STATE OF CALIFORNIA GRAY DAVIS, *Governor*

DEPARTMENT OF INDUSTRIAL RELATIONS

DIVISION OF OCCUPATIONAL SAFETY & HEALTH

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ADDRESS REPLY TO:

P.O. BOX 420603

ELECTRICAL SEWER INSPECTION CAMERAS: TITLE 8 APPROVAL REQUIREMENTS[1]

On 27 March 2001, the California Division of Occupational Safety and Health issued a memorandum explaining California's electrical safety order requirements for the safe use of electrical cameras to inspect sewers and storm drains.

On 25 June 2001, continuing interest in this issue led the Division to issue a follow-up memorandum inviting input from the community of camera users, camera manufacturers, and other interested parties about their compliance approval issues. This input was received at a technical information-sharing session held by the Division on 1 August 2001 in Oakland. At that session, the Division received valuable information from all the participants, and greatly appreciates the input of all those who attended.

Participants in the 1 August session made it clear that they wished to obtain more clarification from the Division regarding the Division's jurisdictional authority to regulate the use of sewer inspection cameras and the provisions of California's Electrical Safety Orders (ESOs)[2] that govern approval of electrical cameras to inspect sewers and storm drains. In response, the Division is providing this Enforcement Policy, in question and answer format, for the regulated community of electrical camera users, electrical camera manufacturers, and other interested parties about the approval requirements for electrical equipment found in Title 8 of the California Code of Regulations.

What is the nature of the Division's jurisdictional authority?

The California Occupational Safety and Health Act[3] grants the Division of Occupational Safety and Health the power to enforce "occupational safety and health standards and orders" in every place of employment in the state.[4] Occupational safety and health standards and orders are defined as those lawfully adopted by the California Occupational Safety and Health Standards Board ("Standards Board").[5]

California's ESOs, adopted by the Standards Board in the early 1980s, are based in significant part on Federal OSHA's electrical safety orders, as contained in the Code of Federal Regulations ("CFR"), 1910, Subpart S -- Electrical, sections 1910.301 through

1910.399. All standards adopted by the state that are adopted in response to a federal standard are reviewed by Federal OSHA for equivalent "effectiveness." While California's ESOs contain many regulatory requirements that are identical to those found in Federal OSHA's electrical safety orders, the ESOs also contain other provisions that are similar but are not identical. Therefore, the Division does recognize that there are important differences between federal and California electrical safety requirements.[6]

It is important to make explicit what standards and regulations the Division has the legal authority to enforce in California. Keep in mind that, under the authority granted to the Division by the California Labor Code, the Division has the legal authority to enforce only what is in Title 8, not what is in the CFR.[7] Similarly, the Division cannot directly enforce non-governmental standards, except where authority to enforce such standards is granted in applicable provisions of Title 8.[8]

Does Title 8 Require Electrical Sewer Inspection Cameras to be Approved?

In Title 8, there are at least three (3) approval requirements with potential for application to the use of electrical equipment and installations in sewers and storm drains.

These approval requirements are found in Section 2305.4, which will be referred to as the "**general approval**" requirement; Section 2340.11, which will be referred to as the "**water safety approval**" requirement; and Section 2540.2, which will be referred to as the "**fire safety approval**" requirement.

1. "General" Approval Requirement -- Section 2305.4

Section 2305.4 requires all conductors and equipment covered by the ESOs to be approved.[9] "Approved" is defined in the section as "approved, listed, labeled, or certified as conforming to applicable governmental or other nationally recognized standards, or applicable scientific principles".

Moreover, section 2305.4(a) is quite explicit that

> "the approval, listing, labeling, or certification of conformity shall be based upon an evaluation performed by a person, firm, or entity with appropriate registered engineering competence or by a person, firm, or entity, independent of the manufacturer or supplier of the product, with demonstrated competence in the field of such evaluation."

