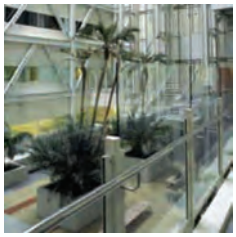
Design

Documentation Guidelines

NZ CONSTRUCTION INDUSTRY COUNCIL CIC

Design Documentation Guidelines

Preface

The New Zealand Construction Industry Council (NZCIC) is the peak industry body for the building and construction industry in New Zealand. It exists to provide a pan-industry perspective to central government on key issues affecting the majority of interests in the building industry.

The council was formally established in 2003 and emerged from an informal association of organisations that previously operated under the name of the Construction Liaison Group.

The council draws its membership from most of the major trade associations, professional institutes, training organisations, and research bodies that operate in the industry.

Issues of interest to the council include building legislation; training, education, licensing, and registration for building practitioners, the New Zealand Building Code; research and development, including that of standards; value-based procurement; industry sustainability; and issues associated with both urban design and structural design.

The council began development of these design documentation guidelines in 2002 following growing concerns about the impact (and limited understanding) of poor documentation on the building industry in New Zealand. These concerns have also been confirmed by studies undertaken in other countries. The guidelines have been the subject of wide industry consultation, as well as an international search on best practice. They have been comprehensively trialled by practitioners in a variety of disciplines to ensure their practical application.

The NZCIC is grateful for the considerable time and effort generously contributed by the individuals of the working party and their organisations.

The industry has an obligation to the clients who contract their services to ensure that they know what they have commissioned and what can be expected for the fees charged. Transparency and fair play are seen as important to the industry, especially in the tendering and procurement phases.

These design documentation guidelines are recommended for use in all building projects, and are an important component in the overall tendering and procurement process. They are part of a suite of guidelines and best practice for the industry as well as for client groups and decision makers. Suggestions for their improvement as a result of their use are always welcome.

New Zealand Construction Industry Council

Design Documentation Guidelines

Endorsement

"The BIA notes the development of the NZCIC guidelines and commends them to the attention of all concerned with activities leading to the construction of buildings. The guidelines will prove a useful reference guide, especially for those who seek to communicate the elements involved in the documentation of building designs. Comprehensive documentation and understanding of the roles of the various disciplines involved can only improve the chances that a building, when constructed, will comply with the New Zealand Building Code.

The quality of a building as built will depend not only on the quality of the documentation, but on whole chain of activities from initial planning to handover. Guidelines outlining each step in the design and documentation process will go a long way to effecting improvement in the end result. It must be remembered that the design and construction of a successful building requires the successful integration of a range of inputs in addition to good documentation. People with know-how, experience, and the ability to deal with situations, the management of risk, adequate financing and resources, and an appropriate concept are all essential ingredients."

New Zealand Building Industry Authority

Design Documentation Guidelines

Preamble

Introduction

The ultimate aim for all involved in designing and constructing buildings should be to enhance the quality of our built environment.

The design is one part of this process, and these guidelines will set a benchmark to which all parties involved in a project can refer. Careful identification of client brief and needs, together with advice by consultants to the clients on the most advantageous outcomes, are important ancillary functions that should be linked to these guidelines. The commentary below provides background on the development of the guidelines and outlines how the guidelines may be used.

The guidelines are intended as general checklists and benchmarks to define the design process for 'building' projects, as distinguished from civil works, industrial processes, and infrastructure projects. They are not intended to provide a definitive solution to the design process and should not be regarded as a replacement for detailed briefs, carefully developed in open consultation between client and service providers. They will need to be updated from time to time to reflect best industry practice.

The guidelines are intended to be tailored to the appropriate level of project complexity and service agreed with the client; the tick boxes can be used to define the service and directly relate it to the design process.

Background

The quality of design documentation is critical to the success of any building project.

Buildings today are very complex in all facets, including form, structure, services, and cladding. Building elements are much more tightly designed than in the past. This has resulted in a situation where 'standard' building details often do not apply to a large portion of a project.

The time frame for delivering projects has also reduced significantly in recent years. All stages of the programme have reduced, from the design phase through to the completion of the project, putting increased pressure on all players. Due to increased complexities, there are now more disciplines involved in the planning, design, and construction of buildings. Greater levels of expertise are required.

Design documents provide the critical ties between all parties in a building project. However, there has been a lack of definition of design documentation that all parties can rely on.

Who has created the guidelines?

The document has been drafted by a working party endorsed by the New Zealand Construction Industry Council (NZCIC) – formerly the Construction Liaison Group. The working party has consulted widely to ensure that the guidelines are workable and will benefit the entire building industry, especially with representatives from the following organisations (alphabetically):

- ACENZ (Association of Consulting Engineers of New Zealand)
- HERA (Heavy Engineering Research Association)
- IPENZ (Institution of Professional Engineers New Zealand)

- NZBSF (New Zealand Building Subcontractors Federation)
- NZIA (New Zealand Institute of Architects)
- NZIOB (New Zealand Institute of Building)
- NZIQS (New Zealand Institute of Quantity Surveyors)
- PCNZ (Property Council of New Zealand)
- PMI (Project Management Institute)
- RMBF (Registered Master Builders Federation)

The guidelines have been co-ordinated in process and terminology to be consistent for all participants in the building industry. The Guidelines have strong support from the professional bodies listed above, and there is a shared intent that the Guidelines become an industry wide best practice document.

What is the purpose of the guidelines?

The purpose of the Guidelines is to:

- define clearly design responsibilities from the outset and communicate these to all parties involved in the project;
- define the scope of design service with the client and communicate this to all parties to the design process;
- provide a 'level playing field' in achieving appropriate remuneration for the standard of design service required; and
- provide a quality assurance reference for users.

How are the guidelines used?

The guidelines outline the design process that all building projects go through irrespective of the procurement methodology or programme. The guidelines differentiate the design process and deliverables into the following five phases:

- concept design
- preliminary design
- developed design
- detailed design
- construction design

A brief description of each phase is provided at the end of this preamble.

Design is an evolutionary process, developing from a set of client driven objectives. Within each of the stages there can often be substantial changes. Ideally however, the fundamental elements of the previous stage should not be overturned.

These guidelines address the design process up to where there are design documents a contractor can directly 'build' from. As such, they do not cover the physical construction or commissioning phases of a project.

The guidelines can be used to define the responsibilities of the various parties throughout the design process (tick-boxes have been provided for easy definition of scope). The level of service provided by a 'designer' could be curtailed at any of the stages. The parties completing the design process will need to carry out the remaining steps in a co-ordinated manner to achieve an effective design.

The document has separate guidelines for the primary design disciplines of architecture, structure, HVAC services, fire protection, hydraulic services, fire engineering, electrical services, and electrical ancillary services. The input from other specialist 'designers', such as geotechnical, acoustic, vertical transportation, and wind consultants, will need to be effectively co-ordinated with the design team. Separate guidelines have not been created for these specialist consultants.

How important is co-ordination in the design process?

The thorough co-ordination of design documents between disciplines is considered to be the single most important issue confronting the industry. The guidelines emphasise the need for a relatively formal co-ordination of the information each discipline provides at the completion of each design phase.

To assist the design practitioner, sample co-ordination checklists have been put together. The sample co-ordination checklists have been developed on the basis of the architect having the primary role of design co-ordination, as this has traditionally been the case for most building projects. However, the role of primary design co-ordination may be undertaken by the principal consultant or any party commissioned to do so. It must be emphasised that all design disciplines have a responsibility for design co-ordination.

The sample co-ordination checklists are generic and are not exhaustive. Therefore design teams are encouraged to develop appropriate co-ordination checklists to suit the needs of each project.

Can the Guidelines be used to define the level of service required from design consultants?

The guidelines can be used to define the level of design services. However, the services provided by design consultants on building projects often extend beyond the design process. Design consultants' services may include management and administration tasks, for example, design management, preparation of conditions of contract, tender evaluation/negotiations, resource and building consent applications, and construction monitoring or observation. Therefore, the guidelines can only be used to define a part of the service provided by design consultants

What is the Impact of the procurement methodology on design documentation?

The input of the designers into the construction procurement methodology and construction is important in the quest for better buildings. Therefore, the appropriate design consultants should be involved in this process.

The determination of construction contract procurement and conditions of contract, methodology of pricing or tendering, and execution of those contracts should be defined at an early stage of the design process, so that the documentation can be arranged accordingly.

How do the guidelines relate to the management of the design process?

Design management may be undertaken by any of the design consultants: client, project manager, contractor, or specialist design manager. Because of the varied nature of how project teams are structured, the task of design management is not addressed in these guidelines. However, the following comments are provided:

- Design management may overlap with some of the design processes listed in the guidelines and include the direction of consultants, the chairing and minuting of regular project meetings, administration of the design delivery programme, and managing information flow to and from the client.

- Responsibility for the design management role needs to be confirmed and formalised at the start of the project and the scope of this role either included in the consultant's service or defined separately.

How do statutory body applications or contractual requirements co-ordinate with this document?

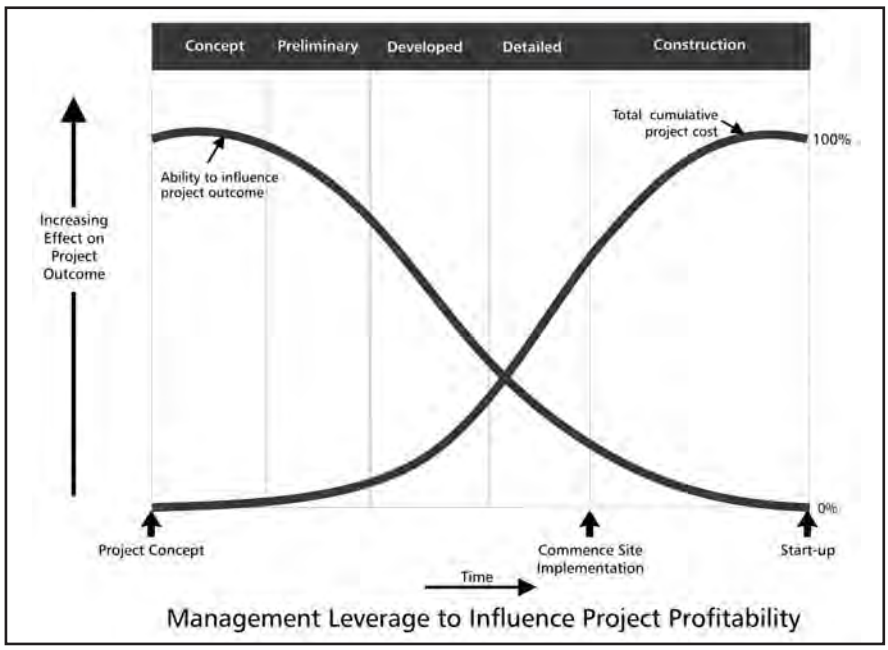
The level of design documentation required for resource consents, building consents, tenders, contract agreements, etc. varies widely between projects, and will need to be separately defined to suit a specific project programme. Therefore, the guidelines do not directly address these consent and contract matters. However, there are commentaries on these issues in the guidelines.

Who controls and sets out the building dimensions in the drawings?

A key to a successful project is good control and 'set-out' of building dimensions in the documentation. For building projects the architect generally has responsibility for dimensions. However, on some projects (often light industrial type or specialist buildings) the engineer acts as principal consultant, taking responsibility for dimensions. Therefore, in the concept design phase it is necessary to define who is responsible for dimensions. The dimensional control and 'set out' is only defined in the architectural guidelines to cover the majority of the projects. Therefore, on the projects where the engineer is responsible for dimensions, the relevant architectural tasks need to be copied over.

When should 'value management' design reviews take place in the design process?

'Value management' (VM) reviews at the appropriate stage(s) of the design process may assist in achieving successful projects. However, reviews undertaken too late can be ineffective and adversely impact on programme and costs. The sketch below graphically illustrates the opportunity of early reviews. Generally VM reviews should be carried out at the end of the concept and/or preliminary design stages, when the design has been co-ordinated between the design disciplines and there is a consistent basis for a cost estimate. The necessary revisions that are identified as part of the VM review can then be input to the start of the next design phase.



Management Leverage to Influence Project Profitability

Why include safety in design guidelines?

Considering safety upfront during the design process can have a positive impact on the safety of the construction process. Efficiencies can be gained through fewer injuries and less down time and through better communication and coordination, resulting in a more effective and efficient design and building programme.

Designers should aim to:

- identify the significant and unusual health and safety hazards relevant to the design, and consider how the building may be safely constructed and maintained;
- consider the risk from those hazards that may arise as a result of the design;
- if possible, alter the design to avoid the risk or, where this is not reasonably practicable, follow the remainder of the hierarchy of risk control process.

