State and local government laser safety requirements

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I. INTRODUCTION

Laser safety requirements in the U.S. are usually centered on specific Federal Government and voluntary standards such as:

(1) The Laser Product Performance Standard of the Center for Devices and Radiological Health (21CFR 1040.10 and 1040.11),

(2) the American National Standards Institute (ANSI Z136 Series),

(3) the Occupational Safety and Health Administration (OSHA),

(4) the Federal Aviation Administration (FAA 7400.2D). These are the principal standards used for both the laser manufacturers and users.[1–4]

Aspects of laser use can also be regulated at the state and local government levels. In the past this was manifest by only a limited number of states that had developed regulations in the early days of laser use (ca. 1970–1975). Most of the states that introduced standards in that era still have standards in place. It is of note that most states have replaced the early versions with up-to-date documents based upon the current ANSI/CDRH philosophies. Only the State of Pennsylvania, in 1981, rescinded the laser regulation that had been originally passed on 10 October 1971. It should also be noted, however, that in the early years (1970–1990), many of the state rules were not well enforced. Also in this early era, local city or county laser regulations were nonexistent.

II. TODAY'S STATE/LOCAL STANDARD ACTIVITY

It is of note that activity in writing laser regulations at the state and local government levels has significantly increased since 1997. This discussion will attempt to review these developments by looking at the following major topics:

(1) Review of comprehensive laser regulations for state governments that have enacted or are considering adoption of new or revised regulations.

(2) Review of the current trends at the state or local level regarding laser pointer regulatory and/or enforcement activities.

(3) Summary of the laser safety related regulatory trends obtained following a polling of the state agencies concerned with laser activities.

(4) Review of ''model state laser safety regulation'' activities of the Conference of Radiation Control Program Directors (CRCPD).

The discussion will include emphasis on those industry sectors that may be the most affected by the resurgence in state and local government laser safety regulations. Projections for future changes in these regulations will be made based upon the polling data gathered.

III. STATE REGULATIONS

Comprehensive laser regulations vary considerably from state to state and have been historically concerned with registration of lasers and licensing of operators and institutions. Current trends now place emphasis on classification, controls, and training. In the past, physicians and medical lasers were generally exempt from most state requirements. The current trend is to include medical laser uses in the regulatory requirements.

Comprehensive state standards relating to laser safety matters currently exist in ten states. The principal factors in the laser safety state regulations are described below and detailed in Table I and Fig. 1.

A. Alaska

The Alaska rules are contained in Title 18 of the Alaska Annotated Code, Part 85, Article 7, Secs. 670–730. These rules are some of the oldest published and date to October 1971. An updated section was introduced in 1979 but was later rescinded. Minimal enforcement is made on the existing regulation.

B. Arizona

The Arizona rules are contained in Article 14, Rules for The Control of Nonionizing Radiation, Secs. R12-1-1421–1444 which became effective 2 January 1996. According to this regulation, all laser facilities must register with the state if they possess or maintain Class III or Class IV lasers. This standard reflects the philosophy of the ANSI Z136 standard and requires a laser safety officer (LSO). The program requires 6 month audits; record keeping; interlocked protective housings; FDA classes; the use of ANSI maximum permissable exposure (MPEs), ANSI signs, FDA labels, laser controlled areas, ANSI-like LSO duties, eyewear, and incident reporting. Special medical and light-show requirements are also included.

C. Arkansas

The Arkansas rules are contained in Act 460, Electronic Products Radiation Control Act. Historically, this laser regulation has been given very minor attention in the state. There is a current interest in having a general non-ionizing radiation law but no activity has begun. They monitor laser light shows and do checks on those that do such shows in the state.

TABLE I. Summary of comprehensive state laser safety regulations.

