Building Information Modelling (BIM): The Way Forward – Common BIM Standards for Lift Design Submission

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Topics

1) Using BIM to transform Regulatory Approval Process - CORENET X
   a) Brief on CORENET X

2) What does this mean for Lift and Escalator (L&E) Sector?
   a) CORENET X Timeline
   b) Benefits of BIM for Design Plan Submission and Processing
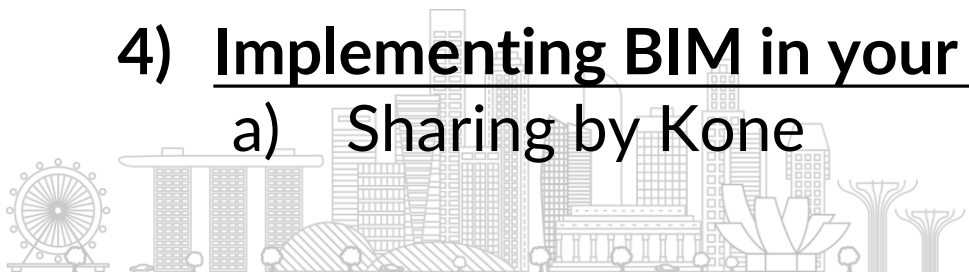   c) Submission Standards in BIM for Design Plan Approval

3) BIM Development for L&E
   a) BIM Guides
   b) Generic BIM Family Lift Models

4) Implementing BIM in your firm
   a) Sharing by Kone

Announcement of CORENET X by Min. Desmond Lee at IBEW 2021

Opening Address by Minister Desmond Lee at the Opening Ceremony of the International Built Environment Week 2021

One-stop integrated digital shopfront for the industry

Streamline more than 20 existing approval touchpoints across agencies

Clear, consolidated and coordinated response to QPs

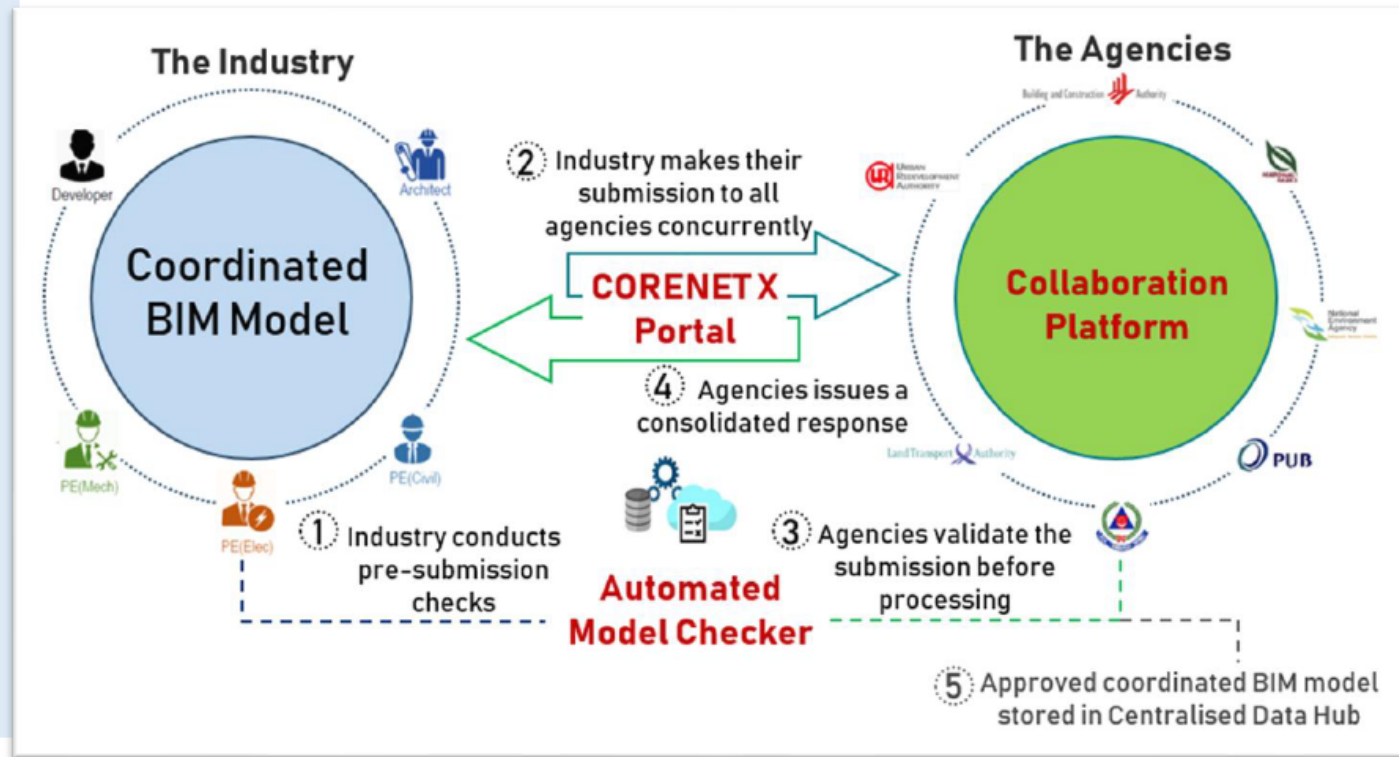Tap on new digital technologies to enhance regulatory submission process

