

DESIGNING FIRE MATRICES THAT ACTUALLY WORK

Understanding intent, gaps and the path forward



Presented by

- › Sheran Khan
- › Senior Fire Safety Consultant

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AGENDA



Introduction to
fire matrices



Current practice
and shortfalls



Regulatory
context



Developing a
fire matrix



Future
outlook



Questions

WHAT IS A FIRE MATRIX

Cause-and-effect diagram – defines how a building’s active fire safety system responds during a fire

		Effect												
		Stair pressurization	Door release	Roof vents	Sound systems for emergency purposes	Plant shutdown	Fuel isolation	Elevator override	Alarm monitoring	Smoke exhaust fans	Smoke curtains	Smoke spill mode	HVAC shutdown	Damper closure
Cause	Sprinkler systems	•	•	•	•	•			•	•		•	•	
	Fire detection and alarm systems	•	•	•	•	•	•	•	•	•	•	•	•	•
	Smoke/heat alarm systems	•	•					•	•	•	•	•	•	•
	Gaseous systems		•		•	•	•		•				•	•
	Aerosol systems		•		•	•	•		•				•	•
	Water mist systems	•	•	•	•	•		•						
	Hydrants								•				•	
	Hose reels								•				•	

Source: AS 1851–2012

THE AUSTRALIAN BUILDING CODE IS PERFORMANCE BASED

Building Code of Australia

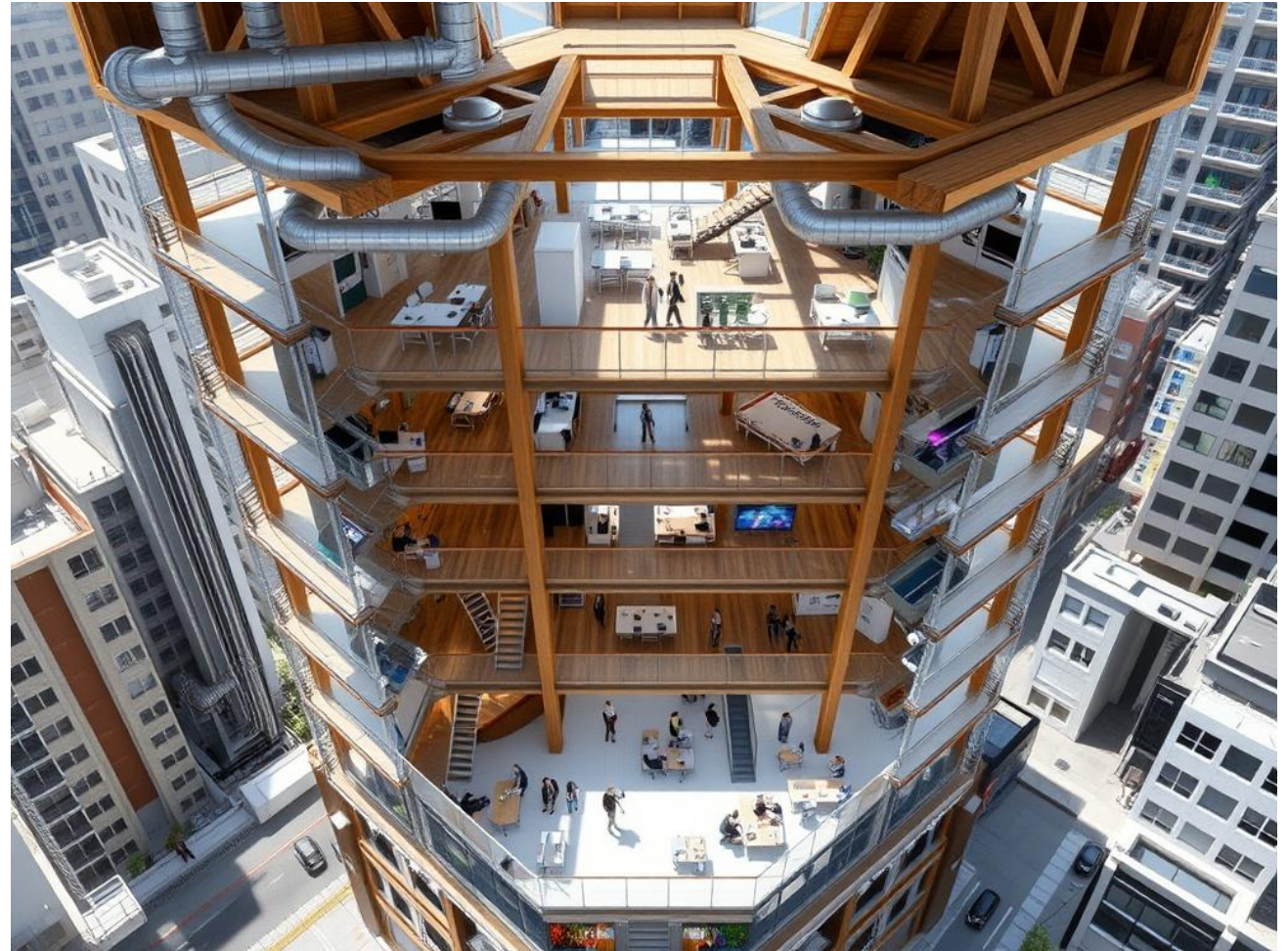
Class 2 to Class 9 Buildings

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Amdt 7 to illustrate its version.



ABCB

Australian
Building
Codes
Board



DEEMED-TO-SATISFY



PERFORMANCE SOLUTION



PERFORMANCE BASED DESIGNS



DTS alternative

Pragmatic alternative to conforming with the prescriptive 'deemed-to-satisfy' requirements of the code



Bespoke

Results in bespoke designs tailored to the project objectives



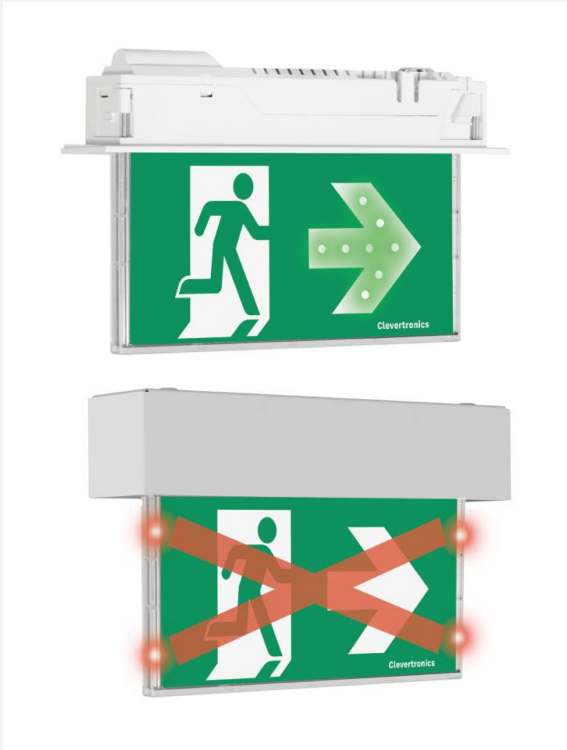
Nuanced

May introduce nuances in fire mode operation of active systems

PERFORMANCE BASED DESIGNS

Specialised systems that are part of fire engineering performance solutions and not typically in the prescriptive (DTS) requirements, for example:

