

Future readying the industry on Regulatory Submission

*Sharing on T&C findings, design plans and
BIM trials*

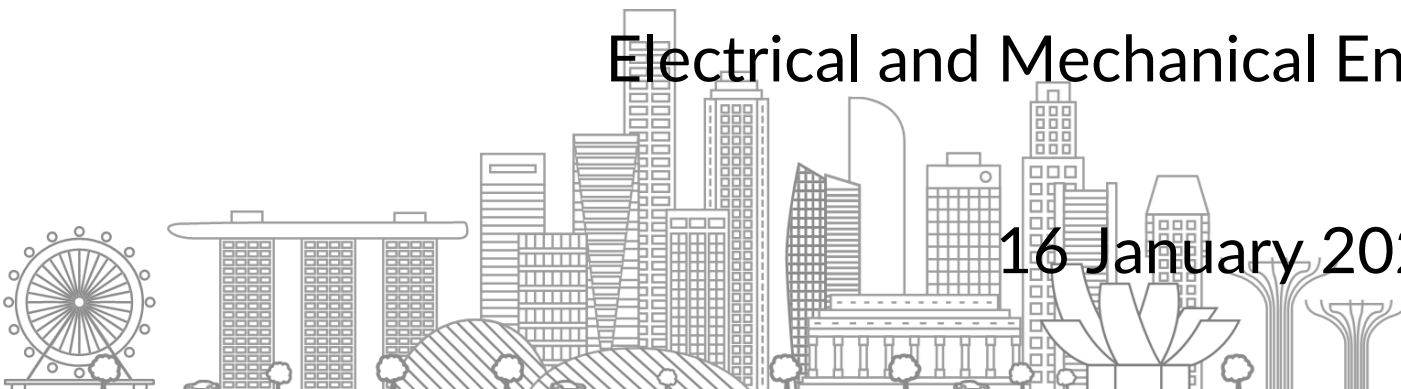
Presented by

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Agenda

- Preparing industry for **Fixed Installation (“FI”) Plan** submission regime
- Findings and Updates on
 - **FI Design Plan Submissions - Trials**
 - **FI Building Information Modelling (BIM) Submissions - Trials**
 - **New lift installations – (Testing and Commissioning) T&C Audits**



Preparing Industry for FI Plan Submission Regime

Submission Requirements

Represented in **BIM** for projects with **Gross Floor Area (GFA)** more than 5,000 sqm

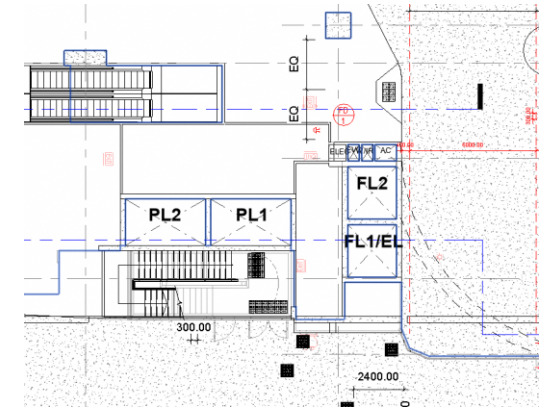
Obtain **BCA approval** before installation can commence

Type Testing Certificates

- Lift Model
- Car door locking device
- Landing door locking device
- Safety gear
- Overspeed governor
- Buffer
- Safety Circuit/PESSRAL
- ACOP
- UCMP

