Global Practices for Protecting Employee and Customer Health During the COVID-19 Pandemic

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Introduction

This Report was commissioned by the New York Metropolitan Transportation Authority (MTA) to identify international and cross-industry practices for protecting human health and safety during the COVID-19 pandemic. This Report builds on prior transit industry publications, such as the American Public Transportation Association (APTA) COVID-19 Guide "Public Transportation Responds: Safeguarding Riders and Employees," to identify potential additional practices to help protect transit agency employees and riders. Information about SARS-CoV-2 (the virus) which causes COVID-19 (the disease) is evolving daily. This Report is current as of the date of its writing but may need to be updated or supplemented in the future as new public health guidance and/or practices are issued or developed.

The United States (US) Centers for Disease Control and Prevention (CDC) is the nation's health protection agency devoted to tracking and monitoring diseases and developing public health guidance to control and prevent the spread of diseases within the US. The CDC, State, and local health authorities work together to evaluate emerging research and collectively determine what should be considered prevailing public health guidance to control the spread of COVID-19 in a given US community. Accordingly, all practices considered in this Report for protecting human health must not conflict with prevailing public health guidance in the US to be considered "acceptable" practices. The Report includes a review of international case studies in order to highlight the broadest possible range of creative practices and innovative approaches being implemented globally, recognizing that many countries in Europe and Asia faced COVID-19 challenges earlier than the United Stated due to the evolving spread of the virus. The presented international case studies for managing the spread of COVID-19 have been reviewed by a team of transit, occupational health, and public health professionals to verify the practices are aligned with current prevailing US public health guidance; this Report indicates any which are not and those that require further research before a determination is made.

This Report is intended for senior public transportation operations leaders of the MTA. The Federal Transit Administration (FTA) requires all transit agencies to implement a Safety Management System (SMS) which includes: 1) Evaluating hazards and system changes for risk; 2) Keeping up with the pandemic's impacts on the public transportation environment; and 3) Making changes that may bring risk tradeoffs. Based on latest available information, the risk posed by COVID-19 must be evaluated and managed accordingly. Before implementing any of these examples, agencies should assess if they can be scaled to the agency's size, age, and modes of transportation; and align with US laws, regulations, and cultural expectations in a manner that does not add unacceptable risk.

Methodology

WSP USA Inc. employed a variety of techniques to identify, contextualize, and document the case studies in this Report including literature review, direct interviews, and a review of international news media sources. The case studies included were reviewed for consistency with similar studies and currently available prevailing public health guidance in the United States. Inclusion of a case study is not an endorsement of the study, its conclusions, or its appropriateness for application in every transit environment. Any information obtained from a news media source was corroborated by cross-referencing information with public documentation and other available information from those organizations the news article cited. Many of these sources were translated to English using a combination of native speakers and web-based translation technology. Wherever possible, web-based hyperlinks are provided and image credits are cited in the Appendix for source documentation transparency; more traditional citations were used where web-based hyperlinks were unavailable.

How to Use this Report

Readers should consider the following when using this Report:

- This Report builds on guidance in the APTA COVID-19 Guidebook published on April 13, 2020.
- The included international practices used for SARS-CoV-2 infection control among agency employees and riders have been reviewed to confirm their alignment with current US public health guidelines unless otherwise noted.
- International practices *not* aligned with current US public health guidelines may not be acceptable for use by a US-based transit agency to control the spread of COVID-19, but are included because elements of these practices may still inspire further research.
- State and local health authorities are vital partners in guiding how the local transit system interprets or applies these international practices.
- Before adopting any practice, transit agencies should conduct a due diligence review to confirm that it can be appropriately operationalized in a manner that does not add unacceptable risk.

The case studies presented have each been given an identification number using the following naming convention:

First two or three alpha characters represent the category of the case study

XXX##

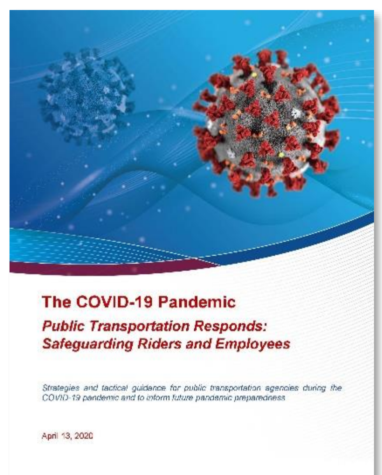
Last two digits serialize the case study

LEGEND

SC = Screening, Testing, or Contact Tracing
PD = Physical Distancing
IA = Indoor Air Quality
CD = Cleaning and Disinfection
PPE = Personal Protective Equipment
VP = Vulnerable Populations
CM = Communications
MF = Pandemic Management Framework

APTA COVID-19 Guide

The APTA COVID-19 Guide “Public Transportation Responds: Safeguarding Riders and Employees”[i] was published on April 13, 2020, to distill CDC guidance into tactical actions for transit operators to help protect agency employee and rider health. The practices in the APTA COVID-19 Guide are being used by transit agencies around the US; this Report considered them a “baseline” for COVID-19 pandemic practices in the domestic transit industry.



The APTA COVID-19 Guide includes guidance in several areas:

- CDC guidelines for SARS-CoV-2 infection control (as of April 13, 2020)
- APTA questions and answers from faculty at the Johns Hopkins Bloomberg School of Public Health
- Strategies and tactical options to help protect agency staff and passengers
- Supply chain resiliency strategies and related information on disinfectants and Personal Protective Equipment (PPE)
- Financial documentation required for pandemic-related expenses

While these focus areas remain topical, this Report presents new information and case studies on emerging practices used to help control the spread of COVID-19.

Core Public Health Guidance in the United States

State and local health departments are a critical partner to transit agencies, especially during the COVID-19 pandemic. While the CDC sets public health guidance at the national level, state and local health departments are responsible for collecting data and monitoring local disease trends; this then informs guidance and policies to address health problems at a local, state, and sometimes Federal level.

Throughout this pandemic, the CDC, state, and local health departments have updated their websites daily to respond to new research on SARS-CoV-2 and COVID-19 and provide additional guidance for communities.[ii]

Federal, State, and Local guidance for individuals

The following prevailing public health recommendations for individuals[iii] can serve as a basis for transit employees and riders to help protect themselves during the pandemic:

- Know signs and symptoms and stay home if sick
- Know how COVID-19 spreads
- Wash your hands often
- Avoid close contact (physical distancing)
- Cover your mouth and nose with a face cover when around others
- Cover coughs and sneezes
- Adopt cleaning and disinfection practices

Federal, State, and Local guidance for communities

The following prevailing public health concepts for communities[iv] apply the guidance for individuals (above), and serve as a basis for transit agency leaders and managers to help prevent the spread of COVID-19; such guidance includes:

- Minimize the chance of exposure (for employees and riders)
- Promote the use of everyday preventive actions (by employees and riders)
- Protect vulnerable populations

Federal, State, and Local guidance for emergency public health communications

Public health authorities throughout the US agree that emergency public health communications must be timely, accurate, credible, empathetic, and respectful. The CDC offers a guidebook on Crisis and Emergency Risk Communications (CERC).[v] In addition, NYSDOH created Interim Guidance for Public Transportation Activities during the COVID-19 Public Health Emergency to provide owners/operators ("Responsible Parties") of public transportation and their employees, contractors, and riders with precautions to help protect against the spread of COVID-19. Responsible Parties should develop a communications plan for employees and riders that includes applicable instructions, training, signage, and a consistent means to provide employees with information.[vi]

Other special transportation guidance for New York residents

- In April 2020, Governor Cuomo issued executive orders 202.17 and 202.18 requiring all people in New York to wear masks or face coverings in public, including when taking public or private transportation or riding in for-hire vehicles.
- On June 5, 2020, New York State issued interim guidance for public transportation during the COVID-19 public health emergency, which aligns with federal public health guidance.

International Public Health Guidance

The international case studies presented in this Report are considered acceptable practices in their country of origin. For these practices to be considered acceptable in the US, they should at the very least not conflict with and at best align with prevailing public health guidance in the United States.

In general, public health guidelines for controlling the spread of COVID-19 are similar around the world. The biggest differences are in the areas of physical distancing and the use of masks by the general public. Currently, various countries consider anywhere from 1 meter (3.28 feet) to 2 meters (6.56 feet) to be a minimum safe physical distance. Despite public health authorities around the world recommending minimum physical distances, public transportation agencies in these countries widely differ in if and how they apply these physical distancing guidelines to the transit operation; some have established policies for more stringent physical distancing requirements in vehicles and facilities while others established less stringent policies. Many of these agencies have not established analogous physical distancing policies at all.[vii,viii]

While the CDC generally recommends a 6-foot minimum physical distance in public spaces, it published interim guidance for mass transit operators on May 23, 2020, which recommends that transit agencies "Institute measures to physically separate or create distance of at least 6 feet between all occupants **to the extent possible**."[ix] On June 5, 2020, New York State issued its interim guidance for public transportation which also advises transit employees and riders to maintain physical distance "when feasible."[x]

The use of face masks is also inconsistent in countries outside the US. Some countries recommend that the general public wear a mask or face covering during the pandemic, while other countries recommend against it. Some transit agencies around the world have set face mask policies for staff and riders to be consistent with local health guidance while others have not. [xi,xii]

Table 1- International comparison of physical distance and mask guidelines for general public as of May 16, 2020.

	World Health Organization (WHO)[xiii]	European Centre for Disease Prevention and Control (ECDC)[xiv]	China Ministries of Health[xvxvi]	Australian Government Department of Health[xviixviii]	New Zealand Ministry of Health[xixxx]	US Centers for Disease Control and Prevention (CDC)[xxi]	Public Health Agency of Canada[xxii]
Recommended minimum safe physical distance for the general public	1.00 meter	1.00 meter	1.00 - 1.50 meters*	1.50 meters	1.00 - 2.00 meters**	1.83 meters†	2.00 meters
	3.28 feet	3.28 feet	3.28 - 4.92 feet*	4.92 feet	3.28 - 6.56 feet**	6.00 feet†	6.56 feet
Recommended general public use of mask or face covering	Only if you are unwell	Only if you are unwell	Yes	Only if you are unwell	Only if you are unwell	Yes	Yes

** Depends on province and other conditions*

*** 1 meter for people that you know; 2 meters for strangers*

† Interim CDC guidance for mass transit administrators is "6 feet between all occupants to the extent possible"

Global Practices Used to Control the Spread of COVID-19

The following global practices were curated to highlight global practices used for protecting human health and safety during the COVID-19 pandemic that may be applicable or adaptable to the US transit industry. MTA may consider each of these examples, in whole or in part, in addition to the practices described in the APTA COVID-19 Guide.

Screening, Testing, and Contact Tracing

Screening, testing, and contact tracing people in and around the transit system can help break chains of person-to-person infection, making transit safer. The CDC currently offers a free, web-based self-assessment (screening) tool on their COVID-19 homepage. Additionally, it provides guidance on Verbal Screening and Temperature Check Protocols.

The screening process helps determine if an individual is suspected to have COVID-19, but a test is required to confirm infection. According to the CDC, currently there are "two kinds of tests are available for COVID-19: viral tests and antibody tests. A viral test tells you if you have a current infection. An antibody test tells you if you had a previous infection. An antibody test may not be able to show if you have a current infection, because it can take 1-3 weeks after infection to make antibodies."[xxiii]

According to the CDC, once an individual has tested positive, trained public health staff can use the process of contact tracing to "work with a patient to help them recall everyone with whom they have had close contact during the timeframe while they may have been infectious. Public health staff then warn these exposed individuals (contacts) of their potential exposure as rapidly and sensitively as possible."[xxiv] It is critical that contact tracing be performed as quickly as possible to isolate patients and ensure their contacts can separate themselves from others to avoid the rapid spread of COVID-19.

A recent scientific study published in Science indicates that, "In Wuhan, China, it has been estimated that undiagnosed cases of COVID-19 infection, who were presumably asymptomatic, were responsible for up to 79% of viral infections. Therefore, regular, widespread testing is essential to identify and isolate infected asymptomatic individuals."[xxv]

The case studies and emerging technology described below are being used by organizations around the world to help their local community screen, test, and perform contact tracing to minimize the spread of COVID-19. Each of these international practices can be considered an element of a comprehensive screening program for transit agency employees, riders, and visiting contractors. Transit agencies should be mindful of and avoid inadvertent bias in those individuals selected for screening, testing, or contact tracing as they design and implement programs.

SC01- Employee Screening (Case Study)

This case study highlights how public transportation agencies have adopted practices to take employee temperatures with different frequencies as part of a more comprehensive employee screening effort.

