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BEP Addendum - Digital Coordination Framework

Introduction

Leveraging the full potential of Revizto requires the harmonious interplay of People, Process, and Technology. We are fortunate to have state-of-the-art technology and a customer success team of passionate and committed subject matter experts at Revizto.

The cornerstone of a successful construction project often lies in the meticulous management and quality control of the original design and construction documentation coordination strategy. This involves a comprehensive review and synchronisation of 'for construction' 2D technical drawings, specifications, and 3D models—a task that, though complex and time-intensive, is vital to the overall project success.

This BEP Addendum for Digital Coordination encapsulates our collective expertise in both the Revizto platform and successful project delivery on a global scale. We've distilled our insights into this strategic guideline that aims to reduce errors and, wherever feasible, streamline the process for greater efficiency. Our goal is to ensure you realise the highest return on your investment in Revizto, facilitating the smooth execution of your project.

The strategies in this document are intended to enhance your project's outcome by ensuring a high-quality, well-coordinated 3D model. To support the efficient implementation of digital coordination, Revizto freely provides the Codifying Coordination Revizto templates.

These templates consist of:

- Search Sets (that support Autodesk Revit and IFC file format workflows),
- Over 100 purpose-built Clash Tests (including Issue Automation rules),
- Appearance, Property, and Stamp Templates, and

- A comprehensive Clash Matrix.

Together these templates enable BIM/VDC coordinators, Designers, Contractors, and Trade partners to get up and running with Revizto's Clash Automation digital coordination processes and methodologies with minimal effort.

For any further support or clarification in applying these strategies and templates please feel free to connect with your local Revizto Sales or Customer Success representative.

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The Revizto team stands ready to help you successfully navigate your project journey.

Document Revision Table:

Version	Description	Date	Approver
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1. Why implement a Digital Coordination Framework

Implementing a digital coordination strategy is about reducing project risk[1] and finding opportunities[2]. While Clash Detection might be the first technology interface project teams experience with digital coordination workflows it is one component of the overall digital coordination framework.

Maximising your return on investment (ROI) from implementing a digital coordination framework comes from combining real-world project experience with the right digital technologies. Knowing how to resolve two clashing model elements, or which model element takes precedence over another is critical to the success of your digital coordination strategy and solutions proposed. Sometimes the most obvious solution is not the best solution when buildability, construction sequencing and supply chain are taken into account.

Mitigating project risk is empowered when all project stakeholders have access to a real-time Shared Data Environment (SDE) and can easily view and comment on the digital (2D and 3D) environment during design and construction enabling their unique expertise and project experience to influence the solutions to identified issues long before they manifest into costly problems on site.

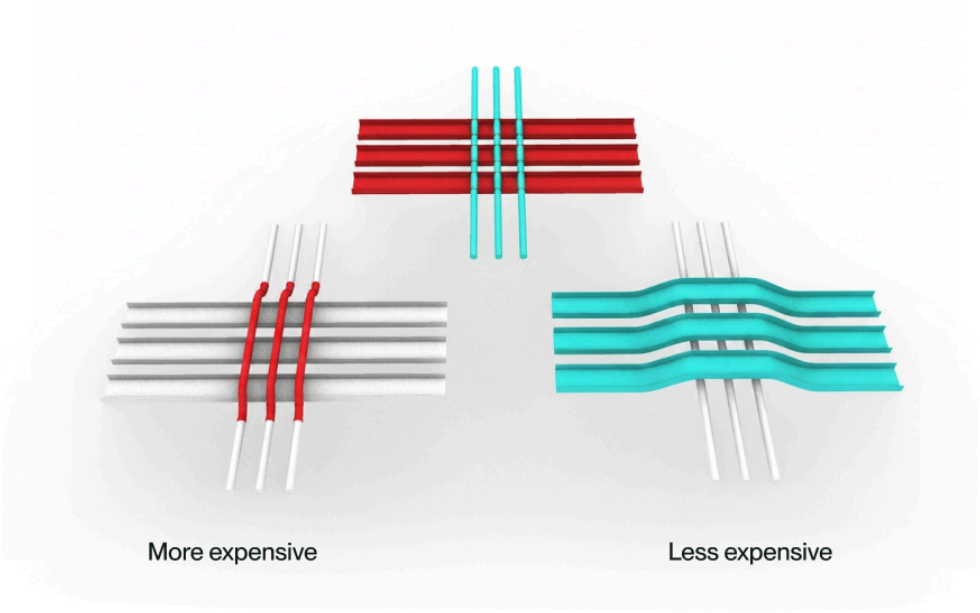


Fig1. Coordination (Clash Detection) vs Buildability (Construction Expertise)

[1] McKinsey & Company: The construction productivity imperative
[2] McKinsey & Company: Reinventing construction through a productivity revolution

2. Coordination Strategy

The goal for digital coordination (2D or 3D) is to ensure the design and construction information is as robust and reliable as possible to mitigate errors during the construction phase of a project.

A key component for ensuring that the digital information is coordinated and reliable, especially between the 2D technical drawings and the 3D models, is to ensure all 2D technical drawings are produced (cut/extracted) digitally from a coordinated 3D (design/construction) model.

As well as ensuring the above and the intended digital coordination processes are undertaken, it is important to nominate a digital consultant (lead consultant, general contractor, or project BIM manager) who is responsible for managing and executing the digital activities (Clash Detection, reporting, and resolution) related to the project's digital deliverables.

Finally, and possibly the most important component, is ensuring all model authors within the project are contracted and responsible for the delivery of a coordinated 3D model and 2D technical drawings as related to their project scope. This should include that all digital coordination activities are to be managed and undertaken within a Shared Data Environment (SDE) where all 3D models, 2D technical drawings, object data, Clash Detection, issue management, and project reporting can be hosted and undertaken seamlessly.

3. Coordination Responsibilities

Everyone involved plays a critical role in the successful delivery of the project's coordination strategy. However, the implementation of the overall coordination strategy is best undertaken with dedicated roles with defined responsibilities that come together for a unified purpose - successful project delivery (on time, on budget, with minimal RFIs).

