

APPENDIX B – PORTAGE AND MAIN UNDERGROUND CONCOURSE ESCALATOR STUDY - JANUARY 2018



December 21, 2017

City of Winnipeg
200 – 65 Garry Street
Winnipeg, Manitoba
R3C 4K4

Attention: **Dave Ruchkall, P. Eng.**
Supervisor of Program Services

Subject: Winnipeg Square Escalators and Lifts

Dear Sir:

We have completed audits of the 8 escalators, 1 handicap elevator and 4 handicap lifts at the above captioned location. The results of our audits are as follows:

ESCALATOR #1 DOWN (MANITOBA SERIAL NUMBER 3676) AND #2 UP (MANITOBA SERIAL NUMBER 3677) ROYAL BANK

- Manufactured and installed by Montgomery Elevator.
- 24” escalators, solid balustrade.
- All the steps have been replaced. These are new design steps. They have a solid axle, vs. the bolt on stub axles on the original escalators. The original type of step could develop cracks at the bolt on axle stubs, which could result in catastrophic failure.
- Up escalator, and the down escalator, have newer step chains.
- Down escalator had water on it. Water damage appears to have been repaired.
- Handrails on both units are in good shape. They pass the friction and step speed match tests. There is no sign that they are wearing unevenly or prematurely.
- Handrail entry switches are functional
- Skirt deflection switches are functional
- Escalators have 1 ½ steps flat portion at upper and lower landings. That is, when the steps are at the upper and lower

landing, the “flat” portion is 1 ½ steps in length. Newer escalators typically have 2 flat steps at the upper and lower landings.

- Stainless steel balustrade
- The top escalator start / stop key switch is worn out and should be replaced.
- Escalators were both last cleaned down last winter.
- The down escalator motor needs new gasketing. This will be done by the service provider during regular maintenance.
- Up escalator, the lower floor plate outside bolt is stripped. This will be repaired on maintenance.
- Down escalator, skirt panel on one side is damaged and actually has a small hole in it. That skirt panel is loose and wearing on the sides of the steps, and needs to be replaced.
- Down escalator handrail drive chain should be replaced. The up escalator drive chain is newer.
- All balustrade fastening bolts should be removed, larger holes drilled and tapped, and new fastening bolts installed. Some screws are different, some holes are stripped, a couple of holes have broken bolts stuck in them.
- Controllers are clean. Central Elevator installed additional relays to facilitate more effective and quicker troubleshooting. They are resettable relays that break out individual parts of the safety circuit so that techs have some idea of why an escalator would have tripped its’ safety circuit.
- Controllers could be upgraded to meet current code standards and provide far better troubleshooting and reliability. The existing escalators have one safety circuit. If a switch is tripped that safety circuit is opened and it causes the escalator to stop. Central Elevator has installed three relays per controller to break out parts of the safety circuit so they have some idea of which part of the escalator in it had the switch that was that tripped, but they don’t know which switch. If there is an intermittent problem it is very difficult to narrow down what is wrong with the escalator causing it to shut down. An current technology new controller would have discreet wiring to all new switches to facilitate accurate troubleshooting and repair.

- There are no jumped out safety circuits in these controllers.
- Floor plates are damaged. It appears that a large spade screwdriver had been used to pry the plates up for removal, instead of using the proper tool, in the past.
- These escalators do not have skirt panel brushes, which are recommended.
- Emergency stop buttons are hidden away and hard to access. We recommend stop switches on pedestals with alarming covers be installed at upper and lower landing of all escalators. This is a non retroactive code requirement. However if something were to happen such as an entrapment, modern style stop switches would facilitate a pedestrian being able to quickly stop an escalator. This applies to all escalator groups.



This skirt plate needs to be removed and replaced. It has a hole in it, and it is wearing on the steps.



The handrail drive chain in the foreground is worn out (down escalator).
Chain in background is up escalator handrail drive chain (newer).



Handrails are in good shape on both escalators. Drives are working properly.



