SHEVS

SMOKE & HEAT EXHAUST VENTILATION SYSTEMS

Partner of:

Kingspan Light+Air | brakel

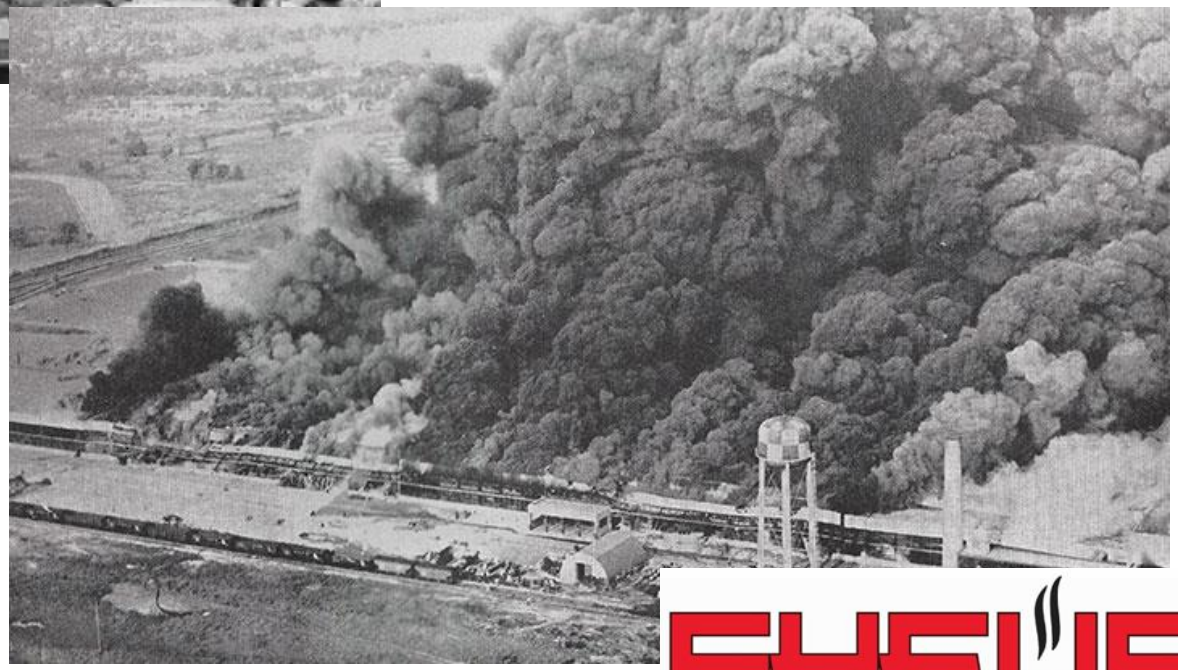
FPASA
MEMBER 10-113

Origins and purpose of SHEV systems

Investigations of a series of fires since the 1950's proved that smoke and heat release from buildings was desirable:

- To help save buildings from destruction by fire and the property inside
- Safer for fire fighters to tackle the fire
- Escape and life safety for occupants

The great GM Hydramatic fire Livonia USA 1953



When it all started. This fire proved the need for smoke ventilation systems

The great General Motors Hydramatc fire of 1953, Livonia, Michigan, USA

- R4,3 billion loss to insurers (2016 Rand)
- 140,000 square metres
- “Roared out of control in 20 minutes”

The great General Motors Hydramatc fire of 1953, Livonia, Michigan, USA

- 15 serious injuries
- 4 dead + 2 electrocutions after fire
- Miracle that 4,200 people escaped
- Served as a “general awakening”

Why the worlds largest building in 1953 – think of 28 rugby fields – was completely lost to fire.

The investigations which followed the disaster concluded:

- The main reason was that there was no smoke and heat release ventilation system installed.
- With no way to escape, the enormous heat of the fire was retained in building causing the fire to rapidly consume all in its path.
- One small area had sprinklers but could not control the fire, attempts to use manual fire extinguishers failed and once it spread to the area without sprinklers there was no stopping it.
- Since the space was open and there was no internal partitioning of the building there was nothing to stop the advance of the fire.
- **It was all over in 30 minutes and the building was lost.**

A roof mounted smoke ventilation system releasing heat and smoke during a fire Cacaoloods ADM in Wormer (Netherlands) 2006.

