Summary of differences between RESNA WC-4:2017, Section 19 (WC19), ISO 7176-19 (July 2008) and ISO 7176-19 (DIS draft 2019)

	WC19 (2017)	ISO 7176-19 (2008)	ISO 7176-19 (DIS 2019)
SCOPE	Similar to ISO but: • Applies to WC used by children & adults 12kg+	Similar to WC19 but: Applies to WC used by children & adults 22kg+	Same as WC19
DEFINITIONS	Includes definitions not in ISO for: adaptor, automatic-locking retractor, back support, back-support post, back restraint, belt guide, belt restraint, buckle, buckle receptacle, delta V, emergency-locking retractor, end fitting, fastener, *g*, harness restraint, head support, latch plate, manufacturer, OEM, reclining-back wheelchair, retractor, seat, seating system, seating-system frame, strap-type tiedown, surrogate wheelchair, webbing, wheelchair, wheelchair base frame, wheelchair frame 3.15 child: person with total body mass between 12kg and 43kg usually between ages of 3-14 years.	Includes definitions not in WC19 for: add-on components, clamp-type tiedown, four-point tiedown, power(ed), wheelchair tiedown adaptor 3.7 child: person having mass ≥22kg, <43kg	Includes definitions not in WC19 for: add-on components, back-support reference plane, clamp-type tiedown, four-point tiedown, power(ed), seat reference plane, wheelchair tiedown adaptor 3.8 child: person with total body mass between 12kg and 43kg usually between ages of 2-14 years.
DESIGN REQUIREMENTS: GENERAL	(4.1) WC shall allow the occupant to attain a seated posture as measured according to RESNA WC-1:2009, Section 7, such that: a) the unloaded wheelchair seat is fixed at, or can be adjusted to, an angle of 30° or less to the horizontal, and b) the unloaded wheelchair back support is fixed at, or can be adjusted to, an angle of 30° or less to the vertical.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS.
	(4.2) The mass of the unoccupied WC shall be measured according to RESNA WC-1:2009, Section 5.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS.
	(4.3.1) WC size and turning radius shall be measured according to the provisions of RESNA WC-1:2009, Section 5.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS.
	(4.3.2) WC length and breadth shall be measured in accordance with RESNA WC-1:2009, Section 5. Notes require disclosure in presale literature and disclosure if sizing does not meet ADA requirements.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS.
	(4.3.3) For wheelchairs designed to accommodate children with a body mass under 23 kg (51 lb), a head and back restraint must be provided such that the back-support height measured along the centerline of the back support from the junction of the back support with the seat (i.e., the seat bight) to the top of the head support shall not be less than 555 mm (21.9 in.) unless the medical needs of the child dictate a shorter back and head-support height.	No requirement in ISO 7176-19.	(4.2.8) For wheelchairs designed to accommodate children with a body mass under 23 kg the centerline of the back support from the junction of the back support with the seat (i.e., the seat bight) to the top of the head support shall not be less than 555 mm (21.9 in.).
	(4.4) The WC shall be designed to reduce the likelihood of injury from contact with WC components by: a) designing the edges of all rigid WC components that could be contacted by the WC user or by other vehicle occupants during a vehicle collision to have a radius of 2 mm (0.08 in) or greater, or by b) covering edges of rigid WC components that may contact the WC occupant or other occupants with a radius of less than 2mm (0.08 in) with energy absorbing padding that conforms with FMVSS 201.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS.
DESIGN REQUIREMENTS: SECUREMENT POINTS	(4.5.1a) Wheelchairs with a total mass of 125 kg (275 lb) or less, measured according to RESNA WC-1:2009, Section 5, shall have exactly two rear securement points and two front securement points	(4.1.1) The WC shall be designed to provide forward-facing securement in a motor vehicle using a four-point, strap-type tiedown system that complies with ISO 10542-2 using a minimum of four securement points, two at the front and two	Same as ISO 7176-19 (2008) except references ISO 10542-1 and notes that in addition to complying with this subclause, the WC may be designed for forward-facing

	for attachment of a four-point, strap-type tiedown system and compliance with the performance criteria of 5.3.	at the rear, that conform with geometric specifications set forth in Annex B and the performance requirements in Clause 5.	securement using other methods of wheelchair securement, including docking-type securement devices
DESIGN REQUIREMENTS: SECUREMENT POINTS (CONT)	(4.5.1b) Wheelchairs with a mass greater than 125 kg (275 lb) shall provide at least two front and two rear securement points, but may provide additional securement points as needed to comply with the performance criteria of 5.3 when secured by a strap-type tiedown system (e.g., heavy wheelchairs may provide three or four rear securement points and two front securement points).	(See 4.1.1 above)	No change from ISO 7176-19 (2008) but notes that in addition to complying with this subclause, the WC may be designed for forward-facing securement using other methods of wheelchair securement, including docking-type securement devices
	(4.5.2) All WC securement points required by 4.5.1 shall be attached to the wheelchair base and/or seat frame, either by designing the securement points to be an integral part of the frame structure or by attaching securement-point brackets to a frame member using permanent fasteners that cannot be removed without the use of tools...	(Annex B.3) just mentions that the securement points shall be attached rigidly to the structural frame of the wheelchair.	(B.4) is same as WC19
	(4.5.3, Figure 3) Dimensions of securement-point opening are 25 – 30 mm by 50 – 60 mm with radius 12 – 15 mm	(Figure B.1) Dimensions of securement-point opening are ≥25 mm by ≥60 mm.	(Figure B.1) is same as WC19
	(4.5.4a) For WC with a seat width of 400 mm or greater, the locations of the front rear securement points relative to each other and to the wheelchair ground plane fall within the hashed regions of Figure 4		(B.3a) The locations of the front securement points relative to the wheelchair ground plane, and with respect to each other, fall within the shaded regions of Figure B.2
	(4.5.4b) The longitudinal horizontal distances between front and rear securement points on both sides of the wheelchair are not less than 100 mm (4 in.).		(B.3b) Same as WC19
	(4.5.4c) For WC with a seating width equal to or greater than 400 mm, the lateral horizontal distance between left and right securement points at both the front and back of the WC shall not be less than 200 mm.	(B.3c - d) The lateral horizontal distance between left and right rear-securement points is not less than 200 mm, and the lateral horizontal distance between left and right front-securement points is not less than 100 mm.	(B.3c - d) The lateral horizontal distance between left and right rear-securement points is not less than 200 mm, and the lateral horizontal distance between left and right front-securement points is not less than 100 mm. **This is conflicting with Figure B.2!**
	(4.5.4d) For WC with a seating width that is less than 400 mm, the lateral horizontal distance between left and right securement points may be less than 200 mm but should not be more than 50 mm less than the seat width.	No requirement in ISO 7176-19 other than B.3 c - d above.	No change from ISO 7176-19 (2008)
	(4.5.4e) All securement-points shall be located relative to WC components so that there is full access to the complete securement-point opening specified in Figure 3 by the hook gage of Figure B.2.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS.
	(Figure 4) includes a top view of the required securement-point zones.	No top view in Figure B.2.	(Figure B.2) Same as WC19
DESIGN REQUIREMENTS: ORS	(4.6.1a) WC shall provide for anchorage of pelvic-belt restraint for occupants over 23 kg in accordance with 4.6.2 – 4.6.6.	No requirement in ISO 7176-19, but 4.2.1 allows for use of a wheelchair-anchored belt.	Not required in ISO 7176-19, but 4.2.1a allows for use of a wheelchair-anchored belt for people with body mass 23 kg or greater.
	(4.6.1 NOTE1) requires the WC manufacturer to clearly indicate if WC is being shipped without the dynamically tested belt restraint installed, the sources for purchasing a dynamically tested pelvic belt, and the type of belt restraint required for use as a restraint in a motor vehicle.	No requirement in ISO 7176-19.	(4.2.1a NOTE) the wheelchair manufacturer shall clearly indicate if the wheelchair is being shipped without a dynamically tested belt restraint installed, and shall be able to provide for purchase of the type of belt restraint tested and required for use as a restraint in motor vehicle.

