



Effect of Cyclone on Buildings

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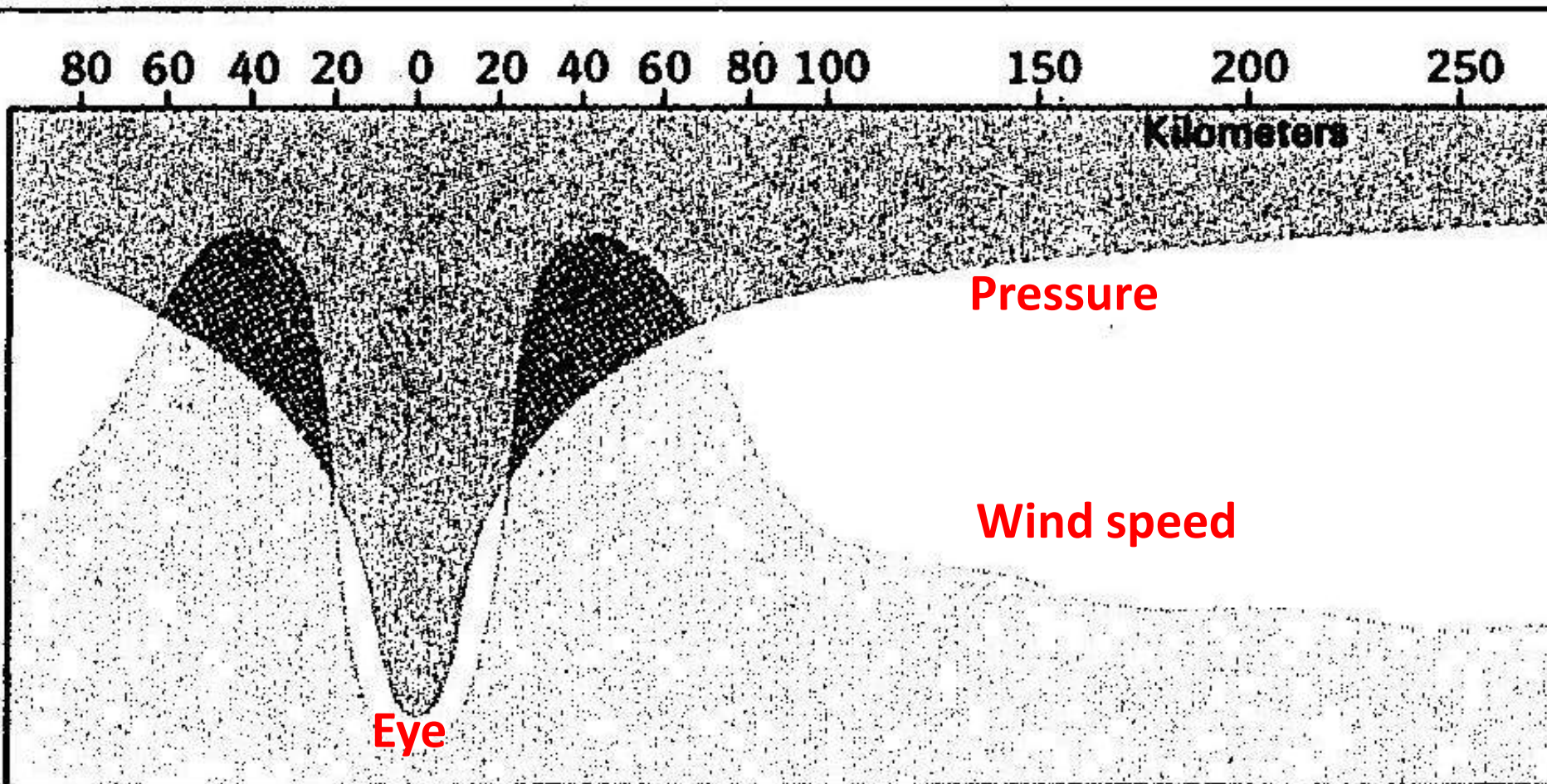
June 25, 2020

