



ASSOCIATION OF  
EQUIPMENT  
MANUFACTURERS

SERVING MANUFACTURERS OF CONSTRUCTION,  
AGRICULTURAL, FORESTRY, MINING AND UTILITY EQUIPMENT,  
AND INDUSTRY-RELATED SERVICE PROVIDERS.

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OCCUPATIONAL SAFETY AND HEALTH  
STANDARDS BOARD

April 21, 2006

Occupational Safety and Health Standards Board  
California Department of Industrial Relations  
2520 Ventura Oaks Way, Suite 350  
Sacramento, CA 95833

RE: Petition to Amend Title 8, Subchapter 4, Article 10, Section 1596 of the  
Construction Safety Orders – Roll-Over Protective Structures (ROPS)

This petition to amend and update the above referenced Construction Safety Order is being submitted by the Association of Equipment Manufacturers (AEM), on behalf of its members who manufacture haulage and earthmoving equipment.

The Association of Equipment Manufacturers, which traces its roots back to 1894, is the North American-based international trade group representing the business interests of companies that manufacture and market equipment, products and services used worldwide in the construction, agricultural, roadbuilding, mining, energy, forestry and utilities fields. The association is headquartered in Milwaukee, Wisconsin, with branch offices in Washington, DC; Ottawa, Canada; and Beijing, China. Of AEM's 700 members, 39 are based in California.

### Summary

AEM's membership identified an inconsistency in the Cal/OSHA regulations with regard to a specific requirement for width of seat belt webbing for off-road equipment. This specific width requirement is inconsistent with current national and international standards. This difference furthermore requires manufacturers to provide unique machine configurations for California and further impacts distributors and end users who must ensure compliance with this regulation for any used equipment obtained from outside of California.

Title 8, Subchapter 4, Article 10, Section 1596, Paragraph (g) (4) [hereafter referred to as "Section 1596"] states that haulage and earth moving machines used in construction, among other things must meet the following requirements: *"The [seatbelt] webbing shall not be less than three (3) inches in width . . . and the breaking strength shall be at least 6,000 pounds."*

In comparison, Subchapter 13, Logging and Sawmill, Article 9 and Subchapter 7 General Industry, Group 4, Article 25, both require that seat belts be in conformance with the Society of Automotive Engineers, SAE J386 standard (46 mm width and 26,700 N (6,000 lbs) breaking strength). Hence the discrepancy between the seat belt webbing width requirements.

The referenced SAE J386 standard is the nationally adopted Society of Automotive Engineers standard which defines the design and performance requirements for the operator restraint system for off-road work machines. This standard is recognized by both the U.S. Occupational Safety and Health Administration and U.S. Mine Safety and Health Administration regulations and is additionally widely referenced as a global requirement.

### **Proposed Action**

In short, the petitioner proposes a revision to Section 1596, Paragraph (g), to expressly require that seat belts subject to the section meet the full requirements of SAE J386, and to delete the detailed requirements of that paragraph, which duplicate those contained in SAE J386. Petitioner attaches as Exhibit "A" a revised Paragraph (g) with additions underlined and deletions lined out. The proposed action would not compromise or reduce the level of safety provided to the operator by the seat belt webbing and installation.

### **Background**

Seat belts were first required on off-road equipment with the introduction of operator protection improvements (ROPS, "roll-over protection") in the 1960's. The seat belt is a critical component for operator protection to ensure the operator is retained in the protected zone in the event of a machine tip or roll. The initial requirements for seat belts were referenced in the Federal Department of Transportation code and were further incorporated into specific performance requirements in SAE J386 introduced in March 1969. This standard has since

undergone regular updates to address design and performance improvements as adopted by the broad-based voluntary standards consensus committee of industry and subject matter experts. It should be noted that since introduction of the original J386 standard in 1969, the webbing strength and width requirements have remained constant.