Vision of CORENET X

A Future Ecosystem of Regulatory Approval of Building Works that Accelerates The Transformation of the Construction Industry

FIRST IN THE WORLD
One-Stop Integrated Digital Shopfront

TRANSFORMATION of INDUSTRY

- Promote design coordination and teamwork

- Promote digitalization of construction sector

- Support IDD[1] & DfMA[2] imperatives

The Industry — Coordinated BIM Model (Developer, Architect, PE(Mech), PE(Civil), PE(Elec))

The Agencies — Collaboration Platform

1. Industry conducts pre-submission checks — Automated Model Checker
2. Industry makes their submission to all agencies concurrently — CORENET X Portal
3. Agencies validate the submission before processing
4. Agencies issues a consolidated response
5. Approved coordinated BIM model stored in Centralised Data Hub

TRANSFORMATION of REGULATORY AGENCIES

- Reduce silos, iterations & condense touchpoints

- Embrace collaboration & raise productivity amidst rising demands

- Improve accessibility & centralise information towards a Single Source of Truth

[1] IDD is the use of digital technologies to integrate work processes and connect stakeholders working on the same project throughout the construction and building life-cycle
[2] DfMA is a continuum of various technologies and methodologies that promote offsite fabrication from prefabricated components to fully integrated DfMA assemblies across the structural, architectural and Mechanical/ Electrical disciplines.

Key Work Areas of CORENET X

2. TECH ENABLERS

[Collaboration Platform]

Facilitate agencies' collaboration and coordination in regulatory processing

[Automated Model Checker]

Enhance productivity for both the industry and agencies by automating part of the code compliance checks

[OpenBIM Format]

Support interoperability and localized requirements – critical for both CP and MC

1. NEW REGULATORY PROCESS THROUGH SERVICE JOURNEY

- o **Discovery Phase:** Service Blueprint and quick wins
- o **Envisioning Phase:** Redesign of regulatory processes

3. GETTING READY FOR CORENET X

- o **INDUSTRY:** Onboarding, Collaboration and Training on new process and requirements

Automated Model Checker

- **Auto-Checking** for regulatory non-compliance against rules across 7 key agencies, across 3 building disciplines (Architectural, Civil & Structural, Mechanical & Electrical)
- **Allow pre-check** by industry prior to submission

Sample views extracted from prototype

Highlight non-compliance – Door did not meet minimum door width requirement

Summary report on number of non-compliances detected

SELF-CHECK
Allow industry to self-check prior to submission

EFFICIENT
Improve turnaround time and overall efficiency

CONSISTENT
Ensure consistent interpretation of requirements

OpenBIM Format

CURRENT REALITY

- Industry uses diverse Proprietary BIM software available in the market

IFC (Industry Foundation Class)
An international open BIM format to facilitate interoperability in building and construction industry

