

CONNECT

OCTOBER 2017

16

**Sparkling
New Stations
On DTL3**

**HELLO
CONVENIENCE
WITH E-PAYMENT**

**WORKS THAT GO ON
WHILE YOU
WERE SLEEPING**

**TRACING
THE TRACKS
FOR DTL TRAINS**

READ & WIN

STAND A CHANCE TO WIN PRIZES WORTH UP TO \$50!



16 SPARKLING NEW STATIONS ON DTL3

The Downtown Line 3 (DTL3) is right on track to open on 21 October 2017, adding 16 new stations – from Fort Canning to Expo – that stretches across the eastern side of Singapore. The new 21km line will double the length of the Downtown Line to 42km, giving commuters greater connectivity to the city. Here are some little facts of each new station:



DT20 FORT CANNING

Inspired by Fort Canning Park, the station has a green curved ceiling. It also has motifs of the former National Theatre etched into the walls.



DT21 BENCOOLEN

At 43m below ground, it is the deepest MRT station in Singapore. When you get on the ground level, you will find the most pedestrian and bicycle-friendly street.

JALAN BESAR DT22

Jalan Besar means “large road” in Malay. It is near the Queen Street bus terminal, which offers bus connections to Johor Bahru.



BENDEMEER DT23

The 2.25km tunnels between Jalan Besar, Bendemeer and Geylang Bahru stations undercrossed old pre-war shophouses.



GEYLANG BAHRU DT24

This station features artwork that recreates scenes of the community going about its daily business, such as painting a wall and buying kopi-O, capturing the essential flavour of Singapore.



DT25

MATTAR
Follow the aroma of good food here, as the station leads to Mattar Road, which is near the Circuit Road hawker centre.

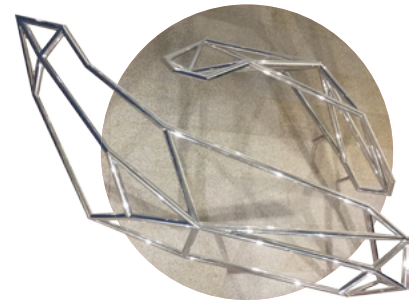




IN THE WORKS

MACPHERSON DT26

The Art-in-Transit piece at this station, "Trails of Thoughts", was developed in collaboration with residents of MacPherson.



DT27 UBI

Ubi is Malay for tapioca. The station has art works inspired by its name, such as a metal sculpture of a tapioca.

DT28 KAKI BUKIT

Kaki Bukit is Malay for "foothills", as the area was formerly part of a village.

DT29 BEDOK NORTH

This station, located at Bedok North Road, is near the 14-hectare Bedok Town Park.



BEDOK RESERVOIR DT30

Enjoy a relaxing stroll or good jog at Bedok Reservoir. If you are looking for some thrill, try out the obstacle courses or the water sports at the park.

TAMPINES WEST DT31

Temasek Polytechnic is just 10 minutes away. The station also serves SAFRA Tampines.

TAMPINES DT32

Along with Paya Lebar, Buona Vista and Expo stations, it is one of four MRT stations in Singapore that serve both aboveground and underground lines.

UPPER CHANGI DT34

The station is near Singapore University of Technology and Design (SUTD), where commuters can check out an antique pavilion donated by Hollywood movie star, Jackie Chan.

EXPO DT35

The station will serve Singapore Expo, Changi Business Park and Changi City Point. Commuters can also make a transfer here to go to the airport.



DT33 TAMPINES EAST

Cyclists can easily head to this station, which is connected via a cycling path. The cycling path also connects to Sun Plaza Park and Tampines Eco Green.





TRACING THE TRACKS



When the Downtown Line 3 opens on 21 October 2017, it is the culmination of a 16-year project. Besides getting the stations and tunnels along the entire 42km line ready, LTA also worked closely with German firm Bombardier Transportation to create the state-of-the-art trains. LTA engineer Xun Haitao takes us behind-the-scenes and shares what goes on before these trains are put on the rails.

BRAVING THE COLD The northeastern Chinese city of Changchun may be known for its harsh winters and heavy snowfall, but it is also the place where Singapore's DTL trains are built. If they can withstand minus 25 degrees celsius, they are hardy enough to withstand anything!