	(4.6.1b) WC shall provide a WC-anchored 5-point harness for WC designed for use by occupants under 23 kg, in accordance with 4.6.3 – 4.6.5.	No requirement in ISO 7176-19.	(4.2.1b) Wheelchairs designed for use by people with body mass under 23 kg (51 lb) shall provide a wheelchair-anchored five-point harness occupant restraint in accordance with 4.2.3 through 4.2.4 when purchased by, and delivered to, the customer.
	(4.6.1 NOTE3) In low g-transportation environments where a high-speed and high-g crash is a very rare event and occupant restraints are allowed but not required, postural support devices that don't meet the requirements of a crashworthy belt restraint can be helpful in retaining WC passengers in their wheelchairs during anticipated non-crash events		(4.2.1 NOTE3) Postural support belts and harnesses that don't meet the requirements of a crashworthy occupant restraint can be helpful in retaining occupants in their WC during non-crash maneuvers, such as sudden braking, and can help occupants maintain an upright seated posture
	(4.6.2) When the WC is setup and loaded with the ATD selected for the frontal impact test of A.5, anchor points of pelvic belt restraints required by 4.6.1a shall be located so that the projected side view angle of the pelvic belt, measured using an inclinometer, is between 30° and 75° to the horizontal, as indicated in Figure 5		(4.2.2) Same as WC19, but refers to A.4 and Figure 3
	(4.6.3a - c) Anchorages and fasteners provided on WC for belt restraints shall: a) use appropriate materials for dynamic strength and durability, b) not rely on fasteners or grommets placed through the belt webbing, and c) be implemented and/or attached only to structural components of the WC base or seat frame.	No requirement in ISO 7176-19.	(4.2.4) Same as WC19 except: c) Meet the applicable subsections of either ECE-R16, and/or FMVSS 209, as indicated in Tables 4 and 5, respectively. There is no mention of appropriate materials for strength and durability.
	(4.6.4) The WC anchored pelvic belt or five-point harness shall be designed to manually adjust to shorten and lengthen the distances listed in Table 1 after the belt has been tightened snugly on the ATD used in the frontal-impact test of Annex A.	No requirement in ISO 7176-19.	(4.2.1c) Wheelchairs shall provide for adjustment of the pelvic-belt restraint and/or the five-point harness restraint that allows for increasing the length and decreasing the length as specified in Table 1
DESIGN REQUIREMENTS: ORS (CONT)	(Table 1) includes minimum requirements for belt length of WC-anchored belt restraints for 3-year-old ATD. Required shortening and lengthening specs for the midsize male ATD are 150 mm, and required shortening spec for the large male is 150 mm.	(Table 1) does not include the 3-year-old. Required shortening and lengthening specs for the midsize male ATD are 200 mm, and required shortening spec for the large male is 200 mm.	(Table 1) Same as WC19
	(4.6.5) The pelvic-belt restraint required by 4.6.1a shall be equipped with pin-bushing anchorages to enable attachment of a suitably equipped, vehicle-anchored shoulder belt on each side of the pelvic belt without having to detach the pelvic belt from the wheelchair. The pelvic belt shall: a) include on each half of the pelvic belt at least one pin-bushing anchorage as shown in Figure 6a with dimensions that provide for effective engagement and secure retention of the shoulder-belt end fitting shown in Figure 6b, b) be designed so that each pin-bushing anchorage is located, or can be adjusted to allow, the shoulder belt to connect to the pelvic belt near the hip of the wheelchair occupant, and c) be designed so that the buckle and latch plate are located closer to the midline of the wheelchair occupant than the pin-bushing anchorages.	No requirement in ISO 7176-19.	(4.2.5) Similar to WC19, except doesn't specify pin-bushing: a) be equipped with a means to anchor the lower end of a vehicle-anchored shoulder-belt restraint on each side of the pelvic belt without having to detach the pelvic belt from the wheelchair

	No design requirements in WC19 because a surrogate shoulder belt is used for testing.	(4.2.2) If a wheelchair-anchored shoulder-belt restraint intended for use as an occupant restraint is provided as part of the wheelchair, when installed on the ATD in accordance with the set-up procedures for the frontal-impact test in Annex A, it shall be designed to: a) fit over the shoulder and across the chest, passing through the 100-mm-wide shaded zone of the ATD used in the test of Annex A, as illustrated in Figure 4, b) have an upper anchor point or upper guide point at, or above, the shoulder of the ATD used in the test of Annex A, c) locate the shoulder-belt restraint/pelvic-belt restraint junction at least as far from the ATD centerline as shown in Table 3, d) provide adjustment in the shoulder-belt restraint that allows for increasing and decreasing the length as specified in Table 4.	(4.2.6) If a wheelchair-anchored shoulder-belt restraint is provided for use by people who weigh 23 kg or greater: a) a WC-anchored pelvic belt shall also be provided to comprise a 3-pt WC-anchored pelvic-shoulder belt restraint, b) the shoulder belt shall fit over the middle of the shoulder and across the chest as illustrated in Figure 6, passing through the 100-mm-wide shaded zone when placed on the ATD in accordance with the set-up procedures for the frontal-impact test in Annex A , c) the upper shoulder-belt restraint anchor point or upper guide point shall be at or above the shoulder of the ATD used in the test of Annex A, d) the shoulder-belt restraint shall provide a means for increasing and decreasing the length as specified in Table 3, when placed on the ATD in accordance with the set-up procedures for the frontal-impact test in Annex A. At least 25 mm of webbing must extend through any fitting where adjustment takes place at all times during testing.
DESIGN REQUIREMENTS: RISK MANAGEMENT	No requirement in WC19.	No requirement in ISO 7176-19 (2008).	(4.2.9) If it is necessary to physically modify a 7176-19 compliant wheelchair to accommodate medical needs of the occupant, the modifier should perform a risk assessment compliant with ISO 14971 Medical Devices Risk Management: Application of Risk Analysis. Changes to wheelchairs that are likely to affect compliance relative to 7176-19 include but are not limited to: moving the securement-point brackets, lowering the back-support height, shortening the seat length, adding secondary postural supports that are not firmly attached to the wheelchair, adding components that have sharp edges (i.e, edges with less than 2mm radius), or any change that compromises the structural integrity of the wheelchair frame.
DESIGN REQUIREMENTS: UDIG	(4.8) If a wheelchair manufacturer intends to provide the wheelchair user with the option of securing their wheelchair by docking securement devices in a wide range of public and para-transit vehicles, the securement points on the wheelchair frame, or on the wheelchair securement adaptor, shall be designed to conform to the UDIG specifications of Annex F.	Same – 4.1.2	No change from ISO 7176-19 (2008)
PERFORMANCE REQUIREMENTS	(5.2a) WC-anchored belt restraint components for use by occupants over 23 kg shall conform with applicable parts of FMVSS 209. (WC19 includes subclauses S4.1a, S4.1b, S4.1g, and S4.2f that are not in ISO requirements).	(5.1) Allows WC-anchored belt restraint components to comply with applicable parts of ECE reg No 16 OR FMVSS 209 (ISO includes subclauses S4.2h, S4.3i, S4.3j, S4.3k and S4.4b that are not in WC19 requirements).	(5.1b) All webbing, metal parts, buckles, release mechanisms and adjustment mechanisms of wheelchair–anchored belt restraints intended for use by occupants with a body mass of 23 kg (51 lb) and over shall conform to applicable subsections of either ECE-R16, and/or FMVSS 209, as indicated in Tables 4 and 5, respectively, or as specified in equivalent mutually recognized regulations.
	(5.2b) WC-anchored 5-point harness restraint components for children less than 23 kg shall conform to applicable subsections of FMVSS 213.	No requirement in ISO 7176-19.	(5.1c) All webbing, metal parts, buckles, release mechanisms, and belt adjustment mechanisms of wheelchair-anchored five-point harness restraints for children with a body mass less than 23 kg (51 lb) shall satisfy applicable requirements for abrasion resistance, light resistance, belt width, snugness of fit and buckle characteristics.

