**** UP Building and Construction Pty Ltd

“Building dreams from the ground UP”

ABN 123 456 789

**UP Building and Construction: Best Practices**

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1. Lean Construction Practice

UP Building and Construction aims to use only resources that the organisation needs during its projects. Lean construction practice involves, among other things, removing or minimising processes that only add cost to finishing a project and retaining or improving on processes that add value to a project.

UP Building and Construction follows these principles of lean construction practice:

1. What is valuable in the customer’s perspective is specified by maintaining constant and open communication with the customers.

2. Processes that will ensure value are identified and integrated into projects through careful scrutiny of processes in construction.

3. Only materials and components that are needed are procured and made when they are needed by creating detailed project plans and adhering to said plans.

4. Continuous improvement is always sought to attain perfection by constantly checking for opportunities for workers to improve their skills through training and education.

2. Sustainable Construction

The aim of sustainable construction is not only to reduce the organisation’s effect on the environment but also to ensure that the future projects of the organisation are secured by current practices.

Sustainable practice focuses on:

1. Earning the most profit that will help the organisation gain recognition.
2. Constructing buildings that provide greater satisfaction and ensure the well-being of its users.
3. Constructing energy-efficient buildings by utilising renewable energy.
4. Treating employees of the organisation with respect and fairness, which includes taking into account health and safety factors.
5. Protecting the environment from harmful effects of construction.
6. Reducing waste and pollution during construction.

3. Complex Designed Buildings

All construction aims to adopt the best practice procedures to ensure a successful outcome to a construction project.

Depending on the type of the building, the site conditions, the cost of materials, the labour available and numerous other factors, the best practice procedures may need to change from project to project.

Complex designed buildings are often built for a purpose, such as a boarding house, to provide accommodation for school students. These buildings are generally purpose-designed and have a lot of input from the client.

The following is a step-by-step guide detailing the processes that normally take place to construct a complex design building:

**Step 1: Consult with relevant stakeholders and construction trades**

More than likely, the client will have a particular building design in mind or at least a problem that the building can solve.

When a complicated building design is proposed, it is important to engage architects and engineers early in the process. What a client imagines can be difficult to pull together in reality and, having architects and engineers in discussions early ensures the proposal is practical and possible.

It is important to listen to the clients’ requirements and make suggestions to assist them through the design process and ensure they end up with a building design that will suit their needs. This part of the process is about helping you gain an informed and clear picture of what the client wants.

Important questions to ask the client are:

* What will you use the building for? (This will be important in working out the class of the building)
* What are the dimensions of any machinery or equipment that will be needed?
* What size building do you think you will need?
* Do you have a specific cladding type in mind?
* What doors or openings do you need to access the building?
* Are there any existing buildings that you like the look of that we can use as a guide?

**Step 2: Survey the site**

This stage determines the condition of the building site. This will help determine the final design and construction of the building.

During this stage, you will need to consider:

* The slope of the site
* The type of soil. Is it rocky or sandy? Is there black dirt or red dirt?
* Will the building fit on the block?
* Are there any local building restrictions?
* What is the boundary easement on the property?
* What is the council zoning? Can you actually build what you want on the block?

**Step 3: Design and plan the building**

Through this stage, the design and plan for the proposed dwelling are developed. This step will involve the input from various people, including the client and other trades, to determine how the construction will be completed.

By the end of this stage, a proposed design will be determined.

**Step 4: Conduct site tests**

In conjunction with the final design, quote, and drawings, you will need to carry out various sites tests that will be provided to the engineers to ensure the design of the building meets the relevant requirements of the NCC.

A soil test will determine the properties of the soil on the site. It will include the compaction rates and reactivity (whether the ground contracts and expands considerably). The soil test will determine what is needed regarding the building’s foundation and footings. This can include how deep the foundations should be and if long piers are needed.

Other inspections like ensuring there are no underground services in the planned building location should be carried out. Having to move an underground service will add extra cost to the construction and needs to be addressed at this stage.