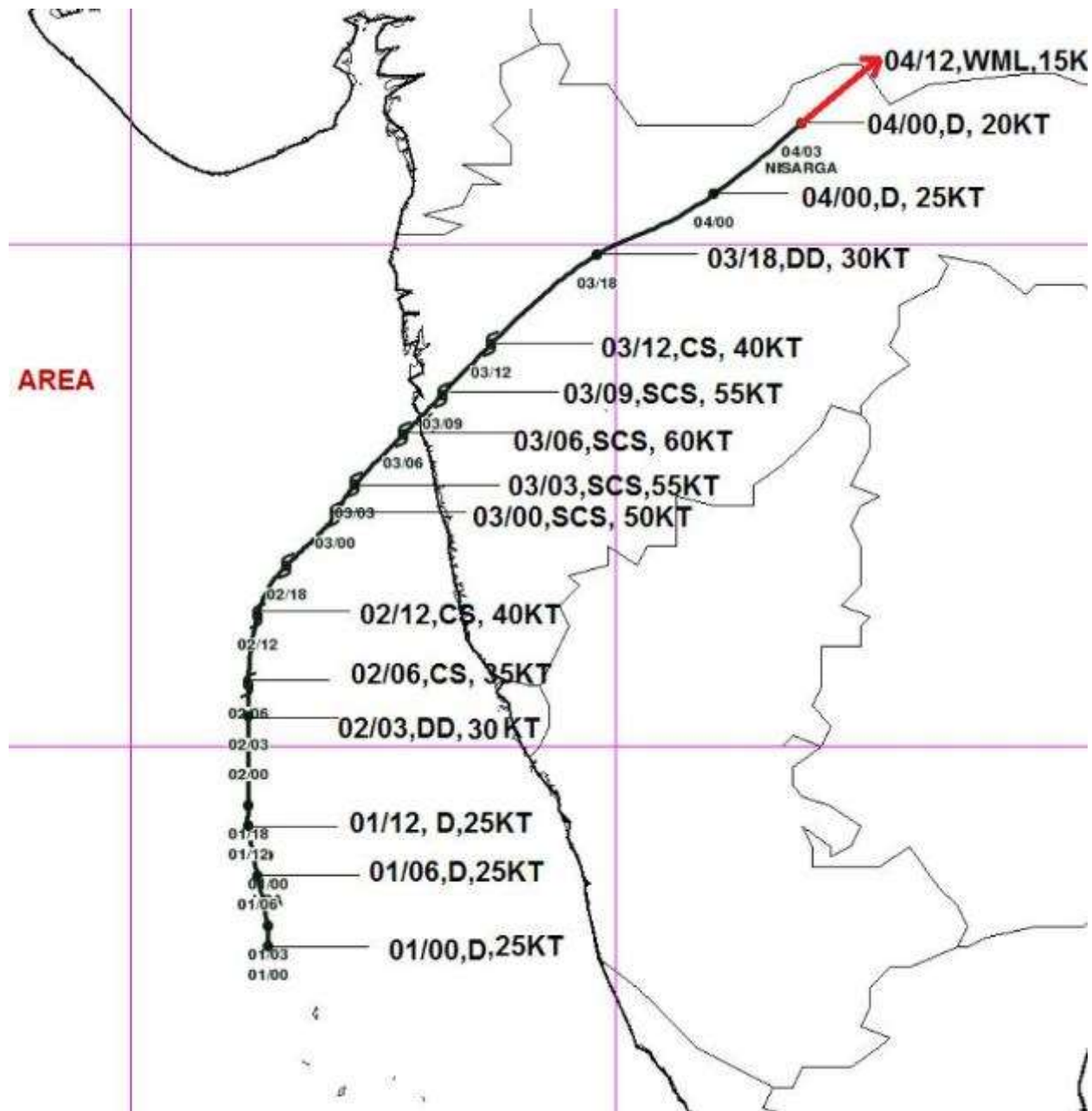
Outline

- Cyclone: general
- Wind and buildings
- Observed damages
- Desirable features in buildings



