left) and decene (right) in similar conditions



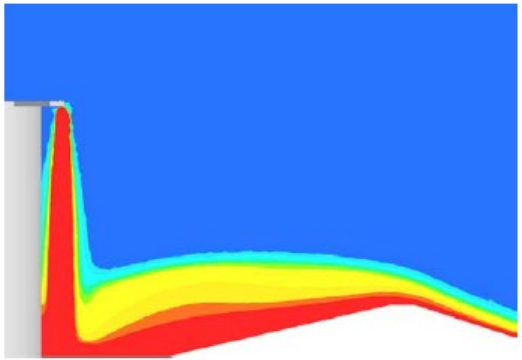
Case D



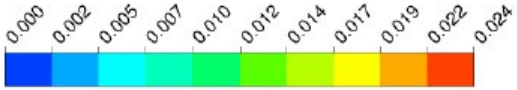
Case E

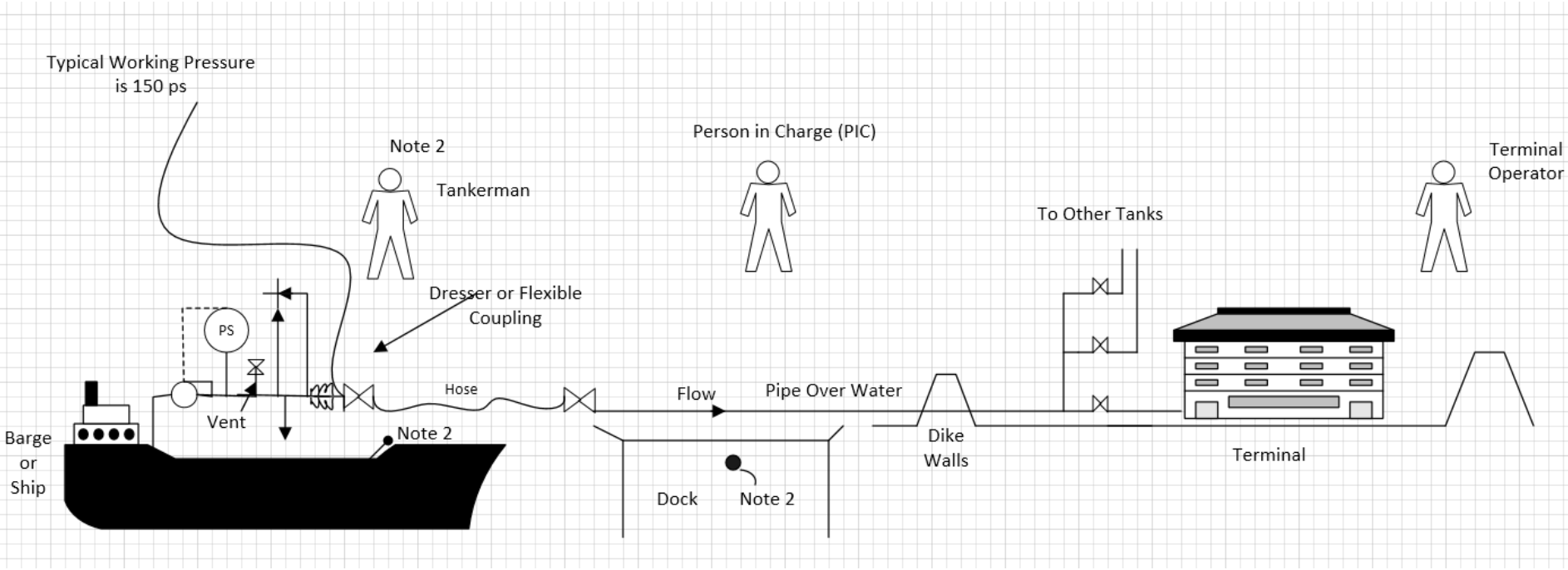


Case F



Case G




Typical Working Pressure is 150 ps
Note 2
Tankerman
Person in Charge (PIC)
Terminal Operator
To Other Tanks
Dresser or Flexible Coupling
PS
Hose
Flow
Pipe Over Water
Vent
Note 2
Barge or Ship
Dike Walls
Terminal
Dock
Note 2

Guidebook for Overfill Prevention & Tank Gauging

ABSTRACT

The public, the regulatory community and industry have expectations that tank overfills should be addressed proactively and in accordance with the current edition of API 2350. We aim to provide you with the knowledge and expertise to address the concern for hazardous liquid overfill unique to your facility, goals, and corporate interests.

Available for download from
https://www.pemyconsulting.com/
Or from Endress Hauser website

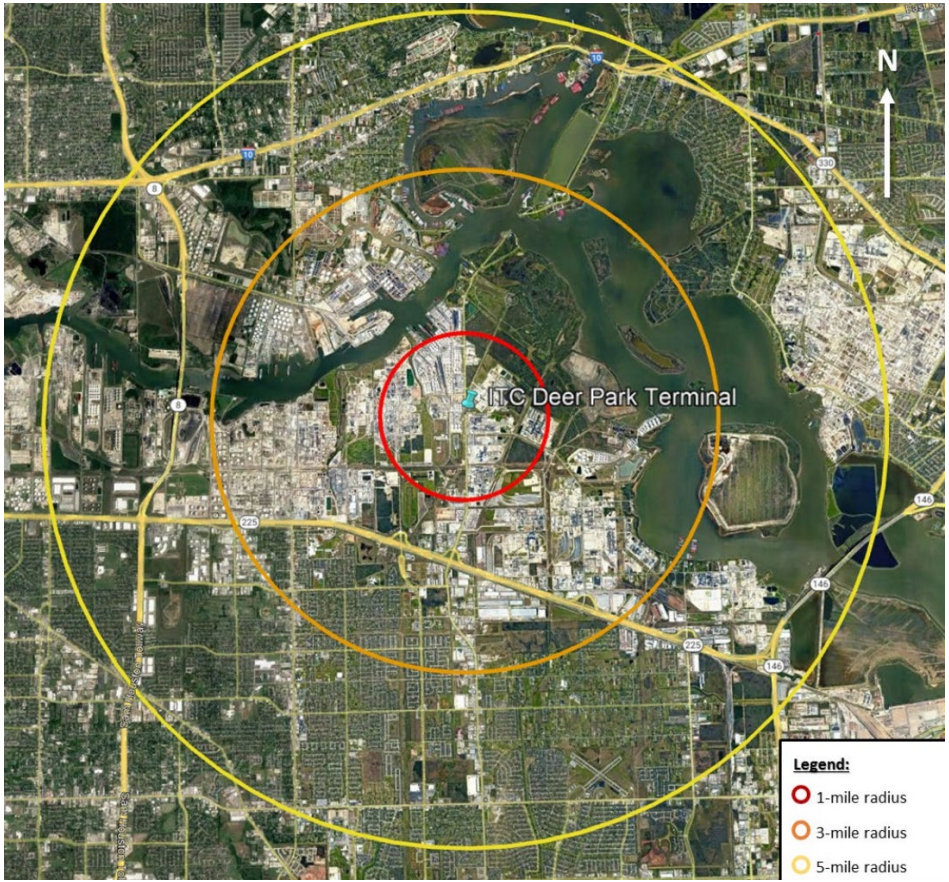
Intercontinental Terminals Company March 17, 2019 Deer Park, TX

Investigation Report

Published: July 6, 2023

SAFETY ISSUES:

- Pump Mechanical Integrity
- Flammable Gas Detection Systems
- Remotely Operated Emergency Isolation Valves
- Tank Farm Design
- PSM and RMP Applicability


