

Need for Correction

As published, the final rule contained a number of minor technical errors that may prove to be misleading and are in need of clarification. The reasons for these technical changes (including clarifying section references and correcting minor grammatical errors) are, for the most part, self-evident. None of these changes is intended to effect substantive requirements; they only correct inadvertent errors in the July 1, 1994 final rule and ensure consistency within the Appendices to the final rule, and between them and the regulatory text.

Corrections 7 and 8, while also technical and non-substantive in nature, warrant a brief discussion. To avoid confusion, corrections 7 and 8 are made to clarify that the Emergency Notification Phone List and Spill Response Notification Form are each separate parts of Section 1.3.1 of the overall response plan. Thus, items 2 and 3 of Section 1.1 each call for a partial inclusion of Section 1.3.1 (item 2 calls for the Emergency Notification Phone List and item 3 calls for the Spill Response Notification Form). Together, items 2 and 3 call for the complete Section 1.3.1. As published, the final rule incorrectly stated that items 2 and 3 each called for the complete Section 1.3.1. This is being corrected to state that each calls for only part of Section 1.3.1.

In addition, an inaccuracy in the summary section of the preamble to the final rule needs to be noted. The U.S. Environmental Protection Agency regulates non-transportation-related facilities under sections 311(j)(1)(C) and 311(j)(5) of the CWA as delegated by Executive Order 12777. The preamble language in one instance incorrectly and inadvertently indicated that the Oil Pollution Prevention regulation applied to transportation-related facilities.

Correction of Publication**PART 112—[CORRECTED]**

Accordingly, the final rule is corrected as follows:

1. On page 34110, in the third column, in the first paragraph under section A.2.3, in line 7, "A2(b)" is corrected to read "A.2.2".

2. On page 34111, in the first column, in the first paragraph under section B.2.3, in line 9, "B2(b)" is corrected to read "B.2.2".

3. On page 34112, in the first column, in section 1.2.8, the text which reads "Other definitions are included in § 112.2, section 1.2 of Appendices C and E, and section 3.0 of Appendix F" is

corrected to read "Other definitions are included in § 112.2 and section 1.1 of Appendix C".

4. On page 34112, in the third column, in section 4.3, in line 9, the text which reads "section 1.2" is corrected to read "section 1.1".

5. On page 34114, in the third column, in section 7.3, in line 4, the text which reads "for Groups 1" is corrected to read "for Group 1".

6. On page 34115, in the first column, in section 7.4, in line 4, the text which reads "for a facility" is deleted.

7. On page 34124, in the first column, in section 1.1, in item 2, the word "complete" is corrected to read "partial".

8. On page 34124, in the first column, in section 1.1, in item 3, the word "complete" is corrected to read "partial".

9. On page 34135, in the second column, in the heading for section 2.1, the text which reads "Page One—General Information" is corrected to read "General Information".

10. On page 34135, in the second column, in the heading for section 2.2, the text which reads "Page Two—Applicability of Substantial Harm Criteria" is corrected to read "Applicability of Substantial Harm Criteria".

11. On page 34135, in the third column, in the heading for section 2.3, the text which reads "Page Three—Certification" is corrected to read "Certification".

Authority: 33 U.S.C. 1321 and 1361; E.O. 12777 (October 18, 1991), 3 CFR, 1991 comp., p. 351.

Dated: September 19, 1994.

Elliott P. Laws,
Assistant Administrator.

[FR Doc. 94-23764 Filed 9-23-94; 8:45 am]

BILLING CODE 6560-50-P

FEDERAL COMMUNICATIONS COMMISSION**47 CFR Part 73**

[MM Docket No. 91-140; DA 94-1013]

Revision of Radio Rules and Policies

AGENCY: Federal Communications Commission.

ACTION: Final rule; correction of rule and confirmation of effective date.

SUMMARY: This *Order* confirms that the stay of certain changes to the FCC's multiple ownership rule was lifted on September 16, 1992, and reprints the corrected rule in its entirety. The Mass Media Bureau takes this action to ensure

that the correct version of the rule is printed in the Code of Federal Regulations. Because the stay was lifted in an ordering clause to a Commission document but not in the Federal Register summary associated with that document, the lifting of the stay was not recognized by the Federal Register. As a result, the rule is currently printed in the Code of Federal Regulations as if the stay was still in effect. This *Order* is intended solely to correct the outdated version of the multiple ownership rule; no substantive rule changes have been made.

EFFECTIVE DATE: September 26, 1994.

FOR FURTHER INFORMATION CONTACT: Jane Hinckley Halprin, Mass Media Bureau, Policy and Rules Division, (202) 637-7792.

SUPPLEMENTARY INFORMATION:**Order**

Adopted: September 15, 1994

Released: September 19, 1994

In the Matter of: Revision of Radio Rules and Policies.

By the Acting Chief, Mass Media Bureau:

1. In its *Report and Order* in MM Docket No. 91-140, 7 FCC Rcd 2755 (1992), 57 FR 18089 (April 29, 1992), the Commission amended 47 CFR 73.3555. The effective date of the changes adopted in the *Report and Order* was subsequently deferred pending resolution of petitions for reconsideration. *Order Deferring Effective Date* in MM Docket No. 91-140, FCC 92-351 (released July 30, 1992), 57 FR 35763 (Aug. 11, 1992). The stay of the effective date was lifted by *Memorandum Opinion and Order* in MM Docket No. 91-140, 7 FCC Rcd 6387 (1992), 57 FR 42701 (September 16, 1992). Because the stay was lifted in an ordering clause to the document rather than in the Appendix that contained the modified rules, the lifting of the stay was not picked up by the Federal Register. As a result, the rule is currently printed in the Code of Federal Regulations as if the stay was still in effect.

2. This *Order* is intended solely to correct the outdated version of Section 73.3555 currently printed in the Code of Federal Regulations. No substantive changes have been made to the rules; notice and comment are therefore unnecessary. See 5 U.S.C. 553(b)(3). The correct version of § 73.3555 is printed in its entirety below.

3. Accordingly, it is ordered that 47 CFR § 73.3555 is amended as set forth below.

List of Subjects in 47 CFR Part 73

Radio broadcasting.

Federal Communications Commission.

Renee Licht,

Acting Chief, Mass Media Bureau.

Rule Changes

Part 73 of Title 47 of the U.S. Code of Federal Regulations is amended to read as follows:

PART 73—RADIO BROADCAST SERVICES

1. The Authority Citation for Part 73 continues to read as follows:

Authority: 47 U.S.C. 154, 303, 334.

2. The stay of the effective date of § 73.3555 was lifted by publication of a *Memorandum Opinion and Order* in MM Docket No. 91-140 in the *Federal Register* at 57 FR 42701 (September 16, 1992), and § 73.3555 is revised to read as follows:

§ 73.3555 Multiple ownership.

(a)(1) *Radio contour overlap rule.* No license for an AM or FM broadcasting station shall be granted to any party (including all parties under common control) if the grant of such license will result in overlap of the principal community contour of that station and the principal community contour of any other broadcasting station directly or indirectly owned, operated, or controlled by the same party, except that such license may be granted in connection with a transfer or assignment from an existing party with such interests, or in the following circumstances:

(i) In radio markets with 14 or fewer commercial radio stations, a party may own up to 3 commercial radio stations, no more than 2 of which are in the same service (AM or FM), provided that the owned stations, if other than a single AM and FM station combination, represent less than 50 percent of the stations in the market.

(ii) In radio markets with 15 or more commercial radio stations, a party may own up to 2 AM and 2 FM commercial stations, provided, however, that evidence that grant of any application will result in a combined audience share exceeding 25 percent will be considered *prima facie* inconsistent with the public interest.

Note to paragraph (a)(1)(ii): When evaluating audience share evidence submitted under § 73.3555(a)(1)(ii), the Commission will consider data that eliminates statistical anomalies, provides a better focused survey area or includes revenue data or other relevant information. Where applicants certify that they do not

have readily available audience share data, they may substitute other information that can serve as a proxy for such data. See *Memorandum Opinion and Order* in MM Docket No. 91-140, 7 FCC Rcd 6387 (1992), 57 FR 42701 (Sept. 16, 1992).

(iii) Overlap between two stations in different services is permissible if neither of those two stations overlaps a third station in the same service.

(2)(i) Where the principal community contours of two radio stations overlap and a party (including all parties under common control) with an attributable ownership interest in one such station brokers more than 15 percent of the broadcast time per week of the other such station, that party shall be treated as if it has an interest in the brokered station subject to the limitations set forth in paragraphs (a) and (e) of this section. This limitation shall apply regardless of the source of the brokered programming supplied by the party to the brokered station.

(ii) Every time brokerage agreement of the type described in paragraph (a)(2)(i) of this section shall be undertaken only pursuant to a signed written agreement that shall contain a certification by the licensee or permittee of the brokered station verifying that it maintains ultimate control over the station's facilities, including specifically control over station finances, personnel and programming, and by the brokering station that the agreement complies with the provisions of paragraphs (a)(1) and (e)(1) of this section.

(iii) Any party operating in conflict with the requirements of paragraph (a)(2)(ii) of this section on September 16, 1992 shall come into compliance within one year thereafter.

(3) For purposes of this paragraph:

(i) The "principal community contour" for AM stations is the predicted or measured 5 mV/m groundwave contour computed in accordance with § 73.183 or § 73.186 and for FM stations is the predicted 3.16 mV/m contour computed in accordance with § 73.313.

(ii) The number of stations in a radio market is the number of commercial stations whose principal community contours overlap, in whole or in part, with the principal community contours of the stations in question (i.e., the station for which an authorization is sought and any station in the same service that would be commonly owned whose principal community contour overlaps the principal community contour of that station). In addition, if the area of overlap between the stations in question is overlapped by the principal community contour of a commonly owned station or stations in

a different service (AM or FM), the number of stations in the market includes stations whose principal community contours overlap the principal community contours of such commonly owned station or stations in a different service.

(iii) A station's "audience share" is the average number of persons age 12 or older on an average quarter hour basis, Monday-Sunday, 6 a.m.-midnight, who listen to the station, expressed as a percentage of the average number of persons listening to AM and FM stations in that radio metro market or a recognized equivalent, in which a majority of the overlap between the stations in question takes place. The "combined audience share" is the total audience share of all AM or FM stations that would be under common ownership or control following a proposed acquisition. In situations where no metro market or recognized equivalent exists, the relevant audience share data are the data for all counties that are within the principal community contours of the stations in question, in whole or in part.

(iv) "Time brokerage" is the sale by a licensee of discrete blocks of time to a "broker" that supplies the programming to fill that time and sells the commercial spot announcements in it.

(b) *Television contour overlap (duopoly) rule.* No license for a TV broadcast station shall be granted to any party (including all parties under common control) if the grant of such license will result in overlap of the Grade B contour of that station (computed in accordance with § 73.684) and the Grade B contour of any other TV broadcast station directly or indirectly owned, operated, or controlled by the same party.

(c) *One-to-a-market ownership rule.* No license for an AM, FM or TV broadcast station shall be granted to any party (including all parties under common control) if such party directly or indirectly owns, operates or controls one or more such broadcast stations and the grant of such license will result in:

(1) The predicted or measured 2 mV/m groundwave contour of an existing or proposed AM station, computed in accordance with § 73.183 or § 73.186, encompassing the entire community of license of an existing or proposed TV broadcast station(s), or the Grade A contour(s) of the TV broadcast station(s), computed in accordance with § 73.684, encompassing the entire community of license of the AM station; or

(2) The predicted 1 mV/m contour of an existing or proposed FM station, computed in accordance with § 73.313, encompassing the entire community of

license of an existing or proposed TV broadcast station(s), or the Grade A contour(s) of the TV broadcast station(s), computed in accordance with § 73.684, encompassing the entire community of license of the FM station.

(d) *Daily newspaper cross-ownership rule.* No license for an AM, FM or TV broadcast station shall be granted to any party (including all parties under common control) if such party directly or indirectly owns, operates or controls a daily newspaper and the grant of such license will result in:

(1) The predicted or measured 2 mV/m contour of an AM station, computed in accordance with § 73.183 or § 73.186, encompassing the entire community in which such newspaper is published; or

(2) The predicted 1 mV/m contour for an FM station, computed in accordance with § 73.313, encompassing the entire community in which such newspaper is published; or

(3) The Grade A contour of a TV station, computed in accordance with § 73.684, encompassing the entire community in which such newspaper is published.

(e)(1) *National multiple ownership rule.* No license for a commercial AM, FM or TV broadcast station shall be granted, transferred or assigned to any party (including all parties under common control) if the grant, transfer or assignment of such license would result in such party or any of its stockholders, partners, members, officers or directors, directly or indirectly, owning, operating or controlling, or having a cognizable interest in:

(i) More than 18 AM or more than 18 FM stations, or more than 20 AM or more than 20 FM stations two years after the effective date of this rule, provided, however, that an entity may have an attributable but noncontrolling interest in an additional 3 AM and 3 FM stations that are small business controlled or minority-controlled;

(ii) More than 14 television stations; or

(iii) More than 12 television stations that are not minority-controlled.

(2) No license for a commercial TV broadcast station shall be granted, transferred or assigned to any party (including all parties under common control) if the grant, transfer or assignment of such license would result in such party or any of its stockholders, partners, members, officers or directors, directly or indirectly, owning, operating or controlling, or having a cognizable interest in, either:

(i) TV stations which have an aggregate national audience reach exceeding thirty (30) percent, or

(ii) TV stations which have an aggregate national audience reach exceeding twenty-five (25) percent and which are not minority-controlled.

(3) For purposes of this paragraph:

(i) *National audience reach* means the total number of television households in the Arbitron Area of Dominant Influence (ADI) markets in which the relevant stations are located divided by the total national television households as measured by ADI data at the time of a grant, transfer or assignment of a license. For purposes of making this calculation, UHF television stations shall be attributed with 50 percent of the television households in their ADI market. Where the relevant application forms require a showing with respect to audience reach and the application relates to an area where Arbitron ADI market data are unavailable, then the applicant shall make a showing as to the number of television households in its market. Upon such a showing, the Commission shall make a determination as to the appropriate audience reach to be attributed to the applicant.

(ii) *TV broadcast station or TV station* excludes stations which are primarily satellite operations.

(iii) *Minority-controlled* means more than 50 percent owned by one or more members of a minority group.

(iv) *Minority* means Black, Hispanic, American Indian, Alaska Native, Asian and Pacific Islander.

(v) *Small business* means an individual or business entity which, at the time of application to the Commission, had, including all affiliated entities under common control, annual revenues of less than \$500,000 and assets of less than \$1,000,000.

(f) This section is not applicable to noncommercial educational FM and noncommercial educational TV stations.

Note 1: The word "control" as used herein is not limited to majority stock ownership, but includes actual working control in whatever manner exercised.

Note 2: In applying the provisions of this section, ownership and other interests in broadcast licensees, cable television systems and daily newspapers will be attributed to their holders and deemed cognizable pursuant to the following criteria:

(a) Except as otherwise provided herein, partnership and direct ownership interests and any voting stock interest amounting to 5% or more of the outstanding voting stock of a corporate broadcast licensee, cable television system or daily newspaper will be cognizable;

(b) No minority voting stock interest will be cognizable if there is a single holder of more than 50% of the outstanding voting stock of the corporate broadcast licensee, cable television system or daily newspaper in which the minority interest is held;

(c) Investment companies, as defined in 15 U.S.C. 80a-3, insurance companies and banks holding stock through their trust departments in trust accounts will be considered to have a cognizable interest only if they hold 10% or more of the outstanding voting stock of a corporate broadcast licensee, cable television system or daily newspaper, or if any of the officers or directors of the broadcast licensee, cable television system or daily newspaper are representatives of the investment company, insurance company or bank concerned. Holdings by a bank or insurance company will be aggregated if the bank or insurance company has any right to determine how the stock will be voted. Holdings by investment companies will be aggregated if under common management.

(d) Attribution of ownership interests in a broadcast licensee, cable television system or daily newspaper that are held indirectly by any party through one or more intervening corporations will be determined by successive multiplication of the ownership percentages for each link in the vertical ownership chain and application of the relevant attribution benchmark to the resulting product, except that wherever the ownership percentage for any link in the chain exceeds 50%, it shall not be included for purposes of this multiplication. [For example, if A owns 10% of company X, which owns 60% of company Y, which owns 25% of "Licensee," then X's interest in "Licensee" would be 25% (the same as Y's interest since X's interest in Y exceeds 50%), and A's interest in "Licensee" would be 2.5% (0.1x0.25). Under the 5% attribution benchmark, X's interest in "Licensee" would be cognizable, while A's interest would not be cognizable.]

(e) Voting stock interests held in trust shall be attributed to any person who holds or shares the power to vote such stock, to any person who has the sole power to sell such stock, and to any person who has the right to revoke the trust at will or to replace the trustee at will. If the trustee has a familial, personal or extra-trust business relationship to the grantor or the beneficiary, the grantor or beneficiary, as appropriate, will be attributed with the stock interests held in trust. An otherwise qualified trust will be ineffective to insulate the grantor or beneficiary from attribution with the trust's assets unless all voting stock interests held by the grantor or beneficiary in the relevant broadcast licensee, cable television system or daily newspaper are subject to said trust.

(f) Holders of non-voting stock shall not be attributed an interest in the issuing entity. Holders of debt and instruments such as warrants, convertible debentures, options or other non-voting interests with rights of conversion to voting interests shall not be attributed unless and until conversion is effected.

(g)(1) A limited partnership interest shall be attributed to a limited partner unless that partner is not materially involved, directly or indirectly, in the management or operation of the media-related activities of the partnership and the licensee or system so certifies.

(2) In order for a licensee or system to make the certification set forth in paragraph

(g)(1) of this section, it must verify that the partnership agreement or certificate of limited partnership, with respect to the particular limited partner exempt from attribution, establishes that the exempt limited partner has no material involvement, directly or indirectly, in the management or operation of the media activities of the partnership. The criteria which would assume adequate insulation for purposes of this certification are described in the *Memorandum Opinion and Order* in MM Docket No. 83-46, FCC 85-252 (released June 24, 1985), as modified on reconsideration in the *Memorandum Opinion and Order* in MM Docket No. 83-46, FCC 86-410 (released November 28, 1986). Irrespective of the terms of the certificate of limited partnership or partnership agreement, however, no such certification shall be made if the individual or entity making the certification has actual knowledge of any material involvement of the limited partners in the management or operation of the media-related businesses of the partnership.

(h) Officers and directors of a broadcast licensee, cable television system or daily newspaper are considered to have a cognizable interest in the entity with which they are so associated. If any such entity engages in businesses in addition to its primary business of broadcasting, cable television service or newspaper publication, it may request the Commission to waive attribution for any officer or director whose duties and responsibilities are wholly unrelated to its primary business. The officers and directors of a parent company of a broadcast licensee, cable television system or daily newspaper, with an attributable interest in any such subsidiary entity, shall be deemed to have a cognizable interest in the subsidiary unless the duties and responsibilities of the officer or director involved are wholly unrelated to the broadcast licensee, cable television system or daily newspaper subsidiary, and a statement properly documenting this fact is submitted to the Commission. [This statement may be included on the appropriate Ownership Report.] The officers and directors of a sister corporation of a broadcast licensee, cable television system or daily newspaper shall not be attributed with ownership of these entities by virtue of such status.

(i) Discrete ownership interests will be aggregated in determining whether or not an interest is cognizable under this section. An individual or entity will be deemed to have a cognizable investment if:

- (1) The sum of the interests held by or through "passive investors" is equal to or exceeds 10 percent; or
- (2) The sum of the interests other than those held by or through "passive investors" is equal to or exceeds 5 percent; or
- (3) The sum of the interests computed under paragraph (i)(1) of this section plus the sum of the interests computed under paragraph (i)(2) of this section is equal to or exceeds 10 percent.

