A Therafin Corporation White Paper

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WC20 Transit Solution

Revision B

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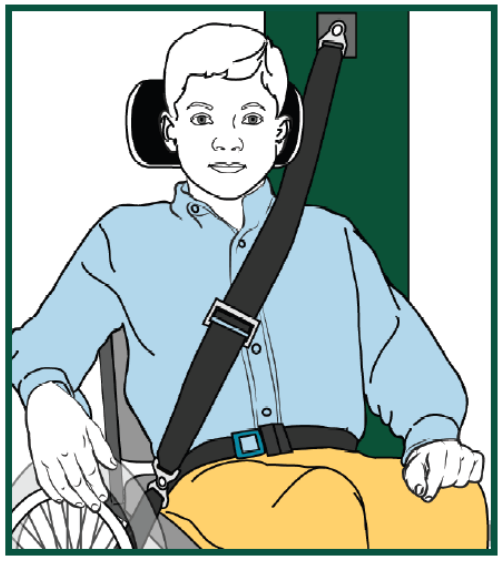
Introduction

For users of wheeled mobility, transportation can present some unique and often difficult challenges. Principal among those challenges is to improve and ensure safety. This is particularly challenging for those that remain in their mobility device during transportation in a vehicle (transit).

Additionally, users of mobility devices frequently have specific individual needs that can require product solutions from a variety of manufacturers. Specialized seating products are among those items often combined with a wheelchair to create a tailored solution. Therefore, developing products which consider an environment of cross-manufactured mobility solutions and a need for transit safety is important.

Once solutions are developed manufacturers of mobility products, used in transit, have a responsibility to disseminate information and to educate the community. Therafin Corporation takes this opportunity to impart our knowledge of existing and future transit standards and also to fully explain the transit solutions we offer.



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Problem Statement

Users of wheelchairs, designed for transportation in a vehicle, will often require the addition of some specialized seating components. Those users, of these multi-manufacturer solutions, need products that can be combined safely and effectively when used in a transit environment. They also need *assurance* that products are designed to work together without compromising safety.

Those same users along with caregivers, medical prescribers and equipment suppliers need to understand the safe use of transit products. This includes knowing the relevant standards and how products that meet those standards can be combined and used.

Previous Condition

Prior to the development of the RESNA WC20 Standard, (and the products that followed) the only way to be sure that a ***seating system*** added to a wheelchair would perform adequately in transit was to test the specific combination of those two products.

Developers of transit ready wheelchairs have, for several years, utilized two related standards in the course of the design process. (WC18 and WC19) These standards help designers establish performance criteria and then test the resulting performance on an objective basis for those wheelchairs.

However, having a transit tested wheelchair that was later modified to include a customized seating system could leave the user wondering if the resulting product was safe unless the manufacturer had tested that exact combination.

It is important to note that the WC20 standard IS NOT a a regulation. This standard is used as an objective measure of performance that a manufacturer must meet to state that one is in compliance with the standard. The wheelchair transit standards in the United States are all voluntary and no law or regulation requires manufacturers to make a transit product. The manufacturer self-certifies that their product is transit worthy. Those manufacturers stating that they comply with the standard must ensure they adequately engineered, and tested, and met all other parts and requirements of the standard (including printed material etc). When a manufacturer makes the statement that they comply with WC19 or WC20, (and so labels the product as required in the standard) the FDA has regulatory right to ensure that the claim is accurate. The FDA may in fact never choose to ensure that the claim and the labeling is accurate. This is the nature of a voluntary standard. Complying with the standard does not guarantee a certain result or outcome in a crash situation, but can provide assurance that every step was taken to try to improve survivability and reduce injury in the event of a crash.

In a transit condition there are three critical components:

1. A Wheelchair Tiedown and Occupant Restraint System (WC18 WTORS)

2. A transit ready wheelchair (tested to the WC19 Standard)

3. A seating device

Prior to the development of WC20, the only measure of performance of a seating system was to test that seating system to the WC19 standard. While this adequately measured the performance of the seat with that specific wheelchair on which it was tested, it did not,

address interchangeability of the product with some other wheelchair. In other words, testing a seating system to WC19 was a test of a specific seating system on a particular chair.

To understand the previous condition it is important to understand both the J2249 and WC19 Standards and how they interact.

WC18 (formerlySAE J2249), Wheelchair Tiedowns and Occupant Restraints for Use in Motor Vehicles.

Image used by permission of the University of Michigan

The SAE J2249 standard was established in 1996 as a critical first step to ensuring safe transportation of a wheelchair in a vehicle. A wheelchair transported in a vehicle should be secured whether occupied or not. The J2249 standard developed design and performance benchmarks for "tiedown" or securement systems. The standard also includes benchmarks for occupant restraints. Securing the wheelchair and containing the occupant in a crash situation was a critical first step to ensuring safety for those that are transported in their mobility device.