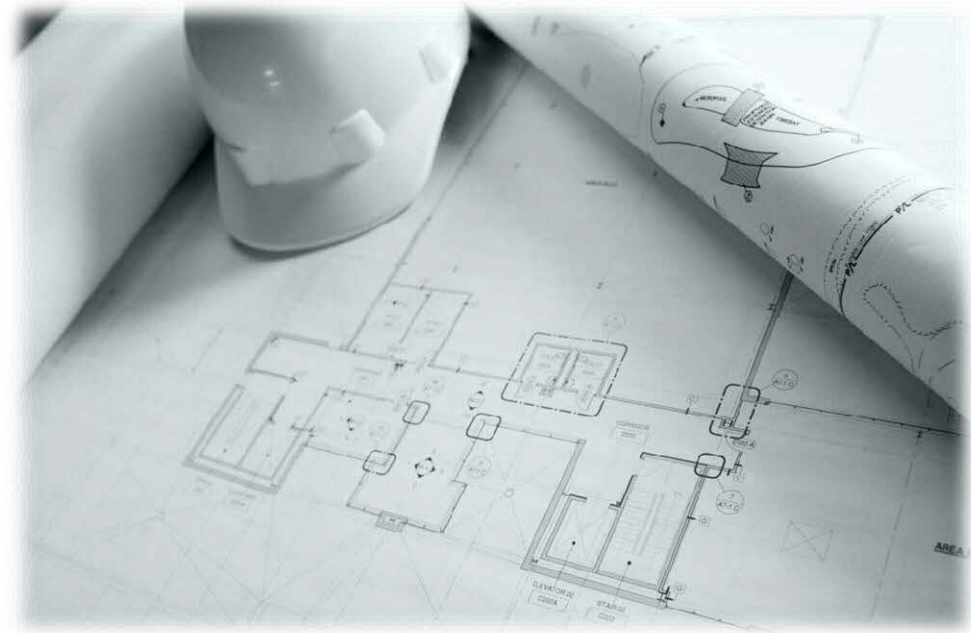
Drawing plans

- Site plans and floor plans (location of machine rooms and lift shafts, access path to machine room)
- Machine room layout plans (entrance dimensions, working spaces around controller and machinery)
- Hoistway and Cross Sectional plans (refuge spaces with buffers fully compressed)
- Lift Pit layout plan (cat ladder and location of buffers and tension pulley)



Observations from Trials on Fixed Installation Design Submission (2D Plans and BIM)

Overview and Observations from Trial



Overview

Trial to gauge firms' internal readiness for Design Approval

Started early 2023

- Participating firms account for **more than 90% of new lifts projects** in Singapore
- Lift owners and lift contractors participated
- Design plans including BIM models were submitted



Observations from Trial

Type Testing Certificates

Detection and stopping sub-systems

- For ACOP and UCMP, the type testing certificates should cover:
 - detection subsystems (including control subsystems for UCMP),
 - stopping subsystems; and
 - self monitoring of brakes (if gearless machine brakes are used as the stopping means)!

Extracts from type testing certificates/reports that stated the self-monitoring portion:

the state (opened/closed) of each brake is monitored by switches that must be connected to the motor controller, so if one of the brakes doesn't open or close, the lift must not start.

The [REDACTED] board takes care of monitoring the functionality of the machine brake, monitoring the functionality of an UCM coil on an overspeed governor, keeping



Observations from Trial

Hoistway Plans

Refuge Space dimensions and component position

The refuge space should be shown with buffer fully compressed

Traction machine position

Protruding features such as under-car sheave should be illustrated

Car top view

Refuge space dimensions marked out clearly

Lift Pit view



Observations from Trial

Requirement




Refuge Space

- One trial model included “empty box” to show refuge space at lift pit

What you have to do

- Include a 3D “empty box” with **exact refuge space dimension** at the confirmed areas of lift pit or car top for refuge space
- Counter measure against underside of soffit (car top) or car bottom to ensure there is sufficient refuge space according to SS 550

Table 4 – Dimensions of refuge spaces in the pit

Type	Posture	Pictogram	Horizontal dimensions of the refuge space (m x m)	Height of the refuge space (m)
1	Upright		0,40 x 0,50	2,00
2	Crouching		0,50 x 0,70	1,00
3	Laying		0,70 x 1,00	0,50

Key for pictograms
①: black colour
②: yellow colour
③: black colour

SS 550 : 2020

Refuge Space



Observations from Pilot

Requirement

Access pathway to motor room at rooftop

- Trial model submitted only showing lift components and model
 - Lift is with motor room but access pathway (staircase, door, sheltered corridor) is not shown
 - No issue for motor-room-less lifts

