RECOMMENDATIONS OF THE LIFT AND ESCALATOR SECTORAL TRIPARTITE COMMITTEE (L&E STC) FOR THE LIFT INDUSTRY

I. Objective

1. This report sets out the recommendations of the Lift and Escalator Sectoral Tripartite Committee (L&E STC) for the lift industry, which was formed in January 2017 to look into initiatives to attract, develop and retain Singapore residents in the L&E sector. The members of the L&E STC comprise representatives from the industry association and unions, key government agencies, lift service buyers and providers (see details under Annex A).

II. Introduction

2. Singapore is a densely populated country with an increasing number of high rise buildings. As these buildings become taller and more densely utilised, vertical transportation infrastructure such as lifts will become increasingly integral to modern living. Today, there are about 67,000[1] lifts in Singapore and numbers are set to rise.

3. The lift industry provides services for the initial installation of lifts as well as the maintenance of these equipment throughout their operational lifetime. Maintenance personnel make up the majority of the sector's workforce and are essential in providing day-to-day servicing to ensure lifts are well-maintained for safe and reliable use.

4. Over the longer term, the demand for lift maintenance services is projected to increase significantly due to the **increasing number of lifts and ageing infrastructure** in Singapore.

III. Manpower Challenges in the Lift industry

5. Despite the strong anticipated demand for lift maintenance services, **the industry faces challenges in expanding its workforce capacity to meet the demand for services.** This is in part due to an **ageing workforce** where an estimated 50% of the Singapore residents (Singapore Citizens and Permanent Residents[2]) in the industry are aged 50 years and above. On top of that, there remains **difficulties for lift companies to recruit Singapore residents to take up lift maintenance as a career,** due to the following reasons:

    a. Low Basic Wages – Based on a survey done by BCA in 2016 with the major lift companies, the entry-level basic wages[3] for Singapore resident lift

[1] As at July 2018.
[2] Singapore Citizens and Permanent Residents make up approximately half of the existing workforce in the sector.
[3] Other variable wage components include allowances, incentives and overtime payment.

technicians ranged from $1,300 to $1,600. This is considerably lower than the other occupations which do not require as high a set of technical skill qualifications yet enjoy better working conditions, e.g. a bus captain with a starting basic salary of about $1,950. Overtime payment (non-guaranteed) does, however, make up a substantial portion of the total remuneration package for maintenance personnel, and can comprise as much as 50%[4] of the gross salary.

b. Demanding Working Conditions – lift maintenance personnel work under demanding working conditions due to a combination of factors:

   i. Work environment. The lift shafts and motor rooms may be dark, stuffy and hot due to the confined nature of these spaces and heat generated by the machines.

   ii. Nature of work. Maintenance work is physically strenuous as it requires climbing into narrow spaces on top of the lift car and into the lift pit. Working with heavy machinery within such confined spaces also carries risk if there is insufficient illumination.

   iii. Working hours. Long and unpredictable working hours are common in the industry due to the need to attend to emergency calls or service lifts, off peak, outside normal working hours.

c. Poor Public Perception – lift maintenance work is often perceived as a blue-collar and thankless job. Even though the work requires deep technical expertise and knowledge particularly at the higher levels, it is often seen as an unglamorous job especially among Singapore residents.

IV. Transformation of the lift industry for long term improvement and to enhance public perception

6. To tackle these challenges, the lift industry requires a transformation, with enhancements in lift maintenance and safety standards, strengthening of capabilities and improvements in productivity for the long run. With this transformation, the industry would be able to offer more attractive jobs to Singapore residents who seek a stable and meaningful career. **The transformation of the lift industry involves the following:**

- *Enhanced safety through raising lift maintenance* standards with Building and Construction Authority (BCA)'s **tightened regulatory regime at the operations and maintenance stage**. In 2016, BCA announced a series of legislative measures which included requiring registered companies to achieve specified outcomes for maintenance, report incidents involving lift equipment

[4] Statistic provided by lift firms during the focus group discussions organised by BCA

and for owners to obtain and display a Permit to Operate. In addition, the **heightened public awareness and attention to lift safety issues** has also led to an increased demand for lift maintenance services in the immediate term.

- *Building up strong manpower capabilities* can enable the industry to deliver better quality maintenance services upfront, which can help to improve efficiency by reducing breakdowns and call backs. More significantly, efforts to professionalise the workforce signal to the public that lift industry could offer stable and more attractive jobs for Singapore residents.
- *Encouraging wider technology adoption* can improve productivity and enable re-designing of work processes, which in turn improves working conditions and environment.

V. Recommendations of the STC

7. In line with this on-going transformation, the STC has developed a set of recommendations to **attract, develop and retain Singapore residents in the lift industry** and **to help the industry meet the demand for maintenance services.** The recommendations seek to provide progression in the four key areas of **jobs, skills, remuneration and productivity**:

A. **Better Jobs:** Provide better jobs to attract Singapore residents to join the industry

B. **Higher Skills**: Upskill workforce to deliver better quality maintenance services

C. **Better Remuneration**: Ensuring better wages to enhance retention

D. **Raising Productivity:** Push for wider adoption of technology to enhance the effectiveness of manpower

VI. Part A: Provide better jobs to attract Singapore residents

8. To better meet the demand for maintenance services, there is a need to **build up the lift workforce and expand its capacity in the longer term by attracting more Singapore residents to join the industry.** The STC recommends adopting a three-pronged strategy to achieve this:

i) Introducing clear career progression pathways based on competencies

9. The existing progression pathway in the industry, based on anecdotal feedback from lift companies, is as shown in Diagram 1. Workers will enter at the Mechanic[5] level and

[5] Mechanic is an entry level position whereby workers are trained to perform maintenance work under supervision, similar to the Asst Specialist role under the proposed progressive wage model (PWM) (see Diagram 2).

accrue some technical knowledge before moving to the Technician[6] level (for which most companies would have a few grades e.g. Technician 1 or 2, Senior Technician 1 or 2 etc.) Better skilled personnel would often take on supervisory roles, which tend to involve less site-based work, to move up the career ladder. **With such a progression pathway, there will be a lack of skilled and experienced technical specialists to anchor the industry.**

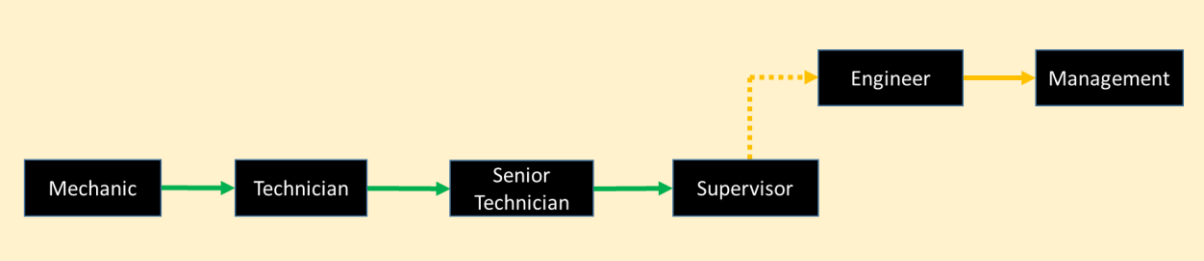


Diagram 1: Existing career progression pathways in lift industry

10. To provide career advancement opportunities while ensuring that the industry builds up a pool of skilled and experienced technical personnel, **the STC recommends introducing clearly defined dual career progression pathways** – supervisory and specialist – under a progressive wage model (PWM) (see Diagram 2a and 2b). The aim is to attract Singapore residents to join the lift industry and retain them through continual upgrading under the PWM.

11. The PWM provides two alternative pathways for maintenance personnel to pursue. First, the supervisory track offers opportunities to progress and build up management capabilities. Second, the specialist track caters to those who prefer to progress and deepen their technical skillsets.

12. To ensure differentiation between the various levels, **the STC recommends a progression with five levels for each pathway under the PWM, where each level has clearly defined job responsibilities** (Diagram 2a). The STC has also identified the respective key competencies at each level (see Annex B). To implement the framework, lift companies need to conduct a mapping exercise to determine the level of the PWM each individual employee would fall under, based on their job responsibilities and competencies they possess.