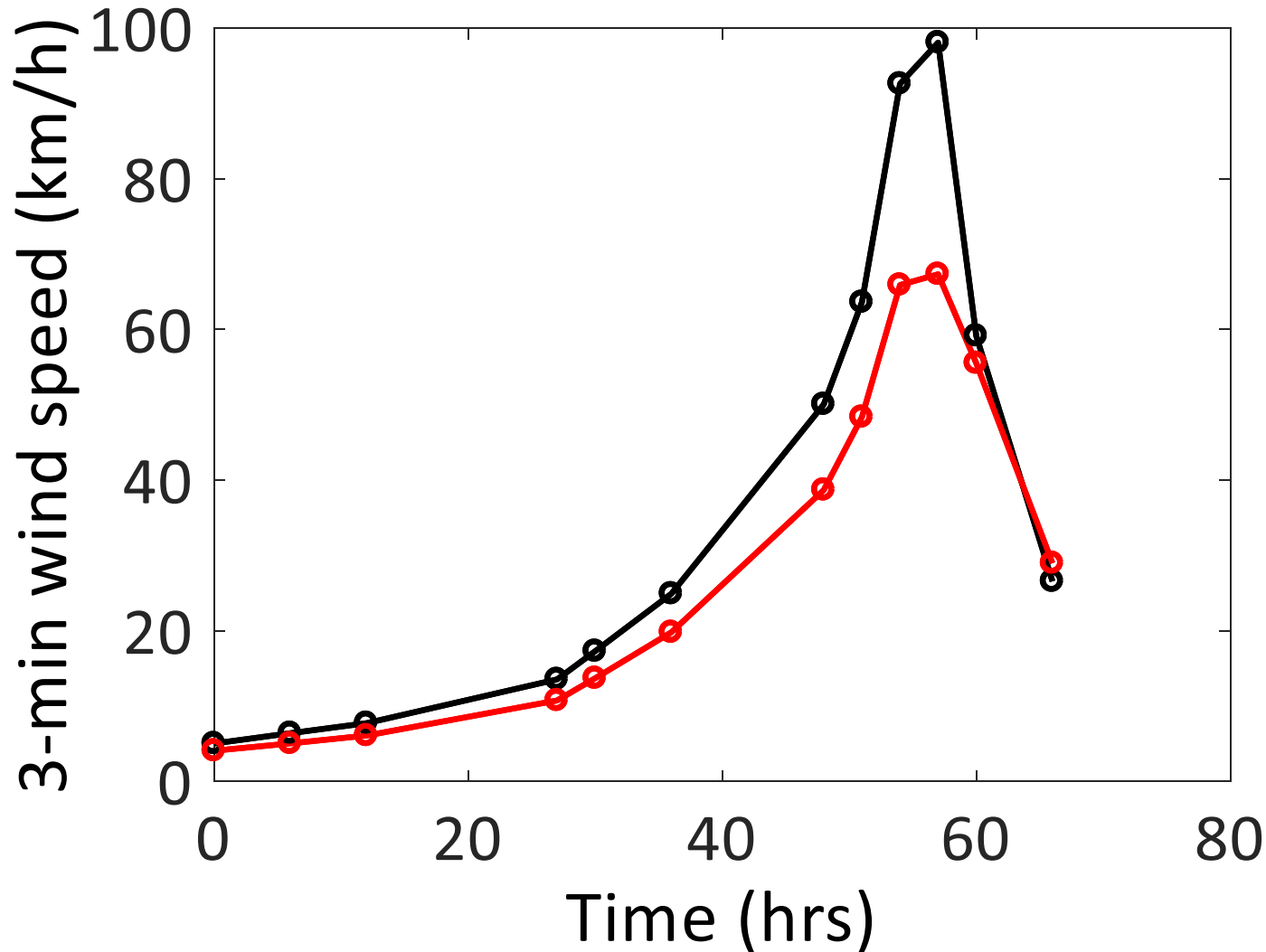
Source: Wikipedia





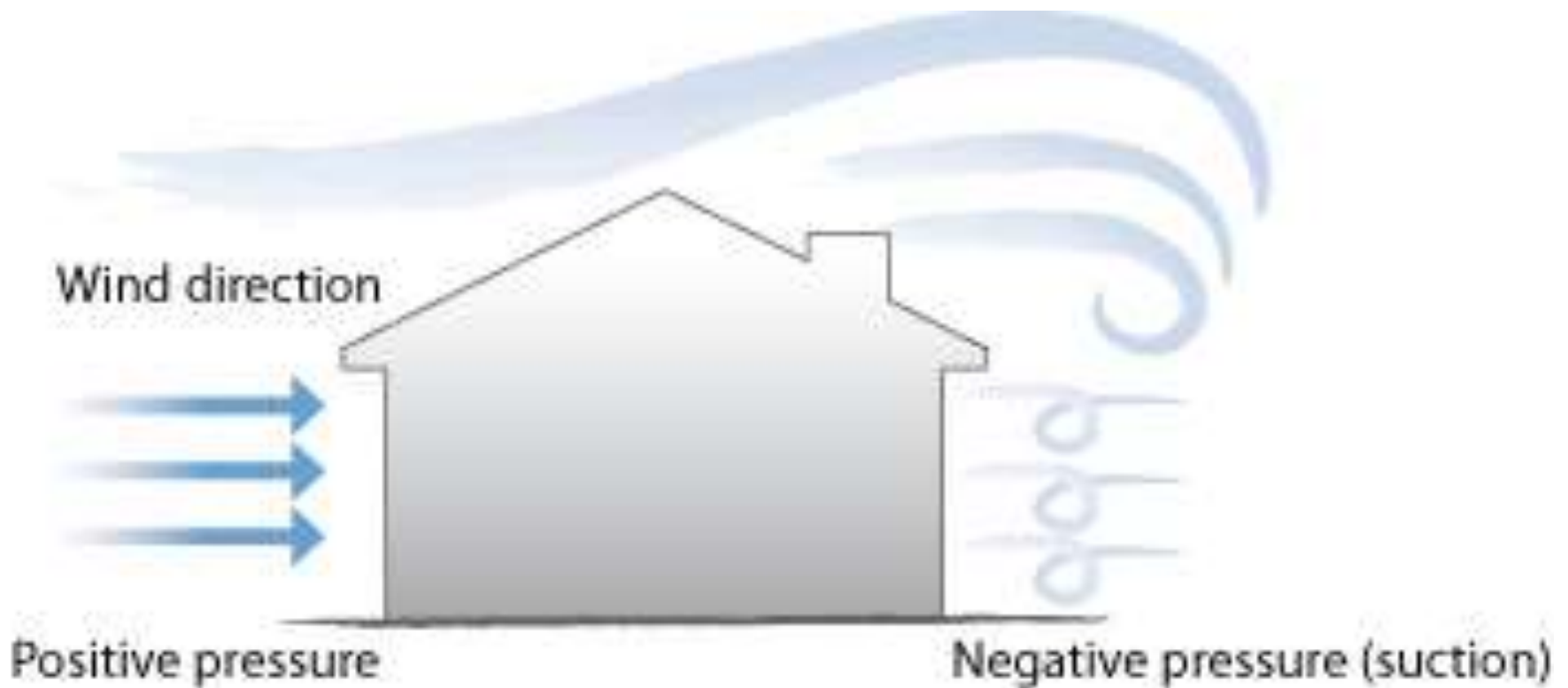
Source: IMD

Nisarga: severe cyclonic storm



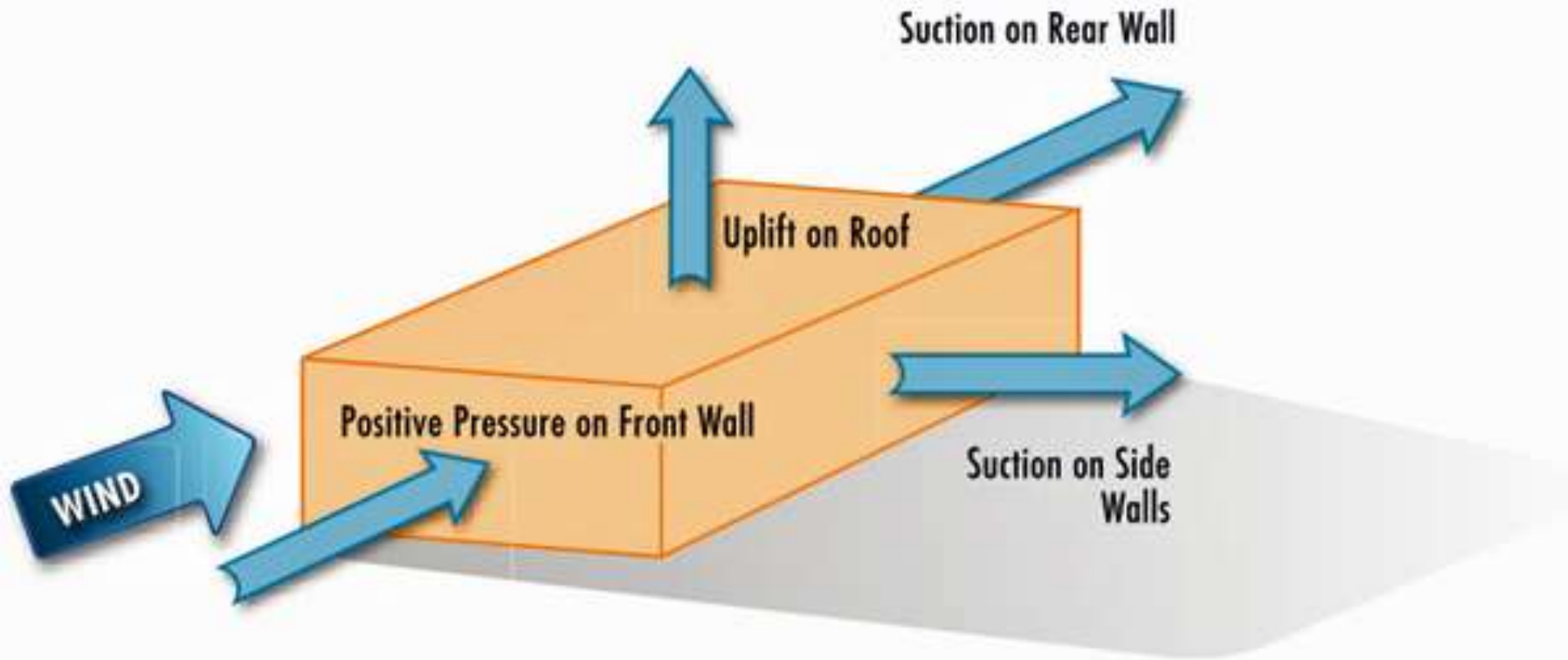
