

# TOP-DOWN BUILDING CONSTRUCTION DESIGN



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Experienced with the conventional use of the Top-Down technique in projects such as the service tunnel linking the Duxton Hotel and the Perth Concert Hall, Airey Taylor Consulting developed the use of this specific construction technique for general use in the building industry in Western Australia. Top-Down has vastly improved the speed of project delivery to the client, offers dramatic Capital cost improvements while providing excellence of finish to the build, enhancing and reducing resource usage, improving cost and reducing pollution.

The principle of Top-Down construction is to install the vertical load-bearing elements and the retaining system using piles and retaining walls constructed from the natural ground level prior to excavating. A cast in-situ lid (the future suspended ground floor) is then constructed covering the area to be excavated. This is followed by excavating under the lid to the required depth, while simultaneously construction of the superstructure proceeds, hence the name.

Top-Down construction for buildings permits the construction of upper floor levels simultaneously with excavating under the ground-floor slab and casting the basement floors below. Essentially, Top-Down construction dispenses with the requirement to excavate a below-ground pit prior to construction commencement, enabling use of the site from day 1 for deliveries. It greatly reduces the damage to adjoining buildings that is associated with soil movement and eliminates the need for sheet piling.

There are a number of detailed steps that are taken as part of this process. These steps include;

#### Step 1:

Cast in-situ piles which double as basement columns and peripheral retaining to form below-ground columns and walls. Airey Taylor has refined this system to achieve a high quality finish and plumb columns.

#### Step 2:

Ground Floor slab is cast atop the piles and perimeter walls.

#### Step 3:

Start of above ground construction;

#### Step 4:

After concrete slab have reached certain strength, excavation under the Ground Floor slab commences.

This process can be repeated if several basement levels are required. The technique is valid for a theoretically unlimited height building.

St. Quentin's Apartments at 40 St. Quentin's Ave., Claremont, is a prime example of the efficiency that can be achieved using the Top-Down Construction technique. The development comprised a basement, ground floor and four upper floors which accommodated 12 luxury apartments, 20 commercial and retail units, 176 car parking bays, a boardroom, swimming pool and gymnasium. Located on a restricted plot size in a busy commercial / residential area, and confined by major arterial roads, the design had to address a number of challenges including:

- a) Extensive dust control;
- b) The need for a rigid retaining system to support the roads and adjoining fragile buildings;
- c) Truck access restricted to outside business hours;
- d) High noise restriction beyond business hours.



St. Quentin's Claremont



*St. Quentin's Claremont - The site was confined by major roads.*

Comparative studies by Dick Kalagow of Top-Down with conventional construction for St. Quentin's identified a potential saving on project construction of five months (most of which was realised).

Airey Taylor Consulting utilised similar elements in design and construction of the structure of the multi award winning State Theatre Centre of Western Australia (STCWA). Recognition in 2011 included the Western Australian Master Builders Association (Best Government

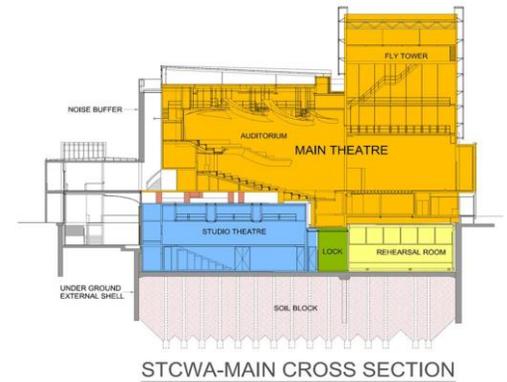
Metro Building) and Engineers Australia as best Small Project. The project won Airey Taylor the top award for Australia in the 2011 Australian Engineering Excellence Awards for redefining structural innovation.

The STCWA was a highly complex engineering exercise, significantly more so than St Quentin's. There were a lot of similarities though – limited site area to work with, a very busy road junction on the north side of the horseshoe bridge in Northbridge, noise issue from traffic (road and rail in this case) and a requirement to design the property with a vertical component due to these limitations.

STCWA had significant extra complexities. A sizeable part of the building had to be submerged – up to 8 metres below the water table, due to height limitations in the area. There were a number of adjacent fragile heritage buildings. By use of a Top-Down variant zero damage was done to these buildings.



*Like St. Quentin's The STCWA located in the CBD was confined by major roads.*



Top-Down Construction is being used for the Cockburn Gateway Shopping Centre Stage 3. The original systems used in Stages 1 & 2 (designed by others) proved cost prohibitive and the Owners were not prepared to proceed with Stage 3 unless a more cost effective building solution could be found. Our team utilised Top Down Construction which resulted in a saving of \$33 million with the project cost reduced from \$112 million to \$79 million., as well as a huge 5 month time saving on delivery of the project. The design/construct proposal was fully validated by Quantity Surveyors and the project is now (2013) under construction

Whilst our innovative adaption of Top-Down to the West Australian market is new, Top-Down is a proven construction method which has been adopted for some iconic projects where time factor is of primary importance. Iconic projects such as the luxurious Hilton Hotel Residences on the Gold Coast, the Indo China Plaza and the Shanghai Tower, which upon its completion in 2014 will stand approximately 632 meters (2,073 ft) high and will have 121 stories making it the tallest in the world have all been constructed utilising the Top-Down Method.

We are presently commissioned to design a number of Top-Down Structures they are;

- a. An office building in Applecross with one basement, ground and three levels of offices.
- b. 500 Hay Street, Subiaco Development for Dradgin Pty Ltd comprising three basements of car parking, a ground floor podium level, six levels of Offices in one tower and nine levels of Hotel with theatres under in a second tower.
- c. Claremont Football Club redevelopment and associated two levels of basement car parking for the Public Transport Authority.

Please contact us to learn more about top down construction or inquire about our services



Hilton Residences



## Benefits of Top-Down Construction

- Dramatic savings in Capital Cost.
- Savings in construction time, yielding holding cost reductions.
- Dust levels kept to a minimum.
- Much reduced volume of concrete used, realising cost and carbon output savings.
- Minimum amount of traffic disruption to surrounding roads.
- Ideal for excavation projects where tieback installation is not feasible and where soil movement must be minimised.
- Very wide applicability to buildings with basements.

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