Comments of

COALITION FOR SAFE BUILDING MATERIALS

(California Pipe Trades Council, California Firefighters Association, Consumer Federation of California, Planning and Conservation League, Center for Environmental Health, Sierra Club of California and Communities for a Better Environment)

on the

ADDENDUM TO ADOPTED MITIGATED NEGATIVE DECLARATION
STATE CLEARINGHOUSE NO. 2000091089
FOR
CHLORINATED POLYVINYL CHLORIDE (CPVC) PIPE
USE FOR POTABLE WATER PIPING IN RESIDENTIAL BUILDINGS

VOLUME IV

APPENDICES TO THE COMMENTS OF
ADAMS BROADWELL JOSEPH & CARDOZO

April 22, 2005

FINAL STATEMENT OF REASONS FOR PROPOSED BUILDING STANDARDS OF THE DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT, REGARDING THE CALIFORNIA PLUMBING CODE, CALIFORNIA CODE OF REGULATIONS, TITLE 24, PART 5

The Administrative Procedure Act requires that a Final Statement of Reasons be available to the public upon request when rulemaking action is being undertaken. The following are the reasons for proposing this particular rulemaking action:

ADOPTIONS, AMENDMENTS, OR REPEALS:

Permanent adoption by reference of Uniform Plumbing Code (UPC) Section 604.1, without amendment, allowing the use of chlorinated polyvinyl chloride (CPVC) plastic pipe in buildings in California.

1) The public problem, administrative requirement, or other condition or circumstance that the (adoption, amendment, or repeal) is intended to address.

The Department of Housing and Community Development (DHCD) proposed, and the California Building Standards Commission (CBSC) approved, an emergency action to adopt by reference Section 604.1 of the UPC, without amendment, allowing the use of CPVC plastic pipe in buildings in California. The effective date of this action was November 30, 1995.

However, Government Code Section 11346.1 states that no regulation adopted on an emergency basis can remain in effect more than 120 days, unless the adopting agency has complied with the all of the requirements of the Administrative Procedure Act. Therefore, the DHCD is proceeding through the rulemaking process and is now proposing permanent adoption of the emergency regulations.

2) Specific purpose and rationale for necessity of the (adoption, amendment, or repeal).

Prior to the emergency adoption, California was the only state prohibiting the use of CPVC plastic pipe within buildings. Various cities in California, such as the City of Colton, were experiencing serious difficulties with the use of metallic piping materials. Metallic piping materials react negatively to soil conditions within certain areas of California, causing excessive premature corrosion of the pipe and resulting in property damage, financial ruin, and severe hardship to homeowners, construction contractors, and insurance companies alike.

The use of CPVC plastic pipe reduces health and safety hazards, and reduces the number of bankruptcies within the construction industry due to lawsuits over property damage caused by broken metallic water pipes. Plastic piping materials, such as CPVC plastic piping, have been proven to maintain longer than metallic piping materials, and do not corrode as easily.

The rationale for restricting the use of CPVC plastic pipe was the delayed completion of an Environmental Impact Report (EIR) examining the possible dangers associated with the use of CPVC plastic pipe for potable water piping within buildings. The DHCD has been conducting a study for 18 years to determine if the transportation of potable water in CPVC plastic pipe poses a health hazard. Although the contractor completing the initial EIR submitted his findings to the DHCD, it was determined by the DHCD's Legal Affairs Office that additional information is required to comply with the California Environmental Quality Act (CEQA).

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Fourth, Mr. Cardozo contradicts the DHCD's claim that the adoption of the UPC is mandated by Health and Safety Code Section 17922, because the DHCD can modify the UPC.

In conclusion, Mr. Cardozo claims that the CBSC has not conducted any CEQA review of the proposed regulatory action, and instead has relied upon the initial findings of the draft 1989 EIR. He continues by stating that CBSC's failure to certify and consider a final EIR prior to action on this project violates CEQA.

In addition, Mr. Cardozo asserts that the CBSC has deprived the Coalition and other members of the public of an opportunity to meaningfully comment or participate in the regulatory proposal by failing to proceed in accordance with APA requirements. Furthermore, Mr. Cardozo claims that the CBSC has failed to present an adequate justification for the proposed building standards as is required by the State Building Standards Law.

Lastly, Mr. Cardozo states that the Coalition requests the Commission not take action on the proposed adoption until it has complied with CEQA, the APA, and the State Building Standards Law.

Department Response

Mr. Cardozo commented that the adoption of the proposed regulations is in violation of the CEQA, and that no adoption may occur until after the preparation and certification of an EIR.

Although adoption of the proposed regulation may be a "project" subject to CEQA, no EIR is required. This is because projects which do not have a potential for a significant environmental impact are exempt from CEQA [CEQA Guidelines promulgated by the Governor's Office of Planning and Research, Section 15061(b)(3)]. It is the DHCD's position that adoption of the proposed regulation would not have a significant effect on the environment for the following reasons:

(a) Through its enactment of Health and Safety Code Section 17921.9 (Stats. 1995, c.785, AB 151 (Baca), effective October 12, 1995), the Legislature has in effect determined that CPVC pipe is safe when installed in compliance with specified installation standards.

1. The Legislature specifically has found that CPVC pipe has been successfully used for many years in other states and in nations around the globe, and has also been widely used, in accordance with federal regulations, in manufactured housing. [Health and Safety Code Section 17921.9, Subdivision (a)(2).]

2. The Legislature has established extensive safe work practices to be adhered to when installing CPVC. Health and Safety Code Subsections 17921.9(d) and (e) apply to <u>any</u> installation of CPVC in the state.

3. Installation of CPVC pipe following the legislatively-required installation standards would mitigate any potential environmental impact to installers to a level of insignificance.

4. In permitting the use of CPVC anywhere in the State by jurisdictions who had approved CPVC locally prior to January 1, 1996, subject to statutorily specified worker safety measures, the Legislature has implicitly determined that use and installation of CPVC does not represent a significant danger to installers or end users.

MINUTES

CALIFORNIA BUILDING STANDARDS COMMISSION
March 19, 1996

Consumer Affairs
400 R Street - First Floor Hearing Room
Sacramento, CA 95814

10:00 a.m.

Commission members present: Joanne Kozberg, Chair; Commissioner Canestro, Vice Chair; Commissioner Baldacci, Commissioner Geneck, Commissioner Holms, Commissioner Mattar, Commissioner Smith, Commissioner Storchheim, Commissioner Ward. Absent: Commissioner Youssef.

Staff members present: Richard Conrad, Maggie Cummins, and Stan Nishimura (CBSC staff); Bill Cady, Legal Counsel; Anita Ahuja, State and Consumer Services Agency.

The meeting was called to order at 10:10 a.m. by Chair Kozberg. The Chair was pleased to announce the reappointment by Governor Wilson of Commissioners Canestro and Storchheim, and that interviews were underway to fill the labor position that was vacated by Commissioner Levitt. Roll was called and a quorum established.

Approval of Minutes

Storchheim / Canestro **Motion to approve the minutes of the November 29, 1996 meeting as submitted**
Motion carried; unanimous vote.

Commissioner Geneck pointed out that in item 8 on page 2 of the minutes, Mr. Burns had agreed to furnish a copy of the pool safety video to Richard Conrad for distribution to Commission members. Mr. Burns also agreed to provide copies of the pool package for each Commissioner and one for the CBSC staff. After several inquiries to Mr. Burns, he still has not provided the information. This was noted for the record.

Item 4 -- CONSENT CALENDAR

A. Certification of rulemaking file for adoption and approval of amendments to the California Building Standards Code adopted in the 1995 annual code adoption cycle and adoption of the 1994 editions of the UBC, UPC, UFC, UCBC, and 1993 NEC.

respect to AB 151, the limited authority in that bill simply is irrelevant to statewide permanent repeal of the CPVC ban. And in fact, we would argue that the legislative history of that bill shows exactly the opposite of what the department is attempting to maintain. When the bill did include statewide repeal, it directed HCD to complete the EIR process before the material would be approved. It was only after the statewide approval was taken out that the EIR requirement was dropped. So we think that's evidence that the Legislature recognized that statewide permanent repeal would require completion of the EIR process."

CHAIRWOMAN KOZBERG: "Yes, Mr. Pitts, do you wish to respond to that issue?"

MR. PITTS: "Only, Ms. Kozberg, that we respectfully disagree. We take a different reading of the Legislature's process. We are aware of all the worker safety concerns that have been brought up throughout the entire 14 years of deliberation, and we feel that the Legislature addressed those very specifically in AB 151. Although it may be an argument that that was intended for a very narrow application, it specifically states in AB 151 that all installations of CPVC pipe in the state of California shall follow these worker safety requirements."

CHAIRWOMAN KOZBERG: "Thank you. For the record, AB 151 was passed by the Senate on a vote of 32-1, and in the Assembly 70-4."

COMMISSIONER MATTAR: "Just...along the lines of what Rebecca brought up, the question is how many codes in the United States (common codes) disallow the use of CPVC...or does not include CPVC as a material that is allowed *(unintelligible...)*? It's a general question; I'm not sure of the answer. Mr. Pitts, do you know?"

MR. PITTS: "All of the major codes permit the use of CPVC as an alternate material, which is not a key issue here. We are not mandating the use of CPVC as the only material in the state; we're only trying to allow this as an alternative. This would bring the California Plumbing Code into compliance with all the major recognized national codes."

COMMISSIONER STORCHHEIM: "Yes, my question is directed to our attorney. There have been statements by Mr. Cardozo concerning the law, what we can do and can't do, and what we're obligated to do... Could you at this time please respond to that?"

BILL CADY: "I'd be happy to, Mr. Storchheim. The analysis of HCD's staff and its legal unit delved into these issues in quite some detail and that obviated the need for us to do it within the staff of the Building Standards Commission. So as to the specific issues of whether CEQA is required or not, pursuant to AB 151 in this process, that was an issue with HCD and we had no reason to question their analysis or conclusion in that regard. I can speak more forcefully as to the issue of whether an EIR is required under the Building Standards Law or Housing Laws required for regulatory rulemaking process. Clearly, it is not."

COMMISSIONER SMITH: "I just have one question. I'm trying to sort through all this information and come up with a clear understanding of what is being proposed for us not to adopt

Bill:
Did Maureen answer in writing? (I know she did verbally)

State of California

MEMORANDUM

To: MAUREEN GORSON, Chief Counsel
Resources Agency

Date: May 21, 1997

From: WILLIAM G. BRENNAN, Deputy Secretary/Special Counsel
Business, Transportation and Housing Agency
980 - 9th Street, Suite 2450
Sacramento, CA 95814-2719

Subject: CEQA Question

Thank you for meeting with Alice Detwiler, Rich Friedman, Bill Cady and myself last Friday to discuss the long-standing CPVC issue. Your patience and expertise in CEQA matters was, and will continue to be, invaluable.

I continue to have a nagging question, and was hoping to be able to get a more detailed response from you.

During the meeting, you indicated that it was not desirable to have a project proponent, or its consultant, perform the environmental analysis. I certainly can understand that it may appear to be somewhat of a conflict of interest and would, therefore, raise some political questions. These considerations can, and will be, an important factor in our decisions. They must, however, be weighed against whether proceeding in that manner presents a <u>real</u> litigation risk.

I note for example, that section 15084 of your Agency's CEQA guidelines expressly provide:

(b) The Lead Agency may require the project applicant to supply data and information both to determine whether the project may have a significant effect on the environment and to assist the Lead Agency in preparing the draft EIR.

and

(d) The Lead Agency may choose one of the following arrangements or a combination of them for preparing a draft EIR.

(3) Accepting a draft <u>prepared by the applicant, a consultant retained by the applicant,</u> or any other person. (Emphasis added.)

It is also my understanding that such arrangements have been noted and approved by the courts. (See *Friends of La Vina v County of Los Angeles*) (1991) 232 Cal.App.3d 1446; 284 Cal.Rptr. 171.)

This is an issue of some relevance, since neither HCD nor CBSC really has staff on board to manage the preparation of a complicated EIR. While I fully endorse your idea to retain a specialist consultant to oversee the project and to ensue the state's independent review of the draft environmental documents, each additional consultant will require a certain level of expense and personnel time. Minimally, there will be costs and delays involved, if nothing else, in the preparation of bid documents and contracts, the establishment of accounting systems to accept funds from the applicant, the payment of contract expenses, and the preparation of final audits. As a practical matter, it will also be much more difficult to ask the project applicant for reimbursement of state costs than to simply ask them to find the appropriate consultants and ensure that quality materials are provided and merely cover the state's billings for the consultant retained to assist in independent review of the prepared materials as you have recommended.

It seems to me that unless there is a legal risk to proceeding in the manner authorized by the CEQA guidelines, that this is an area in which a public/private partnership would produce a better document quicker than to manage the project with the usual bureaucratic impediments. Since the goal is to accomplish this CEQA review quickly and efficiently, I am reluctant to reject this alternative out-of-hand unless it presents an unwarranted litigation risk.

Thank you again for your assistance. Your candor and your advice is most appreciated.

cc: Alice Detwiler, Deputy, Legal Affairs Secretary, Governor's Office
JoAnne Kozberg, Secretary, State and Consumer Services Agency
Marybel Batjer, Undersecretary, Business, Transp. & Housing Agency
Richard Mallory, Director, HCD
Bill Cady, Executive Director, CBSC
Richard Friedman, Acting Chief Counsel, HCD

BRIEFING FOR THE GOVERNOR'S SCHEDULE

MEETING WITH: B.F. GOODRICH
MEETING DATE: FRIDAY, DECEMBER 12, 1997
TIME: (Unknown)
LOCATION: (Unknown)
FROM: Richard Mallory, Director
Department of Housing and Community Development

I. PURPOSE: For the Governor's meeting with representatives of B.F. Goodrich regarding the residential use of Chlorinated Poly Vinyl Chloride (CPVC).

II. BACKGROUND:

Background: The federal government permits the use of CPVC pipe in manufactured homes, and the State of California has permitted CPVC piping to be used in mobilehomes and recreational vehicles since the early 1970s. However, the use of CPVC plastic pipe for potable water systems in residential dwellings has been a long-standing issue in California and is prohibited.

For the first time, the 1982 edition of the Uniform Plumbing Code (UPC) adopted by the International Association of Plumbing and Mechanical Officials (IAPMO), permitted the use of CPVC pipe (in addition to copper, galvanized, and cast iron pipe) in both drinking water systems and drain, waste, and vent systems in residential structures.

In 1983, HCD went before the Commission of Housing and Community Development (hereafter Commission), responsible for the adoption of building standards during that time period, and proposed adoption of the 1982 edition of the UPC which allowed the use of CPVC pipe. However, at the hearing, the Commission determined that an Environmental Impact Report (EIR) was necessary to allay concerns of various entities including the Department of Health Services (DHS) and the California Pipe Trades Council (hereafter Pipe Council) and instructed HCD that the use of plastic pipe could not be expanded beyond what was permitted in the 1979 edition of the UPC until an EIR was prepared. (Since that time, with each adoption of the California Plumbing Code, the use of CPVC for potable water systems in residential dwellings has been prohibited.)

Under the direction of HCD, a task force of interested parties was formed which included DHS, the Pipe Council and the Society of the Plastics Industry, Inc. (hereafter Plastics Industry) to determine the scope of the EIR. In recognition of HCD's limited resources, both the Pipe Council and the

Plastics Industry provided funds for preparation of the EIR. After the parties had agreed on the scope of the EIR, they also agreed that Stanford Research Institute International (SRI) should be retained to prepare the EIR.

In August, 1989, SRI issued a Draft Environmental Impact Report (DEIR). The scope of the DEIR encompassed the following areas: (1) Water Quality: public health aspects of leaching of chemicals from soil into water and leaching of chemicals from plastic pipe into water; (2) Smoke Toxicity: danger of toxic fumes from burning pipe in house fires; and (3) Worker Health: worker exposure to toxic substances (cleaning solvents, glue, dermal absorption, dust from cutting), and effective mitigation measures for confined work areas, poor ventilation, and high temperatures in work areas.

The DEIR did not conclude that the use of CPVC pipe would result in any significant environmental impacts but it did recommend a variety of mitigation measures to reduce the potential hazards associated with the use of CPVC pipe. The DEIR generated a tremendous volume of public comments many of which attacked the overall adequacy of the document as the basis for public decision making.

Upon conclusion of the public hearings, SRI endeavored to address all public comments and prepare a final EIR. In February of 1990, SRI delivered to HCD an "administrative final" EIR. HCD, in conjunction with the Office of the Attorney General, determined that the product delivered by SRI did not constitute a legally-adequate EIR. In addition, a major criticism from the Pipe Council was that the EIR did not address the issue of "mechanical failure"; that is the cracking or breaking of CPVC pipe. Although the Pipe Council has not alluded to the fact that the use of plastic pipe, which is durable and easy to work with, may impact the amount of work required to be performed by plumbers, it is common knowledge that they have this concern.

Due to the efforts by SRI to respond to the voluminous comments, insufficient funds remained in the SRI contract to complete the EIR. In response, the Plastics Industry offered to provide additional funds and circulated a Request for Proposal for completion of the document. However, the bids received were two to three times the Plastics Industry's original cost estimates. In August of 1994, the Plastics Industry informed HCD that it was suspending work on the EIR and asked that HCD also suspend its work pending further notice from the Plastics Industry.

Because the DEIR was never finalized or certified by HCD, it does not provide a basis for public decision making as to the hazards or safety associated with the use of CPVC in residential plumbing. Please note that the UPC adopted by IAPMO has allowed the use of CPVC pipe since the

publication of the 1982 edition.

AB 151/Baca (Chapter 785/1995) specifies that the prohibition against the use of CPVC piping in California shall not apply to any local government that permitted its use within its jurisdiction prior to January 1, 1996, provided specified conditions are met. This legislation contained a sunset date of January 1, 1998. We are aware of 14 counties and 40 cities that have approved the use of CPVC pipe within their jurisdictions prior to January 1, 1996.

The stated intent of the Legislature in enacting AB 151 was "... to allow the use of CPVC water supply piping in building construction in California ..." To implement the stated intent of the Legislature, and at the direction of the Governor in the signing message, the Department developed, and the California Building Standards Commission (CBSC) approved on an emergency basis, the use of CPVC pipe in potable water systems in residential occupancies statewide. However, opponents of these building standards brought suit against the Department and the CBSC. As a result, the San Francisco Superior Court ruled that the adoption of building standards approving CPVC pipe for interior water distribution systems be deleted from the California Plumbing Code and that neither the Department nor the CBSC may take further action to permit the use of CPVC for interior water distribution systems unless requirements of the California Environmental Quality Act (CEQA) have been met.

AB 941 (Miller, 1997) This bill would allow those cities to continue to permit the use of CPVC pipe without violating the law and having to conduct a study to establish a finding of need, hold a public hearing, adopt an ordinance, and forward copies of the findings and ordinance to the Department of Housing and Community Development (HCD). AB 941 failed passage of the Assembly Appropriations Committee.

III. WHAT'S HAPPENING NOW:

In order to achieve the court ordered compliance with the California Environmental Quality Act (CEQA) the Department has begun preparation of an EIR. Given the nature of the project, a Negative Declaration was carefully considered as an alternative to an EIR. However, given that a legal challenge is very likely no matter what the facts are, plus the fact that the standards for successful challenge of a Negative Declaration in the courts are very low, the EIR was considered to be the preferred course of action.

The EIR process normally requires about one year to complete. The Department believes that this can be shortened somewhat for the EIR for

CPVC pipe for residential buildings in California. This is because of the existing information available from the long history of this issue, and the willingness of advocates to CPVC pipe to provide technical support to the effort.

The work on the EIR began in September, 1997. A Draft EIR is expected to be finished in about March of 1998. It may be possible to certify a Final EIR by about August 1, 1998, although there will probably be a concerted effort to delay this with voluminous input. After the final EIR is certified, time the Building Standards Commission may take action to approve CPVC use. It is anticipated that any approval of CPVC use under the EIR will be challenged in court, and this should be expected to include a request for an injunction against implementation. The attorneys for the pipe trades union have been very active in the process, and in addition, a recent flurry of negative letters from various legislators indicates a degree of interest from that branch.

IV. POTENTIAL ISSUES:

- Legislation for 1998: B.F. Goodrich may propose that the use of CPVC should be allowed statewide through legislation. As stated earlier, an attempt was made by Assemblyman Miller to extend to the time that CPVC can be used in localities that allowed the use prior to January 1996 (AB 942). AB 942 was defeated by the California Pipe Trades Council in the Assembly Appropriations Committee. As such, it would be unlikely that the Legislature would pass a bill allowing the use of CPVC statewide.

  You have already demonstrated your support for the statewide use of CPVC through your signing message to AB 151, directing the Department to propose the adoption of emergency building standards allowing the use of CPVC for residential dwellings statewide.

- The Department is receiving letters from Legislators that are prompted by constituent letters from union members that are questioning the Department's objectivity with the completion of the EIR.

- As you may recall, the Senate Rules Committee rejected two of your appointments to the CBSC because of their support for the use of CPVC. Given the controversy surrounding this issue, any action prior to January 12, 1998 may jeopardize my confirmation.

Finally, I have attached a newspaper article from October of 1995 where B.F. Goodrich praised your signing of legislation allowing the use of CPVC as well as the Department's action in the adoption of emergency building standards.

