



Ballot Vote Sheet

TO: The Commission
Alberta E. Mills, Secretary

DATE: September 20, 2023

THROUGH: Austin C. Schlick, General Counsel
Jason K. Levine, Executive Director

FROM: Michael Rogers, Attorney, Regulatory Affairs
Daniel R. Vice, Assistant General Counsel, Regulatory Affairs

SUBJECT: *Federal Register* Notice: Safety Standard Addressing Blade-Contact Injuries on Table Saws, Supplemental Notice of Proposed Rulemaking

BALLOT VOTE DUE: Tuesday, September 26, 2023.

Attached for the Commission’s consideration is a draft supplemental notice of proposed rulemaking for publication in the *Federal Register*, to address the hazard of blade-contact injuries from table saws. In 2017, the Commission published in the *Federal Register* a notice of proposed rulemaking, in which it proposed a mandatory safety standard that would limit the depth of cut to 3.5 mm when a test probe acting as a surrogate for a human finger contacts the running blade of a table saw. This supplemental notice of proposed rulemaking addresses comments received in response to the 2017 NPR, as well as CPSC Staff’s 2017 Special Study on table saws. This supplemental notice of proposed rulemaking also discusses and reflects further testing that staff has carried out since the 2017 NPR was published, as well as recent scientific developments and market changes related to active injury mitigation (AIM) technology. The rule proposed in this notice is largely the same as the rule proposed in the 2017 NPR, but includes revisions to the definition of “table saw,” clarifications to the performance requirement, and a reduction to the anti-stockpiling provision’s maximum level for manufacturing or importing.

Please indicate your vote on the following options:

- I. Approve publication of the attached document in the *Federal Register*, as drafted.

(Signature)

(Date)

U.S. Consumer Product
Safety Commission
4330 East-West Highway
Bethesda, MD 20814

National Product Testing
and Evaluation Center
5 Research Place
Rockville, MD 20850

II. Approve publication of the attached document in the *Federal Register*, with the specified changes.

(Signature)

(Date)

III. Do not approve publication of the attached document in the *Federal Register*.

(Signature)

(Date)

IV. Take other action specified below.

(Signature)

(Date)

Attachment: Draft *Federal Register* notice, Safety Standard Addressing Blade-Contact Injuries on Table Saws, Supplemental Notice of Proposed Rulemaking

Billing Code 6355-01-P

CONSUMER PRODUCT SAFETY COMMISSION**16 CFR Part 1264****[CPSC Docket No. 2011-0074]****Safety Standard Addressing Blade-Contact Injuries on Table Saws****AGENCY:** Consumer Product Safety Commission.**ACTION:** Supplemental notice of proposed rulemaking; notice of opportunity for oral presentation of comments.

SUMMARY: The U.S. Consumer Product Safety Commission (Commission or CPSC) has determined preliminarily that there may be an unreasonable risk of blade-contact injuries associated with table saws. To address this hazard, the Commission proposes a rule under the Consumer Product Safety Act (CPSA) that would establish a performance standard that requires table saws to limit the depth of cut to no more than 3.5 millimeters when a test probe, acting as surrogate for a human finger or other body part, approaches the spinning blade at a rate of 1 meter per second (m/s). The Commission is providing an opportunity for interested parties to present comments on this supplemental notice of proposed rulemaking (SNPR).

DATES: *Deadline for Written Comments:* Written comments must be received by [INSERT DATE THAT IS 60 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

Deadline for Request to Present Oral Comments: Any person interested in making an oral presentation must send an e-mail indicating this intent to the Office of the Secretary at cpsc-os@cpsc.gov by [INSERT DATE THAT IS 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: *Written Comments:* You may submit written comments in response to the proposed rule, identified by Docket No. CPSC-2011-0074, by any of the following methods:

Electronic Submissions: Submit electronic comments to the Federal eRulemaking Portal at: <http://www.regulations.gov>. Follow the instructions for submitting comments. Do not submit through this website: confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public. The Commission typically does not accept comments submitted by e-mail, except as described below.

Mail/hand delivery/courier/written submissions: CPSC encourages you to submit electronic comments by using the Federal eRulemaking Portal. You may, however, submit comments by mail/hand delivery/courier to: Office of the Secretary, Consumer Product Safety Commission, 4330 East West Highway, Bethesda, MD 20814; telephone (301) 504-7923.

Instructions: All submissions received must include the agency name and docket number for this notice. CPSC may post all comments without change, including any personal identifiers, contact information, or other personal information provided, to: <http://www.regulations.gov>. If you wish to submit confidential business information, trade secret information, or other sensitive or protected information that you do not want to be available to the public, you may submit such comments by mail, hand delivery, or courier, or you may email them to cpsc-os@cpsc.gov.

Docket SNPR: For access to the docket to read background documents or comments received, go to: <http://www.regulations.gov>, insert docket number CPSC-2011-0074 into the “Search” box, and follow the prompts.

FOR FURTHER INFORMATION CONTACT: Caroleene Paul, Directorate for Engineering Sciences, U.S. Consumer Product Safety Commission, 5 Research Place, Rockville, MD 20850; telephone (301) 987-2225; fax (301) 869-0294; e-mail cpaul@cpsc.gov.

SUPPLEMENTARY INFORMATION:**I. Background¹**

On April 15, 2003, Stephen Gass, David Fanning, and James Fulmer, *et al.* (petitioners) requested that the CPSC require performance standards for a system to reduce or prevent injuries associated with contact with the blade of a table saw. The petitioners were associated with SawStop, LLC, and its parent company, SD3, LLC (collectively, SawStop). On October 11, 2011, the Commission published an advance notice of proposed rulemaking (ANPR) to consider whether there may be an unreasonable risk of blade-contact injuries associated with table saws. 76 FR 62678. The ANPR began a rulemaking proceeding under the CPSA. The Commission received approximately 1,600 public comments.

On May 12, 2017, the Commission published a notice of proposed rulemaking (NPR) to address blade-contact injuries associated with table saws. 82 FR 22190. The proposed rule stated that it would limit the depth of cut of a table saw to 3.5 mm or less when a test probe, acting as surrogate for a human finger or other body part, contacts the spinning blade at an approach rate of 1 m/s. CPSC staff estimated that the proposed rule would prevent or mitigate the severity of 54,800 medically treated blade-contact injuries annually, and that the proposed rule's aggregate net benefits on an annual basis could range from about \$625 million to about \$2.3 billion.² The Commission received written comments and oral presentations concerning the proposed rule. The written comments are available at <https://www.regulations.gov/document/CPSC-2011-0074-1154/comment>, and a video of the public hearing is available on the Commission's YouTube channel at

¹ On [date], the Commission voted [vote] to publish this supplemental notice of proposed rulemaking.

² See Commission Briefing Package: Proposed Rule: Safety Standard Addressing Blade-Contact Injuries on Table Saws, available at <https://www.cpsc.gov/content/Commission-Briefing-Package-Proposed-Rule-Safety-Standard-Addressing-Blade-Contact-Injuries-on-Table-Saws>.

<https://www.youtube.com/watch?v=BgPmKkGIILc>. Section VIII of this preamble contains a summary of the significant issues raised by the comments submitted, and the Commission's assessment of those issues.

Following publication of the NPR, CPSC staff completed a Special Study of table saw injuries that occurred in 2017.³ On December 4, 2018, the Commission announced the availability of and sought comment on the study. 83 FR 62561. The Commission received written comments on the study results from the public, which are available at [regulations.gov](https://www.regulations.gov), under docket number CPSC-2011-0074.

In September 2019, CPSC staff submitted a Table Saw Update to the Commission with staff's analysis of NEISS data through 2018, including a discussion of the 2017 Special Study.⁴ The results of the 2017 Special Study indicated that there might be a lower risk of injury on table saws equipped with a modular blade guard system that met the latest voluntary standards, compared to older table saws equipped with a traditional blade guard system. However, a 15-year trend analysis (from 2004 to 2018) of table saw injuries reported in the September 2019 update showed no reduction in table saw injuries from 2010 to 2018, despite the fact that a voluntary standard that became effective in 2010 required new table saws to be equipped with modular blade guard systems.⁵

This SNPR analyzes updated incident data through 2021. The data confirm the 2019 analysis and suggest no reduction in table saw injuries despite the fact that the relevant voluntary standard has required table saws to include modular blade guards since 2010.

³ Table Saw Blade-Contact Injuries Special Study Report, available at <https://www.cpsc.gov/s3fs-public/Draft%20Notice%20of%20Availability%20Table%20Saw%20Blade%20Contact%20Injuries%20Special%20Study%20Report%20-%202017%20-%20November%2014%202018.pdf>.

⁴ Available at: <https://www.cpsc.gov/s3fs-public/Table%20Saw%20Update%202019.pdf>.

⁵ *Id.* at 27-32.

Also since publication of the NPR in 2017, staff is aware of several changes to the table saw market that include:

- introduction of a compact table saw with active injury mitigation (AIM) capabilities;
- introduction of a Preventative Contact System (PCS) on a commercial sliding table panel saw;
- introduction of cordless, battery-powered bench saws by at least two manufacturers;
- change in ownership of patents related to SawStop AIM technology, with the acquisition of SawStop, LLC, by TTS Tooltechnic Systems Holding AG (TTS); and
- expiration of two patents related to SawStop AIM technology.

The Commission is issuing this supplemental notice of proposed rulemaking based on staff's analysis of newly available incident data, evaluation of newly available products, and other market information that did not exist at the time of the 2017 NPR. As discussed in greater detail in section VII of this preamble, the revised proposed rule is generally consistent with the rule proposed in the 2017 NPR, but includes an updated definition of the term "table saw," a more precise description of the proposed performance requirement, and a revised anti-stockpiling provision.

The Commission now expects that the proposed rule would prevent or mitigate the severity of an estimated 49,176 injuries treated in hospital emergency departments or other medical settings per year. The Commission further estimates that net benefits would range from approximately \$1.28 billion to \$2.32 billion per year.

II. Statutory Authority

This supplemental notice of proposed rulemaking is authorized by the CPSA. 15 U.S.C. 2051-2084. Section 7 of the CPSA authorizes the Commission to promulgate a mandatory

consumer product safety standard that sets forth performance or labeling requirements for a consumer product if such requirements are reasonably necessary to prevent or reduce an unreasonable risk of injury. 15 U.S.C. 2056(a). Section 9 of the CPSA specifies the procedure that the Commission must follow to issue a consumer product safety standard under section 7.

Pursuant to section 9(f)(1) of the CPSA, before promulgating a consumer product safety rule, the Commission must consider, and make appropriate findings to be included in the rule, on the following issues:

- the degree and nature of the risk of injury that the rule is designed to eliminate or reduce;
- the approximate number of consumer products subject to the rule;
- the need of the public for the products subject to the rule and the probable effect the rule will have on the utility, cost, or availability of such products; and
- the means to achieve the objective of the rule while minimizing adverse effects on competition, manufacturing, and commercial practices.

15 U.S.C. 2058(f)(1).

Under section 9(f)(3) of the CPSA, to issue a final rule, the Commission must find that the rule is “reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with such product” and that issuing the rule is in the public interest. 15 U.S.C. 2058(f)(3)(A)&(B). Additionally, if a voluntary standard addressing the risk of injury has been adopted and implemented, the Commission must find that the voluntary standard is not likely to eliminate or adequately reduce the risk of injury, or substantial compliance with the voluntary standard is unlikely. The Commission also must find that expected benefits of the rule bear a reasonable relationship to its costs, and that the rule imposes the

least burdensome requirements that prevent or adequately reduce the risk of injury for which the rule is being promulgated. 15 U.S.C. 2058(f)(3)(D)-(F).

III. The Product

A. Types of Table Saws

Table saws are stationary power tools used for the straight sawing of wood and other materials. The basic design of a table saw consists of a motor-driven saw blade that protrudes through a flat table surface. To make a cut, the operator places the workpiece on the table and, using a rip fence or miter gauge as a guide, pushes the workpiece into the blade (see Figure 1).

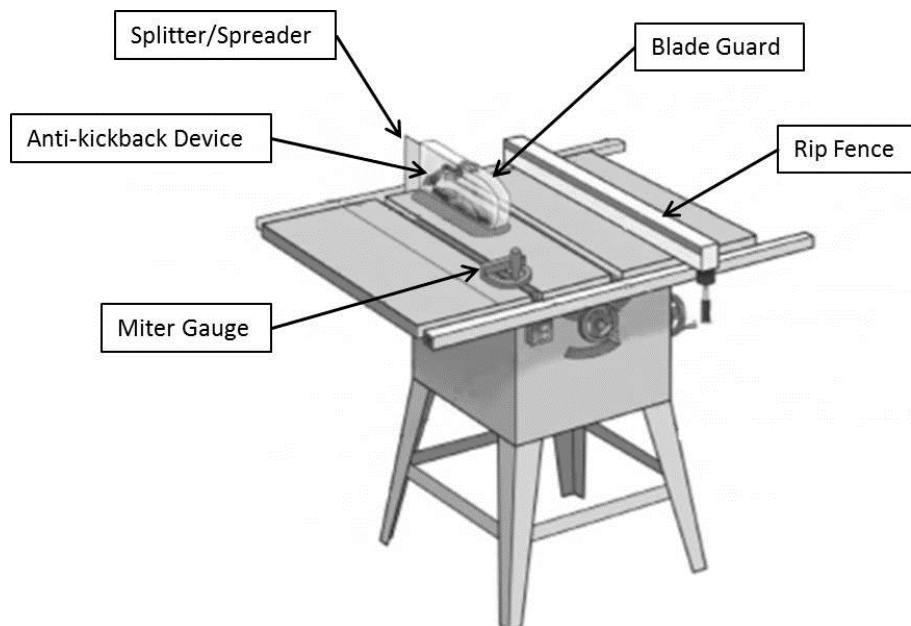


Figure 1. Typical table saw components

Table saws generally fall into three product types: bench saws, contractor saws, and cabinet saws. Although there are no exact distinctions among these types of saws, the categories are generally based on size, weight, portability, power transmission, and price. Some industry participants use additional specialized descriptions, such as “jobsite saws,” “hybrid saws,” and “sliding saws.”

Bench saws are intended to be transportable, so they tend to be small, lightweight, and relatively inexpensive. In recent years, bench saw designs have evolved to include saws with larger and heavier-duty table surfaces, with some attached to a folding stand with wheels to maintain mobility. These larger portable saws on wheeled stands are commonly called “jobsite saws” because they are capable of heavier-duty work but still portable enough to move to work sites. Bench saws are generally powered using standard house voltage (110-120 volts), use universal motors,⁶ drive the saw blade through gears, and range in weight from 34 pounds to 133 pounds. The universal motor and gear drive produce the high decibel noise and vibration that are distinctive characteristics of bench saws. Prices for bench saws range from \$129 to as much as \$1,499 for a high-end model. Based on available information, bench saws account for approximately 79 percent of the table saw market by volume.

Since the 2017 NPR was published, cordless battery-powered bench saws have been introduced widely to the table saw market. The first cordless table saw came to market in 2016, and at least three other brands have been introduced in the last few years. Cordless table saws typically run on lithium-ion batteries that range from 18 volts to 60 volts and are equipped with 8.25-inch blades with thinner kerfs to reduce friction while cutting. Prices for battery-powered bench saws range from \$299 to \$599 for the tool only, and the accompanying battery prices range from \$50 to \$150.

Contractor saws are larger and more powerful than bench saws, and range in weight from approximately 200 to 400 pounds. Although most contractor saws are stationary, a mobile base can be added to the frame. Contractor saws are often used in home workshops as a less

⁶ A universal motor runs on AC or DC power and uses current and electromagnets to rotate a shaft. Universal motors are lightweight, compact, and cheaper to produce than induction motors. An induction motor runs on AC power, which is used to create a rotating magnetic field to induce torque on the output shaft. Induction motors are quieter and last longer, but are also more expensive.

expensive alternative to stationary cabinet saws. Contractor saws generally use a 10-inch blade, are powered using standard house voltage, use induction motors, and are belt driven. Compared to a bench saw, the induction motor and belt drive result in a table saw that produces less vibration and is quieter, more accurate, able to cut thicker pieces of wood, and more durable. Prices for contractor saws range from around \$599 to \$2,000, and contractor saws account for approximately 15 percent of the table saw market by volume of units sold.

Cabinet saws—also referred to as stationary saws—are the largest, heaviest, and most powerful of the three table saw types, and are typically the highest grade saw found in home woodworking shops. Cabinet saws generally use a 10-inch blade, are powered using 220-240 volts, use a 1.75-5 horsepower or stronger motor enclosed in a cabinet, are belt driven, and weigh from around 300 pounds to 1,000 pounds. Components in cabinet saws are designed for heavy use and durability, and the greater weight further reduces vibration so that cuts are smoother and more accurate. Cabinet saws have an average product life of more than 20 years, and prices range from approximately \$1,399 to \$5,000. Based on available information, cabinet saws account for approximately 6 percent of the table saw market by unit volume.

B. Standard Safety Devices

In the 2017 NPR, the Commission described common safety devices on table saws that are designed to reduce contact between the saw blade and the operator. 82 FR at 22192. As described in the NPR, these devices generally fall into two categories: (1) blade guards, and (2) kickback-prevention devices including splitters, riving knives, and anti-kickback pawls.

The riving knife and modular blade guard represent the latest safety measures that have been incorporated into the voluntary standards for table saws. Blade guards surround the exposed blade and function as a physical barrier between the blade and the operator.

Riving knives are curved metal plates that physically prevent the two halves of a cut workpiece from moving back towards each other and punching the splitting blade, which could cause the operator to lose control of the workpiece. The Power Tool Institute (PTI), the industry trade group that represents manufacturers of consumer-grade table saws, has estimated that in 2017, 80 percent of bench saws, 33 percent of contractor saws, and 25 percent of cabinet table saws sold were equipped with modular blade guards and riving knives.⁷

C. Active Injury Mitigation (AIM) Technology

The 2017 NPR described an AIM system that detects imminent or actual human contact with the table saw blade and then performs an action to prevent or mitigate the severity of the injury. The NPR described two AIM systems available at the time: the SawStop system and the Bosch REAXX system. *See* 82 FR at 22193-94. On July 16, 2015, SawStop filed with the U.S. International Trade Commission (ITC) a complaint against Bosch for patent infringement, and requested that the ITC order U.S. Customs to exclude Bosch REAXX saws from entering the U.S. market. On January 27, 2017, the ITC issued an order prohibiting Bosch from importing and selling Bosch REAXX saws, based on a determination that Bosch had infringed on two SawStop patents. *See* 82 FR 9075.

Since the 2017 NPR was published, CPSC staff has become aware of another AIM technology called the preventative contact system (PCS), developed by the Felder Group. The PCS detects motion by using a capacitive field around the blade, which can detect movement before a body part contacts the blade. Marketing of the system indicates that its detection system works for fast and slow body part movement and reacts to impending blade contact by retracting

⁷ PTI comment (CPSC-2011-0074-1343) in response to notification of availability of 2017 Special Study. Retrieved from: <https://www.regulations.gov/comment/CPSC-2011-0074-1343>.

the blade below the table surface in milliseconds. Retraction of the blade is achieved by reversing the polarity of two strong electro-magnets that hold the blade arbor in place. Two magnets with the same magnetic poles will repel each other, and this action moves the saw blade below the tabletop fast enough to prevent injury to a body part that would otherwise contact the rotating saw blade. The PCS system is available as an option on Felder's most expensive sliding table saw.

IV. Risk of Injury

A. Description of Hazard

In 2017, CPSC staff conducted a Special Study of emergency department-treated table saw blade-contact injuries, in order to collect data on saw types, incident details, and injury characteristics that are otherwise not available in the standard National Electronic Injury Surveillance System (NEISS) data collections. The 2017 Study provided detailed information based on a snapshot of incidents that occurred in a single year. In 2017, there were an estimated 26,500 table saw blade-contact, emergency department-treated injuries. Of these, an estimated 25,600 injuries (96.4 percent) involved the finger. The estimated number of injuries for each of the most common diagnoses in blade-contact injuries were: 16,100 lacerations (60.9 percent), 5,500 fractures (20.6 percent), and 2,800 amputations (10.7 percent).

B. NEISS Trend Analysis

In the 2017 NPR briefing package, CPSC staff assessed trends for table saw blade-contact injuries reported through NEISS and concluded that there was no discernible change in the number or types of blade-contact injuries associated with table saws annually from 2004 to 2015. No statistically significant trend was detected in any of the analyses for the number of blade-contact injuries, amputations, hospitalizations, and finger/hand injuries. Staff also

conducted a trend analysis to include the rate of injury per 10,000 table saws in use for each year in the analysis. The analysis again showed that there was no discernible change in the risk of injury associated with blade contact related to table saws from 2004 to 2015. *See* Staff NPR Briefing Package at 25-29.

In the 2019 Status Update briefing package, CPSC staff updated the NEISS trend analyses. Staff assessed trends for table saw blade-contact injuries, amputations, hospitalizations, and finger/hand injuries, and concluded once more that there was no discernible change in the number of blade-contact injuries or types of injuries related to table saw blade contact, this time for the period 2004 to 2018.⁸ Trend analysis for the rate of injury per 10,000 table saws in use also showed that there was no discernible change in the risk of injury associated with blade contact related to table saws from 2004 to 2018, despite the increasing percentage of saws sold with modular blade guards and riving knives.

For this supplemental NPR, staff performed trend analyses for blade-contact injuries, amputations, hospitalizations, and finger/hand injuries up to 2021. The voluntary standards in place have required modular blade guards since the publishing of UL 987, 7th edition, which had an effective date of January 2010. The date ranges for the trend analyses cover a timespan when an increasing proportion of table saws in use were equipped with modular blade guards (2010 to 2021), as well as the approximate period during which table saws equipped with traditional blade guards were no longer being produced (2015 to 2021). Table 1 provides the estimated number of emergency department-treated injuries associated with table saw blade contact from 2010 through 2021.

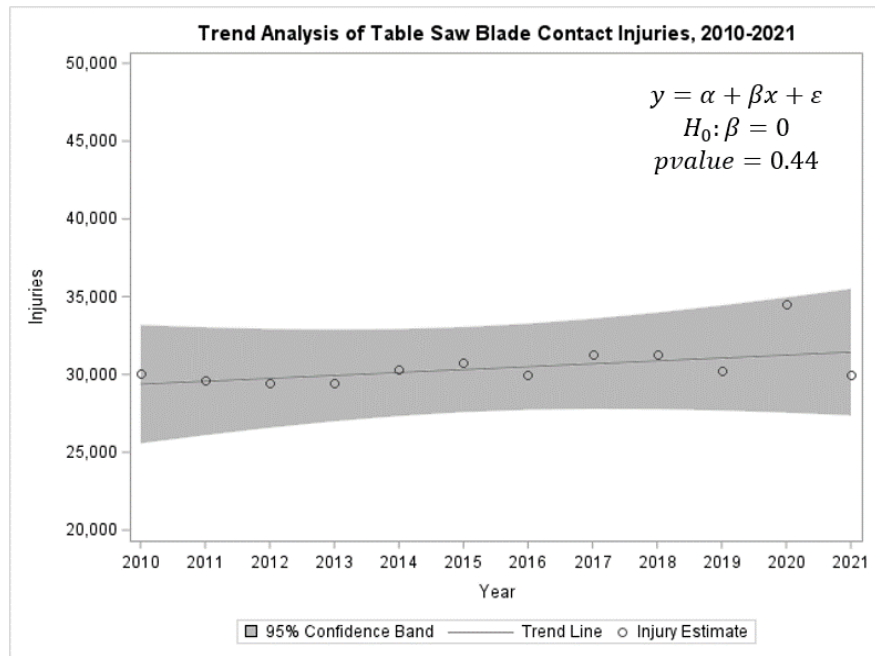
⁸ Table Saw Update 2019. Available at: <https://www.cpsc.gov/s3fs-public/Table%20Saw%20Update%202019.pdf>.

Table 1. NEISS Estimates for Table Saw Blade-Contact Injuries, 2010-2021

Year	Table Saw Blade Contact Injury Estimates			
	N	Estimate	CV	95% Confidence Interval
2021	655	30,000	0.10	24,100-35,900
2020	689	34,600	0.10	27,800-41,300
2019	627	30,300	0.09	24,900-35,700
2018	649	31,300	0.09	25,500-37,100
2017	654	31,300	0.09	25,800-36,700
2016	646	30,000	0.09	25,000-35,000
2015	642	30,800	0.09	25,100-36,500
2014	631	30,300	0.08	25,300-35,300
2013	662	29,500	0.09	24,500-34,500
2012	648	29,500	0.09	24,100-34,900
2011	362	29,600	0.09	24,300-35,000
2010	657	30,100	0.10	24,000-36,200

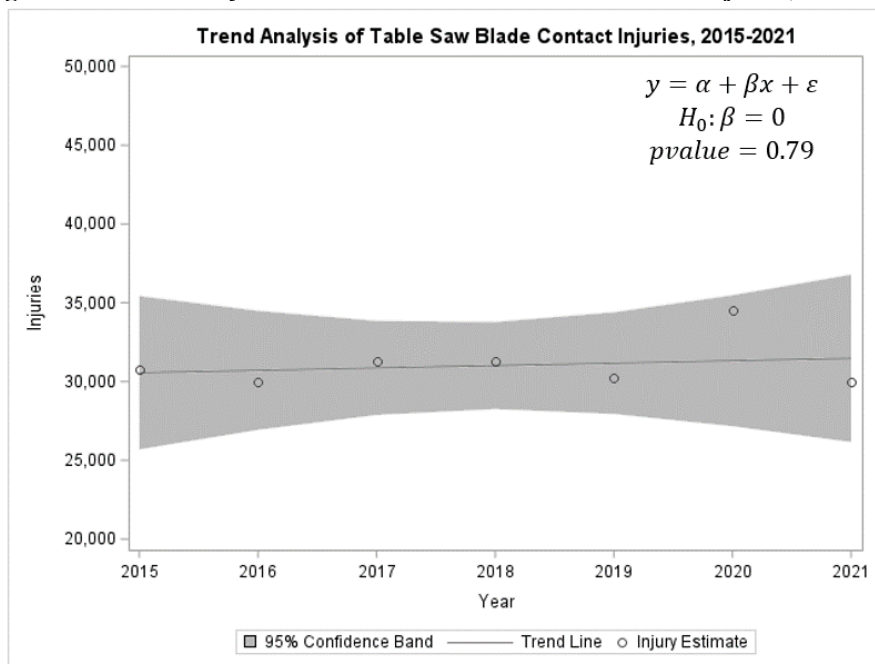
Source: U.S. CPSC: NEISS

Figure 2 provides the estimated blade-contact injuries associated with table saws and the fitted trend line with a 95 percent confidence band for the fitted line from 2010 through 2021. The p-value associated with the slope of the fitted line is 0.44, which indicates that there is not a statistically significant trend in blade-contact injuries associated with table saws over this timeframe.

Figure 1. Trend Analysis of Table Saw Blade-Contact-Related Injuries, 2010-2021

Source: U.S. CPSC: NEISS

Figure 3 provides the estimated blade-contact injuries associated with table saws and the fitted trend line with a 95 percent confidence band for the fitted line from 2015 through 2021. The p-value associated with the slope of the fitted line is 0.79, which indicates that there is not a statistically significant trend in blade-contact injuries associated with table saws over this timeframe, despite the market shift during this time to table saws with modular blade guards and riving knives.

Figure 2. Trend Analysis of Table Saw Blade-Contact-Related Injuries, 2015-2021

Source: U.S. CPSC: NEISS

To assess any changes over time in the severity of table saw blade-contact injuries, CPSC staff performed trend analyses for blade-contact amputations, hospitalizations (including patients who were treated and admitted to the same hospital, as well as treated and transferred to a different hospital), and finger/hand injuries from 2010-2021 and 2015-2021. No statistically significant trend was detected in any of these analyses. Table 2 provides the total estimated number of blade-contact injuries from 2010 through 2021 for amputations, hospitalizations, and finger/hand injuries from blade contact, and expresses those numbers as a percentage of all estimated blade-contact injuries.

Table 2. NEISS Injury Estimates for Table Saw Blade-Contact Amputations, Hospitalizations, and Finger/Hand Injuries, 2010-2021

Year	Amputations		Hospitalizations		Finger/Hand Injuries	
	Estimate (95% CI)	% of blade contact injuries	Estimate (95% CI)	% of blade contact injuries	Estimate (95% CI)	% of blade contact injuries
2021	3,400 (2,200—4,500)	11.2%	2,000 (1,200—2,900)	6.7%	29,100 (23,400—34,800)	97.1%
2020	4,700 (3,200—6,300)	13.6%	3,200 (2,100—4,300)	9.3%	34,100 (27,400—40,800)	98.8%
2019	4,700 (3,200—6,100)	15.4%	2,400 (1,500—3,200)	7.8%	29,700 (24,300—35,100)	98.3%
2018	4,400 (3,100—5,600)	13.9%	3,100 (2,100—4,200)	10.0%	30,600 (24,900—36,400)	97.8%
2017	4,800 (3,200—6,400)	15.4%	2,800 (1,700—3,900)	8.9%	30,400 (25,100—35,800)	97.4%
2016	4,000 (2,600—5,300)	13.2%	3,500 (2,100—5,000)	11.8%	29,600 (24,600—34,500)	98.5%
2015	4,700 (3,100—6,300)	15.2%	3,800 (2,300—5,300)	12.3%	30,500 (24,900—36,100)	99.1%
2014	4,000 (2,400—5,500)	13.1%	3,100 (1,700—4,400)	10.1%	29,400 (24,600—34,300)	97.2%
2013	3,400 (2,300—4,600)	11.7%	3,000 (1,800—4,200)	10.2%	29,200 (24,300—34,200)	99.2%
2012	4,100 (2,700—5,600)	13.9%	2,900 (1,300—4,400)	9.8%	29,100 (23,700—34,400)	98.7%
2011	3,900 (2,700—5,100)	13.2%	2,900 (1,900—3,900)	9.9%	29,400 (24,200—34,700)	99.3%
2010	3,500 (2,500—4,500)	11.6%	2,800 (2,000—3,600)	9.2%	29,800 (23,700—36,000)	99.2%

Source: U.S. CPSC: NEISS

Table 3 provides an estimate of blade-contact injuries per 10,000 table saws in use for each year in the analysis. Figure 4 provides the trend analysis results for that data. The p-value associated with the slope of the fitted line is 0.86, which indicates that there is not a statistically significant trend. When limiting the trend analysis to the years 2015-2021, the p-value associated with the slope of the fitted line becomes 0.17, which also indicates the nonexistence of a statistically significant trend. Possible changes in usage patterns of table saws were not considered in these analyses.

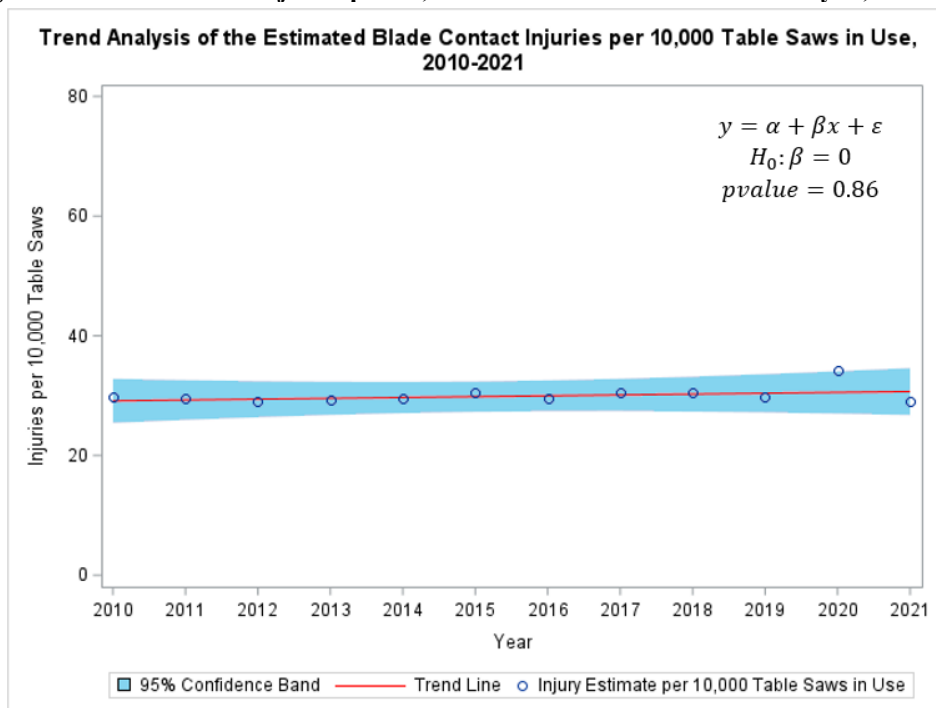
Table 3. Estimated Table Saw Blade-Contact Injuries per 10,000 Table Saws in Use, 2010-2021

Year	Table Saw Blade Contact Injury Estimates		Estimated Number of Table Saws in Use (in 10,000s)*	Estimates** of Table Saw Blade Contact Injury per 10,000 Table Saws in Use	
	Blade Contact Injury Estimate	95% Confidence Interval	Table Saws in Use Estimate	Estimate	95% Confidence Interval
2021	30,000	24,100-35,900	1003.9	29.9	24.0-35.7
2020	34,600	27,800-41,300	883.6	39.1	31.5-46.8
2019	30,300	24,900-35,700	849.8	35.6	29.3-42.0
2018	31,300	25,500-37,100	828.6	37.8	30.8-44.8
2017	31,300	25,800-36,700	820.3	38.1	31.5-44.7
2016	30,000	25,000-35,000	822.2	36.5	30.4-42.6
2015	30,800	25,100-36,500	827.4	37.2	30.3-44.1
2014	30,300	25,300-35,300	831.3	36.4	30.4-42.5
2013	29,500	24,500-34,500	838.2	35.2	29.3-41.1
2012	29,500	24,100-34,900	847.4	34.8	28.4-41.1
2011	29,600	24,300-35,000	855.6	34.7	28.4-40.9
2010	30,100	24,000-36,200	866.5	34.7	27.7-41.8

* CPSC’s Directorate for Economics provided the estimated numbers of table saws in use for this analysis.

** Estimates are calculated from the exact number of injuries point estimate, not the rounded estimate.

Figure 4. Blade-Contact Injuries per 10,000 Table Saws in Use Trend Analysis, 2010-2021



Source: U.S. CPSC: NEISS

Based on the foregoing analyses by CPSC staff, the Commission concludes that there has been no discernible change in the pattern of blade-contact injuries or types of injuries related to

table saw blade contact, despite the transition of the market to modular blade guards and riving knives since 2010 and the phasing out of traditional blade guards since 2015.

V. Relevant Existing Standards

A. UL 987 and UL 62841-3-1

Underwriters Laboratories Inc. (UL) published the first edition of UL 987 *Stationary and Fixed Electric Tools* in 1971. The UL 987 standard includes voluntary requirements for cord-connected and permanently connected stationary and light industrial electric tools. UL revised the standard several times, with the 6th edition in 2005 and the 7th edition in 2007 introducing significant changes to the requirements covering blade guard design. The latest 8th edition was published in 2011, with revisions that clarified the requirements for table saws and defined terms specific to table saws.

In 2016, as part of UL's international harmonization goal to adopt international standards, UL published the first edition of UL 62841-3-1, *Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery Part 3-1: Particular Requirements for Transportable Table Saws*. In 2019, UL removed Section 43 (Table Saws) from UL 987, leaving UL 62841-3-1 as the current voluntary standard for table saws. UL 62841-3-1 is recognized as an American National Standards Institute (ANSI) standard and contains essentially the same blade guard requirements as UL 987.

Section 19.101 of UL 62841-3-1 specifies that a table saw shall provide "either a saw blade guard mounted to an extended riving knife complying with 19.101.2 or an over-arm saw blade guard complying with 19.101.3." Section 19.101.2 specifies that the guard may consist of independent side and top barriers and must have openings that provide visibility of the blade's cutting edge. This modular guard attaches to the riving knife and shall provide coverage over the

saw blade as determined by a probe test. Section 19.103 specifies that a table saw shall be equipped with a riving knife that is located behind the blade at a height below the saw blade that allows the riving knife to pass freely through the cutting groove of the piece being cut. Section 21.106.3 specifies that an antikickback device attached to the riving knife shall be easily removable and function independently from the blade guard.

B. Active Injury Mitigation

Since 2004, table saws have been available in the U.S. market with AIM capabilities that mitigate injuries when a hand or finger makes contact with a rotating saw blade. In February 2015, UL defined an “active injury mitigation” system as an active system that serves to mitigate or prevent injury from exposure to a rotating saw blade. At a basic level, an AIM system for table saws must perform two functions: detect contact or imminent contact between the rotating saw blade and a human body part, and react to mitigate injury. Detection can be achieved by sensing electrical or thermal properties of the human body, or visually sensing and tracking the human body.

In 2015 and 2016, UL balloted proposals to add AIM system requirements for table saws to UL 987 and UL 62841-3-1, respectively. The ballots proposed performance requirements that limited the depth of cut to a probe simulating a human finger to 4 mm or less when introduced to an operating saw blade at an approach rate of 1 m/s. UL has identified a 4 mm cut from the surface of the skin as the quantitative threshold separating simple and complex lacerations in a human finger.⁹ Simple lacerations can be managed at emergency departments with little expertise or by simple home care because these cuts generally heal without complications, while

⁹ Table Saw Hazard Study on Finger Injuries Due to Blade Contact, *UL Research Report*, Jan. 2014. Available at: http://library.ul.com/wp-content/uploads/sites/40/2015/02/UL_WhitePapers_Tablesaw_V11.pdf.

complex lacerations require more significant medical attention. Although CPSC staff expressed support for both ballots,^{10,11} both ballots failed, and AIM requirements were not adopted.

