



Building and Construction Authority

Guidelines

Approval Process for Reduced Maintenance Frequency for Lifts installed with Remote Monitoring and Diagnostics Solution

Disclaimer

These guidelines are not a substitute for independent professional advice. These guidelines and its contents are made available on an "as is" basis, and all implied warranties are disclaimed. These guidelines are not exhaustive in covering all matters on the approval process for reduced maintenance frequency for remote monitoring and diagnostics. BCA, its employees, agents, service providers, representatives and partners shall not be liable for errors or omissions in the transmission of these guidelines, or for any claim or dispute, or liability, damage, loss or expense arising out of or relating to, or in reliance on any of the information provided in these guidelines.

Readers should seek professional legal advice if they need to determine specific legal rights and duties applicable to them. While every effort has been made to ensure that information in these guidelines is consistent with existing law and practice, BCA reserves the right to vary its position accordingly without any prior notice.

Copyright

The contents of these guidelines are protected by copyright and other forms of proprietary rights, and are the property of BCA, or the party credited as the provider of the contents. You may download, view, print, and reproduce copies of these guidelines without modification for your own reference, but you shall not otherwise copy, reproduce, upload, distribute, publish, post, modify, create derivative works, transmit or in any way exploit the contents of these guidelines. If you wish to use the contents of these guidelines for any purpose other than for your own reference, please seek BCA's prior written consent.

©Building and Construction Authority 2022

Table of Contents

1. Introduction	4
2. Approval Process.....	4
3. Stage 1: Pre-Approval Trials.....	5
4. Stage 2: Application Process.....	5
5. Roles and Responsibilities	7
6. Flowchart on the Approval Process.....	8
Annex A.....	9
Annex B.....	11

1. Introduction

- 1.1 In Singapore, lift owners must engage lift contractors registered with BCA to carry out monthly maintenance¹ for lifts in accordance with the maintenance requirements² found in Part 1 of the First Schedule of the Building Maintenance and Strata Management (Lift, Escalator and Building Maintenance) Regulations 2016 (the “**BMSM (LEBM) Regulations**”).
- 1.2 To encourage and facilitate the adoption of Remote Monitoring & Diagnostics (“**RM&D**”) technologies for lifts, an interested lift owner (the “**Applicant**”) can now apply to the Commissioner of Buildings (the “**Commissioner**”) (via BCA) for approval for their lifts³ implemented with a particular RM&D solution⁴ to be subject to a longer maintenance interval of 3 months.
- 1.3 This guide aims to provide lift owners, lift service contractors and RM&D solution providers as well as other stakeholders in the lift maintenance industry more information pertaining to the application process.

2. Approval Process

- 2.1 The approval process would be in 2 Stages.

Stage 1: Pre-Approval Trials

- 2.2 The Applicant would first have to adopt RM&D solution for their lifts in pre-approval trials.
- 2.3 The aim of the pre-approval trials process is for the Applicant to demonstrate to the Commissioner that their RM&D solution meets the requirements specified in BCA’s Code of Practice⁵ for Design and Performance of Remote Monitoring & Diagnostics Solution for Lifts (hereinafter referred to as “**COP**”).
- 2.4 To demonstrate that the RM&D solution meets the requirements in the COP, the lifts installed with the RM&D solution must undergo a trial period of minimum 6 months.
- 2.5 At the end of 6 months, the Applicant would evaluate if the particular RM&D solution satisfies the requirements in Regulation 13A of the BMSM (LEBM) Regulations. During the 6-month pre-approval trial period, these lifts will still be required to be maintained every month by a lift service contractor in accordance with Reg 13 of the BMSM (LEBM) Regulations.

¹ The requirements for periodic maintenance of lifts can be found under Regulation 13 of the BMSM (LEBM) Regulations.

² Lift Contractors must meet a set of 20 Maintenance Outcomes stipulated in the BMSM (LEBM) Regulations that covers the critical areas of maintenance.

³ Other than a home lift, vertical platform or a stairlift.

⁴ “Remote monitoring and diagnostics solution” or “RM&D solution” means a system that (a) continuously collects data from an operating lift, (b) analyses the data to detect, diagnose and predict issues in the lift’s operation; and (c) recommends action for the lift’s maintenance.