N
ITC Deer Park Terminal
Legend:
1-mile radius
3-mile radius
5-mile radius

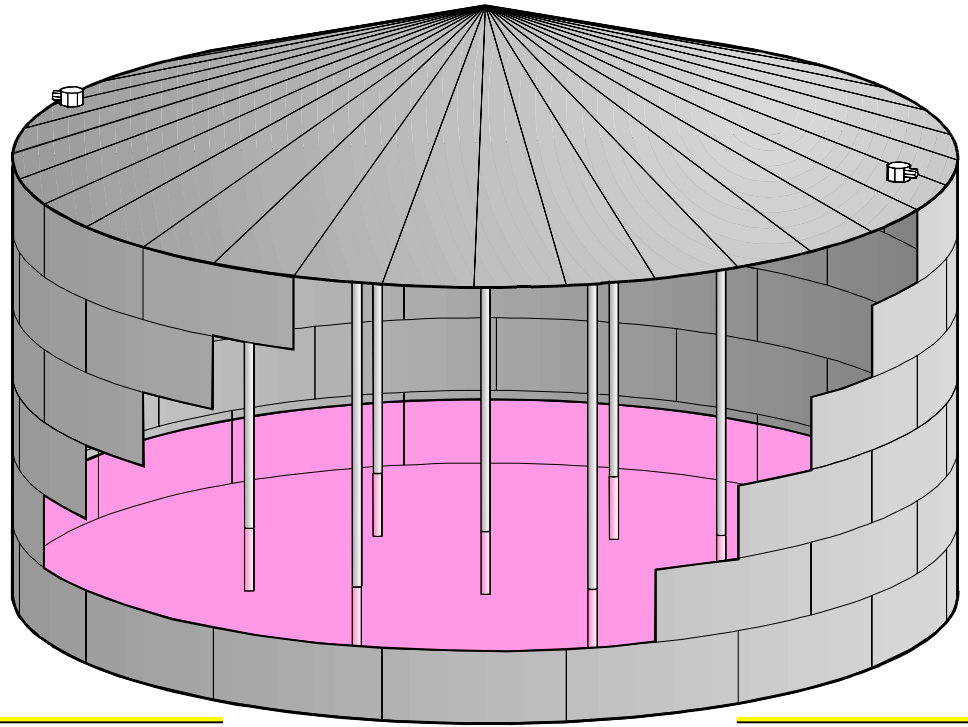
Bottom line

- Butane injection pump seal failure ejects butane cause fire that melts piping
- No flammable gas detectors to alert operators allowing a 30 min headstart
- No emergency shutoff valve on the tank
- No elements of PSM required for this facility

BREAK TIME!

Tank Basics

- Three tank types:
  - Fixed roof tank
  - External floating roof tank
  - Internal floating roof tank



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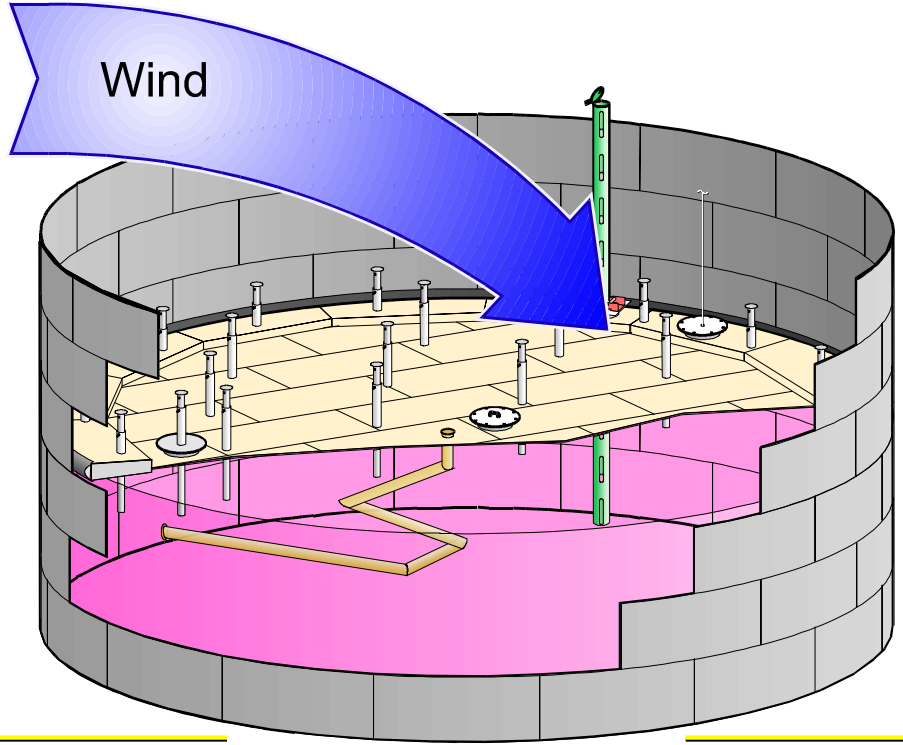
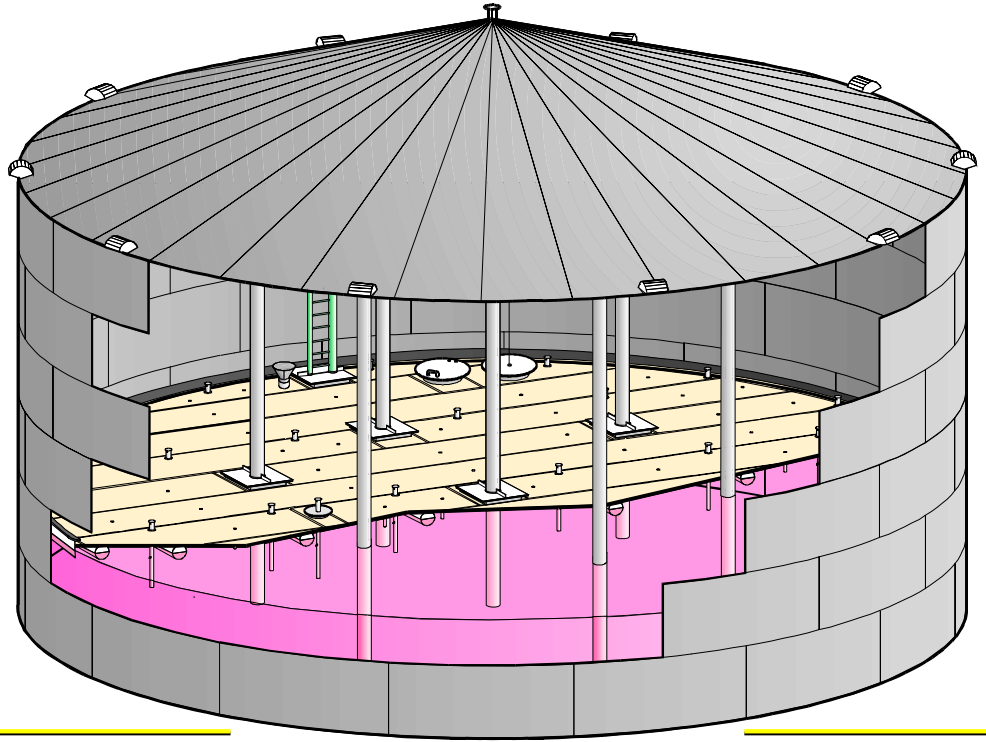