Thus, section 2305.4 describes two paths to obtaining an approval of "conductors and equipment required or permitted by the [electrical] safety orders...." in terms of who can do the approving, i.e., the issuer of the approval.

The first option is for a user or manufacturer to obtain the approval from a person or entity with "appropriate registered engineering competence."[10] The second option is to obtain the approval from a competent person or entity, "independent of the manufacturer or supplier of the product, with demonstrated competence in

the field of such evaluation."[11] Both options are clearly permissible under Title 8.[12]

In addition to addressing *who* can do the approving of electrical equipment, section 2305.4 also specifies three sources of standards or principles against which the acceptability of electrical equipment is to be measured by the approving person or entity.

These sources are: (1) applicable governmental standards;[13] (2) other nationally recognized standards;[14] or (3) applicable scientific principles.[15]

Lastly, the section 2305.4 approval process necessarily requires the evaluation of "conformity" to consider in what manner and in what environments the equipment will be used.

2. "Water Safety" Approval Requirement -- Section 2340.11

The second approval standard is found at section 2340.11 ("Deteriorating Agents") in Article 4 ("Requirements for Electrical Installations"), which states that

> "(a) Unless approved for the purpose, no conductors or equipment shall be:
>
> (1) Located in damp or wet locations.
> (2) Exposed to gases, fumes or vapors, liquids, or other agents which could have a deteriorating effect.
> (3) Exposed to excessive temperatures."

3. "Fire Safety" Approval Requirement -- Section 2540.2

The third approval standard is found at section 2540.2 ("General") in Article 59 ("Hazardous [Classified] Locations"). Section 2540.2(a) and (b) provide:

> "(a) Approval. Equipment shall be approved not only for the class of location but also for the ignitable or combustible properties of the specific gas, vapor, dust, or fiber that will be present. (Title 24, Part 3, Section 3-500-2(a).)
>
> (b) Intrinsically safe equipment. Equipment and associated wiring approved as intrinsically safe shall be permitted in any hazardous (classified) location for which it is approved. Intrinsically safe equipment and wiring shall not be capable of releasing sufficient electrical or thermal energy under normal or abnormal conditions to cause ignition of a specific hazardous atmospheric mixture in its most easily ignited concentration. Abnormal conditions shall include accidental damage to any field-installed wiring, failure of electrical components, application of over-voltage, adjustment and maintenance operations, and other similar conditions. (Title 24, Part 3, Section 3-500-1(b).)"

In addition, section 2540.3 ("Electrical installations") provides:

> "Equipment, wiring methods and installations of equipment in classified locations shall be one or more of the following:
>
> (a) Intrinsically safe.
>
> (b) Approved for the classified location.
>
> (c) Of a type and design which provides protection from the hazards arising from the combustibility and flammability of vapors, liquids, gases, dusts or fibers."

Does the "water safety" approval requirement in Section 2340.11 apply to electrical cameras used to inspect sewers?

The water safety approval requirement applies to sewer inspection cameras whenever they are used in sewers, or any other environments that are wet or damp.

Does the "fire safety" approval requirement in Section 2540.2 apply to electrical cameras used to inspect sewers?

The application of the fire safety approval requirement to sewer inspection cameras depends on whether they are used in environments that are considered to be "classified" pursuant to section 2540.1.[16]

The Division believes that an unknown sewer environment fits the definition of a classified environment,[17] unless and until the contemplated work areas of the sewer are sufficiently tested and monitored to provide reasonable certainty that the work to be performed will not expose the workers to a fire hazard.

How can an operator of an electrical sewer inspection camera comply with the "general," "water safety" and "fire safety" approval requirements?

It is important to keep in mind that these three approval requirements focus ultimately on the ***usage*** of the equipment to be approved, not on the equipment itself. Because of the focus on usage, the general approval requirement captures any safety concern that reasonably arises by virtue of consideration of the intended and reasonably anticipated use of the equipment.