### **California Requirement Imposes Unique Burden**

In order to meet the requirements of Section 1596, equipment manufacturers are required to design and install a seat belt assembly, which currently differs from all other state, national and international requirements. Additionally, end users are similarly burdened to rework machines not originally equipped for the California requirement. This is often found on rental and used machines as equipment is relocated and traded. This difference imposes considerable industry confusion. Considering the importance of this safety feature, the potential for improper design and retrofit of any belts and associated hardware when reworked by the end user could compromise the intended performance of the seat belt assembly.

Practical considerations should also be taken into account. The 3-inch seat belt assembly requires more space to accommodate the bulkier webbing and the larger retractors when used. This can be a problem with some equipment, especially smaller, compact equipment such as skid steer loaders and compact excavators.

### **Observation**

Section 1596 is a very detailed regulation that addresses numerous characteristics of the seat belt assembly when installed on haulage and earthmoving equipment. By comparison, most of the comparable regulations, including others in the state of California, simply state that seat belts must meet the requirements of SAE J386.

For the benefit of the Occupational Safety and Health Standards Board's review of our petition, we have attached a comparison of the requirements of Section 1596 with the current edition of SAE J386 (SAE J386 – 1997), marked Exhibit "B". It will be noted that in many respects the SAE requirements are more detailed, and in some respects more rigorous. And it should be noted that seat belt assemblies must meet the SAE J386 requirements in order to be distributed in virtually all other construction equipment markets.

**Impact of the Change**

Petitioner offers the following:

First, and most importantly, revising Section 1596 as proposed would not compromise or reduce the level of safety provided to the operator by the seat belt webbing and installation.

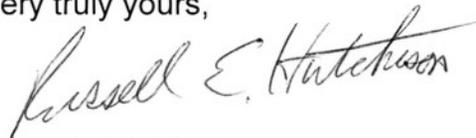
Second, the revision would eliminate a local (California only) machine requirement which complicates the movement of off-road equipment in and out of the state and confuses the marketplace.

Third, the revision would eliminate the need for California equipment dealers and equipment manufacturers to obtain and install 3-inch seat belt assemblies which does not increase the level of safety but does add an incremental cost to the machines affected.

Finally, petitioner would note that numerous advancements such as improved tires, cushioned ride, improved seats and suspensions, and better ergonomics within the operator space have been introduced to enhance operator comfort. With these advancements the 2-inch seat belt is sometimes preferred due to the operator's automotive experience. Given the challenge of ensuring proper seat belt use when operating off-road equipment, we believe that the proposed change also has the potential to help increase seat belt usage.

In closing, we express our appreciation to the California Occupational Safety and Health Standards Board for considering this petition, and we look forward to the opportunity to respond to any inquiries of the Board, the Division of Occupational Safety and Health, or any designated advisory committee.

Very truly yours,



Russell E. Hutchison  
Director, Technical and Safety Services

REH:jn  
Enclosures: Exhibit "A" and "B"

cc: D. J. Drollinger

## Subchapter 4. Construction Safety Orders

### Article 10. Haulage and Earth Moving

#### 1596. Roll-Over Protective Structures (ROPS).

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(g) Seat Belts (i.e., lap belts) and Combination Pelvic/Upper Torso Restraint Systems. Seat belts shall be adequate for the intended service and in good repair. Belts previously approved by the Division and installed prior to January 1, 1971, are acceptable provided they remain serviceable. Belts installed on or after January 1, 1971, shall be labeled as meeting the requirements of the Society of Automotive Engineers (SAE) J386 Operator Restraint System for Off-Road Work Machines standard in effect at the time the belt was manufactured. Where installed, combination pelvic/upper torso (Type 2) restraint systems shall be labeled as meeting the requirements of SAE J2292 AUG97, combination Pelvic/Upper Torso (Type 2) Operator Restraint Systems For Off-Road Work Machines.

Note: For the purpose of subsection (g), the term "upper torso restraint" means a portion of a seat belt assembly intended to restrain movement of the chest and shoulder regions.

