



**Bureau Veritas-National Elevator
Inspection Services, Inc.**

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**Bay Terrace II
Elevator Maintenance Audit Survey and Report**

April 19, 2022

Prepared For:

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EXECUTIVE SUMMARY

A. SCOPE

BV-NEIS was commissioned by the Tacoma Housing Authority, to evaluate the level of preventive maintenance, deficiencies observed, overall condition of the existing equipment and adherence to the maintenance contract requirements provided by Mitsubishi Elevator. The vertical transportation equipment reviewed is located at Bay Terrace II in Tacoma, Washington.

A site review of the physical system components currently in use at Bay Terrace II was conducted by Cory Hunter, Consultant with BV-NEIS on April 18, 2022, to determine condition, performance, effectiveness of maintenance and code compliance. Performance measurements and ride quality were appropriated with regard to operation and evaluated based on similar installations and compared to established BV-NEIS and industry standards.

The results of the evaluation and all noted deficiencies are specifically delineated within this report.

While we recommend you review the entire report, for your convenience we have summarized our findings within this first section including any items requiring immediate attention of the Maintenance Contractor and/or Property Manager.

B. EQUIPMENT IDENTIFICATION

The following elevator equipment was surveyed:

Bay Terrace II – Tacoma, Washington						
Building	Elevator(s)	Elevator Type	Speed	Capacity	Landings	Install/Mod Date
Bay Terrace II	1	Roped-Hydraulic	150	4,000	4	2017

C. ELEVATOR EQUIPMENT CONDITION SURVEY

1. Bay Terrace II: The roped hydraulic elevator at Bay Terrace II was installed by Mitsubishi in 2017. The power unit design is unusual, potentially due to the size and location of the electrical clearances in the machine room. Typical dry pump units of this size have a motor mounted underneath the frame. Mitsubishi has confirmed the original Baldor motor was problematic and was replaced several times and now they have installed a Reliant motor, which has better reliability.
2. Bay Terrace II, Phase 1 Building: We were not asked to review the Phase 1 building but after being onsite, we recommend adding access control to the elevator to keep unauthorized access to the building for safety.

D. EVALUATION OF MAINTENANCE

Mitsubishi Elevator currently provide maintenance service on this property.

The maintenance service levels being provided by Mitsubishi are satisfactory. Mitsubishi provides an adequate amount of spare parts on site to facilitate repairs and reduce shutdown time in case of minor part failure. Mitsubishi has not stocked a replacement motor, which if it fails, may leave the only elevator on the property out of service for extended periods of time.

We have evaluated and rated the observed maintenance conditions as follows:

Mitsubishi Elevator						
	Housekeeping	Lubrication	Replacement /Repair	Adjustment	Record Keeping	Overall Average
Rating = 1-4	3.5	3.0	2.5	3.0	3.0	3.0
Meets Requirements	Yes	Yes	NO	Yes	Yes	NO

Our evaluation of work is based on the following ratings:

Rating	Description
1.	A rating of "1" indicates unacceptable levels of maintenance service provided by the Contractor. This level of maintenance requires a significant increased effort by the maintenance Contractor in several areas in order to justify payment of the monthly contract. Approximately 15% of equipment reviews approach this level.
2.	A rating of "2" indicates below average levels of maintenance in most areas. Typically, some short-term, increased intensified effort is required by your maintenance contractor to improve to the acceptable rating of 3. Approximately 35% of our equipment reviews result in this rating.
3.	A rating of "3" indicates acceptable or average levels of maintenance services being provided by your maintenance contractor. Improvements may be required in specific areas as noted. Approximately 40% of our equipment reviews result in this rating.
4.	A rating of "4" indicates above average levels of maintenance provided by your maintenance contractor. This results in very good overall system performance and operational characteristics of the vertical transportation equipment. Equipment will have infrequent shutdowns due to maintenance-related problems. Approximately 10% of our equipment reviews result in this rating.

E. IMMEDIATE ACTION ITEMS

Contractor Items: The major areas of concern requiring immediate action by the contractor are also located in the deficiency tables below and are:

1. Schedule testing with Owner.

F. CONCLUSION

Mitsubishi Elevator is providing average maintenance service. The original equipment on this property was installed in 2017. As the equipment continues to wear and age, it is critical the minimum maintenance hours of service in the contract are provided to extend the life of these major components.

We recommend Mitsubishi complete the deficiencies noted within 60 calendar days. Upon evidence provided by the contractor of completed deficiencies, a follow up site review may be conducted if requested and scheduled.

This report should be forwarded to the Contractor for their review and action. If the estimated schedule for completion of deficiency items necessitates a meeting to discuss changes, we will contact you to coordinate the most convenient time for all concerned parties.

This concludes our Report Summary. We affirm you will find this report beneficial in evaluating your ongoing vertical transportation maintenance program. Should you have any questions regarding our review, report, etc., please contact us at your convenience.

MAINTENANCE REVIEW

A. DISCUSSION

A quality elevator maintenance program is designed to minimize risk to the Owner and improve reliability for the life of the equipment. Regular and systematic maintenance will ensure the equipment operates within applicable codes, maintains safe operation and avoids high cost repairs.

Maintenance of vertical transportation equipment can be categorized into the following general areas: Housekeeping, Lubrication, Replacement/Repair and Adjustment and Record Keeping.

1. Housekeeping: Over half the time spent maintaining the equipment on site should be allocated to housekeeping. Fire hazards can be evident when there is oil, dirt and debris in the hoistway. Worn components are discovered during routine cleaning. Buildup of dirt causes malfunctions and unnecessary trouble calls. Clean projects allow for maintenance and inspections to be conducted more efficiently.
2. Lubrication: Proper lubrication reduces equipment wear and extends the life of mechanical systems. Newer equipment is beginning to utilize materials and technologies that reduce the need for ongoing lubrication.
3. Replacement and Repair: Regular and systematic repair and replacement of components will extend the life of the elevator system. Parts should be replaced or rebuilt prior to causing a shutdown or callback. Early detection and replacement of worn components reduces unnecessary unscheduled downtime and repairs.
4. Adjustments: Properly adjusted equipment keeps the vertical transportation system operating quietly and efficiently. Adjustments include elevator speed and performance levels being maintained within the original design standards.
5. Record Keeping: Record keeping of maintenance, repairs and testing are required by code. Most jurisdictions require a Maintenance Control Program (MCP). A Maintenance Control Plan (MCP) for each elevator or escalator is mandatory in jurisdictions that have adopted the 2000 or more recent edition of the ASME A7.1/CSA B44 elevator code. Building owners or managers are responsible for having an MCP for each elevator or escalator in the building. The contracted maintenance company is responsible for developing and executing the plan. Maintenance and repair records must be maintained and available for review. We review the onsite MCP and records of maintenance and repair during our site review. This includes all the tasks and procedures required for each piece of equipment and records of the maintenance visits, tests and repairs.

These areas of maintenance are not mutually exclusive of each other. When a routine preventative maintenance visit is being conducted for a specific task, the technician may detect failure of another component or adjustment that is required in another area while working simultaneously on multiple areas.

RECOMMENDATIONS TO OWNER

A. GENERAL

Our recommendations and opinion of probable costs for upgrading the vertical transportation equipment at this facility are included in this section. We also include recommendations for upgrading the equipment to conform to current State Codes, National code and ADA requirements. The first category outlined below notes short term upgrades to the equipment. These are upgrades that should be planned and budgeted to be completed within the next one to five years. The second category discusses long term equipment upgrade recommendations. These are items that should be planned and budgeted to be completed in the next five to ten years, or sooner, based on your requirements.

A complete and comprehensive modernization includes labor and material to install the elevator equipment only, with 12 months of warranty maintenance. This will include all the equipment necessary to meet current ASME A17.1 code and ADA. Our recommendations do not include costs for building related work that must be completed during the modernization such as electrical, mechanical or general construction work. We did not include an opinion of probable cost for the building related work, we can provide that upon request.

The elevator equipment was installed by Mitsubishi and is only 5 years old. Although the warranty period has expired, most of the major system components are covered under a full maintenance agreement. Should the maintenance contract go out to bid, and during the bid process they identify the motor issues the new vendors may qualify they will not cover the pump motor under full maintenance services. The Tacoma Housing Authority may be exposed to the risk for ongoing costs related to the pump motor or pump unit replacement. We have confirmed with Mitsubishi the new replacement motor manufactured by Reliant is more reliable. They have been trying to troubleshoot some overload issues with the starter and motor and feel they have resolved the issue. We recommend keeping Mitsubishi on this property as the maintenance contractor for the near future in the event the motor or starter fail, it will be their responsibility to resolve the repair.

The Bay Terrace II Phase I building needs to have access control added to the elevator. There have been ongoing issues with unauthorized access to the building through the parking garage. We recommend adding key fob access control to the elevator.

B. SHORT TERM RECOMMENDATIONS

There are no short-term recommendations at this time.

C. LONG TERM RECOMMENDATIONS

The equipment should be modernized in 15-20 years. Construction documents should be prepared prior to the modernization to identify related building work items and code required upgrades at that time by a vertical transportation consultant. Costs should be escalated to adjust for inflation.

Description		Opinion of Probable Cost(2022)
1.	We recommend planning to modernize the equipment in 15 years.	\$ 140,000
2.	Building Related Work/Code Updates	TBD
Total:		\$ 140,000

ELEVATOR PERFORMANCE

A. DISCUSSION

This section reviews the individual adjustment and operation of elevators and elements associated with the operation of specific components or equipment of the elevator system. These standards have been established by either the maintenance agreement, code, established BV-NEIS standards, NEII standards, or standards common to the elevator industry.

Performance times are adjustable and can be changed to meet the need and conditions of each building. Performance criteria may be listed in the preventative maintenance agreement, which will then be the basis of evaluation, depending on the agreement type and details. The criterion used to evaluate the performance measured on each elevator is defined below.