13. As part of the effort to rebrand the lift industry and its job opportunities, the job titles under the PWM are also renamed to better reflect the higher competencies required progressing up the ladder.

[6] Technicians will perform maintenance work independently, respond to incidents and replace lift components, similar to the Specialist and Senior Specialist roles under the proposed PWM (see Diagram 2).

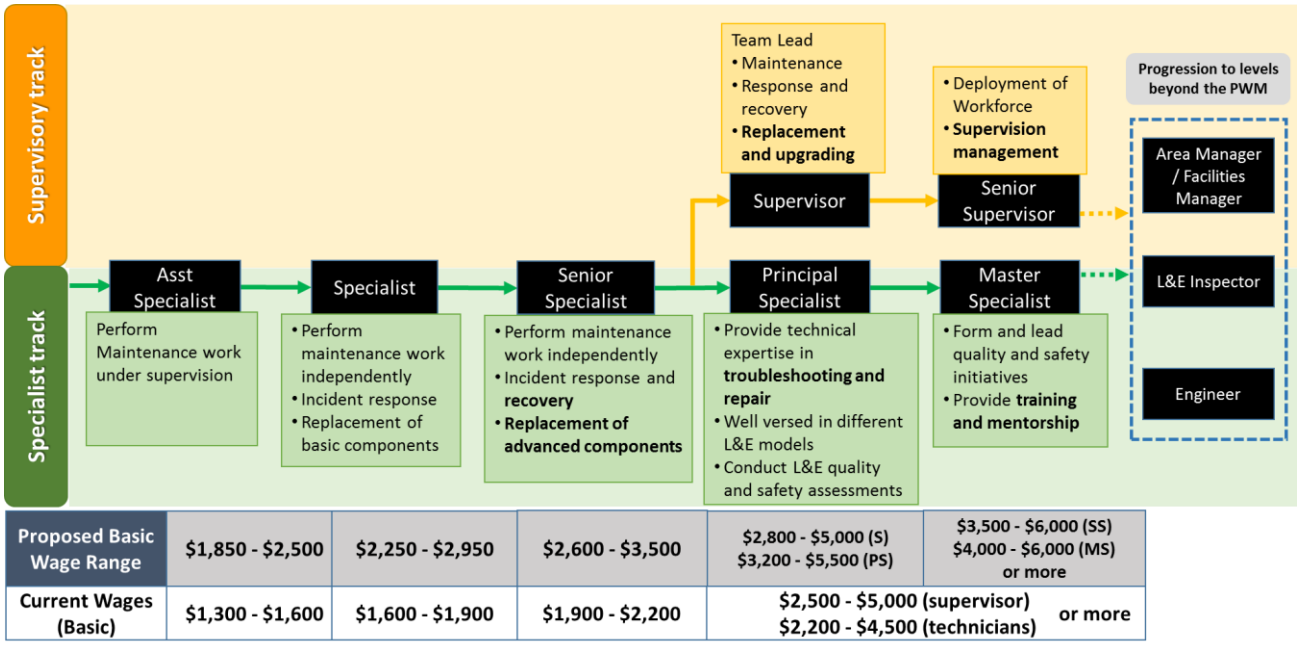


Diagram 2a: Job responsibilities at each level of the career progression pathways under the progressive wage model (PWM). Firms may have different job titles internally, as long as job responsibilities and competencies are mapped to the PWM levels above

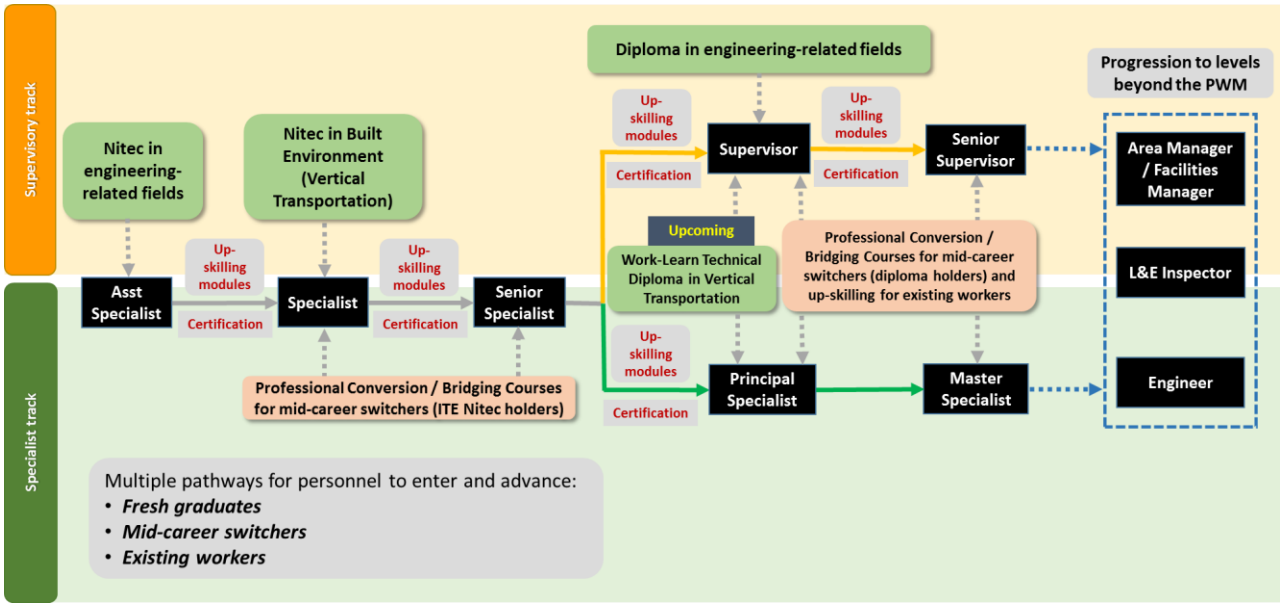


Diagram 2b: **Potential** training courses for each level of the career progression pathways under the progressive wage model (PWM). **Note that this is provisional and subject to further refinement.**

ii) <u>Improving work environment and conditions</u>

14. In addition to providing career progression pathways, there is also a need to **improve the work environment and conditions in the lift industry to enhance the attractiveness of its jobs**. The STC recognizes that there are efforts to study how this can be done. First, the Singapore Standards Committee is reviewing the Singapore Standards SS550[7] to align with international standards and specify higher lighting

[7] SS 550 is the Code of Practice for Installation, operation and maintenance of electric passenger and goods lifts.

levels within the lift shaft to facilitate maintenance work. BCA is also studying the feasibility of improving ventilation within the lift shaft and motor room to create a cooler work environment for the maintenance personnel. In addition, BCA will review regulations and procurement framework to facilitate the adoption of technology that can help streamline existing work processes and improve productivity (see section IX – Push for wider adoption of technology to enhance the effectiveness of the workforce). **The STC encourages all stakeholders, especially building owners and lift companies, to proactively explore measures to improve the working conditions and environment of the lift industry in order to improve the attractiveness of its jobs.**

iii) Enhance perception of careers and opportunities

15. For the sector to attract a steady pipeline of Singapore residents and retain them, **the STC recommends a 3-pronged strategy to enhance public perception of careers and opportunities in the lift industry** (see Diagram 3**).** They are:

a. Enhancing awareness through sustained outreach efforts
b. Strengthening HR practices of lift companies
c. Enhance safety through better management