Designers should be aware of the hierarchy of risk control – eliminate, isolate, minimise – that underpins the modern approach to health and safety management.

The contractor is normally responsible for managing health and safety risks during the construction of a project.

Summary

Good design documentation is a critical key to successful projects. These guidelines provide a basis for defining the scope and responsibilities of the design team creating the documentation.

Design Documentation Guidelines –

Appendix

Description of the design phases:

i. **Concept design** generally involves the application of a design 'idea' to the practical provision of a facility. It represents a phase where sufficient design concepts are developed for the client to be able to establish the feasibility of the project, the development potential of a site, or to be able to select a particular conceptual approach that the client wishes to pursue. The concept design phase may be used to define or verify the brief and may often involve the testing of different approaches/options. During this phase, ideas (concepts) are developed through open interaction by the team of the key elements of the project.

   At the end of this phase, the basic building blocks of the project are defined in general terms and co-ordinated between the design disciplines.

   Concept and preliminary design phases are often combined on less complex projects.

ii. **Preliminary design** generally involves the further refinement of the preferred concept to facilitate testing it against inputs from the team, including cost estimates and regulatory approval. This may provide sufficient information for the communication of the design to a third party for marketing or consultation purposes.

   During this phase the project concepts are developed into firm schemes, where the relationship and sizes of spaces and facilities are defined and co-ordinated between the design disciplines. However, resolution of individual details that do not impact on the key elements is generally left for the next design phase. At the end of this phase, the project should be clearly defined.

iii. **Developed design** is the phase where the scope of each component in the design is clearly defined and co-ordinated. This may involve production of detailed information, including sketch details of all significant componentry and their interrelationships. The developed design phase is where the individual technical experts prepare the necessary documentation to define the scope of all building elements. Major input is required by all designers.

   The completion of the developed design is a critical point in a project. The scope of the project is fully defined. As a result, cost estimates can be prepared on an elemental basis. Developed design generally provides sufficient information for the client/user to clearly understand the aesthetics and functionality of the building, internal spaces, and facilities.

   On some projects the developed design documentation is issued for building consent and/or 'Guaranteed Maximum Price' (GMP) tender. Co-ordination between the design disciplines is therefore critically important at the end of this stage.

iv. **Detailed design** generally provides a level of documentation that clearly defines the design, specification and extent of all building elements. The design should be comprehensively co-ordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from. Changes to anything but detail at this stage are very disruptive and expensive and often result in further problems as, by now, the project has become very complex and it is hard to identify all the ramifications of changes. Detailed design is the phase most commonly used to obtain a tender for the construction of the works.

v. **Construction design** is where the requirements defined in detailed design documents are integrated with changes that may occur during the tender and contract process and with construction requirements such as site conditions, proprietary and performance design elements, erection requirements, and fabricated shop drawings to create drawings that can be directly 'built' from. (Note: shop drawings are produced during this stage.)

Design Documentation Guidelines | Architecture

Concept Design Phase

Design Process

Inputs:

- Client brief, including budget and time schedule. ❐
- Client advice in respect to structure of design process. ❐
- Data Collection including: ❐
  - topographical survey. ❐
  - existing structures and services. ❐
  - certificate of title. ❐
  - other legal Information. ❐
  - geotechnical information. ❐
  - as-built measure of existing structures where additions or alterations are involved. ❐
  - engineering reports on existing structures. ❐
  - district plan rules and objectives including any existing resource consent, LIM and PIM. ❐
  - other design constraints. ❐

Tasks:

- Attend regular design phase meetings with relevant parties. ❐
- Inspect site and prepare site analysis. ❐
- Prepare schedule of accommodation. Agree with client. Distribute. ❐
- Prepare document register. ❐
- Inspect the site and prepare site analysis diagrams. ❐

Deliverables

- Agreed design brief and schedule of accommodation. ❐
- Report on existing facilities and engineering systems if applicable. ❐
- Options studies report. ❐
- Conceptual drawings including: ❐
  - overall site plan. ❐
  - floor plans. ❐
  - elevations. ❐
  - sketches. ❐
  - sections (indicative sufficient to illustrate overall concept.). ❐
- Model. ❐
- Preliminary cost estimate (prepared by quantity surveyor). ❐
- Concept schedule of materials and finishes. ❐

Commentary

1. Confirm conditions of engagement at outset of commission.
2. Note that the preparation of brief is not part of architect's standard service.
3. Agree roles and responsibilities for all participants in building procurement process particularly responsibility for obtaining resource consents.
4. Agree with client the requirements and programme for client information and approvals.
5. Costing may be only on square metre rate basis – quantity surveyor should provide concept cost plan to accompany deliverables.
6. Concept and preliminary design phases may be combined.
7. The approved design may be submitted for a PIM at this stage to identify resource consent issues and to obtain existing conditions/services information.
8. Agree the scale of drawing deliverables for each phase according to project type.
9. Dimensioning and co-ordination is often the responsibility of the architect but this will vary with commission.
10. Advise client on the advantages in maintaining consultant advice at every stage, and the risks incurred where this is not commissioned.

Concept Design Phase continued

Design Process	Deliverables	Commentary
• Discuss and agree with client the additional separate or sub-consultants that are to be retained and by whom, i.e., geotechnical consultant, surveyor, planning consultant, civil, structural, fire, services and acoustic engineers; quantity surveyors, interior designer, landscape architect, specialised project management services, health and safety consultant, others. ❒ • Select and recommend to client appointment of other consultants or sub-consultants: confirm fees. ❒ • Identify responsibility for dimensional control. ❒ • Identify responsibility for design coordination. ❒ • Identify responsibility for design management. ❒ • Investigate district plan requirements, analyse, review with client. ❒ • Prepare formal/functional diagrams, develop viable options, review with client. ❒ • Analyse brief against design constraints. ❒ • Prepare concept design. ❒ • Study siting options and climatic influences; develop massing models; evaluate relationships to site context. ❒ • Test massing options against preferred functional arrangement and brief; review with client. Select model. ❒ • Evaluate provisional concepts for accommodation of systems with structural engineer and building services engineer. ❒		11. If a partial service is commissioned, confirm whether the deliverables for the commissioned phase are affected. 12. Confirm with the client whether design management services are included in the design commission, or whether another party will manage the design process. 13. It may be necessary to obtain from the services engineer a schedule of notional requirements. 14. Refer to separate co-ordination checklist documents.

Design Documentation Guidelines | Architecture

Concept Design Phase continued

Design Process	Deliverables	Commentary
• Evaluate provisional concepts for accommodation of parking and traffic requirements. ❒		
• Prepare architecture concept drawings. ❒		
• Prepare feasibility report. ❒		
• Prepare concept schedule of internal and external materials and finishes, confirm with client, distribute to quantity surveyor. ❒		
• Check disabled access requirements. ❒		
• Check concept against planning and survey requirements. ❒		
• Review concepts for significant health and safety risks relevant to the design. ❒		
• Review scheme with territorial authority planners. ❒		
• Liaise with quantity surveyor to prepare concept design cost estimate. ❒		
• Check concept design for conformity with fire and egress requirements. ❒		
• Establish provisional beam depths, duct crossovers, and floor-to-floor heights. ❒		
• Establish energy conservation design criteria. ❒		
• Prepare energy study. ❒		
• Determine if environmental studies are required if so, prepare and submit. ❒		
• Co-ordinate all design information between disciplines. ❒		

Design Documentation Guidelines | Architecture

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept design. ❒
- Approved concept cost plan. ❒
- Confirmed site topographical, geotech and legal surveys. ❒
- Confirmed district plan analysis and development rules. ❒
- Concept civil and structural engineering constraints. ❒
- Concept services engineering and infrastructural constraints. ❒
- Concept fire engineering. ❒
- Concept environmental studies. ❒
- Concept acoustic advice. ❒
- Project time schedule. ❒

Tasks:

- Attend regular design phase meetings with relevant parties. ❒
- Revise preliminary design brief from concept design including all up-to-date information; confirm with client. ❒
- Update document register. ❒
- Develop list of questions affecting Preliminary Design pertinent to each external discipline; circulate. ❒

Deliverables

Drawings:

- Overall site plan. ❒
- Floor plans. ❒
- Elevations. ❒
- Sections. ❒
- Sketches/perspectives exterior. ❒
- Sketches/perspectives interior. ❒
- Model(s). ❒
- Materials and finishes presentation. ❒
- Other defined marketing material. ❒

Specifications:

- Preliminary schedule of internal and external materials and finishes. ❒

Reports:

- Updated design brief, schedule of accommodation and project time schedule. ❒
- Schedule of areas (net and gross as applicable). ❒
- Design features (options) report (with recommended option to take to developed design). ❒

Commentary

1. Consultation with territorial authority is recommended on key aspects of the design that may be considered outside the 'Acceptable Solution' regime, and unusual/contentious issues.
2. Cost estimates at this stage generally cannot be on a full elemental basis, as secondary elements are not well defined, but ensure independent professional cost advice is provided to the client.
3. Contribution to value management sessions may be required.
4. Preliminary design may provide a level of documentation appropriate for a resource consent application for less complex projects.
5. It may be relevant to review structural engineer's preliminary report and effect on external façade systems, including deflections, seismic impact, and weathering implications.

Design Documentation Guidelines | Architecture

Preliminary Design Phase continued

Design Process	Deliverables	Commentary
• Review preliminary design for significant or unusual health and safety risks the design may present during construction and maintenance. ❒ • Prepare preliminary design work time schedule. ❒ • Review town planning analysis and implications. ❒ • Establish primary reference grids and dimensions ❒ • Evaluate provisional concepts for accommodation of structural systems with structural engineer. ❒ • Evaluate provisional concepts for accommodation of services systems with building services engineer. ❒ • Revise schedule of internal and external materials and finishes; evaluate lifecycle durability and maintenance implications; confirm with client and submit to quantity surveyor. ❒ • Confirm compliance with fire and egress requirements. ❒ • Confirm compliance with disabled access requirements. ❒ • Confirm compliance with sanitary facilities code. ❒ • Confirm compliance with development rules. ❒ • Confirm revisions; request updated cost plan from quantity surveyor. ❒ • Establish provisional lift shaft sizes, air duct sizes, raised floor requirements, plant room sizes/mechanical requirements, and egress requirements. ❒	• Outline of elements not covered in preliminary design. ❒ • Define assumed construction methodology governing design. ❒ • Highlight 'significant' or unusual buildability and health and safety issues. ❒ • Highlight 'special' project risks. ❒ • Report on façade options and weathering issues. ❒	

Preliminary Design Phase continued

Design Process	Deliverables	Commentary
• Prepare architectural preliminary design drawings. ❒ • Determine if specific town planning studies are required, prepare, and submit. ❒ • Review with town planner and territorial authority personnel for advice/comment. ❒ • Review design with client's marketing/real estate advisors, including plan for presentation materials. ❒ • Co-ordinate all design information between disciplines. ❒		

Design Documentation Guidelines | Architecture

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary design. ❒
- Client approval of preliminary cost plan. ❒
- Client approval of feasibility report. ❒
- Reviewed and revised preliminary design. ❒
- District plan analysis. ❒
- Preliminary civil/structural engineering. ❒
- Preliminary services engineering and infrastructural constraints. ❒
- Preliminary fire engineering. ❒
- Preliminary environmental studies. ❒
- Preliminary acoustic advice. ❒
- Preliminary drawing register. ❒
- Current project programme. ❒

Tasks:

- Attend regular design phase meetings with relevant parties. ❒
- Update developed design brief; confirm with client. Distribute. ❒
- Update document register. ❒
- Review each sub-consultant's and other consultant's schematics to architectural, verify match. ❒

Deliverables

Drawings:

- Overall site plan including parking/landscaping. ❒
- Floor plans (dimensioned). ❒
- Elevations (confirmed floor-to-floor heights); sections. ❒
- Sketches of critical and typical details. ❒
- Perspective. ❒
- Typical reflected ceiling plans. ❒

Specifications:

- Developed schedule of internal and external materials and finishes. ❒

Reports:

- Updated design brief, schedule of accommodation and project programme. ❒
- Revised schedule of areas (net and fross as applicable). ❒
- Updated design features (options) report (with recommended option to take to detailed design), including serviceability issues. ❒
- Outline of elements not covered in developed design. ❒
- Define assumed construction methodology governing design. ❒
- Highlight significant or unusual buildability and health and safety issues. ❒
- Highlight weathering/façade issues. ❒

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
2. Developed design generally provides the minimum level of documentation to clearly define the scope of all architectural elements.
3. Developed design generally provides the minimum level of documentation appropriate for a resource consent application for complex projects.
4. Refer to separate co-ordination checklist documents.