B. PERFORMANCE CRITERIA

Item	Criteria
1	Car Speed: Elevator speed is measured with a tachometer. Contract speed should be maintained within criteria range indicated on individual performance evaluations.
2	Floor-to-Floor Performance: Time measured from the instant the doors begin to close until doors are 3/4 open for center-opening doors or 1/2 open for side-opening doors.
3	Stopping Zone: Measured while the car is stopped at the landing. ADA 407.4.4 requires maximum 1/2". Typically, 1/4" can be achieved depending on the individual equipment.
4	Door Open Time: Measured when the doors begin to open until the doors are fully open. Door time performance recommendations are based on the individual door operator equipment installed while providing smooth operation and long equipment life.
5	Door Closing Time: Measured from when the doors begin to close until the doors are fully closed. The ASME A17.1 Code, 2.13.4, limits door closing time by defining the level of kinetic energy generated during door closing operation. We indicate the closing time which approximates this code requirement based on average door weight.
6	Car Door Hold Open Time: Measured from when doors are fully open until the doors begin to close when responding to a car call. Minimum time of 3 seconds required by The Americans with Disabilities Act (ADA). This is the time the doors remain open so passengers can exit.
7	Reopening Device Door Time: Measured from the fully open position until the doors begin to close after interrupting the door protective devices.
8	Nudging Time: Measured from the instant the doors reach the fully open position until the door buzzer sounds and the doors begin to close at reduced speed even though the door protective devices are interrupted.
9	Door Closing Force: Measured with a spring pressure gauge as the doors begin to close. The measured value is the force required to prevent the doors from closing under power. ASME A17.1 Code requires the force needed to stall the closing door be no more than 30 force pounds.
10	Hall Door Hold Open Time: Measured from the instant the doors are fully open until the doors begin to close in response to a hall call registration. 5 seconds minimum required by The Americans with Disabilities Act (ADA).
11	Operation: Subjective evaluation of the quality of ride and door operation. The elements reviewed are: Acceleration Up, Acceleration Down, Deceleration Up, Deceleration Down, Elevator Stop, Door Open, and Door Close.
12	Safety: Communication devices, car door protection devices, car stop switch and alarm bell and emergency lighting for the car are checked to verify they are functioning properly.

ELEVATOR PERFORMANCE EVALUATION

ELEVATOR 1									
Project Name:	Bay Terrace II		Permit ID #:	121801	Group:	1	Review Date:	4/18/21	
Project Location:	2550 S. G Street		Machine Type:	Hydraulic		Elevator Type:	Passenger		
City & State:	Tacoma, WA 98405		Floors Served:	Front:	4	Rear:	0		
Manufacturer (OEM):	Mitsubishi		Capacity:	4,000 lbs.		Contract Speed:	150 fpm		
Contractor:	Mitsubishi		Safety Tests:	Annual	☒ Yes ☐ No	Date Completed:	7/2021		
Install/Mod. Date:	2017			5-Year	☒ Yes ☐ No	Date Completed:	6/2017		
Elevator Information									
Typical Floor Height:	160"		Between Floors:	G-1		Door Operator Speed:	Medium		
Door Type:	Single Speed Center Opening		Door Size:	Height 84 & Width 48		Pre-Opening:	N/A		
	Measured		Target Criteria		Meets Criteria		Comments		
Speed Up ±10%	153 FPM		135-165 FPM		Yes				
Speed Down -20%	109 FPM		120-165 FPM		Yes		Acceptable with no load		
Performance Up	19.1 SEC		13.8 SEC		NO		Requires Adjustment		
Performance Down	21.7 SEC		13.8 SEC		NO		Requires Adjustment		
Stopping Zone ±1/4"	±1/4"		±1/4"		Yes				
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments		
Door Open	2.4 SEC	N/A	2.2 SEC	NO	N/A				
Door Close	2.5 SEC	N/A	2.7 SEC	Yes	N/A				
Short Hold Open (Car Call)	3.6 SEC	N/A	3.0-5.0 SEC	Yes	N/A				
Interrupted Ray Hold Open	3.0 SEC	N/A	>3.0* SEC	Yes	N/A				
Nudging Hold Open	43.0 SEC	N/A	20.0-25.0 SEC	Yes	N/A	Acceptable for this application			
Extended Door Close Time (Nudging)	4.07 SEC	N/A	4.5 SEC	NO	N/A	(1.68 x min. door close time)			
Stall Pressure	24 LBS	N/A	≤30 LBS	Yes	N/A				
Long Hold Open (Hall Call)	5.5 SEC	N/A	5.0-8.0 SEC	Yes	N/A				
Lanterns Call Notification (Hall Call)	N/A	N/A	5.0-10.0 SEC	N/A	N/A				
Observations	Meets Criteria	Comments	Features		Installed	Tested	Comments		
Acceleration	NO	Requires Adjustment	Emergency Light		Yes	NO			
Ride	Yes		Fire Service Ph1		Yes	NO			
Deceleration	Yes		Fire Service Ph2		Yes	NO			
Stop	Yes		Fire Phone Jack		N/A	N/A			
Door Operation	Yes		Standby Power		N/A	N/A			
Door Protection	Yes		Telephone		Yes	NO			
Door Open Button	Yes		Intercom		Yes	Yes			
Alarm Button	Yes		Stop Switch		Yes	NO			
Car Lighting Guarded	Yes		Seismic Operation		Yes	NO			
False Call Cancel	N/A		Door Restriction		Yes	NO			
Additional Comments									
1. Ongoing motor issues with pump unit.									
2.									
3.									

ELEVATOR DEFICIENCIES

Item	Description: Items requiring correction are indicated by ☐. Items corrected are indicated by ✓.	1
1.	Correct leaking oil cooler.	☐
2.	Lubricate felt oilers.	☐
3.	Remove pads from pit.	☐
4.	Adjust acceleration/deceleration leveling time.	☐
5.	Schedule and complete testing.	☐
6.	Adjust door opening time to 2.2 seconds.	☐
7.	Adjust extended door nudging time to >4.5 seconds.	☐
8.	Adjust the floor-to-floor performance time to 13.8 seconds.	☐

SUPPORTING PHOTOGRAPHS



1. Elevator testing should be scheduled and completed.



2. Door equipment is clean, lubricate felt oilers.



3. Cartop is clean



4. Remove oil pads from pit.



5. Roped hydraulic piston sheaves are in serviceable condition.



6. Correct leaking oil cooler.



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**Site 001 K Street
Elevator Maintenance Audit Survey and Report**

April 26, 2022

Prepared For:

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EXECUTIVE SUMMARY

A. SCOPE

BV-NEIS was commissioned by the Tacoma Housing Authority, to evaluate the level of preventive maintenance, deficiencies observed, overall condition of the existing equipment and adherence to the maintenance contract requirements provided by TK Elevator. The vertical transportation equipment reviewed is located at 911 N. K Street in Tacoma, Washington.

A site review of the physical system components currently in use at 911 N. K Street was conducted by Cory Hunter, Consultant with BV-NEIS on April 18, 2022, to determine condition, performance, effectiveness of maintenance and code compliance. Performance measurements and ride quality were appropriated with regard to operation and evaluated based on similar installations and compared to established BV-NEIS and industry standards.

The results of the evaluation and all noted deficiencies are specifically delineated within this report.

While we recommend you review the entire report, for your convenience, we have summarized our findings within this first section including any items requiring immediate attention of the Maintenance Contractor and/or Property Manager.

B. EQUIPMENT IDENTIFICATION

The following elevator equipment was surveyed:

911 N. K Street – Tacoma, Washington						
Building	Elevator(s)	Elevator Type	Speed	Capacity	Landings	Install/Mod Date
911 N. K Street	1	Hydraulic	125	2,500	4	1999/2017
911 N. K Street	2	Hydraulic	125	4,500	4	2017

C. ELEVATOR EQUIPMENT CONDITION SURVEY

1. 911 N. K Street: TK elevator modernized the hydraulic elevators at 911 N. K Street in 2017. The equipment is in good condition and with proactive preventative maintenance; the elevators should perform reliably for 15 more years.

D. EVALUATION OF MAINTENANCE

TK Elevator currently provides maintenance service on this property. The maintenance service levels being provided by TK Elevator are satisfactory. TK Elevator provides an adequate amount of spare parts on site to facilitate repairs and reduce shutdown time in case of minor part failure.

We have evaluated and rated the observed maintenance conditions as follows:

TK Elevator						
	Housekeeping	Lubrication	Replacement /Repair	Adjustment	Record Keeping	Overall Average
Rating = 1-4	3.0	3.0	3.0	3.0	3.0	3.0
Meets Requirements	Yes	Yes	Yes	Yes	Yes	Yes

Our evaluation of work is based on the following ratings:

Rating	Description
1.	A rating of "1" indicates unacceptable levels of maintenance service provided by the Contractor. This level of maintenance requires a significant increased effort by the maintenance Contractor in several areas in order to justify payment of the monthly contract. Approximately 15% of equipment reviews approach this level.
2.	A rating of "2" indicates below average levels of maintenance in most areas. Typically, some short-term, increased intensified effort is required by your maintenance contractor to improve to the acceptable rating of 3. Approximately 35% of our equipment reviews result in this rating.
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4.	A rating of "4" indicates above average levels of maintenance provided by your maintenance contractor. This results in very good overall system performance and operational characteristics of the vertical transportation equipment. Equipment will have infrequent shutdowns due to maintenance-related problems. Approximately 10% of our equipment reviews result in this rating.

E. IMMEDIATE ACTION ITEMS

Contractor Items: The major areas of concern requiring immediate action by the contractor are also located in the deficiency tables below and are:

1. Check packing on Car 1.
2. Adjust door lock on level 3, Car 1.

F. CONCLUSION

TK Elevator is providing average maintenance service. The original equipment on this property was modernized in 2017. As the equipment continues to wear and age, it is critical the minimum maintenance hours of service in the contract are provided to extend the life of these major components.

We recommend TK Elevator complete the deficiencies noted within 60 calendar days. Upon evidence provided by the contractor of completed deficiencies, a follow up site review may be conducted if requested and scheduled.

This report should be forwarded to the Contractor for their review and action. If the estimated schedule for completion of deficiency items necessitates a meeting to discuss changes, we will contact you to coordinate the most convenient time for all concerned parties.

This concludes our Report Summary. We affirm you will find this report beneficial in evaluating your ongoing vertical transportation maintenance program. Should you have any questions regarding our review, report, etc., please contact us at your convenience.

MAINTENANCE REVIEW

A. DISCUSSION

A quality elevator maintenance program is designed to minimize risk to the Owner and improve reliability for the life of the equipment. Regular and systematic maintenance will ensure the equipment operates within applicable codes, maintains safe operation and avoids high cost repairs.

Maintenance of vertical transportation equipment can be categorized into the following general areas: Housekeeping, Lubrication, Replacement/Repair and Adjustment and Record Keeping.