In July 2017, UL announced the availability of its *Recommended Practice for Determining the Depth of Cut on a Test Probe Contacting the Spinning Blade of a Table Saw*, UL RP 3002. The Recommended Practice is available as a test procedure for manufacturers or independent third parties to evaluate AIM performance. UL stated in its comment to the 2017 NPR that it chose to publish this Recommended Practice because it believes the addition of active technology on table saws will further reduce the incidence of blade-contact injuries and represent a marked increase in the safety of these devices.¹²

C. Adequacy of Voluntary Standard in Addressing Injuries

In January 2010, the voluntary standard's modular blade guard requirement took effect. Under this requirement, all table saws sold in the United States shall be equipped with a system consisting of a modular guard and antikickback device attached to a riving knife. In the NPR, the Commission noted staff's conclusion that, while the modular blade guard system was an improvement over the traditional blade guard system, a guard is only effective if used, and incident data and survey data indicate users remove modular blade guards for similar reasons (such as improved visibility or to make certain types of cuts) that they had removed traditional blade guards.

¹⁰ Letter from Caroleene Paul, CPSC, to John Stimitz, UL, dated March 24, 2015. Retrieved from: <https://www.cpsc.gov/s3fs-public/CPSClettertoULcommenttoAIMSproposalwenclosures.pdf>.

¹¹ Letter from Caroleene Paul, CPSC, to John Stimitz, UL, dated March 11, 2016. Retrieved from: <https://www.cpsc.gov/s3fs-public/CPSClettertoULcommenttoAIMS.pdf>.

¹² Comment from Sarah Owen on behalf of UL in response to 2017 NPR. Retrieved from: <https://www.regulations.gov/comment/CPSC-2011-0074-1275>.

In its comments on the 2017 NPR,¹³ PTI reported that its analysis of 299 table saw accidents from 2007 to 2015 indicated that 35 percent of the incidents involved table saws equipped with modular blade guards, and over 50 percent of those users had removed the blade guard prior to being injured. Similarly, staff conducted a Special Study of NEISS table saw incidents that occurred from January to December 2017. A summary of this 2017 Study was provided to the Commission in the Table Saw Update package in 2019. The 2017 Study confirmed that the majority of injuries occur on table saws without a blade guard installed, and that injured users of table saws equipped with modular blade guards removed the blade guard anecdotally at the same rate as injured users of table saws equipped with traditional blade guards. Further, as discussed in section IV of this preamble, CPSC staff assessed trends for table saw blade-contact injuries, amputations, hospitalizations, and finger or hand injuries since 2010, and concluded that there had been no statistically significant change over that time period.

VI. CPSC Staff Testing of AIM Since the 2017 NPR

CPSC staff has conducted tests on table saws equipped with AIM technology, using the test probe and test method described in Appendix A of Tab A of the 2017 NPR briefing package.¹⁴ Staff used a computer-controlled electromechanical linear actuator to move a probe into the spinning blade of a table saw equipped with AIM technology. Staff conducted tests at varying blade heights and approach rates, tests with the ground of the power plug disconnected; and proof-of-concept evaluations of adding AIM technology to a battery-operated bench saw.

As discussed in section V of this preamble, UL identified the threshold between simple and severe lacerations to the finger as 4 mm from the surface of the skin. Because

¹³ PTI comment (CPSC-2011-0074-1288) in response to 2017 NPR. Retrieved from: <https://www.regulations.gov/comment/CPSC-2011-0074-1288>.

¹⁴ Available at <https://www.cpsc.gov/content/Commission-Briefing-Package-Proposed-Rule-Safety-Standard-Addressing-Blade-Contact-Injuries-on-Table-Saws>.

the test probe represents human flesh beneath the epidermis, staff subtracted the 0.5 mm thickness of the epidermal layer of skin from that 4 mm threshold value to arrive at a maximum allowable depth of cut to the test probe of 3.5 mm.

A. Prior Testing

In Tab A of the 2017 NPR briefing package, CPSC staff presented results of tests in which the test probe was introduced to an operating saw blade on a SawStop JSS-MCA jobsite table saw and a Bosch REAXX jobsite table saw. Both saws were equipped with 10-inch blades and some type of AIM technology. As shown in Table 4, the depth of cut for the SawStop table saw tests ranged from 1.5 mm to 2.8 mm, and the depth of cut for the Bosch REAXX table saw tests ranged from 1.8 mm to 2.5 mm.

Table 4. Depth of Cut Values for SawStop and Bosch Table Saws

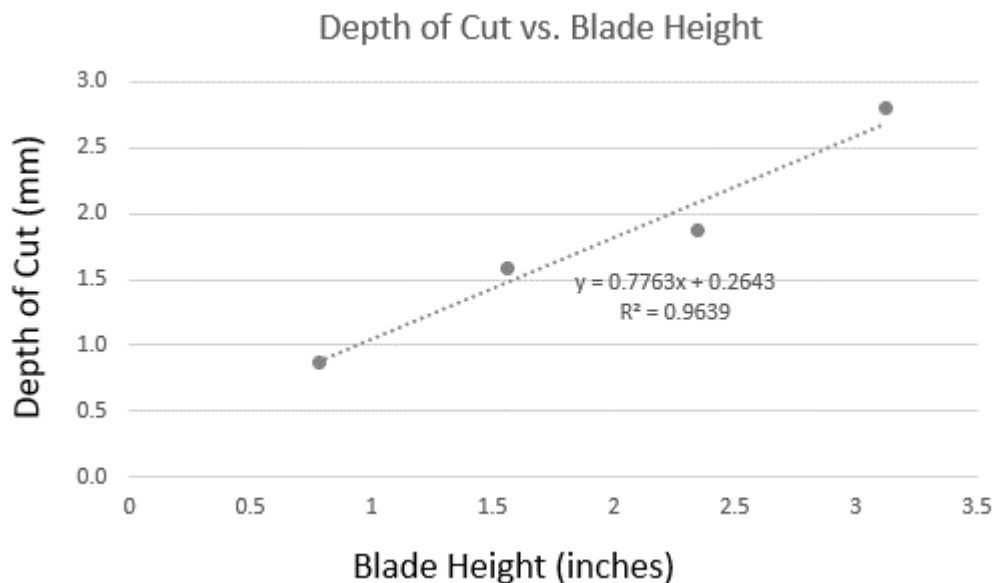
Test Run	Human Body Network (HBN) Capacitance (pF)	Depth of Cut (mm)	
		SawStop	Bosch
1	50	2.3	2.2
2	100	2.8	2.1
3	150	2.5	1.9
4	200	2.5	2.2
5	250	2.7	2.1
6	300	2.1	1.8
7	350	1.5	2.4
8	400	2.1	2.5
9	450	2.7	2.5
10	500	2.6	2.5
11	Short circuit	2.6	2.5

B. Additional Tests at Varying Blade Heights

Staff conducted tests at different blade heights on a SawStop JSS-MCA jobsite saw. As shown in Figure 5, test results indicate a linear relationship between depth of cut to the test probe and blade height. Staff determined the greatest depth of cut occurred when the table saw blade

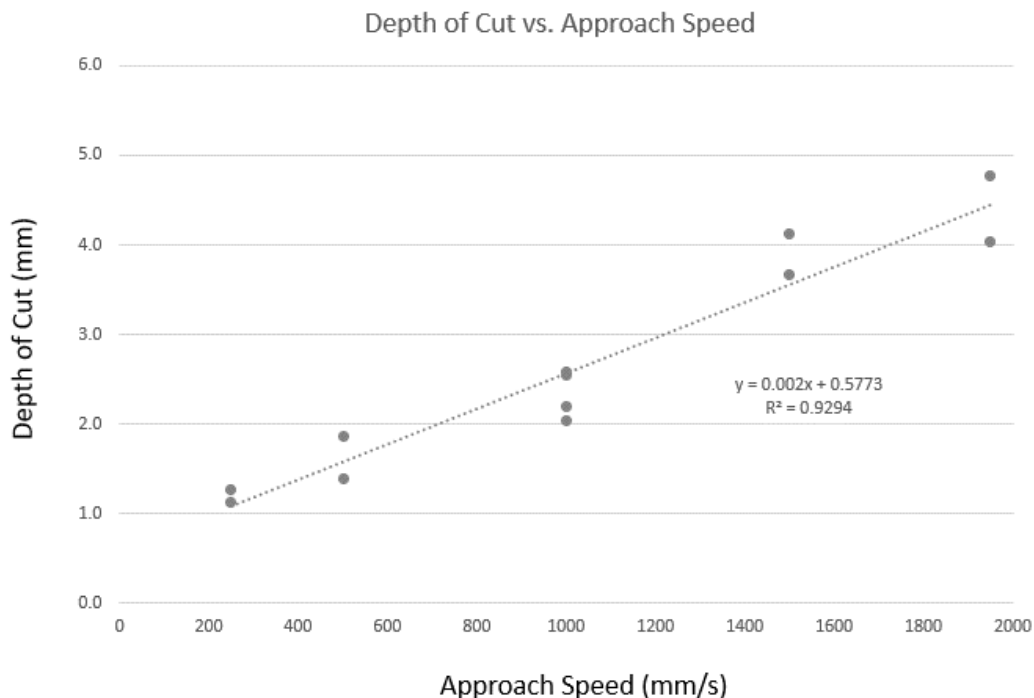
was set at its highest setting. For this reason, the rule proposed in this SNPR specifies that performance must be measured with the saw blade set at its highest setting, with no bevel angle.

Figure 5. Depth of Cut versus Blade Height (tests conducted on SawStop JSS-MCA jobsite saw)



C. Additional Tests at Varying Approach Speeds

The approach rate of the test probe to the saw blade represents the speed at which a human finger moves toward the saw blade during a blade-contact incident. Staff conducted tests at different approach rates of the probe to the blade on a SawStop JSS-MCA jobsite saw. As shown in Figure 6, test results indicate a linear relationship between depth of cut to the test probe and approach speed. This linear relationship renders testing at multiple approach rates redundant, and the proposed rule in this SNPR thus requires that table saw performance be measured at an approach rate of 1 m/s.

Figure 6. Depth of Cut Versus Approach Speed

D. Additional Tests with Ground Disconnected

CPSC staff conducted tests with the ground plug of the power cord on a SawStop JSS-MCA jobsite saw disconnected. Test results showed no effect on AIM functionality.

E. Additional Tests of SawStop Compact Table Saw

Comments to the ANPR and the 2017 NPR questioned whether AIM technology can be applied to small bench saws. Staff conducted tests with an approach rate of 1 m/s on a SawStop CTS compact table saw, with an HBN capacitance of 50 pF.¹⁵ This saw weighs 68 pounds, is equipped with a 10-inch blade, and is the smallest, most portable saw SawStop offers. Upon testing, the compact table saw equipped with AIM technology limited the depth of cut to a test probe, when approaching the blade at 1 m/s, to less than 3.5 mm.

¹⁵ 50 pF represents the body's minimum self-capacitance, and represents a worst-case scenario in which the table saw operator is located in such a way that the effective capacitance is the body's minimum self-capacitance. See Tab A of the 2017 NPR briefing package.

F. Additional Tests Demonstrating AIM on Cordless Battery-Powered Bench Saws

Since the 2017 NPR was published, cordless battery-powered table saws have been introduced to the table saw market. Cordless table saws typically are powered by lithium-ion batteries that range from 18 volts to 60 volts and are equipped with 8.25-inch blades with thinner kerfs compared to typical 10-inch blades for corded electric table saws. To evaluate the feasibility of applying AIM technology on a battery-powered bench saw, staff modified a 33-pound battery-powered bench saw equipped with an 8.25-inch blade by adding lightweight aluminum framing. This modification allowed staff to position a standard SawStop 10-inch brake cartridge at a distance that would stop the bench saw's blade if the brake cartridge was activated. The proof-of-concept testing was designed to evaluate the ability of a lightweight battery-powered bench saw to withstand the energy of an AIM system activating, so the testing did not retract the blade; instead, all of the energy required for stopping the blade was absorbed by the brake cartridge and the bench saw's structure. With the table saw on and the blade spinning at full speed, staff remotely activated the brake cartridge and the bench saw's blade came to a complete stop. The bench saw moved approximately 1 inch vertically, but there was no damage to the saw or its table surface. Based on this testing, CPSC staff concluded that a battery-powered bench saw can withstand the reaction energy of an AIM system.

In addition, applying a signal to the saw blade can be achieved by using the bench saw's battery and a voltage reducer to reduce the battery voltage to the voltage required to induce a detection signal on the saw blade. CPSC staff has noted that battery-powered bench saws already use a voltage regulator to maintain voltage within acceptable limits for the table saw to function; therefore, if there is enough voltage to operate the bench saw, there will also be enough voltage to induce a signal on the saw blade.

VII. Proposed Requirement and Changes from 2017 NPR

Based on staff's evaluations of NEISS incident data, testing conducted prior to and subsequent to the publication of the 2017 NPR, and the comments received in response to the NPR and the Special Study as discussed in section VIII of this preamble, the Commission proposes the following revisions to the rule proposed in the 2017 NPR:

- Specifically reference jobsite saws, hybrid saws, sliding saws, and battery-powered saws in the definition of "table saw," to better clarify the scope of the proposed rule and account for terms used by some industry participants;
- Remove the reference to "radial approach rate" from the rule's description of how the test probe must be introduced to the saw blade, and add descriptive language clarifying that movement of the test probe shall be parallel to the saw's table surface, with the center axis of the probe at a height of 15 ± 2 mm above the saw's table surface, as discussed in Response 1 in section VIII of this preamble;
- Require that testing be conducted while the spinning saw blade is at its maximum height setting, as discussed in section VI of this preamble.
- Revise the rule's anti-stockpiling provision to prohibit the manufacture or importation of noncompliant table saws at a rate greater than 115 percent of the rate at which table saws were manufactured or imported during the 12-month period prior to promulgation of the final rule, rather than 120 percent of the rate at which saws were manufactured during any 12-month period in the five years preceding promulgation, to more closely match the growth rate of the table saw market over the last three years.

This SNPR also proposes to change the CFR part number to 1264.

While the proposed rule establishes performance requirements intended to mitigate the risk of injury associated with contacting table saw blades, it does not dictate how table saw manufacturers must meet those requirements. There already are different methods to limit the depth of cut to a test probe or finger. SawStop stops the blade and allows angular momentum to retract it. The Bosch REAXX retracts the blade with an explosive discharge. Since the 2017 NPR was published, a system based on reverse polarity of electromagnets to retract the blade has also been introduced to the market. Furthermore, manufacturers need not use the particular test procedure described in this preamble and in Tab A of the 2017 NPR briefing package, so long as the test method they use effectively assesses compliance with the standard. Other test probes and test methods using a different detection system may be developed to detect human contact with the saw blade and to measure depth of cut.

VIII. Response to Comments

The Commission published the 2017 NPR in the Federal Register on May 12, 2017. The public comment period ended on July 26, 2017. On August 9, 2017, the Commission held a public meeting to hear oral presentations concerning the NPR. CPSC received 437 comments, which can be found at [regulations.gov](https://www.regulations.gov), under docket number CPSC-2011-0074. Approximately 66 of the 437 NPR comments supported developing regulatory standards for table saws. The other commenters generally opposed the rulemaking proceeding. On December 4, 2018, the Commission published a notice of availability of the 2017 Special Study, with comment period ending February 4, 2019. CPSC received 4 comments to the 2017 Special Study, which can also be found at [regulations.gov](https://www.regulations.gov), under docket number CPSC-2011-0074.

In this section, we describe and respond to comments on the 2017 NPR and the 2017 Special Study. We present a summary of comments by topic, followed by the Commission's response.

A. Performance Requirements and Testing Procedure

Comment 1: Bosch and PTI commented on the use of the term “radial” in section 1245.3(b) of the NPR’s proposed rule text. Bosch commented that a literal interpretation of that term would allow manufacturers to introduce a probe toward the blade at an angle that is likely to result in a shallower depth of cut, or no cut at all, thus resulting in artificially positive testing results. PTI commented that for a typical 10” diameter blade table saw, advancing the test probe along the tabletop at an approach velocity of 1 m/s would lead to slightly less than 900 mm/s in the radial direction towards the center of the blade.

Response 1: CPSC staff agrees the descriptor “radial” can be misleading. For improved clarity, the rule proposed in this supplemental NPR omits that term from its performance requirement. The rule instead describes a frontal approach to the saw blade, which is adjusted to its highest setting, with the center axis of the test probe parallel to the table saw top surface, 15 ± 2 mm above the table saw top surface, and perpendicular to the direction of approach to the saw blade. See Appendix A to Tab A of the NPR briefing package for an illustrated example of this configuration.

Comment 2: Bosch and PTI commented that the geometry of the test probe specified in rule proposed in the NPR may lead to inappropriately deep cut measurements because the contact area available for charge transfer is less on a square probe than on a cylindrical probe. This limited contact area may delay detection and lead to a deeper depth of cut on the test surrogate than would be experienced by a cylindrical probe that more closely resembles a finger.

Response 2: CPSC staff used a cuboid-shaped test probe made of conductive silicone rubber because the probe had already been developed by UL in its own testing of AIM technology and was readily available. Staff's tests using the square probe resulted in cuts less than 3 mm deep, and the commenter provided no evidence that a cylindrical probe will detect and trigger an AIM system faster than a square probe. In addition, body parts that may contact a saw blade, such as the fingertip, are not always cylindrical.

However, under sections 1264.3 and 1264.4 of the proposed rule, testers may use a cylindrical probe as proposed by Bosch and PTI, rather than the square or cuboid probe used in UL's test methodology, as long as it possesses characteristics that render it a suitable surrogate for a human finger. The March 2015 UL Research Report referenced in PTI's comment recommends that a surrogate finger possess the following general characteristics:

- **Triggering:** An ability to trigger the selected safety mechanism upon finger contact with (or in very close proximity to) the blade;
- **Clean Cut:** Material properties that allow the surrogate finger to exhibit a clean cut upon contact with the blade; and
- **Finger Setup Rigidity:** The rigidity of the surrogate finger setup should minimize bending during blade contact with a minimum rigidity of 70 kN/m.

Comment 3: Bosch commented that the test probe is not an accurate representation of the human body. Bosch stated that if a test probe were made from pure zinc or tin and connected to Earth through a low-resistance cable, then it would transfer charge better than a connection made to a human being, which could lead to AIM technology performing better in the test lab than in real-world conditions.

Response 3: The test method described in Tab A of the 2017 NPR briefing package is based on triggering a capacitance-based AIM system with a conductive test probe that is coupled to a human body network (HBN), which is a circuit that mimics the human body. The HBN uses a series of capacitors and resistors to replicate the human body's impedance, the property that triggers a capacitance-based AIM system. When the test probe, connected to the HBN, contacts the blade of a table saw equipped with a capacitance-based AIM, the HBN changes the signal on the saw blade and triggers the AIM system. Whether the probe is made from metal (as posited by this comment) or conductive rubber (as used in staff's testing) is not significant, because, based on CPSC staff's testing, the material of the probe has minimal effect on impedance compared to the series combinations of the HBN and especially the series capacitance.

Comment 4: PTI commented that the rule proposed in the NPR is inconsistent with the February 2015 and February 2016 UL ballot proposals, which required testing at variable approach rates, including rates both above and below 1 m/s. PTI suggested that testing at higher approach rates is necessary because higher approach rates result in more severe injuries.

Response 4: As discussed in section VI of this preamble, the results of staff's testing indicate a linear relationship between approach rate and depth of cut. In fact, the UL ballot proposals included approach rates and maximum depth of cuts that had a linear relationship. This linear relationship renders testing at approach rates greater than or less than 1 m/s redundant, as it is expected that higher or lower rates will result in correspondingly more or less severe injuries.

In addition, the available data on approach rates during both kickback and non-kickback-related table saw blade-contact incidents indicate the approach rate is unlikely to exceed 0.368

m/s.¹⁶ Likewise, victim response information from the 2017 Special Study indicates that in the majority of cases, approximately 57 percent, blade contact did not involve the victim's hand being pulled into the blade. Of those cases, 46 percent involved "reaching to do, or for, something," and in 17 percent "the victim's hand was fed into the blade." CPSC staff advises that these descriptors indicate that movement of the operator's hand during blade contact was below an approach rate of 1 m/s.

Comment 5: PTI commented that the Commission's test protocol needs additional specifications to ensure repeatability and reliability.

Response 5: CPSC has not received specific support for PTI's assertion that the test protocol is not repeatable or reliable. On the contrary, staff's testing of four different table saws equipped with AIM technology has shown that the protocols in the test method are sound and repeatable.

Comment 6: PTI commented that the test procedure proposed in the NPR is incomplete because it does not specify the required distance between the probe holder and the plane of the saw blade and does not specify the required stiffness of the stabilizing strip supporting the probe. PTI also commented that, due to probe flexing, results are not repeatable.

Response 6: The test procedure intentionally does not prevent testers from using a different probe or testing setup from the one described in Tab A of the NPR briefing package, but instead allows different setups that have a minimum rigidity of 70 kN/m. The tester is at liberty to design the probe holder attachment to the linear actuator to ensure that the probe remains secure within the holder and approaches the saw blade in accordance with the

¹⁶ Gass, S. (2012). Retrieved from: <https://www.regulations.gov/document?D=CPSC-2011-0074-1106>.

requirements of the rule. Staff's testing has shown that results produced by the test method are repeatable.

B. Effectiveness of Proposed Rule

Comment 7: Bosch commented that AIM-equipped table saws can require a properly grounded outlet, but properly grounded outlets may not be available on new jobsites or while working on sites with old electrical systems. Bosch suggests that this can affect the functioning of the AIM system and reduce its effectiveness in mitigating the risk of injury.

Response 7: Staff conducted tests with AIM-equipped table saws, and the results showed that the AIM system was effective without being connected to a properly grounded outlet.

Comment 8: PTI commented that UL and CPSC staff have recognized that there will be accidents where AIM technology cannot prevent severe injury. PTI questions how much the assumed effectiveness of AIM technology should be reduced in light of such accidents, and whether the Commission has taken this into account in its economic benefit-cost analysis.

Response 8: A performance requirement limiting the depth of cut to a test probe that contacts a saw blade to 3.5 mm will significantly reduce the number of severe injuries associated with operator blade-contact incidents on table saws. Lacerations less than 3.5 mm from the surface of the skin will not damage nerves or arteries, which would require surgery, and will not result in fractures, amputations, or avulsions. Consistent with the hazard patterns identified in the 2017 Special Study and data provided by SawStop demonstrating that over 7,000 activations of the SawStop AIM technology resulted in no severe injuries, CPSC assesses that nearly all severe injuries involving operator-blade contact from table saws can be mitigated by the proposed performance requirements. Accordingly, this supplemental NPR's preliminary

regulatory analysis conservatively assumes AIM technology is 90 percent effective in reducing the societal costs of blade-contact injuries.

Comment 9: Several commenters, including Robert Witte, Rob Degagne, and Kenny Smith, stated that most table saw injuries are caused by kickback of the workpiece, but the SawStop system does not prevent kickback. Others stated that riving knives eliminate kickback and therefore can prevent or mitigate most injuries.

Response 9: The Commission's analysis of blade-contact incidents indicates that there are many scenarios in which an operator's finger or hand can contact a table saw blade, and there are certain cuts on table saws that require removal of the blade guard. Sudden movement of the workpiece from kickback can cause the operator to lose control of the workpiece and cause the hand to fall into or be pulled into the blade. However, contact is also possible without kickback, for instance when the operator's hand gets too close to the blade while feeding a small workpiece, when the operator is distracted, when the blade catches the operator's glove and pulls the operator's hand into the blade, when the operator reaches to regain control of a workpiece, or when the operator brushes debris from the table while the blade is still spinning after shutoff. Based on incident information from the 2017 Special Study, PTI, and SawStop's activation data, CPSC staff assesses that most blade-contact injuries are not related to kickback, and in almost all instances AIM systems prevented serious injury, whether or not kickback was a factor.

In addition, although riving knives can reduce the potential for kickback, they do not eliminate table saw injuries. Information from the 2017 Special Study indicated that when blade guards were in use, 28 percent of the incidents occurred on table saws equipped with a riving knife. PTI's comments to the 2017 NPR indicate that only 17 percent of accidents reported to

PTI members from 2007 to 2015 involved kickback. Finally, of the accidents reported to PTI, 49 percent of the table saws involved were equipped with riving knives.

C. Benefits and Costs

Comment 10: Many commenters stated that the costs associated with the proposed rule are not justified because the cost to consumers outweighs the benefit of increased table saw safety.

Response 10: As discussed in detail in section X of this preamble, the estimated benefits from the proposed rule far exceed the estimated costs. Using a 3 percent discount rate, aggregate net benefits range from approximately \$1.28 billion to \$2.32 billion.

Comment 11: Many commenters, including hobbyist woodworkers and owners of small woodworking businesses, asserted that a standard mandating the inclusion of AIM technology in table saws will increase the price of table saws and make them unaffordable for many individuals, small businesses, and other groups of concern.

Response 11: As discussed in section X of this preamble, CPSC staff estimates that the prices for the least expensive bench saws now currently available will more than double to \$400 or more. In general, the retail prices of bench saws could increase by as much as \$285 to \$700 per unit, and the retail prices of contractor and cabinet saws could rise by as much as \$450 to \$1,000 per unit. In addition, potential adverse impacts on the utility of table saws could come in the form of consumers who choose not to purchase table saws due to price increases, and a loss of portability due to the increased weight and (potentially) size of table saws to accommodate AIM technology. The Commission seeks comment on all aspects of the SNPR's proposal, including the effects of the expected price increases on consumers generally, or specific groups of consumers.

Comment 12: Some commenters, including hobbyist woodworkers, small business owners, and the Chief Counsel for Advocacy of the Small Business Administration, expressed concern with the potential effects of the proposed rule on small businesses, and in particular whether the proposed rule could dissuade the creation of small businesses.

Response 12: While the proposed rule has no direct effect on regulations or laws concerning small business creation, the rule would affect small businesses that produce table saws by prohibiting the sale of table saws without an AIM system. This prohibition could cause some businesses to exit the table saw market and could indirectly act as a barrier to market entry. Should the holders of patents for AIM technologies refuse to license the technologies, firms would either have to develop their own technology or leave the table saw market. This could raise the general cost to start a small business, possibly to a significant extent. However, there appear to be multiple, competing AIM technologies already available, and adoption of the proposed rule could speed the development of additional AIM technology options, leading to greater licensing opportunities for table saw manufacturers.

Comment 13: Some commenters, including Nicholas Vanaria and Jarrett Maxwell, expressed concern that the proposed rule might incentivize U.S. table saw manufacturers to move their operations to other countries, resulting in domestic job loss.

Response 13: CPSC is not aware of any specific information or data supporting the speculative possibility that manufacturers might relocate to other countries in response to the proposed rule. In addition, the proposed rule would apply to all table saws imported into the United States, regardless of their place of manufacture, and relocating manufacturing operations to a different country would thus not exempt them from the rule. The Commission therefore

finds it unlikely that the proposed rule would incentivize foreign relocation of U.S. businesses to any significant extent.

Comment 14: Several commenters, including Keith Nuttle, Scott Moore, Mark Strauch, and Christopher Fray, stated that the risk of injury as discussed in the 2017 NPR and the Special Study should have been expressed in terms of the number of cuts made or exposure to table saws, rather than the number of table saws. Commenters stated that millions of cuts are made every year without incident.

Response 14: CPSC analyzed the risk of injury using the estimated number of table saws in use for each year because that is relevant data to which the Commission staff has access. Commenters did not provide sufficient data on risks per cut or exposure for staff to perform an analysis using those metrics.

D. Consumer Choice and User Behavior

Comment 15: Numerous commenters, including hobbyists and professional woodworkers, stated that table saw users should apply common sense when operating a table saw and accept the risk of using the tool. The commenters stated that the federal government should not regulate consumer choice or behavior. While most of these commenters stated that they want table saws equipped with AIM technology to be available, and some even stated that they own a SawStop saw, they supported preserving consumers' ability to evaluate costs and benefits for themselves and choose between more expensive AIM-equipped table saws and less expensive table saws without AIM technology. The Chief Counsel for Advocacy of the Small Business Administration suggested an alternative approach whereby manufacturers could continue to produce and sell table saws without AIM technology as long as they also sell a model equipped with AIM technology.

Response 15: There are some situations in the workshop that require table saw operators to remove blade guards, and an operator's decision to use a table saw without all safety devices in operation does not necessarily reflect neglect or ignorance. There are also many situations in which an operator's finger or hand may contact a blade that do not result from operator irresponsibility or negligence. Sudden movement of the workpiece from kickback can cause the operator to lose control of the workpiece and a hand to fall into or be pulled into the blade. An operator may become distracted by events outside their control and inadvertently contact the blade. Many scenarios leading to blade contact become more likely if the consumer is tired or if the consumer's view of the blade or cut is impaired in some way. In these cases, which the proposed rule would likely address, operator neglect or ignorance would not be the primary factor causing the injury.

As discussed in more detail in section X of this preamble, the proposed rule is expected to reduce amputations and other serious blade-contact injuries with a net societal benefit exceeding \$1 billion per year because it would not permit table saws on the market which are not equipped with AIM technology. While staff anticipates that some table saw models would be completely removed from the market as a result of the rule, the proposed rule would also substantially reduce the number of serious blade-contact injuries involving table saws, and their associated societal costs. In addressing the blade-contact risk, the CPSC considers the costs of blade-contact injuries, the utility of tables saws, and the impacts of limiting consumer choice. Further, the Commission has considered alternatives to the draft proposed rule that would not require all table saws to be produced with AIM technology. These alternatives are discussed in section X of this preamble.

Comment 16: Several commenters, including Robert Witte, Steven Schneider, and Bret Jacobsen, stated that adding AIM technology to table saws will give users a false sense of security and therefore increase unsafe user behavior with table saws that will also translate to injuries on other power tools. These commenters expressed concern that users will not learn to respect the dangers of table saws and power tools in general.

Response 16: While consumers who are aware that their table saws use AIM technology may react by taking less care to protect themselves from serious finger and hand injuries, people also tend to fear “dread risks,” which can be defined as “low-probability, high-consequence events,” and such risks have a substantial influence on risk perception. Severe injuries from blade contact on a table saw that employs an AIM system would fall under the category of a “dread risk” because the consequences of such a system failing could be quite severe – involving possible amputation, which would likely evoke visceral feelings of dread or horror – even if the probability of such a failure is low. In addition, consumers likely would be motivated to avoid blade contact even if the consequences of such contact are not severe, because consumers are unlikely to be ambivalent about being cut by a spinning blade with sharp teeth, even if the resulting injury is minor.

The Commission is not able to predict whether consumers will take less care when using a table saw with an AIM system, relative to current table saws—much less whether users’ behavior with other power tools might change for the worse. However, even if this does come to pass, if the AIM system is effective then the severity of an injury resulting from blade contact will be lessened, which would reduce the overall number of severe injuries associated with table saws.

Comment 17: Many commenters, including Douglas Allen and Robert Witte, suggested that, if AIM is required for all table saws, then some users might modify their saws to bypass the safety mechanism. In particular, commenters suggested that some users would engage in this behavior to avoid the nuisance of false activations.

Response 17: Because AIM technology is not expected to interfere with normal use of the table saw, most consumers would have little or no reason to bypass the AIM system once it is already on the saw.

Comment 18: Numerous commenters stated that, in order to avoid paying for a table saw with additional safety features, consumers will likely employ more dangerous methods to cut wood by using other tools such as circular saws, buying used table saws, or continuing to use older table saws that are less safe.

Response 18: The proposed rule will increase the price of table saws, and this increase is likely to reduce sales. Some consumers may hire professionals instead of doing projects themselves. Others might borrow or rent table saws, or use older table saws that they would have preferred to replace. Some might attempt to use other tools in the place of AIM-equipped table saws, as the commenters suggest. If the other tools and strategies used by consumers are more dangerous than table saws equipped with AIM technology, the effectiveness and societal benefits of the proposed rule would be reduced. However, as discussed in section X of this preamble, even if the proposed rule is assumed to be only 70 percent effective at mitigating or preventing serious injuries, the proposed rule's benefits still substantially exceed its costs.

E. Availability of AIM Technology

Comment 19: Several commenters, including businesses, trade associations, and individual table saw consumers, as well as the Chief Counsel for Advocacy of the Small

Business Administration, stated in response to the 2017 NPR that the proposed rule would effectively create a monopoly, because it would require table saw manufacturers to either license the only known effective AIM system or exit the table saw market. PTI relatedly commented that various theoretical detection systems for AIM have not yet been invented in a practical form that can be integrated into table saws.

Response 19: The Commission is aware of three firms that supply, or have supplied, the U.S. market with table saws equipped with AIM technology. These are SawStop (now owned by TTS), which equips all of its table saw models with AIM technology; Bosch, which formerly sold one model that was equipped with AIM technology, but does not currently sell an AIM-equipped table saw in the United States; and the Felder Group, which offers a single AIM-equipped model.

However, the proposed rule does not specify a particular detection system that must be used to meet the performance requirement; it instead allows manufacturers to use any detection system that meets that requirement. The implementation of a performance requirement instead of a technology requirement will encourage innovation in the development of new technologies. Indeed, in the time since the 2017 NPR was published, the Felder Group has developed its new technology called the preventative contact system (PCS), which detects motion by creating a capacitive field around the blade and reacts to impending blade contact by retracting the blade below the table surface in milliseconds. Retraction of the blade is achieved by reversing the polarity of two strong electro-magnets that hold the blade arbor in place.

While we are mindful that the current suppliers of AIM technologies might be able to exert significant power in the U.S. table saw market for a period of time if the proposed rule is adopted, the unusually extended effective date proposed in this SNPR (36 months from

publication of a final rule in the *Federal Register*), together with the encouragement of innovation in AIM that the rule should produce, sufficiently address this concern. We seek comment on this analysis.

F. Voluntary Standards and Other Alternatives to the Proposed Rule

Comment 20: Several commenters stated that table saw injuries are best reduced by training and educating users on safe practices and operation of table saws. Many commenters believed that mandatory training in the form of certification is needed.

Response 20: Warnings are less effective at eliminating or reducing exposure to hazards than designing the hazard out of a product or guarding the consumer from the hazard.¹⁷ Warnings do not prevent consumer exposure to the hazard; they instead rely on educating consumers about the hazard and then persuading consumers to alter their behavior in some way to avoid the hazard. In addition, warnings rely on consumers behaving consistently, regardless of situational or contextual factors such as fatigue, stress, or social influences. Thus, warnings are most suitable to supplement, rather than replace, redesign or guarding, unless those higher-level hazard control efforts are not feasible.

Mandatory training for consumers who purchase or use table saws is not a solution the Commission would be able to implement under its current statutory authority.

Comment 21: PTI stated that the 2017 Special Study should be understood as confirming that the voluntary standards process for table saws is working. PTI suggests that the Study underestimated the benefits of the modular blade guard system required by the voluntary standard, and PTI believes that the risk of injury on a table saw equipped with a modular blade

¹⁷ Smith, Timothy P., 2016. Human factors assessment of blade-contact scenarios and responses to ANPR public comments (Tab E of NPR Staff Briefing Package). Bethesda, MD: U.S. Consumer Product Safety Commission (November 15, 2016).

guard system is lower than reported in the Study. PTI states that its own estimates of table saw sales and populations, modular blade guard market penetration, and table saw lifespan differ from the estimates used in the Study.

Response 21: Since the 2017 Special Study was published, CPSC staff has conducted trend analyses of NEISS injuries associated with table saws. In every trend analysis, the latest of which spans from 2010 to 2021, there is no indication that table saw injuries have declined, even though table saws equipped with modular blade guard systems have come to represent the majority of the table saw population. This indicates that the voluntary standard's requirement that table saws be equipped with modular blade guards is not effective in reducing the number or severity of table saw injuries.

Comment 22: In their comments in response to the 2017 Special Study, Stephen Gass and David Pittle questioned whether the Study's conclusion that the risk of a blade-contact injury is seven times greater on a table saw equipped with a traditional blade guard system than with a modular blade guard system is inconsistent with CPSC staff's conclusion that there has been no statistically significant reduction in blade-contact injuries over the time period when table saws equipped with modular blade guards have saturated the market.

Response 22: If modular blade guard systems reduce the number or severity of blade-contact injuries in comparison to traditional blade guard systems, a detectable decreasing trend should exist within the NEISS data over the period during which table saws equipped with modular blade guards replaced in the market those equipped with traditional blade guards. In the 2017 NPR, the Commission preliminarily concluded that no such trend was detectable. This SNPR includes further trend analysis with data extending through 2021, and again identifies no statistically significant decreasing trend in the number or severity of blade-contact injuries. As

discussed in section X of this preamble, the 2017 Special Study represents only a snapshot view of a single year, as opposed to the multiple trend analyses that were more comprehensive and longer-term, and there are other significant caveats to the Special Study's finding on this point. CPSC staff has determined that the voluntary standard has not effectively reduced the number or severity of blade-contact injuries, notwithstanding the results of the Special Study.

Furthermore, even taking at face value the Special Study's conclusion that blade-contact injuries are roughly seven times more likely on table saws equipped with traditional blade guard systems, tens of thousands of blade-contact injuries continue to occur each year, more than a decade after modular blade guard requirements were incorporated into the voluntary standards. Thus, there remains an unreasonable risk of serious injury associated with table saw use, regardless of which type of blade guard system is used.

We seek further comments on this issue.

Comment 23: Several commenters stated that CPSC should mandate AIM technology on table saws only in industrial or workshop settings or schools, provide an open license for AIM technology, and/or ensure that the price of table saws with AIM technology decreases as costs for manufactures decrease with economies of scale.

Response 23: The CPSA does not give the Commission authority to regulate the use of table saws in industrial settings, to license patents, or to control the cost of products.

IX. Description of the Proposed Rule

A. Scope, Purpose, and Effective Date - § 1264.1

The proposed rule would apply to all table saws that are consumer products, as defined in the proposed rule, including bench saws, contractor saws, and cabinet saws. The proposed rule would include a requirement to mitigate the risk of blade-contact injuries on table saws.