Developed Design Phase continued

Design Process	Deliverables	Commentary
• Verify that all questions from the preliminary design brief relating to engineering disciplines have been resolved. ❒ • Verify significant or unusual health and safety issues have been addressed in the design. ❒ • Confirm any revisions to preliminary cost plan. ❒ • Confirm primary reference grids datum, and dimensions. ❒ • Check preliminary internal and external finishes schedule; revise if necessary. Distribute. ❒ • Prepare architectural developed design drawings incorporating amendments into plans, elevations, and sections. Distribute. ❒ • Test structural design against other criteria; including impact on weathering systems, confirm/amend provisional structural system selection. ❒ • Confirm lift shaft dimensions, overrun and pit requirements, plant room sizes, sheave beam requirements, etc. ❒ • Confirm acceptability of access to fireman's lift and fire control panel. ❒ • Confirm final detail requirements for lifts and escalators. ❒ • Confirm typical floor beam depths, maximum duct depth requirements, floor-to-floor heights. ❒ • Prepare options complying with reflectance, heat gain/loss requirements, glass shading co-efficients; ventilation, energy conservation systems, solar shading systems, review with client and building services engineers. Select. ❒	• Highlight 'special' project risks. ❒ • Material/colour boards. ❒	

Developed Design Phase continued

Design Process	Deliverables	Commentary
• Test mechanical design against other criteria; confirm/amend provisional building services system selections. ❒		
• Confirm that sanitary fixture count meets statutory requirements. ❒		
• Establish location and provisional size of electrical sub-station, if required; consult power supply authority. ❒		
• Prepare/commission energy management study. ❒		
• Prepare computer floor options study. Review with client. ❒		
• Prepare options study for building maintenance unit; review with client. ❒		
• Verify exterior glazing design compatibility with structure and HVAC. ❒		
• Confirm ceiling module dimensions and advise. ❒		
• Confirm all service utility entry points, sizes, and requirements. ❒		
• Confirm fire rating requirements for all building elements. ❒		
• Confirm compliance with all development rules. ❒		
• Review all plans elevations and sections, prepare details of typical construction. ❒		
• Submit developed design to quantity surveyor for review of cost plan. ❒		
• Review and revise project programme. ❒		
• Co-ordinate all design information between disciplines. ❒		

Design Documentation Guidelines | Architecture

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed design. ❒
- Client approval of developed cost plan and feasibility analysis. ❒
- Reviewed district plan analysis. ❒
- Review and revise developed design. ❒
- Developed structural engineering. ❒
- Developed services engineering. ❒
- Developed fire engineering. ❒
- Developed environmental studies. ❒
- Developed acoustic advice. ❒
- Current project programme. ❒

Tasks:

- Attend regular design phase meetings with relevant parties. ❒
- Co-ordinate and check each sub-consultant and other consultants' design and drawings with the architectural drawings at regular intervals. ❒
- Update document register. ❒
- Confirm project drawing, CAD, website, and communication standards. ❒
- Consider buildability constraints and implications. ❒
- Highlight significant or unusual health and safety risks that were identified in the design process. ❒

Deliverables

Drawings:

- Full set of drawings as per drawing register including: ❒
- Site plan including datum, boundary definition and orientation associated earthworks, landscaping and carparking, inground and overhead services, drainage, and all statutory legal title information. ❒
- Key plans to building zoning. ❒
- Floor plans at each level. ❒
- Reflected ceiling plans at each level including coordinated lighting and services fixtures. ❒
- External elevations. ❒
- Interior elevations. ❒
- Cross sections and longitudinal sections. ❒
- Roof plan with falls, gutters, rainwater heads and downpipes. ❒
- Electrical/lighting outlet and switching plan. ❒
- Plumbing layout and schematics. ❒
- Construction details at all typical and atypical locations cross referenced to plans and sections. ❒
- Plans, sections of access stairs, ramps, balustrades, barriers and handrails, including plant access. ❒
- Interior fitout including wall elevations and joinery details. ❒

Commentary

1. It is important to understand the means by which a construction contract is to be procured as this will inevitably impact on the format of the documentation produced and the design quality of the construction achieved. It may also be advantageous to the achieved design quality to have input into the prospective contractors/tender list. Consequently, in the detailed design phase, or any phase in which it is intended to procure a tender, the design consultants may need to:
   - determine method of construction contract procurement.
   - determine form of conditions of construction contract .
   - prepare contract documents for client and contractor's signatures.
   - review and prepare documentation for tender with client, including insurance details, method of tender, bond, liquidated damages and tender protocols (where required).
   - review tenders for compliance with tender documents and respond to technical options offered.
2. Design of secondary architectural elements is sufficiently developed to consult the structural engineer on any specific design required.

Design Documentation Guidelines | Architecture

Detailed Design Phase continued

Design Process

- Confirm and respond to revisions to cost plan. ❒
- Review all plans elevations and sections, prepare details of typical and atypical construction. ❒
- Review tolerances established for all surfaces and materials, co-ordinate with specification. ❒
- Fully dimension all elements and datum. ❒
- Request list of 'Builders Work' items from other consultants, incorporate with architectural details. ❒
- Prepare architectural detailed design drawings. ❒
- Determine form of conditions of contract and incorporate into specification. ❒
- Prepare preliminaries and architecture trade sections to specification and co-ordinate trade sections with other sub-consultants or consultants. ❒
- Confirm finishes schedule against specification and schedule of monetary provisions. ❒
- Obtain client agreement on contingency sum allowances. ❒
- Co-ordinate all design information between disciplines as per separate co-ordination checklist. ❒
- Finalise glazing selection in consultation with building services engineer; confirm against requirements of authorities. ❒
- Review provisions for PABX with Telecom and client's real estate advisers. ❒
- Review and confirm security system provisions with client and building services engineer. ❒

Deliverables

Schedules:

- Schedule of internal and exterior finishes. ❒
- Schedule of internal and external opening joinery. ❒
- Schedule of hardware. ❒
- Schedule of sanitary fittings and tapware. ❒
- Schedule of joinery fittings. ❒
- Schedule of nett sums. ❒

Specifications:

- Building specification including preliminaries and all trade sections. ❒
- Performance specifications for any works involving constructor design. ❒

Contractor Procurement:

- Registration and short listing of contractors. ❒
- Conditions of tender, notices to tenderers and general conditions of contract. ❒
- Contract documents. ❒

Commentary

3. Where appropriate carry out discussion with a 'preferred' contractor on construction methodology.
4. Design may be sufficient to lodge for building consent part way through this process.
5. Detailed design generally provides a level of documentation that clearly defines all architectural elements. Design details should be co-ordinated with other disciplines. However, the documents produced in this phase may not be able to be directly built from.
6. Identify in the specification the significant or unusual health and safety risks that were identified in the design.
7. Refer to separate co-ordination checklist documents.

Detailed Design Phase continued

Design Process	Deliverables	Commentary
• Review and confirm communications and PA system provisions with client and building services engineer. ❒ • Review and confirm cleaning, refuse and waste paper removal system provisions with client and building services engineer ❒ • Confirm if energy management system is to be employed; establish brief. ❒ • Confirm details and compliance of thermal envelope including glazing with code requirements and/or mechanical design with relevant consultants. ❒ • Confirm expansion and control joint details with structural engineer; verify that precast panel design and jointing conforms to thermal and other movement criteria, review impact on weathering. ❒ • Confirm requirements with structural engineer for attaching of cladding systems to edge beams; check details, including fire rating and acoustic requirements. ❒ • Carry out architectural check on architectural drawings as per checklist. ❒ • Submit drawings to quantity surveyor for final adjustment of cost plan. ❒ • Analyse tenders and report recommendations to client. ❒ • Advise client of maintenance and durability responsibilities. ❒ • Obtain client approval and sign off for completed drawings and specification. ❒		

Design Documentation Guidelines | Architecture

Construction Design Phase

Design Process

Inputs:

- Client approval of detailed design incorporating changes resulting from contract agreement process. ❒
- Building consent issues register. ❒
- Construction programme and sequencing. ❒
- Contract documents defined in sufficient detail for sub-trades to produce fabrication documents. ❒
- Craneage or access restrictions defined. ❒

Tasks:

- Attend regular design phase meetings with relevant parties. ❒
- Update document register. ❒
- Prepare architectural construction design drawings incorporating changes agreed as a result of tender process and negotiations. ❒
- Site safety programme issued to all parties. ❒
- Issue shop drawings to consultants for review. ❒
- Coordinate interface between trades and receive, review and coordinate detailed 'shop drawings' for: ❒
  - windows/façade systems. ❒
  - pre-cast elements – wall and flow systems. ❒
  - pre-cut timber framing. ❒
  - steel shop drawings. ❒
  - proprietary items. ❒
  - other fabricated items. ❒

Deliverables

General:

- Review or supply of technical specifications for contractor designed items or alternative designs. ❒
- Revisions of drawings, details and specifications as required by contract agreement process. ❒
- Revisions of drawings, details and specifications as required by building consent process. ❒
- Revisions of drawings, details and specifications as required by construction process. ❒

Shop Drawings:

- Production of construction/fabrication/shop drawings for selected items. ❒
- Review of construction/fabrication/shop drawings for selected items. ❒

Commentary

1. Construction design is perceived as separate from construction phase observation/monitoring or contract administration services.
2. At conclusion of construction design, it should be possible to construct the works without further recourse to the design consultant for design information.
3. Construction phase services need to be defined in the engagement agreement.
4. Refer to separate co-ordination checklist documents.
5. The site safety management plan prepared by contractor should be circulated to all parties.
6. The supply of supplementary information as required during the construction process occurs in the construction phase.
7. Refer to the relevant discipline guidelines for engineering shop drawing requirements.

Construction Design Phase continued

Design Process	Deliverables	Commentary
• Prepare shop drawings for: ❒ – windows/façade systems. ❒ – pre-cast elements – wall and flow systems. ❒ – pre-cut timber framing. ❒ – as built drainage drawings. ❒ – steel shop drawings. ❒ – proprietary items. ❒ • Other fabricated items. ❒ • Co-ordinate the design with detailed shop drawings required by other disciplines: ❒ – HVAC – duct layout, plant selection and technical data. ❒ – hydraulics – schematics, duct layout, plant selection and technical data. ❒ – fire Protection. ❒ – electrical services including layouts and elevations of MSSB. ❒ – lift and escalators – confirmed shaft sizes, car platform sizes, car interiors, setout. ❒ – security systems. ❒ – schedules for sanitary fittings, hardware. ❒ • Review performance specifications. ❒		

Architect/Co-ordinating Consultant

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Verify that limits of existing and new work are clearly shown (additions and renovations only).		•	•	•	•	•	
Verify all structural elements and dimensions against structural drawings.					•	•	
Compare elevations to floor plans; check all features shown on both.			•	•	•	•	
Compare building sections to elevations and plans; check all features on both.			•	•	•	•	
Compare detail wall sections with building sections.				•	•	•	
Verify that all details referenced on plans , elevations and sections.				•	•	•	
Verify rough openings for doors and windows against schedule and structural.					•	•	
Verify movement joint locations and cross-check with structural engineer requirements.					•	•	
Compare Schedule of Finishes with ceiling and wall finish notes.			•	•	•	•	
Check lighting fixture layout against electrical plan and schedules.					•	•	
Check diffusers, grilles and registers against mechanical plans.					•	•	
Check vent locations against reflected ceiling plans and elevations.					•	•	
Verify door schedule data including sizes, types, frame conditions and fire ratings etc.					•	•	
Verify hardware and door furniture schedule against door schedule and specification.					•	•	
Compare door swings with electrical switch locations.					•	•	
Verify fire rated wall locations and details.				•	•	•	
Verify ratings of doors in fire rated walls.				•	•	•	
Check all dimensions				•	•	•	
Verify fit of cabinets and items of equipment.					•	•	
Verify that material descriptions are in specification and not on drawings.					•	•	
Verify data on room finish schedule against all other drawings; check room names and numbers, ceiling heights and finishes.					•	•	
Check detail of plan enlargements against small scale plans.				•	•	•	
Where plan of one floor is on more than one drawing, check match of all meeting lines.					•	•	
Check completed documents are adequate for building consent requirements of Territorial Authority.					•	•	
Verify with Client location of site access and extent of construction area.		•	•	•	•	•	
Check services risers are correct size required and vertically align plan to plan.				•	•	•	
Check structural element, lifts and stair wells vertically align plan to plan.				•	•	•	
Check ground levels and contour co-ordinate with information and are correctly shown on elevation and sections.		•	•	•	•	•	
Locate all in-ground services, power poles, footpaths, existing buildings and existing feature that need to be shown on site and floor plans.		•	•	•	•	•	
Check the acoustic requirements of building elements and indicate their required construction and scope.			•	•	•	•	
Check toilet areas comply with the NZ Building Code in numbers of fittings, disabled access requirements and service requirements.		•	•	•	•	•	
Check window and door sections are adequate or have sufficient strengthening required to take the design wind and seismic loads set by the engineer.				•	•	•	
Have the engineer review all hand rail, balustrade, veranda / balcony and canopy elements are of sufficient size and have adequate fixings to meet the required design loads.					•	•	
Provide references on plans to all sections, wall sections, external and internal elevations, stair and core larger stake drawings etc.			•	•	•	•	
Check stairs, ramps, handrails and egress ways comply with the NZ Building Code for surface slip resistance spread of flame, light levels and signage, general setout, safety from falling and disabled access requirements.			•	•	•	•	
Provide buildings setout datum and reduced levels to all floors, ceilings, parapets, lift towers and other design elements.			•	•	•	•	
Provide tile setout point for floors and walls.				•	•	•	
Check services trenches, penetrations, plinths, and nibs required are shown on floor plans and slab setout plans (if provided).				•	•	•	
Review all expansion and control joints required for slabs, blockwork, solid plaster, sheet products, and concrete products are shown on plans, elevations and sections.					•	•	
Review size and location of seismic joints required by the engineer, having them review the details produced.					•	•	
Ensure all openings have lintels reviewed by the engineer.					•	•	
Have the engineer review the bracing design.				•	•	•	
Review sufficient set-downs are provided to checks and terraces and to the adjacent ground to meet the requirements of the NZ Building Code and disabled persons access.				•	•	•	
Review access panels and hatches have been provided to services for maintenance as required by the services engineers.					•	•	
Ensure safety restraints and anchoring points are provided to roofs and external facades, have the engineer review their design.					•	•	
Confirm the size and fall of the gutters, downpipes and overflows with the hydraulics engineer.				•	•	•	
Is a lighting conductor required.				•	•	•	