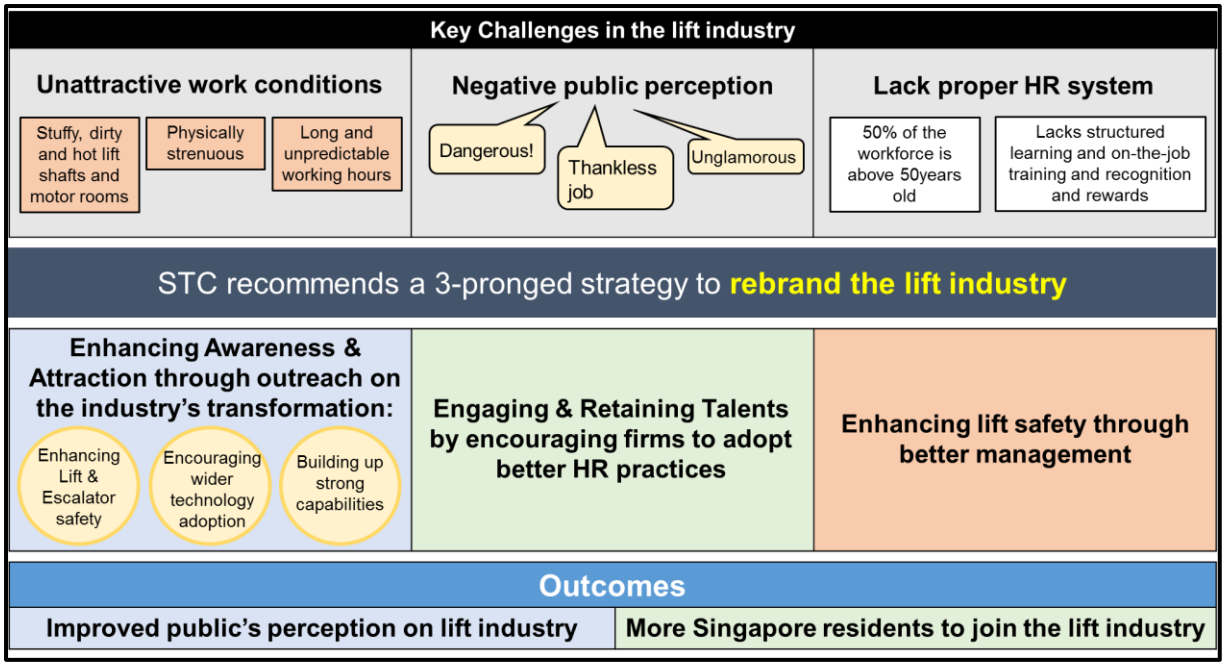


Diagram 3: Overview of strategies to attract and develop talents through enhancing perception of careers and opportunities within lift industry

16. Enhancing Awareness. **The STC recommends broad as well as more targeted outreach efforts** to raise awareness and enhance public perceptions of the lift industry to the public and specific audiences (i.e. students, educators and jobseekers), through communicating the on-going transformation of the lift industry. (covered under section

IV – Transformation of the lift industry for long term improvement and to enhance public perception.)

Types	Target Audience	Outreach strategies
Broad outreach	**General public, new and existing L&E personnel**	Running sustained rebranding campaign through various media platforms **Infographic and videos** A lift sector webpage on the **BCA website** Communicate key rebranding messages via **BCA Facebook Page**
Targeted outreach	**Students, jobseekers, educators**	**Learning Journeys** for to lift firms Secondary, ITE, Poly students **Career Talks** to ITE students from M&E and VT Inviting lift firms to **Career Fairs** (BCA's BE Career and Education Fair, MINDEF's, ITE's, e2i's Career fairs)

Diagram 4: Overview of strategies to enhance awareness on the positive aspects of the sector through broad as well as more targeted outreach efforts

17. Strengthen HR Practices. Companies with good HR practices can help to profile the sector positively and attract new entrants. **The STC recommends that lift companies sign a voluntary pledge to adopt good HR practices and implement the commitments under the pledge**. Good HR practices could include adopting the proposed wages under the PWM (see diagram 2a and section VIII – Ensuring better wages to enhance retention), providing structured learning or on-job-training and putting in place a recognition and reward system for good performance (see Diagram 5).

Good HR Practices	
Structured Competency Framework	See section VIII
Training	Examples: ▪ Annual review and setting aside of budget for employees' training and development needs ▪ Organising in-house and on-job-training ▪ Setting minimum training hours based on employees' developmental goals set during year-end appraisal
Rewards and Recognition	Examples: ▪ **Recognition programmes:** Good performances certificates / rewards to be given out when employee consistently deliver outstanding performances, or 'letter of appreciation' or rewards to be given out when employee reach certain milestones like service anniversaries etc

Diagram 5: Examples of good HR practices that can help to profile the industry positively and attract new entrants

18. Enhance Safety through Better Management. Besides levelling up the competencies of the maintenance personnel, it is equally important that the lift companies have a proper management system that clearly commits its policies and action plans on ensuring lift safety. The STC therefore recommends that BCA considers developing a safety management system for lift companies.

VII. Part B: Upskill workforce to deliver better quality services

19. While the STC has outlined strategies to provide better jobs to attract Singapore residents to join the industry, the STC acknowledges that these would need time to take effect. To professionalise the workforce and demonstrate the importance of the lift industry, the sector needs to develop stronger manpower capabilities through upskilling the workforce. When new technologies such as remote monitoring and diagnostics (RM&D) are adopted, technicians and engineers will have to be retrained to equip them with the necessary skillset for higher value-added jobs e.g. data analysis and troubleshooting off-site (see section IX – Push for wider adoption of technology to enhance the effectiveness of the workforce).

20. Currently, there are no standardised minimum requirements (e.g. qualifications, certification, training etc.) for existing lift maintenance personnel at the rank-and-file level. Training is primarily conducted in-house by companies through on-job-training, with no standardised approach or curriculum across the industry.

21. The STC notes that BCA has in place a suite of scholarship and sponsorship programmes that allow in-service personnel to upgrade themselves while working full-time (see Annex C for details). However, the competency and skill requirements of the workforce are not defined.

22. **The STC therefore recommends implementing a training and certification framework aligned to the proposed PWM** to ensure that all maintenance personnel – new entrants and existing personnel – are equipped with the key competencies required to carry out their job responsibilities (see para 12). The framework would comprise the following elements:

    a. *Training* – to cover the key learning outcomes that would allow an individual to attain the competencies required; the key learning outcomes at each level of the PWM have been identified by the STC (see Annex B);

    b. *Certification* – to assess an individual's achievement of learning outcomes and competencies at the specified level of the PWM.

23. **The STC recommends tailoring the training and certification requirements to cater to varying needs of the different groups of industry personnel** (i.e. new entrants and existing personnel), while still ensuring that they fulfil the necessary competency requirements.

    a. Fresh graduates (with lift qualifications).
        - NITEC in Facility Technology (Vertical Transportation) offered by the Institute of Technical Education (ITE) is currently the only lift-specific qualification available
        - **The STC recommends that institutes providing or looking to provide these lift qualifications align the curriculum to the PWM**, so that graduates possessing these qualifications could join the sector immediately upon graduation

b. Fresh graduates (with non-L&E qualifications).
   - **The STC recommends that bridging courses and certification be provided**, so that these graduates may fulfil the competency requirements under the PWM and join the sector

c. Mid-career switchers.
   - Mid-career switchers from other maintenance-related sectors would possess some practical engineering experience which might be transferable to lift maintenance work
   - **The STC recommends that this group of new entrants could tap on bridging courses and certification to join the lift industry** (see Annex D – Suite of manpower development programmes)

d. Existing personnel.
   - The STC recommends for lift firms to conduct their own mapping exercise to place maintenance personnel at the appropriate levels based on job responsibilities and competencies. (see para 12 regarding mapping exercise)
   - All personnel who wish to progress to the next level of the PWM should undergo training and certification, to ensure that they fulfil the necessary competency requirements under the PWM
   - To level up the manpower capability and safety standards across the industry, the STC suggests that a minimum requirement be imposed across the industry to ensure that lift maintenance personnel have the required competency. The certification test for this minimum requirement will take into account lift personnel's experience and practical skills in performing maintenance work independently, and will be aligned with the competency requirements under the PWM.

VIII. Part C: Ensuring better wages to enhance retention

24. Basic wages of maintenance personnel must be commensurate with the higher competencies for job retention. The STC recommends that entry-level monthly basic wage for maintenance personnel starts from $1,850 (see Diagram 2a). Besides basic wages, the STC recognises that lift companies commonly include other components in remuneration packages, which can make up a substantial portion of the gross salary. **The STC therefore calls upon employers to align their employees' monthly basic wage to the recommended wage range, or better, for each level of the career progression pathway.** The wages recommended under the PWM are tailored for full-time, Singapore resident maintenance personnel.