Typical project roles and responsibilities include:

a. Project owner - responsible for describing the project's digital goals and objectives.

b. Project manager - responsible for clarifying and documenting the project owners' digital goals and objectives (digital brief), including:

i. key project milestones,

ii. digital file and data outputs, and

iii. contractual and collaborative relationships (the digital deliverables).

c. Digital consultant (can be the lead consultant, general contractor, or specialist project BIM manager) - responsible for establishing and facilitating the project's digital (BIM) execution plan in alignment with the project's digital brief, including:

i. project milestones,

ii. digital file and data deliverables,

iii. roles and responsibilities,

iv. data sharing, and

v. defining and executing the coordination strategy, including

1. facilitating and chairing any 3D coordination workshops, and

2. reporting on the delivery of the 3D coordination strategy, to ensure all stakeholders' digital deliverables meet the criteria set out in the project's approved digital (BIM) execution plan.

d. Design (lead) consultant - (design phases) responsible for leading and managing the overall design process, including

i. assisting in the delivery of the digital 3D coordination strategy, and

ii. ensuring all design disciplines digital deliverables meet the criteria set out in the project's approved digital (BIM) execution plan.

e. Design consultant - (design phases)
All disciplines are responsible for ensuring their digital deliverables (models) meet the criteria set out in the project's approved digital (BIM) execution plan, including attendance at any 3D coordination workshops, and responding to any actions identified as part of the digital 3D coordination strategy.

f. Main / General contractor - (construction phases) responsible for leading, and managing the overall shop drawing process, including assisting in the delivery of the digital 3D

coordination strategy, and ensuring all sub trade contractor digital deliverables meet the criteria set out in the project's approved digital (BIM) execution plan.

g. Sub Trade contractor - (construction phases) responsible for ensuring their digital deliverables (models) meet the criteria set out in the project's approved digital (BIM) execution plan, including attendance at any 3D coordination workshops, and responding to any actions identified as part of the digital 3D coordination strategy.

h. Model authors - (design and construction phases) responsible for ensuring all necessary components to describe their scope of works have been modelled in 3D, shared with all necessary project stakeholders, and meet the criteria set out in the project's approved digital (BIM) execution plan.

4. LOD and Coordination explained

The Level of Development or LOD, not to be confused with the Level of Detail (LOd), of a 3D model plays a critical role in the success of the digital coordination of a project. Misalignments in model LODs can impact the overall quality and effectiveness of the end result. It is also important to recognise that model LODs can and do vary between design and construction phases as the project's deliverables develop. By recognising these variations and allowing for them in the overall digital coordination strategy and workflows you can ensure optimum model coordination is achieved at each stage of the project.

Model LODs are best described in the Level of Development (LOD) Specification published by BIMforum.

The BIMforum LOD Specification[3] suggests model elements should have an LOD higher than 300, but not necessarily as high as 400 to enable effective 3D digital coordination. Thus, LOD 350 is suggested as the optimum LOD for undertaking digital (3D) model coordination.

[3] BIMforum LOD Specification 2023 Part 1

5. Macro vs Micro Coordination (Clash Detection) explained

Digital coordination, while involving many components including 2D, 3D and Data validation processes, is often more commonly associated with digital (3D) Clash Detection technologies and processes. Traditional digital Clash Detection methodologies can be broken into two dominant approaches: Macro and Micro coordination.

Macro coordination often refers to the process of or clashing two models against each other and analysing the results generated from this holistic approach.

Benefits for adopting a macro approach include:

- quick initial setup and execution of the digital coordination process,
- limited clash tests to create, manage, and maintain.

Limitations with a macro approach include:

- generation of a higher number of false positives in the clash results,
- extended time and human resources required to review the large volumes of individual clash results.

Micro coordination often refers to the process of clashing two model element categories against each other and analysing the results generated from this focused approach.

Benefits for adopting a micro approach include:

- reduction in the number of false positives in the clash results,
- speed and flexibility in executing clash tests (not all model elements need to be clashed at every coordination milestone during the design and construction phases),
- targeted and higher confidence in the reported coordination results leading to pathways to automate the process of digital coordination, and

- ability to scale and template the digital coordination process across multiple project's typologies, generating greater savings and efficiencies.

Limitations with a micro approach include:

- initial setup is longer,
- potential for more clash tests to create, manage, and maintain.

Note: the above limitations can be reduced to almost zero impact once the overall digital coordination process is templated, or by using the Revizto Codifying Coordination templates.

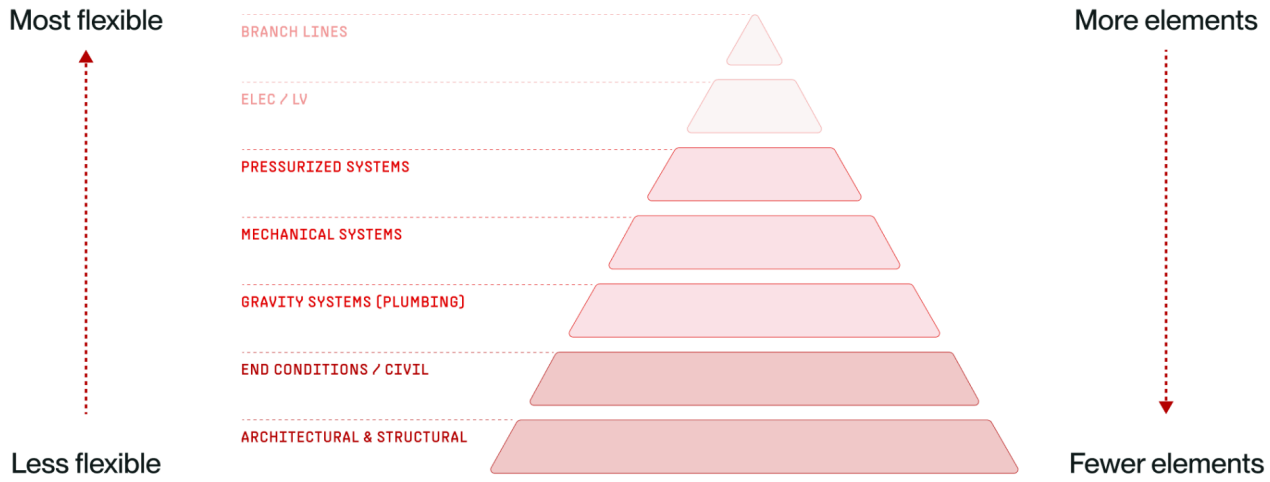


Fig2. Model element category/discipline clash hierarchy

6. Coordination Process

Revizto will be the primary tool for executing digital collaboration and coordination activities throughout the design and construction phase of the project. All project participants will ensure they have appropriate software licensing, hardware, and training to effectively utilise and engage with Revizto in the delivery of their contracted scope of works.