DYNAMIC EXIT SIGNS



Source: clevertronics.com.au

SMOKE CURTAINS



Source: greenefire.com.au

WATER MIST SPRINKLERS



Source: insights.globalspec.com

THE ROLE OF A FIRE MATRIX

PAST



- › Design intent
- › Fire safety strategy

PRESENT



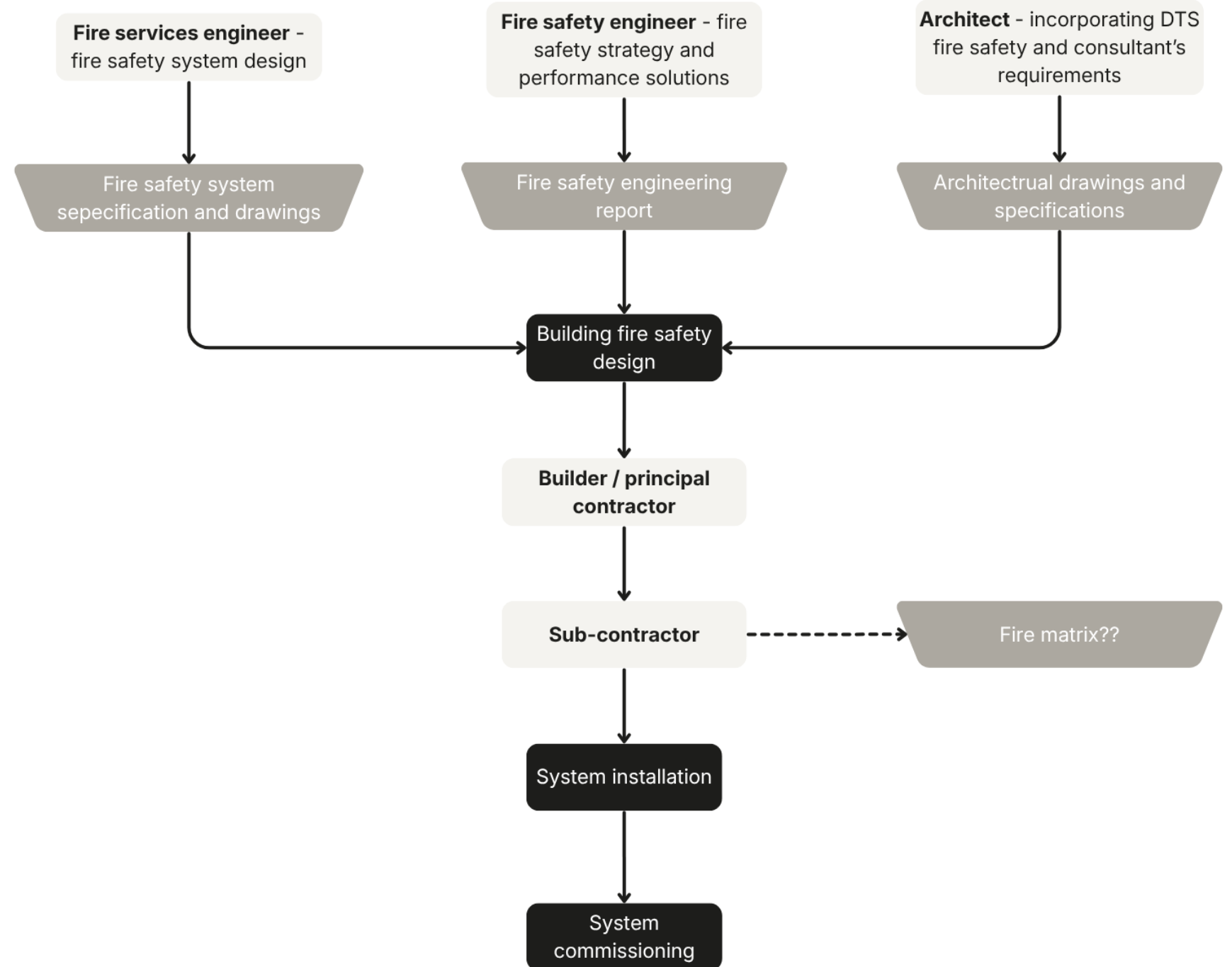
- › Ensuring continuum of design intent during occupancy
- › Baseline for ongoing testing and maintenance