Note 3: In cases where record and beneficial ownership of voting stock is not identical (e.g., bank nominees holding stock as record owners for the benefit of mutual funds, brokerage houses holding stock in

street names for the benefit of customers, investment advisors holding stock in their own names for the benefit of clients, and insurance companies holding stock), the party having the right to determine how the stock will be voted will be considered to own it for purposes of these rules.

Note 4: Paragraphs (a) through (e) of this section will not be applied so as to require divestiture, by any licensee, of existing facilities, and will not apply to applications for increased power for Class C stations, to applications for assignment of license or transfer of control filed in accordance with § 73.3540(f) or § 73.3541(b), or to applications for assignment of license or transfer of control to heirs or legatees by will or intestacy if no new or increased overlap would be created between commonly owned, operated or controlled broadcast stations in the same service and if no new encompassment of Communities proscribed in paragraphs (c) and (d) of this section as to commonly owned, operated or controlled broadcast stations or daily newspaper would result. Said paragraphs will apply to all applications for new stations, to all other applications for assignment or transfer, and to all applications for major changes in existing stations except major changes that will result in overlap of contours of broadcast stations in the same service with each other no greater than already existing. (The resulting areas of overlap of contours of such broadcast stations with each other in such major change cases may consist partly or entirely of new terrain. However, if the population in the resulting areas substantially exceeds that in the previously existing overlap areas, the Commission will not grant the application if it finds that to do so would be against the public interest, convenience or necessity.) Commonly owned, operated or controlled broadcast stations with overlapping contours or with community-encompassing contours prohibited by this section may not be assigned or transferred to a single person, group or entity, except as provided above in this note and by § 73.3555(a). If a commonly owned, operated or controlled broadcast station and daily newspaper fall within the encompassing proscription of this section, the station may not be assigned to a single person, group or entity if the newspaper is being simultaneously sold to such single person, group or entity.

Note 5: Paragraphs (a) through (e) of this section will not be applied to cases involving television stations that are "satellite" operations. Such cases will be considered in accordance with the analysis set forth in the *Report and Order* in MM Docket No. 87-8, FCC 91-182 (released July 8, 1991), in order to determine whether common ownership, operation, or control of the stations in question would be in the public interest. An authorized and operating "satellite" television station, the Grade B contour of which overlaps that of a commonly owned, operated, or controlled "non-satellite" parent television broadcast station, or the Grade A contour of which completely encompasses the community of publication of a commonly owned, operated, or controlled daily newspaper, or the community of license of a

commonly owned, operated, or controlled AM or FM broadcast station, or the community of license of which is completely encompassed by the 2 mV/m contour of such AM broadcast station or the 1 mV/m contour of such FM broadcast station, may subsequently become a "non-satellite" station under the circumstances described in the aforementioned *Report and Order* in MM Docket No. 87-8. However, such commonly owned, operated, or controlled "non-satellite" television stations and AM or FM stations with the aforementioned community encompassment, may not be transferred or assigned to a single person, group, or entity except as provided in Note 4 of this section. Nor shall any application for assignment or transfer concerning such "non-satellite" stations be granted if the assignment or transfer would be to the same person, group or entity to which the commonly owned, operated, or controlled newspaper is proposed to be transferred, except as provided in Note 4 of this section.

Note 6: For the purposes of this section a daily newspaper is one which is published four or more days per week, which is in the English language and which is circulated generally in the community of publication. A college newspaper is not considered as being circulated generally.

Note 7: The Commission will entertain requests to waive the restrictions of paragraph (c) of this section on a case-by-case basis. The Commission will look favorably upon waiver applications that meet either of the following two standards:

- (1) Those involving radio and television station combinations in the top 25 television markets where there will be at least 30 separately owned, operated and controlled broadcast licensees after the proposed combination, as determined by counting television licensees in the relevant ADI television market and radio licensees in the relevant television metropolitan market;
- (2) Those involving "failed" broadcast stations that have not been operated for a substantial period of time, e.g., four months, or that are involved in bankruptcy proceedings. For the purposes of determining the top 25 ADI television markets, the relevant ADI television market, and the relevant television metropolitan market for each prospective combination, we will use the most recent *Arbitron Ratings Television ADI Market Guide*. We will determine that number of radio stations in the relevant television metropolitan market and the number of television licensees within the relevant ADI television market based on the most recent Commission ownership records.

Other waiver requests will be evaluated on a more rigorous case-by-case basis, as set forth in the *Second Report and Order* in MM Docket No. 87-7, FCC 88-407, released February 23, 1989, and *Memorandum Opinion and Order* in MM Docket No. 87-7, FCC 89-256, released August 4, 1989.

Note 8: Paragraph (a)(1) of this section will not apply to an application for an AM station license in the 535-1605 kHz band where grant of such application will result in the overlap of 5 mV/m groundwave contours of the proposed station and that of another AM

station in the 535–1605 kHz band that is commonly owned, operated or controlled if the applicant shows that a significant reduction in interference to adjacent or co-channel stations would accompany such common ownership. Such AM overlap cases will be considered on a case-by-case basis to determine whether common ownership, operation or control of the stations in question would be in the public interest. Applicants in such cases must submit a contingent application of the major or minor facilities change needed to achieve the interference reduction along with the application which seeks to create the 5 mV/m overlap situation.

Note 9: Paragraph (a)(1) of this section will not apply to an application for an AM station license in the 1605–1705 kHz band where grant of such application will result in the overlap of the 5 mV/m groundwave contours of the proposed station and that of another AM station in the 535–1605 kHz band that is commonly owned, operated or controlled. Paragraphs (d)(1)(i) and (d)(1)(ii) of this section will not apply to an application for an AM station license in the 1605–1705 kHz band by an entity that owns, operates, controls or has a cognizable interest in AM radio stations in the 535–1605 kHz band.

Note 10: Authority for joint ownership granted pursuant to Note 9 will expire at 3 a.m. local time on the fifth anniversary for the date of issuance of a construction permit for an AM radio station in the 1605–1705 kHz band.

[FR Doc. 94–23659 Filed 9–23–94; 8:45 am]

BILLING CODE 6712-01-M

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. 93–02; Notice 05]

RIN [2127–AF14]

Federal Motor Vehicle Safety Standards; Compressed Natural Gas Fuel Container Integrity

AGENCY: National Highway Traffic Safety Administration (NHTSA), Department of Transportation (DOT).

ACTION: Final rule.

SUMMARY: This rule establishes a new Federal motor vehicle safety standard, Standard No. 304, *Compressed Natural Gas Fuel Containers*, that specifies performance requirements applicable to compressed natural gas (CNG) fuel containers: a pressure cycling test evaluates a container's durability; a burst test evaluates a container's initial strength; and a bonfire test evaluates a container's pressure relief characteristics. In addition, the final rule specifies labeling requirements for

CNG containers. The purpose of this new standard is to reduce deaths and injuries occurring from fires that result from fuel leakage from CNG containers.

DATES: *Effective Date:* The Standard becomes effective March 27, 1995.

Incorporation by reference: The publications listed in the regulations is approved by the Director of the Federal Register as of March 27, 1995.

Petitions for Reconsideration: Any petition for reconsideration of this rule must be received by NHTSA no later than October 26, 1994.

ADDRESSES: Petitions for reconsideration of this rule should refer to Docket 93–02; Notice 5 and should be submitted to: Administrator, National Highway Traffic Safety Administration, 400 Seventh Street SW., Washington, DC 20590.

FOR FURTHER INFORMATION CONTACT: Mr. Gary R. Woodford, NRM–01.01, Special Projects Staff, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590 (202–366–4931).

SUPPLEMENTARY INFORMATION:

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I. Background

A. General Information

Natural gas is a vapor that is lighter than air at standard temperature and

pressure.¹ When used as a motor fuel, natural gas is typically stored on-board a vehicle in cylindrical containers at a pressure of approximately 20,684 kPa pressure (3,000 psi). Natural gas is kept in this compressed state to increase the amount that can be stored on-board the vehicle. This in turn serves to increase the vehicle's driving range. Since natural gas is a flammable fuel and is stored under high pressure, natural gas containers pose a potential risk to motor vehicle safety.

Vehicles powered by CNG have not been numerous to date, although they are increasing. The number of CNG vehicles in the United States more than doubled from 10,300 in 1990 to 23,800 at the end of 1992. The number of CNG vehicles is projected to again double to an estimated 50,800 vehicles in 1994. As discussed in detail in a final rule regarding CNG vehicles published on April 25, 1994, recent Federal legislation, as well as the need to meet environmental and energy security goals, will lead to greater increases in the production and use of these vehicles. (59 FR 19648).

B. Previous Agency Rulemakings

On October 12, 1990, NHTSA published an advance notice of proposed rulemaking (ANPRM) to explore whether the agency should issue Federal motor vehicle safety standards (FMVSSs) applicable to CNG fuel containers and the fuel systems of motor vehicles using CNG or liquefied petroleum gas (LPG) as a motor fuel. (55 FR 41561). The ANPRM sought comment about the crash integrity of vehicle fuel systems, the integrity of fuel storage containers, and pressure relief for such containers.

On January 21, 1993, NHTSA published a notice of proposed rulemaking (NPRM) in which the agency proposed to establish a new FMVSS specifying performance requirements for vehicles fueled by CNG. (58 FR 5323). The proposal was based on comments received in response to the ANPRM and other available information. The NPRM was divided into two segments: (1) vehicle requirements that focus on the integrity of the entire fuel system, and (2) equipment requirements that focus on the fuel containers alone.

NHTSA decided to model the proposed requirements applicable to CNG fueled motor vehicles on Standard No. 301, *Fuel System Integrity*. Standard

¹ Standard temperature is 0° Celsius or 32° Fahrenheit and standard pressure is 101.4 kilopascals (kPa) or 147.7 pounds per square inch (psi).

No. 301 specifies performance requirements for vehicles that use fuel with a boiling point above 32 °Fahrenheit (i.e., fuels that are liquid under standard temperature and pressure). Vehicles manufactured to use only CNG are not subject to Standard No. 301 since CNG has a boiling point below 32 °F. Standard No. 301 limits the amount of fuel spillage from "light vehicles"² during and after frontal, rear, and lateral barrier crash tests and a static rollover test. The Standard also limits fuel spillage from school buses with a GVWR over 10,000 pounds after being impacted by a moving contoured barrier at any point and any angle. By basing the CNG rulemaking on Standard No. 301, the agency believed that passengers of CNG vehicles would be afforded a level of safety comparable to that provided passengers of vehicles fueled by gasoline or diesel fuel.

With respect to the "vehicle" requirements for CNG vehicles, NHTSA proposed that the fuel system integrity requirements would include frontal, rear, and lateral barrier crash tests for light vehicles, and a moving contoured barrier crash test for large school buses. The agency proposed that fuel system integrity would be determined by measuring the fuel system's pressure drop after the crash test rather than fuel spillage, since CNG is a vapor and not a liquid. The allowable pressure drop for CNG fueled vehicles would be equivalent, as measured by the energy content of the lost fuel, to the allowable spillage of gasoline during Standard No. 301 compliance testing.

With respect to the "equipment" requirements for CNG containers, NHTSA proposed a definition for "CNG fuel tank" and performance requirements that would apply to all such fuel containers manufactured for use as part of a fuel system on any motor vehicle, including aftermarket containers.³ Thus, while vehicles with a GVWR over 10,000 pounds (other than school buses) would not be subject to Standard No. 303, the CNG containers in those vehicles would be subject to the equipment requirements. The agency proposed that each CNG container would be subject to a pressure cycling test to evaluate container durability and a pressure burst test to evaluate the container's initial strength as well as its resistance to degradation over time. In

addition, the NPRM proposed requirements to regulate how the container "vents" its contents under specified conditions of elevated temperature and pressure.

II. Comments on the Proposal

NHTSA received a large number of comments to the docket addressing the CNG proposal. The commenters included manufacturers of CNG containers, vehicle manufacturers, trade associations, other CNG-oriented businesses, research organizations, State and local governments, the United States Department of Energy, and energy companies. In addition, NHTSA met with the Compressed Gas Association (CGA) and the Natural Gas Vehicle Coalition (NGVC) and had telephone conversations and meetings with some of the commenters. A record of each of these contacts may be reviewed in the public docket.

The commenters generally believed that a Federal safety standard regulating the integrity of CNG fuel systems and fuel containers is necessary and appropriate. In fact, some commenters, including the CGA, the NGVC, and CNG container manufacturers stated that NHTSA should issue a Federal standard as soon as possible to facilitate the safe and expeditious introduction of CNG fueled vehicles. With respect to the equipment requirements, the commenters generally believed that Federal requirements about CNG fuel container integrity are needed and should be implemented as quickly as possible. The CNG vehicle industry, led by CGA and NGVC, expressed concern that lack of Federal regulations has created a problem for the industry, given the issuance of potentially conflicting industry and State regulations. Therefore, these commenters stated that CNG container manufacturers may not know the appropriate standards to which they should manufacture their containers. In contrast, the American Automobile Manufacturers Association (AAMA) stated that the vehicle system requirements are sufficient to regulate the overall integrity of CNG fueled vehicles and that separate requirements for CNG fuel containers are not needed. Nevertheless, AAMA provided detailed comments about the container proposal in case the agency decided to issue separate container requirements.

The commenters addressed a variety of issues discussed in the NPRM. These issues include the appropriateness of adopting the American National Standards Institute (ANSI) voluntary

industry standard known as NGV2;⁴ the pressure cycling requirements and test procedures; the burst requirements and test procedures, including the proposed safety factor, hold time interval, and need for sequential testing; the pressure relief requirements and test procedures, including types of pressure relief devices, shielding, test gas, test pressure, test fuel, and fuel pan depth; labeling requirements; leadtime; costs; and benefits.

NHTSA issued an SNPRM proposing to pattern the burst requirements more closely on NGV2, based on its consultation with other Federal agencies, its review of comments to the January 1993 proposal, and other available information. (58 FR 68846, December 29, 1993). NHTSA proposed a burst test that would link the use of particular designs and materials to compliance with safety factors tailored to those designs and materials. NHTSA requested comment on the appropriateness of requiring CNG containers to meet design and material requirements, such as those specified in NGV2, and to meet safety factors tailored to those requirements. As an alternative approach, the agency asked whether it should specify a catch-all high end safety factor for any container whose design and materials are not specified in NGV2.

Most commenters supported the proposal to incorporate NGV2 into the Federal standard. However, AAMA and Ford opposed the design and material specific approach of NGV2.

III. Agency's Decision

A. Overview

In today's final rule, NHTSA is issuing a new Federal motor vehicle safety standard, Standard No. 304, *Compressed Natural Gas Fuel Containers*, that specifies performance requirements applicable to a CNG fuel container's durability, strength, and venting. A pressure cycling test evaluates a container's durability by requiring a container to withstand, without any leakage, 18,000 cycles of pressurization and depressurization. This requirement helps to ensure that a CNG container is capable of sustaining the cycling loads imposed on the container during refuelings over its entire service life. A burst test evaluates a container's initial strength and resistance to degradation over time. This requirement helps to ensure that a

² Light vehicles include passenger cars, multipurpose passenger vehicles (MPV's), trucks, and buses with a gross vehicle weight rating (GVWR) of 10,000 pounds or less.

³ Among the terms used to describe CNG fuel tanks are tanks, containers, cylinders, and high pressure vessels. The agency will refer to them as "containers" throughout this document.

⁴ NGV2 is a recently issued voluntary industry standard that was adopted by the ANSI and addresses CNG fuel containers. It was developed by an industry working group that included container manufacturers, CNG users, and utilities.

container's design and material are appropriately strong over the container's life. A bonfire test evaluates a container's pressure relief characteristics when pressure builds in a container, primarily due to temperature rise. In addition, the final rule specifies labeling requirements for CNG fuel containers.

As previously mentioned, the agency has issued a final rule establishing a new Federal motor vehicle safety standard, Standard No. 303, *Fuel System Integrity of Compressed Natural Gas Vehicles*, that specifies vehicle performance requirements applicable to the fuel system of a CNG fueled vehicle. As explained in that final rule, the fuel system integrity requirements are comparable to those requirements in Standard No. 301. Like that Standard, the new requirements limit the amount of fuel leakage in specified frontal, rear, and lateral barrier crash tests for light vehicles and a moving contoured barrier crash test for school buses with a GVWR over 10,000 pounds.

NHTSA believes that CNG containers must be evaluated in all possible failure modes and environments to which they may be subjected. Since the requirements contained in today's final rule do not address all these situations, the agency is currently investigating other possible requirements for CNG fuel containers and anticipates issuing a SNPRM that would propose performance requirements applicable to such characteristics as a CNG fuel container's internal and external resistance to corrosion, brittle fracture, fragmentation, and external damage caused by incidental contact with road debris or mechanical damage during the vehicle's operation. The agency tentatively believes that these additional performance requirements are critical for determining a CNG container's safety. In addition, the agency anticipates proposing additional labeling requirements that should provide critical safety information about inspecting a CNG container and its service life.

NHTSA notes that it has no statutory authority to regulate certain aspects involving CNG containers, including inspection requirements during the manufacturing process, in-use inspection requirements, and retest requirements during use.

B. Adopting Industry Standards

In the NPRM, NHTSA explained its decision to propose pressure cycling and burst tests and requirements. While the agency's proposal was based on NGV2, the agency decided not to propose certain provisions of the

voluntary industry standard that the agency tentatively believed might unreasonably restrict future designs. Similarly, NHTSA decided not to propose regulations issued by the Research and Special Programs Administration (RSPA)⁵ for CNG storage containers used on motor vehicles, explaining that the RSPA regulations do not address the conditions unique to the motor vehicle environment (e.g., increased cycling due to refueling and pressure relief when the cylinder is less than full). NHTSA further explained that in contrast to RSPA, NHTSA does not typically regulate design and materials since NHTSA is statutorily directed to issue performance-based safety standards.

NGVC and several CNG container manufacturers stated that NHTSA should adopt the voluntary industry standard that has been developed by the CNG industry working group. In support of this request, the American Gas Association (AGA) cited a 1982 Office of Management and Budget Circular that states "It is the policy of the Federal Government to (a) Rely on voluntary standards * * * whenever feasible and consistent with law and regulation pursuant to law * * *." AGA and NGVC believed that the voluntary standards provide a higher level of safety than the regulations proposed by NHTSA. They further stated that if NHTSA were unable to adopt NGV2 due to its prescriptive nature, then NHTSA should still allow automobile and equipment manufacturers the option of certifying to the industry standard by referencing NGV2 in the regulations.

In promulgating a CNG container standard, NHTSA has sought to the extent possible to adopt the tests and requirements set forth in NGV2. NHTSA was limited in its ability to do this by the National Traffic and Motor Vehicle Safety Act (Safety Act, 49 U.S.C. 30111), which commands the agency to issue "motor vehicle safety standards" as minimum standards of motor vehicle performance that are practicable, meet the need for motor vehicle safety, and are stated in objective terms. NHTSA found it necessary to modify certain elements of NGV2 to be consistent with this statutory mandate. For instance, the agency has not incorporated those aspects of NGV2 that are stated in nonobjective terms (e.g., a container shall not show "evidence" of deterioration or failure) NHTSA has decided to incorporate NGV2's design

and material requirements since the agency has been unable to find or develop a meaningful dynamic performance requirement that would adequately evaluate a container's initial strength and susceptibility to degradation over time. The agency believes that the requirements are no more specific than necessary to achieve these safety purposes.