Under section 9(g)(1) of the CPSA, 15 U.S.C. 2058(g)(1), the effective date for a consumer product safety standard must not exceed 180 days from the date the final rule is published, unless the Commission finds, for good cause, that a later effective date is in the public interest. As discussed in section XVI of this preamble, the Commission finds that 180 days is not adequate to allow for manufacturers to comply with the final rule, or for the rule to have its desired effect of promoting the development and commercial availability of additional AIM technologies. The Commission therefore proposes an effective date of 36 months following *Federal Register* publication of a final rule. The proposed rule clarifies that the rule would apply to all table saws manufactured after the effective date.

B. Definitions - § 1264.2

The proposed rule would provide that the definitions in section 3 of the CPSA (15 U.S.C. 2051) apply. In addition, the proposed rule would define “table saw” as:

a woodworking tool that has a motor-driven circular saw blade, which protrudes through the surface of a table. Table saws include bench saws, jobsite saws, contractor saws, hybrid saws, cabinet saws, and sliding saws. Table saws may be powered by alternating current from a wall outlet or direct current from a battery.

This definition has been revised from the definition set out in section 1245.2 of the rule proposed in the NPR. In order to more precisely define the scope of the rule and account for additional classifications used by some industry participants, the definition now specifically identifies jobsite saws, hybrid saws, sliding saws, and battery-powered saws as included table saws. The Commission seeks comment on this proposed definition of a table saw.

C. Requirements for Table Saw Blade Contact - §§ 1264.3 and 1264.4

The proposed rule would require table saws, when powered on, to limit the depth of cut to 3.5 mm when the center axis of the test probe, acting as a surrogate for a human finger or other body part, is moving parallel to, and is 15 ± 2 mm above the table top at a rate of 1 m/s and

contacts the spinning blade that is set at its maximum height setting. The rule would require that the test probe allow for the accurate measurement of the depth of cut to assess compliance with the proposed requirement.

The composition and form of the test probe are not defined. However, any test probe that is used should have the appropriate properties (such as electrical, optical, thermal, electromagnetic, ultrasound, etc.) to indicate human body/finger contact with the saw blade, and the appropriate physical properties to accurately measure depth of cut. While the test probe and test method described in TAB A of staff's 2017 briefing package are considered appropriate for the evaluation of AIM systems using an electrical detection system, the Commission does not propose to make this test method mandatory, because other AIM systems may use a different detection approach. For AIM systems using a different detection approach, the method should be developed based on sound material science and engineering knowledge to accurately assess compliance with the proposed requirement.

A performance requirement that limits the depth of cut to 3.5 mm at an approach rate of 1 m/s will significantly reduce the severe lacerations, fractures, amputations, and avulsions associated with operator blade-contact incidents on table saws, because the probe will have the appropriate properties to indicate human contact with the saw blade and the equivalent injury mitigation on a real human finger will avoid most microsurgery.

The Commission recognizes there may be some scenarios, such as kickback, which can cause the operator's hand to be pulled into the blade at a high rate of speed or lead the operator to reach as fast as possible for a falling workpiece. In these and other scenarios, the speed of the operator's hand or finger may exceed 1 m/s when it contacts the saw blade. At approach speeds greater than 1 m/s, AIM system performance may not be sufficient to prevent injuries that require

extensive medical attention. The use of AIM technology may, however, limit injuries where an incident otherwise would have resulted in an amputation or involved injury to several digits or a wider area, to permit instead microsurgical repair of nerves, blood vessels, and tendons. Thus, the Commission concludes that nearly all operator blade-contact injuries from table saws would be eliminated or mitigated by the proposed performance requirement.

D. Prohibited Stockpiling - § 1264.5

In accordance with section 9 of the CPSA, the proposed rule contains a provision that would prohibit a manufacturer from “stockpiling,” or substantially increasing the manufacture or importation of noncompliant table saws between the promulgation of the final rule and its effective date. The provision would prohibit a firm from manufacturing or importing noncompliant table saws at a rate that is greater than 115 percent of the rate at which the firm manufactured and/or imported table saws during the base period. The base period is the 12-month period immediately preceding the promulgation of the final rule. The cap on manufacture or importation has been reduced from the 120 percent cap proposed in the 2017 NPR to reflect the growth rate of the table saw market over recent years.

The Commission seeks comments on the proposed product manufacture or import limits and the base period with respect to the anti-stockpiling provision.

E. Findings in the Appendix to the Rule

The findings required by section 9 of the CPSA are discussed throughout the preamble of this rule and specifically set forth in the Appendix to the rule.

X. Updated Preliminary Regulatory Analysis

The Commission is proposing to issue a rule under sections 7 and 9 of the CPSA. The CPSA requires that the Commission prepare a preliminary regulatory analysis and that the

preliminary regulatory analysis be published with the text of the proposed rule. 15 U.S.C. 2058(c).

The Commission's updated preliminary regulatory analysis is contained in TAB A of staff's briefing package,¹⁸ and is summarized in this section.

A. Introduction

The CPSC is issuing a proposed rule to address the unreasonable risk of blade-contact injuries associated with table saws. This rulemaking proceeding was initiated by an ANPR published in the *Federal Register* on October 11, 2016. In 2015, to enhance CPSC's understanding of the table saw market, CPSC staff entered into two contracts with Industrial Economics, Inc. (IEc) to conduct market research and cost impact analysis on table saws. One report, titled "*Revised Final Table Saws Market Research Report*" (March 28, 2016) (referred to as IEC, 2016a), updates information relied upon in the ANPR. The report uses publicly available information and limited outreach to potentially affected entities. The other report, titled "*Final Table Saws Cost Impact Analysis*" (June 9, 2016) (referred to as IEC, 2016b), estimates the manufacturing and other costs of possible requirements intended to mitigate table saw blade-contact injuries based on previous information collected by the CPSC in the ANPR, public comments, limited interviews with table saw manufacturers, additional research, and the results of IEC, 2016a. In addition to CPSC staff's analysis of existing data, studies, and reports, staff relied on the IEC reports for additional data and information to support the preliminary regulatory analysis (TAB C of the staff NPR briefing package) and initial regulatory flexibility analysis (TAB D of the staff NPR briefing package). These reports are available on the CPSC website at <https://www.cpsc.gov/research-statistics/other-technical-reports>.

¹⁸ Available at [\[link\]](#).

B. Market Information

1. Manufacturers

The Commission has identified 23 firms that supply table saws to the U. S. market.¹⁹ PTI estimates that its member companies account for 80 percent of all table saws sold in the United States.²⁰ Most of these companies are large, diversified international corporations with billions of dollars in sales, such as Stanley Black and Decker, Robert Bosch, Makita, TTS, and Techtronic Industries Co., Ltd. These five large, diversified firms are currently supplying table saws to the U.S. market, but table saws make up a relatively small part of their revenues, probably less than one percent in each instance.

For smaller, more specialized firms, table saws are generally not a large percentage of firms' sales. One company reported that table saw sales contribute a negligible fraction of its \$15 million annual revenue. IEC, 2016a. Another company with an annual revenue of \$20 to \$40 million stated that table saws represent approximately five percent of total sales. *Id.* A third business CPSC staff interviewed attributed seven to eight percent of total revenue to table saw sales. *Id.*

2. Types of Table Saws Commonly Used By Consumers

As discussed in section III of this preamble, table saws are generally grouped into three categories: bench saws, contractor saws, and cabinet saws. Bench saws (which include saws sometimes referred to as jobsite saws) tend to be lightweight and portable, and are the least expensive of the three categories. Contractor saws are larger, heavier, more powerful, and more expensive than bench saws. Cabinet saws are the heaviest, most powerful, and most expensive

¹⁹ See TAB A of Staff Briefing Package.

²⁰ PTI, 2012. Comment by Susan M. Young for the Power Tool Institute, Inc., on "U.S. Consumer Product Commission [Docket No. CPSC-2011-0074] Table saw blade contact injuries: Advance notice of proposed rulemaking," (March 16, 2012). (Comment CPSC-2011-0074-1081, available at: regulations.gov).

of the categories. Some manufacturers also categorize table saws as “hybrid saws” or “sliding saws.” Sliding saws are similar to cabinet saws, but typically are equipped with an extension that allows for the cutting of large panels, have advanced electronic features, and sometimes include a Graphical User Interface (GUI) for operation. Nearly all sliding saws weigh more than 900 pounds and require equipment to move or relocate.

3. Retail Prices of Table Saws

The range of prices for table saws generally overlaps for three products: bench, contractor, and hybrid saws. Bench saws are the least expensive, ranging in price from \$139 to \$1,399. Prices for contractor saws range from \$599 to \$1,999, and prices for hybrid saws range from \$895 to \$4,279. Generally, cabinet and sliding saws are more expensive. Prices for cabinet saws range from \$1,399 to \$4,999. The price range for sliding table saws is wide, with models priced below \$3,400 and above \$25,000. SawStop models containing AIM technology are consistently priced at the upper end of the price range for each of the three primary table saw categories (bench, contractor, and cabinet). The least expensive saw available from SawStop is the compact table saw priced at \$900. The SawStop bench saw is the most expensive in the bench saw category at \$1,599 to \$1,799, depending on the distributor. Similarly, SawStop contractor saws, ranging in price from \$1,999 to \$2,398, represent some of the more expensive models in that product category. The SawStop cabinet models range in price from \$2,899 to \$5,949, depending on power and performance. The Felder Group model equipped with AIM technology is priced at the high end of the sliding saw price range, with prices exceeding \$25,000 depending on model options/upgrades.

4. Sales and Numbers in Use

Although the design and engineering of table saws may occur in the United States, most table saws currently are manufactured overseas. Data from the U.S. International Trade Commission indicates that from 2014 to 2017 approximately 99 percent of imported table saw units were built in Taiwan and China. A small volume of expensive industrial saws was also imported from European and Canadian manufacturers.²¹

CPSC staff estimated the annual number of table saws in use with the CPSC's Product Population Model (PPM), a statistical model that projects the number of products in use given examples of annual product sales and product failure rates. Total annual shipments of all table saws to the U.S. market from 2002 to 2017 are estimated to have ranged from 429,000 to 825,000, and total annual shipments from 2018 to 2020 are estimated to have ranged from 746,000 to 995,000. Estimates of industry-wide sales value are not readily available. CPSC staff estimated that bench saws account for about 79 percent of the units sold, with contractor saws (including hybrids) and cabinet saws accounting for approximately 12 percent and 9 percent, respectively.

Staff calculated an average product life of 10 years for bench saws, 17 years for contractor saws, and 24 years for cabinet saws. Using these parameters, staff projected a total of about 8.2 million table saws in use in the United States in 2017, including about 5.35 million bench saws (about 65 percent), 1.4 million contractor saws (about 17 percent), and 1.46 million cabinet saws (about 18 percent).

²¹ Data compiled from tariff and trade data from the U.S. Department of Commerce and the ITC for Harmonized Tariff Schedule classification numbers 8465910036 (Tilting arbor table saw, woodworking) and 8465910078 (Sawing machines, woodworking, NESOI). See <https://hts.usitc.gov>.

C. Benefit-Cost Analysis

This section of the analysis consists of a comparison of the benefits and costs of the proposed rule and explains the Commission's preliminary conclusion that the expected benefits of the proposed rule exceeds its expected costs by a wide margin.²² The benefits of the proposed rule are measured as the estimated reduction in the societal costs of injuries resulting from the use of saws containing the AIM technology. The costs of the proposed rule are defined as the added costs associated with the incorporation of the AIM technology in table saws, including the cost of the labor (at both the design and manufacturing stages) and materials required to manufacture table saws that comply with the rule. The rule would also have a cost to consumers in the form of consumer surplus loss resulting from higher prices on table saws. Staff calculated the benefits and costs of the proposed rule on a per-product-in-use basis. Benefits and costs are presented in 2021 dollars.

1. Baseline Risk and Conflicting Data

Beginning in 2010, the voluntary standards governing table saws (at that time UL 987; currently UL 62841-3-1) have required table saws to be equipped with modular blade guard systems, riving knives, and anti-kickback devices. To quantify the hazards associated with blade-contact injuries and to evaluate the effectiveness of the voluntary standards, CPSC staff conducted the 2017 Special Study. Of the 26,501 blade-contact injury cases analyzed for the Special Study, staff concluded that 12.2 percent involved saws that were compliant with the voluntary standard, 19.6 percent involved table saws with "unknown" blade guard types, and the remainder of incidents involved non-compliant saws. The Special Study found that the relative

²² See TAB A of Staff's Briefing Package for a detailed analysis of the expected benefits and costs of the proposed rule.

risk of a blade-contact injury was 7.19 times greater for a non-compliant saw than a complaint saw.

However, there are significant caveats to this finding. First, the Special Study is a snapshot analysis based on only one year of incidents. Second, there is a significant proportion of injuries associated with “unknown” blade guard types. Third, the study does not account for characteristics of the study group. For example, the study did not reveal if the consumers who purchased compliant saws were more risk-averse or safety-conscious. If this was the case, members of that group would be less likely to be involved in a table saw-related injury regardless of the type of blade guard in use. Notably, as discussed in more detail in section IV of this preamble, the NEISS data trend indicates that the rate of table saw blade contact injuries has not declined in more than a decade after the introduction of the modular blade guard requirement. Given this data, CPSC assesses that the voluntary standards have not been effective in the long run at reducing blade contact injuries.

2. Blade-Contact Injuries

The proposed rule is intended to address table saw injuries resulting from blade contact by requiring table saws to be equipped with AIM technology. According to the 2017 Special Study, there were an estimated 26,501 blade contact injuries initially treated in U.S. hospital emergency departments in 2017. The number of table saw injuries initially treated outside of hospital EDs is estimated with the CPSC’s Injury Cost Model (ICM), which uses empirical relationships between the characteristics of injuries (diagnosis and body part) and victims (age and sex) initially treated in hospital EDs and the characteristics of those initially treated in other settings.²³ Based on the 2017 annual estimate of 26,501 blade contact injuries initially treated in

²³ Lawrence, BA, Miller, TR, Waejrer, GM, Spicer, RS, Cohen, MA, Zamula, WW, 2018. The Consumer Product

hospital EDs, as determined in the 2017 Special Study, the ICM projects an additional 22,675 blade contact injuries treated in other treatment settings.

Thus, there was an estimated annual total of about 49,176 medically treated blade-contact injuries. About 60.9 percent of those injuries involved bench saws; 27.1 percent involved contractor saws; and 9.1 percent involved cabinet saws. About 3 percent involved table saws of unknown type. Staff estimates that approximately 21,504 injuries (about 43.7 percent) were treated in doctors' offices or clinics, and 1,171 injuries (about 2.4 percent) resulted in direct hospital admission, bypassing the ED. Overall, about 9.8 percent of the medically treated injuries resulted in hospitalization, either directly or following treatment in an ED.

An estimated 90.1 percent of the injuries involved fingers, with almost all of the remainder involving the hand. About 9.1 percent of the medically treated injuries involved amputations; 58.1 percent involved lacerations; and 23.5 percent involved fractures. About 33.4 percent of the amputations resulted in hospital admission, compared to about 5.9 percent of lacerations and 14.2 percent of fractures. Only about 28.7 percent of the amputations were projected to be treated in doctors' offices, clinics, and other non-hospital settings, compared with about 42.0 percent of lacerations and 49.4 percent of fractures.

The blade-contact injury rate per 100,000 saws is calculated by dividing the number of medically-treated injuries by the estimated number of table saws in use. Using the data from the 2017 Special Study, there were approximately 559 bench saw-related injuries per 100,000 bench saws in use; 951 contractor saw-related injuries per 100,000 contractor saws in use; and 306 cabinet saw-related injuries per 100,000 cabinet saws in use.

Safety Commission's Revised Injury Cost Model. Maryland: Pacific Institute for Research and Evaluation. (February 2018). Available at <https://www.cpsc.gov/s3fs-public/ICM-2018-Documentation.pdf?YWuW4Jn0eb2hExeA0z68B64cv6LIUYoE>.

3. Injury Costs of Blade Contact Injuries

The societal costs of blade-contact injuries are quantified using the ICM. The ICM's components for injury costs include medical costs, work losses, and the intangible costs associated with lost quality of life or pain and suffering.

Medical costs include three categories of expenditures: (1) medical and hospital costs associated with treating the injured victim during the initial recovery period and in the long run, including the costs associated with corrective surgery, the treatment of chronic injuries, and rehabilitation services; (2) ancillary costs, such as costs for prescriptions, medical equipment, and ambulance transport; and (3) costs of health insurance claims processing. Cost estimates for these expenditure categories were derived from a number of national and state databases, including the Medical Expenditure Panel Survey, the National Inpatient Sample of the Healthcare Cost and Utilization Project (HCUP-NIS), the Nationwide Emergency Department Sample (NEDS), the National Nursing Home Survey (NNHS), MarketScan® claims data, and a variety of other federal, state, and private databases.

Work loss estimates include: (1) the forgone earnings of the victim, including lost wage work and household work; (2) the forgone earnings of parents and visitors, including lost wage work and household work; (3) imputed long term work losses of the victim that would be associated with permanent impairment; and (4) employer productivity losses, such as the costs incurred when employers spend time rearranging schedules or training replacement workers. Estimates are based on information from HCUP-NIS, NEDS, Detailed Claims Information (a workers' compensation database), the National Health Interview Survey, the U.S. Bureau of Labor Statistics, and other sources.

The intangible, or non-economic, costs of injury reflect the physical and emotional trauma of injury as well as the mental anguish of victims and caregivers. Intangible costs are difficult to quantify because they do not represent products or resources traded in the marketplace. Nevertheless, they typically represent the largest component of injury cost and must be accounted for in any benefit-cost analysis involving health outcomes.²⁴ The ICM develops a monetary estimate of these intangible costs from jury awards for pain and suffering. Estimates for the ICM were derived from regression analysis of jury awards in nonfatal product liability cases involving consumer products compiled by Jury Verdicts Research, Inc.

This regulatory analysis discounts future benefits and costs using a 3 percent discount rate. The 3 percent rate is intended to represent what is sometimes called the “social rate of time preference,” which is consistent with the rate at which society discounts future consumption flows to their present value.²⁵

Based on ICM estimates and utilizing the 3 percent discount rate, the present value of total injury costs associated with the estimated 49,176 medically treated table saw injuries amounted to \$3.97 billion. This suggests injury costs of about \$80,650 per injury (*i.e.*, \$3.97 billion ÷ 49,176 injuries). This high estimate is largely driven by the costs associated with amputations. While amputations accounted for approximately 9.1 percent of injuries, they accounted for almost 55.3 percent of total estimated costs.

²⁴ Rice, Dorothy P., MacKenzie, Ellen J., and Associates, 1989. *Cost of injury in the United States: A report to Congress*. San Francisco, CA: Institute for Health & Aging, University of California and Injury Prevention Center, The Johns Hopkins University; Haddix, Anne C., Teutch, Steven M., Corso, Phaedra S., 2003. *Prevention effectiveness: A guide to decision and economic evaluation* (2nd ed.). New York: Oxford University Press; Cohen, Mark A., Miller, Ted R., 2003. “Willingness to award” nonmonetary damages and implied value of life from jury awards. *International Journal of Law and Economics*, 23 at 165-184; Neumann, Peter J., Sanders, Gillian D., Russell, Louise B., Siegel, Joanna E., Ganiats, Theodore G., 2016. *Cost-effectiveness in health and medicine: Second Edition*. New York: Oxford University Press.

²⁵ OMB, 2003. *Circular A-4: Regulatory analysis*. Washington, DC: Office of Management and Budget. https://www.whitehouse.gov/wp-content/uploads/legacy_drupal_files/omb/circulars/A4/a-4.pdf; Gold, Marthe R., Siegel, Joanna E., Russell, Louise B., Einsteinin, Milton C., 1996. *Cost-effectiveness in health and medicine*. New York: Oxford University Press; Haddix, et al., *supra* note 24.

The distribution of injury costs by medical treatment setting is provided in Table 5. Overall, medical costs and work losses accounted for 31 percent of the total, while the non-economic losses associated with pain and suffering accounted for 69 percent.

Table 5. Annual Societal Costs Associated with Table Saw Blade Contact Injuries, by Medical Treatment Setting and Injury Cost Component (2021 dollars; 3% discount rate)

Medical Treatment Setting	Average Cost per Injury, by Cost Component			
	Medical	Work Loss	Pain and Suffering	Total
Doctor/Clinic	\$705	\$1,982	\$21,970	\$24,657
Emergency Department (ED)	\$2,206	\$1,894	\$30,211	\$34,311
Hospital, Admitted via ED	\$18,548	\$197,213	\$308,001	\$523,761
Direct Hospital Admission	\$18,999	\$208,590	\$333,386	\$560,975

Estimates of the present value of these societal costs from blade-contact injuries, per table saw in use, and by saw type, are presented in Table 6. Row (a) shows aggregate annual societal costs, by type of saw. Annual societal costs per saw are presented in row (c) and are calculated by dividing the aggregate annual societal costs, row (a), by table saws in use, row (b). The present value of annual societal costs at a 3 percent discount rate are presented in row (e) and range from \$3,503 per bench saw to \$12,865 per cabinet saw. These present value figures represent the maximum benefits that could be derived from a rule addressing blade-contact injuries if such a rule prevented 100 percent of all such injuries.

**Table 6. Present Value of Societal Costs of Injuries per Table Saw in Use, by Table Saw Type
(based on blade contact injuries in 2017)**

	Table Saw Type		
	Bench	Contractor	Cabinet
(a) Aggregate Annual Societal Costs (Millions \$)	\$2,198. 29	\$612. 49	\$1,099. 81
(b) Table Saws in Use (Millions)	5. 35	1. 40	1. 45
(c) Annual Societal Costs per Table Saw [(a) ÷ (b)]	\$411	\$437	\$760
(d) Expected Useful Product Life (years)	10	17	24
(e) Present Value of Societal Costs, Over Expected Product Life (3 percent discount rate)	\$3,503	\$5,750	\$12,865

4. Effectiveness and Expected Benefits of the Proposed Rule

The effectiveness of AIM technology in preventing blade-contact injuries is expected to be high. However, not all injuries would be prevented, because the AIM system activates after the hand or finger comes into contact with an operating blade. Moreover, it will not mitigate all severe blade-contact injuries. For example, it will not mitigate potentially severe blade contact injuries that occur: (1) when the saw is not running; (2) when the blade is operating but the AIM system has been deactivated; (3) when the operator's hand is moving into the blade so quickly that contact with the blade cannot be reduced sufficiently to prevent serious injury; or (4) when the AIM technology leads to complacency or reductions in safety efforts on the part of users that result in injuries the AIM technology is unable to prevent, which may or may not involve blade contact. An example of the fourth category might be an operator's decision to remove other

safety equipment on the table saw, such as an anti-kickback pawl, which might increase the likelihood of an injury involving wood thrown back at the operator.

While there is insufficient information to quantify the impact of these factors with precision, there is information to highlight their impact. The 2007–2008 table saw survey found that in 5.5 percent of table saw injuries, the motor was not running.²⁶ The 2014–2015 NEISS special study found that about 2.4 percent of the blade contact injuries involved saw blades that were not in operation at the time of injury or had just been turned off.²⁷ Additionally, the existing AIM technology cannot be used when cutting conductive materials, such as non-ferrous metals (*e.g.*, aluminum) or wood that is wet enough to conduct sufficient electricity to activate the AIM system. Consequently, table saws with existing AIM systems have a bypass mode that temporarily deactivates the AIM system to prevent nuisance tripping. Although the SawStop saws automatically reset to safety mode whenever restarted, some consumers might deactivate the AIM system even when it is not necessary to do so.

Given the factors discussed in this section, we assume that AIM technology is 90 percent effective in reducing the societal costs of blade contact injuries. Table 7 recalculates benefits with a 90 percent effective rate to estimate the benefits from the proposed rule.

Table 7. Expected Benefits, per Table Saw, Assuming 90% Effectiveness

Table Saw Type	PV of Societal Costs, Over Expected Product life (3 percent discount rate)	Benefits at 90% Effectiveness, 3 Percent Discount Rate
	(a)	(b) = a × 90%
Bench	\$3,503	\$3,153
Contractor	\$5,750	\$5,175
Cabinet	\$12,865	\$11,579

²⁶ Chowdhury, Sadeq R., Paul, Caroleene, 2011. Survey of injuries involving stationary saws, table and bench saws, 2007-2008. Bethesda, MD: U.S. Consumer Product Safety Commission.

²⁷ Garland, Sarah, 2016. Table Saw blade contact injury analysis. Bethesda, MD: U.S. Consumer Product Safety Commission. (November 2016).

As discussed previously in this section of the preamble, there is inconsistent evidence whether table saws complying with the modular blade guard system requirement in UL 62841-3-1 are substantially less likely to cause severe injuries. If the voluntary standard is in fact effective in reducing the number or severity of blade-contact injuries, the proposed rule's expected reduction in societal costs would be reduced, because some of the injuries that an AIM system would be expected to prevent would already have been prevented by adherence to the voluntary standard. For an analysis of expected benefits under an assumption that the voluntary standard is in fact effective, see staff's revised preliminary regulatory analysis.²⁸

5. Costs to Meet Performance Requirements

Table saw manufacturers are likely to incur three primary types of costs to incorporate AIM technology into their table saws:

Costs of AIM technology. Manufacturers would have to either design and develop their own AIM technology or license an AIM technology developed and owned by another party. As previously noted, there are currently at most three suppliers of AIM technology. The Commission considers the development of additional AIM technologies likely if the proposed rule is adopted, but additional competitive entry is not certain. While most manufacturers of table saws would likely continue production by licensing an AIM technology, some firms, especially smaller firms, would likely drop out of the market altogether, resulting in a loss of consumer surplus as well as increased prices due to lessened competition.

Redesign and retooling costs. Incorporating AIM technology into existing models would require manufacturers to redesign each model and retool the facilities where the saws are manufactured. For example, table saw models not currently incorporating AIM technology

²⁸ TAB A of Staff's Briefing Package.

likely would require redesign to provide room for blade retraction, to allow access for users to change the cartridge and blade, and to withstand the force of the AIM system being triggered. PTI estimates that, on average, the cost to redesign and retool existing table saws would range from \$2 million to \$10 million per manufacturer.²⁹ Dr. Gass, however, has said that SawStop's tooling costs were approximately \$200,000 for its first contractor/cabinet table saw, and approximately \$700,000 for its first bench saw. He also emphasized some table saw models are minor variations on one another and share the same basic structure, which reduces costs of redesign and retooling.³⁰ Furthermore, foreign manufacturers may produce saws for multiple U.S. firms; the costs of retooling might be spread across several of their customers if the designs are similar enough.

Material and labor costs. The combination of adding a brake cartridge or other means of stopping or retracting the blade after contact with flesh, and redesigning the table saw to accommodate the additional electronic components and wiring, the required clearances, and the weight and dimensions of the AIM technology, would result in increased materials costs. For SawStop models in 2012, the additional cost associated with the AIM system was approximately \$58.³¹ An estimate from another firm, also in 2012, suggested \$74 (including cartridge, electronics, and mechanical parts).

The structure of some bench saws may need to be strengthened to improve stability and withstand the shock of blade braking and/or retraction. This strengthening may increase the overall weight of some of the lightest saws, reducing their portability and utility.

²⁹ Grahan, J. 2010. Expert report of Dr. John D. Graham. (April 27). Submitted with PTI public comments (2012) CPSC-2011-0074-1106, available at: regulations.gov.

³⁰ IEC interview with Dr. Stephen Gass, Saw Stop, LLC, November 6, 2015.

³¹ Gass, Stephen F., 2012. Comments and information responsive to ANPR for table saw blade contact injuries, by SawStop, LLC. (Mar. 16, 2012). Comment CPSC-2011-0074-1106, available at: regulations.gov.

The commission seeks comments on the impact this proposed rule would have on existing firms.

D. Manufacturing Cost Impact

To estimate the per-unit manufacturing cost of requiring AIM technology for table saws, CPSC staff assume that the costs associated with the rule are fully pushed forward to consumers, and that the expected price increases are reflective of all costs of production and supply. However, these cost impacts do not include royalty fees, which are payments that manufacturers would have to make if they license the AIM technology from other firms rather than developing their own AIM systems. From a societal perspective, royalties represent a transfer payment from one party or sector to another. Because royalties essentially move money from one party to another, and are not payments for goods or services, they are not costs for purposes of the benefit-cost analysis.³² Nevertheless, the royalties will have distributional impacts on manufacturers and consumers that are discussed below.

1. Manufacturing Costs

In 2015, SawStop predicted that retail prices for bench saws would increase by no more than \$150 per unit as result of the rule.³³ Inflated to 2021 dollars, this results in an estimated increase of \$193. In the absence of more specific information about manufacturing costs, CPSC staff used this figure as the basis for the low-end estimate of manufacturing cost increases for bench saws.

For contractor and cabinet saws, the low-end expected cost impacts were based on discussions with other industry members. One manufacturer estimated that the retail price of a

³² OMB, 2003, *supra* note 25.

³³ SawStop, LLC. 2009. Presentation to CPSC, December 8 & 9; *Osorio v. One World Technologies, Inc.*, 659 F3d 81, 83 (1st Cir 2011).

single table saw model that they produce would increase by about 30 percent as a result of the rule, including the cost of royalties. Excluding royalties, and inflated to 2021 dollars, this estimate suggests a cost increase associated with redesign, retooling, and materials of about \$321. For this analysis, we assume that this \$321 low-end cost increase can be applied to all contractor and cabinet saws.

For bench saws, the high-end cost increase is based on information provided by PTI, whose members produce primarily bench saws. In 2012, PTI estimated that the increase would be \$100 to \$800 per saw, excluding royalties.³⁴ Inflated to 2021 dollars, the midpoint of this range is \$651.

For contractor and cabinet saw models, we apply the high end of the range estimated by PTI and other manufacturers. One table saw manufacturer provided an estimate ranging from \$500 to \$800 for “larger saws,” excluding royalties. Another manufacturer estimated that the retail price of saws would increase by 20 percent, excluding the cost of royalties. IEC, 2016b. Applying this percentage to the company’s cabinet saw models results in added costs of about \$260 to \$800. CPSC assumes the high-end incremental cost increase is \$1,002, which is the upper bound of each range suggested by PTI and these two manufacturers, inflated to 2021 dollars. These costs are for the first years following adoption of the proposed safety rule. In the longer term, after about 5 years, the incremental cost should decrease as AIM technology is better developed and deployed.

³⁴ PTI, 2012. Comment by Susan M. Young for the Power Tool Institute, Inc., on “U.S. Consumer Product Commission [Docket No. CPSC-2011-0074] Table saw blade contact injuries: Advance notice of proposed rulemaking,” (March 16, 2012). (Comment CPSC-2011-0074-1081, available at: regulations.gov).

2. Replacement Parts Costs

In addition to the manufacturing costs just described, there will also be the added costs of replacement parts related to the AIM system. For purposes of this analysis, we base the cost of replacement parts on the SawStop system, which requires replacement of the brake cartridge and blade after activation of the system. Replacement part prices are estimated to include \$95 for a replacement brake cartridge, and \$30 to \$90 for a replacement blade.³⁵ Based on sales of replacement brake cartridges, SawStop estimates that the AIM system may activate about once every 9 years of use.³⁶ At a replacement rate of once every 9 years (and assuming \$95 per replacement blade), this results in an annual per-unit replacement part cost of approximately \$17. However, because blades deteriorate and require periodic replacement even in the absence of an AIM activation, CPSC assumes that the need for replacement blades due to AIM activation costs an average of about \$14 annually. The present value of this expected annual cost of \$14 over the life of a typical table saw, and discounted at a rate of 3 percent, would amount to about \$118 for bench saws (with a 10-year expected product life), \$183 for contractor saws (with an estimated 17-year product life), and \$235 for cabinet saws (with an expected 24-year product life).

The SawStop data, however, may overstate the costs of replacement parts. For instance, the AIM-equipped Bosch REAXX bench saw, which has since been withdrawn from the U.S. market, utilized a \$100 cartridge that was usable for two activations. Because the blade was not destroyed by the activation, the Bosch system had lower replacement part costs.

³⁵ PTI, 2016. Table saw facts at a glance. Accessed June 20, 2016. Available at: <http://powertoolinstitute.com/pti-pages/it-table-saw-facts.asp>.

³⁶ SawStop, March 2011, Information Package for Petition CP-03-02. As cited in CPSC (2011). Table Saw Blade Contact Injuries; Advanced Notice of Proposed Rulemaking. September 14.

The direct manufacturing and replacement costs are presented in Table 8 and rely on the low- and high-end direct manufacturing costs and the SawStop replacement costs just described.

Table 8. Direct Manufacturing and Replacement Costs

Table Saw Type	Direct Manufacturing Costs		Replacement Part Cost	Total Direct + Replacement Costs	
	Low-End Estimates	High-End Estimates		Low-End Estimates	High-End Estimates
Bench	\$193	\$651	\$118	\$311	\$769
Contractor	\$321	\$1,002	\$183	\$504	\$1,185
Cabinet	\$321	\$1,002	\$235	\$556	\$1,237

E. Lost Consumer Surplus

The increased retail prices of table saws, as compliance costs are passed on to consumers, would result in a reduction in table saw sales. Consumers who decide not to purchase table saws because of the higher prices would experience a loss in consumer surplus. The assumptions used by Commission staff to estimate the lost consumer surplus are explained in TAB A of staff's briefing package. Applying those assumptions, Table 9 shows the expected reduction in annual sales and the expected lost consumer surplus as a result of adopting the proposed rule. Reduced sales could range from about 110,800 table saws under the low-end cost estimates (column a), to about 329,900 under the high-end cost estimates (column d), representing a sales reduction of about 17 percent to 50 percent, respectively. The annual loss in consumer surplus ranges from about \$13.9 million under the low-end estimates (column c), to about \$120 million under the high-end estimates (column f).

Table 9. Post-Regulatory Annual Table Saw Sales, Sales Reduction, and Lost Consumer Surplus

	Low-End Cost Estimate			High-End Cost Estimate		
	(a) Expected Sales Reduction	(b) Expected Post- Regulatory Sales	(c) Aggregate Lost Consumer Surplus (millions \$)	(d) Expected Sales Reduction	(e) Expected Post- Regulatory Sales	(f) Aggregate Lost Consumer Surplus (millions \$)
Bench	97,917	419,083	\$11.02	297,231	219,769	\$101.50
Contractor	9,098	69,902	\$1.91	23,885	55,115	\$13.14
Cabinet	3,813	51,187	\$1.00	8,758	46,242	\$5.28
Total	110,827	540,173	\$13.92	329,874	321,126	\$119.92

Table 10 presents the total costs per table saw, including the direct manufacturing costs, replacement part costs, and lost consumer surplus. The direct manufacturing and replacement part cost estimates, per table saw, are from Table 8. The lost consumer surplus, per table saw, is calculated as the aggregate lost consumer surplus divided by the post-regulatory estimate of sales. Total per-unit costs range from roughly \$388 to \$1,210 per bench saw, from \$531 to \$1,376 per contractor saw, and from about \$576 to \$1,276 per cabinet saw.

Table 10. Total costs per saw

Table Saw Type	Low-End Cost Estimate			High-End Cost Estimate		
	Direct + Replacement	Lost Consumer Surplus	Total	Direct + Replacement	Lost Consumer Surplus	Total
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(f) = (d) + (e)
Bench	\$311	\$26	\$338	\$749	\$462	\$1,210
Contractor	\$504	\$27	\$531	\$1,138	\$238	\$1,376
Cabinet	\$556	\$20	\$576	\$1,161	\$114	\$1,276

The annual aggregate costs of the rule are estimated in columns (c) and (f) of Table 11, and range from about \$208 million, based on the low-end cost estimates, to about \$400 million,

based on the high-end cost estimates. Bench saws account for about 68 percent of the total under the low-end estimates, and about 66 percent of the total under the high-end estimates.

Table 11. Annual Post-Regulatory Sales, Per-Unit Cost Estimates, and Aggregate Annual Costs of the Proposed Rule, by Cost Level and Table Saw Type

Table Saw Type	Low-End Cost Estimates			High-End Cost Estimates		
	(a) Annual Post-Regulatory Table Saw Sales	(b) Per Unit Rule Cost	(c) Aggregate Costs (millions \$) (a × b)	(d) Annual Post-Regulatory Table Saw Sales Surplus)	(e) Per Unit Rule Cost	(f) Aggregate Costs (millions \$) (d × e)
Bench	419,083	\$338	\$141.55	219,769	\$1,210	\$266.01
Contractor	69,902	\$531	\$37.13	55,115	\$1,376	\$75.84
Cabinet	51,187	\$576	\$29.47	46,242	\$1,276	\$58.98
Total	540,173		\$208.15	321,126		\$400.83

F. Relationship Between Benefits and Costs

Section 9(f)(3)(E) of the CPSA, 15 U.S.C. 2058(f)(3)(E), provides that before adopting a final rule under CPSA sections 7 and 9, the Commission must find “that the benefits expected from the rule bear a reasonable relationship to its costs.” Although this SNPR does not establish a final rule, we nevertheless address that issue here and preliminarily conclude that the expected benefits of the proposed rule comfortably exceed its expected costs. The expected benefits and costs of the proposed rule by table saw type are presented in Table 12. The net benefit estimates suggest that the per-unit benefits exceed costs by a ratio of more than 3.5 to 1 using a 3 percent discount rate. Using a 3 percent discount rate, the estimated net benefits range from about \$503 million to \$1,326 million for bench saws, \$241 million to \$365 million for contractor saws, and \$536 million to \$629 million for cabinet saws.

