CPSC Staff Statement on Analysis of
"*Survey of Injuries Involving Stationary Saws: Table and Bench Saws, 2007−2008*" [1]
June 2014

In March 2011, the Consumer Product Safety Commission (CPSC) released a report titled, "*Survey of Injuries Involving Stationary Saws: Table and Bench Saws, 2007−2008."*

The CPSC report stated:

Of the estimated 76,100 table saw-related injuries generated from the 2007−2008 NEISS special study:

- an estimated 52,300 injuries (68.7%) were related to cabinet saws;
- an estimated 13,900 injuries (18.3%) were related to contractor saws;
- an estimated 8,000 injuries (10.5%) were related to bench saws; and
- an estimated 1,900 injuries (2.5%) were related to an unknown type of table saw.

Of the estimated 76,100 table saw-related injuries in the 2007−2008 NEISS special study:

- an estimated 45,100 injuries (59.3%) involved a direct drive saw;
- an estimated 25,100 injuries (33.0%) involved an indirect drive saw; and
- an estimated 5,900 injuries (7.8%) resulted from a saw with an unknown type of drive.

CPSC staff became concerned that the estimated number of injuries on bench saws (10.5%) did not correspond with the estimated number of injuries on table saws with a direct drive (59.3%). Because bench saws are typically direct driven, the injury estimates for bench saws and table saws with a direct drive should be similar. This disparity prompted CPSC staff to conduct an analysis of the types of saw and the types of drive reported in the 2007−2008 NEISS special study.

Staff found that the estimated number of injuries based on the type of saw are inconsistent with the estimated injuries associated with respondent-declared drive type. Additionally, staff found that bench saws may be associated with a much larger proportion of the estimated injuries than initially reported, based on the respondent-reported type of saw. Notably, CPSC staff considers participant responses and the resulting estimates of hazards, injury cost, blade guard use, and type of cut to be valid because responses to these questions are based on participant experience as opposed to participant knowledge of saw types and the ability to distinguish between them.

In conclusion, based on the recent analysis, CPSC staff recommends that one consider the response integrity of type of table saw in *"Survey of Injuries Involving Stationary Saws: Table and Bench Saws, 2007−2008*" when referencing the report.

[1] This statement was prepared by the CPSC staff. The statement and analysis memo have not been reviewed or approved by, and do not necessarily represent the views of, the Commission.

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CONSUMER PRODUCT SAFETY COMMISSION
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Memorandum

Date: April 14, 2014

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SUBJECT : Addendum to "Survey of Injuries Involving Stationary Saws: Table and Bench Saws, 2007−2008": Evaluation of Response Integrity and Resulting Estimates for Types of Saws and Types of Drives *

Introduction

In March 2011, the Consumer Product Safety Commission (CPSC) released a report titled, "Survey of Injuries Involving Stationary Saws: Table and Bench Saws, 2007−2008."[2] The report presents statistics from follow-up surveys of individuals with injuries recorded as saw-related in CPSC's National Electronic Injury Surveillance System (NEISS) from January 1, 2007 through December 31, 2008. In the March 2011 report, the total estimated number of emergency-department treated injuries to operators of table saws is 76,100. The March 2011 report also breaks down injury estimates by the type of saw and the type of drive (direct or indirect).

The three main types of table saws can be described as follows:

- A portable bench saw is a lightweight and compact saw with an aluminum tabletop and is easily carried around. This saw is typically set on a bench-top or other raised surface. Some models may include removable stands or foldable legs.
- A contractor saw is a medium-duty, semi-portable machine that ranges from 200 to 350 pounds. These saws usually feature a cast iron table top and have an open, attached stand or base that reaches to the floor.

[2] http://www.cpsc.gov/PageFiles/108980/statsaws.pdf.

*This analysis was prepared by CPSC staff. It has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

- A stationary saw, also called a cabinet saw, is a heavy-duty saw that sits on the floor, has a large table top, and has a closed cabinet stand that reaches to the floor. A stationary saw is also sometimes referred to as an industrial table saw.

