The use of a Force Plate while evaluating Vehicle Ingress and Egress

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Consumers Energy
On this Day - April 29 - in History

1899 - Duke Ellington, American bandleader, composer and pianist (Take the A Train)

1954 - Jerome 'Jerry' Seinfeld, comedian/actor

1961 - ABC's "Wide World of Sports" debuts

1986 - Boston Red Sox Roger Clemens strikes out 20 Seattle Mariners

1990 - Wrecking cranes began tearing down Berlin Wall

1996 - Howard Stern Radio Show premieres

2004 - Oldsmobile builds its final car ending 107 years of production.

2011 - Wedding of Prince William and Kate Middleton.
Question to the audience....??

- Heard about it?
- Seen it?
- Done it?
Do we have common ground?

- Who has tripped, slipped or missed a step on a vehicle?
- Fell to the ground?
- Twisted ankle? Knee? Back? Shoulder?
Applicability

- If you access vehicles – THIS applies!
The Ingress/Egress program is used to let employees practice techniques for proper access and exit from all types of vehicles.
“Specifically supports transfer of training in terms of knowledge (e.g., the nature and location of hazards) and skills (practice in a simulated, real-world setting) necessary to proactively increase employee awareness and reduce incidents resulting from accessing and exiting vehicles.”
History of program and WHY!

- Injuries accessing and exiting vehicles
- Learned of UPS’s application
- Virginia Tech insights

<table>
<thead>
<tr>
<th>Condition</th>
<th>Sprains, strains</th>
<th>Fractures</th>
<th>Cuts, lacerations</th>
<th>Contusions, bruises</th>
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</thead>
<tbody>
<tr>
<td>Fall non moving vehicle</td>
<td>2,490</td>
<td>2,050</td>
<td>120</td>
<td>920</td>
</tr>
<tr>
<td>Jump non moving vehicle</td>
<td>720</td>
<td>130</td>
<td>20</td>
<td>100</td>
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</tbody>
</table>
Vehicle Ingress/Egress Awareness

Concept taken from work done at UPS “The Best Foot Forward”
The hardware and software

There are seven mobile balance/force plates used as a part of a comprehensive classroom and hands-on training program.
Force Plate

Provide students with practice time to:

- Demonstrate
  - Current practices of ingress/egress
  - Best Practice demonstration on vehicle
BERTEC Force Plate
BERTEC Balance Plate
Components of training hardware

- Balance plate or force plate
- Rubber pad to prevent plate from moving
- Laptop computer/monitor
- Computer stand or similar support for laptop/monitor
- Vehicle of your choice
Cost

- Balance Plate purchase:
  - $3,400 – $12,000 for plate (depends on what you want to measure)

- Laptop - $
- Computer stand - $40-$200
- Additional monitor - $80-$200
- Props (retractables) - $600 (we use three)
- Carrying case for plate - $50-$150
- Misc. – handouts, etc.
Course Objective:

- Review & practice proper ingress/egress of vehicles
- To increase awareness of body mechanics & potential injuries that can occur

Help you with current issues/injuries if present
Program components:

- **Classroom**
  
  30 minutes on science – the why
  
  mechanics, statistics, injury examples

  *(the classroom stuff specific to your company)*

- **Hands on**
  
  One on one, participant practices a in a controlled environment. The “Ah ha” moment. (on and off vehicle)

  *(the do it stuff)*
Consists of 5 Parts:

- Pre-Survey
- Force Plate practice session
- Classroom presentation
- Force Plate practice session
- Post-Survey
How was training accomplished

- Initial training conducted for Supply chain organization by Corporate Safety and Health
- Training provided at Safety Fair for Electric Lines organization and Generating plant employees by Corporate Safety and Health and Learning and Development
- Incorporate into BLOCK training for 2015 - Train the Trainer provided to Learning and Development organization
Where Used:

- Any business unit
- Low Profile (passenger car)
- Van and Pick-up
- Large Truck (bucket, digger, stake truck, semi, etc.)
- Other (Fork Truck, PIT, etc.)
Promoting Program as:

- Ingress/Egress and Three Points of Contact

May also apply to other uses:

- Ladders?
Where are vehicle incidents likely to occur?