Wind and buildings

Positive and negative pressure



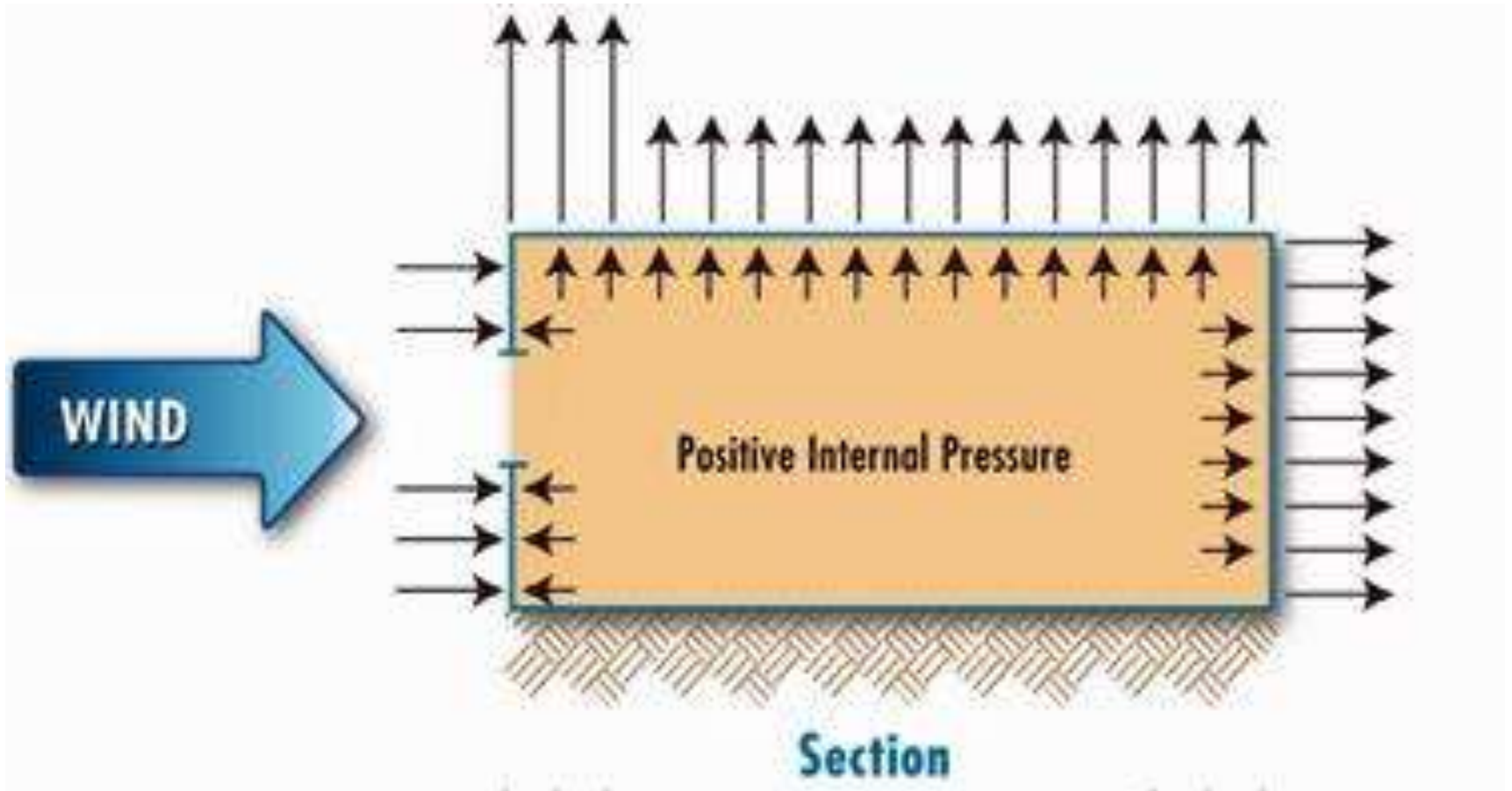
Source: emedia.rmit.edu.au

Wind pressure: no opening



