UNITED STATES GOVERNMENT

Memorandum

U.S. CONSUMER PRODUCT SAFETY COMMISSION

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OFFICE OF THE SECRETARY
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TO : THE COMMISSION

DATE: January 16, 1979

THROUGH: Sadye E. Dunn, Secretary

CONSUMER PRODUCT SAFETY COMMISSION

THROUGH: Andrew S. Krulwich, General Counsel

THROUGH: Stephen Lemberg, Assistant General Counsel

FROM: Harleigh Ewell, Attorney, OGC

SUBJECT: Briefing Package on Final Safety Standard for Walk-Behind Power Lawn Mowers: VOTE SHEET

The subject briefing package dated January 9, 1979, presents for Commission consideration a draft final standard for walk-behind power lawn mowers dealing with the risk of blade contact injury.

Please indicate your vote on the alternatives given below:

I. APPROVE FEDERAL REGISTER NOTICE AS DRAFTED

_____ _____
(signature) (date)

II. APPROVE FEDERAL REGISTER NOTICE WITH CHANGES AS FOLLOWS (Staff will redraft notice for Commission approval)

A. Issue Foot Probe Requirements but not Blade Stop Time Requirements (please check whether to delete _____ or defer _____ issuance of Blade Stop Time Requirements)

1. Issue 360 Degree and Discharge Chute Probing Requirements

_____ _____
(signature) (date)

2. Issue 120 Degree and Discharge Chute Probing, as provided in section 1205.4(b) of draft

60(b) CLEARED:
Identified

_____ ✓ _____
(signature) (date)

Mins
Comments Processed

UNITED STATES GOVERNMENT

Memorandum

6(b) CLEARED:
No Mfrs Identified
Excepted standard development
Mfrs Notified
Comments Processed

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

JAN 12 1979

TO : The Commission
THROUGH: Office of the Secretary
THROUGH: The Office of the Executive Director
THROUGH: Bert G. Simson, Director, Office of Program Management
FROM : William F. Kitzes, Office of Program Management WFK
David K. Parrish, Office of Program Management DP

SUBJECT: Briefing Package on Recommended Final Power Mower Standard

This Briefing Package transmits for Commission consideration a recommended final Consumer Product Safety Standard addressing blade contact hazards associated with walk-behind power lawn mowers. The package includes:

- Final Preamble and Rule - Tabs A&B
- Alternative Language for the Blade Stop Section (1205.5) of the Final Rule and Alternative Label - Tab C
- Injury Reduction Effectiveness Forecast - Tab D
- Comparison of the Requirements of the Final Rule, the May, 1977 Proposal, and the ANSI B71.1 Voluntary Standard - Tab E
- Economic Impact Statement - Tab F
- Compliance Strategy - Tab G

As discussed in the preamble, the Commission may wish to entertain petitions for Reconsideration after issuance of the final standard. This would serve the dual purpose of affording consumers adequate protection at the earliest possible date and allow interested parties the opportunity to submit their final views on the published standard. The Certification Regulation and Preamble will be transmitted under separate cover.

This briefing package was prepared by the Powered Equipment Team and has been approved by the Directorates for Engineering and Sciences, Hazard Identification and Analysis, Compliance and Enforcement, Field Operations and the Office of Communications.

HIA : Joann Langston
E&S : Donald R. Clay
C&E : David Schmeltzer
OC : Kenneth Rashid
Field : Walter Johnson

*U.S. GOVERNMENT PRINTING OFFICE: 1974 733-533/3604 1-3

B. Allow Engine Kill with Manual Restart instead of requiring Power Restart (i.e., delete section 1205.(a)(1)(iv) of draft)

1. Stop Time

(a) Provide for 3 Second Stop Time as in section 1205.5(a)(1)(iii) of draft

_____ _____
(signature) (date)

(b) Provide for 5 Second Stop Time

_____ _____
(signature) (date)

2. Require 360 Degree Foot Probing and Labeling Statement as Staff Recommends at TAB C

_____ _____
(signature) (date)

C. Change Effective Date from December 31, 1981, to

_____ (please provide reasons)

_____ _____
(signature) (date)

D. Petition for Reconsideration (pp. 171-178 of draft)

1. Delete

_____ _____
(signature) (date)

2. Revise (specify) _____

_____ _____
(signature) (date)

E. Delete Second Control for Restart Requirement (section 1205.5(a)(2))

_____ (signature) _____ (date)

F. Warning Label (Fig. 7) (See Warning Labels on p. 7 of briefing paper, p. 149 of TAB A, and both Figs. 7, TAB B)

1. Use Proposed Label as Modified by Staff

_____ (signature) _____ (date)

2. Use Label Suggested by Commenter as Modified by Staff

_____ (signature) _____ (date)

G. Other Changes (specify)

_____

_____

_____ (signature) _____ (date)

III. DO NOT ISSUE FEDERAL REGISTER NOTICE

_____ (signature) _____ (date)

IV. ABSTAIN

_____ (signature) _____ (date)

OTHER COMMENTS/SUGGESTIONS:

Billing Code 6355-01

Title 16 -- Commercial Practices

CHAPTER II -- CONSUMER PRODUCT SAFETY COMMISSION

PART 1205 -- SUBPART A -- SAFETY STANDARD FOR POWER LAWN MOWERS

Final Rule

AGENCY: Consumer Product Safety Commission.

ACTION: Final rule.

SUMMARY: The Commission issues a consumer product safety standard containing performance requirements intended to reduce injuries from contact with the rotating blades of rotary walk-behind power lawn mowers having a rigid or semi-rigid blade, the type consumers usually use. The standard also requires a label warning of the danger of blade contact on both reel-type and rotary walk-behind power lawn mowers. In order to reduce injuries to the operator's hands and feet, the standard requires that rotary walk-behind power mowers have a blade control system that will stop the mower blade within 3 seconds after the operator's hands leave the normal operating position. If the manufacturer chooses to stop the blade by stopping the engine, the mower must be equipped with a power start mechanism. If the mower has only manual start, stopping the blade by stopping the engine is not allowed by the standard. In order to reduce injuries to the operator's feet, the

standard also requires that the mower be constructed so that the rear periphery and discharge chute can be probed with a specified foot probe without the probe or any part of the mower contacting the mower blade.

DATES: The performance requirements of the standard apply to all of the subject rotary power lawn mowers manufactured after December 31, 1981. The labeling requirement is applicable to both rotary and reel-type power mowers manufactured after December 31, 1979. The issuance of the standard is stayed until __, 1979 (insert date that is 45 days after publication of this notice in the Federal Register), to allow for the submission of petitions for reconsideration.

Petitions for reconsideration of the standard must be received in the Office of the Secretary by _____, 1979 (insert date that is 15 days after publication of this notice in the Federal Register).

ADDRESSES: Petitions for reconsideration of the standard should be submitted to the Office of the Secretary, Consumer Product Safety Commission, 1111 18th Street, N.W. Washington, D.C. 20207.

FOR FURTHER INFORMATION CONTACT: (1) Concerning the standard: Allen Brauninger, Compliance and Enforcement, (301) 492-6629. (2) Concerning petition for reconsideration procedures: Harleigh Ewell, Office of General Counsel, (202) 634-7770.

Consumer Product Safety Commission, Washington, D.C. 20207, 301-492-6629.

SUPPLEMENTARY INFORMATION:

A. THE PROBLEM AND THE SOLUTION

The CPSC estimates that there are approximately 77,000 persons injured each year by contacting the moving blades of walk-behind power lawn mowers. Of these, approximately 9,900 injury incidents involve the amputation of at least one finger or toe. The remaining injuries consist of about 11,400 fractures, 2400 avulsions (the tearing away of flesh or a body part), 2300 contusions, and 51,400 lacerations. Not counting any monetary compensation for pain and suffering or loss of use of amputated fingers or toes, these 77,000 blade contact injuries result in injury costs of about $253 million each year.

For the most part, these injuries do not occur because the injured persons intentionally put their hand or foot under the blade housing. Usually, the contact with the blade occurs inadvertently while the person is performing some task in the vicinity of the mower.

For example, an elderly woman stopped mowing to pull some weeds beside the mower. After she had pulled the weeds, she turned back toward the mower and her foot was cut when it accidentally went under the housing.

In another case, a 35 year old teacher was emptying the contents of the grass catcher on his mower when some clippings fell out of the bag. When the operator bent down to remove the clippings, his hand inadvertently went under the housing and his fingers were cut.

Other cases that have been reported to the Commission include a 37 year old man who was attempting to clean the drive mechanism of a self-propelled mower, located under the mower housing, when the rotating blade cut his fingers. Also, a 60 year old printer was attempting to flick grass off the end of the discharge chute of his mower when he amputated a third of two of his fingers.

It may help to understand the ease with which the blade of a typical rotary mower may be reached if one realizes that the blade of such a mower may be only 1/8 in. above the edge of the housing and only 1/4 in. from the inner surface of the housing. Thus, with presently produced mowers, the slightest intrusion of a hand or foot under the blade housing carries with it a severe risk of injury.

The purpose of this document is to issue 16 CFR Part 1205, a consumer product safety standard for walk-behind power lawn mowers. This standard was developed under the "offeror" procedures provided for in the Consumer Product Safety Act ("the CPSA" or "the act", 15 U.S.C. 2051-2081). A more detailed discussion of the development process is given in the "BACKGROUND" section of this notice. The final standard is based on a recommended standard that was developed by Consumers Union as the offeror. Certain modifications were made to that standard as a result of the analysis by the Commission's staff and in response to comments that were received on the standard that was initally proposed by the Commission.

The standard will reduce the risk of injury from blade contact with rotary power lawn mowers by mandating 2 main performance requirements. First, in order to reduce injuries to the hand of the operator, the standard requires that the mower have a blade control that will stop the blade within 3 seconds of the time that the operator releases the handle of the mower. This is intended to insure that when the operator's hands leave the handle, the blade will stop before the operator can put his or her hands in the vicinity of the blade. This requirement will also have the effect of reducing foot injuries that occur when the operator is working or moving around the mower and is not holding onto the handle.

In order to further reduce foot injuries, the standard requires the areas of the mower that can be reached by the operator's feet while he or she is holding the handle to be constructed so that a specified probe that approximates the human foot cannot be brought into contact with the blade from these areas.

The requirements that are being mandated by the Commission will result in a significant increase in the retail price of rotary power lawn mowers. However, as will be explained below in more detail, the cost of these requirements bears a reasonable relationship to the safety benefits expected from the standard. In addition, there is no other way that has been developed up to this time to provide a comparable degree of safety to the user.

The standard also provides for a warning label to be on rotary and reel-type walk-behind power lawn mowers.

The following sections of this notice contain an explanation of the background of the standard development proceeding, a description of the provisions of the final standard that is being issued, the Commission's response to comments that were received on the proposal, an explanation of the changes that were made from the proposal, and discussions of other issues relevant to the issuance of the final standard.

B. BACKGROUND

On August 15, 1973, the Outdoor Power Equipment Institute (OPEI) petitioned the Consumer Product Safety Commission, pursuant to section 10 of the Consumer Product Safety Act ("the act"), 15 U.S.C. 2059, to begin a proceeding for the development of a consumer product safety standard for power lawn mowers. In its petition, OPEI asked the Commission to publish a voluntary standard, ANSI B71.1-1972, "Safety Specifications for Power Lawn Mowers, Lawn and Garden Tractors, and Lawn Tractors," with amendments and a compliance program, as a proposed consumer product safety standard. (ANSI standards are approved by, published by, and available from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018.)

The information about the injuries associated with power mowers that indicated a need for remedial action and that was considered in conjunction with the petition included the following:

1. Hazard analysis of in-depth investigations conducted originally by the Food and Drug Administration and later by the Consumer Product Safety Commission, from June 1, 1964, through September 30, 1973.

2. National Electronic Injury Surveillance System (NEISS) data reported from January 1, 1973, through December 31, 1973. For this period, it is estimated that over 64,000 injuries involving walk-behind power mowers were treated in all hospital emergency rooms in the United States.

3. Hearings of the National Commission on Product Safety, 1968-1970: Volume 5 (pp. 63-274), Supplement II (pp. 499-509), and Final Report (pp. 28-30).

4. Substantial product hazard notifications made to the Commission pursuant to section 15(b) of the act (15 U.S.C. 2064(b)).

After considering the available information concerning injuries and the injury potential associated with power mowers, the Commission preliminarily determined that the following hazards were associated with power lawn mowers and presented unreasonable risks of death or injury to consumers:

1. Lacerations, amputations, avulsions, and other injuries resulting from contact with the rotating mower blade.

2. Lacerations, punctures, and other injuries caused by objects propelled by the mower blade.

3. Lacerations, contusions, abrasions, and other injuries resulting from the rolling, slipping, or overturning of power lawn mowers or from failure of power lawn mower brakes or steering mechanisms.

4. Burns and other injuries resulting from direct contact with exposed heated surfaces of power mowers or from fires caused by ignition of liquids used as fuel for power mowers.

5. Injuries caused by electric shock from electrically powered lawn mowers or from electrical ignition systems.

6. Hearing loss and nonauditory trauma caused by exposure to excessive noise.

Accordingly, on November 16, 1973, the Commission granted the portion of the OPEI petition which requested that the Commission commence a proceeding to develop a consumer product safety standard for power lawn mowers. The Commission, however, denied the OPEI request to publish ANSI B71.1-1972, with amendments, as a proposed consumer product safety standard. This portion of the petition was denied because the Commission believed it should solicit offers to develop a standard and allow interested persons or organizations to submit previously issued or adopted standards as a recommended consumer product safety standard (section 7(b) of the act, 15 U.S.C. 2056(b)).

The Commission began the proceeding to develop a consumer product safety standard applicable to power lawn mowers by publishing a notice of proceeding in the FEDERAL

REGISTER of July 22, 1974 (39 FR 26662). Interested persons were invited to submit an existing standard as a proposed consumer product safety standard or to submit an offer to develop a recommended stafety standard. The notice of proceeding contains a more detailed discussion of the information about injuries associated with power lawn mowers that indicated a need for remedial action and discusses the provisions and adequacy of existing standards as they relate to the unreasonable risks of death or injury that the Commission had preliminarily determined to be associated with power lawn mowers. In response to the notice of proceeding, the Commission received one existing standard and an Invitation for Bid issued by the General Services Administration, which was referred to as an existing standard, for consideration as proposed consumer product safety standards. The Commission also received four offers to develop a standard for power lawn mowers.

The Commission subsequently accepted the offer of Consumers Union of United States, Inc. (CU), 256 Washington Street, Mount Vernon, New York 10550, to develop a consumer product safety standard applicable to power lawn mowers (39 FR 37803, October 24, 1974). CU, as the offeror, insured that representatives of industry, consumers, and other interests were given the opportunity to participate fully in the development of a recommended standard. CU submitted the recommended standard to the Commission on July 17, 1975. This recommended standard was, in fact, a comprehensive

standard that addressed all types of lawn mowers and virtually all lawn mower injuries. The CU recommended standard would have applied to all walk-behind and riding reel and rotary type mowers, including garden tractors and lawn and garden tractors, with either an integral or attached cutting mechanism. The recommended standard contained requirements relating to human contact with the rotating blade, thrown objects propelled by the mower blade, noise, fuel, electrical energy (battery or household current), operating controls, brakes, drive train, stability, hot surfaces, structural integrity, labeling, and instructions. The Commission exhaustively analyzed the recommended standard and, on May 5, 1977, the Commission published a proposed power lawn mower safety standard in the FEDERAL REGISTER for public comment (42 FR 23052). The proposed standard for power lawn mowers also was a comprehensive standard addressing unreasonable risks of injury associated with both walk behind and riding mowers. The proposal addressed not only blade contact injuries but also injuries caused by objects propelled by the mower blade (thrown objects); injuries due to lawn mowers rolling, slipping or overturning, or to failure of lawn mower brakes or steering mechanisms; injuries due to burns resulting from direct contact with exposed heated surfaces of mowers or from fires caused by ignition of liquids used as fuel for power mowers; and injuries caused by electric shock from electrically powered lawn mowers or from electrical ignition systems (42 FR 23052).

The proposed standard did not contain requirements addressing noise, which the Commission had preliminarily found presented an unreasonable risk of injury. The Commission decided to defer regulations in that area to the Environmental Protection Agency (EPA) because EPA had begun the development of a noise standard for power lawn mowers under the Noise Control Act of 1972 (42 U.S.C. 4903(c)). In addition, the proposal did not contain a number of the provisions that had been recommended by CU. The basis for not including those provisions and for modifying other provisions recommended by CU are discussed in detail in the FEDERAL REGISTER notice that proposed the standard (42 FR 23052; May 5, 1977).

On June 7, 1978, the Commission published a notice in the FEDERAL REGISTER (43 FR 24697) announcing that it would issue separately the requirements addressing injuries due to blade contact with walk-behind mowers and requirements addressing injuries associated with thrown objects, fuel and electrical hazards, and riding mowers. The Commission in issuing that notice determined it would be a more effective and efficient method of addressing the unreasonable risks of injury associated with power lawn mowers to first issue requirements that address the most numerous injuries and then to do the additional work that would be required to issue requirements addressing other risks of injury. Approximately 50% of all lawn mower injuries are due to blade contact with walk-behind mowers. The Commission

estimates that a standard addressing blade contact injuries with walk-behind mowers would eliminate or reduce the severity of over 38% of all power lawn mower injuries and 77% of all blade contact injuries associated with walk-behind mowers (NEISS Power Mower Baseline Study, July - September 1977). Therefore, the Commission decided to first issue requirements addressing blade contact injuries with walk-behind lawn mowers and subsequently to issue requirements, as needed, to address other risks of injury, including risks of injury associated with riding mowers, thrown objects, fuel and electrical hazards, and braking and steering mechanisms. Part 1205, which is being issued _____, 1979 (insert date 30 days after publication in the FEDERAL REGISTER) applies only to blade contact injuries with walk-behind mowers. Requirements addressing other risks of injury will be issued as Subparts to the standard as appropriate.

C. HOW PROPOSED STANDARD ADDRESSED BLADE CONTACT INJURIES

The Commission estimates that over 60,000 injuries associated with all types of power lawn mowers are treated in hospital emergency rooms annually. Of these injuries, approximately 47,000 involve walk-behind mowers and 30,000 involve contact with the rotating blade. The remaining injuries with walk-behind mowers are due to a number of different causes including contact with thrown objects, inadvertent fuel ignition, and maintenance activities. Approximately 13% of the blade contact injuries associated

with walk-behind mowers involve amputation of a body part, usually fingers or toes, 15% involve fracture, crushing or dislocation of a body part, and 70% involve laceration or avulsion of body parts. A relatively high proportion of persons injured by lawn mowers are hospitalized (The average rate of hospitalization for all National Electronic Injury Surviellance System (NEISS) products is less than 4%. However, over 10% of persons injured by walk-behind power mowers are hospitalized (NEISS Power Mower Baseline Study, July - September, 1977.)

The Commission addressed some blade contact injuries by including in the proposed standard a requirement for a blade control system. This system would (1) prevent operation of the blade unless the control is actuated by the operator, (2) require that the operator be in continuous contact with the control in order for the blade to continue to be driven, and (3) cause the blade to stop within a specified time upon release of the control by the operator. The effect of these requirements is that if the operator leaves the normal operating position, the blade will stop before the operator can contact the blade with his or her hands or feet. The requirement also provides additional protection against blade contact with the foot when the operator is not in the normal operating position.

The proposal also addressed other blade contact foot injuries by requirements and tests involving a foot probe designed to determine if the operator's foot could contact

the mower blade during commonly occurring conditions associated with mower use on level ground and on the transition to a slope. The foot probe test in the proposal consisted of inserting a specified foot probe as far as possible under all points of the bottom edge of the blade housing and shields and then pivoting the toe of the foot probe upward around the heel as much as possible as the probe was withdrawn. In order for the mower to meet the requirements of the proposal, the probe could not enter the path of the blade or cause any part of the mower to enter the path of the blade. To assure that shields used to reduce foot injuries provided the intended level of protection without interfering with mower utility and performance, the proposal included a shield strength test and a test to insure the shields would not prevent the mower from traversing typical obstructions. There was also a provision that shields could not be removed without tools. The proposal also included handle strength requirements and a requirement for an upstop for the handle to help prevent the operator from coming too close to the mower during mowing.

The proposal also included labeling requirements intended to warn of the danger presented by contact with the blade. The size and content of the label were selected with the intent that the label would be conspicuous to the user and would adequately warn of the hazard.

The proposed standard consisted of 14 sections. However, since the requirements that are issued at this time

are applicable only to blade contact injuries associated with walk-behind mowers, Part 1205 includes only 8 sections covering the following subject matter: § 1205.1, Scope of the standard (proposed § 1205.1); § 1205.2, Effective date (proposed § 1205.1); § 1205.3, Definitions (proposed § 1205.2); § 1205.4, Walk-behind rotary power mower protective shields (proposed § 1205.3); § 1205.5 Walk-behind rotary power mower controls (proposed § 1205.5); § 1205.6, Warning labels (proposed § 1205.12); § 1205.7, Prohibited stockpiling (proposed § 1205.13); and § 1205.8, Findings (proposed § 1205.14).

In a number of instances, the Commission has not included in the final mandatory standard provisions that appeared in the proposal and that also appear in the voluntary industry standard (ANSI B71.1-1972, B71.1a-1974 , B71.1b-1977) because virtually all power mower manufacturers conform to the provisions of the voluntary standard. (These instances are noted below in the discussion of the Commission's response to the comments received on the proposal.) However, the Commission will continue to monitor mower injuries, and if significant numbers of injuries are demonstrated to occur because of non-compliance with the voluntary standard, insufficiency of the voluntary standard requirements, or other reason, the Commission will consider amending the mandatory standard as appropriate.

The following are the voluntary standard requirements relating to the risk of injury from blade contact.

1. A rear protective shield (trailing shield) extending across 90% of the cutting width.

2. A rear protective shield strength test.

3. Except for the discharge or other openings, the housing shall extend 1/8 in below the lowest blade position.

4. Structural integrity test for housing and shields, consisting of the injection of 100 - 1/2 in. diameter steel balls, one at a time, under the housing of the running mower.

5. Requirements limiting the height of the highest point of the bottom edge of the front of the housing.

6. Requirements for arrangement of the starting mechanism and for mower stabilization.

7. Foot probe test of discharge opening.

8. Shields or guards cannot be removed without the use of tools.

9. Protection against unintentional uncoupling of the handle.

10. Upstop for mower handle.

11. Strength test for handle and handle supporting structure.

12. Swingover handles must automatically lock back into operating position.

13. If a handle storage position is provided, the handle shall automatically or manually lock into operating position when the handle is moved into this position.

14. After declutching or shutting off drive power from maximum speed, the blade shall stop rotating within 7 seconds.

15. A shut off control which must be manually activated to restart the mower.

16. For self-propelled mowers:

a. Engine cannot start while drive is engaged.

b. Except for deadman controls, drive controls shall disengage in direction opposite to mower travel. Such controls shall be on handle in the operator zone.

c. Handle mounted engine controls shall move forward for fast and rearward for slow or stop.

d. Cautionary label to start only in neutral.

17. Very quiet mowers shall have an indication of blade rotation.

18. Label stating "CAUTION" or "DANGER" near discharge opening.

19. Label durability requirements.

20. Safety instructions with the equipment.

D. DESCRIPTION OF THE FINAL STANDARD

The final standard being issued below as Part 1205 applies to walk-behind rotary and reel-type power lawn mowers having a minimum cutting width of 12 in and having a rigid or semi-rigid blade. The minimum cutting width was established in order to distinguish the mowers intended to

be covered by the standard from edgers and trimmers to which the standard does not apply. The limitation to rigid and semi-rigid blades was included so that the standard would not apply to mowers with blades of monofilament line which may not present the same risk of injury as do mowers with more rigid blades.

Mowers that have all of the following characteristics are also excluded from the coverage of the standard: a cutting width of 30 in or more; a weight of 200 lb or more; and, if powered by an engine (as opposed to an electric motor), 8 or more hp. This exclusion is to narrow the scope of the standard to the smaller mowers usually used by consumers.

Reel-type mowers are exempt from the performance requirements of the standard but are subject to the labeling requirements of § 1205.6.

Effective date. The performance requirements of the standard apply to mowers within the scope of the standard that are manufactured or imported after December 31, 1981. The labeling requirements apply to such mowers that are manufactured or imported after December 31, 1979.

Foot probe test. The standard specifies a foot probe that is intended to represent actions typical of those that can be achieved by the human foot in typical mowing situations. The foot probe is inserted within the area of the discharge chute and the area at the rear of the mower within 60° of either side of the centerline of the mower. These areas were selected because they are the areas where foot contact

injuries are known to occur while the operator is holding the handle. Foot contact injuries that occur while the operator is not holding the handle will be addressed by the blade control described below.

In the foot probe test, the probe is inserted with an insertion force that does not exceed 4 lb or lift the mower housing. After the foot probe is inserted as far as possible, the probe is withdrawn and, at the same time, is pivoted upward about the "heel" of the probe as far as possible without lifting the mower. In order for the mower to pass the test, the foot probe must not enter the path of the blade or cause any part of the mower to enter the path of the blade.

Obstruction test. An obstruction test is also provided which consists of passing the mower back and forth over a test fixture with a level surface having (1) a 0.99 in deep depression with a 5.90 in radius of curvature lined with a 16- to 36-grit abrasive and (2) a raised obstacle 0.60 in square, each extending the full width of the fixture. The depression and obstacle are located a sufficient distance apart that the mower contacts only one at a time. The test fixture may be relieved only to prevent interference with any blade retaining device. The speed of the mower across the fixture may not exceed 2.2 ft per sec in order to limit any tendency of the mower to bounce as it transits the fixture.

During this test, the mower shall not stop as a result of contact with the raised obstacle, no more than one wheel at a time shall be lifted from the fixture surface, and no shield shall enter the path of the blade.

The obstructions in this test are designed to simulate irregularities in the surface over which the mower may pass in normal use. The requirement that not more than one wheel shall lift is intended to insure that the protective shields of the mower do not lift excessively during use, thus exposing the blade. The requirement that the obstacle not stop the mower is to protect against the possibility that users would be tempted to remove the protective shielding if the mower would "hang up" on irregularities during normal use. This requirement is also intended to protect against a known injury pattern in which sudden stopping of the mower causes the mower to lift and/or the operator to stumble, whereupon the operator's foot contacts the blade. The requirement that the shield not enter the path of the blade addresses the user's potential temptation to remove the shield and prevents the pieces of the shield from becoming a thrown objects hazard if they are knocked off by the blade.

The requirement that the depression is lined with the specified rough surface helps insure that the mower will not slip as it rolls into the depression, thereby making the test results more repeatable.

Shield strength test. The standard requires that any shield located within the areas to be foot probed shall not

permanently separate, crack, or deform when subjected to a 50 lb static tensile force uniformly distributed over not less than half the length of the shield. This force is intended to insure that the shield is sufficiently strong to maintain its structural integrity and remain attached under conditions of use, thus retaining its ability to protect the operator. The force is to be applied for a period of 10 seconds in order to provide an adequate opportunity for deformations, separations, or cracks to occur. This test does not apply to the mower housing or grass catchers.

Movable shields. In order to insure that the protection of the foot probe test is not negated, shields that are movable for the purpose of attaching auxiliary equipment must, when moved, either automatically return to the normal position when the attached equipment is not present or prevent the operation of the blade unless the attached equipment is present or the shield is returned to its normal position.

Blade control system. Walk-behind rotary power mowers must have a blade control system that will (1) prevent the blade from operating unless the operator actuates the control, (2) require continuous contact with the control in order for the blade to continue to be driven, and (3) cause the blade to stop within 3 seconds after release of the control. As explained above, the effect of this requirement is that the blade will stop between the time the operator removes his or her hands from the control and the time the operator could contact the blade with his or her hand.

Unless the mower has a power restart capability, the control must stop the blade without stopping the engine. This is to prevent the operator from being unduly tempted to disable the blade control as a result of the inconvenience of having to manually restart the engine each time the handle is released.

In order to prevent inadvertent starting of the blade by accidental contact with the blade control described above, the standard requires a second means that must be manually actuated before the operator can restart the stopped blade.

Starting control location. In order to insure that the operator is in a position that is protected by the foot probe requirement when the mower is started, mowers with blades that begin operation when the power source starts must have their starting means located within the operating control zone, which is defined as a horizontal cylinder whose axis is tangent to the rear of the handle and that has a 15 in radius. In the Commission's judgment, an operator using starting controls located within this area will be behind the handle and will not be required to stand at the side of the mower while starting the mower, as would be required if the starting controls were located on the engine as are some currently produced power restart controls.

Warning label. Rotary mowers are required to bear a specified warning label near the discharge chute, and reel-type mowers are required to bear the label as near as possible

to the center of the cutting width. The location requirements are intended to insure that the labels will be seen by the operator, and for that reason a minimum size for the label is prescribed.

Stockpiling. Section 9(d) of the CPSA states that consumer product safety standards shall be applicable only to consumer products manufactured after the effective date of the standard. In order to prevent a manufacturer from circumventing the purpose of the standard, section 9(d) authorizes the Commission to issue a rule prohibiting stockpiling of the product covered by the consumer product safety standard. "Stockpiling" is defined as the manufacturing or importing of the product, between the issuance of the standard and its effective date, at a rate that is significantly greater than the rate at which the product was produced during a base period prescribed in the stockpiling rule. The Commisson has issued a stockpiling rule in connection with the walk-behind power lawn mower standard. This rule prohibits production of mowers at a rate that exceeds by 20% the rate at which a person subject to the standard manufactured or imported mowers during their most productive 365 day period between September 1, 1971, and August 31, 1978. The Commission believes that the lengthy base period is sufficient to allow for variations in sales that may have affected any particular business, and the 20% allowance should allow for normal changes in market shares or expansion of sales between the issuance of Part 1205 and its

effective date. Any manufacturer or importer whose business may exceed these limits because of unusual circumstances, and not because of stockpiling intended to circumvent the purpose of the standard, may apply to the Commission for a limited exemption from this stockpiling rule. Such a request should be supported by data showing the unusual circumstances reled upon.

English units. The requirements of the standard are stated in English units of measurement, since the Commission is informed that these units are commonly used by the power lawn mower industry. However, for convenience, the metric equivalents are also given.

E. STATUTORY FINDINGS

In order to issue a rule such as Part 1205, the CPSA requires the Commission to consider and make appropriate findings with respect to a number of topics. These findings are discussed below.

(1) The degree and nature of the risk of injury Part 1205 is designed to eliminate or reduce. The Commission estimates that there are approximately 77,000 injuries to consumers each year caused by contact with the blades of walk-behind power lawn mowers. From 1977 data, the Commission estimates that each year there are approximately 7,300 finger amputations, 2600 toe amputations, 2,400 avulsions, 11,450 fractures, 51,400 lacerations, and 2,300 contusions. Among the lacerations and avulsions, 35,800 were to hands and fingers and 18,000 were to toes and feet. The estimated costs (such as medical

expenses and lost wages) caused by these injuries are $253 million, not counting any monetary damages for pain and suffering. These injuries are caused when consumers accidentally contact the blade, either inadvertently while in the vicinity of the mower, or while intentionally performing some task which they erroneously believe will not bring their hand or foot into the path of the blade.

Part 1205 is expected to eliminate or reduce the severity of about 60,000 blade contact injuries per year, or 77% of all such injuries. The Commission estimates that if all mowers had been in compliance with the standard in 1977, about 6800 finger amputations, 1500 toe amputations, 11,000 fractures, 1800 avulsions, 38,400 lacerations, and several hundred contusions would not have occurred. Of the lacerations and avulsions, 28,300 finger injuries and 9,400 toe injuries would have been prevented. The Commission estimates that $211 million in injury costs would have been prevented.

(2) Consumer products subject to the rule. The products subject to this standard are walk-behind power lawn mowers with a cutting width of at least 12 in. Rotary power mowers with rigid or semi-rigid rotary blades are subject to all the provisions of the standard while reel-type and rotary mowers are subject to the labeling requirements. Mowers that have engines of 8 hp or greater, weigh 200 lb or more, and have a cutting width of 30 in or more are excluded from the standard. The Commission estimates that at least 98% of the total annual market (by unit volume) for walk-behind mowers will be affected by the standard. The Commission estimates that in 1978 this market was 5.4 million units.

(3) Need of the public for the products subject to the rule.

The Commission finds that the public need for walk-behind power mowers, which provide a relatively quick and effective way to cut grass, is substantial. Riding mowers, lawn and garden tractors, hand reel mowers, trimmers and edgers, and sickle-bar mowers also provide grass-cutting services, but walk-behind power rotary mowers are by far the most commonly used devices for maintaining household lawns. There are no devices that can completely substitute for walk-behind power mowers as a group, since they have applications for which other products are not as suitable. Each type of walk-behind power mower has individual properties which meet public needs, although one type of walk-behind is often an acceptable substitute for another. The newly developed monofilament line mower is not included within the scope of the standard and could be a substitute for mowers using rigid or semi-rigid blades under some conditions.

(4) Probable effect of the rule upon the utility of the product.

The Commission finds that the probable overall effect of the standard should be to increase the utility of mowers. Complying mowers may require slightly more time and a few additional actions to operate. Since complying mowers may have more electrical and mechanical parts than current mowers, they may require more maintenance than current mowers. No significant increase in mowing time is expected

if a brake-clutch device is used to comply with the standard since each engagement of the blade would require only a few seconds. The amount of additional time and expense required for maintenance, if any, will be dependent on the design solution the manufacturer uses. Such disutilities are expected to be slight and to be more than balanced by the increased sense of security consumers are likely to experience from having a safer mower. A study of brake-clutch mowers conducted by the Federal Supply Service (GSA) shows that almost all users appreciated the safety features on brake-clutch mowers.

During the development of the rule, questions were raised about whether changes in the shields necessitated by the foot probe requirements would adversely affect utility by being hard to push in grass or by being unable to mow close to walls. At the time of issuance of this rule, mowers are available that will pass a 360° foot probe test, and there are others that will pass rear and side foot probing without any significant loss of utility caused by shielding. Therefore, the Commission concludes that this requirement will not adversely affect the utility of mowers. Mowers with swingover handles, however, may be more difficult to design in this regard, since 120° at each end of the mower, plus the discharge chute, are subject to the foot probe requirement. However, since mowers meeting this requirement have already been built without apparent loss of utility, the Commission concludes that shielding can be

designed so that there should be no loss of utility even for mowers with swingover handles.

As required by section 9(b) of the CPSA, the Commission, in considering the issues involved in issuing a power lawn mower safety standard, has considered and taken into account the special needs of elderly and handicapped persons to determine the extent to which such persons may be adversely affected by the rule. The Commission has determined that there there will be no significant adverse effect on such persons as a result of Part 1205. In the first place, the rule can affect only those persons who are physically capable of using a power lawn mower. None of the rule's provisions will make it more difficult to operate a mower that complies with the standard. On the contrary, complying mowers should be easier to use because the need for manually restarting the mower will be less and because, if the mower uses a brake-clutch to comply with the blade control requirement, use of the brake-clutch can reduce the tendency of the engine to stall in heavy grass. Although a person's ability to hold a device such as a blade control for a long period of time will decline with age, the force required to hold the blade control can be made low enough that it will not be a problem during the length of time that it takes for consumers to mow a lawn.

(5) Probable effect of the rule upon the cost of the product.

The Commission estimates that the retail price impact of the standard will be about $35 for the average walk-behind mower. Based on an average useful mower-life of about 8 years, the additional annual cost to the purchaser is expected to average about $4.40. The probable effect of the standard on the various types of mowers within its scope will differ. Percentage increases in price will vary from about a 7 percent increase for power-restart self-propelled mowers to about a 30 percent increase for gasoline-powered push mowers. (See Table 1 of the CPSC Economic Impact Statement, November 1978, for the incremental cost calculation by product category.) The costs attributable to individual requirements of the standard are discussed in paragraph (8) below.

(6) Probable effect of the rule upon the availability of the product.

The Commission finds that the standard is not expected to have a significant impact on the availability of walk-behind rotary mowers, since domestic production capacity appears to be sufficient to handle any increased demand for safety-related components or materials. Any increased demand for raw materials will be small compared to the volume of raw materials currently used for production of walk-behind mowers. Furthermore, walk-behind power mower production does not consume a large proportion of the annual production of any of the raw materials it uses. Although it may be more costly to adapt some types of power mowers to

the standard than others, the effects of the standard on the price or utility of a particular category of power mowers are not expected to cause radical shifts in demand among types of mowers. The Commission finds that all types of power mowers subject to the standard will be available, although some, such as house-current-powered mowers, may increase their market shares because they can be brought into compliance with the standard at a lesser cost.

Because some manufacturers may not revise their entire product line before the effective date of the standard, individual mower manufactuers may initially have less varied lines than at present, but there should be no decrease in the overall types and features of mowers available to consumers.

(7) Alternative methods.

The Commission has considered other means of achieving the objective of the standard. For example, alternatives were considered such as hand probes, "blade harmless" tests, and blade control by engine kill but allowing manual restart. These alternatives have been rejected by the Commission as being either unfeasible or not as effective as the rule which is being issued.

Similarly, the Commission has found no alternative means of achieving the objective of the standard that it believes would have fewer adverse effects on competition or that would cause less disruption or dislocation of manufacturing and other commercial practices, consistent with

the public health and safety. For the power mower industry in general, the disruptions and dislocations of existing manufacturing and commercial practices due to the standard are expected to be minor. Small manufacturers of relatively low-priced mowers may find their price differentials with the larger, nationally-known firms narrowed. The small manufacturers are primarily assemblers of mowers and will have to rely on their suppliers for most of the components and changes needed to comply with the standard. These small manufacturers are the firms, if any, most likely to withdraw from the mower market since they generally have no engineering staff and have low volumes over which to spread development costs. If any firms should withdraw from the market, it is possible that some portion of them may return when complying designs and parts become available to them. The standard is not expected to have an appreciable impact on foreign trade or domestic competition since exports and imports represent only a small percentage of domestic shipments and production.

The distribution patterns for power lawn mowers may be slightly affected. Retail outlets that provide more service to the customer may benefit from the standard temporarily. Complying mowers will have different controls and features than current mowers, and mower purchasers may want more information and assistance than is provided by outlets such as discount stores and drug stores. Over the long run, as mower purchasers become familiar with the safety-related features, the advantage of the small, service-oriented

outlet will decline. Since lawn mower sales are a relatively small proportion of discount store or drug store sales, no significant impact on these types of outlets is expected.

(8) Unreasonable risk of injury.

The determination of whether a consumer product safety rule is reasonably necessary to reduce an unreasonable risk of injury involves a balancing of the degree and nature of the risk of injury addressed by the rule against the probable effect of the rule on the utility, cost, or availability of the product. The factors of utility and availability of the product, adverse effects on competition, and disruption or dislocation of manufacturing and other commercial practices have been discussed above. The following discussion concerns the relationship of anticipated injury reduction and costs for various requirements of the standard.

The standard consists of 3 main requirements: the foot probe test, the blade control with 3 second stop time, and the warning label. The foot probe and blade control requirements, while worthwhile by themselves, each have additional supporting requirements that increase or guarantee the effectiveness of the primary requirement.

The foot probe requirement for the rear of the mower and the discharge chute is supported by (1) the obstruction test, (2) the shield strength test, (3) the requirement that shields that are movable for the attachment of auxiliary equipment must either return automatically or prevent operation of the blade when the equipment is removed, and (4) the

requirement that power restart controls must be located in the operator control zone.

The foot probe and related requirements are expected to reduce the number of blade contact injuries to the foot by 13,000 each year. It is not possible to apportion this injury reduction among the respective requirements because they are interrelated. The cost of these requirements is estimated to be about $4.00 per mower, mostly for redesign of the shields. The shield strength requirement is similar to a requirement in the existing voluntary standard that is almost universally complied with, and should comprise only a small portion of the $4.00 retail price increase attributable to this related group of requirements. Also, shields complying with the movable shield requirement are featured in some currently produced mowers.

Since 5.4 million mowers are sold, and since the average injury expected to be eliminated by the standard costs approximately $3500, these foot probe requirements should result in a cost increase of about $22,000,000 and undiscounted injury savings of about $46,000,000, exclusive of any allowance for pain and suffering. (Injury costs consist of medical expenses, lost income, and insurance administration.)

The starting location control requirement would apply only to mowers with a power restart capability using engine kill to stop the blade. The cost for relocating the power restart switch, if necessary, should be very minor, and more than offset by the elimination of a clutch, as discussed below.

The requirement that the blade stop within 3 seconds of the release of the blade control is supported by (1) the requirement that those mowers that stop the blade by stopping the engine must have a power restart (to remove the motivation to disable the blade control because of the inconvenience of manually starting the mower each time the control is released) and by (2) the requirement for an additional control that must be actuated before the blade can resume operation (to prevent accidental starting of the blade). Together, these blade control requirements are expected to reduce the number of blade contact injuries by 46,500 per year for an undiscounted savings in injury costs of about $165,000,000 per year, exclusive of pain and suffering.

Virtually all mowers will be subjected to a cost increase of about $3 for the blade control actuating means and $1 for the second control required to restart the blade. (The $1 cost could be eliminated for power restart-engine kill mowers that do not start when the blade control is actuated.)

Also, most mowers would require a brake for the blade in order to achieve a 3 second stop time. This would add another $6.50 - $8.50, depending on the type of mower. Mowers with power restart capability could stop the blade by killing the engine and thus would not need to provide a clutch to disconnect the engine from the blade. Mowers using manual restart would have to provide a clutch or other blade disengagement devices, which would probably be combined with the brake in a unitary brake-clutch mechanism.

The following are the Commission's estimates of the probable retail price increases associated with certain types of currently produced mowers that will be caused by the blade control requirements.

Type of Mower	Blade Control Retail Price Increases
Electric mowers (house current or battery powered)	$15.00
Present electric start gasoline mowers	13.00 - 19.50
Present manual start gasoline mowers	
brake-clutch approach	32.50
power restart approach	29.00 - 39.50

The weighted average retail price increase of the blade stop requirements is expected to be about $31 per mower for a total retail price increase of $167,000,000.

The foot probe and blade stop requirements of the standard will obviously not completely protect the users of rotary mowers under all circumstances. In addition, these requirements are not applicable to reel-type mowers. It is still essential for consumers to be aware of the hazard of blade contact and take the proper precautions to protect themselves. It is especially important that users not become complacent with the knowledge that the mower incorporates blade contact safety requirements. Accordingly,

the Commission has determined that it is desirable that rotary and reel-type mowers bear a label warning of the danger of blade contact. Such a requirement would have practically no effect on the retail price of mowers since labels are very inexpensive and practically all currently produced mowers bear some type of warning label. In view of the hazard that will be associated with power mowers even after the effective date of the standard, and the low cost of the label, the Commission concludes there is an unreasonable risk of injury that can be addressed by the label requirements in Part 1205.

Labeling requirements under the CPSA may be issued under the authority of either section 7 of the act or section 27(e), or both. Under section 7, the Commission must find that the label is reasonably necessary to prevent or reduce an unreasonable risk of injury. Under section 27(e), the Commission must determine that the label conveys performance and technical data required to carry out the purposes of the act, one of which is "to protect the public against unreasonable risks of injury associated with consumer products" (section 2 of the act). The Commission concludes it has authority to issue the labeling requirement of Part 1205 under both section 7 and 27(e) and finds that issuance of the requirement is necessary to convey the performance and technical data concerning the blade contact hazard, in accordance with section 27(e), for the purpose of the act mentioned above.

Therefore, after considering the anticipated costs and benefits of Part 1205 and the other factors discussed above, and having taken into account the special needs of elderly and handicapped persons to determine the extent to which such persons may be adversely affected by the rule, the Commission finds that Part 1205 (including the effective dates) is reasonably necessary to eliminate or reduce the unreasonable risk of injury associated with walk-behind power lawn mowers and that promulgation of the rule is in the public interest.

F. RESPONSE TO COMMENTS

In response to the proposal of May 5, 1977, the Commission received 118 written comments. An informal proceeding to receive oral comments on the proposal was held on July 13, 1977. Those commentors who submitted comments by August 12, 1977, were given a further opportunity until September 6, 1977 to submit comments on oral or written comments that were submitted by others. (42 FR 34892). In addition, the Commission has received a number of late comments, which it has considered, and the Commission's staff has held several public meetings to discuss various issues concerning the lawn mower proposal. Also, on November 2, 1978, (43 FR 51038) the Commission requested additional comments on the data it had received concerning the safety and reliability of brake-clutch mechanisms. Twenty-one additional written comments were received in response to this request, and these comments are addressed

in this notice. Also addressed are oral comments on this issue that were presented during a proceeding held on December 11, 1978.

Comments on the proposal were submitted by individual lawn mower manufacturers, the lawn mower industry trade association, private testing laboratories, private testing laboratories, private inventors, individual consumers, and a consumer testing organization.