			NOTE Subsections of FMVSS 213, FMVSS 209 and ECE R44 relevant for consideration are given in Table H.4 and Table H.5 of Annex H.
	(5.2c) All webbing material used in WC-anchored belt restraints shall conform with flammability requirements of FMVSS 302.	(5.1) All webbing of WC-anchored belt restraints and postural belts shall have a burning rate not exceeding 100 mm/min when tested as specified in ISO 3795.	(5.1a) All webbing of WC-anchored belt restraints and postural belts shall have a burning rate not exceeding 100 mm/min when tested as specified in ISO 3795.
	(5.2d) All pelvic-belt restraint anchorages installed on wheelchairs for occupants with a mass greater than 23 kg (51 lb) shall conform to S4.2.1 of FMVSS 210 when tested in accordance with the static pull test of S5.1.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS 2019.
	(5.3.1) WCs are tested when secured by a surrogate four-point, strap-type tiedown using either a WC-anchored pelvic belt or a WC-anchored 5-point harness. WC manufacturers may also conduct optional tests with the ATD restrained by a surrogate vehicle-anchored three-point belt. WC19 allows for additional (optional) testing other securement methods, such as docking-type securement.	(5.2) WCs are tested using a four-point strap-type tiedown that complies with ISO 10542-2 (commercial or surrogate) and may use a three-point belt with a vehicle, tiedown or WC-anchored lap belt. ISO also allows for additional (optional) testing with other securement methods, such as docking-type securement.	(5.2) Similar to ISO 7176-19 (2008) but references ISO 10542-1 and does not specify four-point, so allows for testing with more strap-type tiedowns (commercial or surrogate). Also allows for additional (optional) testing other securement methods, such as docking-type securement.
	(5.3.2a) Structural components of WC securement points shall not completely fail.	(5.2.2b) WC securement points shall not show visible signs of material failure.	(5.2.2b) Same as WC19
	(5.3.2b) WC securement points shall not deform in a manner that prevents manual disengagement and removal of the hook end fittings of the four-point, strap-type surrogate tiedown system.	No requirement in ISO except (5.2.2h) Release of WC from tiedown system shall not require use of tools.	No requirement in ISO except (5.2.2g) Release of WC from tiedown system shall not require use of tools.
	(5.3.2e) Rigid components, parts, equipment, or accessories in excess of 150 grams (5.3 oz) shall not be detached from the WC.	(5.2.2c) Rigid components, fragments or accessories of the WC with a mass in excess of 100 g shall not be completely separated from the WC.	(5.2.2c) Same as WC19
	(5.3.2g) Primary load-carrying parts and components, including but not limited to, the seat, the back support, wheels, casters, axles, frame members, belt restraints, and belt-restraint anchorages, shall not completely fail, unless there is a backup mechanism or component specified by the WC manufacturer that does not show signs of failure.	(5.2.2e) Primary load-carrying components of WC shall not show visible signs of failure, unless there is a backup system to provide support.	No requirement in ISO 7176-19 DIS 2019.
	(5.3.2h) The horizontal excursion limits in WC19 include criteria for the 3-year-old and have a rearward excursion limit for the large male ATD of -500 mm.	(5.2.1a) ISO does not include excursion limits for the 3-year-old ATD.	(5.2.1a) Same as WC19 but rearward excursion limit for the large male ATD is -450 mm.
	(5.3.2j) Locking mechanisms of tilt seating systems shall not have structural components that completely fail during the test. NOTE: Changes in seating-system orientation that do not result from complete failure of the locking mechanism structural components (e.g., release or slipping of a friction-type clamp) do not constitute failure of this criterion. However, forward rotation of a seating system that results in a side-view seat angle below 0° relative to horizontal during the test is undesirable as it will increase the likelihood of the occupant submarining under the lap belt.	(5.2.2f) Locking mechanisms of tilting seating adjusters shall not show signs of failure.	(5.2.2e) Locking mechanisms of tilting seating adjusters shall not completely fail. No note about slipping allowed.
	(5.3.2l) Seats and back supports shall not separate or detach from WC and/or seat frame members at any attachment point unless there is an additional backup support for the seat or back support in the same area as the separated attachment point that did not separate or detach.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS 2019.

PERFORMANCE REQUIREMENTS (CONT)	(5.3.2m.ii) Batteries and the electronic components of powered wheelchairs, or their surrogate replacement parts, shall remain attached or tethered to the battery compartment.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS 2019.
	(5.3.2n) No webbing of the surrogate wheelchair tiedown and occupant restraint system (SWTORS) shall completely fail due to interaction with the wheelchair or its components during a test.	(5.2.2j) The WC and its components shall not cause partial or complete failure of the webbing of any of the WTORS assemblies during the test.	(5.2.2i) Same as WC19
	(5.3.2o) All securement hooks of the SWTORS shall remain attached to the WC securement points throughout the test and shall be attached at the end of the test.	No requirement in ISO 7176-19.	(5.2.1d & 5.2.2j) No components of the securement system (i.e., securement hooks of the strap-type tiedown or docking device latch mechanism) shall completely detach or disengage from a wheelchair securement point or wheelchair securement adaptor at end of the test. A stabilizer bracket or other component of a docking securement system whose purpose is not primarily to secure the wheelchair, but to aide in alignment or preventing rotation, may be detached or disengaged at the end of the test.
	(5.3.2p) WC-anchored belt restraints shall not become detached at anchorages, disconnected at buckles, or show complete webbing failure.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19 DIS 2019.
	No requirement in WC19.	(5.2.2g) Removal of the ATD from the WC shall not require the use of tools, other than a hoist to lift the ATD.	(5.2.2f) Removal of the ATD from the WC shall not require the use of tools, other than a hoist to lift the ATD.
	(5.4) Requirements for the clear path test of four-point, strap-type tiedowns in Annex B: a) The path between each wheelchair securement point and the corresponding tiedown anchor point shall not deviate from a straight line by more than 40 mm (1.6 in.) and b) All edges of wheelchair components within a 50 mm (2 in.) radius of the center of the tiedown path measured in 5.4a shall have a radius greater than 2 mm (0.08 in.).	No test or requirements in ISO 7176-19.	(5.4) Same as WC19
	(5.5) Ratings for the lateral stability test of Annex C: The lateral stability will be rated as "good" if the average lateral displacement from three tilt tests is less than 20 mm (0.8 in.), as "acceptable" if the average lateral displacement is greater than 20 mm (0.8 in.) but less than 40 mm (1.6 in.), and as "poor" if the average lateral displacement is 40 mm (1.6 in.) or more.	No test or requirements in ISO 7176-19.	No test or requirements in ISO 7176-19 2019.
	(5.6) WC turning radius and turn-around width shall be measured in accordance with RESNA WC-1:2009, Section 5.	No test or requirements in ISO 7176-19.	No test or requirements in ISO 7176-19 2019.
	(5.7) When tested in accordance with the procedures of Annex E, which uses a disconnecting shoulder belt and adjustable-length, vehicle-anchored pelvic belts: a) the rating for the WC shall be at least "acceptable" with regard to the ease of proper placement of vehicle-anchored three-point belt restraints per the criteria of Table E.1 and as specified in E4.1, and b) the rating for the WC shall be at least "acceptable" with regard to the extent to which proper positioning and geometry of the 3-point belt restraint per criteria in Tables E.2 through E.8 and as specified in E4.2a. In addition, both ratings must be disclosed in WC presale literature and user instructions in accordance with 6.2e and 6.3l.	(5.4) The WC shall be tested for accommodation of vehicle-anchored occupant-restraint systems in accordance with Annex D and the resulting rating shall be reported in the product presale literature.	(5.5) Same as WC19