In fact, there is substantial overlap between the general approval requirement on the one hand, and the water safety and fire safety approval requirements on the other, since any general approval will necessarily have to address water and fire safety issues to the extent these issues are raised by the intended and reasonably anticipated use of the equipment. However, there are additional issues implied in the general approval requirement, e.g., resistance of the equipment to wear and tear in sewer environments.

As explained in the 27 March 2001 memorandum, the Division believes that approval of electrical cameras used for the inspection of sewers and storm drains is required under the general approval requirement set forth in Title 8 of the California Code of Regulations, Section 2305.4. And, as has been explained in previous communications from the Division,[18] a general approval will be accepted by the Division if the evaluation: (1) complies with the water safety approval requirement; (2) complies with the fire safety approval requirement as applied to Class I, Division I locations; and (3) is performed by a Nationally Recognized Testing Laboratory ("NRTL").

However, electrical sewer camera users should be aware that other approaches to compliance are acceptable, provided they meet the general approval requirement and do not violate the water and fire safety approval requirements.

These approaches are as follows:

1. Issuer of the Approval

As explained earlier, an NRTL is clearly not the only type of person or entity that may issue the approval.

A person or entity with appropriate registered engineering competence is also authorized to issue the approval.

Therefore, the Division will accept as the "issuer of the approval" a licensed electrical engineer[19] with demonstrated experience in the practice of electrical engineering as applied to the design, manufacture, or evaluation of electrical equipment, with consideration of the safe use of the equipment as a central focus of the experience.

To be adequate, however, the issuer's approval must:

(A) Be in writing;

(B) Accurately and fairly describe the reasonably anticipated use of the device to be approved, and the characteristics of the environment in which the device will be used;

(C) Fully characterize all safety issues presented by the use of the device;

(D) Provide a detailed analysis of how the device is designed and constructed to address the identified safety issues and the adequacy of such engineering design and construction; and

(E) Make an explicit professional engineering determination that the design and construction of the equipment are adequate to address the safety issues identified.

2. Water Safety Approval

If the equipment is to be used in an environment that is not damp or wet, the evaluation is not subject to the water safety approval requirement and need not comply with section 2340.11. If the user intends to use the equipment in the underground space of a sewer, but believes that the equipment will contact neither water nor dampness, the user must be able to credibly substantiate that belief.

If the equipment is to be used in an environment that is damp or wet, the evaluation is subject to the water safety approval requirement and must comply with section 2340.11.

3. Fire Safety Approval

An unknown sewer environment is to be considered a Class I, Division I environment. Therefore, electrical equipment to be used in such an environment must have an approval in compliance with sections 2540.2 and 2540.3. If a sewer environment is adequately tested and monitored to demonstrate the absence of a fire hazard to the worker, it is no longer considered to be an unknown sewer environment or a Class I Division I environment. Sewer cameras used in such environments will not require fire safety approval but will still require general approval pursuant to section 2305.4.

Given the Title 8 electrical equipment approval requirements, what are my options for compliance with the Title 8 approval requirements?

Option 1: NRTL Approval

Pursuant to section 2304.5, you can use a sewer inspection camera approved for Class I, Division 1 conditions and wet or damp environments by a Nationally Recognized Testing Laboratory ("NRTL").

Option 2: Electrical Engineer Approval

Pursuant to section 2305.4, you can use a sewer inspection camera approved for Class I, Division 1 conditions and for use in wet or damp environments by an appropriate licensed electrical engineer.

Option 3: Engineer Approval for Conditional Uses

Pursuant to section 2305.4, you can use a sewer inspection camera conditionally approved by an appropriate licensed electrical engineer. Conditional approvals must address the water safety and fire safety issues raised by the use of sewer cameras.

Water Safety Conditional Approvals.

A water safety conditional approval can be issued by an appropriate licensed electrical engineer upon that professional's determination that the sewer cameral will be safe for use in wet or damp environments subject to the user meeting specified conditions.

Fire Safety Conditional Approvals.

