2005 SUNRISE REVIEW

Colorado Department of Regulatory Agencies
Office of Policy, Research and Regulatory Reform

Conveyances

October 14, 2005

STATE OF COLORADO

DEPARTMENT OF REGULATORY AGENCIES
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Bill Owens
Governor

October 14, 2005

Members of the Colorado General Assembly
c/o the Office of Legislative Legal Services
State Capitol Building
Denver, Colorado 80203

Dear Members of the General Assembly:

The Colorado Department of Regulatory Agencies has completed its evaluation of the sunrise application for regulation of conveyances and is pleased to submit this written report. The report is submitted pursuant to section 24-34-104.1, Colorado Revised Statutes, which provides that the Department of Regulatory Agencies shall conduct an analysis and evaluation of proposed regulation to determine whether the public needs, and would benefit from, the regulation.

The report discusses the question of whether there is a need for the regulation in order to protect the public from potential harm, whether regulation would serve to mitigate the potential harm, and whether the public can be adequately protected by other means in a more cost-effective manner.

Sincerely,

Tambor Williams

Tambor Williams
Executive Director

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The Sunrise Process

Background

Colorado law, section 24-34-104.1, Colorado Revised Statutes (C.R.S.), requires that individuals or groups proposing legislation to regulate any occupation or profession first submit information to the Department of Regulatory Agencies (DORA) for the purposes of a sunrise review. The intent of the law is to impose regulation on occupations and professions only when it is necessary to protect the public health, safety or welfare. DORA must prepare a report evaluating the justification for regulation based upon the criteria contained in the sunrise statute:

> (I) Whether the unregulated practice of the occupation or profession clearly harms or endangers the health, safety, or welfare of the public, and whether the potential for the harm is easily recognizable and not remote or dependent upon tenuous argument;
>
> (II) Whether the public needs, and can reasonably be expected to benefit from, an assurance of initial and continuing professional or occupational competence; and
>
> (III) Whether the public can be adequately protected by other means in a more cost-effective manner.

Any professional or occupational group or organization, any individual, or any other interested party may submit an application for the regulation of an unregulated occupation or profession. Applications must be accompanied by supporting signatures and must include a description of the proposed regulation and justification for such regulation. Applications received by July 1 must have a review completed by DORA by October 15 of the year following the year of submission.

Methodology

DORA has completed its evaluation of the proposal for regulation of conveyances. During the sunrise review process, DORA performed a literature search, contacted and interviewed the applicant and elevator companies, and reviewed licensure laws in other states. DORA interviewed and contacted the Northwest Colorado Council of Governments, Denver Regional Council of Governments, Colorado Municipal League, Colorado Counties, Inc., Pikes Peak Regional Building Department, City of Aurora, City and County of Denver, Colorado Department of Labor, Oil and Safety Division, National Association of Elevator Safety, Fire Marshall's Association of Colorado, and the State of Colorado Capitol Complex. Additionally, independent small business owners who are elevator mechanics and inspectors were consulted. To better understand the practice of elevator inspection, the author of this report accompanied an elevator inspector on an inspection of an elevator in a private home. To determine the extent of conveyance maintenance and inspection in Colorado, a statewide survey was performed by telephone and electronic mail. Representatives from counties, cities, and towns were interviewed to determine whether they had any conveyances in their respective jurisdictions; and if so, whether there are maintenance contracts and whether periodic inspections are required and/or performed.

Proposal for Regulation

The National Coordinator for the Elevator Industry Work Preservation Fund (EIWPF)(Applicant), which is a Joint Labor Management Group between the National Elevator Industry, Inc. and the International Union of Elevator Constructors, has submitted a sunrise application to the Department of Regulatory Agencies (DORA) for review in accordance with the provisions of section 24-34-104.1, Colorado Revised Statutes (C.R.S.). The application and subsequent Senate Bill 05-238 (Elevator and Escalator Certification Act) that was introduced in the 2005 session of the Colorado General Assembly, identifies state licensure of conveyance mechanics, contractors, and inspectors as the appropriate level of regulation to protect the public. The Applicant argues that the use of unsafe and defective lifting devices imposes a substantial probability of serious and preventable injury to employees and the public who are exposed to unsafe conditions.

As defined in the application and SB 05-238, "conveyance" means an elevator, dumbwaiter, escalator, moving sidewalk, platform lift, stairway chairlift, material lift, or automated people mover (APM). An APM, as defined in American Society of Civil Engineers Standard 21-96, Automated People Mover Standards, is a guided transit mode with fully automated operation, featuring vehicles that operate on guideways with exclusive right-of-way. "Conveyance contractors" engage in the business of erecting, constructing, installing, altering, servicing, replacing, or maintaining conveyances. "Conveyance mechanics" install, alter, repair, service, replace, or maintain conveyances; a "certified inspector" engages in the business of inspecting conveyances.

The Applicant proposes that the regulatory program have jurisdiction over the design, construction, operation, inspection, testing, maintenance, alteration, and repair of the following: a) hoisting and lowering mechanisms equipped with a car or platform that moves between two or more landings; and b) power driven stairways and walkways for carrying persons between landings.

The following components characterize the Applicant's recommended licensure program:

- Licensing program administered by the Division of Oil and Public Safety in the Department of Labor and Employment
- Continuing education requirements
- Registration of conveyances
- Disciplinary options including civil penalties, suspension, or revocation of a license
- Qualifications for licensure of conveyance inspectors that include:
    - A certificate of completion from a nationally recognized conveyance inspector training program; or
    - A person currently appointed or designated as a conveyance inspector for a city or city and county as a conveyance inspector. However, such person would be required to obtain certification from a nationally recognized training program within four years of the inception of the regulatory program.

- Qualifications for licensure of conveyance mechanics that include:
    - A certificate of completion from a nationally recognized conveyance mechanic training program or a program with standards substantially equal that is registered with the Office of Apprenticeship Training, Employer and Labor Services in the U.S. Department of Labor; or
    - Evidence that the person worked as an elevator mechanic without direct supervision for three years prior to creation of the regulatory program.
- Qualifications for licensure of conveyance contractors that include:
    - Employment of at least one certified elevator mechanic; and
    - Insurance requirements that include general liability coverage of at least $1 million dollars for injury or death of any number of persons in any one occurrence, with the coverage of at least $500,000 for property damage in any one occurrence, and insurance coverage mandated by the "Workers Compensation Act of Colorado."

History of the Development of Conveyances

Elevators

The modern elevator was first developed during the 1800s and relied on steam or hydraulic plungers for lifting capability. The power elevator debuted in the mid-nineteenth century in the United States as a simple freight hoist operating between just two floors in a New York City building. In 1852, at the New York Crystal Place exposition, Elisha Graves Otis demonstrated an elevator with a safety feature to break the cab's fall in case of rope failure. Even though there were many elevators before Otis' "safety elevator," his invention and its publicity made the public aware of the need for increased safety. By 1857, the country's first Otis passenger elevator was in operation at a New York City department store, and 10 years later, Otis Brothers and Company was established.

In 1867, Leon Edoux manufactured the first secure hydraulic elevator. By 1873 there were approximately 2,000 elevators nationwide. The first hydraulic passenger elevator was installed in 1878. By 1887, an electric elevator was developed in Baltimore, using a revolving drum to wind the hoisting rope, but these drums could not practically be made large enough to store the long hoisting ropes that would be required by skyscrapers.

Motor technology and control methods evolved rapidly. In 1889, the direct-connected geared electric elevator was developed, allowing for the building of significantly taller structures. By 1903, this design had evolved into the gearless traction electric elevator.

Little regulation was apparent in the early twentieth century. A safety code for elevators was first developed before World War I but then suspended until about 1921, when the first edition of the A17 Safety Code for Elevators was published. It contained provisions for locking the landing doors and safety equipment to prevent the car from falling and from excessive speed. The safety code was revised in 1925, and it was adopted as an "American Standard" in 1931. Since that time it has undergone numerous changes and additions. For the past 27 years, a new edition has appeared every three years, and supplements are issued annually. The present title is the "American Society of Mechanical Engineers (ASME) A17.1 Safety Code for Elevators and Escalators." This is the base document and it is accompanied by A17.2, a guide for inspecting elevators, and A17.3 a guide for existing elevators. [1]

Today, there are intricate governors and switching schemes to carefully control cab speeds. Virtually all commercial elevators operate automatically and the computer age has brought micro chip-based capability to operate vast banks of elevators with precise scheduling and maximized efficiency.

Escalators

The earliest type of escalator, patented on March 15, 1892 by Jesse W. Reno was an inclined conveyor belt. At about the same time the American inventor, Charles Seeberger, developed a similar device with horizontal steps, which he trademarked the "escalator." Mr. Seeberger installed the first escalator as an amusement ride at Coney Island in New York in 1897. In 1899, he joined the Otis Elevator Company and produced the first commercial escalator that won first prize at the Paris 1900 Exposition Universelle in France. Originally, escalators had wooden steps; today escalators have metal steps in a continuous loop that move on tracks.

The escalator is comprised of several elements including the truss, the steps, the landing, and the tracks. The truss basically supports the escalator and the steps are separate units that are precision-built to fit together closely. The landing must be terminated in toothed metal comb plates set in the floor so that it extends over the last visible tread in the landing. The track system is built into the truss to guide the step chain, which pulls the steps through an endless loop. While escalators are found in several widths, the typical unit is designed to handle at least 3,000 people per hour. There are at least 30,000 escalators in the United States, which amounts to over 90 billion riders per year.[2]

[1] http://www.eesf.org/safetrider/ELEVHIST.HTM, accessed February 14, 2005.
[2] http://www.eesf.org/safetrider/ESCAHIST.HTM, accessed February 14, 2005.

Conveyance Mechanics

According to the U.S. Department of Labor's *Occupational Outlook Handbook 2004-2005 Edition*, elevator installers and repairers—also called elevator constructors or elevator mechanics—assemble, install, and replace elevators, escalators, dumbwaiters, moving walkways, and similar equipment in new and older buildings. Once the equipment is in service, they maintain and repair it as well. They are also responsible for modernizing older equipment. Knowledge of electronics, electricity, and hydraulics is important in order to install, repair, and maintain modern elevators, which are almost all electronically controlled.

Mechanics review blueprints to determine what equipment is needed to install rails, machinery, car enclosures, motors, pumps, cylinders, and plunger foundations; install electrical wires and controls by running tubing along a shaft's walls from floor to floor; and install electrical components and related devices required at each floor and at the main control panel. Additional responsibilities include bolting or welding together the steel frame of an elevator car at the bottom of the shaft; installing the car's platform, walls, and doors; and attaching guide shoes and rollers to minimize the lateral motion of the car as it travels through the shaft.

To install escalators, it is necessary to establish the steel framework and the electrically powered stairs and tracks, and to install associated motors and electrical wiring. In addition to elevators and escalators, installers and repairers may also install devices such as dumbwaiters and material lifts that are similar to elevators in design, as well as moving walkways, stair lifts, and wheelchair lifts.

The most highly skilled elevator installers and repairers, called "adjusters," specialize in fine-tuning all the equipment after installation. Adjusters ensure that an elevator is working according to specifications and is stopping correctly at each floor within a specified time. Once an elevator is operating properly, it must be maintained and serviced regularly to assure safe conditions. Elevator installers and repairers generally do preventive maintenance, such as oiling and greasing moving parts, replacing worn parts, testing equipment with meters and gauges, and adjusting equipment for optimal performance. Major repairs may include replacing cables, elevator doors, machine bearings, electrical motors, hydraulic pumps, and control panels.

Conveyance Inspectors

Elevator and escalator inspectors generally inspect the operating condition of new and existing installations, using visual observation and mechanical testing equipment to ensure compliance with state laws, rules, codes, and standards for elevator and escalator safety. For example, an average escalator has in excess of 15 safety features that include such devices as emergency stop buttons, broken step-chains, broken drive-chains, skirt obstructions, reversal stop, step upthrust, step level, disconnected motor safety, and handrail speed monitoring device. Inspectors generally review skirt panel surfaces to determine whether they are lubricated and whether a minimal gap between the step and skirt is being maintained, whether combplate entrapment occurs at the interface between the step and the comb, and whether the combplates have proper mesh for each step tread and there are no missing teeth. It is recommended that there is a check at least every tenth step, by riding on it to determine that there is no excessive movement or play in the direction of travel. Dynamic speed tests are performed on the step and handrail simultaneously to gauge the relationship of speed transients between the step and the handrail.

During an elevator inspection, the inspector will access the top of the car at inspection speed, to examine the operation of the interlocks. Also, from the top of the car, ropes can be inspected and door systems and hoistways can be appraised. Machine rooms are inspected regarding equipment condition and housekeeping. During a full-load five-year test, the inspector will oversee loading proper weight on the car and observe the test in the machine room. Additionally, assessment may include tests for hydraulic pressure, fluid loss, door thrust, and kinetic energy, as well as the availability of firefighter service.

Conveyance inspectors often investigate accidents to gather evidence and determine cause. Additionally, they may review proposed construction plans and documents to determine compliance with applicable laws, regulations, and codes. Often they advise contractors, architects, and state and local building officials on the proper design, construction, installation, alteration, maintenance, and operation of these conveyances. They are responsible for issuing certificates to operate for new or existing equipment.

Private Certification and Standards

National Elevator Industry Education Program

Most elevator installers and repairers apply for their jobs through a local of the International Union of Elevator Constructors (IUEC)[3]. Applicants for apprenticeship positions must be at least 18 years old, have a high school diploma or equivalent, and pass an aptitude test. They generally become skilled at their trade in a program administered by local joint educational committees representing the employers and the union. These programs, through which the apprentice learns everything from installation to repair, combine on-the-job training with classroom instruction in blueprint reading, electrical and electronic theory, mathematics, applications of physics, and safety. The program is offered through the National Elevator Industry Educational Program (NEIEP). See Appendix A on page 38 for a comprehensive program outline.

Generally, apprentices must successfully complete a six-month probationary period. After successful completion, they work toward becoming fully qualified within four years. To be classified as a fully qualified elevator installer or repairer, union trainees must pass a standard examination administered by NEIEP. Many elevator installers and repairers also receive training from their employers or through manufacturers to become familiar with a particular company's equipment. [4]

Certified Elevator Technician

Both union and nonunion technicians may take the Certified Elevator Technician (CET) course offered by the National Association of Elevator Contractors (NAEC). NAEC is an association of elevator contractors and suppliers serving primarily the interests of independent elevator contractors and independent suppliers of products and services. The CET educational certification program is specifically designed for the elevator and escalator industry. The CET program includes accountability, testing, and field verification. See Appendix B on page 43 for the complete curriculum of this program.

Certified Accessibility and Private Residence Lift Technician

The Certified Accessibility and Private Residence Lift Technician program (known as CAT), offered by NAEC, is currently the only education program available in the United States for the accessibility and residential community. Anyone who meets the qualification requirements of the CAT program can participate. NAEC does not distinguish between union or nonunion companies or individuals. The CAT program includes accountability, testing, and field verification. The curriculum includes the following topics:

Course 1: Introduction to the Vertical Transportation Industry

- 1.1 Vertical Transportation History
- 1.2 Organizations Relevant to the Vertical Transportation Industry
- 1.3 Applicable Codes and Regulations

[3] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2004-2005 Edition*, "Elevator Installers and Repairers", on the Internet at http://www.bls.gov/oco/ocos189.htm, accessed February 07, 2005.
[4] Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook, 2004-2005 Edition*, "Elevator Installers and Repairers", on the Internet at http://www.bls.gov/oco/ocos189.htm, accessed February 07, 2005.