LABELING REQUIREMENTS: GENERAL	(6.1 General) In addition to requirements of RESNA WC-1, Section 15, WC19 requires the WC frame or base frame, primary seating system components, and crashworthy WC-anchored belt restraints be permanently labeled with the manufacturer's name, month/year of manufacture, product model number, unique product serial number and the symbol of Figure 7, which must be at least 12 mm (about 1/2 inch) in diameter and rendered in any two contrasting colors such that the color at the circumference contrasts with the color of the component to which the symbol is attached and positioned so that the symbol can be easily seen by a vehicle operator or attendant when an occupied WC enters a vehicle.  .	(6.1 General) In addition to requirements of ISO 7176-15, ISO only requires that there be an indication that the WC complies with ISO 7176-19:2008, and that a label be affixed to any belt restraints anchored to the WC that are intended for use as an occupant restraint to indicate that they conform to ISO 7176-19:2008. No specifics about product/manufacturer ID included.	(6.1 General) In addition to requirements of ISO 7176-15, the wheelchair frame/base frame and/or primary seating-system components, and crashworthy wheelchair-anchored belt restraints shall include permanent labels using 12-point or larger bold font with manufacturer's name, month/year of manufacture, product model number, unique product serial number and the symbol of Figure 8, which must be at least 12 mm (about 1/2 inch) in diameter and rendered in any two contrasting colors such that the color at the circumference contrasts with the color of the component to which the symbol is attached and positioned so that the symbol can be easily seen by a vehicle operator or attendant when an occupied WC enters a vehicle. 
	(6.1e.iii) Each WC securement point shall be permanently identified with the symbol in Figure 8 that has line widths that are between 0.78 (0.03 in) and 1.6 mm (0.06 in).	(6.1a.ii) Each WC securement point shall be permanently identified with the symbol in Figure 8 that has line width between 10% and 20% of the overall symbol height.	(6.1) Each WC securement point shall be permanently identified with the symbol in Figure 7 with overall height of at least 12 mm, sufficient contrast to background to be visible in normal room lighting from a distance of 1 m, and the symbol shall not be used to mark sec pts intended for purposes other than securement of occupied WC in vehicle.
	(6.1e.v) Each WC securement point shall be permanently identified with the symbol in Figure 8 that shall be attached near the securement point in a permanent manner so that it will not peel, chip or scrape off over time.	No specification in ISO 7176-19 other than that 'permanent labels or markings that indicate the location of the securement point' be provided.	No specification in ISO 7176-19 other than that 'permanent labels or markings that indicate the location of the securement point' be provided.
PRESALE LITERATURE	(6.2a) In addition to requirements of RESNA WC-1, Section 15, presale literature shall include the WC size, minimum turning radius, and minimum turn-around width as measured by RESNA WC-1:2009, Section 5 and required by RESNA WC-1:2009 Section 15, Annex A, Table 1.	No requirement to disclose the WC size, minimum turning radius, and minimum turn-around width unless this is included as part of the requirements of ISO 7176-15.	No requirement to disclose unless this is included as part of the requirements of ISO 7176-15. However, (6.2c) includes a statement that ease of access to, and maneuverability in, motor vehicles can be significantly affected by WC size and turning radius, and that smaller WC and/or WC with shorter turning radius will generally provide greater ease of vehicle access and maneuverability to a forward-facing position.
	No requirement in WC19.	(6.2a) In addition to requirements of ISO 7176-15, presale literature shall include a statement that the WC is designed to be secured forward facing when used as a seat in a motor vehicle and that it complies with the requirements of ISO 7176-19:2008.	(6.2a) In addition to requirements of ISO 7176-15, presale literature shall include a statement that the WC is designed to be secured forward facing when used as a seat in a motor vehicle and that it complies with the requirements of ISO 7176-19:20XX.
	(6.2c) Presale literature shall include a statement of the total WC mass in the tested configuration.	No requirement in ISO 7176-19, unless this is included as part of the requirements of ISO 7176-15.	No requirement in ISO 7176-19, unless this is included as part of the requirements of ISO 7176-15.
	(6.2d) Presale literature shall include the resulting rating of good, acceptable, or poor from the test for WC lateral stability as required by 5.5 and determined by methods of Annex C.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.

	(6.2e) the ratings for wheelchair accommodation of vehicle-anchored belt restraints, including: i) the rating for ease of properly positioning a three-point belt restraint as required by 5.7a, and ii) the rating for the degree to which proper three-point belt-restraint positioning can be achieved as required by 5.7b		(6.2e) Same as WC19
PRESALE LITERATURE (CONT)	(6.2f) Presale literature shall include the results of the frontal-impact test required by 5.3 using test methods of Annex A, including: i) a description of the WC and how it was configured for the test, ii) the number and location of securement points used in the test, iii) the type of WC-anchored belt restraint used, and iv) a statement of whether the WC complies with the frontal-impact performance requirements of 5.3.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.2g) Presale literature shall include the number of tiedown strap assemblies recommended for effective WC securement in different size vehicles. (No mention of other securement methods)	(6.2b) Presale literature shall include a description of the types of tiedowns that are suitable for use with the WC.	(6.2b) Presale literature shall include a description of the types of tiedowns that are suitable for use with the WC.
	(6.2h) Presale literature shall include for wheelchairs designed for use by adults and children who weigh more than 23 kg (51 lb): i) a statement that the wheelchair provides for anchoring of a crashworthy pelvic-belt restraint that conforms to requirements of this section of RESNA WC-4, and that can be used in conjunction with a vehicle-anchored shoulder belt with a standard lower- anchorage connector for effective crashworthy three-point-belt restraint in a motor vehicle, and ii) the source or sources of suitable wheelchair-anchored pelvic-belt restraints.	(6.2d) Presale literature shall include a statement of whether the wheelchair provides, has been tested with, and can be used with, any manufacturer-designated wheelchair-anchored belt restraints.	(6.2d) Presale literature shall include a statement of whether the wheelchair provides, has been tested with, and can be used with, any manufacturer-designated wheelchair-anchored belt restraints.
	(6.2i) Presale literature shall include for wheelchairs designed for use by children who weigh less than 23 kg (51 lb), a statement that the wheelchair is provided with a five-point harness restraint that is designed for use as a crashworthy restraint in motor vehicles.	(6.2d) Presale literature shall include a statement of whether the wheelchair provides, has been tested with, and can be used with, any manufacturer-designated wheelchair-anchored belt restraints.	(6.2d) Presale literature shall include a statement of whether the wheelchair provides, has been tested with, and can be used with, any manufacturer-designated wheelchair-anchored belt restraints.
	(6.2j) Presale literature shall include for wheelchairs that exceed the mass, length, and/or width of mobility devices that the ADA has specified must be accommodated on public transportation vehicles, a statement that the wheelchair exceeds the ADA dimensions and may not fit on ADA-compliant vehicles.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
USER INSTRUCTIONS & WARNINGS	No mention in WC19 user instruction section, but there is a user warning (6.4a) that the WC is designed specifically for forward-facing use in motor vehicles.	(6.3.1a) The user instructions shall include statement that the WC is designed to be forward facing when used as a seat in a motor vehicle.	(6.3.1a) The user instructions shall include statement that the WC is designed to be forward facing when used as a seat in a motor vehicle.
	(6.3d) User instructions shall include, when applicable, a description with illustration of the wheelchair securement adaptor used to conduct a successful frontal-impact test of the wheelchair when secured by a docking securement device.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.3g) User instructions shall include for WC designed for use by adults and children who weigh more than 23 kg (51 lb), a statement that the WC provides for anchoring a pelvic-belt restraint that conforms to requirements of this section of RESNA WC-4, and that can be used in conjunction with a vehicle-anchored shoulder belt with	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.

	standard lower-anchorage connector as a crashworthy three-point-belt restraint in motor vehicles.		
	(6.3h) User instructions shall include information on where to purchase a compatible crashworthy WC-anchored pelvic-belt restraint indicated in 6.3g.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.3i) User instructions shall include for WC designed for use by children who weigh less than 23 kg (51 lb), a statement that the WC is provided with a 5-point harness restraint that is designed for use as a crashworthy restraint in motor vehicles.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
USER INSTRUCTIONS & WARNINGS (CONT)	(6.3j.iii) User instructions shall include descriptions of the manner by which the lower end of the vehicle-anchored shoulder belt with standard connector is attached to the WC-anchored pelvic-belt restraint.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.3j.iv) User instructions shall include descriptions of specifications for belt restraints that are suitable for use as WC-anchored occupant restraints in a motor vehicle.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.3k.iii) User instructions shall include a statement that the belt-restraint buckle of the 3-point belt restraints must be placed in contact with the occupant's body and away from WC components.	(6.3.4j) User instructions shall include warnings that care should be taken when applying the occupant restraint to position the seatbelt buckle so that the release button will not be contacted by WC components during a crash.	(6.3.4k) User instructions shall include warnings that care should be taken when applying the occupant restraint to position the seatbelt buckle so that the release button will not be contacted by WC components during a crash.
	(6.3k.v) User instructions shall include a statement that the junction of the shoulder belt and pelvic belt of the 3-point belts should be located near the hip opposite to the shoulder over which the diagonal belt crosses and not near the midline of the occupant.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.3l) User instructions shall include the ratings for WC accommodation of vehicle-anchored belt restraints with disconnecting shoulder belts as determined by the procedures of Annex E, including: i) the rating for ease of properly positioning a belt restraint as required by 5.7a, and ii) the rating for the degree to which proper belt restraint positioning was achieved as required by 5.7b.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.3m) User instructions shall include the rating of good, acceptable, or poor as specified by 5.5 for the test of WC lateral stability conducted in accordance with Annex C.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	Implied with several previous statements, but no specific requirement in WC19.	(6.3.2d) The user instructions shall include descriptions of how the WC is to be secured in the vehicle.	(6.3.2d) The user instructions shall include descriptions of how the WC is to be secured in the vehicle.
	No requirement in WC19.	(6.3.2g) The user instructions shall include descriptions of the recommended settings for any adjustable parts, including, where applicable, seat and back rest positions, when the WC is in use in a motor vehicle.	(6.3.2g) The user instructions shall include descriptions of the recommended settings for any adjustable parts, including, where applicable, seat and back rest positions, when the WC is in use in a motor vehicle.
	No requirement in WC19.	(6.3.2h) The user instructions shall include descriptions of the WC mass, as measured in ISO 7176-5.	(6.3.2h) The user instructions shall include descriptions of the WC mass, as measured in ISO 7176-5.
	No requirement in WC19.	(6.3.2i) The user instructions shall include descriptions of the maximum recommended user mass.	(6.3.2i) The user instructions shall include descriptions of the maximum recommended user mass.
	No requirement in WC19.	(6.3.4a NOTE) User instructions shall include warnings that compliance with this standard does not preclude using the WC facing rearward in large accessible vehicles equipped with rear-facing WC passenger stations.	(6.3.4a NOTE) User instructions shall include warnings that compliance with this standard does not preclude using the WC facing rearward in large accessible vehicles equipped with rear-facing WC passenger stations.