Because the Commission at this time is issuing requirements applicable only to blade contact injuries with walk-behind power mowers, only the comments (including late filed comments) pertaining to such requirements are being addressed at this time . Comments on other aspects of the proposal will be addressed when the Commission takes action on other requirements.

The principal issues raised by the comments, and the Commission's responses to the issues, are explained below under the heading of the section of the standard to which they apply. There is also an explanation of the instances in which the final standard differs from the proposal.

Scope of the standard (§ 1205.1)

The industry trade association argues that the Commission has impermissably expanded the scope of the proposed standard as it applies to the blade contact hazard by describing the blade contact hazard as being associated with both operators of mowers and bystanders. They argue that in the notice of proceeding the Commission described only the hazard of blade

contact with the operator and that the notice of proceeding limits the Commission's authority to expand the nature of the hazard to be addressed.

The Commission does not agree that the section 7 notice of proceeding serves as a limitation on the Commission's authority to address the hazards associated with a consumer product in a standard development proceeding. In this instance, it is apparent that lawn mowers can present similar risks of injury due to blade contact to bystanders and operators. There is nothing in the CPSA that limits the Commission's authority to include in a proposed standard provisions that address a risk of injury not specifically described in a section 7 notice of proceeding but which are inherently related to the risk that was described. In any event, the Commission has not included separate provisions in the final standard to address the risk of injury to bystanders. The provisions of the final standard are intended to address the risk of injury to operators, but those provisions may also address any risk of blade contact injury to bystanders.

Several commentors state that the scope of the standard is too broad. They contend that mowers other than rotary mowers (such as reel mowers), 3 wheel mowers, high wheel mowers, mulching mowers, monofilament line mowers, and walk-behind garden tractors should not be included within the scope of the standard. It is their view that the Commission has not given adequate consideration to the effect of the

requirements of the standard on these types of mowers. Several commentors also expressed the view that a maximum cutting width and/or horsepower should be specified to further delineate products within the scope of the standard because otherwise large horsepower walk-behind mowers or lawn and garden tractors might be considered to be within the scope of the standard.

For the reasons discussed below, the Commission has decided to limit the scope of the performance requirements of Subpart A of Part 1205 to rotary walk-behind power mowers equipped with a rigid or semi-rigid blade and having a cutting width of more than 12 inches. Mowers with a cutting width of 30 inches or greater, a weight of 200 lb or more, or an engine of 8 hp or more are excluded from the standard. For reasons also discussed below, the labeling provisions of the standard apply to reel-type mowers of a similar size.

a. Reel-type mowers.

After considering the question of whether the standard should apply to reel-type walk-behind power mowers, the Commission has decided not to apply the standard, except for the warning label provisions, to this type of mower.

The Commission believes that the economic and injury data presently available to it do not show that the risk of injury associated with reel-type mowers justifies applying the standard to reel-type mowers. Reel-type mowers constitute less than 1% of the walk-behind mower market, and thus

consumer exposure to that product is not as great. In addition, the injury data associated with reel-type mowers that are available to the Commission indicate that injuries with these mowers comprise less than 1% of the injuries associated with walk-behind mowers (NEISS Power Mower Baseline Study, July - September, 1977). In view of the lack of injury data, the infrequent use of reel-type mowers, and the differences between reel-type and rotary mowers, reel-type mowers are not required to meet the blade stop time or shielding requirements of the standard. However, because Commission injury data does show that mower operators have contacted the moving blade of reel-type mowers, the labeling provisions of the standard apply to reel-type mowers in order to warn of the hazard of blade contact.

b. 3 wheel, 5 wheel, high wheel, and air supported mowers.

The Commission has included rotary 3 wheel mowers, 5 wheel mowers, high wheel mowers, or air supported mowers in the standard. The number of wheels or the use of an air cushion instead of wheels would appear to have little relevance to the likelihood of contact with the rotating lawn mower blade. These mowers would present the same risks of blade contact as the common 4 wheel rotary mower. The Commission has considered the potential effects of the standard's requirements on these types of mowers. Especially since the final standard requires foot probing only at the discharge chute and at the rear 120° of the mower, the standard should not have an undue adverse effect on these mowers.

c. Semi-rigid blade or rigid blade other than metal.

Most of the mower blades used today are made of metal. The Commission has been advised, however, that some persons are experimenting with rigid or semi-rigid blades made of material other than metal, such as plastic or heavy rubber. However, no convincing evidence has been presented to the Commission to show that these blades present a different risk of injury than metal blades. If these blades are rigid or semi-rigid, they appear to present an unreasonable risk of amputation, laceration, fracture, or avulsion in the same manner as metal blades. Blades typically rotate at a tip speed of approximately 200 mph, and a hand or foot struck by a semi-rigid or rigid blade made of material other than metal, that also cuts grass, can be expected to cause the same types of injuries as a metal blade. Therefore, the Commission believes that mowers with rigid or semi-rigid blades made of materials other than metal should be included within the scope of the standard.

d. Nonrigid blades.

The Commission has not included nonrigid blades, such as those made of a monofilament line, within the scope of the standard. The Commission is aware that prototype mowers and at least one production mower have been developed that use a rotating monofilament line to cut grass. A monofilament line is different by its very nature from a rigid or semi-rigid blade. The Commission has not had an opportunity to evaluate whether this type of grass cutting

mechanism presents the same risk of injury as a rigid or semi-rigid blade. However, the Commission believes that there may be sufficient differences in blade mass, stiffness, and/or sharpness between these mowers and mowers which use a rigid or semi-rigid blade that the Commission cannot presume that they present the same risk of injury. Therefore, the definition of "blade" as used in the standard has been revised to include only rigid or semi-rigid mechanisms.

The Commission intends to conduct an analysis of the injury potential associated with these blades as part of its ongoing investigation of lawn mower injuries. If appropriate, the Commission could take regulatory action in the future with respect to mowers with these flexible "blades".

e. Mulching mowers.

One commentor suggests that mulching mowers should not be included in the standard because they lack a discharge chute, and, therefore, there would be no hazard of blade contact due to clearing the discharge chute. Mulching mowers are essentially the same as other rotary lawn mowers except for the absence of the discharge chute. Except for attempts to clear the discharge chute, blade contact with the hand can occur in the same manner as with other mowers, for example, while making adjustments to the mower or by inadvertent contact. In addition, foot contact with the blade can occur in the same manner as with other mowers, for example by pushing or kicking the mower with the foot, or by slipping or falling while mowing or by other inadvertent

contact. Therefore, the Commission has included mulching mowers within the standard as long as they fit the definition of "rotary power lawn mowers."

f. Maximum HP, weight, and/or blade width.

The Commission's standard for power lawn mowers is intended to address the unreasonable risks of injury associated with the mowers that are typically used by consumers around a residence or household. There are a number of mowers that, although falling generally within the definition of the term "consumer product," were not intended by the Commission to be included within the scope of this standard because of their relatively infrequent use by consumers, and the Commission has decided to exclude these mowers from the scope of the standard. These would include mowers that have a large cutting width, are extremely heavy, and have a large HP engine.

The requirements of the standard may affect these large mowers, and their manufacturers and users, differently. Most manufacturers of these mowers are smaller firms which produce a limited number of mowers for commercial and specialty purposes. The economic burden for these manufacturers could be greater than that for the manufacturers of the smaller mowers usually used by consumers since they must spread the cost of compliance over fewer production units.

Since the cost per unit would be higher, manufacturers might choose to drop models or leave the industry. The

Commission is aware of only six manufacturers that produce walk-behind mowers that will not be covered by the standard. Availability of these large mowers might therefore be more severely affected than the availability of mowers in the smaller size categories where there are far more firms competing.

Accordingly, the Commission has decided to exclude from the standard's coverage mowers that have, in combination, a blade cutting width of 30 inches or more, a weight of 200 lb or more, and an engine of 8 hp or more. Mowers subject to the standard account for approximately 98% of all walk-behind mowers sold. These criteria were selected because few injuries have been reported for these larger mowers and because the Commission believes that such mowers are not typical of the mowers normally used by consumers. The Commission points out, however, that its decision to exclude these large mowers from the standard is not based on a finding that there is in fact no unreasonable risk associated with these mowers. Accordingly, section 26 of the CPSA would not preclude state or local regulation of the blade contact hazard associated with mowers outside the scope of the standard.

Effective Date (§ 1205.2)

The proposed effective date provided that the standard would become effective 2 years after the final standard was issued. At that time, the blade of a walk-behind mower would have to stop within 5 seconds of the release of the

blade control. Two years after that date (4 years after the standard was issued), the permissable blade stopping time would be reduced to 3 seconds. As explained below, the final standard applies to mowers manufactured or imported after December 31, 1981, except for the labeling requirement, which will apply to mowers manufactured after December 31, 1979. When the standard is effective, the blade of a walk-behind rotary mower will have to stop within 3 seconds of the release of the blade control actuating mechanism. The interim 5 second stopping time has been deleted in the final standard and the initial effective date has been lengthened, in order to avoid the need for industry to make more than one change and to achieve the protection of the three second time at an earlier date.

A number of commentors addressed the issue of effective date. Several manufacturers and the industry trade association commented that the proposed effective date of two years for most sections of the standard could not be met by the industry, or could only be met at great cost. Commentors claimed that since the entire industry would be retooling at the same time to meet the standard, tool and die shops would not have the capacity to meet all of the demands, and thus more time would be needed.

Some of the comments opposing the two year effective date indicated that the portions of the proposed standard that concerned thrown objects or riding mowers would be especially difficult in terms of meeting a two year effective date.

Other comments indicated that prototytype and production testing of newly developed mower designs would require two mowing seasons to accomplish.

One manufacturer requested that the effective date coincide with the beginning of the fall production season (usually between September 1 and October 1) and stated that the normal manufacturing and development time for a riding mower or garden tractor would be 2.5 years.

The industry trade association states that the average normal lead time is 44 months. They believe that compliance with the standard as proposed will take considerably longer than this because of the simultaneous tooling demands of the entire industry necessary to meet all the requirements of the proposed standard. Although they do not suggest in their written comment what the lead time should be, the implication is that 4 to 5 years would be necessary.

On the other hand, the consumer testing organization argued that two years is adequate for the industry to achieve a three second stopping time. In addition, it argued that warning labels and other provisions of the standard that are similar to present voluntary standards should become effective in less than one year.

A brake-clutch manufacturer recommended that a two second blade stopping time be set to become effective two years from the date the final standard is issued.

In evaluating these comments, it must be kept in mind that the performance requirements of the standard that is

being issued are intended to address only blade contact hazards for walk-behind rotary mowers. As a result, manufacturers will not have to make nearly so many changes as they would have had to with the proposed standard.

The Commission contracted with Battelle Columbus Laboratories for an analysis of the anticipated economic impact of the proposed standard. Pages 88-92 of their report entitled "Economic Impact Analysis of Proposed Safety Standard for Power Lawn Mowers," dated December 30, 1976, explains the basic factors considered by the Commission in making its decision on the effective date. The Commission concurs with the report's conclusions that are relevant to the blade contact provisions that are being issued at this time. Even though the report is over 2 years old, there have been no changes that would affect the relevant conclusions in the report.

The report points out that among the various firms in the industry there is a wide variance in the engineering capabilities and access to financial capital required to make the changes necessary to comply with the proposed blade contact requirements. There is also a disparity in the degree to which existing mowers already comply with the proposed blade contact requirements. The largest firms in the industry have engineering staffs and the financial capital to produce complying mowers with shorter lead times. Smaller firms may have to rely heavily on their suppliers for both safety-related components and the engineering

expertise to incorporate them in their designs. Another factor that could affect the effective date is the delays that could be caused by a large number of orders being placed simultaneously with tool and die makers by mower manufacturers and suppliers to the mower industry.

Battelle estimated that given these considerations, the time required for making changes to achieve compliance for a typical walk-behind mower with the comprehensive proposed standard would be 21-30 months or more. Most firms they interviewed felt that a minimum of two years would be required to achieve compliance, assuming that the effective dates coincide with the start of a model year. The Commission has reviewed the Batelle report and agrees with its conclusions concerning the effective date.

Production for a model year usually begins about September 1 of the previous year. Therefore, manufacturers will have about thirty-one months before normal production would begin for the model year in which the standard becomes effective. The data available to the Commission indicate that the industry can make the necessary changes by that date.

The Commission believes that the 4 or 5 year lead time suggested by some of the comments is clearly excessive, especially since the provisions of the standard address only blade contact injuries, rather than the broader provisions of the proposal. Substantial research has already gone into ways to comply with the provisions of the proposed standard.

At this time, three manufacturers are making brake-clutch units that appear to comply with the 3 second blade stop requirements of the proposed standard, and patent activity in this field has been strong. The solving of these difficulties by at least three manufacturers indicates that the maximum lead time is not required.

On the other hand, the two year effective date suggested is not believed to be practical. Some manufacturers will have to make major changes to their mowers to comply with the standard. A short effective date could also cause major bottlenecks in the production of safety-related components, and there could be shortages in the number and types of mowers available to consumers. The retail price impacts on consumers would be higher than with a longer lead time, and the number of firms (especially small firms) that could be forced out of business by an inability to meet the effective date would be increased.

Based on a balancing of (1) the need for the standard in order to reduce the risk of injury associated with walk-behind mowers and (2) the possible adverse economic effects caused by the shorter effective dates, the Commission has decided that the standard should become effective December 31, 1981. A detailed discussion of the economic costs associated with this effective date is contained in the Battelle analysis referred to above. It is expected that for this effective date, the adverse effects described above for a two year effective date would be substantially mitigated.

Manufacturers should have had enough time for field testing, and the supply of walk-behind mowers should be adequate to meet the demand. Individual mower manufacturers may initially have less varied lines than at present, but there should be no decrease in the types and features of mowers available to consumers. For example, one manufacturer might choose initially not to provide an 18 inch model and another might choose not to provide a 22 inch model, but each type would probably still be available to the consumer. This time frame makes an allowance for the difficulties involved in redesigning, testing, and tooling for a complete new line.

On the other hand, the Commission agrees with the comments that the labeling requirements can be complied with in one year with no undue adverse economic impact attributable to the shorter effective date. This is because the required label can easily be incorporated into production within this time. In addition, most manufacturers are currently providing a label and will need only to change the form of the label. Accordingly, the labeling requirement is being issued to apply to reel and rotary mowers manufactured after December 31, 1979. (This labeling requirement is issued under the authority of both section 7 and section 27(e) of the act.)

For the reasons given above, the Commission finds that the December 31, 1981, effective date for the performance requirements of the standard and the December 31, 1979, effective date for the labeling requirements are in the

public interest. The Commission also finds, for the reasons given above, that good cause exists for having the effective date for the performance requirements be December 31, 1981, rather than the 180 day limitation on the effective date that would normally apply because of section 9(d) of the CPSA.

Definitions (§ 1205.3)

Because the standard being issued at this time applies only to blade contact injury from walk-behind rotary mowers, only definitions applying to these mowers are being issued, and only those comments addressing definitions applicable to blade contact with these mowers are discussed at this time.

One commentor suggests that the Commission "harmonize" the definitions in the mandatory standard with those in the voluntary industry standard, ANSI B71.1-1972.

When developing its definitions, the Commission reviewed the definitions of ANSI B71.1-1972 and where feasible made the definitions in the mandatory standard consistent with those of the voluntary standard in order to minimize any confusion that might result from the terms used in the mandatory standard.

a. Maximum operating speed.

A commentor suggests that the definition of "maximum operating speed" as proposed at § 1205.2(a)(13) be revised. The definition as proposed by the Commission reads as follows:

> "'Maximum operating speed' means the maximum rpm obtainable by the engine or motor under the conditions of the particular test where the term is used."

The commentor recommends that the term "governed" be inserted prior to "rpm" and that the following language be added to the definition to address mowers other than gasoline mowers:

> "For an electrically-powered mower the speed attained when the mower is energized from 120 volts, 60 Hz, through a 100-foot, 16-gage extension cord. For a battery-powered mower, the speed attained with the battery fully charged at the start of the test."

The term "maximum operating speed" is used in the final standard as a condition for testing blade stopping time. The mower is required to be tested when it is in the condition in which it is intended to be used. If a mower power source is equipped with an integral governor designed to automatically limit the maximum speed attainable by the motor or engine, the mower would be tested at the maximum "governed" rpm obtainable. However, a mower may not be equipped with an integral governor. Its operating speed may be controlled by a variable speed control device or throttle, by adjustments to the fuel mixture, or by other means. Adding the word "governed" could, therefore, confuse the intent of this definition by leading persons to believe that the mower could be tested at less than the maximum obtainable rpm. Since this result is not intended for mowers without an integral governor, the suggested change has not been made in the definition.

In regard to the suggested addition for electric mowers, the use of an extension cord poses potential problems of test reproducibility. In addition, if the Commission were to specify a particular voltage, as suggested by the commentors, the definition would not take into account variations in the voltage that may be available at the testing facility. The Commission agrees that language should be added to take into account (1) the dropoff in voltage that occurs when an extension cord is used with electric mowers and (2) variations in voltage itself. Therefore, the Commission has added language to the definition of "maximum operating speed" for extension cord powered electric mowers to specify that the voltage supplied to the mower shall be in a range that is commonly found at residential branch-circuit outlets (115 V to 120 V). This will allow for a reasonable range of variation in the supply during the test. The following language has been added:

> "For an electrically-powered mower, [maximum operating speed] is the speed attained when the mower is energized from a 60 Hz alternating current source that delivers a voltage no greater than 120 V and no less than 115 V at the power input to the mower with the mower running."

The commentor's suggested revision for a battery powered mower was intended to provide a clearer definition of the blade stopping time test, but it could be subject to differing interpretations of "fully-charged". To reduce that possibility, the following language has been added to the definition:

"For a battery-powered mower, it is the speed attained after the battery has been fully charged in accordance with the mower manufacturer's instructions." The revised definitions of "maximum operating speed" appear in § 1205.3(a)(8) of the final standard.

b. Mulching mower.

A commentor expresses the view that the definition of "mulching mower" in proposed § 1205.2(a)(15) is unclear.

The term "mulching mower," although defined in the proposal, did not appear in the blade contact provisions of the proposed standard. Therefore, there is no need to define the term in the standard that is being issued at this time. It should be noted that the standard applies to all "rotary mowers" as defined in the standard. To the extent that a "mulching mower" is a rotary mower, it would be covered by the standard.

c. Operating control zone.

A commentor states that the term "operating control zone", defined in proposed § 1205.2(a)(17)(i) (final § 1205.3(a)(11)), is unnecessarily restrictive and imposes unwarranted design limitations on the placement of manual restart controls. The commentor contends that because of the effort required to start the mower and because of the potential effects of recoil, placing starting controls in the proposed operator control zone could make the mower unstable or cause the operator to move out of the operator control zone while starting. The comment concludes that the measuring cylinder needs considerable expansion.

From Commission injury data, it is estimated that over 2,000 injuries are treated in hospital emergency rooms each year due to foot contact with the mower blade when the mower is being started. The operating control zone and its related requirement were conceived in order to keep the operator away from the blade if the blade begins to rotate when the power source is started. This degree of separation is necessary to accomplish the safety-related purpose, and mowers currently marketed could easily meet this requirement. It should be noted that mowers whose blades start rotating when the power source is started are almost certainly going to be engine kill blade control mowers that are required to have a power restart mechanism. Therefore, effort and recoil should present no problems. In any event, the Commission believes that manufacturers have the capability of complying with the requirement without introducing additional safety problems of the type referred to in the comment. Any particular designs that could result in injury because of recoil or other factors could be subject to corrective action under section 15 of the CPSA.

d. Rotary mower.

One commentor recommends a change in the definition of "rotary mower", which was defined in the proposal (§ 1205.2 (a)(22)) as follows:

> "'Rotary Mower' means a power lawn mower in which one or more cutting blades rotate about at least one vertical axis."

The commentor suggests that the definition be changed to read:

"Rotary Mower means a power lawn mower in which one or more cutting blades cut grass by impact of rotating blades on free standing grass."

The commentor states that the Commission's proposed definition could result in certain mowers that are not rotaries, such as sickle mowers, being considered as rotaries.

The Commission agrees with the basic principle behind this comment but believes that safety-related characteristics of the type of mower referred to by the term "rotary" can be better described by being more specific about the type of rotation involved rather than by whether the grass is free-standing. Accordingly, the phrase "in essentially a horizontal plane" has been incorporated into the definition. In addition, this definition appears in the February 1975 Federal Specification 00-M-1243A, Mower, Lawn, Power (Heavy Duty, Institutional, Rotary, 21 inch, Gasoline Engine Driven). This specification was approved by the Federal Supply Service, General Services Administration, for use by all Federal agencies. It is, therefore, a definition known to professionals associated with the mower industry. Accordingly, the definition has been modified as described above, and the revised definition appears in § 1205.3(a)(14). The Commission does not interpret this definition as applying to sickle bar mowers.

e. New definitions.

One commentor recommended clarifying the terms "crack," "deform," and "separate" in the shield strength test. These terms, as well as the term "stress," have been defined in the final standard at § 1205.2(a),(3, 5, 15, and 17).

f. Blade

The definition of "blade" that appeared in proposed § 1205.2(a)(2) has been changed to include only a rigid or semi-rigid device. This change was made because non-rigid blades are not covered by the final standard, as explained above under Scope of the standard. The revised definition appears in § 1205.3(a)(1) of the final standard.

a. Foot probe.

1. Area of probing.

Section 1205.3(a)(1) of the proposed standard required that walk-behind mowers be able to pass a foot probe test. The foot probe requirement and test were intended to address potential injuries to the operator's feet caused by contact with the rotating blade during lawn mowing operations. The proposed foot probe test consisted of probing around the entire periphery of the lawn mower with the foot probe specified in British Standard BS 5107, "Specification for Powered Lawnmowers", April 1974 (the UK probe). The proposed test required that the probe be inserted under all points of the bottom edge of any shields (including the housing). The test is passed if the probe does not enter the path of the blade or cause any part of the mower to enter the path of the blade.

Commentors stated that since the foot probe test is designed to address injuries to the mower operator's feet caused by contact with the rotating blade, and since the proposal would require walk-behind mowers to be equipped with a blade control system that stops the blade when the operator leaves the operating position, there is no need to probe the entire periphery of the mower. They point out that if the blade stops shortly after the operator leaves the operating position, then the risk of foot contact with the rotating blade in positions that are not accessible from

the operating position will be addressed by the blade stop provision. The commentors, therefore, suggest that only the rear periphery of the mower should be probed. The Commission generally agrees with these comments.

The blade control system and foot probing were originally conceived as separate requirements, with the former intended to address hand injuries and the latter intended to address foot injuries. However, the Commission has since analyzed all the cases reported to it through December, 1977. These cases show that the blade stopping requirements should eliminate or greatly reduce injuries occurring after the release of the blade control device. Therefore, only injuries occurring when the mower handle has not been released need to be addressed by the foot probing requirements. The great majority of such foot injuries occur at the rear of the mower. Therefore, at § 1205.4(a)(2)(1)(B) of the final standard, the Commission has reworded the foot probing requirements to limit the area to be probed to that in which known injuries occur. This is the area within 60° of either side of the centerline at the rear of the mower and the discharge chute.

The three month representative sampling of mower injuries in 1977, mentioned above, demonstrated that operators who are holding the mower handle can and do contact the mower blade through the discharge chute while performing routine mowing operations.

A requirement that the rear and discharge chute pass the foot probe test, in combination with the blade stop requirement, will address virtually all blade contact foot injuries (CPSC memoranda dated 8/4/78 and 10/26/78).

Anticipating that the Commission might only require foot probing at the rear of the mower, one commentor states that limiting foot probe testing to the rear of the mower will not protect bystanders. However, bystander foot injuries do not represent a substantial injury pattern. As of January, 1978, the Commission had received only four reports of injury to the foot of a bystander. One of these four might have been prevented by a 360° foot probe requirement (CPSC memorandum, January 30, 1978). However, the Commission does not believe that such a requirement can be justified by the injury data concerning blade contact injuries to the feet of bystanders.

2. Nature of Probe.

Many of these same commentors complained about the use of the UK foot probe and about the fact that the test procedure of the proposal differs from that in the British Standard from which the UK foot probe is derived. They stated that the mower industry has had virtually no experience on production units with the UK probe and needs time to evaluate it. They also stated that over 80% of the walk-behind mowers tested by the National Bureau of Standards (NBS) failed the test and that mower housings would have to be

redesigned. They also state that if shields have to be added to the sides and front of the mower there will be an adverse effect on product performance. Specifically, they argued mowers would be 3 times harder to push and would not be able to mow close to walls. The commentors did not provide any data to support their claims.

Two commentors suggest that the worst case for a foot probe test should be used in the standard. They suggest the worst case is represented by a foot smaller than that represented by the UK probe in the proposed test. Two other commentors suggest the UK probe is excessively severe.

NBS analyzed 3 existing foot probes -- ANSI, CU and UK. It determined in a study (NBSIR 77-1294, Power Lawn Mowers: Evaluation of Anthropometric Foot Probes) that, of the probes tested, the UK foot probe most closely represents a human foot. The commentors have not disputed this conclusion. Insofar as the test procedure is concerned, the UK procedure consists of inserting the probe under the housing and raising the probe while keeping the bottom of the probe parallel with the supporting structure. The test procedure called for in the proposal was developed by CU and consists of inserting the probe as far as possible with an insertion force of not more than 4 lb under the bottom edges of the blade housing and shields and then pivoting the toe of the probe upward around the heel as much as possible as the probe is withdrawn.

After considering the available injury data, the Commission concludes that the test procedure in the proposal is representative of the ways that injuries actually occur. The decision to use the UK probe instead of the other available probes is supported by the findings reported in NBSIR 77-1294. 127 males and 74 females ranging in age from 9 to 66 years participated in the study. Tests were run on each participant, with and without shoes, to determine the path the foot would take when inserted into various height openings, rocked back on the heel and then withdrawn. These data were then compared to similar data obtained by repeating the tests using the CU, ANSI, and UK probes. This procedure essentially duplicates the procedures in the final standard. These tests showed that, while none of the probes would have completely protected any of the participants of the study, the UK probe test data most closely approximates the human foot data. Therefore, use of the UK probe in the manner required by the test procedure in the standard will provide the best available representation of the behavior of the human foot (with and without shoes) and will provide a higher degree of protection than the ANSI probe and procedure or the CU probe. As far as the procedure used in British Standard BS 5107 (the UK probe), analysis of the data gained through the NBS study mentioned above shows that the critical difference between these probes and the human foot is the flexibility of the human foot (with or without shoes). The NBS study shows that rotating the UK probe

about its heel provides the best available simulation of the possible action that can be done by the human foot.

The NBS study discussed above showed that a probe based on the 95th percentile test data would be needed to provide greater protection than that afforded by the UK probe. It also showed that the UK probe would not have protected all of the test subjects all of the time. Obviously, it would be possible to make the foot probe, and therefore the standard, more or less severe. The Commission, however, believes that mowers which comply with the foot probe requirements of the standard will be significantly less hazardous than ones which would not comply. While a more severe probing requirement would somewhat increase the level of safety afforded by the standard, the delay in issuing a standard that is inherent in developing such a probe would not be warranted. The foot probe requirements of the final standard will substantially reduce or eliminate foot injuries occurring at the rear of the mower and at the discharge chute.

In regard to the comments that 80% of all walk-behind mowers would fail the proposed foot probe test, it should be noted that NBS only tested 6 mowers, of which one mower passed the proposed 360° foot probe requirements, and one cannot draw sound conclusions from these tests concerning the percent of all mowers that would pass the proposed probe test. In addition, these NBS tests consisted of 360° probing

of the mower. As discussed above, the standard now requires probing of only the rear of the mower and the discharge chute. In addition to the mower that passed the 360° probing test in the NBS study, another mower field tested by GSA (see brake-clutch reliability comments below) will pass the foot probe test in all areas except for one point at the front of the mower midway between the front wheels. Moreover, when these mowers were tested by GSA, they were not found to be hard to push or inconvenient to use. Rather, they were found to adequately cut grass with no loss in cutting performance. Since the GSA test included extensive field tests of 50 mowers, the conclusions of the users on the performance of the mowers are significant.

Some of the comments seem to assume that the only way to meet a 360° foot probe requirement would be to lower the periphery of the mower housing. However, the mower tested by GSA, discussed above, clearly shows other means can be used. This mower used shields around the housing.

As noted above, the voluntary standard (ANSI B71.1-1972) requires a rear trailing shield and probing of the discharge chute. It is anticipated that most mowers that comply with the ANSI standard will be able to meet the foot probe test of the final standard with modifications that involve little or no decrease in mowing utility. Thus, it appears that the concerns of the mower industry with the foot probe test are

unfounded and, in any event, have been largely addressed by the change in the requirement providing for probing only the discharge chute and the rear periphery of the mower.

One commentor suggests that the foot probe is unrealistic because the probe represents a bare foot. However, as discussed above, the data obtained in the NBS study show that the UK probe provides the best state-of-the-art measurement of the accessibility of the rotary mower blade to the human foot (with or without shoes). Further, it should be noted that during the NBS study (NBSIR 77-1294), the British Standards Institution, which developed the UK probe, was contacted. They indicated that the design of this probe is based on the dimensions of the size of shoe most commonly worn by adult males. The probe is a composite designed to provide a reasonable degree of safety and reasonably represent a human foot. The NBS study confirms that the objectives of this design were attained.

Several commentors indicated that the wording of the proposed foot probe test procedure at § 1205.3(a)(2)(B) needed to be clarified to eliminate ambiguity and misunderstanding. Specifically, they felt that, as proposed, the procedure could require insertion of the probe at an unrealistic number of points.

This comment has merit. The wording of the requirement and procedure has been changed accordingly. The requirement now states that the mower must be capable of compliance at any point within the area to be probed rather than that the

probe must actually be inserted at all points under the housing.

The test also states that, during insertion, the sole of the probe is to be kept in contact with the supporting surface and that insertion shall stop when the housing lifts or the horizontal force on the probe reaches 4 lb. A comment contends that the insertion force requirement is unclear. However, the Commission believes the requirement is clear as proposed. The requirement means that the 4 lb force is a maximum force, not a constant insertion force and that shields should not be raised up during the test unless the design of the shield is such that it naturally rides over the probe during insertion. Thus, if the shield was preventing the probe from entering the blade path during the test, insertion would stop at the specified force level.

One comment suggested that it was not fair to mower manufacturers to require that mowers be tested by the foot probe both with and without a grass catcher (if one is made by the manufacturer for use on the mower), when makers of after-market grass catchers are not required to perform similar tests on their grass catchers.

The requirement was included in the proposal to insure that grass catchers made and sold by mower manufacturers specifically for their mowers would not negate the protection of the standard's foot probe requirements. Upon consideration of this comment, however, the Commission concludes that the requirement is unnecessary.

Presently produced mowers are apparently no more hazardous with the grass catcher installed than without it. The Commission cannot predict that mowers that are unsafe with grass catchers installed may be produced in the future. In addition, product liability considerations may prevent either accessory or original equipment manufacturers from recommending the use of their grass catchers with mowers that will not pass the foot probe test with the grass catcher installed. For these reasons, the Commission cannot presently conclude that the risk of injury from unsafe mower-grass catcher combinations is sufficient to warrant a mandatory requirement in this area. However, the Commission will continue to monitor the injury data associated with power lawn mowers after the effective date of the standard, and if injuries are being caused by the use of grass catchers, the Commission could consider amending the standard to include these products.

b. Terrace test.

Section 1205.3(a)(1)(i) of the proposal included a "terrace test." This test was designed to protect against foot contact with the blade when the mower is pushed across a transition from a horizontal surface to a lower inclined surface. Several commentors state that this test fails to realistically portray actual mowing conditions. They suggest several changes in the test to correct the problems they discuss.

The Commission has considered the comments on the terrace test and decided to delete the entire test. The test was developed by the offeror to simulate the action of the mower as it traverses from a level to an inclined surface. This action tends to raise the rear of the mower. Probing the rear under these conditions is a more severe test than probing on level ground. However, analysis of the injury investigations in the Commission's files did not reveal any clearly defined incidents of foot injury while the mower was traversing from a level to an inclined surface. The absence of injury data is the prime reason for deleting this requirement. Also, an investigation of the curvature found on residential slopes indicated that the curvature used for the terrace test in the proposal was too severe. While a fixture using more realistic curvature was not constructed by the Commission, engineering judgment indicates that such a more realistic fixture would be a less severe test than the proposed terrace test. Thus, the theoretical decrease in safety resulting from deleting this test is further miminized.

c. Obstruction test.

Section 1205.3(a)(2)(ii) of the proposed standard required mowers to pass an obstruction test. This test consisted of pushing a mower across a depression in the ground and over a raised obstacle and then pulling the mower backward over the obstacle and depression. In order to pass the test, no more than one wheel at a time could

be lifted from the fixture surface, no shield could stop the mower as a result of contact with the raised obstacle, and no shield could enter the blade path.

Several commentors express concern with the obstruction test requirement that the raised obstacle not stop the mower by interfering with any shields. The commentors state the Commission included this provision to prevent a design which would cause a nuisance or inconvenience to the user. They state that the mower would not present a hazard to the user unless the offending shield was removed. They contend that if a user removes a shield because of its inconvenience, the user has assumed the risk of any resulting injury, and therefore the requirement does not address an unreasonable risk of injury.

In enacting the CPSA, Congress found that the "complexities of consumer products and the diverse nature and abilities of consumers using them frequently result in an inability of users to anticipate risks and to safeguard themselves adequately" (15 U.S.C. 2051(a)(2)). The CPSC was created to protect consumers against unreasonable risks of injury "associated" with consumer products. The term "associated" was used in the act to "convey the fact that the risk of injury did not have to result from the 'normal use' of the consumer product but could also result from such things as 'exposure to or reasonable foreseeable misuse of the consumer product'" 92 Cong. Rec. S18199 (daily ed. October 14, 1972) (remarks of Senator Moss). The Commission

concludes that it is reasonably foreseeable that consumers will intentionally remove a shield (for example a rear trailing shield), if the shield prevents them from pulling a mower backward or pushing it forward. Indeed, a number of the consumer comments on the proposed standard make the point that consumers will remove rear trailing shields if they adversely affect the utility of the mower. The requirement of the obstruction test that shields shall not stop a mower from going over the raised obstacle ensures that the standard will not needlessly have an adverse effect on the utility of the mower.

The fact that a consumer's actions might fall within the tort liability concept of "assumption of risk" would not prevent the existence of an "unreasonable" risk of injury associated with the product. The Commission's injury data show that the large majority of foot contact injuries that occur while the operator is in the normal operating position take place at the rear periphery of the mower. If shields used on a mower will not pass the obstruction test, it is reasonably foreseeable that consumers would remove the shield. Because such action is reasonably foreseeable use or misuse of a mower, the Commission has the authority to address such action in a mandatory standard.

However, the risk of injury resulting from removal of the shield is not the only reason for requiring the obstruction test. The Commission's injury data disclose that mower operators have been injured when the mower is suddenly

stopped by surface irregularities, causing the operator to stumble or become unbalanced and thrust a foot into the blade.

Therefore, since the obstruction test addresses a known hazard and since it addresses the unreasonable risk of the removal of safety devices, it is included in the final standard.

d. Handle and upstop requirements.

Another commentor states that the structural requirements for walk-behind mower handles, and the associated tests as proposed at § 1205.3(b), are not justified. The commentor states that he is unaware of any injury data involving structural failure of a mower handle and does not see how any injuries associated with mowers will be reduced or eliminated by these provisions. He also points out that manufacturers of walk-behind mowers are now voluntarily meeting the criterion of the proposed requirement concerning the distance of handles from the rear of the mower. For the reasons given below, the Commission has decided to delete the handle strength and upstop requirements.

The handle requirements were proposed because the mower handle could create a hazardous situation if it fails structurally or allows an operator to come too close to the blade. These requirements were felt to reasonably ensure that hazardous situations would be prevented. Still, the commentor is correct in observing that Commission data does not clearly demonstrate that mower handles have contributed significantly to injuries.

The ANSI B71.1-1972 voluntary standard contains provisions requiring an upstop which limits the horizontal approach of the handle to the blade to 17 inches. The ANSI B71.1b-1977 supplement contains a 50 lb static force structural test of the handle. While similar to the Commission's proposed requirements, these provisions are less stringent. First, the voluntary standard does not contain a rocking test. The force level used in the voluntary standard is lower than the force proposed by the Commission, and the voluntary requirement only requires that the 17 inch distance is maintained after removal of the force. The Commission's proposed procedure required that the separation from the blade be maintained during the time the force is applied to the handle. These are significant engineering differences. However, as stated above, the Commission has limited data directly associating handle failure with injuries. These voluntary standard requirements were updated and approved in May 1977. The Commission has no reports of injuries caused by a handle that would pass the voluntary requirements but fail the proposed Commission requirements. For these reasons, the Commission has not included the handle or upstop requirements in the final standard.

e. Movable shields.

Several commentors indicated agreement with the intent of § 1205.3(a)(3) of the proposal that movable shields shall not be removable without the use of tools, that a coin is

not a tool, and that shields which are movable for the purpose of attaching auxiliary equipment shall automatically return to their previous position when the equipment is removed. However, they felt that the requirement was design restrictive in that it did not allow manufacturers to use a control to prevent the blade from operating when the shield is not in place. Since this type of blade control would also adequately protect the user from injury, the Commission has decided to allow either such a blade control or a movable shield which automatically returns to its intended position. The revised requirement appears in § 1205.4(c) of the final standard.

The proposal's requirement that shields be removable only with tools, and that a coin would not be considered a tool for this purpose, was intended to discourage consumers from removing the protective shields. A comment suggested that this requirement could result in a decrease in safety to consumers by also discouraging consumers from reinstalling shields after they are removed. The Commission does not know the extent to which users might remove shields with tools and not reinstall them. After considering this comment, however, the Commission concludes that there is insufficient data to support a mandatory requirement in this area, especially in view of the fact that the voluntary ANSI Standard B71.1-1972 requires that the shields not be removable without tools. Accordingly, the proposed requirement that shields not be removable without tools is not included in the final

standard.

f. Shield strength requirements.

Several commentors found the shield strength requirements at § 1205.3(a)(1)(ii) to be ambigious and unclear. Of particular concern was the implication in the proposal that the mower housing would have to be subjected to the strength test. The commentor felt that was unnecessary and alleged that no known housing would fail such a test.

The Commission agrees that the housings of presently produced mowers appear to be adequately strong and present no unreasonable risk of injury due to weak housings. The Commission also notes that the voluntary standard, to which most presently produced mowers conform, includes a structural integrity test for the housing. Accordingly, the mower housing need not be tested in accordance with the shield strength requirement, which appears at § 1205.4(a)(2) of the final standard issued below.

Walk-behind rotary power mower controls (§ 1205.5)

a. Background.

Section 1205.5 of the proposed standard included requirements for blade controls for walk-behind mowers. The proposed blade control system would (1) prevent the blade from operating unless the operator activates the control, (2) require that the operator be in continuous contact with the control in order for the blade to continue to be driven, and (3) cause the blade to stop within a specified time after the operator releases the control. The effect of these requirements is that when the operator lets go of the

mower handle, the blade will stop before the operator's hands or feet can come into contact with the mower blade when the operator approaches the blade area to perform a task such as clearing the path of the mower, attempting to clear a clogged discharge chute, adjusting the wheels, emptying a grass catcher, or making other adjustments to the mower. The injuries that occur due to operator hand and foot contact with the rotating blade include lacerations, amputations, avulsions, and other injuries. The blade control system also will protect against foot contact injuries in areas of the mower other than the rear periphery. As discussed below, the requirements also would address some blade contact injuries to bystanders.

The Commission estimates that over 30,000 injuries due to contact between a mower operator and the rotating blade are treated annually in hospital emergency rooms (NEISS Power Mower Baseline Study, July - September, 1977). Although a voluntary industry standard has been in effect since 1972 and was last upgraded in 1977, the provisions of that standard do not directly address injury due to contact between a mower operator's hands and the rotating blade. According to the industry trade association (OPEI), the incidence of blade contact injuries at the discharge chute has not been reduced by the voluntary standard (OPEI letter dated December 16, 1976, p. 23). An analysis of injury data by OPEI also indicates that, for mowers that comply with the voluntary standard, the number of blade contact injuries occuring

while the operator is outside the normal operating position is increasing, although OPEI has said that this result is anomalous. The Commission estimates that the blade control requirements of the standard will eliminate or reduce the severity of over 18,000 injuries treated in hospital emergency rooms each year (NEISS Power Mower Baseline Study, July -September, 1977).

b. Miscellaneous comments.

One commentor objects to the proposed blade control system and suggests that requiring that a mower operator's hands both guide the mower and engage a blade control could create a hazardous situation, such as difficulty in negotiating a steep hill. No evidence supporting this commentor's concern was submitted. The Commission believes that, on the contrary, to safely operate a mower the operator should firmly grip the handle. The blade control system would not prevent the operator from doing so, and an operator who is firmly gripping the handle should have no difficultly also holding the blade control. The Commission notes that some presently manufactured self-propelled mowers have controls which the operator must hold while operating the mower, and no information concerning hazards associated with this type of control has been reported to the Commission.

One commentor states that a blade stopping control will not protect bystanders since such a control is dependent on operator actuation. As of January, 1978, the Commission had 10 investigation reports on file involving bystanders injured

by the blade of a walk-behind mower. Half the injuries in these reports involved children being injured from unattended running mowers (CPSC memorandum, January 30, 1978). A blade control would prevent such injuries since the blade would not be rotating when the operator is not present. For the remaining injuries, the operator would have to release the control in order for a bystander to be protected. Since such bystander injuries do not represent a substantial injury pattern, and since some bystander protection is affforded by a blade control system, the Commission has not expanded the blade contact requirements of the standard to provide additional bystander protection.

Another comment points out that § 1205.5(a)(2) of the proposed standard is unnecessary. This section stated that a self-propelled mower with a traction control that inherently performs the function of the blade control need not have a separate blade control system. The commentor stated that the statement is unnecessary since the standard clearly does not require a dual system. The Commission agrees and has not included this provision in the final standard.

One commentor says that the blade control requirement should be revised to require that the control which stops the mower blade also stop a self-propelled mower from traveling, in order to address the potential hazard of striking a bystander. The Commission is not aware of any blade contact injuries to bystanders in which the travel of

a self-propelled walk-behind mower was a significant contributing factor. Therefore, the Commission has not included the suggested requirement.

c. Performance versus design requirements. A number of mower industry commentors state that the blade control system provisions of the proposal, which require the blade to stop within a specified time after the blade control lever is released, are design restrictive. They argue that the blade stop time requirement is only one acceptable way to address the potential hazard of contact with the rotating blade. The commentors suggest that the Commission should develop and propose alternative requirements which would allow solutions such as blades that are inaccessible or that are relatively harmless. The commentors suggest that performance requirements could be established by simulating the major blade contact injury patterns using a set of appropriately designed hand and foot probes. These commentors argue that by mandating blade stop time requirements, the Commission will stifle innovation and discourage manufacturers from developing alternative ways of making lawn mowers safer.

Section 7(a)(1) of the CPSA states that a standard should be expressed in terms of performance requirements "whenever feasible." The reasons given in the legislative history for preferring performance requirements are to assure that product innovation is not stifled by government action and the belief that performance requirements can be expected to foster rather than stifle competition. (S. Rep.

92-835, p. 30; H.R. Rep. 92-1153, 189; 92nd Cong., 2d Sess., (1972).) The legislative history provides no discussion of the meaning of "feasible," as it is used in expressing the preference for performance requirements whenever feasible. The ordinary dictionary definitions of the term feasible include: capable of being done or dealt with successfully; suitable; reasonable; likely; and practicable.

Although it would be a factor in the determination of what performance standards are "feasible," the fact that it may be technologically possible to develop a performance standard does not mean that the standard is feasible. In determining whether a standard is feasible, the Commission may consider factors such as whether it is a reasonable use of Commission resources to develop and propose a performance standard for the particular risk of injury, the availability and effectiveness of less performance-oriented standards, and whether it is practicable for manufacturers to produce products that comply with the performance standard. The Commission can also consider the amount of time and resources needed both for the development of a proposed performance standard and for issuance of the final standard.

The Commission does not agree that the blade stop time requirement of the proposed standard is a design as opposed to a performance requirement. Although the proposed standard requires mower blades to stop within a specified period of time, no specific means of meeting the stop time is required. Manufacturers are not restricted to any particular design to

meet the stop time requirement. Two currently known methods for meeting the stop time requirements are by using a blade disengagement system such as a brake-clutch mechanism or by stopping the engine. Manufacturers may use their innovative ability and technology to design other systems that would comply with the blade stop time requirements. (However, for the reasons discussed below, the final standard does prohibit a design that stops the blade by stopping the engine if there is only a manual restart.)

The lawn mower industry has recently suggested the initiation of an effort to develop performance requirements that they believe would be less restrictive than the performance requirements that are being issued by the Commission. They wish to develop hand and foot probes to measure whether the blade is accessible for contact with the operator and, if so, whether the blade is capable of causing an injury. The feasibility of this proposal is discussed below under "Industry trade association probes."