25. To reap the fullest benefit of the PWM, **the STC recommends that the PWM be made mandatory.** However, the STC acknowledges that this cannot be achieved immediately as lift maintenance contracts typically are multi-year and locked-in for several years. The industry will need time to adjust to the higher wages. Thus, sufficient time should be given for the industry to transit to the full recommended PWM wages. In the meantime, **lift firms should work closely with the Unions and their workers early**

for a smooth transition to the PWM by the deadline set by the Government if the recommendation is accepted.

26. To ease the transition and mitigate a sudden cost impact, the STC suggests for funding to be provided to major service buyers who take the lead in adopting the PWM, as well as to service providers that have locked-in contracts. This can alleviate some of the immediate cost impact to service buyers and providers, and help to ease the transition to full PWM wages. Service buyers are also encouraged to work with lift firms to re-negotiate existing contracts to facilitate the adoption of PWM, if these lift firms demonstrate their commitment to the PWM.

IX. Part D: Push for wider adoption of technology to enhance the effectiveness of the workforce

27. Against the backdrop of the tight manpower and the expected increase in manpower cost, the lift industry should also improve its productivity and move towards a more effective workforce in the longer term. This can be achieved through the adoption of technology that **enables existing work processes to be re-designed and streamlined. This would enhance efficiency and reduce manpower needs across the industry.** At the same time, a more technologically advanced industry will **provide a better work environment as well as higher-value adding jobs that will also require new skillsets to be developed.** These benefits will help enhance the public perception to make the lift industry a more attractive career option and attract better quality entrants in the longer term.

28. One example of such technology would include innovative technology that could reduce maintenance work such as maintenance-free lift parts and components. Another example would be remote monitoring and diagnostics (RM&D) technology. Deploying monitoring capabilities can allow engineers to track the status of a lift remotely, and be notified when lifts encounter faults. Diagnostics capabilities can also be built into lift controllers to enable personnel to remotely perform checks and diagnose faults to determine potential causes, so that service personnel who are deployed on-site can perform more targeted rectification work to put the lift back into operation in a shorter time. This can help to minimise lift downtime and improve reliability, as well as raise productivity of maintenance personnel. In addition, adopting these technologies will create the need for new skillsets and higher value-added jobs as data analysts will be needed to perform the data analysis and preliminary trouble-shooting off-site. The monitoring and diagnostics control centre will also provide an improved work environment for these engineers. In the longer term, beyond monitoring and diagnostics, there is also the possibility of conducting more advanced predictive analytics on the data collected to pre-empt potential lift malfunctions or parts failure (depending on the type and extent of information collected through the monitoring devices).

29. **The STC recommends that the industry take the lead in technology adoption to enhance efficiency and reduce manpower reliance, while the Government works with the industry to explore ways to facilitate technology adoption.** For example, joint studies and R&D efforts could help both industry and regulators better understand

these technologies, and how they can be implemented in Singapore's context. As the industry gains capability in these technologies, regulations could be reviewed to assess whether there is scope to adjust the frequency of maintenance for lifts with remote monitoring technology or maintenance-free parts and components.

30. A summary of the STC's recommendations can be found under Annex E.

X. Conclusion

31. In the development of the recommendations, industry stakeholders represented on the STC as well as its two workgroups have provided inputs, views and feedback on the issues which the lift industry faces. These discussions have allowed the STC to better understand the concerns and challenges faced by all stakeholders, and to take in these considerations.

32. Introducing the PWM and rebranding roadmap is a step forward in helping lift personnel earn better wages that are commensurate with better skill sets, higher standards and higher productivity. With clear career progression pathways, lift personnel would be more motivated to upgrade their skills, perform better and seek progression in their jobs. The initiatives under the rebranding roadmap introduced would also complement the PWM to uplift the image and professionalism of the industry. With these steps in place, the industry would be better placed to attract and retain quality manpower to meet its growing needs.

ANNEX A

LIFT AND ESCALATOR SECTORAL TRIPARTITE COMMITTEE

Terms of Reference

1. To develop a progressive wage model for the lifts and escalators sector that would provide a pathway for wages to progress with training, skills competency and higher responsibilities.
2. To develop a training framework which supports the regulatory regime on maintenance of lifts and escalators.
3. To propose a timeline for the adoption and periodic reviews of the progressive wage model.
4. To develop rebranding initiatives to improve image of lifts and escalators sector and professions.

Members

	Agency	Representative
Co-Chairs	**National Trades Union Congress**	**Melvin Yong** *Assistant Secretary-General*
	Building & Construction Authority	**Chin Chi Leong** *Deputy CEO (Building Control) & Commissioner of Buildings*
Unions	**Metal Industries Workers Union**	**Jessie Yeo** *Advisor & Executive Committee Member*
	Singapore Manual & Mercantile Workers' Union	**Surash R Mukundan** *Deputy Secretary General*
	Employment and Employability Institute	**Gilbert Tan** *CEO*
Government	**Building & Construction Authority**	**Teo Orh Hai** *Group Director, Electrical and Mechanical Engineering*
		Er. Grace Mui *Group Director, Manpower Strategy & Planning*
	Ministry of Manpower	**Heng Jian Wei** *Director, Foreign Workforce Policy Dept*
	Workforce Singapore	**Toh Swee Chien** *Director, Healthcare, Social & Business Services* *(up to 1 Jun 2018)*
		Janice Foo *Director, Healthcare, Social & Business Services* *(with effect from 1 Jun 2018)*

Association	**Singapore Lift & Escalator Companies & Manufacturers Association**	**James Lee** *President*
Firms	**Chevalier Singapore Holdings Pte Ltd**	**Quah Eng Hing** *Director & General Manager*
	Fujitec Singapore Corporation Ltd	**Sugumaran N Pillai** *Managing Director*
	Otis Elevator Co (S) Pte Ltd	**Greg Nagle** *Managing Director*
	Ken-Jo Industries Pte Ltd	**Kenneth Lim** *Managing Director*
Service Buyers	**Holland-Bukit Panjang Town Council**	**Juliana Lim** *General Manager*
	Housing & Development Board	**Thomas Seow** *Group Director, Building Development & Procurement (up to 1 Jun 2018)*
		Neo Poh Kok *Group Director, Building Quality (with effect from 1 Jun 2018)*
	JTC Corporation	**Mark Koh** *Group Director, Facilities & Estate Management*
	Real Estate Developers' Association of Singapore	**Augustine Tan** *President*
	Association of Strata Managers	**Chan Kok Hong** *President*
	Association of Property & Facility Managers	**Dr Lim Lan Yuan** *President*

ANNEX B

JOB RESPONSIBILITIES AND COMPETENCIES UNDER THE PROGRESSIVE WAGE MODEL (PWM)

I. Job responsibilities

S/N	JOBSCOPES	Asst Specialist (Under Supervision)	Specialist	Senior Specialist	Principal Specialist	Master Specialist	Supervisor	Senior Supervisor
1	Understudy and Perform lift maintenance works	√						
2	Housekeeping of the lift motor room, shaft, car top and pit	√	√					
3	Lubrication and cleaning	√	√	√				
4	Check of lift components	√	√	√	√			
5	Replacement of minor components*	√	√	√	√			
6	Adjustment of settings (minor)*	√	√	√	√			
7	Troubleshoot safety circuits		√	√	√	√		
8	Attending to breakdowns/callbacks		√	√	√	√		
9	Replacement of major components**			√	√	√		
10	Adjustment of settings (major)**			√	√	√		
11	Troubleshoot lift issues				√	√		
12	Parts replacements and procurement				√ (assist supervisor)	√ (assist supervisor)		
13	Troubleshoot complex lift issues				√	√		
14	Root cause analysis (RCA)				√	√		
15	Risk Assessment				√	√	√	√
16	Quality Control					√	√	√
17	Develop and Conduct training (includes safety and technical)					√		
18	Managing the technical team						√	√
19	Report writing and dispute resolution						√	√
20	Interpret codes, Acts and Regulations						√	√