Wind

Internal Floating-Roof Tank



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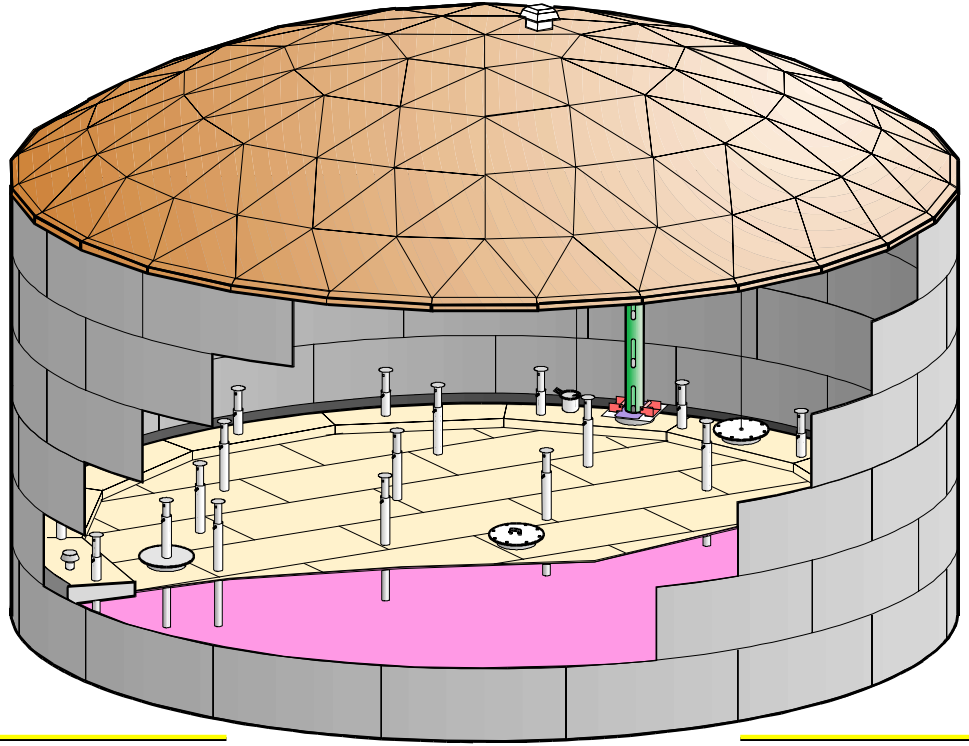


TGB

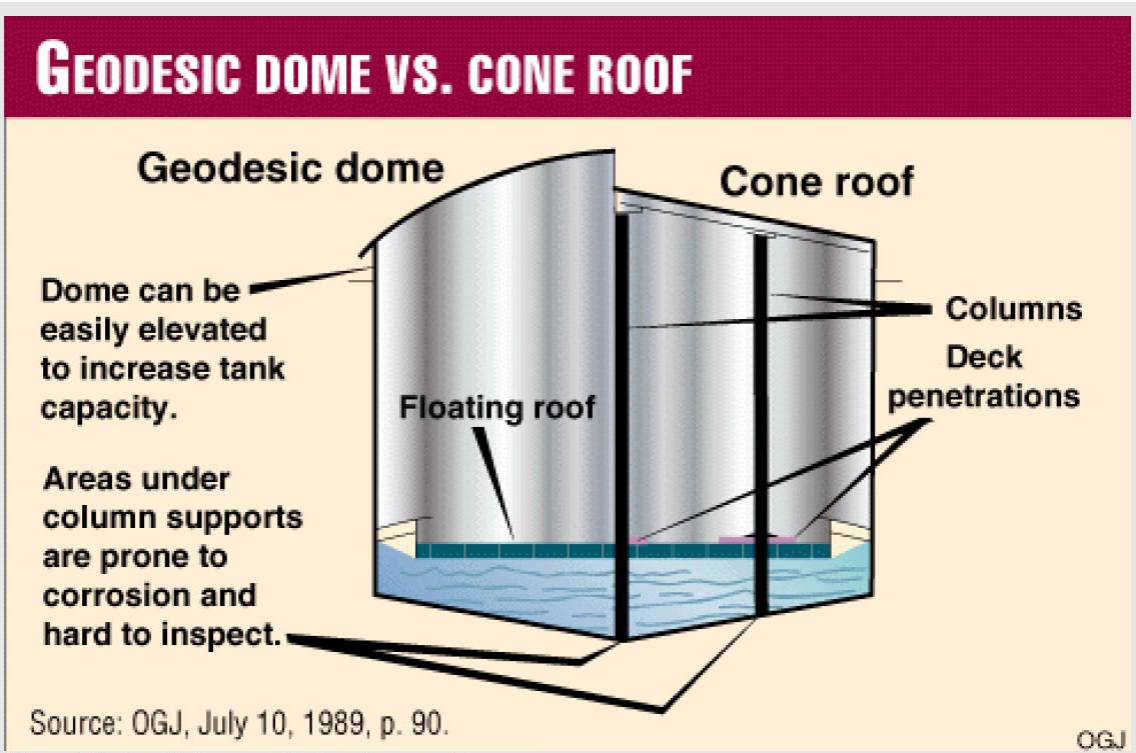
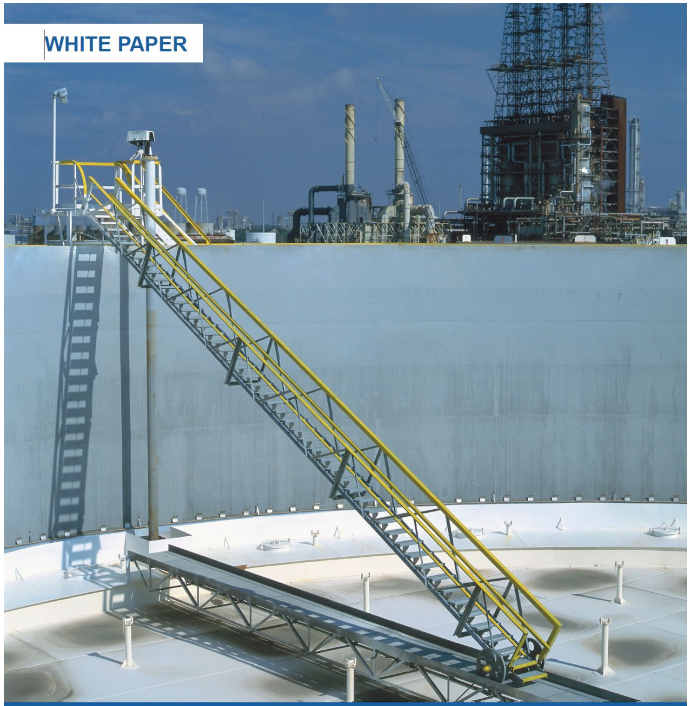


Figure 4 Contrast between geodesic and cone roofs

Quick Facts 3 Cone versus Dome Roofs

WHITE PAPER



Floating Roof Tanks in Petroleum Storage

An overview of roof types, fault modes, failure causes and technology for incident prevention