1. Housekeeping: Over half the time spent maintaining the equipment on site should be allocated to housekeeping. Fire hazards can be evident when there is oil, dirt and debris in the hoistway. Worn components are discovered during routine cleaning. Buildup of dirt causes malfunctions and unnecessary trouble calls. Clean projects allow for maintenance and inspections to be conducted more efficiently.
2. Lubrication: Proper lubrication reduces equipment wear and extends the life of mechanical systems. Newer equipment is beginning to utilize materials and technologies that reduce the need for ongoing lubrication.
3. Replacement and Repair: Regular and systematic repair and replacement of components will extend the life of the elevator system. Parts should be replaced or rebuilt prior to causing a shutdown or callback. Early detection and replacement of worn components reduces unnecessary unscheduled downtime and repairs.
4. Adjustments: Properly adjusted equipment keeps the vertical transportation system operating quietly and efficiently. Adjustments include elevator speed and performance levels being maintained within the original design standards.
5. Record Keeping: Record keeping of maintenance, repairs and testing are required by code. Most jurisdictions require a Maintenance Control Program (MCP). A Maintenance Control Plan (MCP) for each elevator or escalator is mandatory in jurisdictions that have adopted the 2000 or more recent edition of the ASME A7.1/CSA B44 elevator code. Building owners or managers are responsible for having an MCP for each elevator or escalator in the building. The contracted maintenance company is responsible for developing and executing the plan. Maintenance and repair records must be maintained and available for review. We review the onsite MCP and records of maintenance and repair during our site review. This includes all the tasks and procedures required for each piece of equipment and records of the maintenance visits, tests and repairs.

These areas of maintenance are not mutually exclusive of each other. When a routine preventative maintenance visit is being conducted for a specific task, the technician may detect failure of another component or adjustment that is required in another area while working simultaneously on multiple areas.

RECOMMENDATIONS TO OWNER

A. GENERAL

Our recommendations and opinion of probable costs for upgrading the vertical transportation equipment at this facility are included in this section. We also include recommendations for upgrading the equipment to conform to current State Codes, National code and ADA requirements. The first category outlined below notes short term upgrades to the equipment. These are upgrades that should be planned and budgeted to be completed within the next one to five years. The second category discusses long term equipment upgrade recommendations. These are items that should be planned and budgeted to be completed in the next five to ten years, or sooner, based on your requirements.

A complete and comprehensive modernization includes labor and material to install the elevator equipment only, with 12 months of warranty maintenance. This will include all the equipment necessary to meet current ASME A17.1 code and ADA. Our recommendations do not include costs for building related work that must be completed during the modernization such as electrical, mechanical or general construction work. We did not include an opinion of probable cost for the building related work, we can provide that upon request.

The elevator equipment was modernized by TK Elevator in 2017. We recommend adding minimum hours onsite the maintenance agreement.

B. SHORT TERM RECOMMENDATIONS

There are no short-term recommendations at this time.

C. LONG TERM RECOMMENDATIONS

The equipment should be planned for modernized in 15 years. Construction documents should be prepared prior to the modernization to identify related building work items and code required upgrades at that time by a vertical transportation consultant. Costs should be escalated to adjust for inflation.

Description		Opinion of Probable Cost(2022)
1.	We recommend planning to modernize the equipment in 15 years.	\$ 300,000
2.	Building Related Work/Code Updates	TBD
Total:		\$ 300,000

ELEVATOR PERFORMANCE

A. DISCUSSION

This section reviews the individual adjustment and operation of elevators and elements associated with the operation of specific components or equipment of the elevator system. These standards have been established by either the maintenance agreement, code, established BV-NEIS standards, NEII standards, or standards common to the elevator industry.

Performance times are adjustable and can be changed to meet the need and conditions of each building. Performance criteria may be listed in the preventative maintenance agreement, which will then be the basis of evaluation, depending on the agreement type and details. The criterion used to evaluate the performance measured on each elevator is defined below.

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10	Hall Door Hold Open Time: Measured from the instant the doors are fully open until the doors begin to close in response to a hall call registration. 5 seconds minimum required by The Americans with Disabilities Act (ADA).
11	Operation: Subjective evaluation of the quality of ride and door operation. The elements reviewed are: Acceleration Up, Acceleration Down, Deceleration Up, Deceleration Down, Elevator Stop, Door Open, and Door Close.
12	Safety: Communication devices, car door protection devices, car stop switch and alarm bell and emergency lighting for the car are checked to verify they are functioning properly.

ELEVATOR PERFORMANCE EVALUATION

ELEVATOR 1									
Project Name:	Site 001 K Street		Permit ID #:	13503PH	Group:	1	Review Date:	4/18/22	
Project Location:	911 N. K Street		Machine Type:	Hydraulic		Elevator Type:	Passenger		
City & State:	Tacoma, WA		Floors Served:	Front:	4	Rear:	0		
Manufacturer (OEM):	TK Elevator		Capacity:	2,500 lbs.		Contract Speed:	125 fpm		
Contractor:	TK Elevator		Safety Tests:	Annual	☒ Yes ☐ No	Date Completed:	9/2021		
Install/Mod. Date:	1999/2017			5-Year	☒ Yes ☐ No	Date Completed:	7/2018		
Elevator Information									
Typical Floor Height:	115"		Between Floors:	G-1		Door Operator Speed:	Medium		
Door Type:	Two Speed-Side Opening		Door Size:	Height 84" & Width 42"		Pre-Opening:	N/A		
	Measured		Target Criteria		Meets Criteria		Comments		
Speed Up ±10%	129 FPM		113-137 FPM		Yes				
Speed Down -20%	112 FPM		100-137 FPM		Yes				
Performance Up	17.4 SEC		16.3 SEC		NO				
Performance Down	18.2 SEC		16.3 SEC		NO				
Stopping Zone ±1/4"	±1/4"		±1/4"		Yes				
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments		
Door Open	2.6 SEC N/A		3.1 SEC		Yes N/A				
Door Close	4.9 SEC N/A		4.0 SEC		NO N/A				
Short Hold Open (Car Call)	4.1 SEC N/A		3.0-5.0 SEC		Yes N/A				
Interrupted Ray Hold Open	3.1 SEC N/A		>3.0* SEC		Yes N/A				
Nudging Hold Open	21.0 SEC N/A		20.0-25.0 SEC		Yes N/A				
Extended Door Close Time (Nudging)	7.3 SEC N/A		6.7 SEC		Yes N/A		(1.68 x min. door close time)		
Stall Pressure	27 LBS N/A		≤30 LBS		Yes N/A				
Long Hold Open (Hall Call)	5.5 SEC N/A		5.0-8.0 SEC		Yes N/A				
Lanterns Call Notification (Hall Call)	9.1 SEC N/A		5.0-10.0 SEC		Yes N/A				
Observations	Meets Criteria	Comments	Features		Installed	Tested	Comments		
Acceleration	NO	Requires Adjustment	Emergency Light		Yes	NO			
Ride	Yes		Fire Service Ph1		Yes	NO			
Deceleration	Yes		Fire Service Ph2		Yes	NO			
Stop	Yes		Fire Phone Jack		N/A	N/A			
Door Operation	Yes		Standby Power		N/A	N/A			
Door Protection	Yes		Telephone		Yes	NO			
Door Open Button	Yes		Intercom		Yes	Yes			
Alarm Button	Yes		Stop Switch		Yes	NO			
Car Lighting Guarded	Yes		Seismic Operation		Yes	NO			
False Call Cancel	N/A		Door Restriction		Yes	NO			
Additional Comments									
1. Replace certificates in elevators with correct permit									
2. Adjust door lock on 3.									
3. Repack piston.									
4. Check oil container in pit.									
5. Lubricate rails.									

ELEVATOR 2									
Project Name:	Site 001 K Street		Permit ID #:	13504PH	Group:	2	Review Date:	4/18/22	
Project Location:	911 N. K Street		Machine Type:	Hydraulic		Elevator Type:	Passenger		
City & State:	Tacoma, WA		Floors Served:	Front:	4		Rear:	0	
Manufacturer (OEM):	TK Elevator		Capacity:	4,500 lbs.		Contract Speed:	125 fpm		
Contractor:	TK Elevator		Safety Tests:	Annual	☒ Yes	☐ No	Date Completed:	9/2021	
Install/Mod. Date:	2017		Safety Tests:	5-Year	☒ Yes	☐ No	Date Completed:	7/2018	
Elevator Information									
Typical Floor Height:	115"		Between Floors:	G-1		Door Operator Speed:	Medium		
Door Type:	Two Speed-Side Opening		Door Size:	Height 84" & Width 48"		Pre-Opening:	N/A		
	Measured		Target Criteria		Meets Criteria		Comments		
Speed Up $\pm 10\%$	114 FPM		113-137 FPM		Yes				
Speed Down -20%	86 FPM		100-137 FPM		Yes		Acceptable with no load		
Performance Up	16.0 SEC		16.3 SEC		Yes				
Performance Down	15.0 SEC		16.3 SEC		Yes				
Stopping Zone $\pm 1/4"$	$\pm 1/4"$		$\pm 1/4"$		Yes				
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments		
Door Open	1.6 SEC N/A		3.5 SEC		Yes N/A				
Door Close	3.0 SEC N/A		4.6 SEC		Yes N/A				
Short Hold Open (Car Call)	5.8 SEC N/A		3.0-5.0 SEC		Yes N/A				
Interrupted Ray Hold Open	4.8 SEC N/A		>3.0" SEC		Yes N/A				
Nudging Hold Open	20.1 SEC N/A		20.0-25.0 SEC		Yes N/A				
Extended Door Close Time (Nudging)	7.5 SEC N/A		7.7 SEC		Yes N/A		(1.68 x min. door close time)		
Stall Pressure	25 LBS N/A		≤ 30 LBS		Yes N/A				
Long Hold Open (Hall Call)	9.4 SEC N/A		5.0-8.0 SEC		Yes N/A				
Lanterns Call Notification (Hall Call)	13.1 SEC N/A		5.0-10.0 SEC		Yes N/A		Acceptable		
Observations	Meets Criteria	Comments	Features		Installed	Tested	Comments		
Acceleration	Yes		Emergency Light		Yes	NO			
Ride	Yes		Fire Service Ph1		Yes	NO			
Deceleration	Yes		Fire Service Ph2		Yes	NO			
Stop	Yes		Fire Phone Jack		N/A	N/A			
Door Operation	Yes		Standby Power		N/A	N/A			
Door Protection	Yes		Telephone		Yes	NO			
Door Open Button	Yes		Intercom		Yes	Yes			
Alarm Button	Yes		Stop Switch		Yes	NO			
Car Lighting Guarded	Yes		Seismic Operation		Yes	NO			
False Call Cancel	N/A		Door Restriction		Yes	NO			
Additional Comments									
1. Clean pit.									
2.									

