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C-15: Will I be denied access to transport vehicles if I do not have a WC19 compliant wheelchair?

Answer:

No. It was never the intent that WC19 would be used to limit or restrict wheelchair user's access to motor-vehicle transportation, and this is specifically stated in the *Foreword* to the standard. Rather, the purpose of WC19 is to establish reasonable design and performance requirements for wheelchairs related to transportation safety so that wheelchair users have the opportunity to travel in motor vehicles with more safety than has previously been available. It would be ideal if all occupied wheelchairs in motor vehicles complied with WC19. However, even if manufacturers and consumers fully embrace the concept of the WC19-compliant wheelchair, it will be many years before the majority of wheelchairs are in compliance with WC19. Thus, it is going to be necessary to deal with non-WC19-compliant wheelchairs in transportation for the foreseeable future, and it is not appropriate or acceptable to limit access to transportation systems if a wheelchair user does not have a WC19 wheelchair.

Also, ADA specifically specifies that access to public transit vehicles cannot be denied to people using "common" wheelchairs and that they must be provided with wheelchair securement stations meeting specific size and securement strength requirements ([see FAQ: Question A-10](#))

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C-16 Can a non-WC19-compliant wheelchair be retrofitted to include the four securement points?

Answer:

This is certainly possible and is allowed by WC19, at least with regard to retrofit attachment of four suitably strong securement points. However, since, for most wheelchairs, some modifications to the design of the wheelchair frame and/or materials is necessary to achieve the required dynamic strength, providing a retrofit kit of four bolt-on securement points will generally not be sufficient to comply with even the frontal-crash test requirements of WC19. Thus, while there is probably a safety advantage to adding easily accessible securement points to the strongest points on the frame of non-WC19-compliant wheelchairs, this will probably not result in complete compliance with WC19 and is therefore unlikely to be done for reasons of liability. At this time, only one wheelchair manufacturer is offering a retrofit kit to convert a wheelchair with securement points.

C-23: What is the difference between ANSI/RESNA WC19 and ISO 7176/19? If I comply with the requirements of one of these standards, do I comply with the other one?

Answer:

The simple answer to this question is that compliance of a wheelchair with ANSI/RESNA WC19 (hereafter referred to as WC19) implies compliance with ISO 7176-19 (hereafter referred to as 7176-19) with two minor exceptions regarding a) the criteria for rearward head excursion of the test dummy and b) the allowed lateral spacing of wheelchair securement points, but the opposite is not true. However, before answering this question in greater detail, it should be emphasized that ANSI/RESNA WC19 (WC19) and ISO 7176/19 were developed together and with significant coordination and correspondence between the Working Group of the RESNA Wheelchair Standards Committee known as the Subcommittee on Wheelchairs and Transportation (SOWHAT) and the Working Group 6 of ISO TC73 SC1. In fact, much of the leadership and authorship for the two standards came from the same individuals.

Although there was considerable exchange of information and discussion between the two standard-development groups, and every effort was made to harmonize the two standards during their nearly simultaneous developments, there are some differences in the two documents. These differences are primarily with regard to a more limited scope of wheelchair sizes covered by ISO 7176-19, which currently does not provide for testing of pediatric wheelchairs, and with regard to design and performance requirements other than the 48-kph, 20-g frontal impact test.

There is also one primary difference in the method for conducting the frontal impact test in that WC19 specifies and, in fact, requires the use of a surrogate four-point strap-type tiedown to secure the wheelchair on the sled platform. By comparison, ISO 7176-19 requires that the wheelchair be secured by a four-point strap-type tiedown that complies with the frontal impact test of ISO 10542, which can be either a commercial tiedown or the surrogate tiedown.

Scope of Standards

The standards differ in scope in that ISO 7176-19 currently only applies to adult wheelchairs for which testing is conducted using a 168-lb anthropomorphic test device (ATD), better known as a midsize adult male crash-test dummy. WC19 also applies to pediatric wheelchairs for children six-years-old and above, and thus provides for conducting the frontal impact test using other appropriate size ATDs that are near, but under, the upper weight range for the design capacity of the wheelchair. Thus, a pediatric wheelchair can be tested to WC19 but it cannot officially be tested to 7176-19 at the present time. (Note that 7176-19 is currently being revised and the new version will include pediatric wheelchairs in the Scope).

Design Requirements

Securement Points

Both standards include the same design requirement with regard to the type and number of wheelchair securement points, in that both standards require that the wheelchair provide four securement points for securement using a four-point, strap-type tiedown that comply with the same structural geometry specifications. However, the standards differ with regard to the opening geometry such that WC19 is more restrictive. In particular, the securement-point opening for WC19 must be 50-to-60 mm in length and 25 to 30 mm in width, whereas the opening required by 7176-19 must be greater than 50 mm in length and greater than 25 mm in width. Thus, an opening that is larger than 60 mm in length and/or larger than 30 mm in width would comply with 7176-19 but not with WC19. All securement openings that comply with WC19 will, however, comply with 7176-19.

The standards also specify that these securement points must be located within certain zones relative to each other and the ground. These zones are the same in the side view for the two standards but are different in the top view. WC19 currently allows the securement points to be within 100 mm of each other laterally but 7176-19 doesn't allow them to be closer than 250 mm. WC19 is, however, being revised and the lateral spacing requirements of WC19 will be the same as those in 7176-19 in the new version.

