Final Report

MATERIALS TO ASSIST INSURANCE ADJUSTERS WITH ADDRESSING FLOOD DAMAGE TO ELEVATORS

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This document was prepared by

URS Group, Inc.
12420 Milestone Center Drive, Suite 150
Germantown, MD 20876

In Association with:

Michael Blades & Associates
Elevator and Escalator Consultants
5409 Rapidan Court
Lothian, MD 20711

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Alternating Current (AC) – A type of power for an elevator.

Americans with Disabilities Act (ADA) – The Americans with Disabilities Act of 1990 was signed into law by President Bush on July 26, 1990. The ADA is designed to give civil rights protection to people with disabilities, similar to those granted by the Civil Rights Act.

Babbitt – A soft metal used to fill scratches in a plunger surface. It is also used to secure hoist ropes to shackles.

Baked Enamel – An enamel paint that must be baked to adhere to the surface.

Bolster – The bottom member of a sling for a hydraulic elevator.

Brackets (Guide Rail) – The device used to attach the rails firmly to the hoistway.

Brake – An electromechanical device used to prevent the elevator from moving when the car is at rest and no power is applied to the hoist motor. On some types of control, it also stops the elevator when power is removed from the hoist motor with a spring-loaded clamping device that holds the elevator car when the machine is turned off.

Buffer – A device designed to stop a descending car or counterweight beyond its normal limit of travel by storing or by absorbing and dissipating the kinetic energy of the car or counterweight.

Cab – The decorative enclosure in which people ride in a passenger elevator.

Cable (Rope) – Usually four to six in number, it is used to support the car and (passing over the drive sheave to the counterweight) pull the car.

Capacity – Indicates the amount of weight a given elevator is able to support safely.

Car (elevator) – The load-carrying unit, including its platform, frame, enclosure, and car door or gate.

Car Counterweight – A set of weights roped directly to the elevator car of a winding-drum type installation. In practice, this weight is equal to approximately 70 percent of the car weight.

Car Operating Panel – A panel mounted in the car containing the car operating controls, such as call register buttons, door open and close, alarm, emergency stop, and whatever other buttons or key switches are required for operating.

Car Riding Lantern – A fixture mounted in the entry column, soffit, or back wall that shows the direction of car travel.

Car Top Inspection Station – A control panel on top of an elevator car that, when activated, removes the car from normal service and allows the car to run at inspection speed from the car top station only.

Center Opening Doors – A door type that consists of two horizontal sliding panels, which move in opposite directions.

Clutch – A device used in elevator power door operation to engage the car door to the landing door by a grasping and holding movement.

Code – A system of regulations pertaining to the design, manufacture, installation, and maintenance of elevators, dumbwaiters, escalators, and moving walks. The most widely recognized and used is ANSI A-17.1, *Safety Code for Elevators*, sponsored by the National Bureau of Standards, the American Institute of Architects, and the American Society of Mechanical Engineers (ASME), and published by ASME. It has been adopted by many States. Some States and cities have written their own codes, most of which are based on ANSI A-17.1.

Compensating Chain – A welded-link chain used for hoist rope weight compensation. One end of the chain is attached to the underside of the elevator car, and the other end is fastened to the counterweight or stationary fastening in the hoistway.

Control Valve – The device on hydraulic elevators that controls the oil flow to and from the jack.

Controller – A device or group of devices that controls, in a predetermined manner, the apparatus to which it is connected. An electrical panel, which uses electromechanical relays or a computer, to control the operation of an elevator.

Conventional Car Station – A car-operating panel with a faceplate that is mounted in a fixed (non-swing) panel or sidewall.

Counterweight – A weight that counterbalances the weight of an elevator car plus approximately 40 percent of the capacity load.

Crosshead – (1) The upper member of the car frame. (2) The traveling member of a selector.

Cylinder – The outermost lining of a hydraulic jack.

Deflector Sheave – A pulley, aligned with the drive sheave, that provides a path for the cables to drop straight to the counterweight.

Dispatch Control System – A system that controls two or more elevators by governing assignments in response to hall calls. Also controls zoning, peak traffic demands, and parking.

Door Gibs – Devices at the bottom of horizontal sliding door panels that stick into sill grooves and eliminate door panels swinging in or out.

Door Hanger – A rolling assembly fastened to the top of a door panel that supports and allows horizontal sliding movement of the door panel. The door track on which the hanger rolls is part of the door hanger assembly.

Door Lock – Any type of mechanical lock designed to prevent the opening of a hoistway door from the landing side.

Door Operator – A motor-driven device mounted on the car that opens and closes the car doors.

Door Panel – A portion of the door or gate that covers the opening and moves to uncover the opening.

Door Protective Device – Any type of device used with automatic power-operated doors that detects obstructions to the normal closing of the elevator doors and either causes the doors to

reopen or go into some other mode of operation, such as nudging. A safe edge, a safety astragal, a photoelectric device (safe ray), and an electrostatic field device are examples of door protective devices.

Door Sill – The threshold of a door opening with grooves to guide the bottom of the car door.

Door Track – A rail that accepts the rolling assembly of the door hanger and allows the horizontal movement required to open and close the doors. The door track is a part of the door hanger assembly.

Drip Ring – A flange on the guide used to collect oil from the plunger so it can drain into a container.

Drive Machine – The power unit that applies the energy necessary to raise and lower an elevator, material lift, or dumb waiter car or to drive an escalator, an inclined lift, or a moving walk.

Electric Eye – A light beam (or beams) that spans a door opening and, when interrupted, causes the door to reopen.

Emergency Stop Switch – A hand-operated switch in the car push button station that, when thrown to the off position, stops the elevator and prohibits its running.

Enclosure – The ruggedly built room on a freight elevator in which the material being carried is located.

Escalator – A power-driven, inclined, continuous stairway used for raising or lowering passengers.

Faceplate – The decorative cover that houses control devices such as position indicators, pushbuttons, key switches, etc.

Firefighter's Service – A device or group of devices that provide a signal for immediate recall to a designated landing to remove cars from normal use and permit special operation for firefighters or other authorized emergency personnel.

Floor Selector – A mechanical-, electrical-, or microprocessor-driven device that initiates and/or controls some or all of these tools and functions: establishes direction of travel, acceleration, deceleration, leveling, stopping, call cancellation, door operation, position indicators, and hall lanterns for an individual elevator.

Feet per minute (FMP) – A unit of measure of elevator velocity.

Freight Elevator – An elevator used to carry material rather than people and provided with vertical bi-parting doors.

Gates (Double Blade Gate) – A vertical sliding, counterweighted device used to provide entrance protection on freight elevators. It consists of two panels usually made of expanded metal. The blades telescope to reduce overhead space requirements.

Geared Traction Machine – A traction machine in which the power from the motor is transmitted to the drive sheave through reduction gears.