PEMY

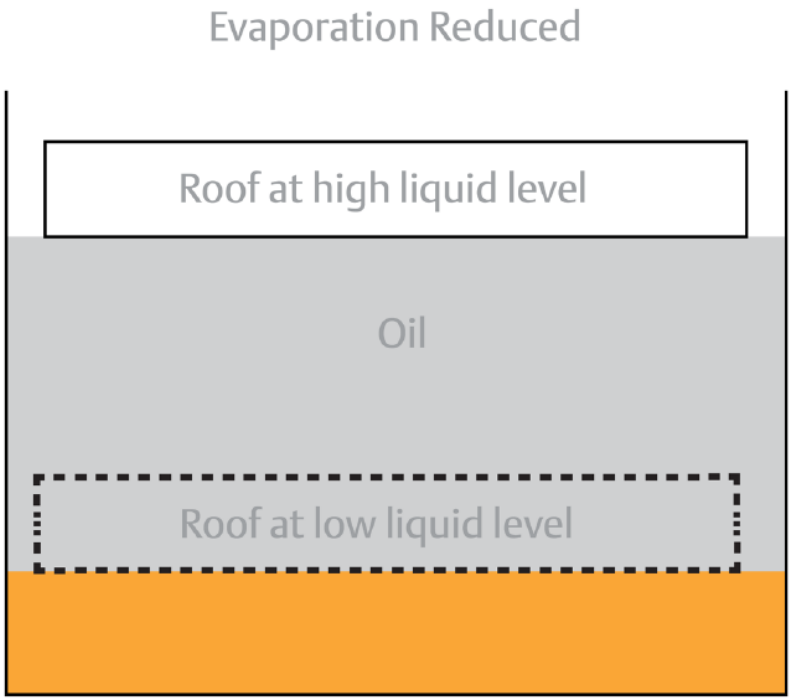


Figure 1 Conceptual diagram of floating roof tank

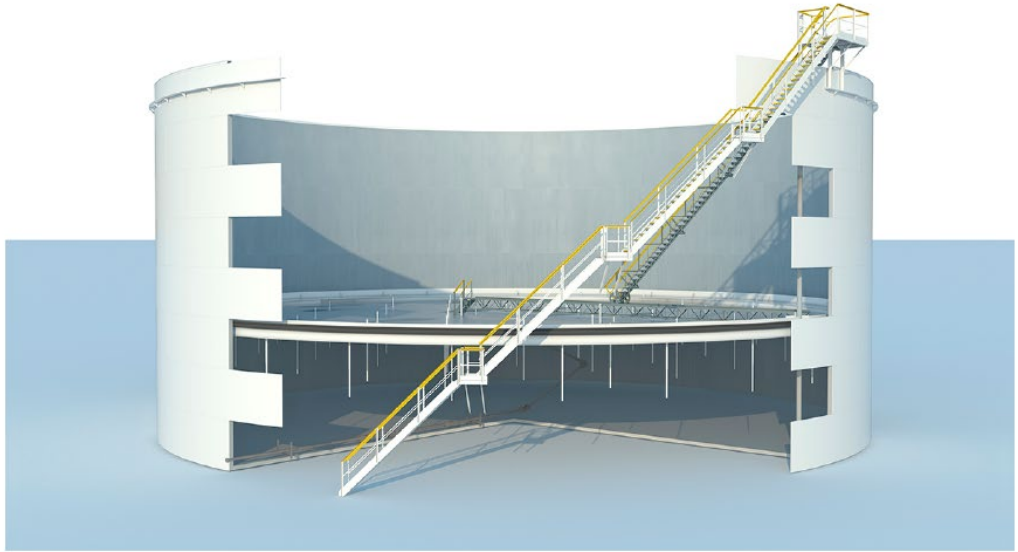


Figure 27 External Floating Roof Tank (EFRT) Cut Away (courtesy Emerson)

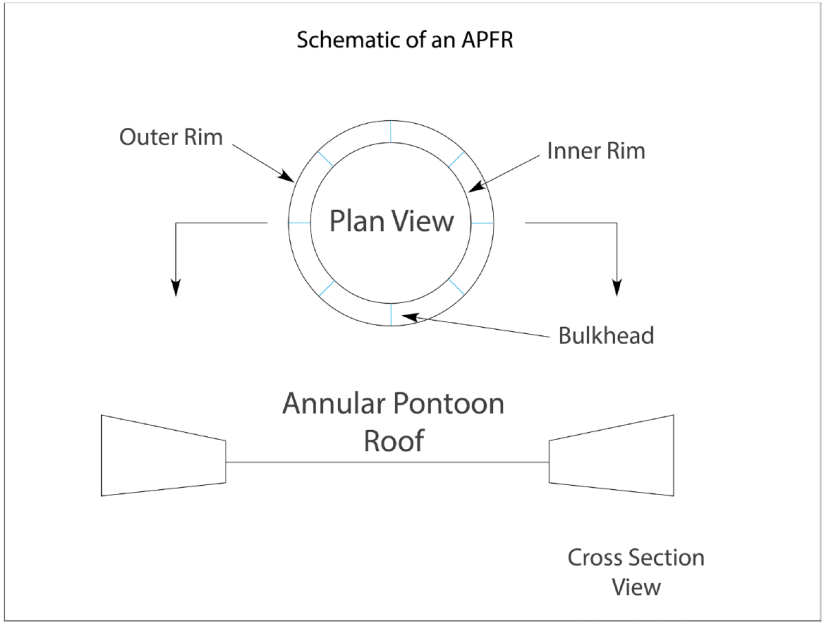
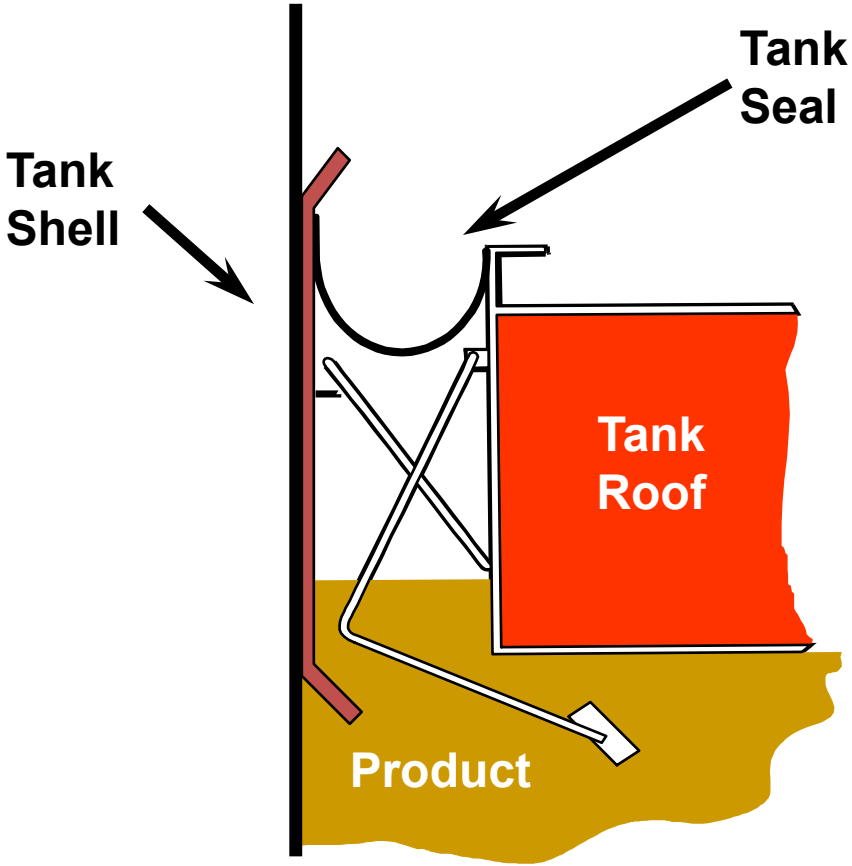


Figure 5 Schematic of an APFR


Tank
Seal
Tank
Shell
Tank
Roof
Product

Differences between large and small

- Thickness (constructability)
- Welding less critical
- No brittle failure
- Materials not critical
- New: UL,
- Inspection: STI SP001
- Up to 50 thousand gallons

- Thickness (Stress)
- Welding critical
- Brittle fracture critical
- Materials critical
- New: API 650, API 620
- Inspection: API 653
- Up to 10 million gallons

