

**DEPARTMENT OF TRANSPORTATION****National Highway Traffic Safety Administration****49 CFR Part 571**

[Docket No. 96-095; Notice 3]

RIN 2127-AG50

**Federal Motor Vehicle Safety Standards; Child Restraint Systems; Tether Anchorages for Child Restraint Systems; Child Restraint Anchorage System**

**AGENCY:** National Highway Traffic Safety Administration (NHTSA), Department of Transportation.

**ACTION:** Notice of proposed rulemaking (NPRM); request for comment.

**SUMMARY:** This document proposes to require that motor vehicles and add-on child restraints be equipped with a means independent of vehicle safety belts for securing the child restraints to vehicle seats. The adoption of the proposal would avoid problems of incompatibility between child restraints and vehicle safety belts and increase the correct installation of child restraints. This proposal would reduce allowable head excursion, which would have the effect of requiring child restraints to be equipped with an upper tether strap, and would require vehicles to have two factory-installed, user-ready anchor points for attaching the tether. It would also require vehicles to have two rear vehicle seating positions equipped with a specialized lower anchorage system, and require child restraints to be equipped with means of attaching to that system.

The proposal for the lower anchorages is based on two of the systems discussed at an October 1996 NHTSA public workshop concerning alternative systems for providing dedicated means for attaching child restraints to vehicle seats. Almost all of the different systems evaluated and discussed at the workshop appeared comparable in terms of demonstrated safety and public acceptance. However, one system appeared to be less expensive and have the advantage of using hardware familiar to consumers. This system is the "uniform child restraint anchorages (UCRA) system," referred to as such by a consortium of manufacturing groups in a June 28, 1996 petition for rulemaking to the agency. The International Standards Organization (ISO) Working Group on child restraint systems recognized in a November 1996 meeting the need for this system to permit improvements in the short term.

The other notable dedicated system is one supported by European members of the ISO Working Group. This alternative, which is completing development, uses a two-prong nonflexible item of hardware on the child restraint to mate with two fixed anchorages at the bottom of the back of the vehicle seat without the use of any belt webbing. Under today's proposal, either of these systems could meet the proposed requirement for a dedicated lower anchorage system, but manufacturers installing the fixed anchorage system would also have to ensure that the system is compatible with the UCRA system, so that UCRA-type child restraints can be used in all vehicles equipped with either anchorage system.

To the extent possible, this proposal also harmonizes with the actions of other regulatory agencies around the world. This proposal seeks to harmonize with Canadian and Australian regulations by requiring an upper tether anchorage and with prospective European regulations by allowing a non-UCRA anchorage system.

This proposal pertains to the compatibility of child restraints with motor vehicle seats, and not that of child restraints with aircraft seats. The Federal Aviation Administration and NHTSA are developing possible requirements and procedures for improving the compatibility of child restraints in aircraft. If the agencies decide that rulemaking is warranted on that issue, such rulemaking will be commenced as a separate action.

**DATES:** Comments on this notice must be received by the agency no later than May 21, 1997.

**ADDRESSES:** Comments should refer to the docket number and notice number and be submitted in writing to NHTSA's Docket Section at the following address: Until March 10, 1997: Room 6130, After March 10, 1997: Room 5109, 400 Seventh Street, S.W., Washington, D.C., 20590. Telephone: (202) 366-5267. Docket hours are 9:30 a.m. to 4:00 p.m. Monday through Friday.

**FOR FURTHER INFORMATION CONTACT:** At NHTSA, for nonlegal issues: Dr. George Mouchahoir, Office of Vehicle Safety Standards (telephone 202-366-4919). For legal issues: Deirdre Fujita, Office of the Chief Counsel (202-366-2992). Both can be reached at the National Highway Traffic Safety Administration, 400 Seventh St., S.W., Washington, D.C., 20590.

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## I. Statement of the Problem

The effective use of child restraints is important because of the number of children killed and injured in vehicle accidents. Annually, about 600 children less than five years of age are killed and over 70,000 are injured as occupants in motor vehicle crashes. Data from the National Center for Health Statistics (for 1991) indicates that motor vehicle

occupant fatalities were the third leading cause of death for this age group (NCHS, 1993).

While child seats are highly effective in reducing the likelihood of death or serious injury in motor vehicle crashes, the degree of their effectiveness depends on how they are installed. NHTSA estimates that the potential effectiveness of child seats, when correctly used, is 71 percent. However, it is estimated that imperfect securing of children in the child seats and/or of the child seats in vehicles reduce that effectiveness from the potential 71 percent to an actual 59 percent. That is, as a group, child seats (those that were used correctly together with those that were misused) have an actual effectiveness of 59 percent.

Child restraint effectiveness is reduced by limitations imposed by vehicle belt design, and by belt anchorage locations. Child seats are generally designed to attach to a vehicle by means of the vehicle's lap belt system. While child seats provide high levels of safety when correctly attached to a standard vehicle seat assembly with only a lap belt, in most vehicles different types of seat belt systems exist in addition to or in lieu of a lap belt. Among the different types are belt systems with a locking latchplate, a non-locking (sliding) latchplate, a reversible lockable retractor, an emergency-locking retractor, or an automatic seat belt. Some of these belt systems, such as those equipped with a locking retractor, are able to hold a child seat without use of attachment accessories, but a parent must correctly manipulate the system, such as by pulling the belt completely out of the retractor and then feeding excess slack back into it after buckling in the child seat. Some belt systems can be used to secure a child seat only when used with an accessory item that impedes movement of the belt or child seat in a crash, such as a locking clip or supplemental strap. Some belt systems, such as an automatic seat belt, may not be compatible with a child seat at all.

The agency recognizes the difficulty of designing vehicle seat belts to restrain both child restraint systems and a wide range of weights and sizes of individuals. Some vehicle seats have the seat belt anchorage positioned far forward of the vehicle "seat bight" (the intersection of the seat cushion and the seat back). Forward-mounted anchor points may better protect an adult using the vehicle seat belt system by drawing the vehicle belt low across the pelvis where the body can best tolerate the forces in a crash. However, when used with a child seat, the belt anchor is so far forward of the seat bight that the

vehicle belts cannot initially provide any resistance to the forward, longitudinal motion of a child seat reacting to a decelerating crash pulse. The child restraint moves forward until it is sufficiently far forward of the belt anchorages that the belt finally can resist the forward, longitudinal motion of the child seat. This forward movement of the child restraint can result in excessive forward movement of the child's head, and a greater likelihood of head impact.

Child restraint effectiveness is also reduced by incorrect securing of children and child restraints due to the complexities of adapting vehicle belts to those purposes and due to failure to follow instructions. To properly install child restraints, devices such as lockable retractors, locking clips, and supplemental belts must be used in many cases. Unfortunately, it appears that many people installing a child seat are either unfamiliar with the use of these devices (which generally are not used or needed except in conjunction with a child restraint), not able to understand or unwilling to read instructions concerning their proper use, or unable to surmise from their design how to use them correctly. People generally are frustrated about the difficulty in installing child seats correctly in vehicle seats. Recent user trials conducted in the U.S.<sup>1</sup> and Canada<sup>2</sup> found that virtually all the people surveyed in the studies expressed high levels of dissatisfaction with conventional means of attaching child restraints in vehicles. NHTSA receives an average of about 50 calls a day to its Consumer Complaint Hotline from people asking for step-by-step guidance in installing their child seats. When an article appears in the media about incompatibility problems between child restraints and vehicle seats, those calls typically increase to over 500 a day. All of these callers express frustration at the difficulty of installing a child seat securely, and all urge NHTSA to make the installation easier. NHTSA understands that child restraint manufacturers also receive a large number of similar calls and asks that commenters verify this.

A four-state study done for NHTSA in 1996 examined people who use child restraint systems and found that approximately 80 percent of the persons made at least one significant error in

using the systems. ("Patterns of Misuse of Child Safety Seats," DOT HS 808 440, January 1996.) Observed misuse due to a locking clip being incorrectly used or not used when necessary was 72 percent, and misuse due to the vehicle safety belt incorrectly used with a child seat (unbuckled, disconnected, misrouted, or untightened) or used with a child too small to fit the belts was 17 percent.

## II. Improved Anchorage System

### a. Standardized System

The difficulty with using vehicle safety belts to attach child restraints arises from the fact that those belts are primarily designed to restrain and protect larger and older vehicle occupants. Given the inability to change vehicle belt design and anchorage location because of this purpose, the agency is seeking a means of securing a child restraint that is independent of the safety belt. For a number of years, industry groups and governmental bodies have explored improving the securement of a child seat on a vehicle seat. The child seat and motor vehicle industry is unanimous that the means of attaching child restraints to the vehicle interior should be easier, more efficient and without incompatibility problems. Further, all agree that there should be a universal and independent means of attaching child restraints. That is, there should be means that are either identical or at least compatible, regardless of vehicle make or model, and that are dedicated solely for use in securing child restraints. The importance of universality across vehicle make or model also compels a universal requirement for the anchorage system, and would mitigate against having the system be available on an optional basis.

The concept of a universal and independent anchorage system was embraced by the "Blue Ribbon Panel on Child Restraint and Vehicle Compatibility," which NHTSA Administrator Ricardo Martinez, M.D., formed in February 1995 to improve the use and attachment of child safety seats.<sup>3</sup> In its May 30, 1995 report recommending ways to improve the compatibility between child restraints

<sup>1</sup> "An Evaluation of the Usability of Two Types of Universal Child Restraint Seat Attachment Systems," General Motors Corporation, 1996.

<sup>2</sup> "The ICBC Child Restraint User Trials," Rona Kinetics and Associates Ltd. Report R96-04, prepared for the Insurance Corporation of British Columbia, December 1996.

<sup>3</sup> The Blue Ribbon Panel included child safety advocates and representatives of the motor vehicle, child safety seat and seat belt industries, including representatives from Ford, Chrysler, General Motors, Mercedes Benz, Volkswagen, BMW, Volvo, Nissan, Toyota, Honda, Century, Gerry, Fisher-Price, Cosco, Evenflo, Kolcraft, Riley Hospital, DANA Foundation, American Academy of Pediatrics, University of Michigan, TRW, and Takata, and advocates Stephanie Tombrello and Annemarie Shelness.

and vehicle seating positions, the panel recommended that there be an entirely separate anchorage system for child restraint installation, given the complex variables affecting the proper installation of child restraints using existing vehicle safety belts.

While there is universal agreement on the need to improve the ease with which child seats can be properly secured to vehicle seats and concurrence with the merits of a separate anchorage system, there is disagreement on which system is best. It is assumed that a "universal" anchorage system must standardize the means of attachment, so that it and it alone would be required for all affected vehicles, and it alone would be the system with which child seats would be required to be compatible. This is needed to ensure universal compatibility between child seats and vehicles.

#### *b. Competing Concepts*

In 1990, the ISO began work on a universal child seat anchorage system ("ISOFIX"). The ISOFIX concept originated as a 4-point rigid system, where four sturdy braces are mounted on the bottom of a child restraint. Each brace has a latch at its end. Two of the latches connect, through holes at the vehicle seat bight, to a metal bar in the seat frame. The other two latches, at the bottom braces, connect to a bar below the vehicle seat cushion. The ISOFIX system is supported by Volvo, as well as others.

Other concepts for universal anchorage systems have developed as alternatives to the 4-point ISO system, many in response to perceived problems with the ISOFIX system, such as ISOFIX being too rigid, too susceptible to false latching, too bulky, unreasonably expensive, and too heavy.

Transport Canada developed the CANFIX system, which consists of two rigid rear anchorages at the seat bight (rather than the four points of ISOFIX), plus an upper tether. This system envisions all vehicles to be equipped with upper tether anchorage locations. CANFIX is supported by Australia, which refers to the system as CAUSFIX. At this time, neither Canada nor Australia requires the CANFIX or CAUSFIX but both are interested in pursuing such a requirement in the near-term. It is noted, however, that Transport Canada has stated that in lieu of rigid lower anchorage points, it could support soft anchorages such as those of the "UCRA" system described below, in addition to an upper tether.

General Motors (GM) helped develop a "uniform child restraint anchorage

(UCRA)" system consisting of two lower anchorages near the bight line and an upper tether anchorage. The lower anchorages have small latches that are compatible with easy-to-use buckles (as well as tether hooks) that would be installed on the child seat. The top tether anchorage would have a buckle or tether hook that is compatible with a tether and latch or hook on the child seat.

GM joined with thirteen other vehicle and child restraint manufacturers in petitioning NHTSA to require the UCRA system on vehicles and componentry compatible with the anchor system on child seats. The joint petitioners are: the American Automobile Manufacturers Association (AAMA), which includes General Motors, Chrysler, and Ford; five companies of the Association of International Automobile Manufacturers (AIAM) (Honda, Isuzu, Nissan, Subaru, and Toyota); the Juvenile Products Manufacturer's Association (JPMA), which includes child restraint manufacturers Century, Evenflo, Fisher-Price, Gerry and Kolcraft; and Indiana Mills and Manufacturing, a supplier of belt systems and hardware.

As another alternative to the ISOFIX 4-point rigid system, several European ISO manufacturer members are currently developing a hybrid system. The system consists of two lower anchorage points located in the seat bight and an upper tether anchorage point located behind the vehicle seat back. A child restraint system could be attached to the two lower anchorage points by means of either a buckle (such as the UCRA buckle) or the ISOFIX connector. The object of this option is to achieve worldwide compatibility between the UCRA and ISOFIX types of connectors.

The four systems described above are the four options, known as "Schemes" A through D, that the ISO has been considering for the past year. The four-point rigid anchor system (ISOFIX) is known as Scheme A; the two-point rigid anchor and rigid attachment, plus tether, is Scheme B; the two-point flexible anchor and flexible attachment, plus tether, is Scheme C; and the two-point rigid or semi-rigid anchor and flexible attachment is Scheme D.

Another approach for a universal anchorage system was advanced by Cosco, a child restraint manufacturer. Cosco suggested in a July 1, 1996 petition for rulemaking to NHTSA that vehicle manufacturers alone should be responsible for improving compatibility between child seats and vehicle seats and the ease of installation of child seats. Cosco believed that vehicles should provide a dedicated Type I lap

belt for child seats, at or rear of the vehicle seat bight. Cosco calls its system the "Car Seat Only (CSO)" system. Cosco envisions that the CSO system would require no changes in the design and manufacture of child restraints.

#### **III. Public Workshop**

The relative merit of each of the systems was discussed at a public workshop NHTSA held on October 16 and 17, 1996 in Washington, D.C. Attending were about 100 persons from the U.S., Canada, Europe, Japan and Australia, representing governments and manufacturers of motor vehicles and child restraints, as well child safety advocates.<sup>4</sup>

NHTSA held this two-day meeting to discuss the various alternatives of universal child restraint anchorage systems that are being considered by the agency, safety advocates, and automotive and child safety organizations, such as the Society of Automotive Engineers (SAE) and the ISO. The five options described above were presented and discussed as to design characteristics, safety performance, public acceptance and economic considerations. The meeting focused on bringing to discussion the characteristics of the various alternatives and not necessarily on reaching a consensus on a system. Participants had the opportunity to experiment with the UCRA and hybrid systems in actual vehicles that were provided by their respective manufacturers.

#### *a. Summary of Presentations*

The following discussion summarizes the remarks of each presenter.

##### **1. ISOFIX 4-point Rigid Systems**

Thomas Turbell (Sweden), presenting on Scheme A (ISOFIX), reviewed the ISO work of the last six years on the 4-point system. He said that the first ideas on an anchorage system envisioned a fixation point in the vehicle where forward-facing child seats and rear-facing seats could be installed. The ISOFIX type 1 system (two rigid points), the ISOFIX Type 2 system ("DELTAFIX," two rigid points and one point in the front) were compared in an early user trial with the conventional Swedish child restraint system (installation by the seatbelt and by two lower tethers attached to the seat frame). Eighty percent of the users installed the

<sup>4</sup>A transcript of the meeting has been placed in NHTSA Docket No. 96-095, Notice 01, and is available from Neal R. Gross, Court Reporters and Transcribers, 1323 Rhode Island Avenue, N.W., Washington, D.C., 20005 (telephone 202-234-4433).

ISOFIX type 1 system correctly the first time, 60 percent the DELTAFIX, and only 30 percent the conventional system. Eighty-nine percent of the subjects indicated that they wanted the new ISOFIX type 1 system. Ninety percent were willing to pay a 50 percent increase over a normal price of a child seat at that time.

Work on the system continued in subsequent meetings of the ISO group in Stockholm in 1993, and Munich, where a list of features considered essential for the system was developed. For example, "misuse should be almost impossible, the cushion of the car seat should have no influence on the system, and \* \* \* the performance should be better than the present systems." A "UNIFIX" proposed by the UK was later changed to the UNIFIX-2 four-point, and in 1993 in San Antonio, the ISO group decided that this was the system to develop. In 1993, the group had its first draft ISO standard on the system, and in 1994 it had a sixth draft completed.

In London in 1995, the ISO group split the draft standard into three parts because there were problems with certain aspects of it. The Blue Ribbon Panel indicated a positive regard for the ISOFIX system, and the group received a resolution from the European Parliament pushing them to introduce the ISOFIX as soon as possible.

In San Diego in 1995, General Motors presented its ideas on the UCRA and the Blue Ribbon Panel modified its earlier support for ISOFIX. In subsequent meetings in Cologne and London in 1996, GM presented its findings on its user clinic, and the Hybrid system was presented. Since then, a consumer clinic has been conducted on the different ISO schemes and a working group meeting has been held in Albuquerque.

After reviewing the history of the development of the ISOFIX, Mr. Turbell noted concerns to consider. He believed that the anchorage system should be unrestricted by design patents.

"[Patents] will probably stop [an internationally] standardized system." He noted a concern about small cars being able to fit anchorage systems in a small rear seat, stating "[W]e can't let the available space in the smallest rear seat decide the size of the child restraints." He also stated his belief that rigid systems might have an advantage over other systems with regard to the ease with which an air bag switch-off device can be incorporated.

## 2. CANFIX 2-Point Rigid System

France Legault (Transport Canada), presenting Scheme B (CANFIX) (the system is also known as CAUSFIX in Australia), explained that Canada varied

from the four-point ISOFIX system because of Canada's high regard for tethers on child seats and tether anchorages in vehicles. Canada requires anchorages in passenger cars, and will soon introduce a regulation extending the requirement to trucks, multipurpose passenger vehicles, and sport utility vehicles.

Ms. Legault stated that CANFIX has one flexible top tether anchored to the body of the vehicle, and two lower rigid points based on the ISOFIX system. CANFIX has the possibility to include improved tether installation with better adjustability, e.g., in a reel or ratchet mechanism. It also has the possibility of a tether interlock, which would prevent the entire system from being installed if one of the points is not attached, and the possibility of an air bag switch-off. She said that before CANFIX was presented to the ISO group in 1995, Canada conducted sled testing and found that performance of the system was slightly improved over a conventional type of child restraint system. In that work, Canada also was able to design and build a device to test anchorages in a vehicle by pulling on them.

Canada's position on a universal child restraint anchorage system is that while it has sponsored the two-point rigid system, Canada is also open to the idea of soft anchors at the bottom "depending on usability and cost. \* \* \*" However, Canada definitely supports a tether. Ms. Legault indicated that Canada will retain its head excursion and chest acceleration criteria, which have the effect of requiring a tether, because of the perceived safety benefits of a tether. Canada will be improving its tether regulation to require factory installation of the actual hardware for the anchorage. Currently, Canada requires only a hole or a threaded hole, and the consumer has to obtain and install the bolt and latchplate.

Canada believes harmonization is an important consideration in developing a universal child restraint anchorage system. Cost is important, and well as useability. Ms. Legault said that a positive engagement feature (e.g., a click or other indication on an engaged attachment) would be important for usability. She is concerned about a "transition period," where new and old vehicles and child seats could be intermixed. New child restraints equipped with components for an anchorage system must be capable of use with older vehicles lacking a system. Ms. Legault said that testing with a CANFIX prototype showed that, in about 85 percent of its vehicles

(lacking receptors for the rigid points), the prongs would go in between the seat cushion and seat back, so that the seat belt could still be used to attach the child seat.

Canada is in the process of testing the CANFIX and several conventional restraints to make sure that the tether will provide additional protection, not just when it is properly used but also when it is used with varying amounts of slack. Canada will be testing high-mounted tethers and low-mounted tethers. Early test results show that a tether improves performance in head and chest acceleration and head excursion, even if the tether is loose. A tether also reduces neck forces and moments.

Canada conducted surveys to determine the use rate of tethers. In a 1992 survey of owners of vehicles that provided no tether anchorage, about 25 percent installed the anchorage and used it. Of vehicles that had standard anchorages, tether use doubled. In addition, new data from the Province of Quebec show that its tether use increased from 47 percent to 65 percent after vehicles became equipped with a tether anchor, even when motorists had to take the extra step of installing the tether anchorage hardware.

## 3. UCRA Soft Anchor System

David Campbell (Century Products), Kazuhiko Miyadara (Toyota), and Jack Havelin (GM), presented Scheme C (UCRA) and the petition for rulemaking on the UCRA. Mr. Campbell stated that the key objectives of its work on a uniform child restraint anchorage system are "to find a single world-wide system, to address the issue of compatibility and misuse, while improving dynamic performance of current restraints." He stated that the system should be independent of the adult seat belt system so that manufacturers can have the flexibility to optimize the performance of the anchorage system for child restraints and allow the adult seat belt system to be optimized for the other occupants in the vehicle. Mr. Campbell stated that child restraint manufacturers believe that the UCRA system is the best system because the buckle and latch plate system is intuitive:

They are the type of systems that are currently available in vehicles \* \* \*. Secondly, it will minimize misuse. You won't have the routing issues that we have through current child restraints today with the vehicle lap belts because they are attached and you know how to use it.

The UCRA also is designed so that current child restraints can be easily adapted to use it. This could be done by

means of a special belt provided by restraint manufacturers. The belt would have buckles on both ends to use with the UCRA latchplates, and would route through the current belt path used today.

