Ashghal Building Information Modelling Standards (ABIMS)

Clash Detection Matrix Template Guide

Guide	Specification	Template
Code	S0301	
Version	V1	
Date	26 May 2022	
Owner	Public Works Authority (Ashghal)	
Author	Engineering Services Department	

Document Properties

Document Title	Clash Detection Matrix Template Guide
Document Owner	Public Works Authority – Ashghal (State of Qatar)
Document Author	Engineering Services Department (ESD)

Version Control

Version	Purpose / Modification	Author	Date
V1	Issued for Approval	ESD	26 May 2022

Release Authorization

The current version of the document is valid from the issue date to the revision date. The document has been authorized by the following:

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PURPOSE OF THE DOCUMENT

This document provides the user with guidance on the concept of Clash Detection, followed by instructions on how to:

- Select the correct clash detection matrix;
- Determine the elements to be coordinated; and
- Fill the appropriate tolerance values on the Clash Detection Matrix Template to complete the process.

This document relies on the Navisworks Template Guide contained with the Clash Report Template which explains how to report on clash detection; as well as the process for Design Coordination included in the BIM Use Processes Design Phase Guide.

Prerequisites: Users should have pre-existing knowledge on the Clash Detection Strategy for the project and Clash Detection Processes in general prior to completing this document.

1 CLASH DETECTION OVERVIEW

The entire Clash Detection process is split across different applications. Some applications have template files that are required to be filled by the users. *Figure 1* demonstrates the sequential order of steps and files used. The **Blue** boxes identify processes covered by this document, the **Red** boxes identify processes covered in the Navisworks Template Guide.
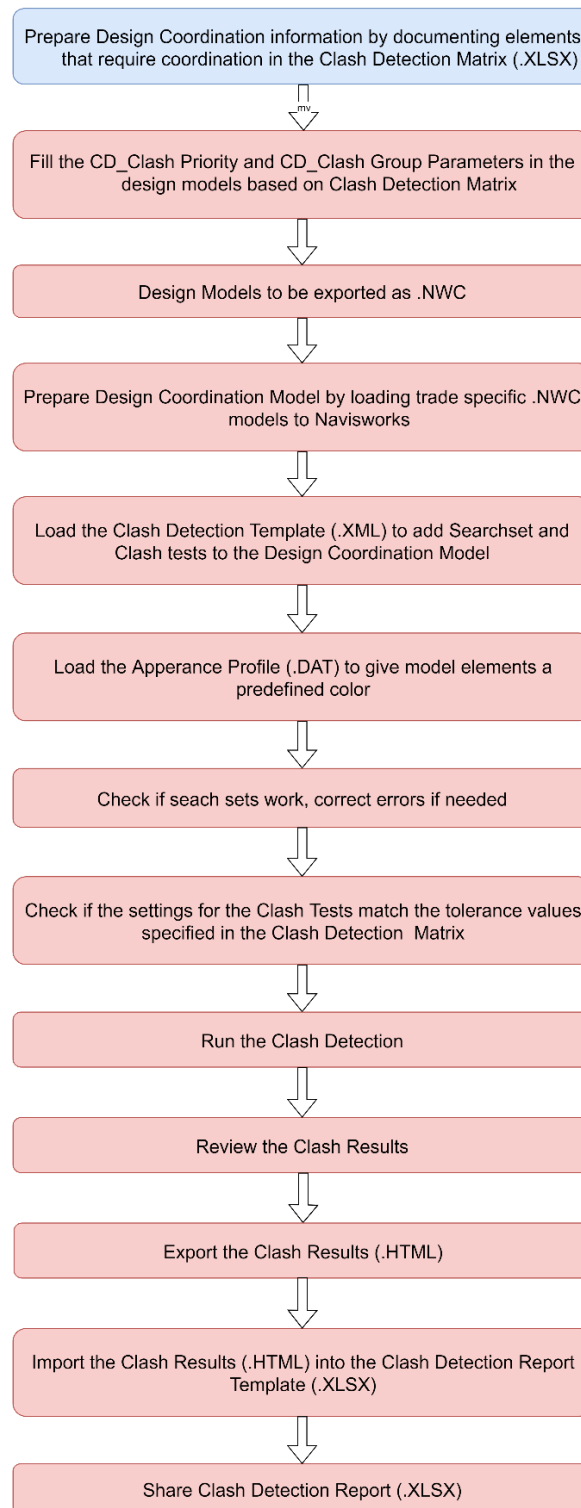

Figure 1: Overview of Different Steps in Clash Detection

2 CLASH DETECTION DEFINITION

Clash detection is an iterative process, in which 3D models from a project are analysed by project stakeholders to identify and resolve existing coordination issues between disciplines before construction. Coordination issues are typically grouped into two types.