Rich Friedman

From: Dennis Beddard
Sent: Wednesday, May 13, 1998 8:13 AM
To: Lita Flores
Cc: Rich Friedman
Subject: RE: CPVC Public Records Request

Thank you for the information. The Public Records Request was directed to HCD and its files. I think Adams & Broadwell may have sent a similar request to Agency. Therefore, I would not recommend requesting the information from Agency.

From: Lita Flores
Sent: Tuesday, May 12, 1998 5:38 PM
To: Dennis Beddard
Cc: Rich Friedman
Subject: RE: CPVC Public Records Request

Robin was "hired" by the agency, not HCD. Consequently, we have no records or paperwork on this. Could you please send this request to Chon? Robin can provide a copy of his resume, I presume. Thanks.

From: Dennis Beddard
Sent: Tuesday, May 12, 1998 11:29 AM
To: Lita Flores
Cc: Rich Friedman
Subject: CPVC Public Records Request

As part of Adams & Broadwell's Public Records Request, they have asked for copies of Robin's resume and the interagency agreement for his hiring. According to Marie Powell, there are no such documents are in Robin's personnel file. However, she thought you might have copies. If you do by any chance, could I please have copies? Thanks.

STATE OF CALIFORNIA -BUSINESS, TRANSPORTATION, AND HOUSING AGENCY PETE WILSON, Governor

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT
DIVISION OF LEGAL AFFAIRS
1800 Third Street, Suite 440
P. O. Box 952052
Sacramento, CA 94252-2052
(916) 323-7288
FAX (916) 322-2815

May 13, 1998

Mr. Daniel L. Cardozo
Adams, Broadwell & Joseph, A Professional Corporation
Attorneys at Law
651 Gateway Boulevard, Suite 900
South San Francisco, CA 94080

Re: Public Records Request

Dear Dan:

This letter is in response to your letter of April 30, 1998, and our telephone conversation of May 12, 1998, specifically requesting a copy of Robin Reynold's resume. I have been advised by Chief Deputy Director Lita Flores that Robin's hiring was done through the Business, Transportation and Housing Agency (the "Agency"), which explains why we do not have any personnel records for Robin. Consequently, copies of any interagency agreements between the Agency and the California Department of Food and Agriculture ("CDFA") (Robin's permanent employer) should be requested from the Agency or CDFA. However, Robin did happen to have in his office a copy of an undated and unsigned standard form State Examination Application. The application summarizes his education and experience through his employment with CDFA. I have enclosed a copy of this document in response to your Public Records Request.

For the future, Robin's secretary, Julia Watson, is responsible for copying all of the materials you have requested from the bibliography as her time permits. As she completes portions of the copying, I have asked her to send the materials directly to you by cover letter signed by her. If at any time you have questions about the Department's response to your request, please continue to contact me directly at (916) 323-7279.

Sincerely,

Dennis L. Beddard
Senior Staff Counsel

Enclosure

cc: Mr. Robin Reynolds
Mrs. Julia Watson
Mr. Richard Friedman

To: Deborah Neale

From: Robin Reynolds

Date: August 26, 1997

Subject: INFOMATION SUBMITTALS FOR CONSIDERATION IN WRITTING THE EIR FOR CPVC PIPE IN RESIDENTIAL BUILDINGS

Thank you for your offer to provide information I might find useful in writing the Draft EIR for the proposed adoption of regulations (building standards) for the use of chlorinated polyvinyl chloride (CPVC) pipe, in addition to metal pipe in the potable water systems of residential buildings. Under CEQA, any person may submit information to the Lead Agency for consideration during the scoping and writing of an EIR (Guidelines Sections 15063 (e) and 15084 (c)). This information may be on any subject and in any form. While bureaucratic convenience is not a particularly high priority in CEQA practice, reducing paperwork and time-efficiency are fairly important in any exercise of government. To these ends, it would be desirable to have any input you wish to submit follow the suggestions below.

Suggested standards for information submittals: In general, there should be citations to published literature for all information provided. These are not requests for new research, this information should all be drawn from existing sources. It is important that all sides be presented where there are differences of opinion or conflicting data. All information should be on 3 ½ inch floppy disc in MS Word, and accompanied by a printed copy. I will need copies (hard copy will suffice) of all literature cited.

The Initial Study dated August 1997 defines the scope and focus of the EIR. Each of the potentially significant environmental effects identified will be treated in its own section of the EIR. This treatment will include a narrative discussion, analyses of the potential impact (including measures to avoid, reduce and mitigate the impact), and conclusions. The following information would be helpful in preparing these sections, and other parts of the EIR:

I. CPVC AND ITS USES

A. What is CPVC? Describe the physical and chemical characteristics. Include a discussion of PVC and differences and similarities, especially in relation to leachates and solvents used for primers and cements.

B. Describe CPVC pipe and fittings used for potable water pipe in residential buildings. . Consider installation, repair, and lifetime (durability), based on history of use and theoretical considerations. Specifically need to address mechanical strength, flexibility, and failure rates in relation to metal pipe materials. Refer to and summarize ASTM standards set forth in the Uniform Building Code.

C. How is CPVC made, and how is it formed into pipe and fittings? For primary production of CPVC, define the feedstocks, their origins and the tons of each per year to satisfy California demand. Is there sufficient production capacity or will new capacity be required? Where is the primary resin produced, and where are the pipe and fittings produced? Does CPVC resin or pipe include recycled material, and is the pipe recyclable? What are the wastes from manufacture, and how are these wastes now managed? Discuss hazardous and non-hazardous waste streams separately. For any hazardous waste streams, this should follow the waste to ultimate disposal or treatment, and be based on manifests and on-site treatment and disposal reports correlated with CPVC production figures and raw material inputs. Describe any worker health and safety standards of requirements related to chemicals found in leachates.

D. What are the other uses of CPVC, in addition to potable water pipe in residential buildings? It is important to "demystify" CPVC, and, to the extent it is used for such things, describe it in terms of familiar items, like barbie dolls, kitchen appliances, car parts etc.

E. CPVC production figures and uses.

1. USA: What are the present annual sales of CPVC pipe, glues, and primers in other states? Gross figures and in relation to other potable water pipe materials. (Note: The use of CPVC in other states for potable water use in residential buildings was called baseless allegation in comments on the proposed regulations. This is an important issue in demystifying CPVC, and a definitive (but not necessarily exhaustive) list would help.)
2. Foreign: Gross production and uses.

F. Glues and primers: List other uses of the solvents. Describe the formulation process, with an emphasis on environmental controls. For example Air Quality Maintenance District limitations on emissions, and worker health and safety standards enforced at the formulation plants.

II. LEACHATES FROM CPVC:

Provide an update of the field since the 1989 Draft EIR, Appendix A, "Water Quality Review Update". The following topics should also be addressed separately:

A. Solvents: Identify the primer and cement solvents used now, specifically, have there been any changes in them since the 1989 survey in the EIR?. In addition, provide data on

trace contaminates. Are recycled solvents used to formulate the cement and primer? Is there any new information on the leaching rate over time?
B. The pipe itself: What are the leachates, their concentrations, and how do their concentrations change over time? Have there been any changes in them since the 1989 survey in the EIR? How do these compounds react with chlorine in the water supply? If there are reactions, what are the reaction products and the concentrations of the reaction products. What about disinfectants other than chlorine?

III. MITIGATION MEASURES:

A. What mitigation measures for CPVC pipe use are required in other states or local jurisdictions? Other countries? Specifically address both:
   1. Worker health and safety (such as ventilation, gloves or other protective clothing, respirators, don't drink the water, etc.); and
   2. Flushing prior to occupancy.
B. Does industry have any standards or recommendations for use?
   1. Worker health and safety (such as ventilation, gloves or other protective clothing, respirators, don't drink the water, etc.); and
   2. Flushing prior to occupancy.

IV. VOLITILE ORGANIC COMPOUNDS (VOC's):

What are the chemicals, including trace impurities, their rates of emission over time, and estimates of quantities involved (gross California sales anticipated on an annual basis). Define each chemicals' potential to contribute to photochemical smog, especially ozone production. (Each of these should also have a toxicological profile see V, below.) A time/emissions rate curve for curing solvent cement welds would be useful.

The issues of one step glue, get cites and discuss the implementalbily and carryover to PVC.

V. STANDARDS AND TOXICOLOGY:

For all the chemicals which leach and/or volitilize, provide workplace standards, drinking water standards, NPDES discharge limitations, air quality maintenance district point source emissions standards, food tolerance standards (if any), background levels, and a toxicological profile. For the toxicological profile, follow the format and subjects in the EIR entitled "The exotic Fruit Fly Eradication Program Using Aerial Application of Malathion and Bait" for the pesticide Malathion on pages A-20 to A-41. Please cite references in the text as endnotes. Exposure routes include ingestion, inhalation, and dermal pathways. Please provide information on the environmental fate of these chemicals, including their fate in a typical municipal wastewater treatment plant.

VI. COMPATIBILITY:

Compare the primers, cements, and fittings used for installation and repair, used for PVC and CPVC pipes. Specifically address if there is any incompatibility between mixing PVC and CPVC pipe, cement and fittings, and if this is done, is there a change in the physical and/or chemical characteristics, such as increased risk of mechanical failure or types or concentrations of leachates.

VII. PYROLYSIS PRODUCTS:

What are the "toxic gasses" produced in fires involving CPVC pipe? What are the background levels of these "toxic gasses" in fires not involving CPVC? Specifically address dioxin formation. Also, what are the solid residues left from CPVC in fires.

VIII. FIRE SPREAD:

What is the situation for fire spread? It has been alleged that "plastic" pipe can slump and burn, allowing fire to penetrate walls. Detail any physical measures such as non-combustible sleeves etc. which are used to avoid or reduce this potential.

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LAKELINE, OHIO 44095

DEBORAH L. NEALE
PRESIDENT

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(216) 946-6713

September 8, 1997

To: Robin Reynolds

From: Debbie Neale

Enclosed are some brochures from Goodrich which might be of help for background material regarding CPVC.

The brochure The Facts About CPVC is slightly dated, but contains a lot on info in a few pages. The blue reports are marketing brochures and tell interesting stories of real life case studies. Finally, I picked up Vinyl 2020 last night at the World Vinyl Summit which is being held in Akron, Ohio this year. It was developed primarily for this conference, which has attendees from 20 countries, by a local academician who specializes in "futures" research. Although Vinyl refers to PVC, Goodrich and many CPVC processors are also at this conference since PVC is the parent polymer to CPVC.

The Goodrich team has divvied up assignments to prepare the information outlined in your memo from our meeting on the 26th, but I thought these items may be of interest in the interim.

Best Regards.

Debbie

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California State Senate

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TWENTY-FOURTH SENATORIAL DISTRICT

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SELECT COMMITTEE ON HIGH EDUCATION
SELECT COMMITTEE ON WORKFORCE PREPARATION
SUBCOMMITTEE NO. 3 ON HEALTH, HUMAN SERVICES AND LABOR

November 18, 1997

Lita Flores
Chief Deputy Director
Dept. of Housing/Community Development
1800 Third Street, Suite 450
P.O. Box 952051
Sacramento, CA 94252-2051

Dear Mrs. Flores:

I am writing about the Department's intent to prepare an EIR on CPCV plastic pipes for drinking water.

It is my understanding that normally the cost of an EIR is borne by the private groups seeking an approval from a public agency. It is also my understanding that consultants possessing the appropriate scientific, engineering, and technical expertise are normally retained to review technical issues and prepare a draft EIR. In the previous effort to prepare a draft EIR on plastic pipes, technical consultants were retained and the cost was borne by the Plastics Industry.

However, it is also my understanding that HCD is proceeding to pay for the costs of preparing the EIR using taxpayer money instead of funds from the plastic industry which produces CPCV. It is also my understanding that scientific, engineering or other technical consultants with specific expertise will not be retained.

I do not understand why the normal EIR process is not being followed in this instance. I am not concerned whether it is appropriate to use taxpayer funds for this purpose. I am also concerned that the failure to hire a team of consultants with the appropriate technical expertise will result in a deficient, legally inadequate EIR.

Consequently, I would appreciate the following information. What is the cost of the staff time that will be used to prepare the CPVC EIR? How does HCD intend to provide adequate technical expertise? Why are outside technical experts not being retained?

What is the justification for using taxpayer dollars for this project? What is the justification for not requiring CPVC manufacturers to pay the full cost, including reimbursement of staff time, for this EIR? Why is this EIR being paid for by public funds when the last effort was paid by the Plastics Industry?

Thank you for your attention to this letter.

Sincerely,

Hilda L. Solis

HILDA L. SOLIS
Senator, 24th District

HLS/jt

NSF International

Ann Arbor, MI • Sacramento, CA • Washington, D.C. • Brussels, Belgium

December 5, 1997
Comment Clerk
Docket Number W-97-11
Water Docket (MC4101)
USEPA, 401 M. St., SW
Washington, D.C., 20460

Dear Dr. Evelyn Washington,

I would like to comment on behalf of NSF International in reference to the Environmental Protection Agency announcement of the draft Drinking Water Contaminant Candidate List; Notice in reference to the occurance of organotins in drinking water resulting from its use as a heat stabilizer in Poly Vinyl Chloride or Chlorinated Poly Vinyl Chloride (PVC / CPVC) pipe used for the transmission of potable water.

As an introduction, NSF International is a third party, independent, not for profit organization, that is dedicated to public health safety and protection of the environment. Since 1944, NSF International has developed product standards and provided third party conformity assessment services to government, users, and manufacturers/providers of products and systems. NSF Certifications and Standards are accredited American National Standards Institute (ANSI) in Canada by the Standards Council of Canada (SCC) and Europe by the Rad vor Accredidate (RvA).

NSF has been involved with developing standards, testing and certification of plastics plumbing components since 1965. There are two NSF Standards that cover PVC/CPVC pipe.

- ANSI/NSF Standard 14: Plastics Piping System Components and Related Materials
- ANSI/NSF Standard 61: Drinking Water System Components - Health Effects

ANSI/NSF Standard 61 establishes requirements for the testing and evaluation of contaminants that are extracted from water which has been exposed to the material or products that convey potable water.

ANSI/NSF Standard 14 requires that all plastic plumbing products intended for use with potable water applications comply with physical performance requirements as well as the health effects requirement of ANSI/NSF Standard 61.

The US EPA has recognized NSF Standard 61 as the criteria for determining health effects acceptability of materials or products that convey potable water, as referenced in Federal Register Notices: Vol. 53, No.130. July 7, 1988, and Vol. 62, No.163 August 22, 1997.

According to a survey by the American Waterworks Association, twenty nine U.S. states have current regulations or legislation requiring compliance of water contact materials to ANSI/NSF Standard 61. There are more than 595 PVC/ CPVC products produced by 88 companies at 148 manufacturing sites currently certified by NSF International to the health effects requirements of ANSI/NSF Standard 14 (NSF Listings book for Standard 14 and Standard 61 are enclosed).

P.O. Box 130140 Ann Arbor, Michigan 48113-0140 USA
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The formulations for all products certified by NSF International are thoroughly reviewed; this includes obtaining information from ingredient suppliers. Organotin stabilizers are added to PVC/CPVC formulations to protect the resin from thermal degradation during processing and usage. These compounds protect the PVC / CPVC by inhibiting the dehydrochlorination reaction by exchanging their anionic group, X, with the allylic chlorine atoms in the polymer. In addition they can react with the HCl produced, producing compounds which may inhibit other side reactions.

When PVC/ CPVC materials or products are tested at NSF International, multiple analytical tests are performed on the water which was exposed to the material; Residual Vinyl Chloride Monomer (measured in the wall of the material), phenolics assay, VOC analysis, regulated metal analysis, tin analysis and any other formulation specific analytes (i.e. acrylates; which are used as impact modifiers).

PVC / CPVC intended for use in pipes or fittings are tested based upon the protocol described in ANSI / NSF Standard 61, Appendix B. (p B9-B10). The lab results are then normalized based upon the intended end use of the product to determine the "at the tap" exposure following the procedure outlined in ANSI / NSF Standard 61, Appendix B (p B38-B51). The normalized concentrations are subsequently compared to pass/fail criteria for contaminants using the Toxicology Review and Evaluation procedure described in ANSI / NSF Standard 61, Appendix A (p A1- A13).

Indirect measurement of organotin is done by measuring the inorganic form of tin and then correcting for the molecular weight differences between the inorganic tin and the organotin species. The compounds which extract are monomethyl tin trichloride, dimethyl tin dichloride, monobutyl tin trichloride and dibutyl tin dichloride.

NSF has set the following action levels for organotins based upon the current guidelines in ANSI / NSF Standard 61, Appendix A.

	Mono and dimethyl tin	Mono and dibutyl tin
Acute: Short Term Exposure Level (STEL)	100 ug/L	100 ug/L
Chronic: Maximum Drinking Water Level (MDWL)	30ug/L	20ug/L

Testing of PVC/CPVC materials at NSF International includes the initial qualification of the material followed by annual sampling. The annual sample is collected on unannounced audits. Approximately 350-500 samples are tested annually at NSF. There are occasions when the extraction of organotin exceed the MDWL. In those cases, a follow up multiple time point analysis is performed. Regression analysis of the data is performed to determine if the extraction of tin decays over time for that material. The day 1 normalized concentration (acute exposure) is then compared to the STEL and the extrapolated Day 90 concentration (chronic exposure) is compared to the MDWL. Based on our current database, all products which have been tested with a multiple time point analysis have met the pass/fail criteria for acute and chronic exposure as defined under ANSI/ NSF Standard 61, Appendix A. This evaluation of PVC/CPVC is done on newly manufactured pipe when organotin extraction is at its highest level when compared to the lifetime of the product.

Triorganotins are more toxic than diorganotins which in turn are more toxic than monoorganotins (WHO 1980). Triorganotins are used as biocides in industry and agriculture (Sadiki 1996) and not as heat stabilizers in PVC/CPVC pipe. It has been our experience at NSF that monomethyl tin, dimethyl tin, monobutyl tin and dibutyl tin are the heat stabilizers of choice used by manufacturers for PVC/CPVC pipe which is used to convey potable water. NSF has tested and certified the majority of PVC/CPVC pipe material which is used to convey potable water in the United States. Currently, there is no record at NSF of a manufacturer using a triorganic tin as an intentional additive for heat stabilization of PVC or CPVC pipe.

It is our opinion that the evaluation of PVC/CPVC pipe based upon the requirements of ANSI/NSF 61 is protective of human health and the presence of the monoorganotin and diorganotin in potable water due to their use as heat stabilizers does not present a human health risk. Any regulation of organotins should be based around triorganotins and not the monoorganotin or diorganotin species.

Please contact me at your convenience if you have any questions.

Sincerely,

Lori Bestervelt

Lori Bestervelt
Manager, Toxicology Services
NSF International

Phone: 313-769-5345
Fax: 313-769-0418

Enclosure: ANSI/NSF Standard 61
NSF Listings- Drinking Water Additives
NSF Listings - Plastic and Plumbing System Components

WHO (World Health Organization), 1980. Environmental Health Criteria 15, Tin and Organotin Compounds. A preliminary Review.

A.I. Sadiki, D.T. Williams, R. Carrier and B. Thomas, 1996. Pilot Study on the Contamination of Drinking Water by Organotin Compounds from PVC Material. *Chemosphere*, Vol. 32, No. 12, p 2389-2398.

VOLUNTARY STANDARDS AND ACCREDITATION ACT OF 1977, S. 825

HEARINGS

BEFORE THE

SUBCOMMITTEE ON ANTITRUST AND MONOPOLY

OF THE

COMMITTEE ON THE JUDICIARY

UNITED STATES SENATE

NINETY-FIFTH CONGRESS

FIRST SESSION

ON

S. 825

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First of all, the Sherman Act case occurs after the fact. It is a long process to prosecute successfully or unsuccessfully an antitrust case. Thus, the resolution of the problem all too frequently comes well after the fact, well after the injury to the potential entrant. And perhaps more importantly, the traditional standard imposed under the Sherman Act has been a rule of reason. While I tend to favor a rule of reason test, I think the judicially developed standard here has not been altogether reasonable or responsive to the problem. The decisions, and I guess the plywood decision is probably as dramatic an example as I can give, tended to indicate that because the standard was ultimately amended and changed consituted a sufficent response.

I think the courts have been handicapped by the fact that there has been no national policy. There has been no statement of national objectives. The Sherman Act itself does not contain such a statement. Accordingly, it seems to me that one of the important functions of S. 825 is to begin the articulation of a statement of national policy and national objectives with regard to standards-making.

Senator ABOUREZK. I have no more questions.

Senator Metzenbaum?

Senator METZENBAUM. No questions.

Senator ABOUREZK. Thank you very much. We appreciate your testimony and your appearance here today.

Mr. Ralph Nader is our next witness. Mr. Nader.

STATEMENT OF RALPH NADER, WASHINGTON, D.C., ACCOMPANIED BY PETER L. MAIER, ATTORNEY

Mr. NADER. Thank you, Senator Abourezk, members of the subcommittee. Thank you for the invitation to testify on S. 825, which is called "The Voluntary Standards and Accreditation Act of 1977." With me today is Peter Maier, who has been working on this subject and who will comment [illegible] specifically on the particular provisions of the legislation.