Mr. Campbell said that the manufacturing costs of the UCRA are lower than those for some of the other systems. There also is less added weight. He agreed with most of NHTSA's estimates about the weight increases of the various systems, but believed the UCRA would add only about 1 to 1.6 pounds (lb), rather than NHTSA's estimate of 4.5 lb. He stated that it would take less leadtime to begin implementing a UCRA requirement as opposed to the alternative systems, because the UCRA uses "existing technology—known systems, known belts, known buckles, known latch plates." Expanding on the cost issue, the presenter stated that current child restraints cost and sell at retail between \$35.00 and \$90.00 in the U.S.:

Our market price is very sensitive, and one of the objectives we have is to increase the usage rate and not have a negative effect on the current usage rate. Soft anchors are predicted to add something in the order of magnitude of \$20.00 to the cost of a child restraint. The Canadian CANFIX, the estimates were about \$55.00 at retail, and for the ISOFIX it was \$95.00. \* \* \* Car seat loaner programs could be affected by this.

Mr. Campbell also stated that the UCRA systems meets Standard 213's performance criteria without attaching the tether. Tethered, it meets Canada's requirements. He stated that use of the tether does significantly reduce head and knee excursions, but there is some trade off in chest accelerations and HIC values, and the use of the tether in a higher position can help reduce that HIC.

Mr. Miyadara discussed past and current work evaluating usability, safety and cost issues for a two-point rigid system, a two-point soft system and current child restraint systems.

A past study evaluated usability in a customer preference clinic of current, past and future users. No significant difference was found between the two-point hard and the two-point soft system. Safety was assessed in dynamic testing. Some differences in HIC and chest G values were found, but the actual effect that those differences could have on a child occupant were unknown. The presenter expected, though, that safety could be somewhat improved with regard to chest Gs. The presenter said that one of Toyota's biggest concerns with both a two-point rigid and a two-point soft system is with

potential "loose fit" of a child restraint on a vehicle anchorage system.

A study of vehicle and child seat cost impacts indicated that a two-point soft system should be much more acceptable to the customer.

Mr. Miyadara discussed current work on addressing the "loose fit" issue. Toyota has been jointly developing a device that could be used with a soft system to avoid the problem of consumers installing a child seat so that its fit is too loose. Toyota is evaluating a strap type device with belt adjuster, strap type with A-lock, lever-type and ratchet type. Toyota believes that it can work out the loose fit issue for a soft system in the near future.

Toyota's future work includes a customer preference clinic on the Schemes A through C systems, and dynamic testing.

Mr. Miyadara concluded by stating that Toyota's goals in joining in the AAMA et al. petition is to achieve international harmonization and provide increased safety to children by eliminating or decreasing misuse and improving crash performance, at a cost acceptable to the consumer. Further, to address the problems of incompatibility as soon as possible, the system should be implemented quickly. Mr. Miyadara said Toyota does not believe there is any reason to select the two-point rigid system over the two-point soft system. He also suggested that NHTSA consider conducting a customer preference clinic of its own.

Mr. Havelin addressed what he believed to be confusion about GM's position on a universal anchorage system. He said that GM supports an internationally harmonized requirement. Mr. Havelin stated that GM believes that an anchorage system should, foremost, increase child restraint use rates (citing the statistic that three out of four of the fatally injured children in the U.S. under the age of five are not using a child restraint), and secondly, reduce the potential for misuse and improve crash protection. GM suggested that NHTSA "establish the template" for international harmonization by issuing an NPRM based on three principles. "First, what does our common customer want, that is, the child seat manufacturer's customer as well as the vehicle manufacturer's customer. We think the results of customer clinics need to be tempered to some degree by sound benefit/cost analysis \* \* \* And finally, that template should be based on valid science. \* \* \* [S]ome [consumer clinics and cost analyses] are better than others and we need to be

focused on which ones are valid and which ones are not."

Mr. Havelin said that GM believes consumers prefer the UCRA system because the dual straps on the child seats use familiar anchorage hardware, and provide an intuitive, secure installation. Also, the tether is obvious and provides a secure anchorage. All three of the strap anchors give a positive indication when correctly attached. He said that other reasons the UCRA is preferred is that the child seat would be light and compact, and without any threatening surfaces (e.g., rigid prongs) associated with it. GM believes that the UCRA is within the acceptable cost range for consumers.

The presenter also highlighted other perceived benefits of the UCRA, such as that it need not be tethered to meet Standard 213's performance requirements, can be retrofitted into existing vehicles, incorporates what GM considers to be "fully developed and field-proven hardware, and can be implemented faster than the other attachment systems."

#### 4. European Industry Hybrid System

Klaus Werkmeister (Germany), presenting Scheme D, provided some historical background on the development of a universal child restraint anchorage system. He believed that interest in a worldwide universal system started in the late 1980's to address a high rate of severe accidents where children were killed or injured. Experts determined that the real problem with those accidents was not the severity of the crash, but the considerable misuse rate of child seats due to the wrong adaptation of seat belts.

In preparing for an April 1996 meeting in Cologne of the ISO Working Group of Child Restraint Systems, German vehicle manufacturers met to identify criteria they believed were important for an anchorage system. They developed a list of 12 properties. First, there should be no top tether, due to concerns about its non-use. Second, the system must have two lower symmetrical anchorage points, because unacceptable performance may result from an unsymmetrical configuration. Third, due to the configuration and dimensions of interior vehicle compartments, especially of smaller cars, there must be a 250 mm to 280 mm lateral spacing between the latch points. Fourth, the latch points must have a degree of stability to ensure that excursion limits are not exceeded. Fifth, the child restraint must be able to attach through a one-hand operation, to ensure that the restraint can be easily installed.

Sixth, there must be a means to prevent attaching the child restraint on one side only. Seventh, the user must be able to tension the child restraint with one hand. Eighth, there must be no reduction of seat comfort for adult passengers. Ninth, the locking device that attaches the child seat to the vehicle system must be attached to the child restraint, not the vehicle, to limit overall cost impacts. Tenth, to avoid design restrictions, the locking device need not be required to be a pushpad buckle. Eleventh, to ensure that a child restraint does not have excessive webbing or ratcheting devices, the length of the adjustment system used to tension the system should not exceed 200 mm. Lastly, the dimensions of the latch points on the vehicle should be as specified in Scheme A.

The presenter said that dynamic testing of the four-point rigid and the soft anchor system showed a reduction in safety performance when the systems are not properly tightened. Also, a non-symmetrical configuration resulted in very high head acceleration.

Mr. Werkmeister said that the Scheme D system incorporates ideas from both rigid and soft anchor systems. The system calls for defining a field around the ISOFIX fixture, which might include an area behind the seat bight (where hard anchors could be located), or an area in front of the seat bight (where semi-rigid anchors could be). A connector would be used to attach the child seat to the anchorage on the vehicle. At the option of the child restraint manufacturer, the connector could be attached to a piece of webbing (such as in the UCRA system), or could be built into the child seat (as in the ISOFIX rigid systems). The presenter estimates that the cost of the connector system would be about \$12 for the vehicle and \$9 to \$15 for the child seat.

The presenter expressed concerns about use rates for a top tether, believing that use rates will be far less than Canada's 65 percent. He also discussed concerns about the width between anchorage points and a symmetrical configuration of the child restraint. He emphasized the need for design flexibility in an anchorage system. He believed manufacturers should be provided maximum design flexibility to meet performance requirements and market demands, and believed that Scheme D best provides this.

#### 5. Car Seat Only System

John Reynolds and Carol Dingley (Cosco), presented the "Car Seat Only (CSO)" system. Mr. Reynolds stated that Cosco looked at three critical issues when evaluating universal anchorage

systems. First, Cosco looked at performance and determined that a system must not reduce the safety performance of existing child restraints. Second, Cosco looked at "implementation," or the transition phase between the existing and new systems, the primary problem being the mix of new car seats with old cars, and old car seats with new cars. Third, Cosco looked at how the systems could affect the cost of child restraints, and in turn, overall use rates. Mr. Reynolds stated that after evaluating the systems under these criteria, Cosco decided to develop its CSO system. Cosco believed that because the system is a simple lap belt, it would have the least negative impact in terms of implementation and transition. Further, the CSO system would have the lowest cost to the car seat user, since the cost to the restraint manufacturer is virtually none.

Ms. Dingley elaborated on Cosco's concerns with implementation time and cost. She said that adopting a system other than the CSO will require considerable research on the part of child seat manufacturers to determine if seats comply. She said that, given the variety of car seats that must be tested (e.g., infant-only, convertible, forward- and rear-facing) and the different types of vehicle seats, just researching a new system prior to rulemaking will take at least many months, if not a year or so. She also indicated that research is needed to determine whether a rigid system might place excessive forces on a child's neck, particularly a young child who has less developed neck muscles. She was also concerned that the actual implementation of competing systems would require long leadtimes to implement (possibly two to five years development time, plus 10 years production time), as well as a great deal of public education. The presenter stated that this is in contrast to the CSO, which can be implemented much more quickly and which requires little education. Ms. Dingley said that international harmonization of an anchorage system does not appear to be realistic in the near term.

The presenter discussed cost concerns at length. She said that a system that significantly increases the price of car seats will decrease the number of new seats purchased at retail, possibly resulting in (1) more used child seats being purchased or (2) more children being incorrectly restrained in seats they have outgrown or by adult belts when they are too small for the belts. She believes consumers in the U.S. will resist purchasing car seats that retail between \$100 and \$200, and that even a \$20 increase would slash sales

dramatically. She indicated that the average price of a convertible restraint is \$63, but about one quarter of the car seats purchased cost \$50 or less; less than 5 percent cost \$100 or more. She believes that perhaps 10 percent of persons purchasing car seats would be unable to purchase a seat if prices increase dramatically. She emphasized a concern about the impacts of cost increases on loaner programs.

Ms. Dingley estimated that a 10 percent decrease in child seat use rates would result in approximately 40 additional child fatalities annually. She also said that about three million car seats are sold each year to retail stores and loan programs. The presenter cautioned that a 10 percent reduction in the number of seats sold means 300,000 children per year riding without a new car seat, which translates into 1.2 million additional children riding unrestrained.

Ms. Dingley stated that questions arising about the CSO system concerning the possibility that adults may mistakenly use the CSO belts are unwarranted. She said that an adult would prefer a lap/shoulder belt to a lap only belt due to the superior performance and comfort of a Type II belt. She also said that the CSO belt could be installed at a location that makes it inaccessible for use with an adult, and could be prominently labeled or color contrasted to distinguish it from an adult belt system.

At the conclusion of her remarks, Ms. Dingley introduced Frank Rumbleton (appearing on behalf of the Juvenile Products Manufacturers Association) ("JPMA"), who presented the views of the North American car seat manufacturers. He said that the number one priority of these manufacturers is to increase the usage and more importantly the proper use of child restraint systems. In addition, they wish to ensure that the changes made to child seats are simple, intuitive and easy for the caregivers to use. They also support worldwide harmonization. Underlying all these priorities, however, is the belief that initiatives must be cost effective, because of a direct correlation between cost and use rates. He said that every dollar of cost at least doubles at the retail shelf. He suggested that the cost of an anchorage system could be better absorbed on the vehicle side than on the child restraint side.

The presenter said that JPMA categorically rejects the four-point ISOFIX system and the two-point CANFIX or CAUSFIX rigid system, because of cost. He said that JPMA supports soft anchor systems, which includes the UCRA, CSO and Scheme D.

JPMA hoped that all parties attending the workshop would focus on the soft systems as a starting point and focus on the similarities and the positive aspects of each of these proposals, to develop a solution that maximizes the potential use of child restraints and minimizes the cost to the ultimate consumer.

#### b. Clinics

Separate presentations were made on the public acceptance and support of the development of a universal anchorage system. The Insurance Corporation of British Columbia (ICBC) along with Rona Kinetics reported on the findings of its clinic on usability of various alternatives. The study surveyed 76 subjects in Vancouver, Canada representing a cross section of age, sex, and experienced/unexperienced groups. General Motors presented the findings of a February 1996, clinic that was conducted in Troy, Michigan with a sample of about 400 subjects. Toyota also presented a customer preference study on various types of soft and rigid anchor systems that was conducted in Japan on rigid and soft systems. Finally, a study was recently initiated in the UK and a progress report on its findings of an initial small number of subjects surveyed was presented.

Generally, the findings of these clinics were in agreement on two major issues: 1) all subjects surveyed seem to prefer a universal anchorage system over the current child restraints and 2) no significant difference in consumer acceptance was detectable when comparing between a rigid and soft anchorage system.

#### c. Cost

The participants agreed that the cost of the rigid options is much higher than the soft anchorage system, with *added costs* to the child restraint system of about \$100 for the 4-point ISOFIX, \$60 for the CANFIX and \$20 for the UCRA soft anchorage system. Cosco, whose alternative does not incur additional costs to current child restraints, raised important concerns regarding the potential negative effects of high increases to the retail price of current child restraints. Concerns over families not being able to afford the increase and over loaner programs with fixed budgets for purchasing and providing free child seats to low income families were discussed. The issue of cost increases was in conflict with European countries' expectations, according to the attendants from Sweden who indicated that these added costs do not have such implications as expected in the U.S. market.

#### d. Tether

Other discussions addressed specific issues pertinent to the development of universal child restraint anchorage systems. One major issue that was discussed pertained to the upper tether. A representative from the Insurance Institute for Highway Safety presented an overview of the experiences and possible reasons for non-use of the upper tether in the US during the 1980s. On the other hand, a participant from Australia reported that the use of the upper tether in Australia is about 98%. Transport Canada also reported substantial increases in use of the tether in Canada. These experiences seem to indicate that the high usage of upper tether stems from the fact that the tether anchor points are provided on the vehicle and are visible to and easily accessible for use by consumers. There appeared to be an agreement among participants that a child restraint with an upper tether provides better protection to the child during a crash.

#### e. Agreement on Differences

In the interactive exchange among attendees during the course of the workshop, several important points relating to development of a universal child seat anchorage system emerged. The following key views were expressed:

- User clinics indicate that consumers are overwhelmingly unhappy with the manner with which current child seats are attached to vehicle seats and wish to see improvement.
- The various systems evaluated in consumer trials (ISOFIX, schemes A through C) do not differ much in terms of safety performance (assuming proper installation) and public acceptance.
- Schemes B, C and D (CANFIX, UCRA and the Hybrid) are virtually variations of the same system, except for the hardware used to connect the child seat to the vehicle. CANFIX has specified a rigid anchor and rigid connectors on the child seat. UCRA specifies a buckle and latchplate system; the buckle would be on a piece of webbing attached to the child restraint and the latchplate would be on a semi-rigid stalk at the vehicle seat bight. The Hybrid system would specify a 6 mm bar (e.g., a D ring) that could connect to a child seat either in front of or behind the vehicle seat bight. The UCRA system differs from the Hybrid system only with regard to the connector piece that fastens the child restraint to the vehicle.
- Purchasers of child restraints in the U.S. are very sensitive to price. Sixty-four percent of the car seats sold in the

U.S. sell for less than \$60. Consumers in this country are unwilling to pay the \$300 it costs on average for a child seat in Sweden.

- The European manufacturers generally still prefer a rigid system, while U.S. manufacturers oppose it. Canada has indicated a willingness to move from a rigid two-point plus tether (Scheme B) to a soft two-point plus tether system.
- Scheme D (the Hybrid system) has potential in accommodating both rigid and soft systems. It would provide the greatest design flexibility, in that it would specify minimum elements of the vehicle anchor (e.g., a 6 mm bar) and a location that could connect to a child seat either in front of or behind the vehicle seat bight. It would provide vehicle manufacturers the option of supporting the anchor rigidly or semi-rigidly. Child restraint manufacturers could choose any means to attach to the anchor. A child seat could have a telescopic or a rigid device, or a soft attachment (piece of webbing), so long as the child seat can attach to the anchor.

• Each system has strengths but also possible weaknesses. Questions were raised about the cost, weight and development time needed for a rigid system, the slack that could be introduced into the belts of a soft system and the suitability of a soft system with fold-over seats, the need for anchors to be visible to consumers in a Hybrid system, the possibility of slack and misrouted belts with the CSO system, and the actual use of a top tether in tethered systems.

- The various systems under consideration are unencumbered by patents of any kind. Britax (a European child restraint manufacturer), when asked about a certain patent application, expressly declared that it holds no patents or applications for patent or other claims that would hinder third parties from making ISOFIX equipped vehicles or child restraints using rigid or semi-rigid anchorages.

#### f. Future Work

Manufacturers of motor vehicles and child restraints extensively explored the differences between the UCRA and European hybrid systems with an agreement to further develop this option to harmonize between the European vehicle manufacturers and Britax and the US and Japanese child restraint/vehicle manufacturers. These participants expressed that future efforts would be made to elaborate on progress of this development at a November 7 and 8, 1996, ISO Working Group on child safety meeting in Albuquerque,



New Mexico and future meetings of the Group.

#### IV. Subsequent Developments

##### *a. Albuquerque, New Mexico*

During the November 7 and 8, 1996 meeting of the ISO Working Group on Child Restraint Systems (ISO/TC 22/SC 12/WG 1), the Group voted on a proposition containing two resolutions on the specifications for the anchorage of a universal child restraint anchorage system. The first resolution recognized the need to allow two anchorage systems: one based on two-prong nonflexible hardware (a system that is under development), and another based on flexible UCRA-type hardware (a system that is available today). A second resolution opposed an upper tether anchor in motor vehicles.

Following the Albuquerque meeting, the Secretariat of the ISO Working Group opposed the proposition—which was intended to advise different governments on how to treat the use of ISOFIX with and without a top tether—on the basis that it goes beyond the mandate of the Working Group. A re-voting of an amended resolution was conducted by correspondence with the delegations of country members, and was due back to the Secretariat on December 6, 1996. The voting on this resolution was to select between: i) specifying a top tether anchorage in vehicles; ii) not specifying the tether; or, iii) either of these options. It was also agreed that two reports—one for the rigid and one for the rigid/semi rigid options—will be prepared by members of the Working Group to describe and specify these systems.

The result of the re-voting was a resolution to produce two draft standards for universal child restraint attachment interfaces. One draft standard would cover an attachment system comprising the UCRA-type attachments on the lower points. The other standard would cover the rigid anchorage system. The standards would not include specifications for an upper tether anchorage. (The results of the re-voting and copies of the rough drafts of the two reports were placed on December 13, 1996 in Docket No. 96-095, Notice 01 for the readers' review.)

##### *b. Additional Information*

On November 21, 1996, some of the UCRA petitioners provided the agency with additional information supporting their petition. NHTSA representatives met with representatives from General Motors, Century Products, Indiana Mills and the Lear Corporation, at the request of the latter, to discuss the resolutions

of the ISO Working Group meeting in Albuquerque. (A December 13, 1996 memorandum describing this meeting and attaching the handouts is entry number 16 in Docket 96-95, Notice 1.) The petitioners emphasized that the North American child restraint manufacturers strongly favor the UCRA system with an upper tether and have doubts that a determination can be made at this time that the rigid system would be a long term solution. They also presented the findings of an evaluation that Indiana Mills performed in response to a NHTSA call for harmonization during the public workshop. (The agency had requested that hardware manufacturers explore the feasibility of an anchorage system that would accommodate buckles, snap hooks and ISO-type connectors with a flat latch or round link, for consideration at the Albuquerque ISO meeting.) Indiana Mills described the advantages and disadvantages of the various types of hardware and its reasons for supporting the existing technology of a flat latch plate/buckle system. Lear Corporation presented cost data for rigid and soft attachments to various types of vehicle seating systems. It stated that the vehicle added cost data should be considered as a complement to the NHTSA study cost figures. Specifically, it included cost figures on items, such as covers and trim of rigid anchors, that were not included in the costing of the NHTSA study. The data showed that the costs of the soft anchorage system per seat on the vehicle range from about \$4 to \$10, as compared to about \$13 to \$30 for the rigid anchorage points system.

##### *c. Petition on Scheme D (Hybrid System)*

On December 18, 1996, BMW, Chrysler, Ford, Land Rover, Mercedes-Benz, Volkswagen, and the University of Michigan Child Passenger Protection Research Program, petitioned NHTSA to consider an approach based on Scheme D and modify the suggestions made in the UCRA petition. These petitioners supported a system incorporating two "latch plates" formed of 6 mm diameter elements for the vehicle, "coupled with the alternatives for the [child restraint system], namely, tether hooks or buckles on belts with tilt-lock adjusters for tension release, or the rigid ISOFIX connectors on a sliding element." The petitioners believe that this system will offer vehicle and child restraint manufacturers the greatest design flexibility, and will further international harmonization at an early date.

#### V. Evaluation of Concepts

During the course of the agency's deliberations on a universal child restraint anchorage system and as a result of the discussions at the October 1996 workshop and other information, the agency has tentatively determined that child seats can be better secured to a vehicle (thereby reducing incompatibility problems and increasing safety) by providing three anchorage points between the restraint and a vehicle seat. One point is at the top center of the restraint (attachment of a child restraint to a vehicle would be accomplished at that point through a top tether), and the other two are at the vehicle seat bight.

##### *a. Top Tether*

ISO Schemes B and C (CANFIX/CAUSFIX and UCRA) include provisions for a top tether. Cosco indicated it would support a tether requirement, although the manufacturer is concerned whether tethers will be used in this country. The European systems do not call for tethers.

As a result of the agency's deliberations on this rulemaking,<sup>5</sup> the agency reevaluated its view of a top tether on child restraints. NHTSA currently does not require a tether or a tether anchorage on vehicles. The agency does not prohibit a tether, but generally requires child restraints to meet Standard 213's 30 mph dynamic testing requirements without attaching a tether to reflect the historically low use rate of tethers in this country.

NHTSA tentatively concludes that a top tether should be provided to better secure a child restraint. By restraining the top portion of a child seat, a tether would supplement the vehicle belt system in limiting forward movement of the child restraint in a crash. With less forward movement, head excursion can be reduced.

This document proposes a performance requirement that would have the practical effect of requiring a tether on child seats. A new head excursion requirement for forward-facing seats would be added to limit excursion to 720 mm (28.35 inches) forward of the Z-point on the test seat assembly when a child seat is attached

<sup>5</sup> On November 15, 1996, the American Academy of Pediatrics (AAP) petitioned NHTSA to amend Standard 213 to require child restraint manufacturers to supply tether straps on all child seats and require vehicle manufacturers to provide tether anchors at all rear seating positions. AAP also requested that child restraint manufacturers be required to make tether straps for existing car seats available to consumers by mail order and at retail outlets. NHTSA granted this petition on January 14, 1997.



to the standard seat assembly in accordance with the manufacturer's instructions. To meet this requirement, manufacturers will likely have to provide a top tether, which would be attached in the test for this new requirement. NHTSA believes that the head excursion limit of 720 mm is practicable with a tether because it is the same as the Canadian requirement and because most, if not all, child restraint manufacturers currently produce child restraints for sale in Canada and thus already meet the requirement for those products. The 720 mm requirement would promote harmonization with Canadian requirements. Further, the European child restraint manufacturers believe that a 720 mm limit could be achieved with the rigid anchorage system with two lower anchorages and no upper tether.