Over the last 67 years laws and regulations around the world have been introduced requiring fire protection initiatives, including smoke and heat ventilation systems, which are required in South Africa by law.

As at 2016 these following South African laws are in force:

Building regulations SANS 10400 part T - fire 2011 edition 3 requires compliance to EN 12101 standard.

Design of system

- Clause 4.42.1 a) Smoke control to accord with EN 12101 Part 5 design for buildings with sprinklers
- EN 12101 part 12 design for buildings without sprinklers (approved and awaiting publishing as at April 2016)

Building Regulations Require Compliance To EN 12101 Parts 2, 3,8,7 Standard - Equipment Compliance.

- Ventilators, fans and smoke dampers must be manufactured in an approved facility with factory production control (FPC) i.e. Quality Management System
- This gives confidence that each product will operate reliably in a fire situation

SA Building Regulations Require Compliance To EN 12101 Standards.
Equipment - Performance And Testing

Clause 4.42.3. of SANS 10400 requires

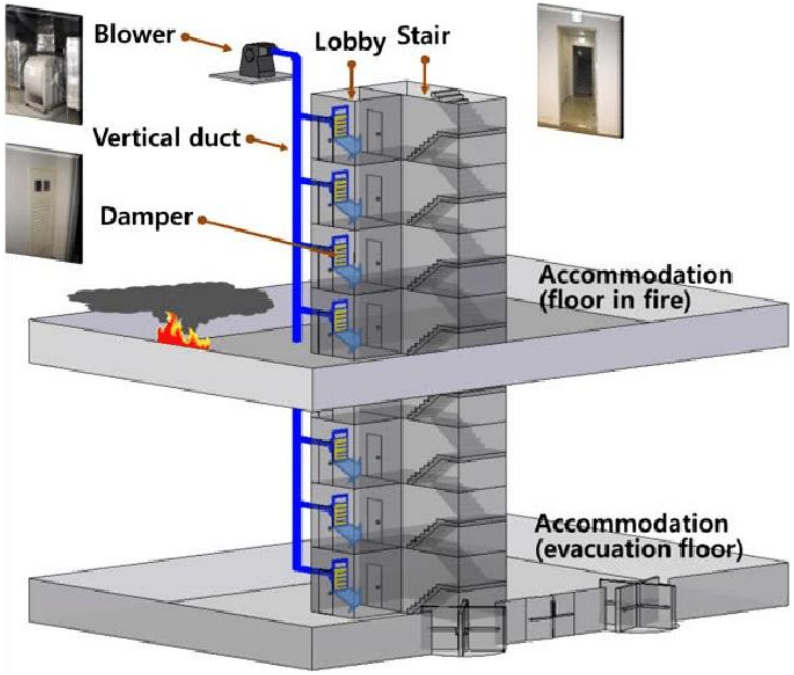
- Part 2 - Smoke and heat ventilators - published
- Part 3 - Powered / extract smoke fans - published
- Part 8 - Smoke dampers - published
- Part 9 - Control panels now part 10
- Part 10 - Power supplies published and therefore in force

Quick Definitions For Brevity

- **Smoke** | Products of combustion, noxious gasses, airborne particulates etc. from a fire.
- **SHEV** | Smoke + Heat + Exhaust Ventilation
- **Fan** | Powered extract unit or mechanical smoke extractor or forced ventilation
- **Vent** | Roof ventilator, open louvre, openable panel or window etc

Some Types of Smoke Ventilation

Fire Escape Staircase Pressurization



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Concepts and purposes of SHEV systems

- Quick recap:
- Building envelopes keep out weather, sunshine, rain, wind, dirt, dust etc., but
- Enclosing a space traps smoke and pollution which creates dangers to the people inside and the risk of loss


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Concepts and purposes of SHEV systems