Broken off bolts in the trim holding balustrades in place. All these should be drilled out, re tapped, for new fastenings.



Controllers are clean. Additional relays have been installed to facilitate troubleshooting.



Floor plates damaged due to improper removal means.

ESCALATOR #3 DOWN (MANITOBA SERIAL NUMBER 3613), #4 UP (MANITOBA SERIAL NUMBER 3614), BMO

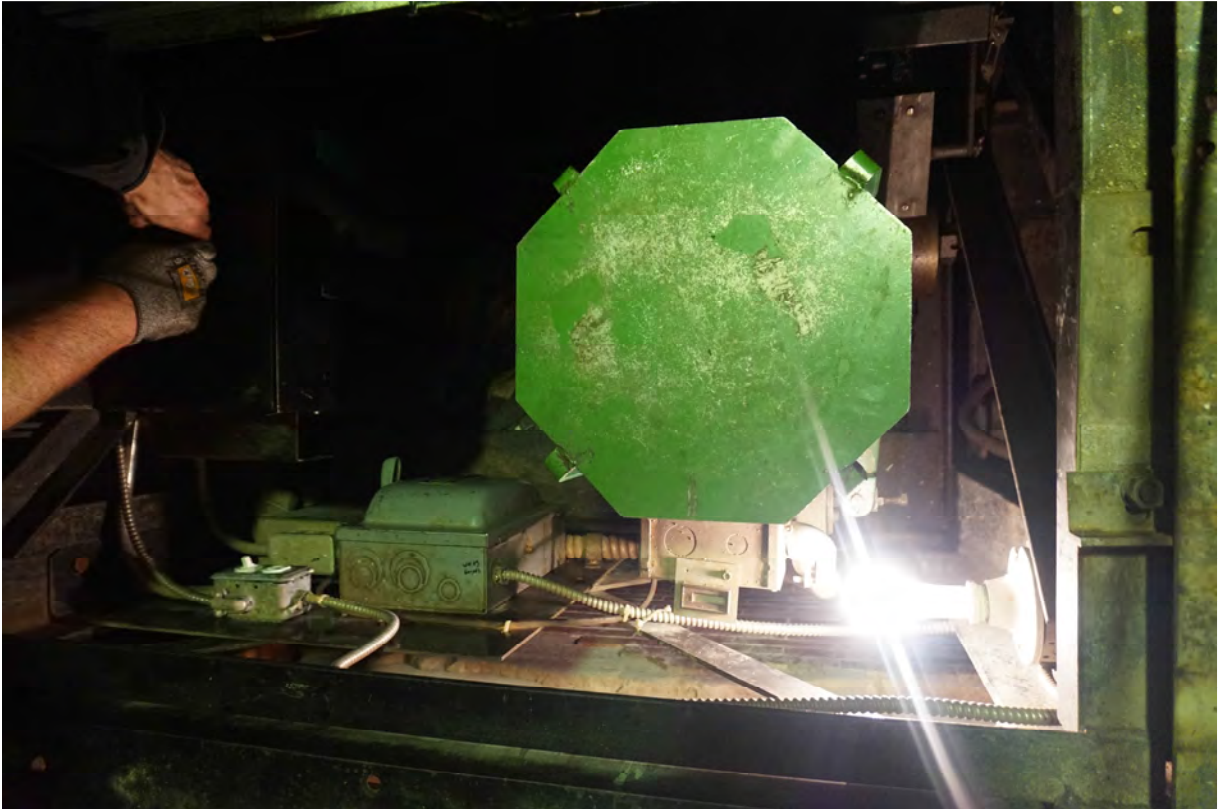
- Manufactured and installed by Otis Elevator.
- These escalators were recently upgraded due to flooding. Step chains were removed and replaced. Main power rectifier was removed and replaced. The main brake was overhauled. The friction reversal switch including plates was removed and replaced, and the escalator was completely cleaned down at that time.
- 24" escalators, solid balustrade.
- Controllers are clean. Central Elevator installed additional relays to facilitate more effective and quicker troubleshooting. They are resettable relays that break out individual parts of the safety circuit so that techs have some idea of why an escalator would have tripped its' safety circuit.