3D models will be uploaded at regular intervals, preferably nightly using Revizto's automated model export technology to limit the amount of manual processes involved, with selected 2D drawings uploaded to assist with coordination between the 2D and 3D project deliverables. Digital 3D coordination (Clash Detection) is best carried out using Revizto's Clash Automation technology from design development (LOD300) onwards led by the digital consultant. All model authors (design and construction) are to make their work in progress (WIP) digital model files and 2D drawings available for upload to Revizto to facilitate the Clash Detection and 3D coordination processes.
Regular model reviews, coordination workshops, and model audits will be conducted by the digital consultant to check and report on alignment with the coordination objectives and deliverables of the overall BIM strategy. Reporting can be automated and shared with all project stakeholders weekly via Revizto's built-in Dashboards and Reports.

6.1 Data sharing

The foundation of collaboration in the digital environment is the free flowing and sharing of digital information (data). The effectiveness of 3D coordination strategy and collaboration processes is governed by the frequency and timely sharing of data.

At a minimum, the 3D digital (model) and selected 2D digital (drawing) files should be exchanged between all project stakeholders (uploaded) to the SDE (Revizto) weekly.

The sharing of model files daily (overnight) is encouraged to facilitate real-time collaboration and information sharing. 2D drawings can also be shared daily to ensure alignment between the 2D and 3D environments in the SDE.

6.2 Coordination milestones

Coordination milestones exist to track and record the progress of the design and construction deliverables. Coordination milestones often align with other project milestones, but are not necessarily restricted to these points in time.

At a minimum, coordination milestones should take place prior to the end of a design or construction phase, and allow sufficient time to resolve any reported issues discovered during the auditing and coordination process. Ideally coordination milestones should take place at 50%, 75% and 90% completion points of the design or construction phase.

Activities undertaken during the analysis of the digital environment (2D and 3D files) should be captured in a digital (BIM audit/coordination) report. Key actions and recommendations for the design or construction teams should be highlighted for completion as part of the current phase of works, as well as any deferred remedial works for the next phase of work.

At a minimum, coordination milestone reports should include the following Key Performance Indicators (KPIs):

a. Assessment of the native digital model files reporting on:

    i. Overall file size to ensure there is no file bloat and/or any unnecessary model content not related to the project's deliverables.

    ii. Level of Development (LOD) review to ensure the content within the model files is aligned with the LOD matrix in the approved BIM/Digital Engineering Execution Plan.

    iii. Authoring platform warning/error logs to ensure the digital model files are free from any items that may cause the files to become corrupt and unusable in the future.

b. Assessment of the collaboration and coordination environment (Revizto) reporting on:

    i. Overall number of issues (including clashes) reported, open, in progress, solved, and closed, assessing the number and priority of reported issues that are able to be resolved within the remaining time for project completion.

    ii. Level of engagement of the project team within the collaboration and coordination environment, highlighting any adoption issues that may pose a risk or delay to the project or another project team member.

    iii. Review of the Clash Detection methodology and clash tests to ensure no major conflicts in the overall model coordination have been left undetected, or may pose a risk or delay to the project, or another project team member.

6.3 Model structure

When creating a framework for digital collaboration in design and construction, it is critical to establish a flexible and scalable approach to authoring and sharing the 3D (model) data sets and files.

A fundamental consideration and key decision to make early in the establishment of your SDE is how big are the models and how many do I need to make?

Determining the answers to the above questions is often dependent on a number of factors, including the scale and complexity of your project, and the team delivering the project. Often the smaller the project the fewer (in quantity) and potentially larger (in size) the model files.

However for larger more complex projects it is typical to have a high number of model files (50+ model files). It is also commonplace for individual model file size limits to be imposed (less than 1GB).

- Smaller projects typically have one model file per discipline. i.e. for a residential project, perhaps everything for the Architectural discipline can be contained in one larger 3D model.

- Large projects often have a large number of discrete model files which can be easily loaded/unloaded for different packages. i.e. for large-scale healthcare facilities the Architectural discipline may be broken in the following typical model files, facade, furniture and equipment, interior components, department xyz, podium, site, and existing context etc.

The key to balancing and optimising the performance of both your digital authoring and collaboration environments is to not overburden project teams with overly large, complex models that can take hours to open every day, while at the same time reducing the manual overhead related to managing and maintaining the health of numerous individual model files that can be required on the largest projects, sometimes in excess of 1000 models.

Revizto can seamlessly support both a single (federated) model even if it is very large in file size, as well as 100s of individual model files that are combined (federated) into one project.

Conversely, the original authoring environment for the digital model files may require models to be split based on known limitations related to the performance of the authoring software.

Limitations in the authoring environment can be driven by the complexity of the geometry being modelled, or by the overall file size of the model being created through the need to share and work on the same file from multiple locations at the same time.

As a guide, it is best practice to align the number of models based on your project team's structure, and limit the overall file size for any single model to the specific hardware (RAM, GPU, CPU and Ethernet) requirements being used to create the model.

