



# TRANSIT TIE-DOWN OWNER'S MANUAL SUPPLEMENT

## AERO X | ZRA

**DEALERS/SUPPLIERS:**

THIS OWNER'S MANUAL SUPPLEMENT MUST BE GIVEN TO THE USER OF THIS WHEELCHAIR

**USER:**

BEFORE USING THIS WHEEL CHAIR, YOU MUST READ THIS OWNER'S MANUAL SUPPLEMENT IN ITS ENTIRETY AND SAVE IT FOR FUTURE REFERENCE.

**ATTENDANTS/ASSISTANTS:**

BEFORE ASSISTING THE USER OF THIS WHEELCHAIR, YOU MUST READ THIS OWNER'S MANUAL SUPPLEMENT IN ITS ENTIRETY AND SAVE IT FOR FUTURE REFERENCE.

## I. WARNINGS

### A. GENERAL WARNINGS

#### **⚠ WARNING**

You should contact TiLite Customer Service at 800-545-2266 with any questions you may have about using this wheelchair for seating in a motor vehicle.

#### **⚠ WARNING**

This Supplement contains detailed information regarding the exact configuration of the TiLite wheelchairs that were subjected to the frontal impact and other tests required by ISO 7176-19. See “Statement of Compliance/Specifications” on page 4. Those test results apply only to the configuration of the wheelchair as tested and described herein. Therefore, if you order your chair differently, such as with a seating system manufactured by someone other than TiLite, you are hereby advised that the wheelchair was not tested in such different configuration and should not be considered “transit approved” by TiLite. Because TiLite has not tested the chair with such different configurations, TiLite has no knowledge of how the product would perform in such configuration. Therefore, TiLite makes no claims or warranties about the wheelchair’s performance in any configuration other than the configuration described herein. TiLite has not authorized any person to make any such claims or warranties on TiLite’s behalf.

#### **⚠ WARNING**

TiLite wheelchairs equipped with TiLite’s Transit Option have been dynamically tested in a forward-facing orientation for a 30 mph (48-km/h) frontal impact with varying weights, as set forth in “Statement of Compliance/ Specifications” on page 4. TiLite wheelchairs equipped with TiLite’s Transit Option have met the performance requirements for traveling forward-facing in frontal impact conditions, and they should be used ONLY for forward-facing seating in motor vehicles. Their use in other orientations (e.g., rearward-facing or sideways-facing) has not been tested, and they should NOT be used in such other orientations.

#### **⚠ WARNING**

Do not ride this wheelchair in a motor vehicle if your weight, together with the weight of all items attached to the wheelchair (such as backpacks, seat pouches, etc.) is more than 250 lbs (113 kg) in the case of the TiLite Aero X or 165 lbs (75 kg) in the case of the TiLite ZRA.

#### **⚠ WARNING**

Alterations or substitutions should NOT be made to the wheelchair securement points or to structural or frame parts or components. The TiLite wheelchairs were tested in the configurations with the components specified in “Statement of Compliance/ Specifications” on page 4. Any significant modification or substitution to the wheelchair’s components or seating could significantly alter the chair’s performance during an impact.

#### **⚠ WARNING**

TiLite expressly disclaims that use of its Transit Option on a TiLite wheelchair will prevent the wheelchair user from injury or death in the event of a motor vehicle accident.

#### **⚠ WARNING**

A sudden stop and/or collision may structurally damage your wheelchair. Such damage may not be visible. IMMEDIATELY STOP using any wheelchair that is involved in any such incident. Because

the structural damage may not be visible, you **MUST** replace any wheelchair that is involved in any such incident.

## **B. USE OEM SEATING AND RESTRAINT SYSTEMS**

### **⚠ WARNING**

Whenever feasible, wheelchair users should transfer into the vehicle seat and use the Original Equipment Manufacturer (OEM) vehicle-installed restraint system and the unoccupied wheelchair should be stored in a cargo area or secured in the vehicle during travel.

## **C. USE APPROPRIATE TIE-DOWN SYSTEMS AND USE THEM PROPERLY**

### **⚠ WARNING**

Your TiLite wheelchair **MUST** be used with Wheelchair Tie-Down and Occupant Restraint Systems (WTORS) that meet the requirements of the SAE (Society of Automotive Engineers) J2249 Recommended Practice – Wheelchair Tie-Down and Occupant Restraint Systems for Use in Motor Vehicles (SAE J2249). Do **NOT** use WTORS that are designed to rely on the wheelchair structure to transfer occupant restraint loads to the vehicle.