What I would like to do is to establish some evidence and some observations about the need for legislative correction in a major area of marketing activity in the United States. Of course, one of the greatest shields of the private trade standards groups in the United States, one of the greatest shields from accountability, is in the fact, that what they do appears to the public to be very dull, and anything that is very dull is usually something that does not provoke public curiosity. But also it is also a good rule of thumb that anything that is very dull is likely to be also very important.

Yesterday on "60 Minutes," Henry Ford was interviewed, and in his admirable candid manner he said to the interviewer, "Sure, we build a lot of lousy cars."

Well, a lot of people in the United States would agree with him, but there is no particular standard to point to that would provide a framework of reference as to how lousy these cars are.

Senator ABOUREZK. If I might just interrupt there. There are a lot of Members of Congress who learned that trick, remaining anonymous and boring and therefore no one calls public notice to them.

Mr. NADER. Yes. Many of them are from the South. If you took a name recognition test of Senators over the years in the United States, they would not be from the South, although over the years many of the most important Senators have been from the South. So, anonymity is a technique of power. Dullness is a technique of power. Garnished with a droning voice, many of these standards association representatives manage to, if they don't lull you to sleep, they manage to inject a kind of verbal novocaine into your intellect so that you really lose any interest. The best definition of a standard that I know of is that a standard informs consumers of what they are buying from sellers. As a result, standards are a critical factor in the element of informed choice, which is the bedrock of the competitive enterprise system. This does not mean that sellers want to generate these kinds of informed standards clearly communicated to consumers. Because in the tussle between sellers and buyers, the sellers have very often liked to camouflage the true properties of their products, their lack of durability, safety, and other qualities, so that consumers are not informed of what they are buying so they cannot reward the better seller and penalize the worst.

There is a magnetic pull to a lowest common denominator performance among many industries where a few companies dominate the industry. For example, the difference between an Impala, a Galaxie, and a Fury is about the difference between tweedledum and tweedledee. There is a lowest common denominator pull among concentrated industries. Rather than a race to the top, there often is a race to the bottom. If the public is unable to differentiate between competing or allegedly competing products, these products are going to become more similar, less innovative, and overall less competitive.

Privately developed trade standards, and I use the word "trade" standards, Mr. Chairman, because I don't want the word "private" to connote something excessively charitable to such operations as the American Society of Mechanical Engineers or the ANSI, or other testing and standards groups. These are trade standards. They are controlled by the industries that they relate to, and to give them a professional coloring, I think would be unjustified by the record.

Privately developed trade standards have an enormous, but largely unrecognized impact on consumers. An estimated 400 trade standards groups publish over 20,000 product standards covering such diverse products as household appliances, portland cement, 16-millimeter movie reels, and microwave tubes. I understand there is a revision of a standard by the American Society for Testing and Materials concerning the traction capability of shoes. A lot of people are slipping all over the country partly owing to their shoes being too slippery, and they are doing a standard on the traction capability which shoes should meet.

At the urging of trade standards groups, many of these standards have been adopted in Government statutes and regulations. For example, State and local governments routinely incorporate by reference trade standards in their construction code requirements.

So, private industry employees develop a standard under the cover of a standards association. The standards association issues the standard. Shortly thereafter, a local State or Federal regulation or ordinance or code adopts the standard almost without changing it.

When the Auto Safety bill was passed in Congress, and the Auto Safety agency was set up in 1966, one of the first things the Auto Safety people did was go to the Society of Automotive Engineers, and there was a strong temptation just to take the Society of Automotive Engineers' braking standards, which were written by the auto company employees, and transform them into Department of Transportation regulations.

The whole thrust to the auto safety law was to lift up the existing auto safety standards and make them much stronger. But still there was that strong pull of the SAE. With their far-reaching impact, product standards have the potential to be used, of course, for productive purposes. For example, they could facilitate competition by giving consumers more and better purchase information; they could lower production costs by increasing industrial efficiency, and protect consumers from unsafe products.

Unfortunately, present trade standards frequently fail to realize their potential for a positive contribution to the Nation's economy. If this subcommittee can do anything toward ameliorating the present sad state of affairs, it will be a major step in a hopefully escalating series of steps to deal with this broad problem. I think also, if the subcommittee could prepare a simple pamphlet that could be widely distributed to consumers, to students, all over the United States, who may be interested in studying standards—particularly, for example, engineering students or law students—the focus on understanding these standards will be much sharper and the process will be much improved.

You have, I am sure, been informed of a book by David Hemenway on standards, and that was one of the few books on standards associations that has been written from a scholarly and consumer perspective. Well, he became interested in this subject as a student of economics at Harvard, and he came down to Washington and worked for a number of public interest groups, including ours, and he went back and he wrote a Ph. D. thesis on standards which now is a major study that is helping policymakers here on Capitol Hill as well as members of the press and others who want to delve into this subject.

So, there is an educational long-range impact to the subcommittee's work, and I would hope that some summary material could be made, apart from the voluminous and very informative hearings that have been and will continue to be compiled on this subject.

Trade product standards often harm consumers. The history of standards is strewn with abuses: standards essentially written by large corporations to exclude competitors from the marketplace, standards that misrepresent hazardous products as safe, standards that boost sales while benefitting only the producer, and standards that are designed to head off tough Government safety requirements rather than protect the public. That is quite a menu, and it has been produced very vigorously all too often by many of the industry indentured standards groups in this country.

This subcommittee has already heard testimony on the use of trade standards by large firms for anticompetitive purposes. In the case of automatic vent dampers, the American Gas Association has used its grip on standards setting for gas appliances to prevent the marketing of a device that would reduce energy consumption for gas home

heating by an estimated 23 percent. The AGA's efforts have thus blocked consumer access to an energy conservation device that would compete with natural gas sales.

In the case of low water boiler cutoff devices, a dominant manufacturer of boiler controls used its close ties to an American Society of Mechanical Engineers standards committee to spread the word—deliberately and incorrectly—that a small competitor's products did not comply with the standard. By this maneuver, McDonnell & Miller, Inc.—which has more than 85 percent of the annual $10 million boiler control market and is owned by ITT—retained its dominant market share and sent the small manufacturer's sales into an immediate tailspin.

The use of standards to exclude competitors from the marketplace is particularly disturbing in view of the ineffectual record of antitrust laws in guarding against such practices. Aside from per se antitrust violations such as price fixing, the courts have generally refused to apply antitrust sanctions to trade standards groups.

A 1972 Federal Trade Commission staff study on standardization supports this assessment, and I quote:

> A survey of legal precedent shows clearly . . . the difficulty courts have had in dealing with the shortcomings of standards and certification programs, particularly their antitrust aspects. Most antitrust cases in the standards area deal with a standards program that has been used to foster conduct which itself constitutes a per se violation of the antitrust laws. . . . Unfortunately, courts have had more difficulty dealing with less obvious restraints of trade attending product standards.

Moreover, few small businesses whose products have been excluded from the marketplace, and even fewer affected consumers, can afford to pursue long and expensive antitrust litigation. The company whose automatic damp vent that was said to be discriminated against by the American Gas Association has just filed a multimillion dollar antitrust suit. It is going to cost that company a lot just to maintain that suit.

The Nation's antitrust laws provide little comfort to consumers and small firms who have been hurt by standards abuses, although there are some exceptions to that observation.

Another common abuse is the use of trade product standards to deceive consumers so as to boost or maintain sales. Later in our testimony we shall show how excessive lighting level standards cause the Nation to waste at least $3½ billion worth of electricity annually through overlighting.

A second example is the plastics industry's use of fire testing trade standards to misrepresent certain polystyrene and foamed polyurethane plastics as "nonburning" or "self-extinguishing." In fact, under actual fire conditions these plastics can burn intensely and release flammable gases. Polystyrene and polyurethane plastics have resulted in numerous fatal fires, including the 1970 dance hall fire in France in which 145 teenagers died.

In 1973 the Federal Trade Commission charged the American Society for Testing and Materials and a group of plastics manufacturers with misrepresenting the fire hazard characteristics of these plastics. Over a billion pounds of the plastics were used for construction and home furnishings in 1972.

According to the FTC complaint, plastics manufacturers used ASTM standards to justify claims that their products did not burn or were self-extinguishing. Yet, the Commission found that, once ignited, the plastics "frequently produce greater fire hazards than traditional materials," spreading flames and generating smoke, heat, and flammable and toxic gases more quickly than ordinary materials such as wood or cotton.

Now, you may say, well that sort of thing is sort of abstractly scientific, but it came home in a very tragic way on the Canary Islands a few weeks ago when two jumbo jets collided in what should have been, for a majority of the casualties, a survivable crash. But apart from those who were in the planes at the point of impact, and who could not have survived that collision, the other passengers in the planes were burned to death or gassed to death. To the extent that they were gassed to death, they were gassed to death by the cyanide and carbon monoxide and other toxic gases in the seat cushions and upholstery and carpeting that were in the plane.

Where, indeed, was ASTM all these years, quite apart from the plastic manufacturers, and the artificial fabric manufacturers? Where were they in delineating the standards in such a clear manner that they would have put the airlines and the airline passengers on greater notice to have raised this issue publicly and developed the pressure for more rigorous standards to prevent the use of such material. It might even have developed a process that might have reached the Federal Aviation Administration in finally issuing what it has long been sitting on, and that is the standards for new kinds of materials with less toxic or no toxic gases in seat cushions and other materials making up the airplanes' interior.

Plastic makers and ASTM had known of these serious fire hazards at least 6 years before the Federal Trade Commission complaint, but had neither warned the public nor put a halt to the misleading claims.

The FTC charged ASTM with knowingly permitting the plastics industry to use ASTM standards to misrepresent the burning characteristics of plastic products, complaining that ASTM had been "dominated or unduly influenced" by the industry and become "infected with commercial intent."

The following year, the plastics manufacturers signed a consent order in which they agreed to stop misrepresenting their products, to notify the public of the fire hazard, and to undertake a $5 million research effort to find remedies to the problem.

Trade standards assume even greater importance, and their abuses even greater severity, when governmental bodies adopt them into law. This governmental adoption is a widespread phenomenon. Federal, State and local governments routinely base their statutes and regulations upon trade standards, thereby elevating them to a mandatory status enforceable by law. Yet governmental bodies, particularly those on the State or local level, often have neither the time nor the expertise to develop their own standards or to study trade standards closely. Therefore, governmental adoption often occurs with only cursory review of the standard's content. The 197[illegible] FTC staff study on standardization supports this view:

> Voluntary standards have a tremendous impact on the development of legislation, particularly safety codes enacted by State and local governments. These codes are for the most part developed with little independent scrutiny by the government body.

Similarly, the 1970 final report of the National Commission on Product Safety found that States had adopted trade standards for electrical appliances, fire extinguishers, and gas appliances "apparently without independent evaluation of their effectiveness."

Trade standards groups fully encourage this widespread governmental adoption. The American National Standards Institute, which is the big one, ANSI, for example, candidly states in its 1976 annual report that one reason the Federal Government has adopted so many trade standards is ". . . ANSI's and its federated membership's successful efforts to encourage use of concensus standards in implementing legislation. . . ." By the way, ANSI had to change its name after a number of congressional hearings contained testimony raising objections to its former name, which was the U.S. Standards Institute, as if it was conveying some official U.S. Government imprimatur. One of ANSI's most successful efforts has been in obtaining the adoption of over 240 of its standards by the Occupational Safety and Health Administration here in Washington.

Indeed, in November 1976, ANSI and OSHA signed a formal agreement designed to facilitate future use of ANSI standards. Little attention should therefore be paid to claims that such trade standards are not lobbied vigorously into legal standards or regulations by their shapers.

In a really ironic way, we have had Congress enact safety laws which have been administered in such a way as simply to further the facilitation of the transfer of private standards into Federal law as a way of circumventing the true congressional intent and making a mockery out of many health and safety laws passed by the U.S. Congress.

Routine governmental adoption of trade standards is particularly disturbing in matters of public health and safety. Time and again in recent years legislatures have placed responsibility for health and safety standards in the hands of Government agencies, where it properly belongs. Yet, Government standardsetters often turn right around and, in effect, give that power back to the private sector by adopting or incorporating by reference trade standards without giving them full review.

The dangerously misleading trade standards for testing plastic products, widely incorporated by reference into State and local construction codes, demonstrate how this faith in private standards is sadly misplaced.

A second example of unwise governmental adoption of trade safety standards is aluminum wiring. As we discuss later in our testimony, aluminum wiring created a fire hazard in 2 million homes because State and local construction codes blindly referenced lax trade standards. These myriad abuses in the trade product standards system provide ample reason for Federal regulation.

This subcommittee can choose among several different approaches to curb the abuses. One method would be to provide a right of

private legal action to aggrieved consumers and businesses. But by itself such a right would not provide the necessary consumer protection. Consumers are seldom aware of the harm wrought by standards abuses. If by chance they do learn of an abuse that affects them, it is usually too late to obtain a useful remedy. From the consumer viewpoint, therefore, standards abuses must be corrected at their source, the standards writing stage. For businesses, however, a right of action specifically based upon the FTC's title 1 rules would be useful.

I am not discounting entirely the usefulness of private consumer legal actions or class actions, but they are a sort of remedial, last gap measure, useful to have around, abut we have to focus on a structure of Government standards setting that inspires prevention and foresees and forestalls abuses in the first place.

Now, it is my personal judgment, Mr. Chairman, that a more promising approach would be to replace the present trade standards system with governmental or consumer institutions capable of setting product standards independently.

If the industries want to have their own groups, fine; they can have their own groups as they do now. But this standards setting function is so fundamental for the proper working of so many Federal health and safety laws that it should go hand in glove with these safety laws instead of the present situation which incorporates industry standards by reference.

For example, our public school systems should have access to independent analyses to determine how much lighting their students need to read by, rather than be forced to follow the self-serving recommendations of the lighting industry's watt hucksters.

Similarly, local building code officials should have access to independently determined safety standards for household wiring, rather than be forced to depend upon the industry apologists at Underwriters Laboratories.

To carry out these duties well, governmental institutions will need a whole new set of tools, such as their own testing labs—or the ability to call upon independent research organizations—and built-in mechanisms for public interest representation.

The approach chosen for title 1, to direct the FTC to write and enforce procedural rules for trade standard setting groups, does not, of course, fashion such a democratic and fair product standards system in which trade standards would have to compete with well-founded alternatives from impartial sources. Instead of shifting the balance of power from producers to consumers, it adjusts the existing system for smoother running.

Nonetheless, title 1 offers important improvements. Its requirements for reforms such as balanced standards committees and effective appeals mechanisms would at long last introduce some procedural fairness into what really should be called the "trade standards" system.

A few words about how these trade standards groups operate. Their procedures for obtaining the participation of consumers, procedures adopted recently, and other independent interests are disgracefully inadequate. Industry representatives always far outnumber those representing consumers on committees where standards are written, the most important step in the standards setting process.

On the ANSI and National Fire Protection Association mobile home standards committee, for example, manufacturer and supplier representatives make up 36 percent of the voting membership, while consumer representatives comprise only 4 percent. The remaining members are representatives of private associations, Government officials, and a handful of others.

Moreover, the industry's representatives have the financial resources to attend meetings regularly, while consumer members can afford to attend only sporadically, if at all.

As a result, the industry's strength far exceeds its theoretical maximum; the mobile home industry's nominal 36 percent representation routinely tops 50 percent at committee meetings.

The American Society for Testing and Materials committee on safety standards for bathtubs and showers—people slip very frequently in bathtubs and showers—provides another example of consumer underrepresentation.

Consumers, who do the slipping in the bathtubs and in the showers, many of them from a Pennsylvania senior citizens group, comprise a far greater percentage of that committee than most such groups, about 10 percent.

Yet, the bathroom products industry so dominates the committee's deliberations that at one point the chairperson canceled a committee meeting because it conflicted with the National Association of Home Builders annual exhibition. Besides their numerical underrepresentation, consumers also lack the preparation time and access to technical resources necessary for effective standards work. Industry representatives, on the other hand, who are paid for their standards work, have ample time and resources to prepare and support their arguments. In contrast, consumer representatives usually must work as volunteers.

Both the American National Standards Institute and Underwriters Laboratories rely upon "consumer council" advisory bodies as their primary source of consumer input. But these councils are little more than public relations gimmicks. Their review of proposed standards comes too late in the process to have a significant impact. Only by active participation in actually writing a standard can consumers have a meaningful voice in its content. Moreover, most of NASI's consumer council members are not even consumers. Instead, they represent producers or industrial and commercial intermediaries. the same is true for many of the members of UL's consumer council.

ANSI's council, for example, includes bogus consumer advocates such as representatives from the American Bankers Association, the Can Manufacturers Institute, du Pont, and Whirlpool. UI 's 1976 council roster lists representatives from corporations such as J. C. Penney, Woolworth, Sears, Roebuck, and Lever Brothers. At least half of ANSI's board of directors represent companies easily identified as big business, including A.T. & T., Exxon, du Pont, IBM, U.S. Steel, and Xerox, and corporations and trade associations comprised all but a handful of ANSI's hundreds of supporting members.

Moving ahead, I would like to discuss in conclusion two examples of how trade standards systems harm consumers and they illustrate the need for title 1 's procedural requirements.

The first involves excessive lighting levels, how industry uses standards to boost sales artificially.

Now, President Carter is going to make a number of addresses and messages this week on energy. He will call for energy efficiency. But I will wager you that nowhere in the administration's message will there be a critique or even an observation on the critical crippling affect on our energy needs that the standards systems which I am about to discuss will continue to have.

The electric companies want to sell more electricity. The illuminating fixtures manufacturers want to put in more lights. They have a vested interest in waste. Operating on the popular myth that the more light there is, the better, in office buildings, schools, libraries, supermarkets, and the like, the electric utilities and the illuminating fixtures manufacturers have continually escalated the standard for lighting intensity in our buildings.

As a Nation we light our buildings far more brightly than is necessary for visual safety, comfort, or efficiency. Experts estimate that U.S. lighting levels can be safely reduced by at least one-third, a reduction that would slash the Nation's total electric lighting bill by at least $3.5 billion a year. Responsibility for the excessive lighting levels rests with a standards group called the Illuminating Engineering Society. About the principal goal of the Illuminating Engineering Society is to illuminate the profits of the corporations that dominate it.

The Illuminating Engineering Society's widely recommended lighting levels have increased dramatically in recent decades and now stand as the world's highest.

A good example of the IES standards' wasteful excess are its school lighting recommendations. The students in the audience today should take this information back to their schools and conduct an energy waste survey in order to determine how the IES has gotten to their school in such a way as to further burden the property taxes that their parents have to pay in order to pay for the overlighting in their schools.

Some of these schools have so much lighting that the lights light the lights. For certain classroom areas, such as study halls, the Illuminating Engineering Society recommends 70 footcandles—one footcandle is equal to the light of one candle at the distance of one foot. Seventy footcandles is the equivalent of an astounding ten ceiling globes, each with a 100-watt incandescent bulb, in a 10 by 10 foot room. That is more lighting than this room has by far, quite apart from the sun that is coming in to make the lights that are now on inadvisable.

These IES school lighting levels are more than twice as high as the 1958 IES recommendation of 30 footcandles, which ophthamologists generally agree is an adequate amount of light for most people in most reading situations. Those of us who went to elementary and high school before 1958 do not recall squinting in order to read our textbooks or our notebooks. It was 30 footcandles then, and more than double that now, and still going up if this process is not stopped.

IES recommended lighting levels for offices and libraries are also ridiculously high. IES office lighting levels are roughly twice as high as those recommended by the Federal Energy Administration. The library levels are double those that Keyes Metcalf, former Harvard

librarian and acknowledged dean of library lighting consultants, recommends as adequate for the substantial majority of library users.

High general lighting levels are not necessary for proper vision. Ophthamologists are in general agreement that lower lighting levels will not harm the eye. In fact, there is even some evidence that high levels may impair vision. Nor are high lighting levels necessary for visual comfort or efficiency for most people. Beyond 20 to 30 footcandles, increased foot candle power provides only minimal improvements in the eye's ability to perceive detail, but a maximum sustenance for greater sales by the electric companies for greater profits. There are some buildings now in the U.S. that have over 100 footcandles and excessive lighting by anybody's standards. The reason for the IES's excessively high lighting standards is that the society, the Illuminating Engineering Society, is essentially a trade association for the lighting industry, promoting its interests rather than the general public's.

Fully 57 percent of IES members, and most of the IES "sustaining member" financial angels, are sellers of lighting products or services who have a direct economic stake in keeping lighting levels high. The roster of IES national officers also shows undue industry influence, almost half represent sellers of lighting equipment or electricity. Further, IES obtains well over half of its income from the lighting industry. The lighting industry's candlepower pushers also largely control the IES technical committees, where the critical work of actually writing the lighting level standards takes place. Sellers or installers of lighting equipment or of electricity provide over half the committee's roster. Through its manipulation of the IES standards, then, the lighting industry has devised the ultimate sales tool: In the name of public health and under the guise of a supposed public service organization, the industry sets ever increasing and wasteful lighting levels that in turn stimulate ever escalating sales.

The second example relates to hazardous aluminum wiring. Standards developed by Underwriters Laboratories, the Nation's largest tester of household electrical products, facilitated the installation of hazardous aluminum wiring in over two million homes from 1965 to 1972. This wiring soon earned a reputation as a serious fire hazard.

Fire departments across the country have identified aluminum wiring as the cause of numerous fires—including at least 12 recorded deaths—and dangerous electrical failures.

