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Inspector General

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July 11, 2019

Andy Byford  
President  
MTA New York City Transit  
2 Broadway, 20<sup>th</sup> Floor  
New York, NY 10004

**Re: Second Avenue Subway  
Escalators Outages  
MTA/OIG #2018-61**

Dear Mr. Byford:

Since the opening on January 1, 2017 of the Second Avenue Subway line (SAS) and its three newly constructed stations at 72nd Street, 86th Street, and 96th Street in Manhattan, the Office of the MTA Inspector General (OIG) received numerous complaints regarding escalator service at these stations. Generally speaking, the complaints concerned the frequency of outages, the prolonged downtime before restoration of service, and the challenges of having to walk up steep escalators to exit the station—the equivalent of seven or eight flights of stairs at the 69th Street and 83rd Street exits, which have no elevators—when all of the escalators in the escalator bank were out-of-service or where the only operating unit was moving in the downward direction.

The OIG analyzed escalator outage and repair data for the 15 month period after service commenced, and found that many of the escalators installed at SAS stations repeatedly failed to meet NYC Transit's performance goal for escalator service. Although that goal is to have each of its escalators available for customers at least 95.2 percent of the time on average each month, only 3 of the 32 SAS escalators met that goal from January 1, 2017 to March 31, 2018.

While escalator outages at *any station* frustrate and inconvenience riders, the frequent and prolonged outages at the SAS stations are especially troubling because the escalators there are comparatively brand new. Most concerning, though, is that NYC Transit cannot adequately explain why these new escalators are so frequently out-of-service. As more fully described below, our analysis found patterns and trends (collectively "trends") in escalator outages. NYC Transit managers told us they were unaware of the outage trends but agreed that they should be thoroughly analyzed. For its part, our analysis points to underlying issues that when corrected should lead to better performance of SAS escalators and provide the agency with valuable lessons that could help to improve future escalator procurement before the next phase of SAS.

Our findings and recommendations follow. We appreciate your response to our draft report and have incorporated your comments and commitment to implemented the recommendations into this report.

## FINDINGS

### SAS Escalator Outages Occurred Repeatedly

An escalator “outage” as used here means an unscheduled service outage, as opposed to one planned for reasons such as preventative maintenance. The unscheduled outage is precipitated by the activation of a sensor, which activation is itself likely caused by a mechanical breakdown or safety issue. Each SAS escalator is equipped with more than a dozen safety sensors and any one of the sensors when activated will stop the escalator. Each outage must be investigated and the cause addressed by a qualified mechanic before the escalator can be returned to service. Consequently, the number of such outages is an indicator of the frequency at which a prompt response and corrective action or repair was necessary.

Consistent with complaints of frequent outages, we found that seven of the escalators at SAS stations repeatedly experienced a higher number of outages than the average of all escalators operated by NYC Transit in Manhattan.<sup>1</sup> Eight other SAS escalators experienced a higher number of outages during one or more of the five quarters that we analyzed. As shown in Table 1 (below), regarding the seven worst SAS escalators, NYC Transit’s Manhattan escalators experienced an outage 19 times per quarter on average, or approximately once every five days. In contrast, to take just one example, SAS escalator ES288, at the 72<sup>nd</sup> Street station was out of service approximately once every two days in the fourth quarter of 2017 (45 outages), and approximately once every three days in the first quarter of 2018 (37 outages).