NHTSA notes that it would be impermissible under the Safety Act for the agency to adopt FMVSS provisions referencing NGV2 in its entirety and stating that automobile and equipment manufacturers had the option of certifying compliance to NGV2 by referencing this voluntary industry standard. The Safety Act provides for manufacturer self-certification with respect to FMVSSs only. To be part of a FMVSS, the provisions of a voluntary industry standard must fully meet all of the requirements of the Safety Act. Since all of NGV2 does not meet these requirements, NGV2 may not be incorporated in its entirety. Even if NGV2 met these requirements, NGV2 could not be incorporated in the FMVSS except to the extent that the FMVSS made compliance with NGV2 mandatory.

C. Pressure Cycling Test

In the NPRM, NHTSA proposed pressure cycling requirements that would require that the fuel container withstand a cycling test at ambient temperature, without any leakage or deformation exceeding one percent of any circumference. In the test, the container would be hydrostatically pressurized to the service pressure, then to not more than 10 percent of the service pressure, for 13,000 cycles. The container would next be hydrostatically pressurized to 125 percent of the service pressure, then to not more than 10 percent of the service pressure, for 5,000 cycles. The cycling rate would not exceed ten cycles per minute.

1. Number of Cycles

The proposed cycling requirements were intended to establish minimum levels of safety performance for the durability of CNG fuel containers used in motor vehicles. The agency stated its tentative belief that the requirements are consistent with provisions in NGV2 and with RSPA regulations for containers used to transport CNG. The agency believed that the pressure cycling requirement would help to assure that a CNG container is capable of sustaining the cycling loads imposed on the container during refuelings. The number of cycles specified in the proposal, 13,000 plus 5,000, is representative of

⁵ RSPA is an administration within the United States Department of Transportation that among other things regulates the transportation of hazardous materials.

four refuelings per day, 300 days per year, for 15 years.

AAMA, Norris, and Thomas commented on the number of pressure cycles. These commenters stated that the proposed number of cycles was excessive and not representative of the actual operating conditions the CNG containers would typically experience. AAMA and Norris stated that cycling the container at 125 percent of service pressure for 5,000 cycles would be adequate. Thomas made inconsistent statements about the appropriate number of cycles. On the one hand, it stated that 9,000 cycles at service pressure would be more reasonable than the proposed number of cycles. On the other hand, it stated that the agency should adopt NGV2 which specifies 18,000 cycles.

After reviewing the comments and other available information, NHTSA continues to believe that the proposed number of pressure cycles accurately represents the extreme conditions that CNG fuel containers could experience during their lifetime, with a margin of safety. This is based on the large number of cycles to which fleet vehicles are subjected. The agency believes that the 5,000 cycles suggested by AAMA and Norris would not ensure the safety of vehicles that experience multiple refuelings each day, such as taxis and other fleets. NHTSA further notes that the number of cycles being adopted is consistent with the cycles in NGV2 and therefore establishes a minimum level of safety that is consistent with NGV2, a standard supported by a large majority of the commenters. Accordingly, the agency has determined that a CNG fuel container will be subject to 18,000 pressure cycles.

2. Failure Criteria

In the NPRM, NHTSA proposed that a CNG fuel container would have to meet two test criteria to pass the pressure cycling test: (1) No leakage, and (2) no permanent circumferential deformation greater than one percent. The agency proposed these two criteria to provide objective means of evaluating a container's durability during compliance testing. NHTSA adopted the no leakage portion of the proposal from NGV2's pressure cycling test. The one percent deformation level, which is not in NGV2's pressure cycling test, was based on the Society of Automotive Engineers (SAE) Recommended Practice J10, August 1985, a requirement involving the performance of metal air brake reservoirs. The agency proposed a limit on circumferential deformation to aid in determining when a container's failure was impending.

No commenters objected to the no leakage criterion. Accordingly, the agency has adopted the no leakage requirement in the final rule. The agency believes that specifying that containers "shall not leak" provides an objective measure that will ensure that a container maintains its integrity by retaining its contents under pressure.

Sixteen commenters addressed the issue of the allowable circumferential deformation criterion. The commenters were NGVC, Brunswick, Pressed Steel Tank (PST), Structural Composites Industry (SCI), Tecogen, CGA, AAMA, Amoco, Alusuisse, Oklahoma Gas, ARC, Fibre, Fiber Dynamics, Norris, Comdyne, and EDO. All the commenters, except Brunswick, believed that the agency should not include a deformation requirement in the pressure cycling or burst tests. The commenters believed that the test requirement is not appropriate for all container materials and designs. They stated that due to the nature of the different materials used in these containers, and their different rates of deformation under load, some materials such as fiberglass, would deform more than others, such as steel. The commenters also stated that deformation was not an indicator of impending failure and that the SAE brake reservoir test was not appropriate for a CNG fuel container application.

NHTSA has decided not to adopt the one percent circumferential deformation requirement. In proposing this criterion, NHTSA tentatively concluded that it would be an appropriate indicator of the fuel container's durability characteristics. However, as the comments note, it is not an appropriate criterion because of the differing construction and materials used for CNG fuel container applications. After reviewing the comments and other available information, the agency now believes that limiting the circumferential deformation is not a meaningful way to determine a container's strength or impending failure, since the larger deformation experienced by some materials does not necessarily represent these characteristics. Instead, the agency believes that the no-leakage requirement, by itself, is the appropriate criterion to define a container failure, after being subjected to the pressure cycling test.

Brunswick further commented that some container designs, such as full-wrapped composite containers, would deform in the axial direction in addition to the circumferential direction. To account for axial deformation, Brunswick recommended allowing a

maximum five percent volumetric expansion of the container.⁶ Brunswick stated that this test is used to assure that the container material exhibits elastic behavior at expected operating conditions.

NHTSA agrees with Brunswick's statement that some container designs deform in the axial direction. Nevertheless, the agency believes that measuring volumetric expansion would not provide an appropriate measure of a container's impending failure in a destructive test (i.e., where the container cannot be used again). In addition, the NPRM provided no notice to amend the standard to measure such expansion in the axial direction. Since the pressure cycling and burst tests being adopted in this rule are capable of evaluating a CNG container's durability, the agency believes that another non-destructive test would be redundant and therefore is not needed. The agency further notes that the five percent maximum level of expansion would not provide a meaningful measure of a container's impending failure, since this level is based on a container's performance under less stringent test conditions.

D. Burst Test

1. Safety Factor

With respect to the burst test, NHTSA proposed that a CNG fuel container would have to withstand an internal hydrostatic pressure of 3.50 times the service pressure for 60 seconds, without any leakage or circumferential deformation over one percent. The multiple of the internal hydrostatic pressure, 3.50, is known as the safety factor. The agency tentatively concluded that the burst test, together with a pressure cycling test, would be sufficient to assure adequate levels of safety performance for both the strength and durability of CNG fuel containers used in motor vehicles.

The proposal of a burst test with a safety factor was based in part on NGV2. NGV2 specifies several sets of detailed material and design requirements. For each set of those requirements, NGV2 specifies a unique safety factor for calculating the internal hydrostatic pressure that the container must withstand. The safety factors range from 2.25 to 3.50, depending on the material and design involved. To satisfy this aspect of NGV2, a container must meet

⁶ Both RSPA's standards and NGV2 incorporate the concept of volumetric expansion. In these standards, the volumetric expansion is measured when hydrostatic testing is performed on the container at 1.50 to 1.67 times the service pressure. This test is a non-destructive one, i.e., the container may be put into service after it is tested.

both the material and design requirements as well as the burst test.

NGV2 specifies four types of container designs. A Type 1 container is a metallic noncomposite container. A Type 2 container is a metallic liner over which an overwrap such as carbon fiber or fiberglass is applied in a hoop wrapped pattern over the liner's cylinder sidewall. A Type 3 container is a metallic liner over which an overwrap such as carbon fiber or fiberglass is applied in a full wrapped pattern over the entire liner, including the domes. A Type 4 container is a non-metallic liner over which an overwrap such as carbon fiber or fiberglass is applied in a full wrapped pattern over the entire liner, including the domes.

The agency did not propose adoption of the material and design requirements of NGV2. Instead, the agency proposed a single safety factor of 3.50 for all containers, regardless of their materials or design. It tentatively concluded that the factor would not impede technological development, yet would assure an acceptable level of safety for all containers.

CNG container manufacturers, CNG trade associations (NGVC and AGA), utility companies, the American Automobile Manufacturers Association (AAMA) and other commenters addressed the issue of the safety factor. Most commenters disagreed with the agency's proposal to require that all containers meet the same safety factor.

NGVC, AGA, and the CNG container manufacturers generally believed that the material and design of the fuel container need to be taken into account in establishing an appropriate safety factor, if safe, cost-effective, and lightweight containers are to be produced. Establishing an overly high factor for a given combination of material and design could result in unnecessarily over-designed, heavy containers, according to these commenters. They believed that some materials, such as fiberglass, need a higher safety factor because they degrade faster over time. In contrast, a material such as steel maintains its strength for a longer time, and therefore containers made of it could be made safely with a lower safety factor.

Many of these commenters recommended that NHTSA adopt the safety factors specified in NGV2. They stated that compared to the regulations proposed by NHTSA, the NGVC voluntary industry standard provides a more appropriate level of safety, given the need to specify safety factors based on the design and materials used.

However, several commenters disagreed with certain safety factors

specified in NGV2. CGA, PST, SCI, and NGV Systems supported a higher safety factor for containers using unproven materials. In particular, they were concerned with containers reinforced with carbon fiber overwrap, for which NGV2 specifies a 2.25 safety factor for all carbon reinforced containers, Types 2, 3, and 4.

NGV Systems stated that a safety factor of 2.25 constitutes an "unacceptable safety risk," given the industry's limited experience with carbon fiber and lack of a significant data base demonstrating this materials safety and reliability. Accordingly, NGV Systems supported a safety factor of 3.5 for what it termed unproven designs, which may then be lowered as more experience and data accumulate. CGA recommended safety factors of 2.5 for all Type 2 containers and 3.33 for all Type 3 and 4 containers, stating that these are used on all fiber reinforced compressed gas containers now in commercial use. CGA indicated that unlike other fiber overwrap used in the past for transportation pressure vessels, there is no commercial experience with the safety of carbon fiber reinforced containers for motor vehicle applications to justify a 2.25 safety factor for such containers. CGA stated that NGV2 does not adequately address damage tolerance concerns for carbon reinforced fully wrapped containers with low safety factors. PST recommended 3.33 for carbon fiber Types 3 and 4 containers. That commenter recommended such conservative safety factors until substantial data are accumulated on the use of carbon fiber containers in actual service. SCI provided similar comments, and recommended safety factors of 3.33 for the fully wrapped containers, which are Types 3 and 4.

Three commenters stated that a single safety factor was appropriate. CNG Pittsburgh, a consulting firm, stated that a safety factor of 3.50 is conservative but reasonable for CNG fuel containers. AAMA stated that adopting NGV2's approach with various safety factors depending on the material and design involved would limit a manufacturer's choice of container designs and materials. EDO recommended a safety factor of 2.5 for all containers.

NHTSA decided to issue an SNPRM proposing to pattern the burst requirement more closely on NGV2, based on its consultation with other Federal agencies, its review of comments to the January 1993 proposal, and other available information. In explaining its reason for issuing the SNPRM, NHTSA stated that there did not appear to be any procedures that

could adequately test a container's susceptibility to degradation over time. Therefore, it believed that specifying a single safety factor would not protect in all instances against these problems since the strength of some containers is dependent on the specific material and method of design. Therefore, NHTSA decided to propose a burst test that would link the use of particular designs and materials to compliance with safety factors tailored to those designs and materials. The agency tentatively concluded that such an approach might be necessary to ensure the safe performance of pressure vessels used for fuel containers. The agency further noted that international standards addressing CNG fuel containers, including regulations of Transport Canada and those being drafted by the International Standards Organization (ISO) link the use of particular designs and materials with strength requirements suitable for those designs and materials.

In the SNPRM, NHTSA requested comment on the appropriateness of requiring CNG containers to meet design and material requirements, such as those specified in NGV2, and to meet safety factors tailored to those requirements. The agency also asked about the effect of adopting NGV2 on future container technology, since the only way a container manufacturer could comply with the Federal standard would be by producing a container that uses those materials and designs specified in NGV2 if the agency incorporated NGV2's material and design provisions in the FMVSS. As an alternative approach, the agency asked whether it should specify a catch-all high end safety factor for any container whose design and materials are not specified in NGV2.

NHTSA received 18 comments to the December 1993 SNPRM about adopting the design and material specific approach of NGV2. Sixteen commenters, including NGVC/AGA, CGA, CNG container manufacturers, public utilities, and two bus manufacturers supported the proposal to incorporate NGV2 into the Federal standard. Eleven commenters supported the safety factors in NGV2. Five others were concerned about the level of some safety factors in NGV2 or the use of relatively new materials, such as carbon fiber. CGA and SCI referenced their earlier comments to the NPRM, again recommending safety factors of 2.5 for all Type 2 containers and 3.33 for all Type 3 and Type 4 containers. AAMA and Ford opposed the design and material specific approach of NGV2. AAMA stated that some of NGV2's requirements limit

opportunities for future development of advance container design or materials that may not fit in the specifications in NGV2. No commenter favored having a catch-all high end safety factor.

Based on the available information, NHTSA has decided to require CNG containers to meet the safety factors applicable to the design and material requirements specified in NGV2, except for carbon fiber. Specifically, the agency is specifying separate safety factors for containers using various materials (e.g., fiberglass, carbon, steel, aluminum) and different designs (non-composite, hoop wrapped or full wrapped composite containers, and welded). The agency believes that this approach will result in the manufacture of safe containers for CNG powered vehicles.

NHTSA has decided to adopt the specific safety factors and related requirements set forth in NGV2, except for those safety factors specified for carbon fiber. While NGV2 currently specifies a safety factor of 2.25 for Type 2, 3, and 4 carbon fiber containers, NHTSA has decided to specify a safety factor of 2.5 for Type 2 carbon fiber containers and 3.33 for the Type 3 and 4 carbon fiber containers. The agency is requiring a higher safety factor for Type 3 and 4 containers since the fibers on those containers carry a greater proportion of the load than on Type 2 containers.

NHTSA made this decision after reviewing all of the comments and information obtained in response to both the NPRM and SNPRM; meetings with container manufacturers, CGA and NGVC/AGA; and discussions with other Federal agencies, including RSPA. Comments and information were presented to support safety factors for carbon fiber containers, ranging from 2.25 to 3.5. Brunswick, in particular, submitted substantial test data and other technical information in support of NGV2's 2.25 safety factor for carbon fiber, including testing it performed on such containers which showed favorable results. RSPA recommended a safety factor of not less than 3.0 for carbon fiber, which is consistent with its FRP-1 and FRP-2 standards.

Notwithstanding comments supporting the 2.25 safety factor, NHTSA has determined that under its statutory mandate, it is necessary to specify higher safety factors for carbon fiber containers. In adopting these more stringent requirements, NHTSA sought the advice of RSPA, which has accumulated significant experience and expertise through its efforts to regulate the safety of pressure vessels used to transport hazardous materials. Specifically, NHTSA has adopted

RSPA's recommendation not to specify the 2.25 safety factor for carbon composite containers.

The more stringent safety factors being adopted are consistent with RSPA's longstanding approach to initially adopt conservative requirements and subsequently modify the requirements, if further real-world safety data become available supporting less stringent regulations. NHTSA has determined that applying this approach to the safety factors for carbon fiber containers is necessary, since carbon fiber containers have not been used extensively in motor vehicle applications. The agency believes that the higher safety factors are justified until further data are developed and become available on the use of carbon fiber containers in motor vehicle applications.

NHTSA acknowledges that using such a safety-oriented approach may result in costlier and heavier carbon fiber containers. However, the agency believes that the requirements being adopted will not preclude the introduction and effective use of this new technology. Overall, the agency believes that the safety factors being specified for carbon fiber containers, along with the remaining safety factors it has adopted from NGV2 for other materials, will result in safe CNG containers.

As for AAMA's comment, NHTSA shares that association's concerns about restricting future developments. However, based on comments by the container manufacturers and other Federal agencies, the agency believes that few, if any, designs beyond those accounted for in NGV2 are planned. If a new container technology is developed, the agency will evaluate its safety in the context of a petition for rulemaking to amend the Federal safety standard.

NHTSA has decided not to adopt the catch-all high level safety factor, which could allow containers incorporating materials or designs that have not been incorporated in NGV2 and thus might be detrimental to safety. The agency further believes that it would be inappropriate, at this time, to add a catchall factor. While such a proviso would facilitate innovation and design change, the agency agrees with commenters that specifying such a catchall might be detrimental to safety, since untested designs and materials would be permitted.

2. Hold Time Interval

In the NPRM, NHTSA proposed that during the burst test, elevated pressure would have to be sustained for 60

seconds. The agency noted that while RSPA regulations also specify a 60-second period, NGV2 requires a 10-second hold time interval once the maximum pressure is obtained. The agency believed that because NGV2 includes additional tests to qualify container designs and the agency was not proposing these additional tests, a shorter hold time would not be suitable.

NHTSA received six comments addressing the appropriate hold time interval. All commenters except EDO believed the 60 second hold time requirement was not necessary. EDO stated that the requirement was "tough but reasonable." NGVC, Brunswick, PST, and ARC stated that specifying the hold time at 60 seconds instead of 10 seconds would not compensate for the lack of other NGV2 required tests. NGVC stated that the ten second hold time interval is not intended as a test of container strength, but as the time for the pressure in the container to stabilize. PST stated that along with the 3.5 safety factor, the 60 second hold time would make an already conservative test even more stringent.

After reviewing the comments and other available information, NHTSA has decided to specify a hold time of 10 seconds instead of 60 seconds. The agency notes that the proposal was based on a misperception of the hold time requirement's purpose. As the commenters stated, the hold period is included only to stabilize the pressure. It is not used as a surrogate for initial burst strength. Therefore, the reduction in hold time will not affect the test's stringency. In addition, the agency anticipates issuing a SNPRM that would propose additional performance requirements to evaluate other aspects of a CNG fuel container's integrity.

3. Sequential Testing

In the NPRM, NHTSA proposed that a container that passed the pressure cycling test would then be subjected to the burst test. In proposing that the same fuel container be used in both the pressure cycling and burst tests, the agency believed that it would be appropriate to establish that the fuel container maintained its initial strength after being subject to the durability test.

Seven commenters addressed the issue of using the same container for both the pressure cycling and burst tests. NGVC, AAMA, Comdyne, Pressed Steel Tanks, and Amoco stated that requiring the same fuel container for both tests would be unrealistic and overly stringent, because in real world situations, a container would not be subject to pressure cycling and burst conditions sequentially. They stated

that otherwise unnecessary material would have to be added to strengthen the container so it could meet the burst test requirement after the pressure cycling test. These commenters believed such additional material would significantly increase the container's cost and weight to the extent that the container would no longer be economically viable to produce. They further stated that most containers that are currently produced to meet NGV2 or RSPA requirements would not be able to meet this requirement. In contrast, EDO and Metropolitan Suburban Bus Authority (MSBA) favored the use of sequential testing.

After reviewing the comments and other available information, NHTSA has decided not to require sequential testing. The agency believes that using different containers in the pressure cycling and burst tests will provide an adequate measure of both the container's initial strength and its durability over its life, without imposing new cost burdens on the industry. The agency notes that such testing is consistent with the way in which industry currently tests under both NGV2 and RSPA standards. The agency further notes that in testing for compliance with some FMVSSs, the agency allows a manufacturer to use a separate vehicle or component for different tests within a standard. For example, three vehicles are crashed in Standard No. 301, and different brake hoses are used for various tests in Standard No. 106, *Brake Hoses*.