Gearless Traction Machine – A type of elevator hoisting machine on which the hoist ropes pass over a traction drive sheave, which is an integral part of the armature (called gearless because no geared reduction unit is utilized).

Generator – An electromechanical device that converts mechanical energy to electrical energy (usually direct current).

Governor – (1) A mechanical speed control mechanism. For an elevator, it is a wire rope-driven centrifugal device used to stop and hold the movement of its driving rope. This initiates the activation of the car safety device. It opens a switch, which cuts off power to the drive motor and brake if the car travels above a preset speed in the down direction. Some types of governors will also open the governor switch and cut off power to the drive motor and brake if the car over speeds in the up direction. (2) On escalators, a direct-driven centrifugal device that, when activated by over speed, cuts off power to the drive motor and service brake.

Governor Rope – A wire rope attached to an elevator car frame that drives the governor and, when stopped by the governor, initiates setting of the car safety.

Guide – An assembly, bolted to the upper end of the cylinder, that centers the plunger in the cylinder.

Guide Rails – Steel T-, round, or formed sections with guiding surfaces installed vertically in a hoistway to guide and direct the course of travel of an elevator car and elevator counterweights.

Guide Shoes – (1) Devices used mainly to guide the car and counterweight along the path of the guide rails. They also ensure that the lateral motion of the car and counterweight is kept at a minimum as they travel along the guide rails. (2) Guiding projections mounted on the bottom edge of horizontally sliding doors or gates, or on the sides of vertically sliding doors or gates to guide them.

Hall Lantern – A corridor-mounted signal light indicating that an elevator car is approaching that landing and the direction in which the car is to travel.

Hall Station – A device located in a hall usually near the elevator to be used when calling the elevator to that floor.

Handrail – (1) The moving handhold provided for escalator passengers, which moves over the top of the balustrade and newels. (2) A railing serving as a support.

Hanger Rollers – Rollers (two per panel) from which horizontal door panels are suspended.

Hoist Rope – The wire ropes used to raise and lower an elevator car.

Hoistway – The space enclosed by fireproof walls and elevator doors for the travel of one or more elevators, dumbwaiters, or material lifts. It includes the pit and terminates at the underside of the overhead machinery space floor or grating or at the underside of the roof where the hoistway does not penetrate the roof. (Hoistway is sometimes called “hatchway” or “hatch.”)

Hoistway Enclosure – The fixed structure, consisting of vertical walls or partitions, that isolates the hoistway from all other areas or from an adjacent hoistway and in which the hoistway doors and door assemblies are installed.

Hydraulic – One of two methods by which an elevator is moved, whereby the elevator is "pushed" up by oil.

Hydraulic Elevator – A power elevator where the energy is applied, by means of a liquid under pressure, in a cylinder equipped with a plunger or piston.

Hydraulic Pump Unit (Reservoir) – Combined assembly containing the pump motor, valve, and oil reservoir that provide the motive power to a hydraulic elevator.

1. Under-Oil Unit: Unit that has a tank above the motor and pump assembly.
2. Submersible Unit: Unit that has all the motors and pump assembly submerged into the oil in a self-contained enclosure.

Hydraulic Valve – In the construction of hydraulic elevators, a valve used to regulate the flow of the fluid, usually low-viscosity oil, to raise and lower the elevator.

Interlock – A device having two related and interdependent functions:

1. To prevent the operation of the driving machine by the normal operating device unless the hoistway door is locked in the closed position. An electromechanical device that prevents operation of an elevator unless the hoistway doors are in the closed and locked position.
2. To prevent opening of a hoistway door from the landing side unless the elevator is in the landing zone and is either stopped or being stopped.

Jack – The device that pushes the hydraulic elevator.

Jamb – Any one of the three members constituting an elevator entrance frame: head jamb, strike jamb, and return jamb.

Landing – That portion of a floor, balcony, or platform used to receive and discharge passengers or freight.

Landing Door – The movable door at the entrance of an elevator that provides access to the hoistway.

Landing Zone – A zone extending from a point 18 inches below an elevator or material lift landing to a point 18 inches above the landing

Limit switches – Devices that control the elevator's level and activating circuitry.

Machine Room – The space in which the driving machine for an elevator, group of elevators, dumbwaiter, escalator, or group of escalators is located.

Main (Car) Guide Rails – Steel T-sections with machined guarding surfaces installed vertically in a hoistway to guide and direct the course of travel of an elevator car.

Oil Buffer – One type of buffer (for elevators with speeds of more than 200 feet per minute) that uses a combination of oil and spring to cushion the elevator. It is located in the elevator pit.

Oil Line – The pipe that channels the oil from the power unit to the jack.

Opening – The clear passageway into an elevator.

Packing Gland – (1) A substance, usually of elastic or flexible material, formed in rings and used in the stuffing box of the worm shaft of a geared machine or of a hydraulic elevator to prevent excessive leakage. (2) Strips or blocks of material used for shimming.

Passenger Car Door Operators – The controls that open and close car doors located at the top of the elevator cab.

Passenger Car Door Protective Devices – The infrared screen detectors that provide for safety and operation of the elevators during normal use.

Passenger Elevator – An elevator used to carry people and provided with horizontal sliding doors.

Pickup Rollers – Devices on the hoistway door that mate with the clutch on the car door to allow the hoistway doors to be pulled open and closed.

Pit – That portion of the hoistway extending from the sill level of the lowest landing to the floor at the bottom of the hoistway.

Pit Channels – Steel channels on the pit floor to anchor the guide rails and other pit-mounted devices.

Platen – A plate used to attach the jack to the bolster.

Platform – The entire floor assembly of an elevator on which passengers stand or the load is carried.

Plunger – The inside moveable part of a hydraulic jack that attaches to an elevator car frame on direct drive application or drive sheave on a cabled hydraulic system.

Position Indicator – A device that indicates the position of the elevator car in the hoistway. It is called a hall position indicator when placed at a landing or car position indicator when placed in the car.

Power Unit – That device on hydraulic elevators that supplies the motive force to run the car.

Preventative Maintenance – Inspections, tests, adjustments, cleaning, and similar activities carried out on elevator and escalator equipment with the intention of preventing malfunctions from occurring during operation. It is designed to keep equipment in proper operating order and is done on a scheduled basis. It is also referred to as scheduled maintenance.

Pump – The device that draws oil from the tank and pushes it through the oil line to the jack to move the elevator up.

Push Button Station – A decorative device containing one or more hand-operated buttons or switches by which the passenger tells the controller what action is desired.

Relay – An electric device that is designed to interpret input conditions, in a prescribed manner and after specified conditions are met, to respond and cause contact operation or create change in associated electric control circuits.

Roller Guides – Guide shoes that use rollers that rotate on guide rails rather than sliding on the rails.

