# State of Maine Elevator and Tramway Safety Program

## Hoist Inspection elements

**Personnel Hoist Inspection Process (Maine Elevator and Tramway Safety Program)**

Set forth below are steps taken by an OPOR State Elevator Inspector during the acceptance inspection and approval of an A10.4 personnel installation and inspection points completed while conducting an acceptance inspection.

**Required Documentation:**

The inspection process begins when a Registered Elevator Contractor (ECP) hired to install the hoist submits an Elevator Plan Transmittal form with plans to the OPOR Chief Elevator Inspector.

The following documentation must be submitted to and reviewed and approved by the Chief Elevator Inspector. It includes:

- Set of drawings
- Reactions
- Building to tower support fastenings requirements designed by a licensed Professional Engineer (PE) and signed off by a PE
- Plans provided by the Equipment Manufacturer to the ECP

**Variance Request**

A variance request must be submitted to and approved by the Chief Elevator Inspector prior to the scheduling of an “acceptance” inspection. A variance request is required because an A10.4 hoist technically does not meet Maine’s adopted elevator standards. Since the installation is a temporary one and the hoist is appropriately designed for the task, the issuance of a variance allows state technical staff to address any special concerns related the installation.

An approved variance requires the following:

- A Maine registered ECP and licensed mechanics to install
- Stipulation that the installation must meet the A10.4 standard which requires trained operators
- Drawings of unit to be onsite
- Licensed Professional engineer to review and approve fastenings to building and lift pad
- Permit with registration number is issued after the plans and variance are approved.

The ECP will call for an inspection once the installation is complete. The acceptance inspection is completed by State elevator inspectors. The inspection checklist from the standard for the equipment (A10.4 Appendix B) is used to as a guide. Not all items on the checklist are applicable to every type of hoist inspected.

# State of Maine Elevator and Tramway Safety Program

## Hoist Inspection elements

A licensed mechanic is present to during the hoist acceptance inspection.

Inspection elements and items evaluated during a state acceptance inspection.

## Inside the car

### Stop Switch (24.2.4)

Complete a functional test of the stop switch and evaluate the type and location.

An emergency stop switch shall be provided in the car and located in or adjacent to the car operating panel. When opened, this switch shall cause the electric power to be removed from the hoist driving-machine motor and brake. Emergency stop switches must:

1. be the type of switch that is manually opened and closed
2. have red operating handles or buttons
3. be conspicuously placed and permanently marked “stop”
4. be positively opened mechanically and their opening shall not be solely dependent on springs

### Floor and sill (11.3)

Ensure the clearance between the car platform sill and the hoistway edge of any landing sill, or the hoistway side of any vertically sliding door is at least ½ inch with side guides or ¾ inch with corner guides. Maximum clearance is 2.5 inches.

Ensure bridging devices are adequate.

If installed are they need to be designed and constructed to support the load., no longer than 12 inches. If hinged, ensure the device is prevented from falling into the car

when in the retracted position and the car shall not operate with the device is extended.

**Lighting (17.9)**

Ensure the light level is appropriate to safely complete the inspection and tests. The standard requires at least 5 foot candles at the threshold

Verify emergency light works

**Gate (18)**

Check the gate for smoothness of operation and automatic locking. The gate may not be opened once away from the landing.

Verify latches secure the gate when closed

Check for looseness or wear in latch mechanism

Each entrance, horizontal or vertical sliding, no scissor type allowed. Verify gates, guides, guide shoes, tracks and hangers are designed to resist deflection.

The Standard requires these components cannot break, deform or displace gate from guides or tracks when a 250 pound force is applied.

Ensure full opening is guarded. Check all entrances if more than one gate.

Sliding vertical gates shall be counterweighted or biparting, made of metal and reject a 1.5 inch diameter ball.

**Enclosure (17)**

# Hoist Inspection elements

Ensure the car is fully enclosed except for entrance and exit, made of metal and fastened to car platform and supports so it cannot loosen or become displaced in ordinary service or when safeties apply or the car strikes buffer.

**Emergency access (17.6)**

Ensure 400 square inch exit is installed on top, with at least 16 inches on any side. Ensure the access panel is not blocked by hoist equipment on top of car, it is hinged to open outward and electrically interlocked to stop the car when open.