**Step 5: Organise engineering certification**

Once a design has been established, an engineer will normally be used to provide a certification for the design.

The engineer will evaluate your design and the future site of the building. They will take into consideration:

* Wind Ratings
* Terrain Categories
* Snow Loadings
* Soil Tests
* What is the class of the building? For example, if it is a commercial workshop or shopping centre, it will have different requirements than a farm shed on a remote rural property.
* During this stage, the engineer will give further feedback and recommendations. These need to be incorporated into the design, which will then go back for stakeholder consultation.

These plans and certificates can then be submitted as part of the building application.

**Step 6: Develop plans and specifications**

The process of further developing plans and specifications for council approval can start to take place, what is commonly referred to as a set of working plans and specifications

These plans and specifications will go through a process of development and require further client engagement to ensure they are happy with the proposed design. It is important at this stage to ensure the client fully understands the plans and what the end project will look like.

Once these plans and specifications have been established, council approvals have been received, and trades are engaged to start quoting works, the design will be relatively fixed. Any changes past this point will start to increase costs and risks that will push timelines out.

**Step 7: Organise building permits and council approvals**

Every council has its regulations and restrictions regarding building design and development.

The council approval step will go through various stages include design approvals and checking whether your finished development complies with the NCC requirements. This can be completed by the council planning staff, or alternatively, you can engage a private building certifier.

It is important to be prepared through this stage. It can often involve a lot of back and forth.

Some best practice approaches to assist through this process are as follows:

* Meet with the council planner prior to submitting your application so you can find out what your local council needs. Every council is different.
* Get together all required paperwork, including drawings and engineers sign-off
* Take your application and supporting documents to the council.
* Go through the back-and-forth process. The council will often request more information and details.
* When all questions are resolved, the council will issue a building permit.
* You can now continue with the development of the building.

**Step 8: Organise the fabrication of building components**

Depending on the type of building, there are various construction methods used. There are a number of components that are fabricated away from the site and transported in for installation. In complex buildings, it is important accurate and clear specifications are provided to different trades during this process as one mistake can have a significant knock-along effect in the construction process.

Components commonly made of the construction that may be developed through this process and may include the following:

* Windows
* Doors
* Flashings.

Compared to a wide span construction, a lot of the work needed takes place on site and working with other trades to ensure the construction goes smoothly is essential.

This process does take time, and delays often have a knock-along effect though the whole project. Hence the importance of keeping to timelines.

**Step 9: Undertake site works**

If the building is being installed on a concrete slab, it is usually necessary to ensure the site is flat and level. Trees and plants will need to be removed, and excess dirt will need to be removed or compacted to allow for this.

Any underground works are usually completed at this stage. Plumbing drainage and electrical installations are best completed at this stage to remove the need for excavation around structures that are being built, basically making these installation tasks more difficult

Other points to consider at this stage are:

* Planning on how the site will be accessed.
* How the site is identified easily for trades and suppliers to find
* A lay down area, basically where suppliers can drop materials for the build
* Where a site hut will be located
* How will electricity be provided for the construction work?

**Step 10: Organise material delivery**

As components required for the construction are fabricated, they will need to be transported to the site as they are required. It is important to ensure components are delivered to the site when they are required, but also before they are needed to ensure trades are not waiting for materials to arrive, which will delay the construction process

There may also be a need to unload trucks as they arrive. This is something that should be checked with the supplier before they arrive at the site. You may need to organise a forklift or similar.

Other points to consider to make delivery as smooth as possible:

* Make sure there is side access for a machine to access the truck.
* Ensure the ground is not soft or washed out due to heavy rain.
* Have someone there to unload your shed when the truck arrives.
* Have room for the shed once it is unloaded.
* Be available to answer your phone on the day just in case the delivery driver needs directions to your site.
* Check your machine can lift the load off the truck. If you plan to use your own machinery to unload, check that it can lift at least 1 tonne. Notify us of your machines lift capacity, and we will let you know if it is capable of unloading the truck.

