



The history of fire escapes

Tanya Reilly (@whereistanya)



*When we first dropped our
bags on apartment floors...*

*Welcome To New York
Taylor Swift*

Content Warning

Fire and deaths caused by fire.





tl;dr

- *focus on better buildings, not better fire escapes*
- *focus on better software, not better incident response*
- *software needs a fire code*

Chinatown





Greenwich Village

Claudia Heidelberg
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East Village

Dan DeLuca
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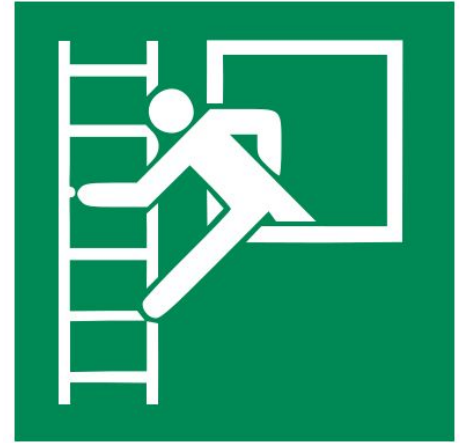


*fire escapes were haphazardly attached to the most elaborately designed facades, with no consideration given to the relationship between the two. **The facade was within the realm of architecture and the fire escape in the realm of the law***

Richard Plunz, *a History of Housing in New York City*

A brief history of NYC fires!

(With apologies to actual historians)



Financial District

1835



1835

What happened?

- contingency plans failed
- no failure domains
- exhausted incident responders

1835

Outcome: better incident response

- a bigger, better, non-volunteer fire department
- reliable water: Croton dam and aqueduct

1835

Outcome: better buildings

- they rebuilt in stone

Tenement Fires

1860



1860

What happened?

- bakery in the basement
- no isolation
- obsolete contingency plans

1860

Outcome: better buildings

- An Act to Provide Against Unsafe Buildings in the City of New York
- fire-proof stairs

The Tenement House Act

1867

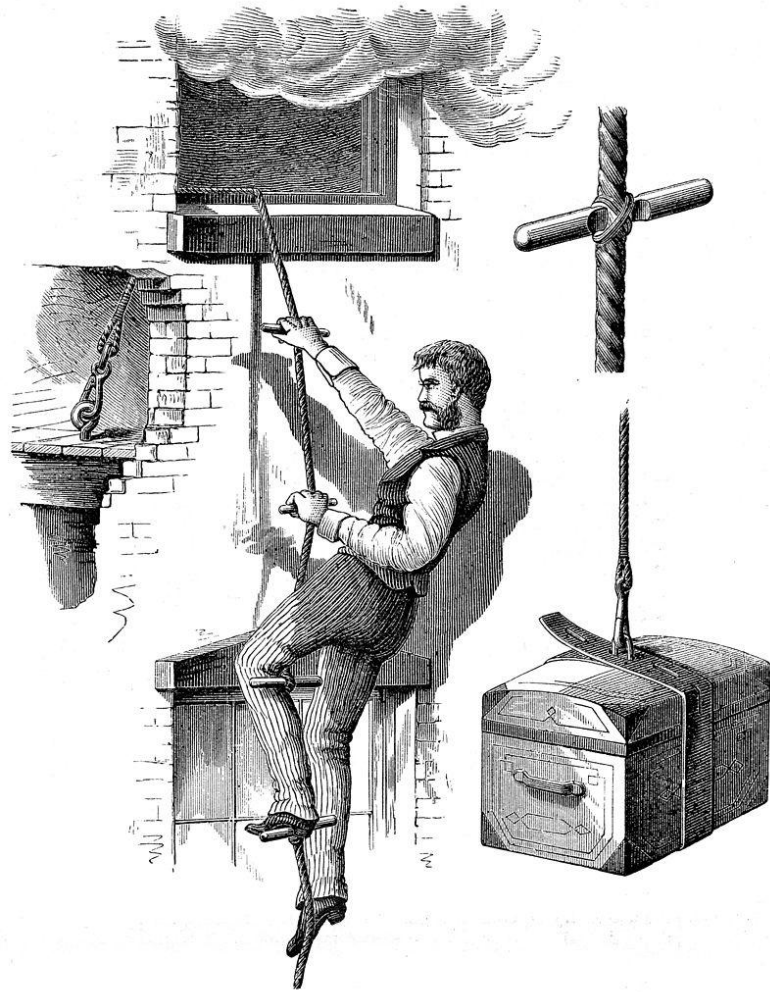
Tenements
must have fire
escapes!
What does that
mean?

~_(ツ)~/



Things that are fire escapes

William
Houghton,
1891



HOUGHTON'S FIRE ESCAPE.