CURRENT GAP

- A need for platform-neutral format to facilitate collaborative workflows
- A need for interoperability among different software

DEVELOPMENT OF IFC-SG

- Adoption of IFC
- Development of extension IFC-SG common representation for local requirements and regulatory needs

Native BIM A
Native BIM B
Native BIM C

Export

Common representation
IFC - SG

Consumed by
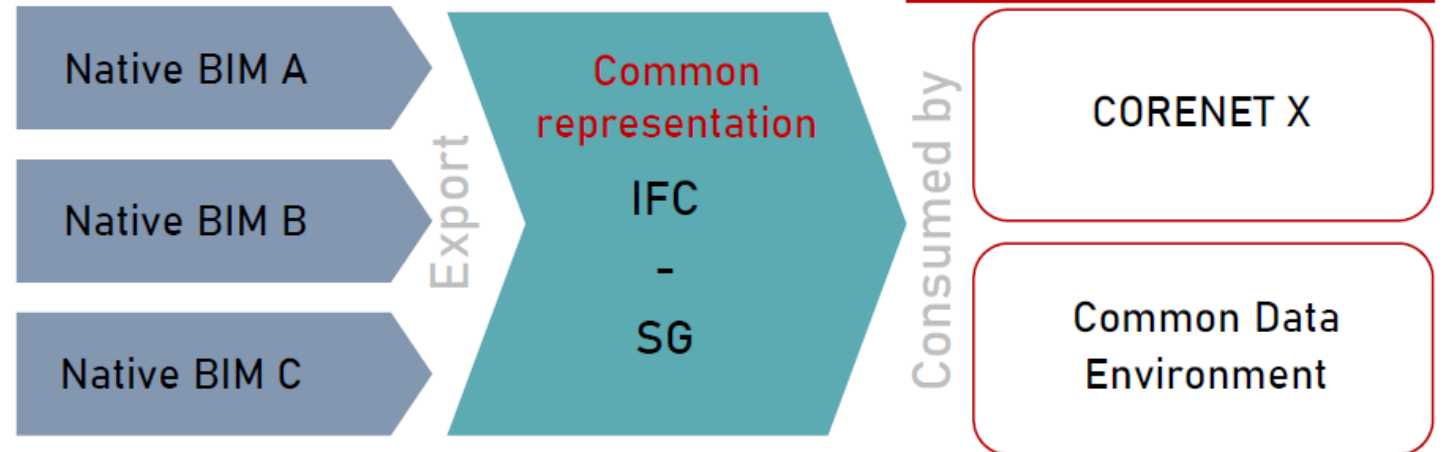
Overall Goal

CORENET X

Common Data Environment

INTEROPERABILITY and OPEN DATA STANDARDS are crucial and important

Why this will benefit the Built Environment Sector?

PRODUCTIVITY AND DIGITALIZATION

- Promote design **coordination** and teamwork with other project parties
  - E.g. allocation of lift well space and motor room access path

- **Reduce rectification** works during Construction Stage
  - Early design approval reduces abortive works in rectifying non-compliance found during testing and commissioning

- Streamline **Asset Management** for downstream facility management
  - Building owners receiving the BIM models will be able to schedule and plan for maintenance of equipment and management of facility

- **Efficiency** in Regulatory Submissions and Approvals
  - Automated Checkers
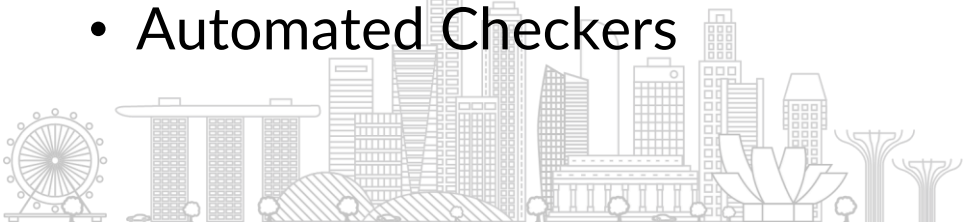
What does this mean for the L&E Industry?