While the APTA COVID-19 Guide recommended screening transit agency employees, a recent survey of international rail agencies by the Union Internationale des Chemins de fer (UIC), an international trade association for rail operators, revealed that some rail agencies throughout the world take employee temperature readings once per day (beginning of shift); others reported twice per day (beginning and end of shift); and other reported up to three times per day.[xxvi]

The "New Corona Pneumonia Outbreak Classification Prevention and Control Guide (2nd Edition)" issued by the China Ministry of Transport on April 11, 2020, prescribes temperature-taking intervals based on the risk level at a specific location. Because transit operators in China can often work up to 16 hours per day,[xxvii,xxviii,xxix] the temperature-taking frequencies in the table below can translate to several times per day.

Table 2- Summary of staff temperature measurement requirements in the "New Corona Pneumonia Outbreak Classification Prevention and Control Guide (2nd Edition)" issued by the China Ministry of Transport on April 11, 2020.[xxx] Note that transit operators can often work up to 16 hours per day, therefore the temperature-taking frequencies below and translate to several times per day.

	High-Risk Areas	Medium Risk Areas	Low Risk Areas
Staff temperature measurement requirements	Once per 4 hours	Once per 6 hours	Each day before and after work

SC02- Passenger Screening (Case Study)

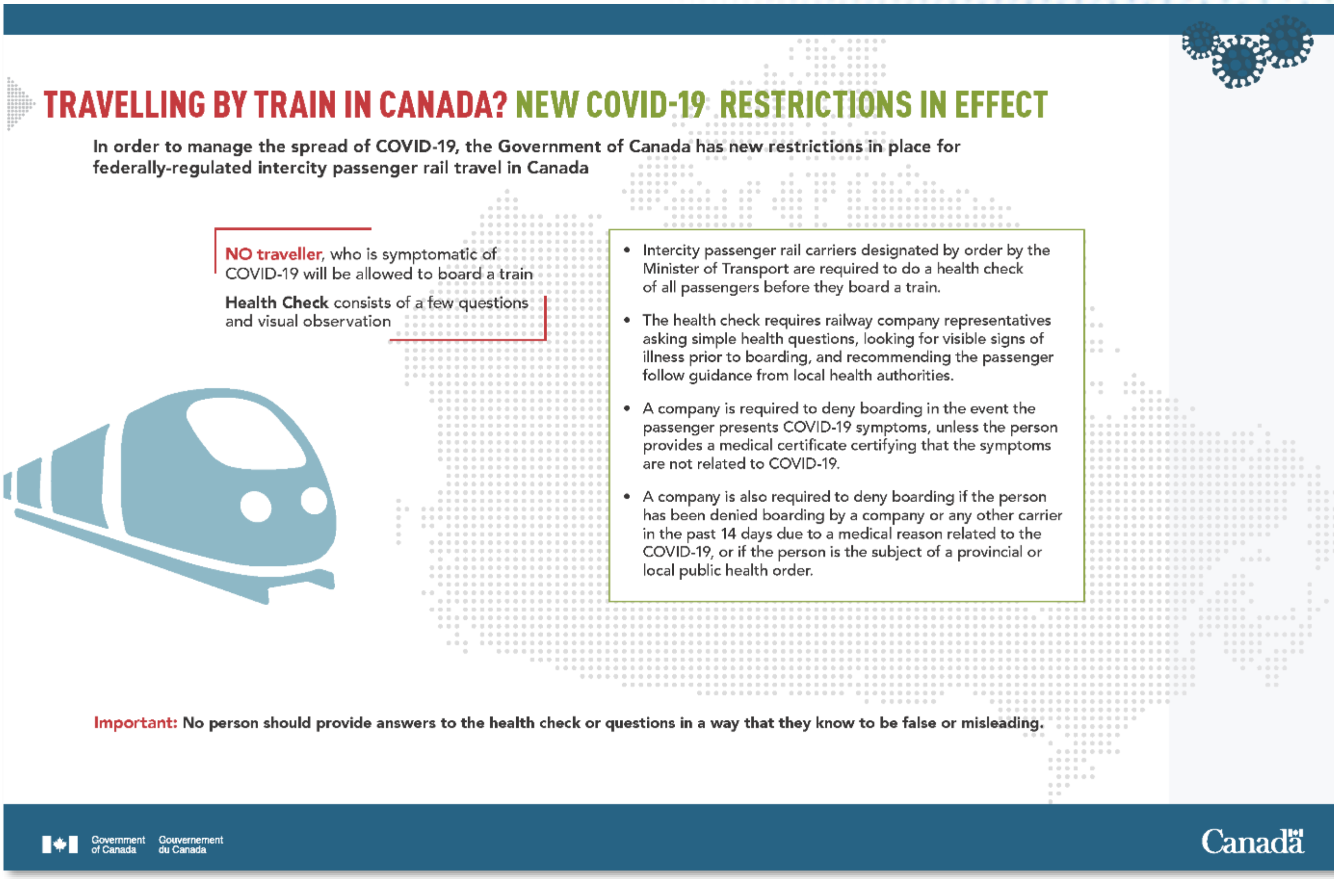
This case study highlights how various transportation agencies have required and performed passenger screening as part of a more comprehensive screening effort.

Screening passengers for COVID-19 signs and symptoms is a common practice for aviation and public transportation organizations outside of the US. The Airports Council International (ACI) recommends that airports around the globe work with local health authorities to ensure passengers "undergo temperature screening, either by handheld infrared detector or infrared screening system. Passengers failing the temperature check will be referred to a medical post for further examination. Provide Health Declaration Forms if required by regulation."[xxxi] Starting on June 1, 2020, all travelers flying Frontier Airlines will have their temperature checked before boarding.[xxxii] Frontier is the first of many airlines in the US adopting this practice.[xxxiii]

While it is easier for airports and airlines to perform passenger screening due to preexisting security screening structures, many public transportation agencies around the world are beginning to adopt a similar practice. The UIC COVID-19 Survey revealed that many rail agencies are currently requiring passenger screening – both visually and by taking body temperature readings before passengers board vehicles; one agency reported random passenger temperature checks while the vehicle was en route.[xxxiv]

The Canadian Ministry of Transportation now requires all inter-city rail providers in Canada to "conduct mandatory health checks for every passenger before the passenger boards the train, and advise every passenger that they are not to provide answers that they know to be false or misleading… In the event that the railway operator observes that the rail passenger has COVID-19 symptoms or that their response to any of the questions on the health check indicates a need to deny boarding, the railway company will be required to refuse to board the person for travel or until a medical certificate is presented that confirms that the symptoms that the person is exhibiting are not related to the COVID-19 virus."[xxxv]

Figure 1- Advertisement to Canadian passengers regarding mandatory passenger COVID-19 screening



SC03- Thermal Cameras for Screening (Emerging Technology)

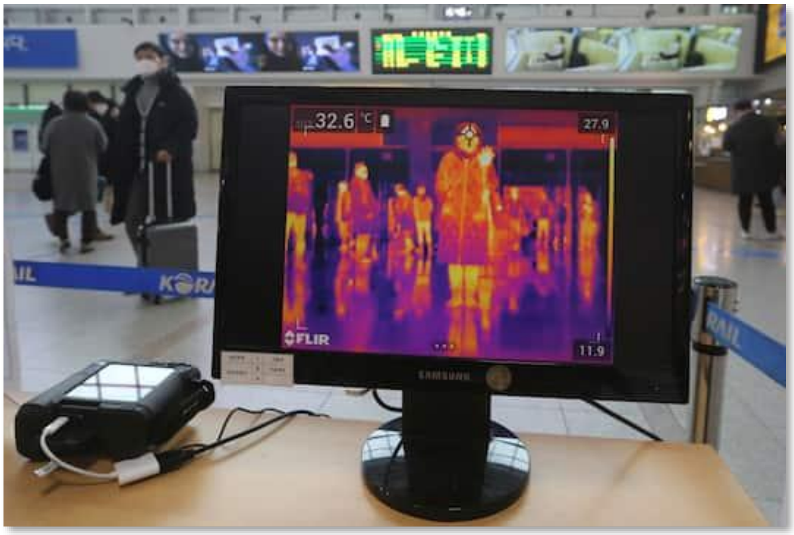
This emerging technology may help identify employees, passengers, or other visitors that require a more thorough screening process.

Airports and some public transportation agencies throughout the world have begun using thermal cameras to increase the efficiency of screening employees and passengers for a fever, which can reportedly gauge the body temperature of a human from 7 to 15 feet away.[xxxvi]

The World Health Organization (WHO) states, "Thermal scanners are effective in detecting people who have a fever (i.e., have a higher than normal body temperature)."[xxxvii] In April 2020, the Food and Drug Administration (FDA) released a document entitled "Enforcement Policy for Telethermographic Systems During the Coronavirus Disease 2019 (COVID-19) Public Health Emergency." This document represents the FDA's current stance on thermal cameras for screening and was published "to provide a policy to help expand the availability of telethermographic systems used for body temperature measurements for triage use for the duration of the [COVID-19] public health emergency."[xxxviii] This document also describes the performance and labeling requirement for those products that are meant to be used for screening humans for fever during the COVID-19 pandemic. The FDA also warns that "Thermal imaging systems have not been shown to be accurate when used to take the temperature of multiple people at the same time. The accuracy of these systems depends on careful set-up and operation, as well as proper preparation of the person being evaluated."[xxxix]

These thermal cameras come in many forms to support the screening process for signs of COVID-19. Some are meant to be used as kiosks, which requires the subject to stand still to register a temperature. Consequently, this system is limited in the number of people it can screen per hour, but making employees or passengers stop for screening can also help with metering them into a facility.[xl] Others come in the form of a helmet[xli] or glasses[xlii] that allow the user to get a readout of any person in their field of view.

Figure 2- A thermal camera monitor at the Seoul Railway Station in South Korea.



The Singapore Land Transport Authority is currently deploying thermal screening devices at select stations to provide an additional layer of screening before commuters enter the public transport network. Commuters who have been identified by the scanners as having a fever will not be allowed to enter the station and be asked to seek medical attention at the nearest clinic(s) immediately.[xliii]

OAO Rossiyskie zheleznye dorogi (RZD), a Russian rail agency, also recently tested similar technology at its Leningrad station. According to their press release, "On the way to long-distance trains, passengers are met with temperature control by a smart system that automatically scans everyone without exception. 'People with temperatures above a critical temperature stand out at a distance of 10 meters,' explained Ivan Ozhgikhin, deputy director general of the manufacturer of the Schwabe system. Passengers with a fever are invited to go to the first-aid post for conducting control measurements with a conventional thermometer. If a person is really unwell, then they call them an ambulance."[xliv]

Several public transportation agencies around the world reported similar use of these devices for passenger and employee screening, including in India,[xlv] South Korea,[xlvi] and China.[xlvii] The United States Army also employs this technology as part of a more comprehensive screening protocol.[xlviii]

SC04- Diagnostic Face Mask (Emerging Technology)

While this technology will not be ready for market any time soon, this emerging technology may offer the ability to more definitively screen employees, riders, and contractors for COVID-19 infection.

In 2016, researchers from the Massachusetts Institute of Technology (MIT) and Harvard University published research on how paper-based sensors can be used to detect the presence of the Zika virus by changing the color of the paper sensor.[xlix] According to a recent article, "Now, they're adjusting their tool again to identify coronavirus cases. The team is designing a face mask to produce a fluorescent signal when a person with the coronavirus breathes, coughs, or sneezes. If the technology proves successful, it could address flaws associated with other screening methods like temperature checks."[l] If and when this type of product is made commercially available, it may help transit agencies screen employees and riders with greater confidence.

SC05- Isolation of People with Suspected COVID-19 Infections (Case Study)

This case study highlights how some public transportation agencies have managed persons with suspected COVID-19 infection after a screening process.

Some public transportation agencies have created isolation areas for sick employees and riders identified through a screening process. The Wuhan Railway Bureau in China established emergency isolation seats on the trains to separate a person with a suspected infection from those without signs and symptoms. They also equipped trains and stations with emergency response kits with personal protective equipment and other materials for the rail staff that might interact with a sick person.[li]

Figure 3- Temporary isolation area set up in Chongqing Rail Transit station.

In a similar fashion, OAO Rossiyskie zheleznye dorogi (RZD), a Russian rail agency, designated rooms for passengers with signs of viral infection in Moscow area stations. According to a press release on the agency's website, "there, citizens can wait for doctors without infecting other visitors... All of them are equipped with thermometry devices, personal protective equipment (masks) and skin antiseptics. All passengers entering this room are re-measured temperature. They are seated in a safe distance and are called [for further evaluation by public health/medical personnel]."[lii]

SC06- Rapid Testing (Case Study)

This case study highlights how on-site rapid testing, which is a critical element in breaking chains of person-to-person infection, is being accomplished with available technology.