- 1.4 "CAT" Industry Terminology
- 1.5 Types of "CAT" Industry Equipment
- 1.6 General Safety
- 1.7 Basic Electricity
- 1.8 Print Reading
- 1.9 Installation

Course 2: Vertical Platform Lifts

- 2.1 Landing Doors/Gates
- 2.2 Landing Doors/Gates Locking Devices
- 2.3 Machinery Tower/Mast
- 2.4 Platform
- 2.5 Hoistway/Runway Enclosure
- 2.6 Information Applicable to All Types

Course 3: Inclined Platform Lifts

- 3.1 Installation (guides/support track)
- 3.2 Operating Signals/Landing Calls (track to platform)
- 3.3 Platform (folding/non-folding)
- 3.4 Barrier Arms
- 3.5 All Types (AV alerts; traveling cables)

Course 4: Inclined Stairway Chairlifts

- 4.1 Installation
- 4.2 Chair Seats/Housings
- 4.3 Requirements for All Types

Course 5: Private Residence Elevators

- 5.1 Landing Doors/Gates
- 5.2 Landing Doors/Gates Locking Devices
- 5.3 Drive Machines (types; benefits; installation; etc.)
- 5.4 Car Enclosure
- 5.5 Hoistway/Runway Enclosure
- 5.6 Guide Rails and Other Guiding Means
- 5.7 All Types

The CAT Candidate Program, a two-year, self-paced education certification program, is structured to meet federal apprenticeship requirements (144 classroom hours / 2,000 on-the-job training hours annually). Upon successful completion of the two-year program, the candidate is required to pass a final examination scoring 85 percent or better. Ten hours of continuing education annually is required to maintain certification.

American National Standards Institute/American Society of Mechanical Engineers Standards

Escalators are manufactured and installed to be in compliance with the American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME) Safety Code for Elevators and Escalators. This safety code, first published in 1921, is published every three years with annual supplements. In the United States building transportation industry, the most widely used code and standards documents are the ANSI/ASME 17.1 - Safety Code for Elevators and Escalators; ANSI/ASME A17.2 - Inspection of Elevators, Escalators and Moving Walks; and ANSI/ASME A17.3 - the Safety Code for Existing Elevators and Escalators.

ANSI/ASME 17.1 is intended to serve as the basis for state, provincial, municipal, and other authorities having jurisdiction in drafting regulations governing the design, construction, installation, operation, inspection, testing, maintenance, alteration, and repair of equipment. Such equipment includes elevators, escalators, moving walks, dumbwaiters, and material lifts, their associated parts, and their hoistways, where located in or adjacent to a building or structure. It includes requirements for acceptance inspections and tests of new or altered installations and periodic inspections and tests of existing installations.

Specific topics addressed in the code include the following: elevator machinery; equipment capacity and loading; hoistway and elevator car construction; hoistway enclosures; elevator electrical equipment operating devices and control equipment; and the National Electrical Code requirements for elevators and related equipment emergency, operations and signaling devices, firefighters' emergency operations, and accessibility of standby power.

Inspectors and inspection supervisors are required by ANSI/ASME A17.1 to be certified by an organization accredited by ASME in accordance with the requirements in the Standard for the Qualification of Elevator Inspectors, ASME QEI-1. It is required that periodic tests are witnessed by an inspector employed by the authority having jurisdiction, or by persons authorized by the authority having jurisdiction.

ANSI/ASME A17.2 includes recommended inspection and testing procedures for electric and hydraulic elevators, escalators, and moving walks required to conform to the Safety Code for Elevators and Escalators, ANSI/ASME A17.1. It details techniques and concepts such as safety sliding distance, top counterweight clearances, working pressure for hydraulic elevators, governor pull through, and release carrier pull out forces.

ANSI/ASME A17.3 contains retroactive requirements for existing elevators and escalators. It includes inspection procedures for electrical traction and winding drum elevators, hydraulic elevators, escalators, and moving walks.[5]

[5] *ASME Codes and Standards A17 Elevators and Escalators*, http://cstools.asme.org/csconnect/CommitteePages.cfm?Committee=L01030000&Action=1918. accessed February 7, 2005.

Qualified Elevator Inspector (QEI) Certification Program

The ASME QEI Accreditation Program certifies elevator inspectors and inspector supervisors in accordance with the ASME QEI-1 Standard. This certification is offered by three accrediting agencies that include Lift Technologies International, the National Association of Elevator Safety Authorities (NAESA), and the Elevator Industry Work Preservation Fund (EIWP). Inspectors certified by any of these three accrediting organizations are qualified to inspect elevators, escalators, and related equipment included in the ANSI/ASME A17.1 Safety Code.

ASME developed safety codes and standards for the design, construction, installation, operation, inspection, testing, maintenance, alteration, and repair of elevators, dumbwaiters, escalators, moving walks, material lifts and dumbwaiters with automatic transfer devices, wheelchair lifts, and inclined-stairway chairlifts. In order to maintain certification, individuals with QEI certification are required to pass an annual renewal test of the latest codes. A complete outline of the certification requirements may be found in Appendix C on page 60.

The Colorado Regulatory Environment

Regulation of conveyances in Colorado is performed at the local level through counties, municipalities, or regional regulatory jurisdictions that encompass both. Depending upon the specific county, municipality, or regional jurisdiction, it may contract with the Pikes Peak Regional Building Department (PPRBD), Denver Regional Council of Governments (DRCOG), or the Northwest Colorado Council of Governments (NWCCOG) for conveyance inspections. Some entities may have in-house staff that performs inspections to ensure the work is performed within code specifications. Additionally, many smaller jurisdictions may contract with the elevator manufacturer for inspection, maintenance, and/or repairs.

The PPRBD is the inspection authority for the County of El Paso and all the cities and towns therein, including Colorado Springs, Fountain, Green Mountain Falls, Manitou Springs, Monument, and Palmer Lake, but excluding Calhan. Since 1966, the City of Colorado Springs and El Paso County have jointly operated a building department. PPRBD conducts initial inspections and annual and semi-annual inspections of elevators and escalators utilizing three full-time inspectors. Approximately 1,270 units are in service currently in El Paso County. PPRBD does not inspect any equipment in any public schools or on federal property. PPRBD inspections adhere to ANSI/ASME A17.1 and A17.3 Safety Codes.

DRCOG's Elevator/Escalator Safety Inspection Program, created in 1984, is a cooperative effort between DRCOG and 24 jurisdictions to provide for independent elevator and escalator inspections by sharing inspector services. The Elevator/Escalator Safety Inspection Program includes jurisdictions across the Front Range, from Pueblo in the south to Berthoud in the north, an area of approximately 8,500 square miles. Five nationally certified inspectors determine whether units comply with codes and work with the building owners to address any inspection concerns by providing the following services:

- performance of semi-annual safety inspections of lift equipment, according to the ANSI/ASME A17.I Safety Code;
- follow-up inspections;
- plan review for new construction;
- jurisdictional records;
- location of the units; and
- contact with building owners/managers, service companies and the general public.

Each participating jurisdiction receives a percentage of an inspector's time based on its number of elevators and escalators. Each jurisdiction supervises the inspector while he/she is working there, and appoints a representative (usually the chief building official/inspector) to the DRCOG Elevator Inspection Advisory Committee. This committee assists DRCOG in developing:

- program policies,
- goals,
- the assessment fee formula, and
- the annual work program and budget.

The program is supported by participating jurisdictions that, in turn, collect fees from building owners. Each jurisdiction's membership fee is based on its number of units. Currently, the cost is $115 per unit. These costs generally remain constant and are usually recovered by the jurisdiction through annual inspection/certificate fees, contractor license fees, and related work permit charges. The building owners contract with service companies to perform needed repairs and maintenance. The table below lists the participants in the DRCOG program.

Table 1

Denver Regional Council of Governments
Participants in the Elevator/Escalator Safety Inspection Program

City of Arvada	City of Golden
Town of Berthoud	City of Greenwood Village
City of Black Hawk	City of Lakewood
City of Boulder	City of Littleton
City of Brighton	City of Lone Tree
City and County of Broomfield	City of Longmont
Town of Castle Rock	City of Louisville
City of Central	Town of Parker
City of Cherry Hills Village	City of Pueblo
City of Commerce City	City of Thornton
Douglas County	City of Westminster
City of Englewood	City of Wheat Ridge
City of Glendale	

The NWCCOG Elevator Inspection Program, created in 1993, performs inspections of elevator and accessibility equipment. Member jurisdictions are invited to sign a "Letter of Agreement" with NWCCOG. Jurisdictions then agree to pass an ordinance authorizing the service and establishing the fee per inspection. Building departments and NWCCOG's elevator inspectors work cooperatively to implement the program in each locale.

After each inspection, any maintenance or repair needs are documented by the inspector and submitted to the building owner to be addressed. It is then the building owner's responsibility to contact the conveyance company or mechanic to conduct the repairs or maintenance. If a building owner repeatedly refuses to address repair or maintenance needs, and the inspector determines that the conveyance is unsafe for use, the inspector reports to the local building official who in turn many decide to "red tag" or close down the conveyance until all issues have been satisfactorily addressed. Prior to the installation or upgrade of equipment, plans must be submitted to the appropriate building department for review.

In addition to providing the services to NWCCOG members, this inspection program also provides services to Routt County, Clear Creek County, and the towns of Hayden, Newcastle, Oak Creek, and Steamboat Springs. NWCCOG currently inspects 1,260 existing commercial conveyances twice per year and also inspects approximately 130 newly installed commercial and residential conveyances per year. The table below lists the participants in the NWCCOG program.

Table 2

Northwest Colorado Council of Governments
Participants in the Elevator/Escalator Inspection Program

Clear Creek County	Town of Granby
Eagle County	Town of Grand Lake
Grand County	Town of Gypsum
Jackson County	Town of Hayden
Pitkin County	Town of Hot Sulphur Springs
Routt County	Town of Kremmling
Summit County	Town of Minturn
Town of Avon	Town of Montezuma
Town of Aspen	Town of Newcastle
Town of Basalt	Town of Oak Creek
Town of Breckenridge	Town of Red Cliff
Town of Dillon	Town of Silverthorne
Town of Eagle	Town of Steamboat Springs
Town of Fraser	Town of Vail
Town of Frisco	Town of Walden
Town of Glenwood Springs	Town of Winter Park

The City and County of Denver conveyance inspectors are responsible for inspecting the 4,844 elevators, escalators; dumbwaiters; stage, orchestra, and man lifts; and sidewalk lifts located in Denver. Denver's requirements for inspectors of conveyances include five years experience as an elevator mechanic supervising the installation of elevators or escalators, and passage of a written examination including areas of inquiry such as the Denver Building Code and related technical job knowledge. Conveyances are inspected once a year by Denver inspectors when mechanics are on-site and the mechanisms are exposed. Additionally, every five years elevators and escalators receive a comprehensive test for full load testing deficiencies.

The State Buildings and Real Estate Programs (SBREP) is located within the Colorado Department of Personnel & Administration, Division of Finance and Procurement. SBREP provides statutory oversight and comprehensive design, construction, and real estate expertise in order to provide assistance and training to state agencies and institutions residing in state-owned or state leased-purchased properties or facilities. SBREP submitted information to the Department of Regulatory Agencies (DORA) regarding state agencies' and institutions' maintenance contracts for elevators.

Generally, state agencies and institutions owning buildings or facilities have appropriated money in their operating budgets for maintenance, repair, and inspections of elevators (see Appendix D on page 63). Some agencies reported that they provide for annual safety inspections, while others provide for monthly safety inspections as well as monthly maintenance. Other agencies do not have pre-established contracts but do have their elevators inspected. Only a few agencies do not have any inspections performed. Of the 647 passenger and freight elevators within state buildings, six conveyances do not have maintenance contracts. These conveyances are located at the Colorado Historical Society, Lamar Community College, and Cumbres & Toltec Scenic Railroad Commission.

The Capitol Complex Facilities within the Department of Personnel & Administration, Division of Central Services has contracted with an elevator contractor for the 35 elevators in the Capitol Complex Facilities (including the state capitol). This contract outlines very specific requirements for the maintenance, testing, and inspection of elevators. Contractors are required to make periodic tests and maintenance inspections of all elevator equipment including annual no-load and five-year full-load safety tests, annual pressure relief test, and three-year flexible coupling pressure tests as required by current ANSI/ASME A17.2 safety codes for elevators, dumbwaiters, escalators, and moving walks. Also, a monthly review of firefighter operations are performed. An individual inspection report on each unit inspected and tested is submitted to the Capitol Complex Facilities for review. The preventive maintenance program outlines the specific tasks that are required to be performed quarterly, semi-annually, or annually.

County And Municipal Regulation

The basic organizational structure of all Colorado counties is the same, except for the home rule counties and the City and County of Denver, City and County of Broomfield, Pitkin County and Weld County. Denver and Broomfield are organized under a charter pursuant to Article XX of the Colorado Constitution. Pitkin and Weld counties are organized pursuant to Article XIV, Section 16, of the Colorado Constitution and section 30-11-501, *et seq*., Colorado Revised Statutes (C.R.S.), which allow voters of a county to adopt a home rule charter establishing the organization and structure of county government, and pursuant to section 30-35-101, *et seq*., C.R.S., which further implements constitutional provisions regarding home rule.

Home rule counties are required to provide all mandatory programs, services, and facilities required by state law. A home rule county is permitted to provide such "permissive" programs, services and facilities as may be authorized by state law. In this sense, home rule counties enjoy no more prerogatives than statutory counties. Article XIV of the Colorado Constitution also establishes the organization and structure of non home rule counties.

Counties are legally considered an extension of state government and as such are granted only those powers that are explicitly stated in statute. They are granted those implicit duties to carry out those explicit powers. Under Titles 29 and 30 of the Colorado Revised Statutes, counties have permitting authority over the construction of projects in their respective jurisdictions. Counties can require that specific projects meet building codes adopted by the respective counties. Most counties, but not all, have adopted all or parts of the 2003 International Building Code or the 1997 Uniform Building Code. There are, however, some counties that have not adopted any building code. The adoption of a code with subsequent elevator/escalator requirements may provide assurances that these projects are performed to minimum standards of ANSI/ASME 17.1-17.3 Safety Codes. If the work is performed incorrectly, an inspector has authority to take certain actions. If the project has been completed, an inspector can demand that the project be modified to comply with the code.

Municipalities do not have the same statutory constraints as counties. As separate entities, they may establish licensing programs (which may include examining the applicant) as well as require permits and inspections of individual projects. As authority to regulate differs between counties and municipalities, so too does the regulation within a county or municipality. Although, generally there is uniformity between jurisdictions, there are times when local communities in the same county may have established different requirements for conveyance inspections. For example, in Larimer County, the Town of Berthoud contracts with DRCOG for elevator/escalator inspections, while Ft. Collins and Windsor contract with a private Qualified Elevator Inspector (QEI), and the City of Loveland has no elevator inspection program in the city; but elevators are repaired, maintained, and inspected by the elevator manufacturer.

To determine the extent of conveyance maintenance and inspection in Colorado, DORA performed a statewide survey by telephone and electronic mail. Representatives of counties, cities, and towns were interviewed to determine whether they had conveyances in their jurisdictions; and if so, whether there were maintenance contracts and whether periodic inspections were required. The tables on the following pages illustrate their responses.

Of the Applicant's estimated 15,000 elevators and escalators in Colorado, approximately 81 percent (12,143 units) are currently inspected by:

- DRCOG (3,730),
- NWCCOG (1,150),
- City and County of Denver (4,844),
- PPRBD (1,270),
- state agencies/institutions (618) (see Appendix D on page 63), and
- the City of Aurora (531).

These conveyances are subject to both initial and semi-annual or annual inspections. However, the City of Aurora differs in its requirements because it is the responsibility of the building owner to schedule these tests and subsequently submit the information to the City of Aurora. Generally, counties with only a few conveyances will contract with the elevator manufacturer for maintenance, inspection and/or repair.

The largest populated area in Colorado with no ongoing inspection program is Grand Junction. The Chief Building Official of Mesa County estimates that there are approximately 100 conveyances in Grand Junction and Fruita. These elevators and escalators are installed by factory certified personnel who provide the initial inspection. Representatives of the City of Grand Junction report that the city plans to review the possibility of implementing an elevator/escalator inspection program in 2006.

Table 3

Colorado County and Municipality Elevator Inspection Programs

County	Inspection / Maintenance			City/Town/Municipality	Entity Performing Inspections / Maintenance and/or Additional Information DRCOG-Denver Regional Council of Governments/NWCCOG-Northwest Colorado Council of Governments/PPRBD-Pikes Peak Regional Building Department
	Yes	No	No Conveyances		
Adams	X			Brighton, Commerce City, Arvada, Westminster, Thornton	DRCOG
		X		Bennett, Dupont, Eastlake, Federal Heights, Henderson, Strausburg, Watkins	Unincorporated Adams County has no inspection program.
	X			Aurora	All elevators and escalators in the City of Aurora are required to have an annual safety test. It is the responsibility of the owner to have this test and to submit a copy to the Building Code Division. The test must be in compliance with the ANSI/ASME Safety Code. The City of Aurora does not employ inspectors to review any safety tests submitted by the owners.
		X		Northglenn	The two elevators located in municipal buildings are serviced monthly by certified NEIEP technicians. In addition, they are annually inspected.
Alamosa	X			Alamosa	Four elevators in the City of Alamosa. Contract with an elevator manufacturer for inspection and maintenance.
	X			Alamosa State College	Alamosa State College has 13 people movers. Contracts with elevator manufacturer for inspection and maintenance.
			X	Hooper	
Arapahoe	X			Cherry Hills Village, Englewood, Glendale, Greenwood Village, Littleton	DRCOG
	X			Centennial	The City of Centennial performs an initial inspection upon installation based on the ANSI/ASME Safety Code. No ongoing program.
			X	Bowmar, Columbine Valley, Deer Trail, Foxfield, Sheridan, Bennett	
Archuleta	Did not Respond.			Pagosa Springs	
Baca	X			Campo, Pritchett, Springfield, Two Buttes, Vilas, Walsh	No elevators or escalators except in Springfield, where there is one outside lift. Maintained by local electricians.
Bent	X			Las Animas	One elevator in the courthouse with a contract with an elevator company for maintenance every three months and a mechanical inspection every year to year and a half.
Boulder	X			Boulder, Broomfield, Longmont, Louisville	DRCOG
		X		Allenspark, Eldorado Springs, Hygiene, Jamestown, Lafayette, Erie, Lyons, Nederland, Niwot, Pine Cliff, Superior, Ward	Lafayette has 20 people movers. No city mandated inspections. Most owners have contracts with private companies for insurance purposes.

County	Inspection / Maintenance			City/Town/Municipality	Entity Performing Inspections / Maintenance and/or Additional Information DRCOG-Denver Regional Council of Governments/NWCCOG-Northwest Colorado Council of Governments/PPRBD-Pikes Peak Regional Building Department
	Yes	No	No Conveyances		
Broomfield	X			Broomfield	DRCOG
Chaffee	X			Poncha Springs, Buena Vista, Salida	Two elevators in the county. Both elevators are under contract with an elevator company for maintenance every three months and mechanical inspections.
Cheyenne	Did not Respond.			Cheyenne Wells, Kit Carson	
Clear Creek	X			Central City, Empire, Georgetown, Idaho Springs, Silver Plume	NWCCOG
Conejos		X		Antonito, La Jara, Manassa, Romeo, Sanford	One elevator located in a private home.
Costilla			X	Blanca, San Louis	
Crowley			X	Crowley, Olney, Sugar City	
	X			Ordway	Ordway court house contracts with the elevator manufacturer for maintenance.
Custer	Not Available			West Cliffe	One elevator in a private office.
			X	Silver Cliffe	
Delta	X			Cedar Ridge, Crawford, Delta, Hotchkiss, Orchard City, Paonia	Five elevators in Delta City. Contract with private QEI for inspection of new conveyances and ongoing inspections based on ANSI/ASME Safety Code.
Denver	X			Denver	City and County of Denver has inspectors responsible for annual inspections of conveyances and five-year full load inspections.
Dolores			X	Dove Creek, Rico	
Douglas	X			Castle Rock, Lone Tree, Parker	DRCOG
			X	Larkspur	
Eagle	X			Avon, Basalt, Eagle, Gypsum, Minturn, Red Cliff, Vail	NWCCOG
El Paso	X			Colorado Springs, Fountain, Green Mountain Falls, Manitou Springs, Monument, Palmer Lake, Ramah	PPRBD
			X	Calhan	
Elbert	X			Elizabeth, Kiowa, Simla	One-two conveyances in the county inspected by the fire department.
Fremont			X	Brookside, Canyon City, Coal Creek, Florence, Rockvale, Williamsburg	
Garfield		X		Carbondale, Rifle	Both Carbondale and Rifle are considering joining NWCCOG.
	X			Glenwood Springs	NWCCOG.
	Did not Respond.			Parachute, Silt, New Castle and Unincorporated Garfield County	

County	Inspection / Maintenance			City/Town/Municipality	Entity Performing Inspections / Maintenance and/or Additional Information DRCOG-Denver Regional Council of Governments/NWCCOG-Northwest Colorado Council of Governments/PPRBD-Pikes Peak Regional Building Department
	Yes	No	No Conveyances		
Gilpin	X			Blackhawk, Central City	DRCOG
Grand	X			Fraser, Granby, Grand Lake, Hot Sulphur Springs, Kremmling, Winter Park	NWCCOG
Gunnison	X			Crested Butte	Mt. Crested Butte contracts with private QEI for inspection of new conveyances and ongoing inspections based on ANSI/ASME Safety Code.
	Did not Respond.			Gunnison, Marble, Pitkin	
Hinsdale	Not Available.			Lake City	One elevator located in a private residence.
Huerfano	Not Available.			La Veta, Walsenburg	One elevator in the courthouse.
Jackson	X			Walden	NWCCOG
Jefferson			X	Bow Mar, Edgewater, Lakeside, Morrison, Mountain View, Superior	
	X			Arvada, Golden, Lakewood, Littleton, Westminster, Wheat Ridge	DRCOG
Kiowa			X	Eads, Haswell, Sheridan Lake	
Kit Carson	Did not Respond.			Bethune, Burlington	
			X	Flagler, Seibert, Vona	
	Not Available.			Stratton	One elevator in town.
La Plata	X			Durango	No program required by the City of Durango but most owners have private contracts to maintain the conveyances.
			X	Bayfield, Ignacio	
Lake	X			Leadville	Contract with elevator manufacturer for inspection and maintenance.
Larimer	X			Berthoud	DRCOG
	X			Estes Park, Ft. Collins, Johnston, Loveland, Timnath, Wellington, Windsor	Elevators in Ft. Collins and Windsor. Ft. Collins, Estes Park, and Windsor contract with a private QEI for inspections on new installations. Ft. Collins inspections must be performed by an approved third-party certified elevator inspector. The City of Loveland has six elevators. There is no elevator inspection program in Loveland. The elevators are repaired, maintained, and inspected by the elevator manufacturer.
Las Animas	Did not Respond.			Aguilar, Branson, Cokedale, Kim, Starkville, Trinidad	One elevator in the courthouse in Trinidad.
Lincoln	Not Available.			Limon	Two elevators in the City of Limon. One in the public school and the other is in a motel. Inspection and maintenance is the responsibility of the facility.
			X	Arriba, Genoa, Hugo	

County	Inspection / Maintenance			City/Town/Municipality	Entity Performing Inspections / Maintenance and/or Additional Information DRCOG-Denver Regional Council of Governments/NWCCOG-Northwest Colorado Council of Governments/PPRBD-Pikes Peak Regional Building Department
	Yes	No	No Conveyances		
Logan	X			Crook, Flemming, Iliff, Merino, Peetz, Sterling	Five elevators in the county. Contract with elevator manufacturer for inspection and maintenance. Elevator in courthouse in Sterling is still under warranty with the manufacturer.
Mesa		X		Collbran, De Beque, Fruita, Grand Junction, Palisade	Over 100 elevators in Fruita and Grand Junction. No inspection program. Elevators are installed by factory certified personnel who provide the initial inspection. Mesa County plans to review the possibility of an inspection program at the time of code adoption near the end of 2006. City and county owned elevators are maintained by elevator manufacturers. Most are not inspected on a regular basis.
Mineral			X	Creede	
Moffat			X	Craig, Dinosaur	
Montezuma	X			Cortez, Dolores, Mancos	One elevator in the courthouse. Contract with elevator manufacturer for inspection and maintenance.
Montrose		X		Montrose, Naturita	No elevators or escalators in the unincorporated county. Montrose has five senior apartment buildings, each having an elevator. The hospital has a bank of elevators. There are three lifts in the Chamber of Commerce building. There are no city inspections. They rely on the fire district to inspect the elevators.
Morgan	Did not Respond.			Brush, Ft. Morgan, Hillrose, Log Lane Village, Wiggins	
Otero	Did not Respond.			Cheraw, Fowler, La Junta, Manzanola, Rocky Ford, Swink	
Ouray	Did not Respond.			Ouray, Ridgway	
Park	X			Alma, Fairplay, Bailey (unincorporated)	One elevator in Bailey and one elevator in Fairplay. Both in county office buildings. Contract with elevator manufacturer for inspection and maintenance. Inspected once a year
Pitkin	X			Aspen, Basalt	NWCCOG
	Not Available.			Snowmass	
Prowers	X			Granada, Harman, Holly, Lamar, Wiley	City of Lamar has four elevators - one is residential and one is no longer operational. City complex has two elevators. City complex elevators are inspected and maintained by the elevator manufacturer.
Pueblo	X			Pueblo	DRCOG
			X	Boone, Rye	

County	Inspection / Maintenance			City/Town/Municipality	Entity Performing Inspections / Maintenance and/or Additional Information DRCOG-Denver Regional Council of Governments/NWCCOG-Northwest Colorado Council of Governments/PPRBD-Pikes Peak Regional Building Department
	Yes	No	No Conveyances		
Rio Blanco	X			Meeker, Rangley	One elevator in the courthouse. Maintenance contract with private company.
Rio Grande			X	Center, Del Norte, Monte Vista, SouthFork	
Routt	X			Hayden, Oak Creek, Steamboat Springs, Yampa	NWCCOG
Saguache			X	Bonanza, Center, Crestone, Moffat, Saguache	
San Juan	Did not Respond.			Silverton	
San Miguel	X			Mt. Village, Telluride	Telluride contracts with a private QEI for inspection.
			X	Norwood, Ophir, Saw Pit	
Sedgwick			X	Julesburg, Ovid, Sedgwick	
Summit	X			Blue River, Breckenridge, Dillon, Frisco, Montezuma, Silverthorne	NWCCOG
Teller				Cripple Creek, Green Mt. Falls, Victor, Woodland Park	
Washington	X			Akron	One elevator in the courthouse. Elevator inspected quarterly and maintained by elevator company (service contract).
Weld	X			Berthoud, Brighton, Longmont, Thornton	DRCOG
	X			Greeley, Windsor	Greeley and Windsor contract with a private QEI for initial inspections.
			X	Ault, Dacono, Eaton, Erie, Evans, Firestone, Ft. Lupton, Frederick, Garden City, Gilcrest, Grover, Hudson, Johnstown, Keensburg, Kersey, LaSalle, Lochbuie, Mead, Millikin, Nunn, Pierce, Platteville, Raymer, Severence	
Yuma			X	Eckley, Wray, Yuma	

The Model Law

Beginning in the 1940's, the National Elevator Industry, Inc. (NEII) published the Model State Law for Elevators, Dumbwaiters and Escalators (Model Law). The Model Law establishes minimum qualifications for mechanics, inspectors, and contractors, and registration requirements for existing elevators, platform lifts, dumbwaiters, escalators, moving walks, and any other conveyances. It also covers the design, construction, operation, inspection, maintenance, alteration, and repair of automatic guided transit vehicles on guideways with an exclusive right-of way.

Qualifications of mechanics include: (1) not less than three years work experience in the elevator industry as verified by current and previous employers; (2) satisfactory completion of a written examination administered by the state's elevator safety review board on the most recent referenced codes and standards; and (3) successful passage of the mechanic examination of a nationally recognized training program for the elevator industry such as the National Elevator Industry Educational Program (NEIEP) or its equivalent; or certificate of completion of an apprenticeship program for elevator mechanics having standards substantially equal to the NEIEP and registered with the Bureau of Apprenticeship and Training, U.S. Department of Labor, or a state apprenticeship council.

The Model Law further requires that qualified elevator contractors employ licensed elevator mechanics and have proof of compliance with state-mandated insurance requirements. The owner or lessee of every existing conveyance is required to register existing elevators, platform lifts, dumbwaiters, escalators, moving walks and any other conveyance, providing the type, rated load and speed, name of manufacturer, and the location and purpose for which it is used. An enforcement program is another component of the Model Law, which ensures compliance with regulations and requirements.

Additionally, it is the responsibility of the owner of all new and existing conveyances located in any building or structure to have the conveyance inspected annually by a licensed elevator inspector according to ANSI/ASME A17.1 Safety Code. A licensed elevator inspector must meet the current ASME QEI-1, Standards for the Qualifications of Elevator Inspectors. Subsequent to inspection, the licensed elevator inspector is required to supply the property owner[s] or lessee and the state program director with a written inspection report describing any and all code violations. Property owners have 30 days from the date of the published inspection report to be in full compliance by correcting the violations.

The regulation of conveyances throughout the 50 states varies significantly, as illustrated by Table 4 on page 24, that was compiled by the Elevator Industry Work Preservation Fund.[6] States having adopted the Model Law include Alabama, California, Florida, Illinois, Indiana, Maryland, Vermont, Virginia, and Washington. Besides Colorado, the seven states without state regulatory oversight are Delaware, Kansas, Minnesota, New York, North Dakota, South Dakota, and Wyoming. Of the remaining states with some type of regulatory program, 12 license inspectors, 9 license contractors, and 4 license mechanics.

The table on the following page summarizes the status of conveyance regulation in other states.

[6] http://www.eiwpf.org/, (Safety Code Committees, Model Code), accessed February 16, 2005.

Table 4

State Safety Code Status

E: Electrical Special
W: Less than Model
Y: Exceeds the Model
Model States are represented by outlining.

	AL	AK	AR	AZ	CA	CO	CT	DE	DC	FL	GA	HI	ID	IL	IN	IA	KS	KY	LA	MA	ME	MD	MI	MN	MS	MO	NE	NV	NH	NJ	NM	NY	NC	ND	OH	OK	OR	PA	RI	SC	SD	TN	TX	UT	VT	VA	WA	WV	WI	WY
Equipment Covered	X	W	W	W	Y		W		W	X	X	X	X	Y	X	X	W	W	W		X	X	X	Y		X	Y	Y		X			X				X	X	X				X	X	X		X		X	
Equipment not Covered	X	W	W	W	X				W	X	X	X	X	X	X						X	X	X			X				X			X				X						X	X	X		X		X	
Definitions	X		W	W	X				W	X	X	X		X	X	W				X	X	X	X	E		X		X		X			X		W			X	X				X		X		X			
Board	X		X				X			X	X	X		X		x				Y	X	X	X	E		X				X					W		X	W	W			W	W		X		X		X	
ASME A17.1	X	'96	'92	'93	X		'98			X	X	X	X	X	X	X		'93	'98		X	X	X	X		'96	X	'O4	'96	'98	'96		X		'O4	X		'96	X	X		'97	X		X	X	X	X	'96	
ASME A17.3	X		X		X					X	X	X	X	X	X						X	X						'O2		X			X				X		X	X			X		X		X	X		
ASME A18.1	X				X					X	X	X	X	X		X					X	X	X			X	X	'O3					X		'O3		X		X	X			X		X	X	X	X	X	
ASME QEI	X		X	X	X					X	X	X	X	X	X	W					X	X		X		X	X	'O1					X		X			X	W	X			X	X	X	X	X	X		X	
ASCE 21	X				X						X	X		X							w																	X					X		W						
Contractor License	X				X		X			X	X	X		X	X	X					X	X	X					X									X		X			W	X			X	X	X		
Mechanic License	X				X		W			X		X		X	W					X	X	X	X	E				X	X							E		E				X		X					
Continuing Education	X				X					X				X	X					X	X	X		X																		X		X					
TM & Emerg License	X				X					X				X	X					W	X	X																X				X		X					
Inspector License	X		X	X	X		X			X	X	X		X	X						X	X	W	E		X		X		X	X				X			X	X			X		X					
Equipment Registration	X	X	X	X	X		X		X	X	X	X	X	X	X	X		X		X	X	X	X	W		X	X	X		X			X		X	X	X	X		X	X	X	X	X	X	X	X	X
Permits	X	X	X	X	X		W		X	X	X	X	X	X	X	X		X		X	X	X	X	X		X	X	X		X	X		X		X		X	X	X		X	X	X	X	X	X	X	X
Enforcement	X	X	X	X	X		W		W	X	X	X		X	X	W		X		X	X	X	X	X		X		X		X			X		X		X	X	X		W	X		X	W	X	W	X
Inspections	X	X	X	X	X		W		X	X	X	X	X	X	X	X		X		X	X	X	X	w		X	X	X		X	X		X		X		X	X	X	X		X	X	X	X	X	X	X	X

Arizona- the City of Phoenix has its own regulations and the Sovereign Indian Nation is exempt.
Delaware has no statewide program. Counties and municipalities have their own codes.
Minnesota - 16 hours each year of continuing education on electrical code. Inspection on new work only.
New Jersey allows self inspection by permitted contractors.
Oklahoma – A17 part of state building code.

New York has no statewide program. Model introduced.
Pennsylvania permits self-inspection.
South Carolina has private annual inspections and contractor tests without inspector for 3 and 5 year.
Virginia - some counties have additional items.

Source: http://www.eiwpf.org

Analysis and Recommendations

Public Harm

The first sunrise criterion asks:

> Whether the unregulated practice of the occupation or profession clearly harms or endangers the health, safety or welfare of the public, and whether the potential for harm is easily recognizable and not remote or dependent on tenuous argument.

The Applicant argues that since elevators and escalators are both technical and powerful, only those persons who have the proper education and training should be allowed to work on the equipment. Furthermore, the Applicant contends that "since the elevator industry is one that has been identified as the fifth most dangerous job in the building and construction industry, it only stands to reason that those working in this industry need to be trained in the hazards of the environment they are working in."[7]

Examples of malfunctions with elevators or escalators include the following:

- Improperly functioning electronic eyes - These mechanisms are used to control the closing of elevator doors. The electronic eye scans to ensure nothing is between the doors. If the eye is not operating properly, it will not read that a person is positioned between the doors. When the door closes, the person may be thrust to the ground and injured.

- Improper gaps - In escalators, too large of a gap between the moving stairs and the sides of the escalator can allow a foot or hand to become wedged between the stairs and the side. Serious injuries may result from this occurrence.

- Improper leveling - This malfunction occurs when elevators do not line up properly with the floor level. The elevator may stop a few inches above or below the level of the floor. This improper leveling may result in falls causing injuries.

- Unexplained dropping - When an elevator suddenly drops one or more floors, it is an indication of a malfunction. This sudden drop may result in falls or other injuries.

- Exposed elevator shafts – Regulations require that no portion of an elevator shaft be exposed. If a person falls down an elevator shaft, serious injuries or death often result from the fall.

[7] Sunrise Application submitted by Elevator Industry Work Preservation Fund, p. 4.

To quantify the number of injuries and accidents relating to elevators and escalators that have occurred in the United States, the Applicant submitted a study, *Deaths and Injuries Involving Elevators or Escalators,* which was prepared by the Center to Protect Workers' Rights (CPWR) as part of a research agreement with the National Institute for Occupational Safety and Health (NIOSH)[8]. This March 2004 report acquired much of its data from information derived from the U.S. Bureau of Labor Statistics, Census of Fatal Occupational Injuries (CFOI) using reports on work-related deaths that were collected and confirmed by state agencies for the period 1992 through 2001. Statistics were also supplied by the National Injury Information Clearinghouse, Consumer Product Safety Commission (CPSC) using data from 1997 through October 2003. According to data provided by these agencies, elevators and escalators kill about 30, and seriously injure about 17,100 people each year in the United States.

The study analyzed injuries/deaths to passengers in addition to injuries/deaths to personnel working on, in, or near elevators and escalators. The category of work-related incidents included not only all construction and general industry deaths, but also injuries/deaths occurring while performing a work function not directly related to the elevator/escalator industry. For example, incidents have occurred while cleaning an elevator or retrieving keys that have fallen down the shaft. While the primary cause of death in work-related accidents was falls, the two leading causes of death of escalator installers/repairers was being caught in/between moving parts, as well by being struck by objects and collapses. Most of the fatal falls involved workers who were not classified as elevator installers or repairers. The majority of people in the industry killed by elevator/escalator incidents were employees of construction contractors.

CFOI reported 207 deaths in the 10-year period from 1992 through 2001. Of these, 146 were working on or near elevators, and 61 were elevator passengers - people entering or riding in elevators. In addition, five deaths due to escalators were reported during the same period. The following table illustrates the 139 work-related deaths (out of the 146 reported) attributed to installation, repair, and other labor near or in elevators.

Table 5

Work Related Deaths Among Construction Workers
1992-2001

Cause	Installing & Repairing	Working in Elevator Shaft/Car	Working Near Elevators
Falls	24	11	32
Caught in/between	24	5	0
Struck by	14	8	0
Collapse	12	0	0
Other	9	0	0
Total	83	24	32

Source: U.S. Bureau of Labor Statistics

[8] Michael McCann, *Death and Injuries Involving Elevators or Escalators.* Silver Spring, MD: The Center to Protect Workers' Rights, 2004.

Of the reported 61 deaths among elevator passengers, a majority was attributed to falls into elevator shafts, including 15 deaths in which an elevator door opened and there was no elevator car. Information on passenger injuries and deaths was reported through the CPSC National Electronic Injury Surveillance System. The CPSC estimated that 75 percent of the escalator injuries resulted from falls. Statistically, it is important to note that the vast majority (approximately 70 percent) of elevator/escalator-related fatalities resulted in the death of construction or other workers rather than public passengers.

The study made five recommendations that include the following:[9]

- Guarantee that elevator parts remain stationary while maintenance or repairs are under way.
- Employ proper fall protection.
- Treat elevator shafts as confined spaces as defined by the U.S. Occupational Safety and Health Administration (OSHA).
- Provide adequate maintenance and inspection.
- Utilize only qualified personnel for elevator repair and maintenance.

The type and number of injuries related to elevator/escalator mishaps are difficult to quantify in Colorado because there is no central reporting agency. In support of the Applicant's contention that regulation of conveyances in Colorado is necessary to protect the health, safety, and welfare of the public, the Applicant submitted several examples of harm as reported in newspapers, in addition to interviews detailed on compact disc and videodiscs. Three incidents submitted occurred in Colorado, while the rest reflected accidents and death that occurred in other states. These are not intended to be considered a complete digest of conveyance incidents as more incidents have occurred throughout the United States. Several of the incidents occurred in states that have licensure programs for mechanics, contractors, and/or inspectors.

[9] Michael McCann, *Death and Injuries Involving Elevators or Escalators.* Silver Spring, MD: The Center to Protect Workers' Rights, 2004, pp. 4-8.

Generally, the incidents of harm in elevators include falls into elevator shafts where an elevator door opened and there was no elevator car, being struck by an elevator or closing elevator door, or the collapse of an elevator with a passenger inside. For example, a hospital elevator door trapped a surgical resident at a hospital in Houston, Texas as he entered, and he was subsequently decapitated as the elevator ascended.[10] Another case recounts the death of an eight-year old boy in Maine who became momentarily trapped between the swing door from the lobby to the elevator and the closed metal grate of the elevator car. When the car began to rise to the second floor, it pushed the boy upward into the upper arch of the doorway, quickly squeezing him to death.[11] Furthermore, a six-year old boy was killed in an elevator accident in Pensacola Beach at a family friend's home. The lawsuit alleged that the home elevator was allowed to run with its security gate open, permitting the boy to put his head between the cab and wall of the elevator shaft. The young boy, lying on the floor of the elevator, was looking down the shaft when his head was crushed as the rising elevator approached the next floor.[12]

To further demonstrate the potential for harm, incidents of escalator accidents were submitted. As reported by the "CBS Early Show" on Thursday, February 17, 2005, while riding an escalator with his father, a four-year old child's foot became stuck in a small gap between the side of the escalator and the moving steps. He lost three toes, muscle, and tissue. It took seven surgeries and a skin graft to repair the foot.[13] In January 2005, in New York City, more than a dozen students were injured on a field trip to the cinema. A screw protruding from the side of an escalator caught on one boy's pants, causing his fall, which resulted in the fall of other students who were behind him.[14]

The Applicant provided the following case studies of Colorado occurrences regarding actual harm. A review of the three cases reveals that two of the fatalities were construction workers whose work environment is under the purview of the Occupational Safety and Health Administration. The Coors Field incident occurred in the City and County of Denver, which has reviewed its elevator/escalator inspection program and made substantial changes to its program. DORA analysis appears in italicized text.

[10] "Hospital Lift Severs Surgeon's Head", *Herald Sun,* August 18, 2003, available from http://www.heraldsun.news.com.au/common/story_page/0,5478,6998479%255E1702,00.html, accessed March 3, 2005.
[11] "Family Reaches $3M Deal in Elevator Death", *Portsmouth Herald*, January 8, 2003, available from http://www.seacoastonline.com/2003news/01082003/maine/6677.htm, accessed March 3, 2005; "Elevator Had Safety Flaw Linked to Boy's Death," *Portland Press Herald*, August 25, 2001.
[12] Circuit Court of Escambia County, State of Florida, Case No. 99-1127-CA-01, June 26, 2001.
[13] Gregg A. Rogers. E-mail to DORA, February 21, 2005.
[14] "Kids Hurt in Escalator Accident," *Newsday*, January 13, 2005.

Case 1: Coors Field Escalator Accident

A 60-foot rise escalator, located in Coors Field, carrying persons from the upper level to the street malfunctioned in July 2003, injuring 35 persons. The preliminary result of the investigation into the Coors Field accident was that the escalator was overloaded and the brakes failed creating a runaway condition. After a lengthy investigation there was inadequate evidence to prove existence of an overload condition. An extensive brake load test was performed on an identical escalator at Coors Field (with new brakes) to determine whether the brakes were code compliant. Both the dynamic test and the static load test passed, indicating that the brakes did not fail.[15] The stadium's contract with the elevator manufacturer required that escalators be serviced twice a year. On June 30, 2003, all seven escalators at Coors Field were inspected, found to be code compliant, and their permits were renewed for six months.[16]

Further investigation was needed to determine the cause of the accident. To examine the performance from no-load to rated load in both motoring and regenerating modes of the Nordic Soft Start, a piece of equipment that controls the escalator's speed, the escalator manufacturer sent components of the escalator to an independent laboratory at Oregon State University. The analysis by the Oregon laboratory reported that the overspeed was most likely caused by the malfunction of the Nordic Soft Start. The current flowing through the controller to the Nordic Soft Start was "unbalanced, distorted and displayed erratic performance in the regenerative mode." Unbalanced current to the motors would disrupt the dynamic braking ability of the motors and allow them to free wheel, thus creating an overspeed condition. The failure of the escalator to come to an immediate stop when overspeed occurred was the result of a missing component known as an overspeed board.

The company that manufactured the escalator at Coors Field required that the overspeed board be installed on every escalator with a Nordic Soft Start device. This device detects the overspeed of the escalator and triggers the application of brakes sufficient to bring the escalator to a complete stop.[17] The laboratory determined that the Nordic Soft Start, malfunctioned and caused the escalator to speed out of control. Additionally, it was reported that the "overspeed board that was designed to trigger the escalator's brakes if the steps moved too fast, was missing from the control panel.[18]

This escalator had been installed, serviced, and maintained by National Elevator Industry Educational Program (NEIEP) certified mechanics employed by the escalator manufacturing company. The conveyance was installed under the guidelines sought by the Applicant.

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[15] City and County of Denver, "Investigative Report of the July 2, 2003 Escalator Accident at Coors Field, December 10, 2003.
[16] "Escalator Investigation," City and County of Denver press release dated Jluly 8, 2003, http://www.denvergov.com/Planning/151press1123.asp, accessed June 15, 2005.
[17] Motor Systems Resource Facility, School of Electrical Engineering and Computer Science, Oregon State University, "Testing of a Nordic Soft-Start Controller from Coors Field", Denver, Colorado, October 2003.
[18] "Coors Field Escalator Collapse Cause Released," *Denver Business* Journal, December 30, 2003, http://www.bizjournals.com/denver/stories/2003/12/29/daily18.htm, accessed June 15, 2005.

Subsequent to the accident, the City and County of Denver contracted with Denver Regional Council of Governments (DRCOG) to review its elevator and escalator inspection program. In its report, DRCOG recommended that city inspectors shadow private company technicians to witness all escalator and elevator inspections, hire more inspectors to handle the increased frequency of inspections, and increase training to ensure that city inspectors are Qualified Elevator Inspector (QEI) certified. Subsequently, Denver shifted the focus of its inspections from the quantity of inspections to quality of inspections. Three inspections, two by the city and one by the contractor licensed to maintain an escalator, merged into one annual inspection by the City and County of Denver.[19]

Also, the Denver City Council approved a measure that would require property owners to shut down any escalator that causes an injury and report the incident to Denver planning officials.

Case 2: Colorado FACE Program Reports

The National Institute for Occupational Safety and Health (NIOSH) investigates deaths through its Fatality Assessment and Control Evaluation (FACE) reports. The program identified 43 elevator-related deaths since the inception of the FACE program in 1982. These deaths generally occurred from elevators collapsing or from electrocution during maintenance. Additional deaths occurred when persons were caught in elevator mechanisms or struck by elevator cars or counterweights.

Of these 43 reported deaths, only one death relating to elevators was reported to, and investigated by the Colorado FACE program during the years 1989 through 2004. The fatal incident occurred in 1993 and involved a newly hired Styrofoam warehouse worker. The employee, on his second day on the job, was instructed to proceed to the second level of the building to cut Styrofoam. The instructing employee assisted the deceased in starting a cable activated freight elevator, which would take the deceased to the second level. The elevator was equipped with a manual switch that would automatically stop the elevator at the next level. The original second floor had been previously removed and the elevator doors had been programmed to not open at that level, but to proceed and open at the newly constructed second level.

It is believed that when the elevator did not stop at the original second level, the deceased panicked thinking that he had missed his floor and exited the elevator while it was still moving. It is speculated that he held on to the inside of the elevator shaft wall between the elevator and the wall until he lost his grip and fell three stories to the concrete floor below. The cause of death was determined to be blunt force trauma to the head with skull fractures, subarachnoid hemorrhage, cerebral and brain stem contusions, and multiple internal injuries. [20]

[19] Brittany Anas, "Escalator Checks Toughen: Denver to Enforce DRCOG Recommendations," *Denver Post*, July 7, 2004.
[20] "Warehouse Worker Dies from Fall Inside an Elevator Shaft in Colorado," Colorado FACE Investigation 92CO056.

This incident appears to be a legitimate case of harm. The warehouse worker should not have been able to jump out of a moving elevator. However, the FACE investigation recommended thorough training of new employees in the operation of equipment, development and implementation and enforcement of a comprehensive written safety program. Also, FACE recommended the implementation of a regularly scheduled job-site survey that would identify potential hazards and appropriate control measures.

Case 3: Worker Dies in Accident at Flatirons Crossing Mall

In September 2000, a construction worker was crushed to death by an elevator he was installing at a restaurant at the Flatirons Crossing Mall in Broomfield, Colorado. The man was working inside the elevator shaft when the elevator plunged and crushed him. The elevator was not operational at the time but it was reported that the power to the elevator was not switched off. [21]

While tragic, this individual was an employee working on the elevator. OSHA investigated the incident and cited the elevator company for an infraction. It is difficult to see how a state regulatory program would have enhanced public protection in this case.

It is important to recognize that although some of the above referenced elevator/escalators events and accidents may have occurred with an operator who was not certified, or even properly trained, many of these events occurred even with mechanics who are certified or properly trained. Although certification increases an operator's knowledge and skills, certification does not ensure the elimination of elevator/escalator accidents, just as a driver's license does not ensure that a motorist will not be responsible for an automobile accident.

Need for Regulation

The second sunrise criterion asks:

> Whether the public needs and can reasonably be expected to benefit from an assurance of initial and continuing professional or occupational competence.

It is evident that the repair, installation, and inspection of technical and mechanically sophisticated elevators and escalators require a workforce that has adequate training and knowledge of the equipment. The public relies on and generally assumes that there are responsible entities periodically inspecting elevators and escalators. Many elevators have signs posted that inform passengers that a "certificate of inspection" is available in the manager's office. Generally, the public does not initiate a review of the inspection certificate nor would the public have the expertise to determine whether an inspection has been performed according to the ANSI/ASME Safety Code. However, many mechanisms are already in place in Colorado to protect the welfare and safety of the public who ride in elevators and escalators.

[21] Kevin McCullen, "Elevator Falls on Installer at Flatiron Mall Man, 27, Dies While Working Inside Shaft at 2-Story Restaurant," *Rocky Mountain News*, September 12, 2000, sec. Local, p. 23A.

Of the estimated (by the Applicant) 15,000 elevators and escalators in Colorado, 1,270 units are under the jurisdiction of the Pikes Peak Regional Building Department's inspection program, 24 jurisdictions with a total of 3,730 units have an agreement with the Denver Regional Council of Government Elevator/Escalator Safety Inspection Program, 4,844 units are inspected by the City and County of Denver, over 600 escalators and elevators are serviced and inspected in state owned office buildings, and 1,260 units within several jurisdictions in northwestern Colorado have an agreement with the Northwest Colorado Council of Governments. In addition, the City of Aurora requires annual inspections in compliance with ANSI/ASME Safety Code for its 517 elevators and 14 escalators. Even without state standards, the majority of the conveyances in Colorado (over 80 percent) are being installed, serviced, and inspected according to the ANSI/ASME Safety Code.

According to the U.S. Department of Labor, *Occupational Outlook Handbook 2004-2005 Edition*, most elevator installers and repairers apply for their jobs through a local of the International Union of Elevator Constructors. The employment workforce of the major elevator and escalator contractors in the United States are comprised of union members who have already successfully completed the apprenticeship program offered by the nationally recognized conveyance mechanic training program that is registered with the Office of Apprenticeship Training, Employer and Labor Services in the U.S. Department of Labor. To create a state regulatory program that requires the successful completion of an apprenticeship program that a majority of personnel already have attained is redundant and not the best utilization of state resources. In addition, a significant number of elevator and escalator inspectors currently practicing in Colorado have successfully attained Qualified Elevator Inspector (QEI) certification status.

Alternatives to Regulation

The third sunrise criterion asks:

> Whether the public can be adequately protected by other means in a more cost-effective manner.

Senate Bill 05-238, which was introduced in the 2005 session of the Colorado General Assembly, proposed the creation of the Elevator and Escalator Certification Act. This act would have required governments to submit information to the Department of Labor (Department), and would have necessitated conveyance mechanics, contractors, and inspections to be certified by the Department. Also, the bill outlined the requirements for certification of conveyance mechanics, contractors, and inspectors; specified the types of equipment that would be required to be registered with the Department; and allowed for civil penalties to be imposed if certain conditions were not met.

The Applicant, in its request for regulation focuses on the licensing of contractors, mechanics, and inspectors. Licensing is only one of several regulatory options. The following options are organized in terms of degree of regulatory burden from least burdensome to most extensive.

- **No Change:** This option leaves in place current programs that exist in municipalities and counties throughout Colorado. As discussed in this report, various programs have been adopted at the local level that require the ANSI/ASME Safety Code to be applied for the inspection and repair of elevators and escalators. The survey conducted for this sunrise review reveals that 81 percent of the conveyances in Colorado (based on the 15,000 conveyances estimated by the Applicant) are currently being repaired, maintained, and inspected by established programs.

- **Certification: "**Certification" is a regulatory term that connotes training and/or an examination process, typically administered by a private trade or professional association for the benefits of its members. Unless adopted by the state, it has no enforcement authority. Certification is used to enhance the competency and/or stature of those certified within the profession or occupation. The National Elevator Industry Education Program (NEIEP), which is a labor/management trust of the International Union of Elevator Constructors and the National Elevator Industry, Inc., offers a four-year elevator constructor apprenticeship program. It has received formal approval from the U.S. Department of Labor, Office of Apprenticeship Training, Employer and Labor Services. Personnel who install, repair, and maintain residential elevators, stair lifts, and vertical platform lifts are certified by the Certified Accessibility and Private Residence Lift Technician (CAT) or the Certified Elevator Technician (CET) Programs sponsored by the National Association of Elevator Contractors.

- **Registration:** The regulatory term "registration" implies that certain essential information about an identified group of individuals and entities is gathered and compiled by the state so that the public has some way of contacting the registrant if necessary. Registration includes the payment of a registration fee and is usually the lowest level of regulation implemented by the state. Because registration is a function of the state, all costs associated with the registration program would be passed on to the registrants in the form of registration fees that would cover the cost of the program. Senate Bill 05-238 would have created the Conveyance Safety Fund and would have required the owner or lessee of every existing conveyance to register the type, rated load and speed, name of manufacturer, location, and intended purpose for such with the program administrator and to pay a fee.

- **Licensure: "**Licensure" is a designation used to describe the highest level of state regulation. Typically, the state grants licensure to an individual who has complied with a legislatively mandated set of minimum education, training, experience and competency standards and has paid the required licensing fee. Regulation through licensure encompasses the setting of eligibility standards, examination requirements and a complaint process to resolve consumer complaints. The complaint process typically involves investigation of complaints and a disciplinary process whereby the licensing authority imposes discipline in situations where the licensee has violated state law. This level of state regulation carries with it the highest level of state expense.

Information submitted by the Applicant indicates that as many as 15,000 conveyances in Colorado would be required to register with the Division of Oil & Public Safety (Division). If regulations for this regulatory program were to be imposed by the General Assembly, the cost of such regulation would be dependent upon the consideration of the following issues:

1. General oversight and administration of the program by the Division
2. Initial rulemaking to implement the act, ongoing rulemaking, and conducting hearings and appeals by the Division
3. Enforcement actions by the Division
4. Review of applications and issuing licenses
5. Development of a database to track registrations and licensees
6. Establishment of new examination or training programs, or the use of established national programs
7. Establishment of requirements necessary to ensure initial or continuing competency within the professions
8. Determination of the need and number of state elevator and escalator inspectors

The Applicant proposes the licensing and permitting program to be funded through licensing and registration fees. If it were determined that the permitting and inspection fees could not reasonably be borne by licensees, other funding sources to cover the cost of those components would have to be identified. It is difficult to precisely determine the cost of establishing any new licensing program. The task is made more difficult in this case because of the unknown factors, such as the number of conveyance mechanics, inspectors, and contractors, and the exact number of elevators and escalators in the state of Colorado.

The U.S. Occupational Safety & Health Administration (OSHA) has promulgated standards pertinent to the health and safety of personnel working with elevators and escalators. These include: lockout/tagout procedures, confined space standards, and adequate fall protection. Lockout procedures are part of OSHA's standard for control of hazardous energy (lockout/tagout) (29 C.F.R. §1910.147) for general industry. More than half of the deaths of those working in and around elevators – especially electrocutions and "caught in/between" and "struck by" deaths – were caused by failure to de-energize elevator electrical circuits or failure to ensure that elevator parts could not move while maintenance or repairs were underway. New construction and repair normally are included in OSHA's construction standard (29 C.F.R. §1926), which does not have a lockout/tagout standard. Nonetheless, safe work practices mandate lockout/tagout when repairing and renovating elevators and escalators.

According to the report *Deaths and Injuries Involving Elevators or Escalators,*[22] over one-quarter of the reported work-related deaths between 1992 and 2001 occurred when workers entered elevator shafts to repair or maintain elevators, or to perform activities such as cleaning, welding, and retrieving fallen objects. OSHA's construction standard states, in part (for new construction), that employees required to enter into confined or enclosed spaces shall be instructed as to the nature of the hazards involved, the necessary precautions to be taken, and in the use of protective and emergency equipment required. (29 C.F.R. §1926.21(6)(i)). OSHA's definition of a confined space is one that has limited or restricted means of entry or exit, is large enough for an employee to enter and perform assigned work, and is not designated for continuous occupancy by an employee (29 C.F.R. §1910.146). Elevator shafts and pits meet that definition. In 1994, OSHA issued a letter of interpretation stating that elevator pits are usually confined spaces.

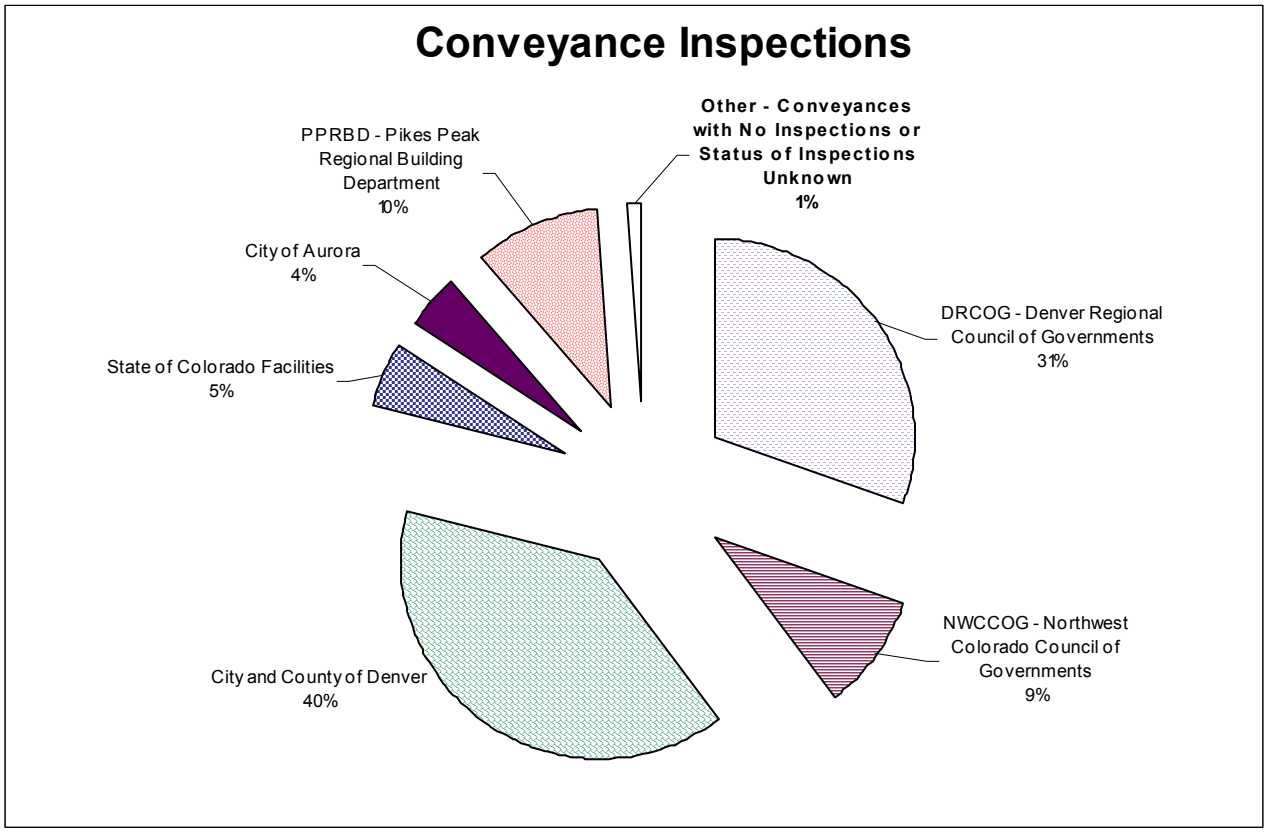
Additionally, 45 percent of the deaths occurring during work on or near elevators resulted from a lack of adequate fall protection. Fall hazards during new elevator construction and repair are described in 29 C.F.R. §1926.500 through 503, part of OSHA's construction standard. Fall hazards during elevator maintenance are described in 29 C.F.R. §1910.22(b).

While there are no specific OSHA standards addressing the pattern of electrical wiring for elevator control panels, OSHA requires employers to provide a workplace that is "free from recognized hazards that are causing or are likely to cause death or serious physical harm to their employees."[23] Employers need to take reasonable steps to assure that employees who perform work on elevators are adequately trained in, and knowledgeable of, elevator design specifications and proper maintenance procedures. Further, equipment must be maintained in accordance with manufacturer design specifications and operating procedures.

Conclusion and Recommendation

To determine whether the unregulated practice of elevator/escalator mechanics, inspectors, and contractors clearly harms or endangers the public, this sunrise review performed a comprehensive survey of the status of the oversight of elevators and escalator maintenance, repairs, and inspections in Colorado. The majority of the public elevators and escalators in the state fall within the jurisdiction of locally established programs in the City and County of Denver, the City of Aurora, Denver Regional Council of Governments, Northwest Colorado Council of Government, and Pikes Peak Regional Building Department. Additionally, several local jurisdictions have contracted with a privately certified inspector, and state-owned buildings in Colorado have established maintenance, repair, and inspection programs. As evidenced in the following pie chart, there are very few conveyances that are not inspected or where the status of the inspections is unknown.

[22] Michael McCann, *Deaths and Injuries Involving Elevators or Escalators*. Silver Springs, MD: The Center to Protect Workers' Rights, 2004, p.6.
[23] U.S. Department of Labor, Occupational and Safety Health Administration, "Electrical Examination, Installation and Use of Equipment, http://www.osha.gov/SLTC/smallbusiness/sec14.html, accessed March 3, 2005.



A component of the survey included interviews with officials of various building and planning departments in counties, municipalities, towns, and special districts. A majority of these representatives did not support state regulation as proposed by the Applicant. They articulated their opinions that municipal and county governments codify building standards and are responsible for the implementation and enforcement. Elevator and escalator safety codes are part of the body of the adopted codes. Senate Bill 05-238 as drafted, would have created a new state program responsible for conveyance registration, personnel licensing, conveyance certification, continuing education, compliance infraction investigation, regulatory enforcement, fees collection, and assessments of civil penalties. Furthermore, building officials articulated that Senate Bill 05-238, as drafted, would have usurped the authority of duly appointed building officials of municipal and county governments to enforce local codes.

The evidence fails to conclusively establish that the public would necessarily benefit from a complex state regulatory program. As an example, the most notable escalator accident that occurred at Coors Field located in the City and County of Denver transpired on a devise that had been installed, serviced, and maintained by National Elevator Industry Educational Program (NEIEP) certified mechanics employed by the escalator manufacturing company. Further, it has been established that the conveyance in question was installed under the guidelines sought in Senate Bill 05-238. Additionally, the Applicant states in the sunrise application that 95 percent of the mechanics who perform repair and maintenance on conveyances currently have the qualifications that would be required by a state regulatory program.[24]

The Applicant's proposed state regulatory program may possibly burden the independent residential elevator inspector with an apprenticeship program that doesn't serve the needs of the accessibility and residential community. The Certified Accessibility and Private Residence Lift Technician program (known as CAT) offered by the National Association of Elevator Contractors is currently the only education program available in the United States for the accessibility and residential community (see page 7 for details). Yet, this private certification program, which is well utilized and respected in the residential elevator community, would not fulfill the requirements of the proposed state regulatory program.

In conclusion, this review finds that there is a more cost-effective way to assure minimal safety of elevators and escalators without creating a new state regulatory program that requires apprenticeship, experience, and training as sought by the Applicant. The requirement that all public escalators and elevators be inspected by competent inspectors could positively impact the areas of the state where there is minimal or no inspection. Such objectives are best achieved by requiring any inspection of an escalator or elevator in a public building to be performed in accordance with ANSI/ASME Safety Code.

Recommendation – Implement a requirement that municipalities or local governments should require inspections of public elevators and escalators according to the ANSI/ASME Safety Code.

[24] Sunrise application submitted by Elevator Industry Work Preservation Fund, 2004, page 4.

Appendix A - National Elevator Industry Educational Program Course Requirements

Year 1 Elevator Industry Fundamentals

1.1 Safety for Elevator Constructors

1.1.1	Introduction to Safety	
1.1.2	Safety During Construction and Modernization	
1.1.3	Safety During Maintenance and Repairs	
1.1.4	Alcohol and Other Drugs	
1.1.5SM	Introduction to OSHA	
1.1.6SM	Hazard Communication	
1.1.7SM	PPE	
1.1.8SM	Materials Handling	
1.1.9SM	Tool Safety	
1.1.10SM	Electrical Safety	
1.1.11SM	Scaffold Safety	
1.1.12SM	Fall Protection	
1.1.13SM	Stairways and Ladders	
1.1.14SM	Confined Spaces	
1.1.15SM	Ergonomics	
1.1.16SM	Fire Safety	28 Hours

1.2 Diversity Training

1.2.1	Harassment and Discrimination in the Workplace	
1.2.2	Diversity and Success	
1.2.3	Case Studies	8 Hours

1.3 Customer Relations

Customer Focus
Presentation
Communications
Dealing with Customers — 4 Hours

1.4 IUEC History

8 Hours

1.5 Fundamentals of Print Reading

1.5.1 Introduction to Installation Drawings
1.5.2 Detail Drawings and Material Specifications — 16 Hours

1.6 Material Handling, Rigging and Hoisting

1.6.1 Tools and Material Handling
1.6.2 Rigging and Hoisting
1.6.3 Crosby Fasteners* (*CD-ROM) — 16 Hours

1.7 Pit Structures

1.7.1 Pit Structures
1.7.2 Welding Basics* (*CD-ROM) — 8 Hours

1.8 Guide Rails

1.8.1 Introduction to Guide Rails
1.8.2 Installation of Guide Rails — 16 Hours

1.9 Machine Room and Overhead Installation

1.9.1 Machine and Sheave Installation
1.9.2 Elevator Control Equipment Installation — 12 Hours

1.10 Car and Counterweight Assembly, Roping and Re-roping

1.10.1 Car and Counterweight Assembly and Roping
1.10.2 Elevator Rope and Roping
1.10.3 Re-roping
1.10.4 Elevator Cab Modernization, Refinishing and Floor Covering — 32 Hours

TOTAL: 144 Hours

Year 2 Basic Electricity for Elevator Constructors

2.1 Basic Math Review

2.1.1	Elementary Technical Mathematics	8 Hours

2.2 Basic Electricity

2.2.1	Arithmetic Review	
2.2.2	Basic Electricity Introduction	
2.2.3	Understanding the Relationship Between Voltage, Current, and Resistance	
2.2.4	Basic Electrical Circuit Components	
2.2.5	Series and Parallel DC Resistive Circuits	
2.2.6	Magnetism and Electromagnetism	
2.2.7	DC Generators and Motors	
2.2.8	Alternating Current Theory	
2.2.9	Transformers	
2.2.10	AC Motors	92 Hours

2.3 Meters

2.3.1	Introduction to Analog and Digital Meters	
2.3.2	Meters Experiments	12 Hours

2.4 Advanced DC Motors and Generators

2.4.1	DC Generator and Motor Theory	
2.4.2	Components of DC Motors and Generators	
2.4.3	Types of DC Motors and Generators	
2.4.4	Maintenance and Service	32 Hours
	TOTAL:	144 Hours

Year 3 Advanced Topics in Elevator Training

3.1 Construction Wiring

3.1.1	Planning, Piping and Wiring	
3.1.2	Piping the Machine Room and Hoistway	
3.1.3	Traveling Cables	
3.1.4	Wiring the Hoistway and Machine Room	
3.1.5	Piping and Wiring the Car	
3.1.6	Start-Up Procedures	28 Hours

3.2 Doors and Operators

3.2.1	Introduction to Passenger and Freight Entrances	
3.2.2	Passenger Elevator Doors and Entrance Installations	
3.2.3	Elevator Cab Assembly and Door Operators	
3.2.4	Freight Elevator Doors and Gates	
3.2.5	Passenger Door Operators	
3.2.6	Freight Door Operators	
3.2.7	Door Protective Devices	
3.2.8	Troubleshooting Door Operators	
3.2.9	Dumbwaiters	48 Hours

3.3 Hydraulics

3.3.1	Drilling and Casing the Jack Hole	
3.3.2	Installing and Servicing the Jack	
3.3.3	Piping and Temporary Operation	
3.3.4	Basic Hydraulic Theory	24 Hours

3.4 Escalators and Moving Walks

3.4.1	Safety and General Installation Procedures	
3.4.2	Escalator Components and Installation Procedures	
3.4.3	Moving Walk Components and Installation Procedures	
3.4.4	Escalator Safety and Terminology	
3.4.5	Escalator Steps and Step Chains	
3.4.6	Escalator Handrails	
3.4.7	Escalator Service and Maintenance	44 Hours
	TOTAL:	144 Hours

Year 4 Circuit Tracing, Solid State Electronics and Elevator Maintenance

4.1 Basic Elevator Solid State Electronics

4.1.1	Capacitors and Capacitance	
4.1.2	Inductors and Inductance	
4.1.3	Diodes	
4.1.4	Transistors and Thyristors	
4.1.5	Analog Integrated Circuits	
4.1.6	Digital Integrated Circuits	40 Hours

4.2 Circuit Tracing

4.2.1	Introduction to Circuit Tracing	
4.2.2	Relays and Timers	
4.2.3	Power and Power Control	
4.2.4	Logic Controls	
4.2.5	Constant Pressure Push Button Systems & Single Automatic Push Button Systems	
4.2.6	Collective Systems	
4.2.7	Variable Voltage Selective-Collective Control Systems	80 Hours

4.3 Elevator Maintenance

4.3.1	Elevator Machine Room Maintenance	
4.3.2	Elevator Hoistway Maintenance	
4.3.3	Hydraulic Elevator Maintenance	24 Hours
	TOTAL:	144 Hours

Source: National Elevator Industry Educational Program Course Information, http://www.neiep.org/courses/default.aspx, accessed March 3, 2005.

Appendix B - CET Curriculum Outline

NAEC CET™ CANDIDATE CURRICULUM OUTLINE

	Class hours
Basic training (recommended course for new hires)	12

COURSE 1
(Field hours – 1000)

INTRODUCTION TO ELEVATORS

Unit 1: Elevator History and Basic Safety (P-4)	35
Unit 2: Basic Print Reading (P-4)	24
Unit 3: Handling Material, Tools, Rigging and Hoisting (P-6)	20

COURSE 2
(Field hours – 1000)

BASICS OF INSTALLING ELEVATOR COMPONENTS

Unit 4: Pit equipment	25
Unit 5: Guide Rails	10
Unit 6: Machine Room Equipment	30
Unit 7: Hoistway equipment	25

COURSE 3
(Field hours – 1000)

MAINTENANCE PRACTICES AND TESTING

Unit 8: General maintenance practices (P-1)	22
Unit 9: Maintenance of Traction elevators	30
Unit 10: Maintenance of hydraulic elevators	20
Unit 11: Maintenance of escalators and moving walks	15

COURSE 4
(Field hours – 1000)

ELECTRICAL THEORY

Basic Math (P-1) 10

Basic Electricity (P-1) 6

AC Circuits (P-1) 6

Introduction to NEC (P-1) 6

Electrical safety (P-1) 6

UPON COMPLETION OF THE FIRST 4 COURSES (APPROXIMATELY 2 YEARS) THE CANDIDATE WILL RECEIVE AN AET™ CERTIFICATE (ASSOCIATE ELEVATOR TECHNICIAN)

COURSE 5
(Field hours – 300)

ELEVATOR DOORS AND EQUIPMENT

Unit 12: Elevator Doors and Equipment (P-2) 20

COURSE 6
(Field hours – 1400)

TRACTION ELEVATORS: MOTORS, MOTOR CONTROL AND FAULT FINDING

AC and DC motors, generators and motor control (P-4) 65

Elevator related circuits, basic circuit analysis and fault finding (P-7) 40

COURSE 7
(Field hours – 300)

ELECTRICAL WIRING AND EQUIPMENT

Unit 13: Construction, Wiring and Equipment (P-5) 20

COURSE 8
(Field hours – 400)

HYDRAULIC THEORY AND INSTALLATION

Unit 14: Hydraulics (P-9) 35

COURSE 9
(Field hours – 800)

BASIC ELECTRONICS AND FUNDAMENTALS

Unit 15: Basic Electronics and Solid State 40

COURSE 10
(Field hours – 400)

MACHINERY TROUBLESHOOTING, ROPE REPLACEMENT

Unit 16: Elevator Rope Replacement 6

Unit 17: Machinery Troubleshooting/repair (P-8) 24

COURSE 11
(Field hours – 300)

ESCALATORS AND MOVING WALKS

Unit 18: Escalators and moving walks 20

COURSE 12
(Field hours – 300)

ACCESSIBILITY

Unit 19: Accessibility 20

Total class hours: 580
Total field hours: 8200

(Hour total does not include basic training)

3

BASIC TRAINING

Class hours – 12 hours
Field hours – 400 hours

A. Public Relations
B. Communications
C. Work Ethic
D. Study Habits
E. Rewards
F. Paperwork
G. Policy and procedure requirements
H. Minimum qualifications – TABE testing
I. Tools for success (Includes sexual harassment and first aid)

PRIMEDIA WEB BASED EDUCATION
J. Safety orientation

COURSE 1

CERTIFIED ELEVATOR TECHNICIAN

Class hours – 79
Field hours -1000

INTRODUCTION TO ELEVATORS

Upon completion of units 1-3 the student should:

- Have gained knowledge of elevator history and equipment
- Have gained knowledge of overall safe methods of operation in the industry
- Have gained knowledge of the elevator related drawings and terminology used in the industry
- Have demonstrated the ability to properly handle material and assist in hoisting and rigging
- Have demonstrated the ability to identify, use and care for the tools involved in the industry
- Have demonstrated the ability to identify use and care for the personal protective equipment

Unit 1: **ELEVATOR HISTORY AND BASIC SAFETY**

1. HISTORY OF ELEVATORS
2. ELEVATOR INDUSTRY ORGANIZATIONS
3. ANATOMY OF AN ELEVATOR
4. TYPES OF ELEVATORS AND DRIVING MACHINES
5. ESCALATORS AND MOVING WALKS
6. APPLICABLE CODES AND PUBLICATIONS
7. WORK OF THE ELEVATOR PROFESSIONAL
8. GENERAL SAFETY
   *Industrial Safety Basics, Back Safety
9. COMPONENT INSTALLATION SAFETY PRACTICES
   *Ladders & Scaffolds
10. SERVICE SAFETY
    *Fall protection
11. TERMINOLOGY

Unit 2: **BASIC PRINT READING**

1. PRINT TERMINOLOGY
2. DRAWING TO SCALE
3. INTRODUCTION TO INSTALLATION DRAWINGS
   *Blue prints (diagrams), Electrical diagrams
4. DETAIL DRAWING AND LAYOUT
5. FITS, TOLERANCES AND FASTENERS
   *Mechanical fasteners, electrical fasteners

Unit 3: **HANDLING MATERIAL, TOOLS, RIGGING AND HOISTING**

1. HANDLING MATERIALS AND TOOLS
   *Intro to hand tools, shop/power tools, and precision measurement instruments
2. RIGGING AND HOISTING
   *Basics, basic lifting, and heavy lifting
3. HANDLING MATERIAL – STORAGE ON THE JOBSITE

5

COURSE 2

CERTIFIED ELEVATOR TECHNICIAN

Class hours – 90
Field hours - 1000

BASICS OF INSTALLING ELEVATOR COMPONENTS

Upon completion of units 4-7 student should:

- Have gained fundamental knowledge of all components that comprise and elevator installation
- Have gained fundamental knowledge the method of installing each component
- Have gained fundamental knowledge of the code related requirements for each component

Unit 4: **PIT EQUIPMENT**

1. INTRODUCTION AND PIT CONSTRUCTION
2. BUFFERS
3. GOVERNOR ROPE TENSION SHEAVES
4. COMPENSATING EQUIPMENT
5. TENSION SHEAVES FOR SELECTORS AND FLOOR CONTROLLERS
6. LIMIT SWITCHES

Unit 5: **GUIDE RAILS**

1. GUIDE RAIL CONSTRUCTION AND CODE REQUIREMENTS
2. PLUMBING THE HOISTWAY
3. GUIDE RAIL-BRACKET FASTENINGS AND SETTING
4. INSTALLING THE GUIDE RAILS
5. GUIDE RAIL GAUGING, ALIGNING, AND FILING

Unit 6: **MACHINE ROOM EQUIPMENT**

1. MACHINE INSTALLATION
2. MACHINE ROOM ACCESSORIES AND INSTALLATION
3. HYDRAULIC COMPONENTS

Unit 7: **HOISTWAY EQUIPMENT**

1. CAR AND COUNTERWEIGHT ASSEMBLIES
2. ELEVATOR ROPE AND ROPING
3. HYDRAULIC DRIVING COMPONENTS
4. TOP OF CAR EQUIPMENT
5. OPERATING FIXTURES AND ADA

COURSE 3

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 87
Field hours - 1000

MAINTENANCE PRACTICES AND TESTING

Upon completion of units 8-11 the student should:

- Have gained fundamental knowledge of all components that comprise and elevator installation.
- Have gained fundamental knowledge of the method for maintaining, adjusting and performing the replacement of maintenance related components.
- Have fundamental knowledge of code related requirements.
- Have fundamental knowledge of code required system testing

Unit 8: **GENERAL MAINTENANCE PRACTICES**

1. LUBRICATION
   *Basic Lubrication
2. BOLTING PRACTICES
3. ELEVATOR ROPES
4. WIRING DIAGRAMS
5. BELTS AND CHAINS
6. CODE REQUIREMENTS
7. TESTING REQUIREMENTS

Unit 9: **MAINTENANCE OF TRACTION ELEVATORS**

1. INTRODUCTION
2. MAINTENANCE INSIDE THE CAR AND OUTSIDE THE HOISWAY
3. MAINTENANCE IN MACHINE ROOM
4. TOP OF CAR AND HOISTWAY MAINTENANCE
5. PIT AND BOTTOM OF CARE MAINTENANCE
6. MAINTENANCE CODE REQUIREMENTS
7. TESTS

Unit 10: **MAINTENANCE OF HYDRAULIC ELEVATORS**

1. INTRODUCTION
2. MAINTENANCE INSIDE THE CAR AND OUTSIDE THE HOISWAY
3. MAINTENANCE IN MACHINE ROOM
4. TOP OF CAR AND HOISTWAY MAINTENANCE
5. PIT AND BOTTOM OF CARE MAINTENANCE
6. MAINTENANCE CODE REQUIREMENTS
7. TESTS

Unit 11: **MAINTENANCE OF ESCALATORS AND MOVING WALKS**

1. INTRODUCTION
2. EXTERIOR MAINTENANCE
3. INTERIOR MAINTENANCE
4. TESTING

COURSE 4
CERTIFIED ELEVATOR TECHNICIAN

Class hours - 34
Field hours - 1000

ELECTRICAL THEORY

*all web-based education

Upon completion, the student should:

- Have an understanding of the basic aspects of working safely around electrical equipment
- Have an understanding of the principles associated with electricity and electrical circuits
- Be able to explain where electricity comes from; what voltage, current and resistance are; and how their values can be calculated for various types of circuits.
- Be able to explain how electrical circuits are affected by induction, inductance, and capacitance
- Have an understanding of the basic concepts associated with the operation of AC circuits
- Have been familiarized with the electrical code and its purpose

ELECTRICAL SAFETY*

Electrical Concepts
- A. Friend or Foe
- B. Current
- C. Voltage
- D. Resistance

Shock
- A. What is Shock
- B. Amount of Current
- C. Length of Time
- D. Path Through The Body
- E. Effects

Hazards
- A. High Voltage Area
- B. Overload Circuits
- C. Damaged Cords
- D. Bare Connectors
- E. Long and Tall Objects
- F. Mobile Equipment
- G. Standing Water

BASIC ELECTRICITY REVIEW*

Basic concepts
- A. Where does electricity come from
- B. Basic electrical Quantities
- C. Ohms Law

Circuit Types
- A. Series
- B. Parallel
- C. Series-Parallel

Circuit characteristics
- A. Induction
- B. Inductance
- C. Capacitance

AC CIRCUITS*

Alternating Current
- A. Current Flow
- B. Sine Waves
- C. Peak Values and Effective Values

Inductance
- A. Inductance and Inductive Reactance
- B. Factors That Affect Inductive Reactance
- C. Inductance, Current And Voltage

Capacitance
- A. Capacitance And Capacitive Reactance
- B. Capacitance, Current and Voltage

AC Power
- A. True Power, Reactive Power and Apparent Power
- B. Single Phase and Three Phase systems

INTRODUCTION TO NEC*

Overview
- A. Purpose and History
- B. Layout

Using The NEC
- A. Navigating
- B. Examples

BASIC MATH*

COURSE 5

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 20
Field hours - 300

Unit 12: DOORS AND DOOR EQUIPMENT

This unit will explain the installation of elevator hoistway entrances and doors, including car door and operators and the principles of operations of various types of door operators.

Part 1: PREPARATION OF SHAFT AND CLEARANCES

A. Beginning the installation

Part 2: PASSENGER ELEVATOR DOOR AND OPERATOR INSTALLATION

A. Slide and center-parting
B. Swing doors
C. Automatic door operator installation
D. Door locking mechanisms

Part 3: FREIGHT ELEVATOR DOORS AND GATES

A. Manual freight Doors and Gates
B. Automatic freight Doors and Gates

Part 4: DUMBWAITER DOORS AND ENTRANCES

A. Dumbwaiter Doors and Entrances

ELEVATOR WORLD

Elevator maintenance manual
Curion video and related text
GAL installation text

WEB-BASED EDUCATION

To be produced (GAL AND COURION)

9

COURSE 6

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 105
Field hours - 1400

LEIA TRACTION LIFTS:

TRACTION ELEVATORS: MOTORS, MOTOR CONTROL AND FAULT FINDING

This first part of this course will detail the operation, care and use of the types of motors and generators used within the elevator industry.

Upon completion, student should:

- Have obtained a detailed knowledge of the construction and operation of A.C. machines used on elevator systems.
- Have obtained a detailed knowledge of the construction and operation of D.C. machines used on elevator systems.
- Understands the Ward-Leonard System of obtaining D.C. supply. Relates Ward-Leonard System to elevator control
- Be able to diagnose electrical faults and apply remedial action.
- Be able to sketch mechanical and electrical wiring diagrams
- Be able to explain with the aid of diagrams, the construction and operation of field regulators

Part 1: AC MOTORS

A. Motor types
B. Requirements of AC motors
C. Faults in AC motors
D. Motor protection

Part 2: DC MOTORS

A. DC motor operation
B. EMF and torque of a DC motor
C. Methods of connection for DC motors

Part 3: MOTOR CONTROL

A. Ward Leonard System of Variable Voltage Control

Part 4: REGULATORS

A. General
B. Open-loop and Closed-loop systems
C. Basic functions of a Field Regulator
D. Circuitry of a Field Regulator

Part 5: GEARLESS MACHINES

A. Types
B. Applications and Safety Precautions

Part 6: BRAKING

A. Basic arrangements
B. Basic circuitry
C. Speed, load and Braking accuracy
D. Dynamic Braking

Part 7: ELECTRICAL FAULT FINDING

A. Basic Introduction

ELEVATOR RELATED CIRCUITS

A. Constant Pressure Push Button Control
B. Single Automatic Push Button Control
C. Collective Control
D. Selective/Collective Control
E. Group supervisory control

SCHEMATIC CIRCUIT DIAGRAMS

A. Power circuits
B. Safety circuits
C. Brake circuit

TESTING ISTRUMENTS AND PROCEDURES

A. Testing instruments
B. Basic instrument procedures

SEQUENCE OF INVESTIGATION

A. General outline
B. Collection and recording symptoms
C. Diagnosis from information available
D. Diagnostic aids
E. Remedial actions and follow-up
F. Safety precautions in fault-finding
G. Car position
H. Motor overheating
I. Floor level

PRIMEDIA EDUCATION

Test equipment, troubleshooting techniques, advanced test equipment 1-3, relays 1-2

11

COURSE 7

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 20
Field hours - 300

ELECTRICAL WIRING AND EQUIPMENT

Unit 13: **CONSTRUCTION AND WIRING**

This course will detail all the electrical work done by the Elevator Constructor on an elevator installation. This includes the installation of all conduit, duct, fittings, operating and signaling fixtures, wiring and connections between the different components of an elevator.

Part 1: PLANNING AND INSTALLATION

A. Planning and installation of piping, wiring and raceways
B. Materials and types
C. Hardware for installation

Part 2: MOTOR ROOM AND HOISTWAY WIRING

A. Machine Room and Hoistway layout
B. Cutting and Bending

Part 3: CONDUIT CONNECTIONS AND CONDUCTOR INSTALLATION

A. Fittings
B. Box termination
C. Conductor installation in conduit and raceways

Part 4: TRAVELING CABLE

A. Traveling Cable application and identification
B. Traveling cable installation

Part 5: PIPING AND WIRING OF CAR ENCLOSURE

A. Top and bottom of car equipment and wiring
B. Shaftway and box clearances

Part 6: POWERING UP EQUIPMENT

A. Initial start up and safety precautions
B. Protection of components
C. Temporary running of car and platform

ELEVATOR WORLD TEXT AND PRIMEDIA EDUCATION
Electrical fasteners, hand bending, raceways, cables and conductors, conduit installation

12

COURSE 8

CERTIFIED ELEVATOR TECHNICIAN

Class hours – 35
Field hours - 400

HYDRAULIC THEORY AND INSTALLATION

Unit 14:

HYDRAULICS

This course will define a hydraulic elevator; explain its operation and the installation of components of a hydraulic elevator.

Part 1: DRILLING AND CASING THE JACK HOLE

A. Drilling and Casing the Jack Hole

Part 2: INSTALLING THE JACK

A. Installing the Jack

Part 3: INSTALLING AND PIPING THE POWER UNIT

A. Installing and Piping the Power Unit

Part 4: CAR SLINGS, ENTRANCES AND DOORS, HOISTWAY WIRING

A. Car Slings, Entrances and Doors, Hoistway Wiring

Part 5: CAR ENCLOSURE, OPERATION,

BASIC HYDRAULIC THEORY

A. Car Enclosure, Operation, Basic Hydraulic Theory

ELEVATOR WORLD
Volume 3 of educational package
Elevator maintenance manual

PRIMEDIA EDUCATION

Actuators, component inspection, fluid and reservoir, principles and circuits, pumps, routine maintenance, troubleshooting, valves 1-2, pipes and pipe fittings

13

COURSE 9

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 40
Field hours 800

BASIC ELECTRONICS AND FUNDAMENTALS

Unit 15:

INTRODUCTION TO ELECTRONICS AND SOLID STATE

Upon completion of this course student should:
Have gained knowledge of electronic and solid state devices and components and its use in the elevator industry.
Have demonstrated the ability to identify, use and care for tools and instruments

DEFINITIONS AND GENERAL INFORMATION
Electrical and electronic circuits
Techniques for conversion
Mechanical to electrical energy conversion
Chemical, solar energy to electrical energy

WATER ANALOGY
Comparison of an electrical system with a water system
Electrical current flow

ELEMENTS OF A CIRCUIT
Voltage, resistance and current
Conductors and graphic symbols

OHMS LAW
Circuit relatio0nships
Ohms law calculation
Circuit protection

CIRCUIT CONFIGURATIONS
Series circuit
Parallel circuit
Series/parallel circuit

POWER
Work and power
Mechanical power
Electrical power
Heat

ALTERNATING CURRENT AND DIRECT CURRENT
Alternating current (reference, sine wave, square wave, frequency spectrum)
Direct current (half wave, full wave, steady state, digital pulses)

RESISTORS
Fixed resistors
Variable resistors

CAPACITORS
Types
Applications

SWITCHES, KEYBOARDS AND ELECTROMECHANICAL RELAYS
Mechanical switches
Keyboards and keypads
Electromechanical relays

MAGNETIC COMPONENTS
Inductors
Impedance
Transformers

MISCELLANEOUS PASSIVE COMPONENTS
Connectors
Indicator lamps
Crystals

INTRODUCTION TO SEMICONDUCTORS
General information
Diode
Thyristors
Bipolar transistors

OPTO-ELECTRONICS
Light emitting diodes
LED displays
Other display technologies

OPTO-ISOLATORS

SOLID STATE RELAYS

ELEVATOR WORLD

Library of basic electronics book 1 and 2

COURSE 10

CERTIFIED ELEVATOR TECHNICIAN

Class hours – 30
Field hours - 400

MACHINERY TROUBLESHOOTING AND ROPE REPLACEMENT

The first part of this course deals with the care and condition of wire rope and the methods for replacement of wire ropes and chains.
The second part of this course deals with the identification, care, diagnosis and replacement of elevator machinery and it's components.

Unit 16:

ELEVATOR ROPE REPLACEMENT

Part 1: APPLICATIONS AND CARE OF WIRE ROPES

A. Applications and Care of Wire Ropes

Part 2: PREPARATION FOR REROPING

A. Preparation for Re-roping

Part 3: REROPING PROCEDURES

A. Re-roping Procedures

ELEVATOR WORLD

EW Volume 2 (maintenance and repair, ropes and roping)
NEMI manual
Elevator maintenance manual

Unit 17:

MACHINERY TROUBLESHOOTING/REPAIR

MACHINERY TYPES AND APPLICATION
MACHINERY COMPONENTS, USE AND CARE
MACHINERY COMPONENT DIAGOSIS AND REPLACEMENT

ELEVATOR WORLD

Electric machinery fundamentals
EW volume #1(machines and motors)
Elevator maintenance manual

PRIMEDIA EDUCATION

Bearings – unit 1-3
Seals – units 1-2
Shaft alignment – 1-3

16

COURSE 11

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 20
Field hours - 300

ESCALATORS AND MOVING WALKS

Unit 18:

This course examines the components of an escalator and the installation of these components.

Part 1: INTRODUCTION AND INSTALLATION

A. Introduction and Installation

Part 2: ESCALATOR ASSEMBLY:
TRUSS ALIGNMENT TO TRACK SYSTEM

A. Truss Alignment to Track System

Part 3: ESCALATOR ASSEMBLY:
NEWELS TO COMPLETED UNIT

A. Newels to Completed Unit

Part 4: GLASS BALUSTRADES AND WALKS (RAMPS)

A. Ramps

ELEVATOR WORLD

Volume 4 of educational package
Elevator maintenance manual

COURSE 12

CERTIFIED ELEVATOR TECHNICIAN

Class hours - 20
Field hours - 300

ACCESSIBILITY

Unit 19:

This course examines the different accessibility products and the installation of these components

Part 1:
Equipment types and application

Part 2:
Code requirements

Part 3:
Product installation

Appendix C - Certification Requirements for Qualified Elevator Inspectors (QEI)

Recent changes in the 2001 ASME QEI-1a Standard Section 2.1 require additional qualifications for applicants to become Certified Elevator Inspectors. National Association of Elevator Safety Authorities International now requires supervisors to certify in writing that the applicant, their employee, meets this requirement. Applicants will be disqualified from taking the QEI test without this completed certified approval letter.

CERTIFICATION REQUIREMENTS FOR INSPECTORS: (Ref. QEI-1 Standard; latest edition)

2.1 Qualifications

An inspector shall have verifiable experience of at least one year (or equivalent) performing inspections and witnessing tests as specified in ASME A17.1 and ASME A18.1**under the direct observation of a QEI Certified Inspector and/or Inspector Supervisor**. An inspector shall also verify that he or she meets the following qualifications:

(a) knowledge of personal safety practices, including, but not limited to, the safety practices contained in the Safety Handbook necessary to perform the following:
  1) acceptance inspections of new construction;
  2) routine and periodic inspections of existing equipment; and
  3) inspections of equipment in hazardous environments, where applicable;

(b) familiarity with industry terminology, including the following:
  1) terms defined and used in ASME A17.1 and ASME A18.1;
  2) terms used in ASME 17.2;
  3) terms defined and used in the National Electrical Code; and
  4) administrative terminology used by the jurisdictional authority;

(c) ability to read architectural and installation drawings, including hoistway and machine room layouts;

(d) working knowledge of electrical, electronic, and circuit construction principles, including but not limited to:
  1) voltage, currents, and resistance;
  2) series and parallel circuits;
  3) grounding; and
  4) ability to read circuit diagrams;

(e) knowledge of the purpose and function of safety devices in the following locations:
  1) machine rooms and machinery spaces;
  2) hoistways;
  3) on the cars;
  4) pits; and
  5) escalators, moving walks, and other related equipment;

(f) working knowledge of mechanical principles as applied to structures, machines, mechanisms, and the effects of traction on ropes and sheaves;

(g) working knowledge of hydraulic principles as applied to the operation of valves, pumps, plungers, piping, and buffers;

(h) knowledge of the various types of equipment; their code requirements, uses, and limitations; and any special problems or applications as included in ASME A.17.1 (past and present) and local regulations:
  1) classifications of usage:
    (a) passenger elevators;
    (b) freight elevators (Classes A, B, C1, C2, and C3);
    (c) private residence elevators;
    (d) sidewalk elevators;
    (e) special purpose personnel elevators;
    (f) inclined elevators
    (g) material lifts and dumbwaiters with automatic transfer devices;
    (h) dumbwaiters
    (i) elevators used for construction;

  2) classifications of driving means:
    (a) traction;
    (b) winding drum;
    (c) hydraulic (direct -plunger hydraulic, electro hydraulic, maintained -pressure hydraulic, and roped hydraulic);
    (d) screw machine;
    (e) rack and pinion;
    (f) hand;
    (g) belt and chain drives;
  3) escalators and moving walks; and
  4) inclined and vertical wheelchair lifts and stairway chairlifts (ASME A17.1b-1998 and earlier);

(i) working knowledge of the functions and operation of elevator systems, including machines, motors,

governors, and other machine r oom equipment; controllers; position devices; door operator systems; hoistway systems; safety system testing and functions; pit equipment; escalators; moving walks; electrical devices and hydraulics;
(j) knowledge of inspection and testing procedures as described in ASME A17.2;
(k) working knowledge of applicable building, fire, electrical, and accessibility codes;
(l) demonstrated ability to perform the duties specified in pars. 2.2;
(m) working knowledge of the requirements of ASME A17.3;
(n) awareness of B44.1/A17.5 to the extent that it is specified in ASME A17.1 and ASME A18.1;
(o) knowledge of the various types of equipment; functions and operations; their code requirements, uses, and limitations; and any special problem s or applications as included in ASME A18.1 (past and present) and local regulations.
(p) must have in his or her personal possession the latest edition of QEI-1, as well as the current editions of the documents referenced in para. 1.5(a); and
(q) must have workplace access to current editions of documents referenced in para. 1.5(b).

2.2 Duties

The duties of an inspector include the following:
(a) making acceptance inspections and witnessing tests to determine whether all parts of the installation conform to the requirements of the applicable code or regulations and whether the required safety devices function as required therein:
(b) making routine or periodic inspections and witnessing test s of existing installations to determine that the equipment is in apparent safe operating condition, has not been altered except in conformity to the applicable code or regulations, and performs in accordance with test requirements; and
(c) reporting the results of the inspection and testing in accordance with the appropriate administrative procedures and the following:
1) The certified inspector's report shall include a clear d escription of the scope of the inspection performed, including the type of inspection (acceptance, periodic, or routine) and whether or not the inspection was performed in accordance with the applicable requirements of ASME A17.1, Section 8.10 or 8.11, or ASME A18.1, Section 10. If any other type of inspection was performed, the report shall include a complete description of the scope of the inspection. The ASME checklist forms as published by ASME for electric elevators, hydraulic elevators, and escalators and moving walks shall only be used when the inspection complies with the requirements in ASME A17.1, Section 8.10 or 8.11.
2) The report shall be signed by the certified inspector, and shall include his or her certification number and certifying agency.
3) All Code deficiencies noted in the report shall include a refer ence to the applicable code and rule number(s).
4) The report shall include the date and time that the inspection was conducted;
(d) maintain his or her personal copy of QEI -1 to be the latest edition, as well as the current edition of documents referenced in para. 1.5(a).

CERTIFICATION REQUIREMENTS OF INSPECTION SUPERVISORS

3.1 Qualifications

An inspection supervisor shall have the qualifications of pars. 2.1 and the following:
(a) demonstrated aptitude for leader ship, administration, and management (should acquire management training within the first year);
(b) demonstrated in-depth knowledge of the applicable codes; and

(c) demonstrated ability to perform the administrative and technical duties in para.3.2 An inspection supervisor shall also meet one of the following experience requirements:
1) five years' experience as an elevator inspector or in a job in an equivalent field at an equivalent level, 2 years of which must have been spent dealing directly with elevator inspections;
2) four years' experience as an elevator inspector and a diploma or certificate of successful completion from a technical/vocational school (including high school) in an equivalent field;
3) three years' experience as an elevator inspector and a bachelor's degree in an equivalent field; or
4) two years' experience as an elevator inspector and a bachelor's degree in engineering from an accredited school in an equivalent field.
(d) must have in his or her personal possession the latest edition of QEI-1, as well as the current editions of the documents referenced in para. 1.5(a); and
(e) must have workplace access to current editions of documents referenced in para. 1.5(b).

3.2. Duties

3.2.1 Administrative. The administrative duties of an inspection supervisor include, but are not limited to, the following:

(a) scheduling of inspections and assignments;
(b) training of inspectors and, where appropriate, others requiring elevator safety familiarity;
(c) development of budget;
(d) selection of new inspectors and trainees;
(e) maintenance and analysis of records that include records of inspections, accident reports, and inspector performance, including inspector compliance with the requirements of paragraph. 2.2;
(f) personnel matters, such as performance appraisals and disciplinary actions;
(g) handing public relations matters and serving as a liaison to concerned parties;
(h) mediation of disputes; and
(i) assuring that inspectors under his or her supervision perform their duties in compliance with the requirements of paragraph 2.2. and
(j) maintain his or her personal copy of QEI -1 to be the latest edition, as well as the current edition of documents referenced in para. 1.5(a)

3.2.2. Technical. The technical duties of an inspection supervisor include, but are not limited to, the following:

(a) reviewing inspection reports and ensuring enforcement of legally adopted requirements;
(b) reviewing applications for waivers and variances and making recommendations to proper authorities as required;
(c) mediating disputes;
(d) answering questions on Code, and obtaining formal interpretations from code-developing organizations;
(e) actively participating in relevant code-developing committees on national, regional, or local levels;
(f) assuring review of elevator plans and drawings;
(g) investigating complaints and accidents; and
(h) helping to develop local policies and laws, and advocating adoption of the latest national codes.

Source: National Association of Elevator Safety Authorities, *Application For QEI Certification*, Inspector/Inspection Supervisor, http://www.naesai.org/files/qeitest.pdf, accessed March 3, 2005

Appendix D - Elevators In State-Owned Buildings

State Agency/Institution	Passenger Elevator.	Freight Elevator	Escalator	Other	Maintenance Contract
Department of Personnel & Administration/Capitol Complex Facilities	26	9	0		Yes
Department of Agriculture/Colorado State Fair	1	0	0		
Department of Corrections	38	1	0	2 lifts 4 dumbwaiters	Yes
Department of Human Services	26	2	0	3 dumbwaiters	Yes
Department of Labor and Employment	2	1	0		Yes
Department of Military and Veterans Affairs	2	0	0		Yes
Department of Public Health & Environment	1	0	0		Yes
Judicial/Heritage Complex	5	2	0		Yes
Colorado School for the Deaf and Blind	4	0	0		Yes
Colorado Historical Society	2	0	0	2 lifts	No
Cumbres & Toltec Scenic Railroad Commission	1	0	0		No
University of Colorado Health Sciences Center	52	17	0	1 dumbwaiter	Yes
University of Colorado at Boulder	86	28	0		Yes
University of Colorado at Colorado Springs	16	3	0		Yes
Colorado State University	78	15	0	2 stage lifts 5 handicap 1 dumbwaiter 1 sidewalk lift	Yes
Colorado State University - Pueblo	16	4	0		Yes
University of Northern Colorado	42	6	0		Yes
Fort Lewis College	10	0	0	1 handicap	Yes
Adams State College	13	0	0		Yes
Mesa State College	12	0	0		Yes
Western State College	11	0	0		Yes
Colorado School of Mines	23	3	0	1 stage lift	Yes
Auraria Higher Education Center	33	0	0		Yes
Arapahoe Community College	7	0	0		Yes
Colorado Northwestern Community College	2	0	0		Yes
Front Range Community College	7	0	0		Yes
Lamar Community College	3	0	0		No
Morgan Community College	0	0	0		N/A
Northeastern Junior College	6	1	0		Yes
Otero Junior College	3	1	0		Yes
Pikes Peak Community College	9	0	0		Yes
Pueblo Community College	6	1	0		Yes
Red Rocks Community College	4	0	0	1 handicap	Yes
Trinidad State Junior College	3`	0	0		Yes
Colorado Community Colleges at Lowry	6	0	0		Yes
Totals	556	94	0	24	

Appendix E - Northwest Colorado Council of Governments Inspection Program

Other Inspections and Fees:
1. Inspections outside of normal business hours, $65.00 per hour *(minimum charge – two hours)*

2. Reinspection fees assessed under provisions of Section 305.8 per inspection, $65.00

3. Inspections for which no fee is specifically indicated, $65.00 per hour

4. Additional plan review required by changes, additions or revisions to plans for which an initial review has been completed, $65.00*(minimum charge – one half hour)*
Or the total hourly cost to the jurisdiction, whichever is greatest. This cost shall include supervision, overhead, equipment, hourly wages and fringe benefits of the employees involved.

Elevator Checklist
One complete set of plans for each elevator, dumbwaiter, escalator, platform lift, or moving walk shall be submitted with each elevator permit application. Compliance with the following items prior to requesting an elevator inspection will minimize delay of final approval.

Machine Room:
1. Permanent access provided
2. Machine room door (self closing and self locking and labeled)
3. Permanent lights, light switches, and convenience outlets (GFI) installed.
4. Lockable Main line disconnect (fused or circuit breaker).
5. Separate lockable 110-volt circuit breaker per car GFI protected.
6. Machine room ventilation is to be thermostatically controlled.
7. Liquid piping and gas piping is prohibited in the machine room.
8. Foreign electrical wiring and equipment is prohibited in the machine room.
9. Machine room enclosure completed (minimum headroom 7 feet).
10. All wall penetrations to be fire caulked.
11. Install permanent fire extinguisher, type ABC
12. Secondary and Overhead Sheave:
1. Proper access installed.
2. Permanent lights, light switches, convenience outlets (GFI), and stop switches installed.
3. Guards installed (if required).
4. Decking/floor installed.

Hoistway and Pit:
1. Hoistway completely enclosed.
2. Hoistway glass (laminated meets requirements of ANSI Z97.1).
3. Hoistway ventilation completed.
4. Projections, recesses, setbacks that are more than 2” shall be beveled at 75 degrees from the horizontal.

5. Top of hoistway clearance as per approved elevator design requirements.
6. Access pit (ladder, light, light switch, receptacle (GFI), stop switch), as per code.
7. Sump covers installed flush with pit floor. The sump shall not be connected to the sewer system.
8. Guards installed (if required).
9. Fire safety apparatus installed.
10. Hoistway wiring completed.
11. Liquid lines or gas lines are prohibited in the hoistway.
12. All wall penetrations to be fire caulked.
13. Elevator Entrances finished for fire rating

Miscellaneous:
1. Fireman's service and smoke detectors installed, Fire Panel PRETESTED and ready for testing.
2. Elevator stand-by power checked and tested.
3. Requirements for the use of shunt-tip circuit breaker controlled by heat detectors in the machine room shall be PRETESTED and ready for testing.
4. Telephone wiring permanently connected to the emergency telephone in the elevators, and OPERATING per code.

Elevator Annual Certificates of Inspection Fees for NWCCOG Members
For each elevator …….…….….. $170.00
For each escalator or moving walk……..… $170.00
For each commercial dumbwaiter ……..…… $ 95.00
For each platform lift ……..……..… $ 95.00

Each escalator or moving walk unit powered by one motor shall be considered as separate escalator or moving walk.

Residential elevators do not require certificates of inspection, but it is recommended annually.