When LTA engineer Xun Haitao arrived in Changchun, China, to oversee the testing and assembling of the Downtown Line (DTL) trains, he was in for a surprise. It was winter in the chilly city in Northeast China, where temperatures can plunge to 25 degrees below zero.

"When I left Singapore, the temperature was about 30 degrees celsius. As I walked out

of the airport in Changchun, I experienced a difference of almost 60 degrees in one day," said Haitao, 34, who has worked at the Land Transport Authority (LTA) for eight years.

Though it was memorable, the harsh weather condition was also one of the hardest part of testing and assembling the DTL trains – a process which took more than five years to complete.

"As most of the train equipment was not designed for operations in such cold weather, heaters were placed in the train to keep it warm. The trains also had to be taken back to an indoor workshop daily, which limited the testing time further," he shared, adding that shorter day time hours in winter meant less time to test the trains.



AT THE SITE

BUILDING THE TRAINS After most of the critical designs have been tested and validated, the manufacturing, assembly and painting of the trains begin. It takes about five months to build one train that is 70.1m in length.



“The sky was dark by 4.30pm, which made it more challenging for train testing.”

The DTL train procurement project began in 2008, with German firm Bombardier Transportation winning the contract to build the trains. Designed in its head office in Hennigsdorf, Germany, and supervised by a Bombardier team based in Singapore, the construction was an international affair, with components sourced from several countries including Britain, Sweden and France.

“After so many years working on it, you finally see that your baby is running.” LTA ENGINEER XUN HAITAO



The testing of the trains was done in Changchun, where a 3km test track was built. Testing was first done on two trains that served as prototypes. They underwent intensive testing to validate the designs including propulsion and braking tests, and interfacing testing for signalling,

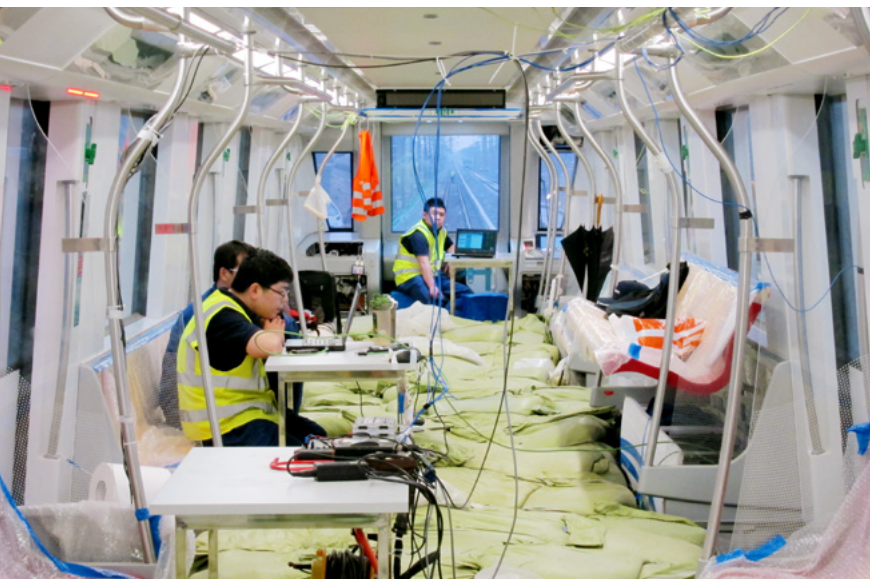
#DidYouKnow

The length of a DTL train is 70.1m. That is almost the same length as a Boeing 747!

communication and the control system. These tests ensure the safety and performance of the train.

When the testing was completed and given the all-clear, a total of 92 trains were built for the DTL that is operated by SBS Transit. The first phase, DTL1, started in December 2013 with six stations.

At that time, Haitao had spent four years working on the project. As he travelled on the DTL train on its first day of passenger service, he was full of emotions. “You feel a sense of satisfaction and success,” Haitao said, beaming. “After so many years working on it, you finally see that your baby is running.”



WHY WAS THE DTL TRAIN FILLED WITH SANDBAGS?

To simulate actual operating conditions such as the loading of passengers, sand bags were placed in the test trains to add weight.

Join us at the Downtown Line 3 Open House on 15 October 2017!