## REGULATORY REQUIREMENTS

- CORENET X is slated for implementation by end-2023
  - Plan submissions (>5,000sqm in BIM would be mandatory)

- All disciplines (Architecture, Structural and MEP) will be required to submit to the regulatory authorities in BIM under CORENET X
  - This would include plan submissions for **Fixed Installations (FI) – (Lifts, Escalators and Mechanised Car Parking Systems)** which would be required in the upcoming regulations for FI in 2023

BIM Development for L&E

To prepare the L&E industry for submission in BIM:

- Guide on BIM e-submission for Fixed Installation (FI)
  - Provide details on the **required components and their properties** that are to be shown in BIM models

- Firms with existing BIM models are invited to check with BCA on their compliance with the BIM guide as well as **participate in trials** on the use of BIM for submissions.

- For Firms which are not BIM-ready yet, **generic lift component family models will be provided** by BCA for reference and for use in preparing BIM models for plan submissions.
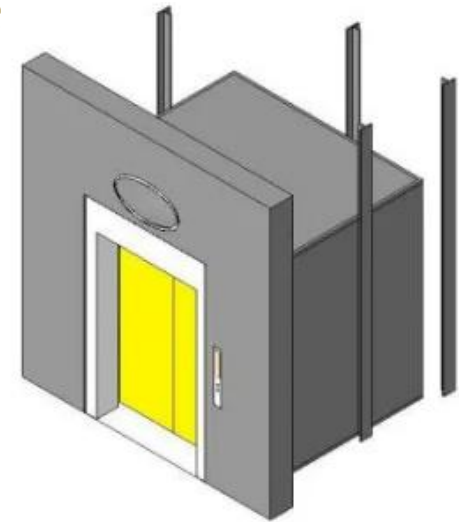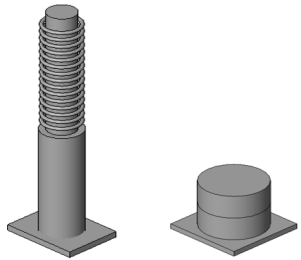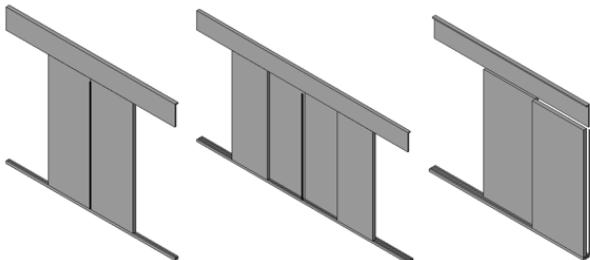
BIM Development for L&E – BIM Guide

Firms have varying standards and level of details

- BIM guide will provide guidance in a **common baseline standards** for firms to follow:
  - Terminology
  - Required components to be included
  - Required parameters to be included
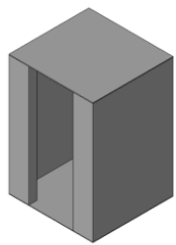 - Equivalent to LOD 350*

Car/Counterweight Buffer

	Parameter Name	Sample Value
Intrinsic Parameters	Rated Speed *not MC parameter	2m/s
	Total Stroke	100mm
	Impact Mass Range *not MC parameter	450kg − 3000kg
Baseplate	Width	200mm
	Length	200mm
	Height	20mm
Column	Diameter	150mm
	Height	200mm
Stroke*rubber	Diameter	100mm
	Height	175mm
Others	Is buffer fixed to lift car?	Yes/No

*not MC parameter but modelling parameter only

Landing Door and Landing Door Lock

	Parameter Name	Sample Value
Body	Width	50mm
	Length	900mm
	Height	2100mm
Others	Vertically sliding for goods lift?	Yes/No
	Number of panel	2/4/6
	Opening direction	Side/Centre
	Door lock openable from pit?	Yes/No