- There are some missing arc deflectors in the controller. Central will replace these under maintenance.
- The control cable to the controller is also coming off its' fastening. This should be repaired under maintenance.
- These escalator controllers have really heavy contactors. Occasionally, it is necessary for a technician to get inside the upper pit and intermittently run the escalator to position steps for removal. For this, the power is on, and the escalator is started and stopped with the start / stop switch. If the controller is removed and then it is laid down and the escalator is started, the weight of the contactors causes it to stay on when it should shut off. This is a safety concern. There is nothing wrong with the controller, this is just the nature of the product. Short of replacing the controllers on these two units, we recommend the installation of very accessible emergency stop switch in the upper escalator pits.
- Controllers could be upgraded to meet current code standards and provide far better troubleshooting and reliability. The existing escalators have one safety circuit. If a switch is tripped that safety circuit is opened and it causes the escalator to stop. Central Elevator has installed three relays per controller to break out parts of the safety circuit so they have some idea of which part of the escalator in it had the switch that was that tripped, but they don't know which switch. If there is an intermittent problem it is very difficult to narrow down what is wrong with the escalator causing it to shut down. An current technology new controller would have discreet wiring to all new switches to facilitate accurate troubleshooting and repair.
- There are no jumped out safety circuits in these controllers.
- Handrails on both units are in good shape. They pass the friction and step speed match tests. There is no sign that they are wearing unevenly or prematurely.
- Handrail entry switches are functional
- Skirt deflection switches are functional
- Escalators have 1 ½ steps flat portion at upper and lower landings.
- These escalators do not have skirt panel brushes.

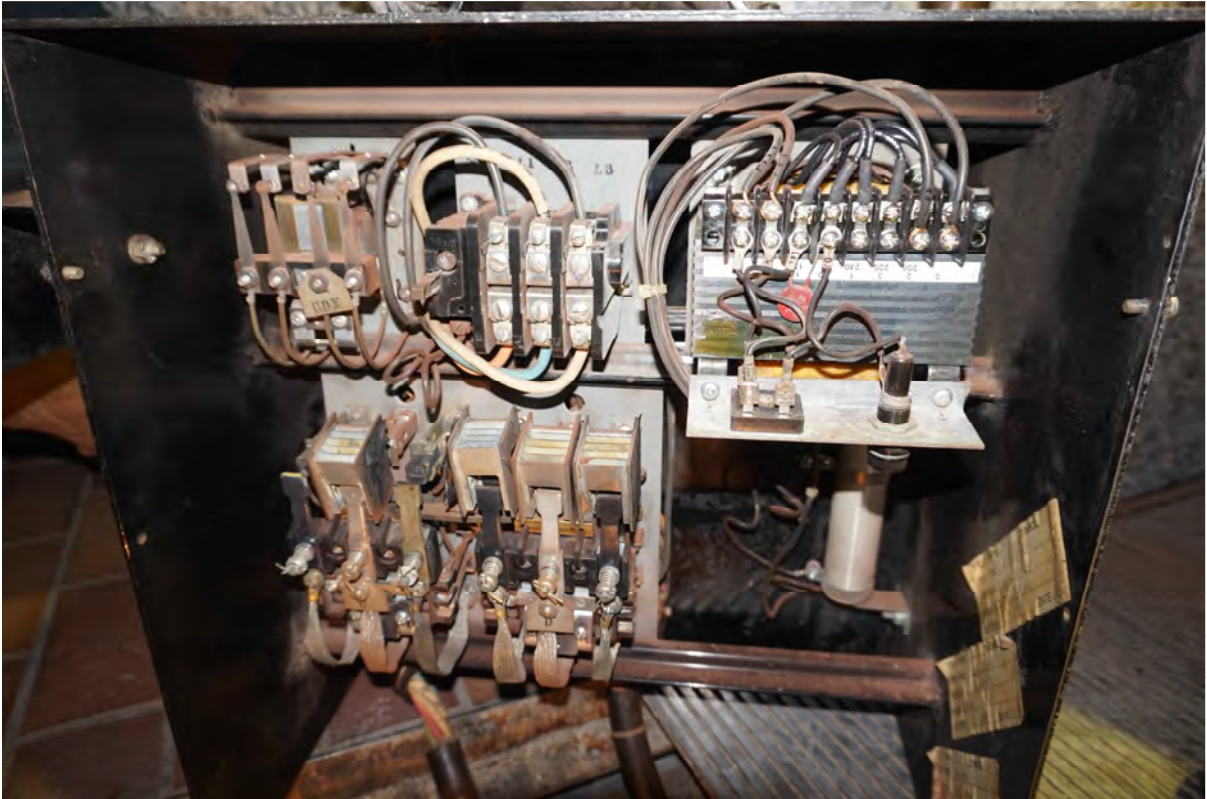
- Need more lighting in the escalator pits. They all have high power single incandescent bulbs which are blinding and cast shadows. It is very difficult to see anything in these escalator pit spaces, which frustrates maintenance.
- Emergency stop buttons are hidden away and hard to access. We recommend stop switches on pedestals with alarming covers be installed at upper and lower landing of all escalators. This is a non retroactive code requirement. However if something were to happen such as an entrapment, modern style stop switches would facilitate a pedestrian being able to quickly stop an escalator. This applies to all escalator groups.
- One handrail on the down escalator is slightly damaged. There appears to be some fastenings missing from under the handrail.