FUTURE



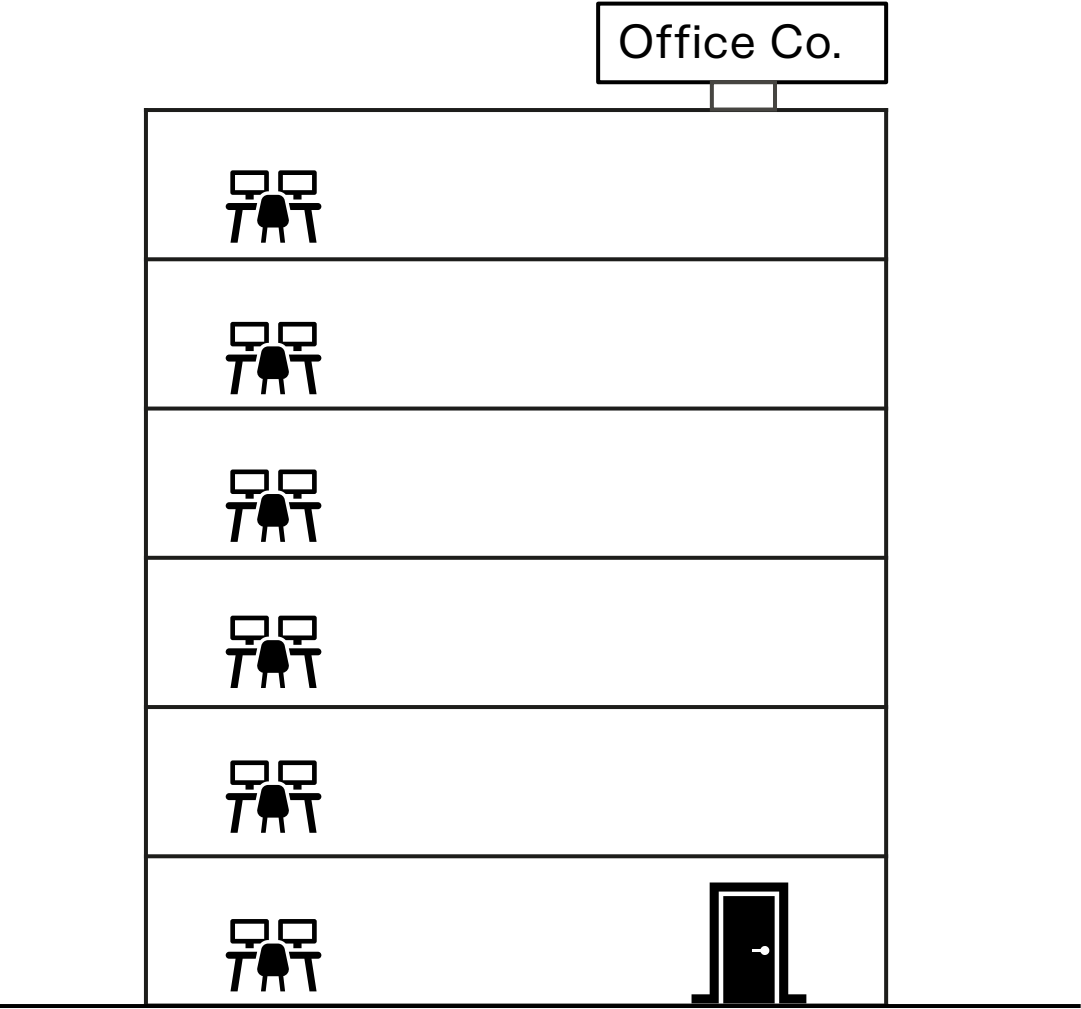
- › Future changes to the original building design
 - › Change of ownership
-