The Vienna International Airport has begun offering Polymerase Chain Reaction (PCR) tests to arriving or departing residents of the City, while the passenger waits.[liii] It takes about three to six hours to get results from this viral test because the analysis is done on-site; other PCR tests used around Austria require days to get results due, in part, to the logistics of using an off-site laboratory. The Vienna Airport charges EUR 190 for each test to provide citizens with the potential benefit of avoiding a 14-day quarantine if the test comes back negative.

SC07- Rapid Testing (Emerging Technology)

This case study highlights how emerging technology may enable more cost-effective and quicker test results without the need for trained medical staff to administer the test.

Most COVID-19 tests on the market require trained medical personnel to administer them. The Rutgers University Cell & DNA Repository (RUCDR) is one of the first to come to market with an at-home COVID-19 test.[liv] Their Infinite Biologics test received an amended emergency use authorization from the FDA for the first SARS-CoV-2 coronavirus test that will allow people to collect their own saliva at home and send to the RUCDR lab which uses an automated workstation to process up to 10,000 saliva samples per day for SARS-CoV-2 testing.

Figure 4- The automated workstation at Rutgers can process up to 10,000 SARS-CoV-2 tests per day.

Other life science companies have made recent advances in developing lateral flow assay tests for SARS-CoV-2. A lateral flow assay test is the same technology used in a home pregnancy test; these tests can be manufactured at a relatively low cost, be self-administered, and do not require a laboratory to interpret results. A press release from a life sciences company announced that their SARS-CoV-2 lateral flow assay test is now moving to clinical trials. According to their press release, their product "is a device designed to be used at point-of-care to detect the presence of the SARS-Cov2 virus in a patient within 10-15 minutes which could make it a critical component of testing protocols being considered by governments as they devise plans to relax physical distancing measures. The Company's test will not require either specialized equipment or lab-based professionals to interpret its test results."[lv]

As more rapid testing methods become commercially available, it is imperative that transit agencies understand the purpose and tradeoffs between different types of tests and implement these tests appropriately to help break the chain of person-to-person infection.

SC08- Contact Tracing (Case Study)

This case study highlights how transit agencies may consider policy, process and/or technology to supplement the efforts of local health officials by increasing the speed and efficacy of contact tracing.

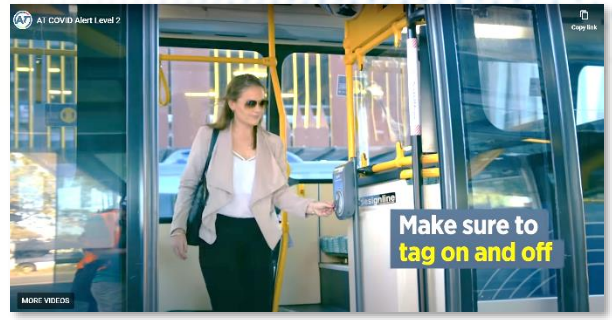
Public health authorities and academic institutions around the world have launched a variety of contact tracing applications. Many of these were described by the Johns Hopkins Bloomberg School of Public Health (JHSPH) in a recent publication that states, "applications in both China and the Republic of Korea rely on personal identification information combined with location histories."[lvi] Accordingly, the contact tracing applications used in these countries may be incompatible with US privacy laws.

Other contact tracing applications used around the world use Bluetooth technology, encryption, and full anonymity to alert individuals when they have been in the vicinity of a known COVID-19 case, including:

- Stanford University's COVID-19 Watch
- MIT's Safe Paths
- Singapore Ministry of Health's TraceTogether
- Australian Government Department of Health's COVIDSafe

While apps like these can help health departments and citizens act quickly to break chains of person-to-person infection, they only work with adequate voluntary use of the app. To help make its transit system safer and reduce the incidence of disease in its local community, Auckland Transport (AT) in New Zealand leveraged policy and technology to assist local health officials with contact tracing. AT first made a policy decision to only allow tap media for fare payments during the pandemic. They then encouraged riders to register their personal contact information with their fare media account to support contact tracing. Lastly, they implemented a policy to have riders "tap" when boarding the transit vehicle to pay the fare, and also "tap" when alighting to log the end of their trip. Collectively, these policy and technology changes enabled AT to assist local health officials with rapid contact tracing if/when an infected passenger was known to be on-board the transit system.[lvii]

Figure 5- Tap media used for boarding and alighting to support contact tracing.



Physical Distancing

Because public transportation systems are designed to move dense passenger loads, public transportation agencies around the globe are challenged to achieve recommended physical distance between their employees and passengers. While the APTA COVID-19 Guide already recommends many physical distancing strategies and actions, the additional case studies and emerging technology described below can be considered to help achieve physical distancing guidance in a spatially constrained environment.

PD01- Transit Demand Management Strategies (Case Study)

This case study highlights how transit demand management strategies are being suggested and used to reduce crowding in transit facilities and vehicles.

New Zealand government recognized the need to manage travel demand early in the pandemic to achieve physical distancing. Accordingly, on March 20, 2020, the New Zealand Ministry of Health recommended that all New Zealand public transportation agencies "provide discounts for off-peak travel to reduce density of people on buses and trains (or free off-peak travel)."[lviii]

The European Commission made a similar recommendation for railways on May 13, 2020: "Off-peak hour travel should be encouraged with incentives, such as adjusted pricing, or flexible working hours in the case of commuter trains, to avoid crowding."[lix]

One example of this was enacted on May 14, 2020 by the City of London (UK). In an effort to reduce crowding on transit during peak hours, protect the health of the elderly, and bolster fiscal sustainability for the public transport systems in London, the City government and Transport for London (TFL) suspended the eligibility of Freedom Passes[lx] and free travel for individuals under 18 years of age during peak hours.[lxi] This meant that elderly, people with disabilities, and riders under the age of 18 could no longer travel for free until October 2020.

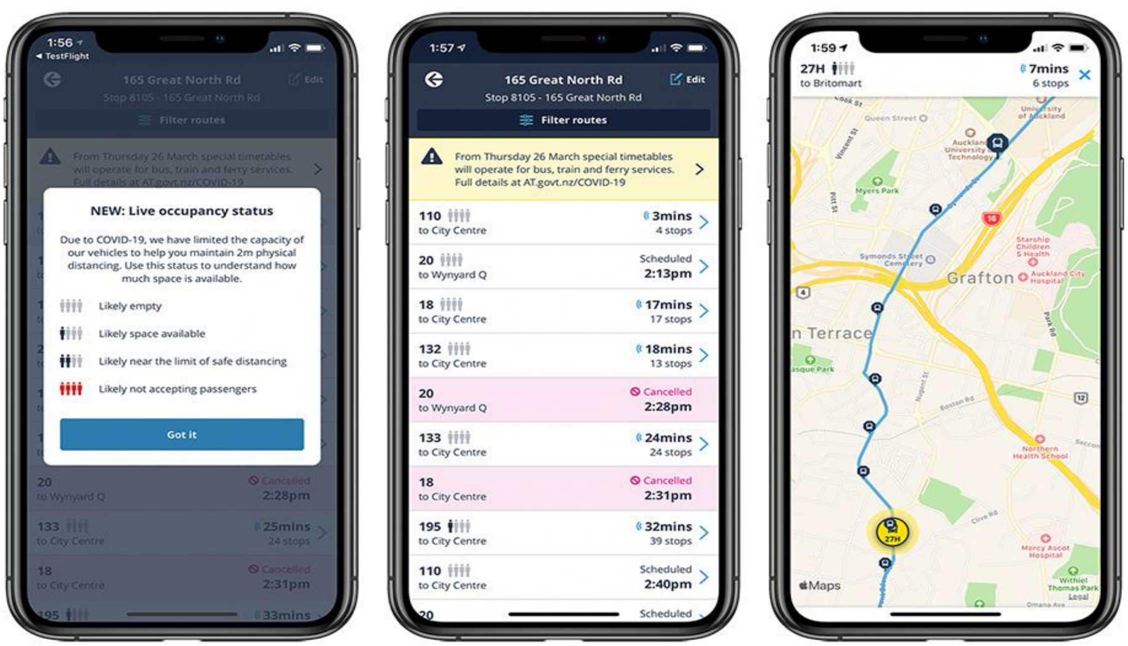
PD02- Vehicle Capacity Limits, Passenger Metering, and Seat Reservation (Case Study)

This case study highlights how some public transportation agencies are creating policies, processes, and tools to help achieve physical distancing in transit vehicles.

The APTA COVID-19 Guide recommended strategies and actions to help achieve physical distancing on transit vehicles, including establishing vehicle capacity limits that support CDC physical distancing recommendations. This Report identifies additional strategies including passenger metering and seat reservation. UIC surveyed 28 rail agencies around the world on their physical distancing protocols for vehicles in April and May of 2020. Many agencies reported setting a limit for transit vehicle capacity somewhere between 30% and 50% of maximum capacity. In most cases, capacity limits were enforced by limiting ticket sales and putting measures in place (e.g., additional staff) to meter passengers into the station and onto the train. Several agencies require passengers to reserve seats in advance and will either provide a seat map to the customer so they can choose their seat while maintaining physical distance from other customers, or by converting general reservations into assigned seats.[lxii]

Two public transportation agencies have also provided real-time vehicle capacity information to their passengers to help them find a vehicle that is not over-crowded. Danske Statsbaner (DSB), the largest rail provider in Denmark recently launched a web application called Pladspårejsen that provides information to customers including "Which departure is the easiest to keep your distance (find the best time); Occupancy rate per train with one click (check S-train); Basic traffic information; Live cards and all trains on the S train network."[lxiii] In addition, Auckland Transport in New Zealand implemented a policy to have riders "tap" their fare media when boarding the transit vehicle to pay the fare, and also "tap" when alighting to log the end of their trip. This policy not only supports contact tracing, as described above, but it also enables the agency to calculate the real-time capacity of the transit vehicle and convey passenger loads to customers through iconography on the agency's mobile application.[lxiv]

Figure 6- Auckland Transport's mobile application which shows real-time vehicle capacity to customers.



PD03- Physical Distancing in Stations and Facilities (Case Study)

This case study highlights how some public transportation agencies are creating policies, processes, and tools to help achieve physical distancing in transit stations and facilities.

In April 2020, UIC published a guidance document to help rail agencies recover from the pandemic. One of the recommendations in this document is to adjust the boarding process on the platform to help achieve physical distance in a station.[lxv] Also in April of 2020, the Agenzia Confederale dei Trasporti e Servizi (AGENS) in Italy recommended the following pedestrian flow management strategies in facilities:

- Separating inbound and outbound flows at stations, stops, and parking lots through dedicated signals (vertical, horizontal);
- Managing queues in waiting areas for means of transports and for the access to front office premises using vertical signals and stickers that encourage distancing; and
- Managing vehicle occupancy through stickers that indicate the available seats and walking points to the passengers.[lxvi]

On May 13, 2020, the European Commission recommended that rail operators remove/rearrange items in facilities that encourage crowding (e.g., benches, tables).[lxvii] Public transportation agencies around the globe have implemented these strategies; examples are provided below.

Amtrak, the largest rail provider in the US, has used signage and floor stickers to help maintain six-foot distance between people in queues. They have also retrofitted staffed stations with glass barriers where needed.[lxviii]

The Singapore Land Transport Authority has also employed safe distancing stickers on all vehicles and facilities and also added field staff to help direct customers to maintain a safe distance. These field staff also function to limit the number of customers that can enter train stations and buses.[lxix] Similarly, the Wuhan Railway Bureau added station staff and volunteers at the passenger concentrated areas, such as entrances and exits (pinch points), to help direct customers to achieve physical distance.[lxx]

Transport for London has implemented a number of related measures including public address system announcements, posters and signage, and two-meter floor markings on platforms. They have also positioned stewards outside of identified stations to oversee the area immediately outside the entrance to encourage customers to maintain physical distance inside the station and as they come in through the controlled entry. British Transport Police officers are also on hand to encourage physical distance but will not be enforcing.[lxxi]

The Massachusetts Bay Transportation Authority (MBTA) divides operating teams into Team 1 and Team 2, limiting staff exposure to a small number of colleagues in operations facilities and in the field. For example, MBTA rotates staff between its main and backup Operations Control Centers by shift and allows each facility to be cleaned and disinfected when not in use. In addition, they have allowed staff to use their personal automobiles as personal spaces for physical distancing.[lxxii]

In operations facilities, LA Metro has installed decals in facilities and elevators to help maintain physical distancing; they also have meetings with labor twice per week to keep labor partners informed of actions and efforts.[lxxiii] Transport for London has installed electronic screens and other signage, and also instituted one-way pedestrian flow measures In depots and control centers to support physical distancing.[lxxiv]

PD04- Physical Distancing in Vehicles, Stations, and Facilities (Emerging Technology)

These emerging technologies may further enhance the ability of public transportation agencies to manage demand and achieve physical distancing in transit vehicles, stations, and facilities.