J2249 set some very specific requirements regarding how a wheelchair should be secured and how an occupant restraint (lap and shoulder belt) should be used. After developing J2249 the standards development group could turn now to the wheelchair itself and establish standards for that component. J2249 has subsequently been revised and is now WC-4 Section 18 or; WC18.

RESNA WC19, Wheelchairs for use in Motor Vehicles

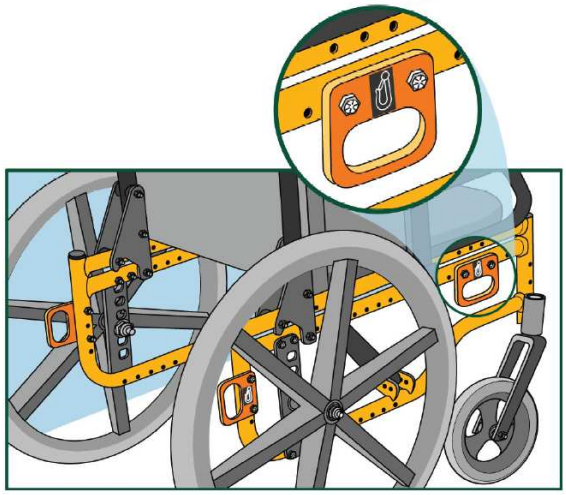

Image used by permission of the University of Michigan

The WC19 standard was established in 2000 and allowed manufactures to design and test against this often tough criteria. The standard contains a 30 mph front impact test to evaluate wheelchair performance when used as a seat in a motor vehicle. WC19 lays out very specific parameters for crash test dummy movements during impact and also how the chair should perform at, and after, impact. As an example, no part of the wheelchair must break off and become a potential projectile during impact.

WC19 also required certain characteristics to be designed into the wheelchair to facilitate clear or obvious securement points. The resulting transit "tiedown" points have become

distinguishing features for chairs that have been designed and tested to meet the standard.

WC19 has also been revised and is now WC-4 Section 19. It is commonly known, however, as WC19.

With two standards developed, and products hitting the market, it was necessary to address the seating component and to develop a standard for this critical component.

The WC20 Solution

WC20 is a section under the standard known as WC-4. WC-4 encompasses transit related standards for wheelchair systems. A standard is developed by (and WC20 was no exception) a group of dedicated individuals who first prepare data to support the need for the standard and then use that data to help develop requirements and measures contained in the standard. After writing a draft standard it is circulated for comments and feedback and so begins a cycle of vetting until a final piece reaches consensus. A voting process follows and a standard is entered into the record.

In the case of WC20, that standard is about improving safety by testing wheelchair seating products in a 20g frontal impact test.

The standard requires that the product perform adequately and not break or collapse under the force. But what makes WC20 unique is that the performance test is not done on a wheelchair, but rather on a wheelchair *surrogate*, that provides for objective measure of the seating system performance.

The surrogate was designed by analyzing data from WC19 test histories, and then developing a specialized surrogate frame that would generally absorb *less* crash energy than those from the research. Absorbing less crash energy, means that the seat must absorb more of that energy. In short, it is tougher to meet the performance requirements of WC20 than it would be to test a seat on a WC19 wheelchair.

By using the surrogate wheelchair, one can reasonably surmise that having performed well in the tougher environment, a seat combined with a WC19 wheelchair will perform similarly or better than the test results in a collision having similar characteristics.

This opened the way for consumers, clinicians and providers to combine products with more assurance. That assurance comes from using products that were tested using standards that in fact recognized that these types of products would be used in combination. The important concept to remember is this:

*When using a **WC19** tested wheelchair, it should be secured with a **WC18** tested tiedown system utilizing a **crashworthy lap and shoulder belt**. If the seat is not native to the chair then that seat should be tested to the **WC20** standard to give reasonable assurance that the products would perform well in a crash situation.*

Safety = WC18 + WC19 + WC20

WC20 also includes specific requirements for product labeling, owners manual contents and pre-sale literature labeling. To be in full compliance with the standard these elements must be present with, and on, the seating system.

In 2012 all three standards were released as RESNA WC-4 Sections, 18 (formerly J2249), 19 and 20. These are now all published in a group contained in Volume 4. (WC-4)

The Therafin Solution

Therafin Corporation has implemented an optional ***Transit*** feature on our custom configured seats and/or backs. The ***Transit*** feature means that the system we deliver is comprised of the set (in part or in whole) of products that we tested* in accordance with WC20 and have met the requirements of the test and the standard.