This is the fastenings under the handrail. Some are missing. If these get loose, they wear on the underside of the handrail. The handrails should be removed, and all hardware should be checked, replaced as necessary and fastened with lock tite.



This is the upper pit of the down escalator. The light is really bright and singular, and reduces night vision, and casts a shadow on the other side of the machine, making it really difficult to see anything. All escalator pits should get lighting improvements to facilitate maintenance and safety.



This is the up escalator controller. Some arc deflectors are missing which should be done under maintenance. These contactors are really heavy and they don't turn off sometimes when the controller is laid down. This is a safety concern. Emergency stop switch should be installed in the upper pits of both escalators.



These connectors should be repaired to avoid damage to the cables.

ESCALATOR #5 UP (MANITOBA SERIAL NUMBER 3615), #6 DOWN
(MANITOBA SERIAL NUMBER 3616), RICHARDSON

- Manufactured and installed by Otis Elevator.
- These escalators were recently repaired due to flooding. The main brakes were removed, dismantled, cleaned, and calibrated, the friction reversal switches including plates were removed and replaced, and the rectifiers including transformers were removed and replaced.
- 48" escalators, solid balustrade.
- These escalators are subject to the most moisture and sand of all the escalators we are surveying for this project.
- The screws holding all the deck plates are 8/32". All these should be removed, holes drilled out and tapped, and larger deck

plate screws should be installed so they are the same as all the other deck plate screws on the other escalators.

- Up escalator handrail drive chain should be done within 5 years.
- Step chains were done about 2 years ago.
- Controllers are clean.
- These escalator controllers have really heavy contactors. Occasionally, it is necessary for a technician to get inside the upper pit and intermittently run the escalator to position steps for removal. For this, the power is on, and the escalator is started and stopped with the start / stop switch. If the controller is removed and then it is laid down and the escalator is started, the weight of the contactors causes it to stay on when it should shut off. This is a safety concern. There is nothing wrong with the controller, this is just the nature of the product. Short of replacing the controllers on these two units, we recommend the installation of very accessible emergency stop switch in the upper escalator pits.
- Controllers could be upgraded to meet current code standards and provide far better troubleshooting and reliability. The existing escalators have one safety circuit. If a switch is tripped that safety circuit is opened and it causes the escalator to stop. Central Elevator has installed three relays per controller to break out parts of the safety circuit so they have some idea of which part of the escalator in it had the switch that was that tripped, but they don't know which switch. If there is an intermittent problem it is very difficult to narrow down what is wrong with the escalator causing it to shut down. An current technology new controller would have discreet wiring to all new switches to facilitate accurate troubleshooting and repair.
- There are no jumped out safety circuits in these controllers.
- Handrails on both units are in good shape. They pass the friction and step speed match tests. There is no sign that they are wearing unevenly or prematurely.
- Handrail entry switches are functional
- Skirt deflection switches are functional
- Escalators have 1 ½ steps flat portion at upper and lower landings.

