

Stability of buildings during construction

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Purpose

The purpose of this document is to emphasise to both commercial and housing builders of the need to adequately brace buildings and structures, during all stages of construction, to ensure they are stable.



Background

WorkSafe inspectors have attended numerous incidents where buildings (includes structures) have partially or totally collapsed during the construction process. These collapses have often resulted in death or injury to workers and other people in the vicinity; in addition to the damage to property and the significant financial cost to the builder from the clean-up and rectification works.

The Building Regulations require that prior to a building permit being issued, the building's design is independently checked and certified that it complies with the Building Code of Australia's (BCA). The BCA requirements ensure the completed building has been designed to have adequate strength, stiffness and stability during its life; when used for the intended purpose.

However, although the stability of the completed building is mandated by the BCA, examinations of construction collapses have generally revealed that the builder had not adequately addressed the building's stability during the different stages of the construction process.

Collapses have often been caused by a lack of adequate lateral support, due to the nature of the joints or connections (pins) used between structural elements or reliance on a permanent component of the structure, which had not been installed and temporary bracing had not been provided.

WorkSafe's expectations

To prevent these types of structural collapses WorkSafe expects the person in control of the construction work to have systems in place that ensure the building or structure is stabilised and adequately braced against live and dead loads, including lateral loads during all stages of construction.

Any system should include the following:

- A competent person needs to check the proposed construction sequence and design appropriate temporary bracings or supports; some construction projects may require input from a structural engineer.
- Stability and bracing requirements should be documented, either in the work method statement or on the building plans, for each stages of construction.
- Stability and bracing arrangements are reviewed when structural changes are made to the building.
- Existing bracing is regularly checked; to ensure the continued robustness of the whole building.
- Ensure that all temporary bracing is installed correctly and is maintained in a serviceable condition until their use is no longer required.

Controlling lateral instability

Buildings and structures are usually stabilised against lateral loads by using any or a combination of the three following structural systems:

- **Triangulation** – additional interconnecting diagonal components (bracing) connecting the columns and beams, which transfer the loads to the ground (See Figure 2).
- **Rigid Structure** – if the joints in the structure are made rigid, the structure can resist lateral loads. This can be accomplished by using knee-braces, deep footings etc (See Figure 3).
- **Shear** – if the supporting structure has walls rather than beams and columns, these walls can be used to resist the lateral loads, i.e. a shear wall (See Figure 4).

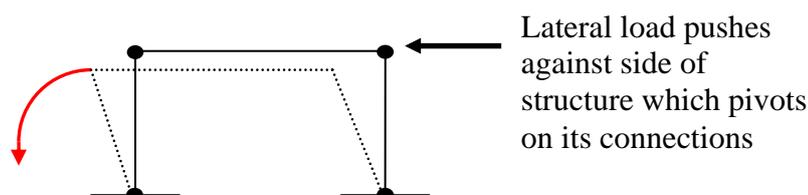


Figure 1 – Simplified unrestrained frame in two dimensions

Possible Solutions:

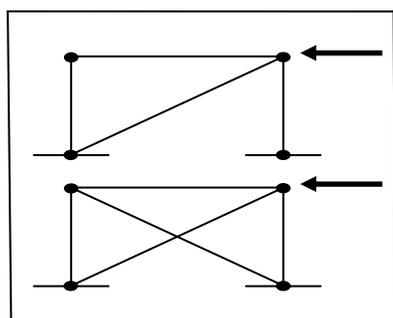


Figure 2 – Triangulation

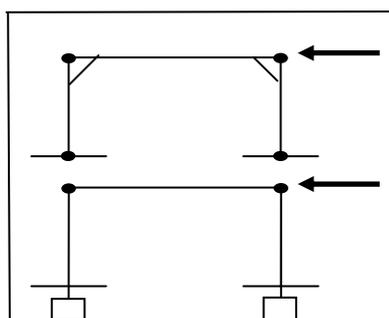


Figure 3 – Rigid Structure

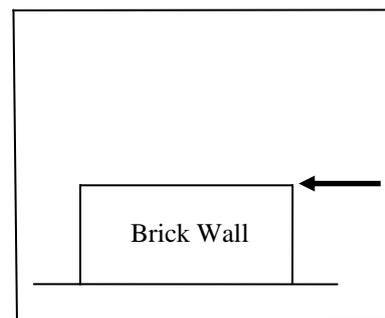


Figure 4 – Shear Wall

When planning the construction process the builder needs to ensure that the installation of required lateral supports follows the construction sequence, so that all parts of the building or structure are adequately braced at all times.

Temporary bracing should be provided where:

- The installation of permanent braces cannot occur until after the rest of skeleton structure is completed, especially when a building relies on these braces for lateral support, or
- Shear walls are not built or in place and the structure relies wholly or partly on these walls for their lateral support.

It should also be noted that it is necessary in multi-storied buildings to provide lateral support at every level unless a lift or stair well is designed to act as a shear wall and provides lateral stability.

In the case of long buildings with multiple bays bracing of just one bay might not be adequate to provide the required stability against lateral forces.

Legislative Requirements

Sections 21, 22 and 23 of the Occupational Health and Safety Act 2004, which is principal safety Legislation stipulates duties of care of employers to ensure that no person is exposed any risk that can affect their health and safety.

The Act and all associated regulations are available from Information Victoria 133 366 356 or online at www.bookshop.vic.gov.au.

Further Information

WorkSafe Alert: Masonry structures - Instability leads to collapse

WorkSafe Alert: Housing construction - Hazards of unsafe roofing supports

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