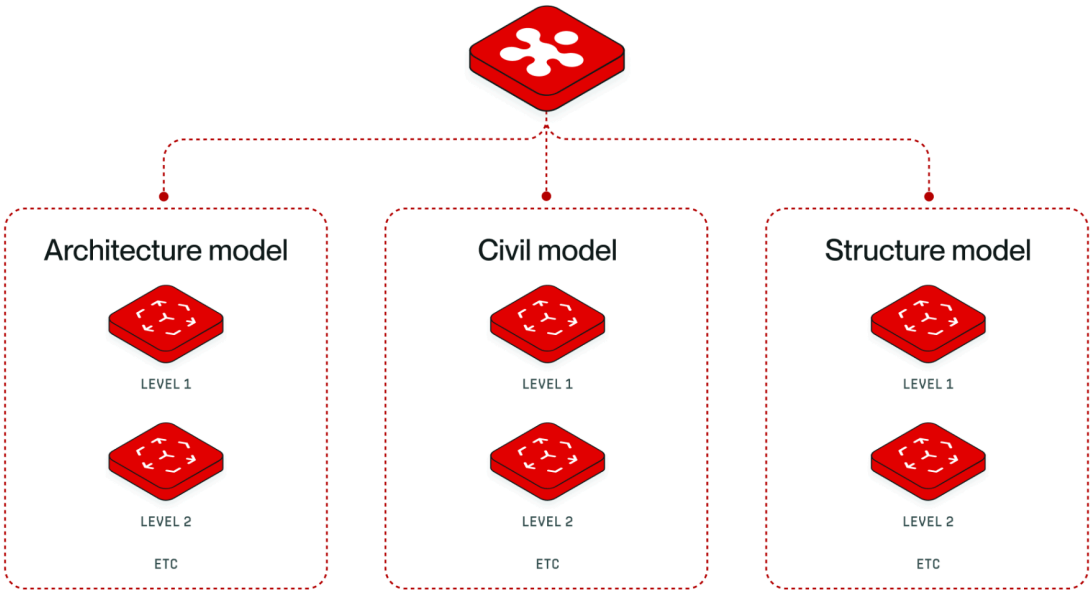


Fig3. An example of a typical (federated) model structure in Revizto

6.4 Coordination Zones

Managing the complexity of construction projects requires numerous moving parts to come together in a systematic and coordinated process. When digital prototyping a construction project in 3D the same requirements are also present. Dividing up the complexity into small, targeted areas, or "Zones", is a fundamental enabler for greater efficiency, risk reduction, and transparency of effort.

Revizto's purpose-built 3D Coordination Zones feature is a powerful tool in establishing and managing coordination zones during the development of both the design and construction phases of a project.

When establishing the 3D Coordination Zones in your project there are several key factors to consider depending on the phase (design or construction) of your project. Consideration should be given to the progression of the phase the project is currently in; if the project is in an early design development phase the coordination zones may be best to form a macro "view" of the project. Conversely, if the project is in detailed design development, or construction phase, it may be best to create additional coordination zones to capture a detailed "view" of the project to assist with overall reporting and execution of the coordination of the project.

It is recommended to also establish a systematic hierarchy to the Coordination Zones. This can then be used within Revizto's Clash Automation and Issue Tracking environment to assist with facilitating and managing the 3D coordination process. Areas of highly congested building services, such as plant rooms, service risers, and ceiling voids often have the highest amount of RFI's on site due to poor coordination. Flagging these areas as high priority zones can bring extra attention to the resolution of any clashes or issues identified within these zones. Areas that have large amounts of free-space and flexibility such as corridors, open-plan office space, and exterior spaces can be assigned a lower priority.

Coordination Zones are created as 3D model elements in the authoring software prior to importing into Revizto. Care should be given to the naming syntax of the 3D model elements within the authoring environment as their names will be used by Revizto's Issue Tracking and Clash Automation tools to tag and associate any issues and clashes located within each zone's volumetric boundary.

An example of Coordination Zone naming syntax is:

<Level>_<Zone Description>_<Zone Priority> i.e.

Level1_Above Ceiling_Critical, or

Roof_Plantroom_Major

By adopting good zoning strategies it is possible to create a digital framework that automates the coordination of your project enabling project teams to spend more time resolving identified issues, rather than looking for issues to resolve.

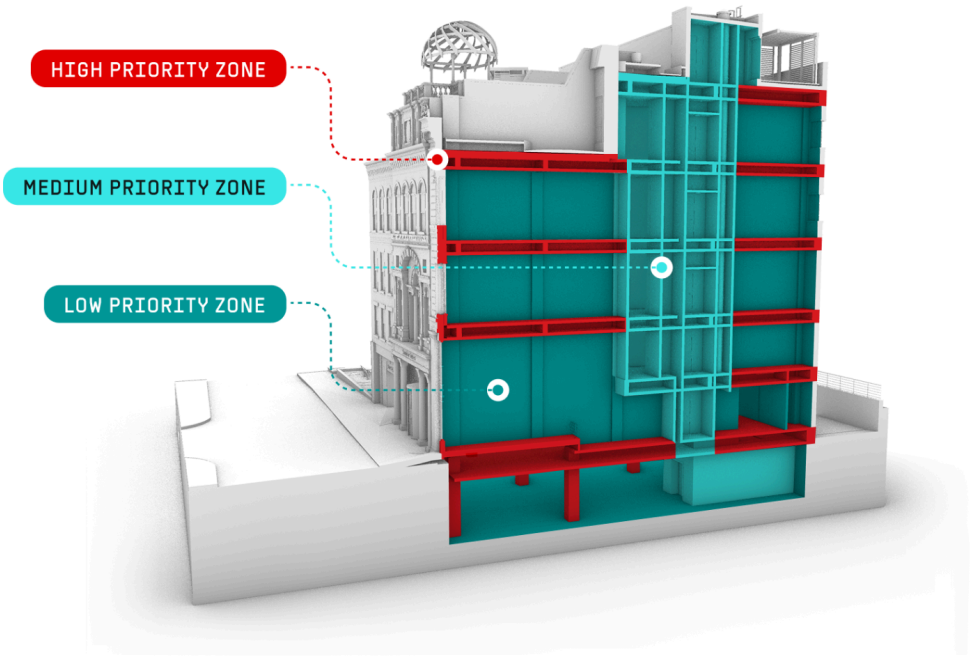


Fig4. An example of a typical coordination zone structure in Revizto

6.5 Clash Matrix

A key tool to assist in defining and managing the digital coordination process is the clash matrix. A clash matrix is a document that captures and communicates the coordination priorities, responsibilities and clash types or clash tolerances to be applied during each clash test.
When developing your clash matrix it's important to consider the hierarchy and number of individual clash tests required for your project. Additional consideration should be given to when (design and of construction phase) each clash test is best executed.

Capturing these important components of your digital coordination workflow in a clash matrix provides a powerful tool to quickly identify who is responsible for any issues identified as part of the Clash Detection process. The clash matrix also serves an important role in defining the

rules the each clash test is based upon.

Revizto's Codifying Coordination templates include an example clash matrix that can serve as a starting point for your project.