### **⚠ WARNING**

Do **NOT** use your TiLite wheelchair with a WTORS unless the WTORS has been installed fully in accordance with the instructions of the manufacturer of the WTORS and SAE J2249.

### **⚠ WARNING**

**ALWAYS** attach the WTORS to your TiLite wheelchair at all four (4) of the TiLite Transit Option securement points in accordance with the instructions provided by the manufacturers of the WTORS and SAE J2249.

**Note:** See Figures 2 and 3 for the location of the four (4) TiLite installed WTORS securement points.

### **⚠ WARNING**

**ALWAYS** attach vehicle-anchored occupant restraints (pelvic belts and upper torso belts) in accordance with the instructions of the manufacturer of such restraints and SAE J2249.

## **D. USE PROPER EQUIPMENT/USE ONLY AS INSTRUCTED**

### **⚠ WARNING**

You **MUST** use your TiLite wheelchair in strict accordance with all warnings and instructions contained in the TiLite Owner's Manual for your particular TiLite wheelchair and this Owner's Manual Supplement for the TiLite Transit Option.

### **⚠ WARNING**

TiLite wheelchairs equipped with TiLite's Transit Option were dynamically tested in a forward-facing orientation with the specified anthropomorphic test dummy restrained by **BOTH** a vehicle-anchored pelvic belt and a vehicle-anchored upper torso belt. **BOTH** pelvic and upper torso (shoulder) belts should be used to reduce the possibility of head and chest impacts with components of the motor vehicle. **TILITE REQUIRES THAT BOTH PELVIC AND UPPER TORSO BELTS BE USED FOR MAXIMUM PROTECTION IN A FRONTAL IMPACT COLLISION.**

**⚠ WARNING**

The backrest angle may be adjustable on your TiLite wheelchair. You must adjust the backrest angle so that it does not exceed the angle specified in Table 1 below, when the wheelchair is occupied during transit in a motor vehicle.

**E. AVOID USING IMPROPER EQUIPMENT/SECURE OTHER EQUIPMENT**

**⚠ WARNING**

Postural supports, such as pelvic positioning belts, anterior trunk supports and lateral trunk supports, should NOT be relied on for occupant restraint in a moving vehicle unless they are labeled as being in accordance with ISO 7176-19.

**⚠ WARNING**

Posturing and positioning accessories, such as pelvic positioning belts, anterior trunk supports and lateral trunk supports, should NEVER be relied upon for occupant restraint in a moving vehicle unless they are labeled as being in accordance with the requirements specified in ISO 7176-19.

**⚠ WARNING**

Whenever possible, other auxiliary wheelchair equipment should be either effectively secured to the wheelchair or removed from the wheelchair and secured in the vehicle during travel so that such equipment does not break free and cause injury to the vehicle occupants in the event of a collision.

**⚠ WARNING**

In order to reduce the potential of injury to vehicle occupants, wheelchair-mounted trays and other accessories, such as IV poles, respiratory equipment, backpacks and other personal items, not specifically designed for crash safety should: (i) be removed and secured separately in the vehicle, or (ii) be secured to the wheelchair but positioned away from the occupant with energy-absorbing padding placed between the tray or other accessory and the occupant.

**⚠ WARNING**

**IF YOU FAIL TO HEED THE WARNINGS IN THIS SUPPLEMENT, YOU MAY DAMAGE YOUR WHEELCHAIR, CAUSE SEVERE PHYSICAL INJURY TO OTHERS OR SUFFER SEVERE PHYSICAL INJURIES YOURSELF, UP TO AND INCLUDING DEATH.**

**II. INTRODUCTION**

This TiLite Transit Option Owners Manual Supplement provides detailed instructions on the proper use of TiLite's Transit Option for your TiLite wheelchair.

In 2001, the International Organization for Standardization (ISO) developed and adopted ISO 7176-19 entitled "Wheeled Mobility Devices for Use in Motor Vehicles" (ISO 7176-19). ISO 7176-19 sets forth design and performance requirements, and associated test methods, for wheeled mobility devices (wheelchairs) that will be used as seats in motor vehicles. ISO 7176-19 was last revised in 2008.

In 2000, the American National Standards Institute, Inc. (ANSI) and the Rehabilitation Engineering and Assistive Technology Society of North America (RESNA) adopted ANSI/RESNA Wheelchair Standards Volume 1, Section 19 entitled "Wheelchairs Used as Seats in Motor Vehicles" (ANSI/RESNA WC/19). ANSI/RESNA WC/19 was developed to establish design and performance requirements for wheelchairs that will be used as seats in a motor vehicle.