- These escalators do not have skirt panel brushes.
- Need more lighting in the escalator pits. They all have high power single incandescent bulbs which are blinding and cast shadows. It is very difficult to see anything in these escalator pit spaces, which frustrates maintenance.
- Emergency stop buttons are hidden away and hard to access. We recommend stop switches on pedestals with alarming covers be installed at upper and lower landing of all escalators. This is a non retroactive code requirement. However if something were to happen such as an entrapment, modern style stop switches would facilitate a pedestrian being able to quickly stop an escalator. This applies to all escalator groups.
- The upper landing gets extremely hot in the summer. The escalator pit gets hotter. Central Elevator has installed a fan to try to get some air circulation going. This heat will affect the longevity of the motor. Short of mechanical cooling of the upper landing area we have no other solution to cool the escalator pits.



Up escalator handrail drive chain is in the background. It should be done within 5 years.

ESCALATOR #7 DOWN (MANITOBA SERIAL NUMBER 3674) AND #8 UP (MANITOBA SERIAL NUMBER 3675) SCOTIA BANK

- Manufactured and installed by Montgomery Elevator.
- 36" escalators, solid balustrade.
- All the steps have been replaced. These are new design steps. They have a solid axle, vs. the bolt on stub axles on the original escalators. The original type of step could develop cracks at the bolt on axle stubs, which could result in catastrophic failure. HOWEVER, when these steps were replaced, the installers over tightened the supporting roller nuts. As a result, when technicians attempted to remove a step, they broke the interference fit between the axle and the aluminium step housing. Now, when step removal is attempted, the axle spins, and then the step can't be removed. It can take up to an hour to get a step out, where it should take about 5 minutes. We examined the steps and do not see a way that the solid interference fit bond between the axles and the steps can be repaired, so all these steps should be replaced.
- Controllers are clean. Central Elevator installed additional relays to facilitate more effective and quicker troubleshooting. They are resettable relays that break out individual parts of the safety circuit so that techs have some idea of why an escalator would have tripped its' safety circuit.
- Controllers could be upgraded to meet current code standards and provide far better troubleshooting and reliability. The existing escalators have one safety circuit. If a switch is tripped that safety circuit is opened and it causes the escalator to stop. Central Elevator has installed three relays per controller to break out parts of the safety circuit so they have some idea of which part of the escalator in it had the switch that was that tripped, but they don't know which switch. If there is an intermittent problem it is very difficult to narrow down what is wrong with the escalator causing it to shut down. An current technology new controller would have discreet wiring to all new switches to facilitate accurate troubleshooting and repair.
- There are no jumped out safety circuits in these controllers.

- Handrails on both units are in good shape. They pass the friction and step speed match tests. There is no sign that they are wearing unevenly or prematurely.
- Handrail entry switches are functional
- Skirt deflection switches are functional
- Escalators have 1 ½ steps flat portion at upper and lower landings.
- These escalators have auto-oilers. Better lubrication is provided by manually lubricating step and handrail chains thoroughly and often.
- These escalators floor plates are in better shape than #1 and #2.
- These escalators have skirt panel brushes.
- Down escalator handrail drive sprocket right hand side was recently replaced.
- Down escalator handrail drive chain is damaged. Aluminum from a disintegrating tensioner has contaminated the lubrication and caused undue wear. It should be replaced within a year.
- Plumbing needs to be fixed! At the bottom of the escalators, there is a red hose that leaks water from some unknown source above. This occasionally gets on the escalator floor plate. If it leaks badly it could wash the lubrication off the step chain, and then step chains would have to be replaced, which would be very costly (\$60,000.00).
- Need more lighting in the escalator pits. They all have high power single incandescent bulbs which are blinding and cast shadows. It is very difficult to see anything in these escalator pit spaces, which frustrates maintenance.
- Step chains should be replaced, probably about 5 years out. The steps should be replaced at the same time.
- Need new flex both sides to step chain tension safety switch.
- Emergency stop buttons are hidden away and hard to access. We recommend stop switches on pedestals with alarming covers be installed at upper and lower landing of all escalators. This is a non retroactive code requirement. However if something were to