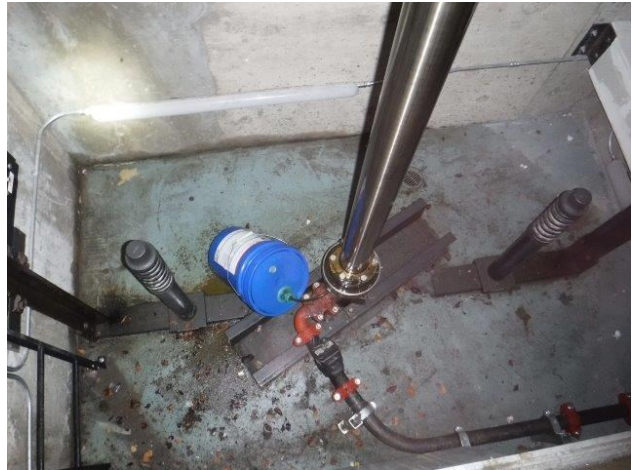
ELEVATOR DEFICIENCIES

Item	Description: Items requiring correction are indicated by ☐ . Items corrected are indicated by ☒ .	1	2
1.	Clean pits.	☐	☐
2.	Place parts in cabinet.	☐	☐
3.	Place correct certificates in each car.	☐	☐
4.	Adjust acceleration/deceleration leveling time.	☐	
5.	Adjust door lock on 3	☐	
6.	Check pit oil collection container and packing.	☐	
7.	Lubricate rails.	☐	

SUPPORTING PHOTOGRAPHS



1. Organize spare parts in cabinet.



2. Clean pits, typical.



3. Cartop is clean, typical.



4. Cartops are clean.



**Bureau Veritas-National Elevator
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**Site 003 G Street
Elevator Maintenance Audit Survey and Report**

April 26, 2022

Prepared For:

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EXECUTIVE SUMMARY

A. SCOPE

BV-NEIS was commissioned by the Tacoma Housing Authority, to evaluate the level of preventive maintenance, deficiencies observed, overall condition of the existing equipment and adherence to the maintenance contract requirements provided by TK Elevator. The vertical transportation equipment reviewed is located at 401 N. G Street in Tacoma, Washington.

A site review of the physical system components currently in use at 401 N. G Street was conducted by Cory Hunter, Consultant with BV-NEIS on April 18, 2022, to determine condition, performance, effectiveness of maintenance and code compliance. Performance measurements and ride quality were appropriated with regard to operation and evaluated based on similar installations and compared to established BV-NEIS and industry standards.

The results of the evaluation and all noted deficiencies are specifically delineated within this report.

While we recommend you review the entire report, for your convenience, we have summarized our findings within this first section including any items requiring immediate attention of the Maintenance Contractor and/or Property Manager.

B. EQUIPMENT IDENTIFICATION

The following elevator equipment was surveyed:

401 N. G Street – Tacoma, Washington						
Building	Elevator(s)	Elevator Type	Speed	Capacity	Landings	Install/Mod Date
401 N. G Street	1	Hydraulic	100	3,500	3	2017
401 N. G Street	2	Hydraulic	100	4,500	3	2017

C. ELEVATOR EQUIPMENT CONDITION SURVEY

1. 401 N. G Street: TK elevator modernized the hydraulic elevators at 401 N. G Street in 2017. The equipment is in good condition and with proactive preventative maintenance; the elevators should perform reliably for 15 more years.

D. EVALUATION OF MAINTENANCE

TK Elevator currently provides maintenance service on this property. The maintenance service levels being provided by TK Elevator are satisfactory. TK Elevator provides an adequate amount of spare parts on site to facilitate repairs and reduce shutdown time in case of minor part failure.

We have evaluated and rated the observed maintenance conditions as follows:

TK Elevator						
	Housekeeping	Lubrication	Replacement /Repair	Adjustment	Record Keeping	Overall Average
Rating = 1-4	3.0	3.0	3.0	3.0	3.0	3.0
Meets Requirements	Yes	Yes	Yes	Yes	Yes	Yes

Our evaluation of work is based on the following ratings:

Rating	Description
1.	A rating of "1" indicates unacceptable levels of maintenance service provided by the Contractor. This level of maintenance requires a significant increased effort by the maintenance Contractor in several areas in order to justify payment of the monthly contract. Approximately 15% of equipment reviews approach this level.
2.	A rating of "2" indicates below average levels of maintenance in most areas. Typically, some short-term, increased intensified effort is required by your maintenance contractor to improve to the acceptable rating of 3. Approximately 35% of our equipment reviews result in this rating.
3.	A rating of "3" indicates acceptable or average levels of maintenance services being provided by your maintenance contractor. Improvements may be required in specific areas as noted. Approximately 40% of our equipment reviews result in this rating.
4.	A rating of "4" indicates above average levels of maintenance provided by your maintenance contractor. This results in very good overall system performance and operational characteristics of the vertical transportation equipment. Equipment will have infrequent shutdowns due to maintenance-related problems. Approximately 10% of our equipment reviews result in this rating.

E. IMMEDIATE ACTION ITEMS

Contractor Items: The major areas of concern requiring immediate action by the contractor are also located in the deficiency tables below and are:

1. Complete overdue testing.

F. CONCLUSION

TK Elevator is providing average maintenance service. The original equipment on this property was modernized in 2017. As the equipment continues to wear and age, it is critical the minimum maintenance hours of service in the contract are provided to extend the life of these major components.

We recommend TK Elevator complete the deficiencies noted within 60 calendar days. Upon evidence provided by the contractor of completed deficiencies, a follow up site review may be conducted if requested and scheduled.

This report should be forwarded to the Contractor for their review and action. If the estimated schedule for completion of deficiency items necessitates a meeting to discuss changes, we will contact you to coordinate the most convenient time for all concerned parties.

This concludes our Report Summary. We affirm you will find this report beneficial in evaluating your ongoing vertical transportation maintenance program. Should you have any questions regarding our review, report, etc., please contact us at your convenience.

MAINTENANCE REVIEW

A. DISCUSSION

A quality elevator maintenance program is designed to minimize risk to the Owner and improve reliability for the life of the equipment. Regular and systematic maintenance will ensure the equipment operates within applicable codes, maintains safe operation and avoids high cost repairs.

Maintenance of vertical transportation equipment can be categorized into the following general areas: Housekeeping, Lubrication, Replacement/Repair and Adjustment and Record Keeping.

1. Housekeeping: Over half the time spent maintaining the equipment on site should be allocated to housekeeping. Fire hazards can be evident when there is oil, dirt and debris in the hoistway. Worn components are discovered during routine cleaning. Buildup of dirt causes malfunctions and unnecessary trouble calls. Clean projects allow for maintenance and inspections to be conducted more efficiently.
2. Lubrication: Proper lubrication reduces equipment wear and extends the life of mechanical systems. Newer equipment is beginning to utilize materials and technologies that reduce the need for ongoing lubrication.
3. Replacement and Repair: Regular and systematic repair and replacement of components will extend the life of the elevator system. Parts should be replaced or rebuilt prior to causing a shutdown or callback. Early detection and replacement of worn components reduces unnecessary unscheduled downtime and repairs.
4. Adjustments: Properly adjusted equipment keeps the vertical transportation system operating quietly and efficiently. Adjustments include elevator speed and performance levels being maintained within the original design standards.
5. Record Keeping: Record keeping of maintenance, repairs and testing are required by code. Most jurisdictions require a Maintenance Control Program (MCP). A Maintenance Control Plan (MCP) for each elevator or escalator is mandatory in jurisdictions that have adopted the 2000 or more recent edition of the ASME A7.1/CSA B44 elevator code. Building owners or managers are responsible for having an MCP for each elevator or escalator in the building. The contracted maintenance company is responsible for developing and executing the plan. Maintenance and repair records must be maintained and available for review. We review the onsite MCP and records of maintenance and repair during our site review. This includes all the tasks and procedures required for each piece of equipment and records of the maintenance visits, tests and repairs.

These areas of maintenance are not mutually exclusive of each other. When a routine preventative maintenance visit is being conducted for a specific task, the technician may detect failure of another component or adjustment that is required in another area while working simultaneously on multiple areas.

RECOMMENDATIONS TO OWNER

A. GENERAL

Our recommendations and opinion of probable costs for upgrading the vertical transportation equipment at this facility are included in this section. We also include recommendations for upgrading the equipment to conform to current State Codes, National code and ADA requirements. The first category outlined below notes short term upgrades to the equipment. These are upgrades that should be planned and budgeted to be completed within the next one to five years. The second category discusses long-term equipment upgrade recommendations. These are items that should be planned and budgeted to be completed in the next five to ten years, or sooner, based on your requirements.

A complete and comprehensive modernization includes labor and material to install the elevator equipment only, with 12 months of warranty maintenance. This will include all the equipment necessary to meet current ASME A17.1 code and ADA. Our recommendations do not include costs for building related work that must be completed during the modernization such as electrical, mechanical or general construction work. We did not include an opinion of probable cost for the building related work, we can provide that upon request.

The elevator equipment was modernized by TK Elevator in 2017. We recommend adding minimum hours onsite to the maintenance agreement. This equipment should have a minimum of 2 hours per quarter of preventative maintenance.

B. SHORT TERM RECOMMENDATIONS

There are no short-term recommendations at this time.

C. LONG TERM RECOMMENDATIONS

The equipment should be planned for modernized in 15 years. Construction documents should be prepared prior to the modernization to identify related building work items and code required upgrades at that time by a vertical transportation consultant. Costs should be escalated to adjust for inflation.

Description		Opinion of Probable Cost(2022)
1.	We recommend planning to modernize the equipment in 15 years.	\$ 300,000
2.	Building Related Work/Code Updates	TBD
Total:		\$ 300,000

ELEVATOR PERFORMANCE

A. DISCUSSION

This section reviews the individual adjustment and operation of elevators and elements associated with the operation of specific components or equipment of the elevator system. These standards have been established by either the maintenance agreement, code, established BV-NEIS standards, NEII standards, or standards common to the elevator industry.

Performance times are adjustable and can be changed to meet the need and conditions of each building. Performance criteria may be listed in the preventative maintenance agreement, which will then be the basis of evaluation, depending on the agreement type and details. The criterion used to evaluate the performance measured on each elevator is defined below.