It was on the basis of these reports that in September 1975 the U.S. Department of Housing and Urban Development banned the use of aluminum wiring in mobile homes. In November 1975, the U.S. Consumer Product Safety Commission "preliminarily determined" certain sizes of aluminum wiring to "present an unreasonable risk of death or injury."

The long string of weak UL standards began in 1966 when UL gave the go-ahead—with only minimal restrictions—for wiring certain outlets and switches with aluminum, despite aluminum's known propensity to overheat and cause fires.

By 1969, however, enough fire departments and homeowners were complaining about fires and smoking wall sockets to wake even a sleeping giant like UL, which then cosponsored a survey with the National Electrical Manufacturers Association to study the problem.

Despite its knowledge of the aluminum wiring hazard in the late sixties, UL did not significantly upgrade its standards until 1971.

The most important of those changes amounted to a long overdue prohibition of "old technology" aluminum wiring connection devices. This prohibition supposedly took effect in September 1971, but in fact UL privately authorized the electrical industry to ignore it and to continue wiring homes with the same connection devices that UL had declared unsafe.

Not until almost a year later, when "new technology" connection devices became available and the industry's profits were no longer endangered, did UL reconcile its private and public policies and require the "new technology" connection devices.

UL's present aluminum wiring standards, though an improvement over earlier ones, remain inadequate to cope with aluminum wiring's dangerous properties. The Consumer Product Safety Commission has criticized the standards as deficient in 13 important aspects. UL's failure to protect the public occurred because in developing its standards UL relies heavily upon product manufacturers at the expense of a consumer orientation.

The cornerstone of this undue industry influence is UL's financial base: UL derives most of its income from manufacturers who pay it for testing their products.

In the late sixties, for example, Mr. Chairman, UL missed the fact that hundreds of thousands of color TV sets were emitting dangerous levels of radiation to unsuspecting viewers in their homes. UL has an interesting record in what it chooses to test and what it chooses not to test, and what it chooses to inform the public from its ample files of safety defects and what it chooses not to inform the public.

A second important source of undue industry influence here is the role UL gives manufacturers in shaping its standards. For its aluminum wiring standards, UL not only solicited the view of its regular manufacturer advisory groups, but also sponsored a special advisory committee that gave the aluminum wiring industry an even stronger voice. A lopsided 73 percent of this committee's non-UL members represented sellers of aluminum wiring products. In contrast, UL's consumer advisory council is little more than a public relations gimmick, as we have already discussed. Given the pro-industry bias of UL's standards setting system, it is not surprising that its aluminum wiring standards guard manufacturers' sales but ignore the public safety. Those are two examples of many to further the record as a basis for support of the legislation that is before this subcommittee. Thank you, Mr. Chairman.

Senator ABOUREZK. Thank you very much, Mr. Nader, for a well prepared statement.

You stated at one point in the statement, and I quote, "a more promising approach would be to replace the present trade standards system with governmental institutions capable of setting the product standards independently." Is it your view that the establishment of product standards is more appropriately a Government function than an industry function, or do you think it might be a joint undertaking of both the Government and the private sectors?

Mr. NADER. Well, industry may want to have its own standards for industry purposes. But when Government has to fulfill congres-

sional mandates for health and safety, the Government should have its own standards capability.

After all, if you look at the purposes for which these standards are used—that is, the health and safety protection of the public, the facilitation of competition in the marketplace, and the enhanced procurement ability of the biggest consumer of all, which is the U.S. Government—it will easily justify the taxpayer expenditure on a Government standards system with Government laboratories, Government testing installations, and Government proving grounds for such situations as automobile and aviation standards.

So that there is just no question in my mind that the taxpayer will be much better off and people will be subject to much greater health and safety environments, and the Government will get more for its money in its multibillion procurement of such things as light bulbs, apparel, drugs, and automobiles, and the thousands of other products that it justifies and independent Government standards capability.

Senator ABOUREZK. Before I ask the next question, I don't want to forget this. I have to announce that you are appearing here today on behalf of yourself, and not on behalf of any organization that your are a member of.

Mr. NADER. That is right.

Senator ABOUREZK. If the Government did have its own standards-setting agency, would you recommend also some sort of protection against industries lobbying, in effect, to accomplish the same things that they are accomplishing now with the private standards?

Mr. NADER. Yes. The best protection is to give the Government its own technical laboratory and proving ground capability.

Senator ABOUREZK. Some kind of insulation from industry lobbying?

Mr. NADER. That is right. Insulation from having to rely on industry data, the way the U.S. Government still has to rely on oil and gas industry data. Imagine, the U.S. Government, one of the biggest buyers of oil and gas, supposedly intent on setting an energy policy for the United States, still relies on the oil and gas industry for reserve data.

I might add that if Sears, Roebuck can afford and economically justify its own testing laboratories and its own specifications directed toward enhancing its purchases of products from manufacturers that it puts in its catalog to sell to consumers, then certainly the Federal Government, which is far larger, has far broader public responsibilities and bigger procurement needs, can justify a similar independent capability.

Senator ABOUREZK. One of the arguments used by the standards-developing organizations against this legislation and against the requirement that standards committees be balanced to include such affected interests as consumers, is that you would be unable to find consumers who are either qualified or willing to serve. Do you have a comment on that position?

Mr. NADER. Yes. You know, that is the age old argument. You remember the British in India. India is simply not ready for democracy because there aren't enough citizens in India who understand democracy, and minority groups in this country aren't ready for full absorption of rights because they don't know how to govern themselves, et cetera.

First of all, demand creates capability. The more demand there is for consumer input, the more incentive and interest articulate and informed consumers will have to come forward from our ample ranks of citizens in the United States and participate.

For instance, 10 years ago President Lyndon Johnson would not have been able to find as many consumer experienced people to go into Government as President Carter is finding. Why? Because there is a growing consumer movement, growing consumer demand, and growing receptivity to consumer advocacy roles.

Secondly, there is a huge area of unemployment in our country called Ph. D.'s, in all kinds of scientific and engineering disciplines. They certainly could be tapped to bring forward a consumer viewpoint.

Thirdly, there are a lot of victims in this country, and if victims know one thing, they know how to ask questions about what victimized them. So, if the trade associations can't find skilled consumer advocates, I suggest they look at some of the consumer complaint letters that come in to Government and come in to their own companies, pick some of the more articulate and detailed ones, and then solicit from those letterwriters' ranks.

Some of these letters represent extraordinarily fine perception and dedication, and could be a reservoir for staffing these standards committees.

In short, Mr. Chairman, I don't buy at all the argument that there aren't enough consumer representatives.

If the industry standards committees were so hot to find consumer representatives, how come I have never received a letter from them. I should be getting letters every day saying who do you recommend for the shoe traction standards committee of ASTM, and many other consumer advocates in the city and in the country should be receiving letters of inquiry if the standards committees and associations can't find people to fulfill these roles.

Senator ABOUREZK. What do you know about ANSI's consumer council, which is what they are recommending we utilize throughout the standards developing industry, rather than this legislation?

Mr. NADER. Again, it is a self-selecting process whereby the more vigorous consumer advocates do not get an opportunity to perform. The definition of consumer involves intermediary companies, or other kinds of associations that represent intermediary companies between the primary seller and the ultimate consumer.

I don't think ANSI is capable of being repaired. I think it knows what its mission is. Its mission is to serve industry and commerce in accordance with the concensus principle, the lowest common denominator, and the politics of the industry that dominates it.

Senator ABOUREZK. Thank you.

Senator Metzenbaum?

Senator METZENBAUM. Yes.

How are the present standards, Mr. Nader, enforced? I know that in some instance in order to get insurance you have to have approval of Underwriters Laboratories. But how are the other enforcement procedures accomplished?

Mr. NADER. Well, first they are enforced by being part of local codes or State and Federal standards. That is the most obvious way they are enforced, because they are incorporated in their totality.

Secondly, they are enforced, as you say, by third party conditions. The insurance industry will say, we will not ensure this building unless the wiring meets Underwriters Lab specifications.

Thirdly, they are enforced to the extent that they are successful as defenses in product liability suits. That is another pernicious misuse of the standards.

A consumer gets injured, say, in a household appliance accident. Let's say a fire in a household appliance. The consumer sues the manufacturer. The manufacturer comes in with their expert witnesses and says to the judge and jury, this product was not negligently constructed or designed because it meets ANSI standards. And to the extent that that kind of defense is allowed in the courtroom and is treated by the jury and the jury relies on it without knowing how these standards were arrived at, to that extent these standards are translated into enforceable codes to deny the consumer adequate compensation for the injuries.

There is a fourth way they are enforced, and that is monopoly. When they are used to drive out small innovative businesses, and when they are used as a way of retarding the rate of innovation because the existing technology that the companies are invested in is sufficiently profitable and perhaps more profitable than new kinds of innovation would be, then the antitrust violation patterns serve as an enforcement mechanism for these standards.

Senator METZENBAUM. Is S. 825 applicable to a public body, such as a state body that might be set up to provide for similar standards?

Mr. NADER. Mr. Maier would like to respond to that.

Mr. MAIER. As I understand the bill, it only applies to trade standards groups, and not to governmental institutions.

Senator METZENBAUM. If that be the case, and that is the way I read the bill also, would it not then be possible for the very same groups who are presently using the trade associations, almost to speak trade associations, standards setting groups, to go to the various State legislative bodies or the State building and standards groups, the commissions that exist in most States, and accomplish the same purpose and be exempt from the provisions of this law?

Mr. MAIER. That is why we think that it is important to provide those governmental institutions with resources for producing their own standards, for example access to independent testing laboratories.

Senator METZENBAUM. Yes, but that doesn't answer my question. My question is, assume the passage of this legislation, and then assume one of these very same groups says, as they did in the insurance industry, that we will go back to the various State bodies and we will set up something similar to that which we have in Ohio called the rating bureau, which really sets forth the policy language and provides for the kind of coverage you get under your insurance policy, and provides for rates, and it is set up as a State body, but it is really totally run by the insurance industry. My question to you is, how would you preclude, assuming the passage of this legislation, the same kind of activity on the part of the various bodies that presently have the standards from accomplishing their same objective by doing it through the 50 States of the Union, and I think they might very well be able to accomplish just that objective?

Mr. MAIER. Yes, that is a danger. I think it would be difficult to preclude them from lobbying.

Senator METZENBAUM. With that I would agree.

Mr. MAIER. That would be a very difficult task, indeed. As I said, I think the way to do that, to prevent that from happening, though, is to take preventive measures, such as equipping governmental agencies with the resources necessary to develop the standards on their own so that they can say to the private standards groups, look, we don't need your standards, we have the resources to develop them on our own.

Senator METZENBAUM. My question leads me to the point of whether or not we don't need language in this legislation to restrict or at least to regulate such activities on the part of the national organizations, because it is they who would be moving into the various States to accomplish the very same objectives that they have been able to accomplish at the present time under this legislation.

Mr. MAIER. That might be very useful, indeed.

Mr. NADER. You might want to redefine the definition of standards to deal with this escape potential within a State jurisdiction, the evasive maneuver that you have just described.

Senator METZENBAUM. I would recommend that you at least give the subject consideration.

Mr. RAY. I think it would be very difficult to stop these organizations from lobbying. But under this legislation, the Federal Trade Commission, can outlaw a restrictive or unreasonable standard in or affecting interstate commerce. It would be able to force the standards-setting organization to withdraw such standards. Of course, it could issue cease and desist orders or seek civil penalties if they continue to lobby to promote such standards. So, the bill is directed at the source and I think the FTC can get after the kind of activities you describe.

Mr. NADER. Do I understand you correctly, Senator Metzenbaum, that what you were saying is, what would stop a national standards group from setting up a separate State group and just operating within each State's boundaries to lobby its state group standards into state law? Wasn't that your question?

Senator METZENBAUM. That is my question, and it comes about by reason of the fact that some years ago there was a Supreme Court decision that raised the question of Federal regulation of the insurance industry. There was then passed legislation at the congressional level, probably before you were born, Ralph. It was a while ago——

Mr. NADER. 1944.

Senator METZENBAUM. You were still pretty young at the time I think this occurred.

Mr. NADER. I was still a Yankee fan.

Senator METZENBAUM. As a matter of fact, what then happened was Congress passed legislation making it possible for requiring the States to move into this field, or otherwise making the insurance industry subject to Federal regulation. The insurance industry moved into the various States, set up these rating bureaus, which I know in Ohio, and I would guess the same is true throughout the Nation, that are an absolute absurdity, because there is no regulation provided. They are totally controlled by the insurance industry. There is no public representation, and there is no public protection.

What I am concerned about is the passage of this legislation and then leaving a door open through which the same situation that presently prevails could be accomplished on a 50-State basis, and I would guess that the various State associations would have sufficient ability to pass such legislation or achieve their objective in a more than majority of the States of the Union. And I am suggesting, although I know that you are saying that you think that it presently is covered, I would want to be certain that it is covered.

A couple more questions. Would a standards setting group or an approving group such as Good Housekeeping or Consumers Union be subject to the language of this legislative proposal? And if not, why not?

Mr. MAIER. It would be my guess that they would be covered.

Senator METZENBAUM. Thank you. I have no further questions, Mr. Chairman.

Senator ABOUREZK. Mr. Sneeden, Mr. Chumbris?

Mr. CHUMBRIS. No.

Senator ABOUREZK. Thank you very much for your presentation.

[The prepared statement of Mr. Nader and Mr. Maier follows:]

PREPARED STATEMENT OF RALPH NADER

Mr. Chairman, thank you for the invitation to testify on S. 825, The Voluntary Standards and Accreditation Act of 1977.

SOUND REASONS EXIST FOR FEDERAL REGULATION OF TRADE PRODUCT STANDARD-SETTERS

Privately-developed trade standards have an enormous, but largely unrecognized impact on consumers. An estimated 400 trade standards groups publish over 20,000 product standards covering such diverse products as household appliances, portland cement, 16-millimeter movie reels, and microwave tubes. At the urging of trade standards groups, many of these standards have been adopted in government statutes and regulations. For example, state and local governments routinely incorporate by reference trade standards in their construction code requirements.

With their far reaching impact, product standards have the potential to be used for productive purposes. For example, they could facilitate competition by giving consumers more and better purchase information, lower production costs by increasing industrial efficiency, and protect consumers from unsafe products. Unfortunately, present trade standards frequently fail to realize their potential for a positive contribution to the nation's economy.

Instead, trade product standards often harm consumers. The history of standards is strewn with abuses: standards essentially written by large corporations to exclude competitors from the marketplace, standards that misrepresent hazardous products as safe, standards that boost sales while benefitting only the producer, and standards designed to head off tough government safety requirements rather than protect the public.

This committee has already heard testimony on the use of trade standards by large firms for anticompetitive purposes. In the case of automatic vent dampers, the American Gas Association (AGA) has used its grip on standards-setting for gas appliances to prevent the marketing of a device that would reduce energy consumption for gas home heating by an estimated 23 percent. The AGA's efforts have thus blocked consumer access to an energy conservation device that would compete with natural gas. In the case of low water boiler cutoff devices, a dominant manufacturer of boiler controls used its close ties to an American Society of Mechanical Engineers standards committee to spread the word—deliberately and incorrectly—that a small competitor's products did not comply with the standard. By this maneuver, McDonnell & Miller, Inc. (which has more than 85 percent of the annual $10 million boiler control market and is owned by ITT) retained its dominant market share and sent the small manufacturer's sales into an immediate tailspin.

The use of standards to exclude competitors from the marketplace is particularly disturbing in view of the ineffectual record of antitrust laws in guarding against such practices. Aside from *per se* antitrust violations such as price fixing, the courts have generally refused to apply antitrust sanctions to trade standards groups. A 1972 Federal Trade Commission staff study on standardization supports this assessment.

Footnotes at end of statement.

EXAMPLES OF UNSUPPORTED ASSERTIONS AND CONCLUSIONS IN DRAFT EIR

CPVC pipe is currently allowed and is used in California for potable water pipe in a number of applications, including mobile homes, other manufactured homes, recreational vehicles, commercial coaches, federal buildings, and public drinking water treatment and distribution systems. CPVC is allowed to be used in residential buildings in all of the other 49 states, and many foreign countries.
(Draft EIR, p. vii)

Some examples are fire suppression sprinkler systems, drinking water well casings, pipe and equipment in public drinking water treatment plants, pipe in public drinking water distribution systems, and industrial pipe systems where corrosion resistance is necessary.
(Draft EIR, p. 4)

. . . . no CEQA compliance was apparently required for these previous approvals.
(Draft EIR, p. 4)

The polymer CPVC consists of long chains of vinyl chloride, to which chlorine is added. CPVC is manufactured in several steps. In summary, starting with vinyl chloride, this gas is polymerized to form polyvinyl chloride or PVC, which is a solid, and is used extensively for many applications, including pipe and fittings for cold water conveyance. It is particularly well known for its use in residential sprinkler systems. PVC, in the form of either fine granules or a solution, may be further chlorinated to yield CPVC. The chlorine atoms attach randomly along the linear strand of PVC. By weight, CPVC is about 70 percent chlorine. The exact proportion of chlorine can vary somewhat depending on the conditions of manufacture. CPVC physically and chemically resembles PVC, but is more resistant to chemical attack and does not soften until it reaches a higher temperature. This latter characteristic makes it suitable for both cold and hot water use. Hot water in residences is 110^0 by California Building Codes. CPVC is suitable for water temperatures over 200^0.
(Draft EIR, p. 5)

CPVC is readily formed into desired shapes, such as pipe and fittings, using heat and pressure, or in the case of formulating cements, it is dissolved in appropriate solvents. CPVC used for potable water pipe and fittings has stabilizers added to protect it from degradation during forming and use. These are tin-containing organic compounds. Other additives include pigments and lubricants to facilitate forming of pipe and fittings. CPVC also contains small quantities of various impurities, acquired during the manufacturing processes.
(Draft EIR, p. 5-6)

As with many other materials, there are numerous different pathways to achieving the final product, and the precise characteristics of the finished material can be varied. Over the several decades since CPVC was introduced for potable water use there have been numerous changes in the details of its manufacture. These have tended to increase the quality of the finished material, and decrease the cost. For example there are several different chemical engineering approaches to achieving the further chlorination of PVC to form CPVC.
(Draft EIR, p. 6)

Discharges of treated wastewater to the environment could be potentially, and have been historically, significant sources of water pollution. As such they are highly regulated, and the sources and environmental consequences of contaminants in wastewater are well studied. Copper originating from the corrosion of potable water piping is known to be an existing significant environmental impact of wastewater discharges to some receiving waters in California.
(Draft EIR, p. 16)

Only CPVC pipe, fittings, cements, and primers tested for safety and suitability and listed by NSF are now allowed to be used in California.
(Draft EIR, p. 17)

The National Sanitary Foundation (NSF) certification is generally considered to provide sufficient protection of public health from contaminants in drinking water arising from materials in contact with potable water.
(Draft EIR, p. 17)

In addition, all of the other 49 states which allow the use of CPVC for potable water systems in residential buildings rely on NSF testing and certification for the pipe, fittings, cements, and primers for both safety (NSF 61) and suitability for intended use (NSF 14).
(Draft EIR, p. 18)

The Lead Agency has also independently reviewed the NSF Standards for Drinking Water System Components Health Effects (NSF 61) <23> and finds them to provide a reasonable assurance of safety. NSF testing and certification to established standards is relied upon in a number of human health and safety critical situations.
(Draft EIR, p. 18)

CPVC and its parent polymer PVC are approved for use in public water supply systems. Therefore, the existing environment of potable water piping in California includes CPVC in the supply systems, up to the service connections of individual residential customers, from the service connection up to the walls of residential and other buildings, for buried potable water piping on residential properties outside of

the perimeters of the building walls, within some types of residential buildings statewide, and within many residential buildings.
(Draft EIR, p. 20)

Data collected by the California Department of Health Services, Drinking Water Program, indicates the occasional presence of one of the solvents used in CPVC and PVC cements and primers in the human drinking water supply of the State. There are four solvents used in these materials. They are acetone, methyl ethyl ketone, cyclohexanone, and tetrahydrofuran. The one which has been detected is methyl ethyl ketone. Between 1984 and 1995 methyl ethyl ketone was detected six times, out of 9,493 samples tested. The concentrations ranged from 15.6 to 1,300 parts per billion, with a mean concentration of 416 parts per billion.
(Draft EIR, p. 20)

That there are two standards reflect a basic reality of leaching: For most contaminants the concentration is highest in the first flush of water, and decreases greatly with use.
(Draft EIR, p. 21)

<u>Standards for CPVC Related Solvents in Drinking Water</u>
(Values expressed in parts per million (ppm))

Solvent	MDWL	STEL
Acetone	1 ppm	16.2 ppm
Cyclohexanone	1 ppm	191 ppm
Methyl Ethyl Ketone	1 ppm	32 ppm
Tetrahydrofuran	1 ppm	100 ppm

(Draft EIR, p. 21)

The highest level of any of these solvents detected in the DHS monitoring program (methyl ethyl ketone at 1,300 parts per billion) exceeds the MDWL by about 30 percent, but is about 146 times less than the STEL. Given the very sporadic detection of this compound, the STEL is the appropriate standard to apply.
(Draft EIR, p. 21)

Organic compounds containing tin (organotins) are added to CPVC as stabilizers. In laboratory experiments, these compounds have been detected in water which has been in contact with CPVC pipe and fittings.
(Draft EIR, p. 21)