Both ISO 7176-19 and ANSI/RESNA WC/19 provide a testing methodology for testing a wheelchair in a simulated frontal impact collision at 30 mph (48 kph). One difference between ISO 7176-19 and ANSI/RESNA WC/19 is that ISO 7176-19 permits the anthropomorphic test dummy to be secured using a vehicle-anchored pelvic belt and a vehicle-anchored shoulder belt while ANSI/RESNA WC/19 requires that the anthropomorphic test dummy be secured using a wheelchair-anchored pelvic belt and a vehicle-anchored shoulder belt.

ISO 7176-19 and ANSI/RESNA WC/19 are intended to promote occupant safety and reduce the risk of injury for motor-vehicle occupants who remain seated in their wheelchair during transit by improving the crashworthiness of wheelchairs that conform to its requirements. In the opinion of the authors of ANSI/RESNA WC/19, “a wheelchair that complies with all the requirements of this standard can be considered to provide a reasonable measure of safe and suitable seating during vehicle ingress/egress, during normal transportation, and in a frontal impact” (emphasis added). However, the authors of ANSI/RESNA WC/19 also noted that “wheelchairs that conform to the requirements of this standard should not be considered to offer seating and occupant restraint that is equivalent to that provided by seats provided by the vehicle manufacturer” (emphasis added). Similarly, the authors of ISO 7176-19 stated that wheelchairs “that comply with this part of ISO 7176 will have additional features that provide increased levels of occupant security and safety whilst their occupants are riding in motor vehicles.” Accordingly, ISO 7176-19 and ANSI/RESNA WC/19 include numerous warnings to the effect that “wheelchair users should transfer to the vehicle seat and use the vehicle-installed restraint system whenever it is feasible.”

Therefore, there are several important considerations that users of TiLite's Transit Option must keep in mind. First, ISO 7176-19 only tests for wheelchair performance where the wheelchair, secured in the forward-facing position, is involved in a frontal impact collision at 30 mph (48 kph). It does not test for wheelchair performance in any other type of collision, including, without limitation, side impacts, rear impacts, rollovers or higher speed frontal impacts. Second, compliance with ISO 7176-19 does not guarantee that the occupant will not be injured, even in a frontal impact collision at 30 mph (48 kph) or less. In such an impact, the forces experienced are very severe and injuries can be sustained even if the wheelchair performs exactly as required by the standard.

This Supplement contains detailed information regarding the exact configuration of the TiLite wheelchairs that were subjected to the frontal impact and other tests required by ISO 7176-19. See “Statement of Compliance/Specifications” below. The results of that testing apply only to the configuration of the wheelchair as tested and described herein. **Therefore, if you order your chair differently, such as with a seating system manufactured by someone other than TiLite, you are hereby advised that the wheelchair was not tested in such different configuration and should not be considered “transit approved” by TiLite. Because TiLite has not tested the chair with such different configurations, TiLite has no knowledge of how the product would perform in such configuration. Therefore, TiLite makes no claims or warranties about the wheelchair’s performance in any configuration other than the configuration described herein. TiLite has not authorized any person to make any such claims or warranties on its behalf.**

**Note:** This Supplement only contains information pertaining to the usage, precautions and options available for the TiLite Transit Option. Please refer to the appropriate TiLite Owners Manual for your wheelchair model for specific and detailed information regarding the set-up, adjustment, operation, maintenance and warranty of your new wheelchair.

### III. STATEMENT OF COMPLIANCE/SPECIFICATIONS

TiLite wheelchairs equipped with TiLite's Transit Option conform to the requirements of ISO 7176-19. Specifically, it has been tested in accordance with Section 5.2 (Frontal Impact), Section 5.3 (Accessibility of Securement Points Intended for Use with Four-Point Strap-Type Tiedowns with Hook-Type End-Fittings) and Section 5.4 (Accommodation of Vehicle-Anchored Belt Restraints) of ISO 7176-19. The Wheelchair Tie-Down and Occupant Restraint System (WTORS) used in these tests was strap-type tiedown that complied with SAE J2249 and ISO 10542-1.