⁵ The COP can be found in BCA’s website: <https://www1.bca.gov.sg/regulatory-info/lifts-escalators/remote-monitoring-diagnostics-for-lifts-in-singapore>

2nd Stage – Application Process

- 2.6 If the Applicant evaluates that the particular RM&D solution satisfies the requirements in Regulation 13A of the BSM (LEBM) Regulations, the Applicant may submit an application under Regulation 13A for the lifts that had undergone the pre-approval trial process in Stage 1 to be subject to a longer maintenance interval of up to 3 months. To this end, the Applicant must complete the application using the requisite form, and prepare the necessary documents and forms to be submitted to the Commissioner.

3. Stage 1: Pre-Approval Trials

- 3.1 This section provides more information on the process of the Stage 1 pre-approval trials.
- 3.2 Applicants who are interested to conduct pre-approval trials in Stage 1 should write to BCA for a consultation with the required information (listed in Annex A) on the details of their RM&D solution.
- 3.3 If the Applicant's RM&D solution is assessed to be suitable after the consultations with BCA, the Applicant can proceed to conduct the pre-approval trials.
- 3.4 During the 6-month pre-approval trials, the Applicant should:
- (i) collect evidence and data, contained in documents, that demonstrate that the RM&D solution is able to meet the monitoring outcomes requirements in Table 1 listed under section 3.7.2 of the COP. The monitoring outcomes describe the lift systems that are required to be monitored and the expectations on the outcome of the monitoring;
 - (ii) collect and submit information to the Commissioner on the RM&D performance indicators⁶, maintenance findings⁷ and servicing reports monthly; and
 - (iii) facilitate audits by the Commissioner for the lifts deployed under the trial during the pre-approval trial period. The lift service contractors engaged to maintain the lifts under the trial must facilitate and assist the Commissioner in any audit inspections that may be required by the Commissioner. The Commissioner will provide advance written notice of such audit inspections.

4. Stage 2: Application Process

- 4.1 This section provides more information on the Stage 2 Application Process.
- 4.2 The application must be made by the owner of the lifts installed with the RM&D solution ("**RM&D Lifts**"). To apply, the Applicant would need to download and fill up the requisite application, supporting forms and relevant documents, and submit them to the Commissioner. The application must set out the list of RM&D Lifts and

⁶ For further details on the Performance Indicators, please refer to the COP.

⁷ Data templates would be provided to the Applicant. The Applicant would have to fill in the necessary data fields and submit them to BCA monthly.

be endorsed by the lift service contractor engaged to maintain the RM&D Lifts as well as the intended RM&D solution provider. The list of forms is listed below and can be found on BCA's website at <https://www1.bca.gov.sg/regulatory-info/lifts-escalators/remote-monitoring-diagnostics-for-lifts-in-singapore>:

- (i) Application to Maintain Lifts using RM&D solutions at reduced maintenance frequency.
- (ii) Form A: Details of Lifts
- (iii) Form B: Details of Performance Indicators Values (Past 6 months)
- (iv) Form C: RM&D Maintenance Findings (Past 6 months)
- (v) Form D: Checklist for monitoring outcomes for BCA's Code of Practice for Design and Performance of Remote Monitoring & Diagnostics Solutions for Lifts

4.3 In evaluating the application, the COB must be satisfied of all of the following:

- (i) that the RM&D solution can collect data on all or most of the maintenance requirements referred to under regulation 13 of the BSM Regulations
- (ii) the RM&D solution can predict issues⁸ in the operation of the RM&D Lifts;
- (iii) the lift owner, lift service contractor and RM&D solution provider agree to comply with any condition imposed by the Commissioner for the approval;
- (iv) given the use of the RM&D solution, the appropriate frequency to carry out maintenance works for the RM&D Lifts; and
- (v) public safety

4.4 Upon written approval of the application by the Commissioner, the lift service contractor may then carry out maintenance works at the approved frequency for the RM&D Lifts, subject to the conditions of approval as may be imposed by the Commissioner.

4.5 In approving the application, the Commissioner may impose conditions of approval which may include one or more of the following:

- (i) the Applicant shall continue to use the RM&D solution throughout the period of approval;
- (ii) the Applicant shall notify BCA in writing if the lift owner, lift service contractor or RM&D solution provider intends to terminate the use of the RM&D solution or wish to revert back to the monthly maintenance regime for the RM&D Lifts, and obtain the Commissioner's approval before such termination or reversion;
- (iii) the Applicant continues to ensure that the approved RM&D Lifts meet the performance benchmarks in **Error! Reference source not found.** at all times;
- (iv) the Application immediately notifies the Commissioner in writing as soon as the Applicant becomes aware of any defects or issues in the RM&D solution that could cause severe unintended consequences affecting public safety;
- (v) the Applicant shall submit data on all maintenance findings, servicing reports and performance indicator results for the RM&D Lifts to BCA on a monthly basis;
- (vi) the Applicant shall ensure that the lift service contractor engaged to maintain the RM&D lifts carries out actions recommended by the RM&D

⁸ To demonstrate this, the Applicant must ensure that performance indicator values submitted in Form B meet the requirements in Annex B.

