APPENDIX B
MODEL COORDINATION

DIGITAL GUIDANCE SUITE:
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CONSTRUCTION SECTOR ACCORD

BIM
BETTER
BUILDING PROCESS.
BUILDING
BETTER PERFORMANCE.

New Zealand Institute of Building

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1— GENERAL

Successful model coordination relies on those operating in the different disciplines understanding their roles and responsibilities for modelling only what they are responsible for, according to the Model Element Authoring (MEA) schedule. Coordination is much more than automated clash detection – the key to successful coordination is to identify and prioritise issues, assign relevant project stakeholders to address them and track the issues until they are resolved.

Each discipline is responsible for implementing an internal coordination process; this includes single-discipline coordination and coordination with other discipline models being performed at regular intervals appropriate to the project stages. The internal coordination process can be achieved through automated processes, visually or a combination of both.

A managed approach to 3D model coordination may not apply to all projects. Where it is applicable, it is the responsibility of the lead consultant, coordinating consultant or project BIM Manager and should centre on the federated model. It is important to note that the responsibility for this must be defined early in the procurement process, for example in the EIR, and be captured in the agreed BEP.

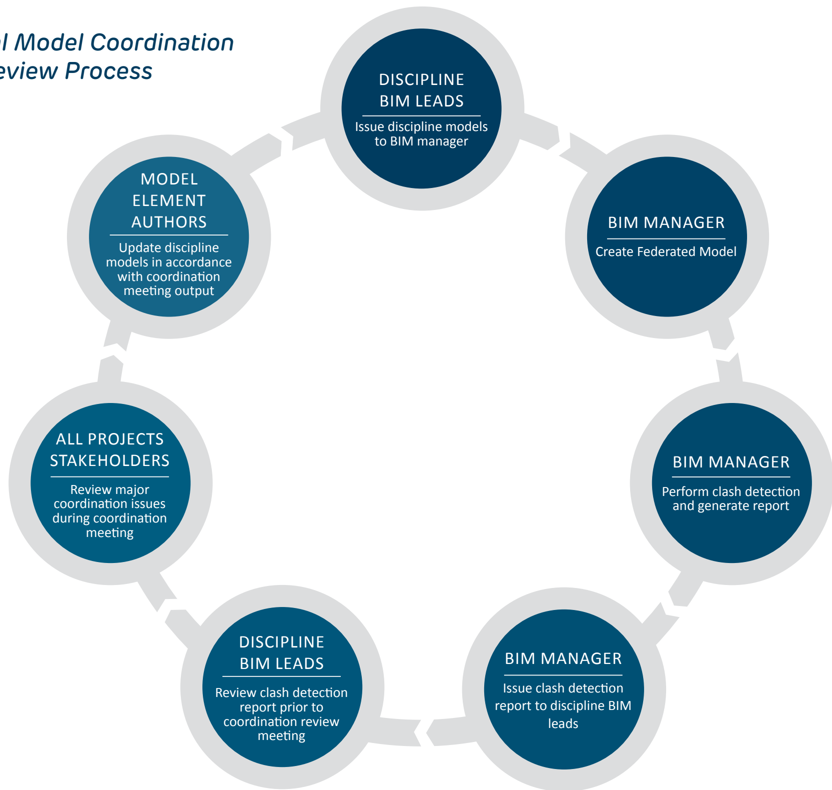
At intervals, as agreed in the project BIM execution plan, the BIM manager should create a federated model and undertake clash detection according to the agreed model coordination matrix and coordination model tolerances per design stage. The BIM manager should issue coordination reports to each discipline BIM lead before scheduled coordination meetings.

The coordination meetings should centre on the federated model to assist in visualising the issues being discussed; major clashes and coordination issues should be highlighted during the meetings to promote resolution.

Any outcomes, including minor clashes and other coordination issues, should be assigned to the relevant project team members. The BIM Manager should track the progress of each clash until it is resolved.

It should be noted that the BIM Manager will carry out the process of 3D coordination, including the federating of the models, undertaking the clash detection, and managing the issue tracking; however, they are not responsible for resolving the identified issues.

Fig 1 – Typical Model Coordination and Review Process



2— COORDINATION MODEL TOLERANCE SCHEDULE

3D coordination should follow preliminary design – because models are considered more fluid, and information provided within the BIMs is at a level of development where 3D coordination is providing few tangible benefit.

A coordination model tolerance schedule should be developed and agreed upon during the development of the BIM execution plan. The schedule defines coordination tolerances to be used for each discipline at each design phase. Note: This table does not infer design tolerances.

DISCIPLINE	PRELIMINARY	DEVELOPED	DETAILED
Arch vs. Other	~100mm	~50mm	~25mm
Structural vs. Other	~100mm	~50mm	~25mm
Mechanical vs. Other	~100mm	~50mm	~25mm
Mechanical vs. Mech	~100mm	~50mm	~25mm

3— HARD AND SOFT CLASHES

A hard clash occurs when two objects physically clash or intersect, such as a steel beam and a mechanical duct.

A soft clash occurs when an object interferes with another object's defined clearance zone. Implement clearance zones to ensure accessibility. Consider maintenance and installation safety as part of the clash detection process.

It is important to note that clash tests should be performed with required objects e.g., a column is to include base plates; where a base plate could pose a higher priority clash result than the column itself.