Table 12. Estimated Net Benefits

Table Saw Type	Benefits per Saw (a)	Cost per Saw (Low Est - top, Hi Est. - bottom) (b)	Net Benefit per Saw (c) = (a) - (b)	Est. Annual Sales (d)	Aggregate Net Benefits (millions, \$) (e) = (c) × (d)
Bench	\$3,503	\$338	\$3,165	419,083	\$1,327
		\$1,210	\$2,293		\$504
Contractor	\$5,750	\$531	\$5,218	69,902	\$365
		\$1,376	\$4,374		\$241
Cabinet	\$12,865	\$576	\$12,289	51,187	\$629
		\$1,276	\$11,590		\$536

This general relationship is not altered with variations in some of the key parameters of the analysis, including variations in the expected product life of table saws, table saw sales, injury rates, and significant variations in the estimated costs of injuries. Furthermore, even if the Commission were to assume that the voluntary standards have been effective in reducing the number and severity of injuries, based on the findings from the 2017 Special Study, benefits would not be strongly negative and could be positive. The Regulatory Analysis Memo contains a discussion of costs and benefits under this assumption.³⁷

G. Sensitivity Analysis

The results of the regulatory analysis demonstrate that the benefits of AIM technology substantially exceed costs under most plausible scenarios. This sensitivity analysis varies several of the key parameters to show the impact on per-unit net benefits.

1. Lower AIM Effectiveness

Net benefits decline modestly if it is assumed that AIM technology is only 70 percent effective at mitigating the societal costs of blade-contact injuries, rather than 90

³⁷ TAB A to Staff's Briefing Package.

percent. Net benefits under this assumption are \$272.92 per bench saw, \$145.98 per contractor saw, and \$357.45 per cabinet saw. Benefits remain substantially greater than costs.

2. Higher Replacement Parts Costs

PTI's comments in response to the 2017 NPR stated that CPSC staff substantially underestimated replacement part costs (*i.e.*, replacement of blade and brake cartridge following activation of an AIM system), and suggested that such costs were more likely to amount to about \$36 annually, as opposed to the \$11 per year estimated in the NPR.³⁸ The PTI estimates would increase the cost per table saw, and would also result in the costs of the proposed rule exceeding the benefits. Specifically, net benefits could result in amounts as low as -\$270.24 per bench saw, -\$70.26 per contractor saw, and -\$82.86 per cabinet saw. Nevertheless, given that estimated gross benefits per saw range from approximately \$3,500 to nearly \$13,000, even the higher replacement parts costs suggested by PTI—which are not consistent with CPSC staff's analysis—result in total costs that bear a reasonable relationship to total benefits.

3. Variations in the Expected Product Life of Bench Saws

PTI commented in response to the 2017 NPR that staff's estimate that the expected product life of bench saws was 10 years was an overestimate; PTI stated that bench saws' actual expected product life was 7.5 years. *Id.* However, a shorter product life reduces the estimated number of bench saws in use while the number and cost of injuries remain the same, thereby increasing the per-unit annual benefit of reduced social costs. The combined effect is a small increase in per-saw benefits and net benefits.

³⁸ Comment by Susan M. Young for the Power Tool Institute, Inc., on U.S. Consumer Product Safety Commission, Table saw blade contact injuries: Notice of proposed rulemaking, (July 26, 2017), available at: [regulations.gov](https://www.regulations.gov).

H. Regulatory Alternatives

The Commission considered several alternatives to the proposed rule. These alternatives would mitigate the proposed rule's costs and potential disruptions in the marketplace. However, these alternatives would also reduce the expected benefits of the proposed rule.

1. Take No Regulatory Action

The Commission could end the regulatory proceeding for table saws if it concludes that a mandatory rule is no longer needed to address an unreasonable risk. We cannot estimate the benefits and costs that would be associated with this alternative, because the estimates would be affected by factors such as the extent to which manufacturers would introduce new AIM-equipped table saws in the absence of a requirement that they do so, the prices of any such table saws, and the rate at which consumers would choose to purchase such table saws. However, because the rate at which AIM technology would be adopted in the absence of a mandatory rule would probably be substantially lower than the rate under a mandatory rule, both the benefits and the costs of this alternative would be much lower than estimated for the proposed rule.

2. Later Effective Dates

The proposed rule includes an effective date of 36 months after the final rule is published in the *Federal Register*. This is a lengthy period of time, particularly given Congress's instruction that consumer product safety rules adopted under sections 7 and 9 of the CPSA ordinarily should take effect within 30 to 180 days. 15 U.S.C. 2058(g)(1). Nevertheless, an effective date even later than 36 months could help reduce the impact of the rule on manufacturers by allowing them additional time to spread the costs of the redesign, and would also allow additional time for new entrants into the market. A later effective date might

especially benefit manufacturers of bench saws because of the added technical difficulties in engineering small bench saws to incorporate AIM technology.

Although later effective dates could mitigate the impact of the proposed rule for some manufacturers, it could also delay a market-wide distribution of table saws with AIM technology. Given the net benefits per unit expected from incorporating AIM technology, delaying the effective date of the proposed rule would also delay the expected benefits of the rule.

3. Exempt Contractor and Cabinet Saws from a Product Safety Rule

The Commission could exempt cabinet and contractor saws on the grounds that, while widely purchased and used by consumers, they are generally intended for professional, commercial, or industrial users. Exempting cabinet and contractor saws could substantially reduce the adverse impact of the rule on small manufacturers because most small manufacturers market contractor and cabinet saws. Under this alternative, however, the benefits and costs would be limited to those associated with bench saws, which account for approximately 60.9 percent of medically treated blade-contact injuries. Thus, more than a third of medically treated blade-contact injuries would remain unaddressed under this alternative.

4. Limiting Applicability of Performance Requirements to Some, But Not All, Table Saws

Rather than requiring all table saws of each manufacturer to meet the requirements of the proposed standard, the Commission could require that only a subset of table saws do so. For example, if a firm produces bench saws and contractor saws, the Commission might require the firm to produce at least one bench saw model and one contractor saw model that meet the requirements of the standard. However, this option would only address a portion of total

injuries. In addition, a rule of this sort might be somewhat more difficult to enforce than a requirement that all table saws contain the AIM technology.

5. Information and Education Campaign

The Commission could conduct an information and education campaign informing consumers about blade contact hazards and blade contact injuries, and the benefits of AIM technology. The Commission could also strongly encourage consumers to always use the passive safety devices required under the voluntary standard, especially if they choose not to purchase a table saw with the AIM technology. This alternative could be implemented on its own, in the absence of other regulatory options, or it could be implemented in combination with any of the alternative options.

However, the effectiveness of warnings and instructions is limited, because they depend on consumers not only receiving and understanding the message, but also being persuaded to heed the message. Although such a campaign could help inform consumers, the Commission preliminarily concludes based on the severity of injuries and recurring hazard patterns of blade-contact injuries, coupled with the high societal costs of these injuries, that a performance requirement is necessary to reduce the unreasonable risk of blade-contact injuries.

XI. Updated Initial Regulatory Flexibility Analysis

This section provides an analysis of the impact the proposed rule would have on small businesses. Whenever an agency is required to publish a proposed rule, section 603 of the Regulatory Flexibility Act (RFA) requires that the agency prepare an initial regulatory flexibility analysis (IRFA) that describes the impact that the rule would have on small businesses and other entities. 5 U.S.C. 603. An IRFA is not required if the head of an agency certifies that the

proposed rule will not have a significant economic impact on a substantial number of small entities. 5 U.S.C. 605. The IRFA must contain:

- (1) a description of why action by the agency is being considered;
- (2) a succinct statement of the objectives of, and legal basis for, the proposed rule;
- (3) a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
- (4) a description of the projected reporting, recordkeeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; and
- (5) identification to the extent practicable, of all relevant Federal rules which may duplicate, overlap, or conflict with the proposed rule.

An IRFA must also contain a description of any significant alternatives that would accomplish the stated objectives of the applicable statutes and that would minimize any significant economic impact of the proposed rule on small entities. According to the IRFA, alternatives could include: (1) differing compliance or reporting requirements that take into account the resources available to small businesses; (2) clarification, consolidation, or simplification of compliance and reporting requirements for small entities; (3) use of performance rather than design standards; and (4) an exemption from coverage of the rule, or any part of the rule thereof, for small entities. The alternatives the Commission considered are discussed in section X of this preamble.

The IRFA prepared by CPSA staff is contained in TAB B of staff's briefing package, and is summarized below.

A. Reason for Agency Action

The proposed rule for table saws would reduce an unreasonable risk of injury associated with blade-contact injuries on table saws. CPSC staff estimate that there were an average of approximately 32,000 emergency department-treated blade-contact injuries annually from 2004 to 2020. AIM technology has been shown to significantly mitigate the severity of injuries caused by a victim's finger, hand, or other body part contacting the blade while the table saw is in operation. Accordingly, the proposed rule would establish a mandatory performance requirement to address the risk of injuries associated with blade-contact injuries on table saws.

B. Objective of and Legal Basis for the Proposed Rule

The objective of the proposed rule is to reduce the risk of serious injuries resulting from blade contact on table saws. The Commission published an ANPR in October 2011, which initiated this proceeding to evaluate regulatory options and potentially develop a mandatory standard to address the risks of blade-contact injuries associated with the use of table saws, and the Commission published an NPR in 2017. The proposed rule would be promulgated under the authority of the CPSA.

C. Small Entities to Which the Proposed Rule Will Apply

The proposed rule would apply to manufacturers, importers, and private labelers of table saws that are sold in the United States. As of March 2023, CPSC is aware of 23 firms that supply table saws to the U.S. market. Of these 23 firms, seven are small according to criteria established by the Small Business Administration (SBA). According to the SBA criteria, a table saw manufacturer is considered small if it has fewer than 500 employees, and a table saw importer is considered small if it has fewer than 100 employees. Private labelers of table saws are considered small if their annual revenue does not exceed \$41.5 million in the case of home

centers, \$35 million in the case of department stores, and \$8 million in the case of hardware stores.

Although the design and engineering of table saws may occur in the United States, most U.S. based suppliers contract the production of table saws to foreign manufacturers, generally in Taiwan or China. Shopsmith, the manufacturer of a multipurpose machine that includes a table saw, is the only small business believed to manufacture its product in the United States.

D. Compliance, Reporting, and Record Keeping Requirements of the Proposed Rule

The proposed rule would require that all table saws incorporate an AIM technology that will reduce the risk of severe injury if the finger, hand, or other body part comes into contact with the blade while the saw is in operation. In particular, the rule would require that a table saw cut no deeper than 3.5 mm into a test probe that approaches a spinning saw blade at a rate of 1 m/s before contacting the blade. The proposed rule sets out a performance requirement rather than a design standard; it does not specify the manner in which the table saw must meet this safety requirement. If a final rule is issued, manufacturers must certify pursuant to section 14 of the CPSA that the product conforms to the standard, based on either a test of each product or any reasonable method to demonstrate compliance with the requirements of the standard. For products that manufacturers certify, manufacturers would issue a general certificate of conformity (GCC).

Section 14 of the CPSA sets forth the requirements for GCCs. Among other requirements, each certificate must identify the manufacturer or private labeler issuing the certificate and any third party conformity assessment body on whose testing the certificate depends, the place of manufacture, the date and place where the product was tested, each party's name, full mailing address, telephone number, and contact information for the individual

responsible for maintaining records of test results. The certificate must be in English. Certificates must be furnished to each distributor or retailer of the product and to the CPSC, if requested.³⁹

1. Costs of Proposed Rule that Would Be Incurred by Small Manufacturers

To comply with the proposed rule, table saw manufacturers would need to license or develop an AIM technology. To license a technology, manufacturers typically pay a royalty or license fee to the owner of the patents on the technology. At this time CPSC is not able to estimate the royalty cost for licensing an AIM technology.

If a manufacturer wished to avoid fees, the manufacturer would have the challenge of developing its own AIM technology that does not infringe on an existing patent. At a minimum, such an effort would likely cost at least several hundred thousand dollars and perhaps several million dollars, based on the estimated costs of developing the existing technologies.

According to several manufacturers, incorporating AIM technology would require a redesign of each table saw model. Estimates of the redesign and retooling costs ranged from about \$100,000 to \$700,000 per model. The redesign and retooling process would be expected to take 1 to 3 years depending on the number and severity of problems encountered in the process. The redesign and retooling costs for subsequent models could be less than the costs associated with the first model.

In addition to the redesign and retooling costs, there would be costs for the additional components needed to incorporate an AIM technology. Depending upon the specific system, additional parts may include a brake cartridge; cables, parts, or brackets to secure the brake cartridge; electrodes and assemblies; and a power supply or motor control. CPSC estimates that

³⁹ The regulations governing the content, form, and availability of the certificates of compliance are codified at 16 CFR 1110.

these additional components would increase the manufacturing cost of a table saw by between \$58 and \$74.

2. Impacts on Small Businesses

Most small manufacturers are expected to license an AIM technology instead of developing their own technology. The costs of developing their own AIM technology would likely be too high for most small manufacturers, especially given the challenge of developing a technology that did not infringe upon an existing patent. However, there is no certainty that small manufacturers would be able to negotiate acceptable licensing agreements with TTS or another patent holder. If small manufacturers are unable to negotiate acceptable licensing agreements for AIM technology, it is likely they would exit the U.S. table saw market.

If a small table saw manufacturer is able to license AIM technology, it would have to determine whether each table saw model would remain profitable after redesigning it with AIM technology. Further, small table saw manufacturers that are able to license the AIM technology from TTS or another table saw manufacturer would pay royalties to a competitor. This could reduce their competitiveness in the table saw market.

Most small manufacturers of table saws also supply other types of woodworking or metal working equipment. Information provided by firms suggests that U.S. sales of table saws account for a small percentage of the total revenue of most small firms. One manufacturer suggested that U.S. table saw sales accounted for about 1 percent of the firm's total revenue. Two other firms estimated that U.S. table saw sales accounted for between 5 and 8 percent of their total revenue. IEc, 2016a. Actions that impact a firm's revenue by more than 1 percent are potentially significant. Given that small table saw manufacturers have expressed they may drop

one or more table saw models or leave the market entirely if the proposed rule is adopted, the proposed rule could have a significant impact on small manufacturers.

E. Federal Rules that May Duplicate, Overlap, or Conflict with the Proposed Rule

The Occupational Safety and Health Administration (OSHA) has established standards that cover woodworking equipment used in workplace settings, rather than by consumers. These standards are codified at 29 CFR 1910. Generally, these requirements cover workplace safety and the use of safety devices such as blade guards and hoods. Currently, OSHA standards do not mandate performance requirements that would use AIM technology on table saws that are used by consumers. Accordingly, the Commission has not identified any federal rules that duplicate or conflict with the proposed rule.

F. Alternatives Considered to Reduce the Burden on Small Entities

Under section 603(c) of the Regulatory Flexibility Act, an initial regulatory flexibility analysis must “contain a description of any significant alternatives to the proposed rule which accomplish the stated objectives of the applicable statutes and which minimize any significant impact of the proposed rule on small entities.” CPSC examined several alternatives to the proposed rule that could reduce the impact on small entities. These alternatives are discussed in section X of this preamble.

G. Comments Filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA) in Response to 2017 NPR

Pursuant to 5 U.S.C. 604, a final regulatory flexibility analysis contained in a final rule must include the agency’s response to any comments filed by the Chief Counsel for Advocacy of the SBA in response to a proposed rule, and a detailed statement of any change made to the proposed rule as a response to the comments. Although there is no such requirement for an

IRFA, staff's separate regulatory flexibility analysis memorandum⁴⁰ includes a summary of the significant issues raised in the Chief Counsel's comments on the 2017 NPR. None of the comments by SBAA resulted in CPSC staff recommending changes to the proposed rule.

XII. Environmental Considerations

Generally, the Commission's regulations are considered to have little or no potential for affecting the human environment, and environmental assessments and impact statements are not usually required. *See* 16 CFR 1021.5(a). The final rule is not expected to have an adverse impact on the environment and is considered to fall within the "categorical exclusion" for purposes of the National Environmental Policy Act. 16 CFR 1021.5(c).

XIII. Preemption

In accordance with Executive Order 12988 (February 5, 1996), the CPSC states the preemptive effect of the proposed rule, as follows:

The regulation for addressing blade-contact injuries on table saws is proposed under authority of the CPSA. 15 U.S.C. 2051–2089. Section 26 of the CPSA provides that:

whenever a consumer product safety standard under this Act is in effect and applies to a risk of injury associated with a consumer product, no State or political subdivision of a State shall have any authority either to establish or to continue in effect any provision of a safety standard or regulation which prescribes any requirements as to the performance, composition, contents, design, finish, construction, packaging or labeling of such product which are designed to deal with the same risk of injury associated with such consumer product, unless such requirements are identical to the requirements of the Federal Standard.

15 U.S.C. 2075(a). Thus, this proposed rule would preempt non-identical state or local requirements for table saws that are designed to protect against the same risk of injury, *i.e.*, injuries associated with blade contact.

⁴⁰ TAB B of Staff's Briefing Package.

Upon application to the Commission, a state or local standard may be excepted from this preemptive effect if the state or local standard: (1) provides a higher degree of protection from the risk of injury or illness than the CPSA standard, and (2) does not unduly burden interstate commerce. In addition, the federal government, or a state or local government, may establish or continue in effect a non-identical requirement for its own use that is designed to protect against the same risk of injury as the CPSC standard if the federal, state, or local requirement provides a higher degree of protection than the CPSA requirement. 15 U.S.C. 2075(b).

XIV. Certification

Section 14(a) of the CPSA requires that products subject to a consumer product safety rule under the CPSA, or to a similar rule, ban, standard or regulation under any other act enforced by the Commission, must be certified as complying with all applicable CPSC-enforced requirements. 15 U.S.C. 2063(a). A final rule addressing blade-contact injuries on table saws would subject table saws to this certification requirement.

XV. Paperwork Reduction Act

This proposed rule contains information collection requirements that are subject to public comment and review by the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1995 (PRA). 44 U.S.C. 3501–3520. We describe the provisions in this section of the document with an estimate of the annual reporting burden. Our estimate includes the time for gathering certificate data and creating General Certificates of Conformity (GCC), keeping and maintaining records associated with the GCCs, and disclosure of GCCs to third parties.

CPSC particularly invites comments on: (1) whether the collection of information is necessary for the proper performance of the CPSC's functions, including whether the information will have practical utility; (2) the accuracy of the CPSC's estimate of the burden of

the proposed collection of information, including the validity of the methodology and assumptions used; (3) ways to enhance the quality, utility, and clarity of the information to be collected; (4) ways to reduce the burden of the collection of information on respondents, including the use of automated collection techniques, when appropriate, and other forms of information technology; and (5) estimated burden hours associated with label modification, including any alternative estimates.

Title: *Safety Standard for Table Saws*

Description: The proposed rule would require table saws, when powered on, to limit the depth of cut to 3.5 millimeters when a test probe, acting as a surrogate for a human body part, contacts the spinning blade at an approach rate of 1 meter per second.

Description of Respondents: Persons who manufacture or import table saws.

Staff estimates the burden of this collection of information as follows in Table 13:

Table 13. Estimated Annual Reporting Burden

Burden Type	Number of Respondents	Frequency of Response	Total Annual Responses	Minutes per Response	Total Burden Hours	Annual Cost
GCC Creation	23	7	161	5	13.42	\$921.28
Recordkeeping	23	7	161	1.25	3.35	\$105.36
Third Party Disclosure	23	7	161	15	40.25	\$1,265.86
Total Burden	69	–	483	–	57.02	\$2,292.50

The proposed rule would require that manufacturers certify that their products conform to the rule and issue a GCC. As of March 2023, CPSC is aware of 23 firms that supply table saws

to the U.S. market. Accordingly, we estimate there are 23 respondents that will respond to the collection annually. On average, each respondent may gather certificate data and create 7 certificates for complying table saws in the market. The time required to issue a GCC is conservatively estimated as about 5 minutes (although the actual time required is often substantially less). Therefore, the estimated burden associated with issuance of GCCs is 13.42 hours (161 responses \times 5 minutes per response = 805 minutes or 13.42 hours). Staff estimates the hourly compensation for the time required to issue GCCs is \$68.65 (U.S. Bureau of Labor Statistics, “Employer Costs for Employee Compensation,” March 2023, Table 4, Private industry management, professional and related occupations: https://www.bls.gov/news.release/archives/eccc_06162023.pdf). Therefore, the estimated annual cost to industry associated with issuance of a GCC is \$921.28 (\$68.65 per hour \times 13.42 hours = \$921.283).

For purposes of this burden analysis, we assume that the records supporting GCC creation, including testing records, would be maintained for a five-year period. Staff estimates burden of 1.25 minutes per year in routine recordkeeping. This adds up to approximately 3.35 hours (161 responses \times 1.25 minutes per response = 201.25 minutes or 3.35 hours). Staff estimates the hourly compensation for the time required to maintain records is \$31.45 (U.S. Bureau of Labor Statistics, “Employer Costs for Employee Compensation,” March 2023, Table 4, Private industry sales and office occupations: https://www.bls.gov/news.release/archives/eccc_06162023.pdf). Therefore, the estimated annual burden cost associated with recordkeeping of GCCs is \$105.36 (\$31.45 per hour \times 3.35 hours = \$105.3575).

The rule would also require that GCCs be disclosed to third party retailers and distributors. Staff estimates another 161 third party disclosure responses, each one of which requires 15 minutes per year. This adds up to 2,415 minutes (161 responses × 15 minutes per response = 2,415 minutes) or 40.25 hours. Staff uses an hourly compensation for the time required to disclose certificates to third parties of \$31.45 (U.S. Bureau of Labor Statistics, “Employer Costs for Employee Compensation,” March 2023, Table 4, Private industry sales and office occupations: https://www.bls.gov/news.release/archives/ecec_06162023.pdf). Therefore, the estimated annual burden cost associated with third party disclosure of GCCs is \$1,265.86 (\$31.45 per hour × 40.25 hours = \$1,265.8625).

Based on this analysis, CPSC estimates the annual PRA burden associated with the rule at 57.02 hours (13.42 hours + 3.35 hours + 40.25 hours) with a total burden cost of \$2,292.50 (\$921.28 + \$105.36 + \$1,265.86). There are no operating, maintenance, or capital costs associated with the collection.

As required under the PRA (44 U.S.C. 3507(d)), CPSC has submitted the information collection requirements of this proposed rule to the OMB for review. Interested persons are requested to submit comments regarding information collection by **[insert date 30 days after date of publication in the FEDERAL REGISTER]**, to the Office of Information and Regulatory Affairs, OMB as described under the **ADDRESSES** section of this notice.

XVI. Effective Date

Section 9(f)(3) of the CPSA provides that a rule issued under sections 7 and 9, “including its effective date,” must be “reasonably necessary to eliminate or reduce an unreasonable risk injury associated with such product.” 15 U.S.C. 2058(f)(3). Section 9(g)(1) addresses effective dates in greater detail and requires that the effective date shall not exceed 180 days from the date

the rule is promulgated, “unless the Commission finds, for good cause shown, that a later effective date is in the public interest and publishes its reasons for such finding.” 15 U.S.C. 2058(g)(1). Similarly, the effective date must not be less than 30 days after promulgation “unless the Commission for good cause shown determines that an earlier effective date is in the public interest.”

The Commission here proposes to find good cause in the public interest to extend the effective date of this rule beyond the statutory range of 30 to 180 days, and to make the rule effective 36 months from the date of publication of the final rule. The rule would apply to all table saws manufactured after the effective date. 15 U.S.C. 2058(g)(1). This effective date is being proposed in light of the unusual market conditions presented here, where the proposed safety rule requires use of advanced technologies that are capable of being supplied competitively, but currently are dominated by a single supplier. The proposed effective date is intended to allow time for development of both existing and new AIM technologies and establishment of commercial arrangements for licensing those technologies. It thereby addresses the concerns about potential unavailability of AIM solutions at affordable cost that some commenters raised in response to the NPR. In addition, this extended effective date would allow manufacturers to spread over a 36-month period the costs of modifying the design of their table saws to incorporate AIM technology, and retooling their factories to produce table saws with the new technology. Finally, it would allow additional time for new entrants into the U.S. table saw market.

XVII. Proposed Findings

The CPSA requires the Commission to make certain findings when issuing a consumer product safety standard. 15 U.S.C. 2058(f)(1), (f)(3). The proposed findings for this proposed

rule are stated in the Appendix for proposed part 1264 and are based on information provided throughout this preamble. While the proposed findings are largely similar to those proposed in the 2017 NPR, they reflect newly available information.

XVIII. Request for Comments

We invite all interested persons to submit comments on any aspect of the proposed rule.

The Commission specifically seeks comments on the following topics:

A. Scope

- Whether certain types of table saws, such as mini or micro tables saws, or table saws that are used primarily for commercial or industrial use, should be excluded from the scope of the rule;
- Whether the scope of the rule should be expanded to include types of saws other than table saws that may present a similar blade-contact hazard (*e.g.*, tile saws);
- Whether the definition of table saws should be revised, or whether other definitions are necessary; and
- Home-made table saws or other dangerous alternatives consumers may pursue if they are unwilling or are unable to purchase a table saw with AIM capabilities.

B. Market Information

- Table saw sales by table saw type (bench, contractor, and cabinet), and information on the expected product life of each type of table saw;
- Opportunities to develop or otherwise obtain access to AIM technology for table saws, the time required to realize those opportunities, related barriers to access, and the anticipated cost of obtaining access to AIM technology; and

- The cost of AIM components, estimates of development and retooling costs, and expected time requirements to complete the development and retooling processes, including with respect to battery powered table saws.

C. Utility

- What impacts AIM technology may have on the utility of table saws for consumers.

D. Effectiveness

- The effectiveness of AIM technologies. CPSC estimates that the requirements of the proposed rule would reduce the societal costs of blade-contact injuries by approximately 90 percent. The Commission seeks comments from the public on this estimate;

- The extent to which table saws are used for cutting wet wood or conductive materials such as non-ferrous metals;

- The extent to which the AIM technology may be bypassed; and

- The extent to which consumers may switch to alternative, potentially unsafe methods to cut wood if table saws are required to be equipped with AIM technology.

E. Manufacturing Costs

- Information on manufacturing costs. The Commission seeks comments that would allow us to make more precise estimates with respect to the cost impact of a rule requiring the use of AIM technology on table saws; and

- The feasibility of incorporating AIM technology into the design of small benchtop table saws, including battery powered benchtop table saws.

F. Test Requirements

- How different detection methods may be applied as part of an AIM system, and appropriate test methods to properly evaluate the triggering of AIM systems employing these detection methods;

- Studies or tests that have been conducted to evaluate AIM technology in table saws; and
- Studies, research, or tests on the speed of the human hand/finger while woodworking and during actual blade-contact incidents, in particular.

G. Regulatory Alternatives

- Whether a 36-month effective date for the proposed rule is reasonable, or whether a longer or shorter effective date is warranted;

- The feasibility of limiting or exempting a type or subset of table saws from the proposed rule; and

- The potential impact of the proposed rule on small entities, especially small businesses.

H. Anti-stockpiling

- The limits on manufacturing or exporting contained in the proposed rule's anti-stockpiling provision; and

- The anti-stockpiling provision's base period.

Comments should be submitted in accordance with the instructions in the **ADDRESSES** section at the beginning of this document.

XIX. Notice of Opportunity for Oral Presentation

Section 9 of the CPSA requires the Commission to provide interested parties “an opportunity for oral presentation of data, views, or arguments.” 15 U.S.C. 2058(d)(2). The Commission must keep a transcript of such oral presentations. *Id.* Any person interested in

making an oral presentation must contact the Commission, as described under the **DATES** and **ADDRESSES** section of this notice.

XX. Promulgation of a Final Rule

Section 9(d)(1) of the CPSA requires the Commission to promulgate a final consumer product safety rule within 60 days of publishing a proposed rule. 15 U.S.C. 2058(d)(1).

Otherwise, the Commission must withdraw the proposed rule if it determines that the rule is not reasonably necessary to eliminate or reduce an unreasonable risk of injury associated with the product or is not in the public interest. *Id.* However, the Commission can extend the 60-day period, for good cause shown, if it publishes the reasons for doing so in the Federal Register. *Id.*

The Commission finds that there is good cause to extend the 60-day period for this rulemaking. Under both the APA and the CPSA, the Commission must provide an opportunity for interested parties to submit written comments on a proposed rule. 5 U.S.C. 553; 15 U.S.C. 2058(d)(2). The Commission is providing 60 days for interested parties to submit written comments. A shorter comment period may limit the quality and utility of information CPSC receives in comments, particularly for areas where it seeks data and other detailed information that may take time for commenters to compile. Additionally, the CPSA requires the Commission to provide interested parties with an opportunity to make oral presentations of data, views, or arguments. 15 U.S.C. 2058. This requires time for the Commission to arrange a public meeting for this purpose and provide notice to interested parties in advance of that meeting, if any interested party requests the opportunity to present such comments. After receiving written and oral comments, CPSC staff must have time to review and evaluate those comments.

These factors make it impractical for the Commission to issue a final rule within 60 days of this proposed rule. Moreover, issuing a final rule within 60 days of the NPR may limit

commenters' ability to provide useful input on the rule, as well as CPSC's ability to evaluate and take that information into consideration in developing a final rule. Accordingly, the Commission finds that there is good cause to extend the 60-day period for promulgating the final rule after publication of the proposed rule.

XXI. Conclusion

For the reasons stated in this preamble, the Commission proposes requirements to address an unreasonable risk of injury associated with table saws.

List of Subjects

16 CFR Part 1264

Consumer protection, Imports, Information, Safety, Table Saws.

For the reasons discussed in the preamble, the Commission proposes to amend Title 16 of the Code of Federal Regulations as follows:

1. Add part 1264 to read as follows:

PART 1264 - SAFETY STANDARD FOR BLADE-CONTACT INJURIES ON TABLE

SAWS

Sec.

1264.1 Scope, purpose and effective date.

1264.2 Definitions.

1264.3 Requirements.

1264.4 Test procedures.

1264.5 Prohibited stockpiling.

Appendix to Part 1264 – Findings Under the Consumer Product Safety Act

Authority: 15 U.S.C. 2056, 2058 and 2076.

§ 1264.1 Scope, purpose and effective date.

(a) This part 1264, a consumer product safety standard, establishes requirements for table saws, as defined in § 1264.2. These requirements are intended to reduce an unreasonable risk of injury associated with blade-contact injuries on table saws.

(b) Any table saw manufactured after [EFFECTIVE DATE] shall comply with the requirements stated in § 1264.3.

§ 1264.2 Definitions.

In addition to the definitions in section 3 of the Consumer Product Safety Act (15 U.S.C. 2051), the following definition applies for purposes of this part 1264:

Table Saw means a woodworking tool that has a motor-driven circular saw blade, which protrudes through the surface of a table. Table saws include bench saws, jobsite saws, contractor saws, hybrid saws, cabinet saws, and sliding saws. Table saws may be powered by alternating current from a wall outlet or direct current from a battery.

§ 1264.3 Requirements.

(a) *General.* All table saws covered by this standard shall meet the requirements stated in paragraph (b) of this section.

(b) *Test.* All table saws, when powered on, must limit the depth of cut to no more than 3.5 mm when the center axis of a test probe is moving parallel to, and 15 ± 2 mm above, the tabletop at a rate of 1 meter per second, and contacts a spinning saw blade that is set at its maximum height setting.

(c) *Test Probe.* The test probe shall act as the surrogate for a human body/finger and allow for the accurate measurement of the depth of cut to assess compliance with paragraph (b) of this section.

§ 1264.4 Test procedures.

Any test procedure that will accurately determine compliance with the standard may be used.

§ 1264.5 Prohibited stockpiling.

(a) *Base period.* The base period for table saws is the 12-month period immediately preceding the promulgation of the final rule.

(b) *Prohibited acts.* Manufacturers and importers of table saws shall not manufacture or import table saws that do not comply with the requirements of this part in any 12-month period between [date of promulgation of the rule] and [effective date of the rule] at a rate that is greater than 115 percent of the rate at which they manufactured or imported table saws during the base period.

Appendix to Part 1464 – Findings Under the Consumer Product Safety Act

The Consumer Product Safety Act requires that the Commission, in order to issue a standard, make the following findings and include them in the rule. 15 U.S.C. 2058(f)(3).

A. Degree and Nature of the Risk of Injury

In 2017, there were an estimated 26,500 table saw blade-contact, emergency department treated injuries. Of these, an estimated 25,600 injuries (96.4 percent) involved the finger. The most common diagnoses in blade-contact injuries were lacerations (approximately 16,100 injuries, or 60.9 percent of total injuries), fractures (approximately 5,500 injuries, or 20.6 percent), and amputations (approximately 2,800 injuries, or 10.7 percent).

On a broader scale, NEISS data collected by CPSC staff indicates that, from 2010 to 2021, there were an average of approximately 30,600 table saw blade-contact injuries per year. Staff determined that there was no discernible change in the pattern of blade-contact injuries or types of injuries over this period and detected no statistically significant downward trend over

the period. Staff also conducted a trend analysis to include the rate of injury per 10,000 table saws in use for each year in the analysis. The analysis suggested that there was no discernible change in the risk of injury associated with blade contact related to table saws over this period, despite the transition of the market to modular blade guards and riving knives to meet voluntary standard requirements intended to reduce blade-contact injuries.

B. Number of Consumer Products Subject to the Rule

The number of table saws in use was estimated with the CPSC's Product Population Model (PPM), a statistical model that projects the number of products in use given examples of annual product sales and product failure rates. Total annual shipments of all table saws to the U.S. market from 2002 to 2017 ranged from 429,000 to 825,000, and total annual shipments from 2018 to 2020 are estimated to have ranged from 746,000 to 995,000. CPSC staff estimated that bench saws account for about 79 percent of the units sold and have an average product life of 10 years; contractor saws (including hybrids) account for 12 percent of the units sold and have an average product life of 17 years; and cabinet saws account for approximately 9 percent of the units sold and have an average product life of 24 years. Based on this information, staff projected that a total of about 8.2 million table saws were in use in the United States in 2017, including about 5.35 million bench saws (about 65.25 percent), 1.4 million contractor saws (about 17.1 percent), and 1.46 million cabinet saws (about 17.65 percent).

C. Need of the Public for the Product and Probable Effect on Utility, Cost, and Availability

Consumers commonly purchase table saws for the straight sawing of wood and other materials, and more specifically, to perform rip cuts, cross cuts, and non-through cuts. Because operator finger/hand contact with the table saw blade is a dominant hazard pattern, the

performance requirement would limit the depth of cut and significantly reduce the frequency and severity of blade-contact injuries on table saws.

However, the rule will increase table saw production costs. CPSC expects that the prices for the least expensive bench saws now available would more than double, to \$400 or more. In general, the retail prices of bench saws could increase by as much as \$285 to \$700 per unit, and the retail prices of contractor and cabinet saws could rise by as much as \$450 to \$1,080 per unit. These higher prices may be mitigated in the longer run, but the extent of any future mitigation is unknown.

Because of the likely decline in sales following the promulgation of a rule, consumers who choose not to purchase a new table saw due to the higher price will experience a loss in utility by forgoing the use of table saws, or because they will continue to use older saws that they would have preferred to replace. There may also be some other impacts on utility, such as an increase in the weight and (potentially) the size of table saws. This factor may have a relatively small impact on the heavier and larger contractor and cabinet saws but could reduce the portability of some of the smaller and lighter bench saws.

D. Other Means to Achieve the Objective of the Rule, While Minimizing the Impact on Competition and Manufacturing

The Commission considered alternatives to the rule. For example, the Commission considered not taking regulatory action, deferring to the voluntary standard development process, exempting or limiting certain table saws from regulation, extending the rule's effective date, and relying on information and education campaigns. However, the Commission finds that these alternatives would not adequately mitigate the unreasonable risk of blade-contact injuries on table saws.

E. Rule and Effective Date are Reasonably Necessary to Eliminate or Reduce Unreasonable Risk of Injury

CPSC estimates that 26,500 table saw-related injuries involving blade contact were treated in hospital emergency departments in 2017. Based on this estimate of blade-contact injuries initially treated in hospital EDs, CPSC's injury cost model projects an additional 22,675 blade-contact injuries treated in other treatment settings. Thus, there was an estimated annual total of about 49,176 medically treated blade-contact injuries in 2017. An estimated 96.4 percent of these injuries involved the finger. The most common diagnoses in blade-contact injuries are laceration injuries, fractures, amputations, and avulsion. Thousands of amputations (an estimated 2,800 injuries in 2017 alone) occur each year on table saws. When compared to all other workshop products, table saws account for an estimated 52.4 percent of all amputations related to workshop products in 2015.

Existing safety devices, such as the blade guard and riving knife, do not adequately reduce the number or severity of blade-contact injuries on table saws. Table saws have been equipped with these passive safety devices since 2010, and there is no evidence that these safety devices have adequately reduced or mitigated blade-contact injuries. In CPSC's 2017 Special Study, an analysis of each individual case provided anecdotal information on the usage of modular and traditional blade guards. Overall, of the estimated 26,500 table saw blade-contact injuries treated in emergency departments in 2017, the blade guard was not in use in an estimated 88.9 percent of injuries (23,600). Anecdotally, the blade guard was not in use for 89.2 percent of the cases (91 of 102 cases) involving table saws equipped with traditional blade guards, and the blade guard was not in use in 88.0 percent of the cases (22 of 25 cases) involving table saws equipped with modular blade guards.

CPSC's trend analysis of the annual estimated number of emergency department-treated injuries associated with table saws covered two timespans after the voluntary standard implemented the requirement for riving knives and modular blade guards on table saws (2010 to 2021 and 2015 to 2021). The data showed that there was no discernible change in the number of injuries or types of injuries associated with table saw blade contact over either of the analyzed periods. A trend analysis to assess the risk of injury per 10,000 table saws in use also showed there was no discernible change in the risk of injury associated with table saw blade contact over the analyzed time periods.

The net benefits for the proposed rule would range from approximately \$3,153 per bench saw to approximately \$11,597 per cabinet saw over each unit's expected product life. Aggregate net benefits over approximately 1 year's production and sale of table saws could, across all categories of table saws, range from about \$1.28 billion to \$2.32 billion.