Follow us for the latest updates:

[f WeKeepYourWorldMoving](#)
[@LTAsg](#)



AT THE SITE

JOURNEY OF A DTL TRAIN

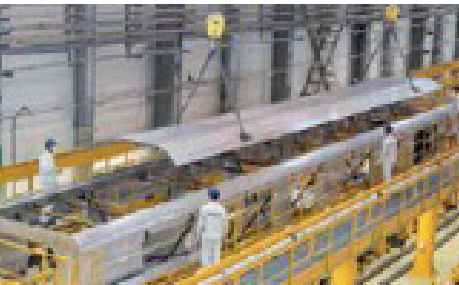


PRODUCTION

2 MONTHS

BUILDING THE SHINY ARMOUR

The lightweight train car body is made from aluminium alloys welded together.



After the walls were welded to the floor, a crane was used to heave the train's roof into position.

#DidYouKnow

Almost 90 per cent of the train's car body can be recycled when it reaches the end of its life cycle, as it is made of high-capacity aluminium.



(Clockwise from top-left) Workers sealing the window into the window frames; Passenger doors, as well as the detrainment doors for evacuation, were fixed in place; The couplers to link the train's carriages and the gangways between the carriages were also fixed; The bogies were installed beneath the carriage.

ASSEMBLY

2 MONTHS

A GLOBAL PRODUCT IN THE MAKING

Various components are made from different countries and put together into the train, such as cables, braking systems, lighting, walls, doors and bogies, which are the frames that carry the trains' wheels. Insulation that prevents warm air in tunnels from heating up the train was installed, together with air ducts and cable ducts.

#DidYouKnow

The Bogie, a structure underneath the train, is made in Germany – the country which produces premium automobiles and efficient rail networks.

ARRIVAL

DELIVERY

TESTING

2 MONTHS

92



READY, GET SET, GO!

All 92 DTL trains have completed the journey. When they reach Singapore, they are housed in two depots: Gali Batu in Woodlands and Kim Chuan in Tai Seng, all ready to be in service.

A JOURNEY OVER SEA & LAND

One train has to be separated into three carriages and shipped 5,175km to Singapore. After arriving in Singapore, each train car requires a special convoy to bring them from the port to depot because they are as long as two double-decker buses!



#DidYouKnow

It takes 2 to 3 weeks for each shipment of trains from Changchun to arrive in Singapore.



Each three-car train was tested on a 3km test track.

HEATING UP THE ENGINE

A comprehensive regime of static and dynamic testing was conducted in Changchun to ensure its functional and operational integrity before shipment to Singapore.



FIND OUT MORE!

[Making of a DTL train](#)

[Delivery of a train](#)



HELLO CONVENIENCE

Can you survive a day without your wallet? Soon, you can with just a smartphone or credit and debit cards to buy lunch or even board buses and trains.

Mr Chan Fung Chieh, the ABT Development Manager and Fare System Principal Engineer, said: "Operation-wise, ABT is more cost-savvy. You do not need a physical machine to do cash top-up. The station staff can also concentrate on their core duties in rail operations."

Fung Chieh is part of the 30-member team that has been looking into e-payments. The team began research as early as 2015 and studied London's example of contactless payments before starting the trial in Singapore.

Other e-payment modes are also being explored. For instance, mobile payment platforms like Apple Pay and Android Pay have been added to the General Ticketing Machines to make it easier to top up stored-value cards. Another idea is to have virtual ticketing machines that can be remotely assessed to help commuters skip the physical queues.

While Singapore works towards becoming a Smart Nation, there are those who may need more time to familiarise themselves with new e-payment modes.

We are working with agencies and grassroots organisations to get commuters acquainted with e-payment modes, and assist them in setting up banking facilities to

link with such payments where necessary.

For students, we are looking at solutions to expand existing top-up options, such as allowing travel cards to be topped up by their parents or guardians.

Going 'e' may be easier than you know. Step by step, we will get there together!



TAP AND GO Train commuters breeze through the gantries with a tap of their EZ-link cards. It will be even easier with e-payment technology.

There is a digital revolution going on, with e-payment technologies making public transport travel on buses and trains hassle free.

More than 95 per cent of commuters are already using stored-value cards instead of cash for payment. Now, we are taking one step further in going into e-payment by piloting account-based ticketing (ABT) where commuters need not bring along, purchase, or top up a separate stored-value card for their travel.