Safe Edge – A mechanical door protective and automatic door-reopening device, used with automatic power door operators. It is arranged so that in the event the door either approaches or meets an obstruction when closing, the safe edge will actuate an edge safety switch that will automatically cause the doors to stop and reopen. It is vertically mounted to extend from the bottom to the top of a horizontally sliding panel and projects forward of the leading edge of the panel.

Safe Ray – A photoelectric door protective and automatic door-reopening device for automatic power door operators. It consists of a photoelectric receiving unit and light source device arranged to project a light ray across the elevator door entrance. The interruption of the light ray will cause the doors to remain open as long as the ray is interrupted, or cause the reversal and reopening of doors that are closing.

Safety – A large clamp that anchors the car to the building to keep the elevator from falling.

Safety Plank – The bottom member of a sling, for a traction elevator, which contains the safety.

Seal – A device mounted on the guide to minimize oil escaping around the plunger.

Selector – An electrical device, driven by the elevator, that simulates elevator movements.

Shackle – Threaded rods to which the hoist cables are socketed and that bolt to the hitch plate and the counterweight.

Sill – The bottom horizontal member of an entrance that provides the foundation and footing for the entrance frame. The sill extends the full width of the door travel.

Sling – The basic structural frame, which consists of two stiles, a crosshead, and a bolster or safety plant, and supports the platform and cab of an elevator.

Spring Buffer – One type of buffer, for elevators with speeds less than 200 feet per minute, that cushions the elevator. It is located in the elevator pit.

Strike Column – Column located inside the car that extends the full height of the elevator door opening. This is the column against which the sliding door closes.

Swing Return Panel – A car-operating panel that extends the full height of the car entrance.

Tank (Reservoir) – A container to store the oil used to move the elevator.

Top-of-car Inspection Station – Controls on the top of the car used by an elevator constructor to operate the car at inspection speed. They provide a means of operating an elevator from on top of the car at slow speed during adjustment, inspection, maintenance, and repair.

Traction Machine – An electric machine in which the friction between the hoist ropes and the machine sheave is used to move the elevator car with the cable.

Traction – One of two methods by which the elevator is moved, whereby the elevator is pulled up by cables.

Traveling Cable – A cable made up of electric conductors that provides electrical connection between an elevator or dumbwaiter car, or material lift, and a fixed outlet in the hoistway or machine room.

Two-Speed AC – A type of traction machine powered by an AC-driven motor (actually two motors built into one) that has two distinct speeds.

Two-Speed Doors – A type of door consisting of two horizontal sliding panels that move in the same direction.

SECTION ONE OVERVIEW

This report was commissioned to review common types of damage to various elevator systems during flooding events in order to provide helpful tools for insurance adjusters who assess elevator damage. The purpose of the information contained in the report is to provide some basic information about elevator systems and to illustrate common risks and damages to these systems while noting important elements that should be included in the scopes of work and estimates to repair damaged elevators. Additionally, based on a review of claims data, some recommendations have been made to consider during data collection and claims processing.

1.1 FLOOD INSURANCE

Flood insurance is designed to provide an alternative to disaster assistance to reduce the escalating costs of repairing damage to buildings and their contents caused by floods. The National Flood Insurance Program's (NFIP's) loss experience indicates that an estimated $1 billion in flood damages are avoided each year as a result of NFIP floodplain management regulations for new construction, which communities must adopt and enforce for flood insurance to be available to their residents. Also, buildings constructed in compliance with NFIP building standards sustain approximately 80 percent less damage annually than those not built in compliance.

By providing best practices and recommended underwriting standards, significant damage and costs associated with the damage can be averted or mitigated.

1.2 RECOMMENDATIONS

Based on the evaluation of elevator system flood damage claims for the NFIP, FEMA recommends the following three items be addressed to better manage flood risk:

Strictly enforce existing policy limiting flood insurance coverage of elevator equipment installed below the base flood elevation (BFE). Based on the existing policy of the NFIP, elevator equipment/components (other than the elevator cab) installed below the BFE, are not covered by a standard flood insurance policy if they were installed after September 30, 1987. This coverage limitation should be clearly identified to policy holders, insurance companies, and insurance adjustors. Moving forward, the program should adhere to this stated policy and not pay claims on repair or replacement of elevator equipment installed below the BFE after September 30, 1987.

In older buildings, the elevator may have been installed after the building construction date. When determining the effective installation date of the elevator, the manufacturer's data tags can be found in several locations on elevator equipment items, including:

- Inside the controller cabinet
- On the car top crosshead data tags
- On the machine data tags

Require appropriate backup documentation for processing claims. Require claims to be substantiated with a damaged equipment statement, repair effort description, and breakdown of material and labor costs to accurately represent the scope of work. Currently, many claims do not include any substantiation other than a lump sum estimate.

Consider depreciation and obsolescence factoring in claims. Elevator equipment is continually changing to reflect code and industry standards. Expected lifecycles of the equipment take into account the need to modernize and make improvements in the commercial real estate market. Addressing prorations or depreciation in claims may decrease claim exposure and indicates a reasonable expectation that equipment will be brought up to national and Federal standards for flood damage prevention over time. One such requirement can be found in ANSI/ASME 17.1b-2007/CSA B44b-09, *Safety Code for Elevators and Escalators (Bi-national standard with CSA B44-07).* Section 2.27.3, *Firefighters' Emergency Operation: Automatic Elevators*, of the code states that for elevators installed under the 2007 code, in the event of an emergency, the elevator cars will not descend below the BFE. Preventing elevator cars from descending below the BFE during a flood event prevents and reduces significant flood damage to elevator systems.

SECTION TWO COMMON DAMAGE AND RECOMMENDED REPAIRS

This section begins with an overview of elevator types and components as well as typical damage observed for each component as a result of flooding. Recommended repairs for common damage is then provided followed by code compliance and depreciation information, and a description of repair work sometimes considered building repair that should generally be included elevator damage flood damage claims.

2.1 ELEVATOR TYPES AND COMPONENTS

To facilitate a discussion of elevator component damage, Figures 1 through 3 illustrate the most common elevator types: direct acting hydraulic, holeless hydraulic, and traction. Elevator equipment that is often located below the BFE and subject to flood damage requiring repair or replacement is highlighted in blue. Based on current standard policy language, elevator equipment installed below the BFE after September 30, 1987, is not covered by flood insurance.