B. PERFORMANCE CRITERIA

Item	Criteria
1	Car Speed: Elevator speed is measured with a tachometer. Contract speed should be maintained within criteria range indicated on individual performance evaluations.
2	Floor-to-Floor Performance: Time measured from the instant the doors begin to close until doors are 3/4 open for center-opening doors or 1/2 open for side-opening doors.
3	Stopping Zone: Measured while the car is stopped at the landing. ADA 407.4.4 requires maximum 1/2". Typically, 1/4" can be achieved depending on the individual equipment.
4	Door Open Time: Measured when the doors begin to open until the doors are fully open. Door time performance recommendations are based on the individual door operator equipment installed while providing smooth operation and long equipment life.
5	Door Closing Time: Measured from when the doors begin to close until the doors are fully closed. The ASME A17.1 Code, 2.13.4, limits door closing time by defining the level of kinetic energy generated during door closing operation. We indicate the closing time which approximates this code requirement based on average door weight.
6	Car Door Hold Open Time: Measured from when doors are fully open until the doors begin to close when responding to a car call. Minimum time of 3 seconds required by The Americans with Disabilities Act (ADA). This is the time the doors remain open so passengers can exit.
7	Reopening Device Door Time: Measured from the fully open position until the doors begin to close after interrupting the door protective devices.
8	Nudging Time: Measured from the instant the doors reach the fully open position until the door buzzer sounds and the doors begin to close at reduced speed even though the door protective devices are interrupted.
9	Door Closing Force: Measured with a spring pressure gauge as the doors begin to close. The measured value is the force required to prevent the doors from closing under power. ASME A17.1 Code requires the force needed to stall the closing door be no more than 30 force pounds.
10	Hall Door Hold Open Time: Measured from the instant the doors are fully open until the doors begin to close in response to a hall call registration. 5 seconds minimum required by The Americans with Disabilities Act (ADA).
11	Operation: Subjective evaluation of the quality of ride and door operation. The elements reviewed are: Acceleration Up, Acceleration Down, Deceleration Up, Deceleration Down, Elevator Stop, Door Open, and Door Close.
12	Safety: Communication devices, car door protection devices, car stop switch and alarm bell and emergency lighting for the car are checked to verify they are functioning properly.

ELEVATOR PERFORMANCE EVALUATION

ELEVATOR 1									
Project Name:	Site 003 G Street	Permit ID #:	12031	Group:	1	Review Date:	4/18/22		
Project Location:	401 N. G Street	Machine Type:	Hydraulic	Elevator Type:	Passenger				
City & State:	Tacoma, WA	Floors Served:	Front: 3	Rear:	0				
Manufacturer (OEM):	Sound/TK Elevator	Capacity:	3,500 lbs.	Contract Speed:	100 fpm				
Contractor:	TK Elevator	Safety Tests:	Annual ☐ Yes ☒ No	Date Completed:	1/2021				
Install/Mod. Date:	2017		5-Year ☐ Yes ☒ No	Date Completed:	4/2017				
Elevator Information									
Typical Floor Height:	116"	Between Floors:	G-1	Door Operator Speed:	Medium				
Door Type:	Two Speed-Side Opening	Door Size:	Height 84" & Width 42"	Pre-Opening:	N/A				
	Measured		Target Criteria	Meets Criteria		Comments			
Speed Up ±10%	96 FPM		90-110 FPM	Yes					
Speed Down -20%	80 FPM		80-110 FPM	Yes					
Performance Up	17.2 SEC		16.3 SEC	NO		Adjust			
Performance Down	18.5 SEC		16.3 SEC	NO		Adjust			
Stopping Zone ±1/4"	±1/4"		±1/4"	Yes					
	Measured Front / Rear		Target Criteria	Meets Criteria Front / Rear		Comments			
Door Open	2.6 SEC	N/A	3.1 SEC	Yes	N/A				
Door Close	4.3 SEC	N/A	4.0 SEC	NO	N/A				
Short Hold Open (Car Call)	4.0 SEC	N/A	3.0-5.0 SEC	Yes	N/A				
Interrupted Ray Hold Open	2.1 SEC	N/A	>3.0" SEC	NO	N/A				
Nudging Hold Open	19.3 SEC	N/A	20.0-25.0 SEC	NO	N/A				
Extended Door Close Time (Nudging)	7.0 SEC	N/A	6.7 SEC	Yes	N/A	(1.68 x min. door close time)			
Stall Pressure	27 LBS	N/A	≤30 LBS	Yes	N/A				
Long Hold Open (Hall Call)	6.3 SEC	N/A	5.0-8.0 SEC	Yes	N/A				
Lanterns Call Notification (Hall Call)	10.1 SEC	N/A	5.0-10.0 SEC	Yes	N/A	Acceptable			
Observations	Meets Criteria	Comments	Features	Installed	Tested	Comments			
Acceleration	NO	Requires Adjustment	Emergency Light	Yes	NO				
Ride	Yes		Fire Service Ph1	Yes	NO				
Deceleration	Yes		Fire Service Ph2	Yes	NO				
Stop	Yes		Fire Phone Jack	N/A	N/A				
Door Operation	Yes		Standby Power	N/A	N/A				
Door Protection	Yes		Telephone	Yes	NO				
Door Open Button	Yes		Intercom	Yes	Yes				
Alarm Button	Yes		Stop Switch	Yes	NO				
Car Lighting Guarded	Yes		Seismic Operation	Yes	NO				
False Call Cancel	N/A		Door Restriction	Yes	NO				
Additional Comments									
1. Testing is overdue.									
2.									
3.									
4.									
5.									

ELEVATOR 2									
Project Name:	Site 003 G Street		Permit ID #:	4758	Group:	1	Review Date:	4/18/22	
Project Location:	401 N. G Street		Machine Type:	Hydraulic		Elevator Type:	Passenger		
City & State:	Tacoma, WA		Floors Served:	Front:	3	Rear:	0		
Manufacturer (OEM):	Sound/TK Elevator		Capacity:	3,500 lbs.		Contract Speed:	100 fpm		
Contractor:	TK Elevator		Safety Tests:	Annual	☐ Yes ☒ No	Date Completed:	1/2021		
Install/Mod. Date:	2017			5-Year	☐ Yes ☒ No	Date Completed:	4/2017		
Elevator Information									
Typical Floor Height:	116"		Between Floors:	G-1		Door Operator Speed:	Medium		
Door Type:	Two Speed-Side Opening		Door Size:	Height 84" & Width 42"		Pre-Opening:	N/A		
	Measured		Target Criteria		Meets Criteria		Comments		
Speed Up ±10%	108 FPM		90-110 FPM		Yes				
Speed Down -20%	75 FPM		80-110 FPM		Yes		Acceptable with no load		
Performance Up	15.9 SEC		16.3 SEC		Yes				
Performance Down	17.4 SEC		16.3 SEC		NO		Adjust		
Stopping Zone ±1/4"	±1/4"		±1/4"		Yes				
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments		
Door Open	2.3 SEC	N/A	3.1 SEC	Yes	N/A				
Door Close	4.4 SEC	N/A	4.0 SEC	NO	N/A	Adjust			
Short Hold Open (Car Call)	4.2 SEC	N/A	3.0-5.0 SEC	Yes	N/A				
Interrupted Ray Hold Open	2.8 SEC	N/A	>3.0* SEC	NO	N/A				
Nudging Hold Open	19.9 SEC	N/A	20.0-25.0 SEC	NO	N/A	Adjust			
Extended Door Close Time (Nudging)	6.6 SEC	N/A	6.7 SEC	Yes	N/A	(1.68 x min. door close time)			
Stall Pressure	26 LBS	N/A	≤30 LBS	Yes	N/A				
Long Hold Open (Hall Call)	6.1 SEC	N/A	5.0-8.0 SEC	Yes	N/A				
Lanterns Call Notification (Hall Call)	9.5 SEC	N/A	5.0-10.0 SEC	Yes	N/A				
Observations	Meets Criteria	Comments	Features	Installed	Tested	Comments			
Acceleration	NO	Requires Adjustment	Emergency Light	Yes	NO				
Ride	Yes		Fire Service Ph1	Yes	NO				
Deceleration	Yes		Fire Service Ph2	Yes	NO				
Stop	Yes		Fire Phone Jack	N/A	N/A				
Door Operation	Yes		Standby Power	N/A	N/A				
Door Protection	Yes		Telephone	Yes	NO				
Door Open Button	Yes		Intercom	Yes	Yes				
Alarm Button	Yes		Stop Switch	Yes	NO				
Car Lighting Guarded	Yes		Seismic Operation	Yes	NO				
False Call Cancel	N/A		Door Restriction	Yes	NO				
Additional Comments									
1. Testing is overdue.									
2.									

ELEVATOR DEFICIENCIES

Item	Description: Items requiring correction are indicated by ☐ . Items corrected are indicated by ☒ .	1	2
1.	Complete ASME and State required testing.	☐	☐
2.	Place parts in cabinet.	☐	☐
3.	Adjust acceleration/deceleration leveling time.	☐	☐
4.	Adjust door closing to 4.0 seconds.	☐	☐
5.	.Adjust interrupted ray hold open time to > 3.0 seconds.	☐	☐
6.	Adjust nudging hold open to 20.0-25.0 seconds.	☐	

SUPPORTING PHOTOGRAPHS



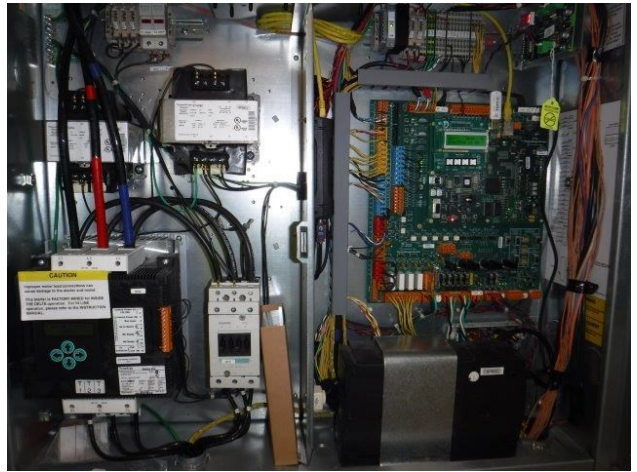
1. Organize spare parts in cabinet.



2. Pits are clean.



3. Cartop is clean, typical.



4. Elevators were modernized in 2017 with new controllers with soft-starts.



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**Site 004 Wright Street
Elevator Maintenance Audit Survey and Report**

April 26, 2022

Prepared For:

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Prepared By:

Cory Hunter, CEI
VP Elevator Consulting

EXECUTIVE SUMMARY

A. SCOPE

BV-NEIS was commissioned by the Tacoma Housing Authority, to evaluate the level of preventive maintenance, deficiencies observed, overall condition of the existing equipment and adherence to the maintenance contract requirements provided by TK Elevator. The vertical transportation equipment reviewed is located at 602 S. Wright Street in Tacoma, Washington.

A site review of the physical system components currently in use at 602 S. Wright Street was conducted by Cory Hunter, Consultant with BV-NEIS on April 18, 2022, to determine condition, performance, effectiveness of maintenance and code compliance. Performance measurements and ride quality were appropriated with regard to operation and evaluated based on similar installations and compared to established BV-NEIS and industry standards.