Organotins have been detected in aquatic ecosystems, presumably as a consequence of the use of a related and far more toxic material, tributyl tin oxide, as a pesticide in marine antifouling coatings.
(Draft EIR, p. 22)

Standards for Organotins in Drinking Water
(Values expressed in parts per billion (ppb))

Material	MDWL	STEL
Mono and Dibutyltin	20 ppb	100 ppb

(Draft EIR, p. 22)

In addition, the chemicals Chloroform and Carbon Tetrachloride are formed during the manufacture of PVC and CPVC resins and have also been detected in water during leaching studies.
(Draft EIR, p. 22)

One of the THMs, Chloroform, has been detected as a leachate from CPVC.
(Draft EIR, p. 23)

In addition, any material approved under this EIR would have to be tested and certified under national standards.
(Draft EIR, p. 23)

Also, naturally occurring materials, some of which are extremely toxic, arsenic for example are present at low levels in both the environment and in man-made products, including metallic pipe used for potable water conveyance.
(Draft EIR, pp. 23-24)

There can be some trace contaminants in the plastic itself, for example traces of chloroform have been reported. The leaching of chloroform and similar compounds is discussed in this EIR under the heading "Disinfection By-Products." Other materials are added to the CPVC during its fabrication into useful shapes. Organotin stabilizers are added to the CPVC to protect it from the extreme heat and pressure conditions of fabrication into pipe and fittings and from degradation during use. These materials have been reported to leach from CPVC pipe. . .
(Draft EIR, p. 25)

Pigments are added to color code the finished product. Lubricants are added to facilitate release of formed CPVC pipe and fittings from their molds and dies. The predominant pigment is titanium dioxide, which is the same pigment used to color interior and exterior house paints after lead oxide was prohibited for use in these products. Titanium dioxide has a very low toxicity, is very insoluble in water and has not been reported to leach into water from CPVC.
(Draft EIR, p. 25)

. . . paraffins, . . .
(Draft EIR, p. 25)

As with titanium dioxide, these materials have very low toxicity, are very insoluble in water and have not been reported to leach from CPVC into water.
(Draft EIR, p. 25)

The cements contain solvents, dissolved CPVC, and dyes. The primers contain the same solvents as the cements and a dye. The solvents used in the primers and cements can be detected for a time in water from a newly installed or repaired system.
(Draft EIR, p. 26)

If these fluxes are allowed to remain in the water-filled pipe for an extended dwell time, it is conceivable that this could result in even more contamination than that observed by Blumenkrantz.
(Draft EIR, p. 28, fn. 31)

The physical characteristics of CPVC pipe do not suggest it has any intrinsic properties which would make it more likely to fail when used for potable water pipe in residential buildings, compared to the materials now in use.
(Draft EIR, p. 29)

The Lead Agency is not aware of any situations where CPVC pipe has failed in use for reasons other than improper installation or extreme events. Improper installation includes the use of incorrect materials, for example a cement not designed or labeled for use with CPVC, and placing CPVC in contact with incompatible materials.
Draft EIR, p. 30)

Based on the evidence discussed in this EIR, approving the use of CPVC for potable water systems in residential buildings would most likely result in a net decrease in the flooding and water damage due to failure of pipe, not an increase.
(Draft EIR, p. 31)

. . . the available evidence is to the contrary.
(Draft EIR, p. 31)

at very low doses it has insidious adverse effects on the neurological development of children. Lead is also toxic at low levels in aquatic and terrestrial ecosystems, and it bio-accumulates. Lead plumbing, cast brass plumbing fixtures with high lead content, lead solders used for joining metallic pipe and fixtures, and fluxes containing high levels of lead have all been used in California in the past and have been identified as contributing to childhood lead poisoning. As a consequence, lead pipe is no longer allowed to be used for potable water piping. Solders, fluxes, and potable water fixtures containing lead may still be used for potable water systems, but there are now limits on the amount of lead which they may contain. High lead

content products are still manufactured and sold for other uses, but are labeled as not suitable for potable water system use. The extent to which high lead content products are still used despite the codes and labeling is open to question. It is a certainty that the low lead solders and brass foundry products still contribute some lead to tap water. There will be some human exposure, especially in the first use of a tap after several hours of nonuse, or in new construction if the system is not flushed. Lead levels can be well in excess of established standards in these circumstances. However, under conditions of normal use, the levels of lead are generally below established standards. These standards are set considering a lifetime of exposure, and incorporate a substantial margin of safety.
(Draft EIR, p. 32 – 33)

Under some circumstances, materials from the CPVC pipe (which for purposes of this impact discussion and analysis includes the fittings) and the solvents used in installation and repair of CPVC have been detected in water which stands in the pipe. The materials found at the highest concentrations are the solvents used in the cements and primers. The concentrations of leachates are highest immediately after installation and decrease over time. There is also some evidence that the chlorine used to disinfect water intended for human consumption can react with some of these leachates and form new compounds not found in either the solvents or the pipe. These new compounds are referred to as "leachate reaction products" or "disinfection by-products."
(Draft EIR, p. 34 – 35)

Previous studies . . . others have shown that these solvents can be detected in water conveyed in freshly assembled CPVC pipe systems, and that the concentrations decrease over time.
(Draft EIR, p. 35)

None of these are classified as human carcinogens by any agency, nor are they known to be reproductive/developmental toxicants.
(Draft EIR, p. 35)

<u>Standards for CPVC Related Solvents in Drinking Water</u>
(Values expressed in parts per million (ppm))

Solvent	MDWL	STEL
Acetone	1 ppm	16.2 ppm
Cyclohexanone	1 ppm	191 ppm
Methyl Ethyl Ketone	1 ppm	32 ppm
Tetrahydrofuran	1 ppm	100 ppm

(Draft EIR, p. 36)

The Lead Agency has also reviewed literature on this potentially significant impact which has become available since the Draft EIR was prepared about a decade ago.
(Draft EIR, p. 36)

There is new information on THF, relating to reports of prolonged exposures to high levels of THF vapors causing tumors in some animals. But, this new information does not change the fact that THF is not considered to be a human carcinogen.
(Draft EIR, p. 36-37)

On the contrary, there is information that was either not available or not considered in the previous draft EIR which reinforces the conclusion that solvent leaching would not occur at levels that would constitute a significant effect.
(Draft EIR, p. 37)

This is a standard practice elsewhere in the United States. . .
(Draft EIR, p. 37)

Based on review of the NSF Standards and testing, the Lead Agency considers NSF testing and certification to existing standards to provide a reasonable and conservative presumption and assurance of safety. The standards which NSF tests against are based on a conservative human health risk assessment process.
(Draft EIR, p. 37)

The new formulations do not include any volatile or leachable materials not present in the older products which were studied, so it is logical to assume that new materials, which contain less solvent, will result in relatively lower emissions of solvents, and less leaching.
(Draft EIR, p. 38)

However, the use of the low-VOC one-step cements currently is not permitted in the Uniform Plumbing Code for reasons apparently unrelated to their efficacy, safety to consumers, worker health and safety, or environmental effects. While the low-VOC one-step cements would clearly reduce emissions of VOCs to the environment, likely greatly reduce worker exposure to solvents, and possibly reduce the leaching of solvents into drinking water,. . .
(Draft EIR, p. 38)

Multiple, simultaneous exposures to different materials can have effects which are greater than, less than, or different from effects observed from exposure to the same materials separately. In the cases of the solvents used in CPVC primers and cements, there is no evidence to suggest synergistic effects between the four

solvents. There is one report of possible adverse interaction following overexposure to one of the solvents used to join CPVC, THF and a general anesthetic.
(Draft EIR, p. 38)

The effects of exposure would not be expected to be additive over time since none of the solvents is known to bio-accumulate.
(Draft EIR, p. 38)

Solvent based leaching would not be a significant effect even in the absence of: 1) Use of new low-VOC cements and primers; 2) NSF 61 testing and certification; and 3) The new requirements for flushing.
(Draft EIR, pp. 38-39)

There are reports of two classes of compounds leaching from CPVC pipe into water. These are: 1) Tin containing organic compounds (organotins) which are added to CPVC as stabilizers, and 2) Products formed from the reaction of chlorine during the production of CPVC resin.
(Draft EIR, p. 39)

These extraction tests are performed at elevated temperatures, and so the actual concentrations of organotins in drinking water would be lower than suggested by these test data.
(Draft EIR, p. 39)

The Lead Agency has reviewed literature reports of organotin leaching from CPVC and finds that the reported values are much lower than the applicable standards: Typically less than 10 parts per billion (ppb) initially (to which the STEL of 100 ppb would apply), then declining to less than one ppb after 20 or so extraction cycles (to which the MDWL of 20 ppb would apply).
(Draft EIR, p. 39)

The highly toxic organotin TBTO has been used as a pesticide. It is extremely toxic to many aquatic species, and it has been used as a pesticide principally to prevent the colonization of marine organisms on articles such as boat hulls, fishing nets, buoys, etc. Environmental contamination from TBTO has been well documented and has resulted in restrictions on its use.

TBTO is detoxified in the environment by natural processes which degrade it in steps. Degradation products of this process include monobutyltin and dibutyltin, which are present in CPVC. These substances are more stable than TBTO and may be useful as indicators of TBTO contamination in the environment. For this reason, the extensive literature related to environmental contamination by TBTO contains

occasional references to monobutyltin and dibutyltin. TBTO is not added to CPVC. The organotins used as stabilizers in CPVC are far less toxic than TBTO.

In reviewing the available information on organotin leaching from CPVC pipe,. . .
(Draft EIR, p. 40)

The highly toxic organotin TBTO is simply notpresent in CPVC.
(Draft EIR, p. 40)

. . . any material sold for that use would have to be tested and certified as meeting established health-based standards. A review of available literature does not demonstrate any adverse health effects or significant environmental contamination from pipe origin leachates at the rates they leach from CPVC. The concentrations are far below the threshold of any measurable effects known.
(Draft EIR, pp. 40-41)

Specifically, one THM, chloroform, has been shown to be carcinogenic in animal testing. There is also preliminary information which shows a statistical correlation between THM levels in drinking water and miscarriages in humans. At the present time THM regulations are being met by changes in disinfection methods in public water supply systems. In the future, this will likely eliminate or at least greatly reduce THM formation. These changes prevent the formation of THMs in water distribution systems by not allowing highly reactive oxidants such as chlorine to be present in the pipelines. Since highly reactive oxidants would not be introduced into the potable water piping systems of residential buildings, any organic materials which might leach from the piping would not form THMs. Regulations are becoming more stringent as a result of new information, and it is likely that chlorine will cease to be used as a disinfectant for drinking water in California. For the present, however, chlorine is still used by some water suppliers to maintain disinfection in the distribution system for this reason, it is necessary to consider the regulatory limits for THMs.
(Draft EIR, p. 41)

Except when newly installed, which is a brief fraction of the service life of CPVC pipe in residential building potable water systems, CPVC does not yield significant quantities of THMs or THM precursors. The MCL for THMs in drinking water is 100 ppb and it appears likely that this limit will be decreased in the future.
(Draft EIR, p. 41)

Many public water purveyors have changed disinfection processes to avoid THM formation downstream of treatment plants in response to the high natural levels of THM precursors in the drinking water sources of California, and this trend will probably increase in the future. If the formation of THMs is avoided downstream of

treatment plants, then any THM precursors which would result from CPVC pipe use for potable water piping in residential buildings, or any other source, would not be converted to THMs.
(Draft EIR, p. 42)

Both CPVC and the materials now in use for potable water piping in residential buildings in California can and do leach a variety of substances into water. However, in both cases the concentrations are generally below the level of significance. While newly installed pipe systems do leach materials into water at substantially higher rates, . . .
(Draft EIR, p. 42)

These solvents are slightly toxic, but unlike soldering fumes, are not known to be carcinogenic.
(Draft EIR, p. 44)

The composition of the solvent cements and primers has been changed. The technology of solvent cements has advanced significantly in the past several years, and has reduced the concentration of volatile organic compounds (VOCs). This has been in response to the regulation of solvent cements and primers for the solvent welding of plastics by the California Air Resources Board (CARB) and Regional Air Quality Maintenance Districts (AQMDs). This reduction in VOC content of cements and primers applies to many adhesives and sealants, not simply those formulated and sold for use with CPVC pipe. These regulations are not uniform throughout the State however. Those AQMDs with the worst air quality problems have required more stringent reductions. Therefore, while workers anywhere in the State could be exposed to lower levels of solvents than those studied by DHS, the extent of this reduction would vary by location, under the current regulatory system.
(Draft EIR, pp. 45-46)

Neither of these advances in technology involves the use of solvents not used in the previous products.
(Draft EIR, p. 46)

There is now additional information on the health effects of THF. There is still no information proving adverse health effects.
(Draft EIR, p. 46)

Previous studies found that some workers' exposures to solvents did sometimes exceed established workplace standards. The probability of exceeding short-term exposure limits was estimated to be 68%, and the probability of exceeding long-term standards was estimated to be 10%.
(Draft EIR, p. 47)

. . . previous studies . . .
(Draft EIR, p. 47)

Measures which would greatly reduce the likelihood of exceeding the standards were implemented prior to the beginning of the preparation of this EIR by entities other than the Lead Agency.
(Draft EIR, p. 47)

It is important to note that none of the studies of worker health and safety found significant adverse effects on workers using either metal or CPVC pipe,. . .
(Draft EIR, p. 47)

This will greatly reduce the potential for worker exposure to solvents, compared to the situations which were previously studied by the Department of Health Services.
(Draft EIR, p. 48)

These standards were not finalized during writing of the Draft EIR but are very likely to be adopted prior to certifying the final EIR.
(Draft EIR, p. 49)

. . . the application of these standards, when finished, to CPVC joining materials to assure that approving the use of CPVC for potable water piping will not significantly contribute to photochemical smog,. . .
(Draft EIR, p. 49)

Based on information in the record, the Lead Agency finds that the potential significant effect of contributing to air quality degradation due to emissions of VOCs, will be less than significant if CPVC is approved for residential use. In summary, this is due to the changes in the technology of CPVC joining brought about by the technology-forcing requirements of the CARB. Requiring the use of low-VOC joining materials statewide for residential use of CPVC pipe will mitigate any potential significant impacts to insignificance.
(Draft EIR, p. 50)

By weight, CPVC is about 70 percent chlorine, which is derived from common salt (sodium chloride). The production of one pound of CPVC requires 1.36 pounds salt. Salt is not in short supply. In the production of CPVC from salt, sodium hydroxide is a by product. Sodium hydroxide is a commodity with market value, and not a waste.

The nonrenewable resource consumed in the largest quantity in CPVC production is liquefied petroleum gas (LPG). LPG is used to make the vinyl chloride monomer which is subsequently polymerized to form PVC, which is then chlorinated to form CPVC. The production of one pound of CPVC requires 0.34 pounds of LPG. LPG is

naturally occurring in both oil and natural gas fields, and is also a product of petroleum refinery operations. The principal uses for LPG are as a fuel and as feedstock for chemical manufacturing. Using LPG to produce a durable product, such as CPVC, is a commitment of a nonrenewable resource, but this is a higher use of this resource than combustion as a fuel. In this sense the use of CPVC is not a wasteful or inefficient use of nonrenewable resources', on the contrary, it is an efficient and productive use of these resources.
(Draft EIR, p. 51)

In addition to the primary inputs of salt and LPG, the manufacture of CPVC and its fabrication involve the use of smaller quantities of other materials. The largest of these minor inputs is limestone, at 0.16 pounds per pound of finished CPVC. As with salt, limestone is not in short supply.
(Draft EIR, p. 52)

. . . CPVC has a lower thermal conductivity than the other materials approved for this use in California.
(Draft EIR, p. 53)

It has been suggested that this could result in a faster rate of fire spread, if CPVC pipe passing through a wall were to melt or slump due to a fire on one side of the wall and leave an opening. In addition, at elevated temperatures CPVC decomposes and produces smoke and gases, which could be toxic and increase the smoke produced by a fire.
(Draft EIR, p. 53)

There is no evidence to suggest, either from the results of tests or from post-fire analysis in the real world, that CPVC pipe presents an unusual risk of fire spread. On the contrary, CPVC is an Underwriters' Laboratory (UL) listed material for fire sprinkler systems, and is extensively used for fire sprinkler systems, which is proof of its physical competence in a fire environment. CPVC is also used as a plumbing material in fire- rated construction. If CPVC is used to penetrate a fire-rated wall, there are a number of UL listed systems available to provide effective, rated fire-stopping.
(Draft EIR, pp. 55-56)

The principal toxic gases in fires are carbon monoxide and, in some fires, hydrogen cyanide. Hydrogen cyanide is liberated in the thermal decomposition of nitrogen-containing compounds, for example wool carpeting and the polyurethane foams used as padding in some furniture. By weight, CPVC is composed mostly of the elements chlorine and carbon. CPVC does not contain nitrogen, the precursor of hydrogen cyanide, and would therefore not contribute to the production of this toxic gas in fires.

The toxicity of gases in residential building fires is primarily due to carbon monoxide. To the extent that CPVC (or any other material containing carbon) is consumed in a fire, a portion of its carbon content contributes to the formation of carbon monoxide. Structure fires do produce very large quantities of carbon monoxide, and the presence or absence of CPVC pipe would not change the fundamental reality that dangerous levels of carbon monoxide will be present in a residential building fire. Also, CPVC has a flash ignition temperature of 900 degrees Fahrenheit, about 400 degrees higher than that of pine, for example and does not appreciably decompose below that temperature. Therefore, by the time a residential fire is hot enough to thermally decompose CPVC pipe, the fire has reached flashover and the fire atmosphere will already be extremely hot and toxic and incapable of supporting life. Also, because the majority of the potable water pipe in a residential building is not located in the interiors of the rooms, the majority of any toxic gasses released from CPVC decomposition in a fire would not be released into a compartment capable of supporting life.

The chlorine content of CPVC is about 70 percent by weight. With thermal decomposition, a portion of the chlorine content of CPVC pipe could be liberated in the form of hydrogen chloride, which when dissolved in water forms hydrochloric acid. Hydrogen chloride gas toxicity and its generation in fires have been well studied. Much of the information regarding its danger in fires has been in the context of aircraft fires, due to the extensive use of chloride containing plastics, such as CPVC, in commercial aircraft construction, and the efforts of aircraft manufacturers and regulators to understand and reduce injuries and fatalities in commercial aircraft accidents. There are obviously large differences between aircraft and residential buildings. The differences of most relevance when comparing hydrogen chloride generation in aircraft fires and residential home fires are the larger quantities of CPVC exposed in aircraft interiors (for example the doors of overhead compartments in aircraft cabins) and the fact that most of the CPVC pipe in an occupied residence would not be in an occupied compartment, it would be filled with water, and it does not begin to thermally degrade to an appreciable degree until the water is gone. These factors would tend to make hydrogen chloride gas concentrations much higher and earlier in the fire's progress in an aircraft cabin fire opposed to a residence fire. Studies have shown that hydrogen chloride gas in the environment of aircraft interior fires does not impair the ability to escape, nor has it been found to be a cause of death or incapacitation in such fires. Also, as noted above, CPVC does not begin to decompose until temperatures are much higher than the ignition point of many common building and home furnishing materials, such as wood and textiles. Therefore, a compartment which is hot enough to yield appreciable hydrogen chloride from CPVC pipe is no longer capable of supporting life. Hydrogen chloride is neutralized on contact with other materials in the fire-involved compartment, principally basic materials such gypsum wall board, concrete, and plasters, to form inorganic salts,

and is not a significant environmental hazard outside of the building involved in the fire.

The presence or absence of CPVC in a residential building, then, would not significantly change the toxicity of the fire environment. Firefighters entering the environment of a residential structure fire must be protected against hazardous gasses whether or not CPVC pipe is present in the building. This is generally accomplished by use of self-contained breathing equipment and ventilation of compartments prior to entry.
(Draft EIR, pp. 56-57)

> After flash-over, fires in residential buildings have a marked propensity to spread beyond the compartment of origin. This is independent of the presence or absence of CPVC pipe for potable water piping.
> Residential structure fires produce hot and toxic gasses which can and do injure and kill both fire occupants and firefighters. The presence or absence of CPVC pipe in the potable water plumbing systems of these structures would not alter the fundamental reality that fire in a residential building will produce a toxic gas environment.