State	Specific state regulation	Effective date
Alaska	Title 18, Alaska Annotated Code: Part 85, Art. 7, Sec. 670–730	October 1971 and April 1973
Arizona	Art. 14, Rules for Control of Nonionizing Radiation Sec. R12-1-1421–1444	2 January 1996
Arkansas	Arkansas Act 460	
Florida	Florida Code: Chap. 64-E4	as amended 7 May 1996 and 12 December 1996
Georgia	Georgia Code: Chap. 270-6-27	1 September 1971
Illinois	Laser Systems Act of 1997	25 July 1997
Massachusetts	Department of Public Health: 105 CMR 121.000	2 May 1997
New York	NY Code Rule 50 of Title 12	(as amended 2 March 1994) Note: new amendments to become effective mid-1999
Texas	25 TAC Sec. 289.301	1 April 1999
Washington	Chap. 296-62-09005	As amended: 8 October 1992

D. Florida

The Florida regulations are contained in Chap. 64-E4 of Florida's Administrative Code. The rules initially became effective on 6 September 1984 and were completely updated 7 May 1996 and later on 12 December 1996. The rules regulate all facilities with Class 3A, Class 3B, and Class 4 laser systems. Registration of lasers is required and no fee is assessed. The standard reflects the classification and control philosophies of both the ANSI Z136 and FDA/CDRH (CFR 1040.10 and 1040.11) standards.

E. Georgia

The Georgia state rules are contained in Chap. 270-6-27, Rules and Regulations for Laser Radiation of the Georgia Department of Public Health and also are one of the oldest state codes. The rules became effective 1 September 1971. These rules, which require the registration of all lasers (regardless of Class) and injury reporting. The rule predates ANSI Z136 and has no specific exposure limitations. Enforcement of this regulation has reportedly been limited. There is some limited activity to update the regulation. The State of Georgia does monitor laser light shows.

F. Illinois

This state replaced its original laser legislation (originally introduced in 1967) with the comprehensive Laser Systems Act of 1997 (P.A. 90-209), effective 25 July 1997. This act will be codified in the Illinois Compiled Statutes (420 ILCS 56/1-65). The law references the CDRH hazard classification scheme and sets forth requirements for registration and authorizes fees, provides for exemption of nonhazardous systems, requires reporting of injuries resulting from use of lasers, and authorizes the adoption of regulations for inspections to ensure the safe use and operation of laser systems. There is activity to update even these recent regulations but no target date for completion has been set.

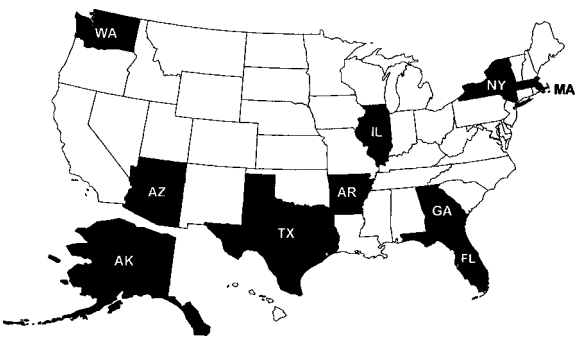

FIG. 1. U.S. state governments with comprehensive laser regulations.

G. Massachusetts

The Massachusetts Radiation Control Program rules are contained in 105 CMR 121.000, Regulations for the Control of Lasers, originally adopted in 1970 and then recently amended effective 2 May 1997. The rule specifically cites the ANSI Z136 family of standards and requires registration of all ANSI Class 3B or 4 lasers. All facilities using a laser or laser product are required to comply with ANSI Z136. Specific pre-use notification is required for out-of-state and all laser light shows uses. Vendors are required to notify the state of all Class 3B or Class 4 purchases.

H. New York

The New York laser program is administered under the Department of Labor although it is considered a radiological health program. The original regulation was introduced in the 1970's and was then updated and amended 2 March 1994. Note that several amendments were proposed but were then later withdrawn in mid 1999. Since its introduction, the New York State Code Rule 50 Regulation was unique in that it required certificates of competence for operators of so-called mobile lasers. Obtaining a certificate required an application and a written examination of prospective operators. Registration of laser systems is required and fees are assessed. Laser classification is either high or low intensity and contains pre-ANSI Z136 based exposure limitation tables.

TABLE II. Main features of state laser safety regulations.