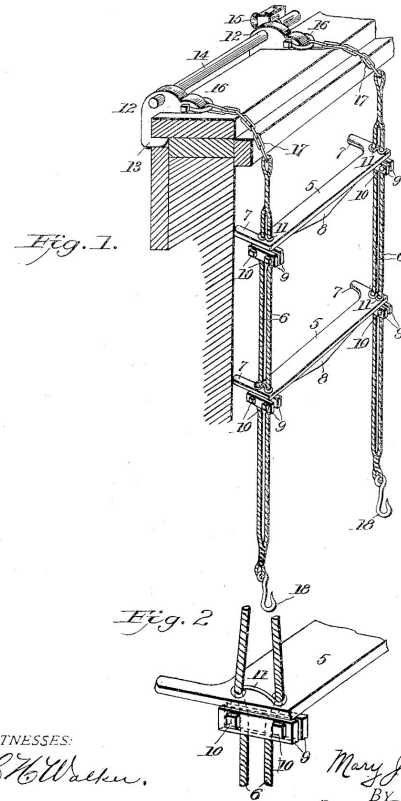
Things that are fire escapes

Mary
McArthur,
1904

No. 800,934.

PATENTED OCT. 3, 1905.

M. J. McARTHUR.
FIRE ESCAPE LADDER.
APPLICATION FILED APR. 26, 1904.



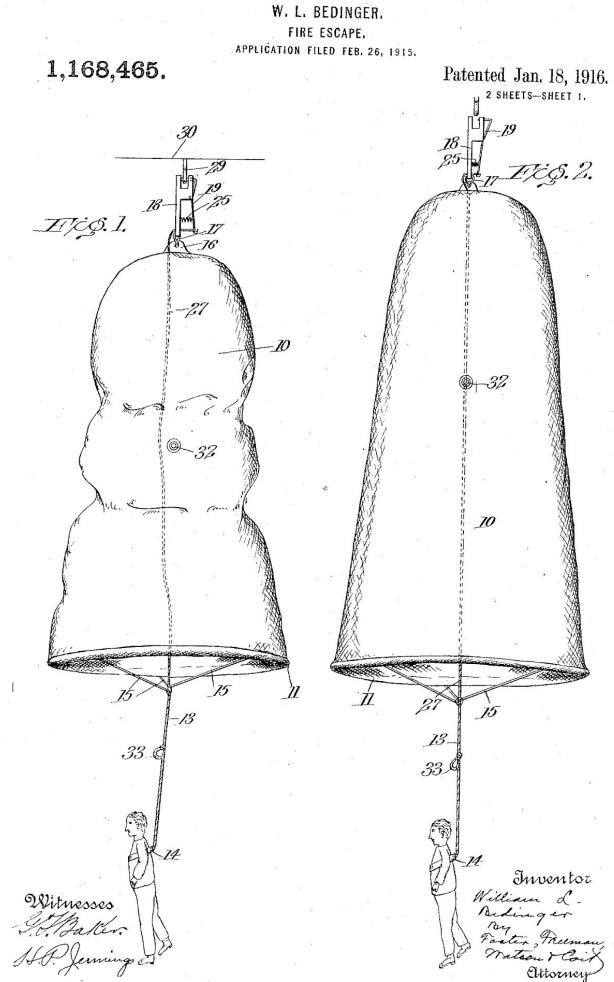
WITNESSES:

E. H. Walker.
M. A. Schmidt.

INVENTOR
Mary J. McArthur.
By
Milo B. Stevens and Co.
Attorneys.

Things that are fire escapes

William
Bedinger,
1915



Things that are fire escapes

Henry Vieregg
1902

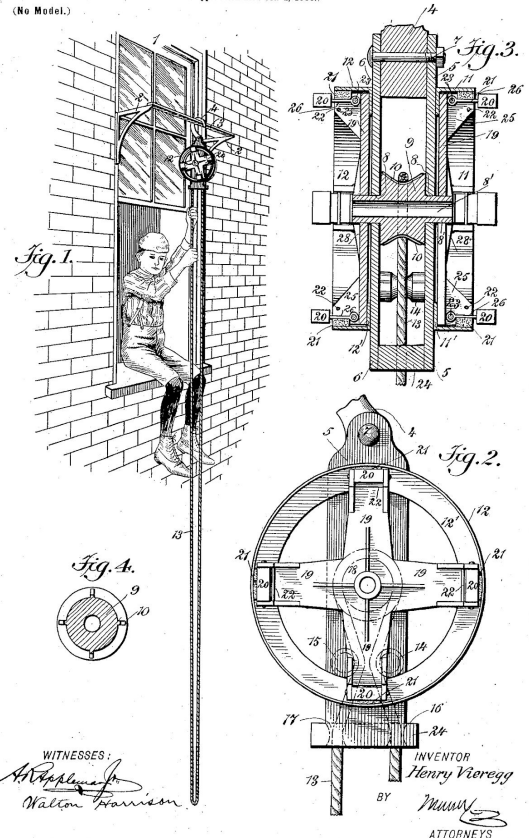
No. 708,846.

Patented Sept. 9, 1902.

H. VIEREGG.
FIRE ESCAPE.

(Application filed Oct. 4, 1901.)

(No Model.)



Things that are fire escapes

Anna
Gonnelly
1887

(No Model.)