	No requirement in WC19.	(6.3.4g) User instructions shall include warnings that the WC should be inspected by a manufacturer's representative before reuse following involvement in any type of vehicle collision.	(6.3.4g) User instructions shall include warnings that the WC should be inspected by a manufacturer's representative before reuse following involvement in any type of vehicle collision.
	(6.4b) Warnings shall be provided that include statements that the WC should only by used in motor vehicles as described in the WC manufacturer's instructions.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4g) Warnings shall be provided that include statements that belt restraints should be positioned on wheelchair occupants in accordance with WTORS and/or the wheelchair manufacturer's instructions as indicated in 6.3k.i through 6.3k.viii	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
USER INSTRUCTIONS & WARNINGS (CONT)	(6.4h) Warnings shall be provided that include statements that five-point harness restraints provided with wheelchairs for children under 23 kg (51 lb) should be positioned on children in wheelchairs in accordance with the wheelchair manufacturer's instructions as indicated in 6.3.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4k) Warnings shall be provided that include statements that the WC manufacturer should be consulted for questions about using the WC for seating in a motor vehicle.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4l) Warnings shall be provided that include statements that sufficient forward and rearward clear space should be provided around the WC occupant, along with the illustration of Figure 12 and statements that the forward clear-space zone (FCZ) needs to be larger when a shoulder-belt restraint is not used.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4m) Warnings shall be provided that include statements that vehicle interior components that cannot be removed from the clear zones of Figure 12, or that near the WC occupant space at a level that may be contacted by a WC occupant's head during a side-impact collision or vehicle rollover, should be padded with material that complies with FMVSS 201.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4o) Warnings shall be provided that include statements that back supports with adjustable recline angles should not be reclined to more than 30° to the vertical during vehicle travel unless necessary for the postural and medical needs of the occupant.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4p) Warnings shall be provided that include statements that for people who use heavy WC, transportation in larger vehicles is recommended when the option exists.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(6.4q) Warnings shall be provided that include statements that in cases where the WC exceeds the mass, width, or length that must be accommodated by ADA-compliant vehicles, a statement that warns the user that the WC may not be accommodated by public transportation vehicles.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	No requirement in WC19.		(6.3.4g) the WC should be inspected by a manufacturer's representative before reuse following involvement in any type of vehicle collision.

ANNEX A FRONTAL IMPACT TEST	(A.3e) Equipment shall include the surrogate four-point, strap-type WTORS that conforms with the design and performance specifications of Annex D.	(A.3.1h) Equipment shall include a four-point, strap-type tiedown and complete upper and lower belt restraint system that conforms to ISO 10542-2. For WC with mass >85kg and/or with WC-anchored belt restraints, it is recommended that a surrogate tiedown, designed in accordance with Annex E, be used instead of a commercial WC securement system.	(A.3.1h) Equipment shall include a strap-type tiedown (with four or more tiedown straps) system that conforms to ISO 10542-1. NOTE 1 For wheelchairs with a mass of 85 kg or more, and/or with wheelchair-anchored belt restraints, it is recommended that a surrogate tiedown, designed in accordance with Annex E, be used instead of a commercial wheelchair securement system.
	(A.3eiii&iv) Equipment shall include a surrogate shoulder belt with standard pin-bushing anchorage connector for required testing of WCs equipped with a WC-anchored pelvic belt or iv) a surrogate three-point vehicle-anchored belt restraint for additional testing of WC that may be requested by manufacturers.	(A.3.1j) Equipment shall include a vehicle-anchored three-point-belt restraint or two-point shoulder-belt restraint that conforms to ISO 10542-1, as required to supplement the belt restraint provided with the WC.	(A.3.1j) Equipment shall include a vehicle-anchored three-point-belt restraint or two-point shoulder-belt restraint that conforms to ISO 10542-1 and is appropriate for the mass of the ATD selected, as required to supplement the belt restraint provided with the WC.
	(A.3i) Equipment shall include a Hybrid III ATD selected from Table A.1. Does not allow use of Hybrid II dummies and does include the 3-year-old ATD for testing WC with user mass between 26-40 lb (12-18kg).	(A.3.1e) Equipment shall include an ATD selected from Table A.1, which includes the option to use either Hybrid II or III dummies. ISO also does not include the 3-year-old ATD as an option.	(A.3.1e) Equipment shall include an ATD selected from Table A.1, which includes the option to use either Hybrid II or III midsize male dummies, as well as VIP, P series or Q series dummies for other sizes.
	(A.3ev) Equipment shall include a 75 mm by 50 mm by 13 mm (3 in. by 2 in. by 0.5 in.) rigid block for setting a consistent level of slack in the surrogate shoulder belt prior to a test as indicated in A5.1k.iv and/or A5.2c.iii.	None listed under Apparatus section in ISO 7176-19, although a 75 mm x 75 mm x 25 mm thick plate is used in A.4.8e setup instructions.	None listed under Apparatus section in ISO 7176-19, although a 75 mm x 50 mm x 13 mm thick plate is used in A.4.8f setup instructions.
ANNEX A FRONTAL IMPACT TEST (CONT)	(A.3evi) Equipment shall include a raised platform on which the WC is placed so that the WC ground plane is at the same height as the rear surrogate tiedown-strap anchor points.	No requirement in ISO 7176-19 (including in Annex E).	No requirement in ISO 7176-19 (including in Annex E).
	No requirement in WC19.	(A.3.1i) Equipment shall include if an additional test is to be performed using a different type of tiedown system, the tiedown device shall conform to the dynamic performance requirements specified in 6.2 of ISO 10542-1:2001.	(A.3.1i) Equipment shall include if an additional test is to be performed using a different type of tiedown system, the tiedown device shall conform to the dynamic performance requirements specified in 6.2 of ISO 10542-1:2012, Section 5.2.1b.
	(A.4a-b) Prior to conducting the test, calibrate the sled accelerometer as specified by the accelerometer manufacturer at least once each year in accordance with SAE J211, and calibrate the test instrumentation.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.4c) Inspect the ATD to insure that all primary components are intact and functioning.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.4f) When necessary for the user capacity of the WC and selected ATD from Table A.1 (i.e. for the small female adult ATD), attach additional mass to the ATD to achieve the desired total ATD mass.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	No requirement in WC19.	(A.4.1d) Equip the WC with any required add-on components.	(A.4.1d) Equip the WC with any required add-on components.
	No option in WC19 to use commercial four-point, strap-type tiedowns, but A.5.1c says to follow WTORS instructions for other types of securement systems.	(A.4.2) Install the WC tiedown anchorages on the sled platform in accordance with the WTORS manufacturer's vehicle installation instructions, or as specified in ISO 10542-1 for other specific types of tiedowns. When a range of installation dimensions is specified, use the midpoint of the range.	(A.4.2) Install the WC tiedown anchorages on the sled platform in accordance with the WTORS manufacturer's vehicle installation instructions, or as specified in ISO 10542-1 for other specific types of tiedowns. When a range of installation dimensions is specified, use the midpoint of the range.
	(A.4g.iii & v) Prepare the WC to be tested: For power WC, install the heaviest batteries specified by the manufacturer for use with the WC. If desired, replace electronic components, including batteries and	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.

