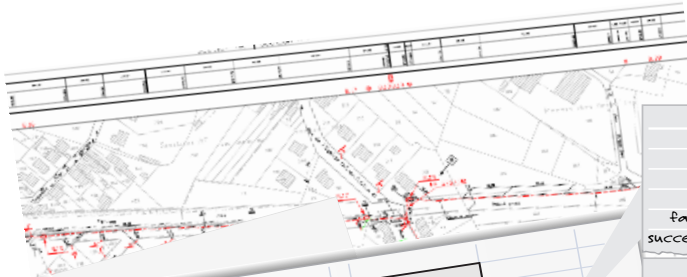




ID	From Station	To Station		
ACME PL	114.2	121.4		
			failures/mile-yr	
			Thd Pty	0.0003
			Corrosion Ext	0.0001
			Corrosion Int	0.0002
			Cracking	0.00006
			Geohaz	0.000008
			Inc Ops	0.00003
			Sabotage	0.00007
	PoF(per mile-year)			
	0.000768			
			Hazard Area (ft ²)	78,400
EL (\$/mile-year)			Receptor Dmgs	\$ 32,000
\$ 76			Business Loss	\$ 19,000
	CoF (\$/incident)		Indirect Costs	\$ 48,000
	\$ 99,000			

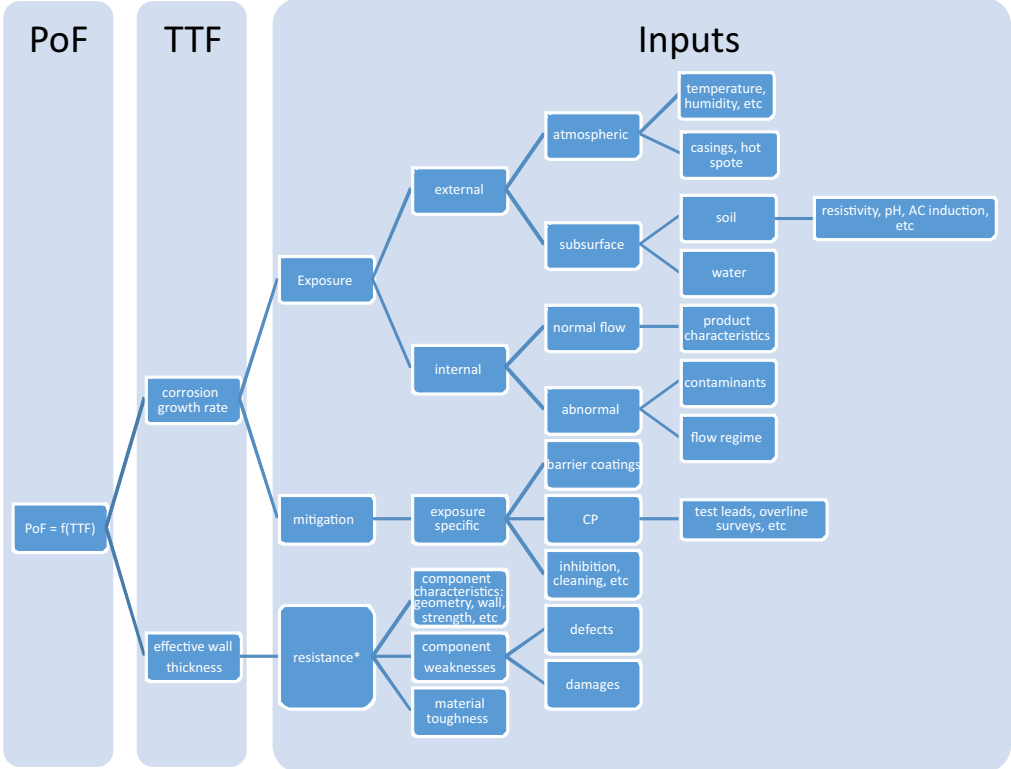


ID	From Station	To Station
ACME PL	114.2	121.4
		failures/mi-e-yr
		Thd Pty 0.0003
		Corrosion Ext 0.0001
		Corrosion Int 0.0002
		Cracking 0.0006
		Geohaz 0.0000
		Inc Ops 0.0000
		Sabotage 0.0000
	PoF(per mile-year)	Hazard Area (ft ²)
	0.000768	78,400
EL (\$/mile-year)		Receptor Dmgs \$ 32,000
\$ 76		Business Loss \$ 19,000
	CoF (\$/incident)	Indirect Costs \$ 48,000
	\$ 99,000	

