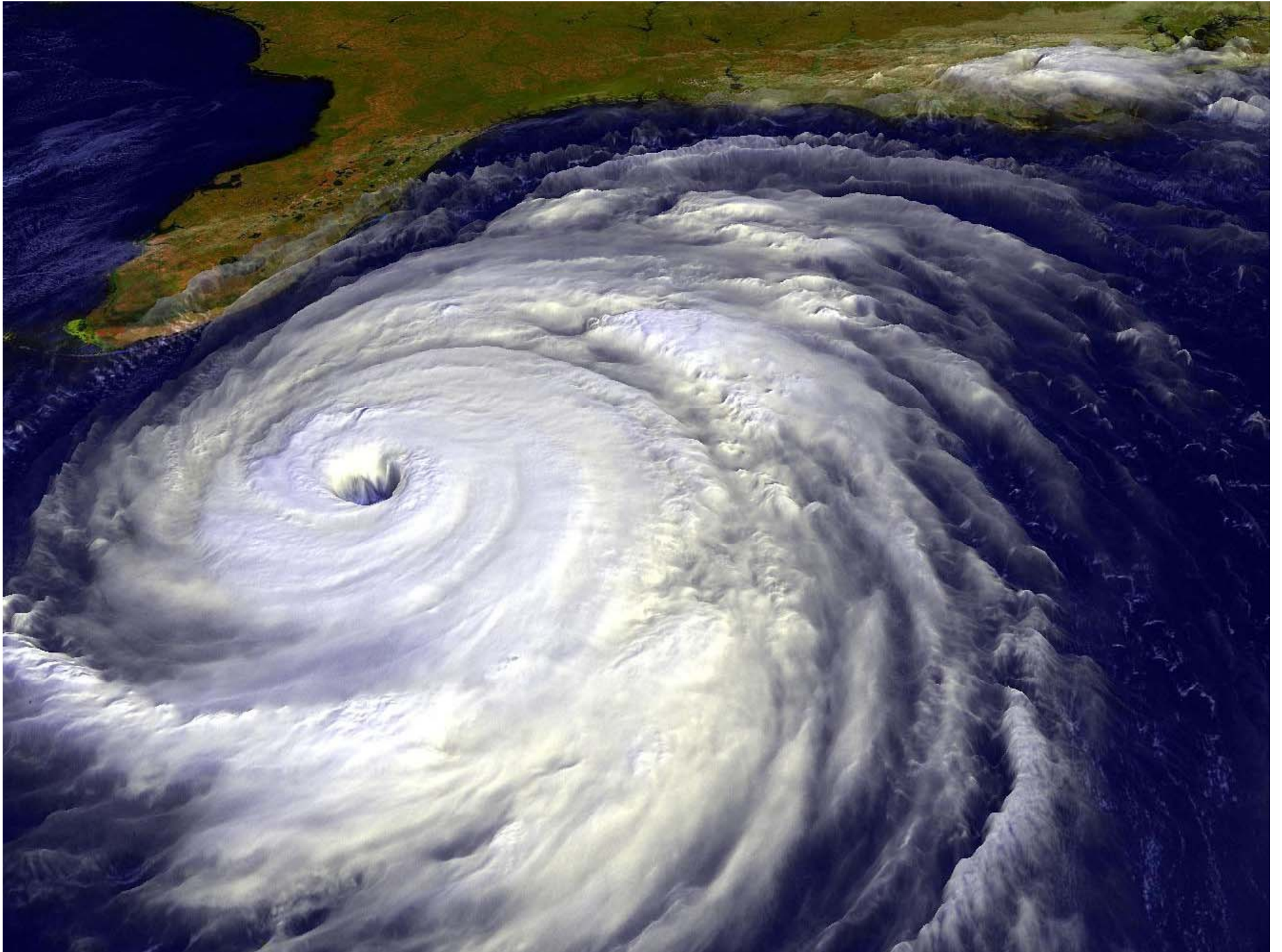
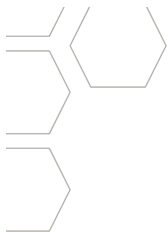


Managing your Flood and Windstorm Risk

Jacob W. Bonnet

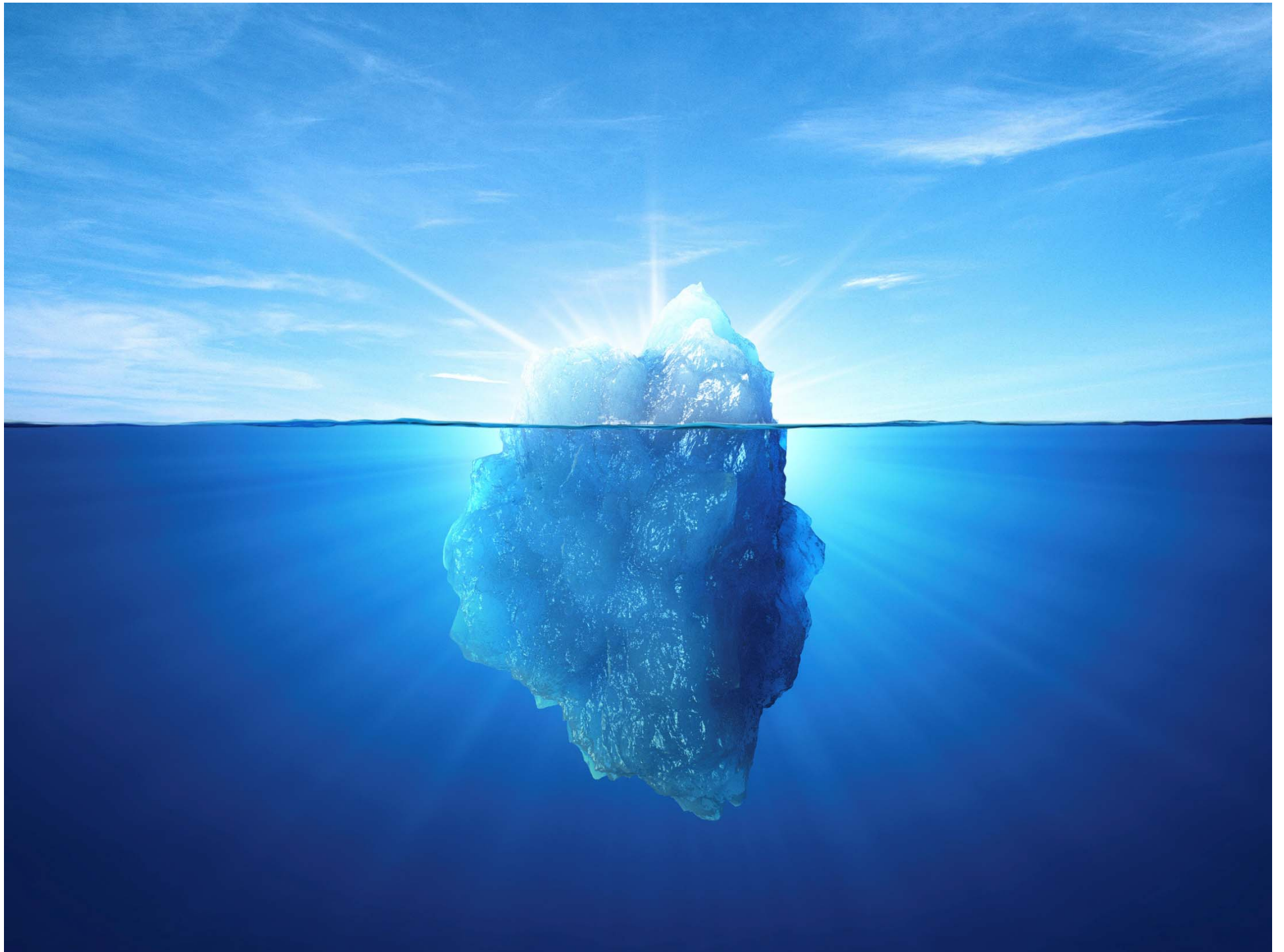
Client Technical Training Specialist
Enterprise Learning, FM Global





What is your experience?







Agenda

Flood

Why flood

Is your facility exposed?

Characteristics of flood

Flood protection management program

Windstorm

Windstorm dynamics

Knowing your exposure

Practical solutions

Windstorm preparedness

< Why flood



Boston 1872



Baltimore 1904

< Why flood



New York 1835



Chicago 1871

< Why flood

Rank	Event		Date	Loss in year it occurred	Adjusted loss (in 2011 dollars)
14	Southern California November wildfire	Sacramento, CA	13-Nov-2008	\$800 million	\$836 million
5	The Southern California firestorm	San Diego County, CA	20-Oct-2007	\$1.8 billion	\$2.0 billion
9	Wildland fire "Cedar"	Julian, CA	25-Oct-2003	\$1.1 billion	\$1.3 billion
11	Wildland fire "Old"	San Bernadino, CA	25-Oct-2003	\$975 million	\$1.2 billion
1	The World Trade Center	New York, NY	11-Sep-2001	\$33.4 billion	\$42.4 billion
8	"Cerro Grande" Wildland Fire	Los Alamos, New Mexico	4-May-2000	\$1.0 billion	\$1.3 billion
13	Power plant (auto manufacturing complex)	Dearborn, MI	1-Feb-1999	\$650 million	\$876 million

Baltimore, MD

7-Feb-1904

\$50 million

\$1.2 billion

Boston, MA

9-Nov-1872

\$75 million

\$1.4 billion

Chicago, IL

9-Oct-1871

\$168 million

\$3.1 billion

New York, NY

16-Dec-1835

\$26 million

\$564 million

18	S.S. Grandcamp and Chemical Co. Plant	Texas City, TX	16-Apr-1947	\$67 million	\$675 million
17	U.S.S. Lafayette (formerly S.S. Normandie ocean liner)	New York, NY	9-Feb-1942	\$53 million	\$731 million
24	Forest fire	Clouquet, MN	12-Oct-1918	\$35 million	\$521 million
2	Earthquake and fire	San Francisco, CA	18-Apr-1906	\$350 million	\$8.7 billion
10	Baltimore conflagration	Baltimore, MD	7-Feb-1904	\$50 million	\$1.2 billion
6	Great Boston Fire	Boston, MA	9-Nov-1872	\$75 million	\$1.4 billion
3	Great Chicago Fire	Chicago, IL	9-Oct-1871	\$168 million	\$3.1 billion
21	Great Fire of New York	New York, NY	16-Dec-1835	\$26 million	\$564 million



National Fire Protection Association
The authority on fire, electrical, and building safety



< Why flood



Flood stuff ...
I need sprinklers!



< Why flood

Yes you do! But remember, if in a flood zone, probability for a major flood is **5** times that of having a major fire.





1. 2012 Sandy - New York - New Jersey
2. 2011 Tropical Storms Lee/Irene
3. 2011 Midwest Flood
4. 2010 Nashville, TN
5. 2009 Louisville, KY
6. 2006 Mid Atlantic States Flood
7. 2005 Katrina and Rita - New Orleans