(Draft EIR, p. 58)

The quantities of plastics, in general, which are recycled are increasing in this State, and are expected to further increase in the future. There is recycling of other plastics, including PVC, the parent polymer for CPVC. The recycling of CPVC and PVC is based on the same basic technologies (sorting, reuse, and reforming).
(Draft EIR, p. 59)

. . . since the raw material, CPVC resin, is more valuable than PVC resin, and PVC, (including PVC pipe) is recycled now. . .
(Draft EIR, p. 59)

It is important to note that manufacturing processes for CPVC pipe for potable water use require, and it is illegal to use other than, virgin CPVC.
(Draft EIR, p. 59)

. . . other CPVC products, which at this time include mobile home skirting, picnic tables, fence posts, and numerous other products.
(Draft EIR, p. 59)

This is probably a conservative assumption, since CPVC is more resistant to chemical attack than PVC.
(Draft EIR, p. 61)

There have been reports of permeation of pipe conveying potable water, resulting in contamination of water, in situations where buried pipe is in prolonged contact with heavily contaminated soil.
(Draft EIR, p. 61)

In addition to the theoretical and laboratory studies of permeation, and reported incidents of permeation in outdoor piping,. . .
(Draft EIR, p. 61)

There have been numerous studies and analysis of the effects of plumbing materials on water quality. These have included real-world analyses, laboratory simulation studies and theoretical analyses.
(Draft EIR, p. 68)

The exception is for leachates from the corrosion of metallic pipe, especially under aggressive water conditions.
(Draft EIR, p. 68)

CPVC pipe decline very rapidly after the first flush of water after assembly, and with the exception of leachates from the corrosion of metallic pipe under aggressive water conditions, contaminant concentrations in both cases drop very quickly to levels with no significance to human health or environmental contamination. The exception is that leachates from copper pipe corrosion have been found to result in significant environmental contamination of receiving waters of the State.
(Draft EIR, pp. 68-69)

. . . fact that neither real-world nor laboratory simulations have found contaminant levels from CPVC pipe systems which exceed established standards for contaminants by the very large margins which have been reported for metallic pipe systems.
(Draft EIR, p. 69)

. . . the materials they are composed of can and do contaminate the drinking water carried in the pipe.
(Draft EIR, p. 72)

Previous studies have examined the extent to which galvanized pipe and copper pipe, fittings, solders, cutting fluids, and fluxes contaminate water carried in the pipe.
(Draft EIR, p. 72)

The two metals, lead and copper, are toxic at low concentrations and are known to leach from pipe and contaminate water. Of the two metals, lead is very much more toxic. In California, contamination of drinking water by these two metals is closely monitored and controlled. In addition to the contamination of water by the metals from which pipe, fittings, and solders are manufactured, the drinking water sources of California have varying background levels of contaminants, including lead and copper. There is a substantial body of data on the background levels of these contaminants in the sources of drinking water in California.
(Draft EIR, p.73)

Prior to this reduction, leaching studies for metal pipe systems using tin/antimony solders showed lead levels in a range from 8 to 20 parts per billion under normal conditions of use. The concentrations of lead were dependent on the quality of the water (how corrosive it is) and the age of the pipe and joints. For unflushed, new systems, with extended dwell times, the levels could be much higher and exceed the current standards for lead in drinking water, but these conditions are not likely to be encountered by consumers for substantial periods of time.
(Draft EIR, p. 74)

. . . requiring all buried copper pipe to be protected from soil contact by installation in plastic pipe, as is now required in Kern County; requiring pipe wraps or coatings, as is now required for buried steel pipe conveying natural gas in residential construction; or requiring internal coating of copper pipe, as is now required in some applications where copper contamination is not acceptable. . .
(Draft EIR, p. 77)

The levels of phenols were 44 times the NSF standard.
(Draft EIR, p. 81)

Water standing in newly installed soldered copper pipe can have very high levels of copper, lead, tin and other materials, even if low lead content solders are used.
(Draft EIR, p. 83)

Avoidance of significant cumulative effects of leachates from CPVC is therefor built into the NSF listing process.
(Draft EIR, p. 97)

CPVC piping is less expensive, costs less to install, and in some circumstances will be more durable than the other materials now employed for potable water piping in residential buildings in California.
(Draft EIR, p. 104)

. . . these studies involved materials with significantly higher concentrations of solvents than the materials which would be allowed to be used in California if the use of CPVC considered in this EIR is approved.
(Draft EIR, p. 112)

. . . despite the fact that there is a long history of its use in this State, other states, and other nations
(Draft EIR, pp. 112-113)

It is very much lower than the human health based standards for organotin leachates from CPVC which are now in place. Nevertheless, for analysis and discussion, the Lead Agency has evaluated the well characterized and very low leaching rates of organotins, (including dibutyltin) from CPVC pipe using this suggested TDI
(Draft EIR, p. 113)

fold margin of safety explicit in the proposed TDI;
(Draft EIR, p. 114)

. . . highly toxic pesticide TBTO, which is not present in CPVC.
(Draft EIR, p. 115)

AIR

GUIDELINES FOR THE PREPARATION OF AIR QUALITY IMPACT ANALYSES

Adopted by the Ventura County

Air Pollution Control Board

October 24, 1989

Ventura County Air Pollution Control District
Air Quality Planning and Evaluation Section
800 South Victoria Avenue
Ventura, California 93009
(805) 654-2806

In addition to the CEQA definitions of significance, the Ventura County Air Pollution Control Board has adopted a policy which states that future general development projects located in the Ojai Valley Clean Air Ordinance (CAO) area and the Ventura 1 Nongrowth area which emit 5 pounds or more per day of either reactive organic compounds (ROC) or oxides of nitrogen (NOx), or general development projects located in the remainder of the ozone nonattainment area of the County which emit 25 pounds or more per day of either ROC or NOx, will individually and cumulatively have a significant adverse impact on air quality.

2.3 SIGNIFICANCE CRITERIA

The following is a list of suggested criteria for determining if an EIR or an MND should be prepared due to potential adverse air quality impacts. Projects meeting any of the following criteria are considered to have potentially significant adverse air quality impacts. Tests of significance are not limited to the criteria listed below. Other factors, especially those related to the location of the project, should be examined. These include: proximity of the project to sensitive receptors (schools, residences, hospitals); proximity of the project to other pollutant sources (industrial facilities emitting odorous or hazardous substances); and projects with potential land use conflicts.

i. Any general development project located in the Ojai Valley CAO area and Ventura 1 Nongrowth area capable of daily emissions of:

Reactive Organic Compounds:	5 pounds
Nitrogen Oxides:	5 pounds

ii. Any general development project located in the remainder of the ozone nonattainment area of the County capable of daily emissions of:

Reactive Organic Compounds:	25 pounds
Nitrogen Oxides:	25 pounds

GUIDELINES FOR

ASSESSING AIR QUALITY IMPACTS OF

LAND USE PROJECTS

DRAFT DOCUMENT: DO NOT CITE OR QUOTE

NORTHERN SIERRA AIR QUALITY
MANAGEMENT DISTRICT
2004

Introduction

This is intended as a guidance document and resource for city/county governments, planners and transportation agencies to address emission impacts from growth. The Northern Sierra Air Quality Management District (referred to here as the District) air quality assessment guidelines provide the lead agency with a systematic approach to 1) screen a project for potential impact to an area, 2) estimate a project's potential emissions, 3) select appropriate control measures from a mitigation list provided within the document and 4) commit to selected mitigations prior to project approval. The adoption of the proposed mitigations during the development of a general plan or any other land use project in its intermediate stages will provide a relative benefit to public health through minimizing air pollution emissions. The lead agency will be able to anticipate needed mitigations early in the design process, instead of later in the land use planning review process when incorporation may be too late or too expensive. This streamlined approach should provide significant benefits to developers and planners, as well as assure that the quality of our air is considered during important growth planning stages.

CEQA requires public agencies to consider and disclose the environmental effects of their decisions to the public and government decision makers. Further, it mandates that agencies implement feasible mitigation measures or alternatives that would mitigate significant adverse effects to the environment.

The District typically assumes one of three roles for every project: lead agency, responsible agency, or commenting agency. Most often the District is a commenting agency, which means the District provides comments to assist the responsible or lead agency in assuring that a project's environmental document is adequate for use and that the subsequent project meets air quality regulations.

National and State Air Quality Standards

DO WE NEED THIS SECTION?

Effective air quality planning will help to assure that sustained, healthy economic growth can occur by avoiding designation to "federal nonattainment" status. An area is designated as "nonattainment" when the monitored ambient air concentration exceeds the health-based standards. Once an area is designated as nonattainment, the areas' economic growth can be severely impacted by onerous, mandated planning requirements and control regulations that impact most segments of the population in one way or another.

State law requires the District to achieve and maintain the state and federal ambient air quality standards in all areas affected by emission sources under its jurisdiction (California Health and Safety Code Section 40001). Once air quality monitors record violations of the state or federal standard, an area is designated by either California or U.S. EPA as nonattainment for that pollutant. Being in nonattainment of an ambient air quality standard means higher rates of respiratory ailments and related health care costs, higher rates of premature deaths, and may require the implementation of control strategies to reduce the emissions of the pollutant. Being

designated as a ***federal*** nonattainment area is generally more economically burdensome to an area than being designated nonattainment due to violations of a ***state*** air quality standard.

Federal nonattainment designation requires air pollution control strategies to be implemented, targeting the air pollution sources that cause the greatest degradation of air quality to clean the air, stop exceedances of the standard and thus protect the public health. However, additional minor sources of the pollutant may come under tighter controls if necessary to clean up the air to healthful levels. While federal mandates are necessary to protect public health, they could bring many economically burdensome requirements to an area. Federal nonattainment should be avoided for financial, as well as health reasons. Once an area is redesignated to federal nonattainment for any criteria pollutant, burdensome control strategies are required which are federally enforceable. These onerous control measures can greatly hinder an areas' economic growth by requiring additional standards for all future construction developments, industrial sources, homeowners, and indirect sources such as shopping areas and business parks. Additionally, federal sanctions are applied to an area if there is failure to adopt effective control strategies within required time frames.

District Authority

These guidelines will assist the Northern Sierra Air Quality Management District and Local Planning Agencies to minimize air pollution from new indirect sources located within Nevada, Sierra and Plumas Counties. An indirect source, such as a shopping center or a residential development, is defined by the State as any facility, building, structure or installation, or combination thereof which generates or attracts mobile source activity that results in the emission of any pollutant for which there is a state ambient air quality standard. The District's responsibility for air quality increased significantly with the passage of the California Clean Air Act (CCAA) and the Federal Clean Air Act (FCAA). Both of these pieces of legislation emphasize the need to reduce emissions from area sources and vehicle miles traveled at the local level. Air quality districts throughout California are required to fulfill a broad number of requirements under these mandates and the California Health and Safety Code including ambient air monitoring, permitting of stationary sources, enforcement to ensure compliance with State and local regulations, development of air quality attainment strategies and plans to control emissions from stationary sources and indirect sources. The following sections from the California Health and Safety Code clarify the District's authority concerning indirect sources.

Section 40000: The Legislature finds and declares that local and regional authorities have the primary responsibility for control of air pollution from all sources, other than emissions from motor vehicles. The control of emissions from motor vehicles, except as otherwise provided in this division, shall be the responsibility of the state board".

Section 40001(a): Subject to the powers and duties of the state board, the districts shall adopt and enforce rules and regulations to achieve and maintain the state and federal ambient air quality standards in all areas affected by emissions sources under their jurisdiction, and shall

enforce all applicable provisions of state and federal law.

Section 40716:

(a) In carrying out its responsibilities pursuant to this division with respect to the attainment of state ambient air quality standards, a district may adopt and implement regulations to accomplish the following:

(1) Reduce or mitigate emissions from indirect and areawide sources of air pollution.

(2) Encourage or require the use of ridesharing, vanpooling, flexible work hours, or other measures which reduce the number and length of vehicle trips.

(b) Nothing in this section constitutes an infringement on the existing authority of counties and cities to plan or control land use, and nothing in this section provides or transfers new authority over such land use to a district.

Of particular interest is **Section 40910** which requires air districts to "consider the full spectrum of emission sources and focus particular attention on reducing the emissions from transportation and areawide sources."

Pollutants of Concern

In the District's jurisdiction, two pollutants have been identified as threatening or even occasionally exceeding ambient air quality standards: ozone and particulate matter. The National and State air quality standards for ozone and PM are listed in Table 1

TABLE I
Air Quality Standards for Particulate Matter and Ozone

Indicator	Averaging Time	California Ambient Air Quality Standards (CAAQS)	National Ambient Air Quality Standards (NAAQS)
PM10 ($\Phi g/m^3$)	24-Hour	50	150
	Annual	30	50
PM2.5 ($\Phi g/m^3$)	24-Hour	na	65 (98th %)

	Annual	na	15 (3-year average)
Ozone (ppm)		0.09 (1-hour)	0.08 (8-hour)

Ground Level Ozone

Ozone is a secondary pollutant generated from automobile exhaust pollutants (nitrogen and reactive organic gases) reacting with sunlight. Ozone levels are influenced by many factors, such as local automobile exhaust, ozone transport from metropolitan areas, solar radiation, inversion heights and strengths, vertical mixing and wind patterns. Significant ozone formation generally requires an adequate amount of precursors in the atmosphere and several hours in a stable atmosphere with strong sunlight. Ozone is a regional air pollutant which is generated over a large area and is transported and spread by wind. The worst air concentrations tend to be found downwind from emission sources. While ozone in the upper atmosphere protects the earth from harmful ultraviolet radiation, high concentrations of ground level ozone can adversely affect the human respiratory system. Many respiratory ailments, as well as cardiovascular disease, are aggravated by exposure to high ozone levels. Ozone also damages some man-made materials such as rubber, paint, and plastics and damages plants and agricultural crops.

Nonattainment Status of California and National Ambient Air Quality Standards

As of mid-1997 a more stringent 8-hour ozone standard was implemented to replace the 1-hour ozone standard. The Grass Valley monitoring site recorded ozone values in 1997, 1998, and 1999 high enough to put western Nevada County into a federal non-attainment designation status. The District believes that all of the Grass Valley exceedances were due to both transport from the Broader Sacramento Area (BSA) and the San Francisco Bay Area. At the time of this writing, the California Air Resources Board (ARB) has proposed that western Nevada County be officially designated as nonattainment for the federal 8-hour ozone standard. It is expected that U.S. EPA will officially promulgate such nonattainment status shortly after January 2001. Once designated nonattainment, the District will be required to prepare a federally enforceable State Implementation Plan (SIP) in accordance with the Clean Air Act of 1990. The SIP is an air quality attainment plan designed to reduce emissions of ozone precursors enough to re-attain the federal ozone standard.

Working with the ARB and special ozone models, the District will attempt to show that control strategies being implemented in the Broader Sacramento Area (BSA) and Bay Area will be sufficient to clean up the air in western Nevada County without most of the onerous control strategies typically required in federal nonattainment areas. However, to demonstrate re-attainment, the District has been warned that the attainment plan will likely end up including

some mandatory local transportation control measures, as well as additional mandatory requirements on stationary sources and the regulated community in western Nevada County. Failure to submit and implement the attainment plan that demonstrates re-attainment could result in federal sanctions (e.g. loss of federal highway funds and greater emissions offset ratios for new sources of ozone precursors).

In addition to exceedances of the NAAQS, Nevada County has been classified as nonattainment for the CAAQS ozone standard due to overwhelming transport from upwind areas. In the past, the ARB has concluded that Nevada County's violations of the CAAQS have been due to overwhelming transport from the Broader Sacramento Area. As such, ARB has relieved the District from most of the attainment planning mandates required by the California Clean Air Act. In recent months, however, the ARB has been drafting new guidelines that would require more local planning strategies in down-wind ozone impacted areas such as western Nevada County, in parallel with the aforementioned federal requirements.

The long term outlook for the area is that although efforts are being made to reduce emissions in the Sacramento and western Nevada County areas, those reductions are largely offset by increases in population and vehicle miles traveled. Although transport of ozone from the Sacramento area continues to be the primary reason for exceedances of both the state and federal standards within Grass Valley, as population, industry and motor vehicle travel grows in the area, the transport excuse becomes less viable if emissions are allowed to grow unmitigated.

Neither Plumas nor Sierra County have exceeded the California or National Ambient Air Quality Standards (CAAQS and NAAQS, respectively) for ozone.

Particulate Matter

Suspended particulate matter (airborne dust) consists of particles small enough to remain suspended in the air for long periods. PM10 and PM2.5 are small enough to lodge in the deepest recesses of the lungs and cause serious respiratory problems. A battery of recent scientific studies have linked particulate matter, especially fine particles with a series of significant health problems, including:

- premature death;
- respiratory related hospital admissions and emergency room visits;
- aggravated asthma;
- acute respiratory symptoms, including severe chest pain, gasping and aggravated coughing;
- chronic bronchitis;
- decreased lung function which can be experienced as shortness of breath;
- work and school absences.

There are two federal air quality standards for particulate matter; PM10 and PM2.5, while the state standard addresses only PM10. Nevada County is currently in nonattainment for the state

PM10 standard and attainment for the national PM10 standard. Major contributors to particulate matter in the Grass Valley area are woodstoves, residential open burning, dust emissions from construction and earth-moving equipment, forestry management burns, transport from agricultural burns, vehicle traffic and windblown dust. PM2.5 specifically is generated from the above mentioned combustion sources. As is the case with ozone, particulate matter levels can be relieved or exacerbated by meteorology.

Air monitoring data for Particulate Matter less than 10 microns substantiates that the air quality in the Portola area is of serious concern, from both the public health and public welfare aspects. Portola has and continues to exceed the California Ambient Air Quality Standards for PM10. Long term continued exposures of this kind could result in increased cardio-pulmonary health risks to the public. As stated in previous documents, the District is very concerned about **NEW** sources of PM10 in the area that have the potential for causing further degradation of air quality in Portola.

The new National Ambient Air Quality Standard for PM2.5 (particulate matter less than 2.5 microns) will be difficult to attain in wood burning communities. The District has only been monitoring PM2.5 in the Portola area since March 1999, so it's too early to tell whether exceedance of this new standard will occur. However, since wood burning is a primary source of PM2.5 emissions, there is real concern that Portola will have a challenge with staying out of federal nonattainment for PM2.5.

Other Criteria Pollutants - Lead, Sulfur Dioxide, Carbon Monoxide and Nitrogen Oxides

Ambient lead and sulfur dioxide are generally emitted from industrial sources and are not generally a concern in Nevada, Sierra or Plumas County. Carbon monoxide is an odorless, colorless highly toxic pollutant that is formed by the incomplete combustion of fuels. Although carbon monoxide emissions have historically been below state and federal standards within the District's jurisdiction, levels could easily rise to unhealthful levels in the more populated areas with increases in residential woodburning, open burning, and vehicle traffic. Nitrogen dioxide is a pollutant of concern since it is a precursor of ozone formation which is formed primarily from the incomplete combustion of fossil fuels under high temperature and pressure.

Evaluation of Project for Potential Air Quality Impact

Consultation Prior to Commencing CEQA

The NSAQMD encourages lead agencies to address air quality issues as early as possible in the development review process. Local jurisdictions should work with applicants on issues such:

1) potential land use conflicts (e.g. odors and other types of nuisance);
2) exposure of sensitive receptors to odors, toxics, and criteria pollutants;

3) site design to encourage alternatives to the automobile and conserve energy; and
4) applicable rules, regulations, and permit requirements.

When Consultation is Required Through CEQA

Prior to Determination to Proceed with a ND or EIR
Notice of Preparation
Scoping Meetings
Review of Proposed Negative Declaration or Mitigated Negative Declaration
Review and Comment on Draft EIR
Response to Comments on Draft EIR

Step One: Primary Screening Process
Each proposed development plan will be reviewed for initial and recurring potential air emissions of criteria pollutants (as established under the California Clean Air Act). Both short term (construction) and long term emission sources will be considered. The following types of projects will require a more in-depth review:

1. All new developments (above 5 units-Residential) with the potential to emit criteria pollutants;

2. Any project with the potential to emit toxic or hazardous air pollutants;

3. Any project utilizing toxic or hazardous materials within 1000' of a school, per AB 3205;

4. Any project with the potential to emit an odor or other air pollutants which could impact a considerable number of persons, leading to a public nuisance; or

5. Any project located near a sensitive receptor such as a school, hospital, senior center, etc.

6. Any project which is located in an area which is designated as nonattainment or has a likely possibility of violating either a state or federal standard.

Projects which could be significant contributors (above-listed projects) will be further evaluated for emissions using emissions formulae, models and information contained in the project's proposal.

Step Two: Estimation of Emissions

An air quality analysis of potential emissions (in pounds per day) from each potentially impacting project using a reasonable worst case scenario needs to be estimated for further

screening purposes. The lead agency should provide a listing of the emission increases anticipated from each project for various categories of emissions sources by phases or project. A comparison should be made of the total emissions increases for PM10, reactive organic gases, nitrogen oxides and carbon monoxide to thresholds of significance. It is important that both short term and long term emission impacts are identified. The impacts of hazardous air pollutants (diesel, asbestos) should be evaluated, as well as an analysis of cumulative air quality impacts.

Construction Emissions

During the construction phase, there are many short-term air quality impacts from construction vehicles and earth moving. Emissions estimates in pounds per day should be provided for the following sources of pollution:

A. Tailpipe emissions of particulate, carbon monoxide and nitrogen oxides from diesel powered earth moving equipment.

B. Particulate emissions from vehicular traffic on unpaved roads.

C. Particulate emissions from soil disturbance. This estimate should be based upon how many acres are disturbed by earth moving equipment.

Mobile Source Emissions

Long-term or mobile source emissions should be estimated using the latest CAPCOA/ARB-approved version of URBEMIS (or other, most recently approved) computer model. Emissions estimates should be provided in pounds per day and tons per year. If a traffic study is performed for a project, it should identify any intersection(s) that would fall below a Level of Service D under the project alone or cumulative development scenarios, a detailed Caline 4 (or other, most recently approved) carbon monoxide analysis should be prepared. The traffic study should evaluate project alone and cumulative Level of Service impacts to such intersections. Additionally, particulate emissions from traffic on sanded, paved roads should be estimated.