Specifications

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Determine form of Conditions of Contract or obtain copy of Conditions of Contract				•	•	•	
Review project file and determine any Special Conditions				•	•		
Write Preliminaries section; check for compatibility with other parts of contract and other disciplines.					•	•	
Circulate CoC and Preliminaries to Client/Quantity Surveyor/Project Manager for review.					•		
Confirm whether Quantity Surveyor will provide Schedule of Quantities			•	•	•		
Provide outline specification of materials and finishes		•			•		
Review progress drawings and compile draft list of all specification sections and subsections required.				•	•		
Confirm specification sections titles.				•	•		
Confirm specification format and style.				•	•		
Obtain and co-ordinate architect's and engineer's specification sections, review and format.					•		
Request list of all 'builders work' items for all other consultants.					•		
Determine if any sections are likely to require performance specifications; if affirmative, agree on method of performance testing.				•	•		
Prepare draft list of Standards likely to be needed for reference; obtain those not in library.					•		
Provide specification data request list to co-ordinate with other team members.					•		
Confirm completion schedule for specification sections and related drawing groups					•		
Develop suggested list of alternatives with Client.					•		
Review drawings as completed, deleting proprietary names (Note: Generally the specification should reference proprietary names not the drawings).					•	•	
Confirm specification of any required staging of construction; check against preliminary construction schedule.					•	•	
Check Schedule of finishes, material and equipment against specification indexes; confirm all finishes, material and equipment are included.					•	•	
Confirm that final issue of drawings matches specified Schedule of Drawings exactly					•	•	
Verify all specification cross-referencing.					•	•	
Eliminate all references as 'by others'; determine and note responsible party.					•	•	
Check all specification references to drawings ("as indicated", "as shown") and verify they are so indicated, and that drawing references to specifications are covered					•	•	
Check major equipment listings against drawings.					•	•	
Confirm schedule of monetary provisions					•	•	
Obtain Client agreement on contingency sum allowances and authority for expenditure					•	•	

Structural Engineering Co-ordination

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Confirm that column coordinate numbering on structural matches architectural.				•	•	•	
Check set back lines and building location (to roof overhang lines, if so defined)					•	•	
Compare bottom of footing levels with water level.			•	•	•	•	
Verify that all footings are on undisturbed bearing or that areas of compaction are shown; check bottom of footing elevations.				•	•	•	
Check perimeter slab dimensions against architectural; check perimeter offset from grid line.					•	•	
Verify that all depressed or raised slabs and penetrations are shown.				•	•	•	
Verify all slab profiles; check architectural and civil					•	•	
Check dimensions of all grade beams and piers against architectural.				•	•	•	
Compare roof framing plan dimensions and coordinates against foundation plan coordinates.				•	•	•	
Check support/corrections to cladding and window systems.					•	•	
Check location of rooftop equipment supports against mechanical.					•	•	
Check location and sizes of all structural penetrations against building services.				•	•	•	
Check location of roof drains against hydraulics (for interior drains).				•	•	•	
Check location of roof drains against architectural (for external drains).				•	•	•	
Confirm that all columns and beams are listed in column and beam schedules.					•	•	
Confirm length of all columns in column schedule against architectural sections.					•	•	
Verify that all structural sections are referenced to plans and elevations.				•	•	•	
Verify that all details referenced on plans and sections have been drawn and fit the conditions.					•	•	
Verify all movement joint details and locations against architectural.					•	•	
Check that any details identified as 'typical' are in fact typical, with any major exceptions noted.				•	•	•	
Confirm that the final data on equipment weights and floor loadings match the brief and has been co-ordinated with other disciplines.				•	•	•	
Check for missing or incomplete drawing notes.					•	•	
Confirm that structural calculations have been submitted where required by authorities					•	•	
Confirm that any notes referenced as 'see other disciplines' have been covered by the other disciplines drawings.					•	•	

Fire Protection and Hydraulics Engineering Co-ordination

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Confirm size and location of all new utilities connections to existing services.			•	•	•	•	
Confirm that plumbing fixture, supply and drain locations match architectural.				•	•	•	
Confirm storm drainage locations and details against architectural.				•	•	•	
Check perimeter foundation drainage against architectural.					•	•	
Confirm supply size of any fixtures requiring special volume supply, such as hot tubs and large spas.				•	•	•	
Verify wall chases, recesses and ducts on architectural at vertical piping locations.				•	•	•	
Confirm that no wet piping is run in unheated spaces (freezing climate only)				•	•	•	
Confirm that all vents are shown on roof plan.					•	•	
Confirm that access panels are provided for all concealed valves.					•	•	
Confirm that materials descriptions are in specification and not on drawings.					•	•	
Confirm that all equipment items requiring electrical connections, such as pumps, whirlpool baths and drinking fountains are shown on electrical drawings.					•	•	
Confirm that all conditions of the Fire Brigade approval are met by the building and fire systems design.				•	•	•	
Confirm the sprinkler system design is in compliance with statutory requirements and insurer's requirements.				•	•	•	
Confirm the fire alarm system is in compliance with statutory requirements and insurer's requirements.				•	•	•	
Check all plumbing fixtures against fixture schedule.					•	•	
Check all plumbing fixtures against specification.					•	•	
Check all taps and fittings against fixture schedule.					•	•	
Check for missing or incomplete drawing notes.					•	•	
Check fire protection hydraulics specification against fire protection and hydraulics drawings.					•	•	
Confirm calculations for gutter sizes; check box gutters for overflows.				•	•	•	
Check coordination of sprinkler heads/detectors with lighting and mechanical air diffusers on reflected ceiling plans.					•	•	
Check that drain has been provided for the fire sprinkler control valve set					•	•	
Check that provision (drain or openable window) has been made for performance testing of hydraulically least favourable hydrant or hose reel.					•	•	

Mechanical Services Co-ordination

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Verify mechanical floor plans and space allocations against architectural.			•	•	•	•	
Confirm that adequate ceiling height clearances exist at intersections of largest ducts, including construction tolerances.			•	•	•	•	
Confirm ducts fit within clear height at raised floors.			•	•	•	•	
Check duct clearances at all deep beams and congested zones.			•	•	•	•	
Verify locations of structural supports at all items of mechanical equipment; compare with structural documentation.				•	•	•	
Verify that smoke and fire dampers are indicated where required.					•	•	
Check grilles and diffusers against reflected ceiling plans.					•	•	
Verify that exhaust fans and relief vents are shown on roof plan.					•	•	
Verify that wall air conditioners, fans, grilles and louvres are shown on elevations.					•	•	
Verify that equipment will fit in space provided; check service clearances.			•	•	•	•	
Verify clearance of installation path for equipment installed after walls are up.					•	•	
Verify door undercuts and door grilles against door schedule.					•	•	
Verify that material descriptions are in specification and not on drawings.					•	•	
Check duct cleaning access provision are accessible.					•	•	
Check equipment items on plans against mechanical schedules.					•	•	
Verify that electrical connections are shown on electrical plans and schedules for all items requiring power connections.					•	•	
Verify locations of condensate drains on architectural documentation.					•	•	
Check for missing or incomplete drawing notes.					•	•	
Check mechanical specification against mechanical drawings.					•	•	
Confirm sizes and locations of all equipment plinths to be supplied by builder.					•	•	
Check and confirm that all builders' work required by mechanical services installation are included in architectural specification.					•	•	

Civil Engineering Co-ordination

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Verify site dimensions against survey.				•	•	•	
Verify easements are indicated.			•	•	•	•	
Verify that proposed and existing grades are shown and keyed; check against survey.			•	•	•	•	
Verify items of demolition, clearing limits and grading limits.			•	•	•	•	
Verify that new site construction does not interfere with existing features to remain including poles, pole guys, manholes, drain inlets and valve boxes.			•	•	•	•	
Cross check all new utilities for interference; verify invert levels, and clearances at all crossings.				•	•	•	
Verify that underground utilities are shown on ground section drawings.				•	•	•	
Confirm plan dimensions and profile dimensions match scaled dimensions for utility structures.					•	•	
Verify that indicated falls match invert levels and distances.					•	•	
Verify hydrant and utility pole locations.					•	•	
Verify elevation adjustment to finished grades of manhole castings, valve boxes, and other access.					•	•	

Lifts and Escalator Co-ordination

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Request analysis of cost options in lift design, speeds, capacities, waiting times.		•	•	•	•	•	
Verify that QS has been advised of the provisional sum for lifts etc				•	•	•	
Check lift and escalator details against structural drawings					•	•	
Check sizes and heights of motor rooms and overruns against architectural				•	•	•	
Confirm lead times for ordering of cars and equipment against construction schedule.					•	•	
Check standard lift door opening details against architectural details					•	•	
Confirm estimates for car interiors against cost plan allowances				•	•	•	
Obtain sample service agreements, review for conformity with spec and submit to Client					•	•	
Verify shaftway sizes, all levels				•	•	•	
Confirm that fireman's lift complies with Fire Service requirements					•	•	
Confirm security requirements for lifts and coordinate with communication system			•	•	•	•	
Check for missing or incomplete drawing notes					•	•	

Electrical Services Co-ordination

Design Process	(included in scope)	concept	preliminary	developed	detailed	construction	Commentary
Confirm location, size, access and other details of substation, vault rooms, or other provision for power supply against architectural			•	•	•	•	
Verify electrical floor plans and dimensions against architectural			•	•	•	•	
Confirm that all light fixtures are shown on architectural reflected ceiling plans				•	•	•	
Verify that sufficient height exists for all recessed fixtures			•	•	•	•	
Confirm that recessed fixtures are not in conflict with beams and ducts				•	•	•	
Verify location and space requirements of all electrical and other service panels; check requirements for radius dimensions of large conduits				•	•	•	
Verify that material descriptions are in specification and not on drawings					•	•	
Check lighting fixture schedule against drawings and specification					•	•	
Verify electric strike releases, hold open devices and security switches with door schedule.					•	•	
Confirm location of incoming services ducts (power/communications). Co-ordinate entry heights/bending radius of ducts.			•	•	•	•	
Confirm electrical services rooms requirements match architectural.				•	•	•	
Verify that suspended exit signs are clear or full height doors.					•	•	
Verify underground external wiring provision for building lighting is shown on sitework drawings.				•	•	•	
Verify light switch positions against door swings.					•	•	
Check for missing or incomplete drawing notes					•	•	
Check electrical specification against electrical drawings					•	•	

Design Documentation Guidelines | Electrical Ancillary Services

Applies to miscellaneous electrical systems including: Data/Communications, Access control, CCTV, MATV, Public Address/Background Music, etc.

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❐
- Project time schedule. ❐
- Site survey information. ❐
- Project delivery methodology. ❐

Design:

- Confirmation of which services are required. ❐
- Identification of areas of coverage. ❐
- Review of client requirements including reliability and redundancy. ❐
- Establish design criteria and develop functional services brief. ❐
- Establish contacts with communication network providers. ❐
- Risk assessments.
- Review concepts for significant health and safety risks relevant to the design. ❐

Deliverables

Drawings:

Sketch drawings (may comprise 'marked-up' architectural drawings), including preliminary equipment room and riser requirements, service entry points, and services routes, including general areas of coverage. ❐

Specifications:

Nil.