The proposed rule includes an effective date of 36 months. The Commission considered a later effective date to mitigate the impact of the proposed rule for some manufacturers, but a later date could also delay a market-wide distribution of table saws with AIM technology. Given the net benefits expected from incorporating AIM technology, delaying the effective date of the proposed rule would also delay the expected benefits of the rule.

The Commission concludes that there is an unreasonable risk of injury associated with blade-contact injuries on table saws and finds that the rule and the effective date is reasonably necessary to reduce that unreasonable risk of injury.

F. Public Interest

This rule is intended to address an unreasonable risk of blade-contact injuries on table saws. The rule would reduce and mitigate the severity of blade-contact injuries on table saws in the future; thus, the rule is in the public interest.

G. Voluntary Standards

The current voluntary standard for table saws is Underwriters Laboratories Inc. (UL) 62841-3-1, *Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery Part 3-1: Particular Requirements for Transportable Table Saws*. This standard specifies that table saws shall be provided with a modular blade guard and riving knife.

The voluntary standard does not adequately address blade-contact injuries on table saws. There has been no statistically significant reduction in the number or severity of blade-contact injuries from 2008 to 2021. The relevant voluntary standards began requiring table saws to include modular blade guard systems in 2010. In addition, available data indicates that a large percentage of table saw users encounter circumstances in which blade guards must be removed in order to effectively use their saws, and at least 100 known blade-contact injuries involving table saws equipped with modular blade guard systems have occurred.

H. Reasonable Relationship of Benefits to Costs

Based on CPSC staff's analysis of NEISS data and the CPSC's Injury Cost Model (ICM), the Commission finds that the rule would address an estimated 49,176 medically treated blade-contact injuries annually. The societal costs of these injuries (in 2021 dollars and using a 3 percent discount rate) amounted to about \$3.97 billion in 2021. Overall, medical costs and work losses account for about 31 percent of these costs, or about \$1.2 billion. The intangible costs associated with pain and suffering account for the remaining 69 percent of injury costs.

Increased manufacturing costs, as well as the expected costs of replacement parts for the AIM system, would range from about \$338 to \$1,210 per bench saw, about \$531 to \$1,376 per contractor saw, and about \$576 to \$1,276 per cabinet saw. These costs likely would be mitigated somewhat over time, but the extent of any future mitigation is unknown. Based on one year's production and sale of table saws, aggregate gross costs could range from about \$208 million to \$400 million annually. In addition to these direct manufacturing and replacement parts costs, many firms would likely need to pay royalty fees to patent holders for the AIM technology, which CPSC estimates could amount to approximately 8 percent of saws' wholesale price.

Additionally, some consumers who would have purchased table saws at the lower pre-regulatory prices will likely choose not to purchase new table saws due to price increases. The cost impact of the proposed rule on market sales may reduce aggregate sales by as much as 17 percent to 50 percent annually. The decline in sales would result in lost utility to consumers who choose not to purchase table saws because of the higher prices. Further reductions in consumer utility may result from the added weight, and hence, reduced portability associated with addition of the AIM technology on table saws.

Nevertheless, because of the substantial societal costs attributable to blade-contact injuries (nearly \$4 billion annually), and the expected high rate of effectiveness of the rule in preventing those injuries, the estimated aggregate net benefits are expected to range from about \$1.28 billion to \$2.32 billion annually. Therefore, the Commission concludes that the benefits expected from the rule bear a reasonable relationship to its costs.

I. Least Burdensome Requirement That Would Adequately Reduce the Risk of Injury

The Commission considered less burdensome alternatives to the proposed rule addressing blade-contact injuries on table saws and concluded that none of these alternatives would adequately reduce the risk of injury.

(a) *Take no regulatory action.* The Commission considered not taking any regulatory action. Under this alternative, table saws would continue to use existing passive safety devices, such as blade guards, riving knives, and anti-kickback pawls. Additionally, table saws with the AIM technology are already available for consumers who want and can afford them, albeit to a limited extent. However, not taking any action would leave the unreasonable risk of blade-contact injuries on table saws unaddressed. Based on the severity of injuries and recurring hazard patterns of blade-contact injuries, the absence of any statistically significant decline in those injuries over time, inaction by voluntary standards organizations to address the blade-contact hazard effectively, and the high societal costs of these injuries, the Commission believes a performance requirement is necessary to reduce the unreasonable risk of blade-contact injuries on all table saws.

(b) *Later Effective Date.* The proposed rule would require an effective date that is 36 months after the final rule is published in the *Federal Register*. An effective date later than 36 months could further reduce the impact of the rule on manufacturers because it would allow them additional time to benefit from the development of new AIM technologies by diverse suppliers, spread the costs of developing or negotiating for the rights to use AIM technology, modify the design of their table saws to incorporate the AIM technology, and retool their factories for production. However, almost certainly, a later effective date would also delay the

ubiquitous availability of table saws with AIM technology into the market. Because we anticipate that a longer period will not be necessary for commercial availability of AIM technologies from diverse suppliers, the Commission finds that a 36-month effective date from the issuance of a final rule is an appropriate length of time.

(c) *Exempt Contractor and Cabinet Saws, or Industrial Saws, from a Product Safety Rule.* The Commission considered whether to exempt certain types of saws commonly used by professional, commercial, or industrial users, based on their size, weight, power, or electrical specifications. Based on the severity of injuries and recurring hazard patterns of blade-contact injuries, coupled with the high societal costs of these injuries, though, a performance requirement is necessary to reduce the unreasonable risk of blade-contact injuries on all table saws. Moreover, there is no clear dividing line between consumer and professional saws.

(d) *Limit the Applicability of the Rule to Some, but Not All, Table Saws.* The Commission considered limiting the scope of the rule to a subset of table saws to allow manufacturers to produce both table saw models with AIM technology, and models without AIM technology. However, based on the severity of injuries and recurring hazard patterns of blade-contact injuries, coupled with the high societal costs of these injuries, the Commission finds that a performance requirement is necessary to reduce the unreasonable risk of blade-contact injuries on all table saws.

(e) *Information and Education Campaign.* The Commission considered whether to conduct an information and education campaign informing consumers about the dangers of blade-contact hazards, and the benefits of AIM technology. Although such a campaign could help inform consumers, without a performance requirement this approach would not be sufficient to address the unreasonable risk of blade-contact injuries on table saws.

Alberta E. Mills
Secretary, Consumer Product Safety Commission



United States
Consumer Product Safety Commission

Staff Briefing Package

Staff's Draft Proposed Rule for Table Saws

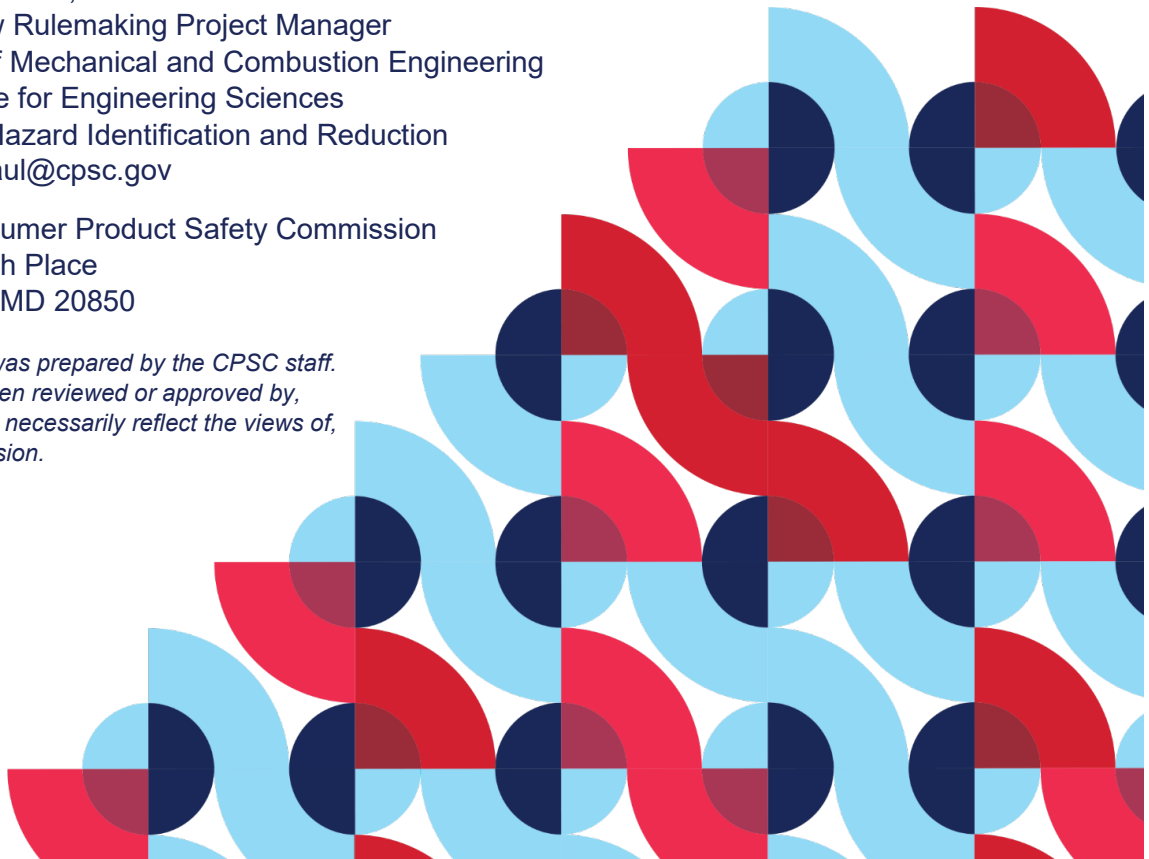
September 20, 2023

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



Briefing Memorandum



Memorandum

TO: The Commission
Alberta E. Mills, Secretary
Austin C. Schlick, General Counsel
Jason K. Levine, Executive Director
DeWane Ray, Deputy Executive Director of Operations

FROM: Duane E. Boniface, Assistant Executive Director,
Office of Hazard Identification and Reduction

Caroleene Paul, Table Saws Rulemaking Project Manager,
Division of Mechanical and Combustion Engineering, Directorate for
Engineering Sciences

SUBJECT: Staff's Draft Proposed Rule for Table Saws

DATE: September 20, 2023

This briefing package consists of the following economic analysis memos in support of the Federal Register Notice for the Supplemental Notice of Proposed Rulemaking for Table Saws:

- Tab A – Supplemental Regulatory Analysis of the Proposed Rule for Table Saws
- Tab B – Regulatory Flexibility Analysis of the Proposed Rule for Table Saws

**TAB A: Supplemental Regulatory Analysis of the
Proposed Rule for Table Saws (EC Staff
Memorandum)**



United States
Consumer Product Safety Commission

Notice of Proposed Rule

Draft Proposed Rule: Supplemental Regulatory Analysis of the Proposed Rule for Table Saws

September 20, 2023

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*This report was prepared by the CPSC staff.
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the Commission.*

Executive Summary

The U.S. Consumer Product Safety Commission (CPSC) staff provides this analysis of the draft proposed rule for table saws to address the risk of blade contact injuries. The draft proposed rule would address table saw blade contact injuries by setting performance requirements that would limit the depth of cut to 3.5 millimeters to a test probe, under specified test conditions. To meet this performance requirement, table saws would use an active injury mitigation (AIM) system, an unspecified technology that actively serves to mitigate blade contact injury resulting from a rotating saw blade by braking or retracting the saw blade. Based on results from a table saw injury special study conducted in 2017, in combination with CPSC's Injury Cost Model (ICM), staff estimates there were 49,176 medically treated blade contact injuries in 2017.

As described in this regulatory analysis and in the staff's 2019 briefing package updating the Commission on the status of the table saw project (Paul, 2019), there are considerable uncertainties regarding the effectiveness of the existing voluntary standard in addressing blade contact injuries. In contrast to injury analyses that staff conducted in 2016 and 2023, which found the existing voluntary standard to be ineffective in addressing blade contact injuries (Garland, 2016, Yang, 2023), the staff's 2017 table saw injury special study found the voluntary standard reduced injuries (Garland and Tu, 2018). While staff assesses the existing voluntary standard has not been effective at decreasing table saw blade contact injuries over the long-term based on CPSC's long-term data, staff includes a scenario in this regulatory analysis where the special study's single-year observed rate of injury reduction from the voluntary standards is assumed to occur over the long-term. Staff includes this scenario to inform the Commission of a conservative outcome for expected benefits from the rule within the range of possible scenarios.

For this regulatory analysis, staff performed a benefits assessment of the proposed rule where benefits derive from the mitigation of table saw blade-contact injuries and the associated costs of those injuries. In the scenario where the regulatory analysis concludes the existing voluntary standard to be ineffective, the estimated benefits from the draft proposed rule are \$3,503 per bench saw, \$5,750 per contractor saw, and \$12,865 per cabinet saw. In the scenario where the regulatory analysis concludes the existing voluntary standard to reduce blade contact injuries, the estimated benefits from the proposed rule (as opposed to the voluntary standard) are reduced to about \$800 per bench saw.¹

The draft proposed rule would impose the following costs: increased manufacturing costs, replacement parts for the AIM system, and decreased consumer surplus. The estimated costs of the draft proposed rule range from about \$338 to \$1,210 per bench saw, \$531 to \$1,376 per contractor saw, and \$576 to \$1,276 per cabinet saw.

An additional cost impact that staff was not able to quantify is the reduction of market competitiveness from the draft proposed rule. Currently, one to three firms have established AIM technology on which they have patents. In the cost assessment of this regulatory analysis, staff assumes the firm or firms with this technology would license to other suppliers. However, this would concentrate significant market power to these firms. Several small manufacturers have indicated that the prospective cost of redesigning their saws to incorporate the AIM

¹ Reliable benefits estimates for contractor and cabinet saws could not be made under this scenario because of the small sample from the special study of these saw types. However, such benefits would presumably be small: the 2017 special injury study found only one NEISS injury involving a compliant contractor saw and one NEISS injury involving a compliant cabinet saw.

technology may be too great, relative to their sales volume, to support such a redesign. They reported that they might respond by reducing or eliminating their offerings of table saws to the U.S. market. Significant reduction in firms would make the market less competitive, which could result in higher prices and reduced availability to consumers.

Finally, staff measured the net benefits (i.e., benefits minus costs) of the draft proposed rule. In the scenario where the voluntary standard is ineffective, net benefits are about \$2,300 to \$3,165 per bench saw, \$4,374 to \$5,218 per contractor saw, and \$11,590 to \$12,289 per cabinet saw. In the scenario where the voluntary standard reduces blade contact injuries, net benefits for bench saws range from -\$407 to \$466 per saw.

1 Introduction

In April 2003, Stephen Gass, David Fanning, and James Fulmer, representing SawStop, petitioned the CPSC to promulgate a mandatory standard for a system to reduce or prevent severe injuries from contact with the blade of a table saw. The petitioners asserted that table saws pose an unacceptable risk of severe injury because they are inherently dangerous and lack an adequate safety system to protect the user from accidental contact with the spinning blade during operation (CPSC, 2011). The request was docketed as CP03-2 and published in the Federal Register for comment (CPSC, 2003).

In July 2006, CPSC voted to grant Petition CP03-2, and directed staff to draft an advance notice of proposed rulemaking (ANPR). An ANPR was published in the Federal Register in 2011 (CPSC, 2011) and a Notice of Proposed Rulemaking (NPR) was published in 2017 (FR, May 12, 2017). The Commission is now further considering a proposed rule that would address blade contact injuries with a performance requirement intended to actively stop the blade or otherwise limit exposure to a rotating table saw blade when it detects flesh.

1.1 Proposed Rule

The draft proposed rule addresses blade contact injuries involving table saws with a performance requirement that would limit the depth of cut to a test probe of 3.5 millimeters (mm) when approaching the operating blade at a rate of 1 meter per second. Staff selected a limit of 3.5 mm for the requirement because such a limit would generally prevent serious injuries – those requiring the need for microsurgery (Amodeo and Gill, 2016, at Tab A). According to Backstrom et al. (2014), a depth of 4 mm (0.16 inches) is the maximum depth for a cut to a finger before serious injury is sustained.

To meet this performance requirement, table saws would use an AIM system, an unspecified technology that actively serves to mitigate or prevent a severe blade contact injury resulting from a rotating saw blade (e.g., by braking or retracting the blade). Conceptually, AIM technology is a two-phased system that: (1) detects contact between the rotating blade and a finger or a hand, and (2) reacts to mitigate a blade contact injury. The AIM technology currently in the marketplace relies on electrical detection of contact between a table saw operator and the rotating saw blade. The reaction system then limits the potential for laceration, by stopping and/or removing the rotating blade from the point of body contact (Amodeo and Gill, 2016).

To conduct the test for conformance to the draft proposed rule, the table saw would be assembled according to manufacturer's instructions and recommendations, with the exception that any blade guard will have been left off or removed (Amodeo and Gill, 2016). Then, under specified test conditions, a probe is made to approach the operating blade at a rate of 1 meter per second. After the probe contacts the blade and the AIM system has been activated, the power to the table saw would be turned off and the probe is examined. The table saw would pass the test if the depth of cut in the probe is 3.5 millimeters or less.

1.2 Need for the Rule

With the publication of the 2011 ANPR (CPSC, 2011), the Commission initiated a regulatory proceeding to consider whether a new performance safety standard is needed to address an unreasonable risk of injury posed by table saws. CPSC estimates that between 2010 and 2021, there were an average of 30,600 emergency department-treated injuries annually (Yang, 2023). These estimates are based on injuries reported through the CPSC's National Electronic Injury Surveillance System (NEISS), a statistical sample of about 96 hospital emergency departments (ED) located throughout the United States (Schroeder and Ault, 2001). Most incidents involved injuries to the hand or arm resulting from contact with the spinning blade of the table saw.

CPSC staff conducted a follow-up in-depth analysis of the table saw injuries reported through NEISS in 2017 (Garland and Tu, 2018). Based on Garland and Tu (2018) analysis, there were an estimated 26,500 blade contact injuries treated in U.S. hospital emergency departments in 2017.² About 9.1 percent resulted in amputations, usually of a finger or fingers. The remainder of NEISS-estimated blade contact injuries consisted mainly of lacerations (58.1 percent), fractures (23.5 percent) and other (9.3 percent). About 9.2 percent of the blade contact injuries resulted in hospitalization.

2 Market Information

This section provides an overview of the table saw market.

2.1 Product Categories

A table saw is a power tool consisting of a circular saw blade protruding through the surface of a table and driven by an electric motor. Table saws are typically segregated into five product types: bench, contractor, cabinet, hybrid, and sliding saws. There is no definitive way to identify the table saw type but generally size, weight, and price are useful in identification. Cabinet and sliding saws are much easier to identify from bench, contractor, and hybrid saws due to their weight.³ Bench saws are typically much lighter and portable allowing for easy transportation by

² This number is not inconsistent with the NEISS estimated annual average of 30,600 injuries associated with table saws from 2004 through 2021; each were based on alternative methodologies. The former, the estimated average of 30,600, was based on estimates reported through NEISS code 0841. It may have included a small proportion of injuries that did not involve blade contact, as well as excluding some table saw injuries coded under other product codes. The latter estimate, in contrast, consisted of blade contact injuries confirmed by means of interviews with the injured, but were based on injuries reported during a single year and therefore subject to statistical variation.

³ Sliding and cabinet saws can weigh up to 2000 pounds which would require special tools to safely relocate or move. Bench, contractor, and hybrid saws typically weigh under 500 pounds and can be moved by hand or using a rolling stand.

even a single individual.⁴ Contractor saws are heavier than bench saws but typically can be safely moved by two people without special equipment. Staff notes that weight and portability can vary widely for all saw types based on the features, accessories and stands provided.

Bench saws (e.g., benchtop, portable saws, jobsite saws; see Fig. 1) can weigh as little as 34

Figure 2: Example of Bench Saw



Figure 1: Example of Contractor Saw



pounds. Bench saws are popular with professional carpenters due to the ease of transporting them to job sites where they can be placed on a work bench or stand. Most bench saw models (approximately 70 percent) come with some form of stand, either a rolling, folding, or fixed stand. For models that include a stand, the stand is included in the retail price. Bench saws can include recently developed saws powered by a portable and/or removable battery. Bench saws account for approximately 79 percent of the table saw market by unit volume; estimates of bench saws as a segment of the table saw market range from 70 percent to 85 percent (PTI, 2012; Grizzly, 2012; IEC, 2016a).

Contractor saws (Fig. 2) are larger and more powerful than bench saws, typically weighing 198 to 470 pounds. Most contractor saws come with a fixed or rolling stand. Power ratings are in horsepower and typically between 1.5 to 2 horsepower range. Contractor saws account for approximately 10 percent of the table saw market by unit volume. (Bailey 2018)

Cabinet saws (also called “stationary saws”, see Fig. 3) are larger, heavier, and more powerful than contractor saws, and their blades are enclosed in a cabinet. They weigh from 300 to 1,250 pounds. Power ratings are usually in the 2 to 5 horsepower range but can sometimes exceed this range. Some cabinet saws can accommodate larger blade sizes than the 10-inch blade size available with bench and contractor saws. Cabinet saws account for approximately 6 percent of the table saw market by unit volume. (Bailey 2018)

⁴ The mean weight of bench saw models identified during staff review was 65 pounds.

Figure 3: Example of Cabinet Saw



In a review of online review of product descriptions and features, staff found five suppliers offering a total of six hybrid saws. Hybrid saws have the energy requirements, weight, and mobility of contractor saws with the structure, accuracy, and dust control features of cabinet saws. Hybrid saws weigh from 240 to 430 pounds and account for the smallest portion of the table saw market by unit volume at 2 percent.

Finally, sliding saws are similar to the cabinet saws but are typically equipped with an extension that allows for cutting of large panels, advanced electronic features, and sometimes include a Graphical User Interface (GUI) for operation. Nearly all sliding saws weigh over 900 pounds and require equipment to move or relocate. Primary difference between sliding and cabinet saws is that sliding table saws have a greater rip capacity for processing sheet goods and some limited automation features.

2.2 Retail Prices

Table saws include bench saws, contractor saws, hybrid saws, cabinet saws, and sliding saws. The range of prices for bench, contractor, and hybrid table saws overlap. Bench saws are the least expensive, ranging in price from \$139 to \$1,399. Prices for contractor saws range from \$599 to \$1,999, and prices for hybrid saws range from \$895 to \$4,279. Generally, cabinet and sliding saws are more expensive. Prices for cabinet saws range from \$1,399 to \$4,999. The price range for sliding table saws is wide with Grizzly's G0623X as the more affordable option at \$3,375 and Felder Group's Kappa models exceeding \$25,000. There is some price overlap between cabinet and sliding saws, but sliding saws are generally more expensive than all other saw types and models.

The SawStop models containing the AIM technology are consistently priced at the upper end of the price range in each of the three primary table saw categories (bench, contractor, and cabinet). The lowest price saw available from Sawstop is the compact table saw priced at \$900. The most expensive, currently available SawStop bench saw category is priced from \$1,599 to \$1,799, depending on the distributor. Similarly, the SawStop contractor saws, ranging in price from \$1,999 to \$2,398, represent some of the more expensive models in that product category. The SawStop cabinet models range in price from \$2,899 to \$5,949, depending on power and performance. The SawStop model priced at \$5,949 represents their highest priced cabinet saw. The Felder Group model equipped with AIM technology is priced at the high end of the sliding saw price range, with prices exceeding \$25,000 depending on model options and upgrades.

2.3 Suppliers

A total of 23 firms that supply table saws to the U.S. market have been identified (IEC, 2016a; IEC, 2016b).⁵ A list of these firms along with their associated brands is presented in Table 1. This list does not include manufacturers of miniature table saws used for constructing doll houses and other hobby products, or tile-cutting table saws. The list also excludes a number of Asian table saw manufacturers that may have some limited U.S. distribution.

The Power Tool Institute (PTI) estimates that its member companies account for 80 percent of all table saws sold in the United States (PTI, 2012). Most of the companies are large, diversified international corporations with billions of dollars in sales, such as Stanley Black and Decker, Robert Bosch, Makita, Tooltechnic Systems (TTS), and Techtronic Industries Co., Ltd.⁶ These five large, diversified firms currently supply table saws to the U.S. market. However, table saws make up a relatively small part of their revenues, probably less than one percent. PTI members tend to represent the mass market bench table saw manufacturers, while many of the smaller suppliers primarily serve the cabinet and contractor saw market segments.

Except for one firm, anecdotal information suggests that smaller, more specialized firms supplying table saws to the U.S. market do not have table saws as a large percentage of firms' sales. One company reported that table saw sales contribute a negligible fraction of its \$15 million annual revenue. Another company with an annual revenue of \$20 to \$40 million stated that table saws represent approximately five percent of total sales (IEC, 2016a). Similarly, a third business staff interviewed attributed seven to eight percent of total revenue to table saw sales.

Table 1: U.S. Table Saw Suppliers

Current Suppliers	Associated	Number of Models
Altendorf Group	Altendorf	3
Baileigh Industrial	Baileigh	12
Chang Type Industrial	Delta Power equipment	13
Chervon Group	Skilsaw, Skil	3
DMT Holdings	General,	3
	General International	
Emerson Electric	Ridgid	3
Felder Group USA	Hammer,Format 4	28
	Felder	
Grizzly Industrial, Inc.	Grizzly, Shopfox	26
Harbor Freight	Hercules	2
	Chicago Electric	
Laguna Tools	Laguna	4
Makita USA, Inc.	Makita	2

⁵ IEC (2016a), IEC (2016b), with CPSC staff updates.

⁶ Tooltechnic Systems is a recent entrant into the U.S. table saw market. In July 2017 TTS purchased Sawstop Incorporated. TTS is more widely known by woodworkers for its power tool brand called Festool. Festool does not currently supply the U.S. market with table saws but does supply a number of other power tool products.

Current Suppliers	Associated	Number of Models
Oliver Machinery	Oliver	4
Positec Tool	Rockwell Tools	1
Rexon Industrial Corp., Ltd.	Tradesman	5
	Rexon	
Richpower Industries	Genesis	1
Rikon Power Tools	Rikon	2
Robert Bosch Tool Corp.	Bosch	2
Shopsmith, Inc.	Shopsmith	1
Stanley Black and Decker, Inc.	DeWalt, Porter-Cable	12
	Craftsman	
Techtronic Industries Co., Ltd., One World Technologies	Ryobi, Milwaukee,	4
Tool Technic Systems	SawStop	9
True Value Company	Master Mechanic	1
Walter Meier Group	Jet, Powermatic	33

2.4 Shipments

PTI provided aggregate annual table saw shipments to US retailers (a proxy for sales) from 2002 through 2012.⁷ ⁸ Staff derived annual shipments for 2013 through 2017 from a table saw market research report published by Global Info Research (2018). (See table 2). Global Info Research also provided estimates for bench, contractor, and cabinet saws for the 2013 to 2017 time period, as shown in Table 2. For purposes of this analysis, staff assumed data provided by PTI included hybrid and sliding saws. For the time period 2013 to 2017 CPSC staff have combined the estimates for hybrid saws with contractor saws, and sliding saws with cabinet saws. In the absence of any other information on market shares by saw type, staff assumed the distribution of table saws *by type* prior to 2013 was the same as the five-year average for the 2013 to 2017 time period. Based on the Global Info Research data, the five-year average for bench, contractor, and cabinet accounted for 79 percent, 12 percent, and 9 percent of shipments respectively.

⁷ PTI annual estimates were reported on the PTI website or provided to CPSC by means of personal communication. For the years 2006 and 2007 PTI provided a range for the sales estimate rather than an exact number. We used a simple average of that range for these two years. This data was used in the regulatory analysis contained in the CPSC's 2017 notice of proposed rulemaking. See Table 4 Tab C of Commission Briefing package "Proposed Rule: Safety Standard Addressing Blade-Contact Injuries on Table Saws"

⁸ PTI provided only total estimated sales for all table saws; it did not provide estimates by table saw type.

Table 2: Annual Table Saw Shipments by Type (Thousands)

Year	Total	Bench Saws	Contractor Saws	Cabinet Saws
2002	725	573	87	65
2003	750	593	90	68
2004	775	612	93	70
2005	800	632	96	72
2006	825	652	99	74
2007	825	652	99	74
2008	650	514	78	59
2009	589	465	71	53
2010	429	339	51	39
2011	600	474	72	54
2012	625	494	75	56
2013	609	477	78	54
2014	625	494	76	55
2015	646	514	78	54
2016	625	496	76	53
2017	651	517	79	55
2018*	746	592	91	63
2019*	871	693	106	74
2020*	995	790	121	84
2021*	1,728	1,372	210	146

* Estimated using growth rate of imports for Tilting Arbor Saws first unit HTS 8465910036

2.5 Imports and Exports

While the design and engineering of table saws may occur in the United States, interviews and public comments on the NPR indicate that most table saws are currently manufactured overseas. Several firms that spoke to CPSC staff indicated that their saws are manufactured in Taiwan (IEc, 2016a). As an example, Grizzly Industrial, Inc., indicated that it operates quality control offices in Taiwan and China, and imports saws from Asia (Grizzly, 2012). This is supported by data from the U.S. International Trade Commission, which shows that from 2014 to 2017 approximately 99 percent of imported table saw units were built in Taiwan and China.⁹ A small volume of expensive industrial saws were imported from European and Canadian manufacturers.

2.6 Population of Table Saws in Use

Staff used CPSC's Product Population Model (PPM) to estimate the population of table saws in use. PPM is a statistical model that projects the number of products in use given estimates of

⁹ Data compiled from tariff and trade data from the U.S. Department of Commerce and the U.S. International Trade Commission for Harmonized Tariff Schedule classification numbers 8465910036 (Tilting arbor table saw, woodworking) and 8465910078 (Sawing machines, woodworking, NESOI). Data accessed on December 2, 2019 at: <https://dataweb.usitc.gov/trade/search>

annual product shipments and information on product failure rates over time. Staff estimated the population of each type of table saw in 2017, based on the annual shipments for each type in combination with information on the expected product life. The expected product life for a bench saw is 10 years, 17 years for contractor saws, and 24 years for cabinet saws.¹⁰ Staff estimated the distribution of failures using a gamma distribution (with a shape parameter of 3) which is a commonly used for modeling product failure rates. Using these parameters with historical shipment data, staff estimated a total of about 8.2 million table saws in use in the United States in 2017, including about 5.35 million bench saws, 1.4 million contractor saws, and 1.46 million cabinet saws. Thus, bench, contractor, and cabinet saws accounted for about 65.25 percent, 17.10 percent, and 17.65 percent of the table saw population, respectively.

2.7 Availability of AIM equipped Saws

Dr. Stephen Gass of SawStop LLC developed an AIM system for table saws in the early 2000s. AIM is intended to mitigate potentially severe table saw injuries from blade contact. SawStop attempted to license this technology to other U.S. table saw manufacturers, but these early efforts were unsuccessful (IEc, 2016b).

After the Commission issued the table saws NPR in 2017, two firms were supplying table saws equipped with AIM technology to the U.S. market. The two firms were SawStop which equipped all table saw models with an AIM system and Bosch which had one model equipped with an AIM system. As a result of an ITC investigation,¹¹ the ITC issued a ban (limited exclusion order) prohibiting the import of Bosch table saws equipped with AIM technology.¹² Once this ban went into effect on March 27th, 2017 SawStop became the only firm supplying the U.S. market with AIM equipped table saws.¹³

In July, 2017, Tooltechnic Systems LLC (TTS) acquired SawStop LLC, and is now the legal owner of all SawStop patents with the flesh sensing technology. TTS has indicated that it is open to the possibility of licensing the AIM technology if the CSPC promulgates a rule requiring the technology on all table saws. However, TTS has also said that “given the breadth of intellectual property that has been developed by SawStop, it no longer is a simple matter to say what such a license would or should include and what structure it would be” (communication between Mr. Fabian Klopfer, CEO of TTS, and Mark Bailey, US CPSC, June 1, 2019).

On December 21st, 2018 SawStop petitioned the ITC in regard to modify the limited exclusion order to allow Bosch to import an AIM equipped saw.¹⁴ This agreement covered U.S. patents 7,895,927 and 8,011,279. But as of this document, Bosch does not supply the U.S. market with AIM equipped table saws. No details related to licensing compensation have been made public

¹⁰ Estimates based on information provided by Peter Domeny, on behalf of PTI, in a meeting with Commissioner Adler on March 2, 2011. PTI has since said bench saws have an average product life of about 7.5 years (PTI, 2017). To address this comment, we have conducted a sensitivity analysis in of the impact of a 7.5 year expected product life on the benefit-cost results. See Section 6 below.

¹¹ ITC Investigation 337-TA-965.

¹² See https://www.usitc.gov/secretary/fed_reg_notices/337/337_965_notice01272017sgl.pdf, accessed on 5/1/2019.

¹³ 14 CFR § 294.51 states that any department order under §294.50 is subject to presidential review for 60 days after issue. The ITC ban was issued on January 27th, 2017.

¹⁴ ITC denied the request to modify the limited exclusion order on February 25th 2019 as it already permits licensed activity.

and the CEO of TTS USA has stated in communications with staff that currently no details on business cases with partners can be shared due to confidentiality agreements.¹⁵

Staff note that SawStop LLC was the only firm manufacturing and marketing table saws with the AIM technology in the United States as of the original NPR publication in 2017. A recent model offered by Felder is being marketed with an equipped AIM system called the Preventative Contact System (PCS) but the model is priced on the higher end of retail prices at over \$25,000.¹⁶ The SawStop models, which account for a relatively small share of the overall table saw market, have been consistently priced at the upper end of the price range in each of the three primary table saw categories (i.e., bench, contractor, and cabinet), thereby limiting the quantity demanded. For example, while the median price of bench saw (the least expensive type of saws available) are about \$400, the SawStop bench saw models retail for about \$900 to \$1,500 per unit.

3 Supplemental Regulatory Analysis: Benefits Assessment

The preliminary regulatory analysis, which compares the benefits and costs of the draft proposed rule, is conducted from a societal perspective, considering all of the significant costs and health outcomes (Gold et al., 1996; Haddix, Teutsch, and Corso, 2003; Neumann et al, 2016). Benefits and costs, as well as product-related risks, are calculated on a per-product in use basis, an approach that has been found useful at the CPSC (Rodgers and Rubin, 1989; Franklin, 2014; Rodgers and Garland, 2016; C Smith, 2016; Jenkins and Rodgers, 2020; Bailey, 2021; Bailey, 2022). Both benefits and costs are presented in 2021 dollars.

The benefits of the rule are measured as the expected reduction in the societal costs of injuries that would result from the draft proposed standard. Societal costs include both the tangible and intangible costs that table saw injuries impose on the victim and other members of society. Similarly, the costs of the rule are defined as the costs associated with incorporating the AIM technology that the draft proposed standard would require, including the cost of the labor (design and manufacturing) and materials required to manufacture table saws that comply with the rule. The regulatory analysis's primary outcome measure is the net benefit (i.e., benefits minus costs) of the rule.

As noted, the primary analysis calculates the benefits and costs of the rule on a per-product in use basis. However, aggregate benefits and costs, as applied to the in-use population of table saws in 2017, are calculated throughout this regulatory analysis for additional context.

This section of the regulatory analysis is organized as follows: section 3.1. describes the incidence and characteristics of blade contact injuries involving table saws; section 3.2. estimates the societal costs of the blade contact injuries; section 3.3 discusses the uncertainty regarding the effectiveness of the existing voluntary standard (Garland, 2016; Garland and Tu, 2018), followed by a discussion in section 3.3.1. of expected benefits under the scenario that

¹⁵ In a call with CPSC staff on April 17th, 2020 Bosch staff also stated that no details related to the agreement with Sawstop can be disclosed at this time.

¹⁶ Currently, this system is only available on one model of Felder's table saws and staff is unaware of any efforts to license the technology.

the voluntary standard *does not* reduced the rate of blade contact (Garland, 2016) and, in section 3.3.2., expected benefits under the scenario that the voluntary standard *does* reduce the rate of blade contact (Garland and Tu, 2018).

3.1 Baseline Risk

Estimating the expected benefits of the draft proposed rule is complicated by conflicting information on the effectiveness of the existing voluntary standard for table saws under the 7th edition of UL 987. This voluntary standard became effective in 2010 and requires a modular blade guard (MBG), a riving knife, and an anti-kickback device.^{17 18} For purposes of this analysis, saws meeting the UL 987, 7th ed. will be referred to as “compliant” to the voluntary standard; all others will be referred to as “non-compliant”.

To quantify the hazards, the Directorate for Epidemiology conducted a special study of table saw blade contact injuries reported through the CPSC’s NEISS during 2017 (Garland and Tu, 2018). A multidisciplinary team of CPSC analysts evaluated the table saw blade contact injuries from NEISS cases to determine whether the saw was compliant with UL 987, 7th edition or later. This analysis found that 57 percent of saws conformed to the voluntary standard. Of the 26,501 blade contact injury cases studied, 12.2 percent of them involved compliant saws, 19.6 percent were associated with “unknown” blade guard types, and the remainder involved non-compliant saws. The special study found that the relative risk of a blade-contact injury is 7.19 times more for a non-compliant saw than a compliant saw. This finding suggests a significant reduced risk of blade contact for table saws compliant with the existing voluntary standard.

However, there are significant caveats to this finding. First, the study is a snapshot analysis based only on one year of incidents (2017). Second, there is a significant proportion of injuries associated with “unknown” blade guard type as manufactured with the table saw. Finally, the study does not account for characteristics of the study group. For example, the study did not reveal if the consumers who purchased compliant saws were more risk-averse and/or safety conscious. If this was the case, that group would be less likely to be involved in a table saw blade contact injury independent of the saws they used. Notably, the NEISS data trend has shown this may be the case since the rate of table saw blade contact injuries has not declined in more than a decade after the introduction of the voluntary standard. Given these data points, staff assesses, based on the NEISS data analysis, that the voluntary standards have not been holistically effective in the long run at reducing blade contact injuries.