Fundamentals of API 653

- covers steel storage tanks built to API 650 and its predecessor API 12C
- Minimum requirements for maintaining the integrity of such tanks
- after they have been placed in service and addresses inspection, repair, alteration, relocation, and reconstruction
- scope is limited to the tank foundation, bottom, shell, structure, roof, attached appurtenances, and nozzles to the face of the first flange, first threaded joint, or first welding-end connection.
- conflicts between the requirements of this standard and API 650 or its predecessor API 12C, this standard shall govern for tanks that have been placed in service
- This standard employs the principles of API 650; however, storage tank owner/operators, based on consideration of specific construction and operating details, may apply this standard to any steel tank constructed in accordance with a tank specification
- standard is intended for use by organizations that maintain or have access to engineering and inspection personnel technically trained and experienced in tank design, fabrication, repair, construction, and inspection

- standard does not contain rules or guidelines to cover all the varied conditions…provide a level of integrity equal to the level provided by the current edition of API 650
- This standard recognizes fitness-for-service assessment concepts
- The owner/operator has ultimate responsibility for complying with the provisions of this standard.
- standard is restricted to organizations that employ or have access to an authorized inspection agency
- If any provision of this standard presents a direct or implied conflict with any statutory regulation, the regulation shall govern. However, if the requirements of this standard are more stringent than the requirements of the regulation, then the requirements of this standard shall govern.
- An assessment shall be made of the potential hazards to which personnel may be exposed when conducting internal tank inspections, making repairs, or dismantling tanks. See guidelines given in API 2015 and API 2217A
- Three types of inspections:
    1. Informal
    2. External
    3. Internal

References

- API Recommended Practice 579-1/ASME FFS-1, *Fitness-For-Service*
- API Recommended Practice 580, *Risk Based Inspection*
- API Standard 620, *Design and Construction of Large, Welded, Low-pressure Storage Tanks*
- API Standard 650, *Welded Tanks for Oil Storage*
- API Recommended Practice 651, *Cathodic Protection of Aboveground Storage Tanks*
- API Recommended Practice 652, *Lining of Aboveground Petroleum Storage Tank Bottoms*
- API Standard 2000, *Venting Atmospheric and Low-pressure Storage Tanks: Nonrefrigerated and Refrigerated*
- API Recommended Practice 2003, *Protection Against Ignitions Arising Out of Static, Lightning, and Stray Currents*
- API Recommended Practice 2009, *Safe Welding, Cutting, and Hot Work Practices in the Petroleum and*
- *Petrochemical Industries*
- API Standard 2015, *Requirements for Safe Entry and Cleaning of Petroleum Storage Tanks*
- API Recommended Practice 2016, *Guidelines and Procedures for Entering and Cleaning Petroleum Storage Tanks*
- API Recommended Practice 2201, *Safe Hot Tapping Practices in the Petroleum and Petrochemical Industries*
- API Recommended Practice 2207, *Preparing Tank Bottoms for Hot Work*

Major Concepts

- Change in service
- Corrosion rate
- External inspection
- Internal inspection
- Fitness-for-services
- Hydrostatic test
- Recognized toughness
- Reconstruction
- Similar service assessment
- Risk based inspection

Suitability for service

Exercise: Define how you would determine suitability for service.

Suitability for service

“When the results of a tank inspection show that a change has occurred from the original physical condition of that tank, an evaluation shall be made to determine its suitability for continued use”.

List of factors to consider

- internal corrosion due to the product stored or water bottoms;
- external corrosion due to environmental exposure;
- stress levels and allowable stress levels;
- properties of the stored product such as specific gravity, temperature, and corrosivity;
- metal design temperatures at the service location of the tank;
- external roof live load, wind, and seismic loadings;
- tank foundation, soil, and settlement conditions;
- chemical analysis and mechanical properties of the materials of construction;
- distortions of the existing tank;
- operating conditions such as filling/emptying rates and frequency.

Change of service (MOC)

- Corrosivity
- Pressure
- Density
- Temperature
- Venting

Basic Concepts You Need to Know

- 3 Inspection Types
  - Informal
  - External
  - Internal

Ask questions!

You must manage, review, or audit inspections …but how…

- I don’t have detailed knowledge of what is in API 653.
- But I am responsible for the integrity of the operation
- What should I know or do?

Fundamentals of Managing Tank Inspections

- Does the owner have a policy statement about tanks?
- Is there a tank database
  - Tank service, size, date constructed, when last inspected, etc. for each tank
- Where and how are the Inspection reports filed?
  - Informals, externals, internals
- What is the site history of spills and incidents
- Look at the SPCC plan
- What is the history of repairs, alterations, modifications made
- There should be lots of hi-res photos from past tank inspections
  - Photos should capture all damage or concerns found by inspector
- Verify the inspector qualifications

Is there a policy?

Global Logistics

GLOBAL MARKETING PROCESS LIBRARY

Terminal Operation Standard: 10.10.2.X.X

10.10.2.X.X – Tank Database Specification

REVISION DATE: 31/May/2005

X.X.1 Summary
X.X.2 Qualification Requirements
X.X.3 Standard
X.X.4 Management System
X.X.5 Training
X.X.6 Definitions
X.X.7 References
X.X.8 Roles and Responsibilities
X.X.9 Sarbanes-Oxley Compliance

Summary (Purpose, Scope & Objective)

Recordkeeping is critical to efficient process and cost savings. Because of the numerous tanks, it is not possible for one person to collect and verify all the information necessary for the purposes of complying with an API 653 program. This standard sets forth the information to be collected and the format of the data so that the AST Integrity Management Program can be monitored.

The purpose of this standard is to define the amount and type of data to be collected from various facilities on aboveground storage tanks, pressure vessels and containers.

Sample Report

MCP REPORT

MARKETING - TERMINAL TANK SUMMARY

TANKAGE-BREATHING AND HANDLING ALLOWANCE RECORD
S-367

DCM1001094

AVON

Tank No.	Tank Built	Last Cleaned	Tank Type	Shell Type	Floating Roof	Tank Cover	Bottom Type	Tank Coating	Product	Diameter Ft. In.	Height Ft. In.	Length Ft. In.	Tank Recpt.	Recpt Rate (GPM)	Load Rate (GPM)	Suction Size	Max. Fill Cap. Bbl	Safe Fill Cap. Bbl	UnAvail. Cap. Bbl	API-Report. Int.	Ext
T-101	1965	2000	IF	BW	SAP	AD	DR	Yes	MUL	054'.00 0/0"	048'.00 0/0"		TP	650	650	12 0/0"	18,105	17,221	1,826	05/31/0	
T-102	1965	1999	IF	BW	SAP	CR	DR	Yes	LSD	048'.00 0/0"	048'.00 0/0"		TP	650	650	08 0/0"	14,722	11,490	1,315		
T-103	1965	1992	IF	BW	SDD	CR	SR	No	TRANSMIX	019'.00 0/0"	040'.00 0/0"		TP	400	400		2,006	1,825	43		
T-104	1997	1997	IF	BW	SAP	CR	DR	Yes	LSD	033'.00 0/0"	040'.00 0/0"		TP	500	500	08 0/0"	5,289	4,512	545	04/02/9	
T-107	1983	1983	HT	SL			NB	No	ADDITIVE	008'.00 0/0"		027'.00 0/0"	T	0	200		238	214	13		
T-108	1991	1990	IF	BW	SAP	CR	SR	No	RUL	094'.00 0/0"	048'.00 0/0"		TP	929	650	16 0/0"	59,747	55,105	5,627		
T-109	1991	1990	IF	BW	SAP	CR	SR	No	SUL	094'.00 0/0"	048'.00 0/0"		TP	929	650	16 0/0"	59,789	55,109	5,451		

TANK TYPE:
IF - Internal Floating Roof
EF - External Floating Roof
FR - Fixed Roof Tank (has not internal floater)
HT - Horizontal
UG - Underground Tank
SP - Spheroid
OT - Other kind of tank (ie sphere)

SHELL TYPE:
SL - Single Lap Weld
DL - Double Lap Weld (both sides)
BW - Full Fusion Butt Welded
RI - Riveted
RW - Riveted Welded
Most welded tanks will be full fusion butt welded.
Do not use old nomenclature as it is inadequate to differentiate type of shell construction

BOTTOM TYPE:
SR - Single Bottom with RPB (HPDE)
SN - Single Bottom with no RPB (HPDE)
DR - Double Bottom
OB - Other Bottom such as tank that is elevated onto grillage
NB - Non Flat Bottom tank like spheroid or sphere
Both the SR and the DR should include some kind of liner such as an 80 mil HDPE. A reinforced concrete slab qualifies a single bottom tank to be SR if it is a full slab and has reinforcing steel in the slab. All other single bottom tanks will be SN.