~~(1) Adjustment. The seat belts shall be capable of snug adjustment by the employee by a means easily within the employee's reach or shall be provided with an automatic locking or emergency locking retractor.~~

~~(2) Marking. Each seat belt and combination pelvic/upper torso restraint system shall be permanently and legibly marked or labeled with year of manufacture, model or style number and name or trademark of manufacturer or distributor, or of the importer if manufactured outside of the United States.~~

~~(3) Stiffness. To minimize "roping," the seat belt webbing shall be woven and/or treated to produce a stiffness in the transverse direction equal to or greater than that obtained with a weave of double plain with one up, one down binder, without stuffers. This stiffness shall be effective for the usable life of the webbing. The webbing shall be flexible in the longitudinal direction to permit adjustment to -40°F.~~

~~(4) Material. The seat belt webbing material shall have a resistance to acids, alkalis, mildew, aging, moisture and sunlight equal to or better than that of untreated polyester fiber. The webbing shall not be less than three (3) inches in width; its ends shall be protected or treated to prevent unravelling and the breaking strength shall be at least 6,000 pounds.~~

NOTE: For seat belt requirements for agricultural and industrial tractors, see Section 3653, General Industry Safety Orders.

~~(5) Release. The seat belt buckle shall be designed so that it can be easily released with a single motion. It shall also be capable of being released with either available mittened hand.~~

~~(6) Closure. The seat belt buckle shall be designed so that it can be easily closed with mittened hands.~~

~~(7) Location. When a two-piece belt is used, the adjustment means shall be on each half of the belt to allow for the centering of the buckle on the operator.~~

Proposed Changes to Subchapter 4 Article 10 Haulage and Earth Moving Seat Belt Requirements

~~(8) Operation. Each adjustment shall be capable of being made with the use of one mittened hand.~~

~~(9) Tests. A typical complete seat belt assembly, including webbing, straps, buckles, adjustment and attachment hardware, and retractors, shall be capable of passing the following destructive tests:~~

~~(A) The assembly loop shall withstand, without failure, a force of not less than 5,000 pounds and each structural component of the assembly a force of not less than 2,500 pounds.~~

~~(B) The length of the assembly loop between anchorages shall not increase more than 14 inches and each half of the assembly loop shall not increase more than 7 inches when subjected to a force of 5,000 pounds.~~

~~(C) Any webbing cut by the hardware during testing shall have a breaking strength at the cut of not less than 4,200 pounds.~~