Exposures	events/mile-year
excavators	0.550
vehicles	25.450
anchors	2.120
shipwrecks	5.500
falling structures	1.000
successive reactions	5.520

Mitigations	% Effectiveness
depth cover	2%
pavement	2.5%
casing	2%
signs	2.5%
patrol	2.5%

Resistance	% Effectiveness
diameter	2.5%
wall	7.5%
SMYS	8.9%
weaknesses	offensive wall loss
acetylene weld	7.2%
mitre bend	5.2%
wall loss	5.9%
dent	5.1%



PoF

TTF

Inputs

PoF = f(TTF)

corrosion growth rate

effective wall thickness

Exposure

mitigation

resistance*

external

internal

exposure specific

component characteristics: geometry, wall, strength, etc

component weaknesses

material toughness

atmospheric

subsurface

normal flow

abnormal

barrier coatings

CP

inhibition, cleaning, etc

defects

damages

temperature, humidity, etc

casings, hot spots

soil

water

product characteristics

contaminants

flow regime

test leads, overline surveys, etc

resistivity, pH, AC induction, etc



ID	From Station	To Station	
ACME PL	114.2	121.4	
			failures/mile-yr
			Thd.Pty. 0.0003
			Corrosion Ext 0.0001
			Corrosion Int 0.0002
			Cracking 0.00004
			Geohaz 0.000008
			Inc Ops 0.00003
			Sabotage 0.00007
			Hazard Area (ft ²) 78,400
			Receptor Dmgs \$ 32,000
			Business Loss \$ 19,000
			Indirect Costs \$ 48,000

PoF (per mile-year)
0.000768

EL (\$/mile-year)
\$ 76

CoF (\$/incident)
\$ 99,000

TTF (years)
9.780

Exposures	mpy
soil	2550
atmosphere	25450
water	3.0
AC	5.500
DC	100

Mitigations	% Effectiveness
coating	2%
cath protect	2.2%

Resistance	% Effectiveness
diameter	3.7%
wall	4.5%
SMYS	8.9%
weaknesses	77.0% wall loss
acetylene weld	4.2%
wire bend	5.2%
wall loss	5.8%
dent	5.8%



ID ACME PL	From Station 114.2	To Station 121.4	
			failures/mile-yr
			Thd Pty 0.0003
			Corrosion Ext 0.0001
			Corrosion Int 0.0002
			Cracking 0.00004
			Geohaz 0.000008
			Inc Ops 0.00003
			Sabotage 0.00007
	PoF (per mile-year) 0.000748		
EL (\$/mile-year) \$ 76			
		Hazard Area (ft ²) 78,400	
		Receptor Dmgs \$ 32,000	
		Business Loss \$ 19,000	
		Indirect Costs \$ 48,000	
	CoF (\$/incident) \$ 99,000		

TTF (years)
4.880

Exposures	mpy
stream based	0.550
abnormal condition 1	0.5750
abnormal condition 2	0.20
abnormal condition 3	5.500

Mitigations	% Effectiveness
cleaning	0%
inhibition	0.2%
internal coating/liner	5.5%

Resistance	% Effectiveness
diameter	0.7%
wall	4.5%
SMYS	80%
weaknesses	77% (no wall loss)
acetylene weld	4.2%
mitre bend	0.2%
wall loss	0.0%
dent	0%