2.1 Clash Types

Hard clashes:

A hard clash is the intersection of Object A with Object B, by a distance of more than the tolerance value set in the clash test.

Figure 2: Hard Clash

Instances where two components occupy the same space.

Example:

- *Pipework running through a steel beam*
- *Structural shear walls and block work overlap horizontally or vertically*

Clearance clashes:

A clearance clash is where Object A and Object B do not intersect but come within a distance of each other, that less than tolerance value set in the clash test.
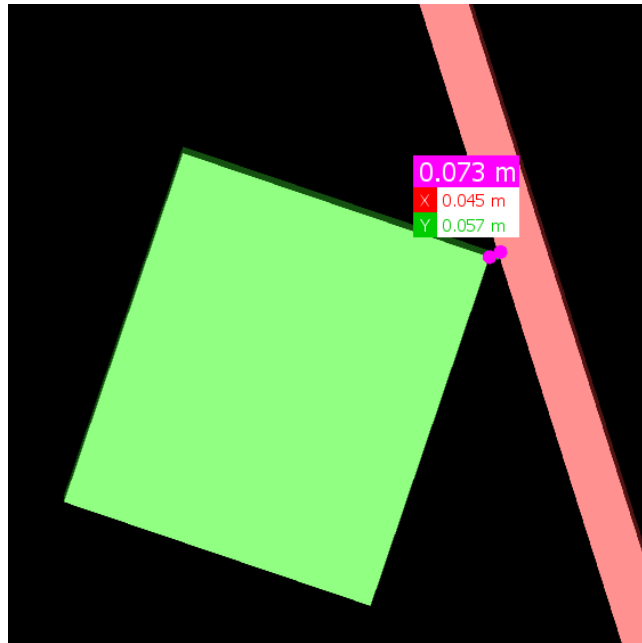

Figure 3: Clearance Clash

Instances where two components are too close to each other.

Example:

- *During the maintenance period, an air conditioning unit may require a certain distance from a beam for safe and easy maintenance access.*
- *During the construction stage, an air handling unit may require a clearance zone for safe installation and connection to other equipment.*
- *During the design stage, a door to an accessible bathroom requires a safe clearance zone at one side for access by a wheelchair user.*
- *During the maintenance period, the access to a service panel might be obstructed by a wall.*

Note: space requirements for maintenance are to be modelled as part of the object as appropriate.

2.2 Clash Severity Definitions

During a coordination review, the clashes are grouped in four different **Clash Severity Levels** based on their impact to the project if left unresolved. This must be captured in the matrix and updated as the project evolves.

Clash Severity Level 1

Clashing of elements (Clash Priority AxA & AxB) that are considered critical to resolve and impact project functionality, compliance to the brief, codes and standards and project cost or income and construction schedule.

Action: Severity Level 1 clashes shall be addressed as soon as possible after detection and must be resolved before detailed design stage.

Example: A structural beam clashing with a main HVAC duct.

Clash Severity Level 2

Clashes of elements (Clash Priority BxB & BxC) that are considered critical, but do not present issues to; functionality, code compliance, standards compliance, cost or construction schedule.

Action: Severity Level 2 clashes must be rectified during detailed design stage.

Example: Door swing interfering with room elements

Clash Severity Level 3

Clashes of elements (Clash Priority CxC) are less critical, but do not present issues to; functionality, code compliance, standards compliance, cost or construction schedule.

Action: Severity Level 3 clashes must be rectified during the final project stage and resolved through coordination. Clash and associated measurement must be closed prior to issue.

Example: Ceiling hangers for cable tray interfering with pipe and duct works

Clash Severity Level 4

Clashes of elements that are not critical and are related to items that must be further detailed during construction stage.

Action: Severity Level 4 clashes must be resolved during the construction stage prior to the issue of shop drawings.

Example: Structural elements clashing in LOD300 with flexible electrical conduits.

Following completion of the clash matrix, the actual clash tests can be setup using the discipline name and the Clash Priority. A strategy for how, who and when to resolve these needs to be part of the BIM Execution Plan.

3 CLASH DETECTION MATRIX TEMPLATE OVERVIEW

The Clash Detection Matrix Template has 2 parts as specified below:

1. **Document Title Block** – refer to *Section 0*
2. **Clash Matrix** – refer to *Section 3.2*

Figure 4: Clash Detection Matrix for Building

3.1 Document Title Block

The project team shall complete the document title block to identify the project and capture any updates to the file as required.