**Signs and data plate (21.2, 21.3, 21.4)**

Verify the rated capacity is stamped or printed in 1 inch high letters and figures

Verify the weight of the car in pounds, max. speed and wire rope data stamped or printed in 1/8 inch high letters and figures

**Platform area and rated load (21.1)**

Ensure the inside platform area is not too large the for the capacity of the hoist.

Check Table 7 in section 21.1 if needed verify hoist rated load is appropriate

**Operating devices (24)**

Must be enclosed electric type

Manual to be continuous switch/push button

Automatic to be continuous pressure operation

Ensure operation is smooth and distinct.

No broken parts, looseness

Ensure wiring is not damaged

**Inspection operation (24.1.3)**

# Hoist Inspection elements

Top of car inspection requires operable emergency stop switch.

Measure the guardrail height. The guardrail must be a top guardrail 42 inches high with an intermediate rail and a 4 inches high toe guard. Verify the guardrail is securely fastened to the car top and must be adequate to prevent falls if the person on top of the car trips or loses balance etc.

**Car rider (26.1.5)**

Ensure no personnel in or on hoist during overspeed test.

## Top of Car

**Stop Switch (24.1.3)**

Ensure proper operation of installed emergency stop switch

**Normal Stopping Device (23.2)**

Test function of normal stopping device. Shall automatically stop the car at or near the top and bottom terminal landings with rated load and normal speed. This is in addition to the normal stopping means and terminal final stopping device.

Verify proper location and mounting screws to ensure proper attachment.to structure

Check the switch arm for freedom of movement

**Final Stopping Device (23.3)**

Verify proper operation. Shall remove power form the hoist driving machine and the brake when car has passed the

terminal landing. Located close to the terminal landing but will not function during normal operating conditions

**Suspension ropes if applicable (25.10)**

Evaluate rope looking for corrosion, broken wires, abrasion, kinking, heat, reduction in diameter, dirt, excessive lubrication.

**Car and counterweight safeties (19**)

Evaluate location and function of installed safeties depending in type of safety. Type A, B, C or Rack and Pinion. Securely attached to the car frame or supporting structure, mounted on a single car frame and shall operate on one pair of guide members or one vertical rack.

Ensure safeties are permanently marked with letters and figures at least ¼ inch high:

Maximum tripping speed in feet per minute,

Maximum load in pounds that the safety is designed to stop and sustain, and

Replacement date of the safety if specified by the manufacturer

Test with full load and ensure platform is level within 3/8 inch per foot in any direction.

Ensure only upward motion will release safeties

Verify length of slide of safeties and evaluation grip on rail. Stopping distances are compared to the requirements in the standard

When a rack and pinion safety, the stop is caused by the engagement of a safety pinion with the car and the stationary vertical rack.

**Speed Governors (20, 20.8, 20.9)**

# State of Maine Elevator and Tramway Safety Program

## Hoist Inspection elements

Shall actuate installed safeties and be located out the car/counterweight travel path with enough space to fully function.

Verify plate markings at least ¼ inch high. Verify speed in feet per minute, rope size, material and construction.

Check tag on enclosed governors for replacement date.

**Wire rope fastening (25.9)**

Ensure the fastening is galvanized or zinc coated drop forged fist grip and wire rope thimble. Number, spacing and torque based on manufacturer recommendations. Check when grips were checked and retorqued.

**Car gate and locks (18)**

Verify structural attachments, assess guides, sheaves, ropes during operation and look for signs of corrosion, misalignment, worn components.

**Hoistway door locks (6.2, 24.8.3)**

Verify locks prevent doors from opening away from the landing

Verify the car will not operate if hoistway door interlock is open, door/gate contact is open.

Ensure component failure of magnetic switch, contactor, relay or accidental ground will not allow operation.

**Top of car guardrail (24.1.3)**

Top clearance and runby (10.5, 10.6, 10.7, 10.8, 10.9)

If counterweighted, verify Car and CWT clearance is adequate by reviewing cwt runby, buffer stroke, sheave position or 2 feet clear above the crosshead

If no counterweight -2.5 feet

If rack and pinion ensure no contact with top of car and nearest striking point on tower

Ensure overhead beams and structures not over the crosshead have proper clearances

**Inspection operation (24.1.3)**

Test emergency stop switch, pendant operational controls, ensure exit hatch switch opening prevents operation

## Machine space/Tower/ Pit

**Access to pit and machine (9.1, 6.2)**

Ensure there is a means to control entry to equipment space. The door needs a lock and interlock.