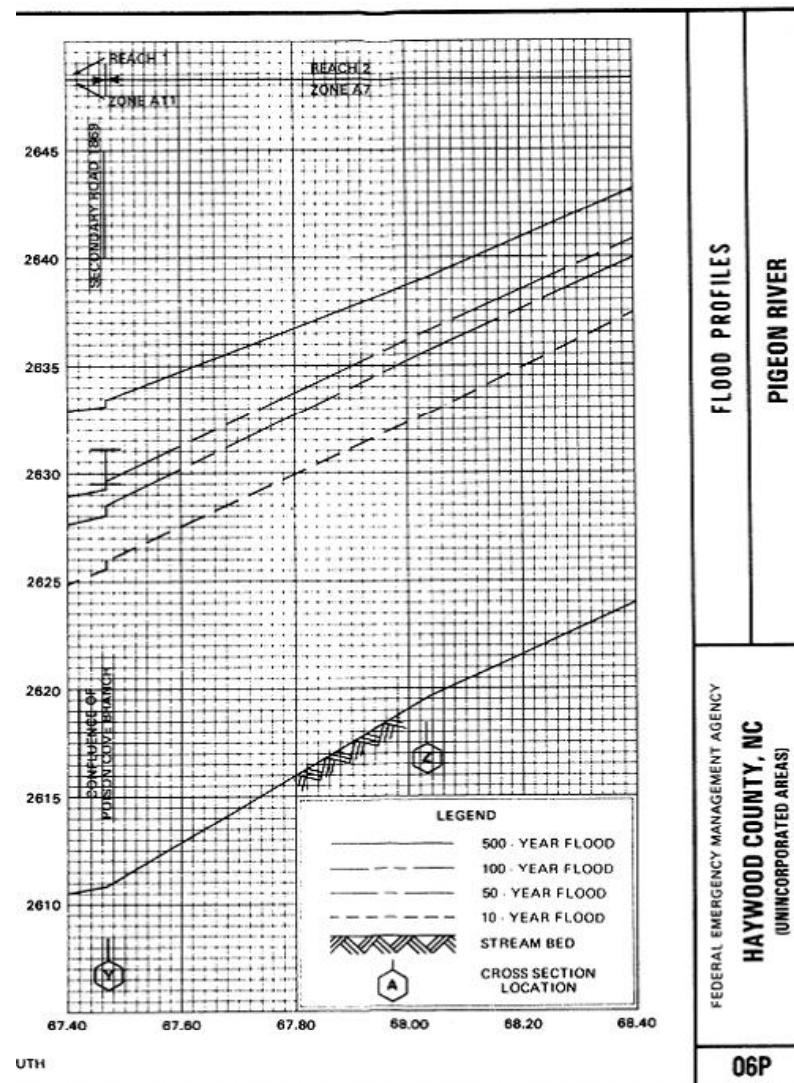
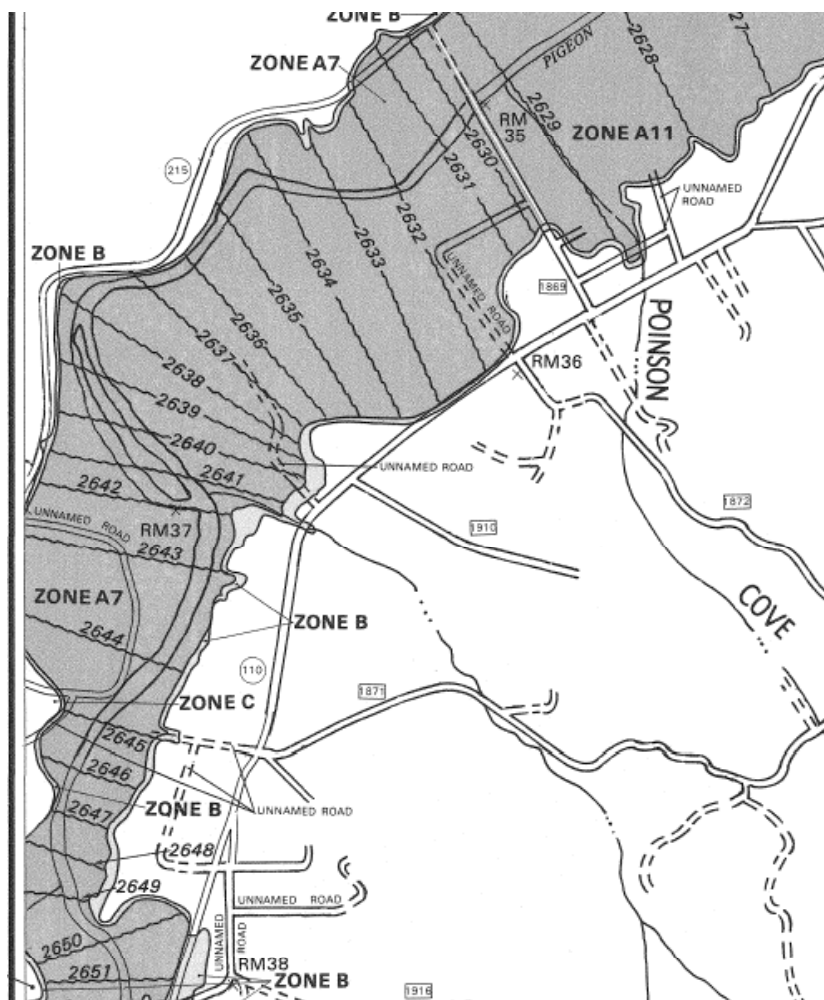


< Is your facility exposed?





< Is your facility exposed?



Is your facility exposed?

FLOOD INSURANCE STUDY

VOLUME 1 OF 6



ALLEGHENY COUNTY, PENNSYLVANIA (ALL JURISDICTIONS)

COMMUNITY NAME	COMMUNITY NUMBER	COMMUNITY NAME	COMMUNITY NUMBER	COMMUNITY NAME	COMMUNITY NUMBER	COMMUNITY NAME	COMMUNITY NUMBER
ALEPH, TOWNSHIP OF	421286	ENDSWORTH, BOROUGH OF	420524	MOOREHEAD, CITY OF	420521	SCOTT, TOWNSHIP OF	421180
ASPINWALL, BOROUGH OF	420506	ETNA, BOROUGH OF	421362	MCKEES ROCKS, BOROUGH OF	420552	SEWICKLEY, BOROUGH OF	420570
AVALON, BOROUGH OF	420508	FAIRY, TOWNSHIP OF	421385	MILLVALE, BOROUGH OF	420553	SEWICKLEY HEIGHTS, BOROUGH OF	420571
BALDWIN, BOROUGH OF	420507	FINDLAY, TOWNSHIP OF	421386	MONROEVILLE, MUNICIPALITY OF	420554	SEWICKLEY HILLS, BOROUGH OF	420572
BELL ACRES, BOROUGH OF	420509	FOREST HILLS, BOROUGH OF	420535	MOON, TOWNSHIP OF	421387	SHALER, TOWNSHIP OF	421181
BELLEVUE, BOROUGH OF	420510	FORWARD, TOWNSHIP OF	421394	MT. LEBANON, MUNICIPALITY OF	421272	SHARPSBURG, BOROUGH OF	420573
BEN AVON, BOROUGH OF	420511	FOX CHAPEL, BOROUGH OF	420536	MUNMALL, BOROUGH OF	420555	SOUTH FAYETTE, TOWNSHIP OF	421186
BETHES PAKE, MUNICIPALITY OF	420512	FRANKLIN PARK, BOROUGH OF	420537	NEVILLE, TOWNSHIP OF	420556	SOUTH PARK, TOWNSHIP OF	421185
BLANCK, BOROUGH OF	420513	FRASER, TOWNSHIP OF	421388	NORTH BRADDOCK, BOROUGH OF	420557	SOUTH VERMILION, TOWNSHIP OF	421187
BRADENBURG, BOROUGH OF	420514	GLASSPORT, BOROUGH OF	420538	NORTH FAYETTE, TOWNSHIP OF	421389	SPRINGDALE, BOROUGH OF	421188
BRADDOCK, BOROUGH OF	420515	GREENFIELD, BOROUGH OF	420539	NORTH HESSEL, TOWNSHIP OF	421390	SPRINGDALE, TOWNSHIP OF	421189
BRADDOCK HILLS, BOROUGH OF	420516	GREEN TREE, BOROUGH OF	420540	OSAGE, BOROUGH OF	420558	STONE, TOWNSHIP OF	421190
BRADFORD WOODS, BOROUGH OF	421282	HAMPTON, TOWNSHIP OF	420578	OSKAY, BOROUGH OF	420559	SWISSVALE, BOROUGH OF	420574
BROOKVILLE, BOROUGH OF	420518	HANNA, TOWNSHIP OF	421391	OTAWA, TOWNSHIP OF	421392	TABERNASH, BOROUGH OF	420575
CARNEGIE, BOROUGH OF	420519	HARRISON, TOWNSHIP OF	420541	OHIO, TOWNSHIP OF	421393	THOMASBURG, BOROUGH OF	420576
CHESTER, BOROUGH OF	420520	HAYSVILLE, BOROUGH OF	420542	OSKORNE, BOROUGH OF	420560	TRAFFORD, BOROUGH OF	420577
CHURCHILL, BOROUGH OF	420521	HEDENBURG, BOROUGH OF	420543	PENNSVILLE, MUNICIPALITY OF	421394	TURTLE CREEK, BOROUGH OF	420578
CLARION, CITY OF	420524	HOMESTEAD, BOROUGH OF	420544	PENNSBURG VILLAGE, BOROUGH OF	420561	UPPER ST. CLAIR, TOWNSHIP OF	421119
COLLIER, TOWNSHIP OF	421388	HOVANA, TOWNSHIP OF	421395	PINE, TOWNSHIP OF	421396	VERONA, BOROUGH OF	420579
CORANGUS, BOROUGH OF	420525	JEFFERSON, BOROUGH OF	420545	PITCAIRN, BOROUGH OF	420562	VERMILION, BOROUGH OF	420580
CRAFTON, BOROUGH OF	420526	KENNEDY, TOWNSHIP OF	421397	PITTSBURGH, CITY OF	420563	WALL, BOROUGH OF	420581
CRESCENT, TOWNSHIP OF	421390	KLICKA, TOWNSHIP OF	421398	PUM, BOROUGH OF	420564	WEST DEER, TOWNSHIP OF	421191
CRAYFORD, BOROUGH OF	420527	LEET, TOWNSHIP OF	421399	PORT VUE, BOROUGH OF	420565	WEST ELEANOR, BOROUGH OF	420582
DUGESNE, CITY OF	420528	LEETDALE, BOROUGH OF	420547	PORT VUE, BOROUGH OF	420566	WEST HOMESTEAD, BOROUGH OF	420583
EAST DEER, TOWNSHIP OF	421381	LIBERTY, BOROUGH OF	420548	RESERVE, TOWNSHIP OF	420567	WEST MIFLIN, BOROUGH OF	420584
EAST PITTSBURGH, BOROUGH OF	420529	LINDA, BOROUGH OF	420549	RICHLAND, TOWNSHIP OF	421391	WEST VIEW, BOROUGH OF	420585
EDGEWORTH, BOROUGH OF	420530	MARSHALL, TOWNSHIP OF	421392	ROBINSON, TOWNSHIP OF	421392	WHITE OAK, BOROUGH OF	420586
ELIZABETH, BOROUGH OF	421383	MCCONNELL, TOWN OF	421393	ROSS, TOWNSHIP OF	420570	WILKINS, TOWNSHIP OF	420587
ELIZABETH, TOWNSHIP OF	420531	MCDONALD, BOROUGH OF	420551	ROSELIN, TOWNSHIP OF	420571	WILKINS, TOWNSHIP OF	420588



REVISED:
MAY 15, 2003

Federal Emergency Management Agency

FLOOD INSURANCE STUDY NUMBER
42003CV001A

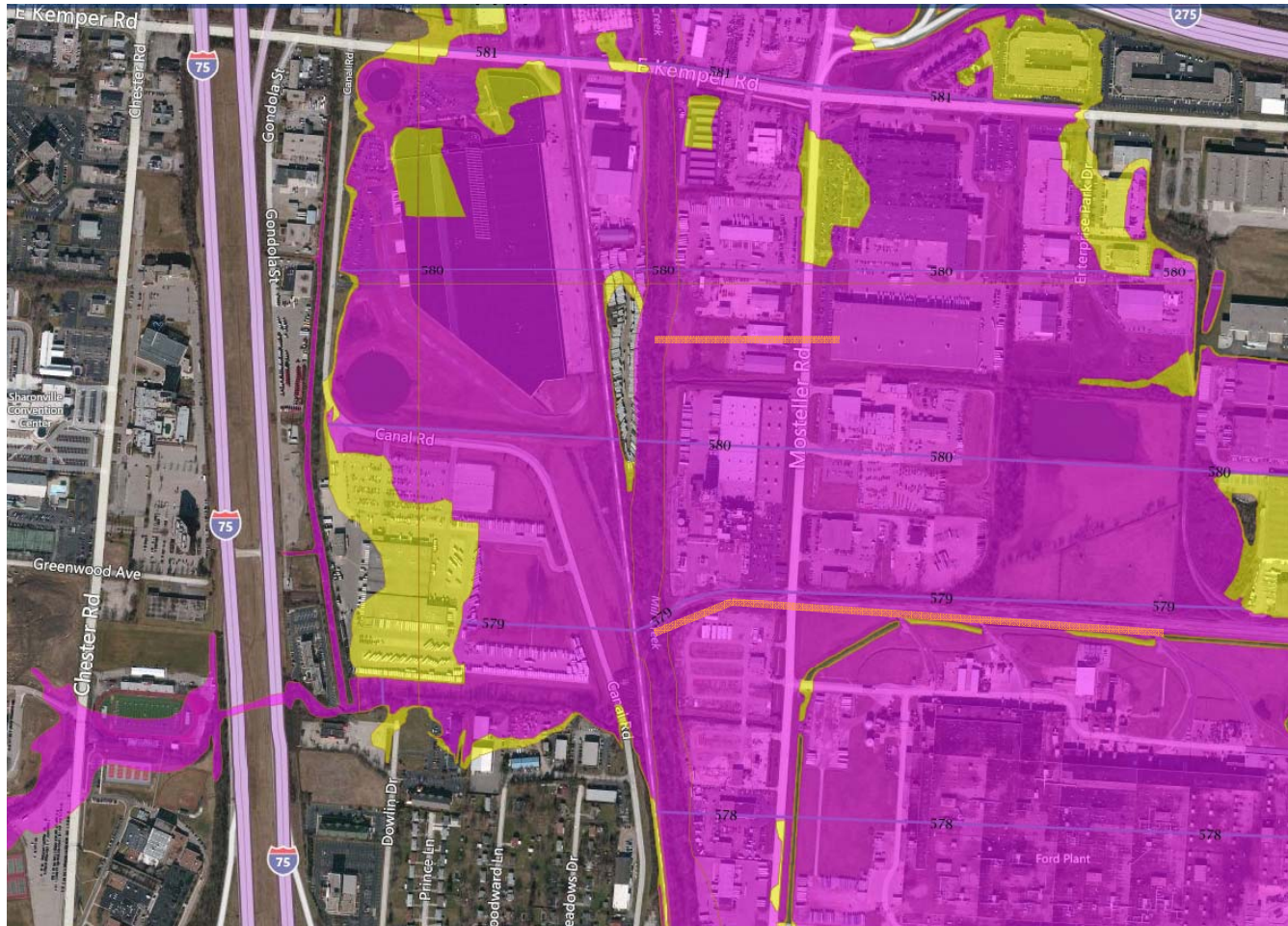
REVISED:
MAY 15, 2003

the hydrologic and hydraulic analyses for the FIS report dated March 16, 1981, were prepared by GAI Consultants, Inc., for the FIA, under Contract No. H-4762. That work was completed in September 1979.

the hydrologic and hydraulic analyses for the FIS report dated March 1979 were prepared by Michael Baker, Jr., Inc., for the FIA, under Contract No. H-4553. That work was completed in March 1978. The hydrologic analysis for the Youghiogheny River was prepared by the USACE. That work was completed in December 1976.