**TABLE 1**  
**TiLite Wheelchair Test Configurations**

	<b>ZRA</b>	<b>Aero X</b>
Seat Width	16 in.	16 in.
Seat Depth	16 in.	16 in.
Seat Back Height	18 in.	18 in.
Rear Seat Height	17 in.	15.5 in.
Seat Angle	7 degrees	8 degrees
Seat Back Angle	11 degrees	8 degrees
Wheelchair Weight	24 lbs.	30 lbs.
Seat Sling	Standard Bolt-On	Tension Adjustable
Back Upholstery	Tension Adjustable by Straps	Tension Adjustable by Straps
Backrest Type	Folding Aluminum Adjustable Height with Aluminum TiShaft Back Release Bar	Fixed Angle, Adjustable-Height with Folding Stabilizer Bar and Integrated Push Handles
Frame Angle	70 degrees	Fixed Front, 80 degrees
Wheels	22" wire wheels with 4 degrees of camber	24" wire wheels with 2 degrees of camber
Casters	5" Performance 5-Spoke Billet Aluminum with Polyurethane Tire	5" Billet Aluminum with Polyurethane Tire
Footrest	Titanium with ABS Cover	Flip-Up
Other Options	Velcro Adjustable Calf Strap; Swing Away Armrests	Heavy Duty Edition
Mass of ATD	130 lbs.	170 lbs.
Maximum User Weight	165 lbs.	250 lbs.

TiLite wheelchairs were tested in accordance with ISO 7176-19 Section 5.2 using a surrogate wheelchair tie-down device that complied with Annex E of ISO 7176-19 and a three-point, vehicle-anchored, occupant restraint system consisting of a shoulder belt and a pelvic belt. The anthropomorphic test dummy weighed as set forth in the table above. The wheelchairs that were tested passed the frontal impact test configured as described above.

The rider of a TiLite wheelchair must not weigh more than the Maximum User Weight stated above. If there are items attached to the wheelchair, such as backpacks, seat pouches, etc., the weight of such attached items must be counted as part of the Maximum User Weight limit for the wheelchair. In other words, if the wheelchair rider has a 20 lb (9.1 kg) backpack attached to the wheelchair, then the wheelchair rider must not weigh more than the Maximum User Weight in Table 1 less 20 lbs. **TiLite wheelchairs were not tested with a wheelchair-anchored pelvic belt, and TiLite does not offer these wheelchairs with a wheelchair-anchored pelvic belt.**

#### **IV. POSITIONING THE WHEELCHAIR IN THE VEHICLE**

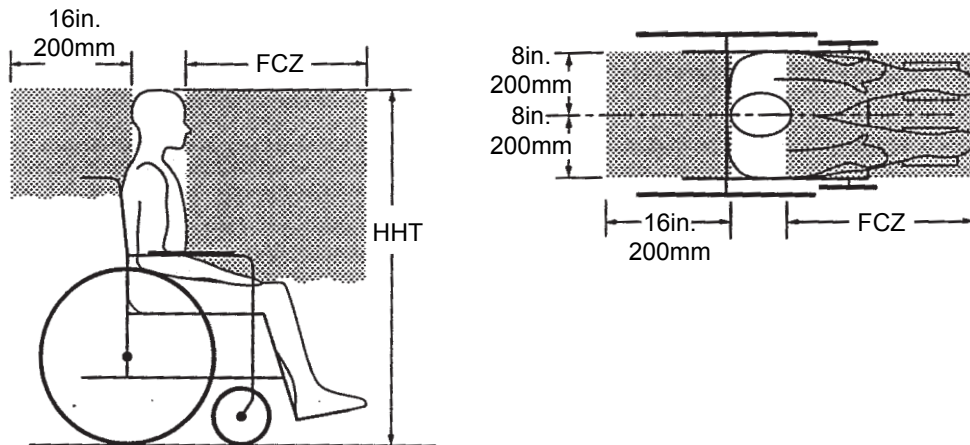
##### **⚠ WARNING**

This TiLite wheelchair equipped with a TiLite Transit Option complies with the requirements of ISO 7176-19 and, as such, has been designed and tested for use ONLY as a forward-facing seat in a motor vehicle. This TiLite wheelchair was not designed to be rearward-facing or sideways-facing when used as a seat in a motor vehicle.

## ⚠ WARNING

It is imperative that the wheelchair ALWAYS be positioned in a vehicle with appropriate clear zones around the wheelchair because in a frontal impact, even when properly secured, the wheelchair and its occupant will move from their secured position. Clear zones are required whether the wheelchair occupant is restrained by both pelvic and upper torso belts or only by a pelvic belt. The use of only pelvic or only upper torso belts is highly dangerous and is never recommended. The minimum necessary clear zones for the TiLite wheelchairs are shown in Figure 1.