Test that the opening of the door will prevent the hoist from running.

Protected from the weather.

Only authorized personnel are allowed to enter

Open the door will the hoist to moving to ensure it will stop the hoist.

**Buffers (14)**

Ensure buffers are under the car aligned with the centerline of the car/counterweight frames as applicable.

Verify buffers are aligned vertically and the support structure is secure with no corrosion

Check stroke of buffer and compare to table 2 in the standard. Minimum stroke distance increase with the speed of the hoist,

Verify buffers are permanently marked with the stroke and load rating.

**Lighting (9.3)**

# State of Maine Elevator and Tramway Safety Program

## Hoist Inspection elements

Ensure proper lighting to perform required tasks

**Housekeeping (5.6.4)**

Area to be free of stored material, tools, equipment and rubbish

**Hoist and counterweight ropes (25)**

Verify suspension means in accordance with section 16 review attachment to car frame or sheaves.

Review wire rope data tags and markings

On crosshead

- Number of ropes
- Rope diameter in inches
- Rated breaking strength

On data tags

- Diameter in inches
- Manufacturer's rated breaking strength
- Grade of material used
- Type of core, non-preformed or preformed
- Construction classification
- Name of rope manufacturer

**Disconnecting means (5.4.6 and 24.4)**

Ensure power supply is independently operated and independent run from the main power to the site. Each has a separate disconnect at the main panel.

# Hoist Inspection elements

Fused disconnect or circuit breaker to each hoist motor must be manually closed multipole type and located in compliance with NFPA 70.

If a circuit breaker make sure it is not an instantaneous type. If a fire alarms system is installed, ensure is will not open when the systems is activated.

Check for an apparent water damage

Verify operation of the control handle

Ensure interlock functions

**Wiring, fuses, grounding (24.3.1)**

Not more than 600 volts

If over 120 volts, ensure proper grounding to traveling cable or separate grounding conductor. Grounding type and size must comply with NFPA 70.

**Drive machine brake (22.1.1.6)**

A friction brake applied by a spring or gravity, to be released electrically or hydraulically. Designed to stop and hold the car with 125% capacity of rated load. Spring closed, hydraulically open when at normal pressure is attained and car movement is initiated.

**Winding drum slack cable if applicable (22, 22.2, 24.2.1)**

When slack rope electric switch is installed ensure the switch is enclosed, manually reset type and causes power to be removed from the driving machine and brake is rope becomes slack.

**Drums (22.2)**

Drums must be grooved of the wire rope. Groove to be machine finished and shall be either helical or parallel. If helical, only one layer of rope is permitted. If parallel, no more than 4 layers are permitted.

**Sheaves (22.4**)

# Hoist Inspection elements

Verify pitch diameter.

Drive- Pitch diameter not less than 40 time the diameter of the hoist rope.

Overhead or deflector pitch diameter not less than 30 times the diameter of the rope

**Phase reversal (24.5)**

Ensure hoists with polyphase ac power supply have a means to prevent starting if the phase rotation in the wrong direction and/or there is a phase failure.

**Absorption of regenerated power (24.9)**

Ensure in an overhauling load, that the energy is absorbed on the load side of the disconnect to prevent the hoist from obtaining governor tripping speed or more than 125% of rated speed, whichever is less.

**Tower structure components (26.7)**

Verify the owner has inspected the tower components prior to each installation.

Ensure no defects are noted.

Replace parts with excessive corrosion, bent or dented components, broken welds or other defects.

**Structure arrangement (5.2)**

Verify the space under the lift the lowest floor. If not, ensure occupied space below is protected from the hoist going through the floor. Evaluate safeties, buffers, structural strength and supports to prevent going into the space below.

**Hoistway enclosure (5.3)**

# State of Maine Elevator and Tramway Safety Program

## Hoist Inspection elements

Outside hoists protected at bottom on all sides and with safety devices to prevent operation if access door is open. Access restricted to authorized personnel.