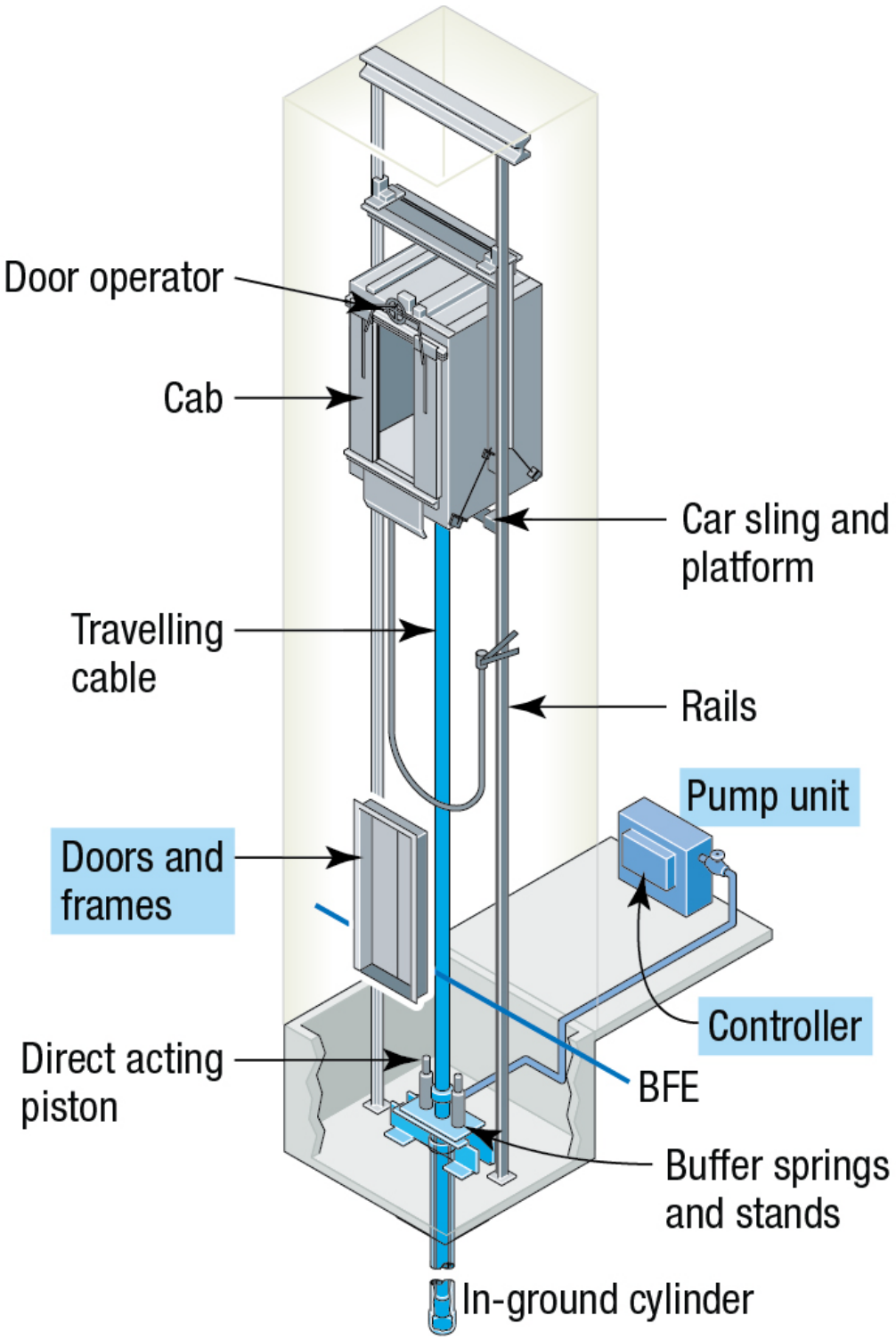

Figure 1: Direct Acting Hydraulic Elevator

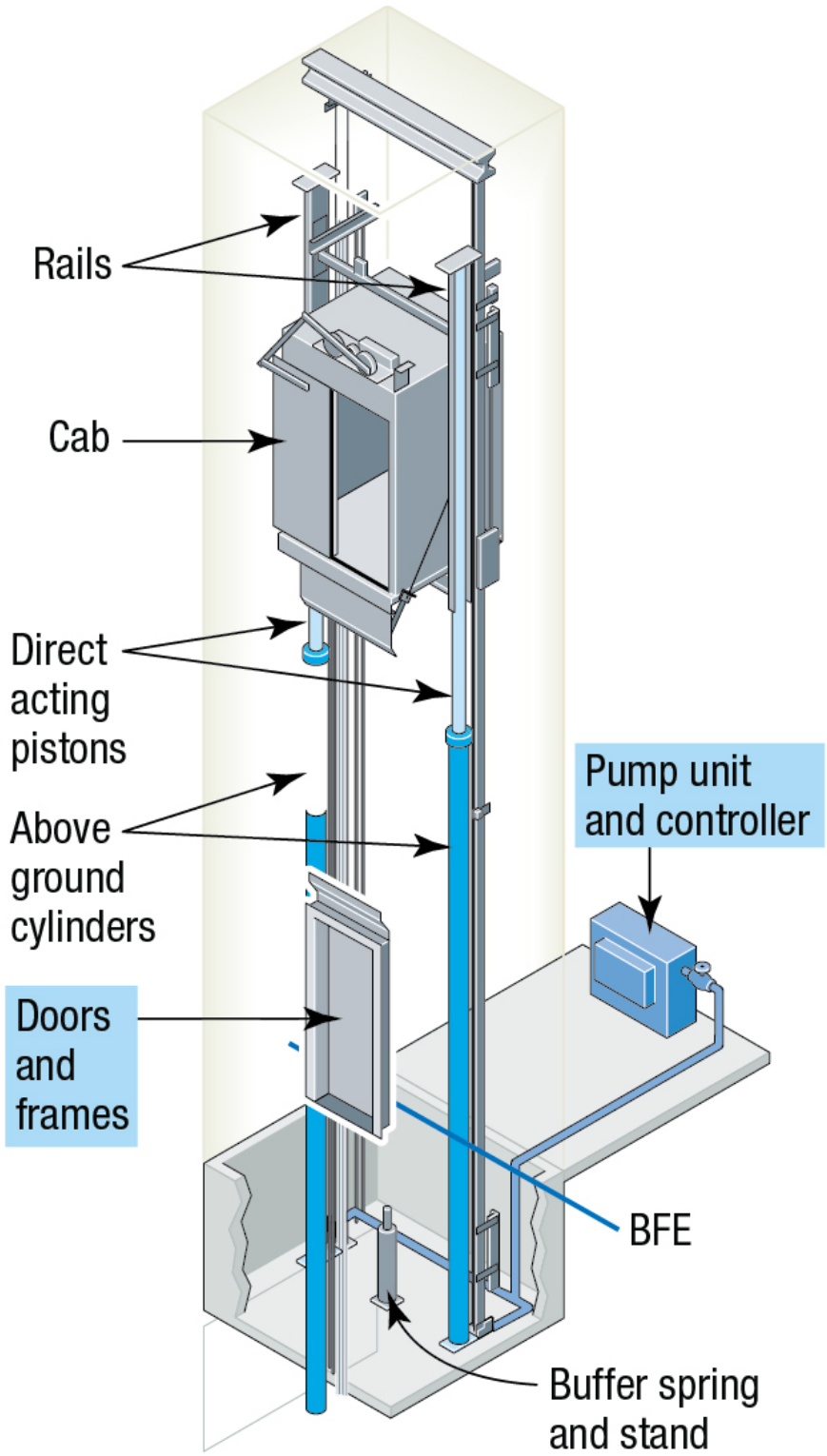

Figure 2: Holeless Hydraulic Elevator

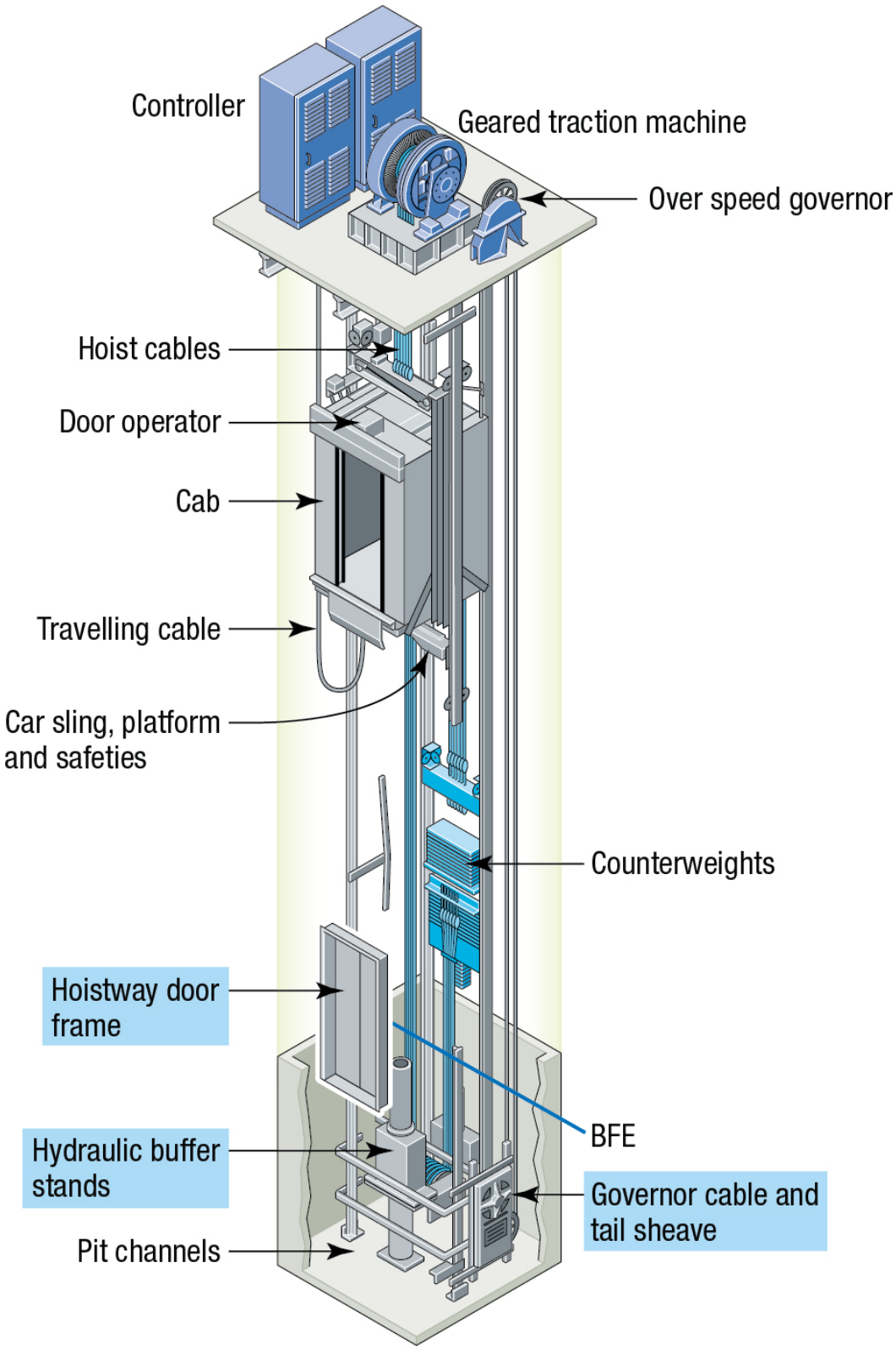

Figure 3: Traction Elevator

Flood-damaged elevator components and installation areas were evaluated to determine their existing condition, location, and suitability for coverage under the NFIP as well as typical damage observed. This section provides the results of the equipment survey.

Many of the typical damage observations are followed by recommended repair or replacement options. These recommendations are based on the current condition of each primary component, its potential reliability, and its maintainability. Equipment relationships and performance are evaluated as to when replacement of one component is suitable without compromising overall system operation by retaining other components. This review considers cost and the cost effectiveness of replacing rather than reconditioning equipment. The damage assessment is broken down into the following areas of damage:

- Machine room equipment damage
- Hoistway and pit equipment damage
- Elevator car damage
- Operating and signaling device damage

2.1.1 Machine Room Equipment

2.1.1.1 Geared or Gearless Traction Machine

Generally, geared or gearless traction machines are on the top level of the building and rarely encounter major damage unless the unit is a basement traction type.

2.1.1.2 Hydraulic Pump Unit (Reservoir)

The hydraulic pump unit element is frequently damaged during flood events because it is often located below the BFE at the lowest level of the building; current codes require them to be installed above the BFE. Open electronics are often damaged, which requires that the entire unit be replaced.