happen such as an entrapment, modern style stop switches would facilitate a pedestrian being able to quickly stop an escalator. This applies to all escalator groups.

- Flex needs to be replaced at one step chain tension safety switch. This will be done by the service provider.



Down escalator handrail drive chain



This is the new, non-aluminium, handrail drive chain tensioner.



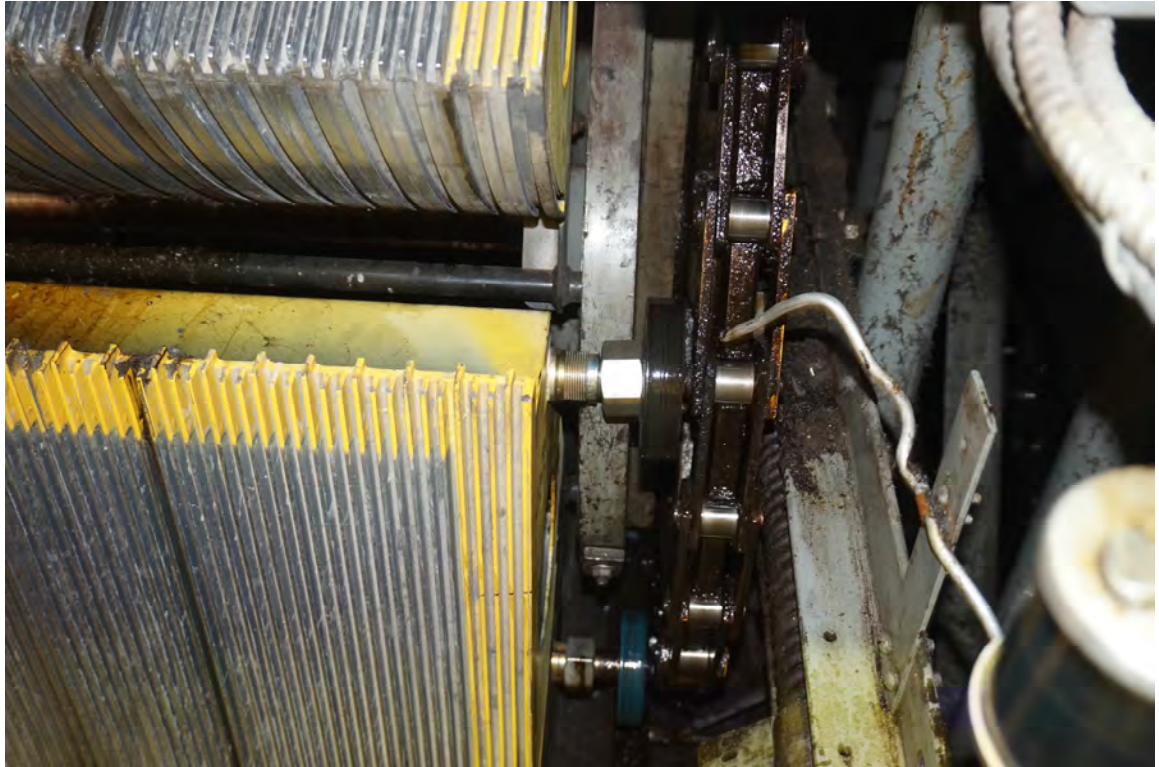
These escalators have the skirt brushes. Skirt brushes are installed just above the steps on the top of the skirt panels, which discourages pedestrians from getting their feet right at the step / skirt panel intersection. That intersection is the cause of most escalator entrapments, where clothing and rubber boots get drawn into the escalator. These should be installed on all escalators that don't have them (#1, #2, #3, #4, #5, #6)



This is the emergency stop switch. Modern ones are located on a pedestal between the escalators at upper and lower landings and are highly visible and accessible.