	motors, with components having equivalent mass, size and center of mass.		
	(A.4h) Prior to conducting the test, fasten the sections of raised WC platform (see Annex D) to the sled platform.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.4i) Prior to conducting the test, bolt the surrogate wheelchair tiedown anchorages to the sled platform using two split-drum assemblies specified in Annex D to provide for length adjustment in the rear tiedown-strap assemblies and using the two pivoting ratchet assemblies used for the front anchor points to adjust the tension in the surrogate tiedown system.	(A.4.4) Secure the wheelchair with the wheelchair tiedown according to the WTORS manufacturer's instructions, and as specified in ISO 10542-1. For testing with four-point strap-type tiedowns, follow the procedures in Annex A of ISO 10542-2:2001.	(A.4.4) Secure the wheelchair with the wheelchair tiedown according to the WTORS manufacturer's instructions, and as specified in ISO 10542-1. For testing with four-point strap-type tiedowns, follow the procedures in A.5.9 of Annex A of ISO 10542-1:2012.
	(A.4i.i) Select anchor points such that the distance between front and rear anchor points is preferably set to 1220 +/- 12 mm (48 +/- 0.5 in). NOTE: In cases where 1220 (48 in) fore/aft anchor-point distance is not possible because of wheelchair size, or when the wheelchair manufacturer and test lab agree that use of a larger distance is appropriate and justified, the distance may be increased to 1295 mm +/- 12 mm.	ISO 10542-1:2012 (A.5.9a.2) The anchor points are located 1300 mm (+ 20 mm/- 0 mm) from the front to the rear.	ISO 10542-1:2012 (A.5.9a.2) The anchor points are located 1300 mm (+ 20 mm/- 0 mm) from the front to the rear.
	(A.4i.iii) The lateral distance between the centers of the front anchor points is between 300 mm and 760 mm (12 in. and 30 in.), such that the anchor points are outboard of, or in line with, the front wheelchair securement points.	(A.5.9a.4) The anchor point shall have a lateral distance between front anchor points of 300 mm to 810 mm.	(A.5.9a.4) The anchor point shall have a lateral distance between front anchor points of 300 mm to 810 mm.
	(A.4j) Prior to conducting the test, set up high-speed video or film cameras to record one or more side views of the test sled, test wheelchair, and ATD during the impact event at a speed of 500 frames per second or higher, so that both forward and rearward ATD excursions in Table 3 can be measured.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
ANNEX A FRONTAL IMPACT TEST (CONT)	(A.5.1a) Position the WC to be tested facing forward on the raised platform between the front and rear tiedown anchor points with the caster wheels in the trailing orientation.	ISO does not specify the position of the caster wheels.	ISO does not specify the position of the caster wheels.
	(A.5.1b.ii & iii) Adjust the fore/aft position of the WC while tensioning the tiedown straps to between 100-200 N (22-44 lbf), to achieve a side-view projected angle of the rear tiedown straps of 45° ± 3° to the horizontal. If a rear tiedown angle in this range cannot be achieved with a rear tiedown length of at least 495 mm (19.5 in.), adjust the lengths of the rear tiedown strap assemblies to between 495 mm (19.5 in.) and 508 mm (20 in.), and measure the resulting side-view projected angles of the rear tiedown straps.	ISO 10542-1:2012 (A.5.9b & d) (b) Secure the TWC in accordance with the WTORS manufacturer's instructions to achieve lengths of the rear tiedown strap assembles of 495 mm to 533 mm, measured from the interface of the tiedown end fitting and the securement point on the wheelchair to the anchor point. (d) If the WTORS is tested with an SWM where the location of the securement points makes it impossible to comply with the anchor point locations and strap lengths as stipulated in a) and b), then the SWM should be secured within, or as close as possible to, the angles given in Figures 3 and 4. (30-45 rear tiedown side-view angle, 40-60 front tiedown side-view angle). ***This implies that you can have rear tiedown angles of greater than 45 deg if you have the length of 495mm as specified in (b)?***	ISO 10542-1:2012 (A.5.9b & d) (b) Secure the TWC in accordance with the WTORS manufacturer's instructions to achieve lengths of the rear tiedown strap assembles of 495 mm to 533 mm, measured from the interface of the tiedown end fitting and the securement point on the wheelchair to the anchor point. (d) If the WTORS is tested with an SWM where the location of the securement points makes it impossible to comply with the anchor point locations and strap lengths as stipulated in a) and b), then the SWM should be secured within, or as close as possible to, the angles given in Figures 3 and 4. (30-45 rear tiedown side-view angle, 40-60 front tiedown side-view angle). ***This implies that you can have rear tiedown angles of greater than 45 deg if you have the length of 495mm as specified in (b)?***
	(A.5.1d & e) For wheelchairs with independently reclining back supports, adjust the back-support angle to between 5° and 30° relative to the vertical as measured along the centerline of the back support when the seat is unloaded. (e) For wheelchairs with	(A.4.5a - c) If applicable, SWM seat and backrest are adjusted as follows: (a) Rotate the backrest rearward to obtain a backrest plane angle not exceeding 10° relative to the vertical, (b) For wheelchairs with independently	(A.4.5a - c) For wheelchairs with independently adjustable back supports, adjust the back-support angle according to the manufacturer's instructions or if none given, to between 5° and 10° relative to the vertical. Measure this angle on

	independently adjustable seat angles, or with tilt seating systems, adjust the seat to an angle that is inclined up at the front between 5° and 30° relative to the horizontal with the seat unloaded, making sure that the seat is tilted up at least 3° to 5° from its most forward tilt position. NOTE 1 Measure the back-support and seat angles using an inclinometer aligned with the back-support posts and seat rails prior to installing the ATD. NOTE 2 It is preferred and recommended that the unloaded back-support angle is between 10° and 25° to the vertical and that the unloaded seat angle is between 10° and 20° to the horizontal.	adjustable seat angles, adjust the seat frame to a maximum incline angle of 10° relative to the horizontal, (c) For wheelchairs with tilt seating, adjust the longitudinal seat frame members to a maximum angle of 30°, relative to the horizontal, without the ATD in the wheelchair or a position selected by the manufacturer.	the back-support reference plane with an inclinometer without the ATD in the wheelchair. For wheelchairs with independently adjustable seat angles, adjust the seat frame according to the manufacturer's instructions or if none given, so that it is inclined up at the front between 5° and 10 ° relative to the horizontal. Measure this angle on the seat reference plane with an inclinometer without the ATD in the wheelchair, making sure that the seat is tilted up at least 3° to 5° from the horizontal. For wheelchairs with tilt seating, adjust the longitudinal seat frame members to a maximum angle of 30°, relative to the horizontal, without the ATD in the wheelchair or a position selected by the manufacturer. NOTE It is preferred and recommended that the unloaded back-support angle is between 0° and 10° to the vertical and that the unloaded seat angle is between 0o and 10° to the horizontal.
	(A.5.1k.ii second bullet) Bolt the upper anchorage of the surrogate shoulder-belt assembly to the rigid support structure specified in A.3d at a location that provides a good fit of the shoulder belt to the ATD's chest and shoulder as illustrated in Figures A.2 and A.3 by: adjusting the lateral distance to the anchor point so that the shoulder belt crosses over the middle of the ATD's shoulder as shown in Figure A.3 for the midsize-male ATD.	(A.4.10b) Bolt the upper anchorage of a 2-point shoulder-belt restraint to the rigid support structure of A.3.1d), and the lower anchorage to the sled platform, at locations that provide a good fit of the shoulder belt restraint to the ATD's chest and shoulder as illustrated in Figure 7. (This is the wrong Figure reference, should be Figure A.2) Figure A.2 only allows you to position the upper anchor laterally at 300 +/- 15 mm from occupant centerline, no note to allow you to adjust lower to achieve good fit.	(A.4.8b) Bolt the upper anchorage for the shoulder-belt restraint to the rigid support structure of A.3.1 d) per the WTORS manufacturer instructions. If no instruction is provided or a surrogate shoulder belt is being used.. Same as WC19
	(A.5.1k.iii) Fasten the connector at the lower end of the surrogate shoulder belt to the pin/bushing anchorage on the WC-anchored pelvic belt.	A.4.10b) Bolt the upper anchorage of a 2-point shoulder-belt restraint to the rigid support structure of A.3.1d), <u>and the lower anchorage to the sled platform.</u>	(A.4.10b) ..and attach the lower end fitting to either the sled platform or to the appropriate anchorage (i.e. latch plate or pin/bushing) on the pelvic belt.
	(A.5.1k.iv) place and adjust the surrogate shoulder belt over the ATD's chest and shoulder to achieve a snug fit with the rigid block of A.3e.v inserted between the ATD's chest and the belt so that the 75 mm (3 in.) side extends outward from the chest and the 13 mm (0.5 in.) dimension is parallel to the centerline of the diagonal belt, and remove the rigid block.		(A.4.8f & A.4.10d) If using a surrogate shoulder belt assembly (per Annex E)... same as WC19
	No requirement in WC19.	(A.4.7) If the wheelchair is provided with postural belts, install and fasten the belts around the ATD as recommended by the manufacturer.	(A.4.7) If the wheelchair is provided with postural belts, install and fasten the belts around the ATD as recommended by the manufacturer.
	(A.5.1m) Install the 25-mm wide strap as illustrated in Figure A.4 with the strap located 125 to 250 mm below the ATD knee-joint center and forward of the ATD knee-joint center the distance A indicated in Table A.2 based on the ATD selected for the test, and tension the strap to 150 to 200 N.	(A.4.13) Install the 25 mm wide foot/leg strap of A.3g) as described in A.3f) so that the strap is 55 mm +/- 15 mm above the ATD knee-joint centre and forward of the ATD's knee-joint centre by the length A listed in Table A.2. Tension the strap to 30 to 50 N before the test.	(A.4.14) Same as WC19
ANNEX A FRONTAL IMPACT TEST (CONT)	(Table A.2) Length A for the position of the foot/leg strap forward of the ATD knee center is 480 mm for midsize male ATD. Table includes length for 3YO dummy.	(Table A.2) Length A for the position of the foot/leg strap forward of the ATD knee center is 510 mm for midsize male ATD. Table does not include length for 3YO dummy.	(Table A.2) Same as WC19
	(A.5.1r) Measure and record the seat and back-support angles when loaded by the ATD.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.