2.1.1.3 Controller

For hydraulic elevators, controllers are often located on the ground floor and sustain water damage during flooding. If damaged, controllers must be completely replaced. When replaced, controllers should be up-to-date, computerized, and solid-state automatic to realize the benefits of modern operational efficiencies, current code safety features, and reliability. All associated wiring from the signaling and operating devices should be replaced.

2.1.1.4 Floor Selector

Floor selectors are damaged when the pit is submerged as a result of a flood event. Selectors should be replaced when new controllers are required.

2.1.1.5 Governor

When the pit is submerged, governor ropes and sheaves in the pit are generally damaged and need to be replaced.

2.1.2 Hoistway and Pit Equipment

2.1.2.1 Guide Rails

Guide rails generally sustain only light damage (rusting) during flooding. When damaged, the car and counterweight guide rails can generally be cleaned and sanded for reuse.

2.1.2.2 Hoistway Entrance

When flooding rises above main floor level, the hoistway entrance is damaged. Generally, frames can be retained, but hollow metal doors should be replaced if inundated with saltwater. Doors should be installed above the BFE to avoid flood damage.

2.1.2.3 Buffer

Buffers are located in the pit, generally below the BFE, and are adversely affected by water in their function as a safety device. Hydraulic buffers (traction elevators) are often damaged by flood events and may be cleaned and honed or may need to be replaced when damaged. Spring buffers (hydraulic elevators) can generally be cleaned and retained.