Figure 1  
Clear Zones



- The rear clear zone is measured from the rearmost point on an occupant's head. The frontal clear zone is measured from the frontmost point on an occupant's head.
- FCZ = 26in. (650mm) with pelvic and upper torso belts and 37-1/2in. (950mm) with pelvic belt only.
- Seated head height (HHT) ranges from about 47in. (1200mm) for a small adult female to about 61in. (1550) for a tall adult male)

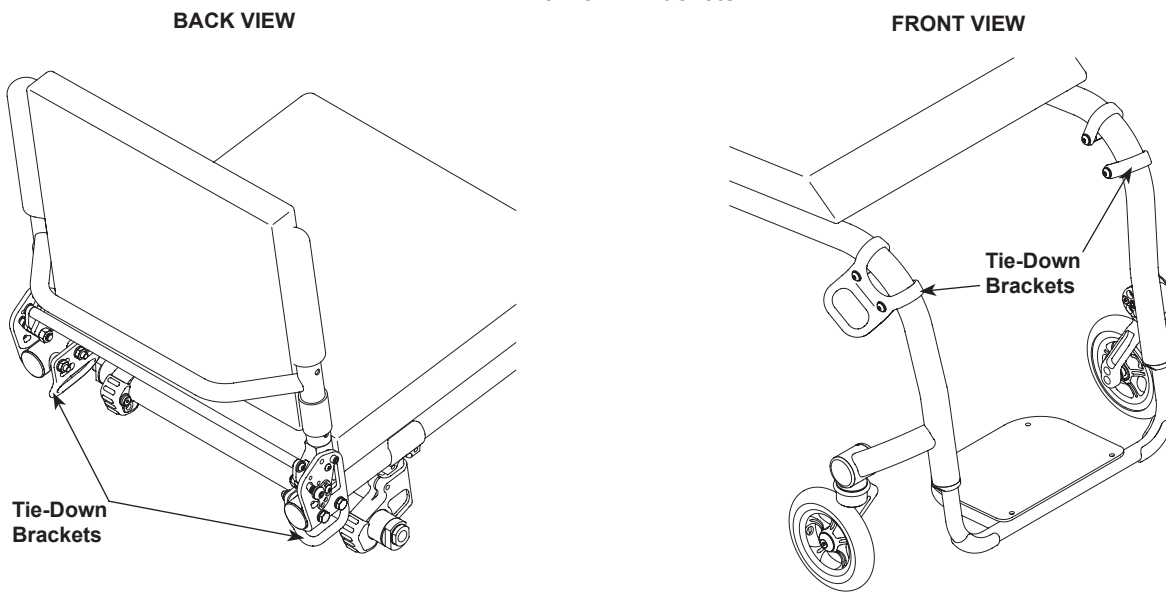
## V. SECURING THE WHEELCHAIR TO THE VEHICLE

### ⚠ WARNING

The Tie-Down brackets on your wheelchair were designed, located and installed by TiLite to comply with ISO 7176-19 and SAE J2249 standards so as to ensure that they operate properly and maximize the performance of the brackets in a frontal impact collision. The two front Tie-Down brackets (see Figures 2 and 3) should NEVER be removed or relocated to another position on the wheelchair frame. In the case of the TiLite ZRA (see Figure 2), if your chair is equipped with a depth adjustable frame/back, then the two rear brackets may be removed ONLY if it is necessary to adjust the seat depth. In the case of the Aero X (see Figure 3), the two rear brackets may be removed ONLY if another component secured by the same bolts requires an adjustment. However, ANY adjustment involving the rear Tie-Down brackets must ALWAYS be performed by an authorized TiLite dealer, and, even if such an adjustment is made, you must ALWAYS use the bolts and nuts originally shipped with your wheelchair. The bolts that secure the rear Tie-Down brackets to the frame must be tightened with a torque wrench to 200 in/lbs. If you substitute another bolt or nut or do not use the appropriate torque, the Tie-Down brackets may not operate properly. Notwithstanding this Warning, you should ALWAYS inspect the brackets before securing the wheelchair in a motor vehicle to ensure that they are properly secured, and, if necessary, the bolts should be tightened.