FLOATING ROOF:
SDD - Double Deck (Steel)
SAP - Steel Annular Pontoon
SFN - Open or Bulkheaded Pan
ASP - Slim and Pontoon Aluminum Floating Roof
AHC - Aluminum Honeycomb Floating Roof
OTR - Plastic Floating or Foam Floating Roof
NOR - No Floating Roof (ie this woud be a fixed roof tank or something like a spheroid or sphere)

API-INSPECTION REPORT:
Physical Report - API-653
Inspection report date file at San Ramon

TANK COATING - INTERNAL
Yes - Brn. 2ft up shell
* - Shell Coated
^ - Roof Coated

TANK COVER:
AD - Aluminum Geodesic Dome
CR - Cone Roof Tank
OC - Other Cover which includes steel domes, umbrella roofs or other roofs not fitting into the choices above. Or roofs such as spheroid such as Golena Park sheroids
NC - No Cover applies to all external floating roof

TANK RECEIPT:
TC - Tank Car
M - Marine/Barge
P - Pipe Line
T - Tank Truck

Print Date:

Sample Report 2

MCP REPORT

MARKETING TANK - API INSPECTION PLAN

DCM1289716

BIRMINGHAM

Tank No.	Tank Built	Last Cleaned	Tank Type	Shell Type	Floating Roof	Tank Cover	Bottom Type	Bottom Slope	Tank Int. Coat	Floating Suction	Diffuser	Product	Tank Diameter	API-Internal Inspection: API-653 Report Date	API-Internal Inspection: Last Inspection	API-Internal Inspection: Next Inspection	API-Internal Inspection: Action Item	API-Internal Inspection: 20 Yr Tank	API-External Inspection: API-653 Report Date	API-External Inspection: Last Inspection	API-External Inspection: Next Inspection
T-1	1942	1994	FR	SL	NOR	CR	SN	FL	Yes	06 0/0"	Yes	JET A	055'.00 0/0"	* 10/23/01	10/23/01	10/01/11		N	* 10/23/01	10/23/01	10/23/06
												Tank Expenditure Plan / Description / Year / Status									
										Capital - Upgrade		TK-1 (JET) BTM/COATING					2006	>			
T-2	1942	1996	FR	SL	NOR	CR	SN	FL	Yes		Yes	LSD	072'.09 0/0"	* 03/07/96	03/01/96	03/01/06		N	* 10/23/01	10/23/01	10/23/06
												Tank Expenditure Plan / Description / Year / Status									
										Expense - Clean & API Only		TK 2 (LSD) CLEAN & API-653					2006				
										Capital - Upgrade		TK-2 (LSD) BTM/COATING/FLOATING SUCTION					2011				
T-3	1942	1997	IF	BW	ASP	CR	DR	SH	Yes*	12 0/0"	Yes	RUL (S# summer)	072'.09 1/2"	* 02/06/97	02/01/97	02/01/07	C	N	* 10/23/01	10/23/01	10/23/06
Tank Plan Remark:	Need replace Aluminum IF																				
												Tank Expenditure Plan / Description / Year / Status									
										Capital - Upgrade		TK-3 (PUL) ROOF/POLE SLEEVE					2007				
T-4	1942	1995	FR	SL	NOR	CR	SN	FL	No		Yes	TRANSMIX	042'.07 0/0"	* 10/07/95	10/07/95	10/07/05		N	* 10/25/01	10/25/01	10/23/06
												Tank Expenditure Plan / Description / Year / Status									
										Expense - Clean & API Only		TK 4 (TRANSMIX) CLEAN & API-653					2005				
										Capital - Upgrade		TK-4 (TANSMIX) BTM/COATING/FLOATING SUCTION					2010				
T-5	1942	1996	FR	SL	NOR	CR	SN	FL	No		Yes	LSD	042'.06 0/0"	* 02/22/96	06/03/96	06/03/06		N	* 10/25/01	10/25/01	10/23/06
												Tank Expenditure Plan / Description / Year / Status									
										Capital - Upgrade		TK-5 (JET) BTM/COATING/FLOATING SUCTION					2006				
T-6	1942	1993	FR	BW			SN					WATER	043'.00 0/0"					N	* 10/25/01	10/25/01	

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HT - Horizontal
UG - Underground Tank
SP - Spheroid
OT - Other kind of tank (ie sphere)

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SPN - Open or Bulkheaded Pan
ASP - Skin and Pontoon Aluminum Floating Roof
AHC - Aluminum Honeycomb Floating Roof
OTR - Plastic Floating or Foam Floating Roof
NOR - No Floating Roof (ie this would be a fixed roof tank or something like a spheroid or sphere)

API-INSPECTION:
API-653 Report Date
* MM/DD/YYYY - San Ramon File

TANK PLAN:
Year > - Job in Progress or Alternative Schedule or Defered (Refer: 10 Year Plan Report for detail)

TANK COVER:
AD - Aluminum Geodesic Dome
CR - Cone Roof Tank
SD - Steel Dome
OC - Other Cover which includes steel domes, umbrella roofs or other roofs not fitting into the choices above. Or roofs such as spheroid such as Golena Park spheroids
NC - No Cover applies to all external floating roof tanks

TANK INTERNAL COAT:
Yes - Btm. 2ft up shell
* - Shell Coated
^ - Roof Coated

BOTTOM SLOPE:
CD - Cone Down
CU -Cone Up
FL - Flat
SH - Shovel
NS - Not Flat (Horizontal Tank)
UN - Unknown

API-II NEXT INSPECTION DATE:
Next inspection date determined by Phil Myers based on corrosion rate and tank overall structure. Interval 10 or 20 yrs considered from API report on file, if no report used last known inspection date.

ACTION ITEM: COULD BE 20 YR IF VERIFIED
DB - Provide construction records showing double bottom
C - Provide construction records showing coating
NR - No Report

A Decent Internal Inspection Report (snippets)

1. TANK DESCRIPTION

GENERAL:	
TANK NUMBER:	116
OWNER:	Kinder Morgan Liquids Terminals, LLC
LOCATION:	Galena Park, Texas
DESIGN STD:	API 650 8th Edition
MANUFACTURER:	Pasadena Tank Corporation
PRODUCT:	REOFOS 35
SPECIFIC GRAVITY:	1.0 (per nameplate)
MAXIMUM DESIGN TEMP:	200°F
NORMAL OPER. TEMP:	Data Not Available
MINIMUM DESIGN TEMP:	Data Not Available
DESIGN PRESSURE:	Atmospheric
CATHODIC PROTECTION:	Yes
NAMEPLATE PRESENT:	Yes
BREAKOUT TANK (DOT):	No
DIMENSIONS:	
DIAMETER:	30.07 ft (as measured)
HEIGHT:	40.00 ft (as measured)
DESIGN LIQUID LEVEL:	40.00 ft (per nameplate)
NOMINAL CAPACITY:	4,900 bbls (per nameplate)
COMPONENT TYPES:	
FOUNDATION:	Concrete Ringwall
BOTTOM:	Lap Welded (Shovel Slope)
SHELL:	Butt Welded (A36)
FIXED ROOF:	Lap Welded Cone w/ Framing
DATES:	
YEAR BUILT:	1991
PRIOR INSPECTION DATE:	May 2, 2006 (Out-of-Service) April 11, 2016 (Internal Floorscan Only) April 5, 2021 (In-Service External Only)

- Maximum fill height
- Next inspections

2. INTERVALS AND FILL HEIGHT CALCULATIONS

FOUNDATION:

The survey found the tank out of level by 1.272 inches. API 653 calculation for deflection of this 0.189 inch. API maximum deflection permitted for this tank is calculated at 1.137 inches. Diffe settlement for this tank does not exceed the API allowable (ref. API 653, Appendix B, Para. B.3).