Safety Gears

	Parameter Name	Sample Value
Intrinsic Parameter	Rated Speed	1.0m/s
Safety Gear Housing	Width	150mm
	Length	150mm
	Height	200mm
Guide Rail Slot	Width	25mm
	Depth	140mm
Type	Type	Instantaneous / Progressive
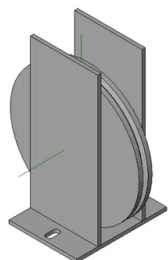
*not MC parameter but modelling parameter only
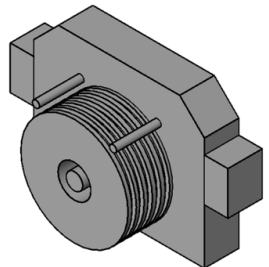
Lift Car

Parameter Name	Sample Value
Clear Height	2400mm
Clear Width	1500mm
Clear Depth	1400mm
Weight Load Capacity	980kg
Passenger Capacity	13 pax
Travel Height	25000mm
Control Device Operable Distance	500mm
Rope Count	3
Rated Speed	1.0m/s
External Height of lift car*	2900mm
Width *	1800mm
Depth*	1600mm

*not MC parameter but modelling parameter only

Required parameters

Governor

	Parameter Name	Sample Value
Intrinsic Parameter	Rated Speed	1.5m/s
Baseplate	Width	250mm
	Length	320mm
	Height	400mm
Pulley	Diameter	320mm
	Groove Angle	15
	Groove Depth	8mm
Type	Type	Bi-Directional / Machine Room Less

Traction Machine and Brakes

*gearless

	Parameter Name	Sample Value
Intrinsic Parameter	Rated Speed	1.5m/s
	Number of ropes	6
	Rope Diameter	10mm
Body	Outer Diameter	600mm
	Inner Diameter	400mm
	Width	250mm

Extrinsic (geometric)	Intrinsic (design details)
Width	Rated Speed
Length	Pax capacity
Height	Weight Load
Diameter	Opening Directions
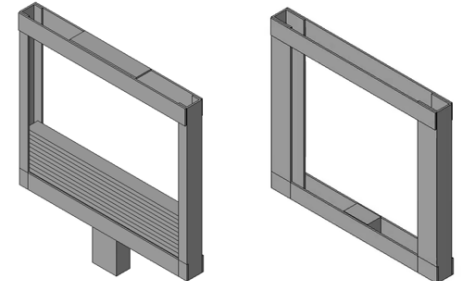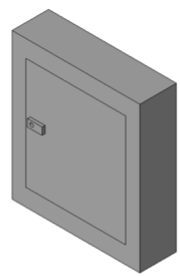
Counterweight

	Parameter Name	Sample Value
Intrinsic Parameter	Weight	1500kg
Frame	Width	200mm
	Length	1200mm
	Height	2000mm
Weight Plate	Width	180mm
	Length	1180mm
	Height	150mm
Guide (Shoes)	Width	111mm
	Length	47mm
	Height	78mm
Sheave	Diameter	400mm

Control Panel and Cabinets

	Parameter Name	Sample Value
Body	Width	250mm
	Length	750mm
	Height	950mm
Others	Type	Control Panel, EBOPS/UPS, E&I Panel

BIM Development for L&E – BIM Guide

Checklist **Verify Compliance to Code**

- Checklist in BIM Guide on key requirements to look out for at design stage
- For e.g. requirements in Lift Well:
  - Clearance between lift car and lift shaft wall (min. 20mm, max. 150mm on side of lift car door)
  - Clearance between counterweight and lift shaft wall (min. 20mm)
  - Clearance between lift car and counterweight (min. 50mm)
  - Position of pit access ladder (min. 1,500mm above landing sill)

Others	a) Distance between consecutive landing doorsills lift landings	• For distance >11m: Emergency doors of minimum 850mm width x 2000mm height must be provided) For consecutive landing sills with distance > 18m, rescue hooks will be required in accordance with SS550:2020 Section 5.2.3.5 [Will be under SCDF requirement]
	b) Length of guiderail	Minimally allows for additional 100mm travel from car/counterweight's highest position
	c) Position and size of vent opening	• Topmost part of lift shaft • Total unobstructed area of at least 1% of horizontal section of the lift shaft • Minimum 0.1 m² for each lift in the lift shaft