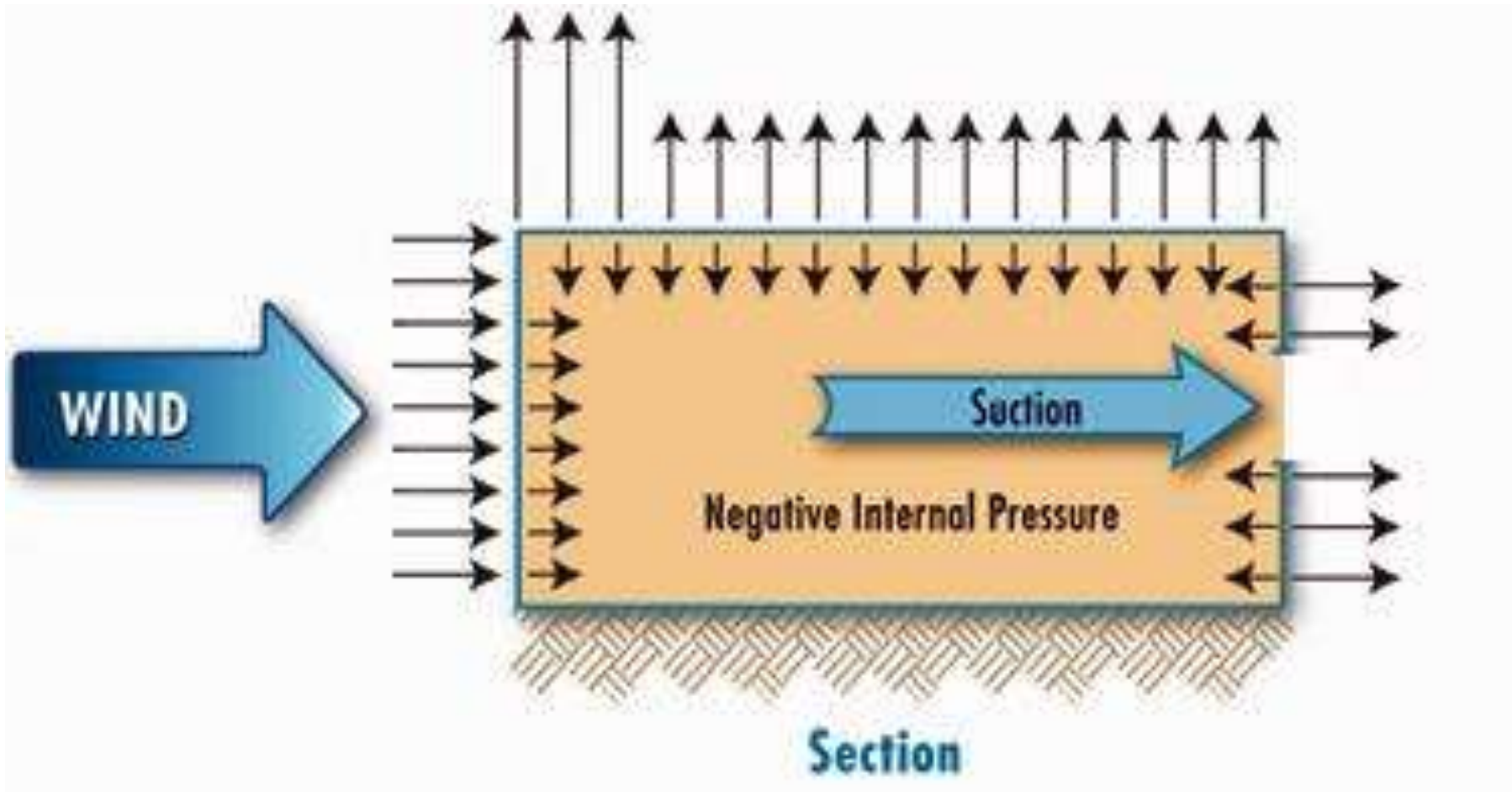
Source: wbdg.org

Wind pressure: opening at front

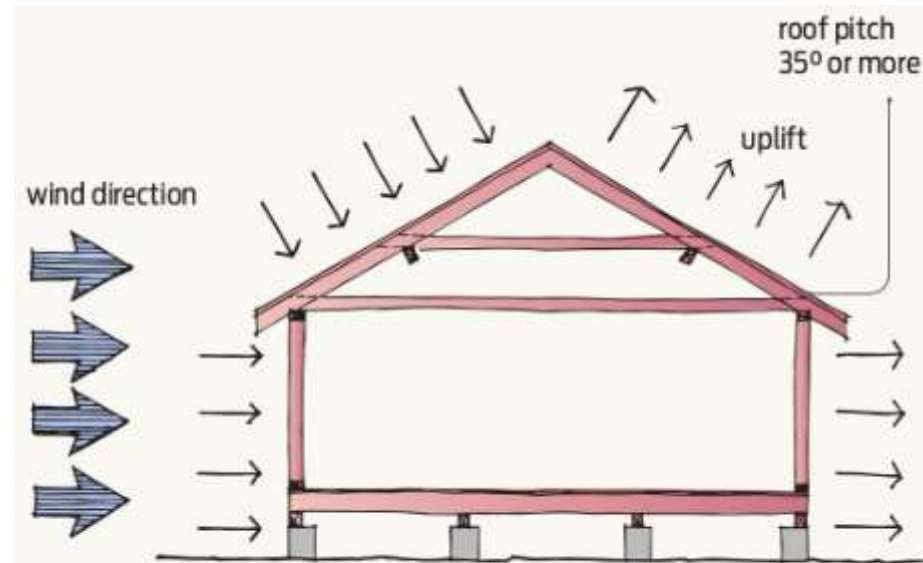
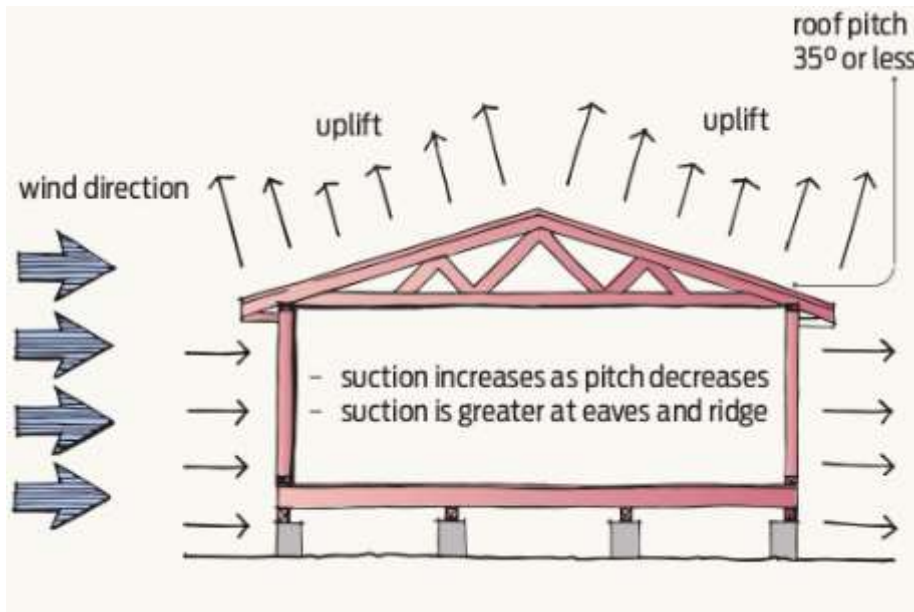