All they need is to tap in and out with their contactless credit or debit cards, and the fares will be automatically charged into their bill.

Singapore is one of the first few cities in the world to test the ABT system for public transport. The trial will be extended beyond the original duration of six months, with Visa and NETS also coming on board from June 2018.

Be one of the first to experience the convenience!

Sign up for the ABT trial [here](#).



Apart from working on e-payment systems, the team at LTA Fare Systems Lab also ensures that the fare gates work with the new payment modes. Fung Chieh showed us around his office.



Photo: Garçon Design

TAKING A PEEK INTO THE FARE SYSTEMS LAB

Step into the Lab and it may not feel too different from boarding a bus or a train. Among its fixtures are MRT gates, top-up machines and bus card readers. Beeping sounds from the fare reader machines fill the air, when the engineers test out the various systems.

"I used to work in the mobile phone and automotive industry before joining LTA," said Fung Chieh, noting the similarities in how new products are tested before launch.

"The idea is quite similar, we also need to put the products (mobile phone and telematics devices) through several tests like we do for the fare cards and fare gates, before they can be rolled out for actual operation."

The Lab features an open concept, which encourages friendly



ARTWORK ON THE WALL The space exudes homely vibes, with artwork done by some of the team members' children displayed on the walls – a contrast with the "cold" machines around the lab.

interactions. They may be in the serious business of making sure our daily commute is safe and convenient, but the team also takes time to have informal discussions and relax when work gets too intense.

THE TESTS WE DO

Here are some of the tests the Lab conducts on Fare Gates to ensure they work in all situations:



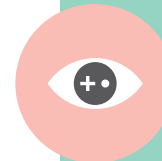
WATER TEST

Fare gates go through water tests to ensure they are waterproof, so they will not break down when water sprinklers are activated in the case of a fire.



TEMPERATURE TEST

Temperature tests are conducted to ensure the cards remain functional even in intense heat, up to 85 degrees celsius.



NO BLIND SPOTS TEST

Other tests include checking that there are no blind spots within the detection field of the card reader, which is typically less than 8cm.



USER EXPERIENCE TEST

a. Gates open longer: The fare gate barriers open for 15 seconds – to make it easier for the elderly or the disabled.

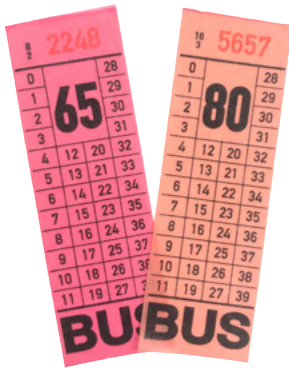
b. Swing door: For newer lines like the Downtown Line, MRT gates have switched from a retractable door to a swing door to enhance user experience. (The swing flap closes towards the passenger so that he/she is able to better see it closing.)





HOW FAR-E WE'VE COME

The first farecard used more than 20 years ago, which is now part of a museum collection, had to be inserted into an MRT gantry gate, or bus validator machine where commuters had to choose the right fare. These memories are fading fast with the constantly evolving fare payment systems in Singapore. Here's a quick recap of how far we've come in advancing our fare payment modes:



BEFORE 1987

ERA BEFORE FARECARDS

During the time when buses had bus conductors and no air-con, commuters had to pay by coins to bus conductors, who had to punch a hole in the paper tickets.

1987-1990

MAGNETIC TICKET

No more coins! The introduction of the magnetic ticket is the first major stored-value farecard in Singapore, which is usable on both buses and trains.



2009

CEPAS CARD

Next-level EZ-link. Smart cards that are CEPAS-compliant can be used for transit and non-transit payments. Remember the first time you could use your CEPAS card to pay for your purchase at McDonald's or 7-Eleven?

#DidYouKnow

"CEPAS" stands for Contactless ePurse Application System.



2001

EZ-LINK CARD

First contactless card in public transport. Commuters who lived through this era may reminisce about magnetic fare cards being "consumed" by the machine and "spewed out" after, a new process that allowed for swifter transitions through the fare gates.

2017

MOVE TOWARDS E-PAYMENT MODES

Start of the ABT trial in March 2017, where commuters can tap in and out with contactless bank cards (credit or debit cards). Other trials on mobile payment modes are also in the pipeline in first quarter of 2018 – using Android Pay, Apple Pay and Samsung Pay.