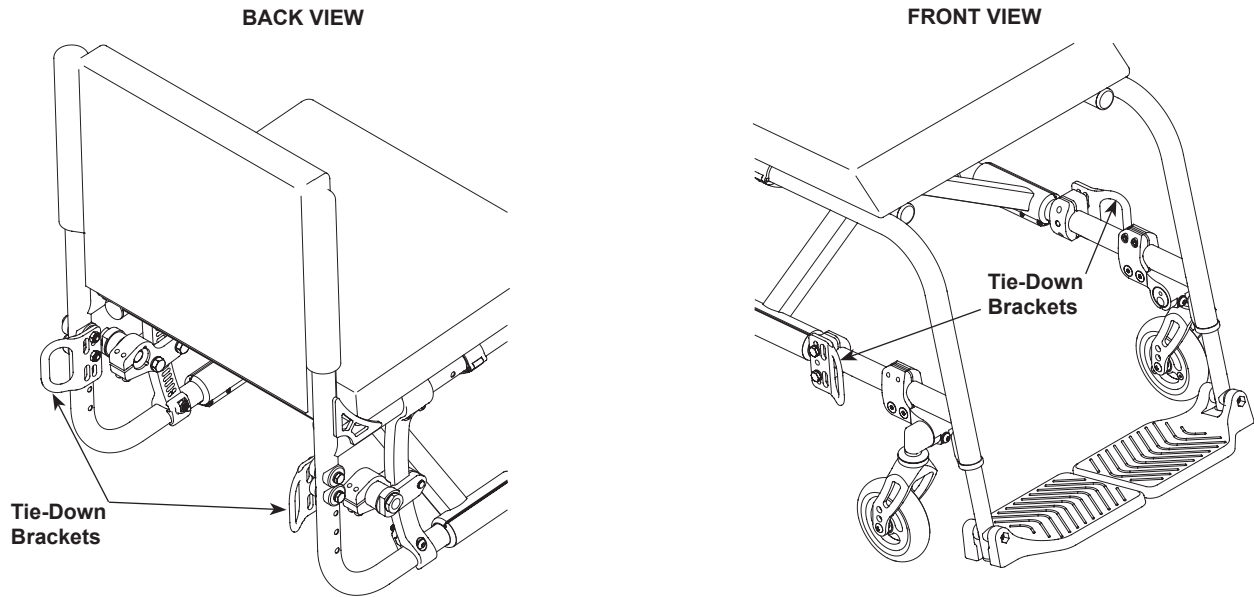
1. Whenever feasible, wheelchair users should transfer to the Original Equipment Manufacturer vehicle seat and use the vehicle-installed restraint system.
  2. This wheelchair must be used ONLY with a WTORS comprised of a four-point, strap-type wheelchair Tie-Down and a three-point, vehicle-anchored, pelvic and torso belt-type, occupant restraint that has been installed in accordance with the manufacturer's instructions and SAE J2249. It is NOT compatible with other types of WTORS.
- Note:** To obtain a copy of SAE J2249 Wheelchair Tie-Down and Occupant Restraint Systems (WTORS) for use in Motor Vehicles, please contact SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA. Telephone: 724-776-4970. Web: [www.sae.org](http://www.sae.org)
3. This wheelchair MUST be positioned in a forward-facing position prior to engaging the WTORS.
  4. The positions of the four wheelchair securement points (Tie-Down brackets) are shown in Figures 2 and 3.
  5. Each of the four Tie-Down brackets (see Figures 2 and 3) is identified with the symbol shown in Figure 4.

**Figure 2**  
**ZRA Tie-Down Brackets**





**Figure 3**  
**Aero X Tie-Down Brackets**



**Figure 4**  
**Bracket Labels**



6. Carefully inspect each of the four Tie-Down brackets to ensure that they are properly secured to the wheelchair.
7. Carefully inspect each wheelchair Tie-Down strap for damage or wear.
8. The four wheelchair Tie-Down straps must be attached to the four Tie-Down brackets in accordance with the WTORS manufacturer's instructions and SAE J2249.
9. Each of the four wheelchair Tie-Down straps must be tightened to ensure that the wheelchair is securely fastened to the vehicle—there should be no “play” or looseness in any of the four wheelchair Tie-Down straps.

## **VI. SECURING THE OCCUPANT; POSITIONING THE PELVIC AND UPPER TORSO BELTS**

### **⚠ WARNING**

A three-point, vehicle-anchored, pelvic and upper torso belt occupant restraint system must be properly installed and worn while riding in your TiLite wheelchair in a motor vehicle.