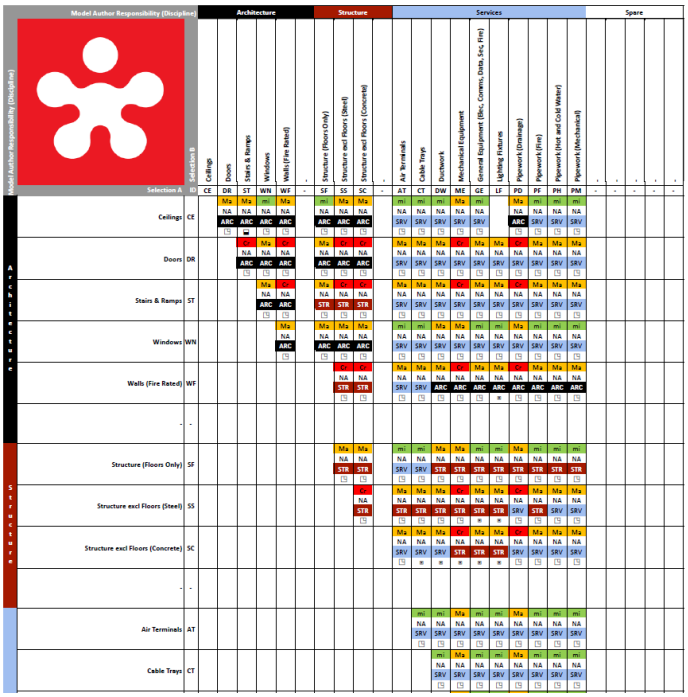


Fig5. Revizto's Codifying Coordination example clash matrix

6.6 Clash Automation

Revizto's Clash Automation engine combines both intelligent Clash Detection and issue management automation, This enables project teams to focus on resolving the design or construction of their project and worry less about managing clashes.

To get the best return on investment (ROI) with Revizto's Clash Automation it is highly recommended that a systematic framework for Search Sets, Clash Tests, and Issue Automation is adopted. By approaching Clash Automation as a systematic, automated process you can scale the workflows to suit any project regardless of complexity, size, or typology.

There are 3 fundamentals to implementing Clash Automation in Revizto:

1. Search Sets are the foundation of Clash Automation and without them Clash Automation cannot be run.

2. Clash Tests define the characteristics of the computational clash (detection) analysis to be run on the model geometry.

3. Issue Automation defines how identified clashes are raised as Issues (automatically) within Revizto's Issue Tracker.

These fundamental components of Clash Automation are explained further in the following sections of this BEP Addendum - Digital Coordination Framework.

6.7 Search sets

Search sets are the foundation of Revizto's Clash Automation and numerous other workflows within Revizto. Having a framework to manage Search Sets efficiently and at scale is paramount to the success of your Revizto implementation.

Search Sets are an incredibly powerful way to define, locate and select components of your Revizto environment. Whether it be entire models or the smallest sub-component or model element, Revizto's Search Sets are flexible enough to cater to any situation.

Because of their flexibility and adaptability, defining a structured methodology for the creation and management of Search Sets is a critical step in the implementation of Revizto on any project.

A recommended best practice for creating and managing Search Sets is to create search sets based on your authoring platform's core data schema; in the case of Autodesk Revit this often revolves around Revit's internal Categories schema. This provides a robust methodology to scale the use of this common data structure and is also supported in OpenBIM workflows via the IFC file format.

Other common Search Sets categories that are recommended include:

1. Models, search sets used to select all geometry of a given model file,

2. Categories, search sets based on the Autodesk Revit Category data schema,

3. Properties, search sets used to select model elements based on unique properties values, and

4. Clash Tests, it is best practice to create specific Search Sets (comprised of other Search Sets) for your clash tests in Revizto's Clash Automation. This avoids unnecessary edits that could disrupt the clash automation and coordination process.

The Codifying Coordination templates include a number of these Search Sets. Utilising Revizto's Batch Create Search Sets feature you can also quickly create your own Search Sets, based on selected properties.

Leveraging Revizto's ability to cascade one Search Set into another enables fast and efficient implementation and, more importantly, long-term maintenance throughout the life of your project. Cascading Search Sets are described in the diagram below.

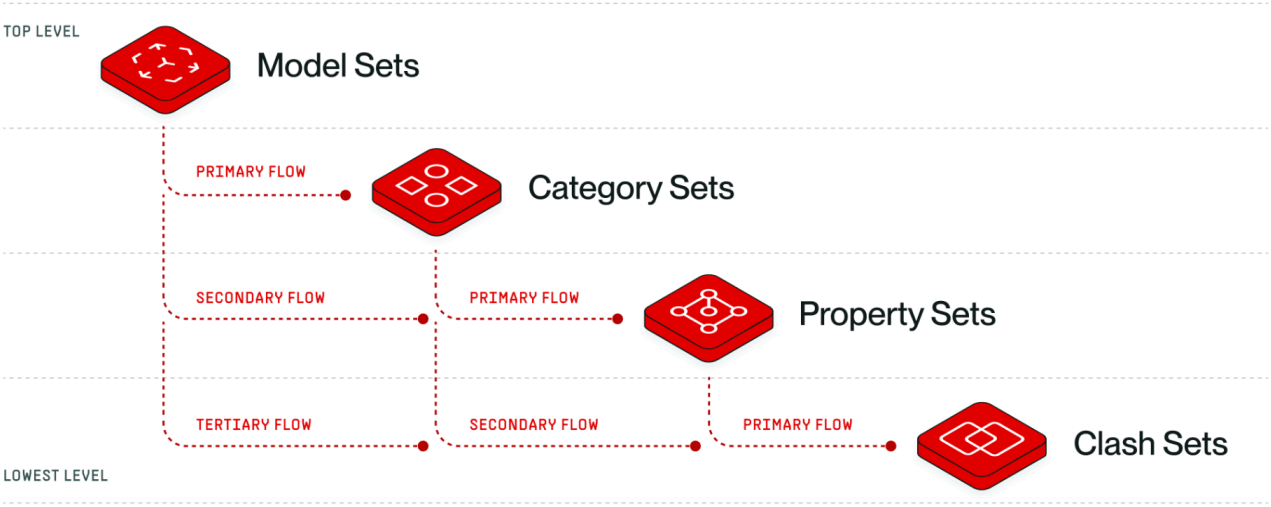
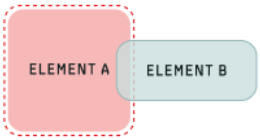