CURRENT PRACTICE



RISK WITH CURRENT APPROACH

Why critical fire safety intent gets lost in real buildings

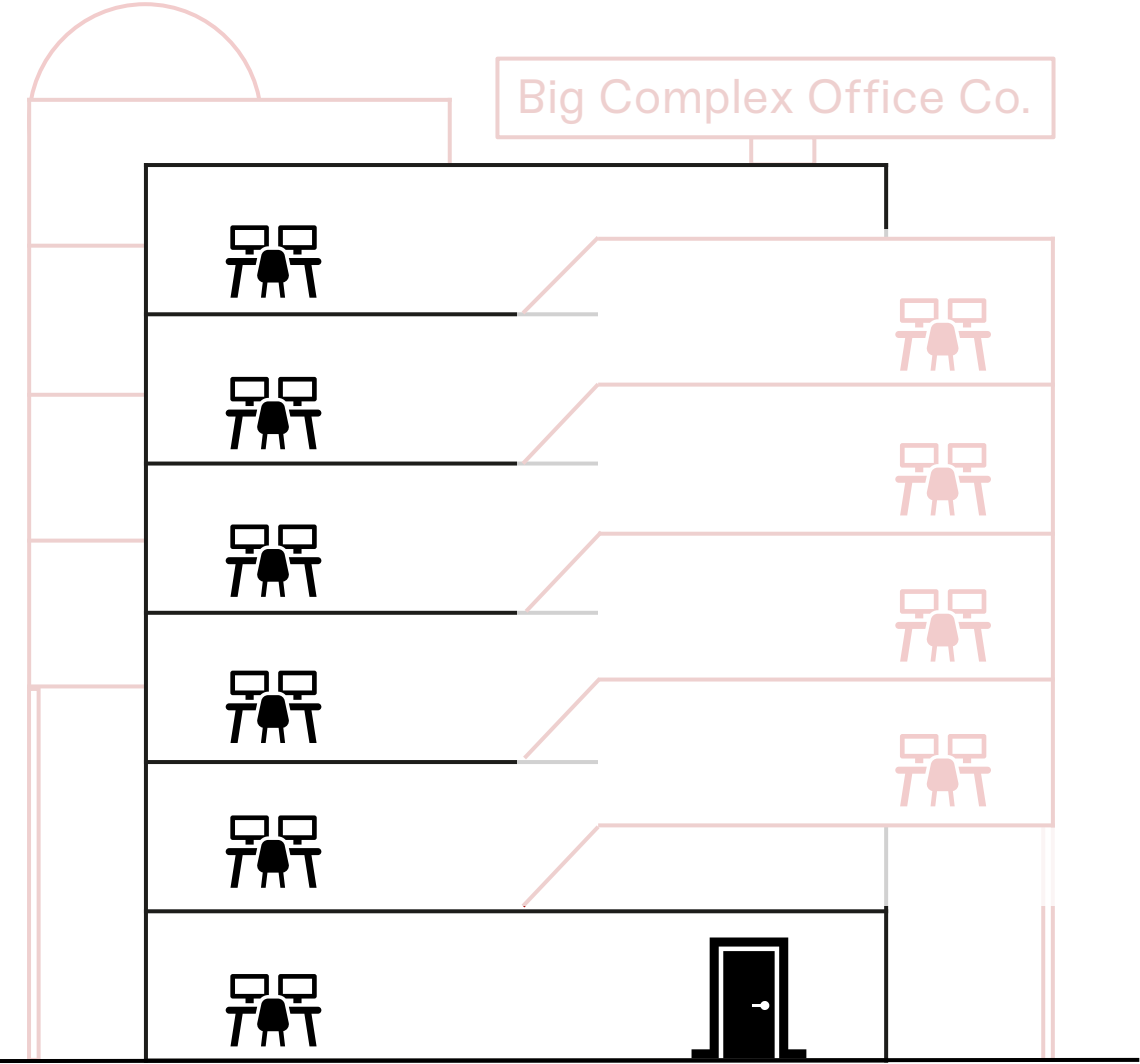


Standard fire matrix

	Stair pressurization	Door release	Roof vents	Sound systems for emergency purposes	Plant shutdown	Final isolation
Sprinkler systems	*	*	*	*	*	*
Fire detection and alarm systems	*	*	*	*	*	*
Smoke/heat alarm systems	*	*				
Gaseous systems				*	*	*
Aerosol systems				*	*	*
Water mist systems	*	*	*	*	*	*
Hydrants						
Hose reels						

RISK WITH CURRENT APPROACH

Why critical fire safety intent gets lost in real buildings



Standard fire matrix

	Stair pressurization
Sprinkler systems	•
Fire detection and alarm systems	•
Smoke/heat alarm systems	•
Gaseous systems	
Aerosol systems	
Water mist systems	•
Hydrants	
Hose reels	

Consolidated fire matrix

	Stair pressurization	Door release	Roof vents	Sound systems for emergency purposes	Plant shutdown	Final isolation
Sprinkler systems	•	•	•	•	•	•
Fire detection and alarm systems	•	•	•	•	•	•
Smoke/heat alarm systems	•	•	•	•	•	•
Gaseous systems		•		•	•	•
Aerosol systems		•		•	•	•
Water mist systems	•	•	•	•	•	•
Hydrants						
Hose reels						

Fire engineering report

STRATEO Consulting Pty Ltd has been engaged by the client to undertake a fire safety engineering analysis of the proposed design for the building located at 123 Main Street, City. The analysis has been prepared in accordance with the Australian Fire Engineering Guidelines (AFEG) and AS/NZS 4576:2018. This report provides the objectives, proposed analysis methods, proposed analysis results, and acceptance criteria.