4. Failure Criteria

In the NPRM, NHTSA proposed that to pass the burst test, a container would have to meet the same two performance criteria as in the pressure cycling test: (1) No leakage, and (2) no permanent circumferential deformation of more than one percent. The purpose of these requirements was to provide objective means to evaluate a container's compliance strength. NGV2 includes the no leakage criterion, but not the one percent circumferential deformation criterion. As explained in the section on the pressure cycling test, the deformation requirement was based on SAE Recommended Practice J10, August 1985, which addresses the performance of metal air brake reservoirs. The agency proposed a circumferential deformation limit to aid in determining a container's impending failure.

After reviewing the comments, NHTSA is adopting the no leakage criterion to evaluate failure of the burst test. The agency has decided not to adopt the one percent deformation criterion because the agency believes

that circumferential deformation is not a meaningful measure of a fuel container's impending failure in the burst test. See the section above regarding the pressure cycling test for a more comprehensive discussion about the agency's decision not to adopt the pressure deformation criterion.

E. Bonfire Test

1. Performance Requirements

In the NPRM, NHTSA proposed performance requirements for CNG fuel containers to address the need to withstand high temperatures and pressures without catastrophic failure. Large pressure increases due to exposure to flames could cause the CNG to escape catastrophically and result in an explosive fire. The agency proposed that the ability to withstand high temperatures and pressures be provided by a pressure relief device. More specifically, it proposed that compliance would be determined by first pressurizing the fuel container to 100 percent of service pressure with nitrogen or air and placing it over a bonfire until the container's contents are completely vented through a pressure relief device. A pressure relief device can prevent a container from experiencing high pressure for long periods of time. The agency proposed a second test to be conducted in the same manner, except the container would be pressurized to 25 percent of the service pressure. The second test would evaluate container performance when containers are partially filled. The purpose of the test is to reduce the explosion potential of CNG containers when exposed to high temperatures and pressures.

The proposed requirements were based on NGV2. However, there were two differences between the agency's proposal and NGV2. First, under the NPRM, the container would be pressurized with nitrogen or air; in NGV2, it is pressurized by CNG. Second, under the NPRM, all fuel containers would be required to use a pressure relief device to completely vent the container's contents; in NGV2, the test is run for 20 minutes or until the container is completely vented, whichever comes first. Therefore, under NGV2, a manufacturer could establish compliance either by a container successfully withstanding the test conditions for 20 minutes without bursting or by completely venting its contents by means of a pressure relief device at some point during that 20 minute period. In the NPRM, the agency sought comment about whether to allow an alternative way of demonstrating

compliance with the bonfire test that did not depend upon a pressure relief device. Under the alternative, a container would be considered to have passed the test if it did not burst during the test period. Compliance with the alternative would be achieved by designing a container so that it has sufficient strength to enable it to sustain the heat and pressure buildup during the test.

Eleven commenters addressed the issue of whether containers should be required to have a pressure relief device. NGVC, EDO, ARC, Flxible, Manchester, Thomas, and MSBA agreed with the proposal to require containers to be equipped with such a device. They stated that a pressure relief device is an integral part of a CNG container and that its importance warrants a requirement that each container have one. In contrast, Brunswick, Comdyne, Pressure Technology, and AAMA stated that containers should not be required to have a pressure relief device because such a requirement would be design restrictive. Brunswick and Pressure Technology stated that the container should be required to "safely vent" its contents without rupturing, whether the venting is done through a pressure relief device or the container wall. AAMA stated that a container should pass the requirement if it possesses enough strength to retain its contents throughout the test. ARC believed that the container sidewalls should not be permitted to rupture during the bonfire test.

After reviewing the comments, NHTSA has determined that each CNG container must be equipped with a pressure relief device. This is necessary because each CNG fuel container needs to possess a means of releasing its contents in case the internal pressure or temperature reaches a dangerous level. By requiring containers to be equipped with a pressure relief device, the agency will ensure the safety of individuals, such as vehicle occupants and rescue personnel, who would be near a CNG vehicle in a fire. The agency notes that the conditions experienced in the bonfire test may be less severe than certain real-world crash situations. Therefore, the agency is adopting a more conservative approach and requiring a pressure relief device for all containers. In addition, such a requirement is consistent with the practice of most container manufacturers and NGV2 which requires such a device on all containers.

Based on the comments, NHTSA has decided to adopt NGV2's test criteria that allows the test to be completed after 20 minutes or when the container has

completely vented, whichever comes first. Adopting these criteria alters the test in that while still requiring a pressure relief device, a container could comply with the bonfire test if it either completely vents its contents by means of a pressure relief device at some point during that 20 minute period or by successfully retaining the container's entire contents without bursting for the duration of the bonfire test (i.e., 20 minutes). The agency believes that each criterion appropriately measures a container's ability to withstand high temperature and pressure because the bonfire test represents extreme conditions. The agency emphasizes that in either case the CNG container must be equipped with a pressure relief device.

NHTSA disagrees with the approach advocated by AAMA, Brunswick and Pressure Technology to allow containers to "safely vent" their contents from an area other than the pressure relief device such as the sidewall. The agency acknowledges that, as an alternative to a pressure relief device, pressure relief can be accomplished by allowing the overpressurized container to vent its contents at a controlled rate, without fragmentation, through the container's sidewall. However, there would be significant problems with this approach. First, it would not afford as high a degree of safety as requiring a pressure relief device. The agency continues to believe that the safest way to release CNG from an overpressurized container is through a pressure relief device because some sidewall ruptures could result in fragments being propelled from the container. Second, it would raise potential enforceability problems since the concepts of "release its contents at a controlled rate" and "rupture without fragmentation" are difficult to define objectively. Based on the above considerations, NHTSA has decided to require each CNG fuel container to either completely vent its contents through a pressure relief device or not burst when tested in accordance with the test conditions.

2. Types of Pressure Relief Devices

The proposal did not specify the use of a particular type of pressure relief device. The agency is aware of three types of devices currently being used: (1) The rupture disc, which is designed to release CNG in the container when it reaches a specific pressure, (2) the fusible plug, which is designed to release CNG in the container when it reaches a specific temperature, and (3) a device that combines these two devices.

Four commenters recommended the use of specific types of pressure relief devices. EDO recommended that the agency require the fusible plug device and prohibit the rupture disc device. EDO stated that a combination of hot conditions and overfill at the refueling pump could cause a rupture disc to activate, releasing CNG and causing a potentially dangerous situation. It further believed that the safety factor in the burst test would be sufficient to prevent over pressurization and that the pressure relief device should only open in a fire situation. Flexible stated that the agency should require a fusible plug to ensure pressure relief of partially filled containers subject to heat or fire. NYCFD stated that the agency should prohibit the combination fusible plug and rupture disc devices, claiming that over-charged containers exposed to high ambient temperature are likely to fail whether or not they are exposed to fire. Thomas commented that the agency should require the combination fusible plug and rupture disc device because it is required by NFPA 52.⁷

After reviewing the comments, NHTSA has concluded that the standard should not specify the type of pressure relief device with which a container may be equipped. The NPRM and SNPRM did not provide sufficient notice for the agency to adopt such a specification as part of this final rule. Further, the agency believes that the bonfire test, which is performed at both 100 percent of service pressure and 25 percent of service pressure, will adequately evaluate a container's ability to vent its contents in a high temperature/pressure situation. In the first test, the combination of the 100 percent service pressure condition and the high heat from the bonfire will cause the container's pressure to increase rapidly. This test evaluates a container's ability to vent its contents at high temperatures and pressures. In the second test, the 25 percent service pressure condition and the heat will cause the container's temperature to increase before the pressure in the container reaches a critical point. This test evaluates a container's ability to vent its contents at high temperatures, where the container is at a less than full condition.

⁷ NFPA 52, *Standard for Compressed Natural Gas (CNG) Vehicular Fuel Systems*, is a voluntary standard adopted by the National Fire Protection Association that specifies guidelines for the "design and installation of CNG engine fuel systems on vehicles of all types including aftermarket and OEMs and to their associated fueling (dispensing) systems." (NFPA 52, § 1-1)

3. Shielding

NHTSA notes that there are two types of shielding that can affect the performance of pressure relief devices in bonfire tests: (1) "Vehicle-based protective shielding" that is placed around the container in the vehicle to protect the container from surrounding heat, and (2) "test shielding" that is placed over the pressure relief device to prevent flames from contacting the device. Test shielding is, as the name suggests, installed only for the purpose of conducting bonfire tests. Unlike vehicle-based protective shielding, it is not used to affect real world performance.

In the NPRM, NHTSA recognized that some CNG vehicles may have vehicle-based shielding installed to protect the containers from exposure to heat. Nevertheless, the agency proposed that no vehicle-based shielding be used during the bonfire test because Standard No. 304 is an equipment standard, and applies to CNG containers, not to vehicles. Further, since the presence or amount of shielding could vary from vehicle to vehicle, the agency tentatively concluded that the containers should be tested in the worst case situation, i.e., without any vehicle-based shielding. Nevertheless, the agency stated that it did not want to discourage vehicle manufacturers from including shielding in CNG vehicles as an added safety feature.

NHTSA received six comments addressing the use of vehicle-based shielding during the bonfire test. PST, EDO, ARC, Ontario, and NGVC agreed with the agency that vehicle-based shielding of the container should not be used during the bonfire test. They believed that such shielding could detract from or mask the results of the test. In contrast, AAMA stated that "[i]f a manufacturer chooses to add the additional expense to protect the fuel tank from exposure to potential flame, the protection ought to be allowed in any test as representative of the tank's use in the vehicle."

After reviewing the comments, NHTSA has decided not to permit vehicle-based shielding of the container during the bonfire test. As explained in the NPRM, the bonfire test is intended to evaluate the container and not the vehicle. Since this is an equipment standard, the tests are designed to ensure that the containers are safe for installation in any vehicle, regardless of the amount of protective vehicle shielding, if any, with which it is equipped. The agency disagrees with AAMA's contention. Using vehicle shielding in compliance testing would

not ensure that a container could perform safely under worst case conditions (i.e., no vehicle-based shielding of any type or extent) that the container could encounter during its service life (e.g., if the container is subsequently placed in a different vehicle).

Test shielding consists of a metal plate over the pressure relief device and is permitted, but not required, under NGV2 for purposes of the horizontal bonfire test. In the horizontal test, the CNG container is positioned over the bonfire with its longitudinal axis in a horizontal position. In the NGV2 vertical bonfire test (container longitudinal axis in a vertical position), pressure relief device shielding is also permitted, but not required, except where the CNG container is fitted with a pressure relief device on both ends. In that case, the bottom pressure relief device must be shielded. The goal is to not allow flames to impinge directly on any relief device. This may be done through test shielding, or by orienting the container so as to avoid flame impingement on any pressure relief device. Without this metal plate, the flames could contact the pressure relief device, possibly causing it to vent the container prematurely. If this occurred, the bonfire test results would neither evaluate the CNG container as a whole nor accurately reflect the container's pressure relief characteristics.

CGA and PST opposed allowing shielding of the pressure relief device during the bonfire test. They commented that shielding the pressure relief device during the bonfire test would not be representative of a real-world crash fire situation. CGA stated that allowing, but not requiring shielding to be placed around pressure relief devices could produce non-repeatable results. PST stated that excessive shielding around the pressure relief device could cause an otherwise acceptable design to fail the test, but did not elaborate as to how this could occur.

NHTSA has decided to require test shielding of the pressure relief device during the horizontal bonfire test. The agency notes that the purpose of this test is to replicate the effect of fires on the pressure relief device and the fuel container as a system. Requiring shielding will assure that the bonfire test is evaluating the fuel container as a whole, rather than merely the pressure relief device, since a flame that impinges on the pressure relief device, could activate prematurely. Requiring shielding, rather than simply allowing it, will assure repeatable and consistent test results. The rule also requires shielding of the pressure relief device

during the vertical bonfire test, except where the container is fitted with a pressure relief device on only one end. In that case, the container is positioned with the pressure relief device on top, so as to avoid direct contact with the flame.

4. Test Gas and Pressure

In the NPRM, NHTSA proposed that the CNG container be pressurized with either nitrogen or air to 100 percent of service pressure for the bonfire test. The agency acknowledged that NGV2 specifies the use of CNG, but tentatively concluded that using nitrogen or air as the test gas would be safer than using CNG.

AAMA and Tecogen recommended that CNG be used as the test gas. Tecogen further commented that the container manufacturers have historically conducted such tests using CNG and are therefore well aware of the necessary safety precautions. It further stated that using CNG as the test gas would reveal the pressure relief valve's effectiveness with respect to the discharge rate. AAMA commented that CNG should be used as the test gas because the thermal properties of CNG differ from those of nitrogen and air and NGV2 specifies the use of CNG as the test gas. AAMA also recommended that the CNG containers be pressurized at the start of the test to 95 to 100 percent of service pressure, but offered no rationale.

After reviewing the comments, NHTSA has determined that using CNG as the test gas would better reflect the real-world conditions in a fire, since the test gas would be the same as the gas used in CNG containers. The agency notes that the bonfire test addresses the responsiveness of the pressure relief device and that air and nitrogen have different thermal properties than CNG. Therefore, the pressure relief device might perform differently if air or nitrogen were used instead of CNG. In the NPRM, the agency explained that using CNG as a test gas might not be safe. These initial concerns have been allayed by the comments indicating that manufacturers are aware of and accustomed to taking the necessary safety precautions when using CNG as a test gas to evaluate a container. NHTSA notes that it decided not to specify CNG as the test gas in the CNG vehicle standard. Nevertheless, the agency believes that differences in reaction to heat are important for the bonfire test, which involves high temperatures, but not for crash tests, which do not involve such temperatures.

NHTSA continues to believe that it is necessary to pressurize the CNG container to 100 percent of service pressure at the outset of the test. The agency has determined that the containers need to be tested at full service pressure to represent the worst case scenario.

5. Wind Velocity and Direction

In the NPRM and SNPRM, NHTSA did not address the allowable wind velocity and direction. The agency received comments from NGVC, CGA, and PST stating that a limit should be placed on wind velocity to increase the bonfire test's repeatability.

After reviewing the comments, NHTSA has decided to specify that the average wind velocity at the container during the test may not exceed 2.24 meters per second (5 mph). The agency believes that permitting higher crosswinds would vary or reduce the flame's heat. Therefore, placing limits on the crosswind assures the test's repeatability and the level of stringency that the agency anticipated in proposing this test.

6. Bonfire Fuel

In the NPRM, NHTSA proposed that the fire for the bonfire tests be generated using No. 2 diesel fuel. This fuel type was proposed so that the standard would be consistent with the bonfire test in NGV2, which also specifies this type of fuel.

NGVC, CGA, AAMA, and Norris commented that the agency should specify a different fuel to generate the bonfire that is more environmentally sound. CGA stated that the large amounts of smoke that would be created by burning the diesel fuel are contrary to the environmental objectives of developing CNG vehicles. NGVC and Norris suggested using a CNG or propane grill for the test.

After reviewing the comments and other available information, NHTSA has decided to specify the use of No. 2 diesel fuel in the final rule. The agency is aware of the environmental problems associated with this type of fuel and will further study whether other fuels should be used to generate the bonfire test. However, until the agency can determine that a different fuel is an appropriate replacement for diesel fuel, the Standard will specify No. 2 diesel fuel for use in the bonfire test.

7. Bonfire Test Fuel Pan Depth

In the NPRM, NHTSA proposed that the bonfire test pan containing No. 2 diesel fuel be at least 100 centimeters (cm) deep. The agency specified a depth

to ensure that there would be an adequate amount of fuel to run the test.

AAMA, Comdyne, CGA, Alusuisse, and PST commented that the fuel pan depth was excessive. Alusuisse stated that a pan of the proposed size would contain more than 1,000 liters of fuel. PST stated that a 100 millimeter (mm) depth would be more reasonable. CGA, AAMA, and Comdyne stated that the depth of the fuel pan should not be specified so long as a sufficient quantity of fuel is provided for the test.

The agency intended to propose a depth of 100 mm. However, due to a typographical error, it proposed a depth of 100 cm. NHTSA agrees that a fuel pan with a depth of at least 100 cm would be too deep. NHTSA also agrees that the fuel pan's depth does not need to be specified, provided that there is a sufficient amount of fuel to maintain the fire for the duration of the test. Accordingly, the agency has removed the requirement for fuel pan depth and has replaced it with the provision that there be "sufficient fuel to burn for at least 20 minutes." The agency believes that this provision is consistent with the test's purpose of simulating a severe fire by raising the container's temperature and pressure by completely surrounding it with flames produced by a specific fuel type.

F. Labeling Requirements

In the NPRM, NHTSA proposed to require that container manufacturers certify that each of their containers complies with the proposed equipment requirements and permanently label the container with the following information: the symbol "DOT" to constitute a certification by the manufacturer that the container conforms to all requirements of the standard; the date of manufacture of the container; the name and address of the container manufacturer; and the maximum service pressure. The agency stated that labeling the container would provide vehicle manufacturers and consumers with assurance that they are purchasing containers that comply with the Federal safety standards. In addition, the agency believed that the proposed requirement would facilitate the agency's enforcement efforts by providing a ready means of identifying the container and its manufacturer.

EDO, NGVC, Thomas, NYCFD, and Volvo GM addressed the proposed labeling requirements. EDO and NYCFD stated that the label should include the maximum fill pressure at a location close to the fill receptacle. NGVC recommended that a blank area for the container installation date be included in the label to be filled in by the

installer. Volvo GM stated that only containers that are manufactured after the standard's effective date, and therefore actually subject to the standard, should be entitled to display the DOT symbol as certification of compliance with the standard. Thomas stated, without elaboration, that the labeling requirements of NGV2 should be adopted. NHTSA's proposal did not include certain additional information included in NGV2, including the type of container, inspector symbols, trademarks, manufacturer's part number, and serial numbers.

After reviewing the comments, NHTSA has decided to adopt the proposed labeling requirements with a slight modification from the proposed format. In item (a), the agency has modified the proposal which states "The tank manufacturer's name and address" to state the following: include the statement that "If there is a question about the proper use, installation, or maintenance of this container, contact [manufacturer's name, address, and telephone number]."

The agency has decided not to require the other additional items of information in NGV2 since the agency did not propose the inclusion of such information in the NPRM. Notwithstanding the agency's decision not to require this additional information, a manufacturer may list such information on the label, provided the additional information does not obscure or confuse the required information. In particular, NHTSA encourages manufacturers to include the container type, e.g., Type 1, 2, 3 or 4, since the agency has decided to adopt NGV2's design and material specifications in this final rule. Specifying the type of container should facilitate oversight of compliance tests since each type of container is required to undergo hydrostatic burst tests, but with different safety factors.

In the upcoming SNPRM, NHTSA anticipates proposing additional requirements about the CNG fuel container's label, including the container type. In addition, the agency anticipates proposing that the label include an additional statement addressing the container's inspection and maintenance. Specifically, the label would state that "This container should be visually inspected after an accident or fire or at least every 12 months for damage and deterioration in accordance with the applicable Compressed Gas Association guidelines." The agency believes that such a statement would alert owners to the desirability for reinspection over time or in the event of an accident. NHTSA will also propose

requirements related to the label's location, in response to EDO's and NYCFD's comment that the maximum service pressure should be labeled in an area close to the fill receptacle.

G. Leadtime

In the NPRM, NHTSA proposed to make the equipment requirements effective on September 1, 1994. The agency believed that this would provide a reasonable time period for manufacturers to make minor modifications in container design. This proposal was based on the agency's belief that the proposed requirements were similar to RSPA standards currently in effect. The agency requested comment on the feasibility of this effective date.