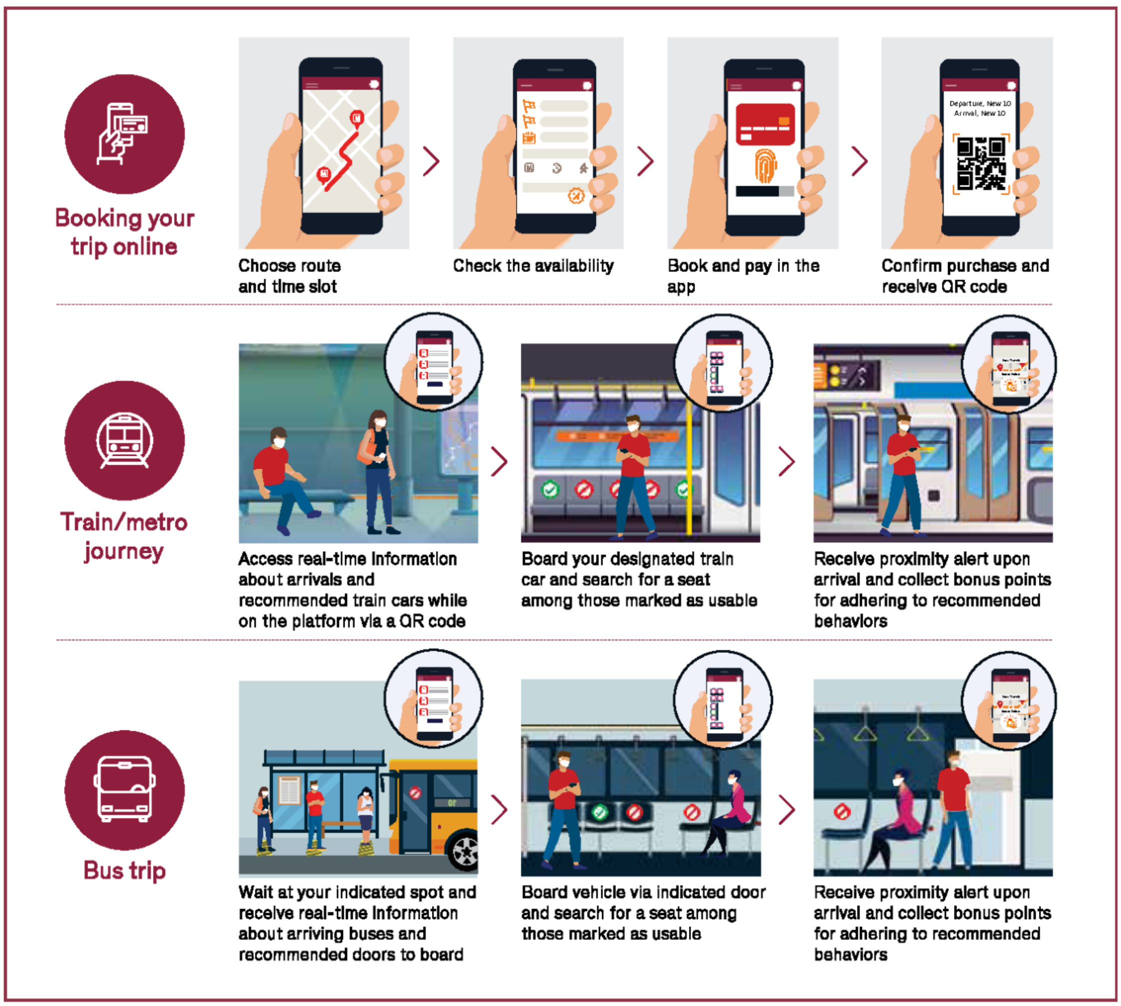
Netherlands Railways (NR) recently worked with a technology company to use Bluetooth and WiFi sensors to gather data on customer behavior and model pedestrian traffic flow through the rail stations. The network of sensors allowed them to capture important metrics in real-time, such as:

- Time people (passenger and non-passenger) spent in the station
- Time spent on escalators, on platforms, and in other spaces
- Passenger distribution on departing/arriving platforms
- Entrance and exit usage[lxxv]

This data and modelling enabled NR to redesign its facilities to optimize passenger flow, manage queues, and manage capacity at rail stations.

AGENS (Italy) has described a strategy for advanced public transportation technology that includes fare payment, seat reservation, real-time vehicle and station capacity monitoring systems, and incentives to encourage correct passenger behaviors.[lxxvi] Today's technology makes this vision achievable but will likely require years to fully implement.

Figure 7- The AGENS Vision for technology integration that will support physical distancing in future pandemics.



PD05- Physical Distance Alert Devices (Emerging Technology)

These emerging technologies may help agency employees in administrative offices, maintenance facilities, and field teams achieve physical distancing.

Several technologies have recently come onto the market to alert employees of proximity encounters. Some take the form of a mobile application (app) which prompts an alert (sound, vibration, or both) if two app users are getting too close together. One such mobile application called "mContain" is offered for free by the University of Memphis[lxxvii] and several others are available from private developers.

Amey plc is a large construction company in the United Kingdom that invested in similar technology for its field staff. Instead of using an app on a mobile phone, Amey outfitted their staff with rugged and waterproof hardware that performs the same function. Their vendor offers a watch-style device that can be worn on the wrist or a "tag device" that can be affixed to a belt, hard hat, or clothing.[lxxviii]

Indoor Air Quality

The CDC states, "It is unknown how long the air inside a room occupied by someone with confirmed COVID-19 remains potentially infectious. Facilities will need to consider factors such as the size of the room and the ventilation system design (including flowrate [air changes per hour] and location of supply and exhaust vents) when deciding how long to close off rooms or areas used by ill persons before beginning disinfection. Taking measures to improve ventilation in an area or room where someone was ill or suspected to be ill with COVID-19 will help shorten the time it takes respiratory droplets to be removed from the air."[lxxix] This makes it important to test heating, ventilation, and air conditioning (HVAC) systems to make sure they're working properly/optimally, and also why JHSPH recommended that "HVAC should be on if it is using fresh air, at the highest setting possible, and filters should be changed regularly"[lxxx] during the COVID-19 pandemic.

The prevailing public health guidance in the US is similar to that of other countries, which has influenced various organizations to test, optimize, and/or modify their HVAC systems in vehicles and facilities. A few of the case studies below describe potential fecal-oral transmission of SARS-CoV-2, which is an emerging field of study nationally[lxxxi,lxxxii] and internationally. While there may be risk for fecal-oral transmission, readers of this Report should understand that global public health experts agree the main transmission route for SARS-CoV-2 is person-to-person through inhalation of viral particles exhaled or expelled through coughing, sneezing, or talking by an infected person.

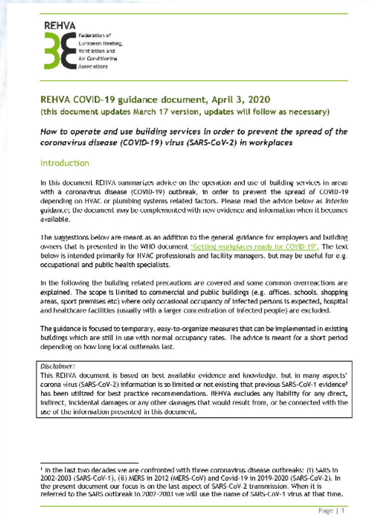
The use of ultraviolet germicidal irradiation (UVGI) to disinfect against SARS-CoV-2 described below is also an emerging area of study. The CDC recognizes UVGI as a viable method for disinfection and sterilization in healthcare facilities,[lxxxiii] and medical articles confirm UVGI can effectively inactivate other human coronaviruses.[lxxxiv] While promising, at this time criteria have not been established for wavelength, temperature, intensity, and duration of UVGI needed to reliably and consistently inactivate the SARS-CoV-2 virus in the air and/or on surfaces, as well as other environmental factors that could play a role in the effectiveness of UVGI. Additionally, how and when this type of method would be incorporated into cleaning and disinfection practices should consider that exposure of UV light can be harmful to human tissue.

IA01- Facility HVAC Strategies (Case Study)

This case study highlights a number of international indoor air quality (IAQ) recommendations and practices to help reduce the spread of COVID-19 in facilities.

On April 3, 2020, the Federation of European Heating, Ventilation, and Air Conditioning Associations (REHVA) published a document called "How to operate and use building services in order to prevent the spread of the coronavirus disease (COVID-19) virus (SARS-CoV-2) in workplaces." It cites public health guidance that is similar to CDC guidance for COVID-19, but it also states, "A third transmission route that is gaining more attention from the scientific community is the fecal-oral route."[lxxxv]

In this document, REHVA recommends the following measures for building services operation:



REHVA

Federation of European Heating, Ventilation and Air Conditioning Associations

REHVA COVID-19 guidance document, April 3, 2020
(this document updates March 17 version, updates will follow as necessary)

How to operate and use building services in order to prevent the spread of the coronavirus disease (COVID-19) virus (SARS-CoV-2) in workplaces

Introduction

In this document REHVA summarizes advice on the operation and use of building services in areas with a coronavirus disease (COVID-19) outbreak, in order to prevent the spread of COVID-19 depending on HVAC or plumbing systems related factors. Please read the advice below as *interim* guidance; the document may be complemented with new evidence and information when it becomes available.

The suggestions below are meant as an addition to the general guidance for employers and building owners that is presented in the WHO document 'Getting workplaces ready for COVID-19'. The text below is intended primarily for HVAC professionals and facility managers, but may be useful for e.g. occupational and public health specialists.

In the following the building related precautions are covered and some common overreactions are explained. The scope is limited to commercial and public buildings (e.g. offices, schools, shopping areas, sport premises etc) where only occasional occupancy of infected persons is expected; hospital and healthcare facilities (usually with a larger concentration of infected people) are excluded.

The guidance is focused to temporary, easy-to-organize measures that can be implemented in existing buildings which are still in use with normal occupancy rates. The advice is meant for a short period depending on how long local outbreaks last.

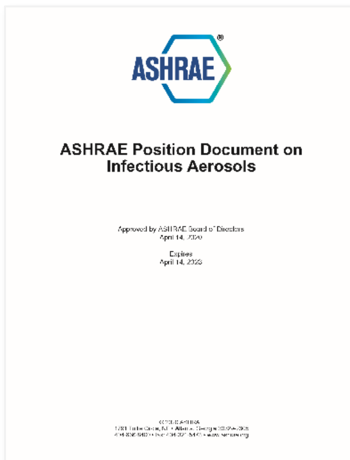
Disclaimer:
This REHVA document is based on best available evidence and knowledge, but in many aspects' corona virus (SARS-CoV-2) information is so limited or not existing that previous SARS-CoV-1 evidence[1] has been utilized for best practice recommendations. REHVA excludes any liability for any direct, indirect, incidental damages or any other damages that would result from, or be connected with the use of the information presented in this document.

[1] In the last two decades we are confronted with three coronavirus disease outbreaks: (i) SARS in 2002-2003 (SARS-CoV-1), (ii) MERS in 2012 (MERS-CoV) and Covid-19 in 2019-2020 (SARS-CoV-2). In the present document our focus is on the last aspect of SARS-CoV-2 transmission. When it is referred to the SARS outbreak in 2002-2003 we will use the name of SARS-CoV-1 virus at that time.