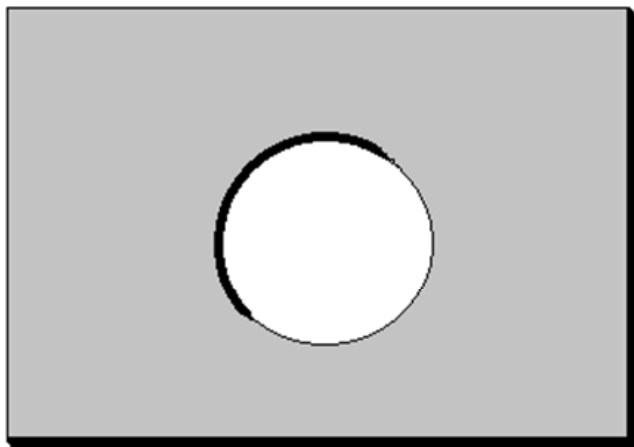
< Is your facility exposed?



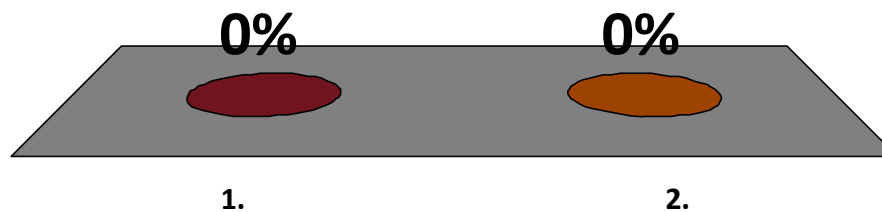


< Test - Question

When heating the metal...



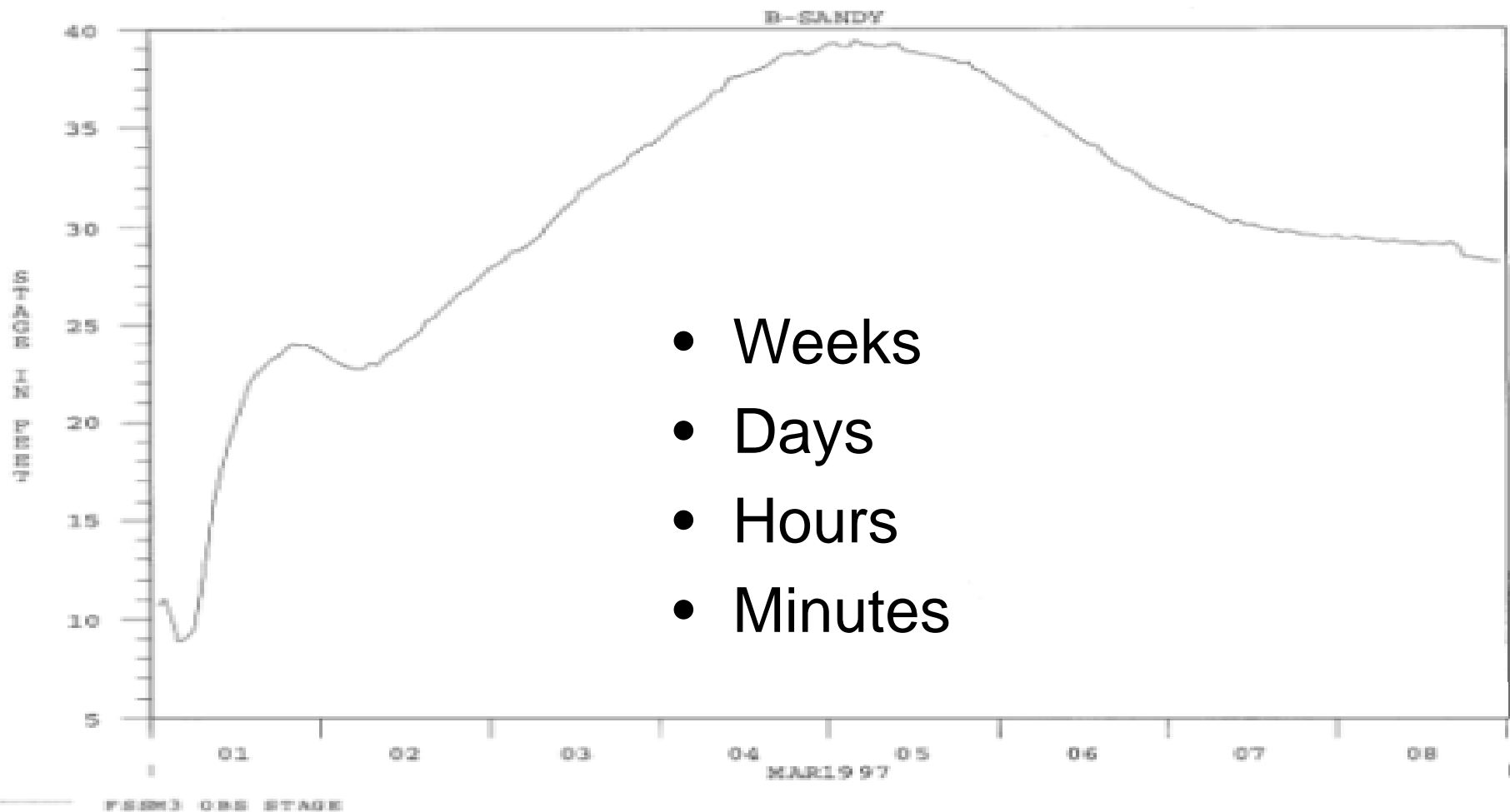
1. *Bigger*
2. *Smaller*





< Characteristics of flood

Warning time



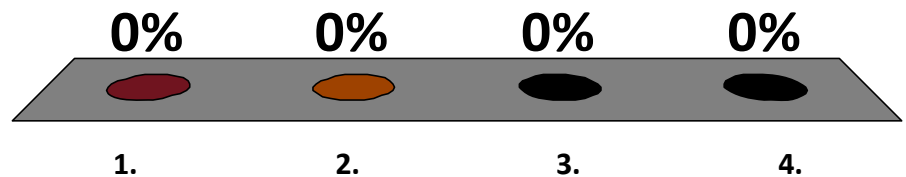


Characteristics of flood - Question

What is the warning time for a large river?



1. ***Weeks***
2. ***Days***
3. ***Hours***
4. ***Minutes***





< Characteristics of flood

What methods provide reliable warning time?

- Internet Sites
- Local Water-level Gauge Indicators
- On-site Monitoring
- TV/Radio Warning



< Characteristics of flood

Reliable warning time?





< Characteristics of flood

Reliable warning time?





< Characteristics of flood

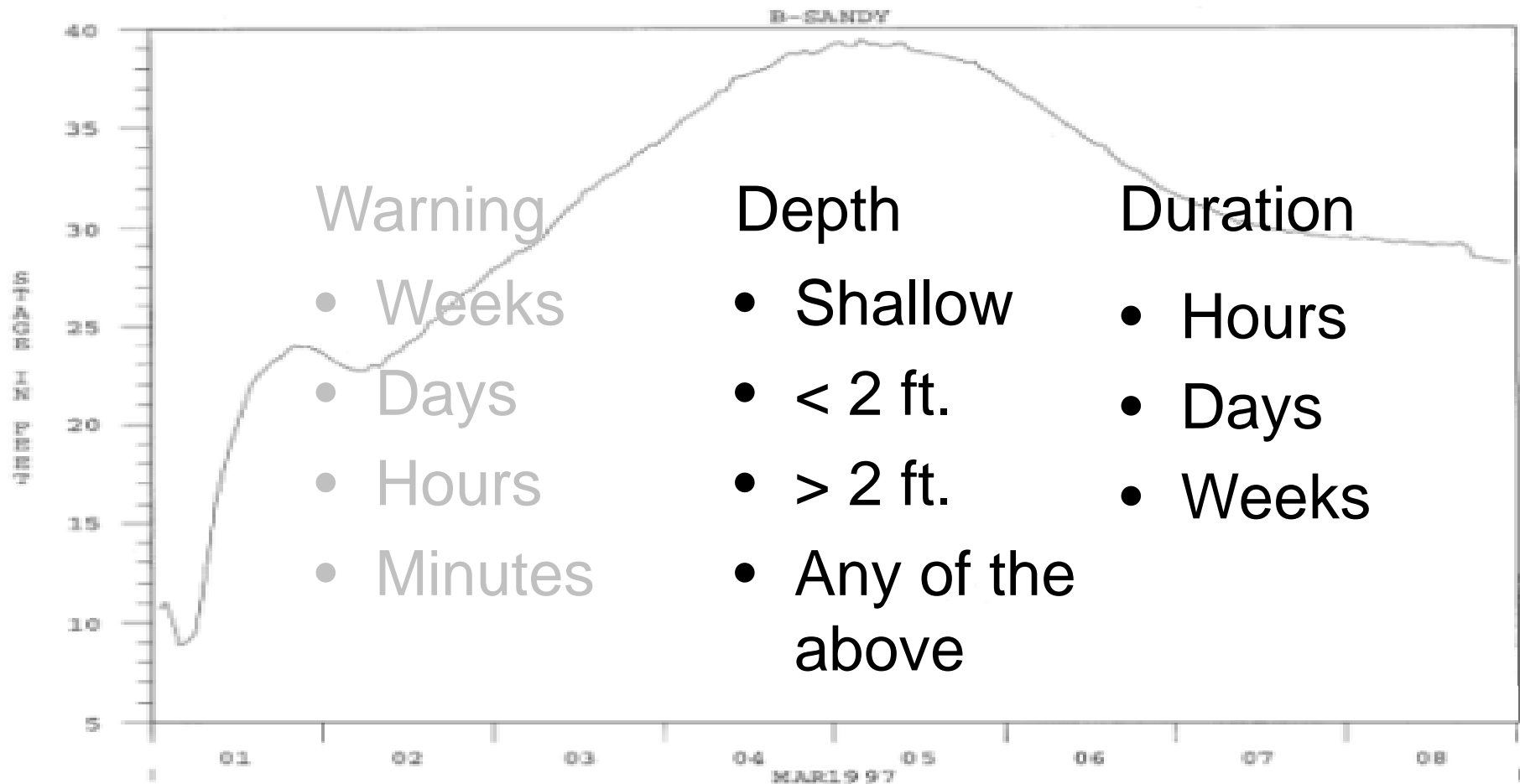
Reliable warning time?





< Characteristics of flood

Other characteristics...





< Characteristics of flood

Other characteristics...





< Characteristics of flood

Other characteristics...





< Flood protection management program

Mitigation approach...