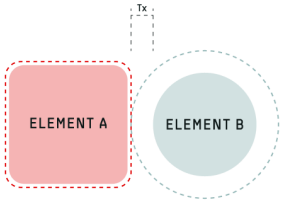
Fig6. An example of a cascading search sets in Revizto

6.8 Clash (detection) tests

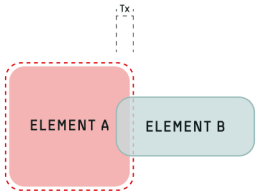
A clash (detection) test, at its most fundamental, is the digital process of analysing and testing two model geometries against a spatial or digital constraint and capturing any instances found as a "clash". Revizto clash tests can be created to test one of the following specific conditions:



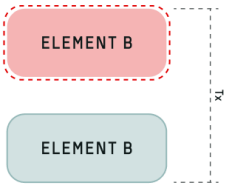
Hard Clash: tests if two objects touch or intersect.
Options include: treat touching objects as clashes, treat objects inside other objects as clashes.



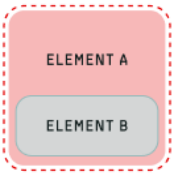
Clearance Clash: tests if two objects are closer than the specified distance. A separate clearance test is available for testing the horizontal and vertical clearances.



Tolerance Clash: tests if two objects overlap greater than the specified distance. A separate tolerance test is available for testing the horizontal and vertical tolerances.
Options include: Treat objects inside other objects as clashes.



Above and Below Clash: tests if two objects are closer than the specified distance either directly above or below.
Options include: Top or Bottom of Element A to Top or Bottom of Element B



Inside Clash: tests if an object is inside another object.

Duplicates Clash: tests if two objects are in the same location and same size (duplicated).

Creating a robust, flexible, and scalable framework for Clash Detection requires more consideration than clashing two models against each other. While this is a possible methodology, refer to the section on Macro vs Micro Clash Detection.

There is much more to be gained (long-term time and cost savings) through the initial investment in setting up a detailed clash test framework as part of your overall Revizto implementation. This involves consideration for mitigating False Positive clash reporting in your clash tests. False positives are two objects (model elements) that overlap or meet the clash test criteria, but are intended to be this way.

6.9 Managing clash results and false positives

Managing the quantity and quality of the results produced by computational Clash Detection processes is critical to the success and level of engagement of your overall digital coordination strategy.

Revizto supports several methods to minimise time reviewing individual clashes and mitigate false positive reporting including:

1. Ignore Rules define the conditions and constraints, that if met, the clashing model geometry is ignored and not reported in Clash Automation in Revizto. Revizto supports several different type of Ignore Rules, including:

a. Ignore Duplicates: if a clashing object includes a part of a mesh that is fully identical to a part of a mesh in the other clashing object, the clash is ignored.

b. Ignore if both objects are in the same model: if clashing objects belong to the same Revizto model, the clash is ignored.

c. Ignore spatial geometry: if a clashing object is a spatial object (Room, Area, Zone, Space), the clash is ignored.

d. Ignore objects that are in the search sets: if an object belongs to any of the specified search sets, clashes with that object are ignored. Includes options for clash selection set A and B.

e. Both objects have the same property value: if clashing objects have the same value of a specific property, the clash is ignored. Multiple conditions of this type can be added to suit your project requirements.

2. Clash Grouping is the process of grouping individual clashes together to form a larger single clash group. Grouping individual clashes (model geometries) together is a common and powerful way to reduce the overall effort in reviewing individual clashes, but to also quickly visualise and understand the context and relationships between clashing model elements. This process when used as part of the overall coordination strategy greatly assists with identifying and mitigating false positives. Revizto supports the following clash group types and methods:

a. Selection set (A or B): groups the clashes identified relative to the selection set used in the clash test criteria, can be either A or B.

b. Level: groups the clashes identified relative to the nearest model level defined within the Revizto environment.

c. Grid intersection: groups the clashes identified relative to the nearest model grid line intersection defined within the Revizto environment.

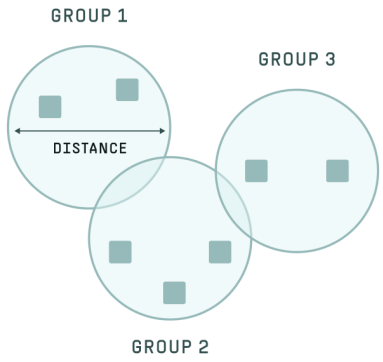
d. Room: groups the clashes identified relative to the spatial boundaries of the defined room model geometry.

e. Area: groups the clashes identified relative to the spatial boundaries of the defined area model geometry.

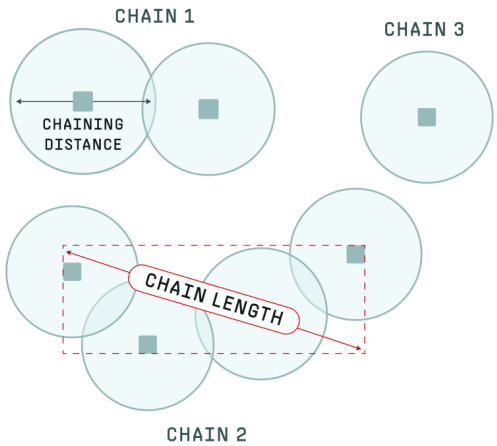
f. Zone: groups the clashes identified relative to the spatial boundaries of the defined zone model geometry.

g. Space: groups the clashes identified relative to the spatial boundaries of the defined space model geometry.

h. Proximity: groups the clashes identified relative to the defined spatial proximity (radius) constraint between individual clashes.



i. Chained proximity: groups the clashes identified relative to the defined spatial proximity constraints including radius and a chained length between overlapping clash group “bubbles”.



j. Property condition: groups the clashes identified based on a defined property (parameter value) within the clashing model elements.

k. Group all clashes together in one group: groups the clashes identified within the clash test into a single clash.

3. Advanced Issue Automation is a feature of Revizto's Clash Automation technology that is specifically designed to analyse the results of a clash test prior to escalating the identified clashes as issues within Revizto's Issue Tracker. Using Advanced Issue Automation to validate identified clashes is one of the most powerful tools that can be implemented in a digital coordination strategy.