Page | 1

- Secure ventilation of spaces with outdoor air
- Switch ventilation to nominal speed at least 2 hours before the building usage time and switch to lower speed 2 hours after the building usage time
- At nights and weekends, do not switch ventilation off, but keep systems running at lower speed
- Ensure regular airing with windows (even in mechanically ventilated buildings)
- Keep toilet ventilation 24/7 in operation
- Avoid open windows in toilets to assure the right direction of ventilation
- Instruct building occupants to flush toilets with closed lid
- Switch air handling units with recirculation to 100% outdoor air
- Inspect heat recovery equipment to be sure that leakages are under control
- Switch fan coils either off or operate so that fans are continuously on
- Do not change heating, cooling, and possible humidification setpoints
- Do not plan duct cleaning for this period
- Replace central outdoor air and extract air filters as usually, according to maintenance schedule
- Regular filter replacement and maintenance works shall be performed with common protective measures, including respiratory protection

On April 14, 2020, the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) published its "ASHRAE Position Document on Infectious Aerosols," which describes the role HVAC can play as part of a larger disease control program. According to the document:



> "Dilution and extraction ventilation, pressurization, airflow distribution and optimization, mechanical filtration, UVGI, and humidity control are effective strategies for reducing the risk of dissemination of infectious aerosols in buildings and transportation environments. Non-healthcare buildings should have a plan for an emergency response. The following modifications to building HVAC system operation should be considered:
>
> - Increase outdoor air ventilation (disable demand-controlled ventilation and open outdoor air dampers to 100% as indoor and outdoor conditions permit).
> - Improve central air and other HVAC filtration to MERV-13 (ASHRAE 2017b) or the highest level achievable.
> - Keep systems running longer hours (24/7 if possible).
> - Add portable room air cleaners with HEPA or high-MERV filters with due consideration to the clean air delivery rate (AHAM 2015).
> - Add duct- or air-handling-unit-mounted, upper room, and/or portable UVGI devices in connection to in-room fans in high-density spaces such as waiting rooms, prisons, and shelters.
> - Maintain temperature and humidity as applicable to the infectious aerosol of concern.

- Bypass energy recovery ventilation systems that leak potentially contaminated exhaust air back into the outdoor air supply."[lxxxvi]

Hong Kong Mass Transit Railway (MTR) enhanced frequency of fresh air intake to facilitate better ventilation in stations, and asked passengers to expect warmer temperatures.[lxxxvii] Of note, the Shanghai Municipal Health Commission in China recommends against using HVAC in facilities during the pandemic,[lxxxviii] which does not align with US public health guidance.

IA02- Facility HVAC Design Modification (Case Study)

This case study highlights how some organizations are beginning to modify facilities' HVAC system design to help control the spread of COVID-19.

A commercial developer in Scottsdale, Arizona, recently announced plans to incorporate touchless technology in tenant and communal spaces and also upgrade "the building's main HVAC systems and elevators to optimize air quality."[lxxxix] The developer is currently reviewing the ASHRAE Position Document on Infectious Aerosols and is "evaluating options to improve the HVAC – including increases to the rate of fresh air changes, improved filter media, and the potential use of UVGI technology in tenant spaces and elevators."[xc]

Figure 8- UVGI in an HVAC system

A fitness studio in Knoxville, Tennessee, has begun using a product that injects vaporized hydrogen peroxide into the HVAC system to disinfect the air.[xci] While the CDC recognizes hydrogen peroxide as a disinfectant,[xcii] and while many products on EPA List N use hydrogen peroxide as an active ingredient,[xciii] the manner of use for many hydrogen peroxide-based disinfectants is via application to a surface. When chemicals are aerosolized, they can cause damage to structures and organs within the respiratory tract, including the lungs, and other organs outside of the respiratory tract, particularly to the eyes and the skin; therefore, further research is needed to ensure that breathing this concentration of hydrogen peroxide will not have unintended and negative health effects for building occupants.

IA03- Vehicle HVAC Practices and Procedures (Case Study)

This case study highlights a number of international indoor air quality (IAQ) recommendations and practices to help reduce the spread of COVID-19 in public transportation vehicles.

ASHRAE has guidance for mass transit operators on their website, which includes the following recommendations for transit vehicles:[xciv]

- Shutting off HVAC systems is NOT recommended.
- If demand-controlled ventilation is present on the vehicle, it should be adjusted to provide maximum ventilation flows consistent with manufacturer's settings.
- Filter upgrades should be coordinated with the system manufacturer to improve the removal of viruses from the passenger compartment and also ensure that before and after total airflow is acceptable.
- Following exposure to a suspected or confirmed COVID-19 positive individual, filters should be replaced as part of an overall vehicle deep cleaning procedure.
- Opening windows is an option when conditions allow and it will not create safety and passenger comfort issues.

- Retrofitting of UV-C lights must be done according to manufacturer's recommendations only as part of a formal [HVAC] redesign effort.

Russian rail operator OAO Rossiyskie zheleznye dorogi (RZD) is currently using UVGI lamps installed inside the duct structure on "Sapsany" trains from Moscow to St. Petersburg.[xcv] In China, Shanghai Keolis adjusted streetcar HVAC to "new wind mode" [fresh air is used instead of recycled air; humidification is turned off], and equipped air-conditioning units with ultraviolet light tubes.[xcvi]

Cleaning and Disinfection

While SARS-CoV-2 is thought to most easily spread person-to-person,[xcvii] public health authorities around the world agree that routine cleaning and disinfection of frequently touched surfaces can help control the spread of COVID-19. In the US, public health authorities recommend using dilute bleach, alcohol (70% or greater concentration), or one of the other EPA List N: Disinfectants for Use Against SARS-CoV-2 to disinfect frequently touched surfaces.[xcviii] While the APTA COVID-19 Guide already recommends many cleaning and disinfection strategies and actions, including alcohol-based hand sanitizer, the following case studies and emerging technology can be considered to help enhance efficiency and/or effectiveness of cleaning and disinfecting transit vehicles and facilities.

The use of ultraviolet germicidal irradiation (UVGI) to disinfect against SARS-CoV-2 described below is also an emerging area of study. The CDC recognizes UVGI as a viable method for disinfection and sterilization in healthcare facilities,[xcix] and medical articles confirm UVGI can effectively inactivate other human coronaviruses.[c] While promising and expected to work, at this time criteria have not been established for wavelength, temperature, intensity, and duration of UVGI needed to reliably and consistently inactivate the SARS-CoV-2 virus in the air and/or on surfaces as well as other environmental factors that could play a role in the effectiveness of UVGI. Additionally, how and when this type of method would be incorporated into cleaning and disinfection practices should consider that exposure of UV light can be harmful to human tissue.

CD01- Vehicle Disinfection Strategies (Case Study)

This case study highlights some overarching strategies for public transportation vehicle disinfection.

In March 2020, UIC surveyed rail agencies around the world on their responses to COVID-19. The survey revealed that multiple agencies reported frequent disinfection of vehicles and station. Some agencies reported comprehensive vehicle disinfection once per day, while others reported multiple times per day. One agency reported comprehensive disinfection of coaches after each trip/journey. Nearly all surveyed agencies reported continual disinfection of high-touch surfaces – some as frequently as every two hours.[ci] In addition, Hong Kong Mass Transit Railway (MTR) advertises on their website that they use "diluted household bleach to clean and disinfect the facilities every two hours in stations and every time the train reaches the last stop."[cii]

To support more frequent bus cleaning and disinfecting, King County Metro installed vehicle disinfecting sites around the county. This allows staff with personal protective equipment to disinfect the buses between trips and drivers to frequently wash their hands.[ciii]

CD02- Liquid Disinfectant Application Techniques (Case Study)

This case study highlights a new dry fogging technology to more efficiently disinfect hard surfaces in a transit vehicle than traditional application methods.

There are currently two chemical products on EPA List N that can be applied via a dry fogging device in a vehicle or room. These products create a turbulent aerosol of the disinfectant and increasingly concentrated micro-droplets everywhere in complex rooms to a broad range of pathogens where they may be beyond the reach of sprays, wipes, or UV lights.

Dallas Area Rapid Transit (DART) uses one of these products for disinfecting its transit vehicles.[civ] According to the manufacturer, one person can disinfect a bus in fifteen minutes or a railcar in thirty to forty minutes by just pushing a button and walking away. The manufacturer also provides test strips than can be placed around the vehicle or facility to validate SARS-CoV-2 kill concentrations were achieved.

Figure 9- Disinfectant fogger on DART Light Rail Vehicle

CD03- Other Disinfectant Application Techniques (Emerging Technology)

This emerging technology may offer automated methods to disinfect a transit vehicle or facility.

Hong Kong's MTR Corp has deployed an automated Vaporized Hydrogen Peroxide Robot to undertake deep cleaning and decontamination of its trains and stations. It automatically sprays hydrogen peroxide solution atomized to a specific concentration, ensuring disinfectants penetrate small gaps that are difficult to reach during normal cleaning work. The operator can set the robot to operate automatically by presetting the floor plan of the designated area or can use a mobile device to control the robot from up to 20 meters away. It takes about four hours to clean an eight-car train in automatic mode.[cv] While the CDC recognizes hydrogen peroxide as a disinfectant,[cvi] and while many products on EPA List N use hydrogen peroxide as an active ingredient,[cvii] further research is needed to confirm that the robot can apply a sufficient concentration of hydrogen peroxide and achieve required contact times to kill SARS-CoV-2.

The Spanish Military Emergency Unit (UME) and organizations in various other countries including Chile, Indonesia, Philippines, Colombia, and the United Arab Emirates have begun using agricultural drones to remotely apply liquid disinfectant to large facilities and spaces.[cviii] Further investigation is needed to determine how sufficient coverage and contact time is assured with this application method.

Two public transportation agencies are using Ozone gas to disinfect rail vehicles: Raaberbahn (Hungary/Austria),[cix] DPP Prague (Czech Republic).[cx] Ozone gas is not a recommended disinfectant by the CDC and is therefore not recommended in the US without further credible scientific research.

CD04- Ultraviolet Germicidal Irradiation (Emerging Technology)

This case study highlights how emerging technology may support frequent or continual inactivation of SARS-CoV-2 without chemicals.

Many organizations across a range of industry sectors rely on Ultraviolet Germicidal Irradiation (UVGI) for surface disinfection. Studies have shown that “UVGI systems can reduce microbial surface contamination in ambulance compartments, but the systems must be rigorously validated before deployment. Optimizing the UVGI fixture position and increasing the UV reflectivity of the interior surfaces can substantially improve the performance of a UVGI system and reduce the time required for disinfection.”[cxi] Yanggao, a public transportation provider in China, has begun using two UV light chambers to disinfect an entire bus at a time. Qin Jin, Deputy General Manager at Yanggao, said the process takes one person five to seven minutes to disinfect a bus compared to a spray/wipe disinfection method which can take two people thirty to forty minutes to disinfect a bus. He claims it kills more than 99.9% of viruses and it does not corrode the surfaces in the bus.[cxii] Moscow Metro in Russia has been using the UVGI for its buses and rail rolling stock as well.[cxiii]

In Denmark, Italy, China, Japan, Thailand, and South Korea, automated UVGI robots are deployed in hospitals disinfect rooms. Because the light is hazardous to human tissue, cleaning staff leave the robot in a room for 10 to 20 minutes to complete its cycle.[cxiv]

The Sahara Centre in the United Arab Emirates,[cxv] and other public buildings throughout Germany,[cxvi] China,[cxvii] Korea,[cxviii] and the Philippines[cxix] have installed UVGI devices on escalator handrails. Many of these units do not require an external power source; they use kinetic energy from the moving handrail to self-generate power.

Figure 10- In China, UV lamps inside and outside of the bus are used to disinfect surfaces.

Figure 11- A UVGI robot disinfects a hospital room in about 20 minutes.

Figure 12- UVGI escalator handrail device

CD05- "Far-UVC" Germicidal Irradiation (Emerging Technology)

Early studies suggest this emerging technology may achieve continual inactivation of SARS-CoV-2 without the risk of damaging human tissue inherent with other UVGI technologies.

Columbia University's Center for Radiological Research uses lamps that emit continuous low doses of a particular wavelength of ultraviolet light, known as far-UVC (205 to 230nm), that can kill viruses and bacteria without harming human skin, eyes and other tissues, as is the problem with conventional UV light. The technology, can be retrofitted into existing light fixtures for application in a variety of facility types. The research team's experiments have shown that far-UVC is effective for inactivating two types of airborne seasonal coronaviruses minutes after they have been breathed, coughed, or sneezed into the air. The researchers are now testing the light against the SARS-CoV-2 virus.[cxx]

Figure 13- "Far-UVC" light may allow for continuous UVGI without harming human tissues.

CD06- Heat Disinfection (Emerging Technology)

Recent studies and press releases have demonstrated that this emerging technology could disinfect a vehicle; the concept may be adapted to facilities and other physical spaces as well.