**Step 11: Build foundations**

Foundations are essential in the construction of any building.

The foundation designs will be included in the final drawings based on the site conditions. The engineer will give specifications based on tests taken at the site during the site inspection, including the soil tests.

Concrete slabs can be constructed using various techniques and depend on various factors. These may incorporate a pier (often a round, deep pier) or a pad foot (a square flatter footing). Complex buildings, depending on the size and floors in the design, may be very intricate, with deep piers required to ensure the stability of the structure.

An excavator will normally be required to excavate footings depending on the type of slab to be installed. Ensure the underground services are below where these footings are required to reduce the chance of damage to services and costly repairs being needed.

**Step 12: Lock up**

Depending on the type of structure, the following will take place during a typical installation up to lock up stage:

* Mark out the site.
* Erect framing as required the frame may be either timber or steel depending on the design
* Stand the walls
* Install the roof structure
* Clad the building as per the design
* Install roof, external doors and windows.

Lock up stage is basically considered the stage where the building can be secured, and people can work internally without being affected by the weather.

**Step 13: Install internal structure**

The wall frames are erected during the initial standing of the frame in a complex building design. This is due to the need for some walls to be load-bearing, and this is one of the major differences to wide span buildings where the only load-bearing walls are often the external walls.

**Step 14: Services rough in**

The term 'rough in' describes the installation of a building's plumbing and electrical services in wall cavities before the walls are lined with plasterboard.

Depending on the design of the building, other trades will commence works internally. This may include the following:

* Plumbers will run water and gas pipes as required to feed fixtures specified in the plans and specifications for the building.
* Electricians will install electrical systems to feed appliances as required.
* Note: In most jurisdictions, plumbing and electrical systems may need to be inspected by regulating bodies before internal cladding is installed.
* HVAC installers will install pipes and ducting as required to ensure air conditioning systems can be installed.
* AV installers may be required to install AV systems, for example, antennas.
* Carpenters will usually install internal doors at this stage.

**Step 15: Internal fit out**

The interior fit out includes the installation of all of the fittings and fixtures, built-in appliances, painting and decorative touches. It may also include the plastering and interior linings if they haven't already been installed by this stage.

* Insulation is installed to ensure the building meets the relevant NCC requirements; this will be largely dependent on the class of building being constructed
* Internal cladding and ceiling are installed. This may be plasterboard or other, depending on the building design. There may be no internal cladding or ceiling if the building is a shed, for example.
* Waterproofing of wet areas and tiling is undertaken. It is common for a waterproofer and tiler to work together or for a tradesman to complete both tasks as there is a risk of leaving a waterproofing membrane exposed to traffic from other trades.
* The building is painted. It is common for a painter to come and complete both internal and external painting at the same time.
* Flooring is installed. This may be tiled, carpet, floorboard or other, depending on the design of the building
* Cabinets and benchtops are installed.

**Step 16: Fit off**

The fit off involves the finishing works, where various trades return to the site to complete the installations they commenced way back in the process during the site works.

In summary, these are as follows:

* Plumbers fit off the different plumbing fixtures for the building and connect to the drainage already installed during the site works.
* Electricians fit off the various power points, light switches, lights and so on as per the building design
* HVAC systems are installed and connected to the ducting and pipework installed during the rough-in stage
* AV installer connects outlets and installs AV equipment as specified.
* Carpenters will install and internal door hardware at this stage.
* Shower screens and mirrors are installed.

**Step 17: Conduct compliance checks**

Something that will take place at different times through the construction is to check the building is being constructed as per the NCC specifications.

Undertaking inspections during the different stages of the construction provides the opportunity to identify issues and resolve them at that point, opposed to identifying issues at the end of the construction and having to back step through various stages to resolve the issue.