It is the Commission's judgment that, at this time, no method other than blade stop time requirements exists which would adequately reduce or eliminate the unreasonable risk of hand injury associated with operator contact with the rotating mower blade. The Commission must address the hazards that now exist with lawn mowers as they are currently manufactured. While some manufacturers argue that their innovative ability would be stifled if the Commission mandates a blade stop time requirement, it must be recognized

that the basic design of lawn mowers has remained essentially the same over the past two decades. Beginning in 1960, a voluntary industry standard went into effect. This standard was last revised in 1972, with supplements in 1974 and 1977. Although the vast majority of all mowers are said to comply with the standard, the number and types of lawn mower injuries, even considering the increased number of lawn mowers in the marketplace, do not appear to have been significantly affected. In the area of blade contact, particularly blade contact by the mower operator who intentionally approaches the blade area to perform a chore such as clearing the discharge chute, emptying a grass catcher, adjusting the wheel height, or making other adjustments to the mower, the industry admits that the voluntary standard has had little or no impact in reducing injuries. Therefore, the Commission believes it must proceed with the blade stop requirements it proposed.

It should be noted that the Commission recognizes that innovative means to cut grass may not present the same risk of injury as rigid or semi-riged blades. As discussed above, the Commission has excluded monofilament line mowers and any other blades that are not rigid or semi-rigid from the scope of the standard.

d. Blade harmless or blade inaccessible.

In the May, 1977 proposal, the Commission stated it would be desirable to have a test that would identify a blade that is reasonably safe if an operator inadvertently

touches it. The Commission specifically sought public comments suggesting a suitable test to determine blade harmlessness. The Commission believed that inclusion of such a test would encourage industry to develop safer blades which might be the most effective means of reducing injuries caused by contact with the blade. The Commission, however, was unable to find a repeatable test that could sufficiently indicate when an individual is likely to be injured by a moving blade.

Several commentors suggested various test methods to measure blade "harmlessness" or blade "inaccessibility." Other commentors suggested various mower or blade designs in which the blade was said to be inaccessible or harmless. The Commission's evaluation of these various designs and test methods is discussed below:

1. CU "blade harmless" test.

Consumers Union's recommended standard for power lawn mowers included a "blade harmless" test that would apply both to mowers without a blade control system and to mowers with a blade control system that would stop the blade or render it harmless after three seconds. In the CU test, a vinyl-wrapped dowel was inserted into the path of the blade, either while it was revolving at maximum operating speed or three seconds after release of the blade control. If the tape was not cut, CU considered the risk of injury acceptable. The Commission did not include CU's "blade harmless" test in its proposed standard because the test did not appear to be

repeatable and because the Commission had no information indicating whether a vinyl wrapped dowel rod was a reasonable surrogate for a human hand.

2. Remote controls, etc. The industry trade association OPEI, contends that there is no need for either a blade stop requirement or hand probes if the mower has no discharge chute and if the controls for starting and for wheel height adjustment are located away from the housing. They believe there will be no occasion for injuries if operators do not need to approach the blade to perform these tasks. However, the data available to the Commission indicate that only 47% of the blade contact hand injuries occur during acts related to clearing the discharge chute, adjusting the mower height, or starting the mower. The remaining injuries result from such things as accidental contact, removing debris, and cleaning the mower or adjusting the carburetor of the mower (NEISS Power Mower Baseline Study, July - September, 1977). Therefore, the elimination of the discharge chute and the relocation of the other controls, alone, would not provide adequate protection against hand contact with the blade, and the Commission does not adopt this view.

3. Other alternative test methods. Two commentors presented comments on alternative test methods for inaccessibility and/or blade harmlessness. One of them identified the complex array of hazard data analysis, human factors analysis, and engineering investigation that would be needed

to support such test methods but did not provide the Commission with a supportable test method.

Another commentor suggested an alternative test to the CU blade harmless test and a different foot probe test. His alternative to the CU test was to replace the vinyl tape on the CU probe with surgical tubing. The tubing, the commentor suggests, would be thicker and more resistant to impact and more closely related to human skin. He also mentioned using chicken legs. The foot probe test submitted by this commentor involves thrusting a natural leather shoe for an adult male, fitted with a snug hardwood shoe tree, into the path of the rotating blade. The test would be run at various engine or motor speeds from 1000 revolutions per minute to the maximum operating speed of the mower. Failure would be measured by "any significant cut or tear that shows conclusive evidence that a serious laceration or amputation would have been sustained by the human foot." A scuff or minor opening in the surface of the shoe leather would not be a significant cut or tear. These suggestions were not supported by any data showing that surgical tubing, chicken legs, or shoe leather would sufficiently indicate the potential for injuries to a mower operator. In addition, there was no showing of what size or shape of shoe should be used or why a shoe would provide more realistic protection than the foot probe. Accordingly, these suggestions are not suitable for inclusion in a final standard.

4. Mower designs presented as means to reduce injury. On May 4, 1977, the Commission held a "Lawn Mower Inventor's Day." At that time, four mower designs which the inventors felt incorporated an inaccessible blade or a "harmless" blade were presented. Two of these inventors participated in the June 13, 1977, oral presentation on the proposed standard, and one of them submitted extensive written comment.

In addition to these individuals, at the oral presentation one person discussed the safety merits of a lawn mower blade being developed by his company. Other persons extensively discussed the merits of including blade inaccessibility and blade harmless provisions and test procedures in the standard in addition to the provision for a blade control system.

These approaches, which would involve the development of foot and hand probes, were not supported by further data. One commentor did state that a mower blade he presented on Inventor's Day and at the oral presentation had not seriously injured his hand at engine speeds of 1000 rpm. However, a major retail chain store commented that it had tested this blade in its laboratory in October 1975 and had concluded that the blade still impacts with sufficient force to damage a person's foot. They also stated that if a hand were contacted by the blade, a finger would probably not be severed but severe injury would result. The laboratory report also indicated the blade did not cut grass properly.

The oral commentor who presented an allegedly less harmful lawn mower blade made similar claims about the ability of his approach to reduce severity of foot injuries (with shoes) from lacerations and amputations to "bruised up pretty bad."

The Commission's staff concluded that these suggested methods for determining the injury potential to the hand or foot from a rotating mower blade were not suitable for use in a mandatory standard due to lack of criteria which could define a requirement to determine if the blade was inaccessible or harmless and the unfeasibility of developing such criteria within a reasonable time.

5. Industry trade association probes. The industry trade association, OPEI, met with the Commission in March of 1978. At that time, they offered for the consideration of the Commission's staff a draft of alternative requirements for determining the accessibility of the mower blade to the hand or foot. This draft used the UK foot probe for determining foot accessibility under various test conditions. It recommended the use of a finger probe developed by UL as an electrical hazard accessibility probe for probing the discharge chute. Two "cupped hand" silhouette type probes were offered for probing the lower edge of the mower housing. The trade association has stated that these recommended alternative provisions were a first draft which they believed points in the right direction and is a step forward in the development of performance language for a final standard. They did not

claim that the submitted provisions were developed and supported sufficiently for their inclusion in a final mandatory standard.

The Commission's staff evaluated these probes, and the Commission has concluded that these probes are not a satisfactory alternative to the blade stop time requirements of the proposed standard (CPSC staff memorandum, October 19, 1978). One deficiency in the suggested "cupped hand" probes is that there has been no data presented to show that the shape of the probes adequately defines the area of potential blade contact that would result from actions which the operator might attempt about the mower. Also, the suggested test procedure for these cupped hand probes provided for the probes to be slid toward the mower in a vertical position. If the mower housing were low enough that the probe would not go under the mower, the mower would pass the test. However, the cupped shape of the probe does not allow for the fact that an actual human hand could easily reach under the housing's edge by opening the hand to a less cupped position.

As far as the finger probe is concerned, the insertion depth of the probe is limited by a collar, and the trade association alleges this would protect against an adequate number of the injuries that have occurred in the past. Current mowers could be made to pass the suggested test by extending the length of the discharge chute past the insertion depth. However, a user who wished to clear the

discharge chute would reach in until the area of the clog is reached and would not be limited to the probe insertion depth unless it was not possible to reach in further.

In general, before hand probes to measure accessibility to the blade could be determined to provide an adequate degree of protection to the consumer, questions must be answered such as (1) what types of hand movements will the users attempt that could result in blade contact and (2) what probe dimensions and degree of manipulation would be needed to protect hands performing these movements. It may not be possible to answer these questions with a reasonable expenditure of money and time, if at all, and the Commission concludes that hand probes to measure blade accessibility are not feasible.

The trade association, after submitting the originally suggested probes, suggested that the probes should be covered with a layer of a relatively soft material that, if cut or penetrated by the operating mower blade, would indicate a sufficient potential for injury by blade contact. The basic problem with this suggestion is that there are no data available that can correlate the type and force of blade impact that would cut open the probe covering with the potential for injury to a human hand. There is no known substitute for an actual hand for the purposes of estimating potential injury from blade contact, and no known methodology for obtaining sufficient data for developing such a substitute.

The difficulties involved with such a development effort were made clear to the Commission in its effort to develop devices that could adequately detect when a point or edge was sufficiently sharp to constitute a hazard to young children. Even after years of work, no test or procedure was developed that the Commission could conclude was suitable as a uniformly applicable mandatory standard. An effort to determine when a power mower blade will not harm the operator is potentially even more complex, since the procedure would have to protect against avulsions and fractures, as well as lacerations.

The trade association has stated further that they believe adequate and supportable blade accessibility and blade harmless test criteria and procedures could be developed within 6 months, and that the Commission should cooperate with industry in developing these tests.

For the reasons given above, the Commission has concluded that mandatory requirements for probes to measure blade accessibility and/or blade harmlessness are not feasible. However, the Commission does believe that requirements other than blade stop time requirements that would adequately protect consumers would be desirable. Therefore, since the industry wishes to attempt to develop such requirements, the Commission is willing to permit the staff to monitor the development of the requirements. However, because of the number and nature of the blade contact injuries that are now occurring, the Commission does

not believe that it would be appropriate to delay issuing the final standard to see what of this effort by the industry may produce. The Commission also wishes to stress that it is not undertaking to develop hand probe requirements itself and that it is simply allowing the staff to cooperate with the industry effort. However, if suitable probes are developed, the Commission will consider whether they are appropriate for inclusion in the mandatory standard.

At the present time, however, the Commission cannot conclude that such probes are feasible requirements. In the first place, it is not clear that criteria for the construction and manipulation of such probes, sufficient to reproduce the range of actions that could be achieved by a mower operator, can be developed with the resources that may be available. Also, the time required for development of such probes, the development of proposed mandatory requirements, the response to comments that are received on the proposal, and the issuance of a final standard would be excessive in view of the number of ongoing injuries caused by contact with the blades of power mowers. For these reasons, and because of the limited resources of the Commission, the Commission concludes that performance requirements of the type suggested by the mower industry trade association are not feasible for proposal as mandatory requirements.

e. Blade stop.

1. Three second stop time. A number of comments concerned the proposed requirement that the blade stop within 3 seconds of release of the blade control. The proposal would have required an interim 5 second stop time 2 years after issuance of the standard and a 3 second stop time 4 years after issuance. The final standard requires a 3 second stop time nearly 3 years after issuance. The purpose of this requirement was to ensure that the blade will stop before the operator's hand can touch it, after leaving the operating position.

Some comments suggested that the 7 second stopping time that is met by most current mowers, if combined with a blade stop control, would adequately protect consumers. These comments reasoned that if the operator knows the blade is going to stop, he or she will wait until the blade has stopped before approaching the area of the blade.

These comments also speculated that the operator would sense the decreasing noise and vibration as the blade comes to a stop and would thereby be warned to keep away until the blade stops. They contend that the stop times should be based on human factors research, taking into account the psychological reaction to the changing environmental conditions associated with the engine stopping.

These comments contend that the studies the Commission considered in setting the blade stop times merely measured how quickly an operator could reach the blade and were

conducted under unrealistic conditions. They noted that the studies either did not use actual lawn mowers or that the mowers were not running. Commentors also suggested that in real life situations, operators will take substantially longer than 3 seconds to reach the blade because operators fear the rotating blade and because time will be needed to prepare to perform the task which brings them near the blade.

The studies the Commission considered in establishing the stop time included:

1. A 1975 NBS analysis of films of blade access times taken by the University of Iowa.

2. A series of tests conducted at Eckerd College by a task group of CU's development effort.

3. A limited blade access study conducted by the Office of the Medical Director of the Commission.

4. A time to blade access study conducted by NBS.

The NBS study was conducted using accepted human factors techniques and shows median times of between 2.0 and 2.4 seconds for the mower operator to reach the blade, depending on the location of the discharge chute. The Iowa and CU data are similar, with mean access times of 2.68 and 2.89 seconds respectively.

The conjectures of the comments that human factors considerations or changing noise and vibration characteristics will result in longer access times in real life situations are totally unsupported. In fact, the Commission

is aware of one incident in which the victim probably contacted the blade less than 3 seconds after intentionally operating the mower's shut-off control. Even if it were true that consumers will often take somewhat longer to approach the blade than is indicated by the studies, this would not warrant lengthening the 3 second stop time requirement. First, it would be virtually impossible to devise a test that would accurately measure the effect of factors such as fear of the blade on the access times without ensuring that the test participants believe they are being subjected to a risk of injury. The only way to establish such tests would appear to be actually subjecting subjects to a risk, and, of course, this would clearly be unacceptable. No commentors suggested a means of testing to take these psychological factors into account. Second, the commentors did not show how much time they believe an operator would need to reach the blade. The Commission's 3 second requirement is already somewhat longer than the median access times produced by the studies. In addition, the Commission believes that different individuals would take different periods of time to reach the blade. To establish longer stopping times based on median human factors considerations (if such could be determined) would still leave many individuals at risk. The Commission believes that the 3 second requirement sets a safety criterion that should protect the vast majority of users from injury resulting from time to blade access. The fact

that some individual consumers might take significantly longer than this is not material.

Some commentors suggested that the Commission establish a 7 second stop time and then amend the standard to lower the time if experience shows that to be needed. The Commission believes it cannot adopt a "wait and see" attitude in view of the seriousness, and large numbers, of injuries that are occurring as a result of contact with the rotating blade. Therefore, it has not adopted this suggestion.

A number of comments stated that 3 seconds after the engine is shut off or the blade is disconnected, the blade will be "coasting" and would not produce a severe injury. This statement was also unsubstantiated. While it seems rational to assume that a blade coasting after 3 seconds has less potential for injury than a blade under full power, there is no way to determine at what length of time and under what conditions a blade could be reasonably expected to produce only an "acceptable" injury. As discussed above, the Commission knows of no acceptable substitutes for a human hand that could determine at what velocity and force the risk of injury from the blade would be reasonable. The Commission notes that the usual rotary mower blade is a relatively heavy sharpened piece of metal, and the Commission is unable to conclude that even at slow speeds such a blade would be safe. Accordingly, it has not changed the 3 second stop time requirement.

Another comment stated that the Commission did not take

into account the effects of normal product deterioration, which could result in longer stopping times as the mower ages and that a consumer would expect the blade to stop in 3 seconds and could be injured if he or she put a hand under the mower after 3 seconds when the blade had not stopped because of product deterioration. It would appear that this comment would support establishing even shorter stopping times and would apply also to any stopping time requirement. However, the Commission has no reason to believe that stopping times will lengthen appreciably as the product is subjected to reasonably foreseeable wear and tear.

One commentor states that the test procedure for measuring stopping time does not consider that in an actual mowing situation the resistance of the grass against the blade will cause the blade to stop faster than it will in the test. The Commission believes it cannot include this consideration because mowers are used in varying situations and under varying conditions. For example, the Commission's injury information shows that numerous injuries occur over already cut grass or even over surfaces other than grass, such as concrete. In addition, even if the mower were over grass, the degree of grass resistance could reasonably be expected to vary considerably according to the particular mowing conditions. Therefore, grass resistance would not be an appropriate factor to include in a test for stopping time.

2. "Engine kill".

The standard requires that the mower blade stop 3 seconds after the operator releases the blade control. The Commission knows of two primary ways manufacturers could meet this requirement: by disconnecting the blade from the power source while the power source continues to run (blade disengagement) or by stopping the engine, thereby stopping the blade (engine kill). If the manufacturer chooses an engine kill method to stop the mower blade, it is possible to restart the mower by at least two methods, by a manual start mechanism or a power start mechanism. Manual starting was defined in the proposal as starting the mower engine with power obtained from the physical efforts of the operator. The proposed standard provided that the engine kill method of stopping the blade could only be used in conjunction with a power restart mechanism or where the mower met an "easy restart" test set forth in the proposal. The Commission included this provision in the proposal because, if a mower had to be manually restarted each time the blade control was released and the engine stopped, and if the mower was difficult to start, mower operators would be likely to disable or override the control (for example, by tying or taping it down) to avoid the inconvenience of manually restarting the mower.

A number of commentors questioned this rationale for requiring an "easy restart" or power restart when a manufacturer chooses to stop the mower blade by an engine kill

method. The commentors suggest that the Commission has no authority to include in a standard a requirement, such as easy restart, for the purpose of reducing the motivation for mower users to disable a blade control system. These commentors suggest that a user who defeats a safety device assumes any risk of injury resulting from this action. Thus, consumers who disable a blade control system assume the risk of being injured by the rotating blade of the mowers. These commentors urge the Commission to allow engine kill with manual restart that would not meet the easy restart requirement.

Nearly all of the consumer comments on the proposed standard, and several other commentors (including CU, the offeror), urged the Commission to retain this provision as proposed. Some argued that it would be inconvenient for an operator to have to restart a mower each time the blade control system was released and that due to the inconvenience, consumers would defeat the blade control. This would be especially true if operators would let go of the handle with both hands in order to perform tasks such as mopping their brows, swatting at insects, or removing debris from the path of the mower. If the blade control were defeated, users would then have no protection, and few injuries would be prevented by the requirement for a blade control.

To defeat a blade control system that uses engine kill with manual restart, all a consumer would have to do is loop a piece of wire around the mower handle and blade control lever - and then release the wire when the consumer desired

to stop the blade.

The Commission recognized in the proposal that stopping a rotating blade by means of engine kill has the advantage of allowing the operator to hear when the engine (and therefore the blade) has stopped. The Commission, however, also recognized that where the blade stopped by means of engine kill, and a manual start was needed to restart the mower, the operator would be tempted to disable the control lever by taping or wiring it down in the activated position or by more permanently overriding the control system. The Commission believes it likely such permanent or temporary defeat would occur so that operators could avoid the inconvenience of having to restart their lawn mower each time they released the blade control lever to, for example, pick up debris in the mowing area, take a drink of water, empty a grass catcher, and the like. The comments on the proposed standard from consumers support the Commission's position. Nearly all of the consumer comments opposed a blade control system that stopped the blade by stopping the engine and required a manual means of restarting the mower. Many of these commentors made it clear that they would take any steps necessary to defeat such a system.

The fact that mower operators are likely to defeat a blade control system that requires manual restart is also supported by the American experience with automobile seatbelt interlocks and warning buzzers. A Department of Transportation (DOT) survey of automobile drivers shows that

as many as 48% of those persons surveyed defeated or circumvented the seat belt interlock system and 36% actually defeated the system, for example by cutting the wires. (Safety Belt Interlock System Usage Survey, DOT-HS-801-594 (1974), DOT-HS-801-957 (1975)). Because of consumer complaints about seat belt warning systems, Congress took the nearly unprecedented action of prohibiting DOT from requiring automobile seatbelt interlock systems or buzzer systems that necessitated buckling of a seat belt to stop the buzzer (Pub. L 93-492, 88 Stat. 1482; 15 U.S.C. 1410b(b)). Thus, it is logical to conclude that consumers would defeat an excessively inconvenient blade control system just as many consumers defeated automobile seat belt interlock and buzzer systems.

An analysis of in-depth investigations also lends some support to the conclusion that consumers will defeat a blade control system that uses engine kill in conjunction with manual start (CPSC memorandum, January 30, 1978). In a review of 160 injury investigations, of the 36 operators who reported why they had not turned off their mower prior to the activity which resulted in injury, 13 gave reasons which would indicate that such users would be tempted to bypass an engine kill blade control with manual restart. These reasons included that the mower was hard to start or that the operator was in a hurry and did not wish to take the time to restart the engine.

Some commentors submitted evidence to suggest that consumers will not try to defeat a blade control system that

combines engine kill and manual restart. A major mower manufacturer submitted the results of a survey in which 89% of the persons surveyed indicated they stop the mower engine when emptying the grass catcher. The Commission does not believe that this opinion of the users of mowers is relevant to whether the users would disable a blade control if the mower were to stop every time the user had to remove his or her hands from the mower handle. In this latter case, the mower would stop many more times than would be the case where the user might intentionally turn off the mower in order to empty the grass catcher.

Another survey indicating that consumers would not disable a blade control that used engine kill with only manual restart was conducted with the members of a consumer sounding board. However, a review by the Commission of the methodology of this survey indicated that the results of this survey cannot be considered reliable. For example, not all of the persons surveyed participated in mowing lawns. In addition, the participants received a thorough briefing on the safety issues involved. The typical consumer may not be as aware of the seriousness of the risk of injury the blade control was designed to reduce. Also, since the participants were volunteers, it is reasonable to assume that they are more safety-conscious than the average person.

For these reasons, the Commission believes that the evidence that consumers using manual start mowers would, in many cases, disable a blade control that stopped the blade

by engine kill is more credible than the evidence to the contrary.

3. Easy restart

A number of commentors argue that the easy restart test the Commission proposed is not technologically feasible or supportable. The Commission agrees that the proposed test is not technologically feasible. Recent tests performed for the Commission by the National Bureau of Standards (NBS) show a poor correlation between the subjective judgment of what constitutes a mower that is easy to restart and the results of tests on the same mowers using the proposed test method. The NBS tests showed that the action needed to start a mower manually is substantially different from the force produced during the proposed easy restart test. Extensive and time-consuming research would be needed to develop an appropriate test method that would overcome this problem. Moreover, even if an acceptable easy restart test should be developed, it is possible it would not be effective, since, as indicated in the comments, it may be that consumers would defeat the blade control because of the inconvenience of repeatedly manually restarting the engine, regardless of the ease of manual restart. Therefore, the Commission has decided not to delay issuance of the standard in order to develop an easy restart method. Therefore, if manufacturers choose to stop the blade by killing the engine, a power restart must be provided.

A number of commentors allege that engine kill is the

safest way to address the hazard of contact with the rotating blade because the operator will notice the changing noise and vibration that indicate the mower blade is stopping. However, Commission injury data show that injuries have occurred even where a mower operator consciously turned off the mower before proceeding to perform a task that resulted in placing a hand in the path of the rotating blade. Thus, the changing sound of the stopping engine and blade cannot be considered a complete protection against the possibility of injury.

These commentors apparently believe that this is an advantage which would not be shared by other blade stopping methods. However, the Commission has witnessed demonstrations of current production mowers which meet the blade stopping requirements without stopping the engine (by using a brake-clutch) and has observed that in these mowers there also is a pronounced and readily distinguishable change in sound and some change in vibration for the mowers between when the blade is engaged and when it is disengaged. Therefore, sound and vibration changes which could warn of a stopping blade are not unique to the engine-kill method of stopping the blade.

In regard to those commentors who argue that the Commission has no authority to consider the situation where a consumer intentionally defeats a safety device, it is the Commission's view, as discussed above under the obstruction test in § 1205.4, that those commentors misread the Com-

mission's authority under the CPSA. The Commission may issue mandatory standards that address unreasonable risks of injury associated with consumer products. The term "associated" was used in the act in connection with the term "unreasonable risk of injury" to convey the fact that the risk of injury did not have to result from "normal use" of the consumer product but could also result from such things as exposure to or reasonably forseeable misuse of the consumer product. It is the Commission's view that the defeat of a lawn mower safety mechanism because of the inconvenience of the mechanism or the adverse effect of the mechanism on the product's utility or performance is a reasonably forseeable use or misuse of the mower. As such, the Commission has the authority under the CPSA to address that use. It has done so in this case by requiring a blade control system that stops the blade within 3 seconds after the blade control lever is released and by prohibiting engine kill as a means of stopping the blade if the mower has only manual restart.

One commentor suggests that engine-kill not be allowed because stopping the engine might increase gasoline consumption. While the Commission has concluded that engine-kill with manual restart will not be permitted, gasoline consumption was not a factor in that conclusion. This is because, if all walk-behind mowers were replaced with engine-kill mowers, the estimated increase in the total fuel consumption for all vehicles would be miniscule (CPSC Memorandum, June 30, 1978).

4. Engine kill with interlocks to prevent defeat of the blade control system.

Several commentors have suggested that a blade control system that relies on engine kill with a manual restart could be designed to discourage consumers from permanently or temporarily defeating the blade control system.

A manufacturer suggests a wiring method that would discourage consumers from permanently defeating the system. The Commission has decided not to accept this suggestion at this time since it is questionable whether the suggested design would effectively minimize the chance that consumers would defeat the blade control system. As discussed below, it is so simple to temporarily defeat the blade control that persons inclined to defeat the control would not need to disable it permanently. Accordingly, the Commission believes that a more effective approach would be to reduce the initial motivation for users to disable the blade control system.

The mower manufacturer also suggested a method (interlocks) whereby if the blade control were defeated by, for example, taping or otherwise tying it down in the operating position, and the engine were then shut off by the shut-off control, the engine could only be restarted if the blade control were released. The commentor suggests that such a method would discourage defeat of the blade control system. However, if a mower operator has gone to the trouble of tying down the blade control in the first place, it is not unreasonable to

assume that person will simply not stop the mower during the mowing operation in order to avoid any inconvenience resulting from having to untie the blade control to restart the mower. This could increase injuries by causing users to perform tasks around the mower while the blade is operating. Moreover, a temporary defeat of the blade control system could be accomplished by simply looping a piece of wire over the handle and control lever and then unhooking the wire to stop the mower. Since the provision of interlocks would merely interpose an additional and easily accomplished step for a person wishing to disable the blade control, the Commission is not convinced that interlocks would decrease the likelihood of operators permanently or temporarily defeating the blade control.

5. Power restart. The proposed standard would allow engine kill as a method of stopping the blade if the mower is equipped with a nonmanual starting mechanism. A non-manual start mechanism could involve pushing a button or flipping a switch. On the other hand, winding a crank to compress a spring that would provide the starting force would be considered "manual restart" as that term is defined in the proposal and in the final standard, because it involves starting the engine with power obtained from the physical efforts of the operator. Electric mowers already have power restart mechanisms since electric mowers can be started by flipping a switch. To meet this requirement, gasoline mowers could use some type of stored mechanical energy or battery power or any other method that could be

developed by manufacturers. The Commission believes that suitable power start mechanisms can be developed by manufacturers at a reasonable cost.

6. Blade disengagement mechanism. Another means of complying with the Commission's blade stop time requirements is through a blade disengagement system. Such a system consists of a blade control that when released disconnects the rotating mower blade and stops it without stopping the engine. One type of blade disengagement system would be a brake-clutch. While manufacturers would be free to develop other methods of blade disengagement, several commentors raised issues concerning brake-clutch mechanisms.

(i) Reliability and safety. A number of mower manufacturers contend that brake-clutch systems are not reliable and may fail in a way that the blade continues to rotate when it should be stopped. They state that, after the blade control is released, consumers will assume that the blade has stopped, and, if it has not, consumers will be injured when they place their hands or feet in the path of the blade. For the most part, commentors provided no data to support their view that brake-clutch systems are unreliable or unsafe.

One mower manufacturer, however, did submit some data to support its contention that these systems are unreliable. This manufacturer assumed that the average number of blade brake-clutch actuations would be 600 cycles per year and stated that a reliable clutch mechanism should be able to

withstand 250 hours of field testing and a lab test life of 20,000 cycles without failure. This manufacturer contends that brake-clutches are unacceptable because of their poor reliability and that the level of reliability required is beyond current industry technology.

To support its contention, the manufacturer provided test data on 19 mower units with 5 different clutch designs. None of the units completed 250 hours without failure and none achieved a cycle life of 20,000 cycles. Tests were terminated for the following reasons:

1. Unit was hard to start
2. Clutch slippage excessive
3. Failure of brake to release
4. Severe knocking noise in clutch
5. Brake failure
6. Sticking clutch
7. Failure of brake to override full throttle
8. Clutch control failure
9. Clutch bearing failure
10. Clutch wear excessive

However, another commentor specifically analyzed the results of the tests conducted by the commentor mentioned above in relation to the clutch of one manufacturer. The latter commentor stated that the engine of the mower with which the clutch was tested runs at a lower speed than the engine for which the clutch was designed, which is the engine used by most lawn mower manufactuers. Since this

critical variable was apparently ignored by the commentor submitting the test results, the Commission is unable to rely on these tests in determining the question of brake-clutch reliability.

Other commentors have expressed their confidence in blade brake-clutch reliability. One clutch manufacturer has presented extensive and detailed evidence of the durability of brake clutches. In actual mowing tests, three units have each completed over 250 hours of field testing without failure. In ongoing field tests, two units have compiled a total of 256 mowing hours and 5016 cycles with no failures to date. In addition to this, the clutch manufacturer, in conjunction with an engine manufacturer, has conducted overload tests and concluded that this clutch does not increase the wear on the engine or crankshaft. In laboratory cycle testing, a cycle life of over 30,000 cycles has been demonstrated, and in laboratory wear tests, 250 hours of operation and 15,000 cycles were completed on several units without a failure to stop the blade in less than 3 seconds. There was no appreciable degradation of blade stopping time throughout the laboratory testing. These tests indicate that the brake-clutches tested are reliable and safe. The Commission has studied the data submitted relating to these tests and has concluded that the tests were conducted under generally acceptable test procedures and accepts their validity.

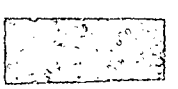
Another clutch design has been subjected to actual

field testing by the General Services Administration (GSA). The GSA, under their Experimental Technology Incentives Program, has reported on the field testing of a mower which GSA felt incorporated unique safety and low noise characteristics (Final Report, Etip Project 150, June 26, 1978). One of the safety features of this mower is a blade brake-clutch. Fifty units of these mowers were tested at ten different locations over a period of four months. This was an accelerated test with usage varying from less than one hour per day to over four hours per day. Fifty per cent of the users were subjecting their mowers to over four hours per day mowing time. There were no reports of a clutch failure. Although the amount of field test time was not recorded for each unit, a conservative estimate would place the test time range from something less than 80 hours to a maximum of 320 hours, with 50% of the units at the high end of the range.

The Commission also notes that at least 2 mower manufacturers are currently manufacturing mowers that include a brake-clutch mechanism.

Because some of the Commission's data became available after the close of the formal comment period, the Commission on November 2, 1978, published a summary of the data on brake-clutch safety and reliability and asked interested persons to examine the data and make additional comments to the Commission if they wished (43 FR 51038).

The time for submitting written comments in response to



this request was extended to December 15, 1978, and a presentation of oral comments was held on December 11, 1978.

In addition to comment on the data that the Commission had received, the Commission requested comment on 4 questions that had been raised by the comments on the proposal that concerned brake-clutch safety and reliability. These questions are discussed separately below:

1. What is the likelihood of a blade brake-clutch system failing in such a way that, rather than stopping, the mower blade continues to rotate?

In dealing with this question, and with the other aspects of brake-clutch safety and reliability, it must be kept in mind that a brake-clutch is a relatively simple device. Due to the large production of brakes and clutches for automobiles and other machines, and because of the extensive use of brake-clutches on other types of machinery, the technology associated with brake-clutch devices is highly developed. As can be seen from the comments, the types of potential problems with any particular application of brake-clutches can be identified, and the technical parameters for solving these problems are also known.

A brake-clutch could be used on a walk-behind power lawn mower to stop the blade without stopping the engine as one means to comply with the standard. The brake-clutch assembly would typically be mounted between the drive shaft of the engine and the blade of the mower. A control assembly would allow the operator to control the brake-clutch while

in the mowing position. While there are various types of clutches and brake-clutch designs, the basic principles can be illustrated through a discussion of a centrifugal brake-clutch. This is the type of clutch referred to by some of the commentors.

When the engine of the mower is started, the clutch is in the disengaged position and the brake is engaged. Thus, rotation of the blade is prevented by both the clutch and the brake. When the operator assumes the mowing position and grasps the blade control device the control releases the brake and engages the clutch, thereby allowing blade rotation to commence. Speed of blade rotation would then depend on the engine throttle setting as it does with today's mowers. When the operator releases the blade control device, the brake is engaged and stops the blade. But, because the clutch has disengaged the blade from the engine, the engine continues to run. The process would begin again when the operator regrasped the blade control device. To improve safety, in one design, the brake is spring loaded, and unless the spring force is overcome by grasping the blade control device, the brake springs cause the brake to engage and the clutch to disengage. Thus, if the actuating linkage broke, the blade of the mower would be stopped.

The parties commenting on this issue agreed that the means for insuring that the blade stops must be resolved for each different model of mower equipped with a brake-clutch. The answer requires engineering analysis and testing of the

total system (the engine and its controls, the brake-clutch and its controls, and the blade, including any linkages and fasteners used to interconnect or control the main components).

Some of these commentors suggested that the concept of "failing in an unsafe manner" should include failures where the blades did not continue to rotate and include mower operational characteristics such as hard starting, time between clutch engagement and achieving blade cutting speed, disengagement or slipping of the clutch while mowing, force needed to activate and hold the blade control, the frequency and cost of necessary maintenance or repair, and the knowledge needed to repair or maintain the brake-clutch. These commentors argued that presence of "safe failures" and/or undesirable operating characteristics would cause consumers to by-pass the blade control and would therefore be hazardous. The Commission does not agree that the occurrence of "safe failures" or the presence of undesirable operating characteristics are at issue when one is evaluating the likelihood of an unsafe failure. They are related rather to issues which are discussed elsewhere concerning the potential effectiveness of the standard, consumer acceptance of the brake-clutch, and the overall reliability of the brake-clutch. Therefore, this discussion will focus on the likelihood of an unsafe failure.

One brake-clutch manufacturer categorically states that the design of its unit is such that the blade will always stop. It states that individual units have been tested up

to 44,254 cycles and 737 hours without failure. It further reports that testing programs have worn out engines, blades, and other components while the clutch continued to function properly. Another brake-clutch and lawn mower manufacturer states its brake-clutch is designed so that if the clutch fails, the brake stops the blade. It also points out that a feature which costs less than one dollar could be added to stop the engine in case of a brake-clutch failure. This manufacturer reports on successful brake-clutch laboratory tests with engines from two different manufacturers.

Field tests conducted in 1977 by a Federal agency (GSA), which were previously reported, were continued in 1978. The mower manufacturer reports that these brake-clutch equipped mowers continue to perform well and several thousand hours of use have accumulated with complete reliability and safety. This report is basically confirmed by a comment from the Federal agency indicating that after extensive use of these 50 mowers under the varied conditions of the field test (10 sites, light and heavy duty use), "there were no complaints about the reliability and safety" of the brake-clutch. Another manufacturer who currently produces brake-clutch equipped mowers states that the fact that these mowers are offered for sale demonstrates their belief in their product's reliability.

A university professor and professional engineer who has taught machine design for 18 years, has been active in lawn mower safety design for ten years, and has experience

testing brake-clutches on both riding and walk-behind mowers states that it is highly unlikely that a well-designed brake-clutch system will fail unsafely.

A group of commentors generally believe that eventually some brake-clutch mowers will experience failures in a way that will permit the blade to continue rotating. These same commentors also state that there are ways to design a system which will not fail in a hazardous manner but at the expense of added complexity, cost, and weight and with the addition of a feature to kill the engine should the brake-clutch fail. They express concern over internal failures of the brake-clutch mechanism, misadjustment, control cable or linkage failures, and the effect of the environment and wear and tear on the mechanism. They predict these factors will lead to unsafe failures. Some of these commentors also provide speculative examples of potential component failures which might, in an unspecified brake-clutch system, lead to unsafe failure.

All parties agree that the likelihood of an unsafe brake-clutch failure is a direct result of the design, production, and assembly of the entire system. The brake-clutch and its components and control system must be compatible with the engine subsystem and blade.

A number of commentors state that, at least at present, such an overall system cannot be designed so that unsafe failures will either not occur or occur only rarely. These commentors, however, present little or no data to support

this conclusion. Some of these concerns are due to control cable or linkage failure caused by use and exposure. However, since control cables and linkages have been used for various purposes on lawn mowers and other devices for many years, the Commission believes that manufacturers should be able to avoid this source of failure.

The Commission also notes and agrees with the comment that any failures of brake-clutch systems on specific mowers will not automatically result in an injury. Rather, even if a small number of mowers fail unsafely, the overall risk of injury will be that of the prestandard mower plus a factor for operator dependence on the brake-clutch for the failed mowers. The rest of the mowers conforming to the standard will have a low risk of injury.

Other comments and supporting data indicate that two fail-safe brake-clutch designs exist, and the manufacturers of these designs have not reported any unsafe failure during field and laboratory testing. In addition, two mowers equipped with brake-clutches are now being offered for sale, and a third manufacturer has one available.

Finally, a professional engineer believes safe and reliable brake-clutch equipped mowers can be produced. For example, a failure of the clutch to disengage when the blade control is released will not be hazardous if the brake is large enough to stall the engine in this event. Failure of the brake spring can be prevented by minimum size and quality specifications for the springs or by providing more than one

spring. Engagement and longevity characteristics of the clutch and brake can be controlled by the proper selection of materials and sizing of the components.

After considering the brake-clutches that are actually in production, the fact that brake-clutch technology is highly developed, the laboratory and field tests showing that brake-clutches are reliable, and the fail-safe features that can be incorporated in the design, the Commission concludes that technology is available to design, produce, and assemble blade brake-clutch equipped lawn mowers which have a minimum likelihood of failing in an unsafe manner. While there may always be some likelihood of specific failures, the use of failsafe design principles and responsible quality control should reduce this likelihood to a minimum.

2. Can brake-clutch systems be designed so that if they fail, they will fail in such a way that the blade does not turn.

This issue is the opposite of the likelihood of a blade brake-clutch failing in an unsafe manner which is discussed above. Some commentors state either that there are existing designs which only fail in such a way that the blade does not turn or that it is technically feasible to design and produce such systems. Other commentors express reservations that this is technically feasible. These comments were discussed under the issue of the likelihood of an unsafe

blade brake-clutch failure. The Commission's conclusion is the same. After careful consideration of the conflicting comment and data, the Commission concludes that technology is available to design, produce and assemble blade brake-clutch equipped rotary lawn mowers which have a minimum likelihood of failing in an unsafe manner.

3. What is the potential for designing a brake-clutch system that is reliable during the operating life of the mower?

A number of interested parties provided comment on this issue in response to the November 2, 1978 and November 29, 1978 FEDERAL REGISTER notices. The commentors included the lawn mower industry trade association, individual lawn mower manufacturers, brake-clutch manufacturers, lawn mower engine manufacturers, a consumer testing organization, private testing laboratories, university professors, a government agency, and private inventors. Information was also received from a large retail sales organization, a lawn mower rental organization, and other interested parties.

In responding to this issue, the industry trade association and a number of mower manufacturers indicated that analyzing the feasibility of designing reliable brake-clutch systems required defining the term "reliability" as it applies to the mower.

Neither the original commentors on the proposal nor the commentors responding to the November 2, 1978 and November 29,

1978, notices offered the Commission an adequate technical basis for defining reliability as it applies to a brake-clutch for a rotary lawn mower. However, they have offered some parameters to frame a general definition of this term. Essentially, these parameters are summarized by the industry trade association which states that a reliable brake-clutch would have to perform at an acceptably high statistical level of reliability:

1) the tasks for which it was intended,
2) in the manner intended,
3) under the actual conditions of expected use, storage, and maintenance,
4) for the expected life of the lawn mower.

A technical dictionary largely concurs, by defining reliability, in the engineering sense, as "the probability that a component part, equipment, or system will satisfactorily perform its intended function under given circumstances, such as enviromental conditions, limitations as to operating time, and frequency and thoroughness of maintenance for a specified period of time." This definition reflects the meaning of the term reliability as used by the Commission's staff.

As these two definitions demonstrate, the term "reliability" is a reasonably well understood technical term which can be used without specifying precise levels of reliability as one could in a procurement specification or in establishing a quality control program.

One commentor states that evaluating the potential for designing a reliable brake-clutch requires defining operating life and establishing acceptable levels of reliability as they relate to operating life. He also states that this must be done with an understanding that not all mowers are, or should be, designed with the same operating life objective. Other commentors state that their company has requirements of performance and reliability, but that they nevertheless believe the Commission should reveal its expectations as to the level of reliability the Commission expects manufacturers to meet. As one commentor asks, will it be a 250 hour life cycle with periodic maintenence allowed, or a 400 hour cycle with no maintenance, or 100 percent reliability for as long as the product is used?

The Commission's technical staff has not performed nor sponsored development of test methods and procedures for laboratory or field tests designed to establish statistically valid predictions of the life of a lawn mower or of a brake-clutch equipped lawn mower. The standard does not state an operating life objective for lawn mowers nor does it state a reliability value which manufacturers must meet. Rather, the standard states the performance the mower must achieve to comply with the standard.

As stated above, manufacturers design their mowers with different operating life objectives. A brake-clutch used on a mower would therefore be expected to provide reliable service for the operating life selected by the manufacturer.

Achieving this objective is ultimately the responsibility of the manufacturer. It would not advance the safety objectives of the standard for the Commission to establish an operating life objective of the mower and therefore of the brake-clutch used on the mower. Rather, the Commission concludes from the available data and from an awareness of the state-of-the-art that it is technically feasible to design, develop, and produce a brake-clutch or other means which, when properly installed and maintained, will stop the blade in the manner required by the standard for a reasonable period of time. What is a reasonable period of time in any given case depends on the expected operating life of the other components of the mower, which is ultimately controlled by the mower manufacturer.

Three lawn mower manufacturers report that they currently manufacture mowers equipped with a brake-clutch that will comply with the final standard and which they believe is reliable. Two of these three lawn mower manufacturers state that they are willing to provide their brake-clutches to other manufacturers. One of these manufacturers has provided some data supporting the reliability of mowers equipped with their brake-clutch, including field testing data showing some mowers reliably functioning after over 370 hours of field use. At least one other lawn mower manufacturer agrees that it would be possible to develop brake-clutches for mowers.

Two brake-clutch manufacturers also claim that reliable brake-clutches are technically feasible. One believes that the laboratory and field data previously shared with the Commission and augmented by additional data submitted with these current comments confirms that their brake-clutch is reliable for the life of the mower. The other brake-clutch manufacturer believes they have "solved all the problems likely to be encountered in mower operation." Indeed, they state that their testing is hampered by engine failure occurring before brake-clutch failure. Both these manufacturers state they are capable of meeting the brake-clutch needs of the mower industry. However, one of these is planning some additional field tests to complete their effort.

Several other mower manufacturers, engine manufacturers, and an inventor questioned the feasibility of designing a reliable brake-clutch. These reservations were largely expressed in terms of cost and in terms of the difficulty of defining the life of the mower (including all environmental factors and human factors) and the difficulty of defining reliability for a specific lawn mower, for a model produced in quantity, and for all lawn mowers. Some speculated on possible ways mowers with brake-clutches might fail (safely or hazardously) because of design problems, production problems, assemblage problems, post-sale maintenance or lack thereof, consumer use and abuse, and the effects of time, weather, storage, moisture, and fertilizer

on the mower. Others discussed the data provided the Commission by brake-clutch manufacturers and some of the results of their own experience and testing. The consensus of this group is, essentially, that the technical feasibility of designing a reliable brake-clutch has not been statistically proven based on laboratory testing, field testing, and consumer or user testing of a very large number of mowers over a long period of time. In one case, the inference was that data would be needed on as many as 100,000 mowers over at least several years of customer use. In considering these comments, the Commission notes that very little concrete data was supplied supporting these views. To explain this lack of data, commentors indicated that:

a. Providing data on in-house testing of concepts might compromise valuable proprietary information.

b. They have not yet designed or evaluated a system they believe to be reliable.

c. They have no data on brake-clutch systems designed by others since they view that as the responsiblity of the marketer of the brake-clutch.

A consumer testing organization, based on a review of the available record and their own knowledge, concluded that it is possible to design and produce lawn mower brake-clutch mechanisms with a high degree of reliability. A private testing laboratory, university professors, and a government agency further supported the feasibility of brake-clutch devices.

A large retail sales organization, a rental firm, and other interested parties question whether the available data support a conclusion that reliable brake-clutches are feasible. These comments are either unsupported by data or speculative.