Of the estimated 76,100 table saw-related injuries generated from the 2007−2008 NEISS special study, the following are the number of estimated injuries associated with each type of saw:

- an estimated 52,300 injuries (68.7%) were related to cabinet saws;
- an estimated 13,900 injuries (18.3%) were related to contractor saws;
- an estimated 8,000 injuries (10.5%) were related to bench saws; and
- an estimated 1,900 injuries (2.5%) were related to an unknown type of table/bench saw.

As described in the questionnaire, direct drive and indirect drive are defined as follows:

- If the blade of the saw is mounted directly onto the motor output shaft, then the table saw is considered to be a direct drive.
- If the blade of the saw is driven by a belt or gear that is attached to the motor, then the table saw is considered to be an indirect drive.

Of the estimated 76,100 table saw-related injuries in the 2007−2008 NEISS special study:

- an estimated 45,100 injuries (59.3%) were related to a saw that was a direct drive;
- an estimated 25,100 injuries (33.0%) were related to a saw with an indirect drive; and
- an estimated 5,900 injuries (7.8%) to a saw with an unknown type of drive.

The estimated number of injuries for the types of saws, and the estimated number of injuries for the types of drives were generated from participants' responses to the survey. Cabinet saws and contractor saws represent 68.7 percent and 18.3 percent of the total injury estimate, respectively. In CPSC's advance notice of proposed rulemaking (ANPR), CPSC staff's description of the relationship between type of saw and type of drive can be summarized as: Contractor saws are usually driven by a single belt; thus, contractor saws have indirect drives. In cabinet saws, the blade is driven by one or more belts; therefore, cabinet saw blades are indirect driven. Most, if not all, bench saws have a direct drive.[3] However, the estimated number of injuries based on the participants' responses for direct drives is 59.3 percent of the estimated injuries to operators of table saws. Estimates based on the participants' responses for portable bench saws with direct drive make up only 10.5 percent of the estimated injuries. Therefore, it can be concluded that: (a) the estimates for types of saws do not represent the actual types of saws in the population of injuries, or (b) the estimates for the types of drives do not represent the actual types of drives in the population of injuries, or (c) a combination of both.

CPSC staff has completed an additional analysis of the type of saw and type of drive for table saws in the 2007−2008 NEISS special study. This memorandum summarizes the results of the analysis.

Scope, Methodology, and Results

Because the survey was executed in Computer-Assisted Telephone Interviewing (CATI) software, a problem with the execution of the survey was quickly ruled out. The CATI software allowed the survey to be scripted for the interviewers. A statistician created the survey instrument and coded the questions and survey logic into the CATI software. Thus, the interviewers read the scripted survey instrument and

[3] http://www.cpsc.gov/PageFiles/90189/tablesaw.pdf.

recorded the response, while the software handled the logic of the instrument, based on the responses entered. The data entered were checked by a member of CPSC's Epidemiology staff for consistency and entry problems as the surveys were completed and the data collected. The statistician checked the data for any entry problems before analysis.

The associated SAS® programs used in the analysis of the survey results were reviewed for possible errors that would lead to incorrect estimates from the survey responses. There were no errors found in the data preparation, statistical methods, or survey analysis programs. The estimates were recalculated in 2014, using the survey data files, methods, and statistical analysis programs specific to the questions of type of drive and type of saw. The results matched the March 2011 report, thus ruling out computational problems.

To understand further the scope of the question raised about the type of saw and the corresponding type of drive, **Table 1** was generated. **Table 1** breaks down the responses and injury estimates for saw type and by the type of drive, based on the participants' responses.[4] Note that the percentages of estimated injuries related to direct drives range from 55.4 percent of the contractor saw injury estimate to 67.5 percent of the bench saw injury estimate; direct drives were 60.2 percent of the cabinet saw estimate. Given that most contractor saws and all cabinet saws are indirect drives, and most bench saws have a direct drive, the results in each category for type of saw are contradictory to the type of drive results in each category. The scope of the problem lies in the respondents' answers to the type of saw question, their answers to the type of drive question, or a combination of both.

[4] Only injuries to the operator of a table saw are included in this addendum.