To obtain the Transit feature, a seat or back must minimally be ordered. The seat and/or back, must include the authorized mounting hardware and must be installed using the instructions contained in the owner's manual.

**Actual results and engineering rationale based on product similarity*

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Commitment to Safety

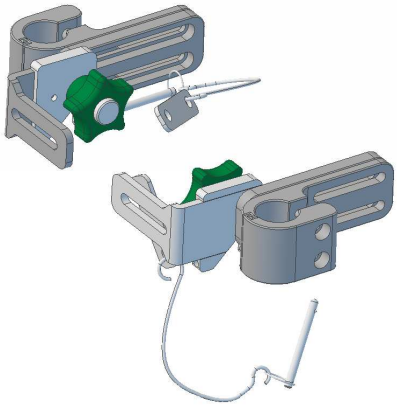
By complying with WC20, Therafin demonstrates our commitment to quality and safety. Testing to the WC20 standard is the industry's tool to determine if the designs of its products are suitable for use in an "In Transit" environment. Therafin seating meets that goal and thus provides assurance of a quality product with safety in mind.

Consumers who seek to transport in their mobility base (wheelchair) need to look for products that meet this standard.

Quality Attaching Hardware

Therafin uses our Wrap-Around Hardware with our WC20 tested seating. This style of hardware is highly adjustable so the consumer can obtain seat and back angles needed for effective positioning. It also supports easy removal of the seating product from the mobility base.

The special Transit hardware includes pins to securely lock the hardware for Transit. They are easy to insert and provide additional security if a consumer or caregiver has not properly tightened the knobs. Each pin is secured with a lanyard for convenience.



Flexible Ordering

The Therafin Transit product can be ordered as a Seat only, a Back only or together as a Seat and Back combination.** When ordered as a Seat and Back combination, the two parts can be separately mounted or can be attached with a Seat/Back Hinge. This flexibility gives the consumer a choice when it comes time to remove the seating from the mobility base.

Therafin also tested with accessories mounted to the seat and back. Ancillary supports can be added to the system to achieve positioning goals.

***If ordering a seat only or back only, the equipment provider and/or the consumer has a responsibility to ensure that other products used as the seat or back also meet the WC20 standard.*

Technical Information

USER WEIGHT LIMITS

Observe the weight limits and ranges for your seating device in the table below. If the occupant is not within this weight range the device MAY NOT be used as a seat in a motor vehicle.

Minimum	**48**	**lbs**	**22**	**kg**
Maximum	**250**	**lbs**	**113**	**kg**

ALLOWED HARDWARE

Seat only 72054

Select Transit Seat Hardwarefor Seat only

2 Knob Wrap Around . .51077
4 Knob Wrap Around . .51078

2 Knob Wrap Around **1 3/8" Tubing ..51094**
4 Knob Wrap Around **1 3/8" Tubing ..51095**

Back only 72055

Select Transit Back Hardware for Back only

4 Knob Wrap Around Back Hardware .51076

Seat and Back without Seat-To-Back Hinge
Select Transit Seat AND Back Hardware

Seat only 72054

Select Transit Seat Hardwarefor Seat only

2 Knob Wrap Around . .51077
4 Knob Wrap Around . .51078

2 Knob Wrap Around
4 Knob Wrap Around

Back only 72055

Select Transit Back Hardware for Back only

4 Knob Wrap Around Back Hardware .51076

Seat and Back with Seat-To-Back Hinge
Select Transit Seat AND Back Hardware

Seat Hardware

2 Knob Wrap Around Seat Hardware . .51077
4 Knob Wrap Around Seat Hardware . .51078

Back Hardware

2 Knob Wrap Around Back Hardware with Flush Seat-To-Back Hinge 51082

2 Knob Wrap Around Back Hardware with 2" Rise 1" Depth Hinge 51083
2 Knob Wrap Around Back Hardware with 2" Rise 2" Depth Hinge 51084
2 Knob Wrap Around Back Hardware with 2" Rise 3" Depth Hinge 51085

2 Knob Wrap Around Back Hardware with 3" Rise 1" Depth Hinge 51086
2 Knob Wrap Around Back Hardware with 3" Rise 2" Depth Hinge 51087
2 Knob Wrap Around Back Hardware with 3" Rise 3" Depth Hinge 51088

2 Knob Wrap Around Back Hardware with 2 Depth-Adjustable Hinges 51089
2 Knob Wrap Around Back Hardware with Depth-Adjustable Hinge 51090

REQUIREMENTS

- ✓ Transit Seating MUST be used in combination with a WC19 Wheelchair and a WC18 WTORS Tiedown System.
- ✓ The wheelchair and occupant must be transported in a forward facing position in the vehicle.
- ✓ Therafin Seats and Back must be constructed of standard ½" plywood
- ✓ System must be installed according to the instructions contained in the Owner's Manual accompanying the system.
- ✓ A Head support MUST be used with any Transit back
- ✓ Pins that accompany the attaching hardware MUST be installed during Transit.