A fire safety conditional approval can be issued by an appropriate licensed electrical engineer for use of a sewer camera in areas of a sewer that have been demonstrated by testing and monitoring not to fall under the fire safety approval requirement. Testing and monitoring will be considered by the Division to be sufficient for this purpose if all measurements indicate that the sewer atmosphere is below 10% of the lower explosive limit (LEL) and if the user meets all of the following additional conditions:

(1) Before each use, inspect cables and electrical equipment for damage or wear that could compromise safety;

(2) Test operate the sewer camera and associated electrical equipment in a dry location away from any potential exposure to hazardous conditions to determine whether the equipment functions normally and without any problems, such as sparking, loose connections, or other similar safety problems;

(3) Test for the existence of a hazardous atmosphere prior to opening any sewer access point using a multi-gas tester, and before energizing the equipment, conduct a test of the sewer atmosphere at the access point estimated to be closest to the endpoint of the camera work;

(4) Provide continuous monitoring in the alarm mode at the access point from which the work is performed at all times while the sewer inspection camera is energized in the sewer;

(5) De-energize all electrical equipment and use mechanical ventilation if a measurement exceeding 10% of the LEL is obtained; and

(6) Discontinue use of all electrical equipment if the sewer environment cannot be maintained below 10% of the LEL.

Can I be cited by the Division for using an unapproved electrical sewer inspection camera?

The Division is aware that for many sewer inspection camera users, the Title 8 electrical equipment approval requirements may not have been widely understood to apply to such equipment in the past. However, the Division does believe that approval of

electrical cameras used for the inspection of sewers and storm drains is required under the general approval requirement set forth in Title 8 of the California Code of Regulations, Section 2305.4, and began in March of 2001 to disseminate that information widely throughout the regulated user community and among electrical equipment manufacturers.

Despite a lack of awareness about the Title 8 approval requirements for electrical equipment in the past, the Division believes that it is now incumbent on all users of electrical sewer inspection cameras in California to recognize the electrical equipment approval requirements found in Title 8 of the California Code of Regulations and to comply with those requirements for the protection of human life in the workplace.

At this time, the Division has no plans to conduct "programmed inspections" of sewer camera operators to determine an electrical inspection camera user's compliance with the Title 8 approval requirements. However, when the Division conducts any investigation of a California place of employment, prompted by the receipt of a complaint, or the occurrence of an employee injury, the Division is under a mandatory statutory duty to issue a citation to the employer when the employer is found by the Division to have violated "any standard, rule, order or regulation ... " adopted by the Standards Board.[20]

How can I get help if I need more information or assistance?

If you have additional questions regarding California's electrical safety orders, or their application to electrical camera equipment installations, or need assistance in complying with Title 8 approval requirements, please contact the Division's Research and Standards Safety Unit in San Francisco at (415) 703-5100, or in Anaheim at (714) 939-8478.

If you have any comments about the Division's Enforcement Policy, please send your comments to DOSH Headquarters, P.O. Box 420603, San Francisco, CA 94142.

Thank you.

John Howard
Chief
Division of Occupational Safety and Health

NOTES

1. Even though the specific subject of this Enforcement Policy is electrical cameras used to inspect sewers and storm drains, the Division believes that the Title 8 approval requirements referenced in the Policy apply to any type of electrical equipment or installation used in a sewer or storm drain.

2. California's Electrical Safety Orders (ESOs) are set forth in Title 8 of the California Code of Regulations ("CCR"), of Division 1 (Department of Industrial Relations), Chapter 4 (Division of Industrial Safety), Subchapter 5 (Electrical Safety Orders), at Sections 2299 through 2974. California's ESOs are divided into two Groups of Articles: Group 1 (Articles 1 through 82), which relate to Low-Voltage Electrical Safety Orders (LVESOs), and Group 2 (Articles 1 through 39), which relate to High-Voltage Electrical Safety Orders (HVESOs).