Source: wbdg.org

Wind pressure: opening at rear

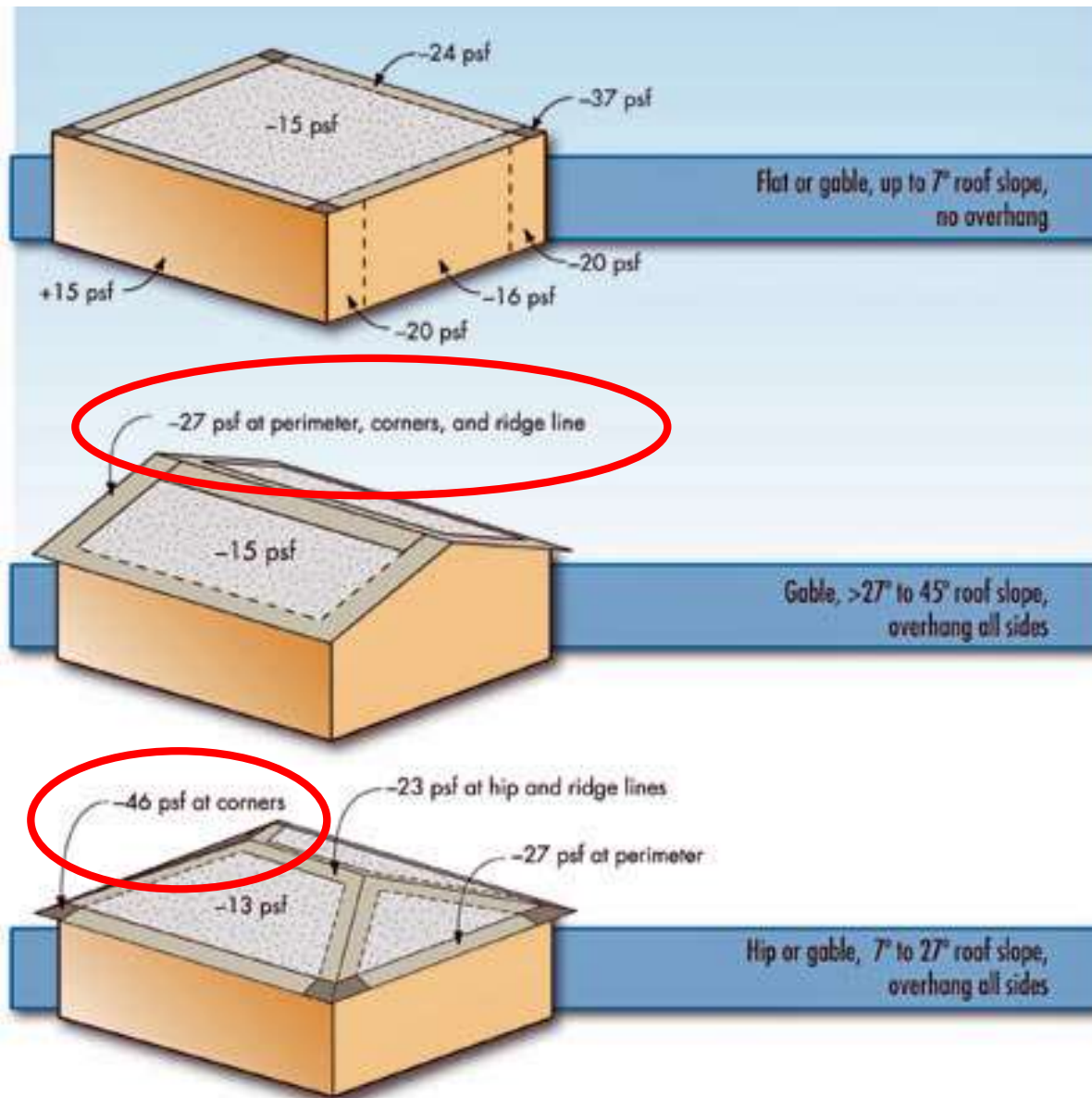


Aerodynamic effects



Note: Roof pitches above 17° may also experience positive forces on the windward slope.

Source: Elkink (2018)



NOTE: Design pressures all assume an enclosed building with the same basic wind speed of 90 mph, exposure B, and 30' roof height.

Observed damages: cyclones

Foundation



Source: Gibbs (2001)