S/N	JOBSCOPES	Asst Specialist (Under Supervision)	Specialist	Senior Specialist	Principal Specialist	Master Specialist	Supervisor	Senior Supervisor
21	Administrating contracts and tendering process							√
22	Preparing contract specifications							√
	Competency	Workplace Safety - Lift Maintenance and Operational Safety						
		-	Check and maintain lift components and systems (independently) Replacement of basic lift components Incident Response				-	-
		-	-	Replacement of major lift components Incident Response and Recovery Basic Troubleshooting			-	-
		-	-	-	Root Cause Analysis and Troubleshooting for Complex Cases		-	-
		-	-	-	-	- Conduct Quality and Risk assessments - Provide Mentorship and conduct training	- Conduct Quality and Risk assessments	- Conduct Quality and Risk assessments
		-	-	-	-	-	- Build team relationships - Effective business writing - Develop effective communication strategy and use negotiation skills - To identify disputes and propose dispute resolution method - To be familiar with the relevant Acts/Regulations	- Build team relationships - Effective business writing - Develop effective communication strategy and use negotiation skills - To identify disputes and propose dispute resolution method - To be familiar with the relevant Acts/Regulations

S/N	JOBSCOPES	Asst Specialist (Under Supervision)	Specialist	Senior Specialist	Principal Specialist	Master Specialist	Supervisor	Senior Supervisor
		-	-	-	-	-	-	- To identify and explain tasks related to administering contracts, contract tendering and award process - To interpret the types of contracts and recognise the issues related to preparing contract specifications - To identify and review contractual issues

*Adjustment of minor settings or replacement of minor components would refer to items which do not have a direct impact on the safety of lifts. These would include, but not limited to, greasing, housekeeping, non-safety switches.
**Adjustment of major settings or replacement of major components would refer to items which have a direct impact on the safety of lifts. These would include, but not limited to, brake adjustment, changing switches, changing electrical components and settings.

II. Competencies and learning outcomes

The following sections covers the learning outcomes for progression from Asst Lift Specialist to Principal Lift Specialist. For progression to Master Lift Specialist, the current intention is to leave it to the individual lift firms to train and appraise.

(B) Training Areas for a Lift Asst Specialist to undertake for progression to a Lift Specialist

No	Topics	General Learning outcome	Specific Learning Outcomes
1	**Workplace Safety & Health (WSH) of workers**	**Maintain safety and health of the individual**	1.1 Obtain the construction safety orientation certificate 1.2 Undergo the height safety course for workers 1.3 Understand and follow LOTO procedures 1.4 Able to identify hazards in the lift work environment 1.5 Understand and follow safety precautions (includes risk assessment) and response when working with different hazards, including fire emergencies 1.6 Competent in wearing Personal Protective Equipment (PPE) 1.7 Understand and recognise all relevant industrial safety signs 1.8 Understand and follow precautionary measures associated with Confined Space Operations 1.9 Understand and follow safe lift car top access procedures 1.10 Understand and follow safe lift pit access procedures
2	**Basics of Lift**	**Introduction to Lift**	2.1 Understand the roles of the different stakeholders involved in the lift industry 2.2 Understand the basic functions of a lift (Able to briefly describe how a lift functions)

No	Topics	General Learning outcome	Specific Learning Outcomes
3	**Basics of Lift**	**Understand the categories of Lifts**	3.1 Understand the differences of the 4 general categories of elevators which are namely: Hydraulic, Traction, Pneumatic and Climbing 3.2 Distinguish the characteristics of these 4 categories of elevators 3.3 Distinguish between Counterweight Rear Drop and Counterweight Side Drop 3.4 Distinguish between single opening, alternate through opening, through opening and Corner Post elevators 3.5 Understand the different types of door system: Side opening (1SP, 2SP, 3SP), Center opening (2PCO, 4PCO, 6PCO), Upsliding opening (2UP, 3UP) 3.6 Understand that there are special types of elevators such as Double Deck, Twin Elevators and Bubble Lifts Machine Room-less elevators 3.7 Understand the 3 types of hydraulic elevators which are namely: Conventional Hydraulic Elevators, Hole-less Hydraulic Elevators and Roped Hydraulic Elevators 3.8 State the advantages and drawbacks of hydraulic elevators
4	**Basics of Lift**	**Identify the main components of the lift system**	4.1 Identify the main components of the lift system and its function 4.2 Identify the components in the car top and describe their functions 4.3 Identify the components in the car cage and describe their functions 4.4 Identify the equipment located in the motor room and describe their functions 4.5 Identify the equipment located in the hoistway and describe their functions 4.6 Identify the equipment located in the pit and describe their functions 4.7 Identify the equipment located in the landings and describe their functions.

No	Topics	General Learning outcome	Specific Learning Outcomes
5	**Basic Lift maintenance skills**	**To perform basic maintenance in lift**	5.1 Perform good housekeeping in lift motor room, car top and lift pit area 5.2 Ensure sufficient oil inside oil box (if provided) and traction machine (if required) 5.3 Able to perform checks and make adjustments to attain the desired car door gap and landing door gap 5.4 Able to perform checks and replace the car lighting and fan 5.5 Able to perform checks on the EBOP and ARD functions 5.6 Able to perform alignment checks on the Tension Pulley Switch and the striking plate 5.7 Able to perform checks on the lift hall buttons, tell-tale indicators and lift position indicators / message display 5.8 Able to perform safe passenger rescue operation in motor room and motor room less lifts
6	**Principles of Electrical Engineering**	**Understand the basic electrical concepts**	6.1 Understand the relationship between voltage, current and resistance 6.2 Able to calculate current, voltage and resistance in various DC Circuits using Ohm's Law 6.3 Identify the three methods of connecting electrical loads: series, parallel and series-parallel 6.4 Understand how 'power' and 'energy' are derived in electric circuits 6.5 Able to interpret the power rating of an electrical load 6.6 Able to calculate the energy consumption of an electrical load in kWh 6.7 Able to calculate the cost of energy consumption using the available electricity tariff 6.8 Able to distinguish the differences between AC and DC 6.9 Able to distinguish the differences between a single-phase and a three-phase supply 6.10 Able to state the functions of a cable and the specific roles of the three main parts of a cable 6.11 Understand the differences between a conductor and an insulator 6.12 Identify the common sizes of cable 6.13 State the old cable colour code of power supply system before the amendment made to CP5 (before 2009) 6.14 State the new cable colour code of power supply system after the amendment made to CP5 6.15 Interpret various types of electrical drawings such as block diagram, schematic drawing and single line drawing (SLD)

No	Topics	General Learning outcome	Specific Learning Outcomes
7	**Principles of Mechanical servicing**	Understand and follow Mechanical safety	7.1 Describe the safety precautions and procedures to be observed when doing mechanical fitting and repair work. 7.2 Understand the use of right tool for right job 7.3 Understand the importance of good housekeeping procedures at the work place
8	**Principles of Mechanical servicing**	Able to read and sketch mechanical drawings	8.1 Able to identify and understand drawing scales and dimensioning details 8.2 Able to identify and understand the common symbols of mechanical engineering components 8.3 Able to read and sketch mechanical drawings like isometric and orthographic projection
9	**Principles of Mechanical servicing**	Able to perform mechanical-related practical work	9.1 Able to identify the right tools and follow the right procedures for sawing, drilling, filing, countersinking, reaming, tapping and hand grinding. 9.2 Able to describe the various types of welding joints and welding defects 9.3 Able to perform basic welding
10	**Principles of Mechanical servicing**	Able to service mechanical drive assembly	10.1 Able to check and service various types of Gaskets/Seals, Belts, Valves, Bearings and Couplings 10.2 Able to describe the purposes of lubrication and the methods of applying lubricants
11	**Testing and Measurement**	Perform testing and measurement	11.1 Able to explain the purposes of the different test instruments in electrical work 11.2 Able to identify the basic terminologies of measurement 11.3 Able to express quantities using scientific notations 11.4 Able to convert from one metric unit to another 11.5 Able to explain the uses of a continuity tester, multimeter, insulation resistance tester and socket outlet polarity tester 11.6 Able to explain the functions of the test instruments 11.7 Able to apply safety precautions when handling and using measuring instruments 11.8 Able to measure, with the use of the appropriate measuring instruments, voltage current and resistance 11.9 Able to describe how to measure a variety of lengths with appropriate accuracy by means of measuring tape, ruler, micro-meter screw gauge, Vernier callipers. 11.10 Able to use digital stopwatches for measuring time intervals