| <b>Seat Belt Requirement Comparisons</b>  |  |   |
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| <b>California Code of Regulations, Title 8, Section 1596. Roll-Over Protective Structures (ROPS). Abstract: OSHA. Subchapter 4. Construction Safety Orders Article 10. Haulage and Earth Moving.</b>  | <b>Current SAE J386 - Operator Restraint System for Off-Road Work Machines</b>   | <b>Comment</b>  |
| California ( Seat Belts (i.e., lap belts) and Combination Pelvic/Upper Torso Restraint Systems. Seat belts shall be adequate for the intended service and in good repair. Belts previously approved by the Division and installed prior to January 1, 1971, are acceptable provided they remain serviceable. Belts installed on or after January 1, 1971, shall be labeled as meeting the requirements of the Society of Automotive Engineers (SAE) standard in effect at the time the belt was manufactured. Where installed, combination pelvic/upper torso (Type 2) restraint systems shall be labeled as meeting the requirements of SAE J2292 AUG97, combination Pelvic/Upper Torso (Type 2) Operator Restraint Systems For Off-Road Work Machines. Note: For the purpose of subsection (g), the term "upper torso restraint" means a portion of a seat belt assembly intended to restrain movement of the chest and shoulder regions. |  | Added text to specifically reference current SAE J386 Operator Restraint System for Off-Road Work Machines. The proposed reference of SAE J386 to this regulation is consistent with the requirements by SAE J2292, Pelvic/Upper Torso (Type 2) Operator Restraint Systems For Off-Road Work Machines |
| (g) (1) Adjustment. The seat belts shall be capable of snug adjustment by the employee by a means easily within the employee's reach or shall be provided with an automatic locking or emergency locking retractor.   | 4.1.3 ADJUSTMENT—The seat belt shall be self-adjusting or readily adjustable by a means within easy reach of the occupant. In all operating positions, adjustment to a snug condition shall at least accommodate the 5th percentile United States female through the 95th percentile United States winter-clothed male, reference SAE J833. To meet the previous requirements, overall length of belt may vary depending upon anchorage locations. | This requirement satisfied by SAE J386  |
| (g) (2) Marking. Each seat belt and combination pelvic/upper torso restraint system shall be permanently and legibly marked or labeled with year of manufacture, model or style number and name or trademark of manufacturer or distributor, or of the importer if manufactured outside of the United States.   | 4.1.6 MARKING (LABELING)—Each seat belt assembly and/or each section of belt assembly shall be permanently and legibly labeled with year of manufacture, model or style number, and name or trademark of manufacturer or importer, and shall state compliance with SAE J386.   | This requirement satisfied by SAE J386  |
| (g) (3) Stiffness. To minimize "roping," the seat belt webbing shall be woven and/or treated to produce a stiffness in the transverse direction equal to or greater than that obtained with a weave of double plain with one up, one down binder, without stuffers. This stiffness shall be effective for the usable life of the webbing. The webbing shall be flexible in the longitudinal direction to permit adjustment to -40°F.  | 4.2.2 STIFFNESS—To minimize roping, the strap material shall be woven and/or treated to produce stiffness in the transverse direction. The stiffness shall be effective for the usable life of the strap. The strap shall be flexible in the longitudinal direction to permit adjustment at -40 °C.  | This requirement satisfied by SAE J386  |
| (g) (4) Material. The seat belt webbing material shall have a resistance to acids, alkalis, mildew, aging, moisture and sunlight equal to or better than that of untreated polyester fiber.   | 4.2.1 MATERIAL—The strap material shall have a resistance to mild acids, alkalies, mildew, aging, moisture, and sunlight equal to or better than that of untreated polyester yarn.   | This requirement satisfied by SAE J386  |

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| NOTE: For seat belt requirements for agricultural and industrial tractors, see Section 3653, General Industry Safety Orders.  |  | No Change, retain note in CAL-OSHA regulatnon   |
| The webbing shall not be less than three (3) inches in width;   | 4.2.4 WIDTH—The strap material shall not be less than 46 mm (1.8 inches) in width when measured under a no-force condition.  | Both CAL-OSHA and SAE J386 performance criteria satisfied by 46mm width webbing. The 3" requirement is unique for Cal-OSHA Construction-Haulage and earth moving. |
| its ends shall be protected or treated to prevent unravelling   | 4.2.5 ENDS—The ends shall be protected or treated to prevent unraveling, and shall not pull out of the adjustment hardware at maximum size adjustment.   | This requirement satisfied by SAE J386  |
| and the breaking strength shall be at least 6,000 pounds.   | 4.2.6 STRENGTH—Condition three specimens for at least 24 h in an atmosphere having a relative humidity between 48 and 67% and a temperature of 23 °C ± 2 °C. After conditioning, the new material shall have a tensile breaking strength of not less than 26 700 N (6 002 pounds). The testing machine shall be verified to have an error of not more than 1% in the range of the tensile strength of the strap material (reference ASTM E 4-89). The distance between centers of the grips of the machine at the start of the test shall be between 100 and 250 mm. After placing the specimen in the grips, the strap material shall be stretched continuously at a uniform rate to failure. The rate of grip separation shall be 50 to 100 mm/min. Each failure force value shall be not less than the 26 700 N (6 002 pounds) tensile breaking strength requirement. | This requirement satisfied by SAE J386  |
| (g) (5) Release. The seat belt buckle shall be designed so that it can be easily released with a single motion. It shall also be capable of being released with either available mittened hand. | 4.1.2 RELEASE—The seat belt assembly shall be provided with a buckle or latch readily accessible to the occupant, and designed to provide easy and rapid release of the assembly with a single motion. It shall also be capable of being released with either hand, bare or mittened. The buckle shall be designed to minimize the possibility of accidental release due to operator movement, inertia, or external forces. The buckle shall meet all the requirements described in 4.3.   | This requirement satisfied by SAE J386  |
| (g) (6) Closure. The seat belt buckle shall be designed so that it can be easily closed with mittened hands.  |  | Current buckle mechanisms meet this requirement.  |