3.2 Injuries Involving Blade Contact

According to the table saw special study, there were an estimated 26,501 blade contact injuries initially treated in U.S. hospital EDs during 2017. In addition to injuries initially treated in hospital EDs, many product-related injuries are treated in other medical settings, such as physicians’ offices, clinics, and ambulatory surgery centers. Some injuries also result in direct hospital admissions, bypassing the hospital ED entirely. Staff estimated the number of table saw injuries initially treated outside of hospital EDs using CPSC’s ICM, which uses empirical relationships between the characteristics of injuries (diagnosis and body part) and victims (age and sex)

¹⁷ The UL 987 requirements state that the blade guard, riving knife, and anti-kickback device must be of “modular design,” which means that each can be installed or removed independently of one another.

¹⁸ UL 987 has been replaced with UL-62841-1.

initially treated in hospital EDs and the characteristics those initially treated in other settings (Lawrence et al, 2019) to extrapolate for a national estimate of all injuries.

The ICM estimate of injuries treated outside of hospitals or hospital EDs (e.g., in doctors' offices, clinics, etc.) is based on data from the Medical Expenditure Panel Survey (MEPS). The ICM uses the MEPS data, in combination with a classification tree analysis technique, to project the number and characteristics of injuries initially treated outside of hospitals. To project the number of direct hospital admissions which bypass hospital EDs, the ICM uses data from the Nationwide Inpatient Sample of the Healthcare Cost and Utilization Project (HCUP-NIS), also analyzed using a classification tree analysis technique.

Based on the annual estimate of 26,501 blade contact injuries initially treated in hospital EDs, the ICM projects an additional 22,675 blade contact injuries treated in other treatment settings. Thus, staff estimated an annual total of 49,176 medically treated blade contact injuries. Table 3 displays these results, along with their distribution among treatment setting and table saw types.

Table 3: Estimate of Table Saw Blade Contact Injuries by Medical Setting and Saw Type

Medical Treatment Setting	Table Saw Types				Total	Share of Total
	Bench	Contractor	Cabinet	Unknown		
(1) Doctor/Clinic	13,102	6,102	1,744	555	21,504	43.70%
(2) Emergency Department (ED)*	13,821	6,516	1,619	912	22,868	46.50%
(3) Hospital, Admitted via ED	2,256	537	840	0	3,633	7.40%
(4) Direct Hospital Admission	746	164	261	0	1,171	2.40%
(5) Total	29,925	13,320	4,464	1,467	49,176	100%
(6) Percent	60.90%	27.10%	9.10%	3.00%	100%	

* Treated and released from ED

The NEISS ED estimates from the table saw special study indicate that almost 85 percent of the blade contact injuries involved adults aged 41 years or more and only 5 percent involved females (Garland and Tu, 2018).¹⁹ An estimated 90 percent of the injuries involved fingers, with almost all of the remainder involving the hand.

Table 4 describes the disposition of injuries by the major injury diagnoses: amputations, lacerations, and fractures. About 9.1 percent of the medically treated injuries involved amputations, 58.1 percent involved lacerations, and 23.5 percent involved fractures. About 33.4 percent of the amputations resulted in hospital admission, compared to about 5.9 percent of lacerations and 14.2 percent of fractures. Only about 28.7 percent of the amputations were projected to be treated in the doctors' offices/clinics and other non-hospital settings, compared with about 42.0 percent of lacerations and 49.4 percent of fractures.

¹⁹ Three of the 161 in-depth investigations used to estimate blade contact injuries from the 2017 special injury survey (about 1.9 percent) involved children under age 18 years.

Table 4: Medically Treated Blade Contact Injuries by Diagnosis and Medical Treatment Setting

Medical Treatment Setting	Injury Diagnosis				Total	Percent
	Amputation	Lacerations	Fractures	Other		
(a) Doctor/Clinic	1,280	12,009	5,700	2,515	21,504	43.70%
(b) Emergency Department (ED)*	1,691	14,901	4,201	2,075	22,868	46.50%
(c) Hospital, Admitted via ED	1,154	1,211	1,268	0	3,633	7.40%
(d) Direct Hospital Admission	333	471	367	0	1,171	2.40%
(e) Total	4,458	28,592	11,536	4,590	49,176	100.00%
(f) Percent	9.10%	58.10%	23.50%	9.30%	100.00%	

* Treated and released in the ED

Table 5 presents information on the number of medically treated blade contact injuries and the population of saws available for use by saw type. Staff uses both information to estimate the rate of table saw blade contact injury, by saw type, by dividing medically treated injuries by the estimated number of table saws in use. Medically treated injuries ranged from a low of about 306 injuries per 100,000 cabinet saws to a high of about 951 injuries per 100,000 contractor saws.

Table 5: Annual Injuries Per 100,000 Saws In Use (based on 2017 injury data)

Table Saw Type	Medically Attended Injuries (adjusted for unknowns) (a)	Saws Available for Use (millions) (b)	Injuries per 100,000 saws (c) = (a) ÷ (b) ÷ 10
Bench	29,925	5.35	559
Contractor	13,320	1.4	951
Cabinet	4,464	1.46	306

3.3 Costs of Blade Contact Injuries

The societal costs of these injuries are quantified with the ICM. The ICM is fully integrated with NEISS data and, in addition to providing estimates of the costs of injuries reported through NEISS, it estimates the costs (as well as the number) of medically treated injuries that are initially treated outside of hospital EDs. The cost components provided by the ICM include medical costs, work losses, and the intangible costs associated with lost quality of life or pain and suffering.²⁰

Medical costs include three categories of expenditures: (1) medical and hospital costs associated with treating the injured victim during the initial recovery period and in the long run,

²⁰ A detailed description of the cost components, the general methodology and data sources used to develop the CPSC's Injury Cost Model, can be found in Lawrence et al. (2018).

including the costs associated with corrective surgery, the treatment of chronic injuries, and rehabilitation services; (2) ancillary costs, such as costs for prescriptions, medical equipment, and ambulance transport; and (3) costs of health insurance claims processing. Cost estimates for these expenditure categories were derived from a number of national and state databases, including the Medical Expenditure Panel Survey, the Nationwide Inpatient Sample of the Healthcare Cost and Utilization Project (HCUP-NIS), the Nationwide Emergency Department Sample (NEDS), the National Nursing Home Survey (NNHS), MarketScan® claims data, and a variety of other federal, state, and private databases.

Work loss estimates are intended to include: (1) the forgone earnings of the victim, including lost wage work and household work, (2) the forgone earnings of parents and visitors, including lost wage work and household work, (3) imputed long term work losses of the victim that would be associated with permanent impairment, and (4) employer productivity losses, such as the costs incurred when employers spend time juggling schedules or training replacement workers. Estimates are based on information from HCUP-NIS, NEDS, Detailed Claims Information (a workers' compensation database), the National Health Interview Survey, the U.S. Bureau of Labor Statistics, and other sources.

The intangible, or non-economic, costs of injury reflect the physical and emotional trauma of injury as well as the mental anguish of victims and caregivers. Intangible costs are difficult to quantify because they do not represent products or resources traded in the marketplace. Nevertheless, they typically represent the largest component of injury cost and need to be accounted for in any benefit-cost analysis involving health outcomes (Rice et al., 1989).

The ICM develops a monetary estimate of these intangible costs from jury awards for pain and suffering. While these awards can vary widely on a case-by-case basis, studies have shown them to be systematically related to a number of factors, including economic losses, the type and severity of injury, and the age of the victim (Viscusi, 1988; Rodgers, 1993). Estimates for the ICM were derived from regression analysis of jury awards in nonfatal product liability cases involving consumer products compiled by Jury Verdicts Research, Inc.

This regulatory analysis discounts future benefits (and costs) using a 3 percent discount rate. The 3 percent rate is intended to represent what is sometimes called the "social rate of time preference," which is more consistent with the rate which society discounts future consumption flows to their present value (OMB, 2003; Gold et al., 1996; Haddix, Teutsch, and Corso, 2003).

The distribution of injury costs, by medical treatment setting, is provided in Table 6. Overall, medical costs and work losses accounted for 31 percent of the total, while the non-economic losses associated with pain and suffering accounted for 69 percent. Injury Cost estimates for non-hospitalized injuries ranged from about \$24,650 for blade contact injuries treated outside of hospital EDs to about \$34,300 for injuries initially treated in hospital EDs (but not admitted). Injury costs for hospitalized injuries, in contrast, averaged over \$520,000 per injury.

Table 6: Annual Societal Costs of Table Saw Injury by Medical Treatment Setting

Medical Treatment Setting	Average Cost per Injury, by Cost Component			
	Medical	Work Loss	Pain and Suffering	Total
Doctor/Clinic	\$705	\$1,982	\$21,970	\$24,657
Emergency Department (ED)*	\$2,206	\$1,894	\$30,211	\$34,311
Hospital, Admitted via ED	\$18,548	\$197,213	\$308,001	\$523,761
Direct Hospital Admission	\$18,999	\$208,590	\$333,386	\$560,975

* Treated and released from ED

Using the ICM estimates in Table 6, the present value of costs associated with the estimated 49,176 medically-treated table saw injuries amounted to about \$3.97 billion (in 2021 dollars) when future losses were discounted at 3 percent. Of that total, \$2.20 billion is from bench saws, \$0.61 billion is from contractor saws, \$1.10 billion is from cabinet saws, and the remaining \$0.03 billion comes from saws whose type is unknown (see row a of Table 7). When the total societal costs is divided by injuries, this equates to \$80,650 per injury (i.e., \$3.97 billion ÷ 49,176 injuries). The high injury cost estimates are largely driven by the costs associated with the amputations. While amputations accounted for about 9.1 percent of the medically treated blade contact injuries (Table 4), they accounted for almost 55.3 percent of the annual estimate of \$3.97 billion in societal costs resulting from blade contact.

3.4 Societal Costs, per Table Saw in Use

Estimates of the present value of societal costs, per table saw in use, and by saw type, are presented in Table 7. Row (a) shows aggregate annual societal costs, by type of saw. Annual societal costs per saw, are presented in row (c), and are calculated by dividing the aggregate annual societal costs, row (a), by table saws in use, row (b). The present value of annual societal costs at a 3 percent discount rate are presented in row (e), and range from \$3,040 per bench saw to \$11,050 for cabinet saw. These present value figures represent the maximum benefits that could be derived from a rule addressing blade contact if such a rule prevented 100 percent of all blade contact injuries.

Table 7: Calculation of Societal Cost of Injuries per Table Saw, Present Value at 3% Discount

Calculation Step	Table Saw Types		
	Bench	Contractor	Cabinet
(a) Aggregate Annual Societal Costs (Millions \$)	\$2,198.29	\$612.49	\$1,099.81
(b) Table Saws in Use (Millions)	5.35	1.40	1.45
(c) Annual Societal Costs per Table Saw [(a) ÷ (b) ÷ 10]	\$411	\$437	\$760
(d) Expected Useful Product Life (years)	10	17	24
(e) Present Value of Societal Costs, Over Expected Product life (3 percent discount rate)	\$3,503	\$5,750	\$12,865

3.5 Benefits of AIM Technology under the Assumption that Voluntary Standard's Requirements contained in UL 987, 7th Edition, Were Ineffective in Reducing the Blade Contact Injury Rate

The effectiveness of the AIM technology in preventing blade contact injuries is expected to be high. However, all injuries would not be prevented because the AIM system activates after the hand or finger comes into contact with an operation blade. Moreover, it will not mitigate all severe blade contact injuries. For example, it will not mitigate potentially severe blade contact injuries that occur: (1) when the saw is not running; (2) when the blade is operating but the AIM system has been deactivated; (3) when the operator's hand is moving into the blade so quickly that contact with the blade cannot be reduced sufficiently to prevent serious injury; or (4) when the AIM technology leads to complacency or reductions in safety efforts on the part of users that result in injury, which may or may not involve blade contact.²¹

While there is insufficient information to quantify the impact of these factors, there is information to highlight their impact. The 2007-2008 table saw survey found that the motor was running in only 94.5 percent of the table saw injuries (Chowdhury and Paul, 2011). The 2014-2015 NEISS special study found that about 2.4 percent of the blade contact injuries involved saw blades that were not in operation at the time of injury or had just been turned off (Garland, 2016). Additionally, the existing AIM technology cannot be used when cutting conductive materials, such as non-ferrous metals (e.g., aluminum) or wood that is wet enough to conduct sufficient electricity to activate the AIM system. Consequently, the table saws with existing AIM systems have a bypass mode that temporarily deactivates the AIM system to prevent nuisance tripping. Although the SawStop saws automatically reset to safety mode whenever the table saw is restarted, some consumers might deactivate the AIM system because they think it is not needed or because they are concerned about a misfiring activation of the AIM system which might require the purchase of a new cartridge and blade. Deactivating the saw may also occur when performing dado cuts, if the owner has not purchased a separate cartridge for use when making such cuts. According to the 2017 table saw survey, 1.9 percent of the injury cases (3 cases)

²¹ An example of a reduction in safety efforts on the part of a consumer as a response to the inclusion of the AIM technology might be a decision to remove other types safety equipment, such as an anti-kickback pawl, which might increase the likelihood of an injury involving wood thrown back at the consumer due to kickback.

involved “non-through/other” cuts (as opposed to “non-through/rip” cuts), which probably involved dado cuts. Graham and Chang (2014) discuss the first two failure modes mentioned in the previous paragraph, and suggest a failure rate (i.e., the rate at which blade contact injuries would not be prevented) of about 4 to 6 percent due to the saw not running at the time of injury and a failure rate of about 3 percent due to the system being deactivated at the time of injury.

CPSC engineering staff considers AIM technology to be an additional safety device to be used in conjunction with an existing blade guard and riving knife. However, the AIM system can mitigate a blade contact injury even if the blade guard or riving knife are removed or fail to function properly (Amodeo and Gill, 2016). Based on testing experience, CPSC engineering staff assesses that the recommended performance requirements can significantly reduce the severity of injury involving blade contact. According to Amodeo and Gill (2016), “incidents that occur under conditions that may improve AIM performance (such /as slower approach rate and/or circumstances that increase detection) may result in minor injuries that do not require extensive medical treatment. Conversely, incidents that occur under conditions that decrease AIM performance may result in injury severity that requires extensive medical attention, including the microsurgical repair of nerves, blood vessels, and tendons, for an incident that might otherwise have resulted in an amputation. Staff recognizes there may be some incidents that occur under conditions so severe that the AIM system is unable to substantially mitigate injury severity. However, staff believes for the majority of operator blade contact instances on table saws, the injury severity can be mitigated by the proposed performance requirements.” Given these engineering considerations, it is possible that, even with the AIM technology, a very small proportion of blade contact injuries might still require extensive medical attention. The remaining injuries may be substantially mitigated, but not prevented entirely.²²

Finally, it is possible that the AIM technology could lead to some complacency in safety behavior that might tend to offset somewhat the injury reduction expected from the rule (T. Smith, 2016). For example, in an incident reported in a woodworking forum cited by Grizzly (2012), a high school teacher noticed that the riving knife was never installed on the school’s table saw. When he mentioned this to the shop instructor, the instructor’s response was that “the saw has a blade brake so it doesn’t need [the riving knife].” However, riving knives address kickback injuries which can occur independently of blade contact. PTI (2016) also suggested that a “sense of security” with the AIM technology might lead to a reduction in the use of blade guards, which could increase the rate of injury caused by kickback or by high velocity particles ejected by the saw blade. Both of these types of behaviors could result in injuries.

Given the factors discussed in this section, staff conducts the main regulatory analysis assuming that the AIM technology is 90 percent effective in reducing the societal costs of blade contact injuries.²³ Table 8 recalculates benefits with a 90 percent effective rate to estimate the benefits from the draft proposed rule. Using a 3 percent discount rate, the expected benefits would range from about \$3,153 for bench saws to about \$11,579 per cabinet saw.

²² In the original NPR we assumed that accidents that would have resulted in amputations, avulsions, or fractures were not prevented entirely, but became (instead) medically treated lacerations; and that accidents that would have resulted in medically-treated lacerations were mitigated to injuries that did not require medical treatment (Zamula, Rodgers, and Bailey, 2016). Under this assumption, societal costs of mitigated injuries are reduced substantially under the proposed rule, but not entirely eliminated.

²³ An analyses provided in sections 6.1.1. and 6.2.1. estimate the expected benefits and net benefits that would result from an estimated 85 percent and 95 percent effectiveness rates.

Table 8: Expected Benefits Under the Scenario Where Existing Voluntary Standards are Ineffective

Table Saw Type	PV of Societal Costs, Over Expected Product life (3 percent discount rate)	Benefits at 90% Effectiveness, 3 Percent Discount Rate
	(a)	(b) = a × 90%
Bench	\$3,503	\$3,153
Contractor	\$5,750	\$5,175
Cabinet	\$12,865	\$11,579

3.6 Benefits of AIM Technology under the Assumption that Voluntary Standard's Requirements contained in UL 987, 7th Edition, Effectively Reduced the Blade Contact Injury Rate

As described above, the results of the 2017 special table saw injury study conducted by the Directorate for Epidemiology suggested compliant table saws substantially reduced the table saw blade-contact injury rate (Garland and Tu, 2018). Table 9 provides information on the marginal benefits of the AIM technology under this assumption. However, staff concludes based on the NEISS data that the voluntarily standard has not been holistically effective in the long run and notes that injuries have not decreased, thus this analysis is included solely for comparison to the main analysis.

The analysis is limited to bench saws because of the rarity of blade contact injuries involving compliant contractor and cabinet saws in the 2017 injury study. For bench saws, there were a total of 100 sample cases from NEISS involving blade contact; 22 were determined to be compliant with the voluntary standard, 58 were non-compliant, and the compliance status of the remaining 20 cases was unknown. One out of 41 sample contractor saw cases involved a complying saw. One out of 10 sample cabinet saw cases involved a complying saw. These data in combination with staff's estimates of compliant contractor and cabinet saws in use, suggest a low risk of blade contact for those types of table saws. However, the small sample of compliant contractor and cabinet saws precluded any reliable estimates of relative risk, a calculation needed to estimate the relative benefits from these types of saws.

Based on injury estimates from NEISS (ED-treated injuries) and the ICM (other medically attended injuries), there were an estimated 22,321 injuries associated with non-compliant saws and about 7,603 associated with compliant saws. Thus, there were 2,318 injuries per million compliant bench saws, and 10,893 per million non-compliant bench saws. This suggests that the injury rate on non-compliant bench saws was almost 4.7 times the rate on compliant saws (i.e., $10,893 \div 2,318$), although a review of NEISS trends over a longer period indicates that the standard has had no effect on injuries. As noted previously, this finding is specific to the incident data in the 2017 special study, and not corroborated by multi-year data from NEISS.

The societal costs of these injuries, based on ICM estimates, amounted to about \$343.2 million for compliant saws, and about \$1,855 million for non-compliant saws. The average cost per injury amounted to about \$45,145 per compliant bench saw and about \$83,108 per non-compliant bench saw. This suggests that injuries involving compliant saws were less severe than injuries involving non-compliant saws, as well as less frequent, and is consistent with the narrative of the 2017 special injury study which reported that "cases for saws manufactured with

a modular blade guard (i.e., compliant saws) seem to veer towards less severe diagnosis compared to the distribution of cases for [non-compliant saws] (Garland and Tu, 2018, p. 28). However, the authors cautioned against drawing too many conclusions from the analysis “due to the small number of cases [involving compliant saws], and those cases being spread across several diagnoses.”

Given the data from the special study on compliant and non-compliant saws, CPSC staff re-ran the analysis in Table 8, but limited to bench saws. Columns 1 and 2 contain the information on injuries and injury costs of compliant and non-compliant saws.

The table is based on three sources of data: estimates of bench saw injuries treated in U.S. hospital emergency departments from the 2017 special injury survey; estimates of other medically attended injuries (and the costs of injuries) from the ICM; and estimates of saws in use from the Product Population Model. There were an estimated 5.35 million bench saws in use (Table 7) in 2017. Saws compliant with the voluntary standard entered the market beginning in 2007; by 2014, virtually all table saws sales were compliant. Based on sales estimates, there were about 3.28 million compliant and 2.07 million were non-compliant bench saws in use in 2017 (row 1).

Table 9: Expected Benefits Under the Scenario Where Existing Voluntary Standards Reduced Injuries

Calculation	Compliant Saws	Non-Compliant Saws	Total
Number of Bench Saws in Use in 2017 (millions)	3.28	2.07	5.35
Medically-Attended Injuries	7,603	22,321	29,924
Medically-Attended Injuries per million Bench Saws	2,318	10,893	559
Total Societal Cost of Injuries (3% discount rate \$millions)	\$343.24	\$1,855.05	\$2,198.29
Average Societal Cost per Injury (row 4 ÷ row 2)	\$45,145	\$83,108	\$73,462
Annual Injury Costs per Table Saw (row 4 ÷ row 1)	\$105	\$896	\$411
Present Value of Injury Costs over 10-year estimated product life (3% discount rate)	\$893	\$7,644	\$3,505
Benefit of AIM assuming 90% effectiveness at reducing injury costs (3% discount rate)	\$803	n.a.	\$3,155

The expected benefits of the AIM technology per compliant bench saw, under the assumption that adding the AIM technology to table saws would not otherwise affect the risk behavior of consumers. Assuming the AIM technology is 90 percent effective, it would result in benefits of \$803 (i.e., \$893 × 90 percent).

However, if the proposed rule is promulgated, it is foreseeable that some unknown proportion consumers would use their saws without the modular blade guard (MBG), or other safety components required by the voluntary standard, because of the presence of the AIM

technology. Consumers may reason that the AIM technology makes the MBG redundant or unnecessary. They may also reduce their safety efforts by not wearing gloves or goggles when operating their table saw. These could increase the likelihood of injury and mitigate the marginal benefits of requiring the AIM technology, which would then be lower than shown in Table 9.²⁴

Staff cannot quantify the impact of this reduction in safety behavior with available information. CPSC cannot model the individual behavioral responses of table saw users to the required presence of AIM technology.

Given this uncertainty, a plausible worst case scenario might be the expected reduction in marginal benefits associated with the AIM technology would be given by approximately $(1 - 0.90) \times (PV_{\text{non-comply}} - PV_{\text{comply}})$, where 0.90 represents the expected effectiveness of the AIM technology and $PV_{\text{non-comply}}$ and PV_{comply} represent the present value figures from row 7 of Table 9. If we discount future costs at a rate of 3 percent, this would amount to a reduction of approximately \$675.1 in the marginal benefits (i.e., $(1 - 0.90) \times (\$7,644 - \$893)$) from the AIM technology. Intuitively, the consumer would still obtain the \$803 in benefits shown in row 8, but would lose 10 percent of the implicit benefits associated with conformance to the voluntary standard which, as noted earlier, equaled $PV_{\text{non-comply}} - PV_{\text{comply}}$. Hence, if the added benefits of the voluntary standard were lost, the marginal benefits of the AIM technology would amount to approximately \$127.9 ($\$803 - \675.1) per bench saw, at a 3 percent discount rate. Consequently, while we cannot precisely quantify this loss, reductions in safety efforts could plausibly reduce benefits (and hence net benefits) by a several hundred dollars.

In summary, based on a 3 percent discount rate, the marginal benefits of the AIM technology, on top of the requirements of the voluntary standard, would be \$803 or lower, but probably no lower than \$127.90.

4 Supplemental Regulatory Analysis: Cost Analysis

The costs of the draft proposed rule are the incremental costs to incorporate an AIM technology into table saws. The cost analysis contained in sections draws from a contract study conducted by Industrial Economics, Incorporated, for the CPSC (IEc, 2016b). This cost analysis presents costs on a per product basis in the same manner as benefits were in section 4.

4.1 Cost Considerations

Table saw manufacturers are likely to incur three primary types of costs to incorporate AIM technology into their table saws, including:

²⁴ Note that this foreseeable impact on safety behavior would also apply to the case in which the voluntary standard was assumed to be *ineffective*. However, in that case, such offsetting behavior was not discussed for two reasons. First, because the voluntary standard was assumed to have been ineffective, no benefits would have been derived from the requirements of the voluntary standard and hence no benefits would have been lost by detaching the safety equipment required by the voluntary standard. Second, because the benefits in that case overwhelmed the costs, reduced safety behavior would have had little practical impact on the overall benefit-cost relationship.

- *Costs of the AIM technology.* Manufacturers would have to either design and develop their own AIM technology or license the AIM technology developed and owned by another party.
- *Redesign and retooling costs.* Incorporating AIM technology into existing models would require manufacturers to redesign each model and retool the facilities where the saws are manufactured. All table saw models not currently incorporating the AIM technology likely would require redesign to provide room for blade retraction, to allow access for users to change the cartridge and blade, and to withstand the force of the AIM system being triggered.
- *Material and labor costs.* The combination of adding a brake cartridge, or other means of stopping or retracting the blade after contact with flesh, and the redesign of the table saw to accommodate the additional electronic components and wiring, the required clearances, and the weight and dimensions of the AIM technology, will result in increased materials costs.
- *Reduced Market Competition.* The requirement of AIM technology in table saws almost certainly would result in most firms licensing the AIM technology from one of the firms who have patented the technology. This could grant a large amount of market power in the licensing of AIM technology. Firms would then have to spend additional money for licensing, along with installation of the technology. While most firms would likely continue production by licensing AIM technology, some firms, especially smaller firms, would likely drop out of the market altogether. This cost analysis captures higher price from licensing, and other costs, in its measurement of lost consumer surplus. There would also be an additional increase in price if a significant number of firms exited the market due to licensing as, according to economic theory, the supply curve for the market would shift left. This impact is not measured because staff is unable to determine, with certainty, how many firms would exit the market. Staff recommends the Commission ask for public comments on the impact this proposed rule would have on existing firms if promulgated.

Each of these types of costs is discussed below.

4.1.1 Development of the AIM Technology

Currently, staff are aware of three manufacturers who have developed AIM technology. These are:

SawStop LLC, now owned by Tool Technic Systems (TTS). SawStop's AIM technology induces a small electrical signal onto the saw blade that is partially absorbed by the human body if blade contact is made. When the reduction of the signal in the blade (due to the body's absorption) is detected, the system applies a brake to the blade, which stops and retracts the blade below the table surface in less than 5 milliseconds. SawStop cabinet saws have been available to consumers since 2004, contractor saws since 2008, and a bench saws in 2016.²⁵

Robert Bosch Tool Corporation. Bosch's Active Response Technology™ rapidly detects human flesh that comes into contact with the blade (through electronic sensors) and initiates an explosive cartridge that drives the saw blade below the tabletop. This system builds on the

²⁵ SawStop website. Accessed on January 23, 2016, at: <http://www.sawstop.com/>.

results of the PTI Joint Venture effort among Hitachi, Bosch, Stanley Black and Decker, and Techtronics that was completed in 2009. Bosch announced this technology in a March 2015 press release,²⁶ and began marketing a single bench saw model with the technology on June 1, 2016. However, the Bosch later withdrew this model from the market following a decision by the ITC not to review an initial determination by an administrative law judge (ALJ) that the Bosch model infringed on SawStop patents.

Felder Group. Felder Group's AIM technology detects human tissue through use of electric conductivity. If potential blade contact is detected the system retracts the blade below the table to prevent blade contact. The system is currently patent pending but Felder has sliding saws with AIM technology currently available for purchase in the U.S.

4.1.2 Patent Issues

According to Dr. Gass of SawStop LLC, the developer and original patent holder for the existing AIM technology, the initial development and design of the SawStop technology required significant time and financial commitment. Dr. Gass (2015) indicated that he raised "a couple of million dollars" to fund the development of the first saw incorporating SawStop's flesh sensing technology.

Various stakeholders have expressed concern that a mandatory rule could impose a monopoly for SawStop technology given the numerous patents that have been filed by Dr. Gass. PTI reports that Dr. Gass has filed more than 140 patent applications, and has more than 100 issued patents that pertain to SawStop technology (PTI, 2016).

Several companies asserted that they had attempted to license the SawStop technology.²⁷ Grizzly Industrial, Inc., indicated in its 2012 comment letter that it tried several times, from early 2007 to 2012, to license SawStop's technology, but could not agree on terms with SawStop because of what Grizzly considered SawStop's "unrealistic demands to convert every existing Grizzly model to include the flesh-sensing technology" (Grizzly, 2012). Grizzly also said that SawStop refused to allow Grizzly to distribute SawStop saws, stating: "It does not make sense for SawStop to distribute saws through Grizzly given SawStop's current distribution network" (Grizzly, 2012).

Bosch began marketing a single bench saw model with the technology on June 1, 2016. Bosch later withdrew this model from the market following an initial determination by an ALJ that the model infringed on SawStop patents, followed by a decision by the ITC not to review the ALJ's initial determination. However, on December 21, 2018, SawStop petitioned the ITC to modify the ITC's exclusion order to allow Bosch to import an AIM equipped saw. No details related to licensing compensation have been made public. Currently, the Bosch model is not available for sale in the U.S.

²⁶ Bosch, 2015. Press release titled: Bosch GTS1041 REAXX™ Portable Jobsite Table Saw Takes User Safety to the Next Level, and Saves the Blade Too. Accessed on January 20, 2016 at: http://www.boschtools.com/About/BoschTools/PressRoom/Pages/031815_reaxxsaw.aspx.

²⁷ To our knowledge, the only company to partner with SawStop, to date, has been Griggio, SA, an Italian manufacturer that collaborated with SawStop to develop a sliding table saw, which was demonstrated in May 2015 at a trade show in Germany. FDMC, May 2015. SawStop and Griggio to develop safer panel saw. Accessed December 8, 2015 at: <http://www.fdmcdigital.com/ArticleDetails/tabid/162/ArticleID/95172/Default.aspx>.

The implication of these legal decisions is that a small number of firms may be granted significant market power by a mandatory rule requiring an AIM system. Other manufacturers likely would license the AIM technology for use in their saws, or leave the table saw market. PTI and SawStop agree that this is the case. The level at which the royalty payments would be set would play a significant role in determining the economic impacts that the proposed rule would have on table saw manufacturers. Staff note that some of the SawStop patents expired in 2020 and 2022 but do not know the status of other SawStop patents, nor the expiration dates of the other existing SawStop patents (McHardy, 2016). Further, current evidence concerning the sale of a sliding saw equipped with an AIM system by the Felder Group indicate that the development of alternative AIM systems by competitors has not been prevented by the patents or legal cases involving Sawstop and market competitors.

The royalty fee for licensing the AIM technology from SawStop is uncertain. Prior to the NPR, Dr. Gass said that SawStop would accept royalty payments of 8 percent of a saw's wholesale price, but there is no certainty that SawStop would actually license the technology under terms that would be acceptable to other manufacturers. Moreover, Dr. Gass conditioned the 8 percent royalty on a rule that requires AIM technology on all table saws. Otherwise, according to Dr. Gass, licensing the patent would harm SawStop's business, allowing competitors to underprice SawStop saws and potentially force SawStop out of business (Gass, 2015).²⁸

Tooltechnic Systems (TTS), acquired SawStop in July 2017. Due to this acquisition, TTS is now the legal owner of all SawStop patents involving the flesh-sensing technology. TTS has indicated that it is open to the possibility of licensing the AIM technology if the CPSC promulgates a rule requiring the technology on all table saws. However, TTS has also said that "given the breadth of intellectual property that has been developed by SawStop, it is no longer a simple matter to say what such a license would or should include and what structure it would be" (email communication between Mr. Fabian Klopfer, CEO, TTS, and Mark Bailey, US CPSC, June 1, 2019). Staff notes that TTS is incorporating AIM technology into a Festool-branded table saw, but there is no indication whether this Festool-branded saw with the AIM technology will be available for sale in the United States.

4.1.3 Redesign and Retooling

Interviews with several manufacturers, as well as a review of public comments provided by PTI, point out that implementing a rule requiring AIM technology would involve a complete redesign of all saws that do not currently have AIM technology (IEc, 2016a). More specifically, the trunnion system would have to be redesigned, and the cabinet/interior of the saw would need to be modified to incorporate the technology and allow for access to replace the brake cartridge or for blade retraction.²⁹ The support structure, such as the stand, would also likely need to be redesigned to bear the extra weight of the AIM system and to absorb the force applied by the

²⁸ The scenario Dr. Gass envisioned was that, in licensing a competitor, the competitor could produce one or two models and underprice SawStop for several years. In his opinion, the royalties earned would be very modest, and would be partially offset by reduced sales of SawStop saws. Once SawStop stopped production of its own saws and disbanded its distribution network, the competitor could then suspend production of the AIM-compliant saw. Thus, the technology would no longer be available to the public, and SawStop would earn neither profits from sales of saws, nor royalties on its AIM technology (Gass, 2015).

²⁹ A trunnion is an assembly that holds a saw's arbor to the underside of the saw table.

AIM mechanism. PTI estimates that the cost to redesign and retool existing table saws would range from \$2 million to \$10 million per company.³⁰

SawStop agrees that the entire table saw would need to be redesigned, but suggests that the total cost would not be in the multi-million dollar range indicated by PTI. Rather, Dr. Gass said that SawStop's tooling costs were approximately \$200,000 for its first cast iron (i.e., contractor/cabinet) table saw, and that costs were approximately \$700,000 for its first benchtop table saw. He also stated that there are not as many distinct models as advertised. Some models are minor variations and share the same basic structure (Gass, 2015).

SawStop's estimates are within the range of estimates provided by other firms. For example, several companies indicated that the cost to redesign saws could be approximately \$500,000 per saw (IEc, 2016b). Another table saw manufacturing representative indicated that retooling could cost \$100,000 to \$200,000. An additional cost of several hundred thousand dollars may be necessary, depending on the level of engineering required for the redesign (IEc, 2016b). According to one company, a redesign of the trunnion system alone may cost \$200,000 (IEc, 2016b).

Uncertainty exists concerning the allocation of the retooling costs. In some instances, Taiwanese and Chinese manufacturers may produce saws for multiple U.S. firms; thus the costs of retooling might be spread across several of their customers, if the designs are similar enough. A representative of one firm also suggested that U.S. manufacturers may be able to work with their respective overseas contract manufacturers to absorb some of the retooling costs. For example, he indicated that when they redesigned products to incorporate new riving knife standards, the manufacturers they contracted with in Taiwan absorbed much of the retooling cost (IEc, 2016b).

Interviews with several companies suggested that the redesign and retooling of table saws, at least on the initial models, would be expected to take 1 to 3 years. However, redesigning and retooling subsequent models would require a shorter period and cost less (IEc, 2016b).

Four small firms interviewed indicated that the cost of redesigning their saws to incorporate AIM technology may be too great, relative to their sales volume, to support such a redesign. They indicated that they might respond by reducing or eliminating their offerings of table saws to the U.S. market (IEc, 2016b).

4.1.4 Material and Labor Costs

In addition to the redesign and tooling costs, costs would result from the added components and increased use of raw materials associated with inclusion of the AIM system. For SawStop models, the additional cost, in 2012, associated with the AIM system is approximately \$58 (including brake cartridge, cartridge key, cartridge cable, cartridge bracket, insulation on arbor, electrode shell assembly, and power supply/motor control) (Gass, 2012). Public comments provided by SawStop on the ANPR also included an estimate from Black & Decker of \$74 (including cartridge, electronics, and mechanical parts) (Gass, 2012).

The AIM technology would also affect the weight of the table saws. While added weight is applicable to all tables saws, it would particularly affect the bench saws which can typically be

³⁰ Graham, J. 2010. Expert report of Dr. John D. Graham. (April 27). Submitted with the PTI public comments (PTI, 2012).

transported by a single person. Currently, the lightest bench saws weigh 35 to 40 pounds. Although the various components needed for AIM compliance may only weigh a few pounds, the structure of some saws may need to be strengthened to withstand the shock of blade braking and/or retraction. Adding the AIM technology could increase the weight of some of the lightest saws, thus reducing the portability and utility of lightweight bench saws.

4.2 *Estimated Costs of the Proposed Rule*

Based on the available information, there is considerable uncertainty in estimating the per-unit manufacturing cost of requiring AIM technology for table saws. Consequently, this cost analysis presents both low and high estimates by table saw type.

Most manufacturers provided estimates in terms of expected retail price impacts. For purposes of this analysis, staff assume that the projected retail price impacts of the draft proposed rule represent the manufacturing costs and all incremental costs down the supply chain. In other words, staff assume that the costs associated with the rule are fully pushed forward to consumers, and that the expected price increases are reflective of all costs of production and further down the supply chain.

Note also that these cost impacts do not include royalty fees, which are payments that manufacturers would have to make if they license the AIM technology. From a societal perspective, royalties represent a transfer payment from one party or sector to another. Because royalties essentially move money from one party to another, and are not payments for goods or services, they are not technically costs, for purposes of the benefit-cost analysis (OMB, 2003). Nevertheless, the royalties will have distributional impacts on manufacturers and consumers that need to be considered and are discussed below.³¹

4.2.1 **Low-End Direct Manufacturing Costs**

SawStop has reported in both a presentation to CPSC and in court testimony that retail prices for bench saws would increase by no more than \$150 per unit as result of the rule.³² The \$150 cost estimate was also suggested in a phone interview with Dr. Gass. Dr. Gass estimates that in the short term (i.e., within the first 5 years following promulgation of the rule). Inflating this value to 2021 dollars using the producer price index³³ for sawmill, and woodworking manufacturing results in an estimate of \$193. In the absence of more specific information about manufacturing costs, the cost analysis uses this figure as the basis for the low-end estimate of manufacturing cost increases for bench saws.

For contractor and cabinet saws, the low-end expected cost impacts were based on discussions with other industry members. One manufacturer estimated that the retail price of a single table saw model that they produce would increase by about 30 percent as a result of the rule, including the cost of royalties (IEc, 2016b). Excluding royalties, this estimate suggested a cost increase associated with redesign, retooling, and materials of about \$256 (IEc, 2016b). Inflating this value in the same manner as bench saws results in an estimate of \$321. For this analysis,

³¹ Distributional effects refers to the concept that, although the net resources available to society have not changed, some entities will benefit, while others experience costs.