**Table 1: Worst SAS Escalators for Unscheduled Outages**

Station/Escalator	1 <sup>st</sup> Quarter 2017	2 <sup>nd</sup> Quarter 2017	3 <sup>rd</sup> Quarter 2017	4 <sup>th</sup> Quarter 2017	1 <sup>st</sup> Quarter 2018
ES288 72 <sup>nd</sup> Street	13	13	28	45	37
ES290 72 <sup>nd</sup> Street	40	32	27	20	28
ES295 72 <sup>nd</sup> Street	7	14	30	23	25
ES296 72 <sup>nd</sup> Street	65	33	15	9	31
ES 274 86 <sup>th</sup> Street	16	10	22	22	21
ES259 96 <sup>th</sup> Street	28	10	22	32	33
ES260 96 <sup>th</sup> Street	15	13	27	19	23
<b>Manhattan Average</b>	19	19	20	19	18

<sup>1</sup> Of the 139 Manhattan escalators, the average age of the 107 non-SAS escalators is approximately 15 years; the oldest of these are 28 years old. South Ferry escalators were excluded from this analysis because they began operating in the third quarter of 2017.

## Trends in SAS Escalator Outages are Disturbing

Our analysis found trends in escalator outages that warrant further investigation by NYC Transit. Some examples follow.

- There was a significant negative performance differential between the 10 escalators at the 72<sup>nd</sup> Street station, which were designed, manufactured, installed, and maintained by the Schindler Elevator Corporation (Schindler), and the 22 escalators at the 86<sup>th</sup> Street and 96<sup>th</sup> Street stations, which were designed, manufactured, and installed by the KONE Corporation (KONE) and maintained by Slade Industries Inc. The 22 KONE escalators experienced 46 outages on average per escalator during the 15 month period of our review while the 10 Schindler escalators experienced 83 outages on average per escalator—80 percent more than the KONE average—in that same period.
- Almost half of all escalator outages at the 72<sup>nd</sup> Street station (46.4 percent) were attributed to the triggering of a comb-impact safety sensor.<sup>2</sup> In contrast, 17 percent of the outages at the 86<sup>th</sup> Street and 96<sup>th</sup> Street stations combined were attributed to the triggering of that sensor. What caused the sensors to trigger and the reason for the difference in outage rates are not clear.
- More than 25 percent of the outages at the 86<sup>th</sup> Street station were attributed to being triggered by activation of one of the emergency stop buttons on the escalator. These buttons, which must be activated manually, are located conspicuously at the top and bottom landings of each escalator. Why these activations occurred is unknown.
- The handrail safety sensor for one escalator at the 96th Street station and one at the 72nd Street station initiated 30 and 12 outages, respectively. The handrail safety device stops the escalator if the moving handrails fail to synchronize with the escalator steps because of slippage, loosening, or breakage. The cause of the failure or of any defect in the handrail or sensors is also unknown.

When we discussed our analysis with managers of the NYC Transit Elevator and Escalator Department (E&E), they stated that they were unaware of the trends in escalator outages, but agreed that these trends should be thoroughly investigated. Moreover, according to one E&E manager, the maintainers assigned by Schindler and Slade to SAS escalators are not currently assigned to any one particular station, and therefore are likely to be unaware of outages that occur repeatedly over several weeks or months.

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<sup>2</sup> A comb plate provides an interface between the moving steps and the stationary landing at each end of the escalator. A comb-impact safety sensor is located on each side of each of the comb plates. The sensor will shut down the escalator when a foreign object is trapped between the comb plate and steps or an activating force is exerted near the sensor.

E&E's Chief Officer told the OIG that E&E's Support Operations unit produces a weekly and monthly report on escalator outages. However, these reports examine trends over only a short period of time. For example, E&E's "Excessive Outage" Report spotlights escalators that experienced a relatively high number of unscheduled outages during the two-week period preceding the report. The short period of time examined is often insufficient to reveal patterns or trends. Additionally, these reports do not examine specific types of escalator outages, such as those related to comb plates or handrails.

### **The Contractor Hired by NYC Transit to Maintain the Escalators at the 72<sup>nd</sup> Street Station Performed Unacceptably.**

E&E, which is responsible for managing NYC Transit's two-year escalator maintenance contract with Schindler at the 72<sup>nd</sup> Street station, found the contractor's performance unacceptable. For example, as reported by E&E, during the first six months of 2018, Schindler failed to adequately perform 67 percent of the required preventative maintenance on the escalators at the 72<sup>nd</sup> Street station.