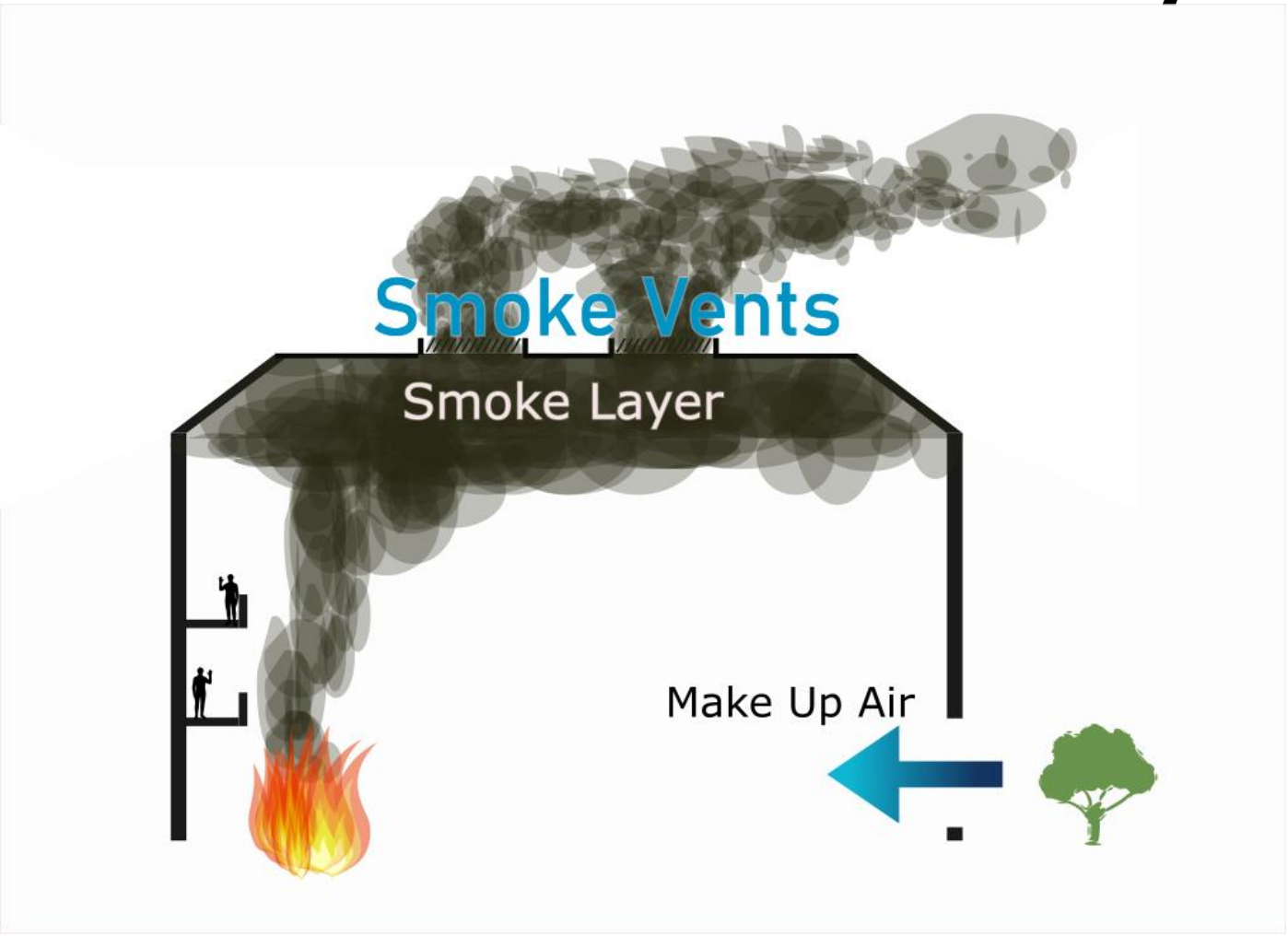
- Allows heat and smoke release
- Replaces the smoke with clean air
- Prevents rapid smoke logging
- Creates a clear(er) layer of air below the smoke
- Reduces build-up of heat and hence reduces the spread of fire

A Common Misunderstanding of Smoke Ventilation

- QUESTION - It doesn't make sense to help the fire burn better and hotter by feeding it with fresh air?
- ANSWER - Tests proved that fires may burn a bit hotter, but with cool replacement air being supplied, hazards are much less, both to people and the building