A. CONNELLY.
FIRE ESCAPE.

No. 368,816.

Patented Aug. 23, 1887.

Fig. 1.

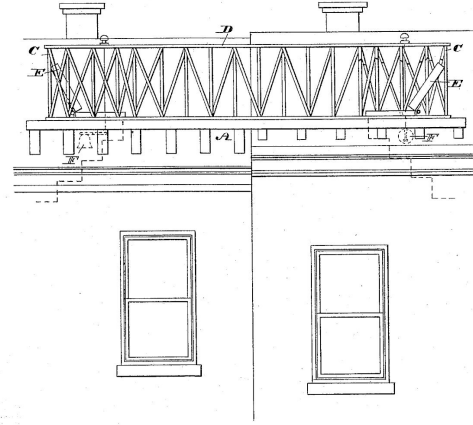


Fig. 2.



WITNESSES
F. Rolli
Jas. F. Kelly.

INVENTOR:
Anna Connelly
BY *Dickstein & Hartman*
ATTORNEYS.

Things that are fire escapes

Pasquale
Nigro
1909



Things that are fire escapes

BB
Openheimer
1879

B. B. OPPENHEIMER.
Fire-Escape.

No. 221,855.

Patented Nov. 18, 1879.



Things that are fire escapes

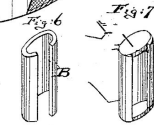
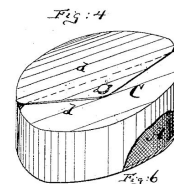
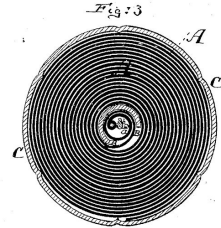
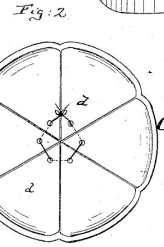
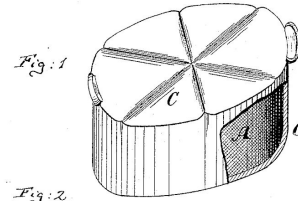
Nicholas
Borgfeldt
1882

(No Model.)

N. H. BORGFELDT.
FIRE ESCAPE.

No. 267,399.

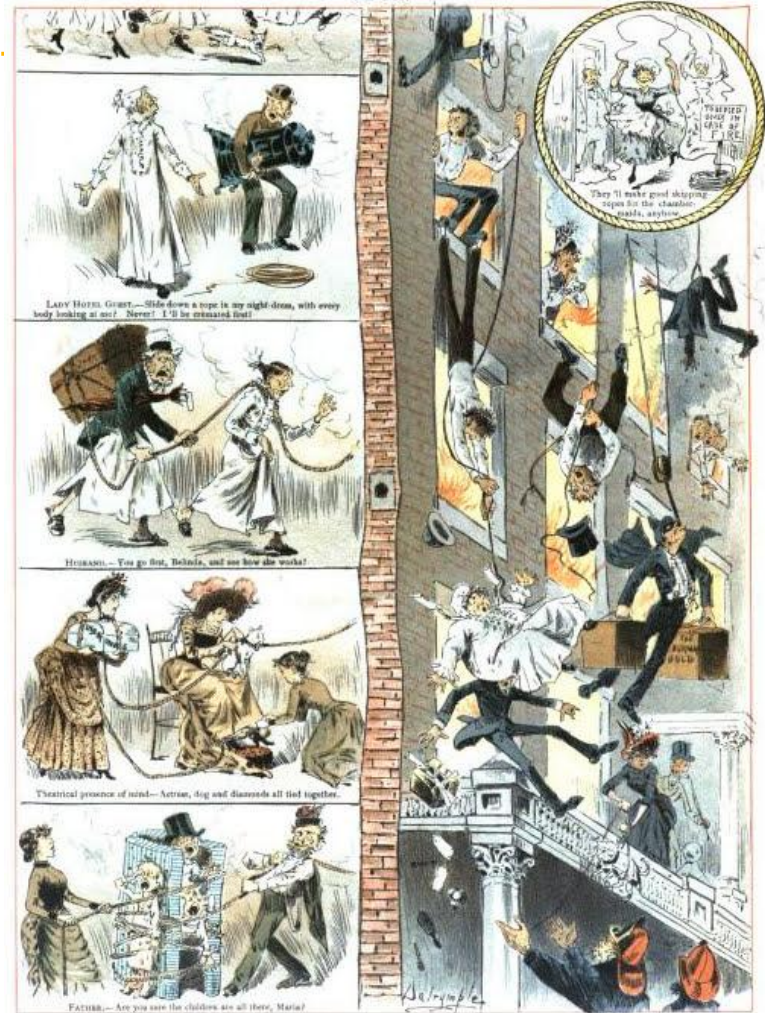
Patented Nov. 14, 1882.



Witnesses
John C. Lambidge,
John M. Spear

Inventor:
Nicholas H. Borgfeldt
by his attorneys
Brisson & Betts

The New Rope Fire-Escape Law for Hotels



THE NEW ROPE FIRE-ESCAPE LAW FOR HOTELS.
Puck's Notion of How It Will Work.