In a letter to Schindler from NYC Transit's Contract Superintendent dated July 10, 2018, Schindler was notified that although the vendor "has been made aware of its deficiencies . . . with respect to its maintenance and repair obligations [at 72<sup>nd</sup> Street] [and] has been given ample opportunity to correct these deficiencies, yet they remain serious and uncorrected." Accordingly, the Contract Superintendent rated Schindler's performance "Unsatisfactory." "Specifically," according to this letter, "Schindler has missed multiple Preventative Maintenances required under the operative schedule, while others have been either incomplete or performed too quickly to allow for a comprehensive approach to the required tasks . . . This has resulted in unnecessary and unscheduled shutdowns, thereby directly impacting our ridership."<sup>3</sup>

By reply letter dated August 3, 2018, Schindler pledged to implement a corrective action plan demanded by NYC Transit. E&E told us that since pledging to improve its performance, Schindler has been performing PM's, but its response to service calls is still often untimely. Schindler's continuing failure to meet performance requirements in its contract with NYC Transit, despite its "Unsatisfactory" rating and opportunity for improvement, is extremely troubling.

Indeed, E&E management has acknowledged to the OIG that the relatively high number of escalator outages that OIG found when analyzing performance trends at the 72<sup>nd</sup> Street station correlate with Schindler's poor preventative maintenance practices. NYC Transit should not continue to tolerate the contractor's abysmal maintenance performance. If Schindler fails to correct its performance deficiencies, NYC Transit should strongly consider terminating its contract with the company.

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<sup>3</sup> NYC Transit has assessed liquidated damages totaling more than \$314,000, 36 percent of the \$870,402 that Schindler billed NYC Transit for its services through the first 10 months of the contract.

Notably, Schindler is under contract to MTA Capital Construction (MTACC) to fabricate and install 17 elevators and 45 escalators for the MTA-Long Island Railroad's (LIRR) East Side Access (ESA) project. The contract includes an option—to be exercised at LIRR's discretion—for Schindler to maintain these escalators and elevators after service commences. The contract also includes an option for the fabrication, installation and maintenance of an additional five elevators and two escalators, which option has not yet been executed. Before even considering these options, MTACC and LIRR need to very carefully evaluate Schindler's equipment installed for ESA and its poor performance history at SAS stations.

As recommended below, NYC Transit should promptly conduct a root cause analysis of the outages to date at the SAS station. This analysis aside, NYC Transit managers have already told us that some outages at 72<sup>nd</sup> Street were caused by failures of the sprocket welds on some Schindler escalators, and the safety brakes on others. Additionally, it remains an open question whether Schindler's design, manufacture, and/or its installation of the escalators at 72<sup>nd</sup> Street, also caused or contributed to their outages in the first place. Accordingly, NYC Transit should promptly communicate to MTACC and LIRR all issues regarding the Schindler escalators, so that MTACC and LIRR can carefully consider them during the testing and commissioning of ESA escalators. Perhaps most important, MTACC should ensure that all necessary escalator testing and commissioning tasks are conducted without delay so that any escalator repairs are performed well before ESA is opened for service.

### **Future Escalator Procurements**

As part of a study regarding future procurements, NYC Transit Capital Program Management is overseeing a consultant analyzing the agency's elevator and escalator capital projects, including design criteria and processes, procurement, manufacture, construction, maintainability, and the process for accepting the work, including field testing. The study's scope-of-work sets out its purpose as follows:

NYCT will continue to make significant investments installing new station elevators and escalators and replacing elevators and escalators that have reached the end of their useful lives. The purpose of this consulting agreement is to obtain the services of a Vertical Transportation Engineering Consultant (the Consultant) to provide an analysis and recommendations concerning the procedures and practices to be used for these capital projects to ensure that NYCT's investments achieve the best results possible for customers.