NHTSA received eleven comments about the proposed effective date applicable to the container requirements. The commenters were TMC, the U.S. Department of Energy, TBB, Oklahoma Gas, NGVC, EDO, Volvo/GM, AAMA, ARC, Navistar, and NGV Systems. EDO and Navistar requested that the final rule be issued as early as possible. DOE and Oklahoma Gas recommended an effective date of September 1, 1995. NGVC recommended an effective date of September 1, 1996, unless NGV2 were adopted which would permit an immediate supply of containers. NGV Systems stated that an earlier effective date would be difficult to meet since the rule, as proposed, would require new tooling, process development, and perhaps equipment modification. ARC stated that the rule, as proposed, would require major modifications, since its containers have been designed to comply with NGV2. AAMA and Volvo/GM stated that the effective dates for the vehicle requirements and the equipment requirements should not be concurrent.

NHTSA notes that these comments were based on the requirements, as proposed in the NPRM. Since the final rule has been made essentially consistent with NGV2 (with the exception of carbon fiber containers), the agency anticipates that container manufacturers can for the most part already certify that containers, other than carbon fiber ones, comply with the new standard. This belief is based on comments on the NPRM and meetings with NGVC, the CGA, and CNG container manufacturers. With regard to manufacturers of carbon fiber containers, EDO indicated that it already complies with the standard and Brunswick indicated that it would need less than one month lead time for a safety factor greater than 2.25. Brunswick further stated that it would

need an unspecified time period to modify the mounting brackets and other hardware. The CNG industry groups have informed the agency that they want a CNG fuel container standard to be effective as quickly as possible. In addition, they favor having an opportunity to "voluntarily certify compliance" to the standard once the final rule is published. The CNG industry groups believe that it is necessary for Federal standards to be in place as soon as possible, given the expected increased demand for CNG containers in light of Federal and State fleet programs for clean fuel vehicles. They also favor quick adoption of a Federal standard to preempt state regulations that otherwise may be promulgated and to ensure that substandard CNG containers are not marketed.

After reviewing the comments, NHTSA has decided to establish an effective date six months after the final rule is issued. As explained above, most CNG containers can be certified to comply with the new Federal motor vehicle safety standard since they already comply with NGV2 or can be modified so that they comply within six months. Nevertheless, the agency believes that it is necessary to provide a leadtime of six months to allow manufacturers time to make whatever design changes are necessary and to conduct testing so that they can certify that their containers comply with the new standard. In the meantime, prior to the standard's effective date, the industry is free to advertise containers as meeting the CNG equipment standard that will take effect in six months.⁸ Manufacturers have taken the approach of seeking early compliance with respect to other agency requirements such as those relating to dynamic side impact protection and air bags. Therefore, the agency encourages manufacturers to seek, to the extent feasible, to manufacture their CNG containers to meet these new requirements before the date the standard takes effect.

With regard to the concern expressed by AAMA and Volvo GM that the effective date of the container regulation should precede that of the vehicle regulation, AAMA based its comments on the belief that it will need to know

the performance of the containers it will use in the fuel systems of its vehicles. NHTSA notes that CNG containers now typically meet NGV2 and thus should comply with NHTSA's standards. Therefore, AAMA members already have access to and detailed knowledge about containers that should meet the new requirements.

H. Benefits

In the NPRM, NHTSA addressed the proposal's benefits with respect to CNG vehicles. The notice did not directly address the benefits of regulating the CNG fuel containers.

NHTSA received no comments directly addressing the benefits of regulating CNG containers. Brunswick criticized the proposal, believing that it would place carbon fiber containers at a competitive disadvantage. Brunswick stated that the proposed single burst factor would provide less benefits than if the agency adopted NGV2.⁹

NHTSA anticipates that the number of CNG fuel vehicles will increase greatly in the near future, in light of directives by the Clinton Administration¹⁰ and legislation by Congress to develop vehicles powered by cleaner burning fuels. This final rule will increase the safety of this growing population of vehicles.

I. Costs

In the NPRM, NHTSA stated that each container would cost \$600. The agency further stated that the container testing costs would range from approximately \$4,050 to \$8,600 for each model of container.

NGVC, NGV Systems, PST, Brunswick, ARC, Thomas Built, and Flexile addressed the costs of the proposal with respect to CNG containers. NGVC and the CNG container manufacturers stated that the proposal, especially given the single safety factor in the burst test requirements, significantly understated the costs of the rulemaking. Brunswick stated that container manufacturers would incur significant costs since they would have to redesign and requalify their currently designed tanks. As a result, it believed that the CNG containers would be more expensive and heavier. It estimated that the

proposal would increase costs between 10 percent and 55 percent, depending on the material and method of construction. Brunswick further stated that this proposal would add many millions of dollars on an industry-wide basis.

NGVC commented that the qualification tests could cost \$20,000 for each model of container since many tests will be required on prototype containers. It stated that some manufacturers estimate that the design, manufacture, and qualification costs could approach \$150,000 per container model, a figure that greatly exceeded NHTSA's estimate of \$74,000.

NHTSA believes that the basis for the comments about the costs of this rulemaking have been largely eliminated except in connection with carbon fiber tanks. The comments were based on the proposal for a single safety factor of 3.5 for all types of tanks. As noted above, the agency has decided to specify multiple safety factors that are consistent with NGV2 except in the case of the factors for carbon fiber containers. Since all the container manufacturers commenting on the proposal either already certify to or can comply with NGV2 without any design changes, the cost to manufacturers will be minimal for noncarbon fiber tanks.

V. Rulemaking Analyses

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

NHTSA has considered the impact of this rulemaking action under Executive Order 12866 and the Department of Transportation's regulatory policies and procedures. This rulemaking document was not reviewed under E.O. 12866, "Regulatory Planning and Review." This action has been determined to be "nonsignificant" under the Department of Transportation's regulatory policies and procedures. NHTSA has estimated the costs of the amendments in a Final Regulatory Evaluation (FRE) which is included in the docket for this rulemaking. As discussed in that document, NHTSA estimates that the cost for the pressure cycling, burst, and bonfire testing will range from \$9,000 to \$21,725 per container size and type. In addition, the cost of the containers used in the test is estimated to range from \$1,800 to \$6,600. Since the safety factors in the burst test applicable to carbon fiber containers are more stringent than those in NGV2, the cost of those containers will increase. Based on comments by Brunswick and other information, the switch from carbon fiber containers meeting a 2.25 safety factor to carbon fiber containers meeting

⁸ However, the agency emphasizes that a manufacturer may not certify a container as meeting the equipment standard until the standard goes into effect. Under the Vehicle Safety Act, a certification is a statement that a vehicle or item of equipment meets all applicable Federal Motor Vehicle Safety Standards that are then in effect. Therefore, until a standard is effective, manufacturers may not certify compliance with it.

⁹ Because NHTSA is adopting Brunswick's request for multiple safety factors, that commenter's concern about a single safety factor is moot.

¹⁰ Executive Order 12844 increased by 50 percent the number of alternatively fueled vehicles to be acquired by the Federal Government from 1993 through 1995. (April 21, 1993) In addition, in 1993, the President established the Federal Fleet Conversion Task Force to accelerate the commercialization and market acceptance of alternative fueled vehicles throughout the country.

the factors adopted in this final rule will increase the container cost and the lifetime fuel costs about 8.75 percent for vehicles equipped with Type 2 containers. Those costs would be range from \$115 for passenger cars to \$602 for heavy trucks. The switch would increase costs about 37.1 percent for vehicles equipped with Type 3 and Type 4 containers, resulting in a cost increase ranging from \$496 for cars to \$2,560 for heavy trucks.

B. Regulatory Flexibility Act

NHTSA has also considered the effects of this rulemaking action under the Regulatory Flexibility Act. Based upon the agency's evaluation, I certify that this rule will not have a significant economic impact on a substantial number of small entities. Information available to the agency indicates that businesses manufacturing CNG fuel containers are not small businesses.

C. Executive Order 12612 (Federalism)

NHTSA has analyzed this rulemaking action in accordance with the principles and criteria contained in Executive Order 12612. NHTSA has determined that the rule will not have sufficient Federalism implications to warrant the preparation of a Federalism Assessment. No state has adopted requirements regulating CNG containers.

D. National Environmental Policy Act

In accordance with the National Environmental Policy Act of 1969, NHTSA has considered the environmental impacts of this rule. The agency has determined that this rule will have no adverse impact on the quality of the human environment. On the contrary, because NHTSA anticipates that ensuring the safety of CNG vehicles will encourage their use, NHTSA believes that the rule will have positive environmental impacts. CNG vehicles are expected to have near-zero evaporative emissions and the potential to produce very low exhaust emissions as well.

E. Civil Justice Reform

This final rule does not have any retroactive effect. Under 49 U.S.C. 30103, whenever a Federal motor vehicle safety standard is in effect, a State may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard, except to the extent that the State requirement imposes a higher level of performance and applies only to vehicles procured for the State's use. 49 U.S.C. 30161 sets forth a procedure for judicial review of final rules establishing, amending or

revoking Federal motor vehicle safety standards. That section does not require submission of a petition for reconsideration or other administrative proceedings before parties may file suit in court.

List of Subjects in 49 CFR Part 571

Imports, Incorporation by reference, Motor vehicle safety, Motor vehicles.

PART 571—[AMENDED]

In consideration of the foregoing, 49 CFR Part 571 is amended as follows:

PART 571—[AMENDED]

1. The authority citation for Part 571 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117 and 30166; delegation of authority at 49 CFR 1.50.

2. Section 571.5 is amended by redesignating (b)(7) as (b)(10) and adding new paragraphs (b)(7) through (b)(9), to read as follows:

§ 571.5 Matter incorporated by reference.

* * * * *

(b) * * *
(7) *Standards of Suppliers of Advanced Composite Materials Association (SACMA)*. They are published by Suppliers of Advanced Composite Materials Association. Information and copies may be obtained by writing to: Suppliers of Advanced Composite Materials Association, 1600 Wilson Blvd., Suite 1008, Arlington, VA 22209.

(8) *Standards of the American Society of Mechanical Engineers (ASME)*. They are published by The American Society of Mechanical Engineers. Information and copies may be obtained by writing to: The American Society of Mechanical Engineers, 345 East 47th Street, New York, NY 10017.

(9) *Computer Analysis by the National Aeronautics and Space Administration (NASA)*. This was conducted by the National Aeronautics and Space Administration. Information and copies may be obtained by writing to: National Aeronautics and Space Administration, 600 Independence Avenue SW, Washington, DC 20546.

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3. A new § 571.304, *Standard No. 304; Compressed Natural Gas Fuel Container Integrity*, is added to Part 571, to read as follows:

§ 571.304 Standard No. 304; Compressed Natural Gas Fuel Container Integrity.

S1. *Scope*. This standard specifies requirements for the integrity of compressed natural gas (CNG), motor vehicle fuel containers.

S2. *Purpose*. The purpose of this standard is to reduce deaths and injuries occurring from fires that result from fuel leakage during and after motor vehicle crashes.

S3. *Application*. This standard applies to containers designed to store CNG as motor fuel on-board any motor vehicle.

S4. Definitions.

Brazing means a group of welding processes wherein coalescence is produced by heating to a suitable temperature above 800 °F and by using a nonferrous filler metal, having a melting point below that to the base metals. The filler metal is distributed between the closely fitted surfaces of the joint by capillary attraction.

Burst pressure means the highest internal pressure reached in a CNG fuel container during a burst test at a temperature of 21 °C (70 °F).

CNG fuel container means a container designed to store CNG as motor fuel on-board a motor vehicle.

Fill pressure means the internal pressure of a CNG fuel container attained at the time of filling. Fill pressure varies according to the gas temperature in the container which is dependent on the charging parameters and the ambient conditions.

Full wrapped means applying the reinforcement of a filament or resin system over the entire liner, including the domes.

Hoop wrapped means winding of filament in a substantially circumferential pattern over the cylindrical portion of the liner so that the filament does not transmit any significant stresses in a direction parallel to the cylinder longitudinal axis.

Hydrostatic pressure means the internal pressure to which a CNG fuel container is taken during testing set forth in S5.4.1.

Liner means the inner gas tight container or gas cylinder to which the overwrap is applied.

Service pressure means the internal settled pressure of a CNG fuel container at a uniform gas temperature of 21 °C (70 °F) and full gas content. It is the pressure for which the container has been constructed under normal conditions.

Stress ratio means the stress in the fiber at minimum burst pressure divided by the stress in the fiber at service pressure.

S5 Container and material requirements.

S5.1 *Container designations*. Container designations are as follows:

S5.1.1 *Type 1—Non-composite metallic container* means a metal container.

S5.1.2 *Type 2—Composite metallic hoop wrapped container* means a metal liner reinforced with resin impregnated continuous filament that is "hoop wrapped."

S5.1.3 *Type 3—Composite metallic full wrapped container* means a metal

liner reinforced with resin impregnated continuous filament that is "full wrapped."

S5.1.4 *Type 4—Composite non-metallic full wrapped container* means resin impregnated continuous filament with a non-metallic liner "full wrapped."

S5.2 *Material designations.*

S5.2.1 *Steel containers and liners.*

(a) Steel containers and liners shall be of uniform quality. Only the basic oxygen or electric furnace processes are authorized. The steel shall be aluminum killed and produced to predominantly fine grain practice. The steel heat analysis shall be in conformance with one of the following grades:

TABLE ONE—STEEL HEAT ANALYSIS

Grade element	Chrome-Molybdenum percent	Carbon-Boron percent	Carbon-Manganese percent
Carbon	0.25 to 0.38	0.27 to 0.37	0.40 max.
Manganese	0.40 to 1.05	0.80 to 1.40	1.65 max.
Phosphorus	0.015 max	0.015 max	0.025 max.
Sulfur	0.010 max	0.010 max	0.010 max.
Silicon	0.15 to 0.35	0.30 max	0.10/0.30
Chromium	0.80 to 1.15	N/A	N/A
Molybdenum	0.15 to 0.25	N/A	N/A
Boron	N/A	0.0005 to 0.003 ..	N/A
Aluminum	0.02 to 0.07	0.02 to 0.07	0.02/0.07

¹ "N/A" means not applicable.

(b) Incidental elements shall be within the limits specified in the *Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements for ASTM A 505 (1987)*.

S5.2.1.1 When carbon-boron steel is used, the test specimen is subject to a hardenability test in accordance with the *Standard Method for End-Quench Test For Hardenability of Steel*, ASTM A 255 (1989). The hardness evaluation is made 7.9 mm ($\frac{5}{16}$ inch) from the quenched end of the Jominy quench bar.

S5.2.1.2 The test specimen's hardness shall be at least Rc (Rockwell Hardness) 33 and no more than Rc 53.

S5.2.2 *Aluminum containers and aluminum liners.* (Type 1, Type 2 and Type 3) shall be 6010 alloy, 6061 alloy, and T6 temper. The aluminum heat analysis shall be in conformance with one of the following grades:

TABLE TWO—ALUMINUM HEAT ANALYSIS

Grade element	6010 alloy percent	6061 alloy percent
Magnesium	0.60 to 1.00	0.60 to 1.20
Silicon	0.80 to 1.20	0.40 to 0.80
Copper	0.15 to 0.60	0.15 to 0.40
Chromium	0.05 to 0.10	0.04 to 0.35
Iron	0.50 max	0.70 max
Titanium	0.10 max	0.15 max
Manganese	0.20 to 0.80	0.15 max
Zinc	0.25 max	0.25 max
Bismuth	0.003 max	0.003 max
Lead	0.003 max	0.003 max
Others, Each ¹	0.05 max	0.05 max
Others, Total ¹	0.15 max	0.15 max

TABLE TWO—ALUMINUM HEAT ANALYSIS—Continued

Grade element	6010 alloy percent	6061 alloy percent
Aluminum ..	Remainder	Remainder

¹ Analysis is made only for the elements for which specific limits are shown, except for unalloyed aluminum. If, however, the presence of other elements is indicated to be in excess of specified limits, further analysis is made to determine that these other elements are not in excess of the amount specified. (Aluminum Association Standards and Data—Sixth Edition 1979.)

S5.2.3 Structural reinforcing filament material shall be commercial grade E-glass, commercial grade S-glass, aramid fiber or carbon fiber. Filament strength shall be tested in accordance with the *Standard Test Method for Tensile Properties of Glass Fiber Strands, Yarns, and Rovings Used in Reinforced Plastics*, ASTM D 2343 (1967, Reapproved 1985), or *SACMA Recommended Test Method for Tow Tensile Testing of Carbon Fibers*, SRM 16-90, 1990. Fiber coupling agents (sizing) shall be compatible with the resin system. If carbon fiber reinforcement is used the design shall incorporate means to prevent galvanic corrosion of metallic components of the fuel container.

S5.2.4 The resin system shall be epoxy, modified epoxy, polyester, vinyl ester or thermoplastic.

S5.2.4.1 The resin system is tested on a sample coupon representative of the composite overwrap in accordance with the *Standard Test Method for Apparent Interlaminar Shear Strength*

of *Parallel Fiber Composites by Short-Beam Method*, ASTM D 2344, (1984, Reapproved 1989) following a 24-hour water boil.

S5.2.4.2 The test specimen shall have a shear strength of at least 13.8 MPa (2,000 psi).

S5.2.5 For nonmetallic liners, the permeation of CNG through the finished container's wall at service pressure is less than 0.25 normal cubic centimeters per hour per liter water capacity of the container.

S5.3 *Manufacturing processes for composite containers.*

S5.3.1 *Composite containers with metallic liners.* The CNG fuel container shall be manufactured from a metal liner overwrapped with resin impregnated continuous filament windings, applied under controlled tension to develop the design composite thickness. After winding is complete, composites using thermoset resins shall be cured by a controlled temperature process.

S5.3.1.1 *Type 2 containers.* Type 2 containers shall have a hoop wrapped winding pattern.

S5.3.1.2 *Type 3 containers.* Type 3 containers shall have a full wrapped "helical or in plane" and a "hoop" wrap winding pattern.

S5.3.2 *Type 4 containers.* Composite containers with nonmetallic liners shall be fabricated from a nonmetallic liner overwrapped with resin impregnated continuous filament windings. The winding pattern shall be "helical or in plane" and "hoop" wrap applied pattern under controlled tension to develop the design composite thickness.

After winding is complete, the composite shall be cured by a controlled temperature process.

S5.3.3 Brazing. Brazing is prohibited.

S5.3.4 Welding. Welding shall be done in accordance with the *American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code*, Section IX, Article II, QW-304 and QW-305 (1992). Weld efficiencies shall be in accordance with *ASME Boiler and Pressure Vessel Code*, Section VIII, UW-12 (1989). Any weld shall be subject to full radiographic requirements in accordance with *ASME Boiler and Pressure Vessel Code*, Section VIII, UW-51 thru UW-53 (1989). For Type 2 and Type 3 liners, longitudinal welds and nonconsumable backing strips or rings shall be prohibited.

S5.4 Wall thickness.

S5.4.1 Type 1 containers.

(a) The wall thickness of a Type 1 container shall be at least an amount such that the wall stress at the minimum prescribed hydrostatic test pressure does not exceed 67 percent of the minimum tensile strength of the metal as determined by the mechanical properties specified in S5.7 and S5.7.1.

(b) For minimum wall thickness calculations, the following formula is used:

$$S = \frac{P(1.3D^2 + 0.4d^2)}{(D^2 - d^2)}$$

Where:

S = Wall stress in MPa (psi).

P = Minimum hydrostatic test pressure in Bar (psig).

D = Outside diameter in mm (inches).

d = Inside diameter in mm (inches).

S5.4.2 Type 2 containers.

S5.4.2.1 The wall thickness of a liner to a Type 2 container shall be at least an amount such that the longitudinal tensile stress at the minimum design burst pressure does not exceed the ultimate tensile strength of the liner material as determined in S5.7 and S5.7.1.

S5.4.2.2 The wall thickness of a liner to a Type 2 container shall be at least an amount such that the compressive stress in the sidewall of the finished container at zero pressure shall not exceed 95 percent of the yield strength of the liner as determined in S5.7 and S5.7.1 or 95 percent of the minimum design yield strength shown in S5.7.3. The maximum tensile stress in the liner at service pressure shall not exceed 66 percent of the yield strength.