**The escape plan
only works for
one of these
people -->**



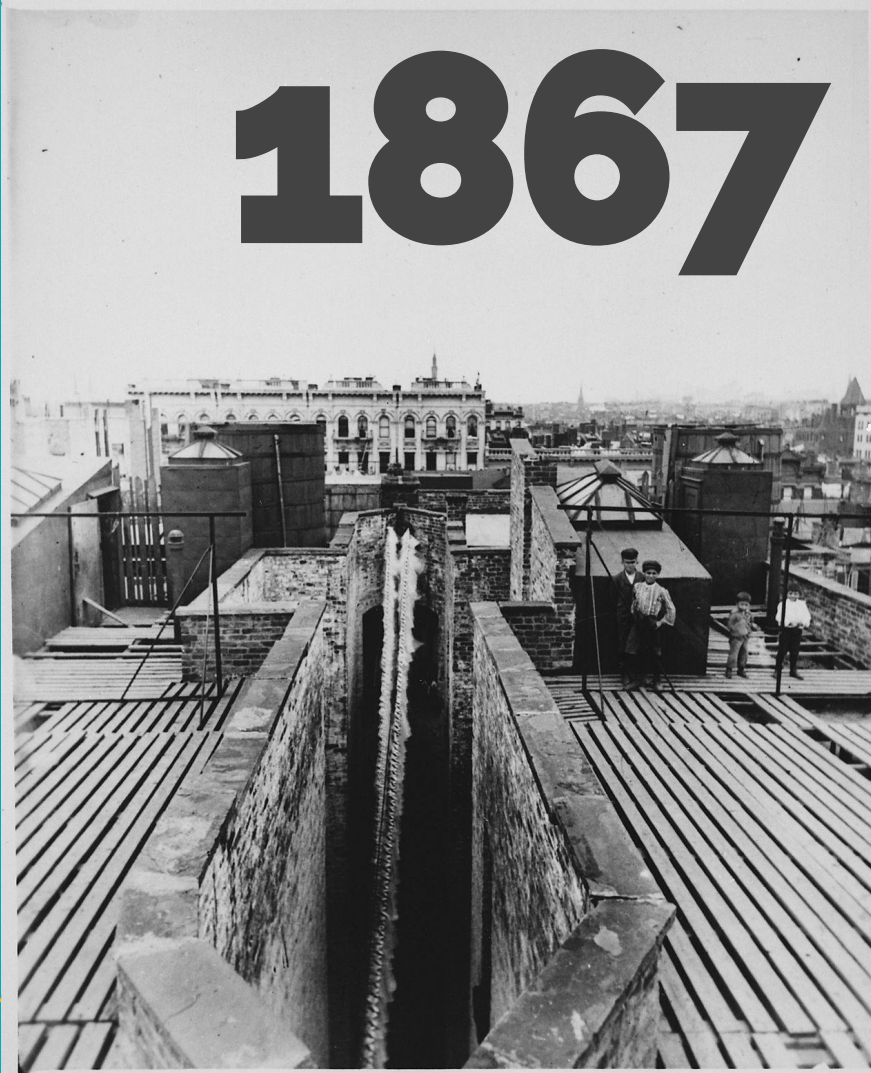
The Tenement House Act

Tenements also must have windows!

What does that mean?

~_(\ツ)_/~

1867



More Tenement House Acts!

1871



Brooklyn Theater Fire

1876



1876

What happened?

- obsolete contingency plans
- clutter
- clumsy incident response
- delayed response
- locked doors

1876

Outcome: better buildings

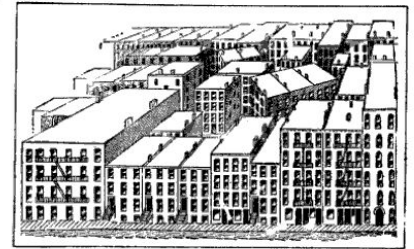
- prosecutions
- new laws
- automated response: sprinklers!