The Commission itself has not designed or performed reliability testing on brake-clutch equipped mowers. However, the Commission has considered all the data and opinions generated during the standard's development period, including all materials offered in response to the November 2 and 29, 1978, FEDERAL REGISTER notices. The Commission also considered the state-of-the-art of brake-clutch usage in chainsaws, existing walk-behind rotary mowers, vehicles, and industrial applications. In addition, the Commission considered the questions concerning brake-clutch reliability raised by some commentors and the confidence expressed by other commentors that designing a reliable brake-clutch for the rotary lawn mower is technically feasible.

For the reasons given in the discussion of question 1, the Commission, is persuaded that it is both technically feasible and within the state-of-the-art to design, develop, and produce a brake-clutch equipped rotary mower which, when properly assembled and maintained, will reliably stop the blade as required by the standard for a preselected period of time which the manufacturer can relate to the expected life of the mower.

4. Would it be desirable to include a requirement in any final lawn mower standard issued by

the Commission requiring that if a brake-clutch system fails in such a way that the blades continue to turn, there must be an audible or visual warning signal that the blade is still turning?

The Commission received numerous comments regarding the desirability of an audible and/or visible warning to indicate failure if a brake-clutch should fail in an unsafe mode. Some commentors found this to be a desirable feature, and others felt it to be unnecessary. Some commentors felt that resources for developing such a device would be better used to improve on present brake-clutch development. Others suggested that a more satisfactory approach would be to use an allegedly inexpensive device which would sense when an unsafe failure occurred and then stop the mower engine. Some said that an audible or visible warning would be very expensive to adopt, and others stated that it involved nominal expense.

Since the Commission believes that a reliable brake-clutch is technologically feasible and can be designed to last for the expected life of the mower, and that injuries resulting from unsafe failure would be infrequent, it would not appear necessary to require that manufacturers of reliable devices incorporate a device to warn the users in the event of unsafe failures. Also, commentors noted that other equally effective protection methods, such as engine-kill in

the event of clutch-brake failure, could be incorporated at nominal expense. A requirement for warning devices, when other equally promising designs are available, does not seem to be appropriate. The Commission also agrees with those commentors who say that delaying the issuance of the major requirements of this standard for the period necessary to develop appropriate requirements offering protection from such an unexpected occurrence would not be in the interest of consumers. The Commission notes that other commentors stated that the changes in air flow, noise, and vibration that occur when the blade stops provide an indication from which the user could determine if the brake-clutch device has failed.

In not requiring these warning devices, however, the Commission does not mean to imply agreement with the comments which allege that such a warning system could lead to injury if the unusual actuation of such a device created curiosity and thus invited access to the blade.

In addition to the specific questions on which comment was solicited by the Commission, comments were submitted on a number of other issues.

Commentors have raised a number of questions about the relationship between the use of a blade brake-clutch and the speed or revolutions per minute (rpm) of the rotary lawn mower engine. Gasoline engines designed for use on rotary mowers may be roughly divided into two categories based on the speed at which they operate. The high speed engines

generally operate at 3000 to 3500 rpm. The low speed engines generally operate at about 2400 to 2600 rpm. The concerns of these commentors are discussed below.

1. A retail sales organization, the industry trade association, and two lawn mower manufactuers state that brake-clutches have not yet been developed to operate reliably on low speed (2600 rpm) engines. They state that low speed engines are now used to reduce noise levels and to reduce the potential for thrown object injuries. They also state that future noise regulations by the Environmental Protection Agency and power mower regulations the Commission may issue to address hazards from thrown objects may require the use of low speed engines to comply with these potential regulations. These commentors argue that the brake-clutch requires use of a high speed engine, thereby preventing them from using a low speed engine to comply with potential regulations on noise levels and thrown objects.

This concern that brake-clutches have not yet been developed to operate on low speed engines is based on tests conducted by two mower manufacturers on one centrifugal type clutch design. These tests indicated unsatisfactory operation at the lower rpm (2600). One manufacturer presented a film of tests at the December 12, 1978, oral presentations. The other manufacturer presented test results as part of the comments on the proposal. This manufacturer restated the conclusions from the previously submitted comment at the December, 1978, oral presentation.

These concerns would only be valid if (1) centrifugal clutches were the only feasible way to meet the blade stop requirements of the standard and if (2) centrifugal clutches could not be designed to operate at low speeds.

In the first place, the centrifugal clutch is not the only type of brake-clutch that can be used to comply with the standard. There are brake-clutches which are not of the centrifugal type, such as the ramp cam clutch currently being developed for use on the rotary lawn mower. Also, one manufacturer of both brake-clutches and lawn mowers states that its centrifugal brake-clutch (1) is readily adaptable to any lawn mower design being manufactured today, (2) can handle virtually any torque and horsepower combination and (3) can be adapted to engage at speeds as low as 300 rpm. This manufacturer states that, for this clutch, engagement speeds are scientifically determined by formulation of clutch rotors, variations in rotor geometry and the total amount of weight used.

The manufacturer of the clutches which were tested by the two mower manufacturers that furnished data to support their concern about centrifugal clutch operation on low speed engines agrees that his standard clutch would not give satisfactory performance on those low speed engines. However, this clutch manufacturer states that "we are confident that by working together with these lawn mower manufacturers, we can, without any great difficulty, alter our standard clutch to provide satisfactory performance on low speed engines."

The Commission notes that the two centrifugal clutch manufacturers mentioned above have furnished the vast majority of the laboratory and field test data which has been presented to the Commission during the development of the standard.

Therefore, after considering all these issues, the Commission is persuaded that, while some technical efforts may be necessary to adapt the centrifugal clutch to a low speed engine, a centrifugal clutch for such engines is technologically feasible.

2. An engine manufacturer stated at the oral presentation that the idle speed of the mower increases between 600 and 800 rpm as the internal friction of the engine decreases due to wear. The Commission surmises that the commentor's concern is that the claimed increase in idle speed due to wear will cause unplanned engagement of a centrifugal clutch.

As stated previously, centrifugal clutches are not the only way to comply with the standard. Centrifugal clutch manufacturers have stated that their clutches can be adapted to any lawn mower design being manufactured today. The data provided to date by these brake-clutch manufacturers has not revealed large changes (600-800 rpm) in engine idle speed.

Further, one of the centrifugal brake-clutch equipped rotary power lawn mowers currently being manufactured and offered for sale is equipped with a governor to regulate the speed of the engine at both idle and normal operating speeds.

Therefore, it would appear that if an engine were to have large increases or decreases in idle speed as the engine breaks in and wears out, technology is available to overcome this alleged difficulty.

OPEI contends warranty costs or costs to the consumer might rise if mowers with brake-clutches had to be brought back for adjustments. One manufacturer (Honda) expressed the opinion that their brake-clutch unit would require little maintenance, and that such maintenance as would be required could be performed by many consumers. The amount of maintenance required for a blade control system may be highly dependent on the particular design of the system. Inferior design might lead to high warranty costs, but manufacturers will balance the costs of better components and quality control against warranty costs. Honda's brake-clutch mower is priced $35 to $40 above its conventional mower, and the Commission can only assume that all expected associated costs are included in this amount. Statements by two brake-clutch producers indicate that the devices would last as long as the mower without any maintenance required.

OPEI further states that industry in general, and small manufacturers in particular, will experience heavy costs in developing and teaching proper servicing procedures to the dealer network. This statement seems to presume that there will be a large number of brake-clutch devices or that there will be many different interactions between blade controls and power designs. The Commission does not expect a large

number of brake-clutch designs to be marketed. The basis for this expectation is the small number of engine manufacturers for the walk-behind mower market. The two major engine manufacturers, Briggs and Stratton and Tecumseh, along with Lawn Boy, which manufacturers its own engines, probably produce better than 95 percent of all walk-behind mower gasoline engines. The Commission expects that small mower manufacturers will rely on engine brake-clutch device combinations recommended by their suppliers, and that the suppliers will provide much of the service support in order to sell their brake-clutch devices. One brake-clutch manufacturer has indicated it will provide this kind of support.

OPEI also contends that the Commission's Economic Impact Statement does not take into account price increases caused by certification costs. However, these are not expected to be significant, since the great majority of all mower manufacturers already conform to the voluntary ANSI standard. Since most of the firms have testing, recordkeeping, and labeling activities related to the ANSI standard requirements, the certification rule should have minimal additional impacts on those firms that comply with the ANSI standard. Those firms that do not comply with the ANSI standard may find the rule will have a relatively greater impact, but in absolute terms the impact should be small. The certification rule which is proposed elsewhere in this issue of the FEDERAL REGISTER will leave a great deal of discretion to the individual manufacturer in designing a testing program,

which should enable the manufacturer to minimize certification costs.

OPEI also raises the issue of product liability costs, which it finds difficult to quantify but believes will be passed on the consumer. OPEI does not identify the source of the product liability costs. Product liability costs would appear to be a function of the reliability of the device. As discussed above, the Commission has concluded that reliable brake-clutch devices are feasible.

Furthermore, the Commission believes that certification costs and research and development are primarily fixed costs. These costs will be spread over many years of production, and the ability of the individual manufacturer to pass these costs along will be determined by competitive pressures. The costs mentioned by the OPEI were not felt to be large enough to warrant inclusion in the Commission staff's Economic Impact Statement.

Both the trade association and an engine manufacturer commented that January, 1982, is a misleading effective date, since, to fit normal production cycles, the industry would have to comply by October, 1981. The Commission is aware of the normal production cycle and discusses the factors relating to the effective date in Section F of this notice. Although the Commission believes that firms can comply with the standard by October 1, 1981, the additional time may be important to firms that encounter unforseen difficulties.

OPEI suggests the effective date be established as October, 1983. The Commission believes this suggestion is not warrented. The December 31, 1981 effective date of the standard will allow two full mowing seasons for testing. An October, 1983, effective date would penalize the suppliers and manufacturers who have already made substantial investments toward complying with the standard and would subject consumers to unnecessary injuries.

Many commentors addressed the question of whether a brake-clutch device would perform in the manner which would be expected. For discussion purposes, these comments can be divided into two basic categories, although in reality the two categories are interrelated.

One category involves consumer acceptance. That is, certain characteristics of a brake-clutch system could be such that consumers might be dissatisfied with the product which incorporates that system. Examples of such characteristics that were noted included controls which are difficult to hold for extended periods, slipping of the clutch while starting or mowing, repair which could be required, and required maintenance which the user might be unable to perform.

The second category relates to the potential effectiveness of a blade-control system if a brake-clutch is used on the mower to meet the requirements of the standard. These comments generally assert that the standard will not be as effective as anticipated because injuries could occur due to

certain potential characteristics of a brake-clutch system. Such possible characteristics noted by the commentors are failure of the brake-clutch device, failure of individual components of the system associated with a brake-clutch, failures resulting from improper maintenance, accidental actuation of a brake-clutch, defects resulting from improper assembly, poor design, manufacturer intent, and defeat of the system by retailers or consumers.

Insofar as the characteristics noted above involve consumer acceptance as separate from safety considerations, the Commission believes that mowers incorporating a brake-clutch can be designed so that they are both reliable and acceptable to the user. Naturally, those mowers which are more convenient to use will have the advantage of greater acceptance and could enjoy a greater share of the mower market than less acceptable mowers.

As explained elsewhere in this notice, the Commission believes that controls can be designed which are not difficult to hold down during normal mowing operations.

While slipping of the clutch while mowing is viewed by some commentors as a disadvantage, this is not necessarily always a disadvantage. A brake-clutch designed to permit slipping under heavy mowing conditions could result in increased utility. Clutches (and thus blades) have been reported to slip when mowing heavy or tall grass. Whereas the engines of presently produced mowers might stall under such conditions, the engine of a mower equipped with a

brake-clutch could continue to run even though the blade stopped. The operator of such a mower would need only to raise the mower long enough for the blade to re-engage without having to restart the engine. Even though some comments report this slipping characteristic for some brake-clutch designs, the Commission does not view this as a disadvantage if the point at which slippage occurs serves to protect against stalling that could otherwise occur. It is significant that users of mowers supplied by the General Services Administration (discussed above) did not report dissatisfaction caused by clutch slipping.

Some comments also argued that excessive clutch slippage could result in failure leading to bypass or expensive repair. However, such failure can be avoided by the proper choice of design. Brake-clutch manufacturers have submitted information which they feel demonstrates that both brakes and clutches have lasted beyond the expected life of the mower. The avoidance of undesirable slipping is basically a problem in reliability. As discussed above, the Commission has concluded that reliable brake-clutches are feasible. The Commission notes that disabling the system to avoid clutch slipping would probably require more than simply tying down the blade control, since the clutch would still slip under this condition.

Several commentors claim that some expected repair and required maintenance of brake-clutches and related systems would be outside the capabilities or inclinations of mower

users. This appears to be a matter of consumer acceptance not necessarily related to the safety of the mower. One manufacturer of a presently produced mower which incorporates a brake-clutch uses a device for adjusting its mower cable controls similar to those used for periodic adjustment of the caliper brakes of a bicycle. This adjustment does not appear to be excessively burdensome or difficult, and it is assumed that the manufacturer of such a control would supply adequate instructions to the buyer. Another manufacturer of brake-clutches claims that his device does not require adjustment or other maintenance over the life of the mower. Thus, it appears that excessive maintenance need not be a problem with brake-clutches. Regarding repair, the Commission believes, as stated elsewhere in this notice, that a brake-clutch can be designed which will be reliable for the life of the mower.

Some commentors described failures which have occurred or might occur and which could cause dissatisfaction or require repairs that could not be reasonably expected to be within the capabilities of the average user. Such noted failures involved cables breaking and failure of internal parts of the brake-clutch device. Again, such failures are preventable through proper system design and selection of components.

Regarding brake-clutch and other system failures, the Commission has determined, as discussed elsewhere, that

development of a reliable brake clutch and related components is well within the capabilities of manufacturers. As noted by some commentors, no mechanical system can be expected to be completely safe from failure. Still, the liklihood of failure, and of injury when failure occurs, is expected to be small compared to the numbers of injuries which occur from presently produced mowers.

Some commentors warn that users of brake-clutch type mowers could become so accustomed to the blade stopping when the control is released that they will routinely and confidently approach the blade path when the engine is running. The manufacturers' instructions and common sense might warn against such action. However, users are currently being injured in numbers greatly exceeding what might reasonably be expected to result from unexpected brake-clutch failure. While manufacturers of mowers using brake-clutches would very legitimately be concerned about the product liability considerations of a design which fails and leads to injuries, the Commission must ultimately consider the protection of the great majority of those users whose systems do not fail in a manner or situation which results in injury. It is the Commission's considered belief that the potential for reliable brake-clutches is such that the injuries caused by presently produced mowers far outnumber any injuries which might occur from unwarranted reliance on the continued performance of safety systems which are intended to stop the mower blade.

Although the comments raised the possibility, intentional non-compliance by manufacturers or the possibility that retailers might offer system defeat as an unadvertised promotional method are not expected to be significant problems in view of the fact that the sale or offering for sale of such mowers would be a prohibited act under the CPSA.

Users might conceivably bypass a brake-clutch system for any number of reasons. However, the Commission believes this will not be a common occurrence since proper choice of design and selection of components can insure that the device is sufficiently reliable that users are not tempted to bypass it.

A number of other comments were received that were identical to comments that had been received in response to the proposal and that are outside the subject matter for which the additional comment period was provided. The Commission's staff has considered these comments but finds nothing in them that would warrant any change in the Commission's conclusion concerning these issues. The Commission's decisions on these matters are explained at the appropriate portions of the remainder of this preamble.

After considering all of the data available to it, including all the comments received, the Commission concludes that, by December 31, 1981, rotary power lawn mower manufacturers will be able to incorporate reliable and

safe brake-clutch mechanisms into their products, if they choose that method of complying with the requirements of the standard.

(ii) Effect of fertilizers and of storage on brake-clutch system. Several commentors express the view that fertilizers on the grass may cause brake-clutch failures and that not enough is known about the effect of fertilizers on brake-clutch systems to allow mower manufacturers to use such systems. Other commentors suggest that a mower manufacturer must consider the effects of periods of storage and nonuse of mowers on the reliability of brake-clutches.

These comments are speculative at best. A manufacturer of mowers must take many things into consideration when designing a lawn mower. The effect of fertilizers and nonuse are merely two of the conditions that must be considered. Furthmore, there is no evidence in the test data submitted to the Commission that fertilizers or nonuse of a mower will have an adverse effect on brake-clutch systems if they are used in mowers. The Commission also notes that at least two mower manufacturers are currently manufacturing mowers that include a brake-clutch mechanism.

(iii) Defeat of brake-clutch mechanisms. One commentor has suggested that, if the brake-clutch control device is tiring to hold, consumers are just as likely to defeat a brake-clutch mechanism as they are to defeat an engine kill with manual start mechanism. Other commentors have expressed the view that it is unlikely that consumers will defeat such a system.

The Commission does not agree that consumers are as likely to defeat a brake-clutch mechanism because it is

tiring to hold as they are to defeat a blade control system that uses an engine kill system with a manual start mechanism. If the brake-clutch mechanism is tiring, all an operator need do is release the control lever for a few seconds. Further, manufacturers can be expected to be aware of the need to make operating controls, particularly frequently used ones, acceptable to the consumer. Lack of such acceptability could reasonably be expected to have an adverse effect on sales.

The 50 mowers tested by the GSA, mentioned above, were supplied to five federal agencies in various locations to provide a broad cross section of user demands. The mowers were used both by light users (those who operated the mower 2 hours or less per day) and heavy users (those who operated the mower for over 4 hours per day.) 72% of the users responded to a GSA questionnaire. Of those responding, 72% indicated that they cut the grass when it was high or very high. In regard to the performance of the brake-clutch, 66% of the light users stated the clutch was easy or very easy to use. Another 33% stated it was neither easy nor hard to use. 50% of the heavy users stated the clutch was either easy to use or neither hard nor easy. While 33% of the heavy users stated the clutch was hard to use and 17% said it was very hard to use, it must be recognized that, these persons used the mower for 4 hours or more at a time and it is questionable whether consumers mowing the grass around their house would use a walk-behind mower for that

length of time. Moreover, 100% of the light users and 66% of the heavy users in the GSA tests stated that they liked the brake-clutch as a safety feature.

A second manufacturer demonstrated his brake clutch equipped mower to the Commission staff in September 1978. As part of the field demonstration, a small area covered with extremely high grass was mowed by several persons unconnected with the manufacturer. None of these users indicated any dissatisfaction with the force required to actuate the brake-clutch lever or keep it actuated.

The president of the mower industry trade association, OPEI, who is also the Chairman of the Board of Directors of a major power mower manufacturer, has stated that the problem of the blade control being too hard to hold was simply one of providing sufficient mechanical advantage in the control and should not pose any significant problem for manufacturers to solve (meeting with CPSC Chairman, October 17, 1978).

In view of existing data on brake-clutch mechanisms, the Commission is unable to conclude that mower operators are likely to defeat the brake-clutch system because they may find it tiring. Also, the Commission has no reason to expect that during the 3 years prior to the effective date of Subpart A, the mower industry will not insure that brake-clutch control levers are easy to use if brake-clutch mechanisms are the means chosen to meet the blade stop time requirements of the standard.

(iv) Warning of brake-clutch failure. One commentor

suggested that the Commission should require mowers that incorporate a brake-clutch system to also include a device that produces an audible or visual warning if the clutch fails to disengage the blade and the blade continues to rotate when it should have stopped.

The Commission believes that manufacturers who are concerned that their brake-clutch system may fail in such a way that the mower blade is rotating when it should have stopped may wish to incorporate such a feature in their lawn mower. One mower manufacturer already incorporates in its mower a visual warning that the blade is rotating, and the Occupational Safety and Health Administration requires such a device in agricultural tractors (29 CFR 1928.57). The Commission, however, has decided not to require such a mechanism in the standard it is issuing at this time. The data available to the Commission on brake-clutch mechanisms does not include any data clearly indicating that a clutch mechanism has failed in a mode where the blade is rotating when it should have stopped. The Commission believes that manufacturers have the technology to develop brake-clutch systems that will "fail safely", that is, if they fail to operate they will do so in a manner where the blade does not turn. Therefore, the Commission sees no reason to conclude that brake-clutch mechanisms will fail in a manner that would require a visual or audible warning. Further, the effectiveness of such a warning is speculative in that the consumer may not realize the meaning of a warning which

occurs only in the event of an infrequent equipment failure.

On this same topic, a mower manufacturer stated that there would be 1 brake-clutch malfunction for every 1000 brake-clutch engagements, that for every 1000 brake-clutch malfunctions there would be 1 injury, and that in 10 years brake-clutch failures would therefore be associated with over 16,000 injuries per year. These figures, however, appear to be assumptions on the part of the manufacturer and not based on any data. The Commission has no reason to believe that these figures are valid, particularly since the brake-clutch data supplied to the Commission show that brake-clutches are capable of a much lower malfunction rate.

f. Momentary release of blade control lever.

Several commentors believe the blade stop time requirements of § 1205.5(a)(1)(iii) of the proposal provide that if the operator momentarily released the blade control system, the engine could not be immediately reactuated. The Commission did not intend this result. The Commission interprets this provision, now found at § 1205.5(a)(1)(iii) of the final standard, as not preventing the blade from immediately resuming normal operating speed if the operator reactuates the blade control. Of course, the mower must meet the blade stop time requirements of the standard if the blade control is not reactuated.

g. Actuation of controls.

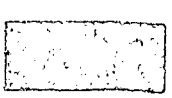
Several commentors believe proposed § 1205.5(a)(3) is unduly restrictive because it requires the operator to

actuate two separate controls, one of which must be the blade control, before blade operation may resume. The commentors suggest rewording this section to allow the operator to make two separate motions by the same actuating means.

The purpose of this requirement is to prevent the operator from unintentionally restarting the mower blade, for example by accidentally coming into contact with the blade control. This provision does not require manufacturers to install a second separate mechanical device on the mower. They may incorporate this second "control," as it was referred to in the proposal, into the blade control system if two distinct and separate actions are necessary to restart the blade. The intent of the requirement, that accidental or unwitting contact with the blade control will not restart the blade, can be achieved by using a separate device or by incorporating a double-action feature into the blade control. This requirement, which now appears in § 1201.4(a)(2), has been reworded to make it clear that this alternative is permissable.

h. Location of controls.

One commentor disagrees with the requirement of § 1205.5 (e)(1) of the proposed standard that, for lawn mowers whose blades start rotating when the power source starts, the starting controls must be in the operating control zone. The commentor states that the purpose of this provision is to place the operator in the "operator position" when the



mower is started and that whatever design the manufacturer elects to use to accomplish this objective should be allowed.

From Commission injury data, it is estimated that over 2000 injuries are treated each year in hospital emergency rooms due to foot contact with the mower blade when the mower is being started. These injuries generally occur when the operator's foot slips under the mower housing in starting the mower. These injuries should be eliminated if the starter controls for mowers whose blades start rotating when the mower is started are located in the operator control zone, because the operator will be separated from the blade.

It should be kept in mind that, since the Commission is not including the "easy restart" criteria as part of the final standard, the only mowers that are likely to have the blade start when the power source starts are mowers with power restart, because all other mowers will have some means for disconnecting the blade from the power source. Some presently produced power restart mowers have a key start located on the engine. Since the Commission is not requiring 360° foot probing of the mower, if a person attempted to start the mower from this position (while holding the blade control), their foot could come into contact with the blade from the side of the mower. These power restart controls should be relatively easy to relocate, and the Commission believes that it is preferable (and less of a burden on the manufacturer) to insure that these controls are relocated than it would be to require foot probing of

the sides of the mower. Tests performed for the Commission by NBS (NBS memorandum, September 14, 1976) show that the area on the mower engine where key starts could be located is within the area which can be reached by a person who is also contacting the blade control.

The Commission has not accepted this comment because it does not indicate what other provisions could address this hazard. The Commission does not know of any, and the comment does not define "operator position" or suggest criteria for determining that the operator would remain in it while starting the mower. In addition, starting effort and recoil should not be a problem with power restart mowers, which are the only ones to which the requirement is likely to apply. Therefore, the Commission sees no need to change this requirement. Of course, any manufacturer who does develop a design that addresses this hazard could petition the Commission to amend the requirement.

i. Shut-off control.

Commentors stated that proposed § 1205.5(d), which required the inclusion of a shut-off control, is not necessary since all mowers produced today already contain a shut-off control.

The Commission agrees that since virtually every mower produced today has a shut-off control, this provision is not necessary. Therefore, this requirement is not included in the final standard.

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Warning label (§ 1205.6)

A number of comments were received concerning the proposed label warning of the danger of blade contact.

The proposed standard would have required rotary mowers to have 2 labels, one near the discharge chute and another where it could be seen by the operator from the normal operating position. One comment suggested that one label should suffice. The Commission agrees that one label located as near as possible to the discharge chute should be sufficient. This area is perhaps the most likely area of the mower that the operator would intentionally approach, and the Commission believes that a label located so that it is likely to be seen by users as they approach that area would be likely to come to the attention of the operator. The Commission realizes that the blade control should protect operators who intentionally approach the discharge chute, unless the blade is still turning because they continue to hold the blade control or approach in less than three seconds. However, the Commission believes that if the label is in this location the user will be more aware of it than if it is in other locations. If the mower has no discharge chute, the label may be located in any position that is conspicuous from the normal position of the operator.

It was also suggested that the pointed area of the label be changed from the top of the label to the bottom. This would have the effect of having the label point toward the hazard of the discharge chute and housing edge. The

Commission agrees that this is a desirable feature that should increase the effectiveness of the label, and it is incorporated in the label requirement for the final standard.

A commentor submitted a suggested alternative label. Instead of the proposed label's showing of a hand with a red diagonal line across it, the suggested label depicts a blade-like object cutting into the forefinger of the hand. (Insert description of Commissions decision on alternative label)

Miscellaneous comments:

a. Applicability of NEISS data.

One commentor states that the Commission's proposed standard is based on injury data accumulated during the 1974-75 mowing seasons. It argues that "these data --which were generated while mowers complying with the new voluntary safety standard ANSI B71.1-1972, and supplements, were just coming onstream -- are now unacceptable for use in the current evaluative process." The data that the Commission has received since the proposal confirms the need for the blade control requirements, and the most recent voluntary standard would not appear to contain additional provisions to protect against blade contact injuries to the hand. The voluntary industry standard, ANSI B71.1, was first issued in 1960. The latest revision was in 1972, with supplements in 1974 and again in 1977. The provisions of that standard as they affect contact between a mower operator's hand and the

rotating blade were not changed in the 1974 and 1977 versions of the standard. In fact, the voluntary standard does not directly address the hazard of the hand coming into contact with the blade. Since 1972, the voluntary standard has been modified to address foot contact injuries by the addition of requirements for a rear trailing shield strength test and a handle strength test.

The Commission has compared National Electronic Injury Surveillance System (NEISS) data for 1975 to NEISS data for 1977. The following table shows that there is no statistically significant difference in the injury data concerning the numbers or percentages of hand and foot injuries:

Body Part Injuries

	Hand	Foot	Other
1975	32,766 (49%)	14,928 (22.5%)	18,525 (28%)
1977	33,229 (50.6%)	13,686 (20.8%)	18,779 (28.4%)

Also, because there has been no change in the ability of voluntary standard to reduce blade contact hand injuries, there is no reason to believe that the data for later years will show a reduction in this type of injury.

Because lawn mowers that comply with the 1977 voluntary standard are just now coming "on-stream," the Commission has not been able to use injury data to establish how effective that standard might be in reducing foot contact injuries. (The additional requirements that appear most related to foot injuries are requirements for the strength of shields

and handles.) However, the Commission has considered the provisions of that standard in deciding on the requirements of the mandatory standard.

It is possible that the rear shield required by the voluntary standard may meet the Commission's requirement for foot probing the rear of the mower. However, since the voluntary standard does not require a blade control, it does not specifically protect against foot injuries at the side and front of the mower. Also, the Commission considers the voluntary standard's requirements for foot probing the discharge chute to provide less protection than the Commission's mandatory requirement.

b. Blade stop time measurement.

A few commentors state that visual observation of blade stop time allowed in the blade stop time test in proposed § 1205.5(b) is not sufficiently accurate and that a more accurate means of determining blade stop time should be used.

The Commission agrees that for enforcement purposes visual observation of blade stop time is probably inadequate since there may be slight variability among testing personnel. Therefore, in the final standard, no specific means for measuring blade stop time is required. The Commission intends to test for blade stop time through an electronic system that has an accuracy of 0.1 second with a high order of repeatability. Manufacturers, however, are not restricted as to the means they must use to measure blade stop time, as

long as the blade in fact stops within 3 seconds after the blade control lever is released.

c. Wear and tear on engines.

One comment states that, if engine kill is used as a method of meeting the standard, the increased amount of engine restarting that will occur will increase the rate of wear on the engine and will require more frequent replacement of the mower.

No data was provided by the commentor to support the comment, and the Commission is unaware of any supporting data. No comments addressing this contention were received from the lawn mower industry. Moreover, lawn mower instruction booklets accompanying lawn mowers produced today frequently recommend that the mower be turned off, for example, when the operator empties a grass catcher or the operator leaves the mower. A lawn mower presumably is designed with these instructions in mind. Accordingly, it can be concluded that the starting of mowers does not cause unreasonable wear rates. Furthermore, manufacturers are free to use means other than engine kill to comply with the blade stop requirements.

d. Useful life of mowers.

In its preliminary economic analysis of the proposed lawn mower standard dated February, 1977, the Commission estimated consumers retain power mowers for 7 years, on the average. A mower manufacturer comments that based on a 1976 survey of previous mower ownership, a significant number of

people keep mowers beyond that time, and only 22% of mowers are scrapped when they are replaced. It suggests that in view of this data it may take 20 years before all mowers are replaced with mowers that meet the standard. The manufacturer implies that no standard should be issued since it will take so long before mowers that comply with the Commission's standard saturate the marketplace.

The Commission disagrees with the implied suggestion that because it may take a number of years before mowers that meet the Commission's standard are in the marketplace, no standard should be issued. The Commission currently estimates that lawn mowers are kept an average of 8 years before they are replaced (memorandum from CPSC's Division of Economic Analysis dated September 9, 1978). Even if this time frame were longer, that would not be an adequate reason for never issuing a standard. While achieving the full potential for injury reduction or elimination would take some time, injury reduction would occur once the mowers were finally purchased by consumers. In addition, to the extent that any longer mowing life data would also apply to complying mowers, the cost attributable to the standard's requirements would be less for each year of use of the complying mower.

e. Change in position of power mowers in CPSC Hazard Index.

A number of commentors observed that, from 1975 to 1976, power mowers moved from 3rd place on the CPSC Hazard Index to 17th place. They contend that this indicates the

voluntary standard has been effective in making power mowers safer.

The Hazard Index is a numerical ranking of products based solely upon NEISS injury frequency and severity surveillance data, adjusted to give greater weight to injuries to children under 15 years of age. It was originally developed as a management tool to generate a list of potentially hazardous products for further study. However there is a tendency for the public to use the index for purposes for which it was not designed. A change in the ranking of a given product category from one year to another may be the result of a real difference in the estimated number and/or severity of injuries for a product category, either for the total population or for the population less than 15 years old. But it could also be due to random variation in the injury frequency and severity associated with a product category. In particular, it could be caused by the weighting procedure used in the computation of the Age-adjusted Frequency Severity Index (AFSI) value.

From 1975 to 1976, the NEISS estimate for the number of power mower injuries (from all types of mowers) treated in hospital emergency rooms decreased from 63,306 to 56,681 injuries. The Commission does not believe this change is statistically significant, since it is well within one standard error of the estimate and, therefore, within the range of a chance variation in the data.

In order to determine some of the characteristics of the computation of the AFSI which may have contributed to the change in ranking for power mowers reflected in the Hazard Index, the Commission conducted an analysis of the power mower data. In order to compute the AFSI, injuries of a particular diagnosis, body part, and case disposition are assigned a severity value. This severity value, which is based upon the judgment of a panel of medical personnel, can be one of eight incremental values. These values increase exponentially, each value being double the value below it. After being assigned an initial severity value, the severity value of an injury may than be increased 2 1/2 times if the victim is less than 15 years old. This results in a possible severity value ranging from 10 to 6290. This value is then multiplied by the statistical weight of the particular NEISS hospital in which the injury was treated. NEISS hospital weights range from 2 to 500. This increases the range of possible severity values to 20 to 3,145,000. These attributes of computing the AFSI may result in exaggerated movement of products on the Hazard Index from one fiscal year to the next. After an exhaustive examination of power mower data, it was found that chance variations of injuries in the highest severity groups were the primary reasons for the drop of power mowers in the Hazard Index from 1975 to 1976. In 1975, the average hospital weight for these injuries was 50.2. In 1976, the average hospital weight was 17.4. Averages for all product

categories in these severity categories for those years were 27.9 and 26.1, respectively.

This explains the apparently dramatic shift of power mowers in the Hazard Index. It should be noted that for 1977, power mowers moved to 6th place in the CPSC Hazard Index with an estimated 67,070 injuries treated in emergency rooms (for all types of mowers). This would seem to reflect a more moderate distribution of hospital weights among severity categories.

f. Shock device. A comment suggested that instead of the blade control requirements, the Commission should allow the use of a device that would apply an electric shock to persons who reached under the mower or into the discharge chute. After considering this comment, the Commission concludes that it is not feasible. First, no apparatus capable of achieving this result has been suggested so that the Commission could more specifically evaluate all aspects of the idea. Generally, the Commission believes that it is preferable to have protective safety requirements rather than punitive ones. In this case, there is no established level for the intensity of the shock that would be required to deter the user without subjecting the user to a risk of injury associated with the shock itself. Also the effect of wet ground or possible malfunctions that could increase the intensity of the shock cannot be predicted. For these reasons, the Commission believes that such a requirement would not be as effective or reliable as the blade control requirements that are included in the final standard.

g. Key requirement.

One commentor questions why a particular requirement which was recommended by the offeror was not included in the proposed standard. This requirement was essentially that a lock and key system must be incorporated in the mower design in order to prevent unauthorized use of the mower. The Commission is aware that some present mowers incorporate such a design and recognizes that this design can prevent unauthorized use. However, the Commission does not know of any significant injury pattern caused by unauthorized use of unlocked mowers. Although the Commission can appreciate the possibility that an unauthorized child may occasionally start a mower, the Commission has no data showing that this risk is sufficient to warrant a mandatory requirement.

h. Economic effects of the standard.

The Commission received a number of comments on the economic effects of the proposed standard.

1. Cost and price effects.

The changes in manufacturing costs and retail prices that are expected to accompany the power mower rule evoked a number of specific comments. The mower industry trade association expressed the view that consumers, when given the choice, will not pay a premium for safety, implying that the price changes expected to accompany the rules would not be acceptable to consumers. This sentiment was expressed by other commentors who said that the expected price increases due to the standard were excessive.

The American Rental Association (ARA), a national trade association of rental firms, said that since the price increases will fall more heavily on the lower priced mowers, the standard imposes the greatest financial hardship on those consumers who can least afford it.

The Commission estimates that the average retail price increase caused by compliance with the requirements of the standard would be about 24 percent.

In general, the expected price increases estimated by Stanford Research Institute (SRI) for the mower industry trade association are not significantly different from the estimates made by the Commission. The issues of increased costs and prices are therefore not centered on how much the expected increase might be, but rather on whether the increase is accompanied by corresponding safety value and, secondly, on the issue of whether the proposal impacts relatively more adversely on lower income groups.

The legislative history of the CPSA indicates that unreasonable risk of injury is to be determined by balancing the nature and degree of the risk against a rule's effect on the product's utility, cost, and availability to the consumer. (H.R. Rep. No. 1153, 92nd Cong., 2nd Sess. 33 (1972).) Section 9(c) of the act, furthermore, requires the Commission to make certain findings for inclusion in consumer product safety rules, including findings concerning the nature and degree of the risk of injury, the need of the public for the products subject to the rule and the rule's

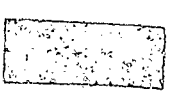
effect upon the utility, cost, and availability of such products, and any means of achieving the objective of the rule while minimizing adverse effects on competition or disruption of manufacturing and other commercial practices.

As a matter of policy, the Commission considers the costs and benefits before issuing regulations under the acts it administers. The Commission also considers on a preliminary basis the costs and benefits of its actions in setting project and program priorities. (See - Commission Policy on Establishing Priorities for Commission Action, 16 CFR 1009.8).

With this background in mind, the Commission questions the utility of quantitiative cost-benefit analysis in the health and safety area. While it is desirable that benefits exceed costs, it is not always necessary or possible to show that they do through the calculation of a precise numerical ratio. Although it is often helpful to do cost benefit analysis, it is simply too crude an instrument at its present state of development in the fields of health and safety for a ratio of less than one to be a necessary condition for regulation. As stated in the legislative history of the Consumer Product Safety Act, "[t]here should be no implication . . . that the Commission would be required to conduct and complete a cost-benefit analysis prior to promulgating standards . . ." (H.R. Rep. No. 1153, 92nd Cong., 2nd Sess. 33 (1972)).

It is difficult to assign monetary values to human suffering in a meaningful way for regulatory purposes. The issues involved in issuing health and safety regulations are likely to require judgments based on values rather than numerical weights. Therefore, while quantified cost-benefit analyses are sometimes used as a decisional tool, the Commission bases its decision to issue consumer product safety rules on a non-numerical balancing of the benefits and costs. However, the following discussion is included to address (1) the comments that contend the standard's benefits will not justify its costs and (2) the Council on Wage and Price Stability's comment that only "those segments of the CU standard which can be shown to have benefits larger than costs should be implemented."

Retail prices of walk-behind mowers are expected to rise an average of $35 due to the regulations. Since the average life of a mower is estimated to be about eight years, a complying mower will cost about $4.40 more per year. The Commission estimates the cost of blade contact injuries associated with walk-behind mowers at $253 million per year, exclusive of pain and suffering. Since there are about 77,000 such injuries occurring each year, each injury results in average costs of about $3,300. Since there are 40 million mowers in use by consumers, there is a 1 in 520 chance of incurring an injury that will cost about $3,300, exclusive of pain and suffering. The expected value of the injury cost associated with each mower is thus about $6.35



per year. If the standard is effective in eliminating 77 percent of the injuries that account for 83 percent of injury costs (CPSC estimates, see Appendix of Economic Impact Statement), then each year, for an average of $4.40 additional cost per mower, a savings of about $5.30 can be expected. If we include a factor for pain and suffering, the savings would be much greater. The above analysis demonstrates that the additional price increases that may accompany the standard are worthwhile in terms of safety.

In its August, 1977, comments, the Council on Wage and Price Stability states that, "Both the CPSC and the SRI cost estimates neglect two important aspects of costs: -- first, since the increase in mower prices would result in a decline in sales, a cost would be incurred by those individuals who would have purchased mowers at the lower prices..." and -- "Secondly, both the SRI and the CPSC analyses mention, but do not address, the possibility of decreased mower utility which would result from the standard."

The first point that the Council attempts to make is not valid because a consumer will not be faced with the decision to purchase the same product at a higher price. Due to the standard, mowers will incorporate safety features. Although the Council states that consumer demand will decline due to the standard, demand may increase under certain conditions. If consumers perceive power mowers to be safer due to the standard, the demand for mowers, as reflected in the willingness of some con-

sumers to pay more for safety, may increase enough to offset any reduction in demand caused by any price increase.

The second cost estimate that the Council claims the Commission neglected is that of "the possibility of decreased mower utility which would result from the standard." An estimate of the cost of lost utility was not made because such losses were not considered to be significant. It has been stated that if blade controls were not accompanied by brake/clutch devices or easy restart devices as specified in the proposal, cutting time might be increased because of the time required to restart the mower on numerous occasions during each cutting session. However, since the final standard does not permit the blade stopping by engine kill if only manual restart is available, any increase in cutting time should be insignficant.

The Commission's analysis of the expected economic impact of the blade contact provisions is intended to identify all the adverse economic effects that could be caused by the standard. All of these adverse impacts may not be applicable to any one manufacturer, and manufacturers may develop solutions to the performance criteria of the standard that are cheaper than those that are presently foreseen. Even now, mowers that appear to meet the blade contact requirements are becoming available in the marketplace. It is likely that the costs of compliance will decline as economies of scale are achieved in the production of safety-related components and as manufacturers gain ex-

perience with the standard. A more detailed discussion of the costs associated with the various provisions of the standard is given under the section of this notice concerned with the findings required by section 9(c) of the CPSA ("STATUTORY FINDINGS") and in the Commission staff's Economic Impact Statement.

The ARA claims that since the proposed standard would result in the greatest price increases among the lowest price mowers, the standard imposes the greatest financial hardship on those consumers who can least afford it. Although this may be true in some cases, it is not as significant an objection to the proposals as price considerations alone might suggest.

Generally speaking, it will cost more to bring mowers that currently sell for relatively low prices into compliance with the standard than it will for mowers that currently sell for higher prices. This is because more features on these lower priced mowers will have to be changed in order for the mowers to comply. The reason for this is thought to be that low priced mowers are often produced by small firms that do not have the engineering expertise that may be available to large firms. In addition, the firms may be unwilling to incur the costs of instituting safety-related changes in a competitive price market. However, to the extent that the standard is cost effective in relation to costs of injury, it would be to the purchaser's economic

advantage, on the average and at any income level, to purchase a safer mower.

The ARA claims that the Commission understates the total cost of the proposals because it "fails to adequately represent the full consumer cost and fully ignores manufacturing and societal costs." This claim is erroneous. If anything, the costs to the consumer may be overstated since competitive forces may lead to lower retail price increases than those estimated by the Commission. In addition, not all the adverse effects identified by the Commission may be applicable to a particular manufacturer. The Commission's estimates of price increases for mowers assume that the manufacturer and the distributor will set their prices using their customary markups over costs for the safety features required by the standard.

The claim that manufacturing costs were ignored is also incorrect. The Commission's preliminary economic assessment discussed the effects of the different requirements on manufacturing costs. Manufacturing costs were the prime consideration behind the expected change in prices. The Commission's final report on the economic impact of the blade contact requirements confirms its earlier preliminary assessment.

Societal costs were also considered. Although costs such as effects on small businesses, changes in employment, effects on customary business practices, changes in compe-

titon, and the like are hard to express in monetary terms, they have been brought to the attention of the Commission in staff studies of the economic impact of the regulation and are discussed above in the section relating to the findings required by section 9(c) of the CPSA ("STATUTORY FINDINGS")

2. Small firm considerations.

The impact of the proposed standard on smaller manufacturers was addressed by seven commentors. Most of the comments stated that small firms with less volume over which to spread the increased capital costs would be at a cost, and therefore price, disadvantage and perhaps be forced out of business. Some of the commentors indicated that needed capital would be difficult for many smaller firms to acquire. Some said that the exit of small firms would result in greater concentration of the industry among the larger manufacturers.

The most important factor that will determine how much costs will change is how many changes to current production are necessary to comply with the requirements of the standard. The degree of deviation from compliance is not necessarily related to the size of the firm involved. Although some small firms may be at a disadvantage because their output is not in compliance, it is also true that those small firms producing a mower close to compliance will have a relative advantage. Similarly, a larger firm with many models out of compliance will have a burden that small firms with few models may not have.

Acquisition of capital to redesign products to comply with the standard may not be relatively more difficult for smaller firms. The financial condition of a firm will be affected by many factors. A firm that is in financial difficulties may find that the standard adds to those difficulties, regardless of size. Exit of small firms from the industry is not expected to occur on a scale that will significantly affect industry concentration.

3. Inflationary impact.

In a series of related comments, the Council of Wage and Price Stability (CWPS) expressed concern about the alleged inflationary impact of a power lawn mower safety standard. (See: (1) CWPS comments on CU's recommended standard (CWPS-91; October 14, 1975); (2) CWPS comments on the proposed standard August 12, 1977); and (3) CWPS comments on CPSC's Policy on Establishing Priorities (CWPS-178; August 17, 1976).)

Although the Council's comments of October, 1975, and August, 1976, are not directly applicable to the May 1977, proposal, they provide some insight into the assumptions upon which the August, 1977, comments are based. The comments on the CU recommended standard review the CU economic analysis that accompanied the CU standard and also review an economic analysis of the CU standard that was prepared by Stanford Research Institute (SRI) for the Outdoor Power Equipment Institute (OPEI).

Many of the comments submitted by CWPS concerning the standard's potential for inflationary impact relate to technical economic concepts. Their arguments have been fully answered by the Commission's staff (memorandum dated February 13, 1978; Review of Comments to the Proposed Lower Lawn Mower Regulations). Basically, the Commission believes that the increased cost of complying mowers, which is estimated to be $4.40 per year over the expected life of the mower, will have no significant effect on the general price level. As explained above in Section E of this preamble ("STATUTORY FINDINGS"), the anticipated costs of the standard are reasonable in relation to the expected benefits. It should be kept in mind that although the standard can be expected to increase the price of mowers, consumers will not be paying the higher price for the same mower as before. The mowers that comply with the standard will incorporate safety features that were not previously provided, and the increased value received should more than offset the increase in price.