For example, a fault in the waterproofing membrane can be resolved relatively easily during the internal fit-out stage. However, if the fault is not picked up until the installation is completed, the fault is very expensive to fix as it will often require extensive demolition to repair and put back together again.

**Step 18: Complete cleaning and handover with client**

The building and site, in general, are cleaned. This is an important aspect of the job and always contributes towards a successful handover with the client.

All associated compliance certificates, manufacturer’s instructions and warranties received from various trades need to be handed over during this stage. Again, ensuring this is organised and provided in a structured manner contributes towards a successful handover.

4. Wide Span Buildings

All construction aims to adopt the best practice procedures to ensure a successful outcome to a construction project.

Depending on the type of the building, the site conditions, the cost of materials, the labour available and numerous other factors, the best practice procedures may need to change from project to project.

For example, wide span buildings are useful for situations when wide, uninterrupted space is required for industrial and commercial purposes. A good example is a factory floor. Walls and pillars may get in the way. Having a clear space provides for machines and production processes to change easily without having to reconfigure the building.

The following is a step-by-step guide detailing the processes that take place to construct a wide span building:

**Step 1: Consult with relevant stakeholders and construction trades**

More than likely, the client will have a particular building design in mind or at least a problem that the building can solve.

It is important to listen to the clients’ requirements and make suggestions to assist them through the design process and ensure they end up with a building design that will suit their needs. This part of the process is about helping you gain an informed and clear picture of what the client wants.

Important questions to ask the client are:

• What will the building be used for? (This will be important in working out the class of the building.)

• What are the dimensions of any machinery or equipment that will be needed?

• What size building do you think you will need?

• Do you have a specific cladding type in mind?

• What doors or openings do you need to access the building?

• Are there any existing buildings that you like the look of that we can use as a guide?

**Step 2: Survey the site**

This stage determines the condition of the building site. This will help determine the final design and construction of the building.

During this stage, you will need to consider:

• The slope of the site

• The type of soil. Is it rocky or sandy? Is there black dirt or red dirt?

• Will the building fit on the block?

• Are there any local building restrictions?

• What is the boundary easement on the property?

• What is the council zoning? Can you actually build what you want on the block?

**Step 3: Design and plan the building**

Through this stage, the design and plan for the proposed dwelling are developed. This step will involve the input from various people, including the client and other trades, to determine how the construction will be completed.

This is an excellent opportunity to look at options such as insulation, ventilation, internal fit-outs, and electrical/AV/HVAC/plumbing that may be required to suit the client’s needs as well as the various other requirements that may be required due to the class of the building and the requirements of the NCC.

By the end of this stage, a design will be determined.

**Step 4: Conduct site tests**

In conjunction with the final design, quote, and drawings, you will need to carry out various sites tests that will be provided to the engineers to ensure the design of the building meets the relevant requirements of the NCC

A soil test will determine the properties of the soil on the site. It will include the compaction rates and reactivity (whether the ground contracts and expands considerably). The soil test will determine what is needed regarding the buildings’ foundation and footings. This can include how deep the foundations should be and if long piers are needed.

Other inspections like ensuring there are no underground services in the planned building location should be carried out. Having to move an underground service will add extra cost to the construction and needs to be addressed at this stage.

**Step 5: Organise engineering certification**

Once a design has been established, an engineer will normally be used to provide a certification for the design.

The engineer will evaluate your design and the future site of the building. They will take into consideration:

• Wind Ratings

• Terrain Categories

• Snow Loadings

• Soil Tests

• What the class of the building is. For example, if it is a commercial workshop or shopping centre, it will have different requirements than a farm shed on a remote rural property.

• During this stage, the engineer will give further feedback and recommendations. These need to be incorporated into the design, which will then go back for stakeholder consultation.

These plans and certificates can then be submitted as part of the building application.

**Step 6: Develop plans and specifications**

The process of further developing plans and speciation’s for council approval can start to take place, what is commonly referred to as a set of working plans and specifications

These plans and specifications will go through a process of development and require further client engagement to ensure they are happy with the proposed design. It is important at this stage to ensure the client fully understands the plans and what the end project will look like.