The results of the evaluation and all noted deficiencies are specifically delineated within this report.

While we recommend you review the entire report, for your convenience, we have summarized our findings within this first section including any items requiring immediate attention of the Maintenance Contractor and/or Property Manager.

B. EQUIPMENT IDENTIFICATION

The following elevator equipment was surveyed:

602 S. Wright Street – Tacoma, Washington						
Building	Elevator(s)	Elevator Type	Speed	Capacity	Landings	Install/Mod Date
602 S. Wright Street	1	Hydraulic	100	3,000	4	1992/2016
602 S. Wright Street	2	Hydraulic	100	2,500	4	1992/2016

C. ELEVATOR EQUIPMENT CONDITION SURVEY

1. 602 S. Wright Street: TK elevator modernized the hydraulic elevators at 602 S. Wright Street in 2016. The equipment is in good condition and with proactive preventative maintenance; the elevators should perform reliably for 15 more years.

D. EVALUATION OF MAINTENANCE

TK Elevator currently provides maintenance service on this property. The maintenance service levels being provided by TK Elevator are satisfactory. TK Elevator provides an adequate amount of spare parts on site to facilitate repairs and reduce shutdown time in case of minor part failure.

We have evaluated and rated the observed maintenance conditions as follows:

TK Elevator						
	Housekeeping	Lubrication	Replacement /Repair	Adjustment	Record Keeping	Overall Average
Rating = 1-4	3.0	3.0	3.0	3.0	3.0	3.0
Meets Requirements	Yes	Yes	Yes	Yes	Yes	Yes

Our evaluation of work is based on the following ratings:

Rating	Description
1.	A rating of "1" indicates unacceptable levels of maintenance service provided by the Contractor. This level of maintenance requires a significant increased effort by the maintenance Contractor in several areas in order to justify payment of the monthly contract. Approximately 15% of equipment reviews approach this level.
2.	A rating of "2" indicates below average levels of maintenance in most areas. Typically, some short-term, increased intensified effort is required by your maintenance contractor to improve to the acceptable rating of 3. Approximately 35% of our equipment reviews result in this rating.
3.	A rating of "3" indicates acceptable or average levels of maintenance services being provided by your maintenance contractor. Improvements may be required in specific areas as noted. Approximately 40% of our equipment reviews result in this rating.
4.	A rating of "4" indicates above average levels of maintenance provided by your maintenance contractor. This results in very good overall system performance and operational characteristics of the vertical transportation equipment. Equipment will have infrequent shutdowns due to maintenance-related problems. Approximately 10% of our equipment reviews result in this rating.

E. IMMEDIATE ACTION ITEMS

Contractor Items: The major areas of concern requiring immediate action by the contractor are also located in the deficiency tables below and are:

1. Refill lubricator reservoirs on Car 2.

F. CONCLUSION

TK Elevator is providing average maintenance service. The original equipment on this property was modernized in 2016. As the equipment continues to wear and age, it is critical the minimum maintenance hours of service in the contract are provided to extend the life of these major components.

We recommend TK Elevator complete the deficiencies noted within 60 calendar days. Upon evidence provided by the contractor of completed deficiencies, a follow up site review may be conducted if requested and scheduled.

This report should be forwarded to the Contractor for their review and action. If the estimated schedule for completion of deficiency items necessitates a meeting to discuss changes, we will contact you to coordinate the most convenient time for all concerned parties.

This concludes our Report Summary. We affirm you will find this report beneficial in evaluating your ongoing vertical transportation maintenance program. Should you have any questions regarding our review, report, etc., please contact us at your convenience.

MAINTENANCE REVIEW

A. DISCUSSION

A quality elevator maintenance program is designed to minimize risk to the Owner and improve reliability for the life of the equipment. Regular and systematic maintenance will ensure the equipment operates within applicable codes, maintains safe operation and avoids high cost repairs.

Maintenance of vertical transportation equipment can be categorized into the following general areas: Housekeeping, Lubrication, Replacement/Repair and Adjustment and Record Keeping.

1. Housekeeping: Over half the time spent maintaining the equipment on site should be allocated to housekeeping. Fire hazards can be evident when there is oil, dirt and debris in the hoistway. Worn components are discovered during routine cleaning. Buildup of dirt causes malfunctions and unnecessary trouble calls. Clean projects allow for maintenance and inspections to be conducted more efficiently.
2. Lubrication: Proper lubrication reduces equipment wear and extends the life of mechanical systems. Newer equipment is beginning to utilize materials and technologies that reduce the need for ongoing lubrication.
3. Replacement and Repair: Regular and systematic repair and replacement of components will extend the life of the elevator system. Parts should be replaced or rebuilt prior to causing a shutdown or callback. Early detection and replacement of worn components reduces unnecessary unscheduled downtime and repairs.
4. Adjustments: Properly adjusted equipment keeps the vertical transportation system operating quietly and efficiently. Adjustments include elevator speed and performance levels being maintained within the original design standards.
5. Record Keeping: Record keeping of maintenance, repairs and testing are required by code. Most jurisdictions require a Maintenance Control Program (MCP). A Maintenance Control Plan (MCP) for each elevator or escalator is mandatory in jurisdictions that have adopted the 2000 or more recent edition of the ASME A7.1/CSA B44 elevator code. Building owners or managers are responsible for having an MCP for each elevator or escalator in the building. The contracted maintenance company is responsible for developing and executing the plan. Maintenance and repair records must be maintained and available for review. We review the onsite MCP and records of maintenance and repair during our site review. This includes all the tasks and procedures required for each piece of equipment and records of the maintenance visits, tests and repairs.

These areas of maintenance are not mutually exclusive of each other. When a routine preventative maintenance visit is being conducted for a specific task, the technician may detect failure of another component or adjustment that is required in another area while working simultaneously on multiple areas.

RECOMMENDATIONS TO OWNER

A. GENERAL

Our recommendations and opinion of probable costs for upgrading the vertical transportation equipment at this facility are included in this section. We also include recommendations for upgrading the equipment to conform to current State Codes, National code and ADA requirements. The first category outlined below notes short term upgrades to the equipment. These are upgrades that should be planned and budgeted to be completed within the next one to five years. The second category discusses long-term equipment upgrade recommendations. These are items that should be planned and budgeted to be completed in the next five to ten years, or sooner, based on your requirements.

A complete and comprehensive modernization includes labor and material to install the elevator equipment only, with 12 months of warranty maintenance. This will include all the equipment necessary to meet current ASME A17.1 code and ADA. Our recommendations do not include costs for building related work that must be completed during the modernization such as electrical, mechanical or general construction work. We did not include an opinion of probable cost for the building related work, we can provide that upon request.

The elevator equipment was installed by Sound/Dover Elevator in 1992 and modernized by TK Elevator in 2016. We recommend adding minimum hours onsite to the maintenance agreement. This equipment should have a minimum of 2 hours per quarter of preventative maintenance.

B. SHORT TERM RECOMMENDATIONS

There are no short-term recommendations at this time.

C. LONG TERM RECOMMENDATIONS

The equipment should be planned for modernized in 15 years. Construction documents should be prepared prior to the modernization to identify related building work items and code required upgrades at that time by a vertical transportation consultant. Costs should be escalated to adjust for inflation.

Description		Opinion of Probable Cost(2022)
1.	We recommend planning to modernize the equipment in 15 years.	\$ 300,000
2.	Building Related Work/Code Updates	TBD
Total:		\$ 300,000

ELEVATOR PERFORMANCE

A. DISCUSSION

This section reviews the individual adjustment and operation of elevators and elements associated with the operation of specific components or equipment of the elevator system. These standards have been established by either the maintenance agreement, code, established BV-NEIS standards, NEII standards, or standards common to the elevator industry.

Performance times are adjustable and can be changed to meet the need and conditions of each building. Performance criteria may be listed in the preventative maintenance agreement, which will then be the basis of evaluation, depending on the agreement type and details. The criterion used to evaluate the performance measured on each elevator is defined below.

B. PERFORMANCE CRITERIA

Item	Criteria
1	Car Speed: Elevator speed is measured with a tachometer. Contract speed should be maintained within criteria range indicated on individual performance evaluations.
2	Floor-to-Floor Performance: Time measured from the instant the doors begin to close until doors are 3/4 open for center-opening doors or 1/2 open for side-opening doors.
3	Stopping Zone: Measured while the car is stopped at the landing. ADA 407.4.4 requires maximum 1/2". Typically, 1/4" can be achieved depending on the individual equipment.
4	Door Open Time: Measured when the doors begin to open until the doors are fully open. Door time performance recommendations are based on the individual door operator equipment installed while providing smooth operation and long equipment life.
5	Door Closing Time: Measured from when the doors begin to close until the doors are fully closed. The ASME A17.1 Code, 2.13.4, limits door closing time by defining the level of kinetic energy generated during door closing operation. We indicate the closing time which approximates this code requirement based on average door weight.
6	Car Door Hold Open Time: Measured from when doors are fully open until the doors begin to close when responding to a car call. Minimum time of 3 seconds required by The Americans with Disabilities Act (ADA). This is the time the doors remain open so passengers can exit.
7	Reopening Device Door Time: Measured from the fully open position until the doors begin to close after interrupting the door protective devices.
8	Nudging Time: Measured from the instant the doors reach the fully open position until the door buzzer sounds and the doors begin to close at reduced speed even though the door protective devices are interrupted.
9	Door Closing Force: Measured with a spring pressure gauge as the doors begin to close. The measured value is the force required to prevent the doors from closing under power. ASME A17.1 Code requires the force needed to stall the closing door be no more than 30 force pounds.
10	Hall Door Hold Open Time: Measured from the instant the doors are fully open until the doors begin to close in response to a hall call registration. 5 seconds minimum required by The Americans with Disabilities Act (ADA).
11	Operation: Subjective evaluation of the quality of ride and door operation. The elements reviewed are: Acceleration Up, Acceleration Down, Deceleration Up, Deceleration Down, Elevator Stop, Door Open, and Door Close.
12	Safety: Communication devices, car door protection devices, car stop switch and alarm bell and emergency lighting for the car are checked to verify they are functioning properly.