Test data strongly support the safety value of a tether. AAMA et al. submitted test results in support of a requirement for a tether anchorage, stating:

Test results clearly demonstrate that a fastened tether can significantly reduce dummy head excursion measurements which most developers and evaluators use as the primary predictor [sic] of a CRS's performance in field accidents \* \* \*.

An Australian report cites forward-facing CRS test results, indicating that "as well as reducing head excursion, a top tether, with the right high mounted geometry, significantly reduces head acceleration and neck loads in frontal impacts" [footnote excluded] \* \* \*. Recent computer simulations and tests of the recommended UCRA concept suggest that \* \* \* a fastened tether significantly reduces dummy head excursion during high severity frontal impacts.

Computer simulations conducted by petitioners AAMA et al. showed a reduction in force levels experienced by a restrained dummy's head, neck and chest when a tether was used as compared to no tether, and a reduction in head and knee excursions. Actual testing of child restraint systems with and without a tether showed that with the tether attached, there generally were reductions in head injury criterion (HIC) values and chest g's, and in head and knee excursions.

These findings are consistent with NHTSA's limited testing of tethers. In two tests of an Evenflo Scout forward-facing convertible seat with the inboard anchor of the lap belt restraining the child restraint to the test seat assembly positioned four inches forward of the seat bight, the HIC and 3 ms chest acceleration clip were 631 and 59.6 g's respectively. When the child restraint was tethered on its top, these HIC and

chest clip measurements were reduced to 503 and 42.2 g's, respectively.

In her comments at the October public workshop, Ms. Legault of Transport Canada reported that on-going testing of tethered, untethered and loosely-tethered restraints indicate improved head acceleration, head excursion and chest acceleration with a tether strap, even when the strap is loose. Additionally, upper neck forces and moments were also improved with a tether. (Transcript of October 17, 1996, pp. 32-34.) (However, Indiana Mills tests showed increased HIC and chest g's for a child seat with a dual strap anchorage with a tether, compared to one without a tether. Comments are requested explaining these increases.)

However, nonuse of the tether has been a problem in the U.S. In an effort to boost use rates, NHTSA once proposed requiring all vehicles under 10,000 lb GVWR to have tether anchorages at all rear-most seating positions, to make it possible for motorists to easily attach the tether straps on their child restraints to the vehicle. 45 FR 81625; December 11, 1980. At the time of the proposal, tether use was about 50 percent. NHTSA terminated rulemaking on this proposal after determining that (a) since the proposal, there was a continual shift toward untethered seats, so that most seats did not need a tether to meet Standard 213's requirements; (b) motor vehicle manufacturers had increasingly been voluntarily providing provisions, such as indentations to identify anchorage points and pre-drilled or threaded holes, in their vehicles to facilitate the attachment of tether straps; and (c) the most effective way to promote child safety would be to amend Standard 213 to require all child restraints to meet Standard 213's requirements without attachment of the tether. July 5, 1985; 50 FR 27632.

Petitioners AAMA et al. believe that a tether will be used. GM's consumer focus group testing indicates a positive response toward a tether, particularly if the tether anchorage is equipped with all the components needed for use with the child restraint. The petitioners state, "Australian field experience shows very high tether use rates are obtainable when *factory installed* tether anchorages are provided." (Emphasis in text.) Indeed, top tether use is reported in excess of 95 percent in Australia, primarily due to requirements for installation of the anchorages and to early and continuous public education on the use of tethers. "Options for a Universal Child Restraint Attachment System," M. Lumley, June 14, 1996, revised October 10, 1996. Petitioners are

also encouraged by information from the Canadian Province of Quebec indicating a 65 percent tether use rate in vehicles required to have just a tether anchorage, and not the tether hardware. "This in spite of the fact, that vehicle owners must install the tether anchorage hardware themselves or return to their dealer to have it installed."

In an effort to increase tether use in Canada, Transport Canada is proposing to require vehicles to have a factory-installed, user-ready tether anchorage, with hardware included. Transport Canada believes that tether use will increase if an anchorage equipped with all needed parts for consumer use is provided at the factory. NHTSA tentatively believes that this information from petitioners AAMA et al. and from Transport Canada provides a basis for concluding that tethers would be used if child seats are equipped with a tether and vehicles are equipped with a factory-installed, easy- and ready-to-use tether anchorage. Accordingly, in view of the potential added safety value of a tether, the agency proposes requiring installation of a ready-to-use tether anchorage at the two seating positions that would be required to have the lower anchorages dedicated for attaching a child restraint system. (See *infra*, section VI.c.) For purposes of harmonization, the proposed requirements for the tether anchorages are essentially identical to those proposed by Transport Canada.

However, because NHTSA does not know the extent to which tethers will be used in this country, the agency believes the standard should also retain the present head excursion requirement, which limits excursion to 813 mm (32 inches) without use of a tether strap. Retaining the requirement would ensure a minimum level of safety performance when the tether strap is not used. Further, NHTSA proposes that child restraints dynamically tested on a child restraint anchorage system with UCRA anchorages should be subject to the 813 mm (32 inches) head excursion requirement without attaching the tether. This accords with the AAMA et al. petition, which suggests not attaching the tether. Comments are requested on this issue. Comments are also requested on the potential of using tethers in aircraft.

#### *b. Lower Anchorage Points*

Improving the lower anchorage points of a child seat to the vehicle would make it easier for parents to correctly attach a child seat to the vehicle.

NHTSA stated in the Federal Register notice announcing the workshop that an

anchorage system should accomplish the following:

- Improve the *compatibility* between child restraint systems and vehicle seats and belt systems, thereby decreasing the potential that a child restraint was improperly installed;
- Ensure an adequate level of *protection* during crashes;
- Ensure correct child restraint system use by ensuring that the child restraint systems are *convenient* to install and use;
- Ensure that the child restraint systems and anchorages are *cost effective*; and
- Achieve *international* compatibility of child restraint performance requirements for uniform anchorage points.

In remarking on the various ISO schemes and in other presentations, participants in NHTSA's workshop concurred with and elaborated on these considerations.

#### 1. Improve Compatibility

All of the anchorage systems appear to improve compatibility between child restraint systems and vehicle belt systems. Consumers comparing ISO Schemes A, B and C systems against conventional child restraints indicated that the new methods of attachment are easier than current methods. Cosco's CSO system was not evaluated in these studies, but to the extent that the CSO does not depend on a locking clip or other means to adapt the belt to a child restraint, an improvement over existing belt systems, at least concerning that aspect of design, can be assumed. The CSO belt would still have to be routed correctly through the child restraint. All anchorage systems would improve compatibility between child restraint systems and forward-mounted anchors. Views were expressed at the October 1996 workshop that Schemes A, B and C systems would improve compatibility between child restraints and contoured vehicle seats. A rigid anchor system may suspend the child restraint above the contoured seat, and a UCRA would provide some resistance to the side-to-side motion of a child seat on a humped contoured seat. The CSO might not be as effective on humped seats in limiting side-to-side motion of a child restraint.

#### 2. Safety Performance

ISO Schemes A, B and C systems have performed satisfactorily in dynamic tests. The CSO system has not been tested, but it simulates the standard seat assembly used in Standard 213 compliance tests.

Consumer clinics indicate that ISO Scheme A, B and C systems are

comparable in terms of a user's ability to correctly install them. Users are able to install child restraints correctly in those systems. Scheme D and the CSO were not evaluated.

The degree to which an anchorage system will be correctly used outside the context of a clinic is unknown at this time, but design differences between the systems could affect such use. Attendees at the public workshop expressed concern with potential misuse problems that could arise by virtue of the design of each system. A type of misuse that could occur with a rigid system (ISOFIX four-point or CANFIX) is if the user does not fully attach all points of the system. Test data indicate that performance of the child restraint is severely degraded if one or more points are not attached. Some attendees believed that users must be able to see clearly where to insert the child seat connector to the vehicle system, and that a guide of some sort is needed if the attachment point is behind the seat bight. Some believed that an education campaign is needed to teach people how to use the system since a rigid bar anchorage is unfamiliar in this country.

Proponents of the UCRA system believe that the soft anchor system is superior to a rigid system in that the connectors are buckles and latches that are consumer-familiar in design to the seat belt hardware on vehicles. Proponents believe that users will know "intuitively" how to use the connector and will recognize the sound and feel of the click that indicates a positive attachment. Several participants expressed concern about a possible misuse problem arising due to the presence of webbing on the connectors, i.e., that slack in the webbing will negate a tight fit of a child seat on the system. Toyota indicated it is developing a means of addressing this potential problem.

Cosco believes the CSO system "is the most intuitive system suggested because people have been using this type of system for years." NHTSA believes that while users might be familiar with the system, the CSO system poses some of the same problems as the lap belt currently used to attach child restraints. The belt would have to be correctly routed through the child restraint, which is a problem occurring with present seats. Slack in the belt would negate a secure fit of the child seat, so an adjuster of some sort would be needed, and it would have to be positioned on the belt where a user could maneuver around the child seat to tighten the belt. The seat belt would have to be long enough to permit it to

be fastened around all types of child restraints, including restraints for children with special needs. A common complaint with current child seats is the difficulty of routing the belts through the system and pulling the belt tight. It appears that the CSO system might not alleviate those problems in all restraints. Further, there is the potential that the CSO belt would be inadvertently used by an adult occupant as a restraint, particularly in a seating position equipped with a lap belt, even if the CSO belt were labeled.

It may be possible to attach child seats with either a rigid anchor (ISOFIX four-point rigid, CANFIX) or a soft anchor (UCRA) system design to a vehicle seat in the same way that current child seats are attached, using the occupant belt system (and meet minimum performance criteria). Thus, it may be possible to use them in a vehicle that lacks an anchorage system. The ability to attach a child seat in a conventional manner, i.e., using the vehicle belt, is an essential feature addressing the use of new child seats with old vehicles, and vice versa (old child seats with new vehicles). Ms. Legault of Transport Canada said that testing with a CANFIX prototype showed that, in about 85 percent of its vehicles (lacking receptors for the rigid points), the prongs could be inserted between the seat cushion and seat back, so the seat belt could still be used to attach the child seat. All child seats with UCRA-designed anchorages can be attached to a vehicle by use of the existing vehicle safety belt, because the UCRA design is based on a simple addition of buckles to current models of child seats. The CSO design would also result in all child seats being able to be attached in a conventional manner. It is unknown whether the four-point ISOFIX seat could be attached with an existing vehicle belt and perform satisfactorily.

The various systems differ in their ability to allow child seats and vehicles to be retrofitted with features of the anchorage system. The ability to retrofit is desirable, since it would increase the number of seats that provide improved protection. Retrofitting seats and vehicles would provide all children the benefits of the improved technology. It does not appear that the four-point ISOFIX or the two-point CANFIX allows for retrofitting either the child restraint or the vehicle. These rigid anchorage systems necessitate an elaborate redesign of existing child seats. The anchorage pins on the vehicle seat would have to be precisely aligned with the prongs on the child seat to ensure that the system performs properly. Alignments of this nature are generally

not believed to be feasible in the aftermarket.

Proponents of the UCRA system state that existing seats can be installed using the UCRA system if the system is supplemented by a special belt with buckles at each end that are compatible with the UCRA latchplates on the vehicle. The belt would be provided to the owner of the old (pre-standard) child seat to route through the existing belt route path on the child seat. Further, proponents of the UCRA system believe that vehicles can be retrofitted with the UCRA system. The CSO system calls for no change in the design of a child seat, so old child seats could be used with a CSO system in a vehicle. Cosco did not indicate whether vehicles can readily be retrofitted with the CSO belt system, although it appears as feasible as retrofitting them with the UCRA system.

### 3. Consumer Acceptability

Consumer clinics indicate that ISO Scheme A (rigid four-point), B (CANFIX) and C (UCRA) systems are comparable in terms of consumer acceptance. Participants in GM's clinic indicated a preference for UCRA. Scheme D and the CSO were not evaluated in the clinics. Participants in all the clinics indicated a desire to see an improvement in the way child restraints are attached to vehicles. With regard to bulk and added weight to a child restraint, the CSO adds no weight, and the UCRA appears to have an advantage over a rigid system and the CANFIX. The rigid prongs and supporting structure on a rigid system add much more weight than the buckles of a UCRA and also protrude from the child restraint.

### 4. Costs and Burdens

Cost is an area where the systems differ greatly. The cost of the rigid options is much higher than the soft anchorage system, with added costs to the child restraint system of about \$100 for the four-point ISOFIX, \$60 for the CANFIX and \$14 for the UCRA soft anchorage system. The agency is concerned that the \$60 to \$100 added costs of the rigid systems could engender public dissatisfaction with child restraints, reduce child restraint use rates and significantly reduce the number of seats available through car seat loaner programs. The CSO system does not incur additional costs to current child restraints.

Schemes A, B and C systems are fairly design restrictive, in specifying the geometry and location of assorted components on the vehicle and child seat. Scheme D (Hybrid) and the CSO

specify only the features of the vehicle system, and not of the child seat. Design flexibility allows manufacturers latitude in meeting market demands and developing new technology, yet would be a trade-off in standardization of the anchorage system.

### 5. Harmonization

Harmonization was one of the major goals of the agency's October 1996 public workshop. NHTSA stressed the importance of international harmonization during the workshop and urged ISO member country member delegates to agree on a unique child restraint anchorage system.

The UCRA system would harmonize with Canada, Australia, New Zealand and Japan in specifying a top tether. With the top tether proposal, the proposed rule would harmonize with Transport Canada's current head excursion threshold and with its planned new regulation proposing to require manufacturers to provide anchors for tethers in motor vehicles. The rigid anchor system is endorsed by European members of the ISO Working Group.

### 6. Leadtime and Availability

The different systems are at varying stages of development in design concept. Final design of the four-point ISOFIX system and the two-point rigid CANFIX have not been completed, although proponents of those systems believe that completion is imminent. Design of the UCRA system is completed.

The view was expressed at the October 1996 workshop that the leadtime needed to implement a requirement for a rigid system would be much longer than that needed to implement the UCRA system. This is because the UCRA uses "existing technology—known systems, known belts, known buckles, known latch plates" (quoting David Campbell). Cosco argues that its CSO system would be the fastest to implement.

### 7. Proposed System

The agency has decided to base a proposal for a universal child restraint anchorage system primarily on the UCRA system. The four-point and two-point rigid and the UCRA appear comparable in terms of safety performance and public acceptance, but the UCRA appears to have advantages over the others with respect to its cost impact, near-term availability and ability to address intermix and retrofit issues. Further, the UCRA system has advantages in terms of its usability. The agency believes the familiarity of its

components (particularly the crucial connector pieces—buckles and latchplates—that attach a child seat to the vehicle system) is a definite advantage over the other systems. Also, the UCRA system is not as bulky or heavy as the other systems, which increases its usability.

In addition, NHTSA believes that the soft anchor system has a potential for use in restraining child seats in aircraft. The Federal Aviation Administration (FAA) stated in a submission to NHTSA's docket for the October 1996 public workshop on a universal anchor system that "preliminary review and evaluation of the proposed ISOFIX systems under consideration by [NHTSA] suggest that the UCRA concept presents the best solution in the aircraft environment." 96-95-N01-008. FAA is concerned that the rigid prongs of an ISOFIX-type child seat may not be compatible with aircraft seat cushions or suited for narrow aircraft seats.

While NHTSA has decided to propose the UCRA system due to its advantages in cost, usability, potential for use in aircraft, and the fact that it is proven technology available today, the agency is still interested in the possibility of achieving harmonization on a universal anchorage system. To that end, NHTSA is proposing to permit vehicle manufacturers to substitute the two lower rigid points of ISO Scheme D (the Hybrid system) in place of the UCRA anchors, provided that the vehicle is also equipped with adapters that enable the lower rigid points to accommodate UCRA-type child restraint systems.

The European manufacturer members of the ISO Working Group on Child Restraints Systems believe that their countries will require the two rigid anchorage points in the future.<sup>6</sup> Accommodating both hardware systems would be consistent with the agency's goal of solving the problem of incompatibility between child restraints and motor vehicles as expeditiously as possible, while promoting harmonization. The UCRA system, being a well developed and familiar current technology, is currently available. The non-flexible system would be given the opportunity to be developed, tested and evaluated in the market place to prove what its proponents believe to be its superiority as the child restraint anchorage technology of the future.

NHTSA tentatively concludes that the two proposed systems can coexist in the

<sup>6</sup>It should be noted that the work thus far by the ISO has been at the Working Group level. Any ISO standard on this matter has still to go to higher committee before it becomes a standard.

short term. The UCRA system will not hinder any development of the non-flexible hardware system. The proposed rule allows vehicle manufacturers to install a 6 mm pin to attach a child restraint that is equipped with jaw-type non-flexible hardware. The proposed rule would not prevent manufacturers of child restraints from developing a restraint with non-flexible hardware, and would facilitate a transition to future technology. However, in the interest of eradicating incompatibility problems henceforth, child restraints with non-flexible hardware would be required to have components (e.g., buckles), permanently attached to the child restraints, that are compatible with the UCRA anchorages. This proposal considers the UCRA system to be paramount, and a rigid system would be allowed as long as the UCRA system is universal for all vehicles and child restraint systems.

### c. Discussion of Alternatives

A number of other approaches have been suggested to minimize or eliminate incompatibility between child seats and vehicle seats. This section addresses these alternatives to the approach proposed today.

#### 1. SAE Recommended Practice J1819

In 1994, the Society of Automotive Engineers (SAE) published its Recommended Practice SAE J1819, "Securing Child Restraint Systems in Motor Vehicle Rear Seats," to promote compatibility between child seats and vehicle rear seats and seat belts. J1819 provides voluntary design guidelines to vehicle manufacturers for certain characteristics of rear seats and seat belts, such as seat cushion shape and stiffness, and seat belt anchorage location, belt length, buckle and latchplate size, and lockability. In addition, J1819 provides design guidelines to child seat manufacturers for child seat features that correspond to the vehicle features.

J1819 specifies a "Child Restraint System Accommodation Fixture" to represent a child seat, so that designers of both the vehicle and child seat can evaluate each product for compatibility.

NHTSA tentatively concludes that J1819 alone does not fully solve incompatibility problems. It is a tool for evaluating incompatibility, not a requirement that vehicle seats and child restraints must be compatible.

In the October 1996 workshop, Mr. Howard Willson (who chairs the Children's Restraint Systems Standards Committee of the SAE) stated that J1819 might be amended to add "a test for seat contour." The test would enable vehicle

manufacturers to "identify seating positions where it's probable that child restraints will not work well because of seat contour." He also stated

I doubt that we will agree to simply design our seating positions so that they're all as flat as the seats in a pick-up truck used to be, for example. There is an appeal to a shaped seat, an appeal to the users. (Transcript of October 18, pp. 8-9.)

At the same workshop, Mr. David Campbell said that a child restraint anchorage system—

should be independent of the adult seat belt system so that manufacturers can have the flexibility to optimize the performance of the anchorage system for child restraints and allow the adult seat belt system to be optimized for the other occupants in the vehicle. (Transcript of October 12, p. 40.)

NHTSA tentatively agrees with this statement. Further, NHTSA recognizes that it is very difficult for a single system to optimize the safety protection for adults of all ranges and child restraints of different types. Nonetheless, the agency requests comments discussing possible design alternatives to a universal child restraint anchorage system.

#### 2. Lockability

In 1993, NHTSA amended its occupant crash protection standard (Standard 208) to adopt a "lockability" requirement effective September 1, 1995. The rule requires vehicle lap belts or the lap belt portion of lap/shoulder belts to be capable of being used to tightly secure child safety seats, without the need to attach a locking clip or any other device to the vehicle's seat belt webbing, retractor or any other part of the vehicle. 58 FR 52922, October 13, 1993. The requirement applies to seating positions other than the driver's position on vehicles with a gross vehicle weight rating of 10,000 pounds or less.

The rule requires the lap belt to be lockable and specifies test procedures demonstrating compliance with the lockability requirement. The rule does not specify how the vehicle belt is to be locked, except to prohibit locking by "inverting, twisting or otherwise deforming" the belt webbing. An example of a permitted means of locking a belt is extending the belt all the way, then feeding in the slack.

NHTSA tentatively concludes that the lockability requirement is insufficient alone in addressing incompatibility problems. While the requirement ostensibly makes a locking clip obsolete, it still depends on the user knowing enough and making the effort to manipulate the belt system. Also, the vehicle belt must be routed correctly

through the child restraint, which may not be an easy task in all cases. Further, the lockability requirement does not address incompatibility problems arising from forward-mounted seat belt anchors. Excessive forward movement of a child seat can still occur, even if the feature is engaged and the belt is "locked." Comments are requested on this issue. NHTSA is considering deleting the lockability requirement as unnecessary if requirements for a child restraint anchorage system are adopted. A lockability requirement may not be needed for a seating system with a universal anchorage system since the vehicle's belt would no longer be used for attaching a child restraint. However, lockability might be needed to attach child seats that are not equipped for a universal anchorage system, even if the vehicle seat has such a system.

#### 3. Cosco's CSO system

Cosco's CSO system is appealing in its simplicity and low cost, but the CSO system is essentially no different from the current lap belt means of attaching child restraints to vehicle seats. NHTSA is concerned that the CSO system might not make attaching a child seat significantly easier than it is today. As noted previously, the CSO belt would have to be correctly routed through the child restraint, which manufacturers believe many consumers find difficult to do. In addition, from photographs of the CSO system, it might be difficult to tighten the belt. Consumers have expressed concern about their child seat not being secure on the vehicle seat because of the lateral side-to-side motion of the child restraint that occurs no matter how tightly the lap belt is adjusted. On a contoured, humped, seat, there is even more lateral "play." The CSO system might not be able to address these concerns. Cosco provided no data on these issues assessing the viability of this approach. Another concern relates to the potential that the CSO belt would be inadvertently used by an adult occupant as a restraint, even if the CSO belt were labeled. It is also unknown how consumers will accept the addition of more seat belt systems in the rear seat, in addition to the Type I and II belts already provided in the rear seat. The agency requests data or comment on any research that has been done on the CSO system evaluating its acceptability by consumers, its performance with child restraints, the potential for correct use with child restraints and for misuse by adult passengers. Focus group testing comparing the CSO system to the UCRA and other standardized systems would be especially helpful.