S5.4.2.3 Stresses at the end designs at internal pressures between no more

than 10 percent of service pressure and service pressure shall be less than the maximum stress limits in the sidewall as prescribed above.

S5.4.3 Type 3 containers. The wall thickness of a liner to a Type 3 container shall be such that the compressive stress in the sidewall of the finished container at zero pressure shall not exceed 95 percent of the minimum yield strength of the liner as determined in S5.7 and S5.7.1 or 95 percent of the minimum design yield strength shown in S5.7.3.

S5.4.4 Type 4 containers. The wall thickness of a liner to a Type 4 container shall be such that the permeation rate requirements of this specification are met.

S5.5 Composite reinforcement for Type 2, Type 3, and Type 4 Containers.

S5.5.1 Compute stresses in the liner and composite reinforcement using National Aeronautics and Space Administration (NASA) NAS 3-6292, *Computer Program for the Analysis of Filament Reinforced Metal-Shell Pressure Vessels*, (May 1966).

S5.5.2 The composite overwrap shall meet or exceed the following composite reinforcement stress ratio values shown in Table 3.

S5.6 Thermal treatment.

S5.6.1 Steel containers or liners.

S5.6.1.1 After all metal forming and welding operations, completed containers or liners shall be uniformly and properly heat treated under the same conditions of time, temperature and atmosphere prior to all tests.

S5.6.1.2 All containers or liners of steel grades "Chrome-Molybdenum" or "Carbon Boron" shall be quenched in a medium having a cooling rate not in excess of 80 percent that of water. "Carbon-Manganese" steel grades shall be normalized and do not require tempering after normalizing.

S5.6.1.3 All steel temperature on quenching shall not exceed 926°C (1700°F).

S5.6.1.4 All containers or liners of steel grades "Chrome-Molybdenum" or "Carbon Boron" shall be tempered after quenching at a temperature below the transformation ranges, but not less than 482°C (900°F) for "Carbon-Boron" steel or 565°C (1050°F) for "Chrome-Molybdenum" steel. "Carbon-Manganese" steel grades do not require tempering after normalizing.

S5.6.2 Aluminum containers or liners (seamless and welded). After all forming and welding operations, aluminum containers or liners shall be solution heat treated and aged to the T6 temper. The liner and composite overwrap shall meet the cycle life and

strength requirements set forth in S5.1 and S5.2 of this standard.

S5.7 Yield strength, tensile strength, material elongation (metal containers and metal liners only). To determine yield strength, tensile strength, and elongation of the material, cut two specimens from one container or liner. The specimen either has (a) a gauge length of 50 mm (2 inches) and a width not over 38 mm (1.5 inches), or (b) a gauge length of four times the specimen diameter, provided that a gauge length which is at least 24 times the thickness with a width not over 6 times the thickness is permitted when the liner wall is not over 5 mm (3/16 inch) thick. The specimen shall not be flattened, except that grip ends may be flattened to within 25 mm (1 inch) of each end of the reduced section. Heating of specimens is prohibited.

S5.7.1 Yield strength. The yield strength in tension shall be the stress corresponding to a permanent strain of 0.2 percent based on the gauge length.

S5.7.1.1 The yield strength shall be determined by either the "offset" method or the "extension under load" method as prescribed by *Standard Test Methods for Tension Testing of Metallic Materials*, ASTM E8 1993.

S5.7.1.2 In using the "extension under load" method, the total strain or "extension under load" corresponding to the stress at which the 0.2 percent permanent strain occurs may be determined by calculating the elastic extension of the gauge length under appropriate load and adding thereto 0.2 percent of the gauge length. Elastic extension calculations shall be based on an elastic modulus of 69 GPa (10,000,000 psi) for aluminum, or 207 GPa (30,000,000 psi) for steel. If the elastic extension calculation does not provide a conclusive result, the entire stress strain diagram shall be plotted and the yield strength determined from the 0.2 percent offset.

S5.7.1.3 For the purpose of strain measurement, the initial strain is set while the test specimen is under a stress of 41 MPa (6,000 psi) for aluminum, and 83 MPa (12,000 psi) for steel. The strain indicator reading is set at the calculated corresponding strain.

S5.7.1.4 Cross-head speed of the testing machine is 3.2 mm (1/8 inch) per minute or less during yield strength determination.

S5.7.2 Elongation. Elongation of material, when tested in accordance with S5.7, shall be at least 14 percent for aluminum or at least 20 percent for steel; except that an elongation of 10 percent is acceptable for both aluminum and steel when the authorized specimen

size is 24t gauge length x 6t wide, where "t" equals specimen thickness.

S5.7.3 Tensile strength. Tensile strength shall not exceed 725 MPa (105,000 psi) for "Carbon Manganese" and 966 MPa (140,000 psi) for "Chromium-Molybdenum" and "Carbon-Boron."

S6 General requirements.

S6.1 Each passenger car, multipurpose passenger vehicle, truck, and bus that uses CNG as a motor fuel shall be equipped with a CNG fuel container that meets the requirements of S7 through S7.4.

S6.2 Each CNG fuel container manufactured on or after March 27, 1994, shall meet the requirements of S7 through S7.4.

S7 Test requirements. Each CNG fuel container shall meet the applicable requirements of S7 through S7.4.

S7.1 Pressure cycling test at ambient temperature. Each CNG fuel container shall not leak when tested in accordance with S8.1.

S7.2 Hydrostatic burst test.

S7.2.1 Each Type 1 CNG fuel container shall not leak when subjected to burst pressure and tested in accordance with S8.2. Burst pressure shall be not less than 2.25 times the service pressure for non-welded containers when analyzed in accordance with the stress ratio requirements of S5.4.1, and shall not be less than 3.5 times the service pressure for welded containers.

S7.2.2 Each Type 2, Type 3, or Type 4 CNG fuel container shall not leak when subjected to burst pressure and tested in accordance with S8.2. Burst pressure shall be no less than the value necessary to meet the stress ratio requirements of Table 3, when analyzed in accordance with the requirements of S5.5.1. Burst pressure is calculated by multiplying the service pressure by the applicable stress ratio set forth in Table Three.

TABLE THREE—STRESS RATIOS

Material	Type 2	Type 3	Type 4
E-Glass	2.65	3.5	3.5
S-Glass	2.65	3.5	3.5
Aramid	2.25	3.0	3.0
Carbon	2.50	3.33	3.33

S7.3 Bonfire test. Each CNG fuel container shall be equipped with a pressure relief device. Each CNG fuel container shall completely vent its contents through a pressure relief device or shall not burst while retaining its entire contents when tested in accordance with S8.3.

S7.4 Labeling. Each CNG fuel container shall be permanently labeled with the information specified in

paragraphs (a) through (d). The information specified in paragraphs (a) through (d) of this section shall be in English and in letters and numbers that are at least 12.7 mm (1/2 inch) high.

(a) The statement: "If there is a question about the proper use, installation, or maintenance of this container, contact _____," inserting the CNG fuel container manufacturer's name, address, and telephone number.

(b) The statement: "Manufactured in _____," inserting the month and year of manufacture of the CNG fuel container.

(c) Maximum service pressure _____ kPa (_____ psig).

(d) The symbol DOT, constituting a certification by the CNG container manufacturer that the container complies with all requirements of this standard.

S8 Test conditions: fuel container integrity.

S8.1 Pressure cycling test. The requirements of S7.1 shall be met under the conditions of S8.1.1 through S8.1.4.

S8.1.1 Hydrostatically pressurize the CNG container to the service pressure, then to not more than 10 percent of the service pressure, for 13,000 cycles.

S8.1.2 After being pressurized as specified in S8.1.1, hydrostatically pressurize the CNG container to 125 percent of the service pressure, then to not more than 10 percent of the service pressure, for 5,000 cycles.

S8.1.3 The cycling rate for S8.1.1 and S8.1.2 shall not exceed 10 cycles per minute.

S8.1.4 The cycling is conducted at ambient temperature.

S8.2 Hydrostatic burst test. The requirements of S7.2 shall be met under the conditions of S8.2.1 through S8.2.2.

S8.2.1 Hydrostatically pressurize the CNG fuel container, as follows: The pressure is increased up to the minimum prescribed burst pressure determined in S7.2.1 or S7.2.2, and held constant at the minimum burst pressure for 10 seconds.

S8.2.2 The pressurization rate throughout the test shall not exceed 1,379 kPa (200 psi) per second.

S8.3 Bonfire test. The requirements of S7.3 shall be met under the conditions of S8.3.1 through S8.3.10.

S8.3.1 The CNG fuel container is filled with compressed natural gas and tested at (1) 100 percent of service pressure and (2) 25 percent of service pressure. Manufacturers may conduct these tests using the same container or with separate containers.

S8.3.2 The CNG fuel container is positioned so that its longitudinal axis is horizontal. Subject the entire length

to flame impingement, except that the flame shall not be allowed to impinge directly on any pressure relief device. Shield the pressure relief device with a metal plate.

S8.3.3 If the test container is 165 cm (65 inches) in length or less, place it in the upright position and subject it to total fire engulfment in the vertical. The flame shall not be allowed to impinge directly on any pressure relief device. For containers equipped with a pressure relief device on one end, the container is positioned with the relief device on top. For containers equipped with pressure relief devices on both ends, the bottom pressure relief device shall be shielded with a metal plate.

S8.3.4 The lowest part of the container is 102 mm (4 inches) above the liquid surface of the diesel fuel at the beginning of the test.

S8.3.5 The CNG fuel container is tested with the valve and pressure relief device or devices in place.

S8.3.6 The fire is generated by No. 2 diesel fuel.

S8.3.7 The fuel specified in S8.3.6 is contained in a pan such that there is sufficient fuel to burn for at least 20 minutes. The pan's dimensions ensure that the sides of the fuel containers are exposed to the flame. The pan's length and width shall exceed the fuel container projection on a horizontal plane by at least 20 cm (8 inches) but not more than 50 cm (20 inches). The pan's sidewalls shall not project more than 2 cm (0.8 inches) above the level of fuel.

S8.3.8 Time-pressure readings are recorded at 30 second intervals, beginning when the fire is lighted and continuing until the container is completely tested.

S8.3.9 The CNG fuel container is exposed to the bonfire for 20 minutes or until its contents are completely vented.

S8.3.10 The average wind velocity at the container is not to exceed 2.24 meters/second (5 mph).

Issued on September 16, 1994.

Ricardo Martinez,
Administrator.

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DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

50 CFR Part 17

RIN 1018-AB92

Endangered and Threatened Wildlife and Plants; Endangered Status for Four Ferns From the Hawaiian Islands

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Final rule.

SUMMARY: The U.S. Fish and Wildlife Service (Service) determines endangered status pursuant to the Endangered Species Act of 1973, as amended (Act), for four plants: *Asplenium fragile* var. *insulare* (no common name (NCN)), *Ctenitis squamigera* (pauoa), *Diplazium molokaiense* (NCN), and *Pteris lidgatei* (NCN). *Asplenium fragile* var. *insulare* is currently known only from the island of Hawaii. The three other species are reported from more than one island: *Ctenitis squamigera* is known from the islands of Oahu, Lanai, and Maui, and *Diplazium molokaiense* and *Pteris lidgatei* are known from Oahu and Maui. The four plant taxa and their habitats have been variously affected or are threatened by one or more of the following: Habitat degradation and/or predation by feral goats, sheep, cattle, axis deer, and pigs; and competition for space, light, water, and nutrients from alien plants. Because of the small number of extant individuals and their severely restricted distributions, populations of these taxa are subject to an increased likelihood of extinction from stochastic events. This final rule implements the Federal protection provided by the Act.

EFFECTIVE DATE: October 26, 1994.

ADDRESSES: The complete file for this rule is available for public inspection, by appointment, during normal business hours at the U.S. Fish and Wildlife Service, Pacific Islands Office, 300 Ala Moana Boulevard, Room 6307, P.O. Box 50167, Honolulu, Hawaii 96850.

FOR FURTHER INFORMATION CONTACT: Robert P. Smith, Field Supervisor, at the above address (808/541-2749).

SUPPLEMENTARY INFORMATION:**Background**

Asplenium fragile var. *insulare*, *Ctenitis squamigera*, *Diplazium molokaiense*, and *Pteris lidgatei* are endemic to the Hawaiian Islands. *Asplenium fragile* var. *insulare* is currently known only from the island of Hawaii. *Ctenitis squamigera* is known

from the islands of Oahu, Lanai, and Maui. *Diplazium molokaiense* and *Pteris lidgatei* are known from Oahu and Maui.

The vegetation of the Hawaiian Islands varies greatly according to elevation, moisture regime, and substrate. Major vegetation formations include forests, woodlands, shrublands, grasslands, herblands, and pioneer associations on lava and cinder substrates. There are lowland, montane, and subalpine forest types. Coastal and lowland forests are generally dry or mesic, and may be open- or closed-canopied, with the canopy generally under 10 meters (m) (30 feet (ft)) in height. Of the four endangered fern taxa, three have been reported from lowland forest habitat. *Ctenitis squamigera* is typically found in lowland mesic forests, while *Pteris lidgatei* appears to be restricted to lowland wet forest. *Diplazium molokaiense* has been reported from lowland to montane forests in mesic to wet settings. Montane forests, occupying elevations between 1,000 and 2,000 m (3,000 and 6,500 ft) are dry to mesic on the leeward (southwest) slopes of Maui and Hawaii. On those islands, as well as Oahu and Lanai, mesic to wet montane forests occur on the windward (northeast) slopes and summits. The dry and mesic forests may be open- to closed-canopied, and may exceed 20 m (65 ft) in stature. *Asplenium fragile* var. *insulare* has been reported from montane mesic and dry forest habitats. *Diplazium molokaiense* is also found in montane mesic forests as well as montane wet forests. At high montane and subalpine elevations, above 2,000 m (6,500 ft) elevation, the forests are usually open-canopied, and form a mosaic with surrounding grasslands and shrublands. Subalpine forests and associated ecosystems are known only from East Maui and the island of Hawaii. *Asplenium fragile* var. *insulare* has been reported from subalpine dry forest and shrubland habitat (Gagne and Cuddihy 1990).

The land that supports these four plant taxa is owned by the State of Hawaii, the Federal government, and private entities. The State lands are under the jurisdiction of the Department of Land and Natural Resources (including the natural area reserves system, forest reserves, and State parks) and the Department of Hawaiian Home Lands. Federally owned land consists of Hawaii Volcanoes National Park, Pohakuloa Training Area on the island of Hawaii, and Schofield Barracks Military Reservation on Oahu. The latter two are under the jurisdiction of the U.S. Army.

Discussion of the Four Taxa

The Hawaiian plants now referred to as *Asplenium fragile* var. *insulare* were considered by William Hillebrand (1888) to be conspecific with *Asplenium fragile* from Central and South America. The Hawaiian plants were subsequently treated as a distinct endemic species, *Asplenium rhomboideum* Brack. (Robinson 1913). However, that species is now considered native to the New World and not present in Hawaii. The name *Asplenium fragile* var. *insulare* was published in 1947, as the Hawaiian plants were considered distinct at the varietal level from the extra-Hawaiian plants (Morton 1947).

Asplenium fragile var. *insulare*, a member of the spleenwort family (Aspleniaceae), is a fern with a short suberect stem. The leaf stalks are 5 to 15 centimeters (cm) (2 to 6 inches (in)) long. The main axis of the frond is dull gray or brown, with two greenish ridges. The fronds are thin-textured, bright green, long and narrow, 23 to 41 cm (9 to 16 in) long, 2 cm (0.8 in) wide above the middle, and pinnate with 20 to 30 pinnae (leaflets) on each side. The pinnae are rhomboidal, 0.8 cm (0.3 in) wide, and notched into two to five blunt lobes on the side towards the tip of the frond. The sori (spore-producing bodies) are close to the main vein of the pinna, with one to two on the lower side and two to four on the upper side (Hillebrand 1888, Wagner and Wagner 1992). The Hawaiian fern species most similar to *Asplenium fragile* var. *insulare* is *Asplenium macraei*. The two can be distinguished by a number of characters, including the size and shape of the pinnae and the number of sori per pinna (Wagner and Wagner 1992).

Asplenium fragile var. *insulare* was known historically from East Maui, where it was recorded from the north slope of Haleakala and Kanahau Hill (Hawaii Heritage Program 1992a6, Hillebrand 1888). On the island of Hawaii, the taxon was found historically below Kalaieha, Laumaia, and Puu Moana on Mauna Kea (HHP 1992a12, 1992a14, 1992a15), Puuwaawaa on Hualalai (HHP 1992a4), west of Keawewai, above Kipuka Ahiu on Mauna Loa (HHP 1992a3, 1992a5), and near Hilo (HHP 1992a2). This fern is now known from eight populations on Hawaii between 1,600 and 2,377 m (5,250 and 7,800 ft) elevation (HHP 1992a7, Shaw 1992). These populations are on Federal, State, and private land. The populations are located at Keanakolu, Puu Huluhulu, Pohakuloa Training Area (nine subpopulations), Kulani Correctional Facility, Keaouhou, the Mauna Loa Strip in Hawaii

Volcanoes National Park, Kapapala Forest Reserve, and the summit area of Hualalai (HHP 1992a1, 1992a7 to 1992a11, 1992a13; Shaw 1992; Paul Higashino, The Nature Conservancy of Hawaii, Daniel Palmer, naturalist, and Warren H. Wagner, Jr., University of Michigan, pers. comms., 1992). The eight known populations total about 295 plants (Shaw 1992; Robert Shaw, *in litt.*, 1993; P. Higashino, D. Palmer, and W. Wagner, pers. comms., 1992). This fern is found in *Metrosideros* (Ohia) Dry Montane Forest, *Dodonaea* (Aalii) Dry Montane Shrubland, *Myoporum*/*Sophora* (Naio/Mamane) Dry Montane Forest (Shaw 1992), and *Ohia*/*Acacia* (koa) forest (HHP 1992a9). *Asplenium fragile* var. *insulare* grows almost exclusively in lava tubes, pits, and deep cracks, with at least a moderate soil or ash accumulation, associated with mosses and liverworts. Infrequently, this fern has been found growing on the interface between younger aa lava flows and much older pahoehoe lava or ash deposits (Shaw 1992). The primary threats to *Asplenium fragile* var. *insulare* are browsing by feral sheep (*Ovis aries*) and goats (*Capra hircus*) and competition with the alien plant *Pennisetum setaceum* (fountain grass). At least one population is threatened by military operations and/or fires resulting from these operations (Loyal Mehrhoff, U.S. Fish and Wildlife Service (USFWS), pers. comm., 1993). Stochastic extinction due to the relatively small number of existing individuals is also of concern.

Ctenitis squamigera was first published as *Nephrodium squamigerum* by Hooker and Arnott in 1832. The species was subsequently placed in the genera *Lastraea*, *Aspidium*, and *Dryopteris*. In 1957 it was transferred to the genus *Ctenitis*, resulting in the currently accepted combination *Ctenitis squamigera* (Degener and Degener 1957).

Ctenitis squamigera, a member of the spleenwort family (Aspleniaceae), has a rhizome (horizontal stem) 5 to 10 millimeters (mm) (0.2 to 0.4 in) thick, creeping above the ground and densely covered with scales similar to those on the lower part of the leaf stalk. The leaf stalks are 20 to 60 cm (8 to 24 in) long and densely clothed with tan-colored scales up to 1.8 cm (0.7 in) long and 1 mm (0.04 in) wide. The leafy part of the frond is deltoid to ovate-oblong, dark green, thin, and twice pinnate to thrice pinnatifid (leaflet sections). The sori are tan-colored when mature and in a single row one-third of the distance from the margin to the midrib of the ultimate segments (Degener and Degener 1957). *Ctenitis squamigera* can be readily

distinguished from other Hawaiian species of *Ctenitis* by the dense covering of tan-colored scales on its fronds (Wagner and Wagner 1992).