- **Drivers & Passenger side** – missing step, ice, jumping down forward, jumping down backward, not having hand contact
- **Rear** – up/down steps, storage areas
- **Side walk up** – stepping on flip down door, facing out when going down, **not having hand contact**
- **Bucket** – walking in belly, getting in/out of bucket
- **Trailer** – jumping off side, walking on tongue
- **Equipment** – jumping off side, facing away from steps, not having hand contact
Contributing Factors

- **Transition areas** – uneven vehicle step heights on cab/sides; *difference in vehicle step heights*, entering bucket
- **Unexpected changes in environment** – stepping into hole, onto rock, or gravel
- **Distractions** - Talking, using phone
- **Obstacles and Vehicle Housekeeping**
- **Contaminants** – ice, mud on steps & possibly handrails/handholds
- **Lighting changes** – glare or not enough light on step surface
Ergonomic Factors

Force and repetition

- Impacts of repeated stress to joints, etc.
Level 1: Seat—7 or more times your body weight

Level 2: Floor—5 to 6 times your body weight

Level 3: Bottom step—1 to 1.5 times your body weight
Most Common Injuries

- **Upslip Hip** (SI Sprain)
- **Knee** (Referred Pain/Meniscus/Ligament)
- **Shoulder Strain** (Rotator Cuff/Biceps)
Van/Pick-up Ingress

Use door, steering wheel & step

Maintain hand contact, sit/slide onto seat, rotate legs in

Evenly place yourself so body is symmetrically positioned in seat.
Van/Pick-up Egress

Observe Surface Conditions and Obstacles BEFORE Exiting

Maintain hand contact, slide to step, step down
Strain on one Shoulder

Lack of contact points w/ hands or feet, high potential for slipping
Lack of hand contact overloads one shoulder

Need inside leg in first
Breaks down seat cushion, 
Lack of hand contact 

Overload one side of body 
when contacting ground
Large Truck Egress

Best Way to Exit Vehicle
Large Truck Egress

Bad
Physical Readiness 24/7: Vehicle Safety
Ingress/Egress Injury Prevention

VAN & PICK-UP TRUCK

1. Set your core muscles.
2. Using three points of contact, step up as a single unit.
3. Maintain three points of contact. As a single unit, slide lower and upper body into driving position.

3. X

Improper Ingress/Egress

Injury Prevention Rationale
The steering wheel can be used as a handle. However, to enhance visibility, have the steering column locked before using.

During ingress, do not extend your right leg or knee into the floorboard and jam hip (kneel hip). During egress, do not place additional force on the down leg or lock knee; use three points of contact.

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EEI
Learnings

- Peer coaching can be effective
- Observation of practices that you may not be aware of (ie: PIT)
- Direct feedback to/from employees
- Vehicle issues (ie: running board)
Ideal applications

- Line school – give it to employees while they are learning everything else
- Same for other work groups that access and exit vehicles on a regular basis
Maintenance of steps, handholds, suggestions

- During vehicle inspection, identify Ingress/Egress contact points (ok?, damaged? Can be improved?)

- Submit issues/suggestions for any contact points to Fleet through your supervisor
REMEMBER

- **Employee** – Proper footwear, behaviors, etc.

- **Home examples** – Family members, elderly, etc.
Other considerations

- Mandatory-vs- non-mandatory
- Time and resource commitment to implement
- Be ready for expansion!
- Frequency of use – pro-active and post incident
Future Plans

- Make units available to areas in the company that are interested
- Establish a period of time for repeat training
- Possibly utilize for post incident refresher
Thanks to:

- Dr. Thurmon Lockhart and others (reference)
- Corporate Safety and Health (support)
- Learning and Development Department (training)
- Operations Safety (reality check)
- Operations (willing to do it!)
- UPS Integrad Training Center – Franklin Park, IL (validation!)
References

- American Society of Safety Engineers - Professional Safety
  http://www.asse.org/professionalsafety/pastissues/053/07/F3_Montante_0708.pdf

- Fortune, VOL. 156, NO. 10 - November 19, 2007

- Thurmon E. Lockhart, Ph.D.-Virginia Polytechnic Institute and State University
QUESTIONS?