## VI. Proposal for New Vehicle Standard

### a. *Highlights of Proposal*

The most significant requirements proposed by this document are highlighted below.

(1) A new safety standard would require all passenger cars and light trucks and vans to be equipped with a child seat anchorage system, defined in the standard, at two rear seating positions. If an air bag cutoff switch is provided that deactivates the air bag for the front passenger position, one system would have to be provided in that position, and another in a rear seating position. If there is no rear seat and no air bag cutoff switch, an anchorage system would be disallowed in the front passenger seat. A built-in child seat may be substituted for one of the systems, but not both, since rear-facing built-in systems are currently unavailable.

(2) The system would consist of two lower anchorages at the vehicle seat bight (the intersection of the seat cushion and the seat back) and a top tether anchorage. The lower anchorages could consist of either UCRA-type latchplates or rigid anchorages (ISO Scheme D), provided that connectors are provided with the Scheme D anchorages that enables a child seat with UCRA buckles to be used with the rigid anchorages. The child restraint system standard (Standard 213) would be amended, in effect, to require child seats to be equipped with a top tether, and with attachment components (e.g., buckles) that are compatible with the UCRA latchplates on the vehicle.

(3) The proposed requirements would specify the construction of the child restraint anchorage system, the location of the anchorages, and the geometry of related components, such as the hardware that attaches to a child seat.

(4) A new safety standard would specify performance and location requirements for the tether anchorages. The standard would apply to all tether anchorages installed in a vehicle, regardless of whether the anchorage is required by a safety standard or voluntarily installed by the manufacturer. The agency tentatively believes that all anchorages should be subject to the proposed performance and location requirements to ensure that any anchorage used in the vehicle performs properly.

(5) To prevent the anchorages from failing in a crash, the vehicle anchorages, including structural components of the assembly, would have to withstand specified loads in a static pull test.

(6) Child restraint systems would be dynamically tested under Standard 213

when attached to the vehicle system. The standard seat assembly specified in the standard to test add-on child seats would be revised to incorporate the upper and lower anchorages of a child restraint anchorage system. It would have both UCRA anchorages (Scheme C) and rigid anchors (Scheme D). A head excursion limit of 813 mm (32 inches) would have to be met without attaching the top tether.

(7) A child seat equipped with features enabling it to be attached to an anchorage system would also have to meet the present 813 mm head excursion requirement of Standard 213 when tested with just a lap belt. This is to ensure a minimum level of safety performance when the child seat is used in a vehicle that does not have an anchorage system.

(8) In addition, each child restraint would have to meet a 720 mm (28 inches) head excursion requirement when tested according to the manufacturer's instructions. A tether provided with the child restraint may be attached in this test.

(9) Instructions for using the anchorage system would have to be provided with each child restraint and in the vehicle owner's manual.

As discussed above, this proposal is based on the premise that a child restraint anchorage system would make child seats compatible with motor vehicles, and thus increase the safety value of restraints. The approach taken by this proposal would be to rectify the vehicle-to-child restraint incompatibility problem along two lines: vehicles would be required to have a child restraint anchorage system with components "ready" to attach a child seat, and child restraints would be required to have components "ready" to attach to the vehicle system. By having a dedicated anchorage system for child restraint systems, manufacturers can optimize the designs of their vehicle belt and child restraint systems to provide higher safety protection to both adults and children.

A potential but seemingly necessary limitation in the proposed compliance tests is that the vehicle system is statically tested by devices that replicate the loads imposed by a child seat, and a child restraint is dynamically tested on a seat assembly simulating a vehicle seat. That is, an actual vehicle anchorage system would not be tested with an actual child restraint, and vice versa. This is to avoid possibly complicating enforcement efforts if an apparent failure arises in a compliance test. If vehicles were tested with actual child seats, and vice versa, and if a vehicle anchorage system, for example,

were found to fail the proposed requirements, an issue could arise as to whether the failure was with the vehicle system, or with the child seat attached to the vehicle system. To avoid this complication, the compliance tests must be as controlled as possible to remove unknown influences on the performance of regulated parts.

While the actual vehicle-to-child seat attachment would not be tested, NHTSA believes that the performance obtained in the compliance test will reflect the real-world performance of the anchorage system and the child restraint. This is because the geometry of the belts and latchplates primarily responsible for the vehicle-to-child seat interface would be precisely specified by this proposal. These components would have to be provided on vehicles and child seats precisely as specified in the standards. In turn, these components, in the same geometry as that specified in the standards, would be used in the compliance tests. Thus, the vehicle-to-child seat interface should be adequately tested.

### b. *Applicability*

The requirement for a child restraint anchorage system would apply to passenger cars and trucks and multipurpose passenger vehicles (MPVs) under 10,000 pounds (lb) gross vehicle weight rating (GVWR) (hereafter referred to as "LTVs"), except as noted below.

Petitioners AAMA et al. suggested, with respect to trucks and MPVs, that the requirement be limited to those with a GVWR of 8,500 lb or less and an unloaded vehicle weight of 5,500 lb or less. AAMA stated:

The GVWR range suggested was incorporated using the identical GVWR range currently required to meet the dynamic performance requirements of FMVSS 208 for occupant protection. The relatively small number of vehicles larger than those within this range, the physical dynamics of these size vehicles and the unexpected use of CRSs [child restraint systems] in them, support maintaining this GVWR range for this proposal.

NHTSA agrees that vehicles with GVWRs of more than 10,000 lb are much less frequently used to carry young children (as compared to vehicles with GVWRs of less than 10,000 lb) and thus should be excluded from a requirement to provide a child restraint anchorage system. However, child restraint systems could be used in vehicles with a GVWR between 8,500 and 10,000 lb, such as in vehicles used for transportation to child care programs. In the interest of best ensuring that a child restraint anchorage

system would be available when needed and to minimize incompatibility problems between child restraints and vehicle seats to the extent possible, NHTSA proposes to apply this rule to trucks, buses and multipurpose passenger vehicles with a GVWR of 10,000 lb or less. Comments are requested on this issue.

AAMA et al. suggested excluding walk-in van-type vehicles and vehicles manufactured to be sold exclusively to the U.S. Postal Service. The agency agrees that these vehicles are unlikely to be used for transporting children in child safety seats. NHTSA made the determination in the rulemaking adopting the lockability requirement, *supra*, that these vehicles are not likely to be used to carry children in child seats. Accordingly, NHTSA proposes to exclude these vehicles from today's proposed vehicle standard.

The AAMA petitioners suggested that the standard should not apply to a vehicle that "the manufacturer designates as not intended for CRS use." The petitioner further suggested that "[v]ehicles not intended for CRS use shall include this information in the vehicle's owner's manual" and on a label in the vehicle. The agency has tentatively decided against this approach. NHTSA does not know, and petitioners did not explain, why manufacturers should be permitted to exclude a vehicle from the proposed requirements, given that such a provision could substantially reduce the number of vehicles that are equipped with an anchorage system. Reducing the universe of vehicles equipped with the anchorage system would eviscerate the "universality" of the system, which could result in many consumers not having an improved means of attaching a child restraint in their vehicle.

#### c. Seating Positions

This proposal would require the child seat anchorage system (i.e., a top tether anchorage and lower anchorages) in two rear seating positions. NHTSA proposes requiring the system to be placed in a rear seating position because available data indicate that the rear seating positions are the safest positions in which to install a child restraint system. Vehicles that lack a rear seating position capable of fitting a rear-facing child seat would be required to provide a system in the front seat if the vehicle has a cutoff switch that deactivates the air bag installed at the right front passenger position in the vehicle. However, a child restraint anchorage system would also have to be installed in the rear seat of these vehicles, because a rear seat that is too small to fit a rear-facing child

restraint can nonetheless probably fit a forward-facing seat. If the vehicle lacks a rear seat and does not have an air bag cutoff switch, an anchorage system would be disallowed in the front passenger seat. A built-in child seat may be substituted for one of the anchorage systems, but not both, since built-in seats currently cannot accommodate a rear-facing restraint.

There was no consensus among the petitioners as to the number of child restraint anchorage systems that should be required and where in the rear they should be. Many believe that the system should be installed at each of the outermost designated seating positions of the second row (and a tether anchorage in the rear lap-belt center position). The Japanese vehicle manufacturers believe that only one rear seat position should be required to have the system. Fisher-Price, a child restraint manufacturer, believes that the rear center seating position is recognized as the safest and that the system should therefore be required there.

NHTSA has tentatively determined that each vehicle with a rear seat should have at least two rear seating positions that can properly hold a child restraint system. The agency is concerned whether there is a need for an anchorage system at more than two seating positions. NHTSA requests information on this issue, such as demographic data on the number of children in child restraints typically transported in a family vehicle. It is noted that nothing in the proposed standard would prohibit a vehicle manufacturer from voluntarily providing child restraint anchorage systems in rear seats at more than the required seating positions, if a purchaser wants additional systems.

This proposal does not specify that both anchorage systems would have to be provided at an outboard position. In some vehicles with large interiors, it may be possible to install one of the required systems in a center seating position.

#### d. Construction

Requirements are proposed for the construction of the child restraint anchorage system. The system would consist of two child restraint anchorages at the vehicle seat bight and a tether anchorage.

##### 1. Lower anchorages

The proposed rule would permit manufacturers to conform lower anchorages to either option A, consisting of requirements based on the UCRA system (ISO Scheme C), or option

B, based on the Hybrid system (Scheme D).

##### Option A (UCRA System)

For vehicles incorporating the UCRA system, the standard would specify that lower anchorages are located 280 mm apart, measured to the centerline of each latchplate when fully extended in a plane parallel to the vehicle's longitudinal axis. When fully extended, the tip of each latchplate must not extend more than 50 mm forward of the seat bight. The 50 mm value was suggested to ensure accessibility of the lower anchorages. The petitioners and the ISO ad hoc group specified this figure in a November 15, 1996 draft ISO/WD13216-1i report.<sup>7</sup> NHTSA tentatively believes the value is reasonable to ensure that the lower latchplates are not so rearward that they may be buried in the seat bight, yet are not so forward that excessive forward movement of a child seat could result.

The standard would also specify the geometry of related components, such as webbing and latchplates (tongues) of the lower anchorage points. NHTSA is proposing the latchplate geometry that was suggested in the petition by AAMA et al. The agency is proposing to specify the geometry of these components as necessary to ensure the universality of the anchorage system.<sup>8</sup> It negates the likelihood that a used child restraint with particular attachment components would be "handed down" or sold to a person owning a vehicle with an incompatible anchorage system. Further, since a simple, effective way of testing anchorage systems with varying components has not been devised, specifying the geometry is the best means of ensuring that anchorage systems will securely attach a child restraint, and provide an adequate level of child protection.

The lower anchorages would be equipped with specialized latchplates that would attach to buckles on a child seat. The geometry of the components is such that the webbing, buckles and latchplates are similar in design to components found on current adult occupant belt systems. This is to ensure that the components and their operation are familiar to persons installing a child seat. The geometry of the components is such that they are smaller in size than

<sup>7</sup> This figure is consistent with the ISO/WD 13216-1i report that are in the December 13, 1996 submittal to Docket No. 96-095, Notice 1.

<sup>8</sup> While the geometry of the vehicle latchplates would be mandated, child restraint systems would not have designs specified, other than that to have "components permanently attached to the system that securely fasten to the [vehicle's] latchplates" (proposed S5.9(a)). However, the agency anticipates the use of UCRA buckles.

like components on the adult occupant belt systems. This is to reduce the likelihood that the person installing a child restraint might confuse the belts and buckles of the child seat anchorage system with the adult occupant belt systems.

Several participants at the October 1996 workshop expressed concerns or suggestions about aspects of the UCRA's belt systems. Klaus Werkmeister expressed concern that the UCRA system's lower anchorages could be lost in the seat bight of a foldover seat after the seat is flattened to make room for cargo and then reinstalled as a seat. On the other hand, John Gane said that the ICBC clinic had folding rear seats and that these didn't interfere with either the hard or soft anchor systems. Transcript, October 17, 1996, page 228-230. Comments are requested on this issue.

Mr. Gane also suggested that the ICBC clinic indicated that the side straps for the UCRA should be distinguished from the straps comprising the harness for the child. He said that when the straps were not distinguished, "we had a huge failure rate of people to understand how the seat was intended to work." *Id.*, p. 220. (Some clinic participants attached the vehicle anchor belt to the child restraint's internal harness.) ICBC later modified the UCRA child restraint to color code the belts. Comments are requested on whether the straps of the UCRA should be distinguished, and if so, what measures should be required to distinguish them (e.g., color coding and/or labeling).

Howard Willson stated that the webbing-supported anchorages of the UCRA should be required to have a specific stiffness so that users can use one hand to attach the child seat connector to the anchorage. The AAMA et al. petitioners also suggested that the latchplates should not displace rearward more than 25 mm under a 50 N rearward load. Comments are requested on the need for such a requirement, the level at which a requirement should be set, the means of testing a requirement, and limiting side-to-side deflection of the latchplates which may degrade the ability to attach the child seat with just one hand. Comments are also requested on any other performance that should be required of the UCRA system to ensure that it will be effective.

#### Option B (Scheme D)

For vehicles incorporating the ISO Scheme D system, the standard would specify anchorage dimensional and marking requirements developed in draft by the ISO in "ISO/WD 13216-1i

Road Vehicles-Child Restraint Systems-Standardized Universal Attachment to Vehicle (ISOFIX)—Part 1: Dimensions and General Requirements," (November 15, 1996). The rule would require the lower anchorages to be 6 mm diameter transverse horizontal round bars with a minimum effective length of 25 mm. The spacing between the bars would be 280 mm apart, center-to-center. This value is harmonized with ISO to be agreeable with manufacturers of European, Japanese and U.S. motor vehicles.<sup>9</sup> Other specifications for the location of the lower anchorage bars would also be set forth in the standard. The anchorage location zone would be determined using a child restraint apparatus (see Figures 1, 2 and 3 of the proposed standard).

Vehicle manufacturers incorporating the Scheme D system would also be required to provide connectors that would enable the system to be used with a UCRA-type child seat. The connector would have a component on one end that latches onto the 6 mm bar, and a UCRA latchplate on the other for attaching a UCRA child seat to the anchorage system. Comments are requested on the degree to which the geometry of the connector should be specified. A connector would have to be provided for each Scheme D lower anchorage point. NHTSA believes that a connector should be provided to ensure that parents having a UCRA-type child restraint can use the restraint in any vehicle. This aspect of the proposal was not included in the petition from BMW et al. Those petitioners suggested that a connector from a child restraint to the vehicle anchorages should be provided on the child restraint, by the child restraint manufacturer. Comments are requested on this issue.

#### 2. Upper Anchorage

The tether anchorage would be harmonized with Canadian and Australian requirements. Canada is preparing to require vehicles to have a factory-installed, user-ready tether anchorage. While AAMA et al. originally petitioned to require a specialized buckle that would be compatible with a latchplate on a child seat tether, petitioners have indicated a desire to harmonize with Canada and Australia. Thus, a simple anchor (such as a ring) on the vehicle would be sufficient, although a more sophisticated anchor could be provided if it is compatible with the tether hook

that today's NPRM proposes to require on child restraints.

#### e. Performance

The main performance requirement for the anchorage system would specify strength criteria for the lower and upper anchorages and related hardware. In addition, the standard would require the system to meet Standard 209's belt and buckle requirements, such as those relating to abrasion, resistance to light, corrosion resistance and temperature resistance. Comments are requested on whether Standard 213's buckle release requirements (S5.4.3.5) should also be met. Among other things, those requirements specify that a buckle must not release when subjected to a force of less than 40 N, and shall release when a force of not more than 62 N is applied.

The proposed strength criteria are to prevent the anchorages from failing in a crash. The anchorages, including structural components of the assembly, would have to withstand specified loads in a static pull test.

The performance criteria for the lower anchorages would require that, in a static test of the anchorages: (a) no portion of the latchplate for each anchorage shall move more than 125 mm forward of the seat bight when subjected to a forward force of 5,300 N and, (b) there shall be no complete separation of any anchorage component of the assembly (including webbing, straps, latchplates, adjustment and anchorage hardware and retractors).

The static pull test would specify that each lower anchorage is tested to withstand the application of a 5,300 N forward load. In the test, a force of 5,300 N would be applied to each anchorage in the forward direction parallel to the vehicle's longitudinal vertical plane. The force would be applied by means of a belt strap that is of sufficient length to extend not less than 250 mm forward from the vertical plane intersecting the seat bight. The belt would be fitted at one end with hardware for applying the force, and at the other end with hardware for attachment to the anchorage latchplate. The 5,300 N force is attained within 30 seconds, with an onset force rate not exceeding 135,000 N per second, and is maintained at the 5,300 N level for ten seconds. The test procedure and force level were selected to harmonize with the proposed Canadian regulations on the upper tether, as well as with the suggested force level of the UCRA petition. The same test is proposed for the rigid anchor system with the adapter attached to each anchor point.

<sup>9</sup>This figure is consistent with the ISO/WD 13216-1i report that are in the December 13, 1996 submittal to Docket No. 96-095, Notice 1.



A static pull test would also be specified in a new standard<sup>10</sup> for the upper tether anchorage, in accordance with Canada's proposed tether anchorage requirement. The force level and application rate would harmonize with the proposed Canadian regulations on the upper tether. The standard would specify that each structural component of the anchorage shall withstand a force of not less than 5,300 N, and that there shall be no complete separation or failure of any anchorage component. Comments are requested on whether more specificity is needed for these strength requirements, and on whether other performance requirements should be included in the standard.

Each tether anchorage would be tested separately. However, more than one tether anchorage installed on a row of seats would be tested simultaneously.

#### f. Instructions

The standard would require that instructions about attaching a child restraint to the vehicle anchorage system be provided in the vehicle owner's manual. The instructions would have to indicate the seating positions equipped with a child restraint anchorage system, and include instructions that provide a step-by-step procedure, including diagrams, for properly attaching a child restraint system to a vehicle anchorage system equipped with UCRA-type anchorages. In addition, for a vehicle equipped with a rigid anchorage system, instructions would also have to be provided for properly attaching a child restraint to the rigid system.

### VII. Proposal for Amendments to Child Seat Standard

#### a. Applicability

Standard 213 would be amended to require all child seats, other than belt positioning seats, to be equipped with components that are compatible with the UCRA anchorages on the vehicle system. Belt-positioning seats, which are a type of booster seat designed for older children, are designed to use a vehicle's lap and shoulder (Type II) belt system to restrain the child occupant. Because a vehicle's belt system is not necessarily directly routed around or through a belt-positioning seat to secure it to a vehicle, and because upper torso protection is provided by the shoulder portion of the Type II belt, there does not appear to be any incompatibility

between a vehicle seat or its seat belts and belt-positioning seats. Also, because a Type II belt system is placed around the child occupant who is seated on a belt-positioning seat, there would be a minimal amount of forward movement of the child and child seat before forward movement is restrained by the Type II belts.

#### b. Required Components

Requirements would be established for the components of the child seat that attach to the vehicle system. A child restraint would be permitted to have components that attach to rigid or semi-rigid Scheme D anchorages (Hybrid system), but the restraint must nonetheless have the UCRA attachments permanently attached to it. This would ensure that persons owning any type of child seat can use the restraint in any vehicle (i.e., all vehicles would be able to attach a UCRA-type seat, either attached to a UCRA system, or by way of UCRA connectors to Hybrid anchorages). The agency requests comments on whether child restraints intended to be used with systems that have Hybrid anchorages should be required to provide an adapter, rather than the UCRA components.

By way of reduced allowances on head excursion, each child seat would be required to have a tether that attaches to the vehicle. To minimize the chances of incompatibility between the seat and the vehicle, the standard would specify the exact geometry of the tether hook.

The regulatory text for this proposal does not include a provision that the child seat components attaching to the lower anchorages of the vehicle system have retractors to take up excessive slack in the belts. NHTSA requests comments on whether a retractor is needed or is manual adjustment enough to ensure that the child seat will be snug against the vehicle seat back. Excessive slack in the connecting belts could result in excessive head and knee excursions for the child occupant, and a greater likelihood of head impact.

In the October 1996 workshop, Kazuhiko Miyadara, Jocelyn Pedder of Transport Canada, and others indicated that a soft anchor system should have a means of taking up slack in the belts. Comments are requested on what type of retractor, if any, should be specified for the UCRA.

#### c. Dynamic Performance

The dynamic test specified in Standard 213 would be used to evaluate the performance of the child seat when attached to the universal vehicle anchorage system. The standard seat assembly specified in the standard to

test add-on child seats would be revised to incorporate a child restraint anchorage system meeting the proposed specifications. A child restraint would be attached to the system using the appropriate buckles and other components of the child restraint. Injury criteria and other performance requirements specified in Standard 213 would have to be met when the child seat is attached to the anchorage system.

Forward-facing restraints would be required to meet a head excursion limit of 720 mm (28.35 inches) when tested in accordance with its manufacturer's instructions. To meet this requirement, most manufacturers would likely have to provide a top tether, which would be attached in the test for this new requirement. Restraints would also be required to meet a head excursion limit of 813 mm (32 inches) when the tether is not attached, to ensure that a minimum level of safety is provided in a misuse situation. Each child seat would also have to meet the 720 mm (tethered) and 813 mm (untethered) head excursion limits when attached by a lap belt. This test would be to ensure a minimum level of safety performance when the child seat is used in a vehicle that does not have a UCRA or rigid anchor system.

NHTSA believes that Standard 209's belt and buckle requirements relating to abrasion, resistance to light, corrosion resistance and temperature resistance, should apply to the webbing and hardware installed on a child seat to connect to a vehicle system as required by the existing provisions of S5.4 of Standard 213. The agency tentatively concludes that these belt and buckle requirements of Standard 209 should apply to ensure the safe performance of the belts and associated hardware.