RISK WITH CURRENT APPROACH

Why critical fire safety intent gets lost in real buildings

THE PROBLEM

- › Works only for stock-standard designs
- › Single-system focus (eg HVAC only)
- › Missing info relating to 'other' systems (e.g. door release, gas shutdown)
- › Missing info relating to performance-based design elements (eg fire curtains, dynamic exit signs)
- › Lack of ownership

THE CONSEQUENCE

- › Systems don't get tested / maintained
- › Only "known" systems on the fire matrix get tested
- › "We had no idea this existed in this building"
- › Fire matrix overlooked during future works – hence the design team miss key fire mode details
- › Fire matrix remains static and does not get updated – maintenance team unaware of design change. Problematic when ownership / maintenance team change

REGULATORY CONTEXT

BUILDING REGULATIONS AND NCC

> Little **GUIDANCE**

> Not a '**REQUIRED**' document in the approvals process



REGULATORY CONTEXT

AUSTRALIAN STANDARDS

There is **SOME** recognition of fire matrices in AS 1851 and AS 1670.1:

- > 'system interface documentation'
- > 'cause and effect information'
- > Lacks guidance on clear **PROCESS** for developing a fire matrix
- > Does not define who is **RESPONSIBLE** for development
- > Does not define who is responsible to **UPDATE** this over the building's lifetime – it's considered a static document

AS 1851 SERVICE RECORD

YEAR	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEPT	OCT	NOV	DEC
23												
24												
25												
26												
27												
ID												