3. See California Labor Code Section 6300 et seq. ("California Occupational Safety and Health Act").

4. "The Division has the power, jurisdiction, and supervision over every employment and place of employment in this state, which is necessary to adequately enforce and administer all laws and lawful standards and orders, or special orders requiring such employment and place of employment to be safe, and requiring the protection of life, safety, and health of every employee in such employment or place of employment." See Labor Code Section 6307.

5. "'Occupational safety and health standards and orders' means standards and orders adopted by the standards board pursuant to Chapter 6 (commencing with Section 140) of Division 1 and general orders heretofore adopted by the Industrial Safety Board or the Industrial Accident Commission." See Labor Code Section 6305(a).

6. Perceived differences between California's occupational safety and health standards and federal occupational safety and health standards often raise the issue of whether the state's regulatory requirements are as "effective as" those of federal OSHA, as is required by the Federal Occupational Safety and Health ("OSH") Act (see 29 U.S.C. Section 667(c)(2)). When such issues are raised during the course of the state's initial adoption of a new federal standard, or subsequent to the state's adoption through a Complaint Against State Program Administration, or "CASPA," federal OSHA may review the state's standards for equivalent effectiveness by using criteria found at 29 CFR 1902.3 and 1902.4.

7. In addition to unenforceable federal standards, the Division also does not have the authority to enforce the content of letters written by Federal OSHA which interpret, or make conclusory factual statements, about occupational safety and health standards found in the *Code of Federal Regulations*.

8. Non-governmental standards, e.g., standards developed and published by such organizations as the Society of Automative Engineering (SAE), the National Fire Protection Association (NFPA), American Society for Testing and Materials (ASTM), American National Standards Institute (ANSI), American Society of Mechanical Engineers (ASME), American Conference of Governmental Industrial Hygienists (ACGIH), and other similar non-governmental standard-setting organizations, can be utilized by Title 8 in several ways. The most common way that non-governmental standards are utilized in Title 8 is when the Standards Board adopts the name of the standard-setting organization (and the name of their particular standard of interest) into Title 8, e.g. section 1591 references SAE standards J236-1971 and other SAE standards. Another way to give enforceable legal effect to non-governmental standards is to adopt language in a Title 8 section referring to non-governmental standards in a generic manner, e.g., Section 2305.4 provides that products, materials, devices, systems or installations be approved "... as conforming to ... nationally recognized standards... ".

9. "The conductors and equipment required or permitted by these orders shall be acceptable only if approved. (Title 24, Part 3, Section 110-2). (a) When the term 'approved' is used in these orders, it shall refer to products, materials, devices, systems, or installations that have been approved, listed, labeled or certified as conforming to applicable governmental or other nationally recognized standards, or applicable scientific principles. The approval, listing, labeling, or certification of conformity, shall be based upon an evaluation performed by a person, firm, or entity with appropriate registered engineering competence in the field of such evaluation. Exception: Where written approval by the Division is required by these orders. (b) The Division may require proof in addition to that under (a) that the products, materials, devices, systems, or installations will provide reasonable safety under the conditions of use. (c) When these orders require an approval of products, materials, devices, systems, or installations and that approval is not available under (a), it will be necessary to submit to the Division engineering calculations, stress analyses, and other data for each design, model, or make for which an approval is requested. The Division will then approve or disapprove the product, material, device, system, or installation as submitted or under specified conditions." See 8 CCR Section 2305.4 ("Approvals").

10. The general approval provision in the equivalent standard in the federal electrical safety orders, 1910.303(a), does not allow for certification of electrical equipment by "a person, firm, or entity with appropriate registered engineering competence."

11. 29 CFR 1910.303(a) allows for three approval routes: (1) through evaluation by nationally recognized testing laboratory; (2) through evaluation by another federal, state or local government responsible for enforcing the occupational safety provisions of the National Electrical Code; and (3) evaluation through the manufacturer, but only for custom-made equipment or installations intended for the use by a particular customer. As mentioned in Note 9 above, the 1910.303 approval process makes no mention of approval or certification through a person or entity with "appropriate registered engineering competence."