INSTALLATION

Seating MUST be installed according to the instructions in the owner's manual.

Therafin has defined critical "Zones" in which mounting hardware must be attached to the seat and back:

Seat:

WARNING
THE SEAT FORKS MUST BE ATTACHED IN SAFE ZONE SHOWN IN (FIG 2).

The Front Seat Mounting Brackets (Forks) MUST be placed within the front safe zone.

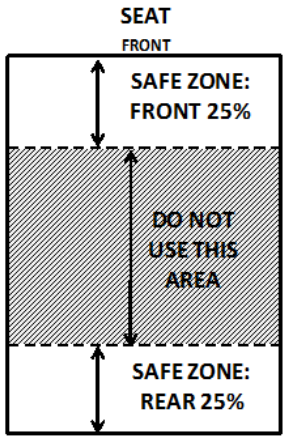


Fig. 2

Back:

WARNING
THE BACK HOOKS MUST BE ATTACHED IN SAFE ZONES SHOWN IN (FIG 1).

If using seat back bracket from step 1, the Top Back Mounting Brackets (hooks) MUST be placed within the top safe zone.

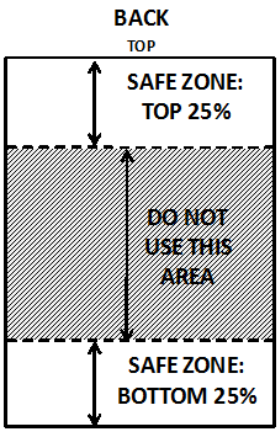
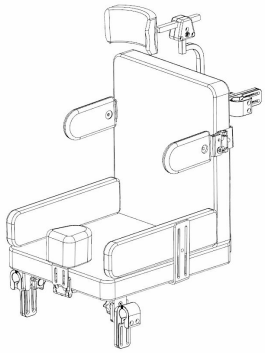


Fig. 1

GENERAL INFORMATION:

THIS SEATING SYSTEM CONFORMS TO ANSI/RESNA WC20, AND SHOULD BE USED WITH A WHEELCHAIR BASE WHICH COMPLIES WITH THE PERFORMANCE REQUIREMENTS OF ANSI/RESNA WC19. THE WHEELCHAIR BASE MUST HAVE SECUREMENT POINTS AND PELVIC ANCHORAGES .
SEATING SYSTEMS MANUFACTURED BY THERAFIN CORPORATION THAT COMPLY WITH WC20 CONSIST OF A SEAT AND/OR BACK WITH VARIOUS POSITIONING ACCESSORIES: THE FOLLOWING DIAGRAM DEPICTS THOSE ITEMS THAT ARE INTENDED FOR USE IN TRANSPORT.



THIS SEATING SYSTEM IS INTENDED FOR USE IN A FORWARD FACING POSITION WHEN TRANSPORTED IN A MOTOR VEHICLE
THE WHEELCHAIR USED IN TESTING IS A SURRROGATE (GENERIC) BASE MEETING THE REQUIREMENTS OF WC20.
WC20 REQUIRES A RATING FOR ACCOMMODATING VEHICLE ANCHORED OCCUPANT RESTRAINTS. THE RATING IS BASED UPON THE FOLLOWING CHART DERIVED FROM EIGHT MEASURES OF OCCUPANT RESTRAINT EASE OF USE AND PERFORMANCE WHEN USED WITH THIS SEATING SYSTEM:

-

A = excellent = score of 17 – 20
B = good = score of 13 –16
C = fair = score of 9 – 12
D = poor = score of 0 - 8

THERAFIN SEATING SYSTEMS HAVE A RATING OF: B RATING

Summary

The advent of the upcoming WC20 Standard and the resulting Therafin seating product helps ensure greater transit safety for wheelchair users. Since WC20 was developed with product interchangeability in mind; all that is required is to use transit tested products in combination to achieve the desired result.

Therafin Transit solutions meet this standard and help provide safe effective seating that's easy to understand and use.

Additional Resources

Therafin Corporation
9450 W Laraway Road
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800-843-7234
www.therafin.com

Transit Web Page:
http://www.therafin.com/wc20transitseating.htm

Ride Safe Website:

http://www.travelsafer.org/index.shtml

RERC on Wheelchair Transportation Safety
http://www.rercwts.org/

Frequently asked question regarding transit as presented by the RERC on Wheelchair Transportation Safety

http://www.rercwts.org/RERC_WTS2_FAQ/RERC_WTS_FAQ.html#WTS_FAQ_Q_Dsection_anchor