Reports:

Concept services brief – to establish available system concepts and a broad report investigating available options and recommendations and definition of system requirements and key assumptions including system types. ❐

Design standards to be used. ❐

Commentary

1. To ascertain client brief and to review/consider applicable options.
2. Agree roles and responsibilities.
3. Concept and preliminary design phases are often combined on smaller projects.
4. Tendering at this stage unlikely to result in 'like for like' bids.
5. No co-ordination completed at this stage.
6. Costing only on per point basis.

Design Documentation Guidelines | Electrical Ancillary Services

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept services design, including confirmation of systems to be included and budgetary implications. ❐
- Network provider requirements/constraints. ❐
- Client approved architectural layouts. ❐
- Design time schedule. ❐

Design:

- Develop service route requirements, both horizontal and vertical. ❐
- Define interface requirements with other services. ❐
- Develop system architecture. ❐
- Identification of equipment requirements to provide required coverage/functionality. ❐
- Confirm spatial requirements for central and distributed equipment rooms. ❐
- Confirm methods of final distribution to outlets (trunking, floor boxes, etc.). ❐
- Identify specific power requirements (UPS, generator supplies). ❐
- Identification of specific earthing and surge protection requirements. ❐
- Operational descriptions. ❐
- Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. ❐

Deliverables

Drawings:

- Single line diagram showing system architecture for each service and interconnections with indicative capacities for each node. ❐
- Layout drawings indicating coverage and indicating equipment room locations, risers, and primary service routes. ❐

Specifications:

- Outline specifications. ❐
- Preliminary equipment schedules. ❐

Reports:

- Design features (options) report, with preferred options agreed/defined where possible, to take to developed design. ❐
- Preliminary electrical equipment heat loads. ❐
- Highlight 'significant and unusual' buildability and health and safety issues. ❐

Commentary

1. Where applicable discuss options with preferred vendor.
2. Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined.
3. Systems could be priced by vendors at this stage but unlikely to get like for like comparison.

Design Documentation Guidelines | Electrical Ancillary Services

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary design and budgetary implications. ❐
- Client approved architectural, structural, and other services preliminary designs. ❐

Design:

- Co-ordination of spatial requirements, including access for installation and maintenance, with other trades. ❐
- Identification of specific locations for devices (cameras, card readers etc.). ❐
- Identification of primary cabling routes and cabling methodology to all final outlet locations. ❐
- Confirmation of network provider connection details. ❐
- Verify that significant and unusual health and safety issues have been addressed in the design. ❐

Deliverables

Drawings:

- Single line diagram for each system showing the entire network with cables and major equipment selected, including connections to external networks. ❐
- Updated layout drawings indicating equipment room locations, risers and service routes, including cabling methodology to final outlets (skirting trunking, etc.). ❐
- Layouts indicating locations of devices and major consolidation points. ❐

Specifications:

- Preliminary technical specifications. ❐
- Equipment schedules. ❐

Reports:

- Finalised design features (options) report, including options selected. ❐
- Highlight 'significant and unusual' buildability and health and safety issues. ❐

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with final elements estimated on typical details.
2. Developed design generally provides the minimum level of documentation to clearly define the scope of all elements.

Design Documentation Guidelines | Electrical Ancillary Services

Detailed Design Phase

Design Process

Inputs:

- Client approval of the developed design and budgetary implications. ❐
- Final architectural (including furniture), structural, and other services layouts. ❐

Design:

- Patch panel and frame layouts. ❐
- Generic equipment selections. ❐
- Final layouts of devices co-ordinated with architecture/furniture and other services. ❐
- Detailed power and earthing requirements identification. ❐
- Detailed tray routes. ❐
- Interface details with other trades. ❐
- Highlight significant and unusual health and safety risks that were identified through the design process. ❐

Deliverables

Drawings:

- Completed single line diagram showing all equipment, cables, and consolidation points. All equipment specified. ❐
- Layouts drawings indicating all field devices, and control panels and final outlet locations. ❐
- Equipment room outline layouts. ❐

Specifications:

- Detailed technical specifications. ❐
- Finalised equipment schedules with generic equipment selections. ❐

Reports:

- Power and earthing requirements provided for implementation by electrical engineer. ❐
- Itemisation of works to be done by others. ❐

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of all elements. Design details should be co-ordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2. It may not be practical for designer to complete this phase prior to specific vendor solution being identified.
3. Co-ordination. In ceiling zones identified with appropriate clearances from structure and other services. Major penetrations identified. Detailed co-ordination of critical areas.
4. Define in the specification the significant and unusual health and safety risks that were identified in the design.

Design Documentation Guidelines | Electrical Ancillary Services

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, interior design, and electrical services. ❒
- Construction time schedule. ❒
- Network provider implementation plans. ❒

Design:

- Final co-ordination with architecture and other services. ❒
- Equipment selection. ❒
- Mounting details for all devices. ❒
- Complete panel, cabinet and frame designs. ❒
- Construction details for tray routes and supports (unless provided by others). ❒
- Seismic bracing. ❒
- Cable labelling philosophy. ❒
- Provisions for access and maintenance. ❒

Deliverables

Drawings:

- Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. ❒
- Equipment submissions for 'review'. ❒
- Fabrication drawings for control panels, frames, desks and cabinets. ❒
- Detailed layouts of equipment rooms. ❒
- Detailing of all tray routes and catenary grids including support/ hanger details (unless provided by others). ❒
- Seismic bracing details ❒
- Conduit routing and installation details. ❒
- Wiring diagrams and points schedules. ❒
- Specific equipment selections. ❒
- Systems configuration and programming. ❒

Review:

- Review shop/fabrication and layout drawings for compliance with design. ❒
- Review equipment submission. ❒

Commentary

1. Normally prepared by the selected vendor/installer.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e., 'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Equipment ordered.
4. At completion of design as built drawings, manuals, and equipment details produced to indicate final installed systems.
5. The contractor is responsible for managing health and safety risks during the construction phase.

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❒
- Architectural sketch concept. ❒
- Project time schedule. ❒
- Preliminary fire safety report. ❒
- Site survey information. ❒
- Site and environmental condition constraints. ❒
- Project delivery methodology. ❒

Design:

- Review of client requirements including reliability, redundancy, and efficiency. ❒
- Establish design criteria and develop functional services brief. ❒
- Investigate interface requirements with existing buildings and equipment. ❒
- Establish hazardous area classification if applicable. ❒
- Review preliminary fire safety report. ❒
- Review applicable authority codes and standards. ❒
- Establish contacts with utility companies. ❒
- Total load estimates (W/m^2). ❒
- Main supply methodology. ❒
- Standby power requirements. ❒
- Main plant space requirements. ❒
- Emergency lighting concept. ❒
- Earthing. ❒
- Review concepts for significant and unusual health and safety risks relevant to the design. ❒

Deliverables

Drawings:

- Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes. ❒

Specifications:

- Nil.

Reports:

- Concept services brief – to establish available system concepts and a broad report investigating available options and recommendations, and definition of system requirements and key assumptions. ❒
- Design standards to be used. ❒

Commentary

1. To ascertain client brief and to review/consider applicable options.
2. Agree roles and responsibilities.
3. Concept and preliminary design phases are often combined on smaller projects.
4. Tendering at this stage unlikely to result in 'like for like' bids.
5. No co-ordination completed at this stage.
6. Costing only on per m^2 basis.

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept services design and budgetary implications. ❒
- Updated fire engineering report. ❒
- Power authority requirements/constraints. ❒
- Client approved architectural, structural, and other services concept designs. ❒
- Design time schedule. ❒
- Preliminary service loadings. ❒

Design:

- Assess supply utility requirements and liase with local authorities. ❒
- Initial sizing of major plant (transformers, generators, and main switchboards. ❒
- Load estimates based on major plant requirements plus W/m^2 for general areas. ❒
- Identification of major service routes. ❒
- Location and capacity of main load centres. ❒
- General area lighting layouts. ❒
- General area power distribution methodology (use of perimeter trunking, etc.). ❒
- Develop services route requirements, both horizontal and vertical and space co-ordination with other trades. ❒
- Define interface requirements with other services. ❒
- Identification of specific earthing and surge protection requirements. ❒
- Identify any special health and safety risks that may present in construction or design and consider alternative, lower risk, options. ❒
- Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. ❒

Deliverables

Drawings:

- Single line diagram showing major plant and major distribution (breakers/cables unsized). ❒
- Layout drawings indicating plant room locations, risers and primary service routes. ❒
- Typical area lighting (reflected ceiling plan) and power layouts or schedules. ❒

Specifications:

- Outline specifications. ❒
- Preliminary equipment schedules for major plant. ❒
- Generic lighting/appliance types. ❒

Reports:

- Design features (options) report (with agreed option to take to developed design). ❒
- Preliminary electrical equipment heat loads. ❒
- Energy efficiency analysis. ❒
- Lightning protecting assessment. ❒
- Preliminary building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined.
2. Systems could be priced by vendors at this stage but unlikely to get like for like comparison.

Design Documentation Guidelines | Electrical Services

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary design and budgetary implications. ❒
- Client approved architectural, structural, and other services preliminary designs. ❒
- Service loads. ❒
- Defined escape routes with locations for emergency signage ❒

Design:

- Elemental load assessments (including documentation of constraints). ❒
- Fault level calculations. ❒
- Lighting calculations and layouts. ❒
- Determine number of power outlets on area by area basis. ❒
- Control methodologies. ❒
- Finalise earthing requirements. ❒
- Major plant and services routes, including access for installation and maintenance, co-ordinated with architecture, structure, and other trades. ❒
- Develop and expand the services concepts, selection of typical plant, review of plant room sizes and service space requirements including sizing of mains, sub-mains, and protection. ❒
- Assessment of specific treatment harmonics (internally and externally generated). ❒
- Identify utility connections. ❒
- Verify significant and unusual health and safety issues have been addressed in the design. ❒

Deliverables

Drawings:

- Single line diagram showing connections to all equipment and boards (breakers and cables sized). ❒
- Layout drawings indicating plant room locations, risers and service routes, and main cable trays. ❒
- Lighting and power layouts. ❒
- Reflected ceiling plans with preliminary co-ordination. ❒

Specifications:

- Preliminary technical specifications. ❒
- Equipment schedules. ❒

Reports:

- Updated design features (options) report, including options selected. ❒
- Supply authority approval submissions. ❒
- Updated energy efficiency review. ❒
- Building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
2. Developed design generally provides the minimum level of documentation to clearly define the scope of all electrical elements

Design Documentation Guidelines | Electrical Services

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed design and budgetary implications. ❒
- Client approved architectural, structural, and other services developed designs. ❒

Design:

- Detailed load assessment. ❒
- Equipment sizing and generic selection. ❒
- Supplies to ancillary systems (public phones, fire alarm panels, etc.). ❒
- Sub-circuit cable sizing and breaker selection discrimination checks. ❒
- Co-ordination in principle with structure, architecture and other building services. ❒
- Design of harmonic treatment. ❒
- Finalise utility supplies. ❒
- Highlight significant and unusual health and safety risks that were identified through the design process. ❒

Deliverables

Drawings:

- Single line diagram showing connections to all equipment and boards (breakers and cables sized). ❒
- Layout drawings indicating plant room locations, risers and service routes and main cable tray routes. ❒
- Plant room and riser outline layouts. ❒
- Lighting and power layouts including switching and circuiting. ❒
- Lighting control zoning and specification. ❒
- Distribution schedules with final circuit breakers and cables sized. ❒

Specifications:

- Detailed technical specifications. ❒
- Detailed equipment schedules. ❒
- Luminaire and fitting schedules. ❒

Reports:

- Nil. ❒

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of all electrical elements. Design details should be coordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2. Co-ordination. In ceiling zones identified with appropriate clearance from structure and other services. Major penetrations identified. Detailed co-ordination of critical areas.
3. Define in the specification the significant and unusual health and safety risks that were identified in the design.