1890-1901

**Even more
Tenement
House Acts!**



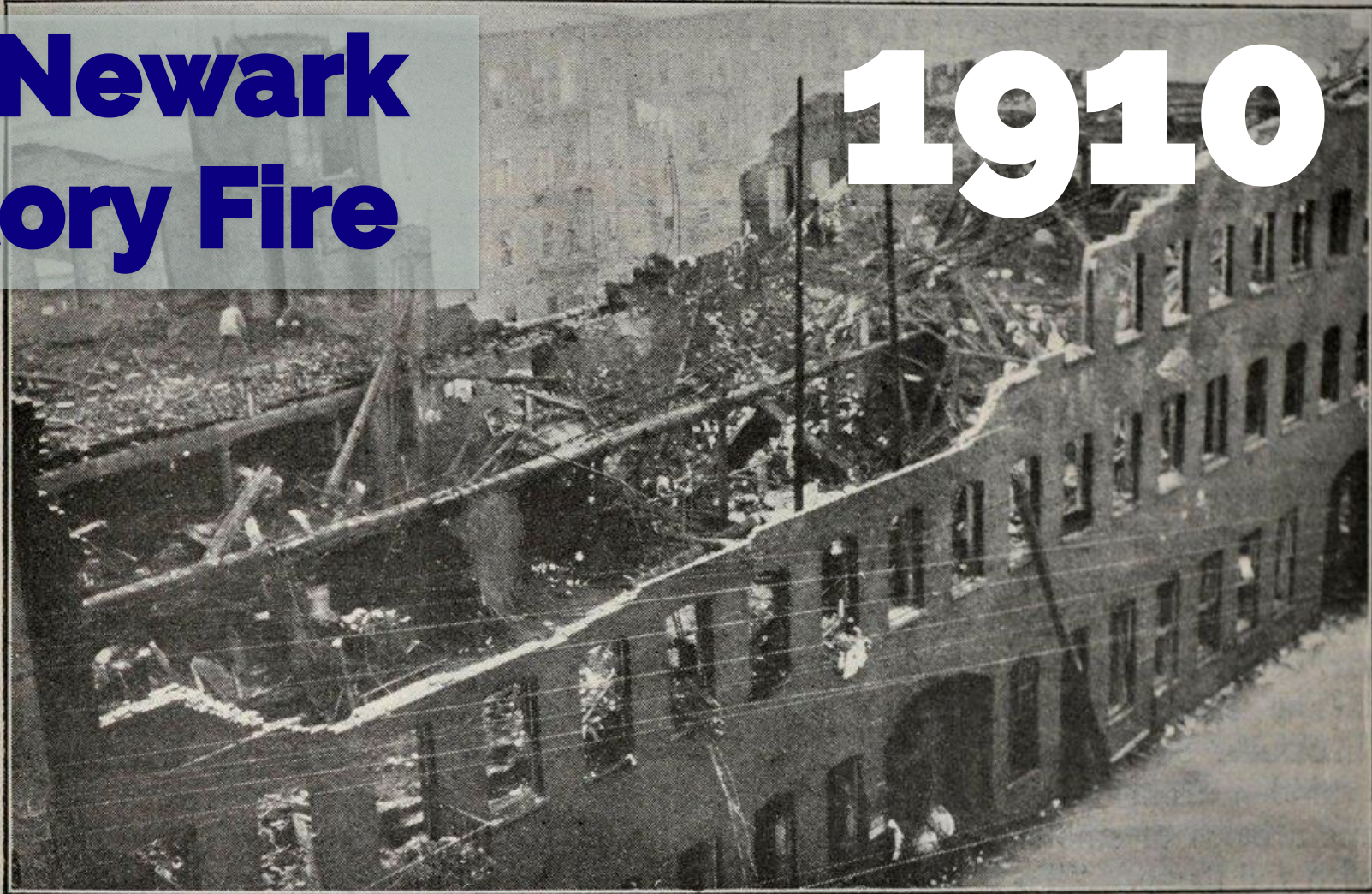
How
the Other Half
Lives



By
Jacob A. Riis

The Newark Factory Fire

1910



1910

What happened?

- no fire alarms
- locked door
- not enough fire escapes
- delayed response, for insurance reasons
- panic.

**Operator
error?**

NOPE.

"The commissioner of the New Jersey bureau regulating fire safety in factories felt that the building was sufficiently constructed and that the victims **merely succumbed to panic.**"

1910

Outcome: ...?

- “They died from misadventure and accident.”
- New York City Fire Chief Croker: "This city may have a fire as deadly as the one in Newark at any time."
- He wasn't wrong.

The Triangle Shirtwaist Factory

1911



1911

What happened?

- no failure domains
- only one fire escape.
- locked doors
- obsolete contingency plans
- and they already knew

1911

Outcome: better incident response

- New fire-fighting equipment

1911

Outcome: better buildings

- 60 new laws in three years
- sprinklers
- professional organisation

- "the common outside form of iron ladder-like stairway anchored to the side of the building is **a pitiful delusion**"