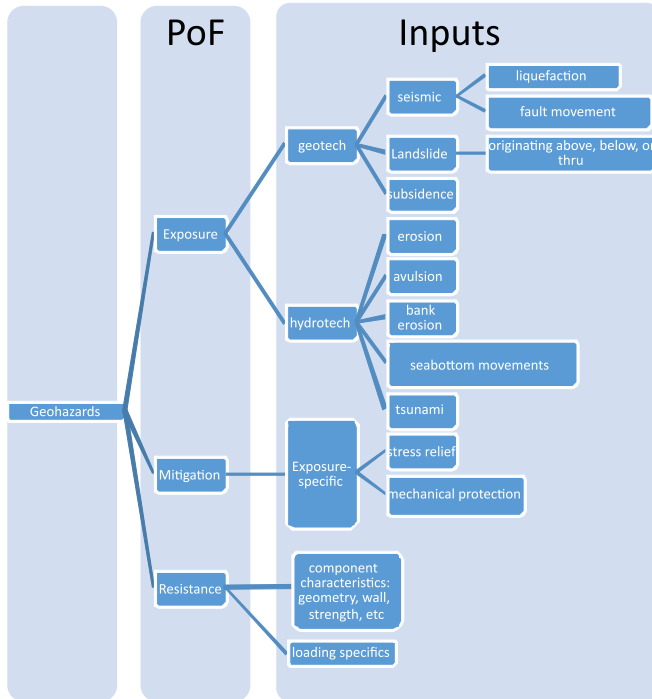
ID ACME PL	From Station 114.2	To Station 121.4
EL (\$/mile-year) \$ 76	POF (per mile-year) 0.000768	failures/mile-yr
CoF (\$/incident) \$ 99,000		Thd Pty 0.0003
		Corrosion Ext 0.0001
		Corrosion Int 0.0002
		Cracking 0.00006
		GeoHaz 0.000008
		Inc Ops 0.00003
		Sabotage 0.00007
		Hazard Area (ft ²) 78,400
		Receptor Dmgs \$ 32,000
		Business Loss \$ 19,000
		Indirect Costs \$ 48,000

TTF (years)
4.880

Exposures	mpy
fatigue cycles	2550
fatigue magnitude	35750
SCC	3.00
HIC	5.500
SSC	857
mechanical decoupling	55

Mitigations	% Effectiveness
operational	2%
barriers	33%

Resistance	% Effectiveness
stress	30%
eff wall	7.5%
toughness	80%
weaknesses	77.5% wall h
acetylene weld	73%
mitre bend	50%
wall loss	50%
dent	50%



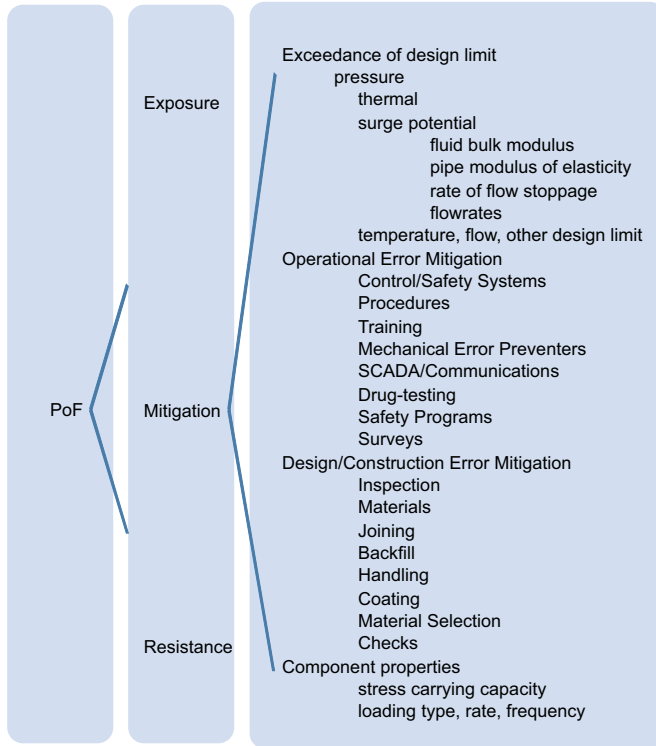


ID	From Station	To Station
ACME PL	114.2	121.4
		failures/mile-yr
		Thd Pty 0.0003
		Corrosion Ext 0.0001
		Corrosion Int 0.0002
		Cracking 0.000006
		Geohaz 0.000008
		Inc Ops 0.00003
		Sabotage 0.00007
	POF(per mile-year)	
	0.000768	
EL (\$/mile-year)		
\$ 76		
	Cof (\$/incident)	
	99,000	
		Hazard Area (ft ²) 78,400
		Receptor Dmgs \$ 32,000
		Business Loss \$ 19,000
		Indirect Costs \$ 48,000

Exposures	mpy
Landslide	3550
seismic fault	25450
Liquefaction	2.00
flood	5.500
erosion	854
weather	53

Mitigations	% Effectiveness
stabilization	20%
ground improvement	20%
isolation	20%

Resistance	% Effectiveness
Load types	2.5%
stresses	4.5%
D/t	85%
weaknesses	47-draw wall has
acetylene weld	4.2%
mitre bend	5.2%
wall loss	5.0%
dent	5.0%