What you have to do

- Work with builder/architect **early** to ensure safe access is designed for
- Ensure lift access to motor room is shown clearly in BIM model

SS 550 : 2020

5.2.2.5 A safe access for persons to machinery spaces and pulley rooms shall be provided. Passageway shall be sheltered with a clear width of 1.0 m and clear height of 2.0 m. Access floor shall be treated such that it is not slippery and safety railings provided along passageway if it is less than 1.5 m from edge of roof/building. For difference in height in the access passageway, this should be effected entirely by way of stairs. In the exceptional case when a conventional staircase cannot be provided, ladders satisfying the following requirements shall be used:

Access pathway not shown



Observations from Trial

Modelling

Parameter Naming

- Components properties in trial model used firm's own naming convention
- To prevent data loss, naming conventions need to be adhered to during the exporting of native (e.g. Revit) file to open format (IFC-SG)

What you have to do

- Follow Parameters naming used in BIM Guide
- Also remember to use the same units (e.g. m, kg, kN)

Dimensions	
Car Inside Width	1600.0
Car Inside Depth	1400.0
Bare ceiling ht	2500.0
Identity Data	
ClearHeight	2300.0
ClearWidth	1600.0
ClearDepth	1400.0
Ratedload	900.000 kg
Car_Mass	1680.000 kg
MaxDecorWeight	450.000 kg
CapacityPeople	13
URL	
Type Image	
Type Comments	
TravelHeight	146.293
ControlDevice_OperbleDistan	0.0
RopeCount	6
RatedSpeed	1.75 m/s



Observations from Trial

Modelling

Lift car at bottom level

- Most contractors place lift car at bottom level during design drawings for calculation of car bottom space
- One Trial model had lift car placed at top floor

What you have to do

- When importing family model of lift car, to **put at bottom floor**
- Measure car top space by calculating against travel height



Observations from Trial

Modelling

Suspension rope

- One trial model included ropes (with the bends and up/down travel) but is **not necessary**

What you have to do

- If your current model include rope (possibly for shop drawings with installer), can **omit** from model for submission to **reduce file size**
- Ensure **rope parameters** are included in components parameters for lift machine
 - Rope count
 - Rope diameter
 - Rope breaking strength
 - Rope configuration

Type Properties

Family: [Redacted] Load...

Type: [Redacted] Duplicate... Rename...

Type Parameters

Parameter	Value
Constraints	
Default Elevation	0.0
Identity Data	
BrakeType	
DriveType	
Geared	
Machine brake model	
Machine_RatedSpeed	0.00 m/s
RopeCount	0
RopeDiameter	0.0
Rope_BreakingStrength	0.00 kN
Rope_Configuration	
Roping	
Type Image	
Keynote	
Model	
Manufacturer	
Type Comments	
URL	
Description	
Assembly Code	
Cost	

Rope parameter



Observations from Trial

Project details

Location of lifts & Lift lobby in development

- Two trial models did not include “site plan” or “location plan”
- Reader (BCA officer) would not be able to understand where is the **location of the lift(s)**
 - Prevent misunderstanding in big projects with multiple lifts
 - Part of basic information to provide

What you have to do

- Request from architect for site plan or first level floor plan if base model is not clear

Good example: Lift locations shown in First Level Floor Level / Location plan



Observations from Trial

Modelling

Level of “Details”

- Trial models included components that were **overly detailed** which added to the overall file size
- Detailed components feature (bolt, screw, complicated shapes...) **not necessary** if dimensions provided are accurate and parameters are provided

What you have to do

- Determine if file size is **too large** (>200mb?) when detailed components are included
- Opening and amending the large model will **take a longer time** during discussion with other project parties
- If it is not, it is not required to remove the detailed components