“

1923

**FIREWALL IN ALL
BUILDINGS SEEN AS
ONLY SAFEGUARD**

**"Horizontal" Escapes Created in 206 City Structures
After Triangle Fire With No Casualties Since**

-- New York Times, February 25, 1923

**More
fires**

**More very
specific
laws**

1968+

**1968 BUILDING
CODE OF THE CITY
OF NEW YORK**

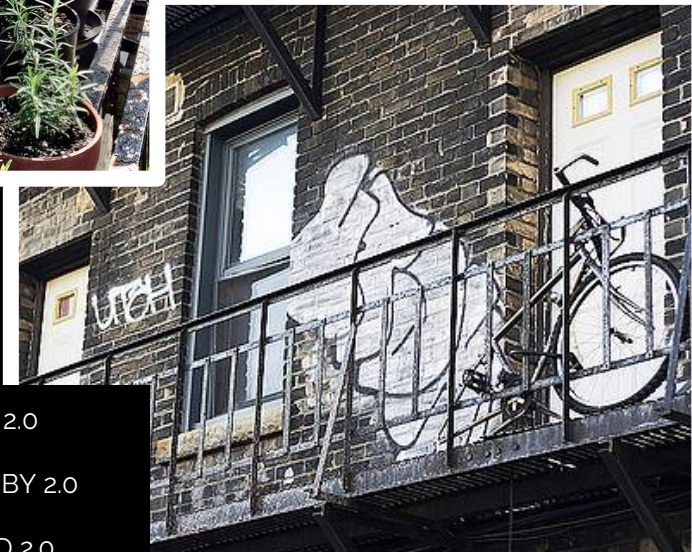
**Plus Reference Standards and Selected Rules and
Regulations of the Department of Buildings**

**Local Law No. 76 Effective December 6, 1968
Includes Amendments to July 1, 2008**

**Fire deaths didn't
decrease because we
built better fire escapes.**

**It was because we built
better buildings.**





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Dan DeLuca CC BY 2.0
Eden, Janine and Jim CC BY 2.0
don toye CC-BY-ND 2.0
Kristine Paulus CC-BY-ND 2.0



*vertical ladders also placed relatively greater stress on their mounts to the building, **leading to fire escape collapses during times of intense use – such as during actual fires.***

John W. Cramer, *The Story of a Tenement House*

**If we're using
a (terrifying)
contingency plan
a lot had to go
wrong**



**we could have
prevented the spark!**

1



**we could have
automatically
fixed it!**

2



**we could have
contained it!**

3



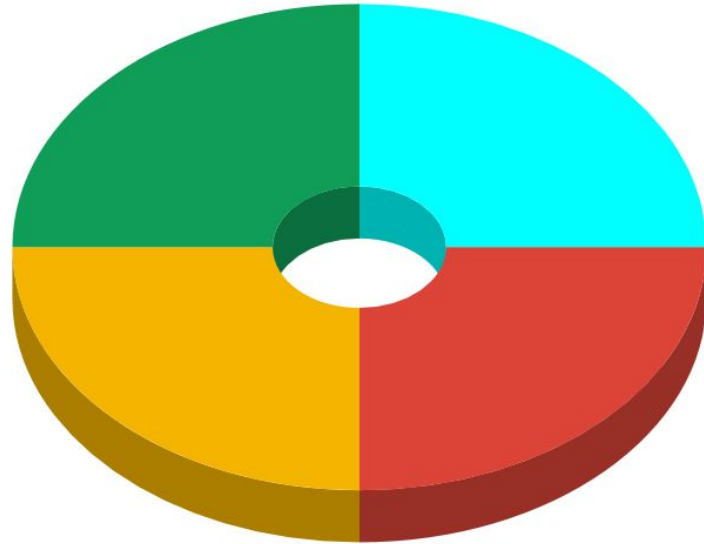
**ok I guess
we're
reacting to
a fire :-)**



at least!

● Prevention ● Detection ● Isolation ● Response

**75% of site
reliability
is not
firefighting**



**Design for failure:
prevention**

prevent the spark!

1



solid structures

- choose your stack carefully
- design review
- think about weak points



wiring inspections

- component design review
- code review
- testing
- fault injection
- be paranoid



hiding the matches

- restrict access
- clean interfaces
- sudo not root



operating with care

- plan changes
- canary everything
- feature flags



fire safety campaigns

- best practices
- conferences!



**Design for failure:
detection**

**automatically
fix it!**

2



smoke alarms

- early warning.
But don't burn
out your
responders!



fire extinguishers

- rollback buttons



sprinklers

- automatic recovery
- automatic response



**Design for failure:
isolation**

contain it!

3



fire barriers

- isolation
- sharding
- failure domains



fire drills

- controlled outages
- disaster tests



avoiding encumbrances

- clean ops
- fatigue awareness



Design for failure:
response

react with
urgency

4



not locking fire exits :-)