	Registration, license, record keeping, or penalties	Special factors, exemptions, and training	Signs required	Controls required	ANSI or FDA based	Outdoor and light show requirements
Alaska	yes	enclosed lasers and below MPEs (e.g., Class 1)	yes	yes	no	no
Arizona	yes	training	yes	yes	ANSI/FDA	yes
Arkansas	yes	inspections allowed	n/a	n/a	no	no
Florida	yes	LSO training Class 1–2A exempted	yes	yes	ANSI	yes
Georgia	yes	n/a	n/a	n/a	no	no
Illinois	yes	enclosed lasers and below MPEs (e.g., Class 1)	n/a	n/a	FDA	no
Massachusetts	yes	transit and storage exempt	yes	yes	ANSI	yes
New York	yes	yes[a]	yes	yes	FDA[a]	yes
Texas	yes	enclosed lasers	yes	yes	ANSI/FDA	yes
Washington	no	training required	yes	eye and skin protection	ANSI/FDA	no

[a]Proposed amendments to Code Rule 50 were withdrawn mid 1999.

I. Texas

Texas initially adopted regulations in September 1974 for the Control of Laser Radiation Hazards. These regulations have been numerous at times and, as of 1 April 1999, the regulations were again revised. This active program now has requirements for registration, reporting of laser incidents, and ANSI Z136 based exposure limits.

J. Washington

Laser regulation is administered by the Department of Labor and Industries as a State OSHA program. It is not considered a radiological health program. The regulations were amended 8 October 1992 and contain reference to ANSI Z136 and FDA/CDRH requirements. The document is contained in Chap. 296-62-09005, Washington Administrative Code (WAC), General Occupational Health Standards. The regulation requires all laser systems to be classified in accordance with FDA and ANSI. Protective eyewear and other controls are required. Safety training is specifically required.

There are several common features in most of the state amendments. This includes features such as registration, eyewear protection requirements, specific sign posting, and equipment labeling in accordance with the ANSI Z136 and/or FDA/CDRH standards. These factors are detailed in Table II.

IV. STATE AND LOCAL LASER POINTER REGULATIONS

The irresponsible use of visible frequency laser pointers has, unfortunately, become a national annoyance. Such pointers, originally intended for use by educators and other professionals while presenting talks in the classroom or at conventions and meetings have become the ''toy of the middle school.'' Even the FDA's official warning on laser pointers indicates the devices to be safe if they are maturely used.[5] They are certainly useful where one needs to point out special items during any instructive situation. Nonetheless, playful use by young people has become the rule—not the exception—and ''dotting'' occurs on almost anything, anywhere at any time. This includes directing the beam into homes, and on movie house screens; aiming at performers at rock concerts, teachers at school, the minister at church, and police and firemen. Recently there have been reports of dotting drivers of cars and aircraft. While the list of nuisance exposure stories continues to grow, such events generally have produced no lasting retinal dysfunction, however, two recent cases appear to have documented that retinal damage is possible following multisecond exposures to Class 3A diode laser pointer devices.[6,7]

Factors of diode pointer exposures have been previously discussed that indicated a pointer could certainly affect perception during certain vision-critical activities.[8] In these cases, the exposed individuals often have the perception of a significant potential harm. This was termed as the *Concerns of a Perceived Hazard (CPH)*, often referred to as ''outrage.'' There is growing evidence that adverse physical effects can be deemed as real by some who are exposed by what is usually considered as a nonharmful laser pointer beam. In this case, the exposed person feels ''victimized'' and often becomes ''outraged'' at the perception of being harmed. The person is actually convinced that harm has been done.

It is of significance that laser pointers are easily purchased in novelty stores, mail-order magazines, office supply

TABLE III. Key features of state ordinances on laser pointers.

	Adult purchase required	Use or sale restrictions	Fines specified	Jail terms specified	Specific targeting restrictions
(State of) Arkansas (1999 HB No. 1343, reported currently engrossed by committee, 2/12/99)	yes 18 yr	yes	yes State: $100	no	no
(State of) California (No. 247.5, 248, 417.15, passed ?)	no	yes	yes State: $2000 County: $1000 misdemeanor	yes Jail: 16 mo-3 yr Jail: 1 yr	yes aircraft and helicopters
(State of) Hawaii (SB No. 365, in committee 2/26/99)	yes 18 yr	yes			no
(State of) Maine (LD No. 0268, draft in committee: 2/11/99)	no	yes	yes State: $2000	yes Jail: 1–3 yr	yes people
(State of) New Jersey (No. 1258, 1387, 1355, drafts in committee, 2/15/99)	yes 18 yr	yes	yes State: $1000	yes Jail: 6 mo	no
(State of) Texas (HB No. 943, draft committee: 2/11/99)	no[a]	yes	yes State: $250	no	yes applies only to uniformed safety officers