#### d. Instructions and Labeling

Standard 213 would be amended to require that instructions about attaching a child restraint to the vehicle anchorage system be provided in the printed instructions accompanying each restraint. The instructions would have to provide a step-by-step procedure, including diagrams, for properly attaching a child restraint system to a vehicle anchorage system equipped with UCRA-type anchorages, and if the child restraint is intended for a vehicle equipped with a rigid or Hybrid anchorage system, instructions for properly attaching to such a system. NHTSA also proposes amending Standard 213's labeling requirements, to either add a new provision or amend an existing one such as S5.5.2(g), to instruct owners to secure the child restraint system with either a vehicle

<sup>10</sup> Assuming a final rule on this subject is issued, the requirements set forth in the proposed tether standard could be incorporated into the standard on the child restraint system anchorage system, rather than in a separate standard.

belt or components attaching to a vehicle's child restraint anchorage system.

S5.5.2(j) of Standard 213 would already require a label instructing owners to secure the top tether strap of the child restraint. That section states that in the case of each child restraint system equipped with an anchorage strap, the following must be permanently labeled:

**SECURE THE TOP ANCHORAGE STRAP PROVIDED WITH THIS CHILD RESTRAINT AS SPECIFIED IN THE MANUFACTURER'S INSTRUCTIONS.**

Comments are requested on what changes, if any, should be made to this labeling requirement to increase the likelihood that parents will attach the top tether strap.

**VIII. Proposed Effective Date**

In their petition, AAMA et al recommended a schedule for phasing in the suggested requirements, should those requirements be adopted. The petitioners requested different schedules for vehicle manufacturers, child restraint manufacturers, and final-stage vehicle manufacturers and alterers. The latter group of manufacturers are typically small businesses. (See table 2, below.) The schedules suggested by AAMA et al. are based on the assumptions that (a) the

attaching system envisioned by the petitioners is adopted, and (b) a final rule is issued by January 1, 1997.

The petitioners suggest that vehicle manufacturers be permitted two alternatives in phasing in complying vehicles, beginning September 1, 1998. Under the first alternative, 10 percent of the vehicles manufactured in the first model year after September 1, 1998, would be required to have the child restraint anchorage system (manufactured on or after September 1, 1998, through August 31, 1999), 30 percent of the vehicles manufactured in the second model year (ending August 31, 2000), 50 percent in the third model year (ending August 31, 2001), and 100 percent in the fourth year (ending August 31, 2002). Under the second alternative, no vehicle need comply with the proposed standard before September 1, 2000, but 75 percent of a manufacturer's vehicles produced on or after September 1, 2000 through August 31, 2001 (model year 2001) would have to comply with the requirements, and 100 percent of its vehicles manufactured on or after September 1, 2001 would have to comply.

The requested schedule for child seat manufacturers also includes two alternatives for phasing in complying child seats, beginning September 1, 1998. The petition refers to child

restraints manufactured in a particular "model year," which apparently assumes the September 1 to August 31 cycle traditionally used to designate vehicle model years. Under the first alternative, 5 percent of the child seats manufactured in the first "model year" after September 1, 1998 would be required to have the components enabling the child restraint to attach to the universal vehicle system (model year ending August 31, 1999), 15 percent of the child restraints manufactured in the second model year (ending August 31, 2000), 25 percent in the third model year (ending August 31, 2001), and 100 percent in the fourth year (ending August 31, 2002). Under the second alternative, no child restraint need comply with the proposed amendments to Standard 213 before September 1, 2000, but 50 percent of a manufacturer's restraints produced on or after September 1, 2000 through August 31, 2001 (model year 2001) would have to comply with the requirements, and 100 percent of its child seats manufactured on or after September 1, 2001 would have to comply.

The petitioners provided the following table showing the requested phase-in schedules for vehicle and child seat manufacturers:

**PETITIONERS REQUESTED PHASE-IN ALTERNATIVES (PERCENT OF PRODUCTS REQUIRED TO COMPLY)**

Model year	Vehicle manufacturers alternative #1 (percent)	Vehicle manufacturers alternative #2	Child seat manufacturers alternative #1 (percent)	Child seat manufacturers alternative #2
1999 .....	10	0	5	0
2000 .....	30	0	15	0
2001 .....	50	75	25	50
2002 .....	100	100	100	100

The requested schedule for final-stage manufacturers and alterers would provide these manufacturers the option of using the phase-in schedule for vehicle manufacturers, described above, or the alternative of having the requirements become mandatory on September 1, 2001 for 100 percent of a manufacturer's vehicles, and not before.

NHTSA has made the following tentative decisions about leadtime. The agency believes that the proposed requirement that vehicles provide a user-ready tether anchorage and that child seats provide a tether can be made effective at a much earlier date than a requirement for the lower anchorages of a child restraint anchorage system. Passenger cars, in particular, generally are already equipped with a tether

anchor (Canada has required a tether anchorage in passenger cars since 1989), so it appears that a user-ready anchorage can be provided in the near future. Canada is proposing an effective date of September 1, 1999 for its tether hardware requirement for passenger cars. NHTSA proposes that its tether anchorage requirement for passenger cars be the same as the Canadian proposal.

For LTVs, Canada has also proposed that its tether anchor (hole) requirement be effective September 1, 1999, and its tether hardware requirement effective a year later. In view of these dates and that anchorages (holes) are apparently not as currently available on LTVs as on passenger cars, NHTSA proposes a

September 1, 2000 effective date for its tether hardware requirement for LTVs.

With regard to child restraints, restraints manufactured in the U.S. and sold in Canada already are equipped with a tether to meet Canadian requirements. NHTSA believes that most U.S. manufacturers produce child restraints for sale in Canada. NHTSA is considering an effective date of September 1, 1999 for its proposal to effectively require tethers by way of reducing Standard 213's head excursion requirement.

As to a requirement for the lower anchorages, the petitioners did not explain why a phase-in is needed, or why more than four years would be needed to implement the requirement. The agency is determined to remedy the

problem of incompatibility of child restraints and motor vehicles as promptly as possible and requests comments on the feasibility of having full implementation (100 percent of affected vehicles) in a shorter period, e.g., two years after the publication of a final rule. GM indicated in the UCRA petition that if allowed, it would begin installing the UCRA system on vehicles before completion of this rulemaking on UCRA's. (NHTSA replied in an August 27, 1996 letter that manufacturers are permitted to voluntarily install the system before completion of a final rule.) Given that the UCRA technology is developed and available, and capable of being installed in today's vehicles, the agency believes the system could be implemented within two years. The same issue arises with regard to the effective date for requiring child restraints to be equipped with buckles and other components compatible with the UCRA system. Comments are requested on why a phase-in is needed, and on whether a shorter compliance date is possible.<sup>11</sup>

NHTSA recognizes that the rigid attachment system may need longer time to implement, especially on vehicles that may need to redesign their vehicle seats and/or floor pans. This was acknowledged by the international safety community in the December 6, 1996 ISO resolution that the rigid system is a hardware alternative that needs some time for development, as compared to the flexible hardware option. (See section IV.a., *supra*.) The agency's proposal would allow the long term rigid anchors solution to coexist with the UCRA approach that is available today. Even though the proposed lead time of 24 months may not be sufficient for the rigid anchorage hardware technology, the proposed rule provides vehicle manufacturers with the option of implementing the rigid system (with connectors) once it is developed, while providing a UCRA-type system in the short term.

## IX. Rulemaking Analyses and Notices

### a. Executive Order 12866 (Federal Regulation) and DOT Regulatory Policies and Procedures

NHTSA has examined the impact of this rulemaking action and determined that it is economically significant within the meaning of Executive Order 12866

and significant within the meaning of the Department of Transportation's regulatory policies and procedures. NHTSA has prepared a Preliminary Economic Assessment (PEA) for this notice which discusses issues relating to the potential costs, benefits and other impacts of this regulatory action.

A copy of this analysis has been placed in the docket for this rulemaking action. Interested persons may obtain copies of this document by writing to the docket section at the address provided at the beginning of this notice.

To briefly summarize the analysis, NHTSA estimates that the cost of a rule requiring the UCRA system would be approximately \$160 million. The cost of the rule related to the vehicle would range, per vehicle, from \$3.88 (one UCRA in front seat only) to \$7.76 (for one UCRA in front seat and one in back seat or two UCRA's in rear seats). NHTSA estimates that 15 million vehicles would be affected: 9 million passenger cars and light trucks with "adequate" rear seats, 3 million vehicles with no rear seat, and 3 million vehicles that can only accommodate a forward-facing child seat in the rear seat (not a rear-facing infant seat). The cost of the rule for vehicles is estimated to be about \$105 million. The cost of the UCRA attachments on the child seat is estimated to be about \$55 million (3.9 million child restraints (excluding belt-positioning boosters) at \$14 per seat).

The benefits of the rule are estimated to be 24 to 32 lives saved per year, and 2,187 to 3,615 injuries prevented.

As discussed in the PEA for this proposal, in view of the cost of the UCRA attachments on a child restraint, estimated to be about \$14 per restraint, NHTSA requests information on the price elasticity of child restraints. NHTSA is concerned about the potential effects of this rule on the purchase behavior of consumers. As one participant in the October 1996 workshop pointed out, if consumer demand is sufficiently sensitive to new car seat prices, the resulting changes in car seat usage could partially or totally offset the benefits of the proposed rule. NHTSA has estimated that the proposed rule will raise the price of the average car seat by \$14. For a \$50 car seat, this represents a 28 percent increase in price. On the other hand, each of the States and the District of Columbia require the use of child restraints in motor vehicles. To what extent, if at all, would an increase in the price of a child restraint lead to a decrease in demand for the product, notwithstanding child restraint use laws mandated by each State? Also, NHTSA and child restraint manufacturers have been inundated

with calls from parents asking for help in installing seats correctly. Would this interest in child safety motivate a sufficiently large number of people to pay \$14 for changes to a child restraint that would make a restraint easier to install and more secure on a vehicle seat? NHTSA is especially interested in comments from consumers on these questions.

Consumers have essentially four choices: buy a car seat despite the higher price, buy a used seat, seek a giveaway or loaner program, or forego the seat altogether. If a 28 percent price increase were to result in a 10 percent decrease in new sales and thus a corresponding decline in usage (assuming options two and three are not available), then the estimated benefits of the rule (24 to 32 fatalities prevented per year) could be offset by an estimated 24 fatalities from reductions in the number of seats in use. Consumers turning to the used car seat market would receive no benefit from the proposed rule. The offsetting effects would be reduced if there is a corresponding increase in giveaway and loaner programs, but by virtue of the price increase these programs would have to find new or additional funding.

The agency does not know how many programs exist and requests information on this issue. A cost increase could result in fewer seats being purchased by the program for loan or giveaway. On the other hand, persons responsible for some State loaner/giveaway programs informed the agency that if the new seats cost more, they would be able to find the funding to keep up with demand. They also said that the time saved installing child seats in each vehicle and making adjustments would be worth the difference in price.

Unfortunately, NHTSA has not located any data or estimates of the actual sensitivity of new child restraint sales to price changes. For the sake of comparison, a large proportion of consumer goods exhibit greater sensitivity to price than that described in the hypothetical example above, even in the short run. If new child restraint purchases in fact exhibit the same magnitude of price sensitivity as many other consumer goods, the proposed rule could increase rather than reduce the overall risks to the Nation's children.

For these reasons, NHTSA strongly encourages data, analyses, and comment on this issue. The agency also requests comments on ways to mitigate these effects, such as ways to minimize effects on price. For example, the \$14 cost increase includes the cost of two buckles that attach to latchplates of the

<sup>11</sup> A phase-in of an amendment to an equipment standard is uncommon. It should be noted that to implement a phase-in requirement, the agency would require manufacturers to provide information on the total annual sales of their seats, so that the agency can determine whether the requisite number of seats complied with the new requirements.

UCRA system on the vehicle. Would costs be reduced if the latchplates were part of the child restraint and the buckles part of the vehicle system? This assumes that the buckle hardware is of higher cost than the latchplates. Should NHTSA conclude that both (1) the combination of expected child restraint price changes and consumer sensitivity to those price changes is sufficiently large and (2) there are no cost-effective ways to mitigate these effects such that the final rule will result in a net increase in child safety, NHTSA would need to reconsider the proposal.

#### *b. Regulatory Flexibility Act*

The Regulatory Flexibility Act of 1980 (Public Law 96-354), as amended, requires agencies to evaluate the potential effects of their proposed and final rules on small businesses, small organizations and small governmental jurisdictions. Section 603 of the Act requires agencies to prepare and make available for public comment an initial regulatory flexibility analysis (IRFA) describing the impact of proposed rules on small entities. NHTSA has included an IRFA in the PEA for this proposal.

NHTSA tentatively believes that the proposed rule could have a significant impact on a substantial number of small entities. The proposed rule would affect motor vehicle manufacturers, almost all of which would not qualify as small businesses, and portable child restraint manufacturers. NHTSA estimates there to be about 10 manufacturers of portable child restraints, four or five of which could be small businesses.

Business entities are generally defined as small businesses by Standard Industrial Classification (SIC) code, for the purposes of receiving Small Business Administration assistance. One of the criteria for determining size, as stated in 13 CFR 121.601, is the number of employees in the firm. There is no separate SIC code for child restraints, or even a category that they fit into well. However, there are categories that could be appropriate. To qualify as a small business in the Motor Vehicle Parts and Accessories category (SIC 3714), the firm must have fewer than 750 employees. The agency has considered the small business impacts of this proposed rule based on this criterion. On the other hand, to qualify as a small business in the category including manufacturers of baby furniture, the firm must have fewer than 500 employees. Comments are requested on which Standard Industrial Classification code would best represent child restraint manufacturers.

The IRFA discusses the possible impacts on small entities and requests

information that would assist NHTSA in further analyzing those impacts. As discussed in the IRFA, the incremental cost increase of \$14 to the current price of a child restraint would significantly raise the price of child restraints, which could have a significant economic impact on a substantial number of small businesses. NHTSA does not know the elasticity of demand for child restraints. While child restraint use is mandated by each State, there is significant nonuse of restraints. An increase in the price of a child restraint could lead to a decrease in demand for the product, notwithstanding the restraint use laws.

According to information from Cosco (see summary, above, of NHTSA's October 1996 public workshop), the average purchase price of a convertible car seat today is \$63. About 25 percent of the car seats purchased cost \$50 or less; less than five percent cost \$100 or more. Cosco estimated that at least 10 percent of the people would not be able to purchase a car seat if prices increased significantly.

Comments are requested on the effect that raising child restraint prices by \$14 (UCRA attachments) to possibly \$100 (hard anchor system) would have on small businesses that manufacture child restraints. Would an across-the-board increase in price reduce small business sales? What is the magnitude of the impact?

As discussed above in section IX.a., a loaner program could have fewer seats available. Assuming that would be the case, NHTSA seeks information on the extent to which the number of seats a program makes available impacts on the organization itself. For example, do proceeds from loaner or giveaway programs (where a nominal fee might be charged) support the not-for-profit organization's activities?

NHTSA tentatively believes that there are no alternatives to the proposal which would accomplish the stated objectives of 49 U.S.C. § 30101 *et seq.* and which would minimize any significant economic impact of the proposed rule on small entities. As discussed above in section V.c., "Discussion of Alternatives," NHTSA considered a number of other approaches to minimize or eliminate incompatibility between child seats and vehicle seats. SAE Recommended Practice J1819, "Securing Child Restraint Systems in Motor Vehicle Rear Seats," does not appear sufficient alone to solve incompatibility problems. It is a tool for evaluating incompatibility, not a requirement that vehicle seats and child restraints must be compatible. Further, it is very difficult for a single system to optimize the safety protection

for adults of all ranges and child restraints of different types. The current "lockability" requirement does not appear sufficient alone in addressing incompatibility, because it still depends on the user knowing enough and making the effort to manipulate and correctly route the belt system. Also, the lockability requirement does not address incompatibility problems arising from forward-mounted seat belt anchors. The "Car Seat Only (CSO)" system suggested by Cosco probably would not make attaching a child seat significantly easier than it is today. The CSO belt would have to be correctly routed through the child restraint, which is a problem occurring with present seats, and appears hard to tighten. Also, Cosco provided no information showing that the CSO belt would improve the securement of a child restraint on contoured (especially humped) seats. Another concern relates to the potential for inadvertent use by an adult occupant.

Comments are requested on possible alternatives to the proposal which mitigate any significant economic impact of the proposed rule on small entities, while accomplishing the objectives of 49 U.S.C. § 30101 *et seq.*

#### *c. Executive Order 12612*

This proposed rule has been analyzed in accordance with the principles and criteria contained in Executive Order 12612, and the agency has determined that this proposal does not have sufficient federalism implications to warrant the preparation of a Federalism Assessment.

#### *d. Unfunded Mandates Reform Act*

The Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4) requires agencies to prepare a written assessment of the costs, benefits and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local or tribal governments, in the aggregate, or by the private sector, of more than \$100 million annually. NHTSA has included an evaluation in the PEA for this proposal. The costs and benefits of the proposal are discussed above and throughout the PEA. (As explained above, the cost would be approximately \$105 million for vehicles, and \$55 million for child restraints. The benefits would be saving approximately 24 to 32 children's lives per year, and preventing 2,187 to 3,615 injuries. An independent means of attaching child restraints would also enable vehicle manufacturers to optimize the design of vehicle belt systems for adult occupants.)

Participants in a NHTSA public meeting held in March 1995 at the Lifesavers National Conference on Highway Safety Priorities, who typically work in State highway traffic safety agencies, community traffic safety programs and State or local law enforcement agencies, expressed strong support for a requirement for a universal child restraint anchorage system, such as that proposed in this NPRM. Support for a universal child restraint anchorage system, such as that proposed in the NPRM, was also expressed at NHTSA's October 1996 public workshop on various types of anchorage systems. As discussed above in sections V.c. and IX.b., and in the PEA, the agency does not believe that there are feasible alternatives to the proposal, including SAE Recommended Practice J1819, the lockability requirement or Cosco's CSO system.

#### e. National Environmental Policy Act

NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action would not have any significant impact on the quality of the human environment.

#### f. Executive Order 12778 (Civil Justice Reform)

This proposed rule does not have any retroactive effect. Under section 49 U.S.C. 30103, whenever a Federal motor vehicle safety standard is in effect, a state may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard, except to the extent that the state requirement imposes a higher level of performance and applies only to vehicles procured for the State's use. 49 U.S.C. 30161 sets forth a procedure for judicial review of final rules establishing, amending or revoking Federal motor vehicle safety standards. That section does not require submission of a petition for reconsideration or other administrative proceedings before parties may file suit in court.

#### X. Comments on the Proposal

Interested persons are invited to submit comments on the proposal. It is requested, but not required, that 10 copies be submitted.

All comments must not exceed 15 pages in length. (49 CFR 553.21). Necessary attachments may be appended to these submissions without regard to the 15-page limit. This limitation is intended to encourage commenters to detail their primary arguments in a concise fashion.

If a commenter wishes to submit certain information under a claim of confidentiality, three copies of the complete submission, including purportedly confidential business information, should be submitted to the Chief Counsel, NHTSA, at the street address given above, and seven copies from which the purportedly confidential information has been deleted should be submitted to the Docket Section. A request for confidentiality should be accompanied by a cover letter setting forth the information specified in the agency's confidential business information regulation. 49 CFR Part 512.

All comments received before the close of business on the comment closing date indicated above for the proposal will be considered, and will be available for examination in the docket at the above address both before and after that date. To the extent possible, comments filed after the closing date will also be considered. Comments received too late for consideration in regard to the final rule will be considered as suggestions for further rulemaking action. Comments on the proposal will be available for inspection in the docket. The NHTSA will continue to file relevant information as it becomes available in the docket after the closing date, and it is recommended that interested persons continue to examine the docket for new material.

Those persons desiring to be notified upon receipt of their comments in the rules docket should enclose a self-addressed, stamped postcard in the envelope with their comments. Upon receiving the comments, the docket supervisor will return the postcard by mail.

#### List of Subjects 49 CFR Part 571

Imports, Motor vehicle safety, Motor vehicles.

#### PART 571—[AMENDED]

In consideration of the foregoing, NHTSA proposes to amend 49 CFR Part 571 as set forth below.

1. The authority citation for Part 571 would continue to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117 and 30166; delegation of authority at 49 CFR 1.50.

2. Section 571.210a would be added to read as follows:

#### § 571.210a Standard No. 210a; Child restraint anchorage system.

S1. *Purpose and scope.* This standard establishes requirements for a system for anchoring child restraint systems to increase the likelihood that child

restraints are properly secured in motor vehicles.

S2. *Application.* This standard applies to passenger cars, and to multipurpose passenger vehicles, trucks and buses with a GVWR of 10,000 pounds or less, except walk-in van-type vehicles and vehicles manufactured to be sold exclusively to the U.S. Postal Service.

#### S3. Definitions.

*Child restraint anchorage* means any component involved in transferring child restraint loads to the vehicle structure, including but not limited to, the attachment hardware on the vehicle structure, webbing and straps attached to the vehicle and hardware attached thereto, the seat frames, seat pedestals, and the vehicle structure itself.

*Child restraint anchorage system* means a system that is designed for attaching a child restraint to a vehicle at a particular designated seating position and for transferring child restraint loads to the vehicle structure and that consists of—

- (1) Two lower child restraint anchorages at the seat bight; and
- (2) A tether anchorage for attaching a top tether strap of a child restraint system.

*Child restraint apparatus* means the fixture depicted in Figures 1, 2 and 3 of this standard which simulates the dimensions of a child restraint, and which is used to determine the space required by the child restraint and the location and access to the lower anchorages.

*Seat bight* means the intersection of the vertical plane tangent to the forward most point of the seat back and the horizontal plane tangent to the uppermost point of the seat cushion.

*Tether anchorage* is defined in 49 CFR 571.210b, "Tether anchorages for child restraint systems."

S4. *Requirements.* Each motor vehicle shall meet the requirements in this section when, as specified, tested in accordance with S5 and this paragraph.

#### S4.1 Type.

(a) Except as provided in S4.1(b) through (d) of this section, each vehicle shall be equipped with a child restraint anchorage system for at least two rear designated seating positions.

(b) A vehicle may be equipped with a built-in child restraint system conforming to the requirements of Standard No. 213 (49 CFR 571.213) in lieu of one of the child restraint anchorage systems required by S4.1(a) of this section.

(c) A vehicle that meets the conditions concerning rear seats in either S4.5.4.1(a) or S4.5.4.1(b) of Standard No. 208 (49 CFR 571.208) and

that has an air bag cutoff switch meeting the requirements of S4.5.4 of Standard 208 shall have a child restraint anchorage system installed for a designated seating position in the front seat, and for a position in the rear seat if the vehicle has a rear seat.