The scope-of-work directs the Consultant to "speak with maintainers regarding lessons learned during the maintenance/repair cycle that could feed back into the design process." In our view, however, NYC Transit itself must probe deeply into the causes of repeated escalator outages at SAS and other stations with recently installed escalators, either through this study or a separate one. We believe that a root-cause analysis of recurring outages experienced by these new escalators could provide valuable information that would be helpful in shaping future escalator designs and procurements.

For example, if any escalator outages at the three SAS stations were caused by design issues, then incorporating the lessons learned from a root cause analysis of these issues into future designs could be critical to the success of future escalator projects—a compelling reason for performing the root-cause analysis well before the commencement of the next phase of SAS.

Our analysis of escalator trends at SAS stations also found that escalators that we classified as “Very-Long” experienced on average, 83.4 outages over the 15 months of our review, approximately 70 percent more outages than experienced by the shorter escalators, which averaged between 46.7 and 49.4 outages (see Table 2 below). Very-Long escalators are located at the 83<sup>rd</sup> Street entrance/exit to the 86<sup>th</sup> Street Station, which has three, and at the 72nd Street Station which has six: three at the 69<sup>th</sup> Street entrance/exit, and three at the 72<sup>nd</sup> Street entrance/exit.<sup>4</sup>

**Table 2: Outages by Escalator Length  
 Second Avenue Subway January 2017 to March 2018**

Escalator Length & Step Count		Number of Escalators	Outages	
			Total	Average
<b>Short:</b>	12-17 Foot (63 to 77 Steps)	10	467	46.7
<b>Medium:</b>	27-37 Foot (108 to 125 Steps)	10	494	49.4
<b>Long:</b>	45 Foot (164 Steps)	3	140	46.7
<b>Very-Long:</b>	68-78 Foot (242 to 269 Steps)	9	751	83.4

E&E managers told OIG that the length of an escalator could affect its performance because of the additional weight placed on the escalator by the very large trusses and chains that are its key components. In addition to resolving present concerns about these escalators, NYC Transit needs to address a fundamental question regarding future procurements: If Very-Long escalators experience significantly more outages than shorter ones, what are the ramifications for escalator designs for the next phase of Second Avenue Subway, which includes new stations at 106<sup>th</sup> Street, 116<sup>th</sup> Street and 125<sup>th</sup> Street?

**During Escalator Outages, Greater Accommodation Must be Provided to Riders Exiting SAS Stations**

Consistent with complaints of riders regarding the challenges of exiting SAS stations during outages, the OIG has made observations confirming that when two escalators in a bank of three are out-of-service, the last escalator is often not running upwards to accommodate riders trying

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<sup>4</sup> For this analysis, we assigned each of the 32 SAS escalators to one of four groupings based on the escalator’s length (see Table 2).

to leave the station. NYC Transit should ensure, when possible, that the last in-service escalator in an escalator bank is running from the station to the street.

To give just one example, on January 25, 2018, riders trying to leave by the 69<sup>th</sup> Street exit to the 72<sup>nd</sup> Street Station walked up the equivalent of some seven steep flights of stairs, when two of the three escalators in this bank were simultaneously experiencing outages, and the remaining operational escalator was running in a downward direction.<sup>5</sup> Notably, there are no elevators at this exit nor is that fact evident before passing through the turnstile. Passengers who are unable to traverse this steep and lengthy flight of stairs would then have to re-enter the station—after paying an additional fare—and walk to the 72<sup>nd</sup> Street elevator or escalator to exit the station.

We recognize that operational issues must be considered before an escalator can be reversed. The reversal process typically requires two NYC Transit personnel, one at the bottom of the escalator and one at the top, in order to make sure that no customers try to use the escalator while it is being reversed. However, NYC Transit should establish a procedure that when two escalators in a bank of three are out-of-service the remaining one is quickly redirected upward where operational conditions permit. Significantly, this is not simply a customer satisfaction issue. Depending on the physical condition of the customer and the surrounding conditions at the station, the challenges involved may pose serious risks to health and safety as well.