[a]Current discussions may indicate that an 18 yr age purchase limitation may also be included.

stores, common electronics stores, and over the Internet. The price has dropped to the $10.00–$20.00 range for laser pointers in the 1–5 mW range that emit a beam that can be seen easily hundreds of meters away—but yet the unit is small enough to be carried in the pocket or on a key chain. Most of these devices exhibit FDA Class 2 or Class 3A warning labels.

Concerns with these low power lasers include ocular effects such as flashblindness, afterimage, and glare. Persons exposed to the beams from pointers can be subject to such effects which could lead to temporary vision dysfunction and cause possible physical dangers if the exposed person is engaged in a vision-critical activity such as driving, flying, or operating machinery.

Note that from a total world market in 1991 of 150 000 units, laser pointer sales for 1998 have grown to an unbelievable estimate of 20 million sold worldwide! Laser pointers now represent the second highest volume single application of visible laser diodes after the 780 nm ''CD'' diode lasers (at 240 million). It is also of note that 90% of all pointers are manufactured in Taiwan.[9]

While there are no national limitations on the purchase of a laser pointer unit, the concerns that have arisen regarding the irresponsible use of laser pointers has created significant concerns within some states, numerous local area governments, and many local school systems in the USA. As a consequence, state and local regulations and/or ordinances have been enacted to limit, in some way, laser pointer purchase and use. Such rules frequently limit sale to adults, limit manner of use, and make inappropriate use a misdemeanor (usually with a fine or other penalty). The regions that currently have such regulations enacted or where the legislation has been written and is pending passage include:

State governments (6): Arkansas, California, Hawaii, Maine, New Jersey, and Texas.

Local/city governments (16): Atlantic City, NJ; Boston MA; Chicago Ridge, IL; Cincinnati, OH; Dearborn, MI; Louisville, KY; Matteson, IL; New York City, NY; North-Wildwood, NJ; Ocean City, MD; Philadelphia, PA; Rehoboth Beach, DE; San Ramon, CA; Stafford, NJ; Virginia Beach, VA; Westchester County, NY.

The state level laser pointer regulations that have been enacted or are pending enactment (and where copies were available for review) are summarized in Table III and Fig. 2.

V. STATE LEVEL LASER POINTER REGULATION SUMMARY

The main features of the five state regulations are centered on the following key factors:

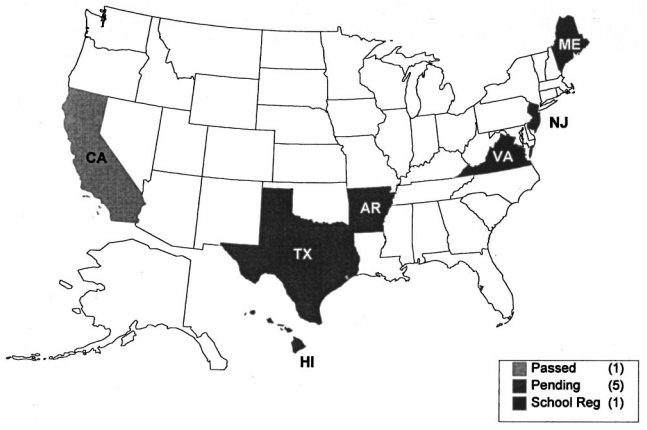

FIG. 2. U.S. state governments with laser pointer regulations either passed or pending.

TABLE IV. Key features of county/city ordinances on laser pointers.