Clash Detection Matrix - Buildings	
Contract Number	
Project Title	
Authority	
Contractor	
Project ID	
Version	
Version Date	

Figure 5: Document Title Block for Buildings

3.2 Clash Matrix

The Clash Matrix has six components that need to be entered by the user to demonstrate how the models will be coordinated:

1. Discipline Code
2. Clash Priority – refer to *Section 3.2.1*
3. Clash Group – refer to *Section 3.2.1*
4. Uniclass Code – mapped to the Model Element Table
5. Elements
6. Clash Test – refer to *Section 4*

Figure 6: Template Overview

3.2.1 Clash Priority and Clash Group

The clash detection method relies on two property fields being added in the authoring software during model development.

1. CD_ClashPriority – This alphabetical value is added to individual elements to isolate them from items with a different priority. It can vary from A to B to C, where A is the highest priority and C is the lowest.

2. CD_ClashGroup – This property is an alphanumeric code added to individual elements to isolate them from other elements. It is composed of a letter identifying the discipline and a four-digit numbers of the element category.

This method is used to filter elements regardless of the authoring software used to create the specific models. Both parameters shall be assigned to elements on the Clash Detection Matrix dependent on the project specific needs. Template might need to be adjusted by the Contractor and provided to the Authority for approval before project start.

Example:

- *AR0010 is the code that has been assigned to all ceilings within architectural discipline model.*
- *ST0520 is the code that has been assigned to all structural columns within the structural discipline model.*

Figure 7: Clash Priority and Clash Group with Search Sets

3. Search Sets – This property is a combination of CD_ClashPriority and CD_ClashGroup with a separator "-".

*Example: **A-AR0010** is the search set name that has been assigned to all ceilings within architectural discipline model for Clash Priority groups.*

4 CLASH TESTS

Clash test are the actual tests that will be run to ensure project (design) coordination is achieved. Clash tests are defined at the intersection of two elements, *e.g., AR0030 or ST0520*. The Clash Groups are also used to name the Clash Tests in a structured manner:

1. Clash Group from the **column**
2. separate by "**_v_**",
3. Clash Group from the **row**

Example: Curtain Wall in Architectural Discipline elements versus Columns in Structural discipline Elements will be codified as **AR0030_v_ST0520**

Note: For Volumes strategy, Clash Test will be codified as Discipline code versus Discipline Code (AR_v_ST)

					AR	AR	AR	AR	AR	AR	AR	AR
Clash Detection Matrix				Discipline Code								
				Clash Priority	A	A	A	A	A	A	A	A
				Clash Group	AR0010	AR0020	AR0030	AR0040	AR0050	AR0060	AR0070	AR0080
				Uniclass Code	EF_40_20	EF_20_10	EF_25_10	EF_25_30	EF_25_30	EF_30_20	EF_30_10	EF_40_20
Discipline Code	**Clash Priority**	**Clash Group**	**Uniclass Code**	**Elements**	Ceilings	Columns	Curtain Walls	Doors	Windows	Floors	Roofs	Handrails, Ladders and Guardrails
AR	A	AR0010	EF_40_20	Ceilings	H-500							
AR	A	AR0020	EF_20_10	Columns	C-500	H-1000						
AR	A	AR0030	EF_25_10	Curtain Walls	n/a	C-100	H-1000					
AR	A	AR0040	EF_25_30	Doors	C-100	C-100	C-100	n/a				
AR	A	AR0050	EF_25_30	Windows	C-100	n/a	C-100	H-1000	H-1000			
AR	A	AR0060	EF_30_20	Floors	C-500	C-500	H-500	H-500	n/a	H-1000		
AR	A	AR0070	EF_30_10	Roofs	n/a	C-500	C-500	C-100	n/a	C-500	H-500	
AR	A	AR0080	EF_40_20	Handrails, Ladders and Guardrails	C-500	H-1000	H-500	C-500	H-1000	H-1000	C-100	H-1000
AR	A	AR0090	EF_30_20	Ramps	C-100	H-1000	C-500	C-500	C-500	C-100	C-100	H-1000
AR	A	AR0100	EF_40_20	Furniture	C-500	n/a	C-100	C-500	C-100	C-100	n/a	H-500
AR	A	AR0110	EF_80_50	Lift / Escalators	C-500	H-500	n/a	C-100	H-500	C-500	C-500	C-100
AR	A	AR0120	EF_35_10	Stairs	C-100	H-500	H-500	C-500	H-1000	H-500	n/a	n/a
AR	B	AR0130	EF_25_10	Walls	H-1000	H-500	H-500	H-1000	H-500	H-1000	C-500	H-1000
AR	B	AR0140	EF_25_10	Cladding	C-100	C-500	C-500	C-100	C-100	C-100	C-500	n/a
AR	B	AR0150	EF_40_10	Signage Products	C-100	H-1000	H-1000	H-100	C-100	n/a	H-500	H-1000
AR	B	AR0160	EF_40_20	Finishes	C-500	C-500	n/a	H-500	H-500	H-500	C-500	n/a
AR	B	AR0170	EF_40_20	Casework	n/a	C-100	C-100	C-500	H-1000	C-100	n/a	n/a
AR	B	AR0180	EF_40_20	Entourage	H-100	C-500	H-500	H-500	C-500	C-100	C-100	C-500
AR	B	AR0190	SL	Spaces allocated for H&S and Maintenance	H-1000	C-100	H-500	H-500	H-1000	C-500	n/a	n/a
AR	C	AR0200	EF_25_10	Partition Walls	H-1000	C-500	n/a	C-500	C-100	H-1000	C-100	C-500
AR	C	AR0210	EF_15_15	Parking	C-		AR0030_v_ST0520			-100	H-1000	C-500
AR	C	AR0220	SL	Spaces	C-500	C-100	H-1000	H-500	H-1000	H-1000	C-100	H-500
ST	A	ST0510	EF_20_05	Foundations	C-100	C-500	C-500	H-1000	C-500	C-100	H-500	H-1000
ST	A	ST0520	EF_20_10	Columns	C-500	C-500	H-500	H-1000	n/a	C-100	C-500	C-500
ST	A	ST0530	EF_20_05	Beams	H-1000	H-500	H-500	C-100	H-500	C-500	C-100	C-500
ST	A	ST0540	EF_25_10	Walls	C-100	C-500	n/a	n/a	C-500	H-500	H-1000	H-1000