Table 1: Type of Saw by Type of Drive Based on the Participants' Responses

Type of Saw (Question 99) As reported by participants	Type of Drive (Question 28) As reported by participants	n	Estimate**	CV for Estimate	Percent of Subtotal Estimate†
Portable Bench Saw	*Direct Drive*	58	5,400	0.19	67.5%
	Indirect Drive	11	*	*	*
	Unknown	10	*	*	*
	Total	79	8,000	0.18	100%
Contractor Saw	*Direct Drive*	89	7,700	0.17	55.4%
	Indirect Drive	53	4,500	0.19	32.4%
	Unknown	21	1,800	0.28	12.9%
	Total	163	13,900	0.14	100%
Fixed Cabinet Saw	*Direct Drive*	325	31,500	0.13	60.2%
	Indirect Drive	213	19,000	0.16	36.3%
	Unknown	21	1,800	0.23	3.4%
	Total	559	52,300	0.13	100%
Unknown	*Direct Drive*	6	*	*	*
	Indirect Drive	1	*	*	*
	Unknown	13	*	*	*
	Total	20	1,900	0.28	100%
Total	***Direct Drive***	**478**	**45,100**	**0.10**	**59.3%**
	Indirect Drive	**278**	**25,100**	**0.13**	**33.0%**
	Unknown	**65**	**5,900**	**0.16**	**7.8%**
	Total	**821**	**76,100**	**0.09**	**100%**

*Indicates an estimate that does not meet the reporting limit.

**Estimates rounded to the nearest hundred. Estimates may not add to totals due to rounding.

†Percentages based rounded estimates. Percentages may not add to 100% due to rounding.

A CPSC staff statistician and CPSC staff mechanical engineer, who is also CPSC staff's subject-matter expert for table saws, independently reviewed the participants' responses to manufacturer, model, and/or horsepower (or amps) to determine the type of saw involved. Each reviewer recorded their classification of the type of saw. The results of the type of saw classification for each reviewer were compared; any contradictions in the classification of type of saw among reviewers were adjudicated.

Table 2 breaks down the numbers of responses and associated injury estimates, whenever possible, for the type of saw, based on participant responses (question 99) with the reviewers' classification of type of saw.

Although model and horsepower (or amps) information were rarely reported (34 of the 821 for model and 97 of 821 for horsepower) by survey participants, manufacturer information was reported by 588 of the 821 participants (72.0%).

CPSC staff looked across a participant's responses to manufacturer, model, and horsepower (or amps) questions. and based on the set of responses, classified each respondent's table saw as one of the following:

(1) *Unknown*: There was insufficient information for CPSC staff to classify the type of saw involved.
(2) *Portable Bench Saw*: The respondent's saw was classified here, if the manufacturer and/or model information signified the type of saw as a bench saw.
(3) *Contractor Saw*: The respondent's saw was classified here, if the manufacturer and/or model information signified the type of saw as a contractor saw.
(4) *Fixed Cabinet Saw:* The respondent's saw was classified here, if the manufacturer and/or model information signified the type of saw as a cabinet saw.
(5) *Bench or Contractor Saw:* If enough information was available to determine the type of saw was either a bench or contractor saw (not a fixed cabinet saw), but could not determine the type of saw to any further degree of specificity, the respondent's saw was categorized as a bench or contractor saw.
(6) *Contractor or Fixed Cabinet Saw*: If enough information was available to determine the type of saw was a contractor or fixed cabinet saw (not a portable bench saw), but the type of saw could not be determined with any further degree of specificity, the respondent's saw was categorized as a bench or contractor saw.

Participants' responses allowed reviewers to classify the saw type into one of the five "known" classification categories in 21.0 percent of the responses. However, most participant responses (649 of the 821, 79.0%) led to an "unknown" table saw type category in the analysis, due to the lack of information available. From **Table 2,** it is noted that 24 of the 79 responses that reported involvement of a bench saw, were confirmed in the analysis to be bench saws. Similarly, 7 of 163 participant responses that reported contractor saws were classified as contractor saws in this analysis; and 25 of the 559 participant responses reporting fixed cabinet saws were classified as fixed cabinet saws in this analysis. Thus, there were a total of 56 responses where the reported type of saw was confirmed in the classification of the analysis. However, the classifications of table saws changed in 109 instances. The remaining seven were consistent with, but not conclusively matching the reported category; there was one contractor saw and six cabinet saws, as reported by participants, that were classified into the "contractor or fixed cabinet saw" category.