Reduce smoke logging and make it possible / easier for firefighters to attack base of fire – NO CLIMBING ON ROOF TO CUT HOLES

Creates a clear and cool layer (survival)



USUALLY 2.5m clear layer

Ventilation with Fire Alarms

- Alarm to activate ventilation
- Coordinate the zones
- Make sure fire alarm is connected
- Automatic shutdown when alarm is cancelled
- Ventilation system not to have manual override during a fire alarm event except with fireman's switch
- Test SHEV system from fire alarm

Ventilation Required Where:

- Space is > 500 square metres
- Space is > 999 in shopping centres (**Vents**)
- Space is > 1,399 in shopping centres (**Fans**)
- Above a stage
- Non pressurised escape staircase < 30m
- As deemed by fire authority

Forced /Mechanical Ventilation

VS

Natural Ventilation

Forced And Natural Ventilation

- **FORCED** = Electric fans/extract units - uses mechanical power to create pressure difference **(sucking)**
- **NATURAL** = Openable roof ventilators, panels or windows - uses convection and buoyancy to allow the hot gasses to **push through**

When forced ventilation may be selected:

- Basements
- High atriums (because of large smoke plumes caused by air entrainment)
- Underground parking
- Large spaces between floors
- Where the are no external walls or roofs
- Where roof is solid concrete
- Where the roof is very high

Where ventilators are often selected:

- Large single storey warehouses
- Large malls where parts of roof allows
- An automatically opening window is deemed to be a smoke ventilator (EN12101-2)

Should Smoke Windows be Certified?

- According to EN 12101 part 2 a smoke release window is a ventilator
- So yes – a smoke window must be a certified unit
- By implication – simply fitting an opening device to any window cannot comply – why?
- Because they cannot be tested to EN 12101 part 2 unless they are complete units
- Are such windows available?
- YES

Routes to legal compliance

- ALWAYS, ALWAYS pay for the services of a consulting engineer, do not try to do a new build or refurbishment without one.
- Purchase certified equipment where ever possible
- Use fire rated accessories and electric cables. Refer to SANS 10142 wiring code
- Use a registered electrical contractor to do the work
- Fan control panels to comply to SANS 10142 wiring code – EN 12101 part 10 does not cover fan controls

Why Routine Maintenance?

- Legal responsibility as building owners
- Avoid repudiation of insurance claims
- Condition precedent to comply with the building regulations
- Fire authorities may request proof
- Local by-laws
- Avoiding maintenance is a risk

Certificate of Conformance

Smoke Ventilation System

The smoke ventilation system serving

Property Name

in

Location

was inspected during

Month 2000

and is confirmed to be in conformance with the relevant SANS regulations that were in effect at the time of commissioning

Servicing and Inspections carried out incordance with the requirements of
SANS / ISO 17020:2012 Ed 2 requirements for bodies performing inspections

(Engineer)

Date

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Certificate of Functionality

Smoke Ventilation System

The smoke ventilation system serving

Property Name

in

Location

was serviced during

Month 2000

and is confirmed to be in a proper functional state.

Servicing and Inspections carried out incordance with the requirements of
SANS / ISO 17020:2012 Ed 2 requirements for bodies performing inspections

(Engineer)