No	Topics	General Learning outcome	Specific Learning Outcomes
12	**Electrical Safety**	Understand electrical safety	12.1 Understand the two types of electric shock (direct & indirect contact) 12.2 Understand the potential dangers in electrical work 12.3 Understand the electrical hazards due to an overcurrent 12.4 Understand electrical hazards due to an earth fault 12.5 Able to describe the precautions and procedures for safe electrical work 12.6 Able to recognise the benefits of good housekeeping in electrical work 12.7 Able to recommend measures to protect against electrical hazards 12.8 Understand the importance of earthing to avoid the risk of electric shock 12.9 Able to describe the application and selection of different electrical protective devices for industrial applications (such as fuses, circuit breakers, residual current operated circuit breakers) 12.10 Understand the reason for connection of the single-pole switches to the phase conductor
13	**Electrical system earthing**	Understand electrical system earthing	13.1 Able to explain the functions of earthing. 13.2 Able to describe the components of an earthing system. 13.3 Able to identify the earthing system used in consumer installation such as TT and TN-S system.
14	**Passenger safety & Rescue operation**	Understand safety & rescue operation	14.1 Understand passenger safety and rescue operation 14.2 Understand the functions of Emergency Battery Operated Power Supply (EBOPS) 14.3 Understand the functions of Automatic Rescue device (ARD) 14.4 Understand emergency power operations due to power failure 14.5 Understand emergency power operations due to fire outbreak 14.6 Understand emergency power operations due to both power failure and fire outbreak

(C) Training Areas for a Lift Specialist to undertake for progression to a Lift Senior Specialist

No	Topics	General Learning outcome	Specific Learning Outcome
1	**Work place Safety**	**To understand safety in rigging operations & lift and working at height for supervisor.**	1.1. To undergo safety training for rigging operations 1.2. To undergo the work at height safety course for supervisors.
2	**Electrical, Electronics and Controls**	**To understand the electrical power supply system and electrical control circuits**	2.1. Understand single / three phase systems in the electrical power supply system 2.2. Able to perform basic calculations involving power and power factor.
3	**Lift drawings**	**To interpret Installation layout drawings**	3.1. Able to identify hoistway, lift car, door opening width and height dimensions. 3.2. Able to identify landing sill to car sill running clearance and cam to roller clearance 3.3. Able to identify the locations of levelling plate and limit switches 3.4. Able to identify floor to floor height, headroom height and lift pit depth
4	**Lift drawings**	**To interpret wiring drawings**	4.1. Able to identify the machine room wirings leading to the motor, brake and encoder. 4.2. Able to identify the machine room wirings leading to the ARD and EBOP. 4.3. Able to identify the car top wirings (including the car top lighting, in-car lighting and fan) 4.4. Able to identify the wirings of the levelling switches and door drive system 4.5. Able to interpret the safety circuit and landing/car door circuit.
5	**Lift Testing and Adjustments**	**Perform insulation tests on lift system**	5.1. Able to conduct insulation testing on the traction machine and hoistway wiring 5.2. Able to use the insulation tester in a safe and proper manner

6	**Lift Testing and Adjustments**	**To perform testing and adjustments of lift in slow speed operation**	6.1 Able to perform checks on the traction machine operation (operation of motor, gear, encoder and brake) 6.2 Able to make appropriate adjustments for the car / counterweight guide shoes 6.3 Able to check and make appropriate adjustments for the limit switches 6.4 Able to check and make appropriate adjustments for the car cage steadying and sill running clearance 6.5 Able to make appropriate adjustments for the landing door, car door and cam clearance 6.6 Able to prepare a proper lift inspection report in respective to the above
7	**Lift Testing and Adjustments**	**To perform testing and adjustments of lift in high speed operation**	7.1. Able to perform checks to ensure all safety switches are effective prior doing the high speed operations 7.2. Able to perform load balancing, overload, full load condition monitoring 7.3. Able to perform function tests on the Speed governor and safety gear. 7.4. Able to perform function tests on the calling buttons and indicators 7.5. Able to perform Level adjustment and checks on ride comfort 7.6. Able to conduct function tests on the ARD and EBOPS 7.7. Able to conduct a hot test and checks for error codes 7.8. Able to conduct checks on Simplex, Duplex and group control operations 7.9. Able to conduct function checks on TMS, Supervisory system 7.10. Able to prepare a proper lift inspection report in respective to the above
8	**Lift Maintenance**	**To perform lift maintenance**	8.1. Able to carry out checks and routine maintenance work on the lift traction machine 8.2. Able to carry out checks and routine maintenance work on the over speed governor machine 8.3. Able to carry out checks and routine maintenance work on the lift controller 8.4. Able to carry out checks and routine maintenance work on the emergency battery-operated power supply unit (EBOPS) and ARD / UPS system 8.5. Able to carry out checks and routine maintenance work on the lift counterweight / guide shoes and rope hitch point 8.6. Able to carry out checks and routine maintenance work on the guide rails / brackets and bolts 8.7. Able to carry out checks and routine maintenance work on the lift roping systems for equal tensioning, wear and tear 8.8. Able to carry out checks and routine maintenance work on the hoistway safety switches eg: limiting switches and landing door lock switches 8.9. Able to carry out checks and routine maintenance work on the hoistway electrical cables and compensation ropes / chain

			8.10. Able to carry out checks and routine maintenance work on the lift landing door mechanism 8.11. Able to carry out checks and routine maintenance work on the lift car door operator (including checking and adjusting the cam clearance) 8.12. Able to carry out checks and routine maintenance work on the lift pit equipment such as buffer, compensation rope pulley and speed governor tension pulley position and its switch. 8.13. Able to carry out checks and routine maintenance work on the brakes 8.14. Able to carry out checks and routine maintenance work on the safety gear

(D) Training Areas for a Lift Senior Specialist to undertake for progression to a Lift Principal Specialist

No	Topics	General Learning outcome	Specific Learning Outcome
1	**Work place Safety**	**To competently perform the roles of a building construction safety supervisor and conduct risk assessment**	1.1. Able to carry risk assessments for various maintenance work. 1.2. Undergo Building Construction Safety course for supervisors (BCSS)
2	**Electrical, Electronics and Controls**	**To understand and trouble shoot electrical control circuits**	2.1. Understand and troubleshoot faults involving components such as batteries, rectifier / inverters electrical circuits 2.2. Able to design and troubleshoot simple timer and latching circuits 2.3. Able to design a simple sequence control and parallel control circuit 2.4. Understand and troubleshoot electrical machines such as the motor, generator and transformer 2.5. Understand binary and hexadecimal system and logic gate circuits
3	**Installation, Maintenance and Modernization**	**To implement installation, maintenance modernization projects**	3.1. Able to conduct lift performance auditing /assessments 3.2. Able to propose and implement Predictive Maintenance solutions for purposes of increasing the UP time 3.3. Plan and coordinate replacement and maintenance work
4	**Trouble shooting and Part replacement**	**To trouble shoot and replace parts**	4.1. Understand and troubleshoot power electronic devices such as Variable Frequency Drives (VFD) and speed control of motors. 4.2. Understand and troubleshoot group control, elevator monitoring system. 4.3. Troubleshooting intermittent failures by analysing the event codes 4.4. Able to supervise and perform parts replacement on components such as: a) Lifts Controller PCBs b) Inverter control PCBs, Thyristors and IGBT modules c) Traction machine encoders, brake units d) Door drive system

			e) ARD and EBOP 4.5. Able perform updates and changes to control system software 4.6. Able to provide technical support to the area supervisor 4.7. Able to conduct incident investigations and root cause analysis
5	**Training and Delivery of lift courses**	**Conduct training to technicians and interested parties to increase competency level in lift systems**	5.1. Able to conduct OJT on lift maintenance / troubleshooting. 5.2. Able to assist in providing technical and safety training 5.3. Undergo the Train the trainer program.
6	**Lift codes**	**To be well-versed with lift codes and authority requirements**	6.1 To be familiar with the relevant lifts codes and requirements by the Authority