A recent scientific study published in *The Lancet Microbe* measured the stability of SARS-CoV-2 at various environmental temperatures. The study found that the virus was undetectable after being exposed to temperatures of 56°C (132.8°F) for 30 minutes or 70°C (158°F) for 5 minutes. This study does not identify specific temperature thresholds for SARS-COV-2 for virus inactivation, but it does provide a basis for considering how heat may be practically used to disinfect a surface or space.[cxxi]

Related to this study, on May 27, 2020, Ford issued a press release that they worked with Ohio State University to develop a way of modifying a police car's existing heating system to disinfect the car's interior. Jeff Jahnes and Jesse Kwiek, faculty from the Ohio State Microbiology department, issued a statement that said, "Our studies with Ford Motor Company indicate that exposing coronaviruses to temperatures of 56 degrees Celsius, or 132.8 degrees Fahrenheit, for 15 minutes reduces the viral concentration by greater than 99 percent on interior surfaces and materials used inside Police Interceptor Utility vehicles." Based on these studies, Ford rolled out a software update for 2013-2019 Police Interceptor Utility vehicles on May 27, 2020, that allows police officers to remotely trigger the heating system to temporarily raises interior temperatures beyond 133 degrees Fahrenheit for 15 minutes to help reduce the viral concentration inside the vehicle by greater than 99 percent.[cxxii] This research and demonstration applies only to one specific model of vehicle, but the science behind the effort can be adapted to other vehicle types and spaces in facilities.

Personal Protective Equipment (PPE)

The use of PPE by transit agency employees and riders has been a challenging topic. At the time of this publication, US public health officials have not provided specific guidance to transit staff about using PPE while carrying out their daily functions, although the CDC does suggest that citizens wear a cloth face covering when in public.[cxxiii] When engaging in maintenance activities, the Occupational Safety and Health Administration (OSHA) suggests that PPE be "selected based upon the hazard to the worker" or "the manufacturer's instructions" when working with equipment or cleaning products.[cxxiv] US health officials are encouraging people to wear face coverings in public; some state governors have made it a requirement to ride transit.[cxxv] However, this is difficult to enforce.

A recent scientific study published in the Journal of *Aerosol Science and Technology*[cxxvi] and later referenced in a *Science* magazine article indicates that "In Wuhan, China, it has been estimated that undiagnosed cases of COVID-19 infection, who were presumably asymptomatic, were responsible for up to 79% of viral infections... For society to resume, measures designed to reduce aerosol transmission must be implemented, including universal masking."[cxxvii]

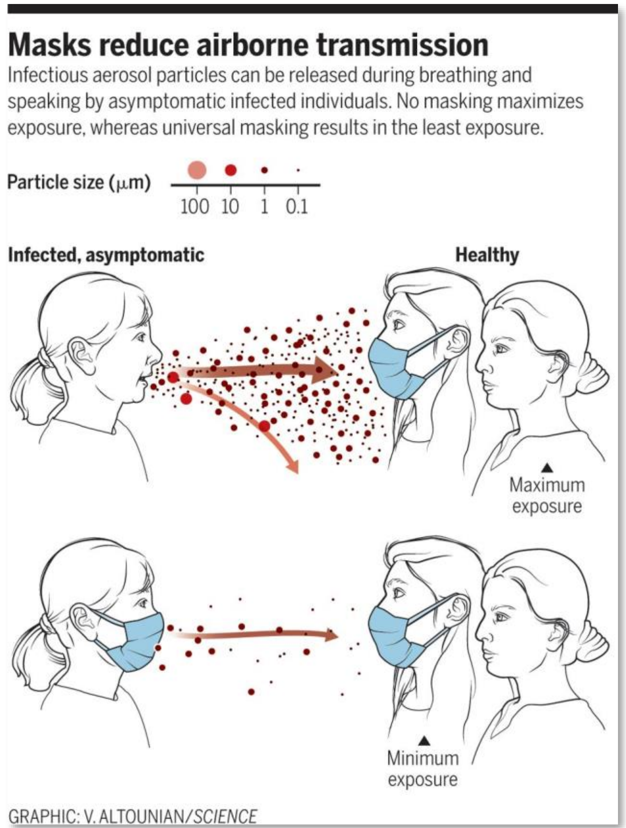
While the APTA COVID-19 Guide already provides guidance on employee and rider PPE, the additional case studies and emerging technology described below may help enhance PPE use during the pandemic.

PPE01- Passenger Face Covering Requirements and Enforcement (Case Study)

This case study highlights how transportation agencies around the world are requiring passengers to use facemasks to reduce the spread of COVID-19.

UIC surveyed rail agencies around the world in March 2020 on their responses to COVID-19. Despite guidance by some health authorities around the world for the general public to *avoid* the use of masks unless they are sick, many agencies reported they are requiring rider to use masks, and many require their employees to do so during daily work-related activities.[cxxviii] Additional examples include Amtrak, the Canadian Ministry of Transportation, Wuhan Public Transport, and Frontier Airlines.

Figure 14- Illustration from Science (a scientific journal) demonstrating the importance of universal face masking to minimize community spread of COVID-19. A high-res version of this graphic is available [here](#).



Amtrak requires all customers in stations, on trains, and on thruway buses to wear a facial covering. Facial coverings can be removed when customers are eating in designated areas, in their private rooms, or seated alone or with a travel companion in their own pair of seats. Small children who are not able to maintain a facial covering are exempt from this requirement. Amtrak customers must supply their own facial covering, and Amtrak directs customers to CDC.gov for detailed instructions on how to make their own mask. Service will be denied to customers not wearing facial coverings.[cxxix]

The Canadian Ministry of Transportation issued guidance to all passenger rail carriers to require travelers to wear a non-medical mask or face covering during their voyage when physical distancing cannot be maintained.[cxxx] In China, Wuhan Public Transport has a similar requirement and has extra staff on the rolling stock to urge passengers to wear masks.[cxxxi]

Airlines are also increasingly requiring mask usage. For example, starting on May 8, 2020, all travelers flying Frontier Airlines are required to wear a face covering over their nose and mouth throughout the journey.[cxxxii]

Because it is difficult to enforce passenger face mask usage, many agencies like LA Metro[cxxxiii] and Transport for London[cxxxiv] encourage passenger face mask usage more passively through signage and educational campaigns.

National and city governments around the world including France,[cxxxv] Taiwan,[cxxxvi] and Brussels (Belgium)[cxxxvii] have also imposed steep fines for passengers not wearing a mask while using public transportation; in all cases, the government has provided legal authority for police and the transit agency to enforce passenger face mask policies.

To make it easier for passengers to comply, some agencies such as Montgomery County Ride On (Maryland)[cxxxviii] and the Montreal Transit Authority[cxxxix] have been handing out face masks to riders; Capital Metro (Austin, Texas)[cxl] is piloting a similar effort. In Portugal, the subway systems now include vending machines to sell masks, hand sanitizer, and gloves.[cxli]

PPE02- Employee Face Covering Requirements (Case Study)

This case study was included to demonstrate that the use of face masks by transit agency employees is widely adopted across the world.

UIC surveyed 28 rail agencies around the world on employee mask usage in April and May of 2020. Of those agencies surveyed, 20 encourage or require their front-line employees to wear masks, and a majority of these agencies are providing masks to their staff.[cxlii] LA Metro,[cxliii] MBTA,[cxliv] and others provide masks to their front-line staff; in fact, according to anecdotal evidence provided by APTA, almost all transit agencies in the US recommend front-line employees use face coverings or masks and many other agencies are also providing masks to their staff.[cxlv]

PPE03- Artificial Intelligence to Monitor Mask Usage (Emerging Technology)

This emerging technology may help evaluate the effectiveness of mask usage policies and enforcement efforts.

The Paris metro system has begun piloting a new software that uses Artificial Intelligence (AI) with existing Closed-Circuit Television (CCTV) systems to identify whether passengers are using face masks. The software provider states, "the goal is not to identify or punish individuals who don’t wear masks, but to generate anonymous statistical data that will help authorities anticipate future outbreaks of COVID-19." The software provider also claims that its product is privacy-conscious and compliant with the European Union's General Data Protection Regulation.[cxlvi]

PPE04- N95 Mask Decontamination and Reuse Systems (Emerging Technology)

This emerging technology may help stem the N95 mask supply chain shortage by enabling safe reuse of masks.

Several N95 mask decontamination and reuse systems have been registered with the FDA for “Coronavirus Disease 2019 (COVID-19) Emergency Use Authorization.”[cxlvii] These systems use hydrogen-peroxide vapor to decontaminate the masks. Testing suggests that these systems safely maintain structural integrity of the masks, potentially for up to 20 cycles. The costs run to more than three dollars a mask, which is higher than a new surgical mask, and less than a new N95s mask. The system can decontaminate 80,000 N95 masks a day.[cxlviii]

PPE05- Plexiglass Shields for Operator Protection (Case Study)

This case study highlights ways to further protect operators of rubber tire vehicles while in close proximity to passengers.

The APTA COVID-19 Guide recommended strategies and actions to protect operators on rubber tire vehicles, including the use of operator shields, which can serve as a barrier against respiratory droplets from boarding passengers. Many transit agencies around the US already installed operator shields on buses; others have begun doing so more recently in response to this pandemic.[cxlix] The Southwest Ohio Regional Transit Authority (SORTA) demonstrates a unique application in this video using the shield as PPE while passengers board and alight, but also to help enforce physical distance between operators and passengers while the vehicle is in motion.[cl]

On May 5, 2020, Honda delivered 10 modified Odyssey minivans to the City of Detroit to help with patient and healthcare worker transport. According to the press release, "To protect the health of the driver from the potential for droplet infection during transportation, the Honda Odysseys have been retrofitted with a plastic barrier installed behind the front seating area, as well as modifications to the ventilation system to maintain an air pressure differential between the front and rear seating areas."[cli] These design concepts may be adapted to paratransit vehicles to offer the operator additional protection.

Figure 15- Illustration of Honda Odyssey modified for extra driver protection. The red line simulates a plexiglass shield, and the shaded areas illustrate HVAC concepts for added driver protection.

Vulnerable Populations

According to the CDC, high-risk populations include "older adults, people with underlying health conditions, people facing homelessness, incarcerated or detained people, and people who work in healthcare or other critical infrastructure jobs."[clii] Johns Hopkins Medicine has also highlighted that people of color are experiencing more illness and death due to socio-economic factors in disadvantaged neighborhoods.[cliii] The chain of infection in these vulnerable populations is key to fighting spread of COVID-19 in the broader community. The following case studies identify how concerted efforts can protect vulnerable populations during the COVID-19 pandemic.

VP01- Strategies to Address Disparate Impacts of the COVID-19 Pandemic (Case Study)

This case study, while not specific to public transportation, presents general communications strategies to help reduce the spread of COVID-19 in vulnerable populations.

On April 20, 2020, Johns Hopkins Medicine posted an article highlighting how there are ways to reduce sickness and mortality in vulnerable populations right now – specifically about ways in which to message educational information about physical distancing and testing. Recommendations from the article include:

- The use of social media and translation of messages into multiple languages in a culturally sensitive manner, and at a literacy level that is appropriate.
- Messaging should address and discourage the stigma associated with COVID-19, which may prevent symptomatic people from seeking tests and/or medical attention until they are dangerously ill. As an example, members of the immigrant community believe that seeking medical attention will make it more difficult to obtain a green card in the future; messaging should communicate that this is not true.[cliv]

VP02- Supporting the Homeless Community (Case Study)

This case study highlights how transit agencies have worked with other organizations to help protect the homeless community from COVID-19.

The Los Angeles Department of Transportation has loaned buses to the Los Angeles Fire Department to provide mobile testing centers for the homeless.[clv] The Los Angeles Homeless Services Authority has also coordinated buses to take homeless to community centers where people can go to sleep at night.[clvi] GoTriangle Transit in Durham, North Carolina, and Metro Transit in Minneapolis/St. Paul have also dedicated fleet to shuttle vulnerable populations to shelters.[clvii]

VP03- Special Paratransit Services for COVID-19 Infected Passengers (Case Study)

This case study highlights how a transit agency is helping protect paratransit riders from COVID-19.

Several transit agencies across the US have changed the way they make eligibility determinations to support customers' ability to maintain physical distancing. King County Metro has waived the certification requirement for people with disabilities who have essential transportation needs during the pandemic.[clviii] TriMet and others have modified the eligibility process to avoid in-person assessments where possible.[clix]

King County Metro's Access paratransit program is also now offering a separate service, using a dedicated sub-fleet, to transport disabled and low-income passengers who have COVID-19 symptoms or a positive diagnosis to essential services. Metro worked with local health authorities and its third-party paratransit operator to "develop the initiative, engineer customized driver shields, and provide additional safety training and personal protective equipment to employees. Passengers with COVID-19 symptoms or a positive diagnosis seeking rides [can] contact their health care provider to access this medical transport service."[clx]

Communications

Communications to transit agency employees, riders, and other stakeholders that is timely, accurate, credible, empathetic, and respectful is critical throughout the COVID-19 pandemic and into the future to help make the system safe and restore ridership. Included below are diverse but strong examples from around the world of effective customer education and engagement.