(d) A vehicle that has no forward-facing designated seating positions to the rear of the front seating positions and no air bag cutoff switch meeting the requirements of S4.5.4 of Standard 208, shall not have a child restraint anchorage system installed for a designated seating position in the front seat.

#### S4.2 Lower anchorages.

The child restraint anchorage system shall have two lower anchorages and shall conform to either S4.2.1, or S4.2.2 and S4.2.3, at the manufacturer's option.

##### S4.2.1 Flexible anchorages.

###### S4.2.1.1 Configuration and Geometry.

A child restraint anchorage system shall incorporate two lower anchorages with latchplates conforming to the configuration and geometry specified in Figure 4 of this standard.

###### S4.2.1.2 Location.

(a) When fully extended in a plane parallel to the vehicle's longitudinal axis, the centerlines of the two latchplates are 280 mm apart.

(b) When fully extended in a plane parallel to the vehicle's longitudinal axis, the tip of each latchplate must not extend more than 50 mm forward of the seat bight.

###### S4.2.1.3 Strength.

When tested in accordance with S5 of this standard, a child restraint anchorage system shall meet the following requirements:

(a) No portion of the latchplate for each lower anchorage shall pass through a vertical, transverse plane that is 125 mm forward of the seat bight; and

(b) There shall be no complete separation of any anchorage component (including webbing, straps, hooks and buckles, latchplates, adjustment and attachment hardware and retractors).

##### S4.2.2 Rigid or semi-rigid anchorages.

###### S4.2.2.1 Configuration and geometry.

A child seat anchorage system shall incorporate two lower anchorages that are 6 mm diameter transverse horizontal round bars with a minimum length of 25 mm.

###### S4.2.2.2 Location.

(a) The transverse spacing of the bars shall be 280 mm, center-to-center.

(b) The lower anchorage bars are located with respect to the child restraint apparatus rearward extensions as shown in Figures 2 and 3 of this standard, with the child restraint apparatus placed on the vehicle seat cushion and against the vehicle seat back. Anchorage bars that are rigidly supported are to be 50 mm rearward of the rearmost surface of the fixture, while semi-rigidly supported bars may be located from 50 mm rearward to 10 mm forward of that surface. The center of rigidly supported lower anchorage bars shall be at least 120 mm behind the vehicle seating reference point.

(c) Rigidly supported lower anchorage bars must be in a zone from 10 to 20 mm above the bottom surface of the child restraint apparatus, while semi-rigidly supported bars must be in a zone from 0 to 20 mm above that surface.

###### S4.2.2.3 Strength.

When tested in accordance with S5 of this standard, a child restraint anchorage shall meet the following requirements:

(a) No portion of any component attaching to the lower anchorage bars shall move forward more than 125 mm.

(b) There shall be no complete separation of any anchorage component.

###### S4.2.3 Connectors.

Each vehicle equipped with lower anchorages conforming to S4.2.2 of this standard shall be equipped with connectors that permit the attachment of a child restraint that is equipped with components which attach to lower anchorages conforming to S4.2.1. Each connector shall be equipped with a latchplate conforming to the configuration and geometry specified in Figure 4 of this standard. When attached to a lower anchorage, the tip of each latchplate must not extend more than 50 mm forward of the seat bight when the connector is fully extended.

##### S4.3 Tether anchorage.

The child restraint anchorage system shall incorporate a tether anchorage conforming to 49 CFR 571.210b, "Tether anchorages for child restraint systems."

##### S4.4 Webbing, buckles and belt adjustment hardware.

###### S4.4.1 Webbing.

The webbing provided with a child restraint anchorage system shall—

(a) After being subjected to abrasion as specified in S5.1(d) or S5.3(c) of FMVSS No. 209 (49 CFR 571.209), have a breaking strength of not less than 75 percent of the strength of the unabraded webbing when tested in accordance with S5.1(b) of FMVSS 209; and

(b) Meet the requirements of S4.2(e) through (h) of FMVSS No. 209 (49 CFR 571.209).

##### S4.4.2 Buckles and belt adjustment hardware.

Each belt buckle and item of belt adjustment hardware used in a child restraint anchorage system shall conform to the requirements of S4.3(a) and S4.3(b) of FMVSS No. 209 (49 CFR 571.209).

##### S4.5 Marking and Guidance.

For lower anchorages conforming to S4.2.2, at least one lower anchorage bar is to be readily visible to the person installing a child restraint. The vehicle seat cushion or seat back shall include markings or features to assist in the correct lateral positioning of the child restraint system as it is moved rearward to engage the lower anchorages.

##### S4.6 Instructions.

The vehicle owner's manual shall:

(a) Indicate the seating positions equipped with a child restraint anchorage system;

(b) Include instructions that provide a step-by-step procedure, including diagrams, for properly attaching a child restraint system to a vehicle anchorage system equipped with lower anchorages conforming to the requirements of S4.2.1 (with or without use of a connector); and,

(c) Include instructions for properly installing a child restraint system in a vehicle anchorage system equipped with lower anchorages conforming to the requirements of S4.2.2, if the vehicle is equipped with such anchorages.

##### S5 Test procedures.

###### S5.1 Lower anchorages.

Test each lower anchorage separately, with or without connectors provided with the vehicle. Apply a force of 5,300 N to each anchorage in the forward horizontal direction parallel to the vehicle's longitudinal axis. Apply the force by means of a belt strap that extends at least 250 mm forward of the seat bight. The belt is fitted at one end with hardware for applying the force, and at the other end with hardware that attaches to an anchorage or connector. Apply force to the belt strap so that the 5,300 N force is attained within 30 seconds, with an onset force rate not exceeding 135,000 N per second, and is maintained at the 5,300 N level for at least 10 seconds.

###### S5.2 Tether anchorage.

Tether anchorages are tested according to the procedures specified in 49 CFR 571.210b, "Tether anchorages for child restraint systems."

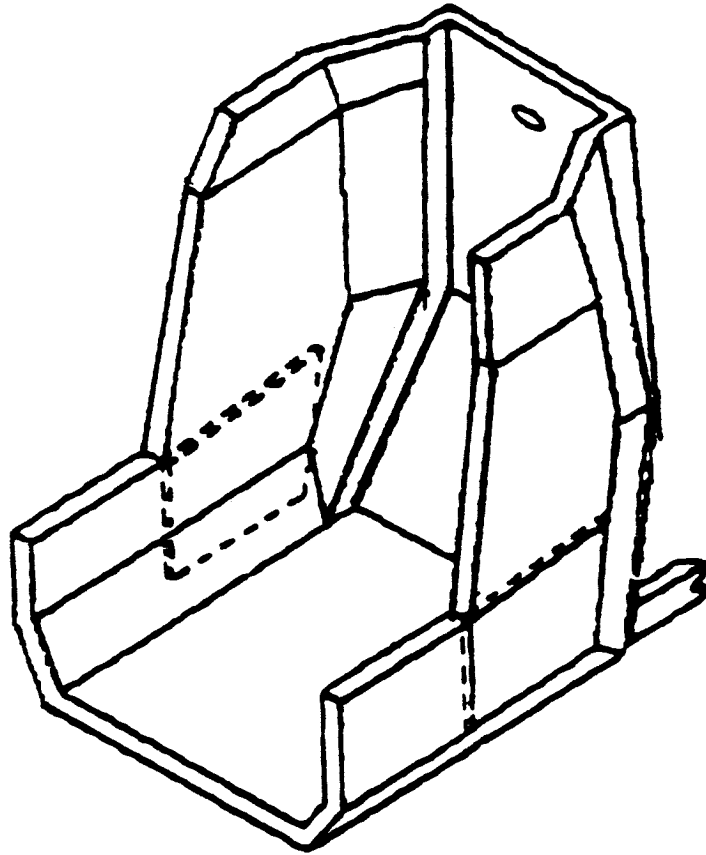


Figure 1—Child Restraint Apparatus-Isometric



**Side & back frames removable  
for installation in vehicle**

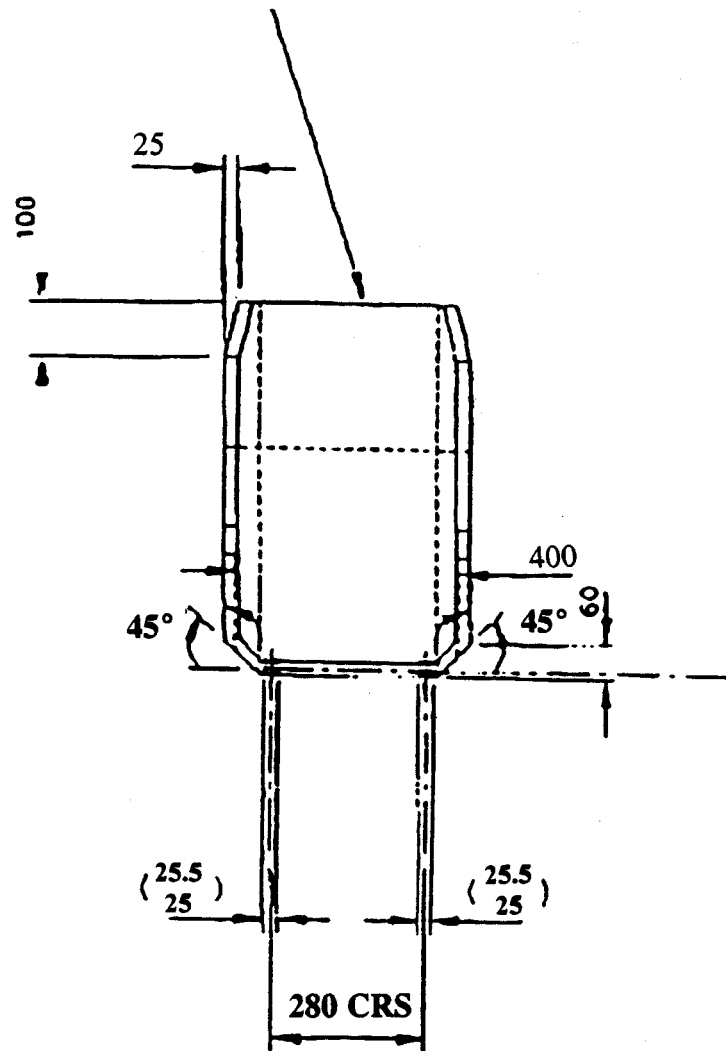


Figure 2a—Child Restraint Apparatus Anchorages Front View

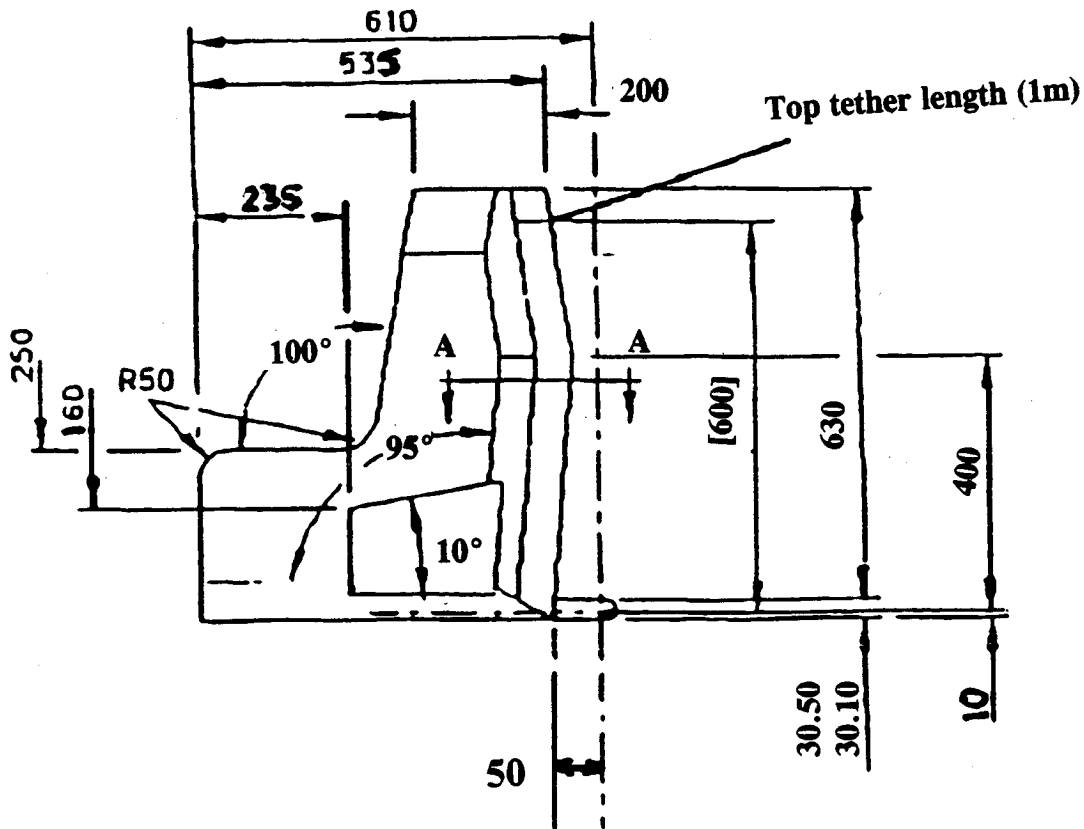
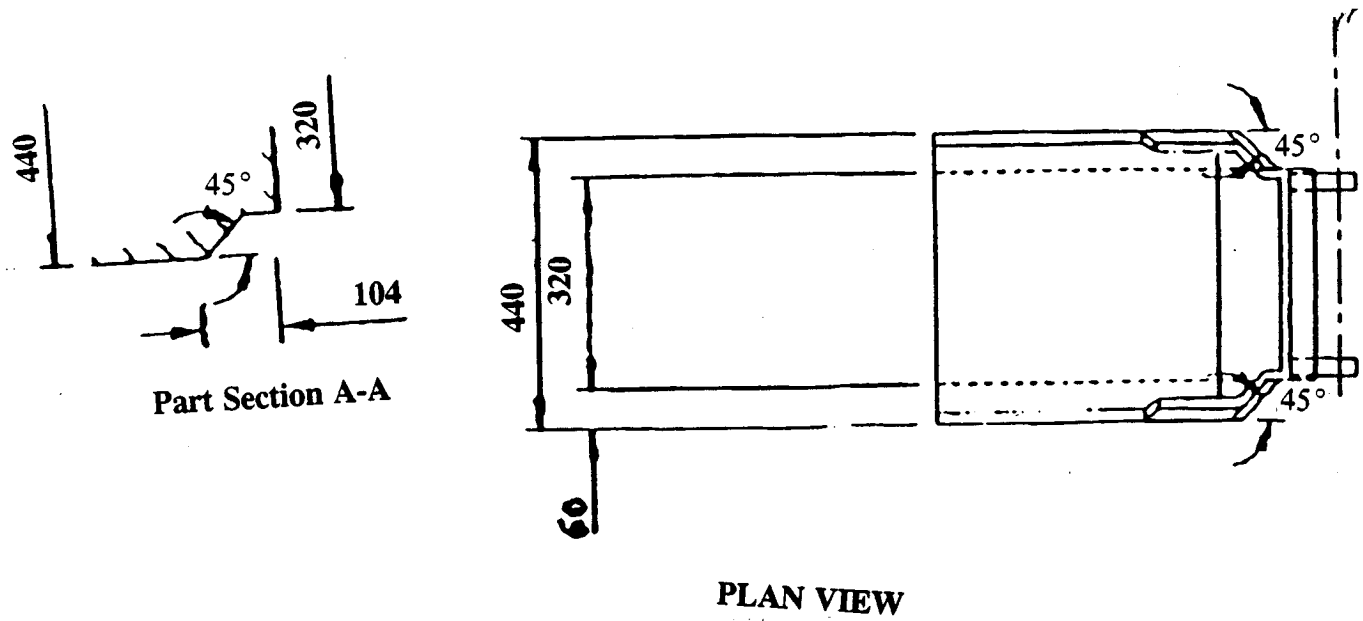
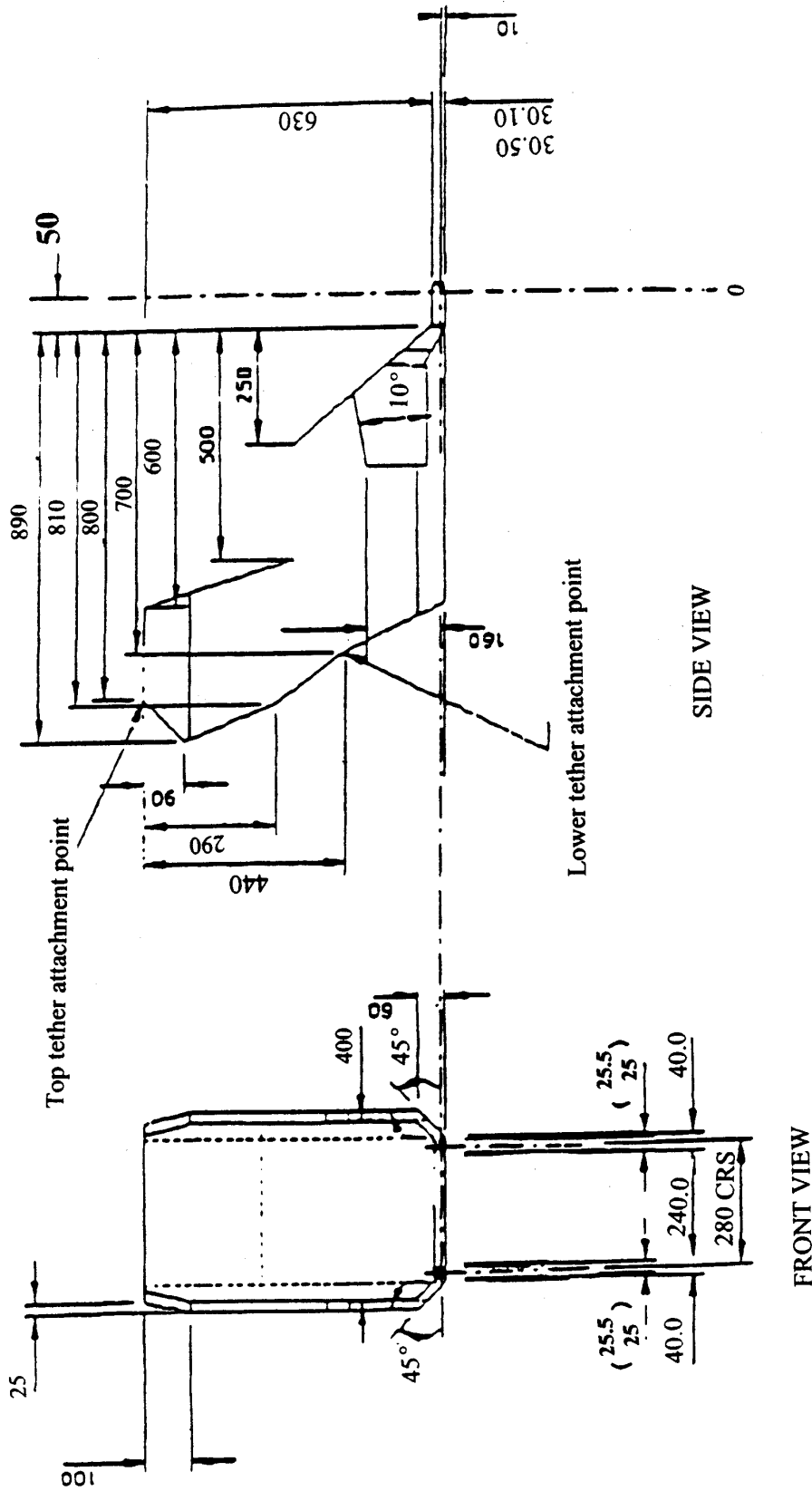
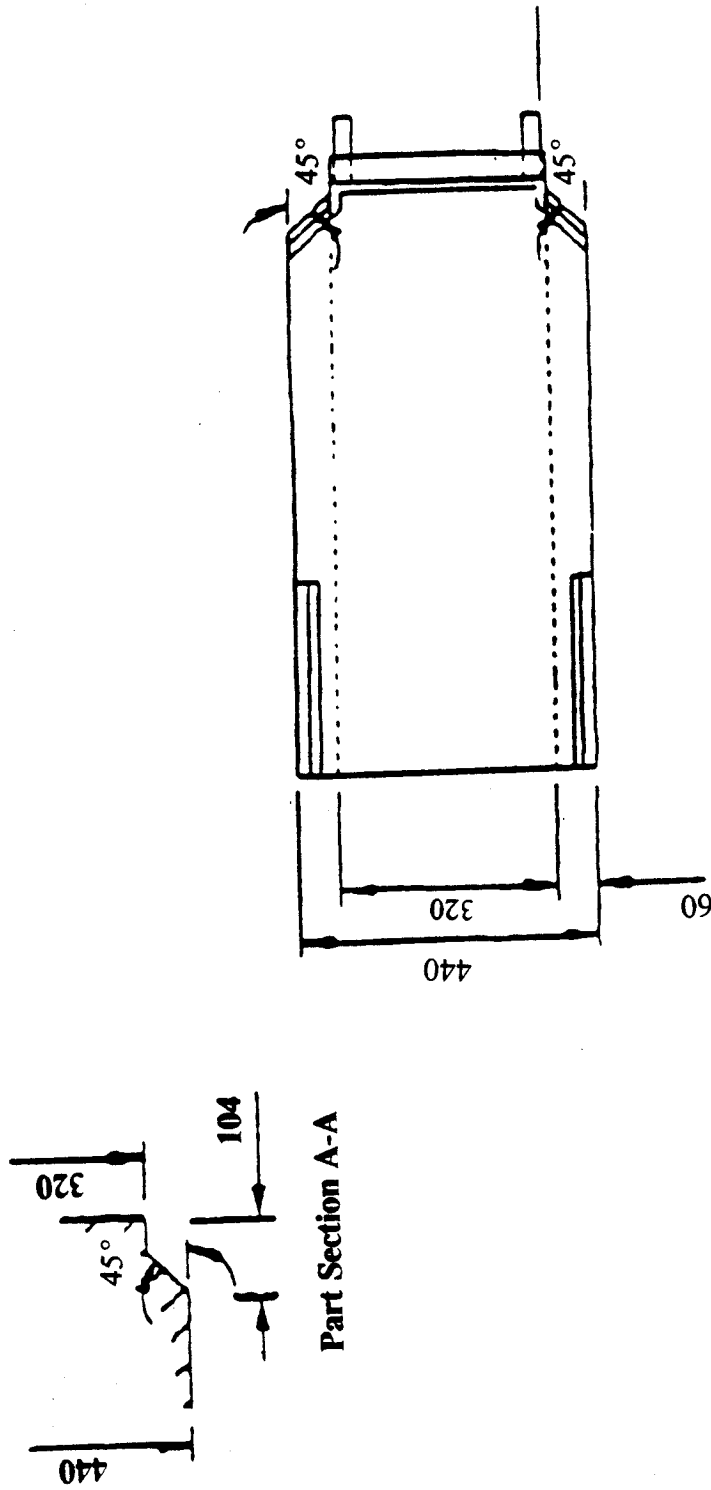