- solution provider, within the timelines suggested by the RM&D solution provider; and/or
- (vii) the Applicant shall facilitate audits by BCA for the RM&D Lifts by ensuring that the lift service contractor engaged to maintain the RM&D Lifts facilitates and assists BCA in any audit inspections that may be required by BCA with advance written notice of such audit inspections.

5. Roles and Responsibilities

- 5.1 Lift owners, lift service contractors and RM&D solution providers are reminded of their respective roles and responsibilities in deploying the RM&D solution for the RM&D Lifts under a longer maintenance frequency.

Lift Owners

- 5.2 In the event that the owner finds that any of the RM&D Lifts are unsafe through information from the RM&D solution or otherwise, the lift owner should put the lift(s) out of operation immediately, alert the lift maintenance contractor and RM&D solution provider. Observations, before and after rectifications, should be recorded and logged in the RM&D data submission templates provided by BCA.
- 5.3 The approval granted by the Commissioner provides flexibility for an extended, condition-based maintenance regime. Notwithstanding any approval granted by the Commissioner, the lift owner should take advice from the lift maintenance contractor to impose a more frequent maintenance regime, should the need arise, on any of the RM&D Lift(s).

Lift Service Contractor

- 5.4 The lift service contractor would need to increase monitoring and is expected to respond expediently and accordingly if the lift service contractor is informed, through the RM&D Solution, the RM&D Solution Provider or otherwise, that the RM&D Lifts require intervention.
- 5.5 Observations and rectification actions during intervention trips should be recorded and logged. In an event the lift maintenance contractor finds the anomalies or recommendations raised by the RM&D solution does not warrant interventions, justifications are to be clearly provided.
- 5.6 The lift maintenance contractor should advise the lift owner as well as the RM&D solution provider on a suitable maintenance frequency/plan if the maintenance arrangements cannot meet the necessary maintenance requirements for the RM&D Lifts to operate in a safe manner.

RM&D Solution Provider

- 5.7 The RM&D solution provider must take the necessary precautions to prevent unauthorized control of and access to the RM&D Lifts remotely. There should be consideration in the RM&D system design minimally to log, trace, and interrupt hijacking and hacking attempts.
- 5.8 The RM&D solution provider has the responsibility to safeguard the RM&D Lifts' data, regardless of storage means. The RM&D Lifts' data must be identifiable and

extracted in a readable format, and be able to be provided to BCA and the lift owner upon request (in addition to the monthly data submissions to BCA, if applicable).

- 5.9 The RM&D solution provider should at all times work with the lift maintenance contractor, as well as lift owner, if necessary, to continuously improve the diagnostic capabilities, raising diagnostic and predictive accuracies through means of on-site validation for feedback to the RM&D Solution.

6. Flowchart on the Approval Process

- 6.1 The processes from consultation to obtaining of approval are as shown in Figure 1.