ELEVATOR PERFORMANCE EVALUATION

ELEVATOR 1										
Project Name:	Site 004 Wright St.		Permit ID #:	12314		Group:	1		Review Date:	4/18/22
Project Location:	602 S. Wright Street		Machine Type:	Hydraulic		Elevator Type:	Passenger			
City & State:	Tacoma, WA		Floors Served:	Front:	4		Rear:	0		
Manufacturer (OEM):	TK Elevator		Capacity:	3,000 lbs.		Contract Speed:	100 fpm			
Contractor:	TK Elevator		Safety Tests:	Annual	☒ Yes ☐ No		Date Completed:	9/2021		
Install/Mod. Date:	1992/2016			5-Year	☒ Yes ☐ No		Date Completed:	10/2021		
Elevator Information										
Typical Floor Height:	114"		Between Floors:	G-1		Door Operator Speed:	Medium			
Door Type:	Two Speed-Side Opening		Door Size:	Height 84" & Width 42"		Pre-Opening:	N/A			
	Measured		Target Criteria		Meets Criteria		Comments			
Speed Up ±10%	110 FPM		90-110 FPM		Yes					
Speed Down -20%	97 FPM		80-110 FPM		Yes					
Performance Up	16.7 SEC		16.3 SEC		Yes		Acceptable			
Performance Down	17.2 SEC		16.3 SEC		NO		Adjust			
Stopping Zone ±1/4"	±1/4"		±1/4"		Yes					
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments			
Door Open	2.0 SEC	N/A	3.1 SEC		Yes	N/A				
Door Close	3.8 SEC	N/A	4.0 SEC		NO	N/A				
Short Hold Open (Car Call)	5.3 SEC	N/A	3.0-5.0 SEC		NO	N/A				
Interrupted Ray Hold Open	6.9 SEC	N/A	>3.0* SEC		Yes	N/A				
Nudging Hold Open	21.6 SEC	N/A	20.0-25.0 SEC		Yes	N/A				
Extended Door Close Time (Nudging)	7.9 SEC	N/A	6.7 SEC		Yes	N/A	(1.68 x min. door close time)			
Stall Pressure	27 LBS	N/A	≤30 LBS		Yes	N/A				
Long Hold Open (Hall Call)	5.6 SEC	N/A	5.0-8.0 SEC		Yes	N/A				
Lanterns Call Notification (Hall Call)	9.6 SEC	N/A	5.0-10.0 SEC		Yes	N/A				
Observations	Meets Criteria	Comments	Features		Installed	Tested	Comments			
Acceleration	Yes		Emergency Light		Yes	NO				
Ride	Yes		Fire Service Ph1		Yes	NO				
Deceleration	Yes		Fire Service Ph2		Yes	NO				
Stop	Yes		Fire Phone Jack		N/A	N/A				
Door Operation	Yes		Standby Power		N/A	N/A				
Door Protection	Yes		Telephone		Yes	NO				
Door Open Button	Yes		Intercom		Yes	Yes				
Alarm Button	Yes		Stop Switch		Yes	NO				
Car Lighting Guarded	Yes		Seismic Operation		Yes	NO				
False Call Cancel	N/A		Door Restriction		Yes	NO				
Additional Comments										
1.										
2.										

ELEVATOR 2									
Project Name:	Site 004 Wright St.		Permit ID #:	12315	Group:	2	Review Date:	4/18/22	
Project Location:	602 S. Wright Street		Machine Type:	Hydraulic		Elevator Type:	Passenger		
City & State:	Tacoma, WA		Floors Served:	Front:	4	Rear:	0		
Manufacturer (OEM):	TK Elevator		Capacity:	2,500 lbs.		Contract Speed:	100 fpm		
Contractor:	TK Elevator		Safety Tests:	Annual	☒ Yes ☐ No	Date Completed:	9/2021		
Install/Mod. Date:	1992/2016			5-Year	☒ Yes ☐ No	Date Completed:	7/2021		
Elevator Information									
Typical Floor Height:	114"		Between Floors:	G-1		Door Operator Speed:	Medium		
Door Type:	Two Speed-Side Opening		Door Size:	Height 84" & Width 42"		Pre-Opening:	N/A		
	Measured		Target Criteria		Meets Criteria		Comments		
Speed Up ±10%	107 FPM		90-110 FPM		Yes				
Speed Down -20%	111 FPM		80-110 FPM		Yes				
Performance Up	18.6 SEC		16.3 SEC		NO		Acceptable		
Performance Down	14.6 SEC		16.3 SEC		Yes		Adjust		
Stopping Zone ±1/4"	±1/4"		±1/4"		Yes				
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments		
Door Open	2.1 SEC N/A		3.1 SEC		Yes N/A				
Door Close	3.5 SEC N/A		4.0 SEC		NO N/A				
Short Hold Open (Car Call)	6.2 SEC N/A		3.0-5.0 SEC		NO N/A				
Interrupted Ray Hold Open	4.6 SEC N/A		>3.0* SEC		Yes N/A				
Nudging Hold Open	22.0 SEC N/A		20.0-25.0 SEC		Yes N/A				
Extended Door Close Time (Nudging)	10.3 SEC N/A		6.7 SEC		Yes N/A		(1.68 x min. door close time)		
Stall Pressure	26 LBS N/A		≤30 LBS		Yes N/A				
Long Hold Open (Hall Call)	5.7 SEC N/A		5.0-8.0 SEC		Yes N/A				
Lanterns Call Notification (Hall Call)	9.4 SEC N/A		5.0-10.0 SEC		Yes N/A				
Observations	Meets Criteria	Comments	Features		Installed	Tested	Comments		
Acceleration	Yes		Emergency Light		Yes	NO			
Ride	Yes		Fire Service Ph1		Yes	NO			
Deceleration	Yes		Fire Service Ph2		Yes	NO			
Stop	Yes		Fire Phone Jack		N/A	N/A			
Door Operation	Yes		Standby Power		N/A	N/A			
Door Protection	Yes		Telephone		Yes	NO			
Door Open Button	Yes		Intercom		Yes	Yes			
Alarm Button	Yes		Stop Switch		Yes	NO			
Car Lighting Guarded	Yes		Seismic Operation		Yes	NO			
False Call Cancel	N/A		Door Restriction		Yes	NO			
Additional Comments									
1. Add oil to guide reservoir.									
2.									

ELEVATOR DEFICIENCIES

Item	Description: Items requiring correction are indicated by ☐ . Items corrected are indicated by ☒ .	1	2
1.	Add lubricant to guide reservoirs.		☐
2.	Adjust acceleration/deceleration leveling time.	☐	☐
3.	Adjust door closing to 4.0 seconds.	☐	☐
4.	.Adjust short hold (car call) dwell time to 3.0-5.0 seconds.	☐	☐

SUPPORTING PHOTOGRAPHS



1. Cab interiors are holding up well.



2. Pits are clean.



3. Cartop is clean, typical.



4. Fill lubricator reservoirs.



**Bureau Veritas-National Elevator
Inspection Services, Inc.**

13000 South Tryon Street • Suite F-260
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503-732-4938 • 800-886-6347

**Site 005 Fawcett Street
Elevator Maintenance Audit Survey and Report**

April 26, 2022

Prepared For:

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EXECUTIVE SUMMARY

A. SCOPE

BV-NEIS was commissioned by the Tacoma Housing Authority, to evaluate the level of preventive maintenance, deficiencies observed, overall condition of the existing equipment and adherence to the maintenance contract requirements provided by TK Elevator. The vertical transportation equipment reviewed is located at Fawcett Street in Tacoma, Washington.

A site review of the physical system components currently in use at Fawcett Street was conducted by Cory Hunter, Consultant with BV-NEIS on April 19, 2022, to determine condition, performance, effectiveness of maintenance and code compliance. Performance measurements and ride quality were appropriated with regard to operation and evaluated based on similar installations and compared to established BV-NEIS and industry standards.

The results of the evaluation and all noted deficiencies are specifically delineated within this report.

While we recommend you review the entire report, for your convenience, we have summarized our findings within this first section including any items requiring immediate attention of the Maintenance Contractor and/or Property Manager.

B. EQUIPMENT IDENTIFICATION

The following elevator equipment was surveyed:

Fawcett Street – Tacoma, Washington						
Building	Elevator(s)	Elevator Type	Speed	Capacity	Landings	Install/Mod Date
Fawcett Street	1	Hydraulic	125	2,500	4	2017

C. ELEVATOR EQUIPMENT CONDITION SURVEY

1. Fawcett Street: TK elevator modernized the hydraulic elevators at Fawcett Street in 2017. The equipment is in good condition and with proactive preventative maintenance; the elevators should perform reliably for 15 more years.

D. EVALUATION OF MAINTENANCE

TK Elevator currently provides maintenance service on this property. The maintenance service levels being provided by TK Elevator are satisfactory. TK Elevator provides an adequate amount of spare parts on site to facilitate repairs and reduce shutdown time in case of minor part failure.

We have evaluated and rated the observed maintenance conditions as follows:

TK Elevator						
	Housekeeping	Lubrication	Replacement /Repair	Adjustment	Record Keeping	Overall Average
Rating = 1-4	3.0	3.0	2.5	3.0	3.0	2.9
Meets Requirements	Yes	Yes	Yes	Yes	Yes	Acceptable

Our evaluation of work is based on the following ratings:

Rating	Description
1.	A rating of "1" indicates unacceptable levels of maintenance service provided by the Contractor. This level of maintenance requires a significant increased effort by the maintenance Contractor in several areas in order to justify payment of the monthly contract. Approximately 15% of equipment reviews approach this level.
2.	A rating of "2" indicates below average levels of maintenance in most areas. Typically, some short-term, increased intensified effort is required by your maintenance contractor to improve to the acceptable rating of 3. Approximately 35% of our equipment reviews result in this rating.
3.	A rating of "3" indicates acceptable or average levels of maintenance services being provided by your maintenance contractor. Improvements may be required in specific areas as noted. Approximately 40% of our equipment reviews result in this rating.
4.	A rating of "4" indicates above average levels of maintenance provided by your maintenance contractor. This results in very good overall system performance and operational characteristics of the vertical transportation equipment. Equipment will have infrequent shutdowns due to maintenance-related problems. Approximately 10% of our equipment reviews result in this rating.

E. IMMEDIATE ACTION ITEMS

Contractor Items: The major areas of concern requiring immediate action by the contractor are also located in the deficiency tables below and are:

1. Check piston and packing.
2. Complete ASME and State required testing.

F. CONCLUSION

TK Elevator is providing average maintenance service. The original equipment on this property was modernized in 2017. As the equipment continues to wear and age, it is critical the minimum maintenance hours of service in the contract are provided to extend the life of these major components.

We recommend TK Elevator complete the deficiencies noted within 60 calendar days. Upon evidence provided by the contractor of completed deficiencies, a follow up site review may be conducted if requested and scheduled.

This report should be forwarded to the Contractor for their review and action. If the estimated schedule for completion of deficiency items necessitates a meeting to discuss changes, we will contact you to coordinate the most convenient time for all concerned parties.