- **Ohio Department of Health, USA (Non-Transport)**
  Thirty-second video promoting physical distancing:
  https://youtu.be/o4PnSYAqQHU

- **Australian Government Department of Health, Australia (Non-Transport)**
  Ninety-second video about a contact tracing app:
  https://www.health.gov.au/resources/apps-and-tools/covidsafe-app

- **Singapore Mass Rapid Transit, Singapore (Rail)**
  Thirty-second video showing employees and riders taking precautions:
  https://www.facebook.com/SMRTCorpSG/videos/mask-up/667936903781462/?__so__=permalink&__rv__=related_videos

- **Ferrovienord, Italy (Rail)**
  Thirty-second video showing bi-lingual posters:
  https://www.youtube.com/watch?v=J2nB3MIpmsc

- **Japan Rail East, Japan (Rail)**
  Agency website and customer advertisements educate riders on railcar HVAC systems:
  https://www.jreast.co.jp/
  https://www.jreast.co.jp/e/pdf/air_circulation_e.pdf

- **Cathay Pacific, China (Aviation)**
  Three-minute video detailing precautionary measures taken to protect customers:

https://www.cathaypacific.com/cx/en_HK/travel-information/travel-preparation/travel-advisories/novel-coronavirus-information-centre/precautionary-measures.html

- **Auckland Transport, New Zealand (Transit)**
  Two-minute video that helps customer anticipate changes to the transit system during the COVID-19 pandemic: https://youtu.be/PGBjEC7gkqs

Pandemic Management Frameworks

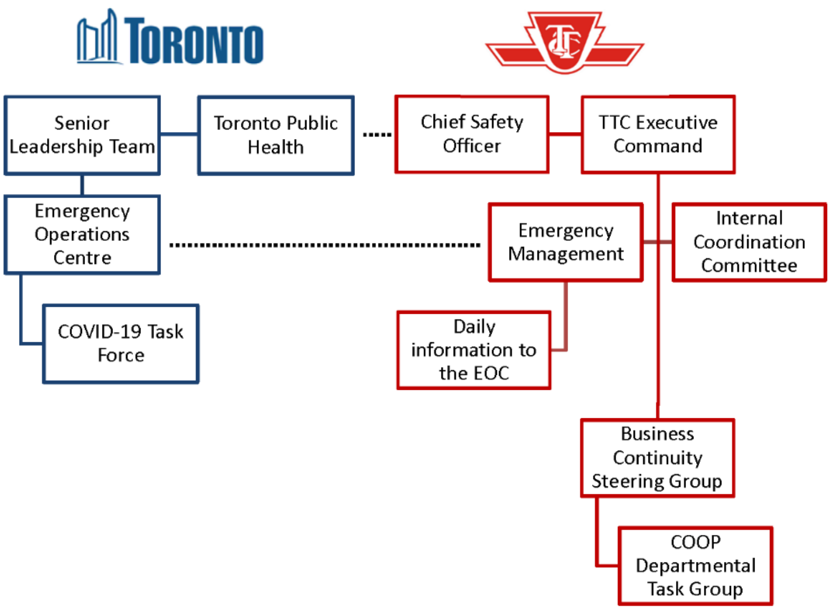
US transit agencies may consider the case studies below to help organize pandemic response and recovery.

MF01- Partnership with Local Health Authority (Case Study)

This case study highlights how partnerships between a transit agency and public health officials are supporting informed decision-making during the pandemic.

The Toronto Transit Commission (TTC) combined forces with its local public health leaders to drive transit management decisions with the best available science. TTC continues to work extensively with Toronto Public Health (TPH) to develop processes and guidelines for employees and/or contractors who have tested positive for COVID-19.[clxi] TTC's internal response plan is collaborative with TPH. In daily operations, TTC and TPH work also together on infection investigation and testing. Once advised of a positive diagnosis, the TTC immediately engages TPH to jointly investigate and determine next steps, including notifying those who may need to take additional action. When a TTC employee who is an essential frontline worker or required to support frontline work exhibits symptoms of COVID-19, TPH provides them with a letter recommending priority testing. TPH also authorizes return of TTC employees to work.

Figure 16- Organizational chart showing partnership between TPH and TTC in response to the pandemic.



MF02- COVID-19 Advisory Committee (Case Study)

This case study highlights how an advisory committee, including scientific experts and stakeholder representatives, is being used to provide the leaders of an organization with access to credible scientific information and demonstrate stakeholder inclusivity in the pandemic decision-making process.

The Metropolitan Transportation Commission (MTC) is the transportation planning, financing, and coordinating agency for the nine-county San Francisco Bay Area. On May 7, 2020, the MTC announced the creation of a 30-person task force that includes elected officials, transit operators, labor representatives, advocates for people with disabilities, transit advocates, social justice advocates, and business representatives to guide Bay Area (regional) pandemic recovery planning efforts.[clxii]

Figure 17- MTC Blue Ribbon Task Force for Regional Pandemic Recovery Planning

A North Carolina courthouse in Pitt County provides another example of an advisory committee that includes scientific advisors. On May 14, 2020, Pitt County held the first meeting of its COVID-19 Courthouse Advisory Committee. According to news media:

> The purpose of this committee will be to provide advisory recommendations to the courthouse decision-makers on how the court and courthouse procedures and operations can resume in a safe and healthy environment and in a timely manner in light of the COVID-19 pandemic. Members include leaders from the county court system, county public health authority, academia, and private sector representatives.
>
> At some point, we will resume normal court functions so cases can be heard and addressed, and we want Pitt County, our local stakeholders, and the public to be as prepared as possible during this unprecedented time,' said Senior Resident Superior Court Judge Marvin K. Blount. 'We all know and understand that it cannot and will not be business as usual, but we want everyone who works in our courthouse, those who have matters with the court, and the public to be as safe as they can knowing that we have collectively tried to address the health and safety concerns related to our Pitt County Courthouse and our local justice system.'[clxiii]

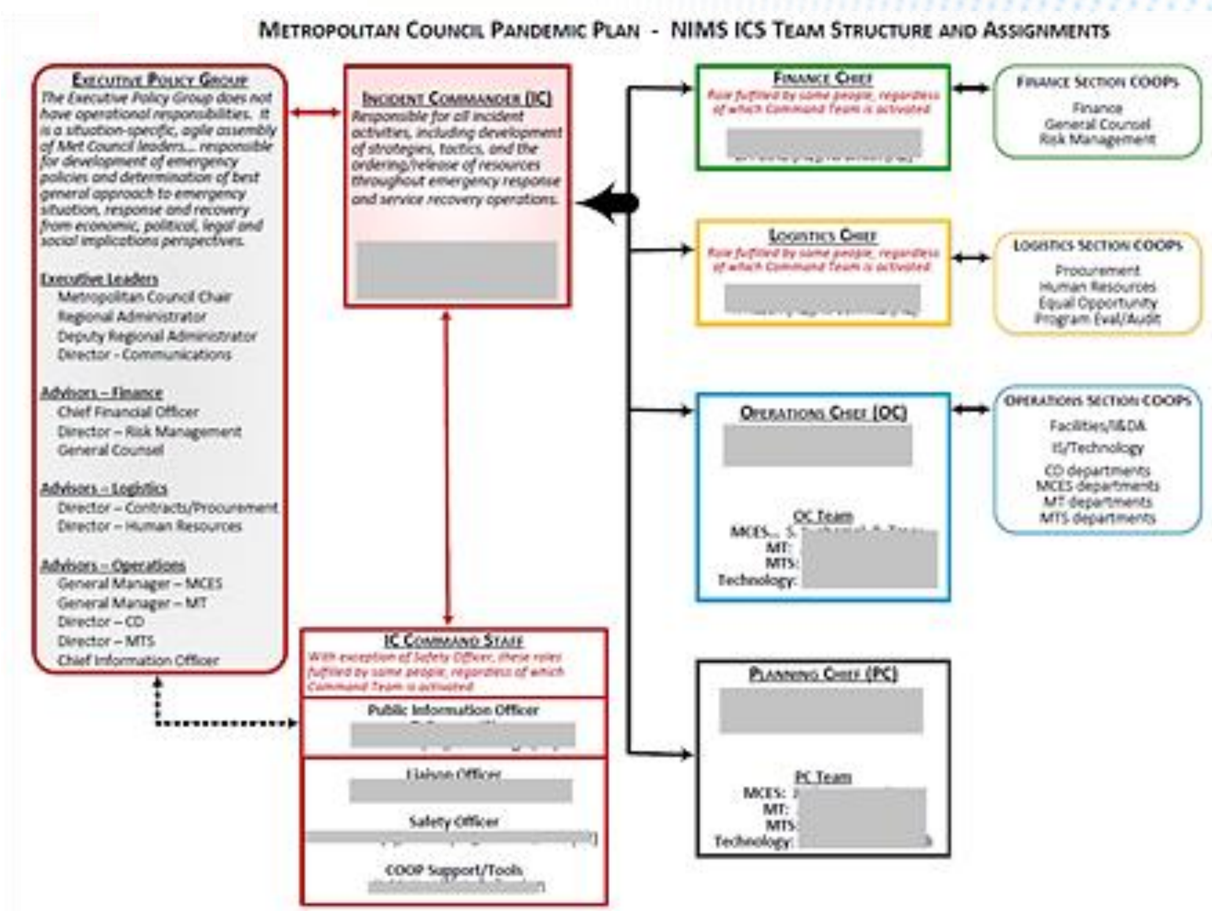
This type of committee can provide MTC and the Pitt County courthouse with stakeholder insight to add insight and credibility to their decision-making process. The Pitt County courthouse example also enhances their decision-making process with access to public health and medical advisors that are in-tune with local needs, lending to further credibility to their pandemic recovery planning efforts.

MF03- NIMS Framework (Case Study)

This case study highlights how a standardized method of organization for emergency management is supporting regional coordination during the pandemic.

For the duration of the pandemic, Metro Transit in Minneapolis/St. Paul and the Tri-County Metropolitan Transportation District of Oregon (TriMet) have been using the Federal Emergency Management Administration (FEMA) National Incident Management System (NIMS) framework to organize emergency response.[clxiv][clxv] NIMS provides a common, nationwide approach to enable the whole community to work together to manage all threats and hazards. NIMS applies to all incidents, regardless of cause, size, location, or complexity. This framework organizes agency leaders and key stakeholders to manage an emergency and rapidly get bottom-line information for quick and effective decision-making. Because NIMS is a national emergency management standard in the US, it provides transit emergency managers with a standard vocabulary and operating model for coordination with neighboring jurisdictions.

Figure 18- Metro Transit's NIMS organizational chart for the pandemic



MF04- Alert Level System (Case Study)

This case study highlights how a risk-based management framework is setting expectations and streamlining communications with a broad range of stakeholders in this pandemic.

New Zealand has managed the pandemic with considerable success to-date, and one facet of their managerial approach is their Alert Level System.[clxvi] According to the New Zealand Government website: “The Alert System was introduced in March 2020 to manage and minimize the risk of COVID-19 in New Zealand. The system helps people understand the current level of risk and the restrictions that must be followed accordingly. This includes increasing or decreasing limits on human contact, travel and business operations.”

The New Zealand COVID-19 Alert Level System clearly describes four alert levels and control measures required for each level: Level 4- Lockdown; Level 3- Restrict; Level 2- Reduce; Level 1- Prepare. Different parts of the country may be at different Alert Levels. This framework allows for easy communication and compliance with pre-determined protocols as the dynamic situation of the pandemic evolves.

Figure 19- A matrix showing the four "Alert Levels" in New Zealand, which is part of their pandemic management framework.

New Zealand COVID-19 **Alert Levels Summary**

Unite against COVID-19

- The Alert Levels are determined by the Government and specify the public health and social measures to be taken in the fight against COVID-19. Further guidance is available on the **Covid19.govt.nz** website.
- The measures may be updated based on new scientific knowledge about COVID-19, information about the effectiveness of control measures in New Zealand and overseas, or the application of Alert Levels at different times (e.g. the application may be different depending on if New Zealand is moving down or up Alert Levels).
- Different parts of the country may be at different Alert Levels. We can move up and down Alert Levels.
- Essential services including supermarkets, health services, emergency services, utilities and goods transport will continue to operate at any level. Employers in those sectors must continue to meet health and safety obligations.
- Restrictions are cumulative (e.g. at Alert Level 4, all restrictions from Alert Levels 1, 2 and 3 apply).