- Physical solutions that require no action
- Physical solutions that require little action
- Flood emergency response plan



< Flood protection management program

Physical solutions that require no action





< Flood protection management program

Physical solutions that require no action





< Flood protection management program

Physical solutions that require no action





< Flood protection management program

Physical solutions that require no action





< Flood protection management program

Physical solutions that require little action





< Flood protection management program

Physical solutions that require little action





Flood protection management program

FM Approved flood mitigation products





< Flood protection management program

FM Approved flood mitigation products





< Flood protection management program

Flood emergency response plan

1. **Understand** flood hazard and risk
2. Uses **reliable** and practical **warning** resources
3. Clearly designates **authority**: Who is to activate
4. Includes appropriate **site shut-down** procedures
5. Uses **available resources** and staff
6. Provides basic **cleanup**, operation & recovery plans
7. Minimizes **fire hazard** during and after the flood
8. Return **fire protection** to service ASAP



1. Know your exposure
2. Understand the hazard
3. Flood management program includes
 - Physical solutions that require no action
 - Physical solutions that require little action
 - Flood emergency response plan



Agenda

Flood

Why flood

Is your facility exposed?

Characteristics of flood

Flood protection management program

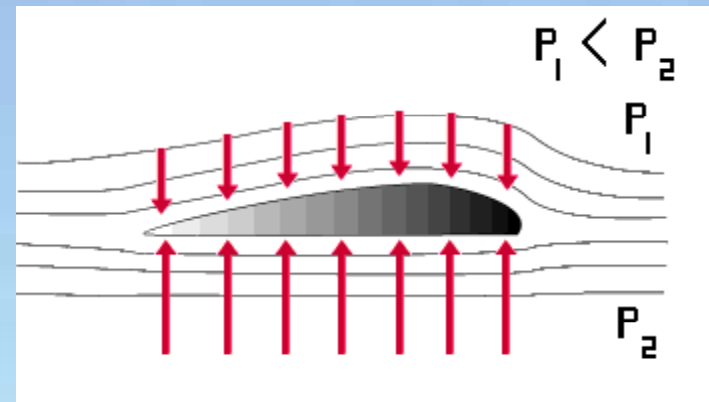
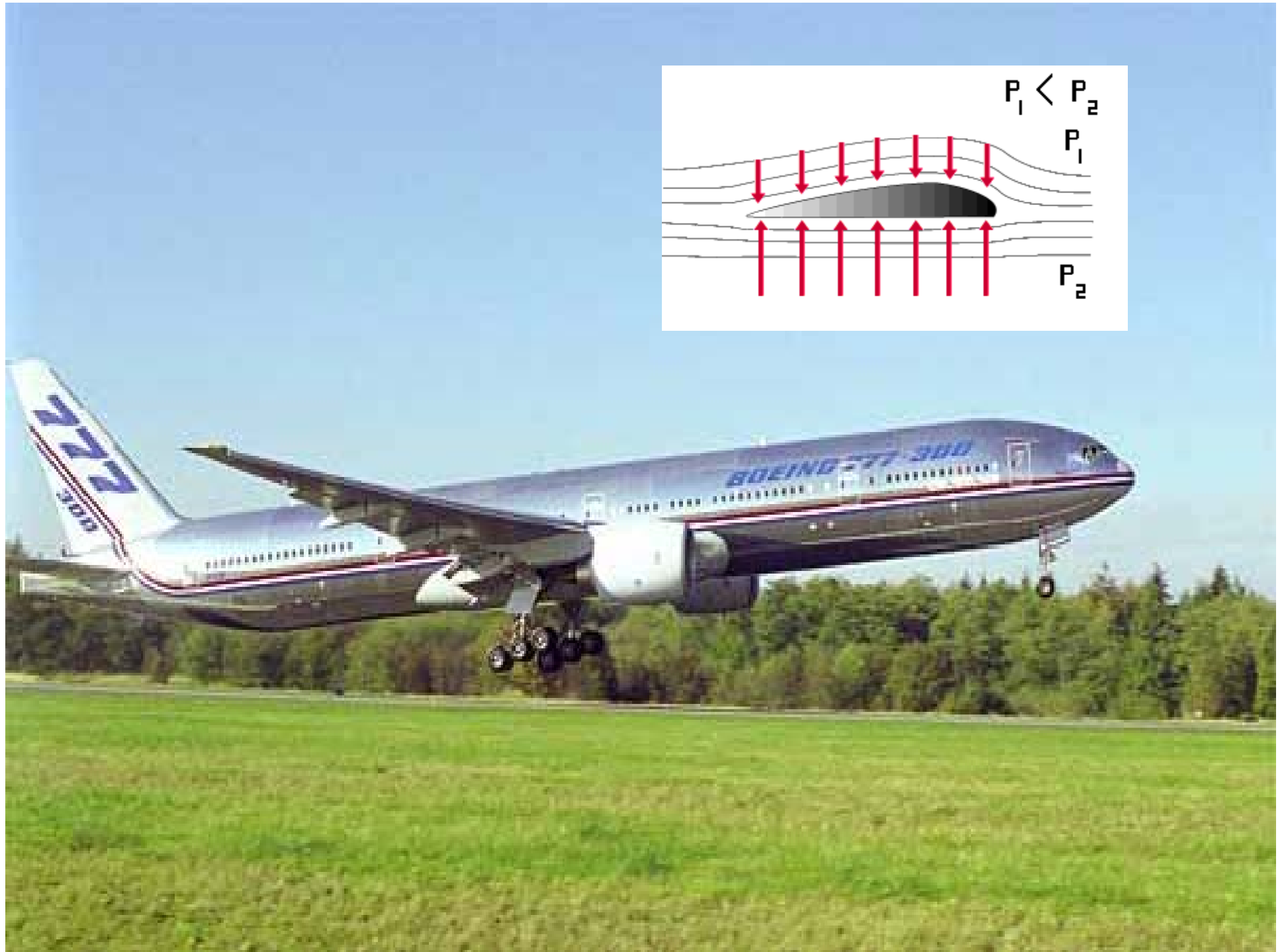
Windstorm