The Foundation Settlement data in 4.2.3 indicates that the tank has a 13.08-inch single slope from S 1 to Station 5. The tank was designed with a 12-inch single slope. Edge settlement calculations e the requirements of API 653, Annex B, Section B.3.4 likely due to the design slope of the tank l and small diameter. Visual (VT) inspection did not identify signs of edge settlement. The tank sett should be monitored at the next internal inspection.

INTERNAL:

The next Internal inspection should be conducted within 20 years if all areas of corrosion below inch on the tank bottom and 0.177 inch in the critical zone are repaired and no later than Novembe (ref. API 653, Para. 6.4.2.2.1). This calculation is based on the measured tank bottom corrosion ra the minimum remaining thickness in accordance with API 653, Para. 4.4.5.

If the tank bottom is replaced, the next internal inspection should be performed within 10 ye establish a corrosion rate. Additional years may be added if measures are taken in accordance w 653, 6.4.2.1.1 and Table 6.1.

EXTERNAL VISUAL AND ULTRASONIC:

The next Visual (VT) external inspection should be conducted within 5 years and no later than Nov 2028 (ref. API 653, Para. 6.3.2.1). This calculation is based on the formula RCA/4N (where RCA difference between the measured shell thickness and the minimum required thickness in mils, ar the shell corrosion rate in mils per year).

Shell corrosion rate calculations indicate the next Ultrasonic Thickness (UT) inspection sho performed within 15 years and no later than November 2038 (ref. API 653, Para. 6.3.3.2.b). calculation is based on the formula RCA/2N (where RCA is the difference between the measure thickness and the minimum required thickness in mils, and N is the shell corrosion rate in mils per

3. FINDINGS AND RECOMMENDATIONS

EXTERNAL COATINGS

The external coatings on the tank have chalking and chipping type failure on 20-30 percent of the tanks surface with isolated areas of visible primer and surface rust. While not required by API 653, coating failure is directly related to active corrosion and other types of metal loss that could result in premature failure of steel components causing hazards to personnel and / or loss of contents. Consideration should be given to properly cleaning and re-coating the external Shell, Nozzles, and Fixed Roof.

FOUNDATION:

There is vegetation growing inside the containment and adjacent to the concrete ringwall. Consideration should be given to removing the vegetation.

The top of the concrete ringwall has been sealed at an unknown date using an unknown material similar to epoxy-based paint. This is provided as information only.

The concrete ringwall has isolated hairline cracks less than 0.0625 inch in width and spalling intermittently around the tank. These areas should be properly sealed.

The tank is equipped with an asphalt type moisture barrier that has dry rotted and failed around the entire circumference of the tank allowing water to penetrate beneath the bottom edge projection. The moisture barrier should be removed, and a new appropriate moisture barrier installed.

The tank is equipped with ten (10) 4-inch X 2.50-inch X 12-inch-tall anchor chairs affixed to 1-inch anchor bolts spaced evenly around the tank. The anchor bolts have active corrosion that has deteriorated up to 60-75 percent of the bolt's material directly above the concrete ringwall. The anchor bolts should be removed and replaced prior to returning the tank to service.

There is active corrosion on the inside of Anchor Chair CC that is beginning to spread to the shell plate. This area should be re-inspected once the bolt is removed.

One (1) leak detection port was visible beneath Manway A. This is provided as information only.

No Cathodic Protection equipment was noted near the tank. This is provided as information only.

BOTTOM:

The tank bottom requires an inspection blast to properly evaluate the entire condition of the tank bottom for repair. Taking in consideration the additional wall loss found on the MFL indications identified in 2016 at the previous bottom scan and the active corrosion on the external bottom edge projection plate, it would be likely that additional corrosion and possible through thickness corrosion would be found after an inspection blast. Consideration should be given to replacing the tank bottom at this time prior to returning the tank to service.

The external bottom edge projection has leafing type corrosion around 40-50 percent of the tanks circumference due to the asphalt moisture barrier failing. Random Ultrasonic Thickness readings were taken where corrosion was present and found remaining thicknesses between 0.130 to 0.180 inch. Thickness readings in some areas could not be obtained due to the condition of the surface. The bottom edge projection should be sandblasted and re-inspected prior to returning the tank to service.

The tank bottom is a lap welded single slope (shovel bottom). The bottom slope was measured at twelve (12) inches by measuring the first shell course at the high point (Manway A) and Low Point (behind the sump nearest the shell).