G. APPLICATION OF THE STANDARD TO RENTAL MOWERS

Under the Consumer Product Safety Act, it is unlawful for any person to distribute in commerce or offer for sale any product which does not conform with an applicable consumer product safety standard. In view of the defintions of "to distribute in commerce" and "commerce" in section 3(a)(11)

and 3(a)(12) of the act, the Commission considers that each time a consumer product is rented, the product is distributed in commerce. Therefore, a rental firm that rents a consumer product manufactured after the effective date of an applicable consumer product safety standard would commit an unlawful act if the product did not comply with the standard.

The Commission realizes, however, that it may be impractical from an economic standpoint to require that rental mowers be tested for compliance with all the requirements of the standard throughout the entire rental life of the mower. It may be that the economic burden on rental firms to frequently test their rental mowers to ensure that they still comply would be unreasonable in relation to the safety benefits to be obtained. In the first place, only a small portion of the total lawn mower production is used for rental purposes. In addition, there is no evidence available to the Commission that the safety-related characteristics of either rental or consumer-owned mowers are likely to deteriorate over time. (When the mowers are sold to the rental firm, they must comply with the standard.)

Another question applicable to rental mowers is the extent to which the rental firm should be responsible for insuring that the mower complies with Part 1205 at the time the mower is sold by the firm.

Since the standard only applies to walk-behind mowers that are manufactured after the effective date of the standard (December 31, 1981), the rentals and sales of old

rental mowers that may be affected by the standard will not occur for nearly 3 years. Accordingly, the Commission intends to propose at a later time for public comment an amendment to the standard concerning the applicability of the standard to rental transactions and to the sale of used rental mowers. After considering any comments that are received on the proposed policy, the Commission will issue a final rule concerning rentals and sales of rental mowers. This would be issued a sufficient time before the effective date of the standard that rental firms would have adequate time to institute whatever procedures might be appropriate for their degree of responsibility under the standard. In the meantime, the standard being issued at this time will not apply to rental transactions or to the resale of used rental mowers by rental firms.

H. PRODUCT CERTIFICATION AND TESTING

Section 14(a) of the CPSA requires every manufacturer and private labeler of a product which is subject to a consumer product safety standard to issue a certificate which shall certify that the product conforms to all applicable consumer product safety standards, shall specify any standard that is applicable, shall state the name of the manufacturer or private labeler issuing the certificate, and shall include the date and place of manufacture. The certificate is required to accompany the product or be otherwise furnished to any distributor or retailer to whom the product is delivered.

Section 14(a) also requires that the certification that the product conforms to all applicable consumer product safety standards must be based on a test of each product or upon a reasonable testing program. Section 14(b) of the CPSA provides that the Commission may issue rules that require a specified reasonable testing program. In the case of the safety standard for walk-behind rotary power lawn mowers, however, the Commission has considered the need for requiring a specific testing program and has concluded that it is unnecessary. Power lawn mowers are a precision device, and the manufacturers' normal quality control procedures should be sufficient to determine that the products that are being manufactured at any particular time comply with the standard. Even for the potentially variable characteristic of blade stopping time, the manufacturers can be expected to continue to test their production periodically to determine that their products will not be subject to recall by the Commission for violations of the standard.

Section 14(c) of the CPSA authorizes the Commission to issue rules requiring the product to bear a label containing information similar to that required to be on the certificate. In addition, section 16 of the CPSA authorizes the Commission to issue rules requiring manufacturers, private labelers, and distributors of consumer products to establish and maintain records reasonably required to determine compliance with rules or orders prescribed under the CPSA.

Elsewhere in this issue of the FEDERAL REGISTER, the Commission is proposing a rule that will require walk-behind rotary power lawn mowers to bear a label for certification purposes containing the following:

1. The statement "Meets CPSC blade safety requirements for walk-behind rotary power mowers."
2. Model identification (except when model identification appears elsewhere on the mower).
3. The name of the person or firm issuing the certificate.
4. The location where the product was principally assembled.
5. The month and year the product was manufactured.

The proposed rule will also require manufacturers and private labelers of walk-behind rotary power lawn mowers to maintain records sufficient to show that their certification is based on a reasonable testing program or on a test of each product.

An explanation of the need for these requirements is contained in the preamble of the proposed labeling and recordkeeping rule.

I. PETITIONS FOR RECONSIDERATION

As stated above, the Commission believes that the provisions of the standard are reasonably necessary to reduce the unreasonable risk of injury caused by contact

with the blade of walk-behind power lawn mowers. In addition, the Commission believes that there are no feasible alternative requirements that will provide an equivalent degree of safety and at the same time allow designs to be used which do not utilize a blade stop control.

However, the Commission realizes that the issuance of this rule involves the resolution of many issues involving the balancing of complex technical, economic, and societal considerations. Although the Commission has had the benefit of extensive comments and data from interested persons in formulating the final rule, it is likely that some persons will disagree with the decisions the Commission has made or with the specific wording of the requirements of the standard.

Ordinarily, the only rights a dissatisfied party has to have a consumer product safety rule modified or set aside are to petition an appropriate United States Court of Appeals for judicial review of the standard under section 11 of the CPSA not later than 60 days after the rule is promulgated or to petition for the amendment or revocation of the rule under section 10 of the CPSA. If a petition for judicial review is filed, the rule would be affirmed if the Commission's findings under section 9(c) of the CPSA are supported by substantial evidence on the record taken as a whole. If the Commission denies a petition under section 10 of the CPSA, the petitioner may, among other things, within 60 days of the denial commence a civil proceeding in a United States district court. If the petitioner can demonstrate to the

satisfaction of the court, by a preponderance of evidence in a de novo proceeding, that failure to take the action requested exposes consumers to an unreasonable risk of injury, the court may order the initiation of a rulemaking proceeding under section 7 or 8 of the CPSA.

These judicial review procedures are expensive and time consuming, both for the party seeking review and for the Commission. Once the Commission issues a rule, however, a judicial proceeding may be the only realistic alternative available to a party who wishes to challenge the rule because of any major or minor disagreements with the rule. For this reason, the Commission has decided to establish a procedure for entertaining petitions for reconsideration of the rule which will provide a final agency forum for resolving any correctable problems with the standard in order to help avoid the possibility of unnecessary litigation.

The Commission believes that by providing interested persons an opportunity to file petitions for reconsideration, the Commission can (1) consider new or overlooked information developed or obtained after the issuance of the rule, (2) reconsider its previous decision, or (3) correct any other correctable specific problems that may have been created by the rule. The Commission hopes that through this procedure it can resolve some problems and thus possibly avoid unnecessary litigation over the rule.

The procedures set forth below give interested persons a right to file with the Commission a petition for reconsideration of any part or all of Part 1205.

Reconsideration Procedures.

1. In order to provide an opportunity for the submission of petitions for reconsideration, the Commission hereby stays the issuance of Part 1205 for 45 days from the date of publication of this notice in the FEDERAL REGISTER (until ____, 1979).

2. Petitions meeting the criteria set forth below may be filed within the first 15 days of this period (to be received by __, 1979).

3. If no valid petition for reconsideration is received during this 15 day period, the Commission shall publish a notice in the FEDERAL REGISTER, on or before the 45th day, affirming the issuance of Part 1205.

4. However, if a valid petition for reconsideration is received within the 15 days, the issuance of the standard shall be further stayed until the Commission publishes the notice described in paragraph 6 below.

5. The Commission's Office of General Counsel shall determine if a document qualifies as a petition for reconsideration. As part of this determination, the Office of General Counsel shall determine whether the submitted data, views, or arguments are new and whether there was good cause for not submitting this information during the original proceeding. A decision by the Office of General Counsel that a submission is not a petition for reconsideration may be appealed to the Commission by a notice filed with the Office of the Secretary within 10 days of the date notice of this determination is mailed to the petitioner.

6. If a document qualifies as a petition for reconsideration (either initially or after an appeal to the Commission), the Commission shall expeditiously publish a notice in the FEDERAL REGISTER announcing that such a petition has been filed and announcing whether a further stay has been granted. The Commission shall also directly notify the petitioner that the submission is being treated as a petition. If feasible, the petition itself or a summary of it will be published in the FEDERAL REGISTER. If an additional stay is granted, it may be for a fixed period or until the Commission announces its decision on the petition.

7. After deciding any petitions for reconsideration, the Commission will publish a notice in the Federal Register explaining its response to the petition and terminating the stay or taking such other action as is necessary.

Since Part 1205 is not being issued until 45 days after the publication of this notice in the FEDERAL REGISTER, the 60 day period during which petitions for judicial review may be filed will not begin until the 46th day. If a petition for reconsideration is filed, and Part 1205 stayed further, the period for filing a petition for judicial review would not begin until the stay is terminated by subsequent action by the Commission or by expiration of the originally granted stay. This will prevent unnecessary litigation over matters which can possibly be resolved before the Commission.

Any interested person, including any consumer or consumer organization, firm, trade association, or other

organization, may file a petition for reconsideration in accordance with the procedures in this notice.

Such petitions must be filed in the Office of the Secretary, Consumer Product Safety Commission, 1111 18th Street, N.W., Washington, D.C. 20207 no later than _____, 1979 (15 days after the publication of this notice in the FEDERAL REGISTER). A petition for reconsideration shall be considered filed when received and time-date stamped by the Office of the Secretary.

Petitions for reconsideration under this part shall meet the following requirements:

(1) Be written in the English language.

(2) Include the name and address of the petitioner.

(3) Identify clearly the provisions of the rule for which additions, deletions, or changes are requested and state with particularity the reasons therefor and provide alternative provisions whenever possible.

(4) State with particularity the manner in which the petitioning party is aggrieved or his or her interests or the public's interests are adversely affected by the rule.

(5) If applicable, state the reasons why the petitioning party did not participate in the earlier stages of the rulemaking proceeding.

(6) Provide the best available information including data, studies, reports, views, and arguments to support the action requested.

(7) Where a petition for reconsideration is supported by data, arguments, or views that were not before the Commission during the original rulemaking proceeding, the petition shall so indicate and include the reason(s) why this information was not presented to the Commission during the original proceeding. The Commission may elect not to consider new information unless the petitioner shows to the Commission's satisfaction that there was good cause for not submitting this information during the original rulemaking proceeding.

(8) Where a petition for reconsideration is supported by data, views, or arguments that were before the Commission during the original rulemaking proceeding, the petition shall identify the information that was previously before the Commission and explain why the Commission's treatment of that information is considered inadequate or erroneous.

The Commission notes that at this time it intends that any stays in the issuance of the standard that the Commission may grant in connection with petitions for reconsideration will not change the effective date of the standard, which will remain December 31, 1981.

Statements in support of or in opposition to a petition for reconsideration may be filed with the Secretary of the Commission no later than 20 days after the Commission publishes in the FEDERAL REGISTER notice that a petition for reconsideration has been filed. Persons submitting such statements shall provide a copy to the petitioner(s).

The Commission may consolidate the proceedings if more than one petition for reconsideration is filed.

In deciding what action to take on a petition for reconsideration, the Commission will consider the petition itself and any timely written comments it receives on the petition. The Commission may also consider any other relevant material and may solicit additional oral and/or written comment from the public on the request.

The Commission may, either with or without further proceedings, grant any petition for reconsideration in whole or in part or may deny the petition.

A petition for reconsideration will be granted if the Commission decides that such action is (1) appropriate based on the data, views, and arguments available to it, (2) consistent with its statutory responsibilities, and (3) in the public interest.

The Commission will announce in the FEDERAL REGISTER its decision on whether to grant or deny a petition for reconsideration and shall directly notify the petitioner of its action. The FEDERAL REGISTER notice will include a statement of the Commission's reasons for the action taken. However, if the petition concerns a subject that was considered by the Commision in initially issuing the final rule, a denial of the petition may incorporate by reference the reasons stated in the original FEDERAL REGISTER notice that published the rule.

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J. ENVIRONMENTAL IMPACT

At the time of the proposal, the Commission determined that there were no significant potentially adverse environmental effects associated with the proposed standard. No comments were received disputing this conclusion, and the Commission reaffirms its preliminary determination with respect to the final standard. Accordingly, it is not necessary to prepare either a draft or a final environmental impact statement.

K. CONCLUSION

Therefore, having considered the comments on the proposal and the other data available to it, and having made the findings required by sections 9 and 27 of the Consumer Product Safety Act, the Commission concludes that the requirements of Part 1205 set forth below are reasonably necessary to reduce an unreasonable risk of injury from contact with the blades of walk-behind power lawn mowers and that, as far as is feasible, the requirements are expressed in terms of performance requirements. Accordingly, the Commission has decided to issue Part 1205 as a consumer product safety standard, combined with a section 27(e) rule for labeling.

Therefore, the Consumer Product Safety Commission amends Title 16, Chapter II, Subchapter B, of the Code of Federal Regulations by issuing, effective _____, 1979 (insert date that is 30 days after publication of this notice in the FEDERAL REGISTER), a new Part 1205 reading as follows:

BRIEFING PAPER
FINAL STANDARD FOR
WALK-BEHIND POWER LAWN MOWERS

Prepared by the Power Equipment Program Team

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Office of Program Management
January 9, 1979

I. Background - Petition to Proposal (8/73 - 5/77)

On August 15, 1973, the Outdoor Power Equipment Institute (OPEI) petitioned the Commission to commence proceedings for the development of a consumer product safety standard for power lawn mowers. In its petition, OPEI requested the Commission to publish a voluntary standard (ANSI B71.1-1972) as a proposed mandatory standard. On November 16, 1973, after consideration of the petition and staff analysis, the Commission preliminarily determined that power lawn mowers presented an unreasonable risk of injury and granted the petition to initiate the development of a consumer product safety standard. The Commission denied, however, that portion of the petition requesting publication of the voluntary standard and directed the staff to draft a Notice of Proceeding inviting interested parties to submit offers to develop the standard. On October 24, 1974, the Commission selected Consumers Union (CU) to develop a consumer product safety standard for power lawn mowers.

Almost nine months after selection as Offeror, CU submitted its proposed standard, technical rationale and economic analysis to the Commission on July 17, 1975. After consideration of the recommended standard, the Commission extended until April 30, 1977,* the time by which it must either publish a proposed standard or withdraw the Notice of Proceeding. On May 5, 1977, the Commission published a "Proposed Standard for Power Lawn Mowers" (42 FR 23052).

The May 5, 1977, proposal covered a wide range of issues addressed in 14 separate sections. Included in the proposed standard were requirements for blade contact, thrown objects, fuel ignition and electrical hazards, as well as riding mower stability, braking and steering systems. The proposal covered the entire sphere of potential and prospective power mower hazards.

II. Focus of the Final Standard.

Subsequent to publication of the proposal, over 110 substantive comments were received from industry, consumer groups, manufacturers and individual consumers. On June 13, 1977, a public hearing was held in Washington, D.C. to provide an opportunity for oral comments. By the end of October 1977, all formal comments were received. The staff categorized the comments by the applicable section of the proposed standard, and a preliminary analysis was initiated.

Soon after the analysis was begun, a clear pattern emerged. The riding mower requirements, which addressed 10% of all mower injuries, were the subject of extensive comment which clearly showed riders posed problems so different from walk-behind mowers that they should be addressed in a separate standard. Fuel ignition, hot surface, and electrical hazards associated with both walk-behind and riding mowers were subject of few technical comments. It was pointed out that there were relatively few documented injuries associated with these three hazard patterns.

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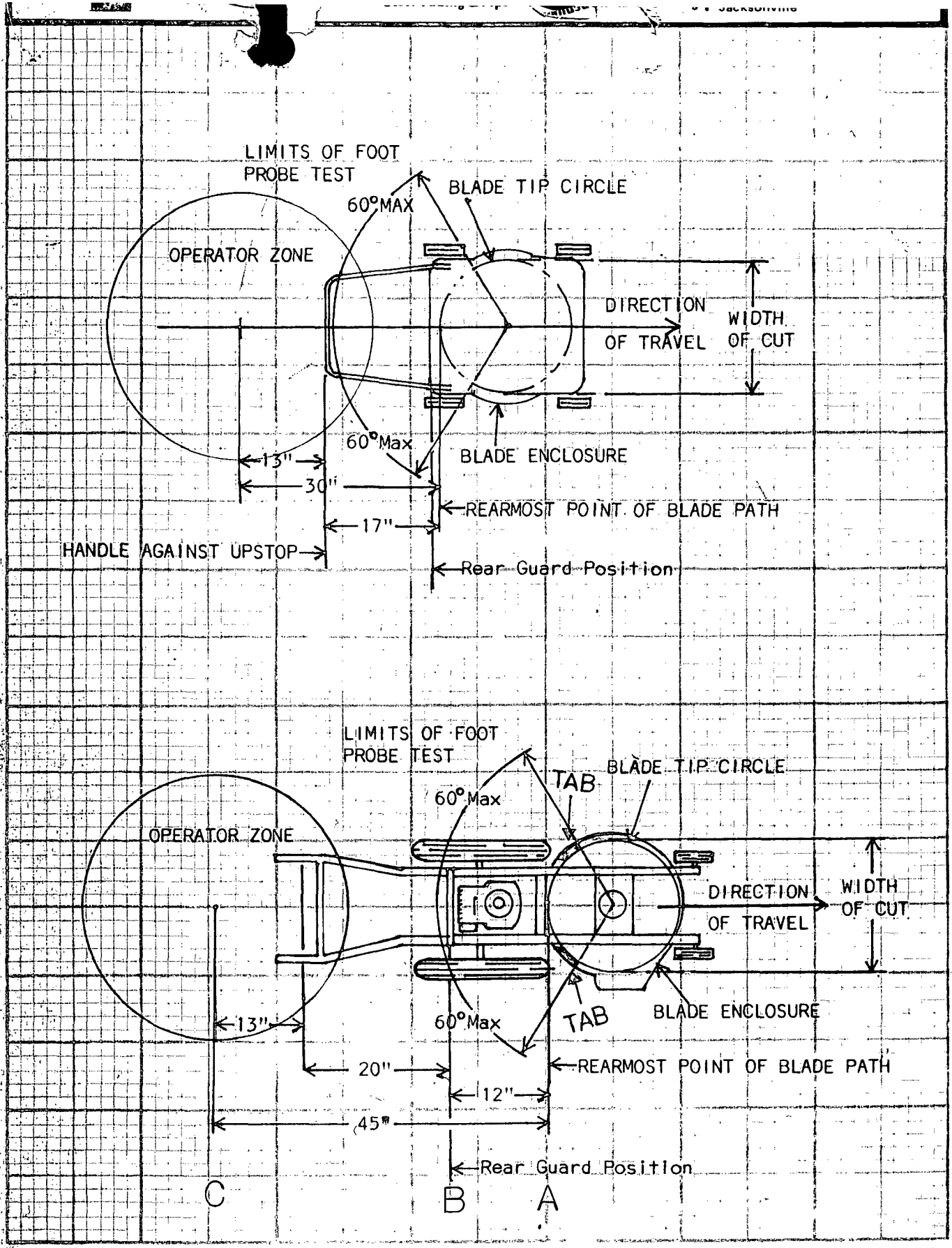
* 40 FR 30863 July 23, 1975
40 FR 45220 October 1, 1975
41 FR 27997 July 8, 1976


LIMITS OF FOOT PROBE TEST
60°MAX
BLADE TIP CIRCLE
OPERATOR ZONE
DIRECTION OF TRAVEL
WIDTH OF CUT
60°Max
BLADE ENCLOSURE
13"
30"
REARMOST POINT OF BLADE PATH
17"
HANDLE AGAINST UPSTOP
Rear Guard Position
LIMITS OF FOOT PROBE TEST
60°Max
TAB
BLADE TIP CIRCLE
OPERATOR ZONE
DIRECTION OF TRAVEL
WIDTH OF CUT
TAB
BLADE ENCLOSURE
60°Max
13"
20"
REARMOST POINT OF BLADE PATH
12"
45"
Rear Guard Position
C
B
A

The thrown object requirements which applied to both riders and walk-behind mowers and addressed approximately 18% of all injuries were the subject of extensive comment. Two key issues were the correlation of the test method to actual mowing conditions and the relationship between the acceptance criteria and the reduction of thrown object injuries. A third major issue was the industry's challenge that the test method did not forecast the effect of design changes and that the test did not evaluate different size mowers equitably. It became apparent that an adequate response would require a greater expenditure of resources and time and would delay issuing blade contact requirements, which address a greater number of injuries.

Staff analysis then focused on the blade contact hazards associated with walk-behind power mowers, which comprise approximately 64% of all walk-behind power mower injuries. A review of the comments raised certain issues which appeared to be solvable without further expenditure of contract resources within a reasonable period of time. This review also indicated that the scope of the standard should be limited to consumer mowers, those under 200 pounds, under 8 horsepower or with less than a 30 inch blade length. By addressing blade contact injuries, the Commission could relatively quickly afford consumers adequate protection against the substantial majority of injuries.

At the Fiscal 1978 mid-year review, the staff reported their findings to the Commission and sought policy guidance as to whether the blade contact requirements for walk-behind mowers should be separated from the other sections of the standard. At the Commission meeting of March 30, 1978, the Commission directed the staff to concentrate their efforts on blade contact injuries and to consider the effect of separation of other requirements in the proposed standard.

Subsequently, the staff began to examine the blade contact hazards for walk-behind mowers in light of recent Commission policy guidance to focus our attention on those requirements which would address the primary hazards in order to effectuate the greatest injury reduction. The briefing package transmitted to the Commission on April 27, 1978 presented the first attempt to adjust the requirements to meet those policy goals. The key aspect of this exercise was to match the predominant hazard patterns with the major requirements of the standard, and to provide the Commission with a final rule which offered adequate protection for consumers at a reasonable cost, without adversely affecting utility, with as little disruption as practicable in the marketplace consistent with the public interest.

III. Analysis of the Data.

To arrive at a final rule addressing blade contact injuries which would serve the needs of consumers and be acceptable to the public at large, the Commisssion staff initiated a tripartite analysis which sought to balance the three major objectives of the safety standard: adequate protection for consumers; no significant impairment of product utility; and a potential increase in cost that is commensurate with safety and utility.

The result of this analysis is a recommended consumer product safety standard which, for walk-behind power rotary mowers, combines a test to probe the rear 120° of the periphery of the mower housing and the discharge chute opening to insure that the operator's foot cannot contact the rotating blade; and a system which will stop the rotation of the blade within 3 seconds of the operator leaving the operator zone without stopping the power source. In the alternative, the power source may stop so long as the physical effort of the operator is not required to restart the mower. Additional supporting requirements include movable shield, obstruction and shield strength provisions. A labeling requirement applies to both rotary and reel mowers. Mowers which use flexible, non-rigid blades are excluded from the coverage of the standard. The standard would become effective three (3) years after final publication, with a one year effective date for the labeling requirement only. The requirements are discussed in detail in Section IV.

a) Adequate Protection for Consumers.

The Commission estimates that over 60,000 injuries associated with all types of power lawn mowers are treated in hospital emergency rooms annually. Approximately 47,000 involve walk-behind mowers and 30,000 of these (approximately 64% of walk-behind injuries) involve contact with the rotating blade. Approximately 3% of the blade contact injuries associated with walk-behind mowers involved amputation of a body part, usually fingers or toes, 15% involved fracture, crushing or dislocation of a body part, and 70% involved laceration or avulsion of body parts. A relatively high proportion of persons injured by lawn mowers are hospitalized.

The Directorate for Hazard Identification and Analysis estimates that the requirements summarized above will eliminate or reduce the severity of approximately 77% of all walk-behind blade contact injuries. (See Tab D).

b) Effect on Utility.

The staff analysis indicates that the recommended requirements may have a positive net effect on mower utility. The blade control system will give the operator a greater sense of security and the ability to travel safely over non-grass surfaces. In addition, if brake-clutch devices are used to meet the performance standard, one result could be fewer restarts and, thus, less user frustration if clutch slippage in heavy grass prevents the engine from stalling. Since shielding will be required only for the rear 120° of the mower no adverse impact on utility is expected from the foot probe requirements.

c) Effect on Cost

The staff estimates that the retail price impact of the standard will be about $35 for the average walk-behind mower. Based on an average useful mower life of about 8 years, the additional annual cost to the

purchaser is expected to average about $4.40. The probable effect on the various types of mowers within the scope of the standard will differ. Percentage increases in price will vary widely from about a 7 percent increase for power-restart self-propelled mowers to about a 30 percent increase for gasoline-powered push mowers.(See Tab F for further analysis)

The staff represents to the Commission that the requirements summarized above are the single most effective method to reduce blade contact injuries associated with walk-behind power lawn mowers. The staff further represents that the technological requirements are within the capabilities of the power mower industry, and do not present unrealistic demands in light of the recommended three (3) year effective date.

IV. Requirements of the Final Standard

1205.4 Foot Probe

Estimates for calendar year 1977 show that foot contact with a walk-behind mower blade resulted in 10,600 foot injuries which required hospital emergency room treatment. Of these foot injuries, an estimated 8,600 occurred at the mower rear and 2,000 occurred elsewhere around the mower, primarily at the discharge chute.

The May 5, 1977, proposed power mower standard addressed these foot injuries by requiring that the entire periphery of the mower blade housing be probed with a specified foot probe. The procedure is to insert the probe under the mower housing and, while withdrawing the probe, to pivot the toe upward about the heel as far as possible without lifting the mower. For a mower to pass this test, the probe cannot contact the blade or cause any mower part to contact the blade.

Foot probing requirements originally were considered as separate from blade control requirements, with the former addressing foot injuries and the latter addressing hand injuries. However, during the comment period for the standard, commentors suggested the 360° probing would not be necessary since the mower blade will stop within 3 seconds when the operator leaves the rear of the mower. In response to this comment the staff reviewed all investigations of injuries involving operator foot injury resulting from blade contact. That review indicates that probing the rear 120° of the mower and discharge chute, in combination with the blade stopping requirements, will address virtually all foot injuries. The probing requirements of section 1205.4 (a)(2) in the recommended standard have been altered to reflect this reduction in the area to be probed.

Reducing the area to be probed has the added advantage of minimizing any loss of utility which some commentors felt could occur if probing requirements were met by lowering the mower housing or attaching shielding outside the blade housing. Such designs might dig into the turf when mowing uneven ground. However, many existing mowers with trailing shields

and discharge chute extensions are expected to meet the recommended probing requirements. Modifications for most non-complying mowers should be relatively minor.

The recommended standard includes three shielding requirements which are supportive of the probing requirements. First, the shield strength test ensures the retention of any shielding used to meet the probing requirements. Second, the obstruction test ensures that added shielding will not create a hazardous situation by stopping the mower or causing shields to strike the blade. Third, the movable shielding requirements ensure that shields which are movable for the purpose of attaching auxiliary equipment will return automatically to a complying position when the equipment is removed, unless the blade is stopped when the shielding is in a non-complying position. In combination, the foot probe test and the supporting requirements should reduce or eliminate 17% of walk-behind blade contact injuries. (Tab D)

1205.5 Blade Stopping Times

In CY 1977, an estimated 19,700 blade contact hand injuries required hospital emergency treatments; 5400 of these involved clearing the discharge chute, 1700 others were discharge chute-related, and 4000 involved height adjustments. The remaining 8600 injuries occurred after the operator left the operator zone.

After careful examination of the above data, plus two studies done by the National Bureau of Standards and Consumers Union examining time to blade access,* the resultant analysis clearly shows that stopping the rotation of the blade after leaving the operator zone will be the single most effective known method to reduce hand contact injuries. The staff estimates that this requirement alone will eliminate or reduce approximately 60% of all walk-behind blade contact injuries. (Tab D)

In addition to the blade stopping within 3 seconds, this provision requires that for a mower with an engine and only manual starting controls, the blade shall stop without stopping the engine. "Manual starting" is defined as a means for starting the engine with power obtained from the physical efforts of the operator.

Over the past few years, a number of approaches to proposed CPSC blade stopping requirements have been discussed. The two presently available methods discussed below have been most frequently mentioned, but it should be noted that any method which accomplishes the objective will be fully acceptable.

1) Blade/Brake Clutch

This method combines any device which would disengage the blade from the drive shaft while the motor continues to run with a system which

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* Time to Blade Contact Data - NBSIR 77-1299 - April 1977.
Time to Blade Access Test Report - Document 76, C.U. Blade Contact Subcommittee, 1975.

would apply a braking force to the blade. A number of brake/clutch units are available to manufacturers, and at least two manufacturers on the market today have mowers which incorporate such a device. This type of mechanism would account for most of the price increase attributed to the overall requirement.

2) Power Restart

In lieu of continuous operation of the engine, manufacturers may provide a system to restart the engine which does not obtain the power to restart from the physical efforts of the operator. An electric mower should have no problem meeting this alternative. For gasoline powered mowers, a battery operated powered start mechanism can be used. This alternative may call for some innovation and advancement of the state of the art, yet it provides designers with flexibility in determining which approach would be better suited for a particular mower.

(1205.5) Engine Kill Option

As an alternative to the two approaches discussed above, the Commission may wish to consider allowing the engine to stop in order to arrest the rotation of the blade even if the mower can only be started manually. This method should be accompanied by a label which informs the consumer that the mower must be constantly restarted whenever the operator leaves the operator position. (Alternative language is provided at Tab C).

Nearly all of the consumer commentors on the proposed standard, however, as well as several other commentors, urged the Commission not to allow engine kill with manual restart. Some argued that engine kill would reduce mower utility and frustrate most operators. They state that having to restart a mower each time the blade control system was released would lead consumers to defeat the system, thereby leaving consumers with little protection.

The likelihood that mower operators will defeat a blade control system that requires manual restart is supported by the American experience with automobile seatbelt interlocks and warning buzzers. A Department of Transportation (DOT) survey of automobile drivers shows that as many as 48% of those persons surveyed circumvented the seat belt interlock system with 36% actually cutting the wires.* Because of consumer complaints about seat belt warning systems, Congress took the nearly unprecedented action of prohibiting DOT from requiring automobile seatbelt interlock systems or buzzer systems that necessitated buckling of a seat belt to stop the buzzer. The comments strongly indicate that consumers consider a blade control system using engine kill in conjunction with manual restart to be an unacceptable system that adversely affects utility because of the necessity of repeatedly restarting the mower. Thus, it is logical to conclude, and a number of commentors state, that system would

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* Safety Belt Interlock system usage Survey, DOT-HS801-594, (1974), DOT-HS-801 957 (1975).

be defeated just as the automobile seat belt interlock and buzzer system was defeated.

To defeat a blade control system that uses engine kill with manual restart, all a consumer would have to do is loop a piece of wire around the mower handle and blade control lever - and then release the wire when the consumer desired to stop the blade. While a brake/clutch system could also be defeated, there would be little, if any, reason to do so, since simply re-engaging the control will return the mower to the grass-cutting mode. In view of the likelihood of operator defeat of a blade control system that uses engine kill in conjuction with manual restart, the staff has not recommended such a system in the final standard.

1205.6 Warning Labels

The staff offers the Commission two similar yet alternative labels for consideration. Label #1 is the original label proposed in May of 1977. Label #2 (Tab C) is a somewhat different design proposed by a commentor to more graphically reflect the hazard of blade contact. While the original design called for the label to be pointed upwards, the staff recommends that in either case, the label be inverted to point toward the hazardous area.

V. Certification Regulation

Section 14 of the Consumer Product Safety Act requires manufacturers to certify that their products are in compliance with applicable Consumer Product Safety Regulations and to base that certification on a test of each product or on a reasonable testing program. The proposed certification regulation requires manufacturers and private labelers (1) to affix a certification label to the mower giving information which includes model, certifier's name, month, year and place of manufacture, and the statement "Meets CPSC blade safety requirements for walk-behind power rotary mowers"; and (2) to maintain sufficient records to show that their certification is based on a reasonable testing program or a test of each product.

Under Section 14 the Commission may specify a reasonable testing program and recordkeeping requirements. However, the staff believes that this is unnecessary for power mowers. Power lawn mowers are precision devices, and the manufacturers' routine quality control procedures can be assumed to be sufficient to determine whether production mowers comply with the standard once the mower models have been certified. Even for the potentially variable characteristic of blade stopping time, the manufacturers can be expected to test their production periodically since they must certify that each product is in compliance with the requirements of the standard.

Substantial recordkeeping is already done by the industry in connection with the voluntary standard and quality control procedures.

PART 1205 - SAFETY STANDARD FOR WALK-BEHIND POWER LAWN MOWERS

Subpart A - The Standard

Sec.

AUTHORITY: Secs. 2, 3, 7, 9, 14, 19, 27, Pub. L 92-573, 86 Stat. 1207, 1208, 1212-1217, 1220, 1224, 1228; 15 U.S.C. 2051, 2052, 2056, 2058, 2063, 2068, 2076.

§ 1205.1 Scope of the standard.

(a) General. This Subpart A of Part 1205 is a consumer product safety standard which prescribes safety requirements for certain walk-behind power lawn mowers, including labeling and performance requirements. The performance requirements of the standard apply to rotary mowers. The labeling requirements apply to both rotary and reel-type mowers. The standard is intended to reduce the risk of injury to consumers caused by contact, primarily of the foot and hand, with the rotating blade of the mower. A detailed discussion of the risk of injury and of the anticipated costs, benefits, and other factors associated with the standard is contained in § 1205.8 Findings.

(b) Scope. (1) Except as provided in paragraph (c) of this section, all walk-behind rotary and reel-type power lawn mowers manufactured or imported on or after the effective date of the standard are subject to the requirements of this standard if they are "consumer products". "Walk behind power lawn mower" is defined as a grass cutting machine with a minimum cutting width of 12 in (305 mm) that employs an engine or motor as a power source. Section 3 (a)(1) of the CPSA defines the term "consumer product" as an "article, or component part thereof, produced or distributed (i) for sale to a consumer for use in or around a permanent

or temporary household or residence, a school, in recreation, or otherwise, or (ii) for the personal use, consumption or enjoyment of a consumer in or around a permanent or temporary household or residence, a school, in recreation, or otherwise." The term does not include products that are not customarily produced or distributed for sale to, or for the use or consumption by, or enjoyment of, a consumer.

(2) It is unlawful to manufacture for sale, offer for sale, distribute in commerce, or import into the United States any product subject to this standard that is not in conformity with the standard. The Commission is not applying the standard to rental transactions or to the ultimate sale of used rental mowers by rental firms.

(c) Exclusions. (1) General. Mowers that have all three of the following characteristics are not covered by the standard:

(i) A cutting width of 30 in (762 mm) or greater,

(ii) A weight of 200 lb (90.7 kg) or more, and

(iii) For engine-powered mowers, an engine of 8 horsepower (6 kw) or more.

(2) Reel-type mowers. Reel-type power lawn mowers need not meet the performance requirements of the standard but they must be labeled as required by § 1205.6.

§ 1205.2 Effective date.

This standard applies to all rotary walk behind power lawn mowers manufactured after December 31, 1981, except § 1205.6 Warning labels, applies to rotary and reel-type walk-behind power lawn mowers manufactured after December 31, 1979.

§ 1205.3 Definitions.

(a) As used in this Part 1205:

(1) "Blade" means any rigid or semi-rigid device or means that is intended to cut grass during mowing operations and includes all blades of a multi-bladed mower.

(2) "Blade tip circle" means the path described by the outermost point of the blade as it moves about its axis.

(3) "Crack" means a visible external fissure in a solid body caused by tensile, compressive, or shear forces.

(4) "Cutting width" means the blade tip circle diameter or, for a multi-bladed mower, the width, measured perpendicular to the forward direction, of a composite of all blade tip circles.

(5) "Deform" means any visible alteration of shape or dimension of a body caused by stresses induced by external forces.

(6) "Engine" means a power producing device which converts thermal energy from a fuel into mechanical energy.

(7) "Manual starting" means starting the mower engine with power obtained from the physical efforts of the operator.

(8) "Maximum operating speed" means the maximum revolutions per minute (rpm) obtainable by the engine or motor under the conditions of the particular test where the term is used. For an electrically powered mower, it is the speed attained when the mower is energized from a 60 Hz alternating current source that delivers a voltage no greater than 120 V and no less that 115 V at the power input to the mower, with the mower running. For a battery-powered mower, it is the speed attained after the

battery has been fully charged in accordance with the mower manufacturer's instructions.

(9) "Motor" means a power producing device that converts electrical energy into mechanical energy.

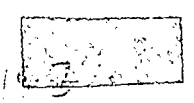
(10) "Normal starting means" is the primary mechanism intended to be actuated by the operator to start a mower's engine or motor (e.g., the cord mechanism of a manual start engine, the switch of an electric motor, or a power start mechanism).

(11) "Operating control zone" means the space enclosed by a cylinder with a radius of 15 in. (381 mm.) having a horizontal axis that is (1) perpendicular to the fore-aft centerline of the mower and (2) tangent to the rearmost part of the mower handle, extending 4 in (102 mm) beyond the outermost portion of each side of the handle (See Fig. 1).

(insert Fig. 1)

(12) "Power source" means an engine or motor.

(13) Reel-type mower means a lawn mower which cuts grass by rotating one or more helically formed



blades about a horizontal axis to provide a shearing action with a stationary cutter bar or bed knife.

(14) "Rotary mower" means a power lawn mower in which one or more cutting blades rotate in essentially a horizontal plane about at least one vertical axis.

(15) "Separate" means to cause to have any apparent relative displacement induced by external forces.

(16) "Shield" means a part or an assembly which restricts access to a hazardous area. For the purposes of this Part 1205, the blade housing is considered a shield.

(17) "Stress" means a force acting across a unit area in a solid material in resisting separation, compacting, or sliding that tends to be induced by external forces.

(18) "Walk-behind power lawn mower" means a grass cutting machine either pushed or self-propelled, with a minimum cutting width of 12 in (305 mm) that employs an engine or a motor as a power source and is normally controlled by an operator walking behind the mower.

(b) Where applicable, the definitions in section 3 of the Consumer Product Safety Act (15 U.S.C. 2052) apply to this Part 1205.

§ 1205.4 Walk-behind rotary power mower protective shields.

(a) General requirements. Walk-behind rotary power rotary power mowers shall meet the following requirements:

(1) When the foot probe of Fig. 2 is inserted under any point within the areas to be probed during the foot probe test of paragraph (b)(1) of this section, the shields shall prevent the foot probe from entering the path of the blade or causing any part of the mower to enter the path of the blade.

(insert Figure 2)

(2) Any shield located totally or partly within the areas to be probed, as defined in paragraph (b)(1)(ii) of this section, shall not permanently separate, crack, or deform when the

shield is subjected to a 50 lb (222 N) static tensile force, uniformly distributed over not less than half the length of the shield. The force shall be applied for at least 10 seconds in the direction which produces the maximum stress on the shield. While being tested, a shield shall be attached to the mower in the manner in which it is intended to be used. (This requirement does not apply to the housing.)

(3) During the obstruction test of paragraph (b)(2) of this section, shields shall not (i) stop the mower as a result of contact with the raised obstacle, (ii) enter the path of the blade, or (iii) cause more than one wheel at a time to be lifted from the fixture surface.

(b) Shield tests - general.

(1) Foot probe test.

(i) The following test conditions shall be observed:

(A) The test shall be performed on a smooth level surface.

(B) Pneumatic tires, when present, shall be inflated to the cold pressures recommended by the mower manufacturer.

(C) The mower housing shall be adjusted to its highest setting relative to the ground.

(D) The blade shall be adjusted to its lowest position relative to the blade housing.

(E) The mower shall be secured so that the mower may not move horizontally but is free to move vertically.

(ii) Areas to be probed.

(A) The minimum area to be probed shall include any discharge opening and an area both 60 degrees to the right and 60

degrees to the left of the rear of the fore-aft centerline of the cutting width. For single-blade mowers, these angles shall be measured from a point on this fore-aft centerline which is at the center of the blade tip circle (see Fig. 3). For multi-blade mowers, these angles shall be measured from a point on the fore-aft centerline of the cutting width which is one half of the cutting width forward of the rearmost point of the composite of all the blade tip circles (See Fig. 4).

(insert Fig. 3)

(insert Fig. 4)

(B) For a mower with a swingover handle, the areas to be probed shall be determined as in paragraph (b)(1)(ii)(A) of

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this section from both possible rear positions and shall include any discharge opening. (See Fig. 5).

(iii) Procedure. Within the areas specified in paragraph (b)(1)(ii), the foot probe of Fig. 2 shall be inserted under the bottom edge of the blade housing and shields. During each insertion tact with the supporting surface. Insertion shall stop when the mower housing lifts, or the horizontal force used to insert the probe reaches 4 lb (17.8 N), whichever occurs first. As the foot probe is withdrawn after each insertion, the "toe" shall be pivoted upward around the "heel" as much as possible without lifting the mower.

(2) Obstruction test.

(i) The following test conditions shall be observed:

(A) Pneumatic tires, when present, shall be inflated to the cold pressure recommended by the mower manufacturer.

(B) The mower housing shall be at its highest setting relative to the ground.

(ii) The test shall be performed on the fixture of Fig. 6, which consists of a level surface having (1) a 0.99 in (25mm) deep depression with a 5.90 in (150 mm) radius of curvature and (2) a raised obstacle 0.60 in (15 mm) square, each extending the full width of the fixture. The depression shall be lined with a material having a surface equivalent to a 16- to 36-grit abrasive. The depression and the obstacle shall be located a sufficient distance apart so that the mower contacts only one at a time.

(insert Fig. 6)

(iii) The test fixture may be relieved, only to the extent necessary, to prevent interference with any blade retaining device.

(iv) The mower shall be pushed forward and pulled rearward perpendicular to and across the depression and the raised obstacle on the fixture. The mower shall be pulled and pushed, without lifting, with a horizontal force sufficient to transit the obstruction fixture at a speed not to exceed 2.2 ft/sec (0.7 m/sec).

(c) Moveable shields.

(1) General

Moveable shields must meet the general shield requirements of paragraph (a) of this section. In addition, moveable shields which are in any of the areas to

be probed defined in paragraph (b)(1)(ii) of this section and which are intended to be moveable for the purpose of attaching auxiliary equipment, when deflected to their extreme open position in the manner intended by the manufacturer and released, shall either:

(A) return automatically to a position that meets the requirements of Subpart A of this Part 1205 when the attached equipment is not present, or

(B) prevent operation of the blade(s) unless the attached equipment is present or the movable shield is returned to a position that meets the requirements of Subpart A of this Part 1205.

(2) Tests.

(i) Automatic return of a moveable shield shall be determined by manually deflecting the shield to its

extreme open position, then releasing the shield and visually observing that it immediately returns to the closed position.

(ii) Prevention of operation of the blade(s) shall be determined, first by manually deflecting the shield to its extreme open position, then, following the appropriate manufacturer's instructions, completing the procedures necessary to operate the blade. Observe, using any safe method, that the blade(s) has been prevented from operating.

§ 1205.5 Walk-behind rotary power mower controls.

(a) Blade control systems.

(1) Requirements for blade control. A walk-behind rotary power mower shall have a blade control system that will perform the following functions:

(i) Prevent the blade from operating unless the operator actuates the control.

(ii) Require continuous contact with the control in order for the blade to continue to be driven.

(iii) Cause the blade motion in the normal direction of travel to come to a complete stop within 3.0 seconds after release of the control.

(iv) For a mower with an engine and with only manual starting controls, this blade control shall stop the blade without stopping the engine.

(2) All walk-behind rotary power mowers shall have, in addition to any blade control required by paragraph (a)(1) of this section, another means which must be manually actuated before a stopped blade can be restarted. This additional means may be either a control which is separate from the control required by paragraph (a)(1) of this section, or may be incorporated into the control required by paragraph (a)(1) of this section as a

double-action device requiring two distinct actions to restart the blade.

(b) Blade stopping test.

(1) General. Any test method that will determine the time between the release of the blade control and the complete stop of the blade motion in the normal direction of travel may be used.

(2) Conditions.

(i) The mower shall be operated at maximum operating speed for at least 6 minutes immediately prior to the test.

(ii) The blade must be at maximum operating speed when the blade control is released.

(c) Starting controls location. Walk-behind mowers with blades that begin operation when the power source starts shall have their normal starting means located within the operating control zone.

§ 1205.6 Warning label for reel-type and rotary power mowers.

(a) General. Walk-behind power lawn mowers shall be labeled on the blade housing or, in the absence of a blade housing, on other blade shielding or on an adjacent supporting structure or assembly, with the warning label shown in Fig. 7. The label shall be at least 3.25 in (82.5 mm) high and 4 in (102 mm) wide, and the lettering and symbol shall retain the same size relation to each other and to the label as shown in Fig. 7.

(insert Fig. 7)

(b) Rotary Mowers. Walk-behind rotary mowers shall have one label as shown in Fig. 7, on the blade housing. The label

shall be located as close as possible to any discharge opening, or, if there is no discharge opening, in a position that is conspicuous to an operator in the normal operating position.

(c) Reel-type Mowers. Walk-behind power reel-type mowers shall have one label as shown in Fig. 7, located as close to the center of the cutting width of the blade as possible. However, in the absence of a suitable mounting surface near the center of the cutting width, the label shall be placed on the nearest suitable mounting surface to the center of the cutting width.