- no encumbrances
- don't comment out the safety system



communication

- status dashboards
- known issues
- announcement email



documented exits

- anticipate what you'll do in a disaster
- playbooks
- gotchas



controlled burns

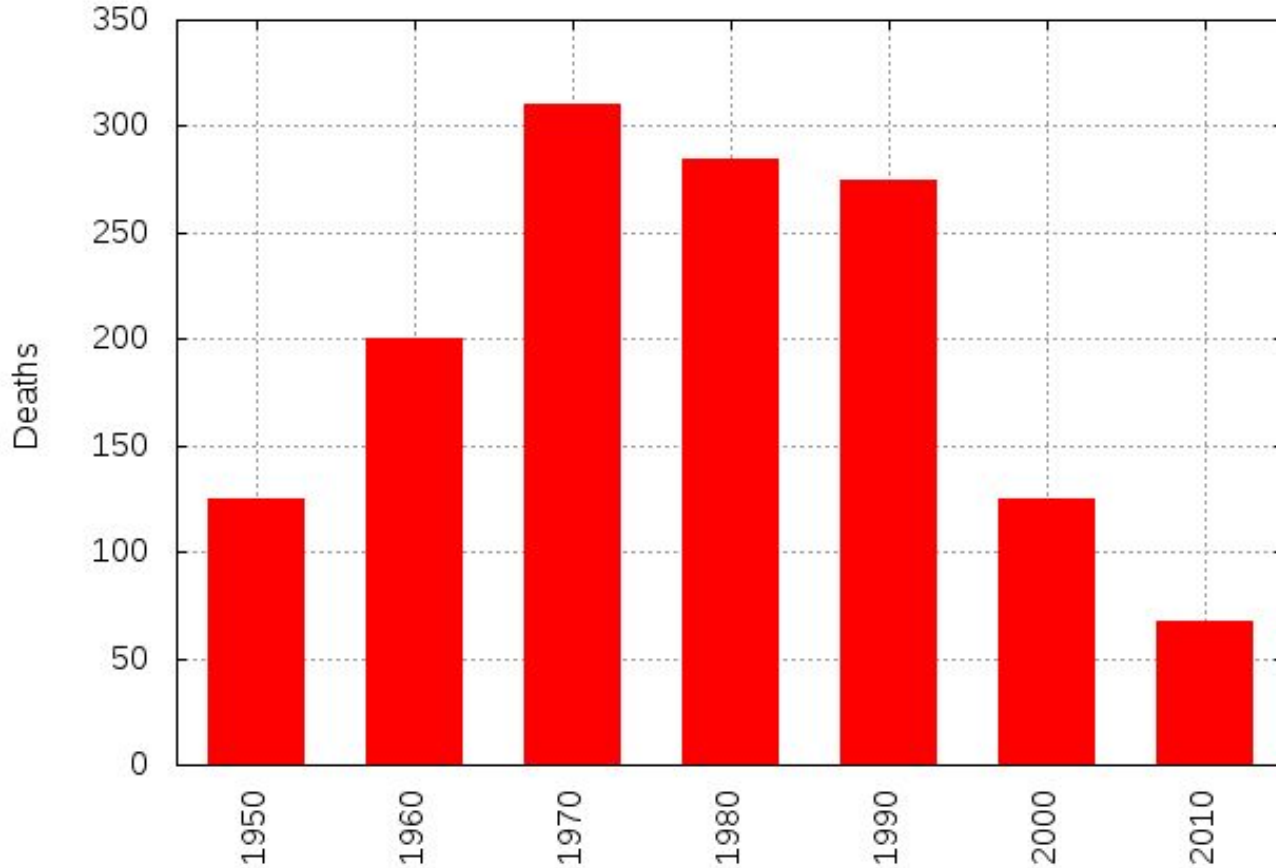
- practice responding
- wheel of misfortune
- find unexpected dependencies



**Reliability can't
be added at the
end. That's why
we do DevOps.**



NYC Fire Deaths by Year



1970
310
people

2016
48
people

data from
http://www.baruch.cuny.edu/nycdata/public_safety/civilianfire.htm
graph made with gnuplot

444 --->
pages!!!

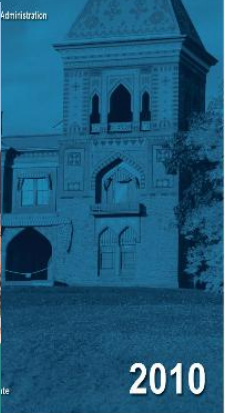
NEW YORK CITY
FIRE CODE



2014

Bill de Blasio, Mayor

444 --->
pages!!!



NEW YORK CITY *FIRE CODE*



2014

Bill de Blasio, Mayor



“Millions of computers throughout the world are executing millions of instructions per second for millions of seconds without a single error [...] In spite of this, **nobody trusts a computer; and this lack of faith is amply justified.**”

Software: A Vital Key to UK Competitiveness
(C) Crown Copyright 1986
via Risks Digest
(<https://catless.ncl.ac.uk/Risks>)
h/t joe Thompson @caffeinepresent

The UK Advisory Council for Applied Research and Development recommended...

- Before any organization can operate a life-critical computer system it **must first obtain a License To Operate (LTO)**
- **Each life-critical system must be operated by a Certified Software Engineer** who is named as being personally responsible for the system.

Some Post-WWII History

Industries that saw massive WWII-era development

- Commercial Air Travel - Radar, ATC, Jets, Aluminum
- Nuclear Power - Fermi/U. Chicago, Manhattan Project
- EMS - Air Transport, Radio, Combat medics
- Space Flight - Project Paperclip
- Electronics Industry/Silicon Valley - Terman
- Computing/Sysadmin - Bletchley Park/WRNS



**slide stolen from @jkuroda's
amazing LISA keynote. Used
with permission**

**The stakes are
lower?**



The stakes are lower?