Thatched roof



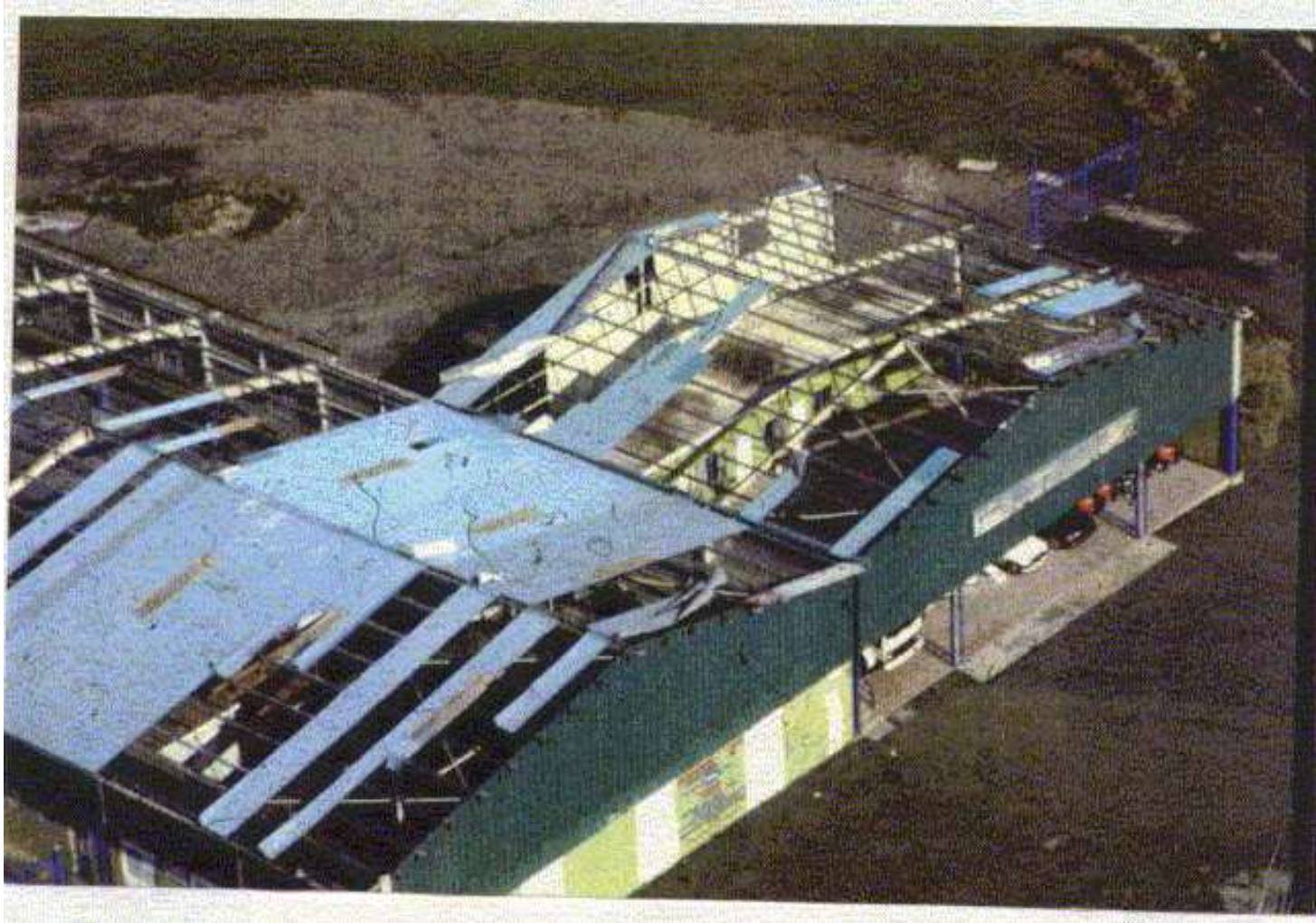
Source: Shanmugasundaram et al. (2000)

Tiled roof



Source: Shanmugasundaram et al. (2000)

Metal sheet roof



Source: Gibbs (2001)

Roof corners



Source: wbdg.org

Truss



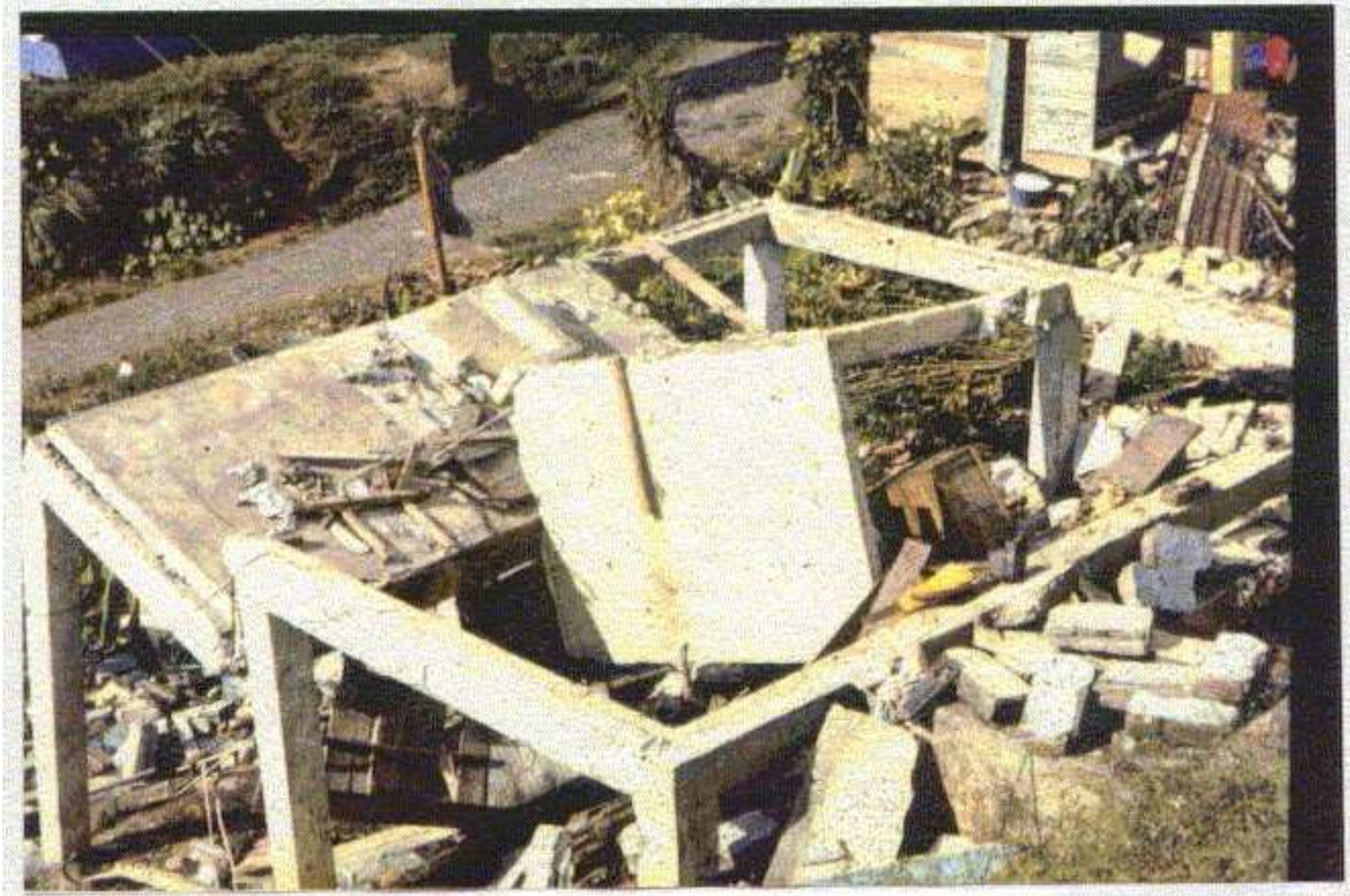
Source: Shanmugasundaram et al. (2000)