Date

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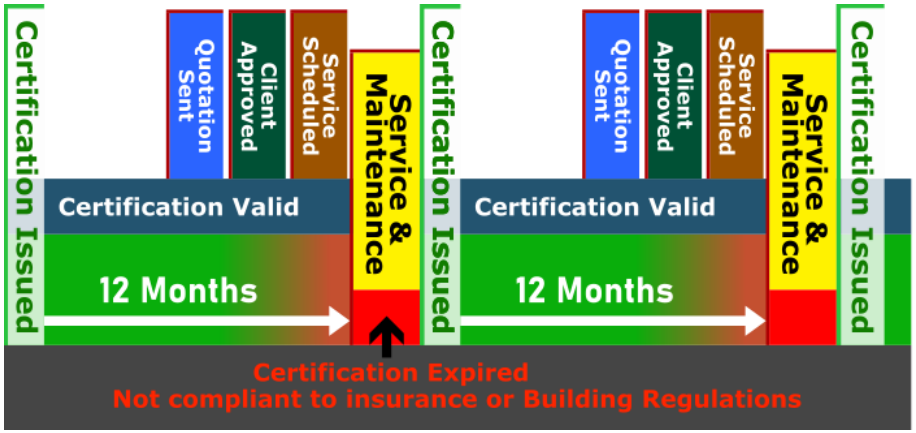
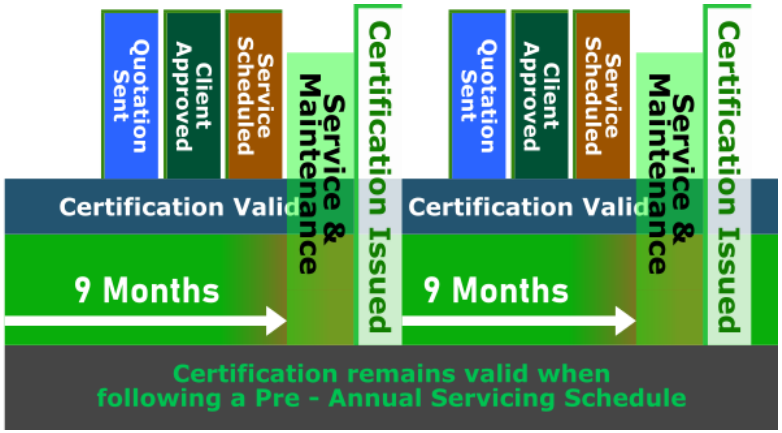
Is there a specified interval?

- Not less than one year in law and insurance
- We recommend every six - nine months, so that there is always a valid certificate
- Some of our clients require it quarterly
- Monthly or even weekly checks are performed in high risk situations, such as shopping centres





Insurance wording:

- “It is a condition precedent to liability under this policy that YOU comply with the National Building Regulations and building standards act as amended or substituted from time to time, or with any similar applicable legislation, and the regulations thereto as well as any other regulations or provisions in any by-law with regard to the installation, **maintenance and servicing of all fire protection** and fire fighting equipment”

Laws & Regulations for Smoke & Heat Exhaust Ventilation Systems:

"It is a condition precedent to Liability that compliance with National Building Regulations, including any By-Law, with regard to Fire Protection and Fire Fighting equipment is applicable relative to maintenance and servicing and installation"

(CIA, 2014. Broadform building insurance policy. Fire Protection)

"Any fire-fighting equipment, installations and fire protection systems in any building shall be so installed and maintained as to be ready for their purpose at ALL times."

"Such fire equipment shall be so installed that it facilitates maintenance. Where compartments are created to house this equipment, they should not impede maintenance."

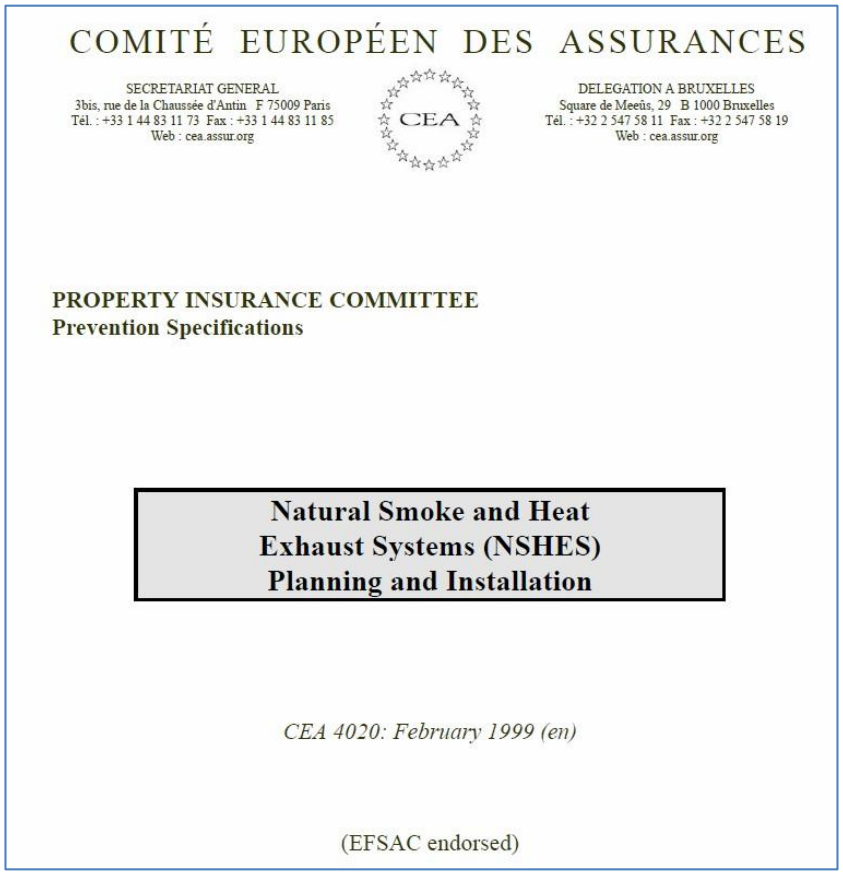
(SANS 10400-T:2008, Provision and maintenance of fire-fighting equipment, installations and fire protection systems)