Windstorm dynamics

Knowing your exposure

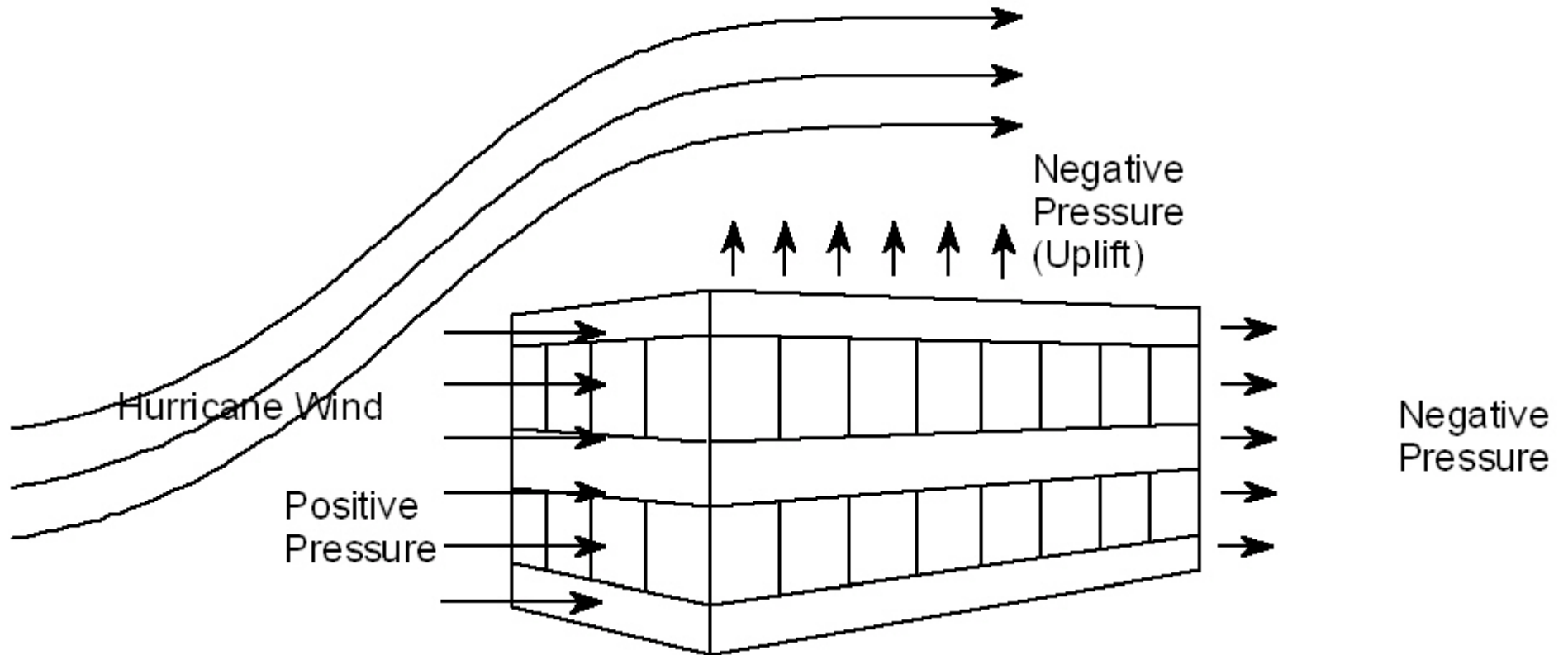
Practical solutions

Windstorm preparedness



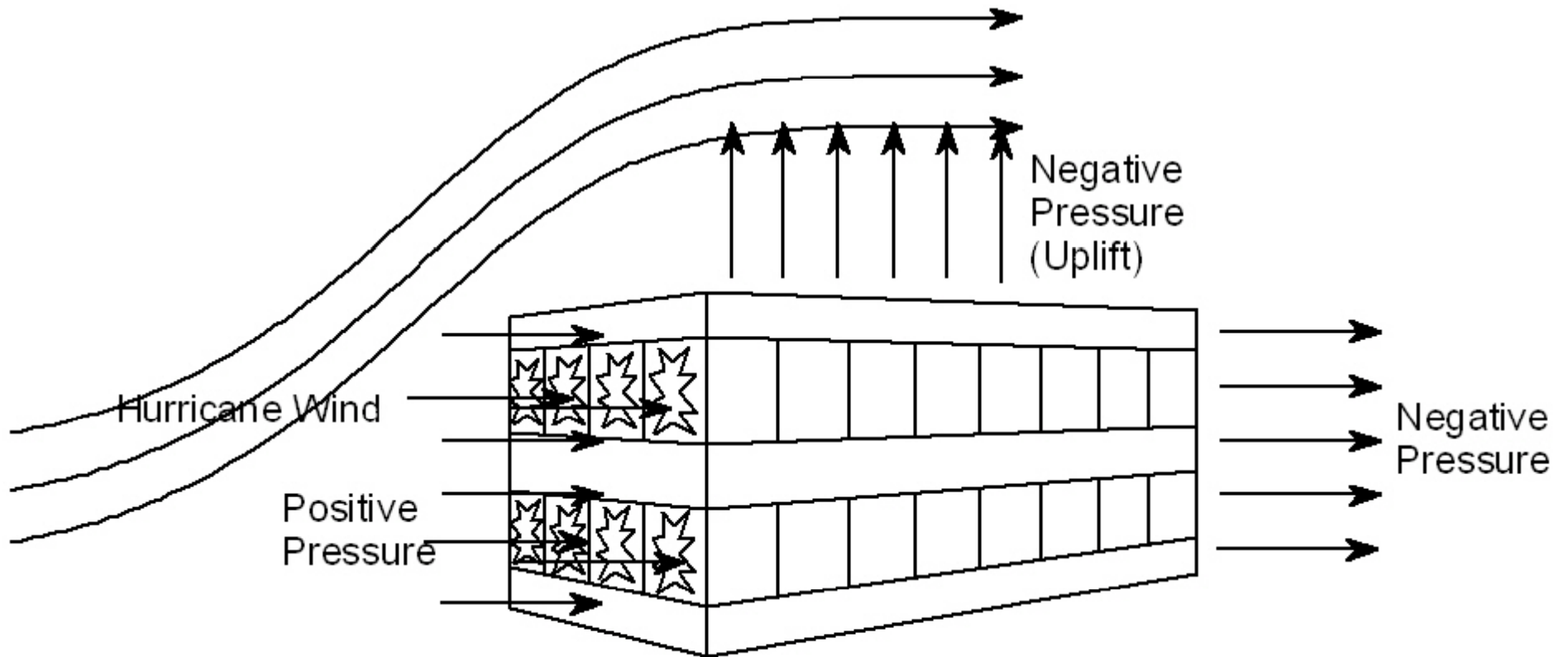


Windstorm dynamics



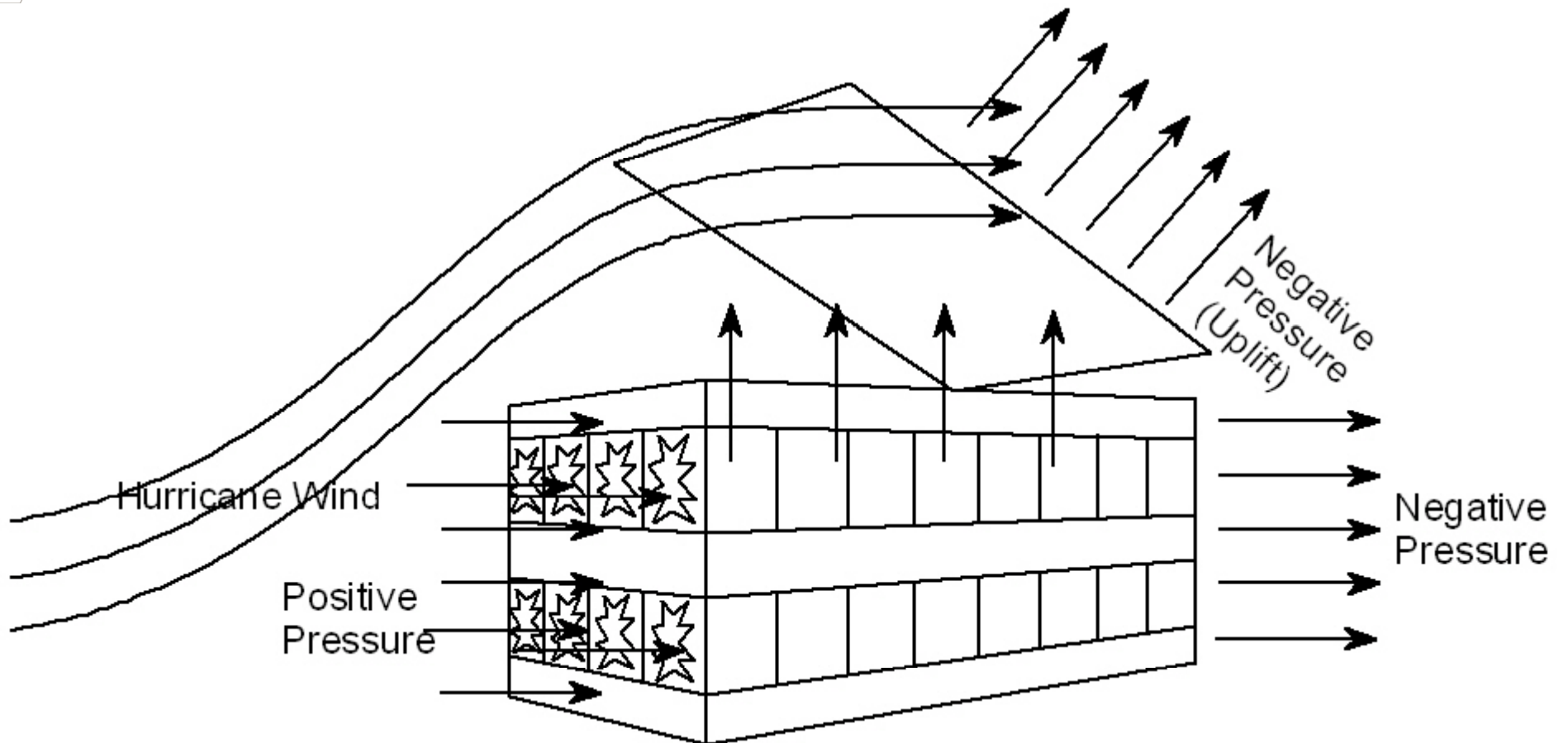


Windstorm dynamics



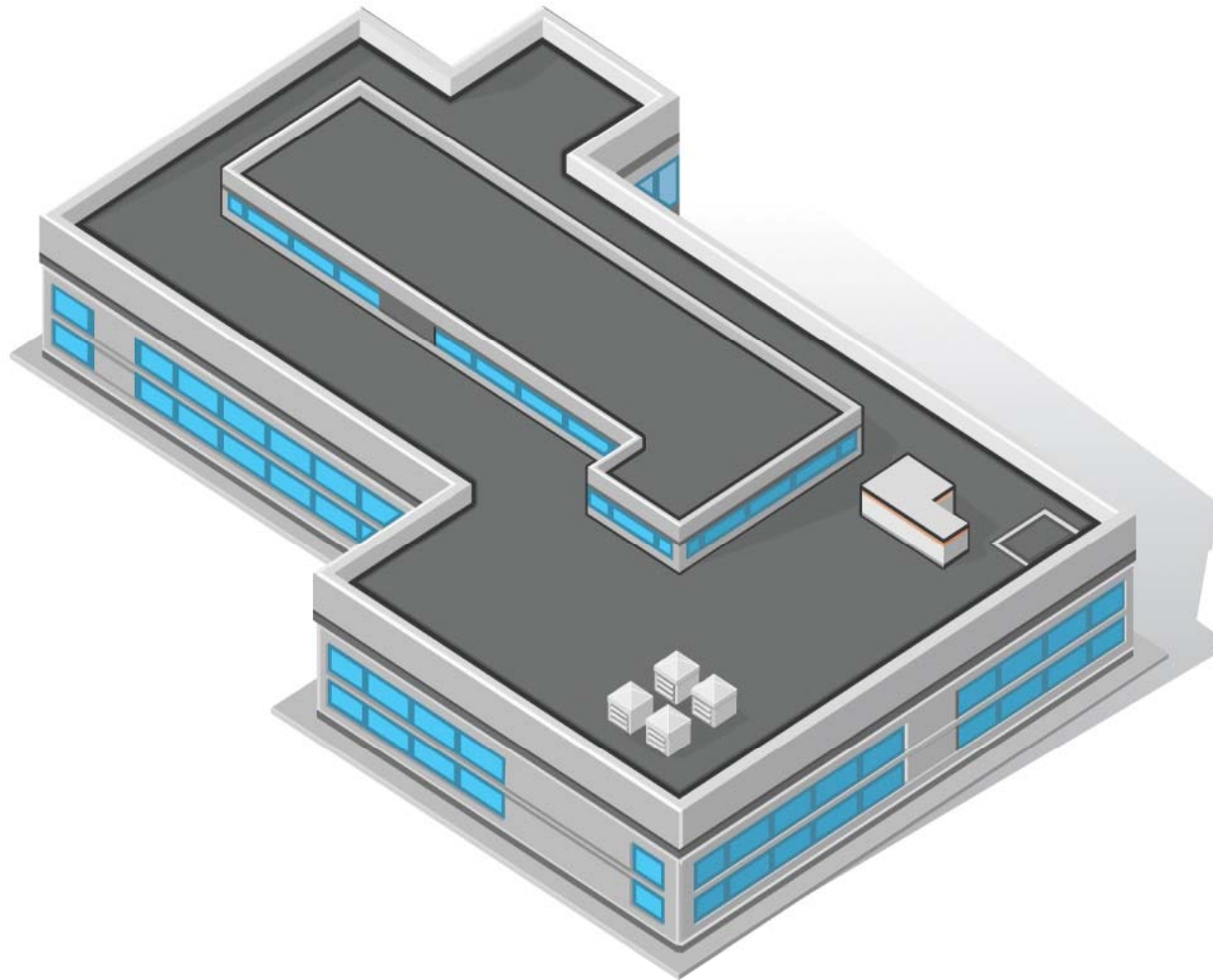


Windstorm dynamics





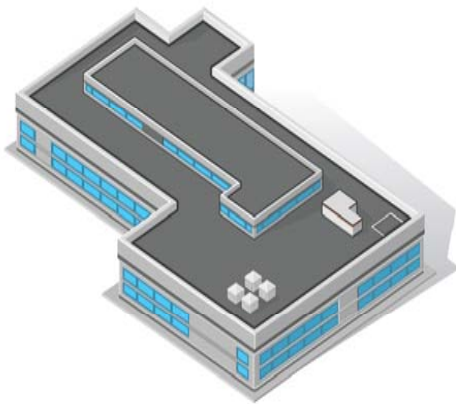
Windstorm dynamics - Question



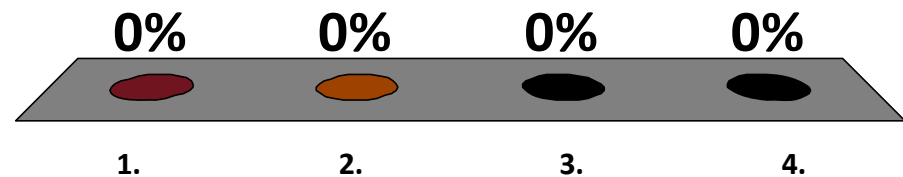


< Windstorm dynamics - Question

What is the most vulnerable area of the



1. *Middle*
2. *Perimeter*
3. *Corners*