	(A.6.1d) Examine the WC and ATD to determine or measure whether the seat or back support broke free of the WC at any attachment point.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.1e) Examine the WC and ATD to determine or measure whether any webbing or structural components of production WC-anchored belt restraints, including anchorages, adjustment mechanisms, and buckles, completely failed.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.1i) Examine the WC and ATD to determine or measure whether WC components that may contact the WC-seated occupant or other nearby occupants have failed or separated in a manner that produced sharp edges with a radius of less than 2mm (0.08 in).	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.1j) Examine the WC and ATD to determine or measure whether the locking mechanism of tilt seating systems released or changed position.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.1k) Examine the WC and ATD to determine or measure whether the batteries remained attached to the WC, within the WC footprint and/or did not move into the WC user's space.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.1l) Examine the WC and ATD to determine or measure whether all securement hooks of the SWTORS remained attached to the WC securement points.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.8) Document if the WC caused complete failure of any SWTORS strap or belt.	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
	(A.6.9) Document if all surrogate tiedown hooks were attached to the WC after the test. (This requirement is redundant with A.6.1k)	No requirement in ISO 7176-19.	No requirement in ISO 7176-19.
ANNEX B (WC19) TIEDOWN CLEAR PATH TEST	Annex B of WC19 specifies equipment, conditions and procedures to determine whether clear paths are provided from the WC securement points to typical vehicle anchor points and to determine the potential for contact of tiedown straps by sharp edges on the WC.	No test in ISO 7176-19.	Annex C is same as WC19 but (C.3.1) Rigid platform with WC securement space, as shown in Figure C.1.
ANNEX B (WC19) / ANNEX C (ISO) SECUREMENT POINT ACCESSIBILITY TEST (CONT)	(B.3a) Tests shall be performed with equipment that includes a rigid platform with WC securement space, as shown in Figure B.1, with the ability to adjust the distance between the front and back partitions and front and rear tiedown-assembly anchor points from 1220 mm ± 12 mm (48 in. ± 0.5 in.) to 1295 mm ± 12 mm (51 in. ± 12 mm) in increments of 25 mm.	(C.3.1) Rigid platform with WC securement space, as shown in Figure C.1.	(C.3.1) Rigid platform with WC securement space, as shown in Figure C.1.
	(Figure B.1) Partition dimensions are the same as ISO but show the preferred distance of 1220 mm +/- 12 mm between front and back walls.	(Figure C.1) Partition dimensions are the same as WC19 but show a fixed distance of 1295 mm +/- 10 mm between front and back walls.	(Figure C.1) Partition dimensions are the same as WC19 but show a fixed distance of 1295 mm +/- 10 mm between front and back walls.
ANNEX C (WC19) LATERAL STABILITY TEST	Annex C of WC19 specifies equipment, conditions and procedures for measuring and rating the potential for lateral movement of occupied WC secured by four-point, strap-type tiedowns when acted on by lateral inertial forces during vehicle travel.	No test in ISO 7176-19.	No test in ISO 7176-19.
ANNEX D (WC19) / ANNEX E (ISO) SURROGATE	Annex D of WC19 provides specifications for surrogate WTORS used in required and optional four-point, strap-type tiedown frontal-impact tests of Annex A and lateral stability tests of Annex C of WC19, as well as the required and optional frontal-impact tests of Annex A of WC20 and the surrogate occupant restraint system needed for tests	Annex E of ISO 7176-19 provides guidelines for general surrogate tiedown devices (four-point and other types). The guidelines are worded very broad/general, so that there is	Annex E of ISO 7176-19 provides guidelines for general surrogate tiedown devices (four-point and other types). The guidelines are worded very broad/general, but an example WTORS that matches the WC19 spec is described.

TIEDOWN SPECS / GUIDELINES	of WC tiedown/securement system required by A.6i of WC18. This Annex includes very detailed requirements for the SWTORS with a particular design and provides info for obtaining a complete set of engineering drawings. This Annex includes details for surrogate occupant restraints, which are not included as an option in the ISO standard.	not a specific surrogate tiedown design that must be used. There are no guidelines for surrogate occupant restraints.	
ANNEX E (WC19) / ANNEX D (ISO) RATING WC ACCOMM. OF VEHICLE-ANCHORED BELT RESTRAINTS	(E.2) Ratings must be disclosed in both wheelchair manufacturer's presale literature and user instructions.		(D.2) Ratings must only be disclosed in presale literature.
	(E.2) The wheelchair is secured using a production or surrogate four-point, strap-type tiedown that conforms with RESNA WC-4:2017, Section 18, or using the four-point, tiedown system specified in B.3b for clear-path testing. A vehicle-anchored three-point belt with a shoulder belt that manually connects and disconnects to/from the lap belt using the pin-bushing anchorage and connector, and that conforms to RESNA WC-4:2017, Section 18 is installed and positioned on the ATD in a manner that optimizes proper belt fit to the ATD.	(D.4.1) WTORS, consisting of a four-point strap-type tiedown and vehicle-anchored three-point belt restraint that complies with ISO 10542-2.	(D.4.1) a WTORS, consisting of a four-point strap-type tiedown and vehicle-anchored three-point belt restraint that complies with ISO 10542-1, and/or the tiedown system specified in C.3.5 for clear-path test.
	(E.3a&e) (a) Inspect the wheelchair to insure that it conforms to the manufacturer's instructions and prepare the wheelchair as specified in A.4g of Annex A. Arm supports of the wheelchair must be installed in their normal use position and may not be removed or pivoted out of position for these ratings. (e) <u>For WC with reclining back supports or tilt seating systems, adjust the angles of the seat and/or back support in accordance with A5.1d-f of Annex A.</u>	(D.3) A complete WC, with seating system comparable in all respects to that used in the frontal impact test of Annex A shall be provided by manufacturer. No mention of specific WC setup.	(D.3) The complete production or prototype wheelchair to be used in the frontal impact test of Annex A (prior to the Annex A test), or a wheelchair configured with a seating system comparable in all respects to that used in Annex A shall be provided by the wheelchair manufacturer. (D.5a) Arm supports of the wheelchair must be installed in their normal use position and may not be removed or pivoted out of position for these ratings.
	(E.3f) NOTE The ATD used in the frontal-impact test of Annex A selected from Table A.1,must be used in this test, i.e., substitute test dummies used for other wheelchair testing are not allowed.		No note in ISO 7176-19.
	(Table E.1) 'Poor' rating received for ease of optimizing proper seatbelt placement on ATD if placement can only be achieved by threading the belt through small openings of less than 75 mm (3 in) or by inserting belt into tight spaces of less than 15 mm (0.6 in) between WC components.	(Table D.1) 'Poor' rating received for overall ease of belt positioning if placement can only be achieved by threading the belt through any openings or by forcing belt into narrow gaps of less than 25 mm (1 in) between WC components.	Same as WC19
	(Table E.1) 'Acceptable' rating received if placement can be achieved by threading the belt through relatively large openings of equal to or greater than 75 mm (3 in).	(Table D.1) 'Acceptable' rating received if placement requires inserting of belt restraint into gaps between wheelchair 1 components but webbing fits easily into gap and threading of webbing and/or hardware through openings is not required. If there is a narrow gap (less than 25 mm) between armrests and wheelchair components, but armrests are removable for increased gap width, rating will be acceptable due to extra step required for application.	Same as WC19
	(Table E.1) 'Good' rating received if placement can be achieved without threading the belt through openings, but requires inserting belt into spaces that are between 15 mm (0.6 in) and 25 mm (1 in) wide between WC components.	(Table D.1) 'Good' rating received if gaps for inserting belt restraint between wheelchair components are 2 greater than 25 mm, or provision is made for positioning belt webbing on the occupant without placing it into gaps (e.g. armrests are open at the front or swing out of the way). Threading of webbing and/or hardware through openings is not required. NOTE!! THIS DOES NOT MAKE SENSE GIVEN A POINT WAS	Same as WC19