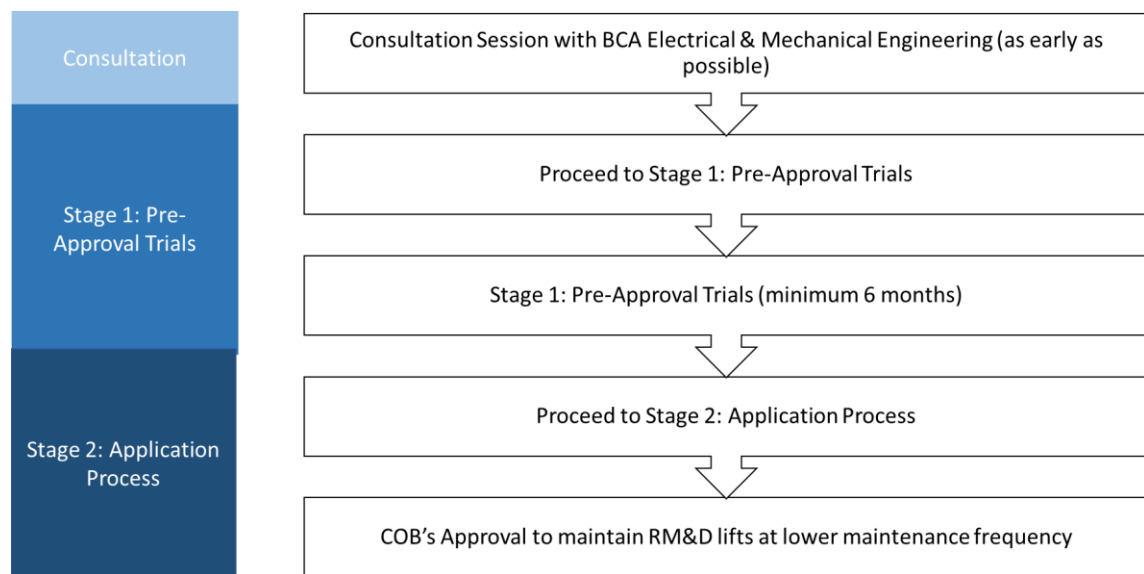


Figure 1: Flowchart on Approval Process

- 6.2 Interested applicants may request for a consultation session or send their enquiries through <https://www.bca.gov.sg/feedbackform>.

Annex A

1. Number of lifts to be used for the pre-approval trials
2. Name of the RM&D solution
3. Brief Description of the RM&D solution (including system architecture)
4. Checklist for monitoring outcome
5. Additional documentations and/or supporting information to demonstrate that the RM&D system meets the COP.

Lift system and their sub-system	Monitoring Outcomes	Does the RM&D system meet the monitoring outcomes? Yes/No
1. Traction Machine	To be able to monitor and analyse the performance of the lift and identify potential issues with the traction machine; and provide recommendation on possible rectification works and indicate when they are required.	
2. Brakes	To be able to monitor and analyse the performance of the lift and identify potential issues with the brakes; and provide recommendation on possible rectification works and indicate when they are required.	
3. Suspension Means	To be able to monitor and analyse the performance of the lift and identify potential issues with the suspension means; and provide recommendations on possible rectification works and indicate when they are required.	
4. Guide system (i.e. guide rail and guide shoes or rollers)	To be able to monitor and analyse the performance of the lift and identify potential issues with the guide system; and provide recommendations on the possible rectifications for the guide system and indicate when they are required.	
5. Car and Landing Doors (including door protective devices)	To be able to monitor and analyse the performance of lift and identify potential issues with the car and/or landing doors system; and provide recommendations on possible rectification works and indicate when they are required.	
6. Levelling Devices	To be able to monitor and analyse the performance of the lift and identify potential occurrences and instances of mis-leveling; and provide recommendations on possible rectification works and indicate when they are required.	

<p>7. Fault Diagnosis including the following components:</p> <ul style="list-style-type: none"> a) Overspeed Governor b) Safety Gear c) Controller and Inverter Drive d) Buffer e) Compensation System 	<p>To be able to monitor and analyse the performance of the lift and indicate if one or more of the following fault(s) is/are possible cause(s) for the stoppage of the lift:</p> <ul style="list-style-type: none"> • Overspeed Governor Activation • Safety Gear Activation • Controller and Inverter Drive Failure • Buffer Activation • Compensation System Activation • Ascending Car Overspeed Protection Activation • Unintended Car Movement Protection Activation • Fire Emergency • Power Failure 	
------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

Annex B

The performance indicators and benchmarks aim to provide a reference where the effectiveness of the RM&D technology can be assessed through the performance of the lifts on 3 key areas: a) safety, b) productivity, c) reliability as well as the diagnostics accuracy of the RM&D Solution.

Table 1: Performance Indicators and Benchmark

Performance Indicators	Performance Benchmark
1. Safety – 20 Maintenance Outcomes	<ul style="list-style-type: none">• < 2 consecutive months of similar high-risk findings• < 4 consecutive months of low/med risk findings
2. Productivity – First Time Fix Rate (FTFR)	>70% for 6 months
3. Productivity – Mean Time to Repair (MTTR)	>10% improvement
4. Reliability – Technical Failure Per Equipment (TFPE)	<0.2 (per month)
5. Reliability – Uptime	>99%
6. Reliability – RM&D Device Availability	>95%
7. Diagnostics Accuracy	85%