   Revizto's Advanced Issue Automation provides a structured framework to analyse clashes based on defined conditions (Location and Search Sets) and, as these conditions are met or not, apply defined metadata (Stamps, Priority, Type, Deadline, Assignee, Watchers, and Tags) to the issues created during the sync with Issue Tracker process.

   Investing the time to add Revizto's Advanced Issue Automation to your coordination workflows provides a pathway to save 100s, if not 1000s, of hours of manual work required to review and evaluate clashes prior to escalating as coordination issues requiring rectification in the original model environment.

6.10 Issue management

Issue management is a critical component of digital coordination workflows within projects. It is essential to have a dedicated and comprehensive tool to capture and actively monitor the progression of issues that get raised through to resolution as part of a digital coordination process.

Revizto's Issue Tracker and Project Workspace were designed to create a collaborative issue management framework that supports and fosters active resolution of identified issues across diverse project teams.

Issue management workflows should be designed to be easily understood and followed by all project team members. Using simple visual aids[4] and Issue metadata[5] identified issues can be quickly and easily communicated across the project team. This ensures individual team members are responding to "their" issues without having to search through unrelated issues.

Revizto supports two fundamental issue formats, the first being a "regular" issue, and the second being a "stamp" issue. The main difference between the two issue formats is the visual display characteristics of the issues within the 2D, 3D, and Issue Tracker environments.

Regular Issues have a comment icon  to indicate the location of the issue or clash.

Stamp Issues contain up to four alphanumeric characters that can be customised (colour and abbreviation) to describe different use cases or highlight responsible parties required to resolve the identified issue.

- 

Rounded issue stamps indicate they were created manually.
- 

Square issue stamps indicate they were created during Revizto's clash automation process.

An essential part of issue management is communicating the progression of identified issues and their respective status and priority through to resolution and close out. Revizto supports many different methods for communicating the status and priority of issues. One of the most powerful methods is using Revizto's project Dashboards and dynamic Charts within the web-based Workspace environment.

Charts and Dashboards can be created to focus on a specific Type, Location, Priority, Status, and other Issue metadata, or to provide an overview across multiple issue data points to suit your project requirements. The dynamic Charts support various visualisations ranging from simple bar and pie charts to sophisticated timeline or layered charts, enabling project teams to clearly understand the progression of identified issues.

The successful implementation of any issue management workflow is directly linked to the effectiveness and simplicity of the issue resolution workflow. Overly complex workflows often

[4] Issue Stamps, and 2D Issue clustering 'Heatmaps'
[5] Priority, Deadline, Location, and Tags

lead to shortcuts or processes not being followed. When processes are too simplified they can create confusion and a lack of clarity in who is responsible for resolving the identified issues.

Balancing complexity versus simplicity is part science and part experience. The science can typically be defined in the number of steps within the resolution process. Experience is often more subjective and related to the human and cultural components that make up any project team. Invest the time to understand the dynamics of both your project team and the projects programme and deliverables when designing your issue management workflows.

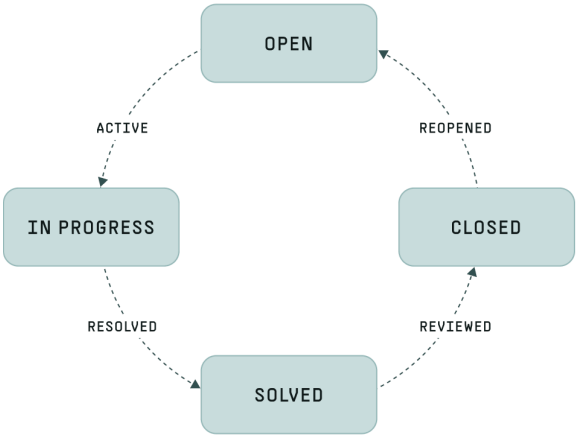


Fig7. An example of a simplified Issue Management workflow

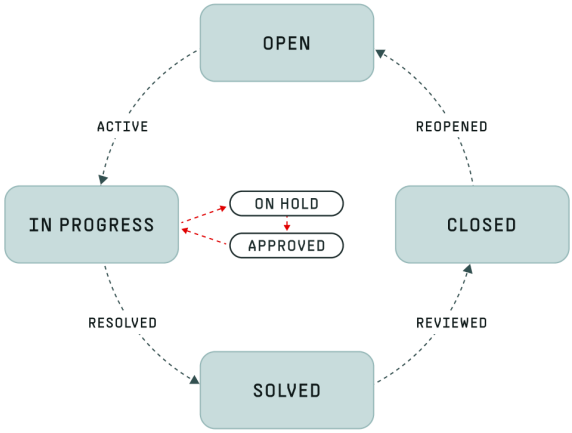


Fig8. An example of a more complex Issue Management workflow

6.11 Issue Stamp Templates

Visual communication is one of the most powerful tools in fostering engagement and collaboration within construction projects. Revizto's Issue Stamp Templates provide a framework to standardise and streamline the communication and management of project issues across multiple projects and teams.

Revizto, by default, provides several Issue Stamp Templates that have been workshopped with industry experts to capture and align the specific uses and workflows across the APAC,

EMEA, and Americas regions. These templates provide an excellent starting point for creating your own bespoke project or organisational issue framework.

When designing your Issue Stamps it is important to consider use cases outside the traditional digital coordination workflows. Issue Stamps have proven to be invaluable in many adjacent workflows, including quality control and auditing (QC/QA), asset and facilities management (AM/FM), manufacturing and process control, health and safety, and any other workflow where a task and location is required to be tracked and monitored.

Issue Stamps should be easily recognisable and the careful use of colour and the four character abbreviation provides a framework to structure and distinguish issues based on either or both the colour and abbreviation. Some common examples include:

- Colour: using different colours to indicate a design, construction, or operational workflow.
- Abbreviations: prefixing the abbreviation with a letter or number to indicate a design, construction, or operational workflow.

It is important to recognise that overly complex Issue Stamp templates can be counter-productive and investing the time and effort to refine the possible combinations of issue stamps while ensuring they remain functional and fit for purpose will increase the level of engagement and effectiveness in your Revizto implementation.