Once these plans and specifications have been established, council approvals have been received, and trades are engaged to start quoting works, the design will be relatively fixed. Any changes past this point will start to increase costs and risks that are pushing timelines out.

**Step 7: Organise building permits and council approvals**

Every council has its regulations and restrictions regarding building design and development.

The council approval step will go through various stages include design approvals and checking whether your finished development complies with the NCC requirements. This can be completed by the council planning staff, or alternatively, you can engage a private building certifier.

It is important to be prepared through this stage. It can often involve a lot of back and forth.

Some best practice approaches to assist through this process are as follows:

• Meet with the council planner prior to submitting your application so you can find out what your local council needs. Every council is different.

• Get together all required paperwork, including drawings and engineers sign-off

• Take your application and supporting documents to the council.

• Go through the back-and-forth process. The council will often request more information and details.

• When all questions are resolved, the council will issue a building permit.

• You can now continue on with the development of the building.

**Step 8: Organise the fabrication of building components**

Depending on the type of wide span building, there are various construction methods used. A cost and time-saving step is to fabricate components for the construction off-site and then have them installed.

A good example of this is a building constructed from concrete tilt panels. The panels are constructed away from the building site, transported to the site and then installed. There are various components of the construction that may be developed through this process and may include the following:

• Structural Members

• Purlins

• Cladding

• Windows

• Doors

• Flashings.

This process does take time and, depending on the building schedule, may commence at various times. For example, the windows may not be fabricated until further along in the construction process. This will save them from being stored either at the site or at the manufacturer’s site.

**Step 9: Undertake site works**

If the building is being installed on a concrete slab, it is usually necessary to ensure the site is flat and level. Trees and plants will need to be removed, and excess dirt will need to be removed or compacted to allow for this.

Any underground works are usually completed at this stage. Plumbing drainage and electrical installations are best completed at this stage to remove the need for excavation around structures that are being built, basically making these installation tasks more difficult.

Other points to consider at this stage are:

• Planning on how the site will be accessed

• How the site is identified easily for trades and suppliers to find

• A lay down area, basically where suppliers can drop materials for the build

• Where a site hut will be located

• How electricity will be provided for the construction work.

**Step 10: Organise material delivery**

As components required for the construction are fabricated, they will need to be transported to the site as they are required. It is important to ensure components are delivered to the site when they are required, but also before they are needed to ensure trades are not waiting for materials to arrive, which will delay the construction process

There may also be a need to unload trucks as they arrive. This is something that should be checked with the supplier before they arrive at the site. You may need to organise a forklift or similar.

Other points to consider to make delivery as smooth as possible:

• Make sure there is side access for a machine to access the truck.

• Ensure the ground is not soft or washed out due to heavy rain.

• Have someone there to unload your shed when the truck arrives.

• Have room for the shed once it is unloaded.

• Be available to answer your phone on the day just in case the delivery driver needs directions to your site.

• Check your machine can lift the load off the truck. If you plan to use your own machinery to unload, check that it can lift at least 1 tonne. Notify the company of your machine’s lift capacity, and they will let you know if it is capable of unloading the truck.

**Step 11: Build foundations**

Foundations are essential in the construction of any building.

The foundation designs will be included in the final drawings based on the site conditions. The engineer will give speciation’s based on tests taken at the site during the site inspection, including the soil tests.

Concrete slabs can be constructed using various techniques and depend on various factors. These may incorporate a pier (often a round, deep pier) or a pad foot (a square flatter footing).

An excavator will normally be required to excavate footings depending on the type of slab to be installed. Ensure the underground services are below where these footings are required to reduce the chance of damage to services and costly repairs being needed.