§ 1205.7 Prohibited stockpiling.

(a) Stockpiling. "Stockpiling" means manufacturing or importing a product which is the subject of a consumer product safety rule between the date of issuance of the rule and its effective date at a rate that is significantly greater than the rate at which such product was produced or imported during a base period prescribed by the Consumer Product Safety Commission.

(b) Prohibited acts. Stockpiling of power lawn mowers that do not comply with this Subpart A of Part 1205 at a rate that exceeds by 20% the rate at which the product was produced or imported during the base period described in paragraph (c) of this section is prohibited.

(c) Base period. The base period for power lawn mowers is, at the option of each manufacturer or importer, any period of 365 consecutive days beginning on or after September 1, 1971, and ending on or before August 31, 1978.

§ 1205.8 Findings.

(a) General. In order to issue a rule such as Part 1205, the CPSA requires the Commission to consider and make appropriate findings with respect to a number of topics. These findings are discussed below.

(b) The degree and nature of the risk of injury Part 1205 is designed to eliminate or reduce. (1) The Commission estimates that there are approximately 77,000 injuries to consumers each year caused by contact with the blades of power lawn mowers. From 1977 data, the Commission estimates that each year there are approximately 7,300 finger amputations, 2600 toe amputations, 2,400 avulsions, 11,450 fractures, 51,400 lacerations, and 2,300 contusions. Among the lacerations and avulsions, 35,800 were to hands and fingers and 18,000 were to toes and feet. The estimated costs caused by these injuries are $253 million, not counting any monetary damages for pain and suffering. These injuries are caused when consumers accidentally contact the blade, either inadvertently while in the vicinity of the mower, or while intentionally performing some task which they erroneously believe will not bring their hand or foot into the path of the blade.

(2) Part 1205 is expected to eliminate or reduce the severity of about 60,000 blade contact injuries per year, or 77% of all such injuries. The Commission estimates that if all mowers had been in compliance with the standard in 1977, about 6800 finger amputations, 1500 toe amputations, 11,000

fractures, 1,800 avulsions, 38,400 lacerations, and several hundred contusions would not have occurred. Of the lacerations and avulsions, 28,300 were finger injuries and 9,400 were toe injuries.

(c) Consumer products subject to the rule. The products subject to this standard are walk-behind power mowers. Power mowers with rigid or semi-rigid rotary blades are subject to all the provisions of the standard while reel-type and rotary mowers are subject to the labeling requirements. Mowers that in combination have engines of 8 hp or greater, weigh 200 lb or more, and have a cutting width of 30 in or more are excluded from the standard. The Commission estimates that at least 98% of the total annual market (by unit volume) for walk-behind mowers will be affected by the standard, and the Commission estimates that in 1978 this market was 5.4 million units.

(d) Need of the public for the products subject to the rule. The Commission finds that the public need for walk-behind power mowers, which provide a relatively quick and effective way to cut grass, is substantial. Riding mowers, lawn and garden tractors, hand reel mowers, trimmers and edgers, and sickle-bar mowers also provide grass-cutting services, but walk-behind power rotary mowers are by far the most commonly used devices for maintaining household lawns. There are no devices that can completely substitute for walk-behind power mowers as a group, since they have applications for which other products are not as suitable.

Each type of walk-behind power mower has individual properties which meet public needs, although one type of walk-behind is often an acceptable substitute for another. The newly developed monofilament line mower is not included within the scope of the standard and could be a substitute for mowers using rigid or semi-rigid blades under some conditions.

(e) Probable effect of the rule upon the utility of the product. (1) The Commission finds that the probable overall effect of the standard should be to increase the utility of mowers. Complying mowers may require slightly more time and a few additional actions to operate. Since complying mowers may have more electrical and mechanical parts than current mowers, they may require more maintenance than current mowers. No significant increase in mowing time is expected if a brake-clutch device is used to comply with the standard since each engagement of the blade would require only a few seconds. The amount of additional time and expense required for maintenance, if any, will be dependent on the design solution used. Such disutilities are expected to be slight and to be more than balanced by the increased sense of security consumers are likely to experience from having a safer mower. A study of brake-clutch mowers conducted by the Federal Supply Service shows that almost all users appreciated the safety features on brake-clutch mowers.

(2) During the development of the rule, questions were raised about whether changes in the shields necessitated by

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the foot probe requirements would adversely affect utility by being hard to push in grass or by being unable to mow close to walls. At the time of issuance of this rule, mowers are available that will pass a 360° foot probe and others that will pass rear and side foot probing without any significant loss of utility caused by shielding. Therefore, the Commission concludes that this requirement will not adversely affect the utility of mowers. Mowers with swing-over handles, however, may be more difficult to design in this regard, since 120° at each end of the mower, plus the discharge chute, are subject to the foot probe requirement. However, since mowers meeting this requirement have already been built without apparent loss of utility, the Commission concludes that shielding can be designed so that there should be no loss of utility even for mowers with swingover handles.

(3) As required by section 9(b) of the CPSA, the Commission, in considering the issues involved in issuing a power lawn mower safety standard, has considered and taken into account the special needs of elderly and handicapped persons to determine the extent to which such persons may be adversely affected by the rule. The Commission has determined that there there will be no significant adverse effect on such persons as a result of Part 1205. In the first place, the rule can affect only those persons who are physically capable of using a power lawn mower. None of the rule's provisions will make it more difficult to operate a mower that complies with the standard. On the contrary,

complying mowers should be easier to use because the need for manually restarting the mower will be less and because, if the mower uses a brake-clutch to comply with the blade control requirement, use of the brake-clutch can reduce the tendency of the engine to stall in heavy grass. Although a person's ability to hold a device such as a blade control for a long period of time will decline with age, the force required to hold the blade control can be made low enough that it will not be a problem during the length of time that it takes for consumers to mow a lawn.

(f) Probable effect of the rule upon the cost of the product. The Commission estimates that the retail price impact of the standard will be about $35 for the average walk-behind mower. Based on an average useful mower-life of about 8 years, the additional annual cost to the purchaser is expected to average about $4.40. The probable effect of the standard will differ on the various types of mowers within its scope. Percentage increases in price will vary from about a 7 percent increase for power-restart self-propelled mowers to about a 30 percent increase for gasoline-powered push mowers. The costs attributable to individual requirements of the standard are discussed in paragraph (i) below.

(g) Probable effect of the rule upon the availability of the product. (1) The Commission finds that the standard is not expected to have a significant impact on the availability of walk-behind rotary mowers, since domestic production capacity appears to be sufficient to handle any

increased demand for safety-related components or materials. Although adapting some types of power mowers to the standard may be more costly than others, the effects of the standard on the price or utility of a particular category of power mowers are not expected to cause radical shifts in demand among types of mowers. The Commission finds that all types of power mowers subject to the standard will be available, although some, such as house-current-powered mowers, may increase their market shares because they can be brought into compliance with the standard at a lesser cost.

(2) Because some manufacturers may not revise their entire product line before the effective date of the standard, individual mower manufactuers may initially have less varied lines than at present, but there should be no decrease in the overall types and features of mowers available to consumers.

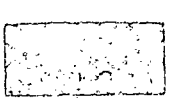
(h) Alternative methods. (1) The Commission has considered other means of achieving the objective of the standard. For example, alternatives were considered such as hand probes, "blade harmless" tests, and blade control by engine kill but allowing manual restart. These alternatives have been rejected by the Commission as being either unfeasible or not as effective as the rule which is being issued.

(2) Similarly, the Commission has found no alternative means of achieving the objective of the standard that it believes would have fewer adverse effects on competition or that would cause less disruption or dislocation of manu-

facturing and other commercial practices, consistent with the public health and safety.

(i) Unreasonable risk of injury. (1) The determination of whether a consumer product safety rule is reasonably necessary to reduce an unreasonable risk of injury involves a balancing of the degree and nature of risk of injury addressed by the rule against the probable effect of the rule on the utility, cost, or availability of the product. The factors of utility and availability of the products, adverse effects on competition, and disruption or dislocation of manufacturing and other commercial practices have been discussed above. The following discussion concerns the relationship of aniticipated injury reduction and costs for various requirements of the standard.

(2) The foot probe and related requirements are expected to reduce the number of blade contact injuries to the foot by 13,000 each year. It is not possible to apportion this injury reduction among the respective requirements. The cost of these requirements is estimated to be about $4.00 per mower, mostly for redesign of the shields. The shield strength requirement is similar to a requirement in the existing voluntary standard that is almost universally complied with, and should comprise only a small portion of the $4.00 retail cost increase compared to pre-standard mowers that is attributable to this related group of requirements. Also, shields complying with the movable shield requirement are featured in currently produced mowers.



(3) The foot probe and related requirements should result in a cost increase of about $22,000,000 and undiscounted injury savings of about $46,000,000, exclusive of any allowance for pain and suffering.

(4) The starting location control requirement would apply only to mowers with a power restart capability using engine kill to stop the blade. The cost for relocating the power restart switch, if necessary, should be very minor, and more than offset by the elimination of a clutch, as discussed below.

(5) The requirement that the blade stop within 3 seconds of the release of the blade control is supported by (i) the requirement that those mowers that stop the blade by stopping the engine must have a power restart (to remove the motivation to disable the blade control because of the inconvenience of manually starting the mower each time the control is released) and by (ii) the requirement for an additional control that must be actuated before the blade can resume operation (to prevent accidental starting of the blade). Together, these requirements are expected to reduce the number of blade contact injuries by 46,500 per year for an undiscounted savings in injury costs of about $165,000,000 per year, exclusive of pain and suffering.

(6) Virtually all mowers will be subjected to a cost increase of about $3 for the blade control actuating means and $1 for the second control required to restart the blade. (The $1 cost could be eliminated for power restart-engine

kill mowers that do not start when the blade control is actuated.

(7) Also, most mowers would require a brake for the blade in order to achieve a 3 second stop time. This would add another $6.50 - $8.50, depending on the type of mower. Mowers with power restart capability could stop the blade by killing the engine and thus would not need to provide a clutch to disconnect the engine from the blade. Mowers using manual restart would have to provide a clutch or other blade disengagement devices, which would probably be combined with the brake in a unitary brake-clutch mechanism.

(8) The following are the Commission's estimates of the probable retail price increases associated with certain types of currently produced mowers that will be caused by the blade control requirements.

Type of Mower	Blade Control Retail Price Increases
Electric mowers (house current or battery powered)	$15.00
Present Electric start gasoline mowers	13.00 - 19.50
Present Manual start gasoline mowers	
brake clutch approach	32.50
power restart approach	29.00 - 39.50

(9) The weighted average retail price increase of the blade stop requirements is expected to be about $31 per mower for a total retail cost increase of $167,000,000.

(10) The foot probe and blade stop requirements of the standard will obviously not completely protect the users of mowers under all circumstances. It is still essential for consumers to be aware of the hazard of blade contact and take the proper precautions to protect themselves. It is especially important that users not become complacent with the knowledge that the mower incorporates blade contact safety requirements. Accordingly, the Commission has determined that it is desirable that mowers complying with the standard bear a label warning of the danger of blade contact. Such a requirement would result in practically no effect on the retail price of mowers since labels are very inexpensive and practically all currently produced mowers bear some type of warning label. In view of the hazard that will be associated with power mowers even after the effective date of the standard, and the low cost of the label, the Commission concludes there is an unreasonable risk of injury that can be addressed by the label requirements in this Part 1205.

(11) Labeling requirements under the CPSA may be issued under the authority of either section 7 of the act or section 27(e), or both. Under section 7, the Commission must find that the label is reasonably necessary to prevent or reduce an unreasonable risk of injury. Under section 27(e),

the Commission must determine that the label conveys performance and technical data required to carry out the purposes of the act, one of which is "to protect the public against unreasonable risks of inury associated with consumer products." The Commission conludes it has authority to issue the labeling requirement of Part 1205 under both section 7 and 27(e) and finds that issuance of the requirement is necessary to convey the performance and technical data concerning the blade contact hazard, in accordance with section 27(e), for the purpose of the act mentioned above.

(j) Conclusion. Therefore, after considering the aniticipated costs and benefits of Part 1205 and the other factors discussed above, and having taken into account the special needs of elderly and handicapped persons to determine the extent to which such persons may be adversely affected by the rule, the Commission finds that Part 1205 (including the effective dates) is reasonably necessary to eliminate or reduce the unreasonable risk of injury associated with walk-behind power lawn mowers and that promulgation of the rule is in the public interest.

Dated: _____, 1979

_____

Sadye E. Dunn, Secretary
Consumer Product Safety
Commission

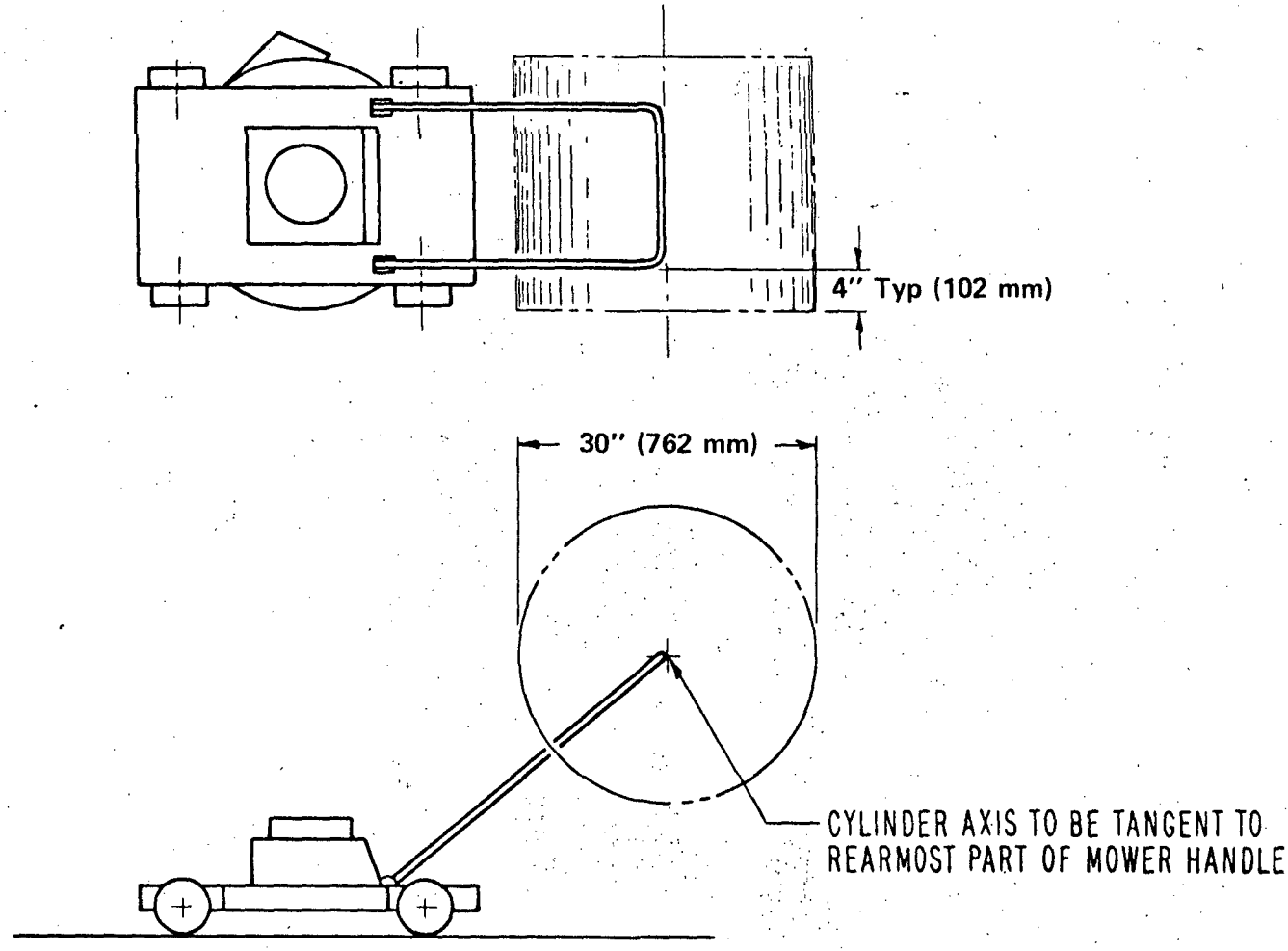


FIGURE 1 – OPERATING CONTROL ZONE

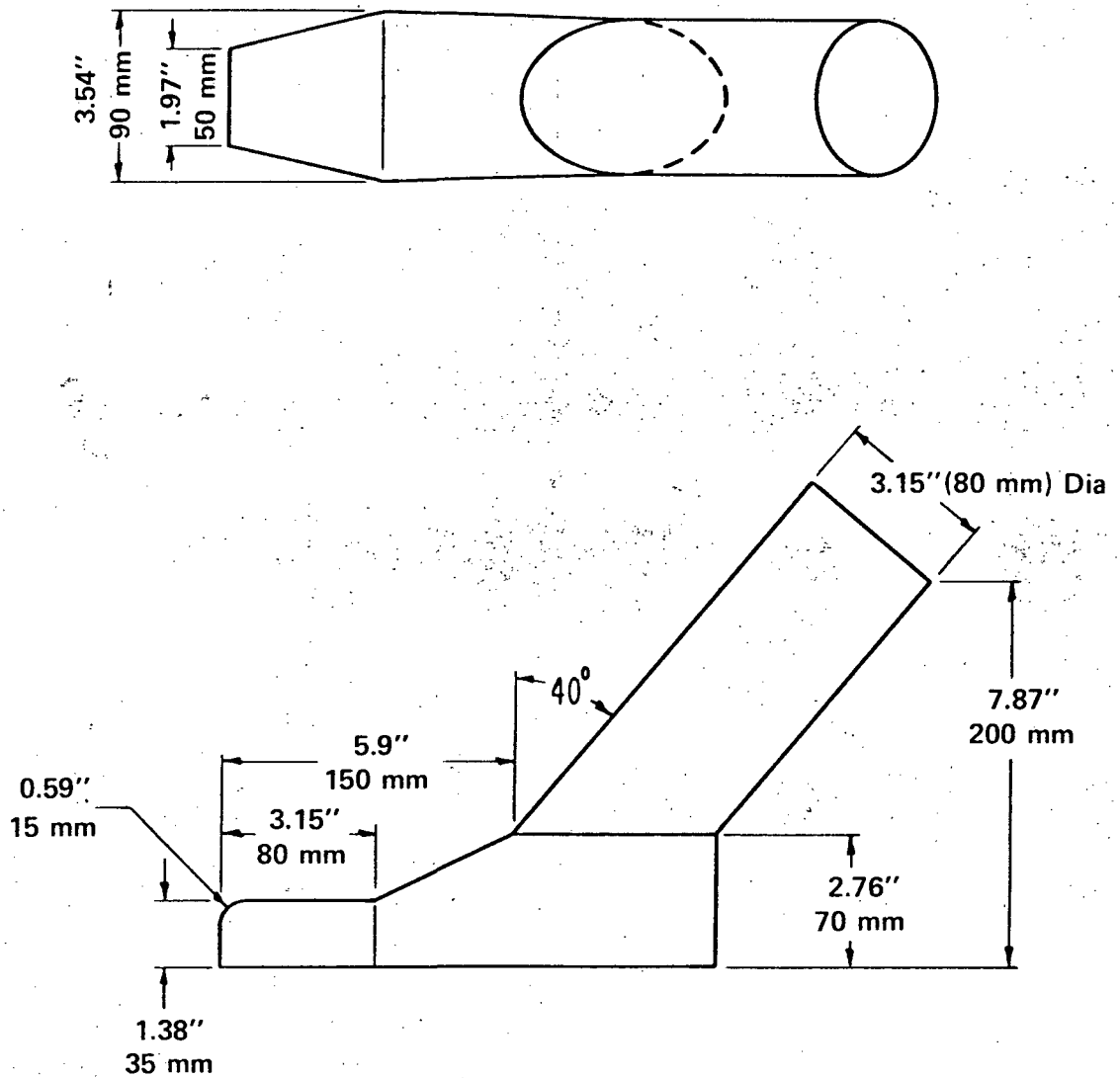


FIGURE 2 – FOOT PROBE

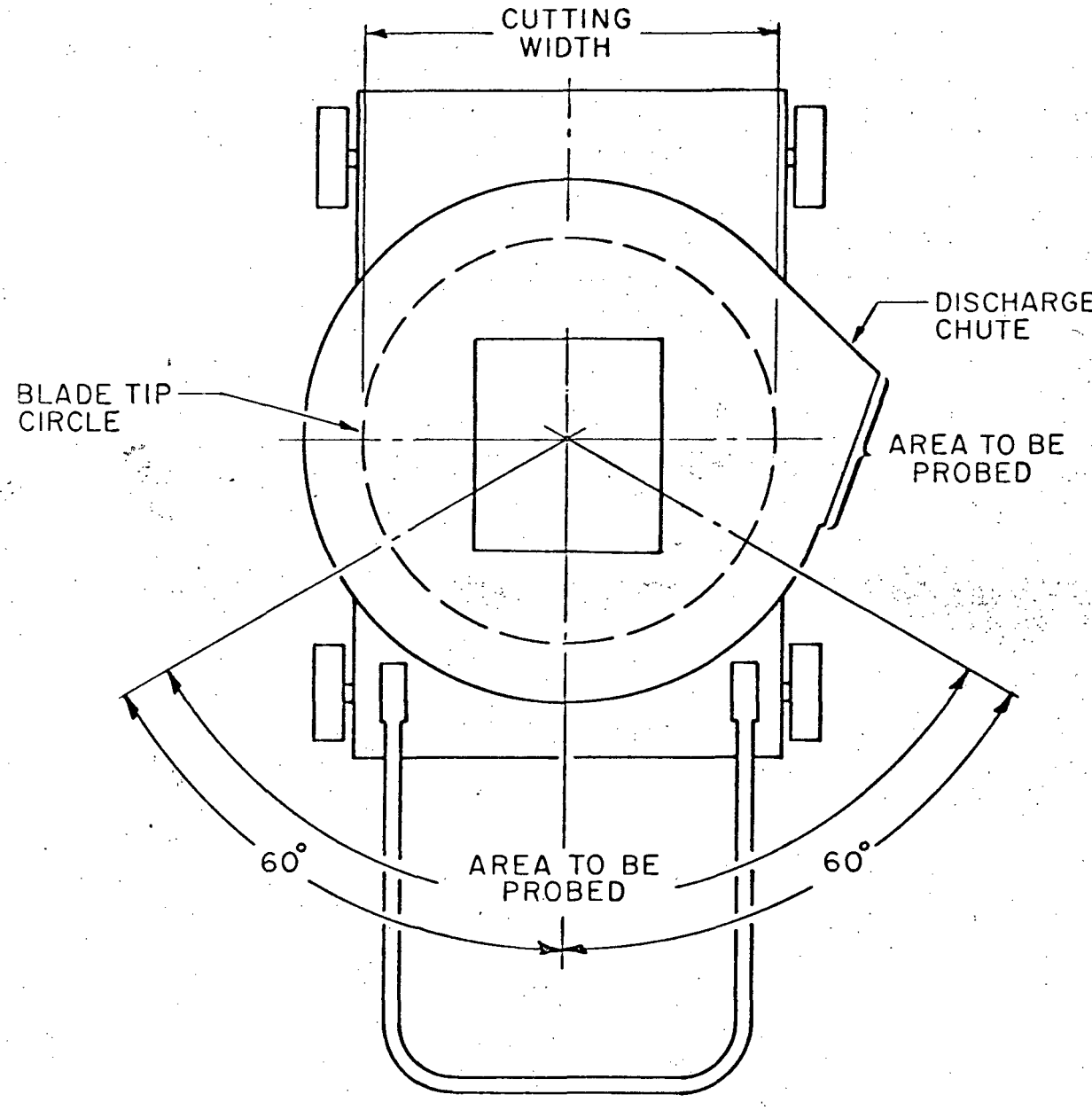


FIGURE 3 – AREA TO BE PROBED

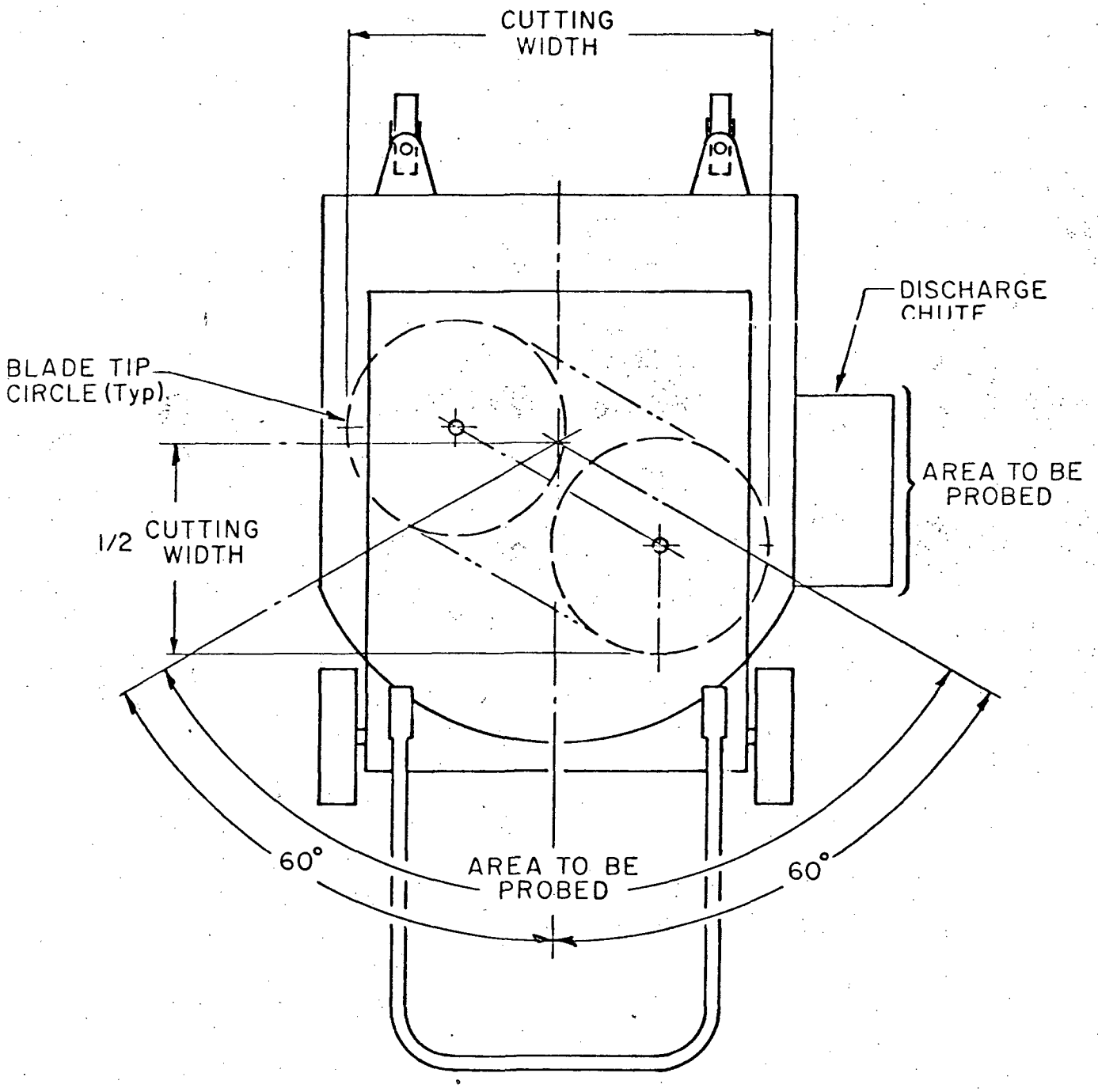


FIGURE 4 – AREA TO BE PROBED MULTI-BLADE MOWERS

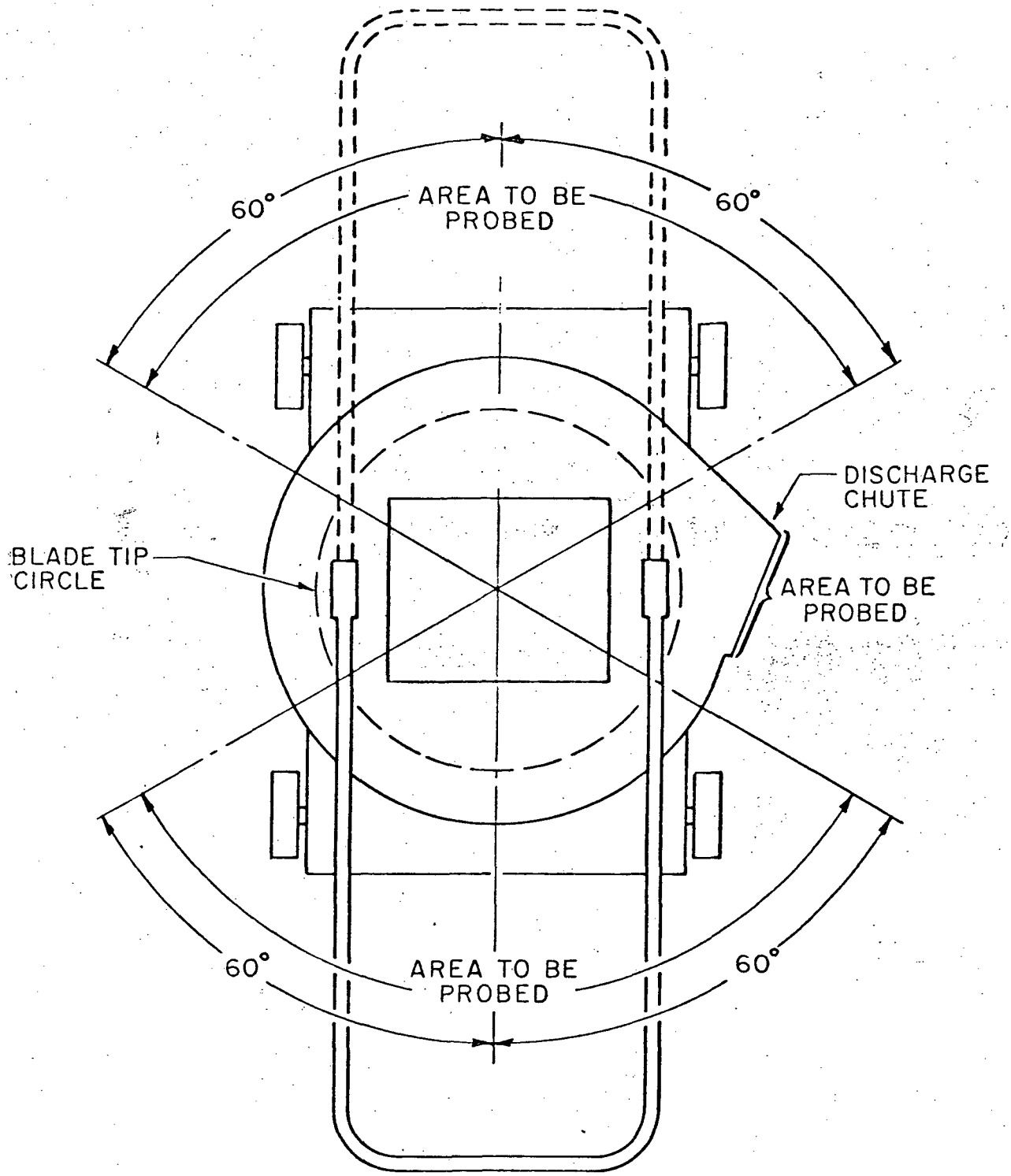


FIGURE 5 – AREA TO BE PROBED SWINGOVER HANDLE

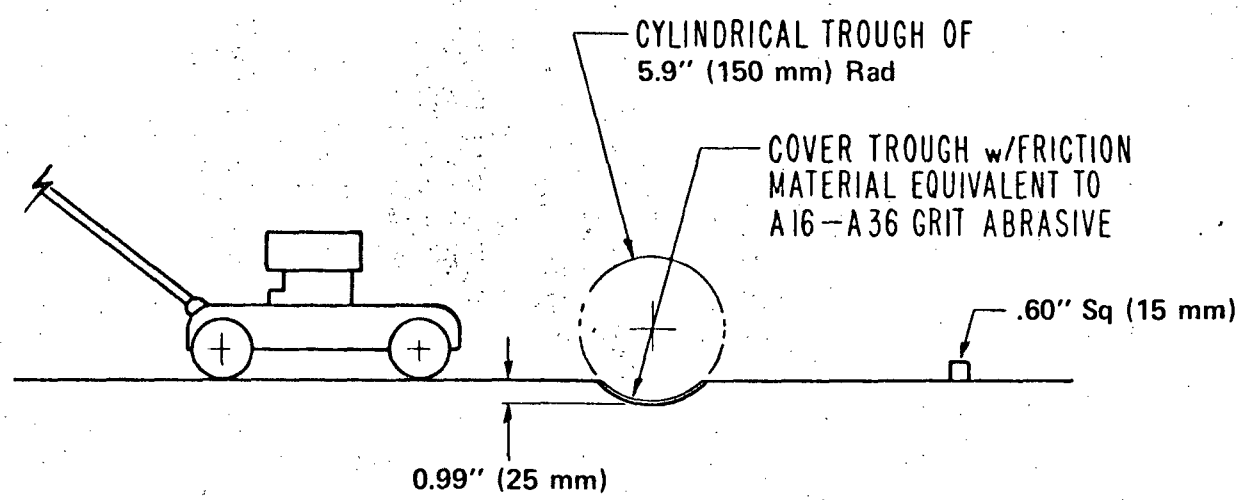


FIGURE 6 – OBSTRUCTION TEST FIXTURE

Since the certification regulation allows manufacturers a great deal of latitude in their recordkeeping, manufacturers should be able to incorporate certification recordkeeping into their present system in a manner which will create minimum difficulties for the manufacturer and be sufficient for Commission compliance programs.

A description of the Commission's projected compliance program for walk-behind power mowers is attached at Tab G.

VI. Other Approaches to Injury Reduction

1) Harmless Blade Mower

Both the offeror and the Commission staff have considered the possibility of proposing a harmless blade test, but no supportable test for measuring the harmlessness of a mower blade is presently available. Still, a monofilament line mower, for which production is now planned, appears to differ inherently from the conventional steel-bladed mower, and the staff recommends that it be exempted from the standard. If a supportable test for measuring blade harmlessness can be developed which allows effective and enforceable alternatives for reducing injuries, the staff would recommend amending the standard to incorporate such a test.

2) Inaccessible Blade Mowers

Several ideas for testing "inaccessible" blade mowers have been suggested to the Commission. They basically include hand probe tests to determine whether contact can be made with the mower blade. Not one of the probes has the potential for reducing injuries as effectively as the recommended blade stopping requirements. In evaluating these suggested "inaccessible" requirements, the staff has considered the nature and severity of the risk of injury as well as the measurable effectiveness of each for reducing the frequency of injury, and has determined that to date, none would provide a supportable or enforceable mandatory requirement. We are continually open to innovative ideas which will provide the injury reduction we forecast for blade stopping requirements and will continue to work with interested parties in an attempt to develop suitable probes and test methods.

In the five years since the Outdoor Power Equipment Institute petitioned the Commission to develop a consumer product safety standard for power lawn mowers, the staff estimates that over 300,000 people have required hospital emergency room treatment for power mower related injuries. Many of the injuries can be caused by a momentary lapse in concentration and can happen quickly and unexpectedly. The dollar value cannot be the only measure of the costs associated with these injuries. The individual cost to the artist who loses the use of his hand and the cumulative burden on society may be intangible, but the reduction in the injuries which can be effectuated by publication of the recommended standard will be significant.


4"
(10.0 cm)
3¼"
(8.25 cm)
DANGER
KEEP HANDS and FEET AWAY
BLACK
YELLOW
RED
1/8" width

FIGURE 7

Engine-Kill Option with Labels and 360° Foot Probing:

If the Commission chooses to allow stopping the engine as a method for meeting the blade stopping requirements of the standard, the staff recommends that further requirements be included in the standard. These further requirements would apply to gasoline powered mowers which (1) stop the blade by stopping the engine and (2) have only manual starting controls. For this type mower, the standard essentially would require 360° foot probing and labeling which would inform the consumer at the point of sale of the engine stopping characteristics of the mower.

Additional Requirements

1205.5(a)(1)(iv): For a mower with an engine and only manual starting controls, the blade control shall stop the blade without stopping the engine unless the mower meets the requirements of paragraph (d) of this section.

1205.5(d) Further requirements. For such mowers as identified in 1205.5(a)(1)(iv), the following requirements shall be met.

(1) The following labeling statement shall be required:

NOTICE: FOR SAFETY REASONS, THE ENGINE OF THIS MOWER MUST BE MANUALLY RESTARTED WHEN THE HANDLE IS RELEASED

(2) The required statement shall:

(i) appear legibly and conspicuously in capital letters at least 0.25 in. (6.35 mm.) high on a label or tag (such as a hanging tag) which is at least 2.5 in. (63.5 mm.) by 7 in. (178 mm.) high. No other words or symbols may appear on the label. The label shall be affixed either to the starting control or to the handle in close proximity to the starting control.

(ii) appear legibly and conspicuously in capital letters at least 0.5 in. (12.7 mm.) high on the top and one side of any retail carton in which such walk-behind power mower is offered for sale or delivered to consumers.

(3) All advertisements for such power lawn mowers being offered for sale to consumers through direct mail, catalogs, telephone solicitation, or under any other circumstances where the consumer in the ordinary course of dealing is not afforded an opportunity to inspect the label before receiving the item, shall contain a clear and conspicuous disclosure of the required labeling statement specified in paragraph (d)(1) of this section.

(4) For such mowers, the areas to be probed as described in 1205.4(a)(2)(B) shall be increased to include the entire periphery of the mower.

FIGURE 7 – ALTERNATIVE LABEL

UNITED STATES GOVERNMENT

Memorandum

U.S. CONSUMER PRODUCT SAFETY COMMISSION

TO : William F. Kitzes, OPM

DATE: October 26, 1978

FROM : William D. Barr, HIEA

SUBJECT: Estimates of Power Mower Blade Contact Injuries and Proposed Blade Contact Standard Effectiveness

In response to recent requests from OPM concerning the estimated effectiveness of the proposed blade contact standard for power mowers and data relating to the location of blade contact injuries around the periphery of the mower, the following table and figures are presented. All estimates are based upon NEISS data for Calendar Year 1977 and the special investigation data collected from July 1 to September 30, 1977.

Estimates of the number of power mower-related injuries for 1977 are presented in Table 1. These are segregated into injuries involving walk-behind mowers and riding mowers. Injury estimates are given for the number of power mower-related injuries treated in hospital emergency rooms and the estimated number of all power mower-related injuries, whether treated in emergency rooms or not.

Table 2 presents the estimated effectiveness of the proposed standard as determined from the special study investigation data. Injury estimates are again given for all injuries as well as those injuries treated in hospital emergency rooms in the contiguous United States. Percents are given using as a base all power mower injuries, all walk-behind mower injuries and all walk-behind mower blade contact injuries.

The attached diagrams supplement the information presented in the August 4, 1978, memorandum from Bill Barr to Dave Parrish. Diagrams attached to that memorandum presented estimates of the injuries addressed by provisions of the proposed blade contact standard. Figures 1 and 2 (attached) depict the location around the periphery of the mower of particular injuries. Figures presented are for all injuries. The figures are basically diagrams of mowers, the four rectangular shapes depicting wheels and the arrow indicating the forward direction of travel. Therefore, injuries in the 6 o'clock position are at the rear of the mower. Injuries occurring at the 2:30 position are at the discharge chute of the mower. It should be noted that the relative error of these estimates may be quite high.

Attachments (4)

bcc: Joann Langston, AED, HI
Dr. Robert Verhalen, DAEd, HIE
Robert Frye, Director, HIEA
Charles Nicholls, Deputy, HIEA
Bill Barr, HIEA
OPM File
Chron File
Central File
Reading File

HIEA:WDBarr:ek: 10/24/78
Revised: 10/26/78

Table 1.

Power Mower-Related Injuries, 1977

	All Injuries	Emergency Room Treated Injuries
All Power Mower Injuries	155,000 (100%)	61,300 (100%)
Walk-Behind Mower Injuries	120,700 (78%)	47,700 (78%)
Riding Mower Injuries	34,300 (22%)	13,600 (22%)

Source: Power Mower Special Study Data (July 1, 1977-September 30, 1977)

U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Table 2.

Power Mower Injuries for 1977 and Estimated Effectiveness of Proposed Blade Contact Standard

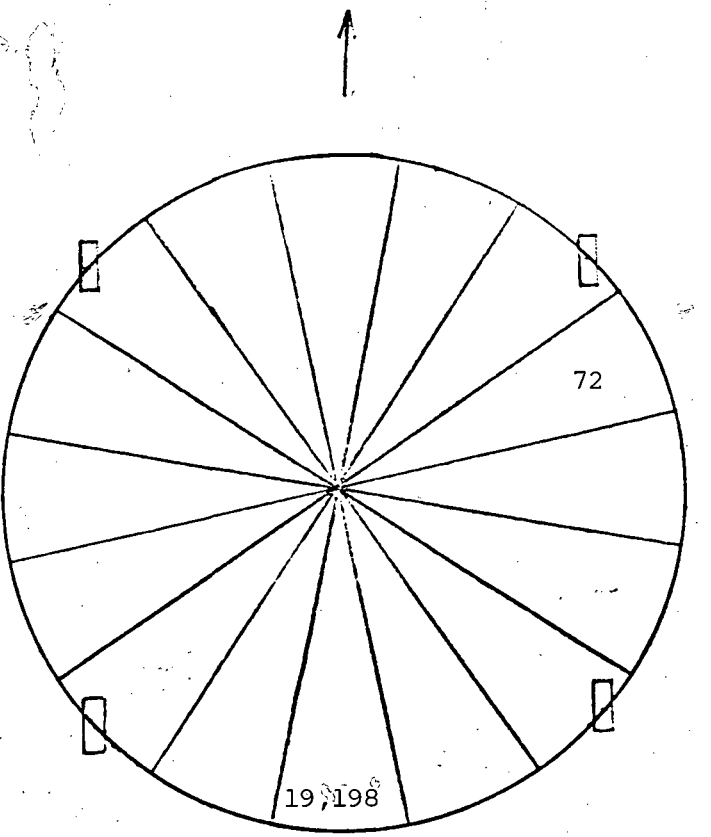
	All Injuries	Emergency Room-Treated Injuries	Percent of All Power Mower Injuries	Percent of Walk-Behind Power Mower Injuries	Percent of Walk-Behind Mower Blade Contact Injuries
Walk-Behind Mower Injuries	120,700	47,700	78	100	—
Walk-Behind Mower Blade Contact Injuries	77,000	30,500	50	64	100
Injuries Reduced by Proposed Standard	59,500	23,500	38	49	77
Injuries Reduced by Blade Stop Requirement	46,500	18,400	30	38	60
Injuries Reduced by Foot Probe Requirement	13,000	5,100	8	11	17

Source: Power Mower Special Study Data (July 1, 1977 - September 30, 1977)

U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Figure 1.

Diagram of Walk-Behind Mower Depicting Location Around Mower of Injuries not Addressed by Blade Stop Requirement

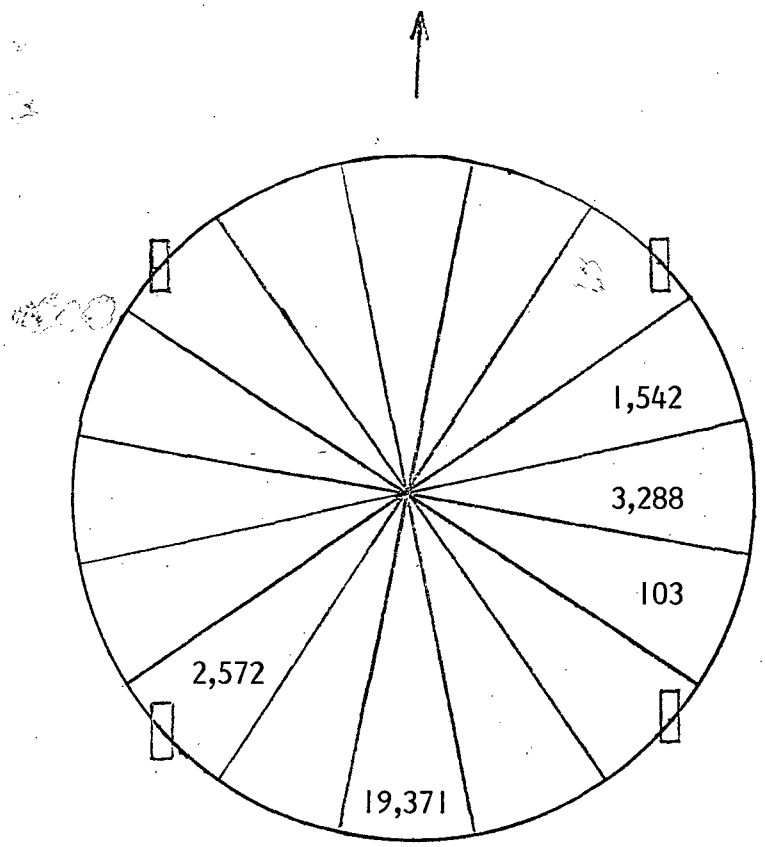


Source: Power Mower Special Study Data (July 1, 1977 - September 30, 1977)

U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Figure 2.