2.1.2.4 Compensating Chains and Cables

Compensating chains and cables are often damaged during flooding. Whether they should be replaced can be a point of contention. Chains can generally be cleaned and retained. Cables need to be replaced when submerged for extended periods of time.

2.1.2.5 Limit switches

Located in the pit, limit switches are commonly replaced after flooding as a result of water immersion. They can be piped into conduits that meet the National Electrical Manufacturers Association (NEMA) 4X standards for little cost when upgrading the equipment.

2.1.2.6 Packing Gland

Because of immersion, packing glands normally require replacement. Debris causes damage to the piston.

2.1.2.7 Plunger

Contaminated water causes some damage to holed cylinders. The piston can be cleaned and honed to acceptable standards. Holeless cylinders are not usually affected because they are elevated.

2.1.2.8 Traveling Cable

Traveling cables are affected when inundation reaches the pit. When they consist of older cloth-covered cables, total replacement is necessary. This type of dated equipment should be eliminated. Newer PVC-coated cables generally do not require replacement because they are waterproof.

2.1.3 Elevator Cars

2.1.3.1 Elevator Car Slings, Platforms, and Safety Devices

The structural members and safety device of the elevator cars usually appear sound and can be reused in any scope of repair. However, if safeties are submerged for an extended amount of time, replacement is necessary.

2.1.3.2 Car Enclosures

When car enclosures are submerged, damage to the finishes and the operating fixtures can be extensive. Preventing the unit from descending into a flooded pit is paramount.

2.1.3.3 Passenger Car Door Operators

Although door operators generally do not experience damage, they should be replaced along with hoistway door equipment if immersed in water to provide long-term reliability and safety. Often, this item is left out of the scope of repairs.

2.1.3.4 Passenger Car Door Protective Devices

Even with shallow flooding, car door protective devices are generally damaged. These items should be replaced under any scope of water damage repairs.

2.1.3.5 Car Station

If the elevator cab is inundated during flooding, the car station is most likely damaged. If any electrical controls in the elevator cab or hallway have been exposed to water, replacement of the electrical device is recommended.

2.2 RECOMMENDED REPAIRS

Tables 1 and 2 list commonly damaged items identified during the claims review along with corresponding recommended repair actions for traction and hydraulic elevators, respectively. Adjusters should always conduct a site review to identify the location of the machine room and to determine what equipment has been damaged as the result of flooding.

Table 1: Hydraulic Elevator Recommended Repair by Equipment Type

Elevator Equipment Type	Floodwater Exposure	Recommended Action
Machine Room Equipment		
Hydraulic Pump Unit[1]	Submerged in water	Replace
Controller[1]	Submerged in water	Replace
Hoistway and Pit Equipment		
Guide Rails	Partially submerged	Clean and paint
Hoistway Entrances[1]	Partially submerged	Clean and paint
Buffer[1]	Submerged in water	Clean and paint
Guide Shoes	Submerged in water	Remove and replace rollers or guide inserts
Limit Switches[1]	Submerged in water	Remove and replace
Packing Gland[1]	Submerged in water	Remove and replace
Plunger[1]	Submerged in water	Clean and hone
Traveling Cable	Submerged in water	Retain unless cloth type
Floor Selector[1]	Submerged in water	Remove corroded selector tape
Elevator Cabs		
Elevator Car Slings and Platforms	Partially submerged	Clean and paint
Car Enclosures	Partially submerged	Remove and replace affected laminate panels; clean and paint all non-electrical elements of cab
Passenger Car Door Operators	Generally no damage	No action
Passenger Car Door Protective Devices	Partially submerged	Remove and replace
Car Station – Push Button Station	Partially submerged	Remove and replace
Hall Push Button Stations	Partially submerged	Remove and replace

1. Item is often located below the base flood elevation (BFE) and subject to flood damage. Based on the existing policy of the National Flood Insurance Program (NFIP), elevator equipment/components (other than the elevator cab) installed below the BFE are not covered by a standard flood insurance policy if they were installed after September 30, 1987.

Table 2: Traction Elevator Recommended Repair by Equipment Type

Elevator Equipment Type	Floodwater Exposure	Recommended Action
Machine Room Equipment		
Machine	Generally no damage	No action
Controller	Generally no damage	No action
Governor	Generally no damage	No action
Hoist Ropes	Generally no damage	No action
Governor Ropes[1]	If pit was submerged	Remove and replace
Hoistway and Pit Equipment		
Guide Rails	Partially submerged	Clean and paint
Hoistway Entrances[1]	Partially submerged	Clean and paint
Buffer[1]	Submerged in water	Clean, hone and paint; replacement sometimes becomes cost effective
Guide Shoes	Submerged in water	Remove and replace rollers or guide inserts
Limit Switches[1]	Submerged in water	Remove and replace
Compensation Cables[1]	Submerged in water	Remove and replace if rusted
Compensation Chain	Submerged in water	Clean and lubricate
Traveling Cable	Submerged in water	Retain unless cloth type
Floor Selector[1]	Submerged in water	Remove corroded selector tape
Elevator Cabs		
Elevator Car Slings and Platforms	Partially submerged	Clean and paint
Car Enclosures	Partially submerged	Remove and replace affected laminate panels; clean and paint all non-electrical elements of cab
Passenger Car Door Operators	Generally no damage	No action
Passenger Car Door Protective Devices	Partially submerged	Remove and replace
Car Station – Push Button Station	Partially submerged	Remove and replace
Hall Push Button Stations	Partially submerged	Remove and replace

1. Item is often located below the base flood elevation (BFE) and subject to flood damage. Based on the existing policy of the National Flood Insurance Program (NFIP), elevator equipment/components (other than the elevator cab) installed below the BFE are not covered by a standard flood insurance policy if they were installed after September 30, 1987.

2.3 CODE COMPLIANCE

The most widely recognized and used code governing the design, manufacture, installation, and maintenance of elevators, dumbwaiters, escalators, and moving walks is ANSI A-17.1, *Safety Code for Elevators*, sponsored by the National Bureau of Standards, the American Institute of

Architects, and the American Society of Mechanical Engineers (ASME), and published by ASME. It has been adopted by many States. Some States and cities have written their own codes, most of which are based on ANSI A-17.1.

Code compliance dictates that any repaired or replaced item must be up to the current standards for that equipment. In some instances, code-required upgrades can substantially increase the costs of the repair. Evaluation of dated or aged equipment must consider this issue and provide underwriting guidance for insurance policies.

2.4 DEPRECIATION

Based on subject matter expertise, Tables 3 and 4 provide industry-accepted costs and useful lifespans for the purposes of depreciation and evaluation of pre-flood conditions. This information is often used to determine claims payout values.