	Adult purchase required	Use or sale restrictions	Fines specified	Jail terms specified	Specific targeting restrictions
Atlantic City, NJ (No. 51, passed 9/2/98)	no	yes	yes City: $1000 County: $1000	yes Jail: 90 days Com. Ser: 90 days	no
Boston, MA (draft in committee: 2/1/99)	yes 18 yr	yes display limits	yes City: $300	no	yes moving vehicles
Chicago Ridge, IL (No. 98-09-20, passed 9/1/98)	yes 18 yr	yes	yes City: $750	yes Prob: 1 yr Com. Ser: discretion	no
Cincinnati, OH (draft in committee: 2/1/99)	yes 18 yr	yes display limits	yes City: $250	yes Jail: 30 days	no
Dearborn, MI (No. 98-749, passed 12/15/98)	no	yes	no	no	yes people and animals
Louisville, KY (No. 247-1998, passed 11/12/98)	no	yes medical and R&D exemption	yes City: $50–100	yes Jail: 50 days	yes occupied vehicles
Matteson, IL (No. 1716, passed 11/2/98)	yes 18 yr	yes	yes City: $500	no	no
New York City, NY (No. 58-1998. passed 12/17/98)	yes 18 yr	yes display limits	yes City: $300–1000	yes Jail: 1 yr	yes uniformed safety officers and marked safety vehicles
North Wildwood, NJ (No. 1310, passed 1998)	no	yes	yes City: $1000 County: $1000	yes Jail: 90 days Com. Ser: 90 days	no
Ocean City, MD (No. 1998-16, passed 7/20/98) (No. 1998-17, passed 8/3/98)	no	yes	yes City: $500	yes Jail: 30 days	no
Philadelphia, PA (No. 980949, passed 12/16/98)	no	yes	yes City: $100	no	yes people
Rehoboth Beach, DE (No. 898-1, passed 8/3/98)	no	yes	yes City: $25–$500	no	no
San Ramon, CA (No. 308, passed 1/26/99)	yes 18 yr	yes	yes Adult: City: $1000 Minor: Com. Ser: discretion	yes Jail: 1 yr	yes moving vehicles
Stafford, NJ (draft in committee: 2/15/99)	yes 18 yr	yes display limits	yes City: $1000	yes Jail: 90 days Com. Ser: discretion[a]	no
Virginia Beach, VA (No. 98-2504, passed 8/25/98)	no	yes	yes City: $5000	yes Jail: 6 mo	no
Westchester County, NY (No. 16-1998, passed 6/26/98)	yes 18 yr	yes display limits	yes County: $1000	yes Jail: 1 yr max.	no

[a]Probation and cummunity service.

Purchase limitations: Several states (AR, HI, NJ, and possibly TX) deemed it appropriate to limit the sale of laser pointers to adults only (e.g., 18 years and older).

Use limitations: All of the state regulations cite restrictions on ''use'' with typical wording that prohibit pointing the laser pointer on people (i.e., dotting) and/or animals in a manner that harass or annoy the targeted person. Note that only the State of California Penal Codes have regulations specific to directing the beams on aircraft in flight. The proposed Texas regulation would apply to targeting only uniformed officers (e.g., police).

Fines and jail terms: All listed state governments allow for fines ranging from $100 to $2000 and three states (CA, ME, NJ) cite jail terms (6 months–3 years). It is of note also

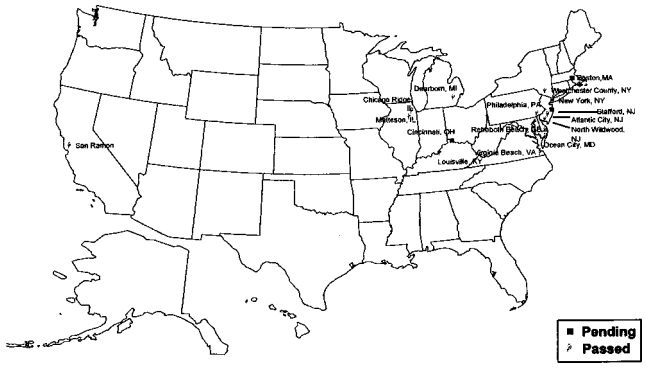

FIG. 3. U.S. cities or county governments with laser pointer regulations either passed or pending.

that the State of Virginia has passed a regulation amending Sec. 22.1–278.2 of the Code of Virginia, which allows local school boards to regulate laser pointer use.