## RECOMMENDATIONS

In order to help improve the performance of SAS escalators and identify patterns or trends in escalator outages that could help improve future designs and procurements, the OIG made five recommendations to NYC Transit. In your written response, which we have incorporated below, you agreed with all of our recommendations and detailed the actions that you have taken and will take to implement them. The OIG will continue to monitor as appropriate.

1. Require that E&E promptly conduct a root cause analysis of the outages to date at the SAS stations, and conduct subsequent similar analyses when there are repeatedly-occurring outages.

*Agency Response: Agreed. "We will track excessive outages, review causes, and ensure that the maintenance company contracted addresses recurring nuisance faults."*

2. Ensure that the contractors responsible for maintenance services at Second Avenue Subway stations are performing all preventative maintenance tasks required under contract and responding in a timely manner to all service calls. If any of the contractors

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<sup>5</sup> The escalators at the 69<sup>th</sup> Street entrance/exit to the 72<sup>nd</sup> Street Station are more than 68 feet in length. Similarly, the escalators located at the 83<sup>rd</sup> Street and 2<sup>nd</sup> Avenue entrance/exit to the 86<sup>th</sup> Street Station are 77 feet in length, and there is no elevator at this exit.

fail to perform in accordance with contract terms, strongly consider terminating their contracts and recover damages as appropriate.

*Agency Response: Agreed. "We will track compliance with the contract requirements pertaining to scheduled maintenance and response time, apply liquidated damages when necessary, and take steps through procurement and the vendor evaluation process to terminate non-performing contractors."*

3. Communicate to MTACC and LIRR

- a. The lessons learned from NYC Transit's root cause analysis and the OIG's review regarding the escalator outages at the SAS stations, so that MTACC and LIRR can carefully consider them during the testing and commissioning of ESA escalators, and
- b. Schindler's maintenance performance at SAS stations.

*Agency Response: Agreed. "We have contacted our counterparts at MTACC and LIRR and will meet to discuss lessons learned during our testing and commissioning process, and the subsequent maintenance contracts."*

4. Require that NYC Transit Capital Program Management investigate the trends in outages for all recently-installed escalators, with the goal of improving future escalator designs and procurements. Such analysis—which should be performed now or in the very near future—should seek to

- a. Identify the root causes of repeatedly occurring escalator outages and determine how the results could be used to inform future designs and procurements; and
- b. Determine why Very-Long escalators breakdown on average more frequently than shorter escalators, and how the results could be used to inform future designs and procurements.

*Agency Response: Agreed. "In coordination with our counterparts in Capital Program Management, we will discuss ways to improve future contracts and designs. We will also analyze the reasons behind the tendency of longer escalators to break down more frequently than shorter escalators and how this analysis can be used in future designs."*



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5. Establish a procedure, as appropriate and practicable, that when two escalators in a bank of three are out-of-service at SAS stations, the last escalator is set to take riders to the street.

*Agency Response: Agreed. "[I]n coordination with the Division of Stations, [the Elevators and Escalators Department] will develop a formal procedure. Our normal practice is to always prioritize service in that upward direction."*

We appreciate the cooperation provided to us by Kevin Moylan, Assistant Chief Officer Elevators and Escalators; Joseph Curry, Superintendent Subways Elevators and Escalators; John McGrath, CPM Construction Engineer and other members of your staff. Please provide us with your comments within 30 days. Should you have any questions, or need additional information, please contact me at (212) 878-0007 or Executive Deputy Inspector General Elizabeth Keating at (212) 878-0022.

Very truly yours,



Carolyn Pokorny

Cc: Sally Librera, Senior Vice President, Subways  
Janno Lieber, Chief Development Officer