**Step 12: Lock up**

As mentioned previously, it is typical for a wide span building to have various components constructed off-site. This being the case, the installation can often take place quite quickly when on site, compared to a typical structure. For example, a 4-bedroom house of brick veneer construction will need a team of bricklayers for around a week to complete the external cladding. Whereas a 40 x 40-meter factory may also be finished in a week because it has used concrete tilt panels as opposed to bricks, a lot quicker to install.

Depending on the type of structure, the following will take place during a typical installation up to lock up stage.

• Mark out the site.

• Erect framing as required

• Stand the structure.

• Clad the building

• Install roof, external doors and windows.

Lock up stage is basically considered the stage where the building can be secured, and people can work internally without being affected by the weather.

**Step 13: Internal structure installation**

Construction of internal walls takes place to make different areas. This may be offices or toilet facilities

This process is quite simple and does not usually require any engineering around loads as the wide span structure is already in place. One of the advantages of a wide span building is the ability to change the internal layout relatively easily in comparison with a more typical complex building design.

**Step 14: Services rough in**

The term 'rough in' describes the installation of a building's plumbing and electrical services in wall cavities before the walls are lined with plasterboard.

Depending on the design of the building, other trades will commence works internally. This may include the following:

• Plumbers will run water and gas pipes as required to feed fixtures specified in the plans and specifications for the building.

• Electricians will install electrical systems to feed appliances as required.

• Note: In most jurisdictions, plumbing and electrical systems may need to be inspected by regulating bodies before internal cladding is installed.

• HVAC installers will install pipes and ducting as required to ensure air conditioning systems can be installed.

• AV installers may be required to install AV systems, for example, antennas.

• Carpenters will usually install internal doors at this stage.

**Step 15: Internal fit out**

The interior fit out includes the installation of all of the fittings and fixtures, built-in appliances, painting and decorative touches. It may also include the plastering and interior linings if they haven't already been installed by this stage.

• Insulation is installed to ensure the building meets the relevant NCC requirements; this will be largely dependent on the class of building being constructed

• Internal cladding and ceiling are installed. This may be plasterboard or other, depending on the building design. There may be no internal cladding or ceilings if the building is a shed, for example.

• Waterproofing of wet areas and tiling is undertaken. It is common for a waterproofer and tiler to work together or for a tradesman to complete both tasks as there is a risk of leaving a waterproofing membrane exposed to traffic from other trades.

• The building is painted; it is common for a painter to come and complete both internal and external painting at the same time.

• Flooring is installed. This may be tiled, carpet, floorboard or other, depending on the design of the building.

• Cabinets and benchtops are installed.

**Step 16: Fit off**

The fit off involves the finishing works, where various trades return to the site to complete the installations they commenced way back in the process during the site works.

In summary, these are as follows:

• Plumbers fit off the different plumbing fixtures for the building and connect to the drainage already installed during the site works.

• Electricians fit off the various power points, light switches, lights and so on as per the building design.

• HVAC systems are installed and connected to the ducting and pipework installed during the rough-in stage

• AV installer connects outlets and installs AV equipment as specified.

• Carpenters will install and internal door hardware at this stage.

• Shower screens and mirrors are installed.

**Step 17: Conduct compliance checks**

Something that will take place at different times through the construction is to check the building is being constructed as per the NCC specifications.

Undertaking inspections during the different stages of the construction provides the opportunity to identify issues and resolve them at that point, opposed to identifying issues at the end of the construction and having to back step through various stages to resolve the issue.

For example, a fault in the waterproofing membrane can be resolved relatively easily during the internal fit out stage. However, if the fault is not picked up until the installation is completed, the fault is very expensive to fix as it will often require extensive demolition to repair and put back together again.

**Step 18: Complete cleaning and handover with client**

The building and site, in general, are cleaned. This is an important aspect of the job and always contributes towards a successful handover with the client

All associated compliance certificates, manufacturer’s instructions and warranties received from various trades need to be handed over during this stage. Again, ensuring this is organised and provided in a structured manner contributes towards a successful handover.