The estimates are reported in **Table 2**, when they met reporting criteria. Findings include:

(1) Only a small proportion of estimated injuries associated with participant-reported fixed cabinet saws could be classified as related to fixed cabinet saws based on the analysis of participants' response to manufacturer, model, and horsepower (1,900 of the 52,300 estimated injuries for cabinet saws; 3.6%). However, 10.1 percent of the estimated injuries associated with participant-reported fixed cabinet saws were classified as related to portable bench saws in the analysis (5,300). Most of the 52,300 injuries associated with participant-reported fixed table saw were classified as "unknown" in the analysis (43,900; 83.9%).
(2) Of the 13,900 estimated injuries associated with participant-reported contractor saws, 2,800 were classified to be associated with portable bench saws (20.1%), while most were classified into the "unknown" type category (76.3%). There were not enough cases in the contractor saw classification to obtain reliable estimates.
(3) Of the 8,000 estimated injuries associated with participant-reported portable bench saws, 2,500 were classified as portable bench saws (31.3%). The remaining estimated injuries in this category were classified as "unknown."

It should be noted, that verification of the type of saw and/or drive was not possible in most of the responses (as shown in **Table 2**, 649 of the 821 responses were classified in the "unknown" type of saw category) because most of the time, only the table saw manufacturer was identified. Further conclusions about the results are limited, at best. If an assumption were made that the responses classified as "unknown" follow the same pattern as "knowns," then fixed cabinet saws are overestimated in the survey, while portable bench saws are underestimated. However, there is not enough evidence to support the assumption that the "unknowns" are missing at random; thus, further extrapolations were not attempted.

Table 2: Classified Saw by Participant-Reported Type of Saw

Type of Saw (Question 99) As reported by participants	Staff Classification	n	Estimate**	CV for Estimate	Percent of Subtotal Estimate†
Portable Bench Saw	*Unknown*	55	5,500	0.17	68.8%
	Portable Bench Saw	24	2,500	0.30	31.3%
	Contractor Saw	0	.	.	.
	Fixed Cabinet Saw	0	.	.	.
	Bench or Contractor Saw	0	.	.	.
	Contractor or Fixed Cabinet Saw	0	.	.	.
	Total	79	8,000	0.18	100.0%
Contractor Saw	*Unknown*	120	10,600	0.14	76.3%
	Portable Bench Saw	33	2,800	0.23	20.1%
	Contractor Saw	7	*	*	*
	Fixed Cabinet Saw	2	*	*	*
	Bench or Contractor Saw	0	.	.	.
	Contractor or Fixed Cabinet Saw	1	*	*	*
	Total	163	13,900	0.14	100.0%
Fixed Cabinet Saw	*Unknown*	457	43,900	0.13	83.9%
	Portable Bench Saw	63	5,300	0.24	10.1%
	Contractor Saw	0	.	.	.
	Fixed Cabinet Saw	25	1,900	0.24	3.6%
	Bench or Contractor Saw	8	*	*	*
	Contractor or Fixed Cabinet Saw	6	*	*	*
	Total	559	52,300	0.13	100.0%
Unknown	*Unknown*	17	1,700	0.31	89.5%
	Portable Bench Saw	3	*	*	*
	Contractor Saw	0	.	.	.
	Fixed Cabinet Saw	0	.	.	.
	Bench or Contractor Saw	0	.	.	.
	Contractor or Fixed Cabinet Saw	0	.	.	.
	Total	20	1,900	0.28	100.0%
Total	***Unknown***	**649**	**61,700**	**0.10**	**81.1%**
	Portable Bench Saw	**123**	**10,800**	**0.14**	**14.2%**
	Contractor Saw	**7**	*	*	*
	Fixed Cabinet Saw	**27**	**2,000**	**0.23**	**2.6%**
	Bench or Contractor Saw	**8**	*	*	*
	Contractor or Fixed Cabinet Saw	**7**	*	*	
	Total	**821**	**76,100**	**0.09**	**100.0%**

*Indicates an estimate that does not meet the reporting limit.

**Estimates rounded to the nearest hundred. Estimates may not add to totals due to rounding.

†Percentages based rounded estimates. Percentages may not add to 100% due to rounding.