Figure 8: Clash Test Naming

The distance in "mm" between elements (also known as the tolerance) shall be filled for all elements that need to be coordinated, preceded by a **C** or **H** to indicate the type of clash. Elements that don't require to be coordinated shall be filled as "**n/a**".

Example:

- **C-1000** *for Clearance clash with a tolerance of 1000mm.*
- **H-500** *for Hard clash with a tolerance of 500mm*

On a project Clash Tests can be defined on two levels:

1. **Volumes** - used to test for high level coordination issues between Infrastructure and Buildings
2. **Discipline** – used to test for coordination issues between elements from one discipline with that of another discipline.

The Clash Tests Sheets shall be used to document the clashes identified on the Clash Detection Matrix. For Discipline clashes that are run at a discipline level shall be identified, what counts as a clash, who is responsible to resolve it, how to resolve it, how severe the clash is. There are 3 different Clash Tests Template Sheets:

1. **Volumes** – Combination of infrastructure and building disciplines (Refer to Clash Detection Matrix Template_Volumes.xlsx)
2. **Infrastructure** – Elements related to infra structures (Refer to Clash Detection Matrix Template_Infrastructure.xlsx)
3. **Buildings** – Elements related to buildings (Refer to Clash Detection Matrix Template_Buildings.xlsx)

Clash Test Overview - Buildings

Contract Number	[Contract Number of the Project]
Project Title	[Name of the Project]
Authority	[Name of the Authority]
Contractor	[Name of the Contractor]
Project ID	[Project ID of the Project]
Version	[Version Number]
Version Date	[Date of Version]

Element Clash (1)	Description (2)	Tolerance (as clearance Value in "mm") (3)	Action (4)	Clash Severity level (5)	Comment (6)
AR0020_v_AR0120	Columns compared with stairs	H-500	To be review with Design Team	1	
AR0130_v_WS1510	Wall compared with Pipes	H-1000	Pipes to be Adjust	-	
FP2540_v_EL3010	Sprinklers compared with Cable Trays	C-500	Sprinklers to adjust	2	

Figure 9: Example Overview of Clash Test Overview

1. **Element Clash** – Elements versus Elements overview. To be documented based on the abbreviation on the Clash Detection Matrix.
2. **Description** – A verbal description of the actual test that needs to be conducted.
3. **Tolerance** (as Clearance Value) – The tolerances as per the requirements from relevant local authorities.
4. **Action** – A proposed action plan to resolve the clash, indicating which Model Element Author (MEA) is in the lead to resolve the design coordination issues.
5. **Clash Severity Level** – A number based on clash severity as defined in *Section 2.2*
6. **Comment** – Room for comments by the project team.

LIST OF FIGURES