"The fire protection system must be maintained on a regular basis and the owner or person in charge of the premises must keep a detailed record of the test and maintenance of the system."

"A fire protection system designed for detecting, fighting, controlling and extinguishing a fire must be maintained in accordance with the National Building Regulations (T2) read in conjunction with a recognised national code or standard, and in the absence of a national code or standard an applicable international code or standard must be used."

(Western Cape Municipality, 2002, By-law relating to community fire safety)

Re-insurers Are Aware of The Vital Purpose of Smoke Ventilation Systems:



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PROPERTY INSURANCE COMMITTEE
Prevention Specifications

Natural Smoke and Heat Exhaust Systems (NSHES) Planning and Installation

CEA 4020: February 1999 (en)

(EFSAC endorsed)

This large document sets out clearly how smoke ventilation must function and how frequently it must be maintained. Not more than one year between maintenance intervals.

Servicing & Testing of Shev Systems

Our 10 Point Service & Maintenance Strategy:

1	We will perform a full system test, as per operating manual.
2	Ventilators/Fans will be inspected for leaks and damage. The rain gutters in each ventilator will be cleaned of bird droppings, sand and accumulated dirt.
3	Mechanisms and dampers will be lubricated and checked for smooth operation etc.
4	Wiring and electrical connections will be checked where accessible.
5	Pop rivets will be inspected and replaced if they are loose.
6	Minor hitches excluding major items such as actuators and control panels will be repaired.
7	Ventilators and fans will be checked according to the service report and history log.
8	If during the course if the inspection, additional repairs and / or major replacement parts are found to be necessary this will be quoted on separately, with the exception of batteries which will be replaced.
9	A service report will be issued highlighting any major repairs or replacement parts if required.
10	Certification will be issued when the service has been completed and a follow up appointment for the next service date will be scheduled on our calendar. In the event that the need for additional repair work has been detected, we will perform the necessary work following your authorization before issuing certification.

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The Dangerous And Illegal:

This ventilator will not open in a fire. A roof smoke ventilator on a large Cape Town shopping centre, Jammed closed.

Its been this way for over a year.

The Dangerous And Illegal:

A common problem. Ventilators designed to be fail-safe and open when there is a problem held down with any heavy object to hand. In this case a few bricks will do the job.

The Dangerous And Illegal

No bricks? Wood will do.
Ignorance or intentional?
Only 6 out of 32 were not jammed closed. None had failed, it just needed simple maintenance

Fortunately we have now made this busy shopping centre safe and legal.

The Dangerous, Illegal *And* Ridiculous

No bricks and no wood? Well lets seal the darned things completely.

Nice job too.

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SMOKE & HEAT EXHAUST VENTILATION SYSTEMS

Registration number: 2010/016374/07

Strategic Partner to IC Colt (Pty) Ltd SA

IC Colt is the Certified Partner to Colt International under Kingspan Light + Air International a Kingspan Group company

Kingspan COLT CERTIFIED PARTNER

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We operate nation wide

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- **Schedule a meeting**
- **Dial a conversation**

We are here to help you.

Here are a few names of some of the businesses on our growing list of clients:

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