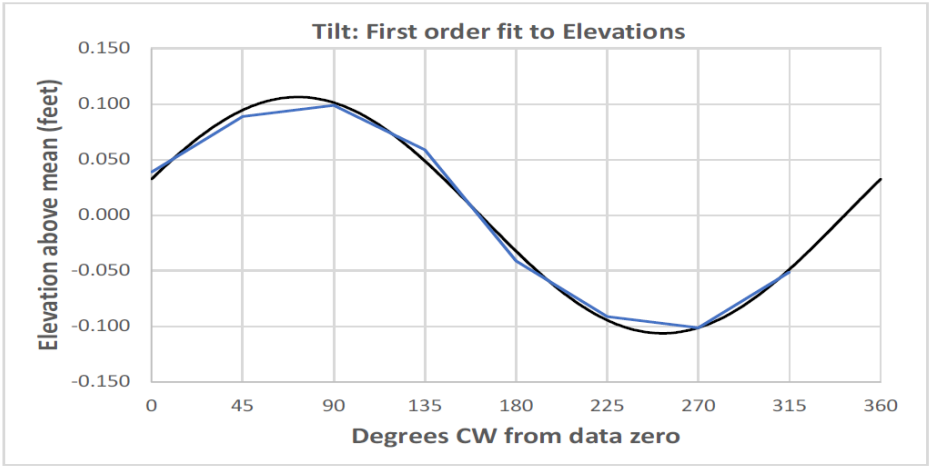
4. INSPECTION CHECKLISTS

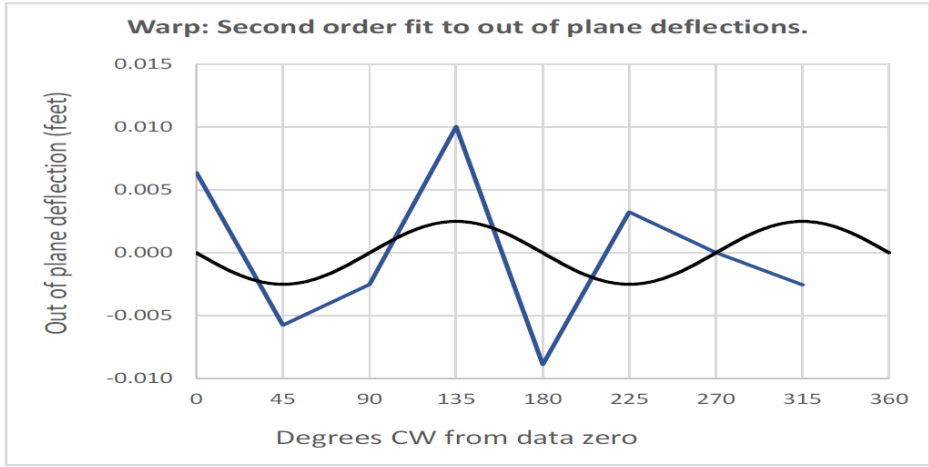
4.1 EXTERNAL COATINGS

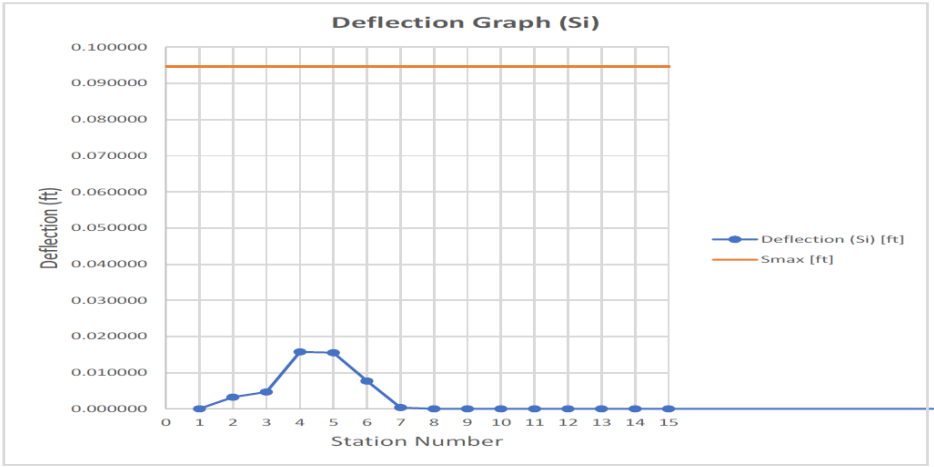
Inspect the External Shell for coating failure:					
☐ 0-5%	☐ 5-10%	☐ 10-20%	☒ 20-30%	☐ 30-40%	☐ 40-50%
☐ 50-60%	☐ 60-70%	☐ 70-80%	☐ 80-90%	☐ 90-95%	☐ Not Coated
☒ Chalking	☒ Chipping	☐ Cracking	☐ Mechanical Damage		
☒ Visible Primer	☐ Red Primer (Lead)	☐ Other:			
☒ Surface Rust Present					
☒ 0-5%	☐ 5-10%	☐ 10-20%	☐ 20-30%	☐ 30-40%	☐ >40%
☐ Acceptable / ☒ Reference Section 3:					

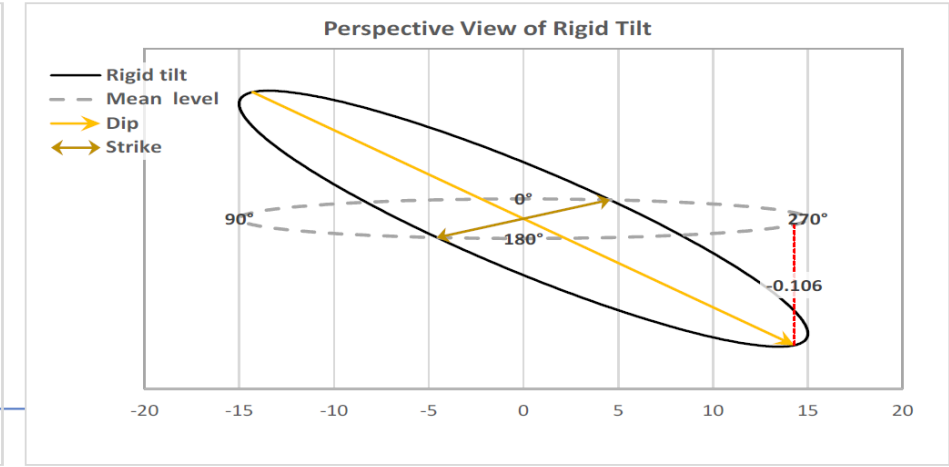
Inspect the External Nozzles and Appurtenances for coating failure:					
☐ 0-5%	☒ 5-10%	☐ 10-20%	☐ 20-30%	☐ 30-40%	☐ 40-50%
☐ 50-60%	☐ 60-70%	☐ 70-80%	☐ 80-90%	☐ 90-95%	☐ Not Coated
☒ Chalking	☒ Chipping	☐ Cracking	☐ Mechanical Damage		
☐ Visible Primer	☐ Red Primer (Lead)	☐ Other:			
☐ Surface Rust Present					
☐ 0-5%	☐ 5-10%	☐ 10-20%	☐ 20-30%	☐ 30-40%	☐ >40%
☐ Acceptable / ☒ Reference Section 3:					

4.2.2 SHELL SETTLEMENT EVALUATION GRAPHS









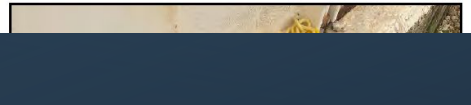
4.2.5 FOUNDATION PHOTOGRAPHS

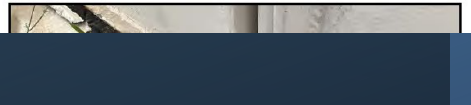
001 Grade Surrounding Tank Foundation

002 Grade Surrounding Tank Foundation

003 Spalling on Ringwall

004 Spalling on Ringwall





031 Active Corrosion on Anchor Chair X

032 Anchor Chair Z

033 Active Corrosion on Anchor Chair Z

034 Anchor Chair BB

API INDIVIDUAL CERTIFICATION PROGRAMS

ANAB
ANSI National Accreditation
ACCREDIT
ISO/IEC 17024
PERSONNEL CERTIFICA
BODY

verifies that

[redacted]

HAS MET THE ESTABLISHED AND PUBLISHED REQUIREMENTS FOR API CERTIFICATION AS AN

API 653 ABOVEGROUND STORAGE TANK INSPECTOR

IN ACCORDANCE WITH THE KNOWLEDGE DEFINED IN THE **API Standard 653**

CERTIFICATION NUMBER **74686**

ORIGINAL CERTIFICATION DATE	August 31, 2017
CURRENT CERTIFICATION DATE	August 31, 2023
EXPIRATION DATE	August 31, 2026

Director, Individual Certification Programs

CERTIFICATION

Steel Tank Institute

[redacted]

STI Inspector No: **AC 44536**

Expires: **January 3, 2028**

The person whose name appears on this certificate has met all the requirements to attain the STI SP001 Adjunct Certification for API 653 Inspectors.
This certification is dependent on an active API 653 certification.
6 PDHs Awarded

Joseph Mentzer, P.E.
Steel Tank Institute

STI SPFA

Issue Date:
01/03/2023

The official status of this certificate can be verified at www.steeltank.com.

A few questions

- Describe your safety and environmental management system and show me the documentation and some examples of leadership messaging about it.
- Can I review the tank database and what do you track?
- Do you use RBI or similar service at the facility. Describe when and how. Show the process for its implementation.
- Can we review the tank inspection report?

- Tell me about the corrosion rates, repair recommendations, the basis for the next internal inspection date, the repairs that were done, the service history, etc.
- Does the tank have an RPB (release prevention barrier)?
- Does the tank have a double bottom?
- Does the tank have leak detection? If so, what kind?
- Can review the photos from the inspection report?

Any Questions?

Philip Myers, Director, PEMY Engineering Services
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925-302-6707

26th California Unified Program Annual Training Conference
February 26-29, 2024