6.12 Issue automation

Digital tools were designed to enable people to do more with less. Revizto's Issue Automation technology has been specifically designed to take this concept to the next level and address the magnitude of potential issues that can be generated in complex construction projects utilising digital coordination workflows.

Revizto's issue automation technology was designed to enable project teams with two core variants. The first being Simple Issue automation where identified clashes are preloaded with defined metadata upon synchronisation with Revizto's Issue Tracker. The second variant is Revizto's Advanced Issue automation which uses defined conditions to analyse the identified clashes on whether certain criteria is met or not before applying the defined metadata upon synchronisation with Revizto's Issue Tracker.

Issue metadata that can be applied to created issues during the issue synchronisation process includes:

- Stamp: applies the defined Stamp template to the issue.
- Type: applies the defined Type to the created issue.
- Priority: applies the defined Priority to the created issue.
- Deadline: applies the defined Deadline date to the created issue.
- Assignee: applies the defined Assignee to the created issue.
- Watcher(s): applies the defined Watcher (can be multiple) to the created issue.
- Tag(s): applies the defined Tag (can be multiple) to the created issue.

Advanced Issue Automation conditions that can be tested during the issue synchronisation process include:

- Filter by Location: clashes are analysed based on an include (create an issue) or exclude (do not create an issue) function where clashes inside or connected to the defined location either create or do not create issues. Locations that can be used with this function include:
    - Levels: uses the defined project Levels to filter the clashes prior to creating an issue.
    - Rooms: uses the defined project Rooms to filter the clashes prior to creating an issue.
    - Spaces: uses the defined project Spaces to filter the clashes prior to creating an issue.
    - Zones: uses the defined project Zones to filter the clashes prior to creating an issue.
    - Areas: uses the defined project Areas to filter the clashes prior to creating an issue.

- Conditional Values: clashes are analysed based on a defined Search Set criteria where clashes that meet defined criteria either create or do not create issues. Search Set conditions can be applied to selection set A or B, and be applied to "has" at least one object (including selection set A and/or B), and all objects, and the exclude option "doesn't have"' for each variant.

Some common examples for Advanced Issue Automation include:

- vertical services passing through floor slabs and tagging these issues with "penetration required".
- horizontal services passing through fire rated walls and tagging these issues with "requires fire protection".

By capturing these often ignored clashes as Issues within the Revizto environment, using Advanced Issue Automation not only provides an efficient and automated process for recording these tasks, but also locates them both within the 3D model, and more importantly on the 2D construction drawings, ensuring the highest levels of design and construction coordination.

Revizto's Issue Tracker can then be used to monitor the design and construction progress of these important components of a building structure and interior fabric, ensuring quality and building standards compliance are maintained throughout the construction lifecycle.

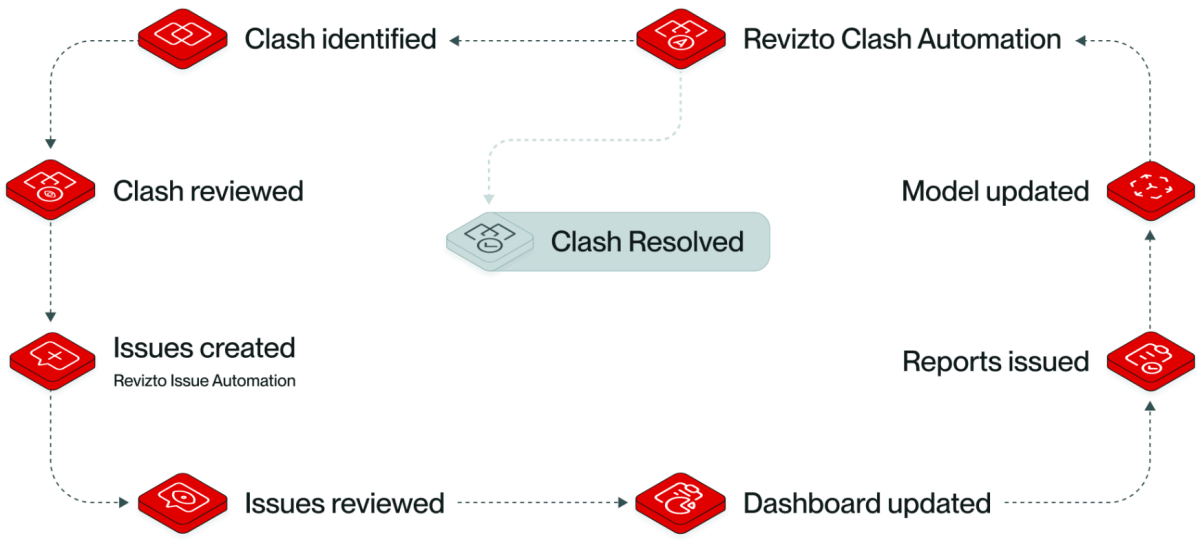


Fig9. Clash and Issue Automation workflow in Revizto

6.13 Project reporting

A cornerstone of successful digital coordination is regular and consistent project reporting and information dashboarding. Revizto integrates powerful Issue reporting and dashboarding tools to ensure project teams are informed at every stage of a project's life cycle. By combining these powerful communication tools with Revizto's automation workflows, project teams are able to stay up to date with changes within the project's digital coordination without additional effort, avoiding costly rework and delays.

Creating a project reporting and dashboarding environment is more than just running a weekly report of active or closed issues, it's also more than creating a dynamic chart of every possible data point. It is crucial to create an environment that promotes transparency and collaboration.

This starts by understanding the types of information project team members need to do their part of the overall project as efficiently as possible. Using automation to remove bottlenecks and manual workflows is a critical step in the overall success of your digital coordination implementation. Streamline and refine information flows and use simple, yet powerful visualisations so the important issues rise to the top, while low priority issues remain tracked and managed so nothing slips through your coordination process to create a bigger issue during a later phase in your project.

Experiment with the frequency of sharing coordination information. As a guide, start with sharing coordination reports highlighting outstanding (in progress) issues requiring attention at the beginning of every working week. Compliment these detailed reports with a dynamic and "real-time" dashboards so project team members can view and monitor progress at an individual level.

Leverage the visualisation aspects of Revizto's powerful charting tools to highlight trends and predict outcomes based on historical data points, creating informative dashboards to communicate to project stakeholders where effort is required and celebrate the hard work of the project team.

7. Revizto Glossary