³² SawStop, LLC. 2009. Presentation to CPSC, December 8 & 9. Also, *Osorio v. One World Technologies, Inc.*, 659 F3d 81, 83 (1st Cir 2011).

³³ Inflated from 2015 (phone call with Dr. Gass) to 2021 dollars using the Bureau of Labor Statistics, Producer Product Index, Sawmill and woodworking machinery, Series ID: PCU33324333243A.

staff assume that this \$321 low-end cost increase can be applied to all contractor and cabinet saws.

4.2.2 High-End Direct Manufacturing Costs

For bench saws, the high-end cost increase is based on information provided by PTI, whose members produce primarily bench saws. PTI estimates that the increase would be \$100 to \$800 per saw, excluding royalties (PTI, 2012). In the absence of more specific estimates, staff use the midpoint of this range, \$450 per saw, which is \$651 when inflated to 2021 dollars, as the short-term high-end estimate for bench saws (IEc, 2016b).

For contractor and cabinet saw models, staff apply the high-end of the range estimated by PTI and other manufacturers. One table saw manufacturer provided an estimate ranging from \$500 to \$800 for “larger saws,” excluding royalties (IEc, 2016b). Another manufacturer estimated that the retail price of saws would increase 20 percent, excluding the cost of royalties (IEc, 2016b). Applying this percentage to the company’s cabinet saw models results in added costs of about \$260 to \$800. Consequently, staff assume the high-end incremental cost increase is \$800, the upper bound of each range suggested by PTI and these two manufacturers (IEc, 2016b). Inflating this value to 2021 dollars equates to a high-end cost increase of \$1,002. In the longer term, after about 5 years, staff expects that the incremental cost would decrease, although the magnitude of such a decrease is uncertain.

4.2.3 Replacement Parts Costs

In addition to the manufacturing costs, there would be the added costs of replacement parts related to the AIM system. CPSC staff base the cost of replacement parts on the SawStop system, which requires replacement of the brake cartridge and blade after activation of the system. Replacement part prices are estimated to be \$95 for a replacement brake cartridge (based on 2023 online prices), and \$30 to \$90 for a replacement blade (PTI, 2016). Based on sales of replacement brake cartridges, SawStop estimates that the AIM system may activate about once every 9 years of use.³⁴ At a replacement rate of once every 9 years (and assuming \$95 per replacement blade), this results in an annual per-unit replacement part cost of approximately \$17 $[(\$95 + \$60) \div 9]$. However, because blades depreciate and would require periodic replacement, even in the absence of an AIM activation, staff assume that the need for replacement blades, due to an activation, costs an average of about \$30 every 9 years (rather than \$60), for an average of about \$14 annually $[(\$95 + \$30) \div 9]$.³⁵ The present value of this expected annual cost of \$14 over the life of a typical table saw, and discounted at a rate of 3 percent, would amount to about \$118 for bench saws (with a 10-year expected product life), \$183 for contractor saws (with an estimated 17-year product life), and \$235 for cabinet saws (with an expected 24-year product life).

The direct manufacturing and replacement costs are presented in Table 10, and rely on the low- and high-end direct manufacturing costs (from section 5.2) and the SawStop replacement costs just described.

³⁴ SawStop, March 2011, Information Package for Petition CP-03-02. As cited in CPSC (2011). Table Saw Blade Contact Injuries; Advance Notice of Proposed Rulemaking. September 14.

³⁵ In this case activations are assumed to occur at the midpoint of the blades useful life.

Table 10: Direct Manufacturing and Replacement Costs

Table Saw Type	Direct Manufacturing Costs		Replacement Part Cost	Total Direct + Replacement Costs	
	Low-End Estimates	High-End Estimates		Low-End Estimates	High-End Estimates
Bench	\$193	\$651	\$118	\$311	\$769
Contractor	\$321	\$1,002	\$183	\$504	\$1,185
Cabinet	\$321	\$1,002	\$235	\$556	\$1,237

A cost of the SawStop AIM system not included in Table 10 is the additional optional hardware needed to perform dado cuts.³⁶ This includes a \$115 dado brake cartridge.³⁷ The dado brake cartridge is not included in the analysis because the frequency and importance of dado cuts are unknown. Nonetheless, the brake cartridge constitutes an added expense for users who wish to make dado cuts.

Additionally, the Bosch REAXX bench saw, introduced on June 1, 2016 but later withdrawn from the U.S. market, used a \$100 cartridge usable for two activations. Because the blade was not destroyed by the activation, the Bosch system had lower replacement part costs. Staff have no information on how frequently the cartridge would have been activated. If, however, the Bosch cartridge activated once every 9 years, based on the SawStop experience, and the cost is \$100 for two activations, then the expected annual per-unit replacement cost would have been about \$5.55 annually ($(\$100/2) \div 9$). The present value of this expected annual cost of \$5.55 over an average product life of 10 years for a bench saw (discounted at a rate of 3 percent) would amount to about \$47 per saw, about half the expected costs of the SawStop system.

Additionally, the Bosch system does not require any additional dado hardware related to the AIM system and it is therefore reasonable to assume that other systems would similarly not require the additional hardware.

4.2.4 Impact on Product Usability/Utility

The additional weight associated with an AIM system would have an impact on the utility of lightweight bench saws. According to Dr. Gass, his system would add only 4 or 5 pounds of weight to a lightweight bench saw. However, SawStop's existing "jobsite" bench saw (the term jobsite is applied to large bench saws intended for commercial users) which has been marketed since 2015, weighs about 80 pounds without the stand, and it is at the high end of the bench saw weight range.

Bosch's AIM system was quite different in some respects and provides an instructive basis for comparison. The Bosch jobsite bench saw with AIM technology was the GTS1041A REAXX.

³⁶ Any cut that does not extend through the top surface of the workpiece is called a non-through cut. A dado cut is a type of non-through cut that produces a simple channel in the width of the workpiece.

³⁷ This cost estimate is based on a current Sawstop advertised prices.

The same table saw without the AIM technology and other electronic features is the Bosch 4100 model. The GTS1041A REAXX (78 pounds, priced at about \$1,500) weighed about 18 pounds more than the 60-pound 4100 model (with a price of about \$700). The 4100 model is also sturdier and heavier than an inexpensive 40-pound bench saw, and the additional 18 pounds on the 4100 model (on top of the 60 pounds of the base model) may be needed to provide the stability necessary to withstand the shock of blade retraction for the Bosch AIM system.

An additional 4 or 5 pounds is not a major weight penalty on a 40-pound bench saw, but an 18-pound increase would reduce portability. An additional 20 pounds (on top of the 18 pounds) for a more substantial jobsite saw-type structure, if necessary, would further decrease portability. For contractor saws, with wheels and stands, the weight penalty would not be substantial. Cabinet saws are not portable at all, so the weight penalty would be negligible.

Another impact of the SawStop system is the need to change the brake cartridge to a dado cartridge when making dado cuts. Replacing the cartridge at the same time the dado blade is installed would require a minor additional effort on the part of the user.

4.2.5 Baseline Sales, Retail Prices, and Per-Unit Costs and Royalty Fees

Table 11 provides baseline sales and median retail price estimates,³⁸ along with the total per-product compliance cost estimates, including both the costs of manufacturing the redesigned table saws and the expected costs of replacement parts over the expected product life of a table saw. Table 11 also provides an estimate of the expected royalty fee, based on Dr. Gass's statements made prior to the NPR that the fee would amount to 8 percent of a saw's wholesale price (Gass, 2015; IEc, 2016b). As described earlier, TTA, which purchased SawStop in 2017 and currently owns the SawStop patents, has not confirmed 8 percent licensing fee arrangement. The per-unit cost and royalty fee estimates are provided for both the low-end and high-end cost estimates.

Table 11: Baseline Annual (non AIM) Table Saw Shipments, Retail Prices, Per-Unit Compliance Costs, and Royalty Fees

Table Saw Type	Pre-Regulatory Baseline Estimates		Per Unit Cost Estimates*		Per Unit Royalty Fees
	Shipments**	Median Price (Per Unit)	Low-End Estimate	High-End Estimate	
Bench	517,000	\$400	\$311	\$769	\$32
Contractor	72,000	\$1,225	\$504	\$1,185	\$98
Cabinet	52,000	\$2,550	\$556	\$1,237	\$204

* Includes direct manufacturing and replacement part costs

** Excludes 10,000 units assumed to contain the AIM technology

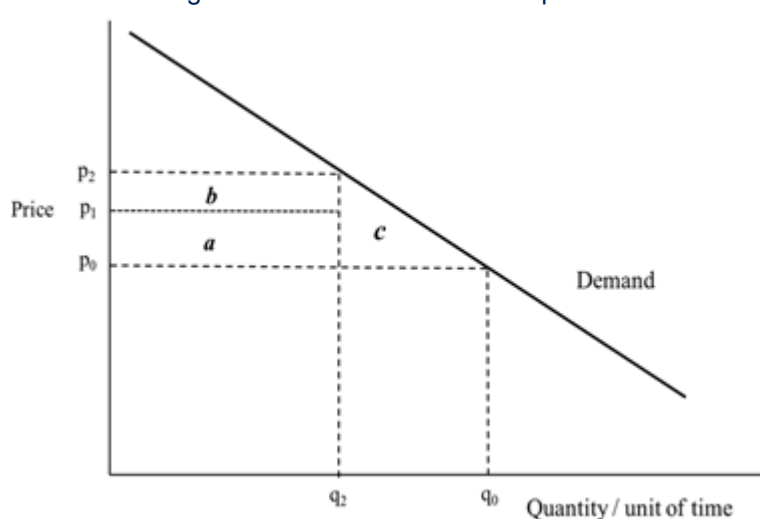
³⁸ We were unable to calculate a weighted average retail price for each category of saws because we do not have sales information for the various models. Consequently, we apply the median price advertised for each category as baseline pre-regulatory retail prices.

4.2.6 Impact of Higher Prices on Sales and Lost Consumer Surplus

The increasing retail prices of table saws, as costs are passed on to consumers, would likely result in a decrease in table saw sales. Consequently, and in addition to the price impacts on consumers who continue to purchase saws, consumers who decide not to purchase table saws because of the higher prices would experience a loss in consumer surplus. These impacts are illustrated conceptually in Figure 1 below. For purposes of this analysis, staff assume that cost increases, as well as royalties, are pushed forward to consumers.

The downward sloping curve in Figure 1 represents the demand for table saws; p_0 and q_0 represent, respectively, the pre-regulatory price and quantity of table saws demanded. After the regulation becomes effective, table saw prices rise to p_2 , and the quantity of table saws purchased declines to q_2 . The change in price from p_0 to p_1 represents the direct costs of the rule per table saw. The area given by the rectangle represents the aggregate direct costs of the rule over the time period being considered (e.g., one year); it is equal to the product of the increase in table saw price ($p_1 - p_0$) and the quantity demanded during the period (i.e., q_2).

Figure 4: Loss in Consumer Surplus



As noted above, royalty fees represent a transfer from one party to another and are therefore not counted as a cost of the rule. Nevertheless, from the point of view of an individual manufacturer who pays the royalty, the payment represents a cost and is assumed to be pushed forward to consumers in the form of higher prices. Thus, in evaluating the impact of the rule on sales, both the direct costs (but excluding the expected costs of replacement parts) and the royalty fee will affect consumer decisions and reduce the quantity of table saws demanded. The price impact of the royalty fee is reflected in the increase in price from p_1 to p_2 . Thus, the total price increase is given by $p_2 - p_0$, and the quantity of table saws demanded at that higher price is given by q_2 in the figure. The area given by the rectangle b represents the royalties being transferred. It is equal to the product of the increase in table saw price associated with the royalties ($p_2 - p_1$) and the post-regulatory quantity demanded (i.e., q_2).

The triangle c represents an additional loss in consumer surplus, which is a cost to consumers in the form of reduced utility. It represents a value over and above what consumers would have paid for the product before the regulation, but which is lost to the consumers who do not

purchase a table saw at the higher price, p_2 .³⁹ For example, if an individual would have paid \$200 for a product (and receives \$200 in utility from the product), and if the product in a pre-regulation scenario was \$150, that individual's consumer surplus is \$50. If in the post-regulation scenario, the product price increased to \$250, then that would exceed the individual's personal price limit of \$200, and that individual would not purchase the product. The net cost to the individual is \$50 loss in consumer surplus, since they retain the \$150 they would have spent on the product to offset against the \$200 loss in utility.

Given the expected impact on price, and information on the elasticity of demand for table saws (i.e., the percentage change in quantity demanded given a percentage change in price), staff can estimate the expected reduction in sales ($q_0 - q_2$) and the lost consumer surplus represented by c in the above graph.

Table 12 displays the information needed to estimate lost consumer surplus. Staff apply an elasticity estimate of -0.3367 for home goods from Taylor and Houthakker (2010).⁴⁰ An elasticity of -0.3367 suggests that a 1 percent increase in the price of table saws results in a reduction in the quantity demanded of about one-third of a percent.⁴¹

Consider, for example, the low-end cost estimates for bench saws. From Table 11, the pre-regulatory baseline price for bench saws was about \$400, and sales amounted to about 517,000 annually. Given these parameters, and combining the low-end direct cost estimate (but excluding the costs of replacement parts)⁴² of \$193 with the royalty payment of \$32, shown in Table 11, sales might decline by about 18.94 percent ($[(\$193 + \$32)/\$400] \times -0.3367$), a reduction of about 97,900 bench saws ($0.1894 \times 517,000$) annually. Additionally, the lost consumer surplus (represented by the area of triangle c in the graph above), amounts to about \$11 million (i.e., $0.5 \times (p_2 - p_0) \times (q_0 - q_2) = 0.5 \times \$225 \times 97,900$).

Spread across the remaining bench saws sold, the estimated lost consumer surplus, per product sold, amounts to about \$26.20 per bench saw ($\$11 \text{ million} \div 419,000 \text{ saws}$). If this per-unit consumer surplus loss is combined with the low-end direct and replacement parts costs, the aggregate per-unit costs of the rule are estimated to be about \$337 per bench saw (i.e., \$311 in direct manufacturing costs and replacement costs + \$26.20 in lost consumer surplus).

³⁹ In general, consumer surplus represents the difference between the market clearing price and the maximum amount consumers would have been willing to pay for the product. Ideally, we would like to measure the costs of lost producer surplus (i.e., a measure of revenue accruing to firms that produce and sell products over and above the price that they would have been willing to supply the products), as well as lost consumer surplus. However, to do so would require information on the supply and demand functions for table saws, which is not available. As an alternative, we assume that the cost of the regulation is borne by consumers in the form of higher prices, and we estimate the change in consumer surplus resulting from increased prices. Additionally, although information needed to derive a well-specified demand curve is not currently available, we employ an assumption about the slope of the demand curve, based on an estimate of price elasticity of demand for home goods provided in Taylor and Houthakker (2010). (Note also that while we have referred to the area of the triangle c in Figure 4 as the loss in consumer surplus for consumers not willing to pay the higher price p_2 , technically, the entire area $a + b + c$ represents the lost consumer surplus relative to the original pre-regulatory price of p_0 .)

⁴⁰ "Home goods" are defined to include products such as "floor coverings; picture frames; mirrors; art products; portable lamps; window coverings and hardware; telephone equipment; writing equipment; and hand, power, and garden tools."

⁴¹ The elasticity of demand value from Taylor and Houthakker (2010) would apply to the purchases of residential consumers and exclude commercial users.

⁴² Although the expected cost of replacement parts is a real cost of the proposed rule, it is excluded from an analysis of the impact of the rule on the quantity demanded (or sales) under the assumption that consumers do not consider the costs of replacing the AIM technology as part of the purchase decision.

Table 12 shows the expected reduction in annual sales and the expected lost consumer surplus. Reduced sales could range from 110,800 table saws under the low-end cost estimates (column a), to about 329,900 under the high-end cost estimates (column d), representing a sales reduction of about 17 percent to 50 percent, respectively. The annual loss in consumer surplus ranges from about \$13.9 million under the low cost estimates (column c), to about \$120 million, under the high cost estimates (column f).

Table 12: Post-Regulatory Annual Table Saw Sales, Sales Reduction, and Lost Consumer Surplus

Saw Type	Low-End Cost Estimate			High-End Cost Estimate		
	Expected Sales Reduction	Expected Post-Regulatory Sales	Aggregate Lost Consumer Surplus (millions \$)	Expected Sales Reduction	Expected Post-Regulatory Sales	Aggregate Lost Consumer Surplus (millions \$)
	(a)	(b)	(c)	(d)	(e)	(f)
Bench	97,917	419,083	\$11.02	297,231	219,769	\$101.50
Contractor	9,098	69,902	\$1.91	23,885	55,115	\$13.14
Cabinet	3,813	51,187	\$1.00	8,758	46,242	\$5.28
Total	110,827	540,173	\$13.92	329,874	321,126	\$119.92

Table 13 presents the total costs per table saw, including the direct manufacturing costs, replacement part costs, and lost consumer surplus. The direct manufacturing and replacement part cost estimates are from Table 10. The lost consumer surplus, per table saw, is calculated as the aggregate lost consumer surplus (from Table 12, columns c and f) divided by the post-regulatory estimate of sales (Table 12, columns b and e). Total per-unit costs range from roughly \$338 to \$1,210 per bench saw, to \$531 to \$1,376 per unit contractor and to about \$576 to \$1,276 per cabinet saw.

Table 13: Total Cost of the Draft Proposed Rule per Table Saw

Table Saw Type	Low-End Cost Estimate			High-End Cost Estimate		
	Direct + Replacement	Lost Consumer Surplus	Total	Direct + Replacement	Lost Consumer Surplus	Total
	(a)	(b)	(c) = (a) + (b)	(d)	(e)	(f) = (d) + (e)
Bench	\$311	\$26	\$338	\$749	\$462	\$1,210
Contractor	\$504	\$27	\$531	\$1,138	\$238	\$1,376
Cabinet	\$556	\$20	\$576	\$1,161	\$114	\$1,276

The annual aggregate costs of the rule are estimated in columns (c) and (f) of Table 14, and range from about \$208 million, based on our low-end cost estimates, to about \$400 million, based on our high-end cost estimates. Bench table saws account for about 68 percent of the total, under the low-end annual cost estimates, and about 66 percent of the costs under the high-end estimates.

Table 14: Aggregate Annual Costs of the Proposed Rule

Table Saw Type	Low-End Cost Estimates			High-End Cost Estimates		
	Annual Post-Regulatory Table Saw Sales (a)	Per Unit Rule Cost (b)	Aggregate Costs (millions \$) (c) = (a) × (b)	Annual Post-Regulatory Table Saw Sales Surplus (d)	Per Unit Rule Cost (e)	Aggregate Costs (millions \$) (f) = (d) × (e)
Bench	419,083	\$338	\$141.55	219,769	\$1,210	\$266.01
Contractor	69,902	\$531	\$37.13	55,115	\$1,376	\$75.84
Cabinet	51,187	\$576	\$29.47	46,242	\$1,276	\$58.98
Total	540,173		\$208.15	321,126		\$400.83

5 Benefit-Cost Comparisons and Findings

This section compares the estimates of benefits and costs developed in sections 5 and 6. Section 6.1 uses the expected benefits under the assumption that the voluntary standard has been ineffective in preventing blade contact injuries, and is followed by a sensitivity analysis in section 6.1.1. Section 6.2 uses the benefits estimated under the assumption that the voluntary standard has reduced the rate of blade contact, and is also followed by a sensitivity analysis in section 6.2.1.

5.1 Net Benefits Under the Assumption that the Voluntary Standard is Ineffective

Table 15 presents expected benefits and costs of the proposed rule, by table saw type, under the assumption that agrees with staff's conclusion based on years of NEISS data that the voluntary standard has been ineffective in preventing blade contact injuries. The net benefit estimates suggest that the per unit benefits exceed costs by a ratio of more than 3.5 to 1 using a 3 percent discount rate. Given post-regulatory table saw sales estimates,⁴³ staff can provide annual aggregate estimates of net benefits.

Aggregate net benefits from post-regulatory sales, using a 3 percent discount rate, range from about \$503 million to \$1,326 million for bench saws, \$241 million to \$365 million for contractor saws, and \$536 million to \$629 million for cabinet saws.

⁴³ Based on the estimated sales reduction estimates from Table 12.

Table 15: Net Benefits Under Scenario that VS are Ineffective

Table Saw Type	Benefits per Saw (a)	Cost per Saw (Low Est - top, Hi Est. - bottom) (b)	Net Benefit per Saw (c) = (a) - (b)	Est. Annual Sales (d)	Aggregate Net Benefits (millions, \$) (e) = (c) × (d)
Bench	\$3,503	\$338	\$3,165	419,083	\$1,327
		\$1,210	\$2,293		\$504
Contractor	\$5,750	\$531	\$5,218	69,902	\$365
		\$1,376	\$4,374		\$241
Cabinet	\$12,865	\$576	\$12,289	51,187	\$629
		\$1,276	\$11,590		\$536

The estimated benefits of draft proposed rule substantially exceeded costs, and that finding was not altered with variations in some of the key parameters of the analysis, including variations in: (1) the expected product life of table saws; (2) table saw sales; (3) the injury rate; and (4) significant variations in the estimated costs of injuries.

5.1.1 Sensitivity Analysis

The results of the regulatory analysis demonstrate that benefits of the AIM technology substantially exceed costs under most plausible scenarios. The sensitivity analysis (under the assumption that the voluntary standard is ineffective) varies several of the key parameters to show the impact on per unit net benefits.

Lower AIM Effectiveness

Net benefits decline modestly if staff assume that the AIM technology mitigated 70 percent of the blade contact injuries (rather than 90 percent). Net benefits under this assumption are \$272.92 per bench saw, \$145.98 per contractor saw, and \$357.45 per contractor saw. Benefits remain substantially greater than costs.

Higher Replacement Parts Costs

PTI comments on the NPR said that CPSC staff substantially underestimated replacement part costs (i.e., replacement of blade and brake cartridge following activation), and suggested that such costs were more likely to amount to about \$36 annually (PTI, 2017), as opposed to the \$11 per year we estimated in the NPR. The PTI estimates would increase the cost per table saw. It also results in the costs of the draft proposed rule exceeding benefits. Specifically, net benefits could result in amounts as low as -\$270.24 per bench saw, -\$70.26 per contractor saw, and -\$82.86 per cabinet saw.

Variations in the Expected Product Life of Bench Saws

PTI commented on the NPR that the CPSC estimate of the expected product life of bench saws (10 years) was an overestimate and that the actual expected product life of bench saws was 7.5 years (PTI, 2017). (PTI did not disagree with our estimates of the expected product life of contractor saws (17 years) and cabinet saws (24 years)). Had we assumed a 7.5 year product life for bench saws, benefits would have increased to \$3,630 at a 3 percent discount rate. Given

estimated costs of \$338 to \$1,210 per bench saw, net benefits would have risen to \$2,420 to \$3,292 per bench saw using a 3 percent discount rate.⁴⁴

5.2 Net Benefits-30 year forecast and annualized aggregate values

In addition to per-unit analysis, staff conducted a prospective analysis of the draft proposed rule that measured benefits and costs across a 30-year study period. The time period covered is 2025 to 2054. Injuries rates per saw are based on the 2017 special study incidents and assumed to remain constant (that is as saws in use increase injuries increase using the 2017 per saw incident rate) over the time period. The table saw in use forecast is created by estimating sales over the time period using a combination of available import data and application of an exponential smoothing method. These values are then combined with CPSC's product population model to estimate the population of saws in use for each year. Using a discount rate of 3 percent provides an annualized 30 year benefit value which is displayed in Table 16 below. (\$9.6 billion)

Calculating costs is completed in a similar manner as costs (manufacturing, replacement, consumer surplus loss) per saw are summed each year for the number of saws sold and discounted using a 3 percent rate. Staff did include a learning curve with manufacturing costs which assumes the real costs of production would decrease throughout the 30-year study period. The aggregate annualized 30 year value is displayed in Table 16. (\$5.5 billion)

Table 16: Summary of 30-Year Prospective Regulatory Analysis

Benefits	\$9,581
Costs	\$5,467
Net Benefits (Benefits – Costs)	\$4,115
B/C Ratio	1.75

As shown above, over the 30 year period the proposed rule is expected to generate significant benefits. Costs are also significantly high but still much lower than potential benefits. Net benefits are in excess of \$4 billion.⁴⁵

5.3 Net Benefits Under the Assumption that the Voluntary Standard is Effective, as Suggested by the 2017 Special Injury Study

The results of the 2017 special table saw injury study indicated that the voluntary standard reduced the risk of blade contact. The expected benefits and costs of the proposed rule requiring the AIM technology, under the assumption that the voluntary standard has been effective, are presented in Table 17. The analysis is limited to bench saws because of the paucity of blade contact injuries involving compliant contractor and cabinet saws in the 2017 injury study.

⁴⁴ A shorter product life reduces the estimated number of bench saws in use thereby increasing the per unit annual benefit of reduced societal costs. Although the present values of the estimated annual benefit are summed over a shorter period of time, the combined effect is a small increase in per saw benefits and net benefits (i.e., benefits – costs).

⁴⁵ Benefit estimates account for a 90 percent effectiveness estimate for AIM technology as stated in previous sections.

Table 17: Net Benefits Under Scenario that VS Reduce Injuries

Table Saw Type	Benefits per Saw	Cost per Saw (Low Est - top, Hi Est. - bottom)	Net Benefit per Saw	Est. Annual Sales	Aggregate Net Benefits (millions, \$)
	(a)	(b)	(c) = (a) - (b)	(d)	(e) = (c) × (d)
Bench	\$803	\$338	\$466	419,083	\$195
		\$1,210	-\$407		-\$89

6 Regulatory Alternatives to the Draft Proposed Rule

6.1 End the Regulatory Proceeding for Table Saws

The Commission could end the regulatory proceeding for table saws if it concludes that a mandatory rule is no longer needed to address an unreasonable risk. The 2017 special table saw injury study suggests that the AIM technology may not be needed for effective risk reduction. If correct, the implied effectiveness of the voluntary standard suggests that the market may already have provided safety roughly comparable to the safety that would be provided by the AIM technology. Additionally, as described in section 2, there does not appear to be a major market failure that precludes consumers from protecting themselves from blade contact injury. Table saws with AIM technology are already available to consumers who want to purchase them. Although the saws currently being produced with the AIM technology are priced toward the upper end of the price range for each of the three major categories of table saws (i.e., bench, contractor, cabinet), their current prices are generally within the range of expected table saw retail prices that would result from a mandatory standard.

Using the single year data point alone, the Commission could therefore decide there is no continued need for the regulatory action contemplated in the NPR.

6.2 Improve the Voluntary Safety Standard for Table Saws

Another alternative might be for Commission staff to continue to encourage additional safety requirements through voluntary standards work. Staff have, in the past, supported changes in the voluntary standard such as improved blade guards, riving knives, and anti-kickback pawls, and considers the newer blade guard systems required in the 7th Edition of the UL 987 voluntary standard for table saws to be a significant improvement over earlier systems (Smith, 2011). It is possible that additional safety improvements in the voluntary standard could be achieved.

This option would be similar to the “no action alternative,” except the Commission could direct staff to pursue safety improvements in the voluntary standard over time as a conditional alternative to a mandatory standard. In the meantime, additional injury information would continue to be collected which might help determine the effectiveness of

the voluntary standard.⁴⁶ The Commission could then reconsider a mandatory standard if efforts to improve the voluntary standard remain unsatisfactory, if blade contact injuries do not decline, or if further analysis suggests additional effective injury reduction strategies. However, staff have no current recommendations other than the use of AIM technology to significantly address the ongoing number of blade contact injuries seen in NEISS data and the voluntary standards have not added the use of AIM technology despite staff activity in this area.

6.3 *Later Effective Dates*

The proposed rule includes an effective date that is 36 months after the final rule is published in the *Federal Register*. Given the complexities and costs that would be associated with a major redesign of virtually all table saw models to incorporate the AIM technology, along with a retooling of production facilities, an effective date later than 3 years could help reduce the impact of the rule on small manufacturers because it would allow them additional time to spread the costs of the redesign. For manufacturers that might choose to exit the table saw market, perhaps because their volume of table saw sales does not justify the cost of a redesign, the additional delay might also provide them with more time to consider alternative business opportunities. This could also provide sufficient time for new market entrants. A later effective date might especially benefit manufacturers of bench saws because of the added technical difficulties in engineering small bench saws to incorporate an AIM technology.

Although later effective dates would mitigate somewhat the impact of the draft proposed rule on some manufacturers, it could also delay a market-wide distribution of table saws with AIM technology. Moreover, the delay could possibly discourage manufacturers from introducing table saws with AIM technology earlier than the effective date, and it might penalize manufacturers that did so. Given the net benefits per unit expected from incorporating AIM technology, delaying the introduction of table saws would also delay the expected benefits of a rule.

6.4 *Exempt Contractor and Cabinet Saws from a Product Safety Rule.*

The Commission could exempt cabinet and/or contractor saws on the grounds that they tend to be used by (and are generally intended for) professional, commercial, or industrial users. There is no clear dividing line between consumer and professional saws, particularly below the very highest levels of price and performance. Additionally, there is little information on the proportion of occupational purchasers for contractor saws and cabinet saws. However, SawStop has claimed on its website that it is the largest manufacturer of cabinet saws, though staff has not confirmed this. Exempting cabinet and/or contractor saws could also substantially reduce the adverse impact of the rule on small manufacturers because most small manufacturers market contractor and cabinet saws.

⁴⁶ The Commission might also reconsider its earlier decision not to conduct further injury surveys and/or an exposure survey to better understand consumer usage patterns. Collecting this information could help the staff explicitly determine the factors associated with the blade contact injury risk.

Under this alternative, the benefits and costs would be limited to those associated with bench saws, which constitute over 60 percent of the table saws in use as well as more than 60 percent of blade contact injuries.

6.5 Exempt a More Narrowly Defined Category of Table Saws

As a more narrowly defined exemption than that described in section 7.5., the Commission could exempt industrial saws with certain size, weight, power, and electrical specifications. For this alternative, the Commission would need to define “industrial saws.” Although there is no clear dividing line between consumer and industrial saws, it seems unlikely, for example, that many consumers would purchase a \$25,000 computerized numerically controlled (CNC) panel saw (a panel saw or sliding table saw is designed to cut large pieces of wood, like sheets of plywood). Industrial users tend to purchase more expensive, capable, and durable machines.

In general, a more expensive table saw is more powerful, larger, heavier, and has more features, and these characteristics apply particularly to cabinet saws. The availability of 12- or 14-inch blades is one indicator of power and capability. Although horsepower or amperage ratings are one indicator of power, other electrical specifications are probably the best indicator. A table saw that requires a minimum of 220, 440, or higher voltage, or three-phase wiring, is geared toward the professional user; most homes are wired for 110-120 volts, and few, if any, homes, have wiring that will accommodate three-phase wiring without substantial rewiring.

Although horsepower ratings for table saws can sometimes be misleading, horsepower ratings for table saws with three-phase wiring capability are generally in the 5 to 10 horsepower range. The weights for these high-end saws are also high, in the 500-pound to 1,000-pound range. We would characterize any cabinet saw with minimum requirements of three-phase wiring, voltage requirements of 220 or more, and a weight of 700 pounds or more as intended for industrial use.

Consequently, the Commission could exclude from the scope of the draft proposed rule table saws that are used by consumers yet geared primarily toward industrial use, without resulting in a significant reduction in expected benefits to consumers.

6.6 Limiting the Applicability of the Performance Requirements to Some, but Not All, Table Saws

Rather than require all table saws to meet the requirements of the draft proposed standard, the Commission could require that only a subset of table saws do so. For example, if a firm produces only bench saws, the Commission might require the firm to produce at least one bench saw model that meets the requirements of the standard. Similarly, if a firm produces bench saws *and* contractor saws, the Commission might require the firm to produce at least one bench saw model and one contractor saw model that meet the requirements of the standard. Or, as a variation, the Commission might allow each manufacturer to produce at least one bench saw model that does not meet the requirements of the standard, as long as their other bench model saws conform to the requirements of the rule.⁴⁷

⁴⁷ This variation in requirements would be somewhat analogous to the requirements for child-resistant packaging under the Poison Prevention Packaging Act.

However, if the Commission concludes that the AIM technology is needed on all table saws to address an unreasonable risk of injury, this option would only address a portion. If, for example, the requirement led to about 50 percent of table saws being equipped with the AIM technology, the expected benefits would be on the order of about 50 percent of the benefits described in the reference case analysis.⁴⁸

A rule of this sort might be more difficult to enforce than a requirement that all table saws contain the AIM technology. However, saws with the AIM technology would be available in greater numbers than in the baseline. This approach would also address the market power issue associated with the supply of AIM technology, and would allow consumers to choose table saws without AIM technology if they prefer. According to one commenter, there is usually a substantial heterogeneity in consumer preferences. Consequently, consumers who place a great value on safety, or who face greater-than-average risks will find the safer table saws more desirable and will be more likely to buy them. Consumers who do not want the safer but more expensive saws (or do not need them because they have lower than average risks) can decide to purchase saws without the AIM technology. In this way, consumer preferences might be better matched with the characteristics of the products purchased compared to the baseline.

If licensing agreements satisfactory to all parties could be arranged, this alternative would also alleviate (though not eliminate) the burden of the rule on some small manufacturers because it would not require that all of their saws contain the AIM technology. However, TTS (the owner of SawStop and the AIM patents) has indicated that it is open to the possibility of licensing the AIM technology *if the CPSC promulgates a rule requiring the technology on all table saws*. Consequently, if TTS were unwilling to license its technology at rates acceptable to other manufacturers, or if TTS refused to license manufacturers unless all of their saw models added the AIM technology, this option might not be practically successful. Staff is unaware of any current efforts by the other AIM technology developer (Felder Group) to license their AIM technology.

6.7 Information and Education Campaign

The Commission could conduct an information and education campaign, informing consumers about blade contact hazards, and how easily and quickly blade contact injuries can occur. If the Commission concluded that the AIM technology was important in reducing the table saw blade-contact injury rate, but chose not to promulgate a mandatory rule for any number of reasons, it could inform the public of the benefits of the AIM technology. This alternative could be implemented on its own, in the absence of other regulatory options, or it could be implemented in combination with any of the alternative we have discussed.

The Commission could also strongly encourage consumers to always use the passive safety devices required under the voluntary standard, especially if they choose not to purchase a table saw with the AIM technology. This recommendation could be supported

⁴⁸ We cannot predict what proportion of table saw sales would ultimately contain the AIM technology under this alternative. If consumers place a high value on safety, and prices are reduced or moderated over time, the proportion might be high. If, however, consumers would generally prefer saws without the AIM technology because of the lower prices or for other reasons, the proportion would be lower. Product liability concerns on the part of manufacturers would probably increase the proportion of table saws with the AIM technology. Once the table saws with AIM technology become more commonplace, table saws without the technology would be more likely to be challenged in product liability suits.

on the grounds that the voluntary standard has resulted in improvements in table saw safety, and that the safety devices are effective if used appropriately.

Such a campaign could be particularly important if the Commission chose an alternative that excluded some table saws from the scope of the draft proposed rule. For example, if the Commission chose to allow manufacturers to market table saw models without the AIM technology as long as one or more models were equipped with the safety technology, an information and education campaign could be aimed at helping to ensure that consumers make an informed choice in their table saw purchase. However, the effectiveness of such information and education approaches is likely to be limited (T. Smith, 2016)

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TAB B: Regulatory Flexibility Analysis of the Proposed Rule for Table Saws (EC Staff Memorandum)



United States
Consumer Product Safety Commission

Mandatory Safety Standard for Table Saws: Regulatory Flexibility Analysis

September 20, 2023

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

Introduction

Whenever an agency publishes a proposed rule, the Regulatory Flexibility Act (5 U.S.C. §601 – 612) requires that the agency prepare an initial regulatory flexibility analysis (IRFA) unless the head of the agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. The IRFA or a summary of it must be published in the Federal Register with the proposed rule. Under Section 603(b) of the RFA, each IRFA must have:

- (1) a description of why action by the agency is being considered;
- (2) a succinct statement of the objectives of, and legal basis for, the proposed rule;
- (3) a description of and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
- (4) a description of the projected reporting, recordkeeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for preparation of the report or record; and
- (5) an identification to the extent practicable, of all relevant Federal rules which may duplicate, overlap or conflict with the proposed rule.

An IRFA must also contain a description of any significant alternatives that would accomplish the stated objectives of the applicable statutes and which would minimize any significant economic impact of the proposed rule on small entities.

Reason for Agency Action

The Commission is considering a draft proposed rule that would establish a mandatory safety standard to reduce an unreasonable risk of blade-contact injury associated with table saws. CPSC staff estimate that there were an average of 32,000 emergency department-treated injuries annually from 2004 to 2020. There is available technology that can significantly mitigate the severity of these injuries. This mandatory standard would ensure all new table saws incorporate this technology.

Objective and Legal Basis for the Rule

The objective of the rule is to reduce the risk of serious injury to the hand or other body part coming into contact with an operating saw blade. The proposed final rule would be issued under the authority of Sections 7 and 9 of the Consumer Product Safety Act.

Comments of the Chief Counsel for Advocacy, SBA

In 2017, CPSC published a notice of proposed rulemaking (NPR) in the Federal Register (82 Fed. Reg. 22190) that proposed safety standards addressing blade-contact injuries on table saws. In response, the Office of Advocacy of the SBA (Advocacy) stated that they contacted several small businesses that would be impacted by the proposed rule. Advocacy then submitted comments on the proposed rule. This section discusses Advocacy's specific comments along with CPSC staff responses below.