This concludes our Report Summary. We affirm you will find this report beneficial in evaluating your ongoing vertical transportation maintenance program. Should you have any questions regarding our review, report, etc., please contact us at your convenience.

MAINTENANCE REVIEW

A. DISCUSSION

A quality elevator maintenance program is designed to minimize risk to the Owner and improve reliability for the life of the equipment. Regular and systematic maintenance will ensure the equipment operates within applicable codes, maintains safe operation and avoids high cost repairs.

Maintenance of vertical transportation equipment can be categorized into the following general areas: Housekeeping, Lubrication, Replacement/Repair and Adjustment and Record Keeping.

1. Housekeeping: Over half the time spent maintaining the equipment on site should be allocated to housekeeping. Fire hazards can be evident when there is oil, dirt and debris in the hoistway. Worn components are discovered during routine cleaning. Buildup of dirt causes malfunctions and unnecessary trouble calls. Clean projects allow for maintenance and inspections to be conducted more efficiently.
2. Lubrication: Proper lubrication reduces equipment wear and extends the life of mechanical systems. Newer equipment is beginning to utilize materials and technologies that reduce the need for ongoing lubrication.
3. Replacement and Repair: Regular and systematic repair and replacement of components will extend the life of the elevator system. Parts should be replaced or rebuilt prior to causing a shutdown or callback. Early detection and replacement of worn components reduces unnecessary unscheduled downtime and repairs.
4. Adjustments: Properly adjusted equipment keeps the vertical transportation system operating quietly and efficiently. Adjustments include elevator speed and performance levels being maintained within the original design standards.
5. Record Keeping: Record keeping of maintenance, repairs and testing are required by code. Most jurisdictions require a Maintenance Control Program (MCP). A Maintenance Control Plan (MCP) for each elevator or escalator is mandatory in jurisdictions that have adopted the 2000 or more recent edition of the ASME A7.1/CSA B44 elevator code. Building owners or managers are responsible for having an MCP for each elevator or escalator in the building. The contracted maintenance company is responsible for developing and executing the plan. Maintenance and repair records must be maintained and available for review. We review the onsite MCP and records of maintenance and repair during our site review. This includes all the tasks and procedures required for each piece of equipment and records of the maintenance visits, tests and repairs.

These areas of maintenance are not mutually exclusive of each other. When a routine preventative maintenance visit is being conducted for a specific task, the technician may detect failure of another component or adjustment that is required in another area while working simultaneously on multiple areas.

RECOMMENDATIONS TO OWNER

A. GENERAL

Our recommendations and opinion of probable costs for upgrading the vertical transportation equipment at this facility are included in this section. We also include recommendations for upgrading the equipment to conform to current State Codes, National code and ADA requirements. The first category outlined below notes short term upgrades to the equipment. These are upgrades that should be planned and budgeted to be completed within the next one to five years. The second category discusses long-term equipment upgrade recommendations. These are items that should be planned and budgeted to be completed in the next five to ten years, or sooner, based on your requirements.

A complete and comprehensive modernization includes labor and material to install the elevator equipment only, with 12 months of warranty maintenance. This will include all the equipment necessary to meet current ASME A17.1 code and ADA. Our recommendations do not include costs for building related work that must be completed during the modernization such as electrical, mechanical or general construction work. We did not include an opinion of probable cost for the building related work, we can provide that upon request.

The elevator equipment was modernized by TK Elevator in 2017. We recommend adding minimum hours onsite to the maintenance agreement. This equipment should have a minimum of 1 hour per quarter of preventative maintenance.

B. SHORT TERM RECOMMENDATIONS

There are no short-term recommendations at this time.

C. LONG TERM RECOMMENDATIONS

The equipment should be planned for modernized in 15 years. Construction documents should be prepared prior to the modernization to identify related building work items and code required upgrades at that time by a vertical transportation consultant. Costs should be escalated to adjust for inflation.

Description		Opinion of Probable Cost(2022)
1.	We recommend planning to modernize the equipment in 15 years.	\$ 150,000
2.	Building Related Work/Code Updates	TBD
Total:		\$ 150,000

ELEVATOR PERFORMANCE

A. DISCUSSION

This section reviews the individual adjustment and operation of elevators and elements associated with the operation of specific components or equipment of the elevator system. These standards have been established by either the maintenance agreement, code, established BV-NEIS standards, NEII standards, or standards common to the elevator industry.

Performance times are adjustable and can be changed to meet the need and conditions of each building. Performance criteria may be listed in the preventative maintenance agreement, which will then be the basis of evaluation, depending on the agreement type and details. The criterion used to evaluate the performance measured on each elevator is defined below.

B. PERFORMANCE CRITERIA

Item	Criteria
1	Car Speed: Elevator speed is measured with a tachometer. Contract speed should be maintained within criteria range indicated on individual performance evaluations.
2	Floor-to-Floor Performance: Time measured from the instant the doors begin to close until doors are 3/4 open for center-opening doors or 1/2 open for side-opening doors.
3	Stopping Zone: Measured while the car is stopped at the landing. ADA 407.4.4 requires maximum 1/2". Typically, 1/4" can be achieved depending on the individual equipment.
4	Door Open Time: Measured when the doors begin to open until the doors are fully open. Door time performance recommendations are based on the individual door operator equipment installed while providing smooth operation and long equipment life.
5	Door Closing Time: Measured from when the doors begin to close until the doors are fully closed. The ASME A17.1 Code, 2.13.4, limits door closing time by defining the level of kinetic energy generated during door closing operation. We indicate the closing time which approximates this code requirement based on average door weight.
6	Car Door Hold Open Time: Measured from when doors are fully open until the doors begin to close when responding to a car call. Minimum time of 3 seconds required by The Americans with Disabilities Act (ADA). This is the time the doors remain open so passengers can exit.
7	Reopening Device Door Time: Measured from the fully open position until the doors begin to close after interrupting the door protective devices.
8	Nudging Time: Measured from the instant the doors reach the fully open position until the door buzzer sounds and the doors begin to close at reduced speed even though the door protective devices are interrupted.
9	Door Closing Force: Measured with a spring pressure gauge as the doors begin to close. The measured value is the force required to prevent the doors from closing under power. ASME A17.1 Code requires the force needed to stall the closing door be no more than 30 force pounds.
10	Hall Door Hold Open Time: Measured from the instant the doors are fully open until the doors begin to close in response to a hall call registration. 5 seconds minimum required by The Americans with Disabilities Act (ADA).
11	Operation: Subjective evaluation of the quality of ride and door operation. The elements reviewed are: Acceleration Up, Acceleration Down, Deceleration Up, Deceleration Down, Elevator Stop, Door Open, and Door Close.
12	Safety: Communication devices, car door protection devices, car stop switch and alarm bell and emergency lighting for the car are checked to verify they are functioning properly.

ELEVATOR PERFORMANCE EVALUATION

ELEVATOR 1									
Project Name:	Site 005 Fawcett		Permit ID #:	4200	Group:	1	Review Date:	4/18/22	
Project Location:	3201 S. Fawcett Ave.		Machine Type:	Hydraulic		Elevator Type:	Passenger		
City & State:	Tacoma, WA		Floors Served:	Front:	4	Rear:	0		
Manufacturer (OEM):	TK Elevator		Capacity:	2,500 lbs.		Contract Speed:	125 fpm		
Contractor:	TK Elevator		Safety Tests:	Annual	☒ Yes ☐ No	Date Completed:	9/2021		
Install/Mod. Date:	2017			5-Year	☐ Yes ☒ No	Date Completed:	2/2017		
Elevator Information									
Typical Floor Height:	113"		Between Floors:	G-1		Door Operator Speed:	Medium		
Door Type:	Single Speed-Side Opening		Door Size:	Height 84" & Width 42"		Pre-Opening:	N/A		
	Measured		Target Criteria		Meets Criteria		Comments		
Speed Up $\pm 10\%$	127 FPM		113-137 FPM		Yes				
Speed Down -20%	97 FPM		100-137 FPM		Yes				
Performance Up	16.3 SEC		16.3 SEC		Yes				
Performance Down	17.3 SEC		16.3 SEC		Yes		Acceptable with no load		
Stopping Zone $\pm 1/4"$	$\pm 1/4"$		$\pm 1/4"$		Yes				
	Measured Front / Rear		Target Criteria		Meets Criteria Front / Rear		Comments		
Door Open	1.8 SEC N/A		2.1 SEC		Yes N/A				
Door Close	4.2 SEC N/A		2.4 SEC		NO N/A				
Short Hold Open (Car Call)	4.2 SEC N/A		3.0-5.0 SEC		Yes N/A				
Interrupted Ray Hold Open	3.0 SEC N/A		>3.0* SEC		Yes N/A				
Nudging Hold Open	20 SEC N/A		20.0-25.0 SEC		Yes N/A				
Extended Door Close Time (Nudging)	15.9 SEC N/A		4.03 SEC		NO N/A		(1.68 x min. door close time)		
Stall Pressure	27 LBS N/A		≤ 30 LBS		Yes N/A				
Long Hold Open (Hall Call)	6.8 SEC N/A		5.0-8.0 SEC		Yes N/A				
Lanterns Call Notification (Hall Call)	N/A N/A		5.0-10.0 SEC		N/A N/A				
Observations	Meets Criteria	Comments	Features		Installed	Tested	Comments		
Acceleration	Yes		Emergency Light		Yes	NO			
Ride	Yes		Fire Service Ph1		Yes	NO			
Deceleration	Yes		Fire Service Ph2		Yes	NO			
Stop	Yes		Fire Phone Jack		N/A	N/A			
Door Operation	Yes		Standby Power		N/A	N/A			
Door Protection	Yes		Telephone		Yes	Yes			
Door Open Button	Yes		Intercom		Yes	Yes			
Alarm Button	Yes		Stop Switch		Yes	NO			
Car Lighting Guarded	Yes		Seismic Operation		Yes	NO			
False Call Cancel	N/A		Door Restriction		Yes	NO			
Additional Comments									
1. Check piston and packing, repack if necessary.									

ELEVATOR DEFICIENCIES

Item	Description: Items requiring correction are indicated by ☐ . Items corrected are indicated by ✓.	1
1.	Check packing and piston for damage, make corrections.	☐
2.	Complete ASME and State required testing.	☐
3.	Adjust door closing to 2.4 seconds.	☐
4.	.Adjust extended door closing time to 4.03 seconds.	☐

SUPPORTING PHOTOGRAPHS



1. Check piston and packing.



2. Clean pit.



3. Cab interiors are holding up wel..



4. Machine room is clean and organized.