### **⚠ WARNING**

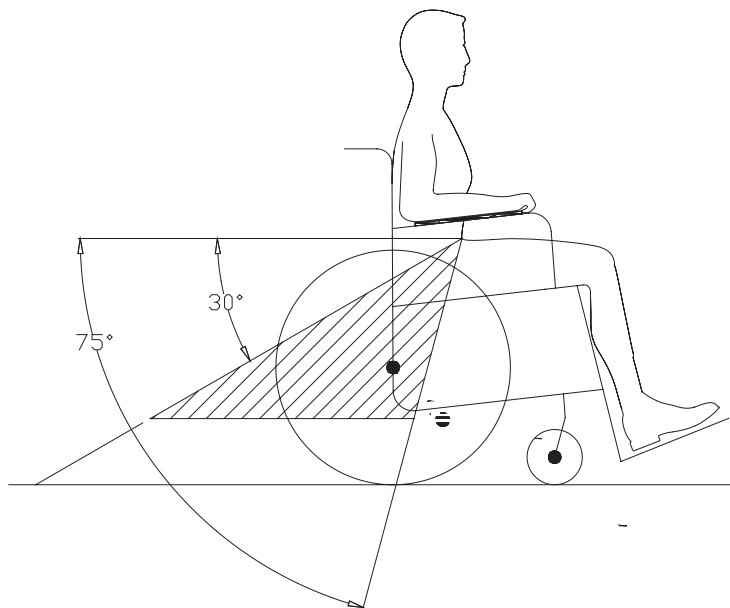
A side-view pelvic-belt angle of 30° to 75° to the horizontal (see Figure 5) is preferred to lower pelvic belt angles.

**⚠ WARNING**

Always ensure that the vehicle-anchored pelvic and upper torso belt buckles are positioned so that the release buttons will not be contacted by wheelchair components during a crash.

1. Carefully inspect the vehicle-anchored occupant restraint system belts, brackets and clamps to ensure that they are properly secured to the vehicle and are not damaged or worn.
2. Secure the wheelchair occupant using the vehicle-anchored pelvic belt and vehicle-anchored upper torso belt. See Figure 5. It is imperative that you position the belts properly. Paragraphs 3 to 7 which follow explain how to properly position your vehicle-anchored restraint belts.
3. The pelvic belt should be worn low across the front of the pelvis so that the angle of the pelvic belt is within the preferred zone of 30° to 75° to the horizontal. See Figure 6. A steeper (greater) angle within the preferred zone is desirable.

**Figure 5**  
**Pelvic Belt Angle**



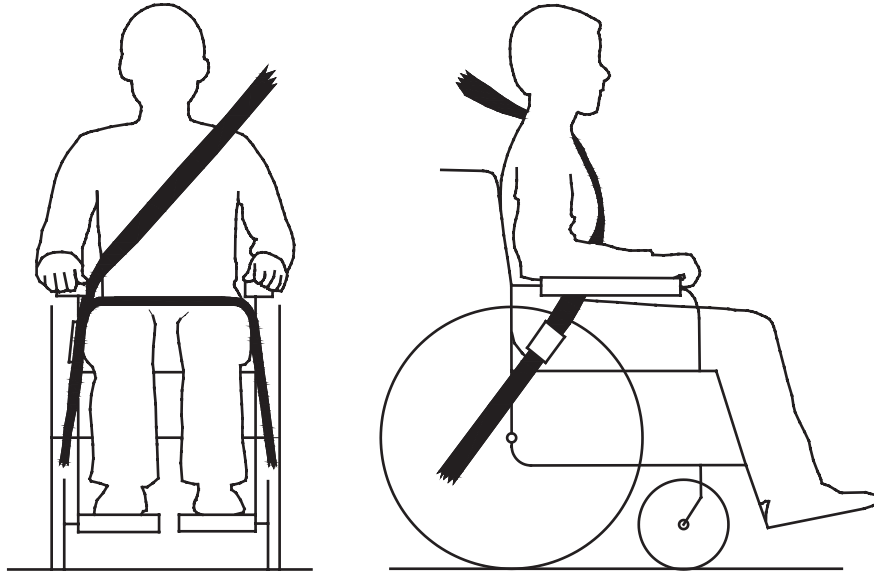
**Note:** Steeper side-view pelvic-belt angles are especially important if the pelvic belt is intended to be used for postural support in addition to occupant restraint in a frontal crash. Steeper angles will reduce the tendency for a vertical gap to develop between the user and the belt due to compliance of seat cushions and belt movement, thereby reducing the tendency for the user to slip under the belt and for the belt to ride up on the soft abdomen during normal use.

