LOG OF MEETING
DIRECTORATE FOR ENGINEERING SCIENCES

SUBJECT: Underwriters Laboratories (UL) Table Saw Working Group Meeting

DATE OF MEETING: November 10, 2011

PLACE OF MEETING: Web Conference

LOG ENTRY SOURCE: Caroleene Paul, ESME

COMMISSION ATTENDEES:
Tim Smith; ESHF

NON-COMMISSION ATTENDEES:
Mahmood Tabaddor; UL
John Stimitz; UL
Peter Domeny; Power Tool Institute
Stephen Gass; SawStop LLC
Ted Gogoll; Black & Decker

SUMMARY OF MEETING:

Discussion points (Working Group meeting notes attached):

- The scope and objective of the working group was revisited and discussed.
- Two parameters for performance requirements were discussed: (1) approach velocity, and (2) acceptable level of injury based on depth of cut.
- Much discussion focused on the approach velocity of an operator's hand to the saw blade during injury and whether a performance requirement should use a worst case approach rate or typical approach rate in its test methodology.
- PTI stated that they have done testing and showed video of maximum possible hand movement that could be generated by a person. Questions were raised as to whether that equated to or was relevant to the maximum approach rate of a hand to a table saw blade. PTI was asked if they could share that research data with the working group.
- PTI rejected the SawStop database as a valid representation of table saw injuries. PTI also questioned the estimates from the CPSC 2007/2008 special study in terms of number of injuries.

The following action items were summarized for the next meeting:

- UL will follow up with PTI on sharing its test data.
- The working group must decide if the current data on approach speeds are sufficient to develop a performance standard or if empirical tests must be done.
- More information must be gathered to finalize acceptable injury criteria.

Performance Requirements for Table Saw Safety

November 10 2011

Table Saw Safety Working Group

Table Saw Performance Requirements

- Defined by 2 parameters
  - Approach velocity of hand/finger relative to non-translating (rotating) blade saw
    - Component of hand approach velocity in the plane of the blade (radial velocity based on center of rotation of blade)
    - Perpendicular component
    - Under 'typical' or severe conditions when hand/finger contact injuries might occur
  - Acceptable level of injury as determined by depth of cut
    - Average human skin thickness (epidermis/dermis) on order of 2-3 mm

Data on Approach Speeds

- Search of currently available information
  - EN 999
  - CPSC table saw safety reports
  - SawStop customer injury survey database

- Factors in prescribing approach velocity
  - Attempt to cover most injuries or 'reasonably foreseeable severe condition'
  - 3 general blade contact conditions: normal feed (distraction), slip/reaching over, kickback

EN 999

- Safety of Machinery (1998) superseded by EN ISO 13855
  - Assumes persons approach danger zone at walking speeds of 1.6-2 m/s (3.6 – 4.5 mph)
    - Walking speed depend upon 'physical and anthropometric data of the population' and is based upon 'groups likely to be found in European populations'.

CPSC Reports

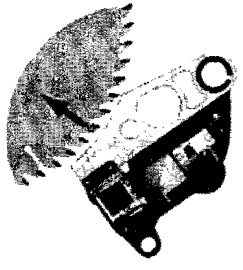
- Comments by PTI to FR notice (2003)
  - Testing by its members indicates the 'approach velocity of the hand can be as high as 200 in/s (11 mph or 5 m/s) during kickback and as high as 60 in/s (3.4 mph or 1.5 m/s) when slipping or reaching over the table saw blade.'
  - Many of non-kickback injuries 'likely occurred under scenarios where the feed rate was more than 12 in/s' (0.7 mph or 0.3 m/s).

SawStop Database

- Analysis on database from SawStop voluntary customer surveys when safety system is activated (provided by SawStop)

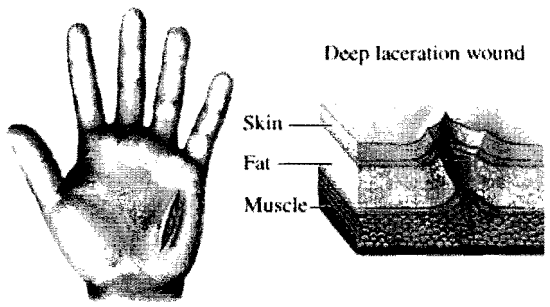
Contact to Detection Time (ms)	Frequency of Occurrence
0 < 0.1	17
0.1 < 0.25	8
0.25 < 0.5	18
0.5 < 1	173
1 < 2	147
2 < 4	256
4 < 8	210
8 < 16	154
16 < 32	74
32 < 64	69
64 < 128	34
>128	4

Note: Minimum possible detection time is 18uS.



  - Over 1100 entries since 2005
  - Using shortest time (0.5 ms + 3 ms) to stop contact skin blade contact that covers 97% of population and the deepest allowable cut (3 mm) suggests approach speeds of 0.8 m/s (2 mph)
  - Can not be used directly for performance requirements but might provides some clue as to 'field failure' conditions.

Injury Levels



- Cut no deeper than epidermis
- Most injuries (~2/3) occur to index finger/thumb according to SawStop customer injury survey database
- Effective blade width
- CPSC Health Sciences group
- References

Next Steps

- Are one of the current references sufficient? Or do we design experiments to simulate conditions of hand/finger approaching blade or slipping to measure approach speeds?
- Gather more information to finalize acceptable injury level
- Other conditions such as wood moisture content, etc. likely to be part of technology specific test method development