Historically, *Ctenitis squamigera* was recorded from above Waimea on Kauai (HHP 1992b3); Kaluanui, southeast of Kahana Bay, Paoa, Nuuanu, Niu, and Wailupe in the Koolau Mountains of Oahu (HHP 1992b4 to 1992b5, 1992b9 to 1992b12); at Kaluaaha Valley on Molokai (HHP 1992b6); in the mountains near Koele on Lanai (HHP 1992b7); in the Honokohau Drainage on West Maui (HHP 1992b1); and at "Kalua" on the island of Hawaii (HHP 1992b13). The seven populations that have been observed within the last 50 years are in the Waianae Mountains of Oahu, Lanai, and East and West Maui. The two Waianae Mountain populations are in the East Makaleha/Kaawa area and at Schofield Barracks (HHP 1991, 1992b2; W. Wagner, pers. comm., 1992). On Lanai, *Ctenitis squamigera* is known from the Waiapaa-Kapohaku area on the leeward side of the island, and Lopa Gulch and Waiopa Gulch on the windward side (HHP 1991). The West Maui population is in Iao Valley (Joel Lau, HHP, pers. comm., 1992). The East Maui population is at Manawainui Stream, 3.5 kilometers (km) (2.2 miles (mi)) north of Kaupo Village (HHP 1992b8). The seven populations are on State, Federal, and private land and total approximately 80 plants (J. Lau and W. Wagner, pers. comms., 1992). This species is found in the understory of forests at elevations of 380 to 915 m (1,250 to 3,000 ft) (HHP 1991, 1992b8), in Ohia/*Diospyros* (Lama) Mesic Forest and diverse mesic forest (HHP 1991). Associated plant taxa include *Myrsine* (kolea), *Psychotria* (kopiko), and *Xylosma* (maua) (HHP 1991; J. Lau, pers. comm., 1992). The primary threats to *Ctenitis squamigera* are habitat degradation by feral pigs (*Sus scrofa*), goats, and axis deer (*Axis axis*); competition with alien plant taxa; and stochastic extinction due to the small number of existing populations and individuals.

Diplazium molokaiense was published by Winifred Robinson (1913) as a new name for the Hawaiian plants that had previously been referred to as the extra-Hawaiian species, *Asplenium arboreum* Willd., by Hillebrand (1888).

Diplazium molokaiense, a member of the spleenwort family (Aspleniaceae), has a short prostrate rhizome. The leaf stalks are 15 to 20 cm (6 to 8 in) long and green or straw-colored. The frond is thin-textured, ovate-oblong, 15 to 50 cm (6 to 20 in) long and 10 to 15 cm (4 to 6 in) wide, truncate at the base, and pinnate with a pinnatifid apex. The sori

are 0.8 to 1.3 cm (0.3 to 0.5 in) long and lie alongside the side veins of the pinnae (Hillebrand 1888; Wagner and Wagner 1992). *Diplazium molokaiense* can be distinguished from other species of *Diplazium* in the Hawaiian Islands by a combination of characters, including venation pattern, the length and arrangement of the sori, frond shape, and the degree of dissection of the frond (Wagner and Wagner 1992).

Historically, *Diplazium molokaiense* was found at Kaholuamano on Kauai (HHP 1992c7); Makaleha on Oahu (HHP 1992c3); Kalae, Kaluaaha, Mapulehu, and the Wailau Trail on Molokai (HHP 1992c5, 1992c11 to 1992c13); Mahana Valley and Kaiholena on Lanai (HHP 1992c8, 1992c9); and Waifuku (Iao) Valley and Waikapu on West Maui (HHP 1992c1, 1992c4). However, within the last 50 years, it has been recorded from only one location on Oahu and three on East Maui. The Oahu population is at Schofield Barracks in the Waianae Mountains (HHP 1992c2). The three Maui populations are on the slopes of Haleakala: Two populations on the north slope at Ainahou and Maliko Gulch (HHP 1992c6, 1992c10), and the third on the south slope at Waiopai Gulch (Robert Hobdy, Hawaii Division of Forestry and Wildlife, and J. Lau, pers. comms., 1992). The currently known populations of *Diplazium molokaiense* are between 850 and 1,680 m (2,800 and 5,500 ft) in elevation (HHP 1992c6, 1992c10) in lowland to montane habitats, including Montane Mesic Ohia/Koa Forest (R. Hobdy, pers. comm., 1992). The four populations are on private, State, and Federal land and total 23 individuals (R. Hobdy and W. Wagner, pers. comms., 1992). The primary threats to *Diplazium molokaiense* are habitat degradation by feral goats, cattle (*Bos taurus*), and pigs; competition with alien plant taxa; and stochastic extinction due to the extremely small number of populations and individuals.

Cheilanthes lidgatei was described in 1883 on the basis of a specimen collected on Oahu. Hillebrand (1888) erected the genus *Schizostege* for this anomalous species. In 1897, it was placed in the genus *Pteris* by H. Christ, resulting in the currently accepted combination *Pteris lidgatei* (Wagner 1949).

Pteris lidgatei, a member of the maidenhair fern family (Adiantaceae), is a coarse herb, 0.5 to 1 m (1.6 to 3.3 ft) tall. It has a horizontal rhizome 1.5 cm (0.6 in) thick and at least 10 cm (3.9 in) long when mature. The fronds, including the leaf stalks, are 60 to 95 cm (24 to 37 in) long and 20 to 45 cm (8 to 18 in) wide. The leafy portion of the

frond is oblong-deltoid to broadly ovate-deltoid, thick, brittle, and dark gray-green. The sori are apparently marginal in position, either fused into long linear sori, or more typically separated into distinct shorter sori, with intermediate conditions being common (Wagner 1949). *Pteris lidgatei* can be distinguished from other species of *Pteris* in the Hawaiian Islands by the texture of its fronds and the tendency of the sori along the leaf margins to be broken into short segments instead of being fused into continuous marginal sori (Wagner and Wagner 1992).

Historically, *Pteris lidgatei* was found at Olokui on Molokai (HHP 1992d4) and Waihee on West Maui (HHP 1992d5). The species was also recorded historically at three locations in the Koolau Mountains of Oahu: Waiahole, Lulumahu Stream, and Waiupe (HHP 1992d1, 1992d2, 1992d6). Only three populations totaling 26 individuals, have been seen within the past 50 years. One population, containing 13 plants, is on State-owned land in the Kaluanui Stream drainage on the windward side of the central Koolau Mountains at 530 to 590 m (1,750 to 1,930 ft) elevation (HHP 1992d3; W. Wagner, pers. comm., 1992). The Kaluanui population grows on steep stream banks in wet *ohia* forest with mosses and other ferns, including *Cibotium chamissoi* (hapu'u ii), *Dicranopteris linearis* (uluhe), *Elaphoglossum crassifolium*, *Sadleria squarrosa* (ama'u), and *Sphenomeris chusana* (pala'a) (HHP 1992d3). One additional plant was discovered on Oahu along the South Kaukonahua Stream (HHP 1993). One population of 12 plants was also discovered along the back wall of Kauaula Valley on Maui (Steve Perlman, National Tropical Botanical Garden, pers. comm., 1993). The primary threats to *Pteris lidgatei* are the alien plant *Clidemia hirta* (Koster's curse), habitat destruction by feral pigs, and stochastic extinction.

Previous Federal Action

Federal action on these plants began as a result of section 12 of the Act, which directed the Secretary of the Smithsonian Institution to prepare a report on plants considered to be endangered, threatened, or extinct in the United States. This report, designated as House Document No. 94-51, was presented to Congress on January 9, 1975. In that document, *Asplenium fragile* var. *insulare*, *Diplazium molokaiense*, and *Pteris lidgatei* were considered to be endangered. *Ctenitis squamigera* was considered to be extinct. On July 1, 1975, the Service published a notice in the *Federal Register* (40 FR 27823) of its acceptance

of the Smithsonian report as a petition within the context of section 4(c)(2) (now section 4(b)(3)) of the Act, and giving notice of its intention to review the status of the plant taxa named therein. As a result of that review, on June 16, 1976, the Service published a proposed rule in the *Federal Register* (41 FR 24523) to determine endangered status pursuant to section 4 of the Act for approximately 1,700 vascular plant taxa, including all of the above taxa considered to be endangered or thought to be extinct. The list of 1,700 plant taxa was assembled on the basis of comments and data received by the Smithsonian Institution and the Service in response to House Document No. 94-51 and the July 1, 1975, *Federal Register* publication.

General comments received in response to the 1976 proposal are summarized in an April 26, 1978, *Federal Register* publication (43 FR 17909). In 1978, amendments to the Act required that all proposals over 2 years old be withdrawn. A 1-year grace period was given to proposals already over 2 years old. On December 10, 1979, the Service published a notice in the *Federal Register* (44 FR 70796) withdrawing the portion of the June 16, 1976, proposal that had not been made final, including these four species, along with four other proposals that had expired. The Service published updated notices of review for plants on December 15, 1980 (45 FR 82479), September 27, 1985 (50 FR 39525), and February 21, 1990 (55 FR 6183). In these three notices, *Pteris lidgatei* was treated as a category 1 candidate for Federal listing. Category 1 taxa are those for which the Service has on file substantial information on biological vulnerability and threats to support preparation of listing proposals. In the 1980 and 1985 notices, *Asplenium fragile* var. *insulare*, *Ctenitis squamigera*, and *Diplazium molokaiense* were considered category 1* species. Category 1* taxa are those which are possibly extinct. Because new information indicated their current existence, *Asplenium fragile* var. *insulare* (as *Asplenium fragile*) and *Diplazium molokaiense* were given category 1 status in the 1990 notice. In that notice, *Ctenitis squamigera* was still considered a category 1* species. However, because this species was rediscovered within the past 3 years, it is included in this rule.

Section 4(b)(3)(B) of the Act requires the Secretary to make findings on petitions that present substantial information indicating that the petitioned action may be warranted within 12 months of their receipt. Section 2(b)(1) of the 1982 amendments

further requires that all petitions pending on October 13, 1982, be treated as having been newly submitted on that date. On October 13, 1983, the Service found that the petitioned listing of these taxa was warranted, but precluded by other pending listing actions, in accordance with section 4(b)(3)(B)(iii) of the Act; notification of this finding was published on January 20, 1984 (49 FR 2485). Such a finding requires the Service to consider the petition as having been resubmitted, pursuant to section 4(b)(3)(C)(i) of the Act. The finding was reviewed in October of 1984, 1985, 1986, 1987, 1988, 1989, 1990, and 1991. Publication of the proposal to list the species constituted the final 1-year finding for these four taxa.

On June 24, 1993, the Service published in the *Federal Register* (58 FR 34231) a proposal to list these four ferns from the Hawaiian Islands as endangered. This proposal was based primarily on information supplied by the Hawaii Heritage Program and observations by botanists and naturalists. With the publication of this final rule, the Service determines these four ferns from the Hawaiian Islands to be endangered.

Summary of Comments and Recommendations

In the June 24, 1993, proposed rule and associated notifications, all interested parties were requested to submit factual reports or information that might contribute to the development of a final rule. The public comment period ended on August 23, 1993. Appropriate State agencies, county governments, Federal agencies, scientific organizations, and other interested parties were contacted and requested to comment. A newspaper notice inviting public comment was published in "The Honolulu Advertiser" on July 16, 1993, "The Maui News" on July 21, 1993, and the "Hawaii Tribune Herald" on July 19, 1993. One letter of comment was received offering additional information on the distribution of one taxon. This information has been incorporated into this final rule. One phone call was received opposing the listing and raising the following issue:

Issue: The control of feral ungulates is unnecessary and done using inhumane methods.

Response: Several studies verify that feral ungulates damage native plants and habitats. Feral goats and pigs have been implicated in the damage of native vegetation ranging from lowland to subalpine areas (Mueller-Dombois and Spatz 1972; Spatz and Mueller-Dombois

1973, 1975; Scowcroft and Sakai 1983). Goat browsing damage has been observed on individuals of *Asplenium fragile* var. *insulare* (R. Shaw, in litt., 1993). Goats, sheep, axis deer, and/or pigs threaten all four taxa through habitat degradation. Recovery efforts for these four endangered taxa should include the control of feral ungulates,

but this control should be done in the most humane way possible, consistent with the need to protect the habitat of these taxa.

Summary of Factors Affecting the Species

Section 4 of the Endangered Species Act (16 U.S.C. 1533) and regulations (50 CFR part 424) promulgated to

implement the Act set forth the procedures for adding species to the Federal lists of endangered and threatened species. A species may be determined to be an endangered species due to one or more of the five factors described in section 4(a)(1). The threats facing these four taxa are summarized in Table 1.

TABLE 1.—SUMMARY OF THREATS

Species	Feral animal activity					Alien plants	Fire	Human impacts	Limited numbers ¹
	Goats	Sheep	Cattle	Axis deer	Pigs				
<i>Asplenium fragile</i> var. <i>insulare</i>	X	X				X	P	X	X
<i>Ctenitis squamigera</i>	X			X	X	X	P		X
<i>Diplazium molokaiense</i>	X		X		X	X	P		X
<i>Pteris lidgatei</i>					X	X			X

X = Immediate and significant threat.

P = Potential threat.

¹ No more than 100 individuals and/or fewer than 10 populations.

These factors and their application to *Asplenium fragile* Presl var. *insulare* Morton (no common name (NCN)), *Ctenitis squamigera* (Hook. & Arnott) Copel. (pauoa), *Diplazium molokaiense* W. J. Robinson (NCN), and *Pteris lidgatei* (Baker) Christ (NCN) are as follows:

A. The present or threatened destruction, modification, or curtailment of their habitat or range. Native vegetation on all of the main Hawaiian Islands has undergone extreme alteration because of past and present land management practices including ranching, deliberate animal and alien plant introductions, and agricultural development (Cuddihy and Stone 1990, Wagner *et al.* 1985). Military operations threaten at least one population of *Asplenium fragile* var. *insulare* (L. Mehrhoff, pers. comm., 1993). Habitat disturbance caused by human activities such as military construction and road building could detrimentally impact *Asplenium fragile* var. *insulare* at Pohakuloa Training Area (Shaw 1992). The primary threats facing the four endangered taxa include ongoing and threatened destruction and modification of habitat by feral animals and competition with alien plants. All four taxa are threatened by feral animals. Pigs, goats, sheep and cattle were introduced either by the early Hawaiians or more recently by European settlers for food and commercial ranching activities. Over the 200 years following their introduction, their numbers increased and the adverse impacts of these ungulates on native vegetation have become increasingly apparent.

First introduced to Maui in 1793 (Stone and Loope 1987), goats became established on other Hawaiian islands by the 1820s (Cuddihy and Stone 1990, Culliney 1988). Far from controlling their numbers, the era of trade in goatskins (mid-1800s) saw the feral goat population increase into the millions (Culliney 1988). As a result of their agility, they were able to reach more remote areas than other ungulates (Culliney 1988). Feral goats now occupy a wide variety of habitats, from dry lowland forests to alpine grasslands, where they consume native vegetation, trample roots and seedlings, accelerate erosion, and promote the invasion of alien plants (Cuddihy and Stone 1990, Stone 1985, Stone and Loope 1987). Three of the endangered fern taxa are threatened by habitat degradation caused by goats. On Oahu, goats are contributing to the decline of a population of *Ctenitis squamigera* at East Makaleha/Kaawa in the Mokuleia region of the Waianae Mountains (HHP 1991). On Maui, large populations of feral goats persist on the south slope of Haleakala, outside of Haleakala National Park, where they threaten the population of *Diplazium molokaiense* at Waiopai (R. Hobdy, pers. comm., 1992). Goats have reduced the species' habitat there to small remnants. On the island of Hawaii, feral goats are also present in large numbers within Pohakuloa Training Area in the saddle between Mauna Loa and Mauna Kea, where they threaten *Asplenium fragile* var. *insulare* through habitat degradation as well as direct browsing on the plants (R. Shaw, in litt., 1993; J. Lau, pers. comm., 1992).

Feral sheep have become firmly established on the island of Hawaii

(Tomich 1986) since their introduction almost 200 years ago (Cuddihy and Stone 1990). Like feral goats, sheep roam the upper elevation dry forests of Mauna Kea (above 1,000 m (3,300 ft)), including Pohakuloa Training Area, causing damage similar to that of goats (Stone 1985). The presence of sheep at Pohakuloa Training Area is contributing to the degradation of the habitat of *Asplenium fragile* var. *insulare*.

Large-scale cattle ranching in the Hawaiian Islands began in the middle of the 19th century on the islands of Kauai, Oahu, Maui, and Hawaii. Ranches, tens of thousands of acres in size, developed on East Maui and Hawaii (Cuddihy and Stone 1990), where most of the State's large ranches still exist. Degradation of native forests used for ranching activities became evident soon after full-scale ranching began. The negative impact of cattle on Hawaii's ecosystems is similar to that described for goats and sheep (Cuddihy and Stone 1990, Stone 1985). Cattle ranching is the primary economic activity on the west and southwest slopes of East Maui, where a population of *Diplazium molokaiense* exists at Waiopai (R. Hobdy, pers. comm., 1992).

Habitat degradation caused by axis deer (*Axis axis*) is now considered to be a major threat to the forests of Lanai (Culliney 1988). Deer browse on native vegetation, destroying or damaging the habitat. Their trampling removes ground cover, compacts the soil, promotes erosion, and opens areas, allowing alien plants to invade (Cuddihy and Stone 1990, Culliney 1988, Scott *et al.* 1986, Tomich 1986). Extensive red erosional scars caused by decades of deer activity are evident on Lanai. Axis deer are

presently actively managed for recreational hunting by the State Department of Land and Natural Resources. All three of the Lanai populations of *Ctenitis squamigera* are negatively affected to some extent by axis deer (HHP 1991).

Feral pigs have invaded primarily wet and mesic forests and grasslands of Kauai, Oahu, Molokai, Maui, and Hawaii. Pigs damage the native vegetation by rooting and trampling the forest floor, and encourage the expansion of alien plants in the newly tilled soil (Stone 1985). Pigs also disseminate alien plant seeds through their feces and on their bodies, accelerating the spread of alien plants through native forest (Cuddihy and Stone 1990, Stone 1985). On Oahu, populations of *Ctenitis squamigera*, *Diplazium molokaiense*, and *Pteris lidgatei* have already sustained loss of individual plants and/or habitat as a result of feral pig activities. The following Oahu populations are threatened by pigs: *Ctenitis squamigera* at Schofield Barracks and nearby East Makaleha-Kaawa; *Diplazium molokaiense* at Schofield Barracks (HHP 1991; J. Lau, pers. comm., 1992); and, in Kaluanui Valley, the only extant population of *Pteris lidgatei* (HHP 1992d3; W. Wagner, pers. comm., 1992). On East Maui, feral pigs threaten the populations of *Diplazium molokaiense* at both Ainahou and Waiopai (R. Hobdy and J. Lau, pers. comm., 1992).

B. Overutilization for commercial, recreational, scientific, or educational purposes. Although not currently known to be a factor, unrestricted collecting for scientific or horticultural purposes or excessive visits by individuals interested in seeing rare plants could seriously impact three of these taxa. *Ctenitis squamigera*, *Diplazium molokaiense*, and *Pteris lidgatei* each number fewer than 100 individuals and fewer than 10 populations, making them especially vulnerable to human disturbance. Such disturbance could promote erosion and greater ingress of alien plant taxa.