**Note:** Steeper belt angles also reduce the tendency for upper torso belts to pull the pelvic belt onto the abdomen during frontal impact loading.

4. The upper torso belt should fit over the shoulder and across the chest. See Figure 6.

**Figure 6**  
**Illustration of Proper Belt-Restraint Fit**

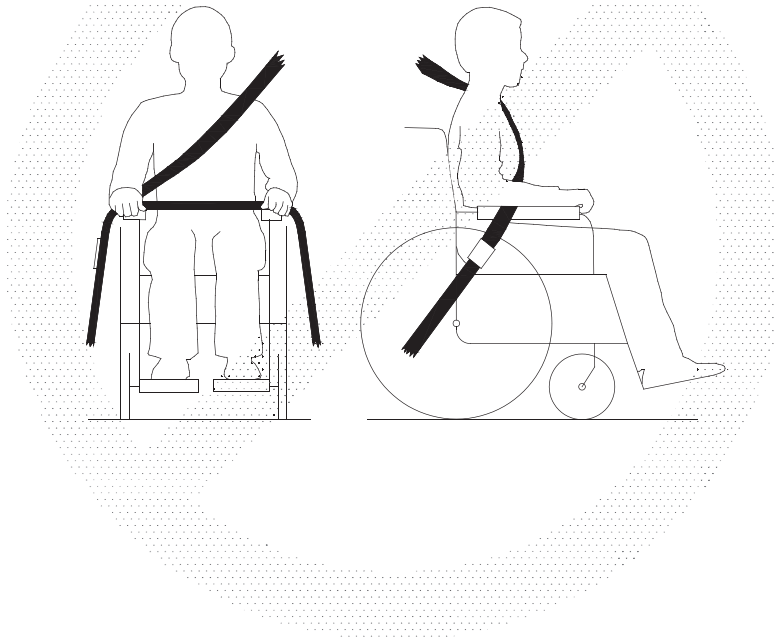
**Belt restraints should make full contact with the shoulder, chest, and pelvis and pelvic belts should be positioned low on the pelvis near the thigh-abdominal junction.**



5. Belt restraints should not be held away from the body by wheelchair components or parts, including, for example, the wheelchair armrests or wheels. See Figure 6 for the correct position of the belt restraints. See Figure 7 for the incorrect position of the belt restraints.

**Figure 7**  
**Illustration of Improper Belt-Restraint Fit**

**Belt restraints must not be held away from the body by wheelchair components such as armrests or wheels**



6. Always adjust the belt restraints to fit as tightly as possible, consistent with the wheelchair user's comfort.

7. Always carefully inspect the belt webbing to ensure that it is not twisted. If it is twisted, it will reduce the surface area of the belt that is in contact with the user, which could adversely affect the performance of the belt and injure the user in the event of an impact.

## **VIII. RATING OF ACCOMMODATION OF VEHICLE-ANCHORED BELT RESTRAINTS**

In accordance with ISO 7176-19 Annex D, the TiLite wheelchairs were evaluated by an independent, university test facility with regard to the effective use of a vehicle-anchored three-point belt restraint system.

The TiLite ZRA received an overall score of 14 points for a rating of C.

The TiLite Aero X received an overall score of 13 points for a rating of C.

## **X. SEATING OPTIONS**

### **⚠ WARNING**

The TiLite ZRA wheelchair was crash-tested in accordance with ISO 7176-19 only with TiLite Tension Adjustable Bolt On seat upholstery. The TiLite Aero X wheelchair was crash-tested in accordance with ISO 7176-19 only with TiLite Tension Adjustable seat upholstery. Therefore, these are the only seating options approved by TiLite for use with the TiLite Transit Tie-Down Option. If you order your TiLite wheelchair with the Transit Option and you use seating components other than these, the performance of the other seating system or upholstery is unknown. Therefore, TiLite makes no warranty or claim as to the performance of the TiLite wheelchair in the event of a motor vehicle accident of any type, even if the other seating system was crash tested with a different manufacturer's wheelchair or with a surrogate wheelchair in accordance with ANSI/RESNA WC/20.

## **XI. WARRANTY MODIFICATION**

A copy of the TiLite Limited Warranty was enclosed with your new wheelchair when it was shipped from our factory. Our warranty is also available on our website, [www.tilite.com](http://www.tilite.com). That Limited Warranty applies to your TiLite wheelchair with the Transit Option, with the following modification: The warranty is void if the wheelchair is damaged as a result of transit use.



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