VI. LOCAL/CITY LASER POINTER REGULATION SUMMARY

The 16 local/city regulations that have been enacted or are pending enactment (and where copies were available for review) are summarized in Table IV and Fig. 3. In a manner similar to the State regulations, the local regulations specify the following:

Purchase limitations: Eight of the local regulations deemed it appropriate to limit the sale of laser pointers to adults only (e.g., 18 years and older).

Use limitations: All of the local regulations cite restrictions on ''use'' with typical wording that limits pointing the laser pointer on people (i.e., dotting) or animals in a manner that harass or annoy the targeted person.

Fines and jail terms: All but one city allowed for fines ranging from $50 to $5000 and all but five cities cited jail terms (30 days–1 year).

Target limitations: Four cities specifically prohibit targeting moving vehicles. It should be noted that the list of state and local governments considering laser pointer regulations continues to grow at an increasing rate. At the time of writing this article, the authors have become aware of additional cities where possible interest in developing laser pointer regulations has been recently reported. The list now includes six cities: Brunswick, MD; Charleston, SC; Honolulu, HI; Lexington, KY; San Francisco, CA; and Tucson, AZ.

VII. STATE GOVERNMENT SURVEY AND INFORMATION POLL

As a part of this State Government laser regulation review, the authors compiled a master listing of the key individual in each of the 50 U.S. states that represents each state in the regulatory matters relating to lasers. This survey included a telephone contact of each individual and a brief discussion regarding laser regulatory matters. The key questions that were asked in this survey were:

(1) Does the state have its own laser regulation in place?

TABLE V. Summary of state laser safety poll.

	Now have existing standard?	New standard activity?	Enabling legislation in place?	Actively monitor light shows?
Alabama	no	no	no	no
Alaska	yes	no	yes	no
Arizona	yes	no	yes	yes
Arkansas	yes	in future	yes	yes
California	no	no	no	yes
Colorado	no	no	no	no
Connecticut	no	in future	yes	no
Delaware	no	no	no	no
Florida	yes	no	yes	yes
Georgia	yes	in future	yes	yes
Hawaii	no	in future	in future	yes
Idaho	no	no	no	yes
Illinois	yes	yes	yes	yes
Indiana	no	no	yes	no
Iowa	no	no	no	no
Kansas	no	in future	yes	yes
Kentucky	no	in future	yes	yes
Louisiana	no	no	no	no
Maine	no	no	no	yes
Maryland	no	no	yes	yes
Massachusetts	yes	no	yes	yes
Michigan	no	no	no	no
Minnesota	no	in future	yes	yes
Mississippi	no	no	yes	no
Missouri	no	no	no	yes
Montana	no	no	no	no
Nebraska	no	in future	no	yes
Nevada	no	no	in future	yes
New Hampshire	no	no	yes	no
New Jersey	no	in future	yes	yes
New Mexico	no	no	no	no
New York	yes	yes	yes	yes
North Carolina	no	no	no	no
North Dakota	no	no	no	yes
Ohio	no	no	no	no
Oklahoma	no	no	yes	no
Oregon	no	no	no	yes
Pennsylvania	no	no	yes	yes
Rhode Island	no	no	no	no
South Carolina	no	no	no	no
South Dakota	no	in future	in future	yes
Tennessee	no	no	no	yes
Texas	yes	yes	yes	yes
Utah	no	no	yes	yes
Vermont	yes[a]	no	yes	yes
Virginia	no	no	no	no
Washington	no[a]	no	yes	no
West Virginia	no	no	yes	no
Wisconsin	no	no	limited	no
Wyoming	no	no	no	no

[a]Under state OSHA regulation.

(2) Is there any activity to create a new regulation or update an existing regulation?

(3) Does the state currently have ''enabling legislation'' in place that empowers activity in the laser area?

(4) Does the state routinely monitor laser light shows and assist with the FDA required notifications by light show companies and performers?

VIII. SUMMARY OF STATE GOVERNMENT POLL

The results of the state government telephone poll survey can be summarized as follows:

State laser regulations: Only ten states have a ''comprehensive'' laser regulation. While some of these regulations date back to the 1970's, many states have regulations of very recent vintage that reflect the current classification and control concepts of the FDA/CDRH and/or ANSI Z136 standards.