C. Disease or predation. No evidence of disease has been reported for the four endangered fern taxa. Predation by feral goats and/or sheep has been reported for *Asplenium fragile* var. *insulare* at Pohakuloa Training Area (Shaw 1992, R. Shaw, in litt., 1993). Because no colonies have been completely decimated by the animals, they apparently do not seek out this fern. However, further predation may occur if their preferred forage is not available. Predation by feral goats is a potential threat to the other two sizable known populations of this fern at Keauhou and

Kulani (Linda Cuddihy, Hawaii Volcanoes National Park, pers. comm., 1992).

D. The inadequacy of existing regulatory mechanisms. Three of the endangered fern taxa have populations located on privately owned land. All four also occur on State and Federal lands. The known populations of these species located on Federal lands are inadequate to ensure their long-term survival. There are no State laws or existing regulatory mechanisms at the present time to protect or prevent further decline of these plants on State or private land. However, Federal listing automatically invokes listing under Hawaii State law. Hawaii's Endangered Species Act (HRS, Sect. 195D-4(a)) states, "Any species of aquatic life, wildlife, or land plant that has been determined to be an endangered species pursuant to the Endangered Species Act [of 1973] shall be deemed to be an endangered species under the provisions of this chapter." This State law prohibits cutting, collecting, uprooting, destroying, injuring, or possessing any listed species of plant on State or private land, or attempting to engage in any such conduct. However, the regulations are difficult to enforce because of limited personnel. Further, the State law encourages conservation by State government agencies. The State may enter into agreements with Federal agencies to administer and manage any area required for the conservation, management, enhancement, or protection of endangered species (HRS, Sect. 195D-5(c)). Funds for these activities could be made available under section 6 of the Federal Act (State Cooperative Agreements). Listing of these four plant taxa therefore triggers, reinforces and supplements the protection available under State law. The Act also provides additional protection to these four species because it is a violation of the Act for any person to remove, cut, dig up, damage, or destroy any such plant in an area not under Federal jurisdiction in knowing violation of State law or regulation or in the course of any violation of a State criminal trespass law.

E. Other natural or manmade factors affecting their continued existence. The small number of populations and of individual plants of these taxa increases the potential for extinction from stochastic events. The limited gene pool may depress reproductive vigor, or a single human-caused or natural environmental disturbance could destroy a significant percentage of the individuals or the only known extant population. For example, only 4 populations of *Diplazium molokaiense*

are known, totaling 23 individuals. *Pteris lidgatei* is known from 3 populations totaling 26 individuals, *Ctenitis squamigera* from 7 populations, and *Asplenium fragile* var. *insulare* from 8 populations. Three of the endangered taxa are estimated to number no more than 100 known individuals and the fourth (*Asplenium fragile* var. *insulare*) numbers fewer than 300 known individuals.

All four endangered fern taxa are threatened by competition with one or more alien plant taxa. Koster's curse, a noxious shrub first reported on Oahu in 1941, had spread through much of the Koolau Mountains by the early 1960s, and spread to the Waianae Mountains by 1970 (Cuddihy and Stone 1990). This shrub replaces native plants of the forest understory and poses a serious threat to the population of *Pteris lidgatei* located in Kaluanui Valley on the windward side of the Koolau Mountains (J. Lau, pers. comm., 1992). It also poses a threat to populations of *Ctenitis squamigera* and *Diplazium molokaiense* in the Waianae Mountains (HHP 1991; J. Lau, pers. comm., 1992).

Noxious alien plants such as *Schinus terebinthifolius* (Christmasberry) have invaded the dry to mesic lowland regions of the Hawaiian Islands. Introduced to Hawaii prior to 1911, Christmasberry forms dense thickets that shade out and displace other plants (Cuddihy and Stone 1990). Both of the Oahu populations of *Ctenitis squamigera*, the West Maui population, and one of the Lanai populations are negatively affected by this invasive plant, as is the population of *Diplazium molokaiense* at Schofield Barracks (HHP 1991; J. Lau, pers. comm., 1992). *Psidium cattleianum* (strawberry guava), a shrub or small tree, has become naturalized on all of the main Hawaiian islands except Niihau and Kahoolawe. Like Christmasberry, strawberry guava is capable of forming dense stands that exclude other plant taxa (Cuddihy and Stone 1990). This alien plant grows primarily in mesic and wet habitats and provides food for several alien animal taxa, including feral pigs and game birds, that disperse the plant's seeds through the forest (Smith 1985, Wagner et al. 1985). Strawberry guava is considered one of the greatest alien plant threats to Hawaii's wet forests and is known to pose a direct threat to the populations of *Ctenitis squamigera* and *Diplazium molokaiense* in the Waianae Mountains on Oahu (J. Lau, pers. comm., 1992). It also threatens the populations of *Ctenitis squamigera* on Lanai and East Maui (HHP 1991; J. Lau, pers. comm., 1992).

Fountain grass is a fire-adapted bunch grass that has spread rapidly over bare lava flows and open areas on the island of Hawaii since its introduction in the early 1900s. Fountain grass is particularly detrimental to Hawaii's dry forests because it is able to invade areas once dominated by native plants, where it interferes with plant regeneration, carries fires, and increases the likelihood of fires (Cuddihy and Stone 1990, Smith 1985). Fountain grass threatens the native vegetation at PTA, competing with *Asplenium fragile* var. *insulare* (J. Lau, pers. comm., 1992).

Toona ciliata (Australian red cedar) is a fast-growing tree that has been extensively planted and has become naturalized in mesic to wet forests (Wagner et al. 1990). This tree threatens populations of *Ctenitis squamigera* and *Diplazium molokaiense* in the Waianae Mountains of Oahu (HHP 1991; J. Lau, pers. comm., 1992). Those same populations are threatened by *Syzygium cumini* (Java plum), a large evergreen tree that forms a dense cover, excluding other taxa. Java plum is an aggressive invader of undisturbed lowland mesic and dry forests (Smith 1985). *Myrica faya* (firetree) has attracted a great deal of attention and concern for its recent explosive increase on several Hawaiian islands. It is capable of forming a dense, nearly monospecific stand (Cuddihy and Stone 1990). Because of its ability to fix nitrogen, it outcompetes native taxa and enriches the soil so that other alien plants can invade (Wagner et al. 1990). The Lanai populations of *Ctenitis squamigera* are threatened by the invasion of firetree (HHP 1991; J. Lau, pers. comm., 1992). Although not yet widespread in the Hawaiian Islands, *Cinnamomum burmannii* (Padang cassia) could become a dominant component of Hawaiian mesic forests (J. Lau, pers. comm., 1992). A dense and enlarging stand of it threatens a population of *Ctenitis squamigera* on Lanai (HHP 1991).

Fire constitutes a potential threat to three of the endangered fern taxa growing in dry to mesic grassland, shrubland, and forests on the islands of Oahu and Hawaii. On Oahu, fire is a potential threat to *Ctenitis squamigera* and the population of *Diplazium molokaiense* on the Schofield Barracks Military Reservation. These populations are located near an area currently utilized as a military firing range. Fires originating on the firing range have the potential of spreading into the native forest habitat of the two fern taxa (J. Lau, pers. comm., 1992). Fire is also a potential threat to the population of *Asplenium fragile* var. *insulare* at Pohakuloa Training Area on the island

of Hawaii (Shaw 1992), where military exercises utilizing live ammunition are conducted. The presence of fountain grass at Pohakuloa Training Area increases the potential of fire.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by these taxa in determining this final rule. Based on this evaluation, this rulemaking will list four taxa—*Asplenium fragile* var. *insulare*, *Ctenitis squamigera*, *Diplazium molokaiense*, and *Pteris lidgatei*—as endangered. All 4 endangered taxa are known from fewer than 10 populations and 3 of the taxa number no more than 100 individuals. The four taxa are threatened by one or more of the following: Habitat degradation and/or predation by feral goats, sheep, cattle, deer, and pigs; and competition from alien plants. Small population size and limited distribution make these taxa particularly vulnerable to extinction from stochastic events. Because these four taxa are in danger of extinction throughout all or a significant portion of their ranges, they fit the definition of endangered as defined in the Act.

Critical habitat is not being proposed for the four taxa included in this rule for reasons discussed in the "Critical Habitat" section below.

Critical Habitat

Section 4(a)(3) of the Act, as amended, requires that, to the maximum extent prudent and determinable, the Secretary designate critical habitat at the time a species is determined to be endangered or threatened. The Service finds that designation of critical habitat is not presently prudent for these taxa. All of the taxa have extremely low total populations and face anthropogenic threats. The publication of precise maps and descriptions of critical habitat in the Federal Register, as required in designation of critical habitat, would increase the degree of threat to these plants from take or vandalism and, therefore, could contribute to their decline. All involved parties and the major landowners have been notified of the general location of these taxa. Protection of the habitat of the taxa will be addressed through the recovery process and through the section 7 consultation process.

Two Federal departments conduct activities within the currently known habitat of the endangered plants—the National Park Service of the Department of the Interior and the Department of Defense. One taxon is found in Hawaii Volcanoes National Park, where Federal law protects all plants from damage or

removal. Three taxa are located on land owned or leased by the Department of Defense or on nearby State lands. Three of the taxa are found on Schofield Barracks Military Reservation. Although military and ordnance training takes place on this federally owned property, the impact areas and buffer zones for these activities are outside the area where the taxa occur. One taxon is known from Pohakuloa Training Area on the Island of Hawaii. The Army is aware of the presence and location of this taxon, and any Federal activities that may affect the continued existence of these plants will be addressed through the section 7 consultation process. Therefore, the Service finds that designation of critical habitat for these taxa is not prudent at this time, because such designation would increase the degree of threat from vandalism, collecting, or other human activities and it would not provide overriding benefits.

Available Conservation Measures

Conservation measures provided to species listed as endangered under the Endangered Species Act include recognition, recovery actions, requirements for Federal protection, and prohibitions against certain activities. Listing can encourage and result in conservation actions by Federal, State, private organizations, and individuals. The Endangered Species Act provides for possible land acquisition and cooperation with the State and requires that recovery plans be developed for listed species. The requirements for Federal agencies and the prohibitions against certain activities involving listed plants are discussed, in part, below.

Section 7(a) of the Act, as amended, requires Federal agencies to evaluate their actions with respect to any species that is proposed or listed as endangered or threatened and with respect to its critical habitat, if any is being designated. Regulations implementing this interagency cooperation provision of the Act are codified at 50 CFR part 402. Section 7(a)(2) requires Federal agencies to ensure that activities they authorize, fund, or carry out are not likely to jeopardize the continued existence of a listed species or to destroy or adversely modify its critical habitat. If a Federal action may affect a listed species or its critical habitat, the responsible Federal agency must enter into consultation with the Service.

A population of *Asplenium fragile* var. *insulare* is located in Hawaii Volcanoes National Park. Laws relating to national parks prohibit damage or removal of any plants growing in the parks. Another population of *Asplenium*

fragile var. *insulare* is located within the Pohakuloa Training Area. The Army is aware of the location of this taxon, and any Federal activities that may affect the continued existence of these plants will be addressed through the section 7 consultation process. *Ctenitis squamigera*, *Diplazium molokaiense*, and *Pteris lidgatei* are found on Schofield Barracks Military Reservation. These plants are not located inside impact or buffer zones for ordnance training. There are no other known Federal activities that occur within the present known habitat of these four plant taxa.

The Act and its implementing regulations found at 50 CFR 17.61, 17.62, and 17.63 for endangered species set forth a series of general prohibitions and exceptions that apply to all endangered plant species. With respect to the four fern taxa listed as endangered, all prohibitions of section 9(a)(2) of the Act, implemented by 50 CFR 17.61, would apply. These prohibitions, in part, make it illegal for any person subject to the jurisdiction of the United States to import or export any endangered plant species; transport such species in interstate or foreign commerce in the course of a commercial activity; sell or offer for sale such species in interstate or foreign commerce; remove and reduce to possession any such species from areas under Federal jurisdiction; maliciously damage or destroy any such species on any area under Federal jurisdiction; or remove, cut, dig up, damage, or destroy any such species on any other area in knowing violation of any State law or regulation or in the course of any violation of a State criminal trespass

law. Certain exceptions apply to agents of the Service and State conservation agencies. The Act and 50 CFR 17.62 and 17.63 also provide for the issuance of permits to carry out otherwise prohibited activities involving endangered plant species under certain circumstances. It is anticipated that few permits would ever be sought or issued because the taxa are not common in cultivation or in the wild.

Requests for copies of the regulations concerning listed plants and inquiries regarding prohibitions and permits may be addressed to the U.S. Fish and Wildlife Service, Ecological Services, Endangered Species Permits, 911 N.E. 11th Avenue, Portland, Oregon 97232-4181 (503/231-2063; FAX 503/231-6243).

National Environmental Policy Act

The Fish and Wildlife Service has determined that an Environmental Assessment or Environmental Impact Statement, as defined under the authority of the National Environmental Policy Act of 1969, need not be prepared in connection with regulations adopted pursuant to section 4(a) of the Endangered Species Act of 1973, as amended. A notice outlining the Service's reasons for this determination was published in the **Federal Register** on October 25, 1983 (48 FR 49244).

Required Determinations

This rule was not subject to review by the Office of Management and Budget under Executive Order 12866. In accordance with the 1982 amendments to the Endangered Species Act, the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*) is not applicable to section 4

listing rules. This rule contains no recordkeeping requirements as defined under the Paperwork Reduction Act of 1980 (44 U.S.C. 3501 *et seq.*)

References Cited

A complete list of all references cited herein is available upon request from the Pacific Islands Office (see ADDRESSES section).

Authors

The primary authors of this final rule are Marie M. Brueggemann, Joan E. Canfield, and Derral R. Herbst of the Pacific Islands Office (see ADDRESSES section) (808/541-2749).

List of Subjects in 50 CFR Part 17

Endangered and threatened species, Exports, Imports, Reporting and recordkeeping requirements, and Transportation.

Regulations Promulgation

Accordingly, part 17, subchapter B of chapter I, title 50 of the Code of Federal Regulations, is amended as set forth below:

PART 17—[AMENDED]

1. The authority citation for part 17 continues to read as follows:

Authority: 16 U.S.C. 1361-1407; 16 U.S.C. 1531-1544; 16 U.S.C. 4201-4245; Pub. L. 99-625, 100 Stat. 3500; unless otherwise noted.

2. Section 17.12(h) is amended by adding the following, in alphabetical order under the families indicated, in alphabetical order, to the List of Endangered and Threatened Plants to read as follows:

§ 17.12 Endangered and threatened plants.

* * * * *

(h) * * *

Species		Historic range	Status	When listed	Critical habitat	Special rules
Scientific name	Common name					
Adiantaceae—maidenhair fern family:						
<i>Pteris lidgatei</i>	None	U.S.A. (HI)	E	553	NA	NA
Aspleniaceae—spleenwort family:						
<i>Asplenium fragile</i> var. <i>insulare</i>	None	U.S.A. (HI)	E	553	NA	NA
<i>Ctenitis squamigera</i>	Pauoa	U.S.A. (HI)	E	553	NA	NA
<i>Diplazium molokaiense</i>	None	U.S.A. (HI)	E	553	NA	NA

Dated: September 9, 1994.

Mollie H. Beattie,

Director, Fish and Wildlife Service.

[FR Doc. 94-23751 Filed 9-23-94; 8:45 am]

BILLING CODE 4310-55-P

50 CFR Part 17

Availability of a Draft Recovery Plan for the California Condor (*Gymnogyps californianus*) for Review and Comment

AGENCY: Fish and Wildlife Service, Interior.

ACTION: Notice of availability.

SUMMARY: The U.S. Fish and Wildlife Service (Service) announces the availability for public review of a draft recovery plan for the California Condor (*Gymnogyps californianus*). Recovery recommendations in the draft plan would likely affect six Southern California counties: Ventura, Los Angeles, Santa Barbara, San Luis Obispo, Kern and Tulare. The Service solicits review and comment from the public on this draft plan.

DATES: Comments on the draft recovery plan must be received by November 25, 1994, to receive consideration by the Service.

ADDRESSES: Persons wishing to review the draft recovery plan may obtain a copy by contacting: Craig A. Faanes, Field Supervisor, Ecological Services, Ventura Field Office, 2140 Eastman Avenue, Suite 100, Ventura, California 93003, or telephone (805) 644-1766. Written comments and materials regarding the draft plan should be addressed to the above address. Comments and materials received are available for public inspection, by appointment, during normal business hours at the above address.

FOR FURTHER INFORMATION CONTACT: Robert Mesta, Condor Program Coordinator, at the above address or telephone (805) 644-1766.

SUPPLEMENTARY INFORMATION:

Background

Restoring an endangered or threatened animal or plant to the point where it is again a secure, self-sustaining member of its ecosystem is a primary goal of the Service's

endangered species program. To help guide the recovery effort, the Service is working to prepare recovery plans for most of the listed species native to the United States. Recovery plans describe actions considered necessary for conservation of the species, establish criteria for the recovery levels for downlisting or delisting them, and estimate time and cost for implementing the recovery measures needed.

The Endangered Species Act of 1973 (Act), as amended (16 U.S.C. 1531 *et seq.*) requires the development of recovery plans for listed species unless such a plan would not promote the conservation of a particular species. Section 4(f) of the Act, as amended in 1988, requires that public notice and an opportunity for public review and comment be provided during recovery plan development. The Service will consider all information presented during a public comment period prior to approval of each new or revised recovery plan. The Service and other Federal agencies will also take these comments into account in the course of implementing approved recovery plans.

As a result of illegal shooting, poisoning, collisions with man-made structures and the loss of habitat, the California condor was extirpated from the wild in 1987. The last wild condor was captured and brought into a captive breeding program in an attempt to save the species from extinction. The California Condor Recovery Plan outlines recovery actions to re-establish the California condor in the wild. The recovery actions will be concentrated in the following six Southern California counties: Ventura, Santa Barbara, San Luis Obispo, Los Angeles, Kern, and Tulare.

Public Comments Solicited

The Service solicits written comments on the recovery plan described. All comments received by the date specified above will be considered prior to approval of the plan.

Authority: The authority for this action is the Endangered Species Act (16 U.S.C. 1531).

Dated: September 17, 1994.

Michael J. Spear,
Regional Director.

[FR Doc. 94-23721 Filed 9-23-94; 8:45 am]

BILLING CODE 4310-55-M

DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

50 CFR Part 675

[Docket No. 931100-4043; I.D. 092194A]

Groundfish of the Bering Sea and Aleutian Islands Area

AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

ACTION: Closure.

SUMMARY: NMFS is prohibiting directed fishing for pollock by vessels catching pollock for processing by the offshore component in the Bering Sea subarea (BS) of the Bering Sea and Aleutian Islands management area (BSAI). This action is necessary to prevent exceeding the allowance of the total allowable catch (TAC) of pollock for the offshore component in the BS.

EFFECTIVE DATE: 12 noon, Alaska local time, (A.l.t.), September 24, 1994, until 12 midnight, A.l.t., December 31, 1994.

FOR FURTHER INFORMATION CONTACT: Andrew N. Smoker, 907-586-7228.

SUPPLEMENTARY INFORMATION: The groundfish fishery in the BSAI exclusive economic zone is managed by the Secretary of Commerce according to the Fishery Management Plan for the Groundfish Fishery of the BSAI (FMP) prepared by the North Pacific Fishery Management Council under authority of the Magnuson Fishery Conservation and Management Act. Fishing by U.S. vessels is governed by regulations implementing the FMP at 50 CFR parts 620 and 675.

The allowance of pollock TAC for vessels catching pollock for processing by the offshore component in the BS was established by the final 1994 initial groundfish specifications (59 FR 7656, February 16, 1994) and a subsequent reserve apportionment (59 FR 21673, April 26, 1994) as 799,662 metric tons (mt).