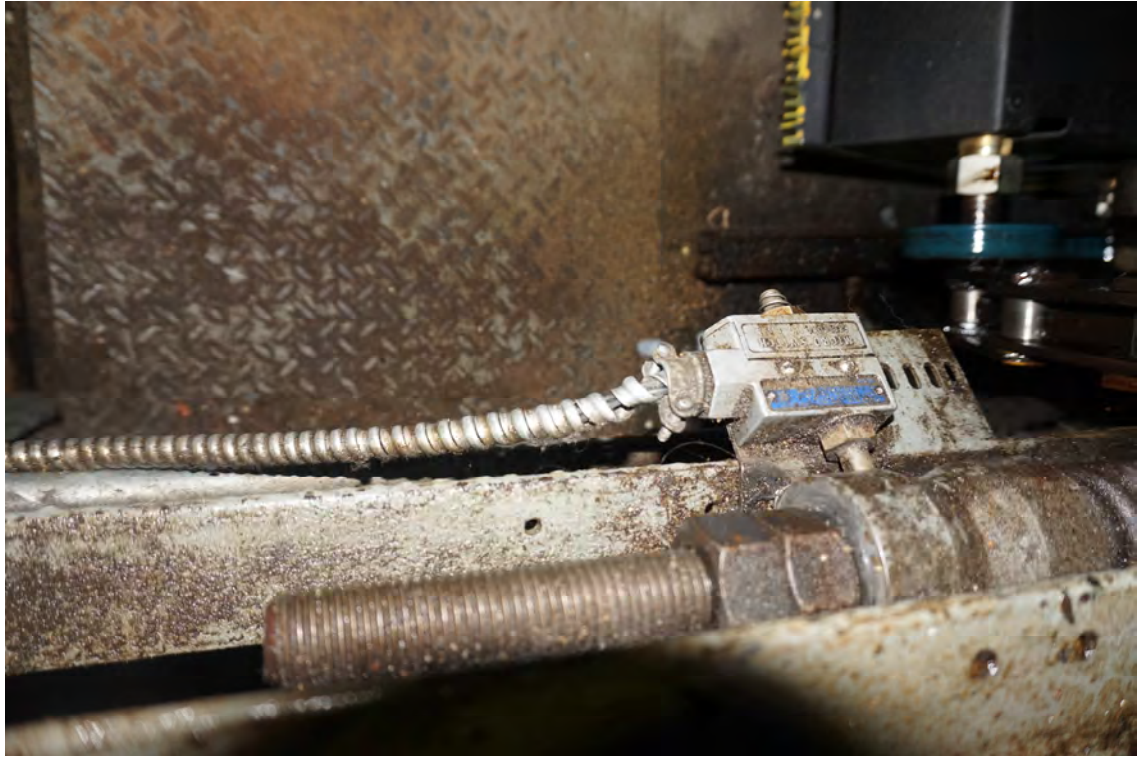
This is the red hose from which water from above comes. It is directed into a bucket, but has been known to overflow, or come out of the bucket and cause water to be deposit on the down escalator lower landing floor plate. This risks very expensive damage to the escalator. We strongly recommend that a permanent solution should be found to redirect this moisture.



This nut has been removed from the step axle. These nuts were excessively tightened, so that when trying to remove them, the seal between the axle and the step sides were broken, now the axle spins within the step. When it spins, it moves from the position it needs to be in to facilitate step removal.