Comment 1: The proposed rule is overly broad and imposes stringent and cost prohibitive requirements that will cause most if not all small table saw manufacturers to exit the market. Advocacy urges CPSC to consider the following, and in doing so, publish a supplemental IRFA for notice and comment in respect to: (1) use of proprietary technology; (2) significant alternatives to minimize the impact on small

businesses; (3) a re-analysis of voluntary standards data to ensure accuracy; and (4) supplementing the additional presentations of cost and benefit analysis. In addition, Advocacy requests that CPSC extend the comment period for the proposed rule until the conclusion of the oral presentation of comments, and until the latest Underwriters Laboratory (UL) injury data report has been released, thus allowing the public adequate opportunity to comment on both.

Response: The CPSC staff addressed in its responses to the ANPR (see section IX page 64 of NPR) and the Notice of Proposed Rulemaking (NPR) IRFA (Tab D) and this SNPR the uncertain, but possible, impact of proprietary AIM technology and patents, as well as significant alternatives of the proposed rule. Additionally, the Directorate for Epidemiology evaluated the impact of the voluntary standard on table saw safety in the NPR (Tab B) and updated that analysis in this SNPR. Regarding Advocacy's comment on supplementing the benefit-cost analysis with additional presentations, CPSC staff have attempted to present an evaluation of benefits and costs as clearly and transparently as possible in the supplemental regulatory analysis, including several sensitivity analyses, one of which includes an estimation of costs and benefits in the long-run (30-year study period).

With regard to the comment period, the Federal Register published the NPR for table saws on May 12, 2017. The comment period closed on July 26, 2018. The Commission presented an opportunity for interested persons to provide oral comments on the NPR at a meeting at CPSC headquarters on August 2, 2018, and accepted written comments on the meeting for up to three weeks after its conclusion. Additionally, the Commission presented the results of a table saw injuries study that is used as the basis for the analysis of the final rule and accepted public comments on the study. Furthermore, the Commission is publishing this SNPR and again requesting comments.

Comment 2: The current proposed rule would require all table saw suppliers and manufacturers to implement patented technology in their devices, the results of which create a monopoly.

Response: The proposed rule would most likely require all suppliers to use patented technology in their table saws. This would suggest the draft proposed rule would give a significant amount of market power to the patent holders, who are also table saw suppliers. (Sawstop or its owner TTS, Robert Bosch Tool Corporation ("Bosch"), Felder Group, and future potential entrants, collectively referred to as "patented suppliers" for the rest of this section). Table saw suppliers would likely pay licensing fees to the patented supplier and continue to sell its table saws. CPSC staff does not currently know the price of licensing fees for AIM technology but past statements by industry individuals have indicated the fee could equate to 8 percent of wholesale price. If a patented supplier sets licensing fees high enough it could result in some table saw suppliers exiting the market. Moreover, if the patents were upheld by the courts, the owner of the patented technology could potentially decide not to license the technology for any fee, a decision that could limit the number of suppliers of AIM technology to a small number of firms and likely result in higher prices and reduced demand. Finally, an effective date of 36 months could allow enough time for new entrants to develop other types of AIM systems that would meet the requirements of the proposed rule.

Comment 3 : There is no indication in the proposed rule that if implemented Sawstop/TTS would license the technology at an affordable price. In addition, licensing the technology is not a requirement for enforcement of the rule, thus there is little reason why Sawstop/TTS would choose to license the product assuming that it is able to meet the increased demand. The proposed rule thus imposes a requirement that may be impossible for small or large businesses alike to meet, without cooperation of Sawstop/TTS.

Response: CPSC lacks authority to mandate licensing of TTS's Sawstop technology to their producers. TTS has stated in communications with CPSC staff that it would honor Sawstop's former promise to

license the patented technology, but TTS has not provided a statement regarding licensing terms including price. Without specific knowledge on the price of licensing, the CPSC staff cannot precisely estimate the proposed rule's impact on the market of table saw suppliers. A high licensing fee by patented suppliers could lead to other table saw suppliers exiting the market, which would have an effect on consumers. However, competition between the firms with patents on AIM technology, including new entrants, could mitigate this effect. Lack of brand recognition in the cabinet/sliding and contractor saw market may make it more appealing to simply license the technology.

Comment 4: The CPSA requires CPSC to consider "any means of achieving the objective of the order while minimizing adverse effects on competition or disruption or dislocation of manufacturing and other commercial practices consistent with the public health and safety." As CPSC recognizes, the proposed rule will have a dramatic effect on the table saw industry and have a large impact on small manufacturers. Further, it will immediately hurt the competition in the table saw sector as only one company currently can produce table saws with AIM technology. The proposed rule as currently written directly contradicts the goals outlined in the CPSA.

Advocacy urges CPSC to eliminate the requirement to use AIM technology in all table saws unless there is an additional requirement that Sawstop license the technology, or in the alternative unless the Commission decides not to enforce the rule until and unless the technology is licensed at a fair price. Furthermore, CPSC may wish to postpone implementation of the rule until the patents expire, or until the court has made final judgement on the pending litigation. At such time, the market will either be allowed to attempt to devise its own technology, or in the case of expiration of the patent, CPSC can monitor the private market's adoption of AIM technology and continue working with the small business community to develop practical standards.

Response: Staff strongly disagrees with the assertion that it is contradicting the goals outlined by the CPSA. The purpose of the draft proposed rule is to significantly mitigate or eliminate the table blade contact injuries while providing options to industry to minimize adverse impacts. This rule does not require the use of specific AIM technology. Firms can develop their own technology to meet the performance standards set by the performance measures in this draft proposed rule. Two firms other than Sawstop have developed AIM technology, and a 36-month effective date is being proposed to allow other firms to become competitive suppliers. Finally, CPSC lacks authority to mandate licensing of TTS's Sawstop technology to their producers.

Ultimately, the Commission must weigh the potential costs from reduced competition that may occur from the rule with the costly societal impacts blade-contact injuries have to consumers and society, including an estimate of over 32,000 emergency department visits and approximately 3,000 amputations annually. The Supplemental Regulatory Analysis (SRA) and this IRFA present several alternatives to the proposed rule that would not require the use of AIM technology on all table saws. However, these alternatives provide substantially less societal benefits and do not adequately address the unreasonable risk of blade contact injuries.

Comment 5: To fulfill the requirements of the RFA and fully consider business impacts, the CPSC must bolster their RFA analysis by including full consideration of alternatives. CPSC should publish for notice and comment a supplemental IRFA that includes feasible alternatives, cost analyses that are specific to small business, and reasons as to why the alternatives were not chosen. Furthermore, if CPSC decides to go forward with finalizing this rulemaking, Advocacy urges CPSC to choose an alternative that minimizes burden to small business, or in this instance, saves most if not all small businesses from having to close.

Response: The SBA's concerns are addressed in this IRFA. Under the RFA, an IFRA must describe the small entities potentially affected by the rule, the requirements and burdens the rule would create, and significant alternatives to the rule. In this SNPR and IRFA briefing package, staff detailed the potential costs to small businesses for each of the proposed provisions and discussed significant alternatives to minimize potential burden. Staff concluded that the proposed rule would have a significant impact on a substantial number of small businesses. That conclusion continues in this SNPR.

Comment 6: Alternatives should be analyzed for their impacts on small businesses specifically. In the current rule, CPSC only refers to the full regulatory analysis in section XI.J. and information provided in the staff briefing package. However, the alternatives section of the regulatory impact analysis (RIA) is limited. For example, the analysis of later effective dates is not a quantitative evaluation and does not show the effects on costs or benefits. Further, the RIA does not provide information on how each alternative impacts small businesses specifically. CPSC should perform a cost analysis for every alternative in the IRFA to fully understand how this proposed rule can be altered to provide relief to small businesses.

Response: CPSC staff acknowledge that all the alternatives in this IRFA would be less burdensome economically on small businesses, compared to the proposed rule, because they either dispense with or delay the final rule, or limit the rule to a subset of table saws. Staff does not recommend these alternatives because they do not significantly reduce the hazard. The CPSC does not require that CPSC choose the most cost-beneficial regulatory alternative, nor that benefits exceed costs, but authorizes the Commission to determine the best course of action in preventing hidden hazards in consumer products. Staff provides a full description of the alternatives considered, their impact to small businesses, and the reason they were not selected.

Comment 7: Alternatives in the proposed rules IRFA are taken from the RIA. While the alternatives may overlap and be considered for both analyses, the alternatives in the IRFA must be "significant" alternatives to the proposed rule which accomplish the stated objectives of applicable statutes, and which minimize any significant economic impact of the proposed rule on small entities. In this context, the alternatives considered are incomplete. CPSC should include alternatives that specially provide relief to small businesses; these alternatives may be derivatives of the alternatives considered in the RIA. For example, alternatives in the RIA, which would allow manufacturers to continue producing and selling table saws without the AIM technology if they had a model with licensed AIM technology, should be considered and analyzed as a small businesses-only option in the IRFA.

Response: To address this comment, CPSC staff have added a discussion of several alternatives that could mitigate the final rule's impact to small businesses. One alternative comes from the SBA comment; this alternative would allow small suppliers to produce and sell table saws without AIM technology if they also had at least one model with AIM technology. For this alternative, staff note that uncertain licensing arrangements could make this alternative unfeasible for small businesses (and large businesses). One patent holder has stated that they would be unwilling to license to a competitor unless the AIM technology is applied to all the competitor's table saw models. Furthermore, this would allow continued sales of saws without AIM technology, which staff analysis of the NEISS data demonstrates an unreasonable risk of blade contact injury.

Comment 8: CPSC should analyze the feasible alternatives that help to minimize the impacts to small businesses. Such alternatives may include but are not limited to:

- i. Delaying the effective date of the proposed rule until and unless Sawstop licenses the AIM technology thus ensuring that the cost of compliance is not so high as to force small entities out of the market.
- ii. Delaying the effective date of the proposed rule until the patent expires thus allowing other entities to develop their own AIM technology.
- iii. Allowing for voluntary compliance with the proposed rule so long as entities carry both AIM and non-AIM technology products and inform customers of this technology.
- iv. Reanalyzing and removing certain types of table saws from the proposed rule based on the latest injury data report in an effort to make the rule less broad.
- v. Requiring that consumers who own table saws older than a certain date have their devices re-outfitted with the latest injury prevention technology, as table saw longevity outlasts updates to safety technology, or if this is not within the authority of the Commission, require manufacturers to provide guards and other safety measures at little to no cost to consumers.
- vi. Increasing consumer knowledge of safety features currently available on table saws through the use of safety campaigns, mandatory literature in stores, training classes, and requiring that operators of the saws understand the risks and implications of removing such devices before they are allowed to purchase a saw.

Response: Option v, recommended by SBAA, would not be legally feasible for CPSC because it would regulate consumer behavior or, alternatively impose a retroactive safety rule on previously sold products. Options iii, iv, vi are alternatives in this IRFA.

Options i and ii would entail practical considerations that make them difficult to enact. Rules published in the *Federal Register* are required to have a specified effective date. Thus, options i and ii could occur only if the Commission waited until the conditions were met to issue the final rule. However, the conditional effective date would be indefinite if the underlying condition(s) never occur. The conditions stated by the comment are themselves uncertain. For example, how would staff determine when the cost of compliance “was not too high”, especially considering the overwhelming positive net societal benefit of the regulation? Alternatively, the Commission could set an effective date but then delay the rule if its conditions were not met. Given the uncertainties of such a conditional final rule, it seems highly unlikely that either of these alternatives could realistically be implemented.

Comment 10: CPSC should provide clarification in its Economic Analysis regarding the current universe of table saws, the replacement rate of table saws, and the costs and benefits of the proposed rule over time. Currently, the rule presents a majority of the costs and benefits per table saw over the course of the product lifetime. However, for clarity, the Commission should consider showing the costs and benefits in aggregate over time. By presenting this data, it will be easier to understand how the benefits and costs flow over time as the proposed rule is implemented and the newly compliant products reach the market. This analysis may illuminate potential alternatives and provide easier analysis of delayed implementation dates.

CPSC also should discuss key baseline assumptions about the table saw market and its future. Specifically, if the price of table saws rises dramatically due to regulation, consumers may be reasonable expected to keep their older saws longer, instead of replacing them. Further, patents on the Sawstop AIM technology will expire in the future, which will lead to more saws with AIM technology entering the market. An industry desire to increase market share of saws with AIM technology has

already been shown by Bosch and others. The current no-rule baseline scenario should include an expected decrease in table saw injuries after the patents expire. Under the baseline scenario, the benefits of this rule would also be reduced.

Response: The regulatory analysis provides information about the universe of table saws. For example, the regulatory analysis contains a description of table saw shipments, table saws in use, the expected product life of table saws by type, and approximate replacement rates. The analysis does provide estimates of aggregate costs and benefits of the proposed rule over 30 years in its sensitivity analysis.

The baseline for the RIA was 2015, the most recent time period for which detailed injury data were then available. Baseline sales (net of the small proportion of table saws with AIM technology) were discussed in the regulatory evaluation. A key assumption of the analysis was that the proportion of table saws with AIM technology was small enough that its impact on the overall injury rate was negligible in the current market. CPSC staff did not maintain this assumption in the supplemental regulatory analysis which was conducted several years after the initial RIA.

The initial regulatory analysis took into account likely reductions in the table saw replacement rate and consumers keeping their older table saws for longer periods because of this regulation. Section 4.3.6. of the initial regulatory analysis described the expected sales reduction resulting from the expected increase in the costs of producing table saws. At the low end of our cost estimates, post-regulatory annual sales were expected to decline by about 14 percent; the high-end cost estimates were expected to reduce annual sales by about 36 percent.

The expiration of patents could potentially reduce the costs associated with the AIM technology and lead to an increase in the production of table saws with AIM technology in the absence of a rule. However, Sawstop reportedly has more than 100 other table saw patents granted and more pending, and it is unknown to what extent these other patents would impede other manufacturers from producing table saws with AIM technology. If those patents are linked to the original patents, they may expire at the same time. Current evidence suggests that these patents are not impeding other firms' efforts in development of AIM technologies as Felder Group has developed another version of the AIM system.

Comment 11: Finally, Advocacy urges the CPSC to extend the comment period deadline, as there is simply not adequate information at this time to go forward with rulemaking. The Commission should extend the deadline until both the oral comments hearing has taken place, and until the latest injury report has been released, thus allowing the public opportunity to comment on both.

Response: The issue of blade contact injuries from table saws was first petitioned to CPSC in April 2003. Since that time, CPSC has published reports and rulemakings, and hundreds of thousands of injuries have occurred. When applicable, CPSC has followed the notice and comment process on this topic. The Commission published the NPR for table saws in the Federal Register on May 12, 2017, with a comment period that closed in July 2018. It was not extended, as requested by Advocacy. However, the Commission presented an opportunity for interested persons to provide oral comments on the NPR at a meeting at CPSC headquarters on August 2, 2018 and accepted written comments on the meeting for three weeks after its conclusion. Additionally, the Commission presented the results of a table saw injuries study that was intended to be the basis for the analysis of the final rule, and accepted public comments on the study. Finally, the Commission is now publishing this SNPR with an additional comment period.

Significant Economic Issues Raised by the Public

The significant economic issues raised by the public in comments to the NPR largely focused on four issues: possible increases in cost production and price of table saws from the rule, the rule potentially creating a monopoly for Sawstop, the lack of consumer choice should the rule go into effect, and the possible (tangible and intangible) effect on small businesses. Fifty-four of the economic-related comments, a majority, focused on the rule potentially creating a monopoly. Thirty-nine comments expressed concern over the lack of consumer choice, specifically with the rule forcing them to buy safety features on table saws. Twenty-seven commenters stated a concern about the potential increase in the price of table saws. Only a few commenters expressed concern about the possible small business effects (both tangible and intangible), the potential loss of job loss from offshoring, and the potential for one manufacturer to leave exit the table saw market. CPSC staff responds to these concerns and other comments related to economic issues below.

Comment: The rule creates a monopoly, as any requirement would effectively require all table saw manufacturers to either license the only known effective AIM system or exit the market. This is a significant concern of the public.

Response: Since the publication of the NPR, three firms supply, or have supplied, the U.S. market with table saws equipped with AIM technology: SawStop (which is now owned by TTS), which equips all table saw models with AIM technology; Bosch, which has formerly sold one model equipped with AIM technology; and the Felder Group with a single AIM equipped model. In 2017, the U.S. International Trade Commission (ITC) issued a limited exclusion order prohibiting the import of Bosch table saws equipped with AIM technology as a result of an ITC investigation (337-TA-965).

Once this ban went into effect on March 27, 2017, Sawstop became the only firm supplying the U.S. market with AIM-equipped table saws for a short period of time. Bosch has stated that although it reached an amicable agreement was reached related to the ITC investigation, Bosch has no current plans to sell an AIM equipped saw in the U.S. (communication with Meredith Kling, Bosch Corporate Governmental Affairs North America, May 1, 2020). Firms without AIM technology would be likely to license the technology from one of the two current AIM system suppliers (Sawstop and Felder Group), or a new supplier of AIM technology. Accordingly, patent suppliers may be able to exercise a significant amount of market power in the U.S. table saw market if there is not additional competitive entry, but this concern would be greatly reduced with entry by new suppliers either before or after the proposed effective date of the rule. Patent suppliers may have factors that make it likely they will license the technology, primarily profit potential from additional sales of table saws that the firm does not have to manufacturing capability to produce.

Comment: At least two commenters compared a potential regulation requiring AIM technology in table saws to regulations requiring the use of seat belts in automobiles. The commenters implied that taxpayers pay for the table saw injuries due to higher insurance premiums and loss of productivity from the injured person.

Response: Externalities would be the costs of injuries that are borne by third parties; that is, people other than users or suppliers of table saws. As the commenters point out, the externalities from blade contact injuries are the financial costs of medical treatment and work losses shifted to the public through medical insurance premiums and unemployment compensation. This rule would reduce such incidents and alleviate those externalities.

Comment: Many commenters stated that the costs of regulation to increase table saw safety are not justified because the cost to consumers and manufacturers outweigh the benefits.

Response: The estimated benefits from the rule requiring the AIM technology on table saws, in both the NPR and SNPR, significantly exceed the estimated costs. Aggregate net benefits, using a 3 percent discount rate, range from about \$504 million to \$1,327 million for bench saws, \$241 million to \$365 million for contractor saws, and \$536 million to \$629 million for cabinet saws.

Comment: Commenters asserted that a standard mandating the AIM technology will increase the price of table saws and will make table saws unaffordable for many individuals, small businesses, and other groups of concern.

Response: As stated in the public comment responses in to the 2017 NPR, the Commission is aware that the proposed rule would bring significant costs and would result in disruption of the table saw market. The Commission must balance the number and severity of blade-contact injuries with the proposed rule's impact on the product utility, cost, and availability to the consumer. The regulatory analysis for this SNPR estimates that the prices for the least expensive bench saws now currently available are expected to more than double to \$300 or more. In general, the retail prices of bench saws could increase by as much as \$285 to \$700 per unit, and the retail prices of contractor and cabinet saws could rise by as much as \$450 to \$1,000 per unit. These higher prices may come down to increased competition from other AIM technologies, but CPSC staff cannot with certainty know the extent of any future price reductions. However, given that the least expensive bench saws currently cost about \$139, and the least expensive contractor saws are priced at about \$599, CPSC staff expects that some bench and contractor saws will still retail for under \$1,000.

Due to the likely decline in sales following the promulgation of a final rule, consumers who choose not to purchase a new saw due to higher prices will experience a loss in utility from foregoing the use of table saws or continuing to use older saws that they would have replaced. Another utility impact could come from the increased weight and (potentially) size of table saws to accommodate AIM technology. Although this factor may have a relatively small impact on the heavier and larger contractor and cabinet saws, the impact on some of the smaller and lighter bench saws could reduce their portability. These issues are discussed in the regulatory analysis of the SNPR.

CPSC staff found no evidence to suggest that the proposed rule will eliminate table saws from home hobby use or for starting small businesses. However, staff acknowledges that the proposed rule would have significant impacts on the cost, utility, and availability of table saws in the near term. In its regulatory analysis, staff clearly sets out all these considerations.

Comment: One commenter expressed concern with the potential small business effects, specifically the effect of not starting a small business.

Response: CPSC staff assesses that the proposed rule's indirect effect on small business creation will likely be minimal but has the potential to be significant. The rule will affect small businesses that produce table saws by prohibiting the sale of table saws without an AIM system. This prohibition could cause some businesses to leave the table saw market and could indirectly act as a barrier to market entry, because AIM technology is currently patented. Should the patent suppliers refuse to license the technology, firms would either have to develop their own technology or leave the table saw market. This could raise the general cost, possibly significantly, to start a small business.

Comment: There is potential loss of domestic jobs from offshoring, and for one manufacturer to leave the table saw market entirely, if the rule is adopted.

Response: Currently, manufacturers outside the U.S. produce a large share of the table saws sold in the U.S. The remaining domestic producers could potentially relocate their manufacturing in response

to increased production costs; CPSC did not receive any specific information or data supporting this claim, however.

Any manufacturer that cannot meet the requirements of the rule will be unable to sell noncompliant table saws.

Comment: Many commenters stated that the risk of injury is misleading because risk should be expressed per numbers of cuts made, and millions of cuts per year are made without incident.

Response: CPSC staff analyzed the risk of injury using the estimated number of table saws in use for each year because that was the information available to staff. Commenters did not provide sufficient data on risks per cut for staff to perform that analysis.

Unintended Consequences

Comment: Numerous commenters stated that adding AIM technology to table saws will give users a false sense of security and will increase unsafe user behavior that will translate to injuries on other power tools. Many commenters felt that users will not learn to respect the dangers of table saws and power tools in general.

Response: Staff finds it difficult to predict whether consumers will take less care when using a table saw with an AIM system relative to current table saws. However, even if true, a key factor in assessing the ultimate effect of an AIM system is whether such a system will likely result in a decrease in serious injuries. If the system is effective and works as intended, the severity of an injury resulting from blade contact will be lessened, which would likely reduce the overall number of severe injuries associated with table saws. Staff note no specific data concerning this was submitted by commenters.

Comment: Several commenters suggested that some users might modify the saws to bypass the safety mechanism, especially in the case of false activations, which users will perceive as a nuisance.

Response: Some consumers might attempt to bypass the AIM safety technology. As discussed in the regulatory analysis, this would tend to reduce the benefits of the proposed rule. However, because the AIM technology is not generally expected to interfere with the normal use of the table saw, most consumers would have little reason to bypass the AIM system.

Comment: Numerous commenters also stated that to avoid paying for a table saw with additional safety features, consumers will pursue more dangerous methods to cut wood by using other tools, such as circular saws, buying used products, or continuing to use an older table saw past its safety life. One commenter included photos of a circular saw that had been inverted to function as a table saw.

Response: CPSC staff agrees that the proposed rule will increase the price of table saws, and that these price increases are likely to reduce sales. Staff do not know how consumers who would have purchased a new table saw had the price not increased will respond. Some may hire professionals, instead of doing some projects themselves. Others might borrow or rent table saws, or use an older table saw that they would have preferred to replace. Some might attempt to use other tools in the place of table saws, as the commenters suggests. If the "other" substitute tools are riskier than table saws without AIM technology, then the estimated benefits attributed to the draft proposed rule would be reduced.

Small Entities to Which the Rule Will Apply

The rule would apply to manufacturers, importers, and private labelers of table saws that are sold in the United States. As of March 2023, CPSC staff is aware of 23 firms that supply table saws to the U.S. market. Of these 23 firms, seven are small according to criteria established by the Small Business Administration (SBA).¹ According to the SBA criteria, a table saw manufacturer is considered small if it has fewer than 500 employees and a table saw importer is considered to be small if it has fewer than 100 employees. Private labelers of table saws are considered to be small if their annual revenue exceeds \$41.5 million in the case of home centers, \$35 million in the case of department stores, and \$8 million in the case of hardware stores.²

Although the design and engineering of table saws may occur in the United States, most U.S. based suppliers contract the production of table saws to manufacturers in Taiwan or China. A small number of table saws are manufactured in Canada, Germany, Austria, and Italy.³ Shopsmith, the manufacturer of a multipurpose machine that includes a table saw, is the only small business believed to manufacture its product in the United States.

Compliance Requirements of the Draft Proposed Rule, Including Reporting and Recordkeeping Requirements

Table saw manufacturers, importers, and private labelers would be required to ensure that all their table saws comply with the requirements in the proposed rule. The proposed rule would require that all table saws incorporate an AIM technology that would reduce the risk of severe injury if the hand or other body part comes into contact with the blade while the saw is in operation. The proposed rule issues a performance requirement rather than a design standard. The proposed rule establishes a test method to determine the adequacy of the AIM technology incorporated in a table saw. The test involves moving a test probe at a rate of 1 meter per second towards the spinning blade of the table saw. To pass the test, a table saw can cut no more than 3.5 millimeters deep on the test probe. Although the proposed rule does not specify the manner by which the table saw must comply with the requirements, current AIM technology systems rapidly stop the rotation of the saw blade or quickly retract the blade in the presence of hand, arm, or other body part. CPSC staff are unaware of other currently available safety systems that could meet this requirement.

Under section 14 of the CPSA, manufacturers, importers, and private labelers of table saws will be required to certify, based on a test of each product or upon a reasonable testing program, that their table saws comply with the requirements of the draft proposed rule. Each certificate of compliance must identify the manufacturer or private labeler issuing the certificate and any third party conformity assessment body on whose testing the certificate depends. The certificate must be legible and in English and also include the date and place of manufacture, the date and place where the product was tested, including the full mailing address and telephone number for each party, and the contact

¹ "Revised Table Saw Market Research Report," Memorandum from Jane Israel, Matthew Baumann, and Jennifer Baxter (Industrial Economics, Incorporated) to William Zamula and Robert Franklin (Consumer Product Safety Commission, Directorate for Economic Analysis (March 28, 2016) was updated to reflect the recent acquisitions that occurred in the table saw market since the report was published.

² Under the North American Industrial Classification System (NAICS) manufacturers of table saws are classified in category 333243 (Sawmill, Woodworking, and Paper Machinery Manufacturing). Importers or private labelers of table saws include some department stores (NAICS category 452210, home centers (NAICS category 444110), and some hardware stores (NAICS category 444130).

³ Revised Table Saw Market Research Report," Memorandum from Jane Israel, Matthew Baumann, and Jennifer Baxter (Industrial Economics, Incorporated) to William Zamula and Robert Franklin (Consumer Product Safety Commission, Directorate for Economic Analysis (March 28, 2016)

information for the person responsible for maintaining records of the test results. The certificates may be in electronic format and must be provided to each distributor or retailer of the product. Upon request, the certificates must also be provided to the CPSC.⁴

Costs of Draft Rule That Would Be Incurred By Small Manufacturers

To comply with the draft rule, table saw manufacturers would be required to license or develop an AIM technology. To license a technology, manufacturers must pay a royalty to the owner of the patents on the technology. The royalty cost for licensing an AIM technology is uncertain. Previously, Dr. Stephen Gass of SawStop has stated that they would be willing to license the SawStop AIM technology for a royalty payment of 8 percent of the wholesale price of the saw, but only if the Commission establishes a mandatory standard requiring AIM technology. However, there is no certainty that SawStop or its parent Tool Technic Systems would license its technology under terms that would be acceptable to other manufacturers even if CPSC established a mandatory standard. Felder has recently developed and released a table saw model with AIM technology, but staff is unaware of any effort to license the technology to other firms.

If a manufacturer wished to avoid royalty or license fees, the manufacturer could seek to develop its own AIM technology or possibly other arrangements. Such an effort would likely cost at least several hundred thousand dollars and perhaps several million dollars, based on the estimated costs of developing the existing technologies. Additionally, a manufacturer would have to develop the new technology in a manner that did not infringe upon an existing patent to avoid royalty payments. Stephen Gass of SawStop has reportedly asserted that it is probable that any practical AIM technology would infringe upon one or more of the patents associated with the SawStop technology, although Felder has recently brought such technology to the market.

After acquiring an AIM technology, manufacturers would need to redesign their table saws and retool their manufacturing facilities to incorporate the technology. According to several manufacturers, incorporating an AIM technology would require a redesign of each table saw model. Speaking in reference to the existing SawStop or Bosch technologies, the manufacturers stated that the trunnion, the cabinet, and the interior of the saw would need to be redesigned to incorporate the parts required for the AIM technology and to allow access to the interior of the saw to replace the brake cartridge or allow for clearance of the blade retracting. The support structure of the table saw, including the stand, might have to be strengthened to bear the added weight of the system and to absorb the force that could result from the system being triggered.

Estimates of the redesign and retooling costs ranged from a low of about \$100,000 per model to \$700,000. The redesign and retool process would be expected to take 1 to 3 years depending on the number and severity of problems encountered in the process. The redesign and retooling costs for subsequent models could be less than the costs associated with the first model.

There is some uncertainty as to how the redesign and retooling costs would affect manufacturers. One manufacturer noted that the redesign and retooling costs must be paid upfront, and manufacturers generally desire to amortize these costs over three years. However, most table saw brand owners contract with Chinese or Taiwanese firms to manufacture their table saws. In some cases, these manufacturers may produce table saws for more than one firm and may be willing to absorb some of the costs to remain in the market.

⁴ The regulations governing the content, form, and availability of the certificates of compliance are codified at 16 CFR 1110.

In addition to the redesign and retooling costs, there would be costs for the additional components needed to incorporate an AIM technology. Depending upon the specific system, additional parts may include a brake cartridge, cables, parts, or brackets to secure the brake cartridge, electrodes and assemblies and a power supply or motor control. CPSC staff estimates these additional components to incrementally increase the manufacturing cost of a table saw by between \$58 and \$74.

Impact on Small Manufacturers

As stated above, CPSC staff expects most small manufacturers would try to license an AIM technology instead of developing their own technology. The costs of developing their own AIM technology would be too high for most small manufacturers, especially given the challenge of developing a technology that did not infringe upon an existing patent. However, there is no certainty that small manufacturers would be able to negotiate acceptable licensing agreements with a patented supplier. If small manufacturers are unable to negotiate acceptable licensing agreements for AIM technology, it is likely that all small table saw manufacturers would exit the U.S. table saw market.

If a small table saw manufacturer was able to license AIM technology, it would have to determine whether each table saw model would remain profitable after redesigning it with AIM technology. If the manufacturer does not believe that the sales volume would be sufficient to recoup retooling costs in a reasonable amount of time, it is likely that the manufacturer would discontinue the sale of the model (at least in the United States).⁵ Small table saw manufacturers that were able to license the AIM technology from SawStop would pay royalties to a competitor. This would reduce their competitiveness in the table saw market. Four firms indicated to CPSC staff that they would likely reduce or eliminate the table saws that they currently offer in the United States if AIM technology is mandated.⁶

Except for SawStop and one other firm, most small table saw manufacturers also supply other types of woodworking or metal working equipment. Information provided by firms suggests that U.S. sales of table saws account for a small percentage of the total revenue of most small firms. One manufacturer suggested that U.S. table saw sales accounted for about 1 percent of the firm's total revenue. Two other firms estimated that U.S. table saw sales accounted for between 5 and 8 percent of their total revenue.⁷ Actions that impact a firm's revenue by more than 1 percent are potentially significant. Given that small table saw manufacturers have expressed they may drop one or more table saw models or leave the market entirely if CPSC mandated AIM technology, CPSC staff assesses the proposed rule would have a significant impact on small manufacturers. If other technology becomes available to comply with the rule, this impact may be reduced. Staff notes that due to the purchase of Sawstop by TTS in 2017 Sawstop can no longer be classified as a small business.

Federal Rules which may Duplicate, Overlap, or Conflict with the Proposed Rule

The Occupational Safety and Health Administration (OSHA) has established standards that cover woodworking equipment used in workplace settings. These standards are codified at 29 CFR 1910. Generally, these requirements cover issues such as blade guards and hoods. The OSHA standards do not mandate or prohibit the use of AIM technology on table saws.

⁵ One small manufacturer stated that they would want to be able to amortize the redesign and retooling costs over a 3-year period (Telephone conversation on November 30, 2015).

⁶ "Revised Table Saw Market Research Report," Memorandum from Jane Israel, Matthew Baumann, and Jennifer Baxter (Industrial Economics, Incorporated) to William Zamula and Robert Franklin (Consumer Product Safety Commission, Directorate for Economic Analysis (March 28, 2016), p. 20.

⁷ Ibid., (IEc) p. 12.

Alternatives for Reducing the Adverse Impact on Small Entities

CPSC staff considered several alternatives to the proposed rule that could have reduced the impact on small manufacturers. These included the alternatives of taking no regulatory action, working to improve the voluntary standard for table saws, alternative effective dates for the rule, exempting certain categories of table saws from the proposed rule, and requiring AIM technology on some, but not all table saws. The sections below discuss each in more detail.

Take No Regulatory Action and Rely Upon Voluntary Standards

Under this alternative, the status quo would be maintained. Manufacturers would not be required to modify their table saws to incorporate AIM technology. Under this option, the main safety devices for table saws would likely be passive devices that are required by the voluntary standard. This includes blade guards, riving knives, and pawls. According to the most recent table saw special study (Garland and Tu, 2018), there is evidence that these passive safety devices have reduced injuries.

Even if the Commission opted to take no mandatory regulatory action with regards to table saw safety, it could still direct staff to participate in and encourage efforts to improve the voluntary standard for table saws, UL 987. However, staff is not aware of any improvements to the voluntary standard that could significantly reduce injuries, short of requiring AIM technology on table saws. The voluntary standards committees have twice rejected initiatives by UL to develop voluntary standards which include AIM systems for table saws. It seems unlikely that such a requirement will be added to the voluntary standard in the short run. Therefore, the no action scenario would be unlikely to significantly mitigate the injuries that are associated with table saw blade contact.

Alternative Effective Date

The draft proposed rule includes an effective date that is three years after the final rule is published in the *Federal Register*. Given the complexities and costs that would be associated with developing (or licensing) the AIM technology -- redesigning virtually all table saw models, and retooling production facilities -- later effective dates could reduce the impact of the rule on small manufacturers. A later effective date would allow manufacturers to spread the costs of developing or negotiating for the rights to use an AIM technology, modifying the design of their table saws to incorporate the AIM technology, and retool the factories for the production. For manufacturers that might choose to exit the table saw market, the additional delay will allow them more time to transition to alternative product markets or business opportunities.

While later effective dates would provide time for new AIM technologies to be introduced and mitigate the impact of the proposed rule on some small manufacturers, it would also delay the introduction of table saws with AIM technology into the market. A later effective date could discourage manufacturers from introducing table saws with AIM technology earlier than the effective date so they could avoid the additional costs for as long as possible. This would create cost advantage to firms who delay introducing their retooled saws and a penalty to manufacturers that would introduce their retooled saws early.

Exempt Certain Categories of Tables from Draft Rule

The Commission could exempt cabinet and perhaps contractor saws from the proposed rule on the grounds that they tend to be used by (and are generally intended for) professional, commercial, or industrial users. This alternative would reduce the impact on small table saw manufacturers because cabinet and contractor saw manufacturers tend to be small. (Manufacturers of bench saws, on the other

hand, tend to be large.) There is no clear dividing line between consumer and professional saws, particularly below the very highest levels of price and performance. CPSC staff had sparse information on the proportion of occupational purchasers for contractor saws and cabinet saws. However, on SawStop's website, it claims it is the largest manufacturer of cabinet saws. It has also stated that 75 percent of its sales were to industrial users. This implies that industrial users constitute a large proportion of the market for cabinet saws. While contractor saws are likely used by a larger proportion of consumers than cabinet saws, they are still generally intended for professional use.

While professionals use cabinet and contractor saws in commercial settings, these saws are available to consumers. A substantial number of woodworkers and hobbyists use these saws. Additionally, schools frequently use cabinet and contractor saws for educational purposes. Finally, even though cabinet and contractor saws exhibit a lower injury rate than bench saws, they are still associated with a substantial number of injuries and the regulatory analysis found that mandating AIM technology on cabinet and contractor saws would result in substantial net benefits.

Require the AIM Technology on Some but Not All Table Saws

Rather than requiring all table saws be equipped with AIM technology, an alternative would be to require a subset of table saws have AIM technology. For example, if a firm produces only bench saws, the Commission might require the firm to produce at least one bench saw model with the AIM technology. Similarly, if a firm chooses to produce bench saws *and* contractor saws, the Commission could require at least one bench saw model and one contractor saw model with the AIM technology. Or, as a variation, the Commission might allow each manufacturer to produce at least one bench saw model without the AIM technology as long as their other bench models conform to the requirements of the rule.⁸ This alternative would reduce (though not eliminate) the burden of the rule on some small manufacturers, since it would not require that all of their saws contain the AIM technology.⁹

Limiting the requirement for the AIM technology to a subset of table saws would have several advantages. If the patent holder is willing to license AIM technology but not all table saws were required to have it, this alternative may address market power concerns arising from a small number of firms holding rights to AIM technologies. Thus, saws with the AIM technology might be available in greater numbers than they have been in recent years. It would also allow consumers to choose table saws without AIM technology if they prefer.

This approach, though, would address only a portion of the estimated 32,000 annual blade contact injuries. If, for example, the requirement led to about 50 percent of table saws being equipped with the AIM technology, the expected benefits would be on the order of about 50 percent of the benefits described in the reference case analysis.¹⁰ Such a rule might also be more difficult to enforce than a requirement that all table saws contain the AIM technology.

⁸ This variation in requirements would be somewhat analogous to the requirements for child-resistant packaging under the Poison Prevention Packaging Act.

⁹ This also assumes that small manufacturers would still be able to license AIM technology and the licensing fee would still amount to roughly 8 percent royalty on the wholesale price of a saw, even though Dr. Gass conditioned his 8 percent royalty fee proposal on a rule that requires all table saws contain the AIM technology.

¹⁰ We cannot predict what proportion of table saw sales would ultimately contain the AIM technology under this alternative. Product liability concerns on the part of manufacturers would probably increase the proportion of table saws with the AIM technology. Once the table saws with AIM technology become more commonplace, table saws without the technology would be more likely to be challenged in product liability suits. We can already see this tendency in some recent product liability lawsuits against table saw manufacturers.