		DEDUCTED UNDER THE ACCEPTABLE RATING FOR REQUIRING AN EXTRA STEP!!	
	(Table E.1) 'Excellent' rating received if placement can be achieved without threading the belt through openings and without having to insert belt into openings less than 25 mm (1 in) wide between WC components.	No excellent rating available for overall ease of belt positioning in ISO.	Same as WC19
	(Table E.2) 1 point awarded if the lab belt makes contact over the front of the ATD's pelvis but does not make contact with either or both of the ATD's hips due to interference by WC components.	(Table D.2) 'Acceptable' rating / 1 point awarded if the lab belt makes less than 50% contact across full breadth at the front of the ATD and does not contact the ATD H-points.	Same as WC19
	(Table E.3) 1 point awarded if the shoulder belt makes contact with the ATD's sternum but contact area is reduced due to interference by WC components.	(Table D.3) 'Acceptable' rating / 1 point awarded if the shoulder belt makes less than 50% contact across the thoracic section of the ATD and touches the ATD's sternum.	Same as WC19
ANNEX E (WC19) / ANNEX D (ISO) RATING WC ACCOMM. OF VEHICLE-ANCHORED BELT RESTRAINTS (CONT)	(Table E.3) 2 point awarded if the shoulder belt makes full and unrestricted contact with the ATD's sternum and the anterior surface of the ATD's shoulder.	(Table D.3) 'Good rating / 2 point awarded if the shoulder belt makes greater than 50% contact across the thoracic section of the ATD and contacts the ATD's sternum and anterior curve of the shoulder.	Same as WC19
	(Table E.8) 0 point awarded if sharp edges on the WC that could contact the lap belt during a frontal crash fall within the sharp edge-clearance zone of Figure E.2.	(Table D.8) 'Poor' rating / 0 point awarded if the lap belt makes contact with sharp edges on the WC that could cause wear of belt material over time and/or failure of webbing during impact loading.	Same as WC19
	(Table E.8) 1 point awarded if sharp edges on the WC that could contact the lap belt during a frontal crash do not fall within the sharp edge-clearance zone of Figure E.2, but come within 25 mm of the zone.	(Table D.8) 'Acceptable' rating / 1 point awarded if the lap belt does not contact but comes within 25 mm of sharp edges on the WC.	Same as WC19
	(Table E.8) 2 point awarded if no sharp edges on the WC that could contact the lap belt during a frontal crash come within 25 mm of the sharp edge-clearance zone of Figure E.2.	(Table D.8) 'Good' rating / 2 point awarded if the lap belt does not come within 25 mm of any sharp edges on the WC.	Same as WC19
	(E.4) WC is rated separately for ease of proper belt positioning and the extent to which proper belt fit is achieved. If either rating is "poor", then the WC does not comply with the requirements of 5.7 of WC19.	(D.6) One overall rating of belt-restraint accommodation is assigned and must be reported in the presale literature.	Same as WC19
	(E.4.2a) Rating for the extent to which proper belt fit is achieved is "poor" if the total sum of scores from Tables E.2 through E.8 is less than 8 or of a score of zero is assigned for any of the Tables.	(D.6.1) If the score for one or more of the tests obtained from Tables D.1 to D.8 is zero, an overall rating of "poor or C" should be recorded. If none of the scores are zero, and the sum of the scores from D.1 to D.8 is 7 or less, than an overall rating of "poor or C" is assigned.	Same as WC19
	(E.4.2b) Rating for the extent to which proper belt fit is achieved is "acceptable" if the total sum of scores from Tables E.2 through E.8 is from 8 to 11 and none of the scores are zero.	(D.6.2) If none of the scores are zero, and the sum of the scores from D.1 to D.8 is 8 to 11, than an overall rating of "acceptable or B" is assigned.	Same as WC19
	(E.4.2c) Rating for the extent to which proper belt fit is achieved is "good" if the total sum of scores from Tables E.2 through E.8 is 12 to 16, the sum of the scores for Tables E.2, E.4 and E.6 is less than 8, and none of the scores are zero.	(D.6.2) If none of the scores are zero, and the sum of the scores from D.1 to D.8 is 12 to 16, than an overall rating of "good or A" is assigned.	Same as WC19
	(E.4.2d) Rating for the extent to which proper belt fit is achieved is "excellent" if the total sum of scores from Tables E.2 through E.8 is 12 to 16, the sum of the scores for Tables E.2, E.4 and E.6 is 8, and none of the scores are zero.	There is no excellent rating in ISO.	Same as WC19

ANNEX F SPECS FOR UDIG	No differences.	No differences.	No differences.
ANNEX G WC DESIGN, PERFORMANCE, AND LABELLING RECOMMENDATIONS FOR IMPROVED PROTECTION OF OCCUPANTS SEATED FACING FORWARD IN WHEELCHAIRS DURING REAR IMPACTS	Not included in WC19		Informative annex includes test methods and performance criteria for rear impact testing
ANNEX G RECOMM. FOR OPTIMIZING WC SECUREMENT POINTS FOR 4-POINT, STRAP-TYPE TIEDOWNS	This informative annex establishes general guidelines to assist WC manufacturers in selecting securement-point locations that will optimize impact and stability performance and minimize forces on the WC frame.	Not included in ISO 7176-19.	Not included in ISO 7176-19.
ANNEX H CHECKLIST OF CRITERIA FOR COMPLIANCE OF ISO 7176-19	Not included in WC19		Informative annex with a checklist of design, performance, and labeling and literature requirements for manufacturers to use
ANNEX H RECOMM. AND INFO FOR DESIGNING WC-ANCHORED PELVIC BELTS	This informative annex provides the relevant ATD dimensions (including pelvis and button dimensions and seated shoulder height) and geometry to help in designing WC seats and locating anchor points for belt restraints in a manner that complies with the angle requirements of the standard.	Not included in ISO 7176-19.	Not included in ISO 7176-19.
ANNEX I SOURCES OF INFO FOR DOCUMENTS, STANDARDS, ENGINEERING DRAWINGS AND ATDs	This informative annex provides contact information for the dummy manufacturers, for acquiring copies of federal motor vehicle safety standards, for SAE recommended practices and for engineering drawings for SWTORS.	Not included in ISO 7176-19.	Not included in ISO 7176-19.