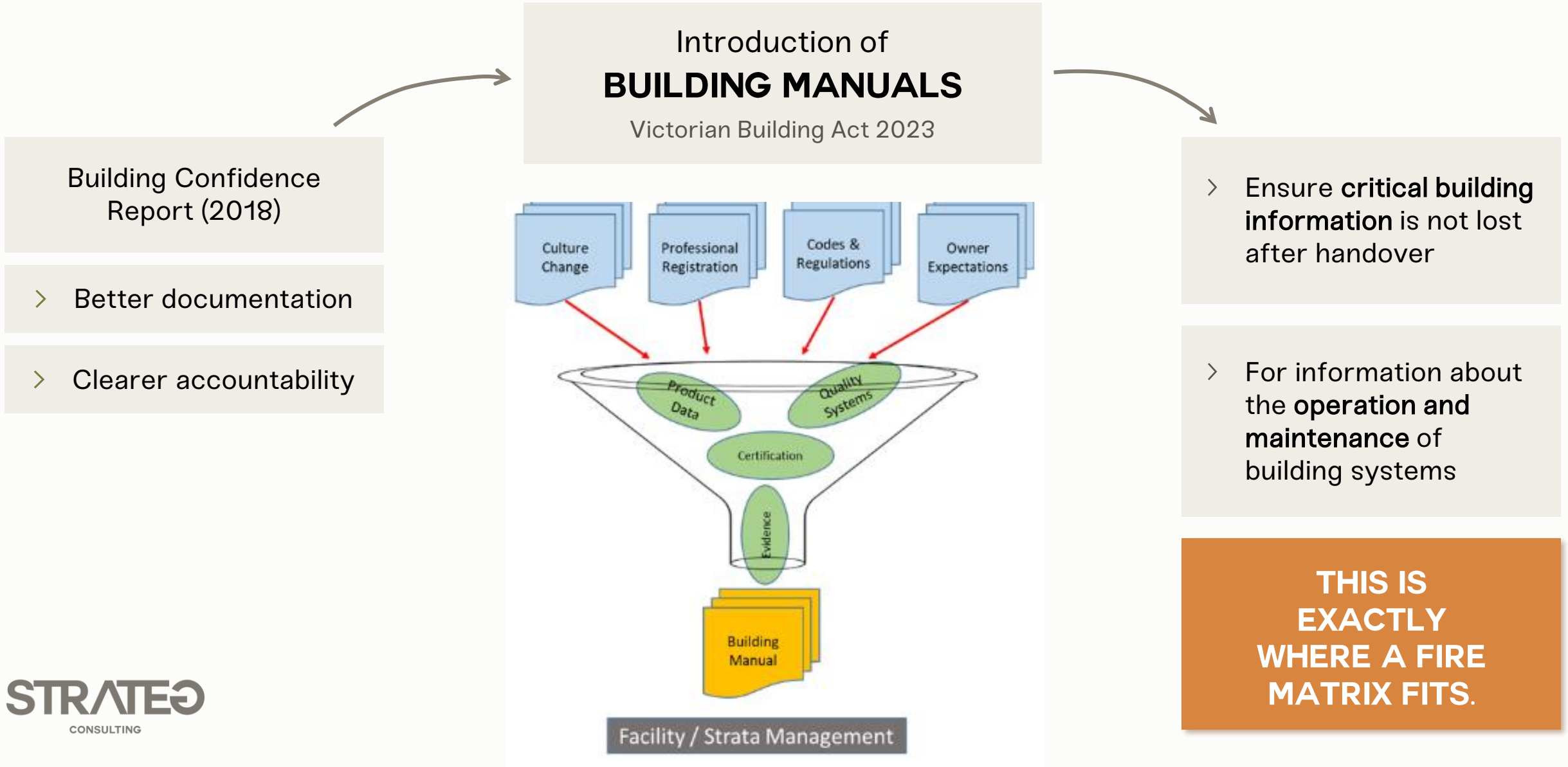


FIRE MATRICES

**WHEN EVERYONE
IS PARTLY
RESPONSIBLE,**

**NO ONE IS FULLY
RESPONSIBLE.**

BUILDING MANUALS



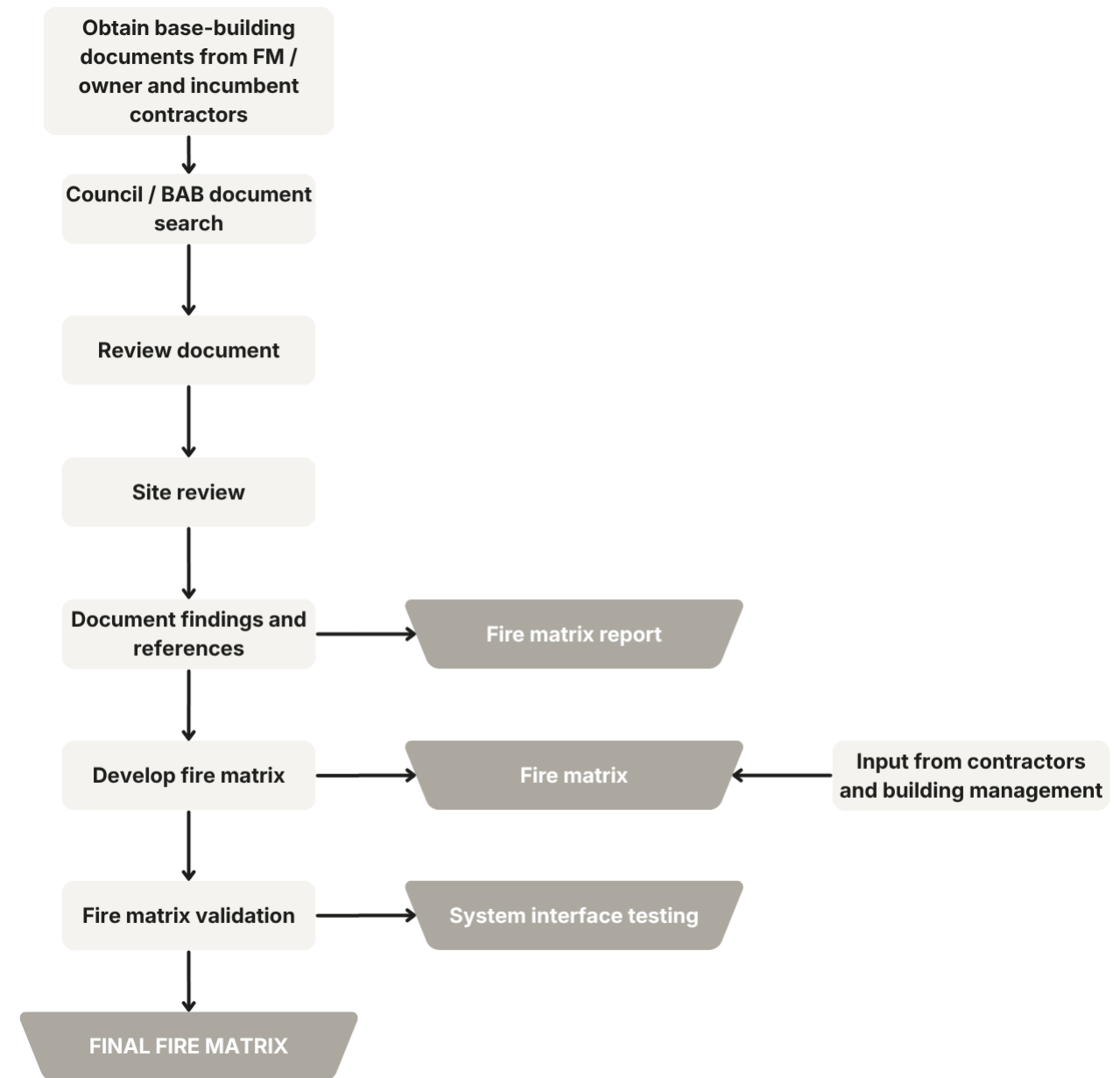
- › Builder **side** contractor to develop initial fire matrix
- › Fire matrix to be reviewed by fire safety engineer and fire services engineer
- › Fire matrix to be revised to capture bespoke design features part of performance solutions
- › Fire safety engineer and fire services engineer to endorse the fire matrix
- › All parties involved in fire matrix development to take part in commissioning system interface test