Diagram of Walk-Behind Mower Depicting Location Around Mower of Foot and Toe Injuries



Source: Power Mower Special Study Data (July 1 1977 - September 30, 1977)

U.S. Consumer Product Safety Commission
Directorate for Hazard Identification and Analysis - Epidemiology

Blade-Contact Requirements for Walk-Behind Power Mowers

From Proposed Standard May 5, 1977	Staff Recommendations November 1978	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
§ 1205.3 Walk-behind mower protective devices.	§ 1205.4 Walk-behind rotary power mower protective shields.	
(a) Shields. (1) General requirements. Shields on walk-behind mowers (including the housing) shall meet the following requirements:	(a) General requirements. Walk-behind rotary power mowers shall meet the following requirements:	
(i) During the foot probe test and terrace test of paragraphs (a)(2)(i) and (a)(2)(ii) of this section respectively the shields shall prevent the foot probe of Fig. 3 from entering the path of the blade or causing any part of the mower to enter the path of the blade.	(1) When the foot probe is inserted under any point within the areas to be probed during the foot probe test of paragraph (b)(1) of this section, the shields shall prevent the foot probe from entering the path of the blade or causing any part of the mower to enter the path of the blade.	13.2 Protective Guard. A protective shield shall be provided at the rear of the mower which shall extend to not more than 1 inch above a level supporting surface at all cutting heights, and shall have a composite width, including wheels, within the width of cut area, of at least 90 percent of the width of cut.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(ii) The shields shall not permanently separate, crack, or deform in a manner that prevents the mower from meeting the requirements of this standard when each of the front, back, and both sides of the mower are, in turn, subjected to a 222 newton (50 lb.) force, uniformly distributed over not less than half the length of the shield on that side of the mower. The force shall be applied in the direction which produces the maximum deformantion of the shield.	(2) Any shield located totally or partly within the areas to be probed as defined in paragraph (b)(1)(ii) of this section shall not permanently separate, crack or deform when the shield is subjected to a 50 lb. static tensile force, uniformly distributed over not less than half the length of the shield. The force shall be applied for 10 seconds in the direction which produces the maximum stress on the shield. While being tested, a shield shall be attached to the mower in the manner in which it is intended to be used. (This requirement does not apply to the housing).	13.2.1 Rear Protective Guard Test. The mower shall be supported horizontally and the test performed with the mower restrained in any suitable manner. A 50-pound tensile force, uniformly distributed over not less than half the length of guard und test, shall be applied in the following: (1) downward direction, (2) rearward direction. 13.2.1.1 Test Acceptance. The guard shall not separate from the mower. Neither the guard nor any component part or assembly of the guard shall fracture or be permanently deformed in a manner that would prevent the mower from meeting the requirements of 13.2 Protective Guard. 10.1 Blade Enclosure. The mower blade shall be enclosed except on the bottom, and the enclosure shall extend 1/8 inch minimum below the lowest blade position, including tolerance, except for the discharge openings and such other openings as described in 13.1 and 14.1.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
		11.5 Structural Integrity Test - Blade Enclosure and Guards. The test shall be conducted with the equipment shown in Fig. 5, and shall consist of the vertical introduction of 100 hardened, minimum Rockwell C scale 45, 1/2 inch diameter steel balls one at a time through two or more equally spaced holes for each blade. The balls shall be divided in approximately equal numbers among the holes. The mower or mower attachment shall be equipped with a 3/4 inch plywood panel, which shall be faced with a 16 gage steel plate for wear resistance, parallel to and 5/8 inch below the horizontal plane of the blade. The panel shall extend a minimum of 1 inch beyond the blade tip circle at the discharge opening(s) An air inlet hole with a diameter approximately 30 percent of the blade length, shall be provided in the panel concentric with each blade tip circle. The holes in the test panel for the introduction of the test material shall be 1 inch in diameter and generally equally spaced from the primary hole, which shall be located 45 degrees back of a radial line drawn through A, center point of the discharge opening, as shown in Fig. 5. The angular location of the other holes may be varied slightly to avoid interferences with the structural components or the test equipment. The

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
		test material shall be injected with sufficient energy that it will rise a minimum of 1/2 inch and a maximum of 12 inches, if unobstructed, above the horizontal plane of the blade. Spring, air, or other assists may be used to ensure proper introduction of the test material. When a tube is used to introduce the test material through the holes, the end of the tube should be 2 inches below the horizontal plane of the blade in order to permit the test material to emerge freely from the tube.
		13.1 Blade Enclosure, Front (See Fig. 1 and 2.) The highest point on the bottom edge of the blade enclosure, front, except the discharge opening, shall be such that any line extending from such point at a maximum of 15 degrees downward from the horizontal toward the blade shaft axis (axes) shall not intersect the horizontal pane within the blade tip circle, nor shall any point be more than 1-1/4 inches above the horizontal plane of the blade in the lowest blade position. The highest point in the openings of the front comb or rake arrangement shall be considered as a point on the bottom edge of the blade enclosure, front. A mower with a swingover handle shall have no front opening(s) in the blade enclosure.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
		13.3 Starting Arrangement. The starting mechanism shall be arranged in such a way that to use it an operator need not stand within the angle of opening, as shown in Figs. 1 and 2. 13.4 Mower Stabilization. A mower with a rope starter shall have a labeled, designated area for stabilizing the mower when starting the engine.
(iii) During the obstruction test of paragraph (a)(2)(iii) of this section, shields shall not (A) stop the mower as a result of contact with the raised obstacle, (B) enter the path of the blade, or (C) cause more than one wheel at a time to be lifted from the fixture surface.	(3) During the obstruction test of paragraph (b)(2) of this section, shields shall not (i) stop the mower as a result of contact with the raised obstacle, (ii) enter the path of the blade, or (iii) cause more than one wheel at a time to be lifted from the fixture surface.	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(2) Shield tests - general. (i) Foot probe test. (A) The folliwng test conditions shall be observed: (1) The test shall be performed on a level surface. (2) Pneumatic tires, when present, shall be inflated to the cold pressures recommended by the mower manufacturer. (3) The test shall be performed with mower housing at its highest setting relative to the ground. (4) The blade shall be adjusted to its lowest position relative to the blade housing. (5) The mower shall be secured so that the mower may not move horizontally but is free to move vertically. (6) If a grass catcher is provided or sold by the mower manufacturer for use with the mower, the test shall be performed both with and without the grass catcher in place. A grass catcher is not considered a shield except for the purposes of this foot probe test.	(b) Shield tests - general. (1) Foot probe test. (i) The following test conditions shall be observed: (A) The test shall be performed on a level surface. (B) Pneumatic tires, when present, shall be inflated to the cold pressures recommended by the mower manufacturer. (C) The mower housing shall be adjusted to its highest setting relative to the ground. (D) The blade shall be adjusted to its lowest position relative to the blade housing. (E) The mower shall be secured so that the mower may not move horizontally but is free to move vertically.	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
	(ii) Areas to be probed. (A) The minimum area to be probed shall include any discharge opening and an area both 60° to the right and 60° to the left of the rear of the fore-aft centerline of the cutting width. For single-blade mowers, these angles shall be measured from a point on this fore-aft centerline which is at the center of the blade tip circle. For multi-blade mowers, these angles shall be measured from a point on the fore-aft centerline of the cutting width which is one half of the cutting width forward of the rearmost point of the composite of all the blade tip circles. (B) For a mower with a swingover handle, the areas to be probed shall be determined as in paragraph (b)(1)(ii)(A) of this section, from both possible rear positions and shall include any discharge opening.	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(B) Procedure. The foot probe of Fig. 3 shall be inserted under all points of the bottom edge of the blade shousing and shields with the "sole" of the probe in contact with the supporting surface until the applied horizontal force reaches 18 newtons (4.1 lbs.) or the blade housing lifts, which ever occurs first. As the foot probe is withdrawn after each insertion, the "toe" shall be pivoted upward around the "heel" as much as possible without lifting the mower.	(iii) Procedure. With the areas specified in paragraph (b)(1)(ii), the foot probe of Fig. 2 shall be inserted under the bottom edge of the blade housing and shields. During each insertion, the "sole" of the probe shall be kept in contact with the supporting surface. Insertion shall stop when the mower housing lifts, or the horizontal force used to insert the probe reaches 4 lbs. whichever occurs first. As the foot probe is withdrawn after each insertion, the "toe" shall be pivoted upward around the "heel" as much as possible without lifting the mower.	11.8 Probe Test - Discharge Opening(s). The blade enclosure shall be so designed and constructed that, with guards or deflectors, or both, securely fastened in the normal operating position and the mower support members in contact with the supporting surface, a probe, as shown in Fig. 6, shall not enter the path of the blade(s) assembly when inseted as far as possible into the discharge opening(s) at any point. The probe shall be held in a vertical plane and rotated horizontally and vertically at a maximum of 15 degrees each side of the center line, as shown in Fib. 6, and shall be tested in all positions within those rotation limits. Tests shall be made with the blades in the highest and lowest cutting positions. If the blade path height is different at different blade speeds, the test shall be conducted as to include the two blade height extremes. The test shall be conducted under static conditions. Components of mowers or vehicles, or both such as wheels, frames, etc., may be considered as part of the blade enclosure for the purpose of this test.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(ii) Terrace test. (A) Conditions (2) (3), and (4) of the foot probe test of paragraph (a)(1)(A) of this section shall also apply to this test. (B) The test shall be performed on the fixture shown in Fig. 4, which has a horizontal surface connected to a surface inclined 30° from the horizontal by a curved surface having a radius of curvature of 500 mm. (19.68). (C) The mower shall be moved over the working length of the test fixture (see Fig. 4), attempting to deep at least three of the mower's wheels, including both rear wheels, in contact with the fixture surface. The working length shall begin at the point where the front wheels first contact the curved surface and end when the rear wheels have left the curved surface. (D) At each position on the fixture, the mower shields shall not allow the foot probe of Fig. 3 to enter the path of the blade or cause any part of the mower to enter the path of the blade when the probe is inserted and withdrawn in the following manner at all points on the bottom edge of the rear of the blade		

From Proposed Standard May 5, 1977	Staff Recommendation:	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
housing and shields that are located between the rear wheels or the spread of the handles, whichever is wider. During each insertion, a portion of the "sole" of the probe shall be in contact with the test fixture surface and the probe shall be inserted as far as possible until the applied force parallel to the "sole" of the foot probe reaches 18 newtons (4.1 lbs) or the blade housing lifts, whichever occurs first. As the foot probe is withdrawn after each insertion, the "toe" shall be pivoted upward around the "sole" as much as possible without lifting the mower. In a mower with a swingover handle, both the front and rear of the mower shall be probed.		

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 » B 71.1a - 1974 B 71.1b - 1977
(iii) Obstruction test. (A) Conditions (2) and (3) of the foot probe test of paragraph (a)(2)(i)(A) of this section shall also apply to this test. (B) The test shall be performed on the fixture of Fig. 5, which consists of a level surface having (1) a 25 mm. (.99 in.) deep depression with a 150 mm. (5.90 in.) radius of curvature and (2) a raised obstacle 15 mm. (0.60 in.) square, each extending the full width of the fixture. The depression shall be lined with a material having a surface equivalent to a 16- to 36-grit abrasive. The depression and the obstacle shall be located a sufficient distance apart so that the mower contacts only one at a time.	(2) Obstruction test. (i) The following test conditions shall be observed: (A) Pneumatic tires, when present, shall be inflated to the cold pressure recommended by the mower manufacturer. (B) The mower housing shall be at its highest setting relative to the ground. (ii) The test shall be performed on the fixture of Fig. 6, which consists of a level surface having (1) a 25 mm. (.99 in.) deep depression with a 150 mm. (5.90 in.) radius of curvature and (2) a raised obstacle 15 mm. (0.60 in.) square, each extending the full width of the fixture. The depression shall be lined with a material having a surface equivalent to a 16- to 36-grit abrasive. The depression and the obstacle shall be located a sufficient distance apart so that the mower contacts only one at a time.	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(C) The test fixture may be relieved to prevent interferece with any blade retaining device. (D) The mower shall be pushed forward and pulled rearward perpendicularly across the depression and the raised obstacle on the fixture. The mower shall be pulled and pushed without lifting with a horizontal force suf- to transit the obstruction fixture at a speed not to exceed 0.7 meter/sec. (2.2 feet/sec.). (E) As required by 1205.3(a)(1)(iii), mower shields must not cause more than one wheel at a time to be lifted from the fixture surface and no shield shall stop the mower as a result of contact with the raised obstacle.	(iii) The test fixture may be relieved only to the extent necessary to prevent interference with any blade retaining device. (iv) The mower shall be pushed forward and pulled rearward perpendicular to and across the depression and the raised obstacle on the fixture. The mower shall be pulled and pushed, without lifting, with a horizontal force sufficient to transit the obstruction fixture at a speed not to exceed 0.7 meters/sec. (2.2 feet/sec.).	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(3) Movable shields. In addition to the general shield requirements of paragraph (a)(1) of this section, movable shields must meet the following requirements: (i) Shields which are movable for the purpose of attaching auxiliary equipment shall return automatically to a position that meets the requirements of Subpart A of this Part 1205 when the attached equipment is removed.	Movable Shields (1) General Movable shields must meet the general shield requirements of paragraph (a) of this section. In addition, movable shields which are in the areas to be probed as defined in paragraph (b)(1)(ii) of this section and which are intended to be movable for the purpose of attaching auxiliary equipment, when deflected to their extreme open position in the manner intended by the manufacturer and released, shall either: (i) return automatically to a position that meets the requirements of Subpart A of this Part 1205 when the attached equipment is not present, or (ii) prevent operation of the blade(s) unless the attached equipment is present or the movable shield is returned to a postition that meets the requirements of Subpart A of this Part 1205. (2) Tests (i) Automatic return of a movable shield shall be determined by manually deflecting the shield to its extreme open position, then releasing the shield and visually observing that it immediately returns to the closed position. (iii) Prevention of operation of the blade(s) shall be determined, first by manually deflecting the shield to its extreme position,	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
	then, following the appropriate manufacturers instructions, completing the procedures necessary to operate the blade. Observe, using any safe method, that the blade(s) has been prevented from operating.	
(ii) Shields shall not be removable without the use of tools. For the purpose of this requirement, a coin shall not be considered a tool.		4.4 Attachment of Shield or Guard. All shields or guards shall be either permanently attached or secured to prevent removal without the use of tools.
(b) Handles. Power mower handles must meet the following requirements.		
(1) Removal. In order to prevent the unintentional separation of the handle from the mower, the removal of a handle from a power lawn mower shall require the removal or unlatching of at least one other part.		12.1 Handle Structure 12.1.1 Fastening. The mower handle shall be fastened to the mower so as to prevent unintentional uncoupling while in operation.
(2) Upstop. A restraining means shall be provided to prevent the rearmost part of the handle from moving closer than 430 mm. (16.93 in.) to the vertical line through the nearest point on the blade tip circle. A means to deliberately and temporarily disengage the handle restraining means is permitted.		12.1.2 Operating Position(s). A positive upstop shall be provided which does not allow the rearward part of the handle to come closer than 17 inches horizontally behind the closest path of the mower blade(s) during normal operation.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(ii) Handle upstop test. A 270 newton (60 lb.) force shall be applied to the handle at the place and in the direction that will produce the maximum stress against the handle restraint (upstop). This test shall be conducted after the handle structure test of paragraph (b)(4)(i) of this section.		(1) The mower shall be positioned on a horizontal supporting surface and restrained from movement at the wheels or blade enclosure. (2) A static force of 50 pounds shall be applied to the rearward part of the handle on the longitudinal center of the mower in a direction to the front of the mower and parallel to the supporting surface. 12.1.4.1 Test Acceptance. There shall be no failure of the handle and handle supporting structure while the static force is applied. Upon removal of the force, the mower shall comply with the requirement given in 12.1.2. 12.1.2.1 Swing-Over Handle. A swing-over handle shall be allowed if positive operating positions are provided. If, during normal operation a disengaging mechanism is provided to bypass the operating position(s) in order to swing the handle over the mower, the mechanism must automatically tock back into the operating position(s). A mower with a swing-over handle shall meet the requirements of this specification for all operating positions of the handle. 12.1.2.2 Handle Storage Position. If a handle storage position is provided, a handle shall automatically or manually lock back into the operating position(s) when the handle is moved into this position(s), and shall be so noted in the operator's manual.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
1205.5 Walk-behind mower controls. (a) Blade control systems - (1) Requirements for blade control. A walk-behind power mower shall have a blade control system that will perform the following functions: (i) Prevent operation of the blade unless the control is actuated by the operator. (ii) Require continuous contact with the operator in order for the blade to continue to be driven. (iii) Upon release of the control by the operator, cause the blade to stop within a time that meets the requirements of paragraph (b) of this section. For a mower with manual starting controls, this control shall stop the blade without stopping the power source, unless the mower meets the "easy retart" criteria of paragraph (d) of this section.	1205.5 Walk-behind rotary power mower controls. (a) Blade control systems. (1) Requirements for blade control. A walk-behind rotary power mower shall have a blade control system that will perform the following functions: (i) prevent the blade from operating unless the operator actuates the control. (ii) require continuous contact with the control in order for the blade to continue to be driven. (iii) cause the blade motion in the normal direction of travel to come to a complete stop within 3.0 seconds after release of the control. (iv) for a mower with an engine and with only manual starting controls, this blade control shall stop the blade without stopping the engine.	9.2 Blade Stopping Time. The blade(s) shall stop rotating from the manufacturer's specified maximum speed within seven seconds after either declutching or shutting off drive power. The mower shall have a minimum run-in period of one hour prior to test.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(2) A separate blade control system is not required for a self-propelled walk-behind power mower that has a traction drive control that also satisfies the requirements of paragraph (a)(1) of this section with respect to blade operation.		

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(2) All walk-behind power mowers shall have, in addition to any blade control required by paragraph (a)(1) of this section, another control which must be manually actuated before a stopped blade can be restarted. (b) Blade stopping times - (1) Requirements. After release of the blade control required by paragraph (a)(1) of this section, the blade of a walk-behind power mower shall come to a complete stop within whichever of the following times is applicable: (i) For mowers manufacted after the overall effective date of the standard but before two years after the overall effective date of the standard, the blade shall stop within 5.0 seconds of the release of the blade control. (ii) For mowers manufactured on or after two years after the overall effective date of the standard, the blade shall stop within 3.0 seconds of the release of the blade control.	(2) All walk-behind power mowers shall have, in addition to any blade control required by paragraph (a)(1) of this section, another means which must be manually actuated before a stopped blade can be restarted. This additional means may be either a control which is separate from the control required by paragraph (a)(1) of this section or a double-action device requiring two distinct actions to restart the blade.	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(2) Test. (i) General. Any test method that will measure the time between the release of the blade control and the coming to rest of the blade to the nearest 0.1 second may be utilized. The times may be determined by visual observation, such as by manual operation of a stopwatch. In this case, blade movement may be observed by placing the mower over a reflective surface or by placing the mower over a transparent surface so that it may be ovserved from below.	(b) Blade Stopping test. (1) General. Any test method that will determine the time between the release of the blade control and the complete stop of the blade motion in the normal direction of travel may be used.	
(ii) Conditions. (A) The mower shall be operated at maximum operating speed for at least 6 minutes immediately prior to the test. (B) The blade must be at maximum operating spped when the blade control is released.	(2) Conditions. (i) The mower shall be operated at maximum operating speed for at least 6 minutes immediately prior to the test. (ii) The blade must be at maximum operating speed when the blade control is released.	
(c) Starting controls location. Walk-behind mowers with blades that commence operation when the power source starts shall have their starting controls located within the operating control zone.	(c) Starting controls location. Walk-behind mowers with blades that begin operation when the power source starts shall have their normal starting means located within the operating control zone.	

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(d) Easy restart. (1) Requirements. Walk-behind mowers with manual starting controls and a power source that stops when the blade control of paragraph (a)(1) of this section is released must be capable of being started by no more than three applications of the starting procedure outlined in paragraph (d)(2)(ii) of this section.		
(2) Test. (i) Equipment. The test apparatus shown in Fig. 7 shall be utilized. The apparatus shall be connected to the starting control so that the control will be pulled in the direction specified in the manufacturer's instructions when the weight W is released, or in the horizontal direction if no other direction is specified. The weight W shall not exceed 23 kg. (50 lb.). The distance h through which the weight W may fall shall not exceed 610 mm. (24.0 in.) All slack shall be removed from the cable that is attached to the starting control. The mower shall be secured so that the mower will not move when the starting force is applied.		
(ii) Procedure. The mower shall be warmed up by being run at maximum operating speed for at least 6 minutes. It shall then be turned off and prepared for restart according to the manufacturer's instructions. The weight W is then released so that it may fall through the distance h. The restart attempts shall be timed so that three attempts can be made between 30 seconds after shut-off and 4 minutes after shut-off. If the mower restarts on the first or second attempt the subsequent attempt(s) need not be made.		

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
(e) Shut-off control. All mowers shall be provided with a shut-off control, the actuation of which will stop the operation of the power source. This control shall require a manual operation before tha power source can be restarted.		3.2 Controls - Walk-Behind Mowers 3.2.1 Shut-off Control Device A shut-off control device shall be provided to stop operation of the engine (motor). This device shall require manual and intentional activation in order to restart th engine (motor). 3.2.3 Self-Propelled Mowers 3.2.3.1 A means shall be provided to prevent the starting of the engine when the wheel drive control is in the engaged position. Such means shall not be required on units equipped with deadman controls. 3.2.3.2 Wheel drive controls shall move generally opposite to the direction of mower travel in order to desengage the drive, except deadman controls, which may operate in any direction to disengage the drive Wheel drive disengaging controls shall be mounted on the mower handle within the operator zone. 3.2.2 Handle-Mounted Engine Controls, A handle-mounted engine control(s) shall move forward for fast, and rearward for slow or stop. 9.1 Blade Rotation Warning. An indicator of blade rotation shall be provided on mowers that operate so quietly that it may not be evident that the blade(s) is rotating.

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
1205.12 Warning labels. (a) Power mawn mowers shall be labeled on the blade housing(s) or, in the absence of a blade housing, on other blade shielding or on an adjacent supporting structure or assembly, with the warning label shown in Fig. 10. The label shall be at least 82.5 mm. (3.25 in.) high and 100 mm. (4 in.) wide, and the lettering and symbol shall retain the same size relation to each other and to the label as shown in Fig. 10. (b) Rotary mower shall have one label located as close as possible to any discharge opening. Rotary mowers shall be labeled on both sides of the blade housing with at least one label visible to a standard test operator standing in the operating position. (c) Walk-behind non-rotary mowers and riding mowers with front-mounted non-rotary mowing units shall be labeled as close to the center of the cutting width of the blade as possible, with the label legible from in front of the mowing unit. Riding mowers with rearmounted non-rotary mowing units mounted under the vehicle shall be labeled on both sides of the mowing unit with the label visible from each side.	1205.6 Warning labels. (a) Power lawn mowers shall be labeled on the blade housing(s) or, in the absence of a blade housing, on other blade shielding or on an adjacent supporting structure or assembly, with the warning label shown in Fig. 7. The label shall be at least 82.5 mm. (3.25 in.) high and 100 mm. (4 in.) wide, and the lettering and symbol shall retain the same size relation to each other and to the label as shown in Fig. 7. (b) Rotary mowers shall have one label on the blade housing located as close as possible to any discharge opening. (c) Walk-behind power reel mowers shall have one label, located as close to the center of the cutting width of the blade as possible. However, in the absence of a suitable mounting surface near the center of the cutting width, the label shall be placed on the nearest suitable mounting surface to the center of the cutting width.	10.1.2 Warning Notice. The word "CAUTION" of "DANGER" shall be placed on the mower at or near each discharge opening. Such warning shall conform to the legibility requirements of 10.2, item (1). 3.2.4 Warning Notice - Self-Propelled Mowers. The following warning, or one with similar wording, shall be clearly visible at the primary engine starting point: "CAUTION. Be sure the operating control is in neutral before starting the engine."

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
		7. Durable Label Requirements. 7.1 Labels provided for directional or cautionary information shall be certified by the mower or vehicle manufacturer to meet the following minimum requirements. 7.1.1 Labels shall form a durable bond with the base material surface and shall show no appreciable loss of adhesion during weathering exposure. When processed and applied in accordance with the label manufacturer's recommendations, labels shall be weather resistant per 7.1.2 and, following normal cleaning procedures, shall show no appreciable fading, discoloration, cracking, crazing, blistering, or dimensional change. Labels shall not curl at the edges nor be removable without destroying the label or the painted surface to which they are applied. Labels shall not be affected by spilled gasoline or oil. 7.1.2 The label design shall be certified to comply with the following test or an equivalent accelerated exposure test: Samples shall be exposed to the sun at an angle of 45 degrees to the horizontal and facing south per ASTM D 1014-66[7], and shall remain legible and durable after the following test period: in the Midwest, 24 months; or, in Miami, Fla., 12 months. 7.1.3 An embossed cast or molded

From Proposed Standard May 5, 1977	Staff Recommendations	From ANSI B 71.1 - 1972 B 71.1a - 1974 B 71.1b - 1977
		label (sign) shall be considered sufficient to meet the requirements of "durable lable." 7.1.4 Silk screening when used shall meet the requirements of 7.1.1 and 7.1.2. 20. Safety Instructions for Ope[redacted]rs A manufacturer shall supply with the equipment pertinent instructions for safe operation such as shown in Figs. 9 and 10.

F.6

ECONOMIC IMPACT

OF

BLADE CONTACT REQUIREMENTS

FOR POWER MOWERS

January 1979

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I. Introduction

The purpose of this report is to provide information about the probable economic impacts of a mandatory safety rule for walk-behind power lawn mowers. In May, 1977, the Consumer Product Safety Commission published a proposal to regulate power lawn mowers. The proposed rule was applicable to all walk-behind mowers - rotary and reel, riding mowers, and garden tractors. The hazards addressed in the proposed rule were: contact with the blade, thrown objects, fuel ignition hazards, electrical hazards, steering and stability of riding mowers, and braking requirements for riding mowers. A preliminary economic assessment by the Commission, dated February 1977, estimated the costs and projected benefits associated with the proposed standard.

Subsequent to receipt and analysis of comments related to the proposal, the Commission decided to issue a rule limited to the blade contact hazards associated with rotary, walk-behind power lawn mowers. The May 1977 proposal specified a performance requirement for power lawn mowers with a two-step blade stopping time requirement. A two year effective date for a five-second stopping time was to be followed two years later by a three-second stopping time. The Commission staff recommends a single requirement for a three-second stopping time to be effective three years from promulgation.

The rule to be promulgated is a set of performance requirements. Specifically, the blade must stop in three seconds or less after a person leaves the operator's position. Foot probes must be inserted in certain locations without coming into contact with the moving blade or causing any mower part to contact the blade. The means to achieve compliance is left up to the manufacturer.

The provisions of the standard are applicable to rigid and semi-rigid blade mowers. There is some indication that mower production may shift toward greater use of flexible blade mowers, which are not subject to the standard. Although these mowers are not yet widely available and there is not much experience with them, it seems likely that the hazards associated with flexible blades would differ greatly from rigid and semi-rigid blades. In addition, mowers may be marketed with designs that make it impossible to come in contact with a moving blade. Therefore, exemptions from some performance requirements related to blade-stop may be considered by the Commission.

Sources of data for this report include, among others, analyses by private consultants prepared for the Commission and for the Outdoor Power Equipment Institute, and comments received subsequent to publication of the proposal. All data related to costs of compliance and costs of injury have been revised by the Division of Economic Program Analysis to reflect price changes that have occurred since original estimates were made.

It is estimated that 98-99 percent of the total market (by unit volume) of walk-behind mowers will be subject to the standard. Reel mowers, which make up about one percent of walk-behind sales, are subject only to the labeling requirement.

II. Summary

After reviewing available data, our analysis leads to the following observations: in 1977, blade contact mower accidents resulted in about 77,000 injuries. The economic losses associated with these injuries have been estimated to be about $253 million, exclusive of any factor for pain and suffering. The standard is expected to prevent about 59,000 injuries per year, based on the current injury rate. About 8,300 of the injuries estimated to be prevented are amputations. At 1978 prices, once all mowers in consumers hands are in compliance, the economic value of the expected benefits of injury reduction is estimated to be about $211 million annually.

The standard may increase average prices for rotary walk-behind mowers by about $35 per unit. This would have resulted in a maximum total annual increase in retail expenditures of about $189 million, if all of the 1978 production incurred this increase. Power lawn mowers are estimated to have an average expected life of about eight years. Therefore, the cost to a consumer of a safer mower would be about $4.40 per year.

The standard may lead some small firms to drop power mower production, some temporarily, and others permanently; other firms may find that the standard creates an opportunity to enter the industry. The same relative competitiveness is expected to be maintained after the standard as now exists. No significant increase in prices or narrowing of product choice is expected to occur due to the industry net entry or exit. Since exports and imports represent such a small percent of domestic shipments and production, no significant impact is expected on foreign trade.

Because the standard is expected to be highly effective in reducing the hazards associated with walk-behind rotary mowers, the change in overall utility associated with products that comply with the standard is expected to be positive.

III. Mower Market Highlights*

The stock of mowers in consumer use is estimated to be about 40 million. The four largest producers of power lawn mowers account for over one-third of industry shipments. The fifty largest firms manufacturing the class of products that includes power mowers, produce about 96 percent of the value of shipments of these products; the remaining 4 percent is produced by about 30 to 50 very small firms. The total number of firms in the industry is about 80-100. Employment by firms that produce lawn and garden equipment was estimated to be over 18,000 in 1976.

Retail sales of about 5.2 million units produced about 700 million in revenues in 1977. The Outdoor Power Equipment Institute (OPEI) estimated that 5.4 million units will be retailed in 1978. The average retail price of a walk-behind rotary mower is between $125 and $150. Actual prices range from under $100 to around $400.

Most of the firms that are considered manufacturers of power lawn mowers are actually assemblers. Only a few of the largest manufacturers are vertically integrated. Only a few firms produce engines for power lawn mowers, and with the exception of a few mower firms that produce their own engines, most mowers use Briggs and Stratton engines.

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*For a more complete description of the mower mower industry, see "Power Lawn Mowers -- Industry Profile," Nov. 1978. Staff revision of CPSC-C-74-195.

Imports of walk-behind mowers are less than one-half of a percent of U.S. production. About five percent of U.S. production is exported.

IV. Projected Benefits of the Standard

The main objective of the standard is to prevent injuries that occur when a person comes into contact with the moving blade of a mower. The measures adopted in the standard to achieve this objective are two-fold -- a requirement that the blade stop in three seconds or less when the operator leaves the cutting position and a test to allow the mower to be probed in certain locations without the blade being contacted.

The Epidemiology Program Analysis Division has estimated that walk-behind mowers resulted in 77,000 blade contact injuries in 1977. The economic value of these losses is estimated at $253 million (see Appendix). The blade stop requirements are expected annually to prevent 46,500 injuries and the probe requirements 13,000.* The economic losses of these 59,500 injuries are estimated at about $211 million per year (see Appendix), thus, preventing them would result in benefits of that amount if all mowers were in compliance.

V. Retail Price Impacts of the Standard

Since power mower products are differentiated, it is likely that some of the costs incurred to achieve compliance will differ among firms and products. Product differentiation occurs in fuels and fuel sources (gasoline versus electric, house current versus battery), locomotion (push type versus self-propelled), engine design (2-cycle versus 4-cycle), starting means (manual or electric), and blade (rigid versus flexible).

Given the wide range of products covered by the blade contact standard, estimations based on sections of the standard related to types of mowers should be regarded as rough approximations only. Further, the blade contact standard should not be considered in isolation from other potential requirements for reducing mower hazards. Protective devices intended to prevent blade contact may also offer protection against thrown objects; conversely, the design of these devices may influence the approach taken to comply with a future standard on thrown objects.

(a) Blade-Stop Price Impacts

The basic intent of the blade-stop requirement is to have the blade moving only when the operator is in the normal cutting position at the rear of the mower. Thus, it is expected that a control device (deadman control) will have to be actuated while the operator is holding the handle of the mower in order for the blade to move.

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*Source: Power Mower Special Study Data (July 1, 1977-Sept. 30, 1977), U.S. Consumer Product Safety Commission, Directorate for Hazard Identification and Analysis - Epidemiology.

To comply with the blade-stop requirement, some manufacturers have indicated they would utilize braking devices in combination with a clutch or power-restart package. The clutch will eliminate the need to restart the engine each time the blade is stopped. The power-restart may be used in those instances where the engine is stopped along with the blade. Where clutches are used, an additional control that requires activation prior to depressing the deadman control will be needed to avoid accidental depression of the deadman control. This is to protect a person who may be working near the blade when another person accidentally actuates the blade.

For virtually all mowers, the retail price impact of the "deadman" control and the other starting controls is relatively minor, perhaps $3 for the deadman control and $1 for a control to actuate the blade. These estimates, as well as all other cost or price estimates in this section, were provided by Battelle Columbus Laboratories as part of a research report.* The estimates made by Battelle were not significantly different from cost and price estimates by others, such as Stanford Research Institute in a report prepared for the Outdoor Power Equipment Institute.** None of the comments received took issue with the compliance cost estimates. We conclude that the estimates are fairly reliable.

For two-cycle or four-cycle gasoline engine mowers, the two most likely approaches appear to be a centrifugal brake/clutch device or a power-restart package, combined with a brake for the blade.

For gasoline mowers already equipped with electric starting, the retail price impact of the braking mechanism could be as little as $13, assuming that the mower batteries have adequate power reserves for multiple restarts. Of this total about $6.50 would be required for a brake to achieve a three-second stopping time and about $6.50 for all wiring and controls. If a power pack is necessary for multiple restarts, this would add approximately $6.50 to the retail price. Thus, the retail price impact on electric-start mowers could vary from about $13 to $19.50.

An entire system utilizing the brake/clutch approach to the blade stop requirements could have a total retail impact of about $32.50 for gasoline manual start rotary mowers. The other alternative, a blade control system with electric start would add from about $29 to $39.50 for a similar mower.

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*"Research Report on Economic Impact of Proposed Safety Standard for Power Lawn Mowers," CPSC-C-75-0098, Task 8042, Dec. 30, 1976 (Rev. Feb. 18, 1977).

**An Analysis of the Proposed CPSC Lawn Mower Safety Standard, May 1977.

The blade deadman control systems for house current or battery powered mowers might include a control lever, switch, wiring and other modifications to connect them to the on-off switch. This could add about $6.50 to the retail price. An additional $8.50 may be necessary for a brake to achieve a three-second stopping time. Therefore, the total impact on house-current or battery-powered walk-behinds is expected to be about $15 for the 3-second stopping time.

The weighted average retail price increase of the blade stop requirements is expected to be close to $31 per mower, with a range from about $15 for electric rotary to about $33 for gasoline manual start push rotary.

(b) Foot Probe Price Impacts

A combination of closely related requirements for foot probe, an obstruction test, and provisions for movable shields is expected to lead to an interrelated set of design solutions to the problem of blade accessibility. Possible deck reconfiguration, as well as the use of shields and guards, is expected to offer satisfactory results. The expected retail impact of these requirements is estimated to be about $4 per mower, regardless of type of mower.

The total weighted average retail price impact of the standard is expected to be about $35 per mower ($31 for blade-stop, $4 for the foot probe and other requirements). Table 1 summarizes the retail price impacts for different types of mowers.

VI. Utility

The utility aspects of all these systems are similar. They will all provide the operator with a greater sense of security than current mowers, since the operator can position and move around the mower without fear of blade contact. By releasing the deadman control the operator can travel over gravel or other surfaces without fear of thrown objects. A brake-clutch unit may also prevent damage to the engine crankshaft in the event the blade strikes an object.

Very little change is expected in the characteristics of electric mowers, except for the minor effort required to actuate the control for the blade after each blade stop.

There may be some minor disutility associated with complying mowers. Brake-clutch devices generally require three to four seconds to engage the blade, which might add sixty to eighty seconds to each mowing session. Blade engagement and holding down the deadman control require some effort, but the effort is not expected to fatigue the user in typical consumer use. In very heavy brush there may be some difficulty in engaging the blade. Mowers currently on the market also have difficulty in maintaining blade motion in heavy grass.

With electric restart, the only additional effort that will be required will be the switching of the control that will actuate the blade.

TABLE 1

ESTIMATED IMPACT OF PROPOSED STANDARD ON NET RETAIL PRICE PER UNIT FOR SELECTED TYPES OF MOWERS IN 1978 DOLLARS

Type of Machine	Average (a) Net Retail Price Without Standard	Estimated Average Retail Price Impact of Standard on the Effective Date	Percentage Change in Price Resulting from the Standard
Average for All Walk-Behind Mowers	$143	$35(b)	24
Manual Start Push Rotary	125	37	30
Electric Re-Start Self-Propelled Rotary	305	20	7
Electric Rotary	109	19	17

(a) Average prices are Battelle 1976 estimates adjusted for price increases with the Producer Prices and Price Indexes Data for April 1978, Bureau of Labor Statistics

(b) Weighted to reflect the market shares of the three classes listed below.

All of the blade control systems mentioned above will add weight to the mower, perhaps several pounds for gasoline-powered mowers. They may also require some additional maintenance due to the additional controls, wiring, and mechanical components needed for the blade control system. Due to the demands constant restarting puts on the engine, electric restart equipped complying mowers may require more frequent engine maintenance than current mowers. However, mower owners who now turn off their mowers when they leave the operating position would not have their maintenance requirements increase.

VII. Effects on Competition

Statements from industry representatives indicate that they expect large firms with broad product lines to gain a larger share of the market at the expense of small producers with a narrow product line, especially if that narrow product line is largely made up of relatively inexpensive walk-behinds. The top 20 firms in the industry have engineering staffs that can assist in complying with the standard.

The smaller firms often produce the lower priced gasoline rotary walk-behind mowers which are likely to need greater change to bring into compliance. Lower volume over which to spread increased cost and limited access to capital sources may put small manufacturers at further disadvantage. According to the 1972 Census of Manufacture the 50 largest firms manufacture 96 percent of the value of the product class that includes walk-behind mowers (SIC 35247). Thirty to 50 small firms manufacture the remaining 4 percent. Even in the unlikely event all the firms outside the top 50 departed the industry, concentration ratios are not expected to change significantly. The walk-behind mower industry is therefore expected to maintain the same relative competitiveness after the standard as now exists. That is, we do not expect that the possible exit from the industry of a few small firms will have any effect on power mower prices or the range of product choice. Small business effects are discussed in Section IX., below.

VIII. Manufacturing Impact Considerations

The firms that manufacture power walk-behind mowers are a varied group. Some produce only lawn mowers, some only lawn and garden equipment, and others are very product diversified. Some are very large, and some are very small.

The 20 largest firms (based on shipments of lawn and garden equipment in 1972) had an average of $41.3 million in sales, and had an average employment of 745. On the other hand, the 50 smallest firms had shipments that averaged only $1.1 million and an average employment of 29. The 20 largest firms had capital expenditures that averaged $2.2 million in 1972 and the smallest 50 firms averaged $19,000 in capital expenditures in the same year. These differences in size of firms, shipments, capital expenditures, and employment can have various impacts on efforts to comply with the proposed standard.

Several factors are considered important in assessing the capabilities of firms to comply with the proposed standard:

(a) The engineering capabilities and related facilities needed to design complying mowers are not evenly distributed throughout the industry. The 20 largest firms are believed to have engineering staffs that in some cases have turned their attention to the implementation of a new standard. Smaller companies typically lack engineering capabilities and have limited financial and manufacturing resources. These smaller firms will probably rely heavily on both their suppliers and specialized design and engineering organizations.

(b) The most important factor affecting ability to comply with the standard and the cost of compliance is lead time, according to many mower manufacturers. Adequate lead time can minimize adverse effects on sales. If the effective date coincides with the start of the model year (usually around September 1), many firms feel that a minimum of two years lead time from the date of promulgation to effective date would be necessary, although some firms felt that three or four years might be needed.

The following schedule may approximate the time required for making changes to achieve compliance for a typical walk-behind mower:

Activity	Time Required* Months
Redesign appropriate systems and components	1-4
Build prototype of modified unit incorporating design changes	2
Test design	4
Redesign and incorporate change	1-3
Modify prototype and test redesigned models	2
Complete final design and release for production tooling	1-2
Order and receive production tooling	6-8
Manufacture components and assemble first production units	2
Test first production units	2-3
	21-30 months

*Research Report on Economic Impact of Proposed Safety Standard for Power Lawn Mowers, CPSC-C-75-0098, Task 8042, Battelle Columbus Laboratories, December 30, 1976.

The time required could vary from these estimates. For example, if tooling changes are needed for a new deck configuration, the time for tooling could be longer. Or if many manufacturers are ordering components at the same time, from the same suppliers, lead time may lengthen.

IX. Small Business Considerations

Although the largest firms in the industry will probably adapt more readily to the standard than small firms, firm size is not the only factor relating to ease of compliance with the standard. A small manufacturer with only a few models and those relatively close to compliance might be in a better position than a large manufacturer with many models relatively far from compliance It is, however, expected that the small firms producing relatively inexpensive walk-behind mowers will experience the greatest impact from the standard. As mentioned previously, these small firms have fewer units over which to spread the costs of complying with the standard. Some may decide to drop power lawn mower production rather than undergo the expenses of complying.

It is believed that most of the firms not complying with the voluntary standard sponsored by the Outdoor Power Equipment Institute may be found among these small firms. Such firms would incur expenses for product testing and quality control that they had not incurred before. From the 1972 Census of Manufactures data, it appears that some small manufacturers have sales of less than $300,000 annually. With such small sales volume, even minimal certification and compliance requirements might have an impact on a firm's profitability.

The standard is not expected to have a deleterious effect on most small retailers. The small retailers that offer sales and service may actually find themselves in a better position relative to discount stores or catalog showrooms, since consumers may want more information on safety features and more assurance that their mowers will be properly adjusted, assembled, and serviced. Mower outlets such as catalog showrooms, discount stores, and drug stores may suffer some loss of mower market, but mower sales do not account for a significant share of their sales volume.

X. Foreign Trade

No significant impact on foreign trade is expected due to the lawnmower standard. Imports of lawnmowers were valued at $1.6 million dollars in 1977, less than 1 percent of domestic shipments in that year. Exports were about 5 percent by units of domestic shipments, but the export figure includes riding mowers and lawn and garden tractors. Walk-behind rotary mowers do not make up a significant proportion of our trade with any foreign country.

XI. Comparison of Estimated Costs and Projected Benefits

When applied to product safety standards, such as the power mower standard considered here, cost-benefit analysis attempts to identify all of the costs associated with adopting the standard, and compare those costs with the benefits expected.

The principal benefits of the standard are the reduction of injuries associated with power lawn mower accidents, although other benefits such as a greater sense of security and perhaps a more durable product may also be realized. To estimate the benefits in such a way as to compare them with costs, we must assign a monetary value to the total societal costs of power lawn mower accidents. Of the benefits cited here, only the medical costs of accidents and lost working time lend themselves to relatively precise quantification. The pain and suffering associated with accidents, including factors such as psychic damage, are extremely difficult to quantify.

The principal costs to society of complying with the standard are measured by the estimated increase in retail expenditures due to the standard. Other costs that are not so easily quantifiable in monetary values are changes in such variables as consumer utility, competition, technology, and net employment effects.

As evident from the above, not all of the costs and benefits of health and safety standards are readily quantifiable. Therefore, the outcome of cost-benefit analysis is not sufficient for decision making purposes. Other criteria must be considered in balancing the standard against the costs.

In order to assist in evaluating the power mower standard, it may be convenient to compare the estimated quantifiable costs relative to compliance of a single year's production with the quantifiable benefits that are expected to be associated with complying mowers. The costs to consumers occur at the time of purchase of the mower, whereas the benefits to be derived from a safer mower accrue over the life of the mower. Since future benefits are generally valued at less than current benefits, the benefit stream must be discounted to reflect society's time preference.

Choice of a discount rate can affect the outcome of a cost-benefit analysis, since there is an inverse relationship between the discount rate and the present value of the stream. Factors such as the expected rate of change in the price of medical care (which has been rising at a faster rate than consumer prices in general) and many other factors should be considered when a rate is selected. Even when this is done, the choice of rate may not be obvious. The Office of Management and Budget (OMB) in circular no. A-94 (revised) suggests that streams of costs and benefits be discounted at 10 percent. Since a rate closer to 5 percent is available to most consumers who might consider a savings account an appropriate alternative for funds not spent on a product such as lawn mowers, we have discounted benefits at both 10 percent and 5 percent in the example that follows.