Design Documentation Guidelines | Electrical Services

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, structural, and other services. ❒
- Construction time schedule. ❒

Design:

- Production of larger scale detailed shop drawings including seismic details. ❒
- Co-ordination of all services, structure and architecture. ❒
- Equipment selection and technical submissions. ❒
- Confirmation of capacities, sizes based on equipment selection of all trades. ❒
- Seismic bracing. ❒
- Detailed tray routes and supports. ❒
- Control system programming. ❒
- Detailed layouts of plant rooms and risers. ❒
- Provisions for access and maintenance. ❒

Deliverables

Drawings:

- Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. ❒
- Equipment submissions as defined in detailed design. ❒
- Fabrication drawings for switchboards and panels. ❒
- Equipment plinth details, mounting and isolation detailing. ❒
- Detailed layouts of plant rooms. ❒
- Detailing of all tray routes and catenary grids including support/hanger details. ❒
- Conduit routing and installation details. ❒
- Seismic bracing details. ❒
- Wiring diagrams and points schedules for control systems. ❒
- Compliance certificates. ❒

Review:

- Review shop/fabrication and layout drawings for compliance with design. ❒
- Review equipment submission. ❒

Commentary

1. Normally prepared by the services sub-contractor to enable fabrication of the services design.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e., 'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Equipment ordered.
4. At completion of design as built drawings, manuals, and equipment details produced to indicate final installed systems.
5. The contractor is responsible for managing health and safety risks during the construction phase.

Design Documentation Guidelines | Fire Engineering

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❐
- Client or building owner requirements for property protection, business interruption, insurance, specific building operational requirements. ❐
- Architectural sketch concept drawings (e.g., bulk and location and typical floors). Include proposed occupancy type and use. ❐
- Project program. ❐
- Site plan including details of any neighbouring property boundaries. ❐
- Site subdivision requirements. ❐

Design:

- Review client requirements. ❐
- Establish design criteria for fire engineering design, i.e., either acceptable solution or alternative solution. ❐
- Develop fire safety brief including definition of fire safety precautions, egress principles, and neighbouring property protection. ❐
- Review applicable authority codes and standards. ❐

Deliverables

Drawings:

- Sketch drawings (may comprise 'marked-up' architectural drawings) including firecell locations, escape routes, etc. ❐

Specifications:

- N/A.

Reports:

- Concept fire engineering design report. ❐
- Describe various design options where applicable. ❐
- Draft fire engineering design brief (if applicable). ❐

Commentary

1. Ascertain client brief and to review/consider applicable options.
2. Discuss design options with client.
3. Agree roles and responsibilities.
4. Concept and preliminary design phases are often combined on smaller projects.
5. No co-ordination completed at this stage.
6. For existing buildings, include a broad overview of existing construction and existing fire protection systems, identifying further work required in future stages.
7. On large or complex projects the fire engineer would prepare a fire engineering design brief during this phase.

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept fire engineering (including draft fire engineering design brief if applicable). ❒
- Design programme. ❒
- Client approved architectural drawings. ❒
- Client approved structural drawings.
- Assess Fire Service New Zealand requirements under Building Code clause C.3.3.9. ❒
- For existing buildings, list further investigative work required. ❒

Design:

- Develop fire engineering concepts and identify special requirements. ❒
- Confirm escape route requirements and dimensions. ❒
- Egress analysis including required egress time and available egress time (if applicable). ❒
- Review structural design and advise on fire rating requirements. ❒
- Define interface requirements with other services. ❒
- Identify smoke control measures required (if applicable). ❒
- Meet with the New Zealand Fire Service in conjunction with the evacuation scheme provider to explain the project, discuss the fire safety provisions provided for fire service use under the New Zealand Building Code clause C3.3.9, and for the evacuation scheme provider to outline the proposed draft evacuation scheme. ❒

Deliverables

Drawings:

Layout drawings locating firecells, fire ratings and escape routes, evacuation zones (if applicable). ❒

Specifications:

Outline specification of fire engineered features not covered by other designers. ❒

Reports:

Preliminary fire engineering design report based on the client approved concept design. ❒

Updated fire engineering design brief (if applicable). ❒

Commentary

1. Discuss evacuation philosophy with client, particularly if stage evacuation or evacuation to another part of the building is to be considered.
2. Preliminary fire report is a performance based document specifying features and design requirements that other consultants need to include in their design and documentation.
3. Preliminary fire report is not suitable for building consent. It typically will not include justification for building code compliance (done at developed design). Not all fire engineering design detail required by other parties will be complete at this phase.
4. Fire engineered features that may need an outline specification include protection of structure, measures to control fire or smoke spread, complex interfaces with other building systems including building operational requirements, escape route features and wayfinding.

Design Documentation Guidelines | Fire Engineering

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary fire engineering design. ❒
- Client approved architectural drawings. ❒
- Client approved structural drawings. ❒
- Fire protection preliminary design. ❒
- Building services preliminary design. ❒
- Client to advise specific type and location of storage areas. ❒

Design:

- Fire severity analysis. ❒
- Analysis of structural behaviour in fire (if applicable). ❒
- Radiation to boundary calculations. ❒
- Smoke production and extract calculations (if applicable). ❒
- Detailed egress analysis (if applicable). ❒

Deliverables

Drawings:

- Drawings showing fire ratings, locations of firecells, fire separations, egress routes and sizes, fire doors, locations for exit signs, etc. ❒
- Sections as necessary to show fire ratings. ❒

Specifications:

- N/A. ❒

Reports:

- Updated fire engineering design report. ❒
- Confirmation from New Zealand Fire Service that the fire safety provisions provided for their use, meet their requirements as per New Zealand Building Code clause C.3.3.9. ❒
- Fire Service to also advise the evacuation scheme provider that the draft evacuation scheme is acceptable or suggest changes that need to be made to the draft scheme. ❒

Commentary

1. The fire engineering design would typically be at least 80 percent complete at developed design phase.
2. 'Marked up' architectural drawings may be appropriate for small jobs. However, on large projects it is envisaged that CAD drawings would be produced. CAD drawings assist with interdiscipline co-ordination and allow easy update of fire plans when changes occur to the architectural drawings.

Design Documentation Guidelines | Fire Engineering

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed fire engineering design. ❒
- Client approved architectural drawings. ❒
- Client approved structural drawings. ❒
- Client approved fire protection and building services developed design reports. ❒

Design:

- Refine design based on updated architectural and structural design. ❒

Deliverables

Drawings:

- All fire safety drawings defining fire engineering requirements including plans and sections. ❒

Specifications:

- Detailed specification of fire engineered features not covered by other designers. ❒

Reports:

- Fire engineering design report, suitable for building consent. ❒

Calculations:

- Fire engineering design calculations and supporting documentation to accompany the drawings and design report submitted with the building consent application. Documentation to verify compliance with the building code and client design brief. ❒

Commentary

1. Detailed design documents to provide a sufficient level of detail to define the design requirements of the fire engineering. (Refer to developed design phase – commentary, note 2 with regard to fire safety drawing production).
2. Co-ordination by other designers.
3. Assumes building consent is lodged after completion of this phase.

Design Documentation Guidelines | Fire Engineering

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, structural, and other services. ❒
- Construction programme. ❒
- Building consent commentary and conditions. ❒

Design:

- Minor revisions and so on are to take account of queries raised by the territorial authority during the consent process. ❒

Deliverables

Drawings:

- Fire engineering detailed design drawings updated and issued 'for construction'. ❒

Reports:

- Fire engineering design report, as issued for building consent, issued 'for construction'. ❒

Commentary

1. Report and drawings are required to incorporate building consent issues and outcomes from design coordination into the 'for construction' fire engineering design.
2. Specific timing of the 'for construction' milestone will be project specific. Agreement with all parties will be required on projects in which a constructor also has design responsibility or where investigative work is required during the construction phase for alteration of existing buildings.

Design Documentation Guidelines | Fire Protection

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❒
- Architectural sketch concept drawings (e.g., bulk and location). ❒
- Preliminary fire safety report. ❒
- Project time schedule. ❒
- Infra-structure reports, e.g., water flow tests. ❒

Design:

- Review with client building usage requirements. ❒
- Establish design criteria. ❒
- Review preliminary fire safety report – (prepared by others). ❒
- Review applicable authority codes and standards. ❒
- Establish contacts with local authorities and utility companies. ❒
- Review concepts for significant and unusual health and safety risks relevant to the design. ❒

Deliverables

Drawings:

- Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes. ❒

Specifications:

- Nil. ❒

Reports:

- Concept services brief – to establish available system concepts, a broad report investigating available options and recommendations, and definition of system requirements and key assumptions. ❒
- Design standards to be used. ❒

Commentary

1. To ascertain client brief and to review/consider applicable options.
2. Agree roles and responsibilities.
3. Concept and preliminary design phases are often combined on smaller projects.
4. Tendering at this stage unlikely to result in 'like for like' bids.
5. No co-ordination completed at this stage.
6. Costing only on per m^2 basis.

Design Documentation Guidelines | Fire Protection

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept services design and budgetary implications. ❐
- Updated fire engineering report. ❐
- Design time schedule.
- Client approved architectural, structural, and other services concept drawings. ❐
- Assess supply utility requirements and liaise with fire authorities. ❐

Design:

- Develop system concepts and identify special requirements. ❐
- Confirm plant room space/location requirements. ❐
- Develop services route requirements, both horizontal and vertical and space co-ordination with other trades. ❐
- Define interface requirements with other services. ❐
- Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. ❐

Deliverables

Drawings:

- Schematic drawings outlining services concepts. ❐
- Layout drawings locating plant rooms, risers, and primary services routes. ❐
- Preliminary plant room layouts. ❐
- Preliminary sprinkler/heat detector layouts. ❐

Specifications:

- Outline services performance specifications. ❐
- Preliminary equipment schedules for major plant. ❐

Reports:

- Utility services reports. ❐
- Design report including key design criteria, proposed system concepts, and features. ❐
- Preliminary electrical loading. ❐
- Preliminary equipment weights. ❐
- Preliminary building services interface matrix. ❐
- Highlight 'significant and unusual' buildability and health and safety issues. ❐

Commentary

1. Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined.
2. Systems could be priced by vendors at this stage but unlikely to get like for like comparison.

Design Documentation Guidelines | Fire Protection

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary services design and budget ary implications. ❒
- Client approved architectural, structural, and other services preliminary design. ❒

Design:

- Services co-ordination with structural, architectural, and other services. ❒
- Develop and expand the services concepts, selection of typical plant, review of plant room, and services space requirements including sizing of plant and pipe work. ❒
- Identify utility connections. ❒
- Fire authority approved in principle. ❒
- Verify significant and unusual health and safety issues have been addressed in the design. ❒

Deliverables

Drawings:

- Single line pipe work layouts. ❒
- Major plant concepts and layouts. ❒
- Sections as necessary. ❒
- Piping schematics. ❒
- Reflected ceiling plans, preliminary co-ordination. ❒

Specifications:

- Preliminary performance specifications, equipment schedules, and interface requirements with other services. ❒

Reports:

- Updated design features report including options selected. ❒
- Approvals for fire control room, control panel, and utility connections. ❒
- Building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
2. Developed design may be sufficient to define the requirements for fire protection services due to the prescriptive nature of the codes and contractor signoff requirements.

Design Documentation Guidelines | Fire Protection

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed services design and budgetary implications. ❒
- Client approved architectural, structural, and other services developed design. ❒
- Final fire reports. ❒

Design:

- Detailed system design including equipment and pipework. ❒
- Co-ordination in principle with structure, architecture, and other building services. ❒
- Finalise utility supplies. ❒
- Fire authority approvals. ❒
- Highlight significant and unusual health and safety risks that were identified through the design process. ❒

Deliverables

Drawings:

- Completed schematic and layout drawings defining services requirements including plans, elevations, and sections. ❒
- Detailed pipe work layouts. ❒
- Plant room layouts including detailed sections. ❒

Specifications:

- Detailed specifications. ❒
- Detailed equipment schedules. ❒
- Performance specifications for fire protection services. ❒

Reports:

- Nil. ❒

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of all fire protection elements. Design details should be co-ordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2. Co-ordination. In ceiling zones identified with appropriate clearance from structure and other services. Major penetrations identified. Detailed co-ordination of critical areas.
3. Define in the specification the significant and unusual health and safety risks that were identified in the design.

Design Documentation Guidelines | Fire Protection

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, structural, and other services. ❒
- Construction time schedule. ❒

Design:

- Production of larger scale detailed shop drawings including seismic details. ❒
- Co-ordination of all services, structure, and architecture. ❒
- Equipment selections and technical submissions. ❒
- Control system programming. ❒
- Detailed layouts of plant rooms. ❒

Deliverables

Drawings:

- Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. ❒
- Pipe work support and joint detailing. Seismic bracing. ❒
- Equipment plinth details, mounting, and isolation detailing. ❒
- Equipment submissions as defined in detailed design. ❒
- Wiring diagrams and points schedule. ❒
- Detailed layouts of plant rooms.
- Fabrication details of pipework, switchboards, etc.

Review:

- Review shop/fabrication and layout drawings for compliance with design.
- Review equipment submission.

Commentary

1. Normally prepared by the services sub-contractor to enable fabrication of the services design.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, 'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Equipment ordered.
4. At completion of design as built drawings, manuals and equipment details produced to indicate final installed systems.
5. The contractor is responsible for managing health and safety risks during the construction phase.