Photo: Garçon Design



WHILE YOU WERE SLEEPING

As the shutters come down at the train stations, a flurry of activity starts to ripple through the night. While you are sound asleep, maintenance and replacement works are carried out so you can enjoy a smooth ride the next day.

DURING 1.30AM – 4.30AM

1 RESIGNALLING WORKS

The new signalling system upgrade on the North-South Line will allow trains to run more closely to each other.

BENEFIT

Shorter waiting time, reducing from 120 seconds to 100 seconds



2 THIRD RAIL REPLACEMENT

Trains are powered by electricity supplied by the third rail, which is exposed to constant wear and tear. The third rail has been entirely replaced for the two oldest lines – North South and East West Lines (NSEWL).

BENEFIT

Reduce power faults

3 POWER UPGRADE

The NSEWL power system will be upgraded, including an automatic switchover to an alternative power supply intake in the event of a loss of power.

BENEFIT

Better fault detection and identification



IS RAIL MORE RELIABLE? YES!

WHY?

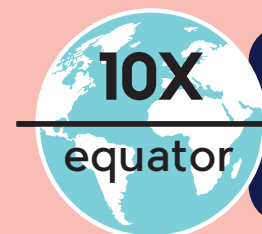
Trains today are travelling longer distances before a slowdown.



HOW DO WE KNOW?

This is calculated using the Mean Kilometre Between Failure (MKBF), an international benchmark for rail reliability. It measures the distance trains travel before a delay of more than 5 minutes. The higher the MKBF, the better.

In the first half of 2017, the MKBF is nearly 393,000km. That's three times more than in 2015, when MRT trains travelled an average of 133,000km before a slowdown.



#DidYouKnow

393,000km is equivalent to travelling 10 times around the equator.



#IHaveAThingWithBridges

Pedestrian overhead bridges (POBs) are unique fixtures on our roads. They come in different lengths and designs. Some POBs are constructed in steel, while others in concrete. Here are three unique POBs.



A LONG, LONG BRIDGE

The longest POB measures 145m, and is located at the Ayer Rajah Expressway near Blk 13 Telok Blangah Crescent. #WalkingAcrossTheAYE #LikeABoss



IT'S A CONTAINER, IT'S A BRIDGE

A POB at Ang Mo Kio Ave 1 near Lorong Chuan looks like a yellow container with hexagonal windows. It was commissioned by the Public Works Department in 1975. #NowYouSeeMe #NowYouDont



MY FATHER'S BRIDGE

The oldest POB is 50-years-old. It was built in 1967, and is located at the junction of Serangoon Road and St Michael's Road. #BridgingGenerations

CONNECT

LTA EDITORIAL TEAM

HELEN LIM
Group Director,
Corporate Communications

AGNES LIM
Director,
Marketing Communications

JOYCE CHUA
Deputy Director,
Corporate Relations

MICHELLE ANG
Manager,
Corporate Relations

EDITORIAL CONSULTANCY

THE NUTGRAF
www.nutgraf.com.sg

18 Howard Road
Novalty BizCentre
#06-06
Singapore 369585

CHEN YINGLIN
Deputy Manager,
Corporate Relations

CHERYL LEOW
Assistant Manager,
Media Relations

DEXTER TAY
Assistant Manager,
Interactive Media Unit

GLADYS SIM
Assistant Manager,
Marketing Communications

DESIGN CONSULTANCY

GARÇON DESIGN
www.garcondesign.com

91 Bencoolen Street
#05-06
Singapore 189652

READ & WIN!

Did you enjoy reading this issue of Connect? You can be one of the three lucky readers to win a prize worth up to \$50!

JUST ANSWER 3 SIMPLE QUESTIONS:

1. Commuters can now pay with their credit or debit card without having to top up. What is this system called?
2. The MKBF, an indicator of rail reliability, has gone up. What does MKBF stand for?
3. Name one example of an upgrading work that is carried out to improve rail reliability.

Email your answers to connect@lta.gov.sg by 30 November 2017, and include your name and NRIC with the Subject "Connect Oct 2017".

The winners will be notified via email. Good luck! Note: Your email address will automatically be subscribed to Connect when you participate in this contest.