The benefits of a single year's sales of complying mowers are assumed to be one-eighth of the total expected benefits based on an assumed eight years expected life of a power lawn mower. In this analysis we use a production of 5.4 million units per year (1978 production estimate).

As mentioned earlier, the standard is expected to prevent about 59,500 injuries annually at an injury cost saving of $211 million, excluding pain and suffering. One year's complying production will thus account for approximately $26.4 million in reduced injury costs per year, assuming that costs of injuries remain constant. However, if the price level continues to rise throughout the ownership of the power mower at the same approximately 6 percent rate that we have experienced for the past 10 years, then the benefits should be price adjusted upward to indicate this rise. Exhibits A and B illustrate the quantifiable costs and benefits under these different assumptions. In both cases, the compliance costs of one year's production are estimated at $189 million (5.4 million units X $35 per unit).

As shown in Exhibit A if we assume constant benefits over the life of the mower, the present value of benefits, exclusive of a factor for pain and suffering, is about $141 million and $171 million, discounted at 10 percent and 5 percent, respectively. This compares with compliance costs of $189.

In Exhibit B, where benefits are price adjusted for inflation, the present value of benefits (again exclusive of a factor for pain and suffering) are about $170 million and $208 million, discounted at 10 percent and 5 percent, respectively.

The results of Exhibit A and B above suggest that:

1) the present value of benefits, exclusive of a factor for pain and suffering, exceeds costs if one assumes a discount rate of 5 percent and also assumes that prices will continue to rise in the future as they have for the past 10 years.

2) the present value of benefits, exclusive of a factor for pain and suffering, is less than costs in two other cases with a discount rate of 10 percent and benefits price adjusted, and discount rate of 5 percent with constant benefits.

3) in the fourth case costs exceed the present value of benefits by about $48 million when a discount rate of 10 percent is combined with constant benefits.

These examples demonstrate that under the assumptions that led to observation 1) above, benefits exceed costs even when no estimate is included for pain and suffering. Among the 59,000 injuries expected to be prevented over the life of a year's production of complying mowers are about 8,300 amputations. If we consider the likely pain and suffering including psychic damages that are associated with the lifetime loss of the use of amputated extremities, the benefits may well exceed costs in situations 2) and 3) above.

Exhibit A

Costs and Constant Benefits Discounted at 10% and 5%

A Year	B Costs (millions)	C Benefits (millions)	D Present Value of Benefits Discounted at 10% (millions)	E Present Value of Benefits Discounted at 5% (millions)
1	$189	$26.4	$24.0	$25.1
2	-	26.4	21.8	23.9
3	-	26.4	19.8	22.8
4	-	26.4	18.0	21.7
5	-	26.4	16.4	20.7
6	-	26.4	14.9	19.7
7	-	26.4	13.6	18.8
8	-	26.4	12.3	17.9
Totals	$189	$211.2	$140.8	$170.6

Exhibit B

Costs and Price Adjusted Benefits Discounted at 10% and 5%

A Year	B Costs (millions)	C Benefits[1/] (millions)	D Present Value of Benefits Discounted at 10% (millions)	E Present Value of Benefits Discounted at 5% (millions)
1	$189	$26.4	$24.0	$25.1
2	-	28.0	23.1	25.4
3	-	29.7	22.3	25.7
4	-	31.5	21.5	25.9
5	-	33.5	20.8	26.3
6	-	35.4	20.0	26.4
7	-	37.5	19.3	26.7
8	-	39.7	18.5	26.9
Totals	$189	$261.7	$169.5	$208.4

1/ Prices are assumed to increase by 6 percent per year.

Note: Exhibit A and B are for a single year's production.

As one indicator of how injuries from lawn mowers are valued, data for 1974 jury verdicts in suits about lawn mower injuries indicate that the average verdict for all types of lawn mower injuries was $35,087, with a mid-point verdict of about $25,000.*

Another approach is to consider cost-effectiveness of accident prevention related to an "average" power lawn mower. The 77,000 injuries per year result in injury costs of about $253 million, exclusive of a factor for pain and suffering. Thus, each injury results in an average cost of about $3,300. Since there are about 40 million mowers in use, we can say that there is about 1 chance in 520 of receiving an injury that will cost about $3,300. Thus, on the average the expected value of injury costs associated with any mower is about $6.35. The standard is expected to yield about $5.30 in undiscounted benefits. The average increase in the retail price of a mower may be about $35, or about $4.40 per year over the eight year expected life of the mower. Thus, a consumer pays $4.40 per year to avoid about $5.30 in expected value of injury costs. Statistically, this is a worthwhile purchase.

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*See Personal Injury Valuation Handbooks, No. 178, Injury Valuation Reports, pp. 1,047-48, Jury Verdict Research, Inc., 1975.

APPENDIX

The total cost of power lawn mower blade contact injuries is based on estimates made by Stanford Research Institute (SRI) as part of a study* conducted for the Outdoor Power Equipment Institute (OPEI). SRI calculated injury costs after reviewing National Safety Council (NSC) and National Highway Traffic Safety Administration (NHTSA) injury costing approaches. SRI's total costs estimates yielded results greater than NSC's, and less than NHTSA's. Differences in the NSC and NHTSA estimates are due to such factors as age of victims, rate of injured persons hospitalized, measures of indirect and intangible costs and severity of injuries. We are in general agreement with the explanations SRI gave for deviating from these other two costing techniques (see pages H-11 - H-15 of SRI report).

Our approach involves allocating the 77,000 blade contact injuries into serious, moderate, and minor categories and applying the appropriate average cost per injury to estimate the total injury costs. Since our injury data groups lacerations and avulsions, and SRI classified avulsions as a moderate injury and lacerations as a minor injury, we had to allocate these, and did so by classifying 95.5 percent as lacerations and 4.5 percent as avulsions.

Similarly, the injury costs expected to be eliminated by the standard are estimated for the three injury categories and totaled.

The SRI injury cost estimates are calculated at 1977 price levels. We have applied the change in medical care prices as reported in the Consumer Price Index to bring the total injury costs up to the 1978 level of prices. Thus, we estimate total injury costs of blade contact at $253 million and injury costs to be reduced at $211 million. Chart 1 illustrates these estimates.

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*An Analysis of the Proposed CPSC Lawn Mower Standard, May, 1977.

CHART 1

Calculations of Power Mower Associated Injury Costs

	A. All Blade Contact Injuries[1] (Annual Estimate)	B. Blade Contact Injuries Estimated to Be Prevented Annually	C. SRI Costs Per Injury	All Blade Contact Injury Costs $ Million (AxC)	Injury Costs Eliminated $ Million (BxC)
Serious Injuries:					
Finger Amputations	7321	6792			
Toe Amputations	2607	1478			
Total	9928	8270	$20,000	199	165
Moderate Injuries:					
Avulsions	2420	1809			
Factures	11452	11125			
Total	13872	12934	$ 1,400	19	18
Minor Injuries:					
Lacerations	51378	38398			
Contusions	2319	323			
Total	53697	38721	300	16	12
	77497[2]	59925[2]			
Total at 1977 Price Levels				234	195
Total at 1978 Price Levels				253[3]	211

1/ Power Mower Baseline Study Data, July 1-Sept. 30, 1977, CPSC.

2/ These totals do not exactly match the estimates of 77,000 and 59,500 previously cited from the Epidemiology Special Study due to rounding reported errors in computer program used to compile these estimates.

3/ The Medical Care Component of the Consumer Price Index rose 8.3% from April 1977 to April 1978. The $253 and $211 million figures are attained by multiplying $234 and $195 million by 108.3, respectively.

ECONOMIC IMPACT

OF

BLADE CONTACT REQUIREMENTS

FOR POWER MOWERS

November 1978

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Division of Economic Program Analysis

I. Introduction

The purpose of this report is to provide information about the probable economic impacts of a mandatory safety rule for walk-behind power lawn mowers. In May, 1977, the Consumer Product Safety Commission published a proposal to regulate power lawn mowers. The proposed rule was applicable to all walk-behind mowers - rotary and reel, riding mowers, and garden tractors. The hazards addressed in the proposed rule were: contact with the blade, thrown objects, fuel ignition hazards, electrical hazards, steering and stability of riding mowers, and braking requirements for riding mowers. A preliminary economic assessment by the Commission, dated February 1977, estimated the costs and projected benefits associated with the proposed standard.

Subsequent to receipt and analysis of comments related to the proposal, the Commission decided to issue a rule limited to the blade contact hazards associated with rotary, walk-behind power lawn mowers. The May 1977 proposal specified a performance requirement for power lawn mowers with a two-step blade stopping time requirement. A two year effective date for a five-second stopping time was to be followed two years later by a three-second stopping time. The Commission has decided instead to promulgate a single requirement for a three-second stopping time to be effective three years from publication.

The rule to be promulgated is a set of performance requirements. Specifically, the blade must stop in three seconds or less after a person leaves the operator's position. Probes must be able to be inserted in certain locations without coming into contact with the blade or causing any mower part to contact the blade. The means to achieve compliance is left up to the manufacturer.

The provisions of the standard are applicable to rigid and semi-rigid blade mowers. There is some indication that mower production may shift toward greater use of flexible blade mowers, which are not subject to the standard. Although these mowers are not yet widely available and there is not much experience with them, it seems likely that the hazards associated with flexible blades would differ greatly from rigid and semi-rigid blades. In addition, mowers may be marketed with designs that make it impossible to come in contact with a moving blade. Therefore, exemptions from some performance requirements related to blade-stop may be considered by the Commission.

Sources of data for this report include, among others, analyses by private consultants prepared for the Commission and for the Outdoor Power Equipment Institute, and comments received subsequent to publication of the proposal. All data related to costs of compliance and costs of injury have been revised by the Division of Economic Program Analysis to reflect price changes that have occurred since original estimates were made.

It is estimated that 98-99 percent of the total market (by unit volume) of walk-behind mowers will be subject to the standard. Reel mowers, which make up about one percent of walk-behind sales, are subject only to the labeling requirement.

II. Summary

After reviewing available data, our analysis leads to the following observations: in 1977, blade contact mower accidents resulted in about 77,000 injuries. The economic losses associated with these injuries have been estimated to be about $253 million, exclusive of any factor for pain and suffering. The standard is expected to prevent about 59,500 injuries per year, based on the current injury rate. About 8,300 of the injuries estimated to be prevented are amputations. The economic value of the expected benefits of injury reduction is estimated to be about $211 million annually once all mowers are in compliance.

The standard may increase average prices for rotary walk-behind mowers by about $35 per unit. This would have resulted in a maximum total annual increase in retail expenditures of about $189 million, if all of the 1978 production incurred this increase. Power lawn mowers are estimated to have an average expected life of about eight years. Therefore, the cost to a consumer of a safer mower would be about $4.40 per year.

The walk-behind mower industry is expected to maintain the same relative competitiveness after the standard as now exists, although some firms may leave the industry. Since exports and imports represent a small percent of domestic shipments and production, no significant impact is expected on foreign trade.

Because the standard is expected to be highly effective in reducing the hazards associated with walk-behind rotary mowers, the change in overall utility associated with products that comply with the standard is expected to be positive.

III. Mower Market Highlights*

The stock of mowers in consumer use is estimated to be about 40 million. The four largest producers of power lawn mowers account for over one-third of industry shipments. The total number of firms in the industry is about 80-100. Employment by firms that produce lawn and garden equipment was estimated to be over 18,000 in 1976.

Retail sales of about 5.2 million units produced about $700 million in revenues in 1977. The Outdoor Power Equipment Institute (OPEI) estimated that 5.4 million units will be retailed in 1978. The average retail price of a walk-behind rotary mower is between $125 and $150. Actual prices range from under $100 to around $400.

Most of the firms that are considered manufacturers of power lawn mowers are actually assemblers. Only a few of the largest manufacturers are vertically integrated. Only a few firms produce engines for power lawn mowers, and with the exception of a few mower firms that produce their own engines, most mowers use Briggs and Stratton engines.

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*For a more complete description of the power mower industry, see "Power Lawn Mowers -- Industry Profile," Nov. 1978. Staff revision of CPSC-C-74-195.

Imports of walk-behind mowers are less than one-half of a percent of U.S. production. About five percent of U.S. production is exported.

IV. Projected Benefits of the Standard

The main objective of the standard is to prevent injuries that occur when a person comes into contact with the moving blade of a mower. The measures adopted in the standard to achieve this objective are two-fold -- a requirement that the blade stop in three seconds or less when the operator leaves the cutting position and a test to allow the mower to be probed in certain locations without the blade being contacted.

The Epidemiology Program Analysis Division has estimated that walk-behind mowers resulted in 77,000 blade contact injuries in 1977. The economic value of these losses is estimated at $253 million (see Appendix). The blade stop requirements are expected annually to prevent 46,500 injuries and the probe requirements 13,000.* The economic losses of these 59,500 injuries are estimated at about $211 million per year (see Appendix), thus, preventing them would result in benefits of that amount if all mowers were in compliance.

V. Retail Price Impacts of the Standard

Since power mower products are differentiated, it is likely that some of the costs incurred to achieve compliance will differ among firms and products. Product differentiation occurs in fuels and fuel sources (gasoline versus electric, house current versus battery), locomotion (push type versus self-propelled), engine design (2-cycle versus 4-cycle), starting means (manual or electric), and blade (rigid versus flexible).

Given the wide range of products covered by the blade contact standard, estimations based on sections of the standard related to types of mowers should be regarded as rough approximations only. Further, the blade contact standard should not be considered in isolation from other potential requirements for reducing mower hazards. Protective devices intended to prevent blade contact may also offer protection against thrown objects; conversely, the design of these devices may influence the approach taken to comply with a future standard on thrown objects.

(a) Blade-Stop Price Impacts

The basic intent of the blade-stop requirement is to have the blade moving only when the operator is in the normal cutting position at the rear of the mower. Thus, it is expected that a control device (deadman control) will have to be actuated while the operator is holding the handle of the mower in order for the blade to move.

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*Source: Power Mower Special Study Data (July 1, 1977-Sept. 30, 1977), U.S. Consumer Product Safety Commission, Directorate for Hazard Identification and Analysis - Epidemiology.

To comply with the blade-stop requirement, some manufacturers have indicated they would utilize braking devices in combination with a clutch or power-restart package. The clutch will eliminate the need to restart the engine each time the blade is stopped. The power-restart may be used in those instances where the engine is stopped along with the blade. Where clutches are used, an additional control that requires activation prior to depressing the deadman control will be needed to avoid accidental depression of the deadman control. This is to protect a person who may be working near the blade when another person accidentally actuates the blade.

For virtually all mowers, the retail price impact of the "deadman" control and the other starting controls is relatively minor, perhaps $3 for the deadman control and $1 for a control to actuate the blade. These estimates, as well as all other cost or price estimates in this section, were provided by Battelle Columbus Laboratories as part of a research report.* The estimates made by Battelle were not significantly different from cost and price estimates by others, such as Stanford Research Institute in a report prepared for the Outdoor Power Equipment Institute.** None of the comments received took issue with the compliance cost estimates. We conclude that the estimates are fairly reliable.

For two-cycle or four-cycle gasoline engine mowers, the two most likely approaches appear to be a centrifugal brake/clutch device or a power-restart package, combined with a brake for the blade.

For gasoline mowers already equipped with electric starting, the retail price impact of the braking mechanism could be as little as $13, assuming that the mower batteries have adequate power reserves for multiple restarts. Of this total about $6.50 would be required for a brake to achieve a three-second stopping time and about $6.50 for all wiring and controls. If a power pack is necessary for multiple restarts, this would add approximately $6.50 to the retail price. Thus, the retail price impact on electric-start mowers could vary from about $13 to $19.50.

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The weighted average retail price increase of the blade stop requirements is expected to be close to $31 per mower, with a range from about $15 for electric rotary to about $33 for gasoline manual start push rotary.

(b) Foot Probe Price Impacts

A combination of closely related requirements for foot probe, an obstruction test, and provisions for movable shields is expected to lead to an interrelated set of design solutions to the problem of blade accessibility. Possible deck reconfiguration, as well as the use of shields and guards, is expected to offer satisfactory results. The expected retail impact of these requirements is estimated to be about $4 per mower, regardless of type of mower.

The total weighted average retail price impact of the standard is expected to be about $35 per mower ($31 for blade-stop, $4 for the foot probe and other requirements). Table 1 summarizes the retail price impacts for different types of mowers.

VI. Utility

The utility aspects of all these systems are similar. They will all provide the operator with a greater sense of security than current mowers, since the operator can position and move around the mower without fear of blade contact. By releasing the deadman control the operator can travel over gravel or other surfaces without fear of thrown objects. A brake-clutch unit may also prevent damage to the engine crankshaft in the event the blade strikes an object.

Very little change is expected in the characteristics of electric mowers, except for the minor effort required to actuate the control for the blade after each blade stop.

There may be some minor disutility associated with complying mowers. Brake-clutch devices generally require three to four seconds to engage the blade, which might add sixty to eighty seconds to each mowing session. Blade engagement and holding down the deadman control require some effort, but the effort is not expected to fatigue the user in typical consumer use. In very heavy brush there may be some difficulty in engaging the blade. Mowers currently on the market also have difficulty in maintaining blade motion in heavy grass.

With electric restart, the only additional effort that will be required will be the switching of the control that will actuate the blade.

TABLE 1

ESTIMATED IMPACT OF PROPOSED STANDARD ON NET RETAIL PRICE PER UNIT FOR SELECTED TYPES OF MOWERS IN 1978 DOLLARS

Type of Machine	Average (a) Net Retail Price Without Standard	Estimated Weighted Average Retail Price Impact of Standard on the Effective Date	Percentage Change in Price Resulting from the Standard
Average for All Walk-Behind Mowers	$143	$35	24
Manual Start Push Rotary	125	37	30
Electric Re-Start Self-Propelled Rotary	305	20	7
Electric Rotary	109	19	17

Source: (a) Average prices are Battelle 1976 estimates adjusted for price increases with the Index of Producer Prices and Prices Indexes Data for April 1978, Bureau of Labor Statistics.

All of the blade control systems mentioned above will add weight to the mower, perhaps several pounds for gasoline-powered mowers. They may also require some additional maintenance due to the additional controls, wiring, and mechanical components needed for the blade control system. Due to the demands constant restarting puts on the engine, electric restart equipped complying mowers may require more frequent engine maintenance than current mowers. However, mower owners who now turn off their mowers when they leave the operating position would not have their maintenance requirements increase.

VII. Effects on Competition

Statements from industry representatives indicate that they expect large firms with broad product lines to gain a larger share of the market at the expense of small producers with a narrow product line, especially if that narrow product line is largely made up of relatively inexpensive walk-behinds. The top 20 firms in the industry have engineering staffs that can assist in complying with the standard.

The smaller firms often produce the lower priced gasoline rotary walk-behind mowers which are likely to need greater change to bring into compliance. Lower volume over which to spread increased cost and limited access to capital sources may put small manufacturers at further disadvantage. According to the 1972 Census of Manufactures the 50 largest firms manufacture 96 percent of the value of the product class that includes walk-behind mowers (SIC 35247). Thirty to 50 small firms manufacture the remaining 4 percent. Even in the unlikely event all the firms outside the top fifty departed the industry, concentration ratios are not expected to change significantly. The walk-behind mower industry is therefore expected to maintain the same relative competitiveness after the standard as now exists, although there would be certain small business effects (see IX. below).

VIII. Manufacturing Impact Considerations

The firms that manufacture power walk-behind mowers are a varied group. Some produce only lawn mowers, some only lawn and garden equipment, and others are very product diversified. Some are very large, and some are very small.

The 20 largest firms (based on shipments of lawn and garden equipment in 1972) had an average of $41.3 million in sales, and had an average employment of 745. On the other hand, the 50 smallest firms had shipments that averaged only $1.1 million and an average employment of 29. The 20 largest firms had capital expenditures that averaged $2.2 million in 1972 and the smallest 50 firms averaged $19,000 in capital expenditures in the same year. These differences in size of firms, shipments, capital expenditures, and employment can have various impacts on efforts to comply with the proposed standard.

Several factors are considered important in assessing the capabilities of firms to comply with the proposed standard:

(a) The engineering capabilities and related facilities needed to design complying mowers are not evenly distributed throughout the industry. The 20 largest firms are believed to have engineering staffs that in some cases have turned their attention to the implementation of a new standard. Smaller companies typically lack engineering capabilities and have limited financial and manufacturing resources. These smaller firms will probably rely heavily on both their suppliers and specialized design and engineering organizations.

(b) The most important factor affecting ability to comply with the standard and the cost of compliance is lead time, according to many mower manufacturers. Adequate lead time can minimize adverse effects on sales. If the effective date coincides with the start of the model year (usually around September 1), many firms feel that a minimum of two years lead time from the date of promulgation to effective date would be necessary, although some firms felt that three or four years might be needed.

The following schedule may approximate the time required for making changes to achieve compliance for a typical walk-behind mower:

Activity	Time Required* Months
Redesign appropriate systems and components	1-4
Build prototype of modified unit incorporating design changes	2
Test design	4
Redesign and incorporate change	1-3
Modify prototype and test redesigned models	2
Complete final design and release for production tooling	1-2
Order and receive production tooling	6-8
Manufacture components and assemble first production units	2
Test first production units	2-3
	21-30 months

*Research Report on Economic Impact of Proposed Safety Standard for Power Lawn Mowers, CPSC-C-75-0098, Task 8042, Battelle Columbus Laboratories, December 30, 1976.

The time required could vary from these estimates. For example, if tooling changes are needed for a new deck configuration, the time for tooling could be longer. Or if many manufacturers are ordering components at the same time, from the same suppliers, lead time may lengthen.

IX. Small Business Considerations

Although the largest firms in the industry will probably adapt more readily to the standard than small firms, firm size is not the only factor relating to ease of compliance with the standard. A small manufacturer with only a few models and those relatively close to compliance might be in a better position than a large manufacturer with many models relatively far from compliance It is, however, expected that the small firms producing relatively inexpensive walk-behind mowers will experience the greatest impact from the standard. As mentioned previously, these small firms have fewer units over which to spread the costs of complying with the standard. Some may decide to drop power lawn mower production rather than undergo the expenses of complying.

It is believed that most of the firms not complying with the voluntary standard sponsored by the Outdoor Power Equipment Institute may be found among these small firms. Such firms would incur expenses for product testing and quality control that they had not incurred before. From the 1972 Census of Manufactures data, it appears that some small manufacturers have sales of less than $300,000 annually. With such small sales volume, even minimal certification and compliance requirements might have an impact on a firm's profitability.

The standard is not expected to have a deleterious effect on most small retailers. The small retailers that offer sales and service may actually find themselves in a better position relative to discount stores or catalog showrooms, since consumers may want more information on safety features and more assurance that their mowers will be properly adjusted, assembled, and serviced. Mower outlets such as catalog showrooms, discount stores, and drug stores may suffer some loss of mower market, but mower sales do not account for a significant share of their sales volume.

X Foreign Trade

No significant impact on foreign trade is expected due to the lawnmower standard. Imports of lawnmowers were valued at $1.6 million dollars in 1977, less than 1 percent of domestic shipments in that year. Exports were about 5 percent by units of domestic shipments, but the export figure includes riding mowers and lawn and garden tractors. Walk-behind rotary mowers do not make up a significant proportion of our trade with any foreign country.

XI. Comparison of Estimated Costs and Projected Benefits

In order to assist in evaluating the standard, it may be convenient to compare the estimated costs relative to compliance of a single year's production with the benefits that are expected to be associated with complying mowers. The costs to consumers occur at the time of purchase of the mower, whereas the benefits to be

derived from a safe mower accrue over the life of the mower. Since future benefits are valued less than current benefits, the benefit stream must be discounted to reflect society's time preference.

The benefits of a single year's sales of complying mowers are assumed to be one-eighth of the total annual expected benefits, based on an assumed eight years expected life of a power lawn mower. The benefits are discounted at 10 percent. In this analysis, we use a production of 5.4 million units per year (1978 production estimate).

As mentioned earlier, the standard is expected to prevent about 59,500 injuries annually at an injury cost saving of $211 million, excluding pain and suffering. One year's complying production will thus account for approximately one-eighth or $26.4 million in reduced injury costs per year. The compliance costs of one year's production are estimated at $189 million (5.4 million units x $35 per unit). Under the assumptions we derive the following:

A Year	B Costs (Millions)	C Benefits (Millions)	D Discount Factor	(CXD) Present Value of Benefits (Millions)
1	$189	$26.4	.909	24.0
2	--	26.4	.826	21.8
3	--	26.4	.751	19.8
4	--	26.4	.683	19.0
5	--	26.4	.621	16.4
6	--	26.4	.564	14.9
7	--	26.4	.513	13.5
8	--	26.4	.467	12.3
	$189	$211.2		$141.7

The present value of benefits as calculated are less than costs. As previously noted, the benefit calculation does not include a factor for pain and suffering associated with injuries. Among the 59,500 injuries expected to be prevented over the life of a year's production of complying mowers are about 8,300 amputations. If a factor of about $5,700 is added for pain and suffering, including the lifetime loss of use of the amputated fingers or toes, the costs would equal benefits. Adding a small amount for such pain and suffering as may be associated with each of the other 51,000 injuries prevented could substantially increase benefits.

As one indicator of how injuries from lawn mowers are valued, data for 1974 jury verdicts in suits about lawn mower injuries indicate that the average verdict for all types of lawn mower injuries was $35,087, with a mid-point verdict of about $25,000.*

Another approach is to consider cost-effectiveness of accident prevention related to an "average" power lawn mower. The 77,000 injuries per year result in injury costs of about $253 million, exclusive of a factor for pain and suffering. Thus, each injury results in an average cost of about $3,300. Since there are about 40 million mowers in use, we can say that there is about 1 chance in 520 of receiving an injury that will cost about $3,300. Thus, on the average the expected value of injury costs associated with any mower is about $6.35. The standard is expected to yield about $5.30 in undiscounted benefits. The average increase in the retail price of a mower may be about $35, or about $4.40 per year over the eight year expected life of the mower. Thus, a consumer pays $4.40 per year to avoid about $5.30 in expected value of injury costs. Statistically, this is a worthwhile purchase.

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*See Personal Injury Valuation Handbooks, No. 178, Injury Valuation Reports, pp. 1,047-48, Jury Verdict Research, Inc., 1975.

APPENDIX

The total cost of power lawn mower blade contact injuries is based on estimates made by Stanford Research Institute (SRI) as part of a study* conducted for the Outdoor Power Equipment Institute (OPEI). SRI calculated injury costs after reviewing National Safety Council (NSC) and National Highway Traffic Safety Administration (NHTSA) injury costing approaches. SRI's total costs estimates yielded results greater than NSC's, and less than NHTSA's. Differences in the NSC and NHTSA estimates are due to such factors as age of victims, rate of injured persons hospitalized, measures of indirect and intangible costs and severity of injuries. We are in general agreement with the explanations SRI gave for deviating from these other two costing techniques (see pages H-11 - H-15 of SRI report).

Our approach involves allocating the 77,000 blade contact injuries into serious, moderate, and minor categories and applying the appropriate average cost per injury to estimate the total injury costs. Since our injury data groups lacerations and avulsions, and SRI classified avulsions as a moderate injury and lacerations as a minor injury, we had to allocate these, and did so by classifying 95.5 percent as lacerations and 4.5 percent as avulsions.

Similarly, the injury costs expected to be eliminated by the standard are estimated for the three injury categories and totaled.

The SRI injury cost estimates are calculated at 1977 price levels. We have applied the change in medical care prices as reported in the Consumer Price Index to bring the total injury costs up to the 1978 level of prices. Thus, we estimate total injury costs of blade contact at $253 million and injury costs to be reduced at $211 million. Chart 1 illustrates these estimates.

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*An Analysis of the Proposed CPSC Lawn Mower Standard, May, 1977.

CHART 1

Calculations of Power Mower Associated Injury Costs

	A. All Blade Contact Injuries[1] (Annual Estimate)	B. Blade Contact Injuries Estimated to Be Prevented Annually	C. SRI Costs Per Injury	All Blade Contact Injury Costs $ Million (AxC)	Injury Costs Eliminated $ Million (BxC)
Serious Injuries:					
Finger Amputations	7321	6792			
Toe Amputations	2607	1478			
Total	9928	8270	$20,000	199	165
Moderate Injuries:					
Avulsions	2420	1809			
Factures	11452	11125			
Total	13872	12934	$ 1,400	19	18
Minor Injuries:					
Lacerations	51378	38398			
Contusions	2319	323			
Total	53697	38721	300	16	12
	77497[2]	59925[2]			
Total at 1977 Price Levels				234	195
Total at 1978 Price Levels				253[3]	211

1/ Power Mower Baseline Study Data, July 1-Sept. 30, 1977, CPSC.

2/ These totals do not exactly match the estimates of 77,000 and 59,500 previously cited from the Epidemiology Special Study due to rounding reported errors in computer program used to compile these estimates.

3/ The Medical Care Component of the Consumer Price Index rose 8.3% from April 1977 to April 1978. The $253 and $211 million figures are attained by multiplying $234 and $195 million by 108.3, respectively.

UNITED STATES GOVERNMENT

Memorandum

U.S. CONSUMER PRODUCT SAFETY COMMISSION

DATE: DEC 19

TO : William F. Kitzes, Program Manager, OPM
Through: Assoc. Exec. Dir. for Compliance & Enforcement
Through: Director, CERM

FROM : Chris Nelson, CERM

SUBJECT: Final Standard for Walk Behind Power Lawn Mowers and Proposed Certification Rule

The purpose of this memorandum is (1) to discuss the enforcement issues associated with the final standard for walk behind power lawn mowers and the proposed certification rule and (2) to provide a brief description, including the estimated cost in staff hours, of the subsequent compliance program that will be initiated by the staff to enforce the standard after it goes into effect.

I. Enforcement Issues

A. General

The final standard for walk behind power mowers defines power mowers which are subject to the standard and describes the requirements with which subject mowers must comply. These requirements address injuries which result from the operator contacting the rotating blade of the mower. A proposed certification rule accompanies the final standard. Under the proposed certification rule manufacturers and importers are responsible for (1) certifying that each model mower subject to the standard complies with all requirements of the standard, (2) basing this certification on a reasonable test program, (3) keeping records which demonstrate that certification was based on a reasonable test program and (4) issuing a certificate of compliance in the form of a permanent label applied to each mower which states that the mower complies with the standard and supplies other specified information.

B. Testing

1. Test Methods

The standard specifies requirements for power mowers and describes the tests the Commission will use to determine compliance with these requirements. Within a year after the final standard is published, the Commission will develop and publish a compliance test manual which will describe in detail the procedures the Commission will follow in testing power mowers for compliance. The compliance test manual will be available on request. Neither the standard nor the certification rule requires that manufacturers use specific test methods for certification testing. The manufacturer may use any test methods which enable him to determine whether or not the mower complies with the standard.

2. Test Frequency

Neither the standard nor the certification rule requires that any testing be performed other than certification testing. The manufacturer could test once for the purpose of certification and never test again as long as he was certain that his production mowers were identical to the mower(s) tested for certification in all ways relating to the ability of the mower to meet the requirements of the standard. Testing and recertification of a model should be done if there are any changes in model specifications which would affect the mower performance in relation to the requirements of the standard. In the event that there were changes in parts, suppliers of parts, or production methods, the prudent manufacturer probably would perform quality control testing or certification type testing to detect any changes in mower performance, particularly in relation to the standard requirements.

3. Testing for Long Term Reliability

There are no requirements for reliability testing (i.e., testing after a specified number of hours or cycles or performance) in either the standard or the certification rule. If a mower model has a component which fails in such a way that the failure presents a substantial product hazard to consumers or the mower has a defect which presents a substantial product hazard, the mower model could be subject to recall under Section 15 of the Consumer Product Safety Act. A defect or component failure which does not result in a hazard to consumers would not cause a mower to be subject to recall under the Consumer Product Safety Act.

If a manufacturer learns of component failures or defects which he believes present a substantial product hazard, he is required by Section 15 of the act to report such failures or defects to the Commission. If after evaluating the problem, the Commission has reason to believe that the failure or defect was not an isolated incident and the degree of hazard is significant, the manufacturer would be required to conduct a recall. The possibility of using manufacturing and test records to limit the recall to products manufactured during a particular time period or at a certain manufacturing site is discussed in the following section.

C. Recordkeeping

1. Content

The certification rule requires that records be kept which demonstrate that a reasonable test program was followed in certifying that mowers comply with the standard. Neither the standard nor the certification rule specifies the content of these records. The manufacturer is responsible for determining what information is sufficient to demonstrate that a reasonable test program was followed.

A manufacturer's records could be useful in limiting the scope of a recall in the event that one was necessary. Records of dates and locations of production of various models; dates of changes in specifications, parts, suppliers, manufacturing procedures, etc.; and dates and results of quality control, or re-certification testing are some of the types of information which could serve to identify the period of time during which non-complying or defective mowers were manufactured. In the absence of such information the entire production of a model would be subject to recall.

2. Format

No format for records is specified by the standard or the certification rule.

D. Non-Compliance

1. Violations of the Standard

The Commission will establish if violations of the standard exist by testing sample mowers of a model according to procedures described in the compliance test manual. Manufacturer's production and test records can be used to demonstrate that violations of that model are limited to a particular lot, manufacturing run, production period, or manufacturing location.

The manufacture for sale, offering for sale, distribution in commerce, or importation into the United States of any power mower which does not comply with the standard is a violation of Section 19(a)(1) of the Consumer Product Safety Act. Civil penalties for such a violation are authorized by Section 20 of the Act if the violation is knowing. Criminal penalties are authorized by Section 21 of the Act if the violation is both knowing and willful.

The Commission may bring an injunction against any person or firm to restrain the manufacture, distribution or importation of any power mowers which do not comply with the standard in accordance with Section 22(a) of the Consumer Product Safety Act, not withstanding the fact that the products may have been certified to comply with the standard.

Any power mowers which do not comply with the standard are subject to seizure in accordance with Section 22(b) of the Consumer Product Safety Act, notwithstanding the fact that the products may have been certified to comply with the standard.

2. Violations of Certification Requirements

Failure to issue a certificate of compliance or knowingly issuing a false certificate of compliance is a violation of Section 19(a)(6) of the Consumer Product Safety Act for which civil penalties may be assessed under Section 20 of the Act. Criminal penalties may be assessed under Section 21 of the Act if the violation is both knowing and willful.

II. Compliance and Enforcement Strategy

A. Profile of the Industry

Based on information provided by the economic analysis staff, we estimate that there are 50 major manufacturers who produce approximately 96% of the walk behind power mowers for the consumer market and 30 to 50 smaller manufacturers who produce the remaining 4%. We believe that almost all are domestic manufacturers. There is one industry trade association which has closely followed the development of the standard and could be of assistance to the Commission in educating member firms. This industry trade association represents almost all of the major manufacturers. We believe that most of the smaller manufacturers do not belong to the trade association. These firms must be located and educated prior to the effective date of the standard if 100% compliance is to be achieved.

B. Training and Information Programs

There are two major target groups to reach with training and information programs relating to compliance: CPSC personnel and power mower manufacturers.

1. CPSC Personnel.

a. CPSC Laboratory Technicians.

Training in how to perform compliance testing and report and evaluate results will be necessary for CPSC laboratory technicians. It is imperative that tests be performed correctly and that testing be uniform from one technician to another and from one laboratory to another, if testing is done in field labs as well as the headquarters lab. We believe that training could be conducted on an informal basis, and the number of people involved would be small.

b. CPSC Investigators.

CPSC investigators who will inspect power mower manufacturers will need training on the requirements of the standard. Some area offices may choose to send one investigator for training, but those area offices with a relatively heavy concentration of mower manufacturers located within their jurisdictions may want to send two investigators for training. Training should be conducted in a location where there is a laboratory and equipment available for testing demonstrations. The training course should include the requirements of the standard, familiarization with the features of power mowers particularly as they relate to the standard requirements, familiarization with the tests CPSC will conduct to evaluate compliance, field screening of power mowers, and test records, and information to collect during establishment inspection. Training CPSC investigators would require an estimated _____ staff hours ($).

2. Manufacturers.

There are several strategies we can use to reach and educate manufacturers. The first strategy is to mail a copy of the standard to every manufacturer of power mowers, engines and other components that we can identify through the industry association and business registers. The area offices may be able to help identify smaller manufacturers and assemblers. Copies of the standard should be mailed soon after the final standard is published. Compliance with the standard generally will involve redesign, testing of new designs and retooling for manufacture, and these are time consuming processes.

As mentioned earlier in this memorandum, within a year of publication of the final standard a compliance test manual will be developed which will describe in detail the procedures the Commission will follow in conducting compliance testing. This test manual will be available on request. When we mail copies of the final standard to manufacturers, we can enclose a stamped self addressed post card which the manufacturers can use to indicate that they would like to receive a copy of the compliance test manual. The cost of mailing copies of the standard to 100-150 manufacturers would be minimal.

The staff of the Engineering Laboratory is willing to meet with manufacturers on an individual basis to discuss test procedures and how to apply them to various features of the mower. We could conduct a compliance seminar if a number of manufacturers express an interest in having one. If the compliance seminar were to include demonstrations of the test procedures the Commission will be using, it would be held at the CPSC Engineering Laboratory or at the National Bureau of Standards. If the compliance seminar involved a discussion of legal issues and standard requirements but no demonstration of test procedures, regional seminars could be held at several CPSC area offices around the country. Regional seminars could include a videotape of test procedures as a substitute for actual demonstrations.

C. Initial Compliance Program

1. Number of Manufacturers to be Inspected

During the first eight months after the standard goes into effect we anticipate inspecting 12 (one-fourth) of the major manufacturers and 12 (one-fourth) of the smaller manufacturers. This total of 24 inspections should provide sufficient data to evaluate the level of industry compliance and the need for further enforcement activity.

2. Information to Obtain During Inspections

In addition to obtaining routine inspectional data, investigators will determine the number of models of power mowers manufactured and the identification of each model and will obtain a description of each model. Investigators will determine whether the manufacturer is aware of the standard (we anticipate that most manufacturers will be), what the manufacturer has done to comply with the standard and whether he has any questions regarding the requirements of the standard. Investigators will be encouraged to refer questions on technical matters to headquarters for reply. Investigators will also determine whether the manufacturer has done or is doing any in house certification testing, what records are kept on testing, what certification and quality control test procedures are used, when was certification testing conducted, what were the test results; observe any testing being performed; and obtain descriptions of test procedures used. If certification testing is performed by an outside party such as a testing laboratory, the identity and location of the outside party will be determined as well as information on test records, procedures, frequency and results. Certification test results and individual power mowers will be examined for purposes of field screening. Since inspections will involve examining test procedures, records and individual mowers, inspection time will be greater than the average of 11.4 hours. We estimate that the average time to complete an initial inspection for this standard will be 25 hours. The total estimated time for inspections is 600 hours of field time ($21,600).

3. Field Screening of Power Mowers

Investigators can do field screening of power mowers by examining certification test results for borderline results and examining the mower itself. However, only limited field screening of the mower is possible because special test fixtures and equipment are needed and/or it is necessary to start and operate the mower in order to evaluate compliance with several requirements of the standard including shield strength, blade stopping time and the obstruction test. The test fixtures and equipment are cumbersome, and it would be impractical and time consuming to transport and set them up at retail outlets or manufacturing facilities. Furthermore, we believe it is not feasible to operate power mowers in or around retail establishments or some manufacturing facilities

because of noise from both electric and gasoline powered mowers, exhaust from gasoline powered mowers, and the exposure of investigators, bystanders and property to fire and burn hazards by the use of gasoline. As we learn more about what the industry will do to comply with the standard, we may be able to develop more specific measures for field screening.

4. Compliance Samples

For each manufacturer inspected, we anticipate collecting two models of lawnmowers for compliance testing. Three mowers of each model will be obtained for a total of six mowers per manufacturer. For purposes of this compliance program, a sample of power mowers would be three mowers of the same model, and each individual mower would be a sub-sample. A maximum of 144 mowers representing 48 models would be collected during the initial compliance program. If test results of early samples indicate that variation between mowers of the same model is minimal, it may be possible to reduce the number of mowers collected during the latter part of the initial compliance program.

In selecting models for sampling, the investigator first will examine certification test results to see if the test results for any model are borderline. The investigator will do a limited examination of the mower. If there are no borderline test results or obviously suspect mowers, only one sample or no samples may be collected.

Some samples may be collected from the manufacturer at the time of the inspection. Because of the size of the samples, it may be impossible to collect all six mowers at one time unless it can be arranged to ship sample mowers directly from the manufacturer to the CPSC test lab. If direct shipment is impossible, additional mower sub-samples can be collected on a return trip to the manufacturer or from retail outlets. Mowers of the same model should be collected and shipped within approximately a one month period so that they can be tested together. Sample collections will be spread out over an eight month period to avoid overloading lab test facilities.

The time required for collecting sub-sample mowers could vary from 5.1 hours (average sample collection time) if all three sub-samples were collected from one location to 15.3 hours if sub-samples were collected from three separate locations. The estimated total time for sample collections is 244.8 to 734.4 hours of field time ($7,200 to $25,200).

Based on information supplied by the staff of economic analysis, it is estimated that the average wholesale cost of each sub-sample mower will be $150. The estimated cost to purchase samples is $21,600. The time required for laboratory testing is estimated to be one year or 1400 hours headquarters time ($36,000).

D. Follow-Up on Non-Compliance

We estimate that the rate of compliance could range from 75% to 95%. Our previous experience with other standards indicates an average rate of noncompliance of 25%. However, we believe that compliance could be as high as 95% for two reasons. First, 96% of power mowers for consumers are manufactured by 50 major manufacturers, most of whom have monitored the development of the standard through the industry trade association. We believe that these major manufacturers will be well informed regarding the requirements of the standard. Second, manufacturing variations can be minimized. If a model mower complies with the requirements of the standard initially, if quality control measures are followed and if changes or substitutions of parts, and production changes are monitored to make sure that there are no changes in model specifications or performance which would affect the ability of the mower to comply with the standard, production mowers should continue to be in compliance. At the lower rate of compliance of 75%, six cases of non-compliance would be identified through the initial compliance program. Reinspection of each of six firms could be accomplished in an average inspection time of 11.4 hours and a total of 68.4 field staff hours ($2520).

Based on previous experience we anticipate that three cases would be litigated at 450 hours of time per case or a total of 1,350 hours of headquarters time ($32,400).

E. Evaluating Results and Planning Future Compliance Programs

The information obtained from inspections and compliance testing of samples will enable us to estimate the overall level of compliance of the industry and identify particular problem areas. Problem areas may center around certain requirements of the standard, mowers with certain features, mowers in a particular price range or certain types of manufacturers. We will know much more about industry practices and approaches to meeting the requirements of the standard when the initial compliance program ends. A future compliance program can be designed to focus on the particular problem areas identified in the initial compliance program. We may be able to develop more extensive screening criteria and tests, and we can limit testing to those requirements where there was significant non-compliance. If compliance with the standard is found to be generally high, and there are no major problem areas, the future compliance program can be postponed, or we can implement a very limited compliance program.

UNITED STATES GOVERNMENT

Memorandum

U.S. CONSUMER PRODUCT SAFETY COMMISSION

DEC 2 1 1978

TO : William F. Kitzes, OPM
Through: Assoc. Exec. Dir. for Compliance & Enforcement
Through: Director, CERM

DATE:

FROM : Chris Nelson, CERM

SUBJECT: Update of December 19, 1978 Memorandum on Final Standard for Walk Behind Power Mowers and Proposed Certification Rule

This memorandum includes additional and corrected preliminary estimates of time and cost for the initial compliance program for the power mower standard. Page numbers given for each subject refer to the December 19, 1978 memo.

Development of a Compliance Test Manual (P. 1&5)
4 sm. (Engineering)

Training Investigators (P. 5)
4 sm. (Engineering)
.5 sm. (Compliance & Enforcement)
1.5 sm. (Training Division - professional and clerical staff time)
1 sm. (Field)
Travel and Per Diem for Attendees $6,000

Seminars for Manufacturers - Tentative (P. 5)
3 sm. (Engineering) To plan and conduct seminars
2 sm. (Engineering) To develop videotape on testing
1 sm. (Compliance and Enforcement)

Engineering Analysis of Technical Information Obtained During Inspections (P. 6)
Engineering analysis will be required only in cases involving noncompliance. See estimates under "Follow-Up on Noncompliance"

Compliance Testing of Samples (P. 7)
Original estimate is changed from 12 sm. to 15 sm. (Engineering)

Follow-Up on Noncompliance (P. 8)
4 sm. (Eningeering) Additional compliance testing
8 sm. (Engineering) Engineering support for analysis of inspection data.

The estimate of 1,350 hours for litigation is for Compliance and Enforcement.

Except where noted, resource estimates are in terms of professional staff time and exclude items such as leave, supervision and clerical support as done currently in budget and planning exercises.