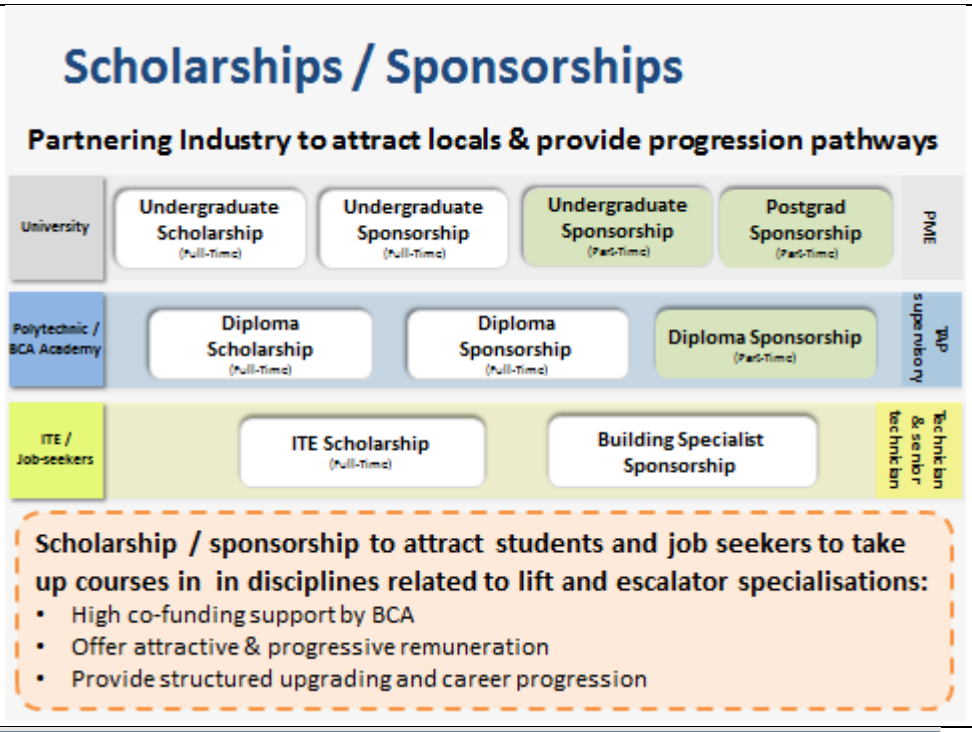
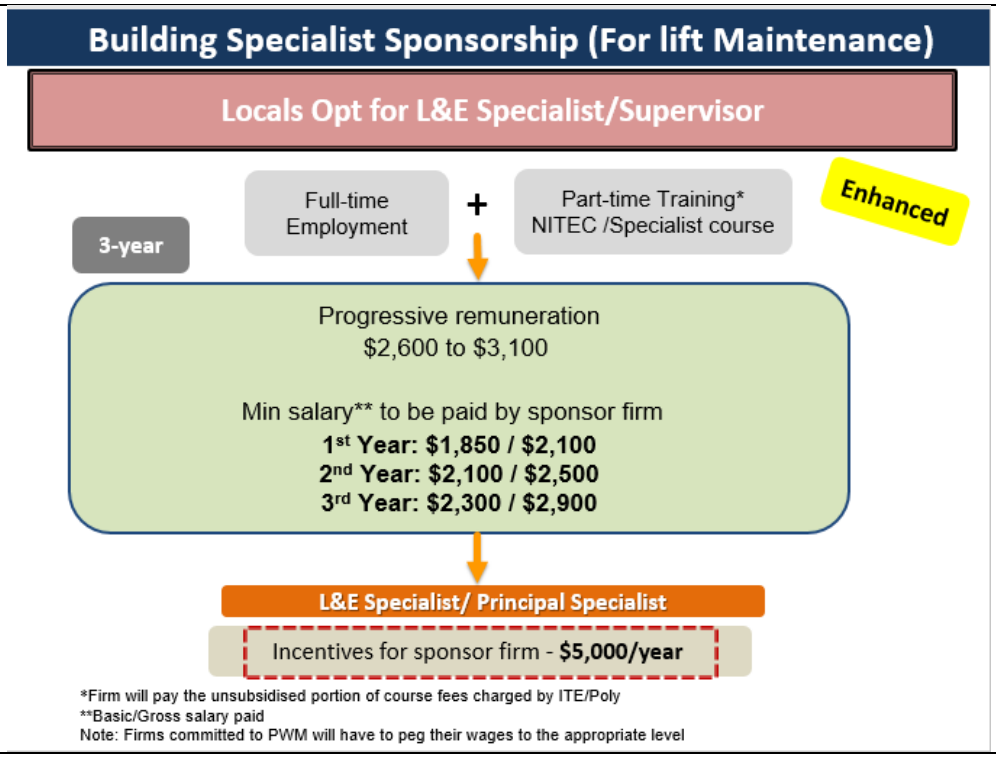
(E) Training Areas for a Lift Senior Specialist to undertake for progression to a Supervisor

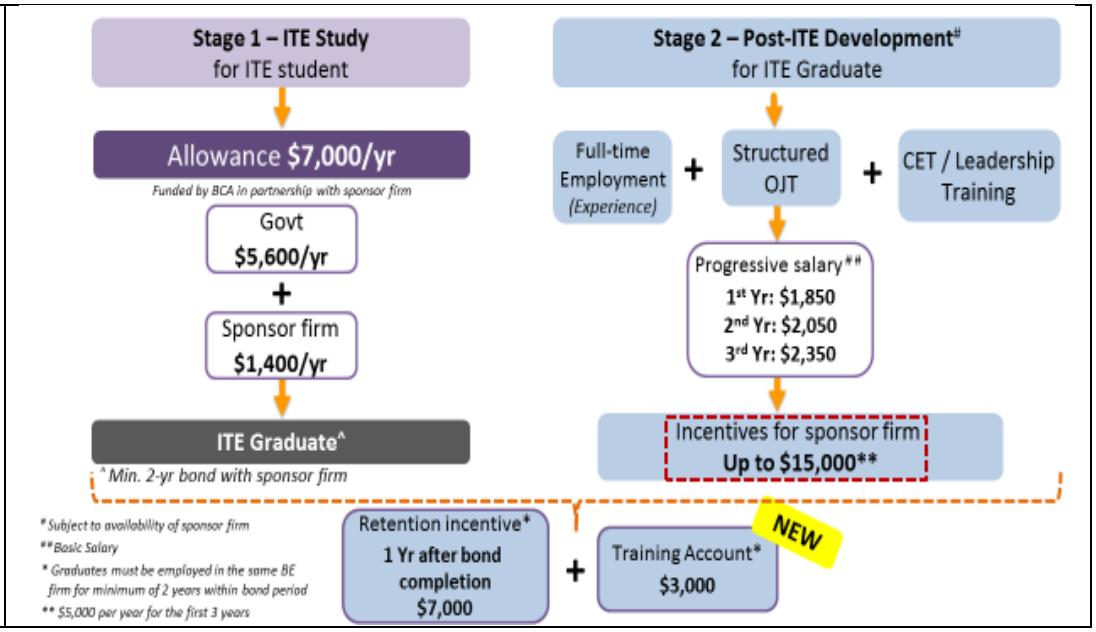
No	**Topics**	**General Learning outcome**	**Specific Learning Outcome**
1	**Work place Safety**	**To competently perform the roles of a building construction safety supervisor and conduct risk assessment**	1.1. Able to carry risk assessments for various maintenance work. 1.2. Undergo Building Construction Safety course for supervisors (BCSS)