Residential Heating

The emissions from this source are long term and difficult to mitigate once installed. An accurate estimate of particulate, carbon monoxide and nitrogen oxide emissions needs to be estimated from all likely residential heating devices (fireplaces, wood stoves, propane, natural gas, etc.).

Miscellaneous Emissions

Emissions of particulate matter, carbon monoxide and nitrogen oxides should be estimated from gasoline powered landscape tools, such as lawn mowers, leaf blowers and chainsaws.
Emissions from any recreational activities, the emissions from any gasoline powered amenities should be estimated, if applicable.

Step Three: Emission Thresholds of Significance

This section describes and establishes the NSAQMD's Thresholds of Significance. These thresholds are recommended for use by Lead Agencies when preparing Initial Studies. If, during the preparation of the Initial Study, the Lead Agency finds that any of the following thresholds may be exceeded and cannot be mitigated, then a determination of significant air quality impact must be made and an EIR is required.

Thresholds of significance are based on a source's projected impacts and are a basis from which to apply mitigation measures. The District has developed a tiered approach to significance levels: a project with emissions meeting Level A thresholds will require the most basic mitigations; projects with projected emissions in the Level B range will require more extensive mitigations; and those projects which exceed Level C thresholds will require the most extensive mitigations. The tiered thresholds for Level A, B and C are given below for a project's estimated emissions of criteria pollutants in lbs/day.

	Level A Thresholds	
NOX	**ROG**	**PM10**
<24 lbs/day	<24 lbs/day	<79 lbs/day

	Level B Thresholds	
NOX	**ROG**	**PM10**
24-136 lbs/day	24-136 lbs/day	79-136 lbs/day

	Level C Thresholds	
NOX	**ROG**	**PM10**
>136 lbs/day	>136 lbs/day	>136 lbs/day

NOx, ROG and PM10 emissions must be mitigated to a level below significant. If emissions for NOx, ROG and PM10 exceeds 136 pounds per day (Level C), then there is a ***significant*** impact; below Level C would be ***potentially significant.***

Step Four: Select Mitigation Measures

As stated in the CEQA, the responsible or commenting agency (in most cases, the District) shall submit to the lead agency complete and detailed performance objectives for mitigation measures. Once emission impacts from all significant sources are calculated, the District will request that the lead agency review a suggested list of mitigations (listed below) for both short-term and long term sources. This list is not all-inclusive, and may be revised by the lead agency. As the lead agency, the planning agency will either accept or reject recommendations of the District (as a responsible agency). The District will request that the lead agency contact the District office to discuss the mitigations before the lead agency commits to a final mitigation plan for each project. It is expected that projects with higher emissions (Level C Thresholds) will automatically mitigate more emissions, quantitatively, than will a lower impact project (Level A).

I. Mitigations Suggested for Use During Construction Phase of Project

For all Significance Level Thresholds (A, B and C)

a. Alternatives to open burning of vegetative material will be used unless otherwise deemed infeasible by the District. Among suitable alternatives are chipping, mulching, or conversion to biomass fuel.
b. Adequate dust control measures will be implemented in a timely and effective manner during all phases of project development and construction.
c. All material excavated, stockpiled, or graded should be sufficiently watered, treated or covered, to prevent fugitive dust from leaving property boundaries and causing a public nuisance or a violation of an ambient air standard. Watering should occur at least twice daily with complete site coverage, preferably in the mid-morning and after work is completed each day.
d. All areas (including unpaved roads) with vehicle traffic should be watered or have

dust palliatives applied, as necessary, for regular stabilization of dust emissions.

e. All on-site vehicles should be limited to a speed of 15 mph on unpaved roads.

f. All land clearing, grading, earth moving or excavation activities on a project will be suspended as necessary when winds are expected to exceed 20 mph.

g. All material transported off-site will be either sufficiently watered or securely covered to prevent a public nuisance.

h. Temporary traffic control will be provided during all phases of the construction to improve traffic flow as deemed appropriate by local transportation agencies and/or Caltrans.

i. Construction activities should be scheduled to direct traffic flow to off-peak hours as much as practicable.

For Classifications as Level B Threshold

j. All controls discussed above (a - i.) should be implemented.

k. All disturbed portions of the construction site should be covered, seeded, or watered until a suitable cover is established.

l. All inactive construction areas (previously graded areas which remain inactive for 96 hours) shall be kept visibly moist or covered with plastic tarps, or shall be treated with County-approved non-toxic soil stabilizers (according to manufacturer's specifications) in accordance with the local grading ordinance. Acceptable materials that may be used for chemical stabilization of soils include petroleum resins, asphaltic emulsions, acrylics and adhesives which do not violate Regional Water Quality Control Board or California Air Resources Board standards.

For Classification as Level C Threshold

m. All controls discussed above (a-l) should be implemented.

n. During initial grading, earth moving, or site preparation, larger projects may be required to construct a gravel or paved (or dust palliative treated) apron, at least 100 feet in length, for all vehicles exiting onto paved public road(s).

o. Wheel washers shall be installed where project vehicles and/or equipment enter and/or exit onto paved streets from unpaved roads on larger projects. Vehicles and/or equipment shall be washed prior to each trip, as necessary to prevent visible dust emissions from adhering dirt or deposition on roadways.

II. Mitigation for Residential Heating if Project Emissions are Classified as either Level A, B or C Threshold

a. All new wood burning devices will be EPA Phase II certified.

III. Mitigation for Public Transit

For All Significance Thresholds (Level A, B or C)

a. Street should be designed to maximize pedestrian access to transit stops, where feasible.

For Classification as Level C Threshold

b. The project will provide for on-site road and off-site bus turnouts, passenger benches, and shelters as demand and service routes warrant subject to review and approval by local transportation planning agencies.
c. Larger projects may be required to contribute a proportionate share to the development and/or continuation of a regional transit system. Contributions could consist of dedicated right-of-way, capital improvements, easements, etc.

IV. Mitigation for Traffic Emissions

For Classification as Level B Threshold

a. The project will provide for pedestrian access between bus service and major transportation points within the project where deemed feasible.
b. The project should contribute to traffic-flow improvements (IE, right-of-way, capital improvements, etc.) that reduce emissions and are not considered as substantially growth inducing.
c. Larger projects may be required to provide for, contribute to, or dedicate land for the provision of off-site bicycle trails linking the project to designated bicycle commuting routes in accordance with an adopted citywide or countrywide bikeway plan.

V. Mitigation for Land Use Emissions
For Classification as Level B Threshold

a. The project will incorporate mixed uses, where permitted by local development regulations, to achieve a balance of commercial, employment, and housing options within the project site.
b. Larger projects will provide for neighborhood parks or other recreational options such as trails to minimize vehicle travel to off-site recreational uses and/or commercial areas.
c. The project should provide densities of nine units per acre or greater, where allowed by the General Plan and/or Zone Plan, along bus routes and at bus stops to encourage transit use.
d. The project should encourage neighborhood retail sales and services.

Offsite Mitigation

If a new project is unable to provide adequate on-site mitigation of their long-term air quality

impacts, an off-site mitigation program may be necessary. Projects emitting certain high levels of pollutants (to be determined) should be required to implement all feasible on-site mitigation measures AND participate in an offsite mitigation program to reduce emissions.

Impacts of local pollutants are cumulatively significant when modeling shows that combined emissions from the project and other existing and planned projects will exceed air quality standards. With an offsite mitigation program, these programs could be better coordinated, especially across county jurisdictional lines.

Mitigation Monitoring and Reporting

A mitigation monitoring and reporting program should include the following components:

* a description of each mitigation measure adopted by the Lead Agency;
* the party responsible for implementing each mitigation measure;
* a schedule for the implementation of each measure;
* the agency or entity responsible for monitoring mitigation measure implementation;
* criteria for assessing whether each measure has been implemented;
* enforcement mechanisms.

Basis for Thresholds of Significance

The NSAQMD used the Governor's Office of Planning and Research definitions of significant environmental effect as the basis to establish air quality thresholds of significance for the District. Section 15382 of the CEQA Guidelines defines "significant effect on the environment" as "substantial, or potentially substantial, adverse change in any of the physical conditions within the area affected by a project, including . . . air."

Appendix G of the CEQA Guidelines contains a list of effects that may be deemed as a "significant effect on the environment":

< A project that will conflict with or obstruct implementation of the applicable air quality plan;

< A project that will "violate any ambient air quality standard, contribute substantially to an existing or projected air quality violation;"

< A project that will "expose sensitive receptors to substantial pollutant concentrations;"

< A project that will result in a "cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors).;" or

< A project that will "create objectionable odors affecting a substantial number of people."

Appendix G of the CEQA Guidelines also indicates that a project could have a significant impact on the environment related to transportation/traffic if

< A project "causes an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system...;"

< A project "exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways;" or

< A project conflicts with "adopted policies, plans or programs supporting alternative transportation."

Since the primary source of ozone precursors are from vehicle emissions, any increases in traffic emissions has a direct bearing on air quality impacts. Additionally, vehicles can cause increases in PM10, CO and diesel emissions.

Basis for Ozone Precursor Thresholds

Western Nevada County often violates the state and federal ozone ambient air quality standards, and will soon be designated as nonattainment for the NAAQS for ozone. Therefore, the emissions related to an individual projects, if substantial, will contribute to existing violations of the ozone standards. The NSAQMD defines "substantial contribution" for ozone precursor emissions in terms of the California Clean Air Act requirements for moderate nonattainment areas [CH&SC §40918]. Land use projects are therefore subject to the same emissions offset requirements as stationary sources, which according to CCAA requirements must offset all emissions down to the thresholds set by the CCAA for an area's nonattainment classification. The NSAQMD staff have researched and evaluated many significance thresholds established by other air quality management agencies in California and found that most agencies use the same approach.

Although it may be argued that any increase in nonattainment precursor emissions may be significant, a reasonable threshold is still needed to avoid unnecessarily burdening every project with a requirement to prepare an EIR, which is clearly not intended by CEQA nor desired by the

NSAQMD.

Other parts of the NSAQMD occasionally violate the state ozone standard and therefore should be held to less stringent thresholds.

Basis for PM10 Thresholds

The entire NSAQMD is nonattainment for the PM10 CAAQS. The NSAQMD has adopted regulations governing various activities that contribute to the overall PM10 problem. For example, Rule 226 regulates fugitive dust emissions related to construction and other types of activities. Therefore, the NSAQMD has determined that any determination of significance with respect to construction emissions should be based on a consideration of the control measures to be implemented in compliance with any existing related rules, regulations or ordinances. From the perspective of the NSAQMD, compliance with Rule 226 and implementation of all other control measures indicated in Tables * and ** (as appropriate, depending on the size and location of the project site) will constitute sufficient mitigation for reducing construction-related PM10 impacts to a level considered less than significant.

Sections to be Included in Future Revisions

Detailed air quality analysis methods for different air pollutant sources

MDAQMD and AVAQMD

California Environmental Quality Act (CEQA)

And

Federal Conformity

Guidelines

March 2002

Engineering Section
Surveillance Section

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Background

Under CEQA, the AVAQMD and MDAQMD (Districts) are expert commenting agencies on air quality and related matters within their jurisdiction or impacting on their jurisdiction. Under the Federal Clean Air Act the Districts have adopted federal attainment plans for ozone and PM_{10}. The Districts have dedicated assets to reviewing projects to ensure that they will not: (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any air quality standard; or (3) delay timely attainment of any air quality standard or any required interim emission reductions or other milestones of any federal attainment plan. These Guidelines are intended to assist persons preparing environmental analysis or review documents for any project within the jurisdiction of the Districts by providing background information and guidance on the preferred analysis approach.

Jurisdictions

The Antelope Valley Air Quality Management District (AVAQMD) has jurisdiction over the northern, desert portion of Los Angeles County (please refer to Map 1). This region includes the incorporated cities of Lancaster and Palmdale, Air Force Plant 42, and the southern portion of Edwards Air Force Base.

The Mojave Desert Air Quality Management District (MDAQMD) has jurisdiction over the desert portion of San Bernardino County and the far eastern end of Riverside County (please refer to Map 2). This region includes the incorporated communities of Adelanto, Apple Valley, Barstow, Blythe, Hesperia, Needles, Twentynine Palms, Victorville, and Yucca Valley. This region also includes the National Training Center at Fort Irwin, the Marine Corps Air Ground Combat Center, the Marine Corps Logistics Base, the eastern portion of Edwards Air Force Base, and a portion of the China Lake Naval Air Weapons Station.

Nonattainment Designations and Classification Status

The United States Environmental Protection Agency and the California Air Resources Board have designated portions of the Districts nonattainment for a variety of pollutants, and some of those designations have an associated classification. Please refer to Table 1 for a chart of these designations and classifications.

Table 1 - Designations and Classifications

Ambient Air Quality Standard	AVAQMD	MDAQMD
One-hour Ozone (Federal)	Nonattainment; classified Severe-17	Nonattainment; classified Severe-17 (portion of MDAQMD outside of Southeast Desert Modified AQMA is attainment)
Eight-hour Ozone (Federal)	Nonattainment	Nonattainment
Ozone (State)	Nonattainment; classified Extreme	Nonattainment; classified Moderate
PM_{10} (Federal)	Unclassified	Nonattainment; classified Moderate (portion of MDAQMD in Riverside County is attainment)
New PM_{10} (Federal)	Unclassified	Unclassified
$PM_{2.5}$ (Federal)	Attainment	Attainment
PM_{10} (State)	Nonattainment	Nonattainment
Carbon Monoxide (State and Federal)	Attainment	Attainment
Nitrogen Dioxide (State and Federal)	Attainment	Attainment
Sulfur Dioxide (State and Federal)	Attainment	Attainment
Lead (State and Federal)	Attainment	Attainment
Particulate Sulfate (State)	Unclassified	Attainment (Searles Valley Planning Area is nonattainment)
Hydrogen Sulfide (State)	Unclassified	Unclassified (Searles Valley Planning Area is nonattainment)
Visibility Reducing Particles (State)	Unclassified	Unclassified

Attainment Plans

The Districts have adopted a variety of attainment plans for a variety of nonattainment pollutants. Please refer to Table 2 for a chart of these attainment plans.

Table 2 - Attainment Plans

District	Name of Plan	Date of Adoption	Applicable Area	Pollutant(s) Targeted	Attainment Date
AVAQMD	1994 Air Quality Management Plan		Entire District	NO_x and VOC	2007
MDAQMD	1991 Air Quality Attainment Plan	26-Aug-91	San Bernardino County portion	NO_x and VOC	1994*
MDAQMD	Searles Valley PM_{10} Plan	28-Jun-95	Searles Valley Planning Area	PM_{10}	1994*

District	Name of Plan	Date of Adoption	Applicable Area	Pollutant(s) Targeted	Attainment Date
MDAQMD	Mojave Desert Planning Area Federal Particulate Matter Attainment Plan	31-Jul-95	Mojave Desert Planning Area	PM_{10}	2000*
MDAQMD	Attainment Demonstration, Maintenance Plan, and Redesignation Request for the Trona Portion of the Searles Valley PM_{10} Nonattainment Area	25-Mar-96	Searles Valley Planning Area	PM_{10}	N/A
MDAQMD	Triennial Revision to the 1991 Air Quality Attainment Plan	22-Jan-96	Entire District	NO_x and VOC	2005
MDAQMD	Reasonable Further Progress Rate-Of-Progress Plan	26-Oct-94	Southeast Desert Modified AQMA	NO_x and VOC	2007
MDAQMD	Post 1996 Attainment Demonstration and Reasonable Further Progress Plan	26-Oct-94	Southeast Desert Modified AQMA	NO_x and VOC	2007

*Note: A historical attainment date given in an attainment plan does not necessarily mean that the affected area has been re-designated to attainment; please refer to Table 1.

Rules and Regulations

Each District maintains a set of Rules and Regulations to improve air quality and maintain good air quality. Please contact the Districts to obtain a copy of either District rulebook.

Recommended Environmental Setting Elements

Air Quality Data

Each District gathers a variety of air quality data from a variety of monitoring sites. Table 3 details the data available from the Districts for each monitoring site.

Table 3 - Available Air Quality Data

Site	Address	Pollutants	Dates
Lancaster	W. Ponderosa	O_3, NO_x, CO, PM_{10} (Hi-Vol and TEOM)	
Barstow	225 E. Mountain View	O_3, NO_x, SO_x, CO, PM_{10}	5/1/80 to present
Hesperia	17288 Olive	O_3, NO_x, SO_x, CO, PM_{10}	1/2/86 to present
Lucerne Valley	8560 Aliento Road	PM_{10}	6/1/89 to present
Phelan	Beekley Road	O_3, NO_x, SO_x, CO	

Site	Address	Pollutants	Dates
Trona	Market Street	PM_{10}	1/28/85 to 2/13/94
Trona	Athol Street	O_3, NO_x, SO_x, H_2S, PM_{10} (Hi-Vol and TEOM)	1/25/93 to present
Twentynine Palms	6078 Adobe Road	O_3, NO_x, SO_x, CO, PM_{10}	5/1/80 to 6/2/93
Twentynine Palms		O_3, NO_x, SO_x, CO, PM_{10}	6/3/93 to present
Victorville	County Fairgrounds	O_3, NO_x, SO_x, CO, TSP	5/80 to 3/86
Victorville	Eighth Street	O_3, NO_x, SO_x, CO, TSP	3/86 to 6/1/90
Victorville	County Fairgrounds	O_3, NO_x, SO_x, CO, PM_{10}	6/1/90 to 4/91
Victorville	Amargosa Road	O_3, NO_x, SO_x, CO, PM_{10}	4/91 to present

Meteorological Data

A variety of meteorological data is available from the Districts for several monitoring sites throughout the Districts. Table 4 contains a list of monitoring sites and the data available for each site.

Table 4 - Available Meteorological Data

Site	Address	Data	Dates
Lancaster	W. Ponderosa	Wind speed/direction, pressure, temperature, humidity	
Barstow	225 E. Mountain View	Wind speed/direction, temperature, humidity	8/80 to present
Hesperia	Olive	Wind speed/direction, temperature	1/86 to present
Phelan	Beekley Road	Wind speed/direction, temperature	1/88 to present
Trona	Athol Street	Wind speed/direction, pressure, temperature	1/25/93 to present
Twentynine Palms	W. Adobe	Wind speed/direction, pressure, temperature, humidity	8/93 to present
Victorville	Amargosa Road	Wind speed/direction, pressure, temperature, solar radiation	4/91 to present

Topography and Climate Discussion

The Districts together make up the vast majority of the Mojave Desert Air Basin (MDAB). The MDAB is an assemblage of mountain ranges interspersed with long broad valleys that often contain dry lakes. Many of the lower mountains which dot the vast terrain rise from 1,000 to 4,000 feet above the valley floor. Prevailing winds in the MDAB are out of the west and

southwest. These prevailing winds are due to the proximity of the MDAB to coastal and central regions and the blocking nature of the Sierra Nevada mountains to the north; air masses pushed onshore in Southern California by differential heating are channeled through the MDAB. The MDAB is separated from the southern California coastal and central California Valley regions by mountains (highest elevation approximately 10,000 feet), whose passes form the main channels for these air masses. The Antelope Valley is bordered in the northwest by the Tehachapi Mountains, separated from the Sierra Nevadas in the north by the Tehachapi Pass (3,800 ft elevation). The Antelope Valley is bordered in the south by the San Gabriel Mountains, bisected by Soledad Canyon (3,300 ft). The Mojave Desert is bordered in the southwest by the San Bernardino Mountains, separated from the San Gabriels by the Cajon Pass (4,200 ft). A lesser channel lies between the San Bernardino Mountains and the Little San Bernardino Mountains, the Morongo Valley.

The Palo Verde Valley portion of the Mojave Desert lies in the low desert, at the eastern end of a series of valleys (notably the Coachella Valley) whose primary channel is the San Gorgonio Pass (2,300 ft) between the San Bernardino and San Jacinto Mountains.

During the summer the MDAB is generally influenced by a Pacific Subtropical High cell that sits off the coast, inhibiting cloud formation and encouraging daytime solar heating. The MDAB is rarely influenced by cold air masses moving south from Canada and Alaska, as these frontal systems are weak and diffuse by the time the reach the desert. Most desert moisture arrives from infrequent warm, moist and unstable air masses from the south. As can be seen from Table 5, the MDAB averages between three and seven inches of precipitation per year (from 16 to 30 days with at least 0.01 inches of precipitation). The MDAB is classified as a dry-hot desert climate (BWh), with portions classified as dry-very hot desert (BWhh), to indicate at least three months have maximum average temperatures over 100.4° F.

Table 5 - MDAB Average Precipitation and Evaporation History

Location	Precipitation (inches)	Precipitation (days)	Evaporation (inches)	Length of Observations (years)
Trona	3.82	16		48
Randsburg	5.89	23		48
China Lake	4.42			34
Goldstone Echo	5.42	20		23
Daggett Airport	3.87	23		48
Barstow Fire	4.60	23		16
Barstow CIMIS	5.60	28	72	11
Granite Mountain	5.76	22		5
Victorville CIMIS	6.60	27	66	3
Mitchell Caverns	10.41	32		38
Mountain Pass	7.63	28		41
Parker Reservoir	5.38	24		48
Needles Airport	4.55	23		48
Twentynine Palms	3.95	19		48
Blythe Airport	3.57	17		48

Location	Precipitation (inches)	Precipitation (days)	Evaporation (inches)	Length of Observations (years)
Iron Mountain	3.40	19		48

Recommended Impacts Discussion Elements

Direct Impacts

Direct impacts are the result of the project itself (from its construction and operation), in the form of project activity and trips generated by the project. For example, in the case of a subdivision project, construction emissions (equipment exhaust, wind erosion, vehicle exhaust), housing use activity (natural gas consumption) and trips to and from the housing (vehicle exhaust, tire wear) represent direct impacts. In the case of a new mine project, construction emissions (equipment exhaust, wind erosion, vehicle exhaust), material handling (drilling, blasting, transfers, crushing, screening, bagging), operational emissions (wind erosion, vehicle travel, vehicle exhaust, tire wear), and employee/customer/delivery travel (vehicle exhaust, tire wear) represent direct impacts.