BIM Submissions

- More BIM submissions are expected as architects using BIM and clients requesting submissions to be in BIM models
 - Firms encouraged to take part in pilot trial:
 - Refer to **BIM guide**
 - Make use of Generic BIM Family lift **components models**
 - Attend BIM **courses** developed based on lift requirements
 - Enquiry or registration of interest: jake_ang@bca.gov.sg



Findings from Testing and Commissioning (T&C) Audits for New Lift Installations

Overview, Process, Scheduling Issues and Observations from Trial



Overview

- **Observations**

- Some lift contractors **did not follow SS 550 fully** when carrying out T&C
- A number of SPEs **did not supervise** the examination, inspection, testing and commissioning carried out by the contractors
- **43%** of sites were found to have **non-compliances with** code

- Trials conducted since early 2023

- **Familiarize the industry** on BCA inspection requirements and process
- Trials covered 40% of lift contractors (with new installation projects) and 55% of SPEs (who inspects new installation works)



Scheduling Issues

PTO is delayed

Other firms' sites are delayed

Just before scheduled day of inspection, contractors inform:

- “Power not ready on site”
- “SPE has actually not conducted inspection”
- “Lift breakdown” just when officers attending to site
- “Forgot to arrange for weights to be delivered”
- “Forgot tester is not available”

What you have to do

- **Update BCA early** on condition of site
- Ensure **equipment and testers (QA/QC)** are available for inspection



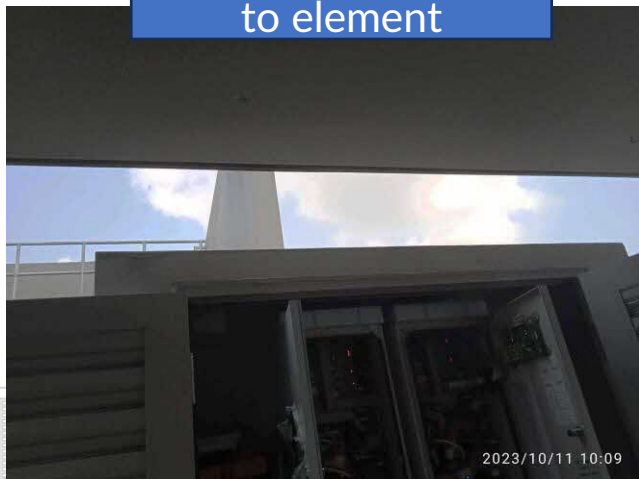
Common findings

Controller must be properly sheltered

- **No proper shelter** for equipment from weather elements



Controller exposed to element



Such improper installations will hinder **maintenance or rescue work** and also cause **reliability** issue to the lift system (e.g. frequent breakdown due to overheating)

Common findings

Refuge spaces must be marked

Good Examples:



Lift pit

Car top



Data plate

Important to ensure the lift workers are able to take refuge quickly in time of danger



Common findings

No earthing for E&I panel door

Doors of E&I panel are considered exposed conductive parts which have danger of becoming live in fault conditions.

Please ensure earthing is provided for the panel door as well.



Critical Findings from T&C inspections

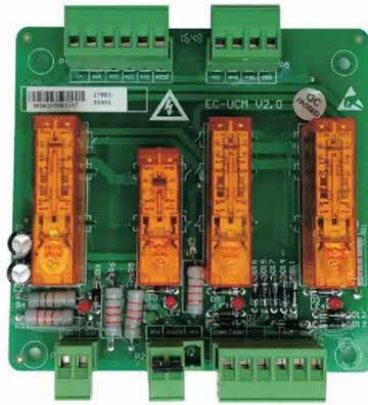
Difficult to rectify or Pose high safety risks to public and workers



Critical Findings



- **ACOP and UCMP systems were not installed!**
- **SPE failed to highlight issue EVEN AFTER his inspection!**



ACOP and UCMP are essential lift features in SS550
Contractor and SPE ***MUST*** be familiar with code requirements
SPE ***MUST*** point out non-compliances during T&C



DO



Critical findings



DON'T

- Earthing cable for supply not connected at the distribution board



Without earth connection, the lift system is not protected by the earthing protection in the building. This is very dangerous for all personnel working on or using the lift.