The step axle is horizontal, the inside of the step is black. Where the axle passes through the side of the step it is a negative interference fit. On many steps this rigid fit has been broken free, allowing the axle to spin when trying to remove the nut. If the axle spins, the nut can't be removed. Once the axle spins, it moves out of the position it needs to be in, to remove the steps.



This flex will be replaced under maintenance.

HANDICAP ELEVATOR 3678

- The handicap elevator was manufactured and installed by Montgomery elevator, circa 1978.
- Two stop, front and rear opening, direct acting hydraulic drive.
- Roller guides on carframe and standard 1 ½ elevator rails.
- Shallow pit
- 12" apron guard
- Double bottom hydraulic cylinder without corrosion protection.
- Spirator door closers.
- Mechanical safety shoe car door and passenger protection. No safety light rays.

- Relief valve is sealed by the Office of the Fire commissioner. It has not likely been tested since 1978.



This photo shows the in ground hydraulic cylinder for the handicap elevator.

HANDICAP LIFTS (A & B)(MANITOBA SERIAL NUMBERS 6395 AND 6396) AT TD

- Manufactured by Savaria Handicap Lift company
- These two lifts are directly across from one another, they are identical, two stop, front and rear opening.
- The flooring in the unit has been removed, revealing a bare steel floor surface. This does not meet the requirements for barrier free design for a slip resistant, color contrasted lift floor surface, and new flooring should be installed.

- This is a poor quality product that is being used very frequently. These type of products are designed for intermittent and light usage.
- The doors, door operators, and machine are all in poor and worn out condition. This product should be replaced with a new, more robust, B355 compliant lift.
- The lower landing at both of these lifts shares a common floor surface. This floor surface has been renewed, moving the floor elevation up to the point where it is barely below the lower landing entrance doors of both of these lifts. The floor surface can't be added to any more, or the doors won't open. This should be considered when these lifts are replaced.

HANDICAP LIFT "C" AT BMO, (MANITOBA SERIAL NUMBER 6077)

- Manufactured by Savaria Handicap Lift company
- The flooring in the unit has been removed, revealing a bare steel floor surface. This does not meet the requirements for barrier free design for a slip resistant, color contrasted lift floor surface, and new flooring should be installed.
- Two stop, front and rear opening.
- This is a poor quality product that is being used very frequently. These type of products are designed for intermittent and light usage.
- The doors, door operators, and machine are all in poor and worn out condition. This product should be replaced with a new, more robust, B355 compliant lift.

HANDICAP LIFT "D" AT RICHARDSON BUILDING (MANITOBA SERIAL NUMBER 6397)

- Manufactured by Savaria Handicap Lift company
- Two stop, front and rear opening, unenclosed type handicap lift.

- Lower door is full height, power operated.
- Upper door is a half door, also power operated.
- Upper door is badly damaged. It opens with the speed and force that it is designed for, but it is too slow for some users of the lift. It has been repeatedly smashed from the inside. This door should be changed, and a floor stop should be installed so that it can't be over extended at the upper landing.
- Similarly, the lower landing door is damaged. The door closer hardware is damaged and requires constant attention from the service provider. As a bare minimum, this door and door opener should be changed to a more robust designed product.
- The flooring in the unit has been removed, revealing a bare steel floor surface. This does not meet the requirements for barrier free design for a slip resistant, colour contrasted lift floor surface, and new flooring should be installed.
- The lower door hinges bolt fastenings are all stripped from excessive abuse on the door assembly. As a bare minimum, this door and opener should be replaced with a new more robust design unit.
- This is a poor quality product that is being used very frequently. These type of products are designed for intermittent and light usage.
- The doors, door operators, and machine are all in poor and worn out condition. This product should be replaced with a new, more robust, B355 compliant lift.



Upper door is damaged and should be replaced.



This lift requires new flooring to be installed.

We are working on a spreadsheet to summarize budget costs of upgrades recommended pursuant to this report and will provide to you under separate cover.

Please call to discuss at your convenience.

Sincerely,

Chuck Gulay, P.Eng. EDM-F,
Gulay Elevator Services Inc.
Consulting Engineering