4. *All the above*





< Knowing your exposure



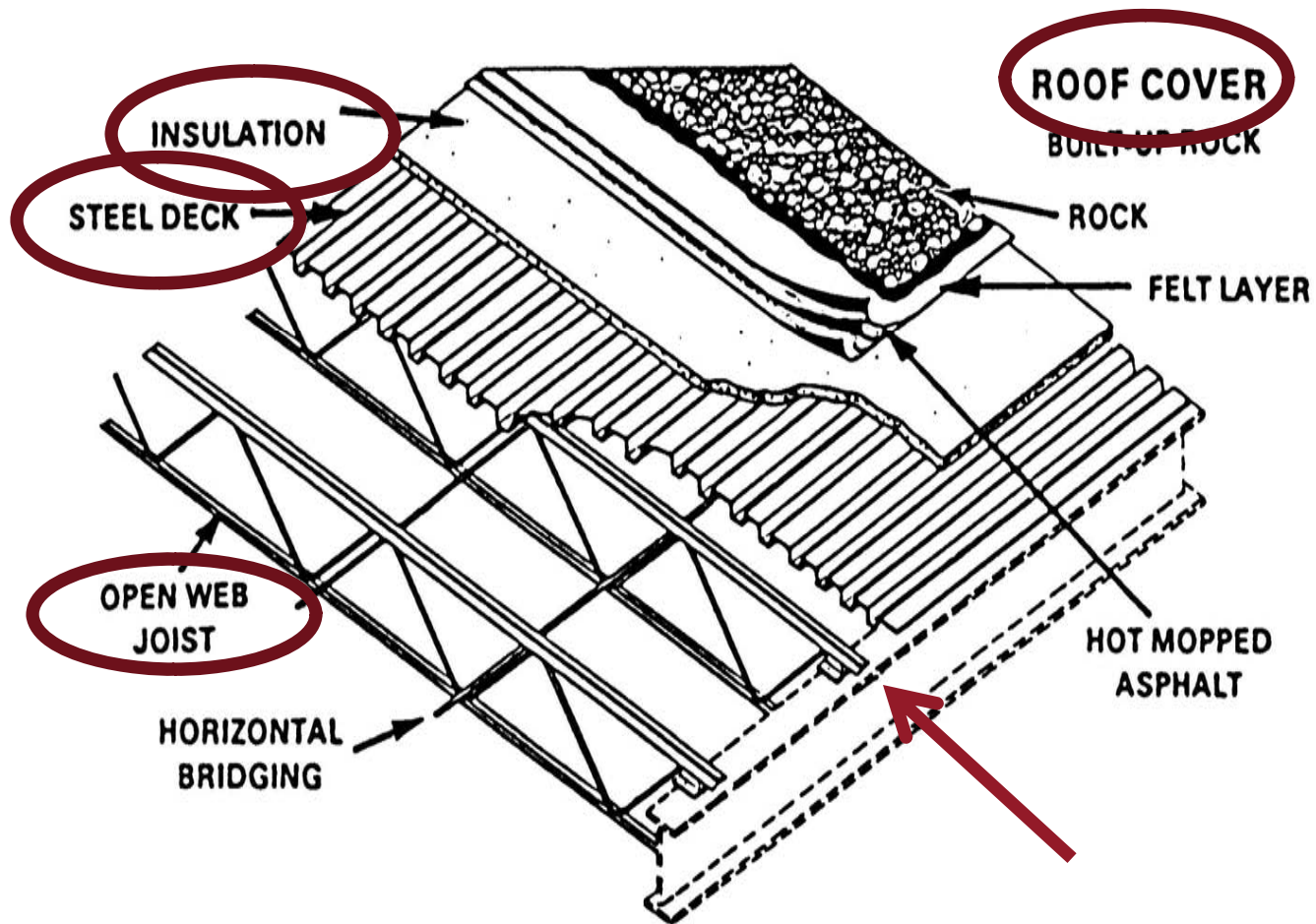


< Knowing your exposure



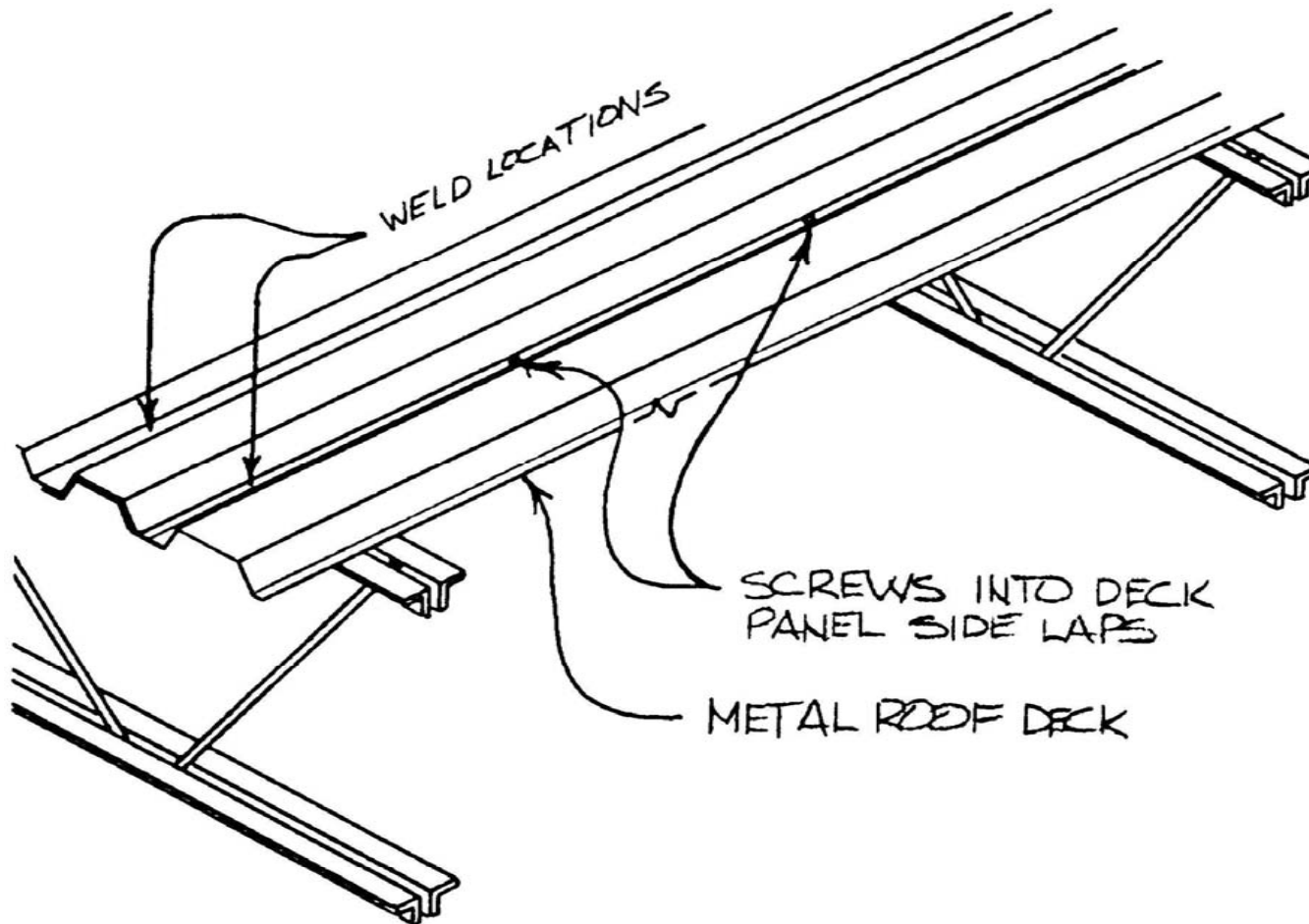


Practical solutions





Practical solutions





< Practical solutions



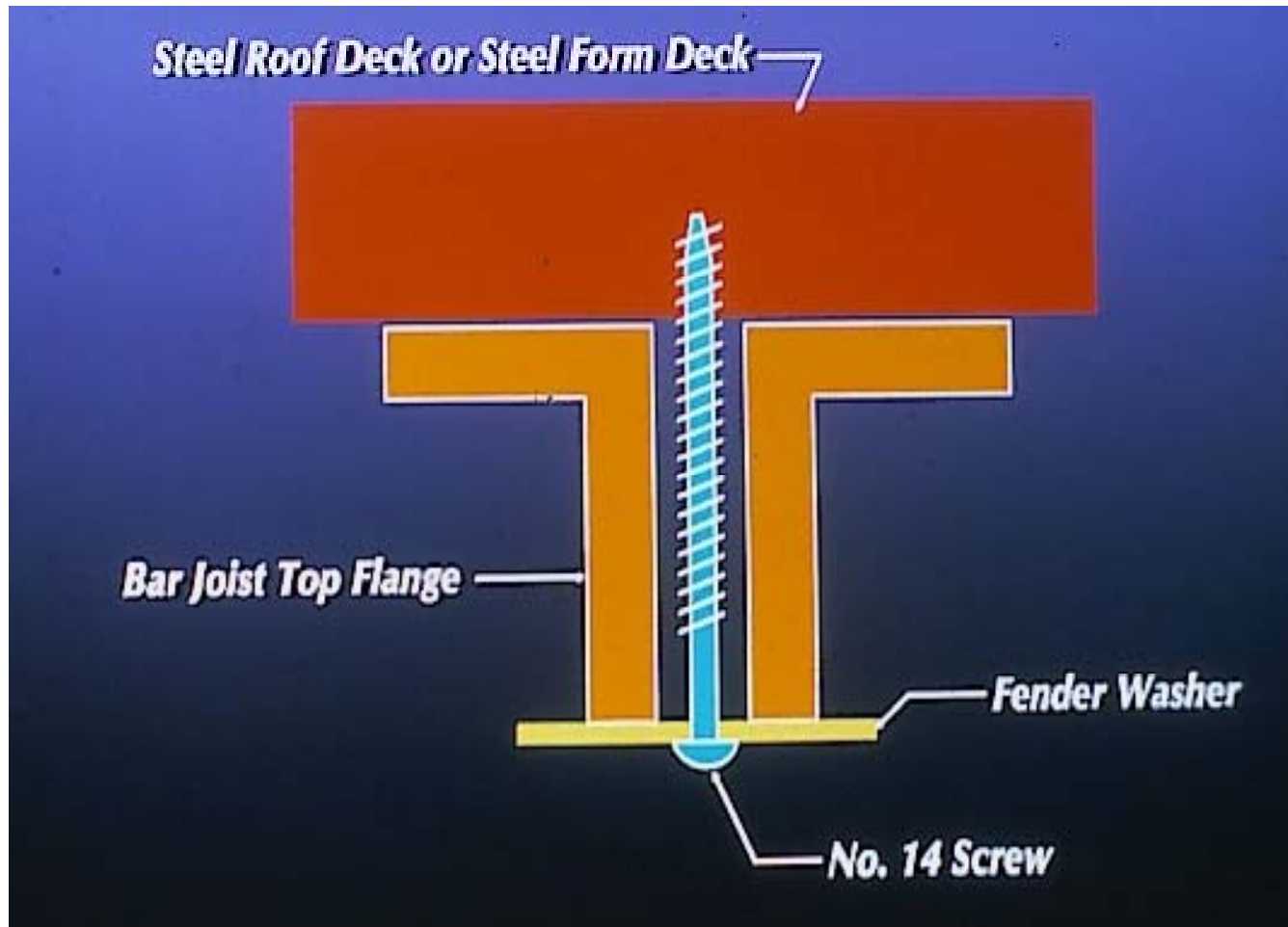


< Practical solutions





< Practical solutions





< Practical solutions



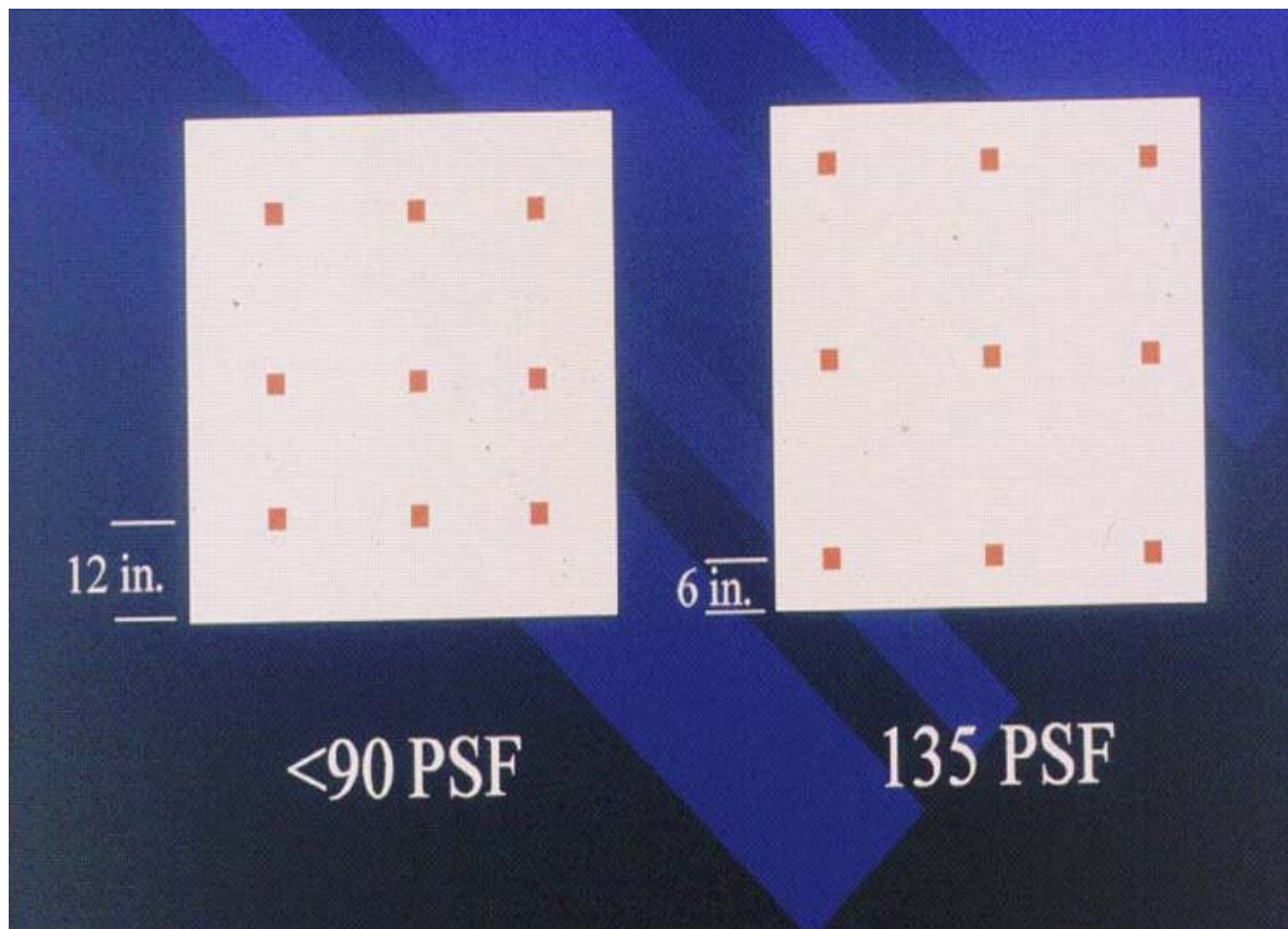


< Practical solutions





< Practical solutions





< Practical solutions - Question





< Practical solutions - Question

Is this installation OK?