- (1985-1987) Therac-25
- (1992) London Ambulance dispatch failure
- (2013) "Character substitution errors may occur"
- (2017) "autocorrects medications to names of different medications [...] without telling the user"



*It took an Iroquois Theater fire to improve the safety of theaters. It took a Titanic disaster to improve the safety of vessels. **It took a Newark fire and a Triangle fire to bring New York State's fire legislation to its present inefficiency.***

Inis Weed, New Outlook
volume 104, 1913

**Maybe software
could improve
without a disaster?**

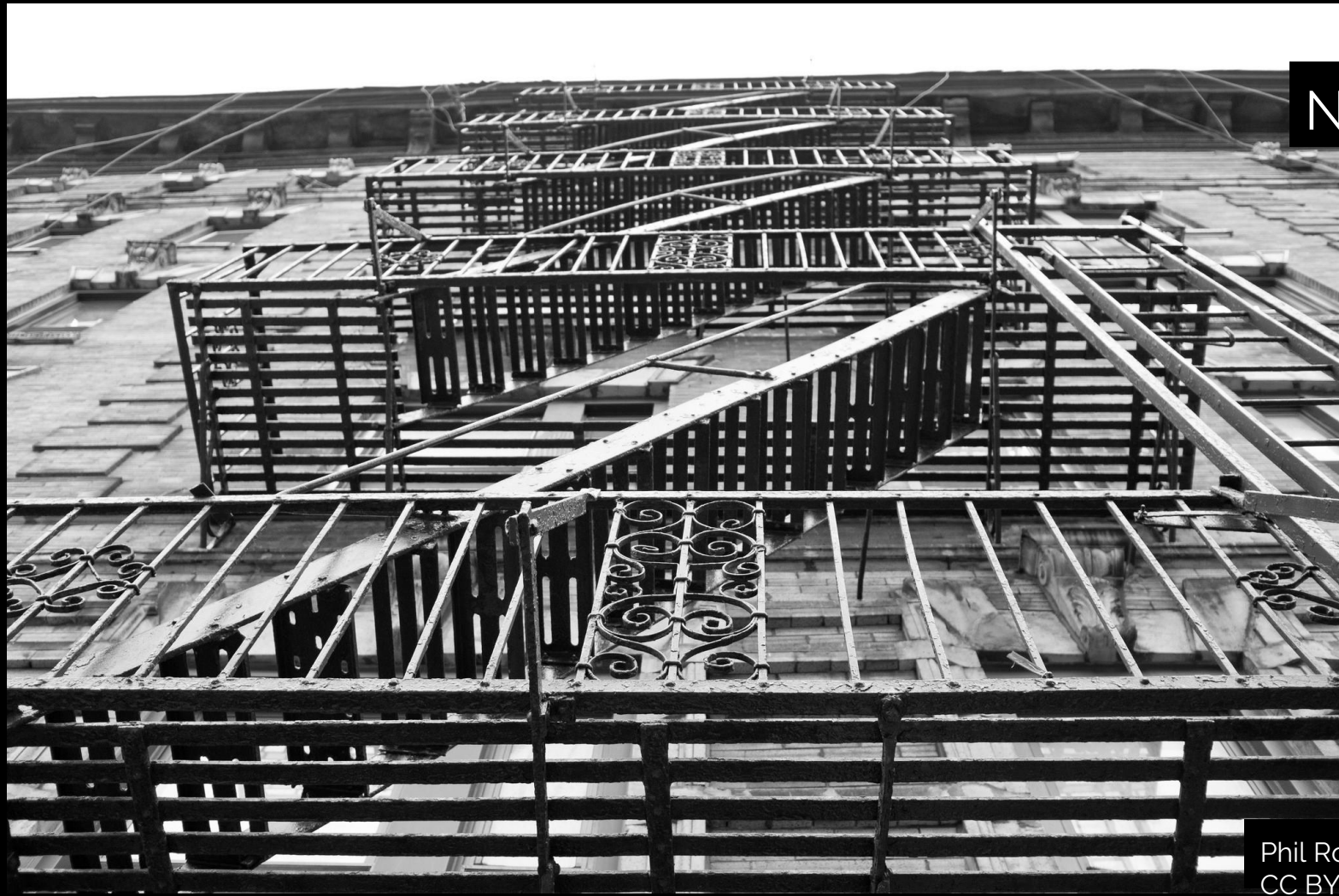
**Let's choose not to
build tenements**



- <http://noidea.dog/fires>
- [Escapes in Urban America: History and Preservation, Elizabeth Mary Andre](#)
- [No exit: the rise and demise of the outside fire escape: Sara E Wermiel](#)
- [How Fire Disaster Shaped the Evolution of the New York City Building Code, Charles Shelhamer](#)
- [The Creative and forgotten fire escape designs of the 1800s, Lauren Young](#)
- [New Outlook vol 104 \(May-August 1913\)](#)
- [RISKS Digest](#)
- [1910 Newark Factory Fire, Mary Alden Hopkins](#)
- [New York City \(NYC\) Disasters, Baruch College](#)
- Presentation template by [SlidesCarnival](#)

Questions, objections?
Find me at @**whereistanya**
or **fires@noidea.dog**





Nolita

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East Harlem