Indirect Impacts

Indirect impacts are the result of changes that would not occur without the project. In the case of a subdivision project, indirect impacts on the surrounding community can be generated in many ways: nearby construction of roadways (or roadway modifications) and other infrastructure to support the subdivision, construction and operation of new commercial/retail establishments, changes in traffic/circulation patterns that result in increased congestion/delays, etc. In the case of a new mine project, indirect impacts can be generated by nearby construction of infrastructure to support the mine, housing constructed and/or occupied by mine employees, changes in traffic/circulation patterns that result in increased congestion/delays, etc.

Cumulative Impacts

Cumulative impacts are similar to direct and indirect impacts of the project, which the project contributes to. In the case of a subdivision project, a given project has a cumulative impact with all other subdivision projects, from the standpoint of each type of impact (cumulative construction emissions, residential natural gas consumption, solvent use, transportation emissions, congestion, etc.). Similarly, a new mine project has a cumulative impact with all other mining projects, from the standpoint of each type of impact (cumulative construction emissions, diesel equipment emissions, blasting emissions, fugitive emissions, transportation, congestion, etc.).

Conformity Impacts

A project is non-conforming if conflicts with or delays implementation of any applicable attainment or maintenance plan. A project is conforming if it complies with all applicable District rules and regulations, complies with all proposed control measures that are not yet adopted from the applicable plan(s), and is consistent with the growth forecasts in the applicable

plan(s) (or is directly included in the applicable plan). Conformity with growth forecasts can be established by demonstrating that the project is consistent with the land use plan that was used to generate the growth forecast.

Significance Thresholds

A project is significant if it:

1. Generates total emissions (direct and indirect) exceed the thresholds given in Table 6; and/or,
2. Generates a violation of any ambient air quality standard when added to the local background;* and/or,
3. Does not conform with the applicable attainment or maintenance plan(s);* and/or,
4. Exposes sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to 1 in a million and/or a Hazard Index (HI) (non-cancerous) greater than or equal to 0.1.*

** These significance thresholds are not applicable to all projects. Contact the District to clarify whether your project should be evaluated under these thresholds. In general, the emissions comparison (criteria number 1) is sufficient.*

A significant project must incorporate mitigation sufficient to reduce its impact to a level that is not significant. A project that cannot be mitigated to a level that is not significant must incorporate all feasible mitigation. Note that the emission thresholds are given as a daily value and an annual value, so that multi-phased project (such as project with a construction phase and a separate operational phase) with phases shorter than one year can be compared to the daily value.

Table 6 – Significant Emissions Thresholds

Criteria Pollutant	Annual Threshold (tons)	Daily Threshold (pounds)
Carbon Monoxide (CO)	100	548
Oxides of Nitrogen (NO_x)	25	137
Volatile Organic Compounds (VOC)	25	137
Oxides of Sulfur (SO_x)	25	137
Particulate Matter (PM_{10})	15	82

Recommended Substantiation Discussion Elements

Quantification

Calculations (attachment)

District Contacts

If an address is not listed, use the general address for the particular District, to the attention of the listed individual.

AVAQMD General and Rulebook	Crystal Bates (661) 723-8070 43301 Division Street, Suite 206 Lancaster, CA 93535-4649
AVAQMD Air Quality and Meteorological Data	Bob Ramirez (760) 245-1923
AVAQMD CEQA and Conformity	Alan De Salvio (760) 245-1661 x6122
AVAQMD Permitting	Barbara Weese (760) 245-1661 x1882
MDAQMD General	(760) 245-1661 x2574 14306 Park Avenue Victorville, CA 92392-2310
MDAQMD Rulebook	Vilma Landsman (760) 245-1661 x6728
MDAQMD Air Quality and Meteorological Data	Bob Ramirez (760) 245-1923
MDAQMD CEQA and Conformity	Alan De Salvio (760) 245-1661 x6122
MDAQMD Permitting	Barbara Weese (760) 245-1661 x1882

Appendix A – Basic Definitions of Major Air Pollutants

Technical and/or legal definitions exist for many of these pollutants, depending on context. The following definitions are for general, introductory purposes only:

Carbon Dioxide (CO_2) - Common product of combustion. Not a criteria pollutant, but considered an important "greenhouse gas." Important on a national or global scale.

Carbon Monoxide (CO) – Common product of incomplete combustion. A criteria pollutant with state and federal standards. Not a primary photochemical reaction compound, but involved in photochemical reactions. Dissipates rapidly, and is therefore only important on a local scale near sources.

Criteria Pollutants – Those air pollutants specifically identified for control under the Federal Clean Air Act (currently six: carbon monoxide, nitrogen oxides, lead, sulfur oxides, ozone and particulates).

Lead (Pb) – A heavy metal, present in the environment mainly due to historical use in motor vehicle fuel. Primarily associated with lead smelting operations. A criteria pollutant with state and federal standards. Primarily of concern near sources.

Oxides of Nitrogen (NO_x) – Common product of combustion in the presence of nitrogen. Includes NO_2, which is a criteria pollutant with state and federal standards. Locally and regionally important due to its involvement in the photochemical formation of ozone.

Oxides of Sulfur (SO_x) – Common product of combustion in the presence of sulfur. Associated primarily with diesel and coal burning. Includes SO_2, a criteria pollutant with state and federal standards. Primarily of concern near sources.

Ozone (O_3) – A gas mainly produced by a photochemical reaction between reactive organic gases and oxides of nitrogen in the presence of sunlight (also produced by molecular oxygen in the presence of ultraviolet light or electrical discharge). A strong oxidant that is damaging at ground level but necessary at high altitude (in the stratosphere, where it absorbs dangerous ultraviolet light). Also considered an important greenhouse gas. A criteria pollutant with state and federal standards.

Particulate Matter (TSP or PM_{30}) – Solid or liquid matter suspended in the atmosphere, excluding water. Includes aerosols and droplets that form in the atmosphere. Locally and regionally important.

Reactive/Volatile Organic Compounds/Gases (ROG, VOC, NMOG, NMOC) – A portion of total organic compounds or gases, excludes methane, ethane and acetone (due to low photochemical reactivity). "ROG" is generally used by the California Air Resources Board, "VOC" is generally used by the United States EPA, but all four terms are interchangeable for most uses. Regionally important due to its involvement in the photochemical reaction that produces ozone.

Respirable Particulate Matter (PM_{10}, and $PM_{2.5}$) – That portion of particulate matter that tends to penetrate into the human lung. The subscript refers to aerodynamic diameter. Criteria pollutants with state and federal standards. Locally and regionally important.

Total Organic Compounds/Gases (TOC or TOG) – Compounds containing at least one atom of carbon, except carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and metallic carbonates. Primarily methane in the atmosphere. Includes greenhouse gases (especially methane).

Antelope Valley AQMD

California Environmental Quality Act (CEQA)

and

Federal Conformity

Guidelines

May 2002

AVAQMD Stationary Sources Section
AVAQMD Surveillance Section

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Figure 1 - Antelope Valley Air Pollution Control District Jurisdiction 1

Background

Under the California Environmental Quality Act (CEQA), the AVAQMD (District) is an expert commenting agency on air quality and related matters within its jurisdiction (or impacting on its jurisdiction). The District has dedicated resources to reviewing projects to ensure that they will not: (1) cause or contribute to any new violation of any air quality standard; (2) increase the frequency or severity of any existing violation of any air quality standard; or (3) delay timely attainment of any air quality standard or any required interim emission reductions or other milestones of any federal attainment plan. The District has adopted a federal attainment plan for ozone pursuant to the Federal Clean Air Act.

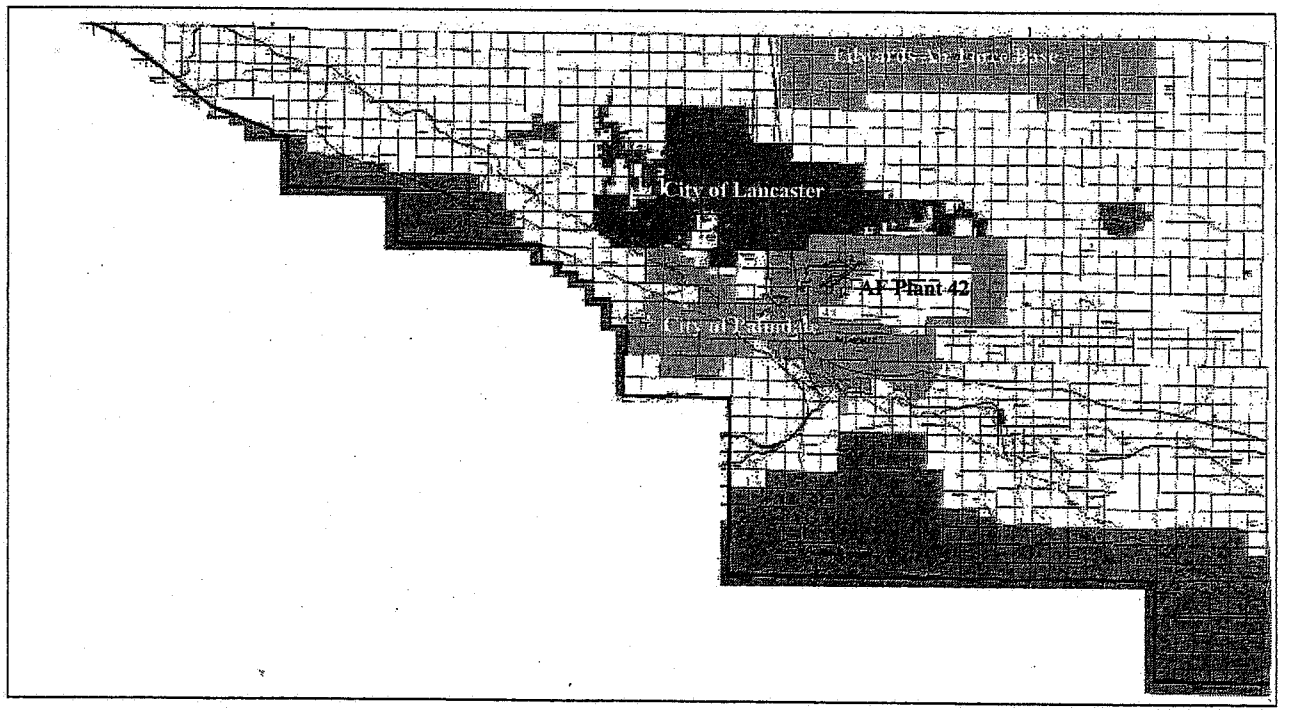
Purpose

These Guidelines are intended to assist persons preparing environmental analysis or review documents for any project within the jurisdiction of the District by providing background information and guidance on the preferred analysis approach.

Jurisdiction

The District has jurisdiction over the northern, desert portion of Los Angeles County (please refer to Figure 1). This region includes the incorporated cities of Lancaster and Palmdale, Air Force Plant 42, and the southern portion of Edwards Air Force Base. The Kern County-Los Angeles County boundary forms the northern boundary of the District; the San Bernardino-Los Angeles County boundary forms the eastern boundary of the District.

Figure 1 - Antelope Valley Air Quality Management District Jurisdiction



Non-attainment Designations and Classification Status

The United States Environmental Protection Agency and the California Air Resources Board have designated portions of the District non-attainment for a variety of pollutants, and some of those designations have an associated classification. Please refer to Table 1 for a chart of these designations and classifications.

Attainment Plans

The District has adopted a single attainment plan for ozone. Please refer to Table 2 for information regarding this attainment plan.

Table 1 – AVAQMD Designations and Classifications

Ambient Air Quality Standard	AVAQMD
One-hour Ozone (Federal)	Nonattainment; classified Severe-17
Eight-hour Ozone (Federal)	Unclassified
Ozone (State)	Nonattainment; classified Extreme due to historical SCAB designation
PM_{10} (Federal)	Unclassified
New PM_{10} (Federal)	Unclassified
$PM_{2.5}$ (Federal)	Unclassified
PM_{10} (State)	Nonattainment
Carbon Monoxide (State and Federal)	Attainment
Nitrogen Dioxide (State and Federal)	Attainment
Sulfur Dioxide (State and Federal)	Attainment
Lead (State and Federal)	Attainment
Particulate Sulfate (State)	Unclassified
Hydrogen Sulfide (State)	Unclassified
Visibility Reducing Particles (State)	Unclassified

Table 2 – AVAQMD Attainment Plan

District	Name of Plan	Date of Adoption	Applicable Area	Pollutant(s) Targeted	Attainment Date
AVAQMD	1994 Air Quality Management Plan	9/94	Entire District	NO_x and VOC	2007

Rules and Regulations

The District maintains a set of Rules and Regulations to improve air quality and maintain good air quality. Please contact the District to obtain a copy of the District rulebook.

Recommended Environmental Setting Elements

Air Quality Data

The District gathers a variety of air quality data at the Lancaster monitoring site. Table 3 details the data available from the District for this site.

Table 3 - Available Air Quality Data

Site	Address	Pollutants	Dates
Lancaster	W. Ponderosa	O_3, NO_x, CO, PM_{10} (Hi-Vol and TEOM)	7/1/97 to 11/01
Lancaster	W. Ponderosa	$PM_{2.5}$	1/1/99 to 11/01
Lancaster	43301 Division St.	O_3, NO_x, CO, PM_{10} (Hi-Vol and TEOM), $PM_{2.5}$	11/01 to present

Meteorological Data

A variety of meteorological data is available from the District for the Lancaster site. Table 4 contains a list of the data available for the Lancaster site.

Table 4 - Available Meteorological Data

Site	Address	Data	Dates
Lancaster	W. Ponderosa	Wind speed/direction, pressure, temperature, humidity	7/1/97 to 11/01
Lancaster	43301 Division St.	Wind speed/direction, pressure, temperature, humidity	11/01 to present

Topography and Climate Discussion

The District covers a western portion of the Mojave Desert Air Basin (MDAB). The MDAB is an assemblage of mountain ranges interspersed with long broad valleys that often contain dry lakes. Many of the lower mountains which dot the vast terrain rise from 1,000 to 4,000 feet above the valley floor. Prevailing winds in the MDAB are out of the west and southwest. These prevailing winds are due to the proximity of the MDAB to coastal and central regions and the blocking nature of the Sierra Nevada mountains to the north; air masses pushed onshore in Southern California by differential heating are channeled through the MDAB. The MDAB is separated from the southern California coastal and central California Valley regions by mountains (highest elevation approximately 10,000 feet), whose passes form the main channels for these air masses. The Antelope Valley is bordered in the northwest by the Tehachapi Mountains, separated from the Sierra Nevadas in the north by the Tehachapi Pass (3,800 ft elevation). The Antelope Valley is bordered in the south by the San Gabriel Mountains, bisected by Soledad Canyon (3,300 ft).

During the summer the MDAB is generally influenced by a Pacific Subtropical High cell that sits off the coast, inhibiting cloud formation and encouraging daytime solar heating. The MDAB is rarely influenced by cold air masses moving south from Canada and Alaska, as these frontal systems are weak and diffuse by the time the reach the desert. Most desert moisture arrives from infrequent warm, moist and unstable air masses from the south. As can be seen from Table 5, the MDAB averages between three and seven inches of precipitation per year (from 16 to 30 days with at least 0.01 inches of precipitation). The MDAB is classified as a dry-hot desert climate (BWh), with portions classified as dry-very hot desert (BWhh), to indicate at least three months have maximum average temperatures over 100.4° F.

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Location	Precipitation (inches)	Precipitation (days)	Evaporation (inches)	Length of Observations (years)
Trona	3.82	16		48
Randsburg	5.89	23		48
China Lake	4.42			34
Goldstone Echo	5.42	20		23
Daggett Airport	3.87	23		48
Barstow Fire	4.60	23		16
Barstow CIMIS	5.60	28	72	11
Granite Mountain	5.76	22		5
Victorville CIMIS	6.60	27	66	3
Mitchell Caverns	10.41	32		38
Mountain Pass	7.63	28		41
Parker Reservoir	5.38	24		48
Needles Airport	4.55	23		48
Twentynine Palms	3.95	19		48
Blythe Airport	3.57	17		48
Iron Mountain	3.40	19		48

Recommended Impacts Discussion Elements

Direct Impacts

Direct impacts are the result of the project itself (from its construction and operation), in the form of project activity and trips generated by the project. For example, in the case of a subdivision project, construction emissions (equipment exhaust, wind erosion, vehicle exhaust), housing use activity (natural gas consumption) and trips to and from the housing (vehicle exhaust, tire wear) represent direct impacts. In the case of a new mine project, construction emissions (equipment exhaust, wind erosion, vehicle exhaust), material handling (drilling, blasting, transfers, crushing, screening, bagging), operational emissions (wind erosion, vehicle travel, vehicle exhaust, tire wear), and employee/customer/delivery travel (vehicle exhaust, tire wear) represent direct impacts.

Indirect Impacts

Indirect impacts are the result of changes that would not occur without the project. In the case of a subdivision project, indirect impacts on the surrounding community can be generated in many ways: nearby construction of roadways (or roadway modifications) and other infrastructure to support the subdivision, construction and operation of new commercial/retail establishments, changes in traffic/circulation patterns that result in increased congestion/delays, etc. In the case of a new mine project, indirect impacts can be generated by nearby construction of infrastructure to support the mine, housing constructed and/or occupied by mine employees, changes in traffic/circulation patterns that result in increased congestion/delays, etc.

Cumulative Impacts

Cumulative impacts are similar to direct and indirect impacts of the project, which the project contributes to. In the case of a subdivision project, a given project has a cumulative impact with all other subdivision projects, from the standpoint of each type of impact (cumulative construction emissions, residential natural gas consumption, solvent use, transportation emissions, congestion, etc.). Similarly, a new mine project has a cumulative impact with all other mining projects, from the standpoint of each type of impact (cumulative construction emissions, diesel equipment emissions, blasting emissions, fugitive emissions, transportation, congestion, etc.).

Conformity Impacts

A project is non-conforming if conflicts with or delays implementation of any applicable attainment or maintenance plan. A project is conforming if it complies with all applicable District rules and regulations, complies with all proposed control measures that are not yet adopted from the applicable plan(s), and is consistent with the growth forecasts in the applicable plan(s) (or is directly included in the applicable plan). Conformity with growth forecasts can be established by demonstrating that the project is consistent with the land use plan that was used to generate the growth forecast. Consult with the local land use agency to obtain the local land use plan.

Significance Thresholds

A project is significant if it:

1. Generates total emissions (direct and indirect) exceeding the thresholds given in Table 6;[1] and/or,
2. Generates a violation of any ambient air quality standard when added to the local background;[2] and/or,

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[1] A project's indirect and cumulative emissions are not significant if the project is a residential or commercial development whose population, employment and traffic increases are consistent with the local general plan, and the local general plan is consistent with the applicable attainment plan. Such a project's direct emissions are only significant if they have the potential to generate a violation of the carbon monoxide, nitrogen dioxide or particulate ambient air quality standards.

[2] These significance thresholds are not applicable to all projects. Contact the District to clarify whether your project should be evaluated under these thresholds. In general, the emissions comparison (criteria number 1) is sufficient.

3. Does not conform with the applicable attainment or maintenance plan(s);[2] and/or,
4. Exposes sensitive receptors to substantial pollutant concentrations, including those resulting in a cancer risk greater than or equal to 1 in a million and/or a Hazard Index (HI) (non-cancerous) greater than or equal to 0.1.[2]

A significant project must incorporate mitigation sufficient to reduce its impact to a level that is not significant. A project that cannot be mitigated to a level that is not significant must incorporate all feasible mitigation. Note that the emission thresholds are given as a daily value and an annual value, so that a multi-phased project (such as a project with a construction phase and a separate operational phase) with phases shorter than one year can be compared to the daily value.

Table 6 – Significant Emissions Thresholds

Criteria Pollutant	Annual Threshold (tons)	Daily Threshold (pounds)
Carbon Monoxide (CO)	100	548
Oxides of Nitrogen (NO_x)	25	137
Volatile Organic Compounds (VOC)	25	137
Oxides of Sulfur (SO_x)	25	137
Particulate Matter (PM_{10})	15	82

Recommended Substantiation Discussion Elements

Quantification

A project's substantiation discussion should include a complete and detailed presentation of its direct, indirect and cumulative emissions, in pounds per day (if the project will last less than one year, has phases that will last less than one year, or has elements that are active for less than one year) and tons per year. This discussion should identify emissions from each significant project source, such as individual equipment or classes of equipment.

Calculations

The quantification discussion should reference the source of emission factors and activity information. Use of the methodologies as presented in the latest South Coