

# Maintenance Control Program

by John Koshak

This article has been adapted from *Maintenance on New Equipment Designs – Application of the Maintenance Control Plan to Machine-Room-Less Elevators*, a new book from John Koshak available in May 2010 from ELEVATOR WORLD.

## Learning Objectives

After reading this article, you should have learned about:

- ◆ Maintenance control programs (MCPs) and what they entail
- ◆ The importance of scheduled interval maintenance
- ◆ How interval maintenance should be scheduled
- ◆ What check charts are and what they do
- ◆ Applicable components and where a list of them can be found
- ◆ What maintenance records include and where they should be located
- ◆ Code data plates
- ◆ Jumper control programs
- ◆ Critical operating circuits
- ◆ The importance of cleaning and housekeeping in the field

A section in the code for maintenance has existed since the first code was published<sup>1</sup> in 1921. With years of experience, expanding this section had to consider customary maintenance methods, new maintenance methods and the changing technology of equipment. One difficulty was determining how many requirements were enough and how to provide requirements for documentation that maximized the safety of elevator personnel and users. The code is an evolving document and still contains some inconsistencies, which over time will be interpreted and changed. However, it will ensure a minimum level of safety when the conveyance conforms to it.

As maintenance items became more numerous in the code, they converged into a maintenance program. The present language specifies an MCP, and is performance and prescriptive based. Since it is in the code and required for existing conveyances<sup>2</sup>, when a jurisdiction adopts the ASME A17.1b-2003 addenda and later codes, the MCP is required and must be in place for each conveyance. This is the framework all elevator personnel

should use when performing maintenance, inspections, tests, repairs, replacements and adjustments. Below are the specific requirements with some explanation.

### A17.1a-2008

**8.6.1.2.1** A written Maintenance Control Program shall be in place to maintain the equipment in compliance with the requirements of 8.6.

“In place” does not require that the entire MCP be on the job. Currently there are differing interpretations within the industry of what this requirement mandates; this book [*Maintenance on New Equipment Designs*, ©2010] will serve as a starting point upon which to build.

The entire program consists of subcomponents 8.6.1.2.1(a)(1) through 8.6.1.2.1(a)(4), as elaborated below:

**8.6.1.2.1(a)** The Maintenance Control Program shall consist of but not be limited to:

(1) examinations, maintenance, and tests of equipment at scheduled intervals in order to ensure that the installation conforms to the requirements of 8.6. The maintenance procedures and intervals shall be based on:

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**Value: 2 contact hours  
(0.2 CEU)**

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- (a) equipment age, condition, and accumulated wear
- (b) design and inherent quality of the equipment
- (c) usage
- (d) environmental conditions
- (e) improved technology
- (f) the manufacturer's recommendations for any SIL rated devices or circuits

8.6.1.2.1(a)(1) requires that the MCP include examinations, maintenance and tests of equipment at scheduled intervals, and that the intervals must have some rationale justifying the frequency (or lack thereof). This is required "in order to ensure the installation conforms to the requirements of 8.6."

From this requirement, there must be a time-based chart or schedule of tasks that define the interval that maintenance tasks, for the items detailed in 8.6, are performed. It is reminiscent of the check charts most elevator personnel are familiar with. It doesn't say "check chart," it is written in performance language, and could be provided to fulfill this requirement. An example (Figure 1) of a compliant check chart is found in a logbook available from Elevator World, Inc.

A schedule of tasks in the form of an electronic communication device can send reminders to the owner and/or technician, where it can be electronically updated. In some jurisdictions, a written record must be left in the machinery space or building office.

One check chart or schedule of tasks does not fit all conveyances. Each conveyance unit must have its own MCP that addresses its particular requirements. Conditions may be the same for units that are side by side, but at the same building, a freight elevator may have different conditions that result in different intervals and maintenance requirements than a passenger elevator. Therefore, each unit must have an individual check chart. These should be made for specific applicable components per unit and any other tasks the equipment may require. For example, the check chart item "Motor Bearings" would alert a technician to perform a task relative to that technology. For older jobs, the technician might verify the oil level of a sleeve (Babbitt) bearing and add fluid if it were low; for later jobs one might verify and fill a grease cup or grease fitting. On newer jobs, one might simply listen to the sealed bearing.

The check chart only provides the location to record when the procedure was completed; however, there must be a list of generic procedures for measurable maintenance tasks. For example, a brake procedure might ask to verify a spring length, nut tightness, brake-pad thickness, pin lubrication and specific clearances. This becomes an inspectable condition of maintenance by an [Authority Having Jurisdiction (AHJ)] and verifiable by the building owner. This list of generic procedures is a component of the MCP but not necessarily required to be on a check chart.

A complete training procedure for a technician might include complete illustrations of the brake, the steps of assembly and reassembly, followed by specific replacement components and lubrication requirements, ordering information, testing procedures and material properties of the brake pad. The training the technician should have is provided by his experience and company education to perform the task. The generic procedures associated with the tasks on the check chart would not be as detailed and only list the abbreviated procedures to be done. The generic maintenance procedures should also contain a document specifying the oils and greases and the replacement intervals for the various devices so that the technician has the correct information and that the incorrect lubricant isn't used in a device.

**ELECTRIC ELEVATOR and ESCALATOR MAINTENANCE LOG**  
THE TEXT IN THIS LOG BOOK IS ONLY A SUMMARY OF SECTION 8.5.1.2 OF ASME A17.1 SAFETY CODE FOR ELEVATORS & ESCALATORS

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Building Name: _____ Address: _____ Contractor: _____ Owner: _____	Installation #/s: _____ / _____ / _____ Elevator #/s: _____ / _____ / _____ Escalator #/s: _____ / _____ Moving Walk #/s: _____ / _____
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Figure 1: Check chart (courtesy of Log Books Unlimited)

In some jurisdictions, these generic procedures must be provided in the conveyance machinery space, machine room, or in the building office where the conveyance is located. It is also possible that an owner or a maintenance company can provide these in the form of a compact disc (CD) or other electronic media that can be used by the technician and inspected by the AHJ.

The owner and maintenance company are required to establish the interval of maintenance based on 8.6.1.2.1(a)(1)(a) through (f). These establish the frequency that the motor bearings are to be “maintained” for example. To continue with the sleeve-bearing example from above, these generally require more frequent maintenance attention and should be checked more often due to impurities entering the oil from outside the bearing. This would not occur with a modern sealed ball bearing designed to prevent impurities from getting into the bearing race. The differences are clear; an older sleeve bearing requires more frequent attention (a shorter interval) than newer sealed bearings.

How often should that task be done? The analysis should consider, for instance, the type of bearing, how often the conveyance runs and the location of the conveyance. Those should be considerations or factors when establishing the length of an interval. The same logic also applies if the conveyance is in an oil refinery or concrete plant where the dirt, grime and other airborne contaminants are everywhere, versus one that is in a cleaner office building.

Consideration of the environment is critical when determining the interval of maintenance. It must also be considered that a conveyance design for an office building may not be appropriate for a refinery; the equipment enclosures may be vastly different, and designed to prevent the environment from getting into the system, perhaps justifying longer intervals. Therefore, analysis must be done on the exact equipment in its environment. This is necessary because there might be an office complex inside a refinery with four passenger elevators and a freight elevator with other units in the refinery environment itself. The analysis must bore down into the environment of an individual conveyance; instead of simply applying the “refinery” location to all conveyances.

Age, condition, accumulated wear, usage, environmental conditions, technology, and inherent quality of the listed maintenance applicable components must be considered when determining the interval. This analysis is typically done by the maintenance company by virtue of the contractual relationship with the owner. The owners may have no idea what type of bearing is used, or any of the items on the 8.6 list. They usually rely on their maintenance company to provide the analysis.

The procedures for these tasks must consider all these conditions. To further the sleeve-bearing example, if an

elevator machine is in an office building, there is less likelihood that the bearing oil will get contaminated than if the same machine were in an industrial facility. One analysis may show to change the bearing oil every five years; another may show that the oil needs to be changed every six months. Additionally, there may be special oils due to the loading of one particular machine that requires different oil than all other machines of the same type. Lastly, the procedures may say it’s acceptable to remove the oil from the top of the cavity or drain from the bottom of the oil reservoir to remove particulates. The specific procedures must be provided in the training to be a technician, and these generic procedures are required to be in the MCP and available to elevator personnel.

**8.6.1.2.1(a)** The Maintenance Control Program shall consist of but not be limited to:

(2) cleaning, lubricating, and adjusting applicable components at regular intervals and repairing or replacing all worn or defective components where necessary to maintain the installation in compliance with the requirements of 8.6.

8.6.1.2.1(a)(2) requires cleaning, lubricating and adjusting applicable components at regular intervals to stay in compliance with 8.6. It also requires that repairs and replacements of worn or defective components. Bearings, sliding members, rollers and high-current electrical components wear, require lubrication, adjustment and cleaning. If these are applicable components, the analysis is necessary to establish intervals to maintain compliance with 8.6. They must be identified on the chart or schedule for periodic tasks to be completed and documented.

As components operate in normal use, they wear. Even well designed components will need to be repaired or replaced. If wear of any component can cause the conveyance to not be in compliance with 8.6, then the repair must be done and documented. It’s that simple. For example, if the steel wire hoist ropes exceed the number of allowable wire breaks, then they are not in compliance and must be replaced. It should not take a repeated write-up from an inspector to cause a repair or replacement. The owner, and contractually the maintenance company, are charged to keep the conveyance in compliance with 8.6, not allow it to lapse out of conformance and be “discovered” by the inspector and written up as a deficiency.

Cleaning/housekeeping is necessary in all machinery spaces to ensure that any component in the system operates as intended. All conveyances rely on clean system components, functions and sub-systems. If accumulated dirt and debris cause unintended consequences, there should have been more frequent cleaning. Each job will need cleaning that depends on the environment. If a machinery space has visible debris on the floor and in the controller cabinet, it may not directly cause devices to be

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inoperative, but it is an indication that there is less attention being paid to overall cleaning. Over time, debris will cause some operational failure and, therefore, the MCP requires cleaning.

**8.6.1.2.1(a)** The Maintenance Control Program shall consist of but not be limited to:

(3) tests of equipment at scheduled intervals (8.6.1.7) in order to ensure that the installation conforms to the requirements of 8.6.

8.6.1.2.1(a)(3) is for testing<sup>3</sup>. Testing is a verification to ensure that a safety device or function is operating correctly. Requirement 8.6, since 2008, lists the functions, devices, components, systems or sub-systems that must be tested periodically to demonstrate compliance. In previous editions of the Code, these were located in Section 8.11, in the 2008 addenda these were moved to Section 8.6. Category 1, 3 or 5 Tests are performed by technicians<sup>4</sup> and are witnessed by inspectors<sup>5</sup> that are certified by an ASME accredited organization. An editorial error was made in the 2008 addenda excluding technician testing. It was corrected in the 2010 edition. In some jurisdictions, some tests are allowed to be done without being witnessed by a certified inspector, but this is not common practice and is a regulatory or statutory departure of the Code requirements by the local AHJ.

Section 8.6 requires that test records be maintained and available to elevator personnel. The test itself should not be performed by the person who witnesses it. However, due to budget constraints and jurisdictional staff shortages, it is not uncommon for some routine tests to be witnessed by the same person with some qualifications. The person must be certified by an accredited organization and authorized by the AHJ, in addition to signing a test report legibly for later review, if necessary.

Requirements 8.10<sup>6</sup> of A17.1a-2008, and items in the ASME A17.2-2007 (Guide for Inspection of Elevators, Escalators and Moving Walks) require that inspectors be certified by an ASME accredited organization elevator inspectors.<sup>7</sup> Additionally, they are required to report the test results, so that there is a record of the tests performed. These requirements verify what tests must be performed, who performed and witnessed them, and which results must be made available to elevator personnel.

**8.6.1.2.1(a)** The Maintenance Control Program shall consist of but not be limited to:

(4) all Code required written procedures (e.g., check out, inspection, testing, and maintenance).

8.6.1.2.1(a)(4) addresses procedures that are part of the MCP. Several implications with this requirement are being debated within the industry. One purpose of this requirement was to assure that when new technology is

introduced, specifically through A17.7/B44.7, procedures for maintenance, inspection, testing, adjustment, repair or replacement are available to elevator personnel who will work on the equipment. For example, all E/E/PES [Electrical/Electronic Programable Electronic System] devices, if used, must have specific procedures provided in the MCP by the provider of the devices. In fact, all A17.7/B44.7 certified devices must have these documents provided in the MCP.

**8.6.1.2.1(b)** The instructions for locating the Maintenance Control Program shall be provided in or on the controller along with instructions on how to report any corrective action that might be necessary to the responsible party.

The Code requires that the instructions for locating the MCP must be provided in or on the controller and instructions for contacting someone to report if any corrective actions might be necessary.

Who is reporting what? Only authorized personnel and elevator personnel<sup>8</sup> are allowed in the locations where this is kept. Both of these groups include the technician, the inspector, the building engineer, security persons, fire inspectors (conditionally based on training) or of course the owner, who can go anywhere in the building because he is the owner.

For example, if smoke is coming from equipment while in a machinery space, someone not familiar with the contract information or maintenance company may not know to whom this should be reported. The requirement provides a way to contact a responsible party. The same is true if an inspector finds a violation and plans to shut the conveyance off. The necessary information on who to notify is available in the instructions for locating the MCP.

A placard, sign, sticker or tag is required in or on the controller with specific information on how to find the MCP and how to contact the responsible party. The MCP itself can be anywhere by Code; at the maintenance companies' local office, corporate headquarters, on the internet, in the building manager's office, or in the machine room. There are no provisions for it to be anywhere specific, only that it be available and how to locate it if you are an authorized person.

**8.6.1.2.1(c)** The maintenance records required by 8.6.1.4 shall be kept at a central location.

**8.6.1.2.1(d)** The Maintenance Control Program shall be accessible to the elevator personnel and shall document compliance with 8.6.

**8.6.1.4.2 Record Availability.** The maintenance records shall be available to the elevator personnel.

"Maintenance records" are lists of events or actions, in the context of conveyances and Requirement 8.6.1.4, which includes a list of descriptions and dates of all

maintenance tasks, examinations, tests and adjustments, repairs, replacements, callbacks or reports, corrective actions taken.

It also includes the monthly Firefighter’s Emergency Operation tests.<sup>9</sup>

The code specifies items that must be available when elevator personnel are on the job. For example, it is helpful to know that the hydraulic control valve was replaced last week if the callback today is misleveling. It is also useful for the inspector to know if and when all the required tests have been performed, and what the results were (Figure 2).

These records are required to be available to elevator personnel and based on the present code language, if an inspector is on the jobsite, he or she should have them available. However, the inspector’s roles with regard to testing are to witness the testing done by maintenance company technicians. If the records are kept electronically and the inspector and technician are together, then the record is available for review.

An inspector may be on the job for certain types of inspections or at the request of the owner. Some inspections verify compliance but do not include testing. It is also common practice for some jurisdictions to perform some inspections and test certain items separately. Since some jurisdictions practice this type of testing, having the maintenance records physically available is required.

When would an inspector be there without the maintenance company personnel? There are times that an inspector may be on the job for certain types of inspections or at the request of the owner. There are simple inspections that verify compliance which do not include testing. It is also common practice for some jurisdictions to perform some inspections and test certain items alone, though this is not strictly allowed in Code at the time of this writing. Since some jurisdictions practice this type of testing, it is required to have the maintenance records physically available.

This illustrates a divide between what the inspectors have available, based on the present Code language, without a technician who has the records and not having the technician there, which is relevant because of the age of electronic recordkeeping. In these situations, the owner must either require the company to keep these records on the job or provide inspectors access to the electronic records. With that said, there will be a time when both the technician and inspector will be on the job as there are other tests that must be witnessed. Needing to see the records may not be as urgent if the inspection does not have any need to record the results of a test such as during a routine inspection. In an ideal world, the AHJ knows when the next annual test is and the technician will be there and provide the records on demand. However the requirements are clear, they must be available to elevator personnel at all times.

Because the language is unconditional and at this time every maintenance company can provide written records, some AHJs require this to be provided. Unless and until there is another way to provide access to this information, the Code is clear that it must be available and this will be a sticking point for all AHJs. In typical business practice, the contracted maintenance company takes the callback. However, it is possible that another company may be called to respond in certain situations. Ultimately, the owner is required to have the records available.

Some buildings do not have onsite management who can provide these records. Since the inspector can be there for many inspectable items that do not require the presence of the technician in the normal course of business, these records should be available onsite by the owner, even if the maintenance company only has them electronically.

Two interpretations have been published on this matter by the [American Society of Mechanical Engineers

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**PERIODIC (5 YEARS) TEST REQUIREMENTS - ELECTRIC ELEVATORS - 8.11.2.3**

CAR & COUNTERWEIGHT SAFETIES 8.11.2.3.1	OVERSPEEDS, HOVING SPEED & PULL THROUGH TEST 8.11.2.3.2	OIL BUFFERS 8.11.2.3.3	BRAKING SYSTEM 8.11.2.3.4	EMERGENCY & STANDBY POWER OPERATION 8.11.2.3.5	EMERGENCY TERMINAL STOPPING & SPEED LIMITING DEVICES 8.11.2.3.6	POWER OPENING OF DOORS 8.11.2.3.7	LEVELING ZONE & LEVELING SPEED 8.11.2.3.8	INNER LANDING ZONE 8.11.2.3.9	EMERGENCY STOPPING DISTANCE 8.11.2.3.10	UNIT NO.	SIGNATURE	DATE

**MARK 'X' FOR SATISFACTORY — "O" FOR UNSATISFACTORY (SEE COMMENTS ON REVERSE)**

Figure 2: Periodic Test Log (Courtesy of Log Books Unlimited)

(ASME)]<sup>10</sup> to help clarify the requirements. There are many reasons to have the maintenance records on the jobsite; however, in the age of electronic dispatching and recordkeeping, many business systems are designed from customer call-in, to corrective action, to employee paycheck – all done with electronic systems and input devices. These systems might also provide the tasks, intervals and access to records and history. Since those who really need the information have it when needed, the requirement is satisfied. In other specific cases, the inspector can only write the deficiency of the record availability and require the owner to provide them. If an elevator technician or inspector is on the job and does not have access to the information, the job is not in compliance with the code.

The requirement does not presently have conditions on referenced “elevator personnel”; the presumption is the personnel performing the maintenance and testing. Also remember that the owner of the conveyance may be contracting out the work but it is still their responsibility to have the MCP (or have it made for them) and to make it available for any elevator personnel engaged to work on the conveyances.

If a different maintenance company wishes to bid on the job, it may bring in elevator personnel for an evaluation. The complete MCP is not available to this company unless the owner provides it. The onsite maintenance records should be available; however, every maintenance company should have the skill set to perform the analysis.

For small startup companies to go into the maintenance business, they must establish their qualification and perform their own interval analysis. An owner can give its analysis to them unless the analysis is held by the maintenance company and only provided on request.

**8.6.1.2.1(e)** Procedures for tests, periodic inspections, maintenance, replacements, adjustments, and repairs for all SIL rated E/E/PES electrical protective devices and circuits shall be incorporated into and made part of the Maintenance Control Program. See 2.26.4.3.2, 2.26.9.4(b), 2.26.9.5.1(b), and 2.26.9.6.1(b).

**8.6.1.2.1(f)** Where unique or product-specific procedures or methods are required to inspect or test equipment, such procedures or methods shall be included in the Maintenance Control Program.

The MCP can be thought of as a basket that the code has created in which to place important information. It isn't only for new equipment; it is for all applicable components listed in 8.6. For example, 8.6.1.2.1(f) requires that the procedures for tests, inspection, maintenance, replacement, adjustment and repair must be provided in the MCP when “unique or product-specific procedures or methods are required to inspect or test equipment.”

This is where the line is drawn between “traditional” or legacy equipment and new equipment (unique or product-specific); such as MRL [(machine-room-less)] elevators. Technician training is vital. The training on company procedures for performing a brake test, inspecting it, maintaining, adjusting and repairing it (in addition to the professional training a technician receives from accredited education programs for general procedures) is critical.

Inspectors and maintenance technicians are not expected to know how to test everything they see. The equipment designers are expected to know this. Since maintaining companies test and inspectors witness for every brand of equipment, they need to know how to test it in order to understand a successful test when they witness and most importantly how to perform the test safely.

The MCP requirement for SIL-rated [Safety Integrity Level-Rated] E/E/PES devices and circuits is the beginning of many special requirements that relate directly to the departure from legacy equipment. Without the information, the potential for the elevator being unsafe is elevated if maintained or altered incorrectly. You may think “I'm just a technician; the boss said I have this new job on my route and it doesn't even look like an elevator once I get in the hoistway. Holy Cow, I don't want to touch ANYTHING!”

This can be intimidating; however, during the transition of equipment designs from relay to computer controls, elevator personnel had to learn solid-state electronics and general computer controls; suddenly technicians were kings of knowledge.

Many years ago, code writers recognized that there are a minimum number of things that must always be provided to elevator personnel. This is another key to the expansion of the maintenance section. This requirement mandates that procedures for tests, inspections, maintenance, replacements, adjustments and repairs for all SIL-rated E/E/PES electrical protective devices and circuits shall be incorporated into and made part of the MCP.

If a technician is employed by an OEM, they will have access and training for the equipment. If not, access to training and procedures may be limited and therefore not in compliance with the code. This is the heart of proprietary

versus non-proprietary designs and it is necessary to understand when an owner chooses a maintenance company. By requiring E/E/PES-related maintenance, replacement, adjustment, repair, inspection and test procedures in the MCP, they will be available to the owner.

For SIL-rated devices, there are requirements to provide more information than is required for other types of components. This is an important distinction, as from a practical standpoint not all applicable components in the maintenance section require the availability of written procedures for maintenance, repair, replacement and adjustment. Many of these items are common, like a GAL<sup>11</sup> interlock. It is not necessary to provide all the information for all things, but for other novel items (things that are unique or product-specific), it is required and is how the code will address these items in the future.

**8.6.1.2.2** Where a defective part directly affecting the safety of the operation is identified, the equipment shall be taken out of service until the defective part has been adjusted, repaired, or replaced.

In the best of worlds, this is a requirement that shouldn't have to be written. It should be obvious to an elevator person when something important is badly broken. Notice this requirement is for any component, not just for those listed in 8.6. There are components that could have failed such as the car top sitting on the floor of the cab after a safety test or a door crashed in by a forklift that also affect the safe operation of the conveyance. This requirement applies to the entire system.

**8.6.1.3** Maintenance Personnel. Maintenance, repairs, replacements and tests shall be performed only by elevator personnel (see 1.3).

"The purpose of this requirement is to prevent unqualified persons from performing maintenance that may render the equipment unsafe." (Donoghue, 2007)<sup>12</sup>

**8.6.1.4 Maintenance Records**

**8.6.1.4.1** Maintenance records shall document compliance with 8.6 of the Code and shall include records on the following activities:

- (a) description of maintenance task performed and dates
- (b) description and dates of examinations, tests, adjustments, repairs, and replacements
- (c) description and dates of call backs (trouble calls) or reports that are reported to elevator personnel by any means, including corrective action taken
- (d) written record of the findings on the firefighter's service operation required by 8.6.11.1

**8.6.1.5 Code Data Plate**

**8.6.1.5.1** A data plate that indicates the Code and edition in effect at the time of installation and any alteration (see 8.7.1.8) shall be provided. The data plate shall also specify the Code and edition in effect at the time of any alteration and the applicable requirements of 8.7.

The code data plate (Figure 3) has been required for both new and existing equipment since first published in the A17.1-1996 edition. This is a useful requirement, as it informs elevator personnel of very important information about the conveyance. Maintaining compliance requires knowing which code year is to be used for enforcement.

A code data plate is also critical for the inspection to be performed, because for the life of the conveyance, the noted code(s) will be used for its inspection. Without this information, the inspector may accidentally require functions that were not designed into the system, because they may not have been required at the time of installation. In North America, if there is a controller without a code data plate, it is a violation and should be remedied immediately. This is a critical component for ensuring proper safety requirements are enforced during inspection and testing.

The code data plate is also where alterations are recorded. These are critical elements in knowing how a replacement of a device or component may affect the safety of the elevator. If an alteration has been done, upgrading a system or electronic device, there may be different replacement parts that are not backwards compatible which could make important safety features inoperable or new maintenance tasks and test procedures required for the new technology. The list of alterations in A17.1, Section 8.7, provides the information as to what types of alterations require noting on the code data plate. This is vital for compliance and continued safe operation of the conveyance.

Because of the array of equipment and the requirement to test and inspect to the code at the time of installation or alteration, providing this data streamlines the inspection process. It is not up to the inspector to provide this data, though a call to the inspector can provide a clue to the year of installation in order to get the code data plate made.

**8.6.1.6 General Maintenance Methods and Procedures**

**8.6.1.6.1** Making Safety Devices Inoperative or Ineffective. no person shall at any time make inoperative or ineffective any device on which safety of users is dependent, including any electrical protective device, except where necessary during tests,

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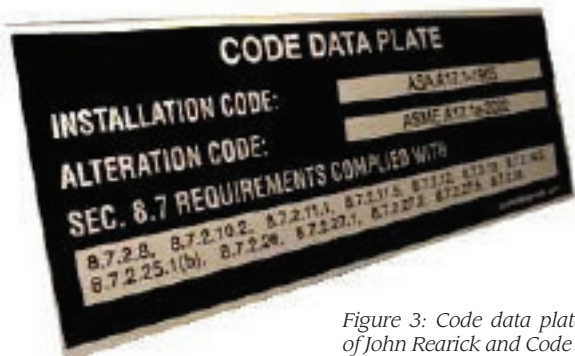


Figure 3: Code data plate (courtesy of John Rearick and Code Data Plate)

inspections (see 8.10 and 8.11), maintenance, repair, and replacement, provided that the installation is first removed from normal operation.

Such devices shall be restored to their normal operating condition in conformity with the applicable requirements prior to returning the equipment to service (see 2.26.7 and 8.6.1.6).

Among things that should not have to be codified is a requirement to use good judgment when using jumpers. However time has shown that unless jumper use is under a control system, mistakes can be made with drastic results. It is good policy and code required to have a jumper control program at the maintenance company and practice it.

*"It is recognized that temporary circuit jumpers or clips (jumpers) may be required for conducting some service work on elevators, escalators or moving walks. All field personnel shall be trained in the proper use of jumpers for defeating safety circuits."<sup>13</sup>*

This is also a design requirement for conveyance companies. A test of some safety functions is often impossible unless they are temporarily disabled. This potentially opens the opportunity to accidentally leave the safety function disabled. For example, in order to do a safety test, an AHJ might require the safety plank switch to be jumped to demonstrate that the elevator is stopped mechanically and not electrically. After the test is completed, the jumper must be removed. If this test is done in software, in order to prevent the necessity of using jumpers, then the risk is that the software could allow the plank switch to remain jumped out. The OEM must have embedded safeguards to prevent the permanent bypassing of any circuit when the equipment goes back into service.

**8.6.1.6.2 Lubrication.** All parts of the machinery and equipment requiring lubrication shall be lubricated with lubricants equivalent to the type and grade recommended by the manufacturer. Alternative lubricants shall be permitted when intended lubrication effects are achieved. All excess lubricant shall be cleaned from the equipment. Containers used to catch leakage shall not be allowed to overflow.

The most basic maintenance tasks include oiling and greasing devices that need it. Catch pans or buckets must not be allowed to overflow. This can have many ramifications. One example of the need for this requirement occurred when a very full gear shaft overflow container was poured back into the geared basement winding-drum machine. Unknown to the technician, a large nut used to weigh the container down was completely immersed in the gear oil. When pouring the oil back into the gear case, the nut went into the gear and exploded the very old basement winding-drum machine case. Had that container not been full, the technician's safety and that of the users would not have been at risk. If there is exces-

sive oil in the catch pan, change the seal. Never pour by-passed oil back into the system.

### **8.6.1.6.3 Controllers, Wiring, and Wiring Diagrams**

- (a) Up-to-date wiring diagrams detailing circuits of all electrical protective devices (see 2.26.2) and critical operating circuits (see 2.26.3) shall be available in the machine room.
- (b) The interiors of controllers and their components shall be cleaned when necessary to minimize the accumulation of foreign matter that can interfere with the operation of the equipment.
- (c) Temporary wiring and insulators or blocks in the armatures or poles of magnetically operated switches, contactors, or relays on equipment in service are prohibited.
- (d) When jumpers are used during maintenance, repairs, or testing, all jumpers shall be removed and the equipment tested prior to returning it to service. Jumpers shall not be stored in machine rooms, control rooms, hoistways, machinery spaces, control spaces, escalator/moving walk wellways, or pits (see also 8.6.1.6.1).

NOTE [8.6.1.6.3(d)]: See *Elevator Industry Field Employees' Safety Handbook* for jumper control procedures.

- (e) Control and operating circuits and devices shall be maintained in compliance with applicable Code requirements (see 8.6.1.1.2).

A significant change in the Code is the requirement that wiring diagrams (prints) of the critical operating circuits must be on the job. Incidents can be traced back to elevator personnel not having the correct prints available and making costly mistakes. The prints must also include all changes made to the controller of critical circuits. Critical ones include all electrical protective devices; think safety string. This is an important distinction, because the whole set of prints is not required to be on the job. Many proprietary designs are in the marketplace, and to protect the intellectual property, only safety circuits are required to be provided on the wiring diagrams left behind after a company loses a contract.

Cleanliness of the controller is also required. Dirt and dust can interfere with the safe function of the elevator and create a hazard.

Neither temporary wiring nor relay blocks are allowed. If a manufacturer recommends that a circuit requires rewiring, the changes must be made permanent. If a relay is faulty, replace it. If a function is no longer needed or wanted, remove the circuit permanently and make all changes to the wiring diagrams.

**8.6.1.6.4 Painting:** care shall be used in the painting of the equipment to make certain that it does not interfere with the proper functioning of any component. Painted components shall be tested for proper operation upon completion of painting.

**8.6.1.6.5 Fire Extinguishers:** in jurisdictions not enforcing NBCC, Class "ABC" fire extinguishers shall be provided in elevator electrical machine rooms, control rooms, and control spaces outside the hoistway intended for full bodily entry, and walk-in machinery and control rooms for escalators and moving walks;



and they shall be located convenient to the access door.

**8.6.1.6.6 Workmanship.** Care should be taken during operations such as torquing, drilling, cutting, and welding to ensure that no component of the assembly is damaged or weakened. Rotating parts shall be properly aligned.

Elevator personnel are trained and routinely practice their skills. They should act and work in a workmanlike fashion. For example, they should not use a torch to make a structural hole because they should know that the heat will change the characteristics of the metal, weakening it. While they should know this, it does happen. As a result of poor workmanship structural failures have occurred. Other examples abound, one is remembering to use a double nut on the brake. If the nuts vibrate loose, the brake may not hold the load, and the elevator may move when it should be stationary.

The technician has one chance to get it right the first time. He or she should not cut corners, but should use the correct tools for the job and take the appropriate time to complete the work correctly. If unfamiliar with the equipment, call for assistance and training; it is available. The safety and lives of people rely on every job the technician does.

**8.6.1.6.7 Signs and Data Plates.** Required signs and data plates that are damaged or missing shall be repaired or replaced.

Data plates are essential for inspecting purposes. Keeping them readable is required.

That's the whole of the general requirements, while elaborating on them here was a long exercise; the real tasks are further defined in 8.6. Our goal in this article is to provide some guidance on the actual maintenance procedures on new equipment which are based on the general requirements.

**Endnotes:**

- 1] *A Code of Safety Standards for the Construction, Operation and Maintenance of Elevators, Dumbwaiters, and Escalators* – 1921. This Code of safety standards is intended as a guide for the construction, maintenance and operation of elevators, dumbwaiters, escalators and their hoistways, except as stated in the following paragraph. Rule 702 Maintenance. ASME, 1921.
- 2] ASME A17.1a-2008/CSA B44a-08 – General: this Code applies to new installations only, except Part 1, and 5.10, 8.1, 8.6, 8.7, 8.8, 8.9, 8.10 and 8.11, which apply to both new and existing installations.
- 3] ASME A17.1a-2008/CSA B44a-08 – Section 1.3: periodic tests, category: a grouping of tests performed at common intervals required by the AHJ.
- 4] ASME A17.1a-2008/CSA B44a-08 – 8.10.1.1.2: the person installing or altering the equipment shall perform all of the tests required by 8.10.2 through 8.10.5 in the presence of the inspector specified in 8.10.1.1.1.
- 5] ASME A17.1a-2008/CSA B44a-08 – 8.10.1.1.3: the inspector shall meet the qualification requirements of ASME QEI-1. Inspectors and inspection supervisors shall be certified by an organization accredited by ASME in accordance with the requirements of ASME QEI-1.
- 6] ASME A17.1a-2008/CSA B44a-08 – Section 8.10 - ACCEPTANCE INSPECTIONS AND TESTS Requirement 8.10 covers acceptance inspections and tests of new or altered installations.

NOTE: Compliance with certain requirements is verifiable through review of design documents, engineering, or type tests.

*Continued*

**8.10.1 General Requirements for Acceptance Inspections and Tests**

**8.10.1.1 Persons Authorized to Make Acceptance Inspections and Tests**

**8.10.1.1.1** The acceptance inspection shall be made by an inspector employed by the authority having jurisdiction, or by a person authorized by the authority having jurisdiction.

**ASME A17.1a-2008/CSA B44a-08 - Section 8.11 PERIODIC INSPECTIONS AND TESTS** Requirement 8.11 covers periodic inspections and tests of existing installations.

NOTE: Compliance with certain requirements is verifiable through review of design documents, engineering, or type tests.

**8.11.1 General Requirements for Periodic Inspections and Tests**

**8.11.1.1 Persons Authorized to Make Periodic Inspections and Tests.** The inspector shall meet the qualification requirements of the ASME QEI-1. Inspectors and inspection supervisors shall be certified by an organization accredited by ASME in accordance with the requirements of ASME QEI-1. This requirement does not apply to Canadian jurisdictions.

**8.11.1.1.1 Periodic Inspections.** Periodic inspections shall be made by an inspector employed by the authority having jurisdiction or by a person authorized by the authority having jurisdiction.

**A17.1-2007/CSA B44 - 8.11.1.1.2 Periodic Tests**

(a) Periodic tests shall be witnessed by an inspector employed by the authority having jurisdiction, or by persons authorized by the authority having jurisdiction.

(b) The owner or the owner's authorized agent shall have all of the tests required by 8.11.2, 8.11.3, 8.11.4, and 8.11.5 made by persons qualified to perform such service in the presence of the inspector specified in 8.11.1.1.2(a).

**ASME A17.1a-2008/CSA B44a-08 - (a)** Periodic tests as required in 8.6 shall be witnessed by an inspector employed by the authority having jurisdiction, or by persons authorized by the authority having jurisdiction.

(b) The inspector shall submit a signed written report to the authority having jurisdiction containing the following information:

- (1) date of inspection(s)
- (2) type of test(s) performed
- (3) detailed results of the test(s) including but not limited to, speed, governor trip speed, safety slide distance, relief valve setting, escalator/moving walk brake torque setting, etc.
- (4) Code deficiencies noted during the test
- (5) statement as to any corrective action taken

**7] ASME A17.2-2007 - QUALIFICATIONS OF INSPECTORS -** Inspectors and inspection supervisors are required by ASME A17.1d-2000 and earlier editions and A17.1-2000 and later editions, requirements 8.10.1.1(c) and 8.11.1.1 to be certified by an organization accredited by The American Society of Mechanical Engineers Qualifications for Elevator Inspectors Committee in accordance with the requirements set forth in the Standard for the Qualification of Elevator Inspectors, ASME QEI-1 and be recognized by the authority having jurisdiction.

**8] ASME A17.1a-2008/CSA B44a-09, Section 1.3, Definitions:** authorized personnel: persons who have been instructed in the operation of the equipment and designated by the owner to use the equipment. Elevator personnel: persons who have been trained in the construction, maintenance, repair, inspection or testing of equipment.

**9] ASME A17.1a-2008/CSA B44a-08, 8.6.1.4 Maintenance Records**

**8.6.1.4.1:** maintenance records shall document compliance with 8.6 of the Code and shall include records on the following activities:

- (a) Description of maintenance task performed and dates
- (b) Description and dates of examinations, tests, adjustments, repairs, and replacements
- (c) Description and dates of call backs (trouble calls) or reports that are reported to elevator personnel by any means, including corrective action taken
- (d) Written record of the findings on the firefighter's service operation required by 8.6.11.1

**10] Inquiry 03-03** Subject: Requirement 8.6.1.4, Maintenance Records Edition: ASME A17.1 - 2000

Does requirement 8.6.1.4 require maintenance records be available immediately? Or does it mean within another time limit? This is not

addressed by the Code. A17 Standards Committee approval: May 7, 2003

**Inquiry 04-06** Subject: Requirements 8.6.1.4(a), (b) and (c), Maintenance Records Edition: A17.1-2000

Questions: 1) Do the maintenance records have to be hard copies, or do electronic records comply with these requirements? 2) Do the records have to be physically stored at the maintenance site? 3) If the answer to question 2 is "Yes," is there a required location at the site where the records are required to be stored? 4) If the answer to (3) is "Yes," then where?

Answers: 1) Either hard copy or electronic records comply with these requirements. 2) No. See requirements 8.6.1.2.1(c) and 8.6.1.4.2. 3) See answer to (2). 4) See answer to (3). A17 Standards Committee approval: May 6, 2004

- 11]** GAL is a registered trademark of GAL Corp.
- 12]** Donoghue, Edward (2007). ASME A17.1/CSA B44 Handbook. New York City, NY: ASME. Page 456
- 13]** *Elevator Industry Field Employees' Safety Handbook*, 2010, Elevator World, page 45.

**Learning-Reinforcement Questions**

Use the below learning-reinforcement questions to study for the Continuing Education Assessment Exam available online at [www.elevatorbooks.com](http://www.elevatorbooks.com) or on page 143 of this issue.

- ◆ How should one describe "elevator personnel"?
- ◆ Where are MCPs required to be located?
- ◆ For which functions are an MCP required?
- ◆ Why are interval maintenance schedules important?
- ◆ Are all maintenance plan intervals the same? Why or why not?
- ◆ What are some examples of maintenance-applicable components?
- ◆ What defines a maintenance record?
- ◆ Where or how should one find the instructions for locating an MCP?
- ◆ Why are jumper control programs important?
- ◆ Why is it important that the machine room be kept clean and tidy?

**John Koshak** is head and founder of Elevator Safety Solutions, Inc. Directly prior to reactivating the company in September 2008, Koshak served as director of Codes and Standards for North America for ThyssenKrupp Elevator. He was formerly in research at ThyssenKrupp Research, Innovation and Design. Koshak got his start in the industry in 1980 with Westinghouse Elevator Co. and has worked for Dover Elevator, Amtech Elevator and Adams Elevator Equipment Co., where he was vice president of Technical Support. He was a National Elevator Industry Educational Program instructor from 1982 to 1991, designed the LifeJacket™ hydraulic elevator safety and holds several patents for elevator-component designs. Koshak is a member of the ASME A17 Standards Committee and a regent of the Elevator Escalator Safety Foundation.





## ELEVATOR WORLD Continuing Education Assessment Examination Questions

### Instructions:

- ◆ Read the article **“Maintenance Control Program”** (page 101) and study the learning-reinforcement questions.
- ◆ To receive **two hours (0.2 CEU)** of continuing-education credit, answer the assessment examination questions found below online at [www.elevatorbooks.com](http://www.elevatorbooks.com) or fill out the ELEVATOR WORLD Continuing Education Reporting Form found overleaf and submit by mail with payment.
- ◆ Approved for Continuing Education by **NAEC for CET®**, **NAESAI for QEI** and **QEI Services for QEI**.

1. Elevator personnel are:
  - a. Building engineers with Firefighter’s Emergency Operation training.
  - b. Sales personnel in a company branch office.
  - c. Technicians trained for safety procedures.
  - d. Persons trained in the maintenance of elevators.
2. In what year did ASME A17.1 define the MCP?
  - a. 1996.
  - b. 2000.
  - c. 2003.
  - d. 2005.
3. The code requires an MCP to be in place. This means that the MCP is to be:
  - a. Located on the jobsite.
  - b. Available on request.
  - c. In the building manager’s office.
  - d. On the Internet.
4. An MCP is required for:
  - a. Every elevator.
  - b. Each bank of elevators.
  - c. Each building in which there are elevators.
  - d. Each brand of elevator.
5. The interval or frequency of maintenance tasks are:
  - a. Determined by past history.
  - b. Determined by components on the floor.
  - c. Determined by an analysis of the elevator.
  - d. Determined by the AHJ.
6. Seven items make up the considerations for the frequency of the maintenance interval. These include:
  - a. Age, condition, accumulated wear, usage, environmental conditions, technology and quantity of components.
  - b. Age, condition, accumulated wear, usage, environmental conditions, technology and inherent quality.
  - c. Age, accumulated wear, usage, environmental conditions, brand, technology and inherent quality.
  - d. Age, condition, accumulated operation, usage, environmental conditions, technology and inherent quality.
7. An applicable component does not comply with the code:
  - a. Once it is worn, broken or has met a replacement criterion.
  - b. Once it is noticed by the technician.
  - c. Once it is noticed by the AHJ.
  - d. Once it is noticed by the owner of the conveyance.
8. Tests required by code are:
  - a. Done daily.
  - b. Done by technicians.
  - c. Done by the AHJ.
  - d. Done by the owner.
9. Tests required by code must be:
  - a. Witnessed by the building superintendent.
  - b. Witnessed by the building owner.
  - c. Witnessed by the AHJ.
  - d. Witnessed by the technician’s supervisor.
10. The instructions to locate the MCP must:
  - a. Be located in the building manager’s office.
  - b. Be located in or on the controller.
  - c. Be located on the back of the machine-room/control-room door.
  - d. Be available from a phone number listed on the crosshead of the car.
11. Maintenance records are:
  - a. A list of descriptions and dates of all maintenance tasks.
  - b. A list of descriptions and dates of all examinations.
  - c. A list of descriptions and dates of all tests and adjustments.
  - d. All the above.
12. Code data plates have been required for all equipment, regardless of installation date, in plain view on every elevator controller since:
  - a. 1996.
  - b. 1998.
  - c. 2000.
  - d. 2005.
13. A “Jumper Control Program” is:
  - a. A specific requirement for terminals on printed circuit boards.
  - b. A car-top railing device that prevents technicians from falling.
  - c. An industry effort to prevent controller jump.
  - d. A practice of training and jumper control to prevent temporary circuit bridging.
14. “Critical Operating Circuits” are:
  - a. Defined in the operating manual of the motor controller.
  - b. Critical to proper operation of the door operator.
  - c. Circuits devised to display multicolored push buttons.
  - d. Required to be available on the job.
15. An ABC fire extinguisher is required to be provided in:
  - a. Elevator and escalator rooms and spaces where full body entry is intended.
  - b. Every pit.
  - c. Every car top.
  - d. All of the above.

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