4— MODEL COORDINATION MATRIX

A model coordination matrix should be produced during the development of the BIM execution plan; see the example at the end of the appendix. The matrix defines the discipline models and elements that will coordinate with each other. Coordination requirements may differ at different stages of a project. For example, during preliminary and developed design, model coordination may be generalised per discipline. As design progresses it may be necessary to coordinate specific discipline elements, as shown in the example.

In the absence of client-specific coordination requirements outlined in the EIR, the BIM manager will lead the development of the model coordination matrix, with input from discipline BIM leads and members of the wider design team. It is important to note that the Discipline Design Leads must be involved in the development of the matrix, as it defines ways to coordinate the design; it is not solely a BIM function.

The coordination matrix should describe the priorities for the coordination of elements. It needs to include the phase in which they need to be coordinated within or by.

5— ISSUE PRIORITY DEFINITION

As the BIM execution plan is developed, the BIM manager, discipline BIM leads, and design leads should define clash priority rules for each element in the model, including issue priority definitions and populating an issue priority table. See the example below.

Clash priority considerations:

- Model discipline, i.e. Architecture, Structural, Services, Landscape, Civils
- Object type/category, i.e. Steel Structure, Fire Sprinklers, Fire Walls, Concrete Slab
- Intersection orientation, i.e. parallel or crossing
- Object size, i.e. 30mm diameter hydraulics pipe, steel beam
- Buildability of design
- Requirement of design input to resolve, i.e. multiple disciplines
- Construction state, i.e. proposed or existing
- Construction sequencing and critical path
- Code compliance requirements

Examples of high-priority issues include:

- Duplicate components
- Missing elements
- Components inside one another
- Intersections with doors, windows, columns, and beams
- Intersection orientation (parallel or crossing)

Examples of low-priority issues:

- Crossing between small pipes
- Partition walls against architectural slabs
- Pipes penetrating partition walls, where penetrations have not been modelled

Typically, large fixed objects are harder to move or adjust than small components. A simple rule of thumb: the larger (e.g. cooling tower) or more permanent (e.g. foundation) the object, the greater its right of way in a clash scenario.

Some small objects might have rights of way over others (e.g. fire sprinkler locations vs. cable trays), as other constraints, such as building regulations, come into play.

Examples of clash priority definitions are shown below.

PRIORITY	PRIORITY DEFINITION	EXAMPLE	DETECTION PHASE
1	Critical-priority clashes are reported clashes that are considered critical to the design and construction process. The highest priority is assigned to rectifying them as soon as possible after detection.	Building envelope, primary structure, and main service routes or zones.	Report from end of preliminary design onwards.
2	High-priority clashes are reported clashes that are considered important to the design and construction process. They should be rectified during design phases.	Service pipes that are 100mm in diameter or greater, secondary structure.	Report from 50% developed design onwards.
3	Medium-priority clashes are reported clashes that, while considered important to the correctness of the model, will generally change on a regular basis throughout the design and construction process. They can be assigned a lower-level priority and should be rectified before end-of-phase submissions of the models. Medium-priority clashes requiring further design input during detailed design will be elevated to major.	Service pipes that are less than 100mm in diameter.	Report from 70% developed design onwards.
4	Low-priority clashes are elements that will be moved without question during construction.	Service pipes that are less than 50mm in diameter.	Report from 100% developed design onwardS

6— DEVELOPING A CLASH MATRIX FORMAT

When developing a clash matrix, it is important to involve Discipline Leads, and to ensure it is project specific. The matrix should list all discipline objects or categories that will require coordination efforts. The format can be Excel or a table in Word; an example of how to set out a matrix is below:

● Critical ● Major ● Minor ● Trivial ○ Excluded

ELEMENT B (List by Element, Category or Discipline)

Continue the element listing to include all within your project.

ELEMENT A (List by Element, Category or Discipline)

Continue the element listing to include all within your project.

	STRUCTURE	ST1 Foundations	ST2 Columns	ST3 Framing	...	ARCHITECTURE	AR1 Enclosure	AR2 Roof	AR3 Doors	...	HYDRAULICS	HY1 Wastewater Pipework	HY1 Stormwater Pipework	HY3 Hot & Cold-Water Pipework	...
STRUCTURE															
ST1 Foundations		Excluded													
ST2 Columns		Excluded	Excluded												
ST3 Framing		Excluded	Excluded	Excluded											
...															
ARCHITECTURE															
AR1 Enclosure		Major	Minor	Minor			Minor								
AR2 Roof		Trivial	Minor	Minor			Trivial	Minor							
AR3 Doors		Major	Trivial	Critical			Excluded	Major	Major						
...															
HYDRAULICS															
HY1 Wastewater Pipework		Critical	Critical	Major			Minor	Minor	Major			Minor			
HY1 Stormwater Pipework		Trivial	Minor	Major			Minor	Minor	Major			Minor	Minor		
HY3 Hot & Cold-Water Pipework		Major	Major	Major			Minor	Minor	Critical			Minor	Major	Major	
...															

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The New Zealand BIM handbook.

This document is one of a suite of documents forming the New Zealand BIM Handbook. You can download or view the remaining documents here:
http://www.biminnz.co.nz/nz-bim-handbook