Design Documentation Guidelines | HVAC Services

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❒
- Architectural sketch concept. ❒
- Project time schedule. ❒
- Preliminary fire safety report. ❒
- Site survey information. ❒
- Site and environmental condition constraints. ❒
- Project delivery methodology. ❒

Design:

- Review of client requirements including reliability, redundancy, and efficiency. ❒
- Establish design criteria and develop functional services brief. ❒
- Investigate interface requirements with existing buildings and equipment. ❒
- Review preliminary fire safety report – (prepared by others). ❒
- Estimate total load using W/m^2. ❒
- Review applicable authority codes and standards. ❒
- Establish contacts with local authorities and utility companies. ❒
- Review concepts for significant and unusual health and safety risks relevant to the design. ❒

Deliverables

Drawings:

- Sketch drawings (may comprise 'marked-up' architectural drawings) including preliminary plant room requirements and services routes. ❒

Specifications:

- Nil. ❒

Reports:

- Concept services brief – to establish available system concepts and a broad report investigating available options and recommendations, and definition of system requirements and key assumptions. ❒
- Design standards to be used. ❒

Commentary

1. To ascertain client brief and to review/consider applicable options.
2. Agree roles and responsibilities.
3. Concept and preliminary design phases are often combined on smaller projects.
4. Tendering at this stage unlikely to result in 'like for like' bids.
5. No co-ordination completed at this stage.
6. Costing only on per m^2 basis.

Design Documentation Guidelines | HVAC Services

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept services design and budgetary implications. ❒
- Updated fire engineering report. ❒
- Preliminary acoustics report. ❒
- Design time schedule. ❒
- Client approved architectural, structural, and other services concept designs. ❒
- Assess supply utility requirements and liase with local authorities. ❒
- Electrical lighting and power loads. ❒

Design:

- Develop preliminary load profiles. ❒
- Develop system concepts and identify special requirements. ❒
- Confirm plant room space/location requirements. ❒
- Assess impact of the location of system and equipment intake and discharge. ❒
- Develop services route requirements, both horizontal and vertical and space co-ordination with other Trades. ❒
- Define interface requirements with other services. ❒
- Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. ❒

Deliverables

Drawings:

- Schematic drawings outlining services concepts. ❒
- Layout drawings locating plant rooms, risers, and primary services routes. ❒
- Preliminary plant room layouts. ❒

Specifications:

- Outline services specifications. ❒
- Preliminary equipment schedules for major plant. ❒

Reports:

- Utility services reports. ❒
- Design report including key design criteria, proposed system concepts, and features. ❒
- Preliminary equipment weights. ❒
- Energy efficiency analysis. ❒
- Preliminary building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues.

Commentary

1. Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined.
2. Systems could be priced by vendors at this stage but unlikely to get like for like comparison.

Design Documentation Guidelines | HVAC Services

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary design and budgetary implications. ❒
- Client approved architectural, structural and other services preliminary designs including building fabric details. ❒

Design:

- Services load calculations. ❒
- Services co-ordination with structural, architectural, and other services. ❒
- Incorporate requirements of the fire, acoustic, or other relevant report. ❒
- Develop and expand the services concepts, selection of typical plant, review of plant room and services space requirements including sizing of duct and pipe work. ❒
- Identify utility connections ❒
- Co-ordination of plant, equipment, services routes, diffusers, etc. ❒
- Verify significant and unusual health and safety issues have been addressed in the design. ❒

Deliverables

Drawings:

- Single line pipe work and duct work layouts. ❒
- Major plant concepts and layouts. ❒
- Sections as necessary. ❒
- Piping and air flow schematics. ❒
- Reflected ceiling plans, preliminary co-ordination. ❒

Specifications:

- Preliminary technical specifications. ❒
- Equipment schedules. ❒

Reports:

- Updated design features (options) report, including options selected. ❒
- Electrical loadings report. ❒
- Updated energy efficiency review. ❒
- Approvals for utility connections. ❒
- Building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
2. Developed design generally provides the minimum level of documentation to clearly define the scope of all HVAC elements.

Design Documentation Guidelines | HVAC Services

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed design and budgetary implications. ❒
- Client-approved developed designs for architectural, structural and other services. ❒
- Final Fire and Acoustic reports. ❒

Design:

- Detailed system design, including equipment, ductwork and pipework. ❒
- Co-ordination in principle with Structure. ❒
- Architecture and other Building Services. ❒
- Finalise utility supplies. ❒
- Fire authority approvals. ❒
- Interface details with other trades. ❒
- Highlight significant and unusual health and safety risks that were identified through the design process. ❒

Deliverables

Drawings:

Completed schematic and layout drawings defining requirements for services, including plans, elevations, and sections. ❒

Detailed pipe work and duct work layouts for mechanical services. ❒

Plant room layouts including detailed sections. ❒

Piping and air flow schematics. ❒

Specifications:

Detailed specifications. ❒

Detailed equipment schedules. ❒

Reports:

Nil. ❒

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of HVAC services. Design details should be coordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2. Co-ordination. In ceiling zones identified with appropriate clearance from structure and other services. Major penetrations identified. Detailed co-ordination of critical areas.
3. Define in the specification the significant and unusual health and safety risks that were identified in the design.
4. Define in the specification the significant health and safety risks that were identified in the design.

Design Documentation Guidelines | HVAC Services

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, structural, and other services. ❐
- Construction time schedule. ❐

Design:

- Production of larger scale detailed shop drawings including seismic details. ❐
- Co-ordination of all services, structure and architecture. ❐
- Equipment selections and technical submissions. ❐
- Control system programming. ❐
- Detailed layouts of plant rooms. ❐

Deliverables

Drawings:

- Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. ❐
- Equipment submissions as defined in detailed design. ❐
- Compliance certificates. ❐
- Detailed layouts of plant rooms and risers. ❐
- Fabrication details of ductwork, pipework, switchboards, etc. ❐
- Equipment plinth details, mounting, and isolation detailing. ❐
- Wiring diagrams and points schedules for control systems. ❐
- Seismic bracing details. ❐

Review:

- Review shop/fabrication and layout drawings for compliance with design. ❐
- Review equipment submissions. ❐

Commentary

1. Normally prepared by the services sub-contractor to enable fabrication of the services design.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e., 'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Equipment ordered.
4. At completion of design as built drawings, manuals and equipment details produced to indicate final installed systems.
5. The contractor is responsible for managing health and safety risks during the construction phase.

Design Documentation Guidelines | Hydraulic Services

Concept Design Phase

Design Process

Inputs:

- Client brief and budget. ❒
- Architectural sketch concept drawings (e.g., bulk and location). ❒
- Project time schedule. ❒
- Infra-structure reports, e.g., water-flow tests. ❒

Design:

- Review of client requirements. ❒
- Establish design criteria for hydraulic services. ❒
- Develop functional services brief – including definition of services. ❒
- Review applicable authority codes and standards. ❒
- Establish contacts with local authorities and utility companies. ❒
- Review concepts for significant and unusual health and safety risks relevant to the design. ❒

Deliverables

Drawings:

- Sketch drawings (may comprise 'marked-up'architectural drawings) including preliminary plant room requirements and services routes. ❒

Specifications:

- Nil.

Reports:

- Concept services brief – to establish available system concepts, a broad report investigating available options and recommendations, and definition of system requirements and key assumptions. ❒
- Design standards to be used. ❒

Commentary

1. Ascertain client brief and to review/consider applicable options.
2. Agree roles and responsibilities.
3. Concept and preliminary design phases are often combined on smaller projects.
4. Tendering at this stage unlikely to result in 'like for like' bids.
5. No co-ordination completed at this stage.
6. Costing only on per m^2 basis.

Design Documentation Guidelines | Hydraulic Services

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept service design and budgetary implications. ❒
- Design time schedule. ❒
- Client approved architectural, structural, and other services concept design. ❒
- Assess supply utility requirements and liase with local authorities. ❒

Design:

- Develop preliminary load profiles. ❒
- Develop system concepts and identify special requirements. ❒
- Confirm plant room space/location requirements. ❒
- Develop services route requirements, both horizontal and vertical and space co-ordination with other trades. ❒
- Define interface requirements with other services. ❒
- Review preliminary design for significant and unusual health and safety risks the design may present during construction and maintenance. ❒

Deliverables

Drawings:

- Schematic drawings outlining service concepts. ❒
- Layout drawings locating plant rooms, risers, and primary service routes. ❒
- Preliminary plant room layouts. ❒

Specifications:

- Outline services specifications. ❒
- Preliminary equipment schedules for major plant. ❒

Reports:

- Utility services reports. ❒
- Design report including key design criteria, proposed system concepts, and features. ❒
- Preliminary equipment weights. ❒
- Preliminary building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage generally cannot be on a full elemental basis, as final distribution is not well defined.
2. Systems could be priced by vendors at this stage but unlikely to get like for like comparison.

Design Documentation Guidelines | Hydraulic Services

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary services design and budgetary implications. ❒
- Client approved architectural, structural and other services preliminary design. ❒
- Final fire and acoustic reports. ❒

Design:

- Service load calculations. ❒
- Major plant and services routes co-ordinated with architecture, structure and other trades. ❒
- Material selections. ❒
- Incorporate requirements of the fire, acoustic, or other relevant reports. ❒
- Develop and expand the services concepts, selection of typical plant, review of plant room, and service space requirements, including sizing of pipe work. ❒
- Identify utility connections. ❒
- Verify that significant and unusual health and safety issues have been addressed in the design. ❒

Deliverables

Drawings:

- Single line pipework layouts. ❒
- Major plant concepts and layouts with sections as necessary. ❒
- Piping schematics. ❒

Specifications:

- Preliminary technical specifications. ❒
- Equipment schedules. ❒

Reports:

- Updated design features report including options selected. ❒
- Electrical loadings report. ❒
- Building services interface matrix. ❒
- Highlight 'significant and unusual' buildability and health and safety issues. ❒

Commentary

1. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
2. Developed design generally provides the minimum level of documentation to clearly define the scope of all hydraulic elements

Design Documentation Guidelines | Hydraulic Services

Detailed Design Phase

Design Process

Inputs:

- Client approval of developed design and budgetary implications. ❒
- Client approved architectural, structural, and other services developed designs. ❒

Design:

- Detailed system design including equipment and pipework. ❒
- Co-ordination in principle with structure, architecture and other building services. ❒
- Finalise utility supplies. ❒
- Detailed layouts of plant rooms. ❒
- Highlight significant and unusual health and safety risks that were identified through the design process. ❒

Deliverables

Drawings:

- Completed schematic and layout drawings defining services requirements including plans, elevations, and sections. ❒
- Detailed pipework duct work layouts for hydraulic services. ❒
- Plant room layouts including detailed sections. ❒
- Piping schematics. ❒

Specifications:

- Detailed specifications. ❒
- Detailed equipment schedules. ❒

Reports:

- Nil. ❒

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of hydraulic services.
2. Design details should be coordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
3. Co-ordination: in ceiling zones identified with appropriate clearance from structure and other services; major penetrations identified; and detailed co-ordination of critical areas.
4. Define in the specification the significant and unusual health and safety risks that were identified in the design.

Design Documentation Guidelines | Hydraulic Services

Construction Design Phase

Design Process

Inputs:

- For construction design phase, drawings for architectural, structural, and other services. ❒
- Construction time schedule. ❒

Design:

- Production of larger scale detailed shop drawings including seismic details. ❒
- Co-ordination of all services, structure, and architecture. ❒
- Equipment selections and technical submissions.
- Control system programming. ❒
- Detailed layouts of plant rooms. ❒

Deliverables

Drawings:

- Revise detailed design documentation to incorporate buildability changes suggested by contractor if they impact on the design intent. ❒
- Equipment submissions as defined in detailed design. ❒
- Detailed layouts of plant rooms. ❒
- Wiring diagrams and points schedule.
- Equipment plinth details, mounting, and isolation detailing. ❒
- Fabrication details of pipework, switchboards, etc. ❒
- Pipe work support and joint detailing. Seismic bracing. ❒

Review:

- Review shop/fabrication and layout drawings for compliance with design. ❒
- Review equipment submission. ❒

Commentary

1. Normally prepared by the services subcontractor to enable fabrication of the services design.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e., 'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Equipment ordered.
4. At completion of design as built drawings, manuals and equipment details produced to indicate final installed systems.
5. The contractor is responsible for managing health and safety risks during the construction phase.