Steel frame



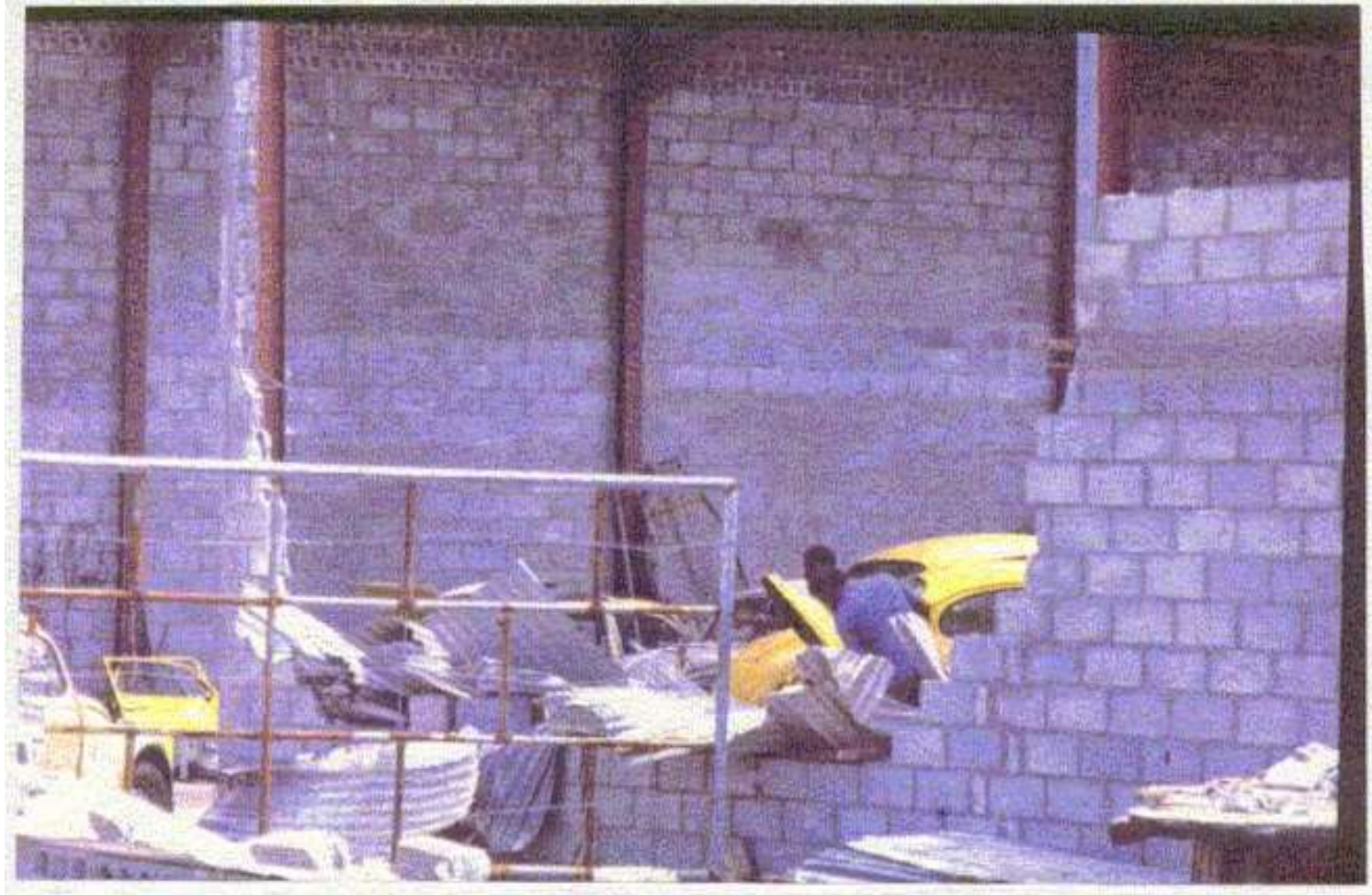
Source: Gibbs (2001)

RC frame



Source: Gibbs (2001)

Wall



Source: Gibbs (2001)

Wall



Source: Shanmugasundaram et al. (2000)

Wall/truss



Source: Shanmugasundaram et al. (2000)

RC column



Source: Shanmugasundaram et al. (2000)

Windows



Source: Gibbs (2001)

Observed damages: Nisarga

Roof



Source: lokmat.com

Roof/wall



Roof/wall



Desirable features

No observed damage



Source: Gibbs (2001)

Favorable features

- Shape
 - Simple
 - Compact
 - Symmetrical
- Hipped roof
 - Sloping steeply in all four directions
- Small overhang
- Robust structural system

Acknowledgements

- Gujarat Institute of Disaster Management
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Thank you!