1. Yes
2. No



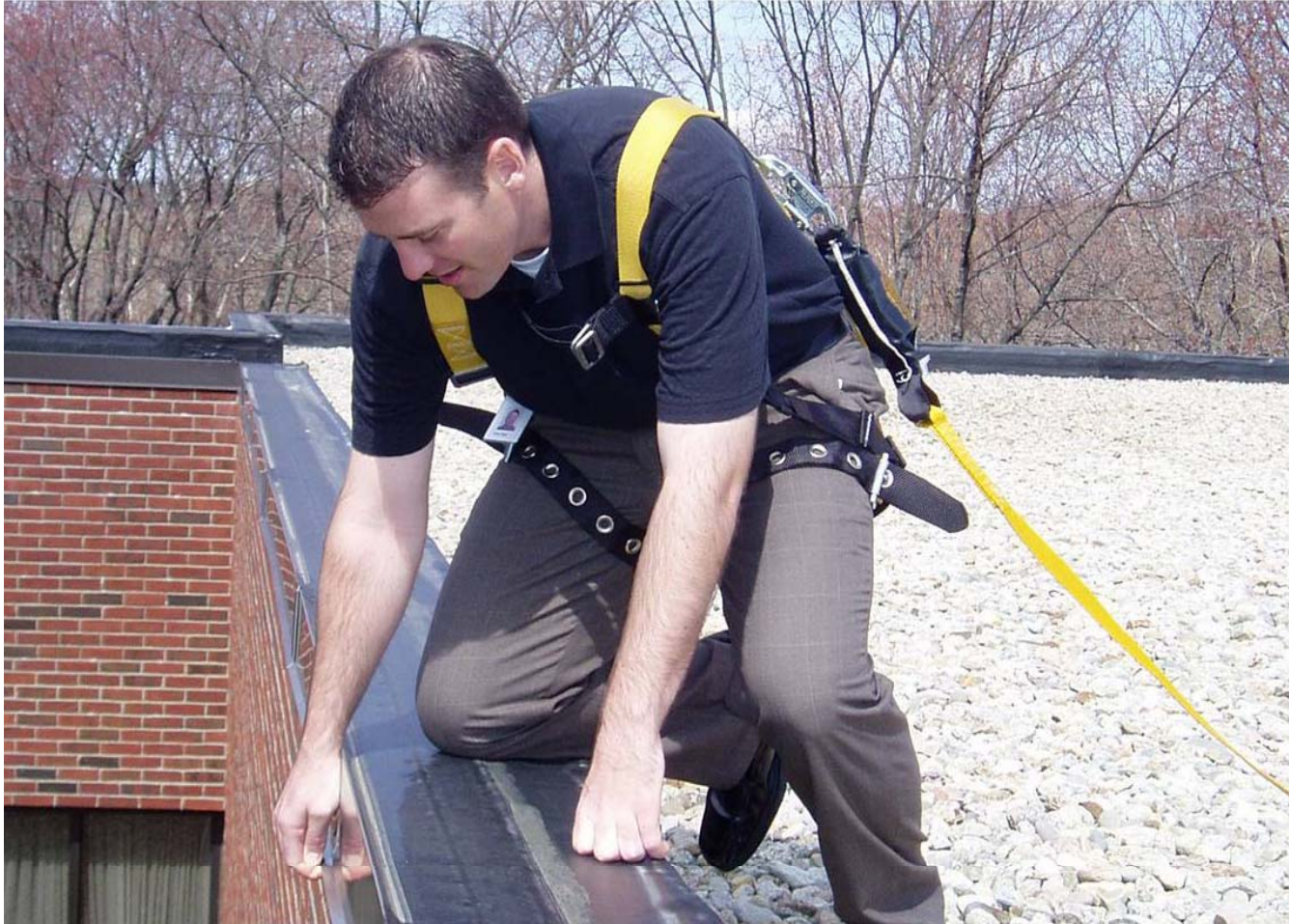


< Practical solutions





< Practical solutions



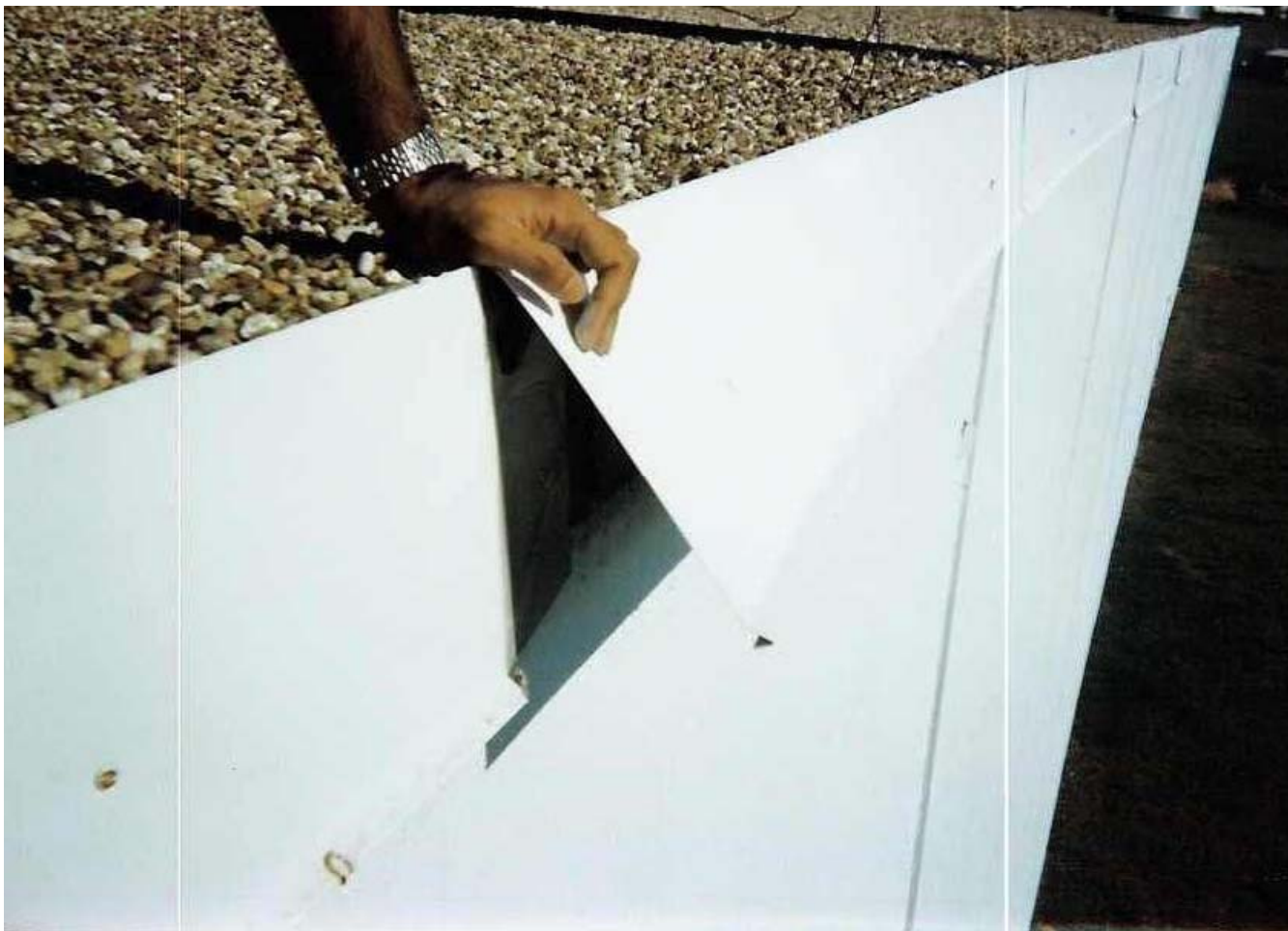


< Practical solutions





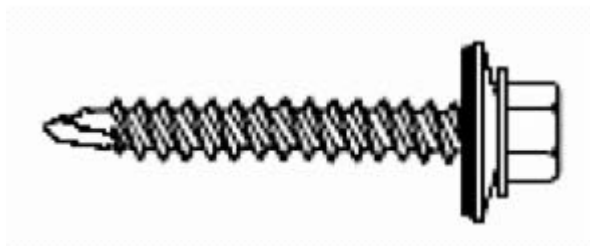
< Practical solutions



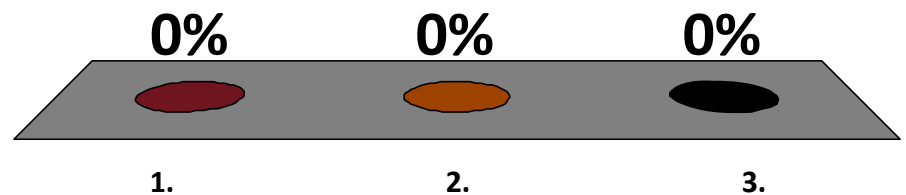


< Practical solutions - Question

Where should we install the screws?