Proper connection to building earth should be **ensured** before turning on the power for the lifts.



DO

BCA

Critical findings



DON'T

• Pit e-stop button not working



This is very dangerous for the lift worker in the lift pit, as the lift may move unexpectedly and result in serious injuries or death

Check and confirm all safety buttons are functioning as intended



DO



Some essential on-site tests

- Functional tests:
 - ACOP
 - UCMP
- Safety gear test (125% load with rated speed)
- Buffer strike test
- Brake tests (single and double brake with load)



Testing issues

Site inspection cancelled; PTO delayed

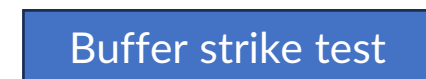


DON'T

- Tester on site **did not know how to conduct tests for essential safety features**
 - E.g. technician on site did not know how to isolate single brake for brake test
- Different lift models (brands) may require different testing methods
 - SPE must discuss with the installer and carry out the testing method in accordance with code requirement **AND not skip it**



Load test



Buffer strike test

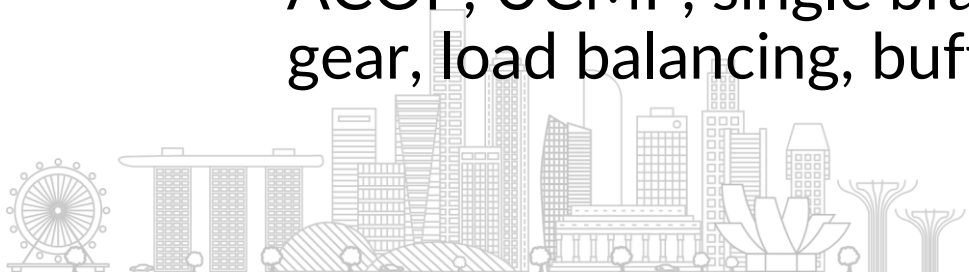
Contractor and SPE ***MUST*** be familiar and know how to carry out these tests for the lifts as they are essential tests



DO

Preparing for BCA's T&C inspection

- Ensure SPE has carried out his inspection and all comments are cleared
- Lift details (system model number, code compliance, controller model number, rated load, rated speed etc) are available
- Testing equipment such as weights (up to 125% rated load), door gauge, multimeter, accelerometer/tacometer (if applicable)
- Ensure representative on site is competent to carry out all functional tests
 - ACOP, UCMP, single brake, door closing force, governor, safety gear, load balancing, buffer strike




Summary

Design Approval

- Firms are encouraged to **participate in pilot trials** to gauge readiness
 - Submit design plans or BIM of a recent project
 - BCA will provide feedback to you and/or work out together an acceptable design plans or BIM

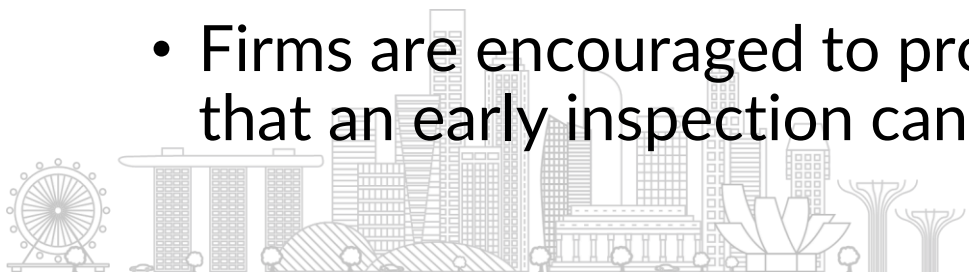


To participate in trials or feedback:
jake_ang@bca.gov.sg OR
desmond_ang@bca.gov.sg



T&C inspections

- Firms are encouraged to proactively **inform us once the site/lift is ready** so that an early inspection can be scheduled



Thank you



@BCASingapore