12. The enforceability of section 2305.4 was upheld in 1991 by the California Occupational Safety and Health Appeals Board. See Contra Costa Electric, Inc. OSHAB 91-1067 and 1068, Decision After Reconsideration, at p.3.

13. The term "applicable governmental standards" is not defined in section 2305.4, but the Division understands the term to mean standards adopted by Federal OSHA as compiled in the *Code of Federal Regulations*.

14. The term "other nationally recognized standards" is not defined in section 2305.4, but the Division understands the term to mean non-governmental occupational safety and health standards that are recognized by federal and state governments, non-governmental standard setting entities, professional or industry associations and other entities as a basis for judging acceptability.

15. The term "applicable scientific principles" is not defined in section 2305.4, but the Division understands the term to mean current and generally accepted engineering practices as applied to the design and manufacture of electrical equipment that is safe for its intended and reasonably anticipated use.

16. "This article covers the requirements for electric equipment and wiring for all voltages in locations which are classified depending on the properties of the flammable vapors, liquids or gases, or combustible dusts or fibers which may be present therein and the likelihood that a flammable or combustible concentration or quantity is present. Hazardous (classified) locations may be found in occupancies such as, but not limited to, the following: Aircraft hangers, gasoline dispensing and service stations, bulk storage plans for gasoline or other volatile flammable liquids, paint-finishing process plants, health care facilities, agricultural or other facilities where excessive combustible dusts may be present, marinas, boat yards, and petroleum and chemical processing plants. Each room, section or area shall be considered individually in determining its classification. These classified locations are assigned six designations as follows: Class I, Division 1, Class I, Division 2, Class II, Division 1, Class II, Division 2, Class III, Division 1, and Class III, Division 2. (Title 24, Part 3, Section 3-500-1(a))." See 8 CCR Section 2540.1 ("Scope").

17. The Division's position relative to approval of electrical equipment to be used by employees in "unknown" sewer environments is not new. In a 15 January 1997 letter to James M. Kennedy, Vice President, Sales and Marketing, Pearpoint, Inc., and in a 20 May 1998 letter to Paul Stenzler, Vice President, Sales and Applications, Cues, Inc., the Division stated that it considered "unknown sewer environments to be hazardous, classified locations defined by Electrical Safety Order Section 2540.1 as a location in which flammable gases or vapors are or may be present in the air in quantities sufficient to produce explosive or ignitable mixtures."

18. See Note 17 above.

19. Note that California Business and Professions ("B&P") Code Section 6730 requires that "[I]n order to safeguard life, health, property and public welfare, any person... who practices... electrical engineering... in this state... shall be registered... by the board [for Professional Engineers and Land Surveyors]." The Division considers the act of performing a section 2305.4 evaluation in California to be one which requires registration as an electrical engineer in California. However, B&P Code Section 6747 provides an exemption to the requirements of California registration found in Section 6730 for the "performance of engineering work by a manufacturing, mining, public utility, research and development, or other industrial corporation, or by employees of that corporation, provided that the work is in connection with, or incidental to, the products, systems, or services of that corporation or its affiliates." If the act of performing a section 2305.4 evaluation occurs in another state, the electrical engineer performing the evaluation and approval must be a licensed or registered electrical engineer in that state.

20. "If upon inspection... the Division believes that an employer has violated ...or any standard..., it shall with reasonable promptness issue a citation to the employer." See Labor Code Section 6317. If the Division conducts a complaint or accident investigation of a sewer inspection camera user, and finds an unapproved electrical inspection camera in use, then the Division will issue a citation, referencing a alleged violation of section 2305.4. Other sections of Title 8 may be cited depending on the specific circumstances of camera use. To ensure consistency throughout the Division, however, all citations referencing sections of the California ESOs which are proposed for issuance by the Division's Enforcement Unit for an employer's failure to use approved equipment will be reviewed prior to issuance by the Division's Legal Unit.