Table 3: Typical Elevator Costs

Type Elevator	New Installation Costs (2012 dollars)	Replacement Cab Costs
Holeless Hydraulic 2–3 floors	$50,000.00–$60,000.00	$30,000.00–$40,000.00
Holed Hydraulic 2–5 floors	$50,000.00–$80,000.00	$30,000.00–$40,000.00
Machine room less (MRL) Traction Elevator 3–8 floors	$80,000.00–$120,000.00	$50,000.00–$100,000.00
Geared Traction Elevator 6–12 floors	$150,000.00–$230,000.00	$50,000.00–$100,000.00
Gearless Traction Elevator 12–22 floors	$180,000.00–$330,000.00	$50,000.00–$100,000.00

Table 4: Elevator Equipment Useful Lifespans

Equipment	Useful Lifespan
Machine room Equipment	
Controller	20–25 years
Geared or Gearless Traction Machine	40–50 years
Hoist and Governor Ropes	10–15 years
Hydraulic Pump Unit (Reservoir)	20–25 years
Floor Selector	20–25 years
Governor	40–50 years
Hoistway and Pit Equipment	
Guide Rails	50 years +
Hoistway Entrances	50 years +
Buffer	50 years +
Compensating Chain and Cables	20–25 years
Guide Shoes	20–25 years
Limit Switches	20–25 years
Packing Gland	10–15 years
Plunger	50 years +
Traveling Cable	20–25 years
Elevator Cabs	
Elevator Car Slings and Platforms	50 years +
Safety Devices	50 years +
Car Enclosures	20–25 years
Passenger Car Door Operators	20–25 years
Passenger Car Door Protective Devices	10–15 years
Car Station – Push Button Station	10–15 years
Hall Push Button Stations	10–15 years

2.5 BUILDING-RELATED WORK

The repair and replacement of elevators and elevator components requires coordination with multiple vendors for a full evaluation of cost. Additional-building related work is commonly shown in the damage assessments; however, it may not be outlined in the scope of elevator repairs because it does not fall in the contractor’s scope for elevator equipment. Separate vendors may be involved and should be included in the total costs of the elevator-related claim. Such building-related items may not be known at the time of the original claims investigation.

Awareness of the related items will help define the final claim. The following lists provide some examples of work that should be included in elevator repair estimates and scopes of work but often are left off.

Machine Room and Machinery Spaces

- Replacement of self-closing and locking access door
- Repair of ventilation and heating equipment for elevator equipment
- Replacement of shaft wall
- Painting of walls and ceiling

Hoistway and Pit

- Protection of open hoistways and entrances during construction per Occupational Safety and Health Administration regulations
- Installation of wall blockouts and fire-rated closure for control and signal fixture boxes that penetrate walls
- Cutting and patching walls and floors

Electrical Service, Conductors, and Devices

- Replacement and installation of main line disconnects and service panels
- Replacement and installation of low voltage disconnects and service panels
- Replacement and installation of fire alarm devices and related wiring
- Replacement and installation of shunt trip devices
- Replacement and installation of telecommunication wiring and conduit
- Replacement and installation of security devices and related wiring

SECTION THREE SCOPE OF REPAIRS

The following summarizes information necessary to develop a clear scope of work to demonstrate elevator repair costs for the purposes of flood insurance claims.

A dedicated service company is usually contracted for regular maintenance and testing of elevators. A basic outline of their responsibilities is usually contained in a preventative maintenance agreement. Some basic information that may be available in this maintenance contract to assist an adjuster in determining the cost elements of a claim include:

- Prorated equipment
- Regular hourly rates
- Terms and conditions for working hours

An elevator repair or replacement proposal should include the following items:

- Photographs of damaged equipment
- A description of damage to specific equipment and the intended action down to the primary component level (i.e., water damaged limit switches in pit – remove and replace)
- Quantity of equipment
- Material costs
- Hourly breakdown for team or individual labor rates

3.1 RECOMMENDED COST FORMAT

Tables 5 and 6 provide examples of itemized estimates of probable costs for hydraulic and traction elevator repairs as a result of flooding. Note that damages to low-rise hydraulic units can be proportionately higher (as a percentage of total cost) than damage to high-rise traction units because significant portions of the operating equipment are located below or close to the BFE for hydraulic units.

Table 5: Sample Cost Estimate Breakdown for Repair of Flooded Hydraulic Elevator

Item No.	Item Description Title / Component Description	Qty	Units	Unit Price	Total Cost
	ELEVATORS 1–2				
1	**MACHINE ROOM**				
2	Controller car and machine room flooded, total replacement	2	Ea	18,000.00	$36,000.00
3	Wiring for controller	2	Ea	4,000.00	$8,000.00
4	Removal of machine room equipment	8	Hr	307.38	$2,459.04
5	**ELEVATOR SHAFT / PIT LEVEL**				
6	Repair pistons	1	Ea	3,000.00	$3,000.00
7	Provide new rails car 2	1	Ea	1,000.00	$1,000.00
8	Pit structural cars 1 and 2	2	Ea	1,000.00	$2,000.00
9	Oil line (Includes coupling)	75	L.F.	25.00	$1,875.00
10	Buffer assembly car 1–2	2	Ea	0.00	$0.00
11	Clean and paint equipment	2	L.S.	1,500.00	$3,000.00
12	Liquid-tight limit switches	2	Ea	1,500.00	$3,000.00
13	Cloth travelling cables replacement	2	Ea	3,000.00	$6,000.00
14	**RELATED WORK IN PIT**				
15	Incandescent fixture, interior, vapor tight, ceiling/wall mounted, 200 W, incl lamps, mounting hardware and connections	2	Ea	161.00	$322.00
16	Toggle switch, quiet type, single pole, 15 amp	2	Ea	19.90	$39.80
17	Receptacle devices, resi, decorator style, GFI, EMT & wire, 20', 15 amp, incl box & cover plate	2	Ea	190.00	$380.00
18	Detection Systems, heat detector, smoke detector, ceiling type, excl. wires & conduit	2	Ea	187.00	$374.00
19	Smoke detectors, resi, box, #14/3, type EMT wire, 20'	2	Ea	170.00	$340.00
20	Pump, pedestal sump, iron base, 21 GPM, 1/3 H.P., at 15' head, includes float control	2	Ea	282.00	$564.00
21	Motor connections, flexible conduit and fittings, 1 phase, 115 volt, up to 1 HP motor	2	Ea	80.00	$160.00