1. *Top 1/3*
2. *Middle*
3. *Bottom 1/3*





< Practical solutions





< Practical solutions





< Practical solutions





< Practical solutions



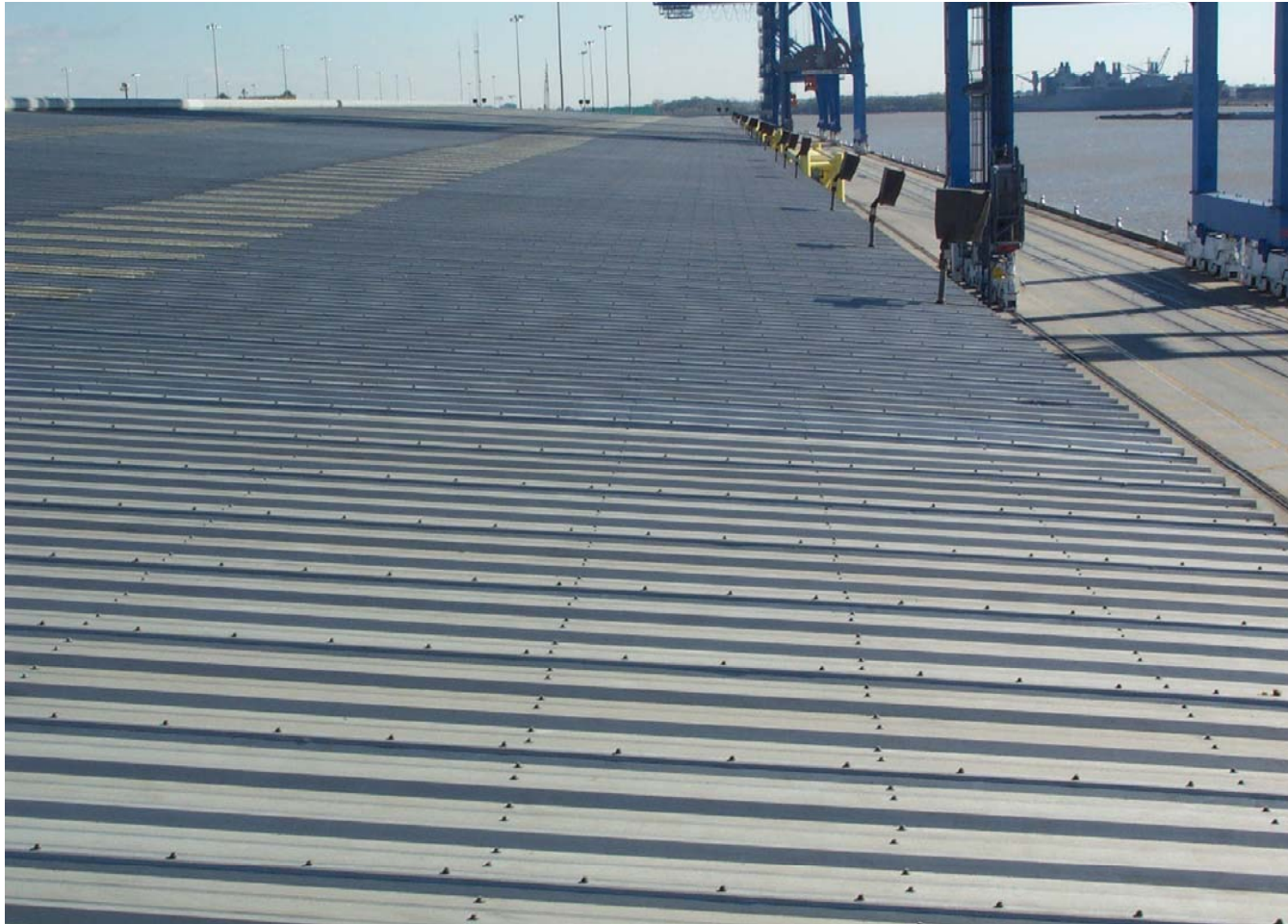


< Practical solutions





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< Practical solutions



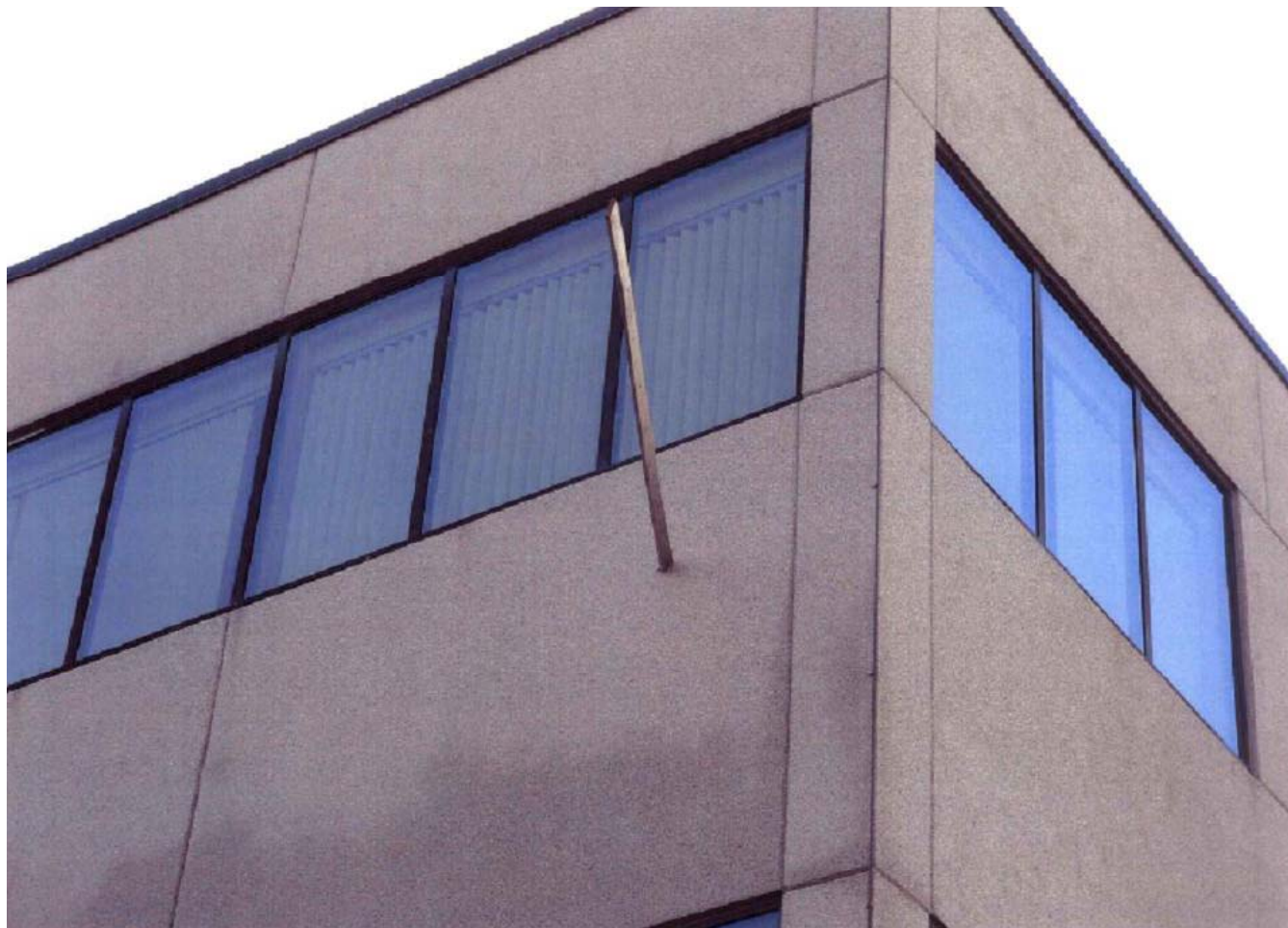


< Practical solutions





< Practical solutions



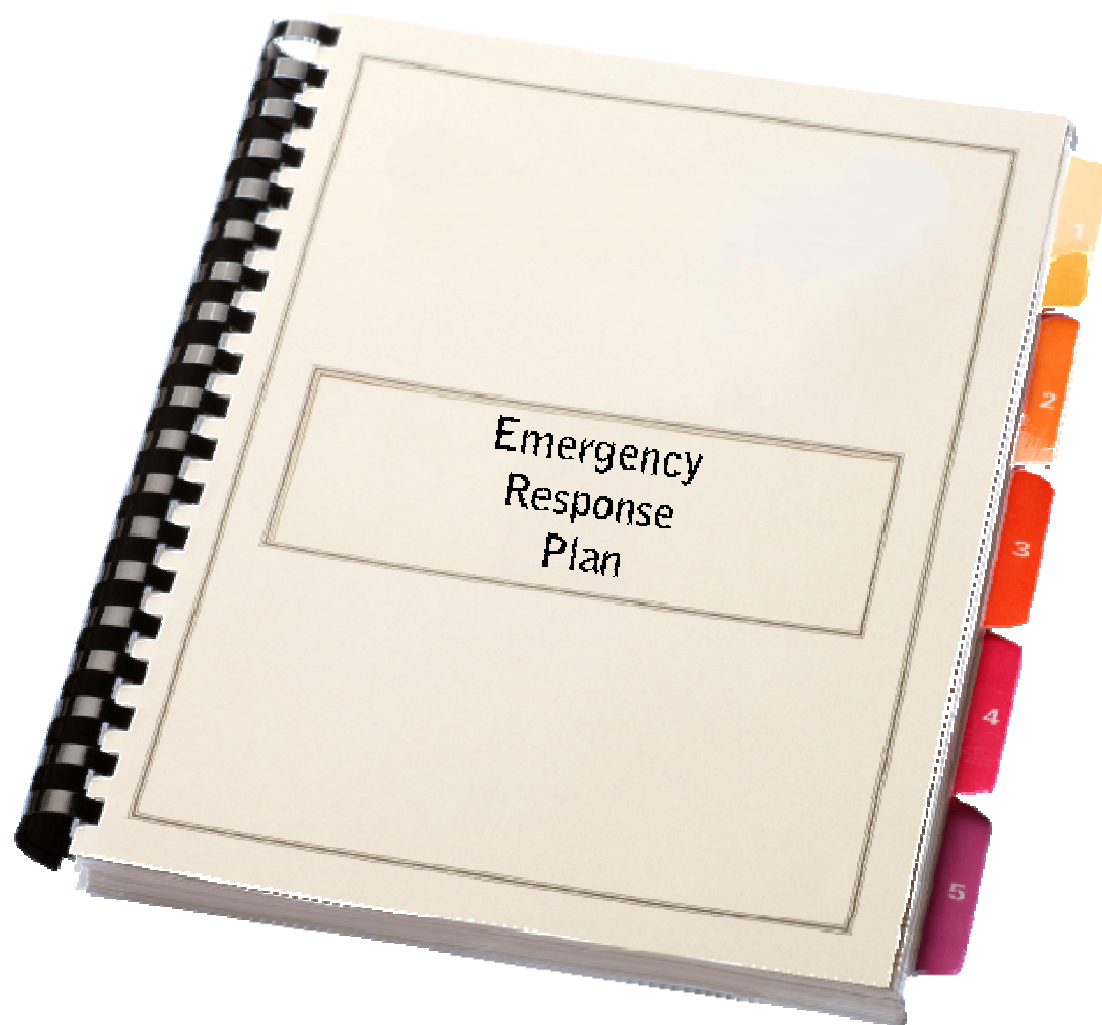


< Practical solutions



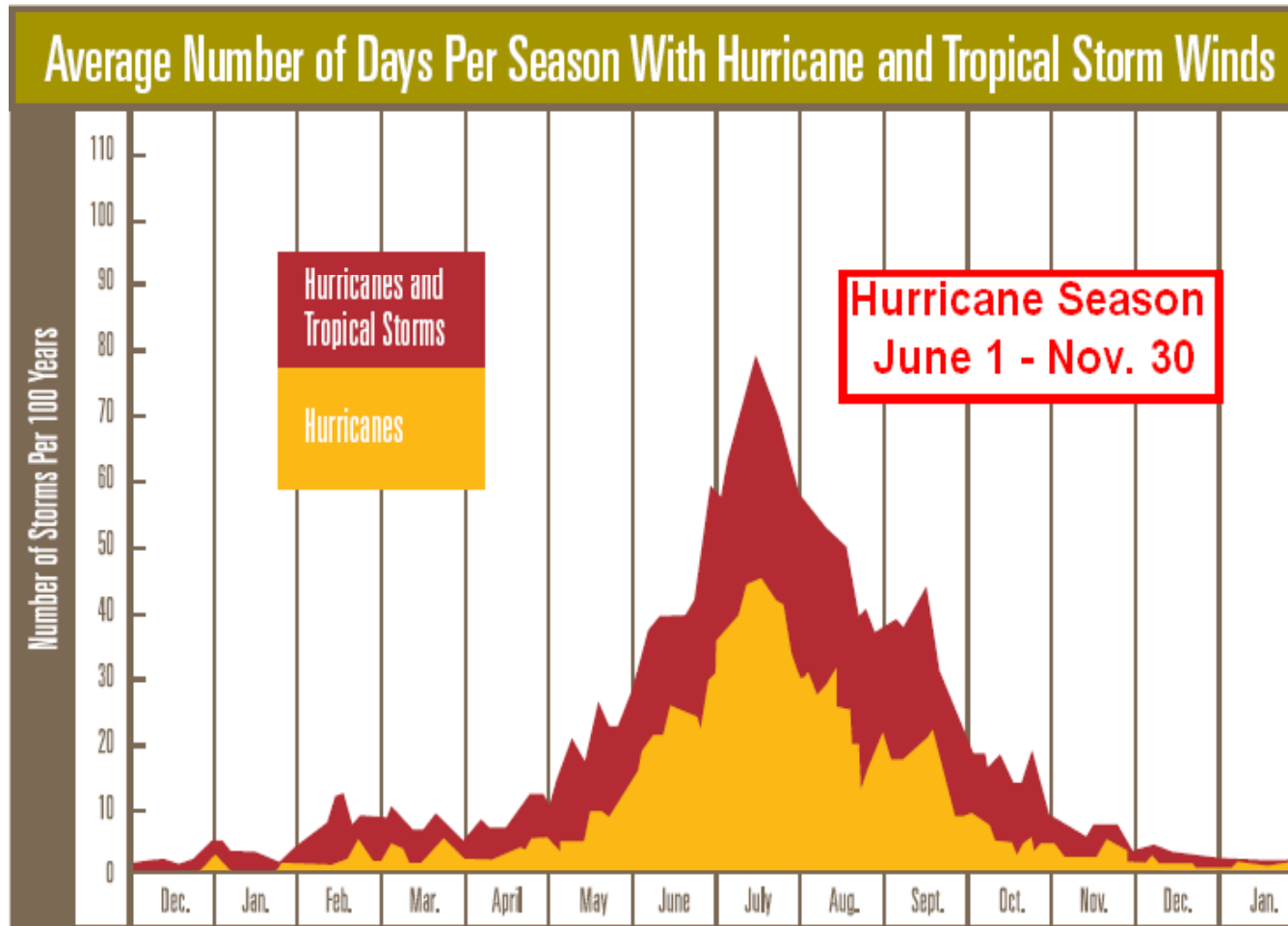


< Windstorm preparedness





< Windstorm preparedness





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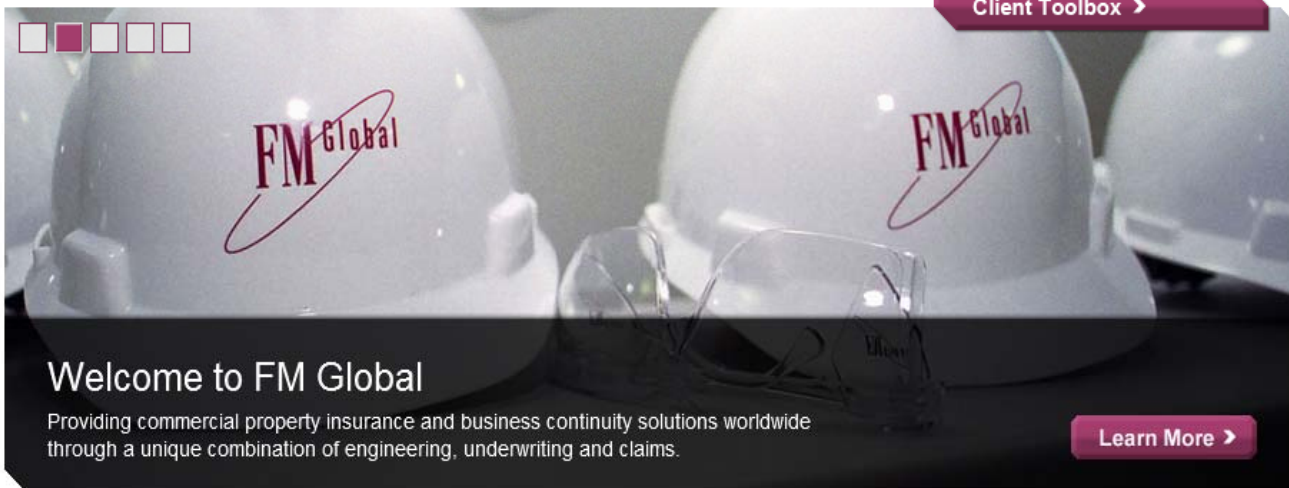
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< Questions?