Lift Shaft

Clearance Distances (involving lift shaft walls, lift car, counterweight, and pit access ladder)	a) Clearance between lift car and lift shaft walls	• Minimum 20mm (except on the side used for loading/unloading for lift car) • Maximum 150mm for the side of lift car doors
	b) Clearance between counterweight and lift shaft walls	Minimum 20mm
	c) Clearance between lift car and counterweight	Minimum 50mm
	d) Position of pit access ladder with respect to lift shaft wall and lift landing entrance	• Minimum 200mm clearance between back of rung of ladder and lift shaft wall • Maximum distance of 600mm between middle of ladder rungs and edge of lift landing entrance • Minimum 1500mm vertical distance between top of ladder uprights (or other suitable handhold) and landing sills

Machine Room (if applicable)

Structural	a) Headroom from machine room floor	• Minimum 2100mm at working areas (or minimum 1500mm for secondary machine room) • Minimum 1800mm at other areas
	b) Difference in levels of machine room / machinery space floors	• For level difference of > 380mm: A standard railing of minimum 1100mm height shall be provided at the edge of the higher level, and stairs/ladders shall be provided for access between levels
	c) Access ways	Minimum 500mm width (or 400mm where there are no moving parts or hot surfaces)
	d) Dimensions of machine room and maintenance doors	Minimum 1000mm width x 2000mm height
	e) Height of curb around openings for ropes	Minimum 50mm

BIM Development for L&E – BIM Guide

Lift Components

- Lift Components mentioned in SS 550 are split into two groups:
  - [1]Requirement Components which are **key lift components** to be included in the BIM model as they contain **key parameters**
  - [2]Peripherals components which are **secondary components** that do not contain key parameters but are usually included in BIM models to **complete the whole lift design**

Identified Objects	Object Type
Lift Landing Door	Component
Lift Car	Component
Traction Machine	Component
Governor	Component
Control Panel	Component
Counter Weight	Component
Sheave	Component
Buffer	Component
Ventilation Opening	Part of Component
Lift Car Apron	Part of Component
Lift Car Door	Part of Component

Generic family model provided

Identified Objects	Object Type
Access Door	Peripheral
Ladder	Peripheral
Wire-mesh Screen	Peripheral
Door	Peripheral
Ship's Ladder	Peripheral
Handrail	Peripheral
Maintenance Door	Peripheral
Guardrail	Peripheral
Lift Landing Door Frame	Peripheral
Trap Door	Peripheral
Counter Weight Screen	Peripheral

Example – Lift Landing Door

- Parameters include dimensions such as outer dimension and width and intrinsic parameters such as number of panels, opening direction, vertically sliding for goods lift or whether door lock is operable from pit
  - *E.g. "Checks on whether the door lock is operable from pit" for those that has no access door to the pit. Door lock within 1.8m high and within 0.8m horizontally from pit ladder*

Landing Door and Landing Door Lock		
	Parameter Name	**Sample Value**
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	Length	900mm
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	Opening direction	Side/Centre
	Door lock openable from pit?	Yes/No

Example - Buffer

- Parameters include dimensions such as height and intrinsic parameters such as buffer stroke or if it is fixed to the lift car
  - Buffer stroke is required for calculation of the gravity stopping distance
  - "fixed to lift car" for models where buffer is installed to hit on pedestal on pit floor