Item No.	Item Description Title / Component Description	Qty	Units	Unit Price	Total Cost
22	Rigid galvanized steel conduit, 1/2 diameter, to 15' H, incl. 2 terminations, 2 elbows, & 11 beam clamps per 100 L.F.	120	L.F.	9.45	$1,134.00
23	**ELEVATOR SHAFT 1st LANDING**				
24	Entrance doors	2	Ea	2,785.00	$5,570.00
25	Sills	2	Ea	1,200.00	$2,400.00
26	Door hardware mechanical	2	Ea	1,200.00	$2,400.00
27	Door hardware electrical	2	Ea	800.00	$1,600.00
28	Wiring	2	L.S.	800.00	$1,600.00
29	**ELEVATOR CAB**				
30	Elevator cab car 1	1	Ea	20000.00	$20,000.00
31	Elevator cab car 2	1	Ea	20000.00	$20,000.00
32	Car operating panels	2	Ea	4000.00	$8,000.00
33	Car platforms	2	Ea	0.00	$0.00
34	Wiring	2	L.S.	4,000.00	$8,000.00
35	Electronic scan	2	Ea	1600.00	$3,200.00
36	Bottom guide assemblies	2	Ea	1200.00	$2,400.00
37	**GENERAL CONTRACTING**				
38	Selective demolition, rubbish handling, 50' haul, load, haul to chute and dumping into chute, cost to be added to demolition cost	50	C.Y.	32.50	$1,625.00
39	Selective demolition, rubbish handling, loading & trucking, chute loaded, including 2 mile haul, cost to be added to demolition cost	50	C.Y.	48.50	$2,425.00
				TOTAL ELEVATOR FLOOD DAMAGE	**$148,867.84**

Table Notes:
Ea = each
Hr = hour
L.S. = lump sum
L.F. = linear foot
C.Y. = cubic yards

Table 6: Sample Cost Estimate Breakdown for Repair of Flooded Traction Elevator

Item No.	Item Description Title / Component Description	Qty	Units	Unit Price	Total Cost
	ELEVATOR #1				
1	**MACHINE ROOM**				
2	No damage elevator #1				
3	**RELATED WORK IN MACHINE ROOM**				
4	No related work in machine room				
5	**ELEVATOR SHAFT / PIT LEVEL**				
6	Guide rail pit steel clean/paint to above BFE	8	Hr	$307.38	$2,459.04
7	Buffer assembly clean and paint	1	Ea	$800.00	$800.00
8	Clean and paint fascia and pit structural	1	Ea	$1,500.00	$1,500.00
9	Clean and paint structural equipment	1	Ea	$1,500.00	$1,500.00
10	Limit switches	1	Ea	$1,500.00	$1,500.00
11	**ELEVATOR SHAFT 1st LANDING**				
12	Provide entrance doors	1	Ea	$3,286.00	$3,286.00
13	Sills clean and paint hardware	1	Ea	$600.00	$600.00
14	**ELEVATOR CAB**				
15	No damage to cabs				
16	***ELEVATOR #2***				
17	**MACHINE ROOM**				
18	No damage				
21	**ELEVATOR SHAFT/ PIT LEVEL**				
22	Guide rail pit steel clean/paint to above BFE	8	Hr	$307.38	$2,459.04
23	Provide buffer assembly	1	Ea	$6,525.00	$6,525.00
24	Clean and paint fascia and pit structural	1	Ea	$1,500.00	$1,500.00
25	Provide governor rope	1	Ea	$2,479.00	$2,479.00
26	Clean and paint tail sheave and lubricate	5	Hr	$307.38	$1,536.90
27	**ELEVATOR SHAFT 1st LANDING**				
28	Entrance doors clean and paint	1	Ea	$3,286.00	$3,286.00
29	Sills clean and paint hardware	1	Ea	$600.00	$600.00
31	**ELEVATOR CAB**				
32	No damage to cabs				

Item No.	Item Description Title / Component Description	Qty	Units	Unit Price	Total Cost
33	**RELATED WORK IN PITS IN BOTH CARS**				
34	Incandescent fixture, interior, vapor tight, ceiling/wall mounted, 200 W, incl lamps, mounting hardware and connections	2	Ea	$161.00	$322.00
35	Toggle switch, quiet type, single pole, 15 amp	2	Ea	$19.90	$39.80
36	Receptacle devices, resi, decorator style, GFI, EMT & wire, 20', 15 amp, incl box & cover plate	2	Ea	$190.00	$380.00
37	Detection Systems, heat detector, smoke detector, ceiling type, excl. wires & conduit	1	Ea	$187.00	$187.00
38	Smoke detectors, resi, box, #14/3, type EMT wire, 20'	1	Ea	$170.00	$170.00
39	Pump, pedestal sump, iron base, 21 GPM, 1/3 H.P., at 15' head, includes float control	1	Ea	$282.00	$282.00
40	Motor connections, flexible conduit and fittings, 1 phase, 115 volt, up to 1 HP motor	1	Ea	$80.00	$80.00
41	Rigid galvanized steel conduit, 1/2 diameter, to 15' H, incl. 2 terminations, 2 elbows & 11 beam clamps per 100 L.F.	20	L.F.	$9.45	$189.00
42	Wire, copper, stranded, 600 volt, #12, type THWN THHN, in raceway	70	L.F.	$0.69	$48.30
				TOTAL ELEVATOR FLOOD DAMAGE	**$31,729.08**

Table Notes:
Hr = hour
Ea = each
L.F. = linear foot

SECTION FOUR NFIP RECOMMENDATIONS

Based on the evaluation of elevator systems for the NFIP, building owners, and insurers, FEMA recommends the following three items be addressed to better manage flood risk.

Strictly enforce existing policy limiting flood insurance coverage of elevator equipment installed below the BFE. Based on the existing policy of the NFIP, elevator equipment/components (other than the elevator cab) installed below the BFE, are not covered by a standard flood insurance policy if they were installed after September 30, 1987. This coverage limitation should be clearly identified to policy holders, insurance companies, and insurance adjusters. Moving forward, the program should adhere to this stated policy and not pay claims on repair or replacement of elevator equipment installed below the BFE after September 30, 1987.

In older buildings, the elevator may have been installed after the building construction date. When determining the effective installation date of the elevator, the manufacturer's data tags can be found in several locations on elevator equipment items including:

- Inside the controller cabinet
- On the car top crosshead data tags
- On the machine data tags

Require appropriate backup documentation for processing claims. Require claims to be substantiated with a damaged equipment statement, repair effort description, and breakdown of material and labor costs to accurately represent the scope of work.

Consider depreciation and obsolescence factoring in claims. Elevator equipment is continually changing to reflect code and industry standards. Expected lifecycles of the equipment take into account the need to modernize and make improvements in the commercial real estate market. Addressing prorations or depreciation in claims may decrease claim exposure and indicates a reasonable expectation that equipment will be brought up to national and Federal standards for flood damage prevention over time. One such requirement can be found in ANSI/ASME 17.1b-2007/CSA B44b-09, *Safety Code for Elevators and Escalators (Bi-national standard with CSA B44-07).* Section 2.27.3, *Firefighters' Emergency Operation: Automatic Elevators*, of the code states that for elevators installed under the 2007 code, in the event of an emergency, the elevator cars will not descend below the BFE. Preventing elevator cars from descending below the BFE during a flood event prevents and reduces significant flood damage to elevator systems.