Wheelchair-Anchored Belt Restraints

The primary difference in the design requirements of the two standards is that WC19 requires that a wheelchair provide the wheelchair occupant with the option of using a wheelchair-anchored lap belt and that a wheelchair-anchored lap belt be used instead of a vehicle-anchored lap belt in the frontal impact test. 7176-19 allows a wheelchair to provide for, and be crash tested with, a wheelchair-anchored lap belt, or even wheelchair-anchored lap and shoulder belts (as does WC19), but it does not require it. However, the design requirements for the wheelchair-anchored lap belt are the same in both standards.

Wheelchair size and Configuration

WC19 also places design requirements on the size, mass, and configuration of a wheelchair. The wheelchair must:

- A. provide for a seated posture with a seatback angle of 30 degrees or less to the vertical (e.g., a mobility device that allows only for very recline postures does not comply),
- B. have a total mass of less than 182 kg (400 lb),

- C. have overall dimensions when measured according to ANSI/RESNA WC-93 (the standard for maximum overall dimensions) such that the maximum length and width do not exceed 1300 mm by 700 mm, respectively.

ISO 7176-19 does not place any limitations on wheelchair size, mass, or configuration regarding seating posture.

Performance Requirements

Both standards include performance requirements for wheelchairs for:

- A. a 48-kph frontal impact test
- B. accessibility of securement points using a standard hook gauge

Also, both standards include performance requirements for wheelchair-anchored belt restraints (when provided in 7176-19 and required by WC19) based on either ECE Reg. 16 or FMVSS 209 in 7176-19 and on FMVSS 209 in WC19.

However, WC19 stipulates several other performance requirements that are not included in 7176-19, including:

- a test for tiedown clear paths and proximity to sharp edges,
- a test for lateral stability (or really lateral movement),
- a test for turning radius based on Section 5 of ANSI/RESNA wheelchair testing, and
- a test for wheelchair accommodation of vehicle-anchored belt restraints.

With the exception of the clear-path/sharp-edge test, these additional tests are disclosure requirements, not pass/fail requirements, in that the wheelchair manufacturer must disclose the test results in their presale literature.

Frontal Impact Test Methods

The primary and most important performance requirement of both standards is satisfactory performance in a 48-kph, 20-g frontal impact test. As previously indicated, this test is conducted by securing the wheelchair on the sled platform using a surrogate four-point strap-type tiedown (S4PT) which is specified in Annex D of WC19. 7176-19 allows the test to be conducted using a commercial four-point strap-type tiedown that has been successfully tested to Annex A of ISO 10542-1 and 2. Since the S4PT meets this requirement, it can be used to secure the wheelchair in 7176-19 testing. Thus, a frontal impact test conducted in WC19 with a 76-kg ATD is also conducted in accordance with 7176-19.

However, a frontal impact test that is conducted using a commercial four-point tiedown is not conducted in accordance with WC19.

Frontal Impact Performance Criteria

Section 5.3 of WC19 and Section 5.2 of 7176-19 specify the wheelchair performance criteria for the 48-kph frontal impact test of Annex A. As previously noted, the test methods are the same except for the allowance of a commercial four-point strap-type tiedown to secure the wheelchair in 7176-19 and the requirement to use a surrogate four-point, strap-type tiedown in WC19. Importantly, the primary pass/fail performance requirements, including the forward wheelchair and ATD excursion limits and signs of failure in primary load carrying components, are the same, even though they are formatted and/or worded somewhat differently in the two standards.

There are, however, several minor differences in the performance requirements for the frontal impact test, as follows:

1. WC19 requires that detachable seating systems must not separate from the wheelchair base frame at any attachment points, while 7176-19 is silent on this issue.
2. WC19 requires that deformation of wheelchair securement points does not prevent disengagement of any tiedown hooks, while 7176-19 is silent on this.
3. 7176-19 requires that removal of the ATD from the wheelchair after the test shall not require the use of tools (other than a hoist), while WC19 is silent on this point.
4. WC19 does not allow the wheelchair to cause partial or complete failure of any part of the tiedown or restraint system, while 7176-19 is silent on this.
5. The maximum allowed rearward head excursion in WC19 is 450 mm for the midsize adult male ATD while it is 400 mm in 7176-19.
6. 7176-19 specifically states that locking mechanisms of tilt seating systems shall not show signs of failure after a test, while WC19 does not specifically refer to tilt locking mechanisms but rather includes this requirement under the requirement that "primary load carrying parts" shall not show signs of failure.

The net result is that the performance criteria for the frontal-impact test in WC19 are generally greater than those for 7176-19 and, if the rearward head excursion of the ATD is less than 400 mm in a WC19 test, compliance with WC19 implies compliance with 7176-19.

Conclusions

While the key requirements and pass/fail criteria of ANSI/RESNA WC19 and ISO 7176-19 are essentially the same, there are some differences in the scope of wheelchairs covered by the current standards, in the scope and level of design requirements, in the number of performance requirements, and in the test methods and pass/fail criteria for the frontal-impact test. The scope of WC19 current applies to pediatric wheelchair for children aged six years and older, whereas 7176-19 applies only to adult wheelchairs at this time. With two

exceptions, the requirements and test methods of WC19 are more demanding or more restrictive than for 7176-19. These two exceptions are that:

1. WC19 allows the wheelchair securement points to be spaced laterally closer together, and
2. WC19 allows 450 mm of rearward head excursion for the midsize male adult ATD during rebound, whereas 7176-19 allows only 400 mm of rearward head excursion.

It can therefore be concluded that:

1. if the lateral spacing of the securement points on a wheelchair is 250 mm or greater, and
2. the rearward ATD head excursion during the frontal impact test of the wheelchair is less than 400 mm,
3. a wheelchair that complies fully with WC19 also complies with 7176-19.

The inverse of this statement is, however, is not true. That is, a wheelchair that complies with 7176-19 may not comply with WC19.