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| (g) (7)     | Location. When a two-piece belt is used, the adjustment means shall be on each half of the belt to allow for the centering of the buckle on the operator.   |  | Not included in current SAE J386. However, it is current industry practice for 2 pc belts. Not applicable for belt with retractor. |
| (g) (8)     | Operation. Each adjustment shall be capable of being made with the use of one mittened hand.  |  | Not included in current SAE J386. However, it is current industry practice for 2 pc belts. Not applicable for belt with retractor. |
| (g) (9)     | Tests. A typical complete seat belt assembly, including webbing, straps, buckles, adjustment and attachment hardware, and retractors, shall be capable of passing the following destructive tests:            |  |  |
| (g) (9) (A) | The assembly loop shall withstand, without failure, a force of not less than 5,000 pounds   | 4.1.5 BREAKING STRENGTH—The complete seat belt assembly shall withstand a loop force of not less than 22 200 N (4 990 pounds) applied at the center of the loop by a loop force testing machine.   | This requirement satisfied by SAE J386   |
|             |   | 4.4.3.3 STRENGTH   |  |
|             | and each structural component of the assembly a force of not less than 2,500 pounds.  | a. Attaching (Mounting) Bolts—Attaching (mounting) bolts shall withstand a force of 22 200 N when tested in accordance with SAE J140.  | SAE J386 requirement for 5,000 lbs exceeds Cal-OSHA requirement  |
|             |   | b. End Fittings (Mounting Brackets)—End fittings (mounting brackets) shall withstand a loop force of 22 200 N (4 990 pounds) when tested on equipment similar to that shown in Figure 3. During the test, the attaching bolts shall be parallel to or at an angle of 45 or 90 degrees to the strap material, whichever results in an angle nearest to 90 degrees between the strap material and the end fitting. Exception: Eye bolts shall be mounted vertically. | This requirement satisfied by SAE J386   |
| (g) (9) (B) | The length of the assembly loop between anchorages shall not increase more than 14 inches and each half of the assembly loop shall not increase more than 7 inches when subjected to a force of 5,000 pounds. | 4.2.7 ELONGATION—Elongation shall not exceed 20% at 11 100 N (2 495 pounds) when measured during the test for strap material breaking strength as in 4.2.6.  | Elongation requirement specified by SAE J386 is accepted industry practice   |

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| <p>(g) (9) (C) Any webbing cut by the hardware during testing shall have a breaking strength at the cut of not less than 4,200 pounds.</p> | <p>4.2.8 ABRASION—The strap material from three seat belt assemblies shall be tested for resistance to abrasion by rubbing over the hexagon bar prescribed in Figure 4 in the following manner. The strap material shall be mounted in apparatus shown schematically in Figure 4. One end of the strap material, A, shall be attached to a weight, B, which has a mass of 2.3 kg ± 0.05 kg. The strap material shall be passed over the new abrading edges of the hexagon bar, C, and the other end attached to an oscillating drum, D, which has a stroke of 330 mm. Suitable guides shall be used to prevent movement of the strap material along the axis of the hexagonal bar, C. The drum shall be oscillated for 5000 strokes (2500 cycles) at a rate of 60 strokes ± 2 strokes (30 cycles ± 1 cycle) per minute. The abraded strap material shall be conditioned and tested for breaking strength as described in 4.2.6. The median value for the breaking strength determined on abraded specimens shall be not less than 20 000 N (4 496 pounds) tensile strength.</p> | <p>SAE J386 requirements for abrasion performance more specific than Cal-OSHA standard and provides consistent test criteria</p> |
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