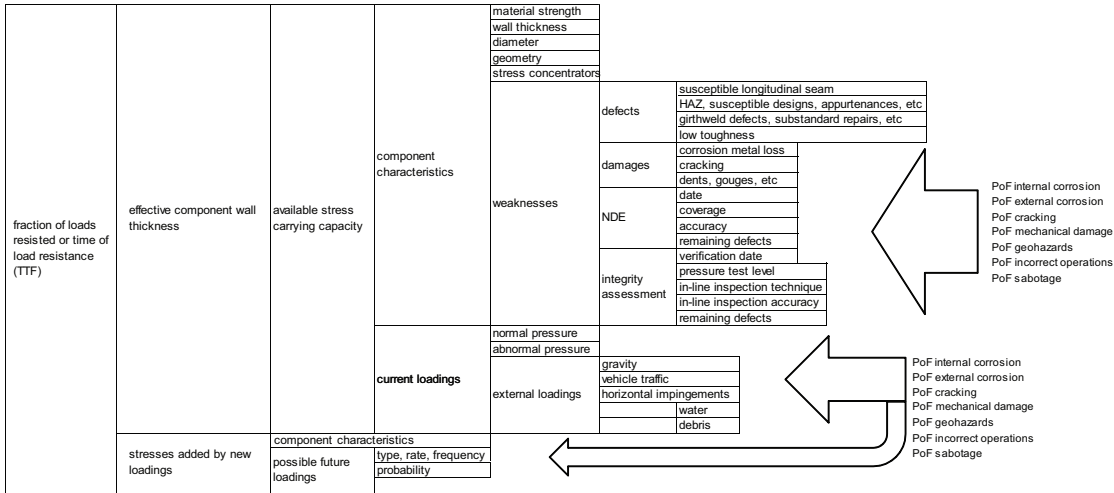


ID ACME PL	From Station 114.2	To Station 121.4	
			failures/mile-yr
			Thd Pty 0.0003
			Corrosion Ext 0.0001
			Corrosion Int 0.0002
			Cracking 0.00004
			Geo haz 0.000008
			Inc Ops 0.00003
			Sabotage 0.00007
EL (\$/mile-year) \$ 76	PoF (per mile-year) 0.000748		
		Hazard Area (ft ²) 78,400	
		Receptor Dmgs \$ 32,000	
		Business Loss \$ 19,000	
	CoF (\$/incident) \$ 99,000	Indirect Costs \$ 48,000	

Exposures events/mile-year	
pressure surge	3650
thermal overpressure	26750
vessel over-fill	250

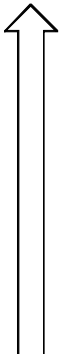
Mitigations	% Effectiveness
training	20%
procedures	20%
control/safety systems	20%
substance abuse program	20%

Resistance	% Effectiveness
types of limit exceedances	20%
stresses	4.5%
weaknesses	41.4% wall loss
acetylene weld	4.2%
mitre bend	3.2%
wall loss	5.0%
dent	5.0%



CoF per incident

	Scenarios 1 to n					
Receptor damages	hazard zone					
Population Environment High Value Areas indirect consequences	hazard zone (area of potential damage)			hazard zone boundary selection		hazard zone probability
	Dispersion	Spill Size			based on intensity threshold	based on damage state
	secondary containment weather (wind, humidity, heat transfer, etc), currents, wave action, etc topography surface flow resistance and penetration product characteristics leak detection emergency response ignition probability	gas	liquid	combination (HVL, aerosols, etc)	thermal radiation intensity levels	Receptors' sensitivities
		hole size diameter pressure product characteristics	failure size flowrate	volume released leak detection flow rate flow stopping time deinventory volumes	overpressure intensity levels contaminant concentration	injury/fatality potential mechanical effects (building damage scenarios, etc) remediation/restoration requirements contaminant concentration



hazard area(s)
counts
per hazard area unit
damage probability
damage rates per count

Product Characteristics	Acute Hazards	thermal effects	flammability events (jet fire, fireball, flashfire)
			explosion potential
			mass
			material properties
			accumulation potential
	ignition probability	ignition sources	
	Chronic Hazards	toxicity mechanical effects long term toxicity environmental persistence ignition probability corrosivity reactivity	aquatic toxicity
			mammalian toxicity