Table 3 breaks down results for the type of drive (as reported by participants) by the classified type of saw.

There is little evidence to show that the "type of drive" question was answered correctly. Because direct and indirect drives exist on many types of products (tables saws are just one), it is possible that the respondents had enough knowledge of drive types to answer this question accurately, while misidentifying the type of saw. However, due to the limited data available from this analysis, it cannot be concluded, one way or another, that this question was answered accurately; although there is a small amount of evidence to suggest that this the question might have been answered more accurately than the type of saw question. No conclusions should be based on the results of this question about the population of injuries associated with one type of drive over another. It can only be stated that the injury estimates are the estimated injuries associated with the *reported* drive type.

From **Table 3**, the following was found about the type of drive reported and the classification of type of saw:

(1) In the portable bench saw category, from the classification review, 8,500 of the 10,800 estimated injuries (78.7%) were associated with a direct drive saw, based on participant responses. Most of the remaining 1,700 estimated injuries (15.7%) in this classification category were associated with indirect drive saws, based on participant responses.
(2) Based on responses classified as "fixed cabinet saws," an estimated 1,400 of the total 2,000 estimated injures (70.0%) were associated with indirect drives.
(3) The "unknown" classification category, by far the largest category, has an estimated 61,700 injuries. Of this estimate, an estimated 35,300 injuries (57.2%) are associated with a direct drive, based on participant responses; and 21,100 estimated injuries (34.2%) were associated with an indirect drive, based on participant responses.

Table 3: Classified Type of Saw by the Participant-Reported Type of Drive

Staff Classification	Type of Drive (Question 28) As reported by participants	n	Estimate**	CV for Estimate	Percent of Subtotal Estimate†
Unknown	*Direct Drive*	363	35,300	0.10	57.2%
	Indirect Drive	228	21,100	0.14	34.2%
	Unknown	58	5,300	0.17	8.6%
	Total	649	61,700	0.10	100.0%
Portable Bench Saw	*Direct Drive*	97	8,500	0.13	78.7%
	Indirect Drive	20	1,700	0.29	15.7%
	Unknown	6	*	*	*
	Total	123	10,800	0.14	100.0%
Contractor Saw	*Direct Drive*	1	*	*	*
	Indirect Drive	5	*	*	*
	Unknown	1	*	*	*
	Total	7	*	*	*
Fixed Cabinet Saw	*Direct Drive*	9	*	*	*
	Indirect Drive	18	1,400	0.29	70.0%
	Unknown	0	.	.	.
	Total	27	2,000	0.23	100.0%
Bench or Contractor Saw	*Direct Drive*	7	*	*	*
	Indirect Drive	1	*	*	*
	Unknown	0	.	.	.
	Total	8	*	*	*
Contractor or Fixed Cabinet Saw	*Direct Drive*	1	*	*	*
	Indirect Drive	6	*	*	*
	Unknown	0	.	.	.
	Total	7	*	*	*
Total	***Direct Drive***	**478**	**45,100**	**0.10**	**59.3%**
	Indirect Drive	**278**	**25,100**	**0.13**	**33.0%**
	Unknown	**65**	**5,900**	**0.16**	**7.8%**
	Total	**821**	**76,100**	**0.09**	**100.0%**

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Conclusion

The contradiction in injury estimates, based on the participants' responses to the type of saw for the type of drive, most likely stems from respondents' confusion about the type of saw being operated at the time of injury, the type of drive of the corresponding table saw, or both. This could be attributed to the survey instrument's phrasing of the question and the respondent's lack of knowledge on the types of saw/drive referenced. However, this cannot be concluded from the data available.

The results of this analysis show that we cannot conclude that the estimated number of injuries, based on participant responses to type of saw and type of drive, are reliably representing the types of saws/drives associated with injuries. There is insufficient evidence to conclude the actual distribution of injuries across different types of saws, as most were categorized as "unknown" in the analysis, due to the lack of data available to classify each response. Thus, there is evidence to suggest that the distribution of injuries for different types of saws cannot be based on how respondents answered questions about the type of saw. However, there is evidence to support the following: It is possible that bench saws are associated with a much larger proportion of estimated injuries than reported, based on the respondent-reported type of saw.