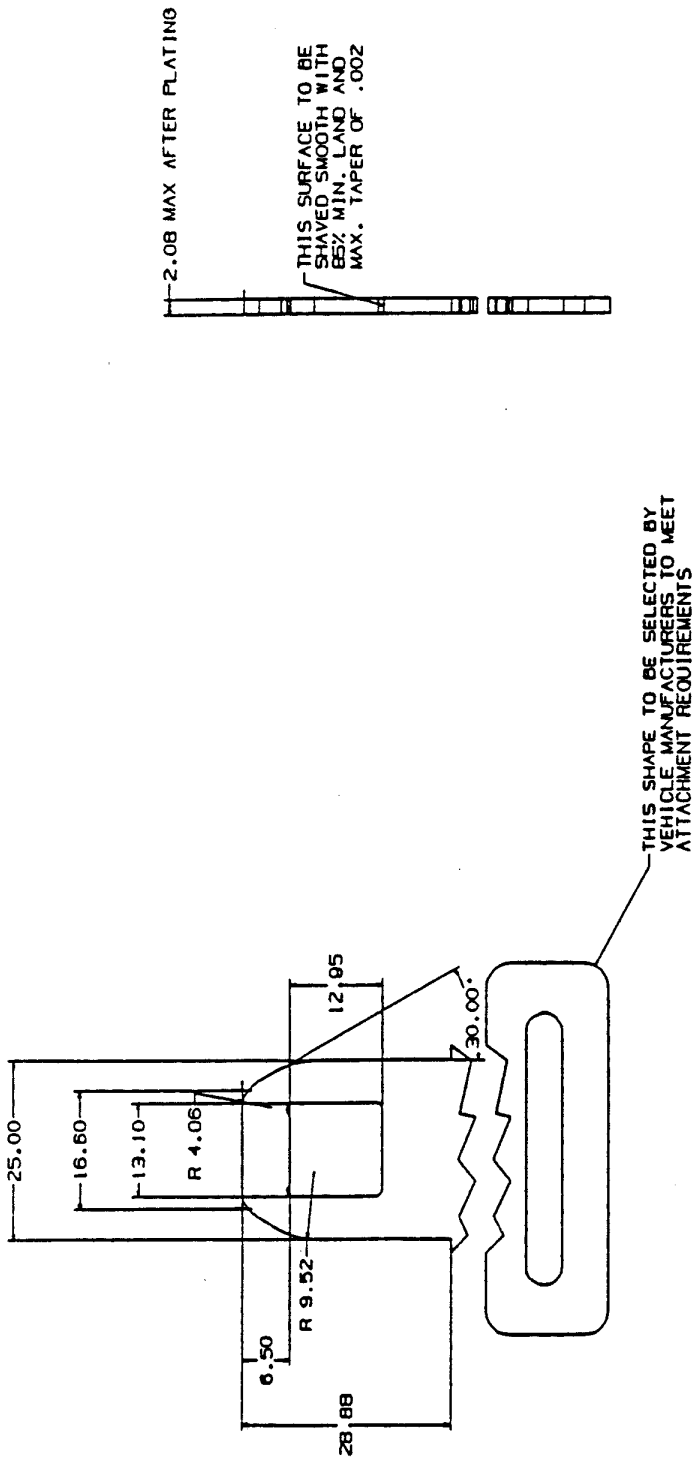
Figure 2b—Child Restraint Apparatus Anchorages Side and Plan View



**Figure 3a-Child Restraint Apparatus Anchorage  
Rear-Facing  
Front and Side Views**



**Figure 3b-Child Restraint Apparatus Anchorages  
Rear-Facing  
Plan View**



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Figure 4 -- Child Restraint Attachment Plate Specifications

3. Section 571.210b would be added to read as follows:

**§ 571.210b Standard No. 210b; Tether anchorages for child restraint systems**

**S1. Purpose and scope.** This standard establishes requirements for the strength and location of tether anchorages to ensure proper anchoring of child restraint systems.

**S2. Application.** This standard applies to tether anchorages installed in passenger cars manufactured on or after September 1, 1999, and in multipurpose passenger vehicles, trucks and buses manufactured on or after September 1, 2000.

**S3. Definitions.**

**Tether anchorage** means any component that transfers loads from tether anchorage hardware to the vehicle structure.

**Tether anchorage hardware** means any component that transfers tether strap loads to a tether anchorage and is designed to accept a tether strap hook.

**Tether strap** means a device that is fitted with a tether strap hook and secured to the rigid structure of a child restraint system and that transfers the load from that system to the anchorage hardware.

**Tether strap hook** means a device, illustrated in Figure 11 of Standard No. 213 (49 CFR 571.213), used to attach a tether strap to tether anchorage hardware.

**S4. Requirements.** Each tether anchorage shall meet the requirements of this section.

**S4.1 Configuration.**

**S4.1.1** Except as provided by S4.1.2, each tether anchorage shall—

(a) Be equipped with tether anchorage hardware that is easily accessible and that permits the attachment of a tether hook meeting the configuration and geometry specified in Figure 11 of Standard No. 213 (49 CFR 571.213) of this section;

(b) Be located in accordance with S4.2 of this section; and

(c) Be sealed to prevent the entry of exhaust fumes.

**S4.2 Anchorage positioning requirements.**

**S4.2.1 Passenger cars and multipurpose passenger vehicles.** The vertical centerline of each tether anchorage and each tether anchorage hardware component shall be located within the shaded zone shown in Figures 2, 3, 4 and 8 of this standard, with reference to the shoulder reference point of a template described in section 3.1 of SAE Standard J826 (June 1992), where

(a) The H-point of the template is located at the unique Design H-point of the seat, as defined in section 2.2.11.1 of SAE Recommended Practice J1100 (June 1993), at the full rearward and downward position of the seat;

(b) The torso line of the template is at the same angle from the vertical plane as the seat back with the seat adjusted to its full rearward and full downward position and the seat back in its most upright position; and,

(c) The template is positioned in the vertical longitudinal plane that contains the H-point of the template.

**S4.2.2 Trucks and buses.** Subject to S4.3.2.1, the vertical centerline of each tether anchorage and each tether anchorage hardware in a truck or bus shall be located within the shaded zone shown in Figures 5, 6, 7, and 8 of this standard, with reference to the H-point of a template described in section 3.1 of SAE Standard J826 (June 1992), where

(a) The H-point of the template is located at the unique Design H-point of the seat, as defined in section 2.2.11.1 of SAE Recommended Practice J1100 (June 1993), at the full rearward and downward position of the seat;

(b) The torso line of the template is at the same angle from the vertical plane as the seat back with the seat adjusted to its full rearward and full downward position and the seat back in its most upright position; and

(c) The template is positioned in the vertical longitudinal plane that contains the H-point of the template.

**S4.3.2.1** The centerline of a tether anchorage in a truck or bus may be

located outside the shaded zone referred to in S4.3.2 if a routing device that is of sufficient strength to withstand the loads referred to in S4.4 is installed within that shaded zone.

**S4.4 Strength.**

**S4.4.1** If a tether anchorage is installed for only one designated seating position on a seat, the tether anchorage with the tether anchorage hardware installed shall, when tested in accordance with S5, withstand a force of 5,300 N. There shall be no complete separation or failure of any anchorage component.

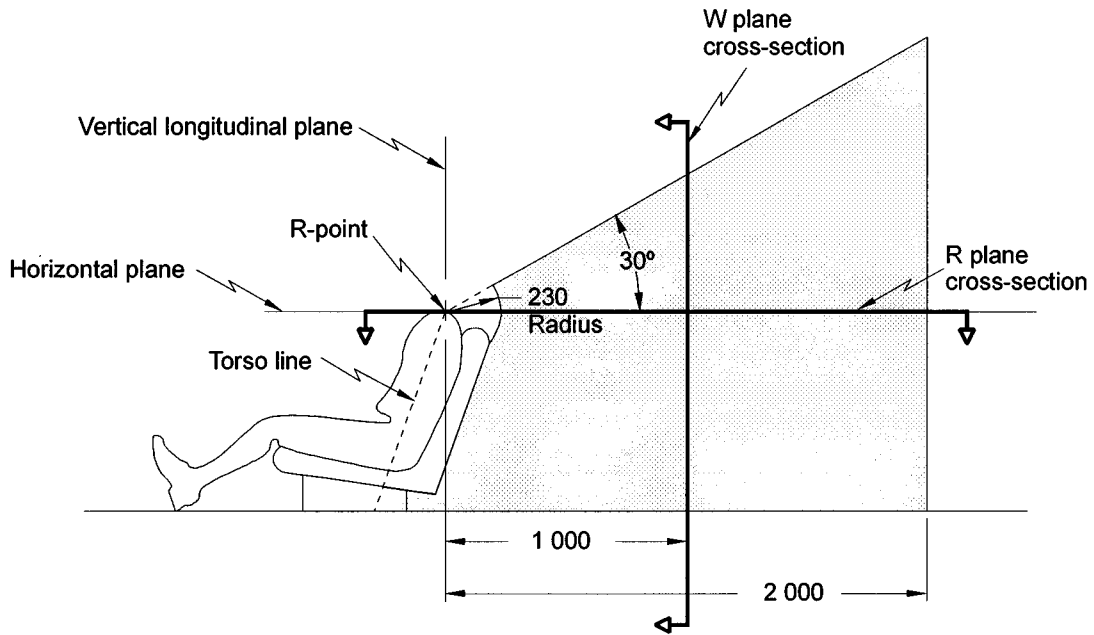
**S4.4.2** If a tether anchorage is installed for more than one designated seating position on a bench seat, each tether anchorage with the tether anchorage hardware installed shall, when tested in accordance with S5, withstand the simultaneous application of a force of 5,300 N to each assembly of tether anchorage and tether anchorage hardware. There shall be no complete separation or failure of any anchorage component.

**S5 Test procedure.**

With the seat adjusted to its full rearward and full downward position and the seat back in its most upright position, attach a belt strap that extends not less than 250 mm forward from the vertical plane intersecting the seat bight (the intersection of the surfaces of the seat cushion and the seat back). The strap is fitted at one end with hardware for applying the force and at the other end with a bracket for attachment to the tether anchorage hardware and passes over the top of the vehicle seat back as shown in Figure 8 of this standard. Apply a force of 5,300 N to each anchorage in the forward horizontal direction parallel to the vehicle's longitudinal axis. The 5,300 N force is attained within 30 seconds, with an onset force rate not exceeding 135,000 N per second, and is maintained at the 5,300 N level for one second.

Figure 1—[Reserved]

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Notes:

Dimensions in mm, except where otherwise indicated

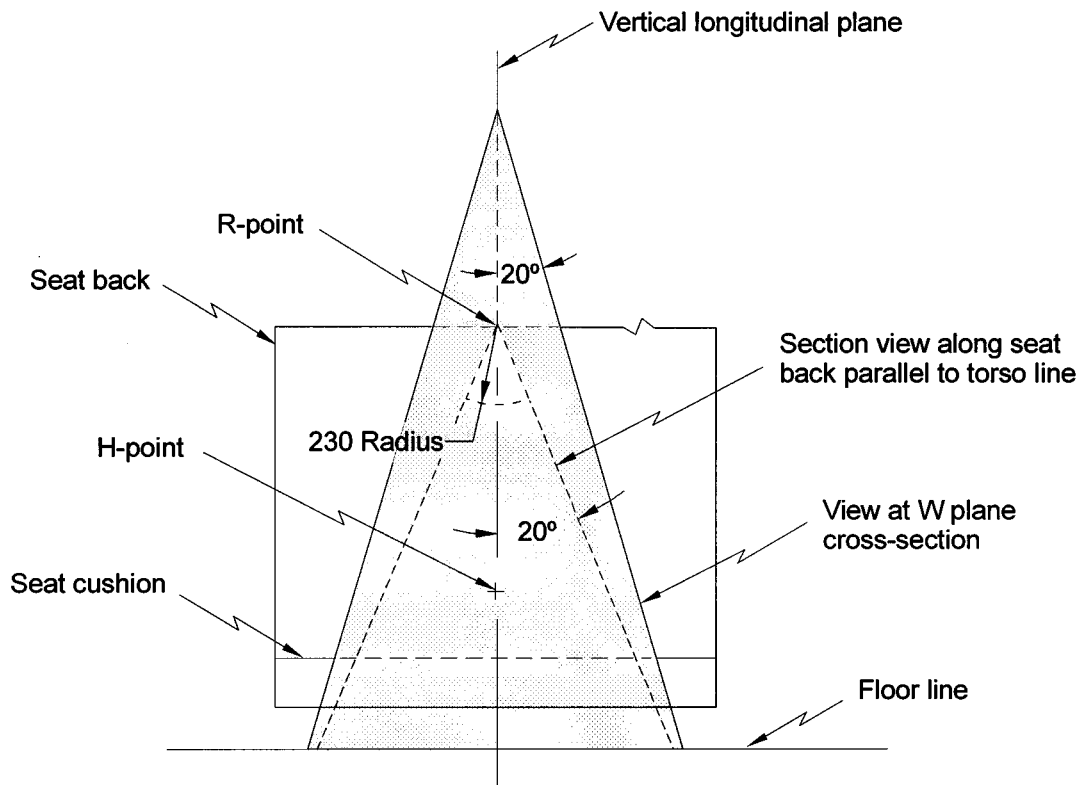
Centreline of tether anchorage to be located within shaded zone

R-point : shoulder reference point

Drawing not to scale

Figure 2—Side View, Tether Anchorage Location for Passenger Cars and Multi-Purpose Passenger Vehicles





Notes:

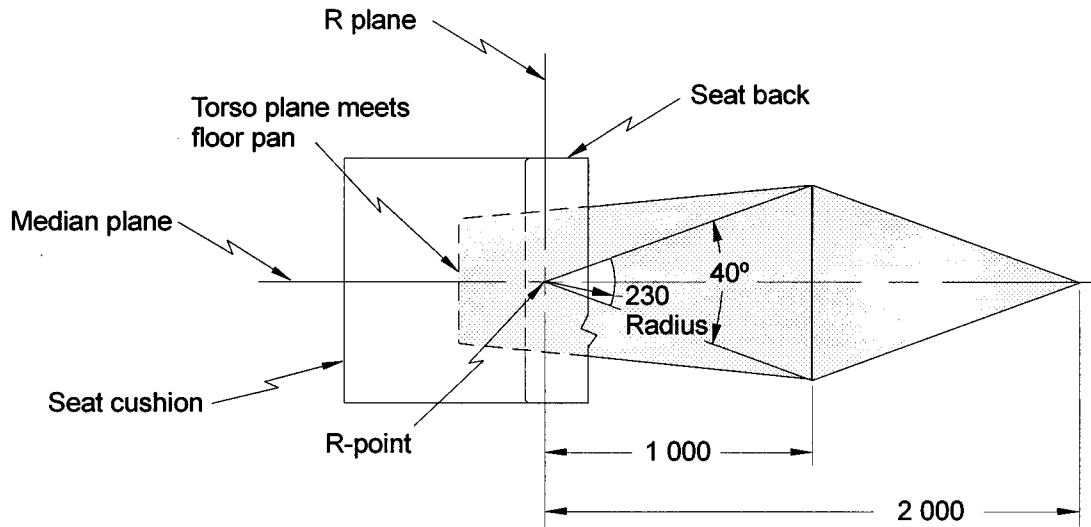
Dimensions in mm, except where otherwise indicated

Centreline of tether anchorage to be located within shaded zone

R-point : shoulder reference point

Drawing not to scale

Figure 3—Rear View, Tether Anchorage Location for Passenger Cars and Multi-Purpose Passenger Vehicles



## Notes:

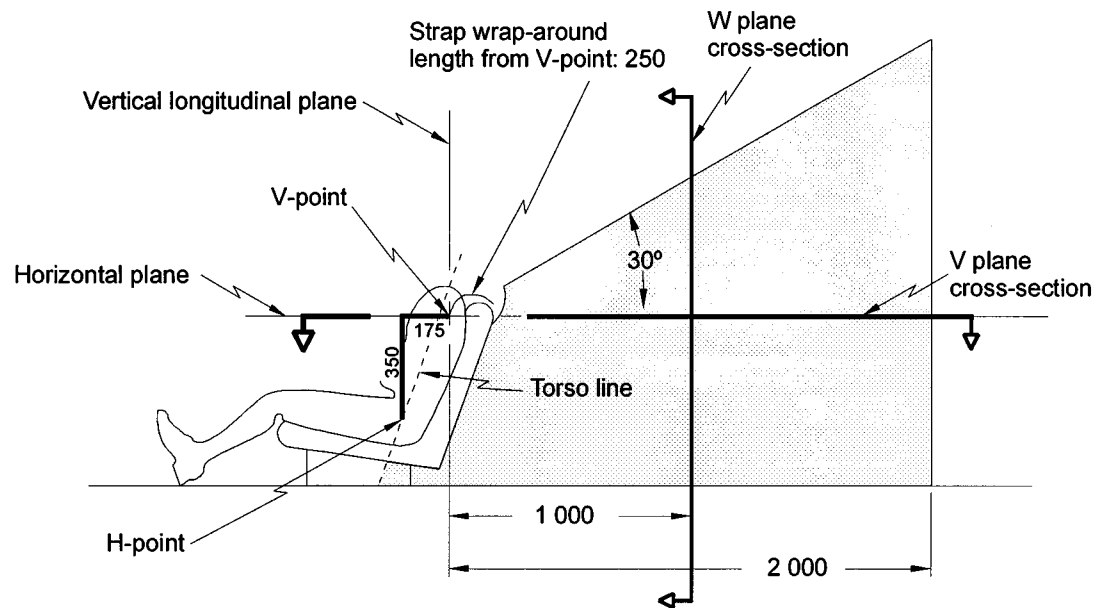
Dimensions in mm, except where otherwise indicated

Centreline of tether anchorage to be located within shaded zone

R-point : shoulder reference point

Drawing not to scale

Figure 4—Plan View, (R-Point Level), Tether Anchorage Location for Passenger Cars and Multi-Purpose Passenger Vehicles



Notes:

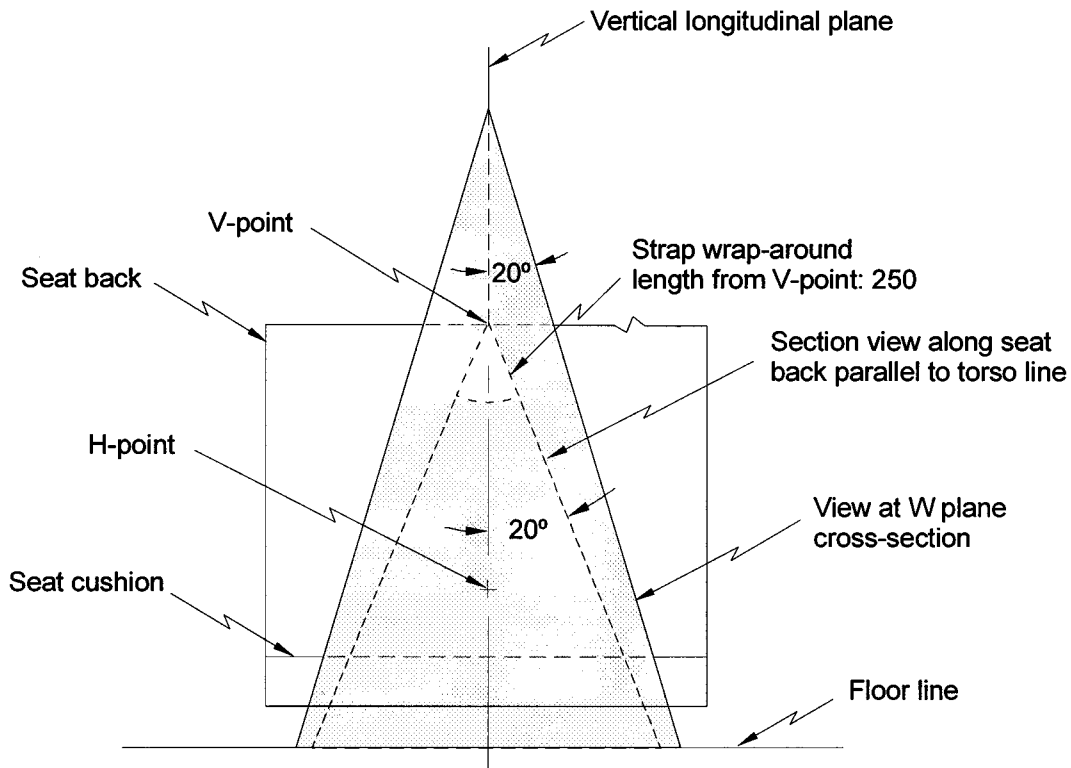
Dimensions in mm, except where otherwise indicated

Centreline of tether anchorage to be located within shaded zone

V-point : V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point

Drawing not to scale

Figure 5—Side View, Tether Anchorage Location for Trucks



Notes:

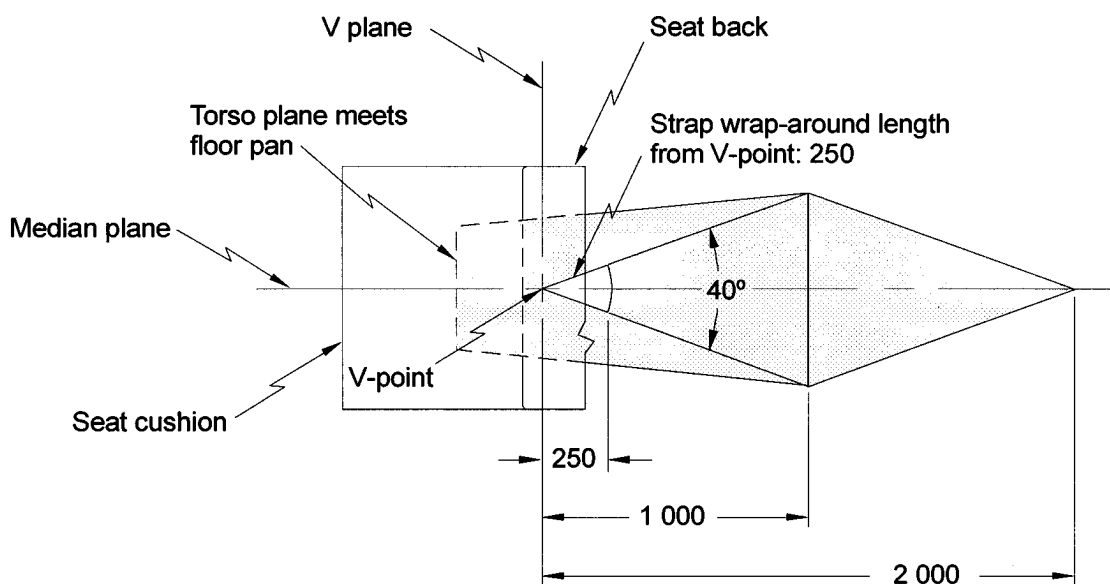
Dimensions in mm, except where otherwise indicated

Centreline of tether anchorage to be located within shaded zone

V-point : V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point

Drawing not to scale

Figure 6—Rear View, Tether Anchorage Location for Trucks



Notes:

Dimensions in mm, except where otherwise indicated

Centreline of tether anchorage to be located within shaded zone

V-point : V-reference point, 350 mm vertically above and 175 mm horizontally back from H-point

Drawing not to scale

Figure 7—Plan View, (V-Point Level), Tether Anchorage Location for Trucks

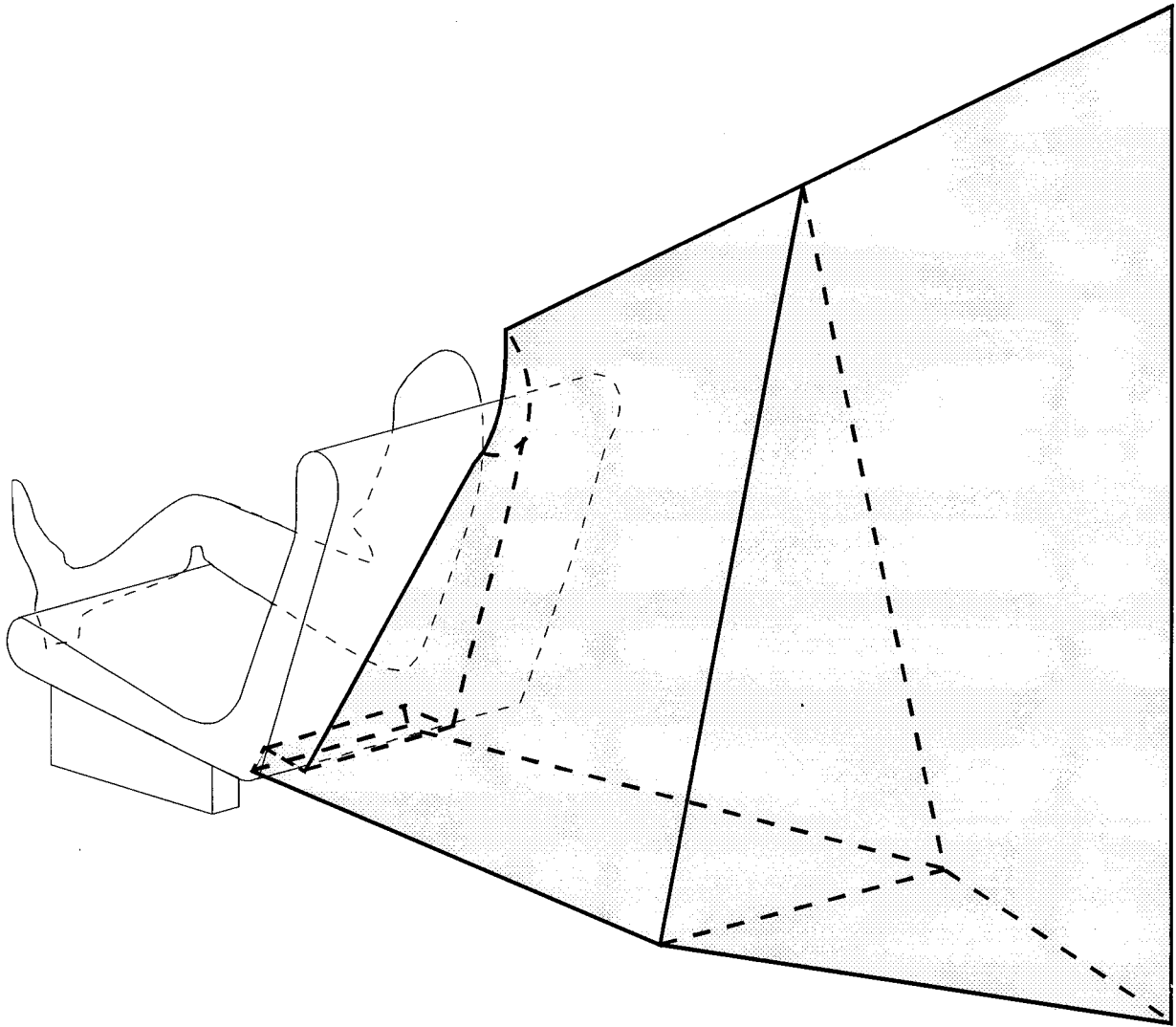


Figure 8—Three-Dimensional Schematic View for Tether Anchorage Location for Passenger Cars, Multi-Purpose Passenger Vehicles and Trucks

4. Section 571.213 would be amended by:

- a. adding to S4, in alphabetical order, a definition of "child restraint anchorage system," "tether anchorage hardware," "tether strap," and "tether strap hook";
- b. revising S5.1.3, S5.1.3.1, S5.3.1, S5.3.2 and S5.6.1;
- c. adding S5.9 and S5.10;
- d. revising S6.1.1(a)(1), S6.1.1(c) and S6.1.2(a)(1)(i);
- e. adding S6.1.2(d)(1)(iii); and
- f. revising Figure 1A and adding figures 11 and 12.

The revised and added paragraphs would read as follows:

**§ 571.213 Standard No. 213; Child restraint systems**

\* \* \* \* \*

**S4. Definitions.**

\* \* \* \* \*

*Child restraint anchorage system* is defined in S3 of FMVSS No. 210a (49 CFR 571.210a).

\* \* \* \* \*

*Tether anchorage hardware* is defined in S3 of FMVSS No. 210b (49 CFR 571.210b).

*Tether strap* means a device that is fitted with a tether strap hook and secured to the rigid structure of a child restraint system and that transfers the load from that system to the tether anchorage hardware.

*Tether strap hook* means a device, illustrated in Figure 11 of this standard, used to attach a tether strap to tether anchorage hardware.

\* \* \* \* \*

S5.1.3 *Occupant excursion.* When tested in accordance with S6.1 and the requirements specified in this paragraph, each child restraint system shall meet the applicable excursion limit requirements specified in S5.1.3.1 through S5.1.3.3.

S5.1.3.1 *Child restraint systems other than rear-facing ones and car beds.* Each forward-facing child restraint system shall retain the test dummy's torso within the system.

(a) In the case of an add-on child restraint system, no portion of the test dummy's head shall pass through a vertical, transverse plane that is 720 mm forward of point Z on the standard seat assembly, measured along the center SORL (as illustrated in figure 1B of this standard), and neither knee pivot point shall pass through a vertical, transverse plane that is 915 mm forward of point Z on the standard seat assembly, measured along the center SORL, when attached to the seat assembly as described in S6.1.2(a)(1)(i)(A)(1).

(b) In the case of an add-on child restraint system, no portion of the test

dummy's head shall pass through a vertical, transverse plane that is 813 mm forward of point Z on the standard seat assembly, measured along the center SORL (as illustrated in figure 1B of this standard), and neither knee pivot point shall pass through a vertical, transverse plane that is 915 mm forward of point Z on the standard seat assembly, measured along the center SORL, when attached to the seat assembly as described in S6.1.2(a)(1)(i)(A)(2) or S6.1.2(a)(1)(B).

(c) In the case of a built-in child restraint system, neither knee pivot point shall, at any time during the dynamic test, pass through a vertical, transverse plane that is 305 mm forward of the initial pre-test position of the respective knee pivot point, measured along a horizontal line that passes through the knee pivot point and is parallel to the vertical plane that passes through the vehicle's longitudinal centerline.

\* \* \* \* \*

**S5.3 Installation.**

S5.3.1 Except for components designed to attach to a child restraint anchorage system, each add-on child restraint system shall have no means designed for attaching the system to a vehicle seat cushion or vehicle seat back and no component (except belts) that is designed to be inserted between the vehicle seat cushion and vehicle seat back.

S5.3.2 (a) When installed on a vehicle seat, each add-on child restraint system, other than a belt-positioning seat, shall be capable of being restrained against forward movement solely by means of:

(1) A Type I seat belt assembly (defined in § 571.209) that meets Standard No. 208 (§ 571.208);

(2) A Type I seat belt assembly plus a tether anchorage; and,

(3) A child restraint anchorage system.

(b) Each belt-positioning seat shall be capable of being restrained against forward movement by means of a Type II seat belt assembly (defined in § 571.209) that meets Standard No. 208 (§ 571.208).

\* \* \* \* \*

**S5.6.1 Add-on child restraint systems.**

Each add-on child restraint system shall be accompanied by printed installation instructions in English that provide a step-by-step procedure, including diagrams, for installing the system in motor vehicles, securing the system in the vehicles, positioning a child in the system, and adjusting the system to fit the child. If the child

restraint system has components for attaching to a child restraint anchorage system, installation instructions shall be included that provide a step-by-step procedure, including diagrams, for properly attaching a child restraint system to a vehicle anchorage system equipped with lower anchorages conforming to the requirements of S4.2.1 of Standard No. 210a (49 CFR § 571.210a). In addition, if the child restraint is equipped with components that attach to a vehicle anchorage system equipped with lower anchorages conforming to the requirements of S4.2.2 of Standard No. 210a, instructions shall be provided for properly installing a child restraint to such an anchorage system.

\* \* \* \* \*

**S5.9 Attachment to child restraint anchorage system.**

(a) Each add-on child restraint system, other than a belt-positioning seat, shall have components permanently attached to the system that securely fasten to the latchplates conforming to S4.2.1 of Standard No. 210a (49 CFR § 571.210a) and depicted in Drawing Package \_\_\_\_\_ (consisting of drawings and a bill of materials) with addendum A, revision dated January 6, 1997, (incorporated by reference; see § 571.5).

(b) In addition to the components required by S5.9(a), each child restraint system intended for use with lower anchorages conforming to S4.2.2 of Standard No. 210a (49 CFR § 571.210a) shall have components of a configuration depicted in Figure 12 of this standard, in a location that enable the child restraint to securely fasten to the anchorages.

S5.10 Each tether strap on a child restraint system must be equipped with a tether strap hook that conforms to the configuration and geometry specified in Figure 11 of this standard.

\* \* \* \* \*

**S6.1.1 Test conditions.**

(a) Test devices.

(1) The test device for add-on restraint systems is a standard seat assembly consisting of a simulated vehicle bench seat, with three seating positions, which is described in Drawing Package SAS-100-1000 with Addendum A Revised (consisting of drawings and a bill of materials), dated December \_\_, 1996 (incorporated by reference; see § 571.5). The assembly is mounted on a dynamic test platform so that the center SORL of the seat is parallel to the direction of the test platform travel and so that movement between the base of the assembly and the platform is prevented.

\* \* \* \* \*



(c)(1) Attached to the seat belt anchorage points provided on the standard seat assembly (illustrated in Figures 1A and 1B of this standard) are Type I seat belt assemblies in the case of add-on child restraint systems other than belt-positioning seats, or Type II seat belt assemblies in the case of belt-positioning seats. These seat belt assemblies meet the requirements of Standard No. 209 (§ 571.209) and have webbing with a width of not more than 50 mm, and are attached to the anchorage points without the use of retractors or reels of any kind.

(2) Attached to the standard seat assembly is a child restraint anchorage system conforming to Standard No. 210a (§ 571.210a). The seat assembly is equipped with lower anchorages that conform to S4.2.1 and S4.2.2 of that standard.

\* \* \* \* \*

S6.1.2 *Dynamic test procedure.*

(a) Activate the built-in child restraint or attach the add-on child restraint to the seat assembly as follows:

(1)(i) *Test configuration I.*

(A) Except for a belt-positioning seat, an add-on child restraint system is installed at the center seating position of the standard seat assembly using either the standard lap belt or the child seat anchorage system—

(1) In accordance with the manufacturer's instructions provided with the system pursuant to S5.6.1; or

(2) In accordance with the manufacturer's instructions, except that the add-on restraint is secured to the standard vehicle seat using only the standard vehicle lap belt (except a child harness, a backless child restraint system with a top anchorage strap, and a restraint designed for use by physically handicapped children are not subject to this paragraph.

(B) A belt-positioning seat is attached to either outboard seating position of the standard seat assembly in accordance with the manufacturer's instructions provided with the system pursuant to S5.6.1 using only the standard vehicle lap and shoulder belt.

\* \* \* \* \*

(d) \* \* \*

(1) \* \* \*

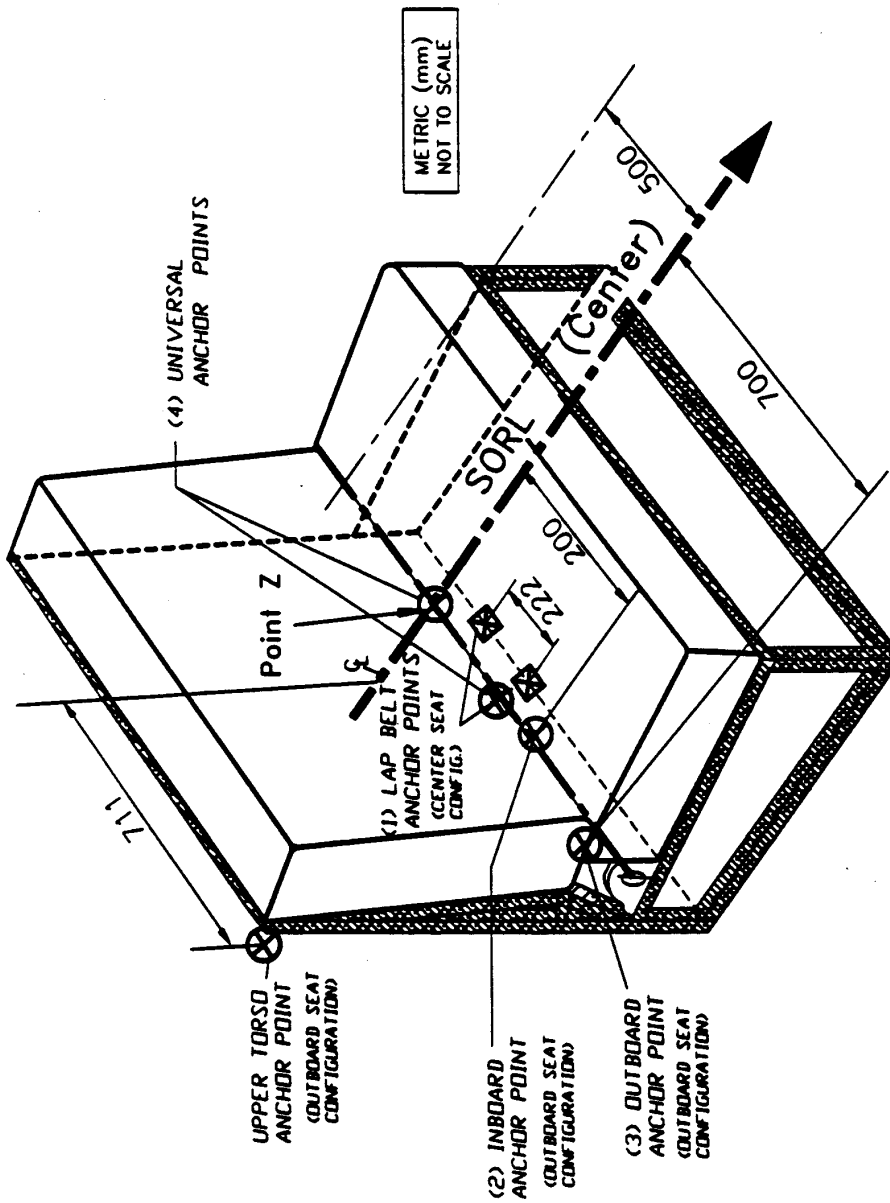
(iii) When attaching a child restraint system to the child restraint anchorage system on the standard seat assembly, all belt systems used to attach the restraint to the standard seat assembly are tightened to a tension of not less than 53.5 N and not more than 67 N, as measured by a load cell used on the webbing portion of the belt.

\* \* \* \* \*

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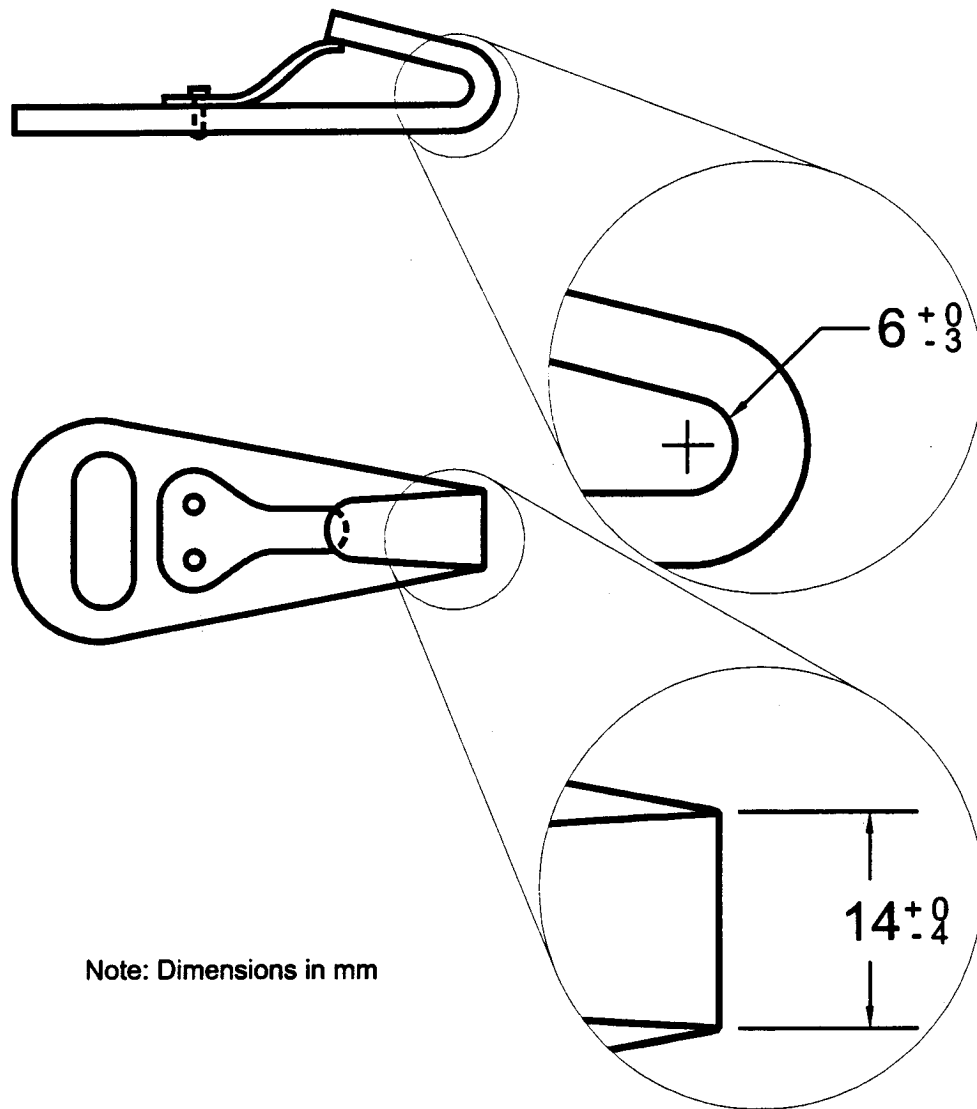
**Notes:**

- (1) Lap belt anchor points are symmetrically located with respect to the center SORL
- (2) Maximum distance from the seat bight to the end of the buckle is 175 mm
- (3) Outboard anchor point located 700 mm from the center SORL
- (4) (i) Minimum distance between universal anchor points is 280 mm; maximum distance is 300 mm
- (ii) End of latchplate located  $\leq 50$  mm forward of seat bight



**SEAT ORIENTATION REFERENCE LINE AND BELT ANCHORAGE POINTS LOCATIONS ON THE STANDARD SEAT ASSEMBLY**

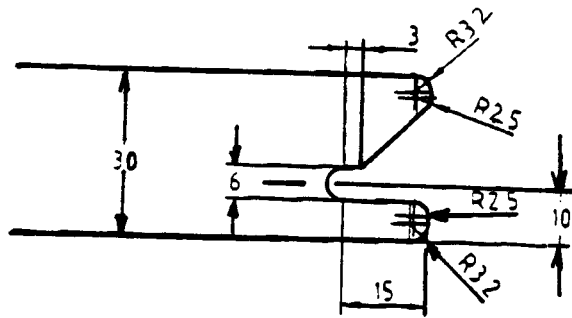
Figure 1A



Note: Dimensions in mm

Notes:  
Dimensions in mm  
Drawing not to scale

Figure 11—Tether Strap Hook



Dimension according  
ISO/WD 13216-10

Figure 12—Rigid Connector-Side View

Issued on February 13, 1997.

L. Robert Shelton,

*Associate Administrator for Safety  
Performance Standards.*

[FR Doc. 97-4084 Filed 2-18-97; 8:45 am]

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