New regulation activity: Only 12 states indicated that new regulation activity was under way or was contemplated at all in the future. Most states indicated minimal interest which was often followed by a statement that funding levels were simply too low to allow such activities. Also, most state agencies had only ''headline'' knowledge of the laser pointer regulation activity in their state, even in states where new laser pointer regulations were pending or had passed.

Enabling legislation: A total of 24 states had legislation in place that could empower their state agency to become active in laser regulations. Some states were not sure whether it was in place and a few did not even know what the term meant!

Monitoring laser light shows: A total of 27 states responded that some attention was given to the FDA required notifications sent to their offices from laser light show companies. Some indicated they frequently checked the shows while others indicated they rather infrequently checked the shows. This was especially true for those companies for which the state had previously done a background check and where the company had a ''good track record'' for compliance. Several states indicated the forms were routinely filed.

State agency listing: A useful byproduct of the survey and polling was to achieve an up-to-date listing of state agencies that included the name, address, phone and fax numbers and the electronic mail addresses of the individuals in each state that have the laser regulatory mission for that state. This listing has been compiled and is now available on the Internet at the author's website address: http://www.rli.com under the listing of state government contacts. Every effort will be made to keep the listing current.[10] A detailed summary of the state survey and poll is given in Table V.

IX. SUGGESTED STATE REGULATION

One of the documents that has been developed is the so-called ''model state standard,'' developed by the Conference of Radiation Control Program Directors (CRCPD). It is possible that the future state laser regulations may change pending consideration by states of the ''suggested state regulation for lasers'' which is currently being promulgated by the CRCPD. The first ''model state standard'' published document is out of date with current changes in the FDA/CDRH and ANSI Z136 standards and is reportedly undergoing a rewrite at this time.

X. CONCLUSIONS

Action in the states on broad-based laser standards has been rather significant within the past few years with several states recently adopting completely revised standards which include criteria such as defined in the FDA/CDRH and/or ANSI Z136 standards. Most of the revisions occurred in states which previously had active laser regulatory practices. It also appears that several state governments are planning regulatory activity in the next several years provided funding is authorized by their respective state governments. Action will also continue at the state level to introduce laws restricting sale and/or use of laser pointer devices.

Activity is currently significant at the regional and local government level with the introduction of numerous regulations specific to the sale and use of laser pointer devices. Expansion of the list of counties and cities will certainly continue and, in the future, most major metropolitan areas will have codes that limit the sale and use of such laser pointer devices.

[1] Food and Drug Administration: Performance Standard for Laser Products, Center for Devices and Radiological Health, Food and Drug Administration (DHHS), Code of Federal Regulations (CFR), 50, 33682–33702, Tuesday, 20 August 1985.
[2] American National Standards Institute, *American National Standard for the Safe Use of Lasers: ANSI Z-136.1 (1993)*, (Laser Institute of America, Orlando, FL, 1993).
[3] Department of Labor: Guidelines for Laser Safety and Hazard Assessment, OSHA Instructional PUB 8-1.7, Directorate of Technical Publications, 19 August 1991.
[4] *FAA 74002D Outdoor Laser/High Intensity Light Demonstrations* (Federal Aviation Administration, Washington, DC), Chap. 34.
[5] FDA Announcement (P97-45): FDA issues warning on misuse of laser pointers (the Food and Drug Administration is warning parents and school officials about the possibility of eye damage to children from hand-held laser pointers), 18 December 1997.
[6] Student suffers permanent eye damage from laser pointer, eSchoolNews, February 1999.
[7] J. K. Luttrull and J. Hallisey, ''Laser pointer-induced macular injury,'' Am. J. Ophthalmol. **127**, 95–96 (1999).
[8] R. J. Rockwell, Jr., W. J. Ertle, and C. Eugene Moss, ''Safety recommendations for laser pointers,'' J. Laser Appl. **10**, 174–180 (1998).
[9] R. V. Steel, ''Review and forecast of laser markets,'' Laser Focus World, Part II **35**, (1999).
[10] Lasernet: http://www.rli.com