**Tie ins (5.4.2, 5.4.3**)

Ensure installations are in accordance with manufacturers' instructions, designed by PE, at least every 30 feet of vertical height, secured to the building and tower by appropriate fasteners or welding.

**Hoistway doors (6)**

Doors at least 6 feet and 6 inches high, any opening to reject a ¾ inch ball. The doors, door guides, guide shoes and locking devices shall not deflect beyond the car to landing sill clearance and resists deformation. Standard require no permanent deformation beyond centerline when subject to 250 pound force.

**Guide members and supports (13**)

Ensure components are steel (guide members, brackets, rail clips, fishplates and fasteners) have a tensile strength of not less than 55000psi and at least 22 percent elongation. Bolts are A307, A325 or 490.04a. if not steel, review calculations to ensure equivalency.

**Overhead beams and supports (7)**

**Wiring (8.1)**

Verify compliance with NEC, in enclosed metallic raceways inside or outside the hoistway. Securely fastened to guide member or guide member supports. Traveling cables to be EO or Type W. Live parts need to be enclosed/guarded to protect against incidental contact. Max 600 volts but if over 120 volts grounding is required.

**Landings (5.6)**

# Hoist Inspection elements

Rigid to resist incidental forces, railing installed on open sides, and clear of material, tools, equipment

**Overhead protection(7.3)**

Ensure overheard protection is provided to prevent falling objects striking personnel using the hoist.

**Counterweights (15)**

Ensure frames secure the counterweights and are properly supported

Verify at least 1 inch clearance between car and counterweight

Verify the clearance between the counterweight and screen is at least .75 inches.

Ensure the counterweights weigh the correct amount as required manufacturer and/or professional engineer

Inspect compensating chains if installed

Ensure rollers or guide shoes are securely attached and a backup guide shoe is installed to guide counterweight if roller or guide shoes breaks away or comes off due to overtravel

**Counterweight guarding (12)**

Check installed guard is not more than 12 inches off the floor. Verify the guard is 6 to 8ft high and is fastened to the frame and properly reinforced support structure.

**Car frames and platforms (16)**

Ensure car frame and platform are an integral part of the car construction. Check that upper and lower guide shoes are attached to the frame.

Verify condition and attachment of backup guide shoes

Ensure platform floor is a has no holes, is steel and fire retardant.

# Hoist Inspection elements

Check attachment to car platform to frame.

Verify frame material is structural steel (ASTM A36 or ASTM A283), forged steel ASTM A668 or Cast Steel ANSI A27.

Verify fasteners are an acceptable material i.e bolting, nuts.

Ensure any welding was completed by a qualified welder.

**Bottom clearance and runby (10.1,10.2,10.3,10.4)**

Ensure at least 2 feet clearance between the pit floor and the lowest structural component on the car when the car is resting on the buffers

` Ensure bottom runby for the counterweight is at least 6 inches

**Final terminal stopping device (23.3)**

Verify the power is removed from the drive machine and brake if the top or bottom final terminal stopping device is actuated.

Ensure terminal limit is placed to not impact normal operation but will work if the car goes past the terminal landing.

Ensure limit switch are installed on the car and actuated by cam installed on the hoist structure.

**Normal terminal stopping device (23.2)**

Verify this stops the car near the top or bottom landing under any normal load or speed.

Verify it acts independent of normal stopping means or the final terminal stopping device.

Verify it continues to work until the final limit is actuated.

# State of Maine Elevator and Tramway Safety Program

## Hoist Inspection elements

Ensure limit switch are installed on the car and actuated by cam installed on the hoist structure.

## General

### Registration number on disconnect

Ensure hoist registration number is legibly labeled on the f ace of the disconnect switch.

### Operator qualifications (30)

Ensure only trained operators will be allowed to operate the hoist.

### Plans/Permit (29)

Verify the permit for the installation is conspicuously posted in the car

Ensure a copy of the approved installation plans are available during the inspection.

### Welding verification (16.7.3)

If applicable verify, welding is in compliance with American Welding Society (AWS) structural standards and the welding is performed in accordance with AWS D1.1.

### Replacement of certified devices (27.3)

Ensure only properly listed devices are used to replacement in accordance with ASME A17.5

### Hoist operations log (26.8, 27.1)

Verify log is on site and being properly maintained

**Provided by OPOR Staff**

**April 26, 2021**

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