Design Documentation Guidelines | Structural

Concept Design Phase

Design Process

Inputs:

- Client briefing, including budget and time schedule. ❒
- Geotechnical information on types of foundation systems. ❒
- Survey information, including legal and physical. ❒
- Architectural sketch concept drawings (e.g., bulk and location). ❒
- Site constraints, including planning and fire issues. ❒
- Conditions of consents. ❒
- Existing building and site information/records. ❒

Design:

- Structural type and form. ❒
- Main gravity and lateral load resisting systems. ❒
- Floor system. ❒
- Ground retention systems. ❒
- Foundation system. ❒
- Façade support systems. ❒
- Roof support systems. ❒
- Identify structural scheme options. ❒
- Special project features concepts, (e.g., large canopies). ❒
- Design co-ordination of key elements with other disciplines. ❒
- Identify responsibility for control and set-out of dimensions. ❒
- Identify responsibility for design co-ordination and management. ❒

Deliverables

Drawings:

- Sketch drawings. ❒

Reports:

- Sketch drawings where necessary within report. ❒
- Structural concept design brief, including floor loadings. ❒
- Key risks and assumptions. ❒
- Concept report outlines key issues and options considered. ❒

Commentary

1. Costing only on square metre rate basis.
2. Concept and preliminary design phases are often combined on smaller projects.
3. Agree roles and responsibilities for all participants in project procurement process.
4. Discuss with client the requirements and programme for client information and approvals.
5. Establish project procedures for communication, document issue, approvals, etc. Note: larger projects may have a project procedure manual or web-based document control systems.
6. Establish a design programme for key milestones and deliverables including design team co-ordination.

Design Documentation Guidelines | Structural

Preliminary Design Phase

Design Process

Inputs:

- Client approval of concept design, including ratification of cost estimate. ❒
- Preliminary fire engineering (where appropriate). ❒
- Preliminary wind studies (where appropriate). ❒
- Preliminary acoustic advice (where appropriate). ❒
- Preliminary geotechnical report, including preliminary design parameters. ❒
- Design programme. ❒

Design:

- Evaluate and select primary structural systems. ❒
- Define grid layout (with architect). ❒
- Preliminary analysis to establish critical member sizes for primary elements. ❒
- Define key serviceability criteria.
- Design co-ordination of key elements with other disciplines. ❒
- Define floor to floor heights. ❒
- Preliminary assessment of floor vibration and building movement. ❒
- Preliminary assessment of primary members of existing buildings (where appropriate). ❒
- Address durability requirements. ❒
- Preliminary input to Architect on 'architectural' elements. ❒
- Identify high risk and/or high cost elements in structure.

Deliverables

Drawings:

- Drawings outline primary members as mark-ups of architectural drawings (1:200). ❒
- Proposed primary framing.
- Prelim. sizes of primary members only with reinforcing as kg/m^3 and steel as kg/m. ❒
- Preliminary foundation layout. ❒
- Indicative structural connection types. ❒
- Outline system for secondary elements. ❒
- Outline durability/coating systems. ❒
- Indicative surface finish for exposed concrete. ❒
- Critical details that may have significant cost implication. ❒
- Proposed primary elements of strengthening for existing buildings (where appropriate). ❒

Specifications:

- Outline specification of key structural elements. ❒

Reports:

- Design brief, including fire protection requirements for structural members. ❒
- Design features (options) report, with recommended option to take to developed design. ❒

Commentary

1. Where appropriate carry out discussion with a 'preferred' contractor on construction methodology.
2.* Consultation with Building Consent Authority is recommended on key aspects of the design that may be considered outside the 'Acceptable Solution', and unusual/contentious issues.
3. Cost estimates at this stage generally cannot be on full elemental basis, as secondary elements are not well defined.
4. Contribute to value management session, if required.
5. Agree the scale of drawing deliverables for each phase according to project type.
6. A specialist façade design consultant may need to be engaged, if the façade system is particularly complex or demanding.

* Amended August 2008

Design Documentation Guidelines | Structural

Preliminary Design Phase continued

Design Process continued

- Define key elements of ground retention system (if required). ❒
- Define design parameters for façade systems. ❒
- Incorporate additional structural implication of fire and acoustic requirements. ❒
- Assess implication of dynamic motion of building services equipment. ❒
- Consider buildability of primary structural system, including significant health and safety issues during construction. ❒
- For unusual structures or existing structures where stability may be affected by the sequence of construction, consider significant health and safety issues. ❒
- Assess maintenance requirements of structural components, including health and safety issues. ❒
- Coordinate relevant design information between disciplines. ❒

Deliverables continued

- Outline of elements not covered in preliminary design drawings or design features report. ❒
- Define assumed construction methodology governing design (where appropriate). ❒
- Highlight 'significant' buildability issues and significant/unusual health and safety issues arising from the structure. ❒

Commentary

Design Documentation Guidelines | Structural

Developed Design Phase

Design Process

Inputs:

- Client approval of preliminary design, including ratification of the cost estimate. ❒
- Final geotechnical report. ❒
- Final wind report (if required). ❒
- Final fire report. ❒

Design:

- Determine sizes of all primary and most secondary structural members; however, there may be some architectural and services secondary support members not defined at this stage. ❒
- Generic connection details. ❒
- Agree serviceability performance criteria with client (e.g., floor vibration, interstorey drifts, etc). ❒
- Structural input to architectural elements. ❒
- Confirm building movements with the design team. ❒
- Incorporate likely erection/construction requirements (where appropriate), including consideration of significant/unusual health and safety issues arising from the structure. ❒
- Key support details for façade elements. ❒
- Structural support requirements for building maintenance systems (e.g., BMU and abseil anchor points). ❒
- Coordinate relevant information with other disciplines. ❒

Deliverables

Drawings:

- Drawings (1:100 plans) defining all primary framing members, with reinforcing as kg/m^3. ❒
- Layout and size of secondary framing members (e.g., lift, stairs, canopies, and platforms). ❒
- Generic reinforcing details for typical primary elements. ❒
- Typical connection details for primary elements. ❒
- Define elements covered by proprietary design (e.g., precast floor and piling). ❒

Specifications:

- Preliminary technical specifications, including durability and serviceability issues. ❒

Reports:

- Updated design brief, including fire protection requirements for structural members. ❒
- Updated design features report, including serviceability and maintenance issues. ❒
- Define key risks and assumptions, including erection/buildability and significant/unusual health and safety issues arising from the structure. ❒
- List elements where the scope has not been fully defined elsewhere in the documents. ❒
- Highlight significant health and safety issues. ❒

Commentary

1. Separate primary reinforcement from secondary stirrup or ties in quantity estimates.
2. Cost estimates at this stage can be produced by quantity surveyor on elemental basis, with secondary elements estimated on typical details.
3.* Developed design generally provides the level of documentation to define the scope of all building elements.
4.* Where appropriate carry out discussions with a 'preferred' contractor on construction methodology.
5.* Consultation with Building Consent Authority may be helpful on key aspects of the design that may be considered outside the 'Acceptable Solution', and unusual/contentious issues.

* Amended August 2008

Design Documentation Guidelines | Structural

Detailed Design Phase

Design Process

Inputs:

- Client approval of completed developed design, including ratification of the cost estimate. ❒

Design:

- Complete the design and coordination of all structural elements, including connection details, except for elements that can be adequately covered by non-specific design codes. ❒
- Address serviceability and maintenance criteria in the design. ❒
- Highlight significant/unusual health and safety risks arising from the structure that were identified through the design process (if any). ❒
- Co-ordinate relevant information with other disciplines. ❒

Deliverables

Drawings:

- Drawings defining all structural elements, including plans, elevations, sections and details, with adequate cross-referencing. ❒
- Define all connections by either defining specific connection details or referencing to industry standard connection details (e.g., HERA connection details) or specifying forces for a propriety connection system. ❒
- Construction sequences and positions of control/construction joints. ❒
- Includes stairs, plant platforms and façade system support. ❒
- Reinforcing details defined (see commentary). ❒
- Precamber/set established for members. ❒
- Include seismic and gravity support of ceiling/partition systems (optional). ❒

Specifications:

- Detailed specifications for each structural trade. ❒
- Performance specifications where appropriate, including performance criteria for proprietary design. ❒
- Method statements for critical construction processes governing design. ❒
- Design loadings for design of proprietary non-structural elements e.g., glazing, seismic bracing of services. ❒
- Define deliverables from contractor e.g., producer statements, shop drawings, and testing requirements. ❒

Commentary

1. Detailed design generally provides a level of documentation to clearly define the design of all structural elements. Design details should be coordinated with other disciplines. However, the documents produced in this phase may not directly be able to be 'built' from.
2. Structural drawings should dimension the main building grids, critical structural elements, and other elements that are the direct responsibility of the structural engineer.
3. Reference the architectural plans or other disciplines for other dimensions (unless agreed otherwise).
4. HERA report DR4-106, *Structural Steelwork* documentation 'Specification', sections vi, vii, and ix outline documentation details that need to be addressed in the working drawings and specifications.
5. Design and documentation of secondary architectural elements are generally shown on the architect's drawings; the structural engineer will have input where requested by the architect.
6. Reinforcing details defined means that all reinforcing required to construct the project is defined on the drawings, in quantum and size, such that shop drawings and/or bar bending schedule can be produced by others without further additional information.

Design Documentation Guidelines | Structural

Detailed Design Phase continued

Design Process	Deliverables continued	Commentary continued
	• Coating requirements for structural elements that are not addressed by the architect or other disciplines. ❒ • Define required tolerances where different from industry standards. ❒ **Reports: *** • Design Features Report including explanation of structural systems and load paths, design standards used, key design parameters and assumptions. ❒	7. The level of design detail shown on drawings in this phase, particularly for concrete and masonry elements, varies in the industry between regions, building types and procurement methodologies. A major factor is the capability of the local building industry to efficiently provide the construction phase documentation. The level of detail outlined in these guidelines is appropriate where the contractor has the skills and resources to efficiently provide construction phase documentation. For some projects, a greater level of detailing may need to be produced by the design consultant. The appropriate level of detailing required should be agreed with the client prior to the commencement of the project. 8. Define in the appropriate specification the significant/ unusual health and safety risks that arising from the structurewere identified in the design. 9. The contractor is responsible for managing health and safety risks during the construction phase. 10.*Detailed design documentation is recommended for building consent submissions.

* Amended August 2008

Design Documentation Guidelines | Structural

Construction Design Phase

Design Process

Inputs:

- Construction programme and methodology, including craneage or access restrictions. ❒
- Client approved ('for construction') drawings and specifications. ❒
- Design and performance requirements for propriety elements. ❒

Design:

- Design of proprietary systems, e.g., flooring, glazing, plant support, etc. ❒
- Detailed co-ordination required with other disciplines, site conditions, proprietary elements, erection requirements, and shop details. ❒
- Prepare structural construction sequence, temporary erection and heath and safety plans. ❒
- Determine the impact of temporary erection loads and construction sequence on structural members and connections. ❒
- Check the design of structural members and connections for temporary construction conditions and loads, and redesign if required. ❒
- Liaise with the design and construction teams to coordinate any revisions to the detailed design. ❒

Deliverables

Drawings:

- Drawings (incl. shop drawings and rebar schedules) on an elemental basis, including position, dimension, materials and finish of all details, including relevant material specifications (steel, timber, precast, etc.). ❒
- Site management plans and/or method statements defining the construction sequencing and temporary erection requirements. ❒
- Details of the temporary works. ❒
- Revision of drawings, details and specifications arising from contract agreement, building consent, and construction requirements. ❒

Concrete:

- * Precast concrete shop drawings generally as defined in Precast NZ Code of Practice and AS/NZS1100. ❒
- * Proprietary system layout drawings and connection details. ❒
- * Embedded items and penetrations defined and located. ❒
- * For non-standard conditions the following are to be provided where applicable. ❒
  - formwork ❒
  - propping and bracing ❒
  - scaffolding and access ❒

Steel:

- Shop drawings generally as defined in *Australian Detailer Handbook ASDH101* or the *American Institute of Steel Retailers Guidelines.* ❒

Review:

- Review shop drawings, technical specification, and construction method statement submissions for consistency with detailed design. ❒

Commentary

1. Before the commencement of construction drawings the following need to be in place; contract details confirmed and tender accepted; sub-contract agreements confirmed; and owner supplied components available.
2. Deliverables contain sufficient details for elements to be manufactured/constructed without reference to other documents, i.e. ,'the details have co-ordinated the relevant design information across all disciplines and can be built from'.
3. Final determination of some dimensions may be dependent on proprietary design of non-structural elements (e.g., mechanical services duct sizes). Such proprietary design may need to be advanced to enable structural dimensions to be completed.
4. The constructor is responsible for managing health and safety risks during the construction phase.

5.* Significant changes or clarifications to the structural work in relation to the initial building consent documentation should be submitted to the Building Consent Authority and if necessary an amended building consent obtained to cover these changes

* Amended August 2008