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Alert Level	Risk Assessment	Range of Measures (can be applied locally or nationally)	
Level 4 – Lockdown Likely the disease is not contained	• Community transmission is occurring. • Widespread outbreaks and new clusters.	• People instructed to stay at home in their bubble other than for essential personal movement. • Safe recreational activity is allowed in local area. • Travel is severely limited. • All gatherings cancelled and all public venues closed.	• Businesses closed except for essential services (e.g. supermarkets, pharmacies, clinics, petrol stations) and lifeline utilities. • Educational facilities closed. • Rationing of supplies and requisitioning of facilities possible. • Reprioritisation of healthcare services.
Level 3 – Restrict High risk the disease is not contained	• Community transmission might be happening. • New clusters may emerge but can be controlled through testing and contact tracing.	• People instructed to stay home in their bubble other than for essential personal movement – including to go to work, school if they have to, or for local recreation. • Physical distancing of two metres outside home (including on public transport), or one metre in controlled environments like schools and workplaces. • People must stay within their immediate household bubble, but can expand this to reconnect with close family / whānau, or bring in caregivers, or support isolated people. This extended bubble should remain exclusive. • Schools (years 1 to 10) and Early Childhood Education centres can safely open, but will have limited capacity. Children should learn at home if possible. • People must work from home unless that is not possible. • Businesses can open premises, but cannot physically interact with customers.	• Low risk local recreation activities are allowed. • Public venues are closed (e.g. libraries, museums, cinemas, food courts, gyms, pools, playgrounds, markets). • Gatherings of up to 10 people are allowed but only for wedding services, funerals and tangihanga. Physical distancing and public health measures must be maintained. • Healthcare services use virtual, non-contact consultations where possible. • Inter-regional travel is highly limited (e.g. for essential workers, with limited exemptions for others). • People at high risk of severe illness (older people and those with existing medical conditions) are encouraged to stay at home where possible, and take additional precautions when leaving home. They may choose to work.
Level 2 – Reduce The disease is contained, but the risk of community transmission remains	• Household transmission could be occurring. • Single or isolated cluster outbreaks.	• People can reconnect with friends and family, and socialise in groups of up to 10, go shopping, or travel domestically, if following public health guidance. • Keep physical distancing of two metres from people you don't know when out in public or in retail stores. Keep one metre physical distancing in controlled environments like workplaces, where practicable. • No more than 10 people at gatherings (to be reviewed 25 May), except funerals and tangihanga, which can have a maximum of 50 people if registered with Ministry of Health. • Businesses can open to the public if following public health guidance including physical distancing and record keeping. Alternative ways of working are encouraged where possible. • Hospitality businesses must keep groups of customers separated, seated, and served by a single person. Until 21 May alcohol can only be served when purchasing a meal. Maximum of 100 people at a time.	• Sport and recreation activities are allowed, subject to conditions on gatherings, record keeping, and – where practical – physical distancing. • Public venues such as museums, libraries and pools can open if they comply with public health measures and ensure 1 metre physical distancing and record keeping. • Event facilities, including cinemas, stadiums, concert venues and casinos have a limit of 100 customers in each workplace at any time, with 1 metre physical distancing and record keeping. • Health and disability care services operate as normally as possible. • It is safe to send your children to schools, early learning services and tertiary education. There will be appropriate measures in place. • People at higher-risk of severe illness from COVID-19 (e.g. those with underlying medical conditions, especially if not well-controlled, and seniors) are encouraged to take additional precautions when leaving home. They may work, if they agree with their employer that they can do so safely.
Level 1 – Prepare The disease is contained in New Zealand	• COVID-19 is uncontrolled overseas. • Isolated household transmission could be occurring in New Zealand.	• Border entry measures to minimise risk of importing COVID-19 cases. • Intensive testing for COVID-19. • Rapid contact tracing of any positive case. • Self-isolation and quarantine required. • Schools and workplaces open, and must operate safely. • Physical distancing encouraged.	• No restrictions on gatherings. • Stay home if you're sick, report flu-like symptoms. • Wash and dry hands, cough into elbow, don't touch your face. • No restrictions on domestic transport – avoid public transport or travel if sick.

This Alert Level System efficiently communicates with a wide range of audiences and sets clear expectations for what will happen in an unpredictable situation like this pandemic. The Alert Level System is also similar to the four stages of recovery that many US governors have included in their reopening plans and can be considered as a model for transit agencies to set expectations for employees, riders, and contractors alike.

MF05- Risk-Based Transportation Operations Framework (Case Study)

This case study highlights how intra-agency communication and risk-based planning can enable agencies to rapidly adjust operating procedures in any part of the transit system based on real-time conditions.

On April 11, 2020, the China Ministry of Transport issued the second edition of its COVID-19 control guide (China Control Guide).[clxvii] Translation of the China Control Guide was performed by a Google service for purposes of this Report. While many of the practices in the China Control Guide do not align with CDC guidelines, the general framework could be acceptable for use in the US. The China Control Guide breaks down activities by mode; within each mode it provides specifications for each of the following activity types, by location, with special requirements for each level of risk:

- Disinfection
- Ventilation
- Crowding Controls
- Employee Screenings
- Passenger Screenings
- PPE
- Public Communications

Note some of the details/criteria in the China Control Guide excerpt below do not align US public health guidance. This excerpt is only provided to illustrate how operational protocols are organized in the China Control Guide.

Figure 20- A section of the China Ministry of Transport COVID-19 Control Guide (China Control Guide) that depicts includes three columns to indicate how operational procedures should be modified based on high, medium, or low risk areas in the transit system. While some details in the China Control Guide do not align with CDC guidelines, the general framework could be acceptable for use in the United States.

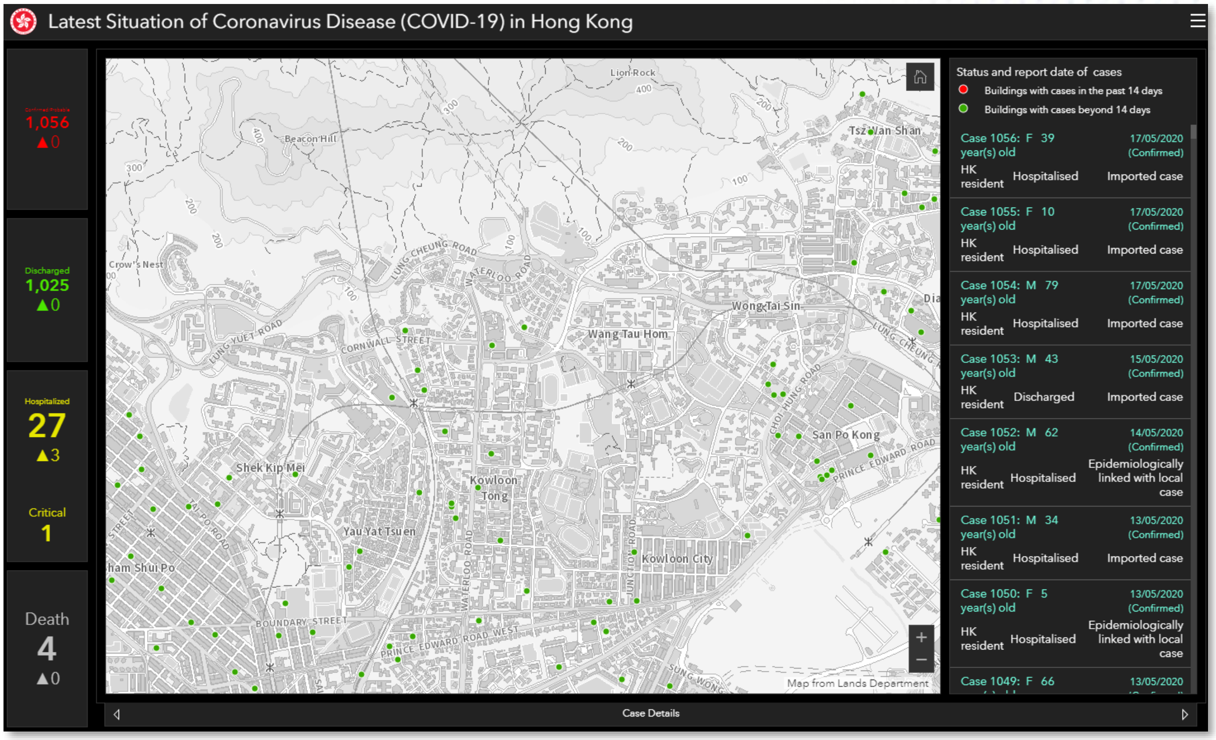
<table>
<tr><th colspan="3">Project</th><th>High-risk areas</th><th>Medium Risk Areas</th><th>Low-risk areas</th><th>Note</th></tr>
<tr><td rowspan="7">Disinfection</td><td rowspan="6">Station</td><td>Frequent passenger contact with facility equipment (site) disinfection frequency: Station security equipment, self-service ticketing equipment, gate machines, etc.</td><td>Once per hour</td><td>Once per 4 hours</td><td>Morning or evening, once each</td><td>In the event a person's fever, immediately disinfect the contact area and facilities equipment.</td></tr>
<tr><td>Passengers easy to contact facility equipment (site) disinfection frequency : Stair handrails, escalator handrails, public health room door handles, four walls of straight-stairs, etc.</td><td>Once per 4 hours</td><td>Once per 6 hours</td><td>Morning or evening, once each</td><td></td></tr>
<tr><td>Frequent disinfection frequency in passenger contact areas: Closed environment of the station entrance sentry and exit, platform, station hall, public restroom, etc.</td><td>Once per 4 hours</td><td>Once per 6 hours</td><td>Morning or evening, once each</td><td></td></tr>
<tr><td>Re-use of one-time ticket (card) disinfection frequency</td><td>Once per day</td><td>Once per 3 days</td><td>Once per week</td><td rowspan="4"></td></tr>
<tr><td>Air conditioning filter disinfection frequency (or replacement filter frequency)</td><td>Disinfect 1 time per 3-5 days (or replace once per 15 days)</td><td>Disinfect 1 time per 5-7 days (or replace once per 15 days)</td><td>Disinfect 1 time per 7-10 days (or routine repair)</td></tr>
<tr><td>Toilet hand sanitizer</td><td>Equipped with</td><td>Equipped with</td><td>Equipped with</td></tr>
<tr><td>Train</td><td>Frequency of disinfection inside the carrier : Grip, column, handrail, door and other passenger slots easy to touch</td><td>Once per 4 hours</td><td>Once per 6 hours</td><td>—</td></tr>
</table>

MF06- Local Situational Dashboard (Case Study)

This case study highlights how data transparency is helping to build employee and public confidence that an organization is actively managing the pandemic for positive health outcomes.

Early in the pandemic, the Government of the Hong Kong Special Administrative Region (HKSAR) established a Local Situational Dashboard which is publicly available on the internet.[clxviii] The dashboard was meant to provide transparency and build citizens' confidence that the pandemic was being actively managed. While this example conveys community health statistics, which is not an appropriate dataset for a transit agency to maintain, it is presented in this Report to showcase the value of data transparency to citizens that are impacted by the pandemic.

Figure 21- Hong Kong Special Administrative Region (HKSAR) established a Local Situational Dashboard. The concept of a public, real-time dashboard can be used to build confidence that a transit agency is monitoring and managing the situation.



Transit agencies can consider if this concept of public data transparency can be applied to the types of safety-related data being tracking in the agency. The Washington Metropolitan Area Transit Authority (WMATA) maintains a COVID-19 public information dashboard to track the number of employees that a had confirmed SARS-CoV-2 infection, the number that have returned to work, and the number that have been hospitalized.[clxix] For the first 100 cases of employee SARS-CoV-2 infection, WMATA made even more details available to the public including known location of potential exposure to other contacts and if a cleaning/disinfecting process was completed in that location.[clxx]

One smaller example of this is the ONClean real-time dashboard being piloted by Ontario Northland (ONTC), a bus operator in Canada.[clxxi] This new web application allows bus riders to type in a vehicle ID and see the cleaning history for that vehicle (e.g., how many minutes/hours since it was last cleaned and disinfected). In addition to helping the transit agency have a better assurance system in place for its vehicle cleaning/disinfection regimen, ONTC hopes that this transparency with the riding public will help reduce their fears of riding during the pandemic.

Figure 22- ONTC public dashboard for real-time cleaning history of buses

MF07- Dedicated COVID-19 Employee Phone Lines (Case Study)

This case study highlights how credible medical information about SARS-CoV-2 and COVID-19 is being made available to transit employees.

The Imperial College London's Transport Strategy Centre benchmarked the COVID-19 responses from over 100 metro, rail, bus, light rail, and airport operators. The information in their report has been anonymized to respect confidentiality according to the protocols of each group. Their study, published on April 27, 2020, states, "Dedicated phone lines are being opened for [transit] staff to obtain information; these may be staffed by medical professionals."[clxxii]

Image Credits

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