FIRE MATRIX DEVELOPMENT NEEDS TO BE A MORE COLLABORATIVE PROCESS

DESIGNING A FIRE MATRIX FOR EXISTING BUILDINGS

- › Biggest challenge – finding baseline data
 - › FM / owner , council / BAB document search, incumbent contractors
- › Document review
 - › Fire detection / sprinkler block plans, HVAC asset list, services drawings, FSERs , occupancy permit, FBP program
- › Site review
 - › Site conditions don't always match design documents
- › Document findings, references and thought process
 - › Ensures traceability and accountability
- › Seek input from contractors and building management
 - › Operational requirements not documented anywhere
- › Validate and finalise fire matrix



FIRE MATRIX DEVELOPMENT FOR EXISTING BUILDINGS IS LIKE SOLVING A JIGSAW PUZZLE

CAUSE

Fire detection
alarm zones /
floors

Sprinkler flow /
pressure switches

Manual call points

Duct probes

Special hazard
systems

FFCP overrides

EFFECT

Stair/ Zone pressurisation	Smoke exhaust	Carpark exhaust	HVAC shutdown	Damper operation
Door releases	Dynamic signs / VADS	OWS	Nurse call / pager	Fire/smoke curtains
Fire alarm monitoring	Gas shutoff	Lift operation	DDA alarms	EV charger shutdown



FINAL THOUGHTS AND FUTURE OUTLOOK

THE FIRE MATRIX OF THE FUTURE

- › Live digital / online tool
- › Integration with the BMS

A LIVING AND BREATHING DOCUMENT

- › Not a static document
- › Design changes to existing buildings – must consider impact on fire matrix
- › Changes to FBP program, re-zoning etc – must be captured in fire matrix

STRONGER REGULATORY ALIGNMENT

- › Requirement for occupancy – part of building manuals
- › Better ownership and accountability
- › Current best practice may become expected practice

LET'S CHAT

 Sheran Khan

 sheran@strateg.com.au

 0481 726 809

 <https://strateg.com.au/>



> **QUESTIONS**