Car/Counterweight Buffer

	Parameter Name	Sample Value
Intrinsic Parameters	Rated Speed *not MC parameter	2m/s
	Total Stroke	100mm
	Impact Mass Range *not MC parameter	450kg – 3000kg
Baseplate	Width	200mm
	Length	200mm
	Height	20mm
Column	Diameter	150mm
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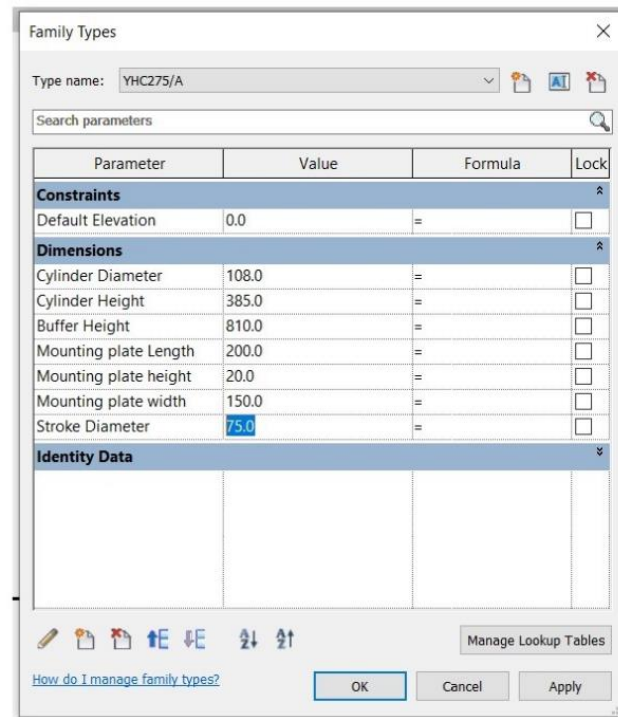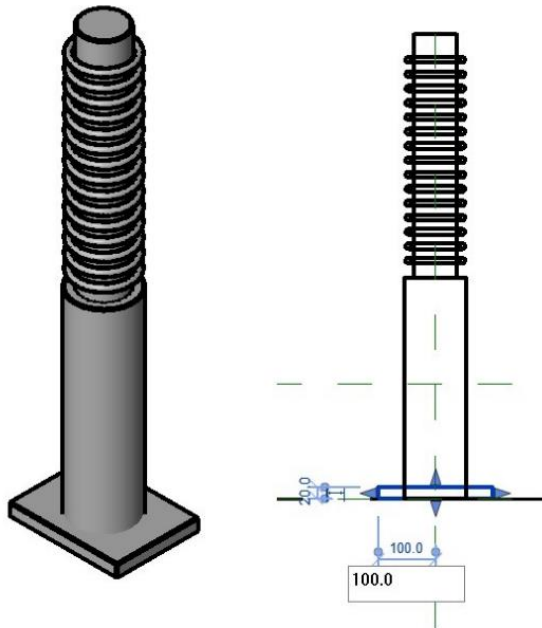*not MC parameter but modelling parameter only

BIM Development for L&E – Generic BIM Family Lift Models

Firms can download for their own use

- BCA will provide generic lift component templates in Revit for firms to use
    - Able to **modify components** according to each brand/model's <u>specifications</u>

Identified Objects	Object Type
Lift Landing Door	Component
Lift Car	Component
Traction Machine	Component
Governor	Component
Control Panel	Component
Counter Weight	Component
Sheave	Component
Buffer	Component

Timeline

1Q 2023	2Q 2023	3Q 2023	4Q 2023
Launch BIM Guide	Implementation of FI Plan submissions		Launch of CORENET X*

*BIM submissions required for plans (>5,000 sqm)

Details on BIM Guide and generic Lift component Templates will be provided on BCA's website by 1Q2023

Implementing BIM in your firm

Kick-start building BIM capability

- **Understand and believe** that BIM will bring <u>benefits</u> to your operation
- **Define** <u>requirements, schedule, scope and process</u> of using BIM before starting on your projects
- **Assign** <u>roles and responsibilities</u> to your team members including skill proficiency and training
- **Put in place** <u>procedures to follow for all interactions</u> across all stages of projects from conceptualizing, schematic design, detailed design, documentation, installation, coordination with project parties and asset management
- Attend BIM course
  - Certification in BIM Modelling -MEP track (BCA Academy)

    www.bcaa.edu.sg/what-we-offer/academic-programmes?CourseId=0c7405c1-e404-42af-8f40-c3824accc660

  - Certification on BIM Management (BCA Academy)

    www.bcaa.edu.sg/what-we-offer/academic-programmes?CourseId=2a0f8947-88ee-423b-99c6-5a336c01a41a

  - BIM course catered specifically for Lift and Escalator (Autodesk)

Thank you

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