2	**Team Leadership**	**To demonstrate leadership skills**	2.1. Develop self 2.2. Support Team 2.3. Build Team Relationships 2.4. Support Achievement of Results 2.5. Implement Change
3	**Effective Business Writing**	**To be well-versed in report writing**	3.1. Reviewing sentence components 3.2. Writing Sentences 3.3. Writing paragraphs 3.4. Using language appropriately 3.5. Writing concisely 3.6. Communicating business matters
4	**Communication**	**To demonstrate effective communication skill**	4.1. To understand the different type of minutes 4.2. To conduct committee and informal meetings, and perform minute taking 4.3. To identify cultural factors affecting negotiation 4.4. Develop strategic plans for pre-negotiation 4.5. Understand the negotiation process 4.6. Identify the characteristics of a good complaint handling system 4.7. Respond to complaints effectively
5	**Dispute Resolution**	**To identify disputes and propose dispute resolution method**	5.1. Define dispute, mediation, arbitration and litigation 5.2. Use of extension of time (EOT) to resolve disputes 5.3. Use Liquidated Damages (LD) to resolve contractual issues 5.4. Propose contract dispute resolution through arbitration, mediation or litigation
6	**Lift codes**	**To be well-versed with lift codes and authority requirements**	6.1. To be familiar with the relevant lifts codes and requirements by the Authority

ANNEX C

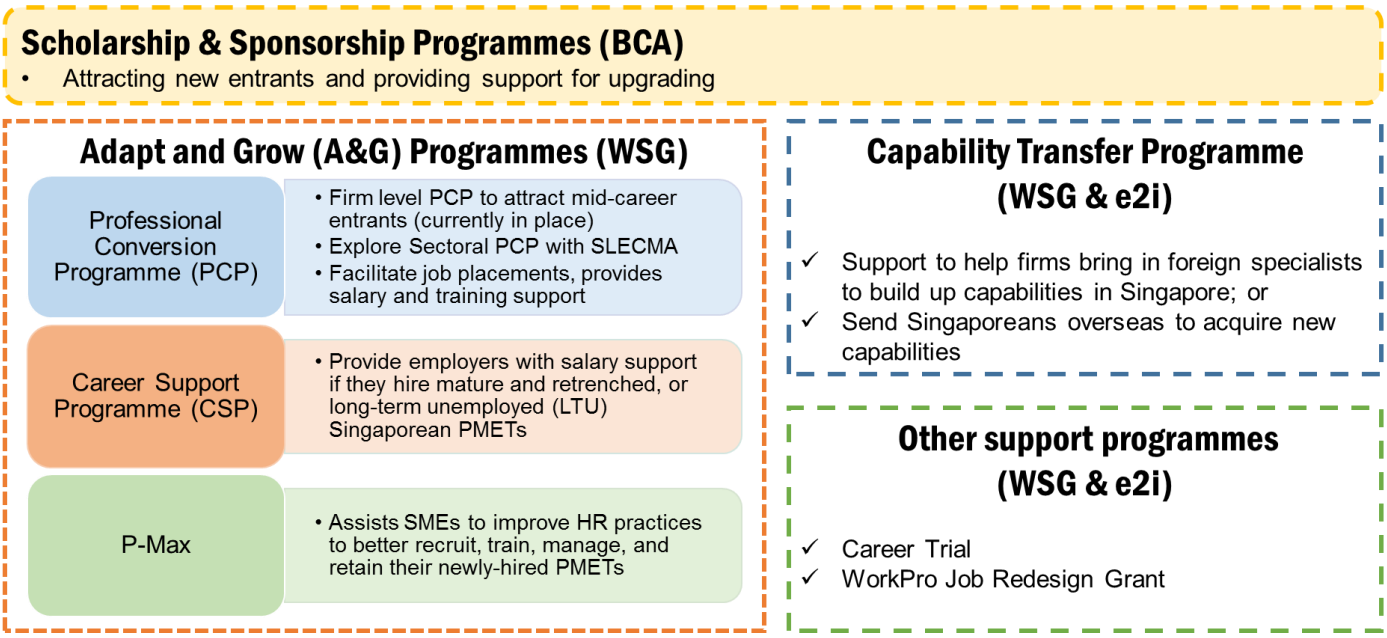
DETAILS OF SCHOLARSHIP AND SPONSORSHIP PROGRAMMES

Overview of Full Suite of Scholarship / Sponsorship Programme to attract Singapore residents to join the lift industry	
Building Specialist Sponsorship (Lift Maintenance)	

ITE Scholarship	

ANNEX D

SUITE OF MANPOWER DEVELOPMENT PROGRAMMES



ANNEX E

SUMMARY OF RECOMMENDATIONS BY L&E STC

S/N	Recommendation
Provide better jobs to attract Singapore residents	
1	Introduce clearly defined career progression pathways – supervisory and specialist – under a progressive wage model (PWM)
2	Relevant stakeholders, especially building owners and lift companies, to proactively explore measures to improve the working conditions and environment of the lift industry
3	Enhance perception of careers and opportunities in the lift industry through a 3-pronged strategy: a. Enhancing awareness through sustained outreach efforts b. Strengthening HR practices of lift companies c. Enhance safety through better management
Upskill workforce to deliver better quality services	
4	Implement a training and certification framework aligned to the proposed PWM and tailored to needs of the different groups of industry personnel
Ensuring competitive wages to enhance retention	
6	Employers to align their employees' monthly basic wage to the recommended wage range, or better, for each level of the career progression pathway.
Push for wider adoption of technology to enhance the effectiveness of the workforce	
7	Government to review existing regulations and procurement framework to incentivize and facilitate technology adoption

ANNEX F

ACKNOWLEDGEMENT OF ORGANISATIONS & INDIVIDUALS THAT HAVE CONTRIBUTED TO THE L&E STC

No.	Name of Organisation	Name of Individual	Designation
1.	Kone Pte Ltd	Jérôme Audais	Managing Director
2.		Tan Kian Hwa	Service Equipment Business Director
3.	Chevalier Singapore Holdings Pte Ltd	See Kok Leng	Deputy General Manager
4.		Jennifer Eng	Human Resource Manager
5.	Mitsubishi Elevator (Singapore) Pte Ltd	Mary Kok	Human Resource Manager
6.	Fujitec Singapore Corporation Ltd	Erik Lim	Human Resource Manager
7.		Andy Khoo	Human Resource Executive
8.	Otis Elevator Co (S) Pte Ltd	Tan Siang Choon	Communications & Training Executive
9.		Jael Ng	Communication & Training Executive
10.	Hitachi Elevator Asia Pte Ltd	Wong Cherk Haw	Human Resource Manager
11.	Institute of Technical Education	Chin Kok Leong	Head of Vertical Transportation
12.		Loh Kum Fei	Director, School of Engineering, College East
13.	Singapore Polytechnic	Lim Bock Teck	Senior Lecturer, School of Electrical & Electronic Engineering
14.	Singapore Manual & Mercantile Workers' Union	Wong Chip Mun	Deputy Secretary General
15.	Singapore Industrial & Services Employees' Union	Sylvia Choo	Executive Secretary
16.		Goh Sor Imm	Deputy Executive Secretary
17.		Raven Lee	Assistant Executive Secretary
18.	United Workers of Electronics & Electrical Industries	Jonathan Ong	Senior Industrial Relations Officer
19.	Building Construction & Timber Industries Employees' Union	Wendy Tan	Principal Industrial Relations Officer
20.	National Trades Union Congress	Timothy Phang	Electronics and Precision and Machinery Engineering Cluster Lead

21.		Kevin Ong	Former Electronics and Precision and Machinery Engineering Cluster Lead
22.	Ministry of Manpower	Peggy Heng	Assistant Director
23.	Employment and Employability Institute	Judy Tan	Assistant Director
24.		Lim Geok Khim	Deputy Director
25.	Workforce Singapore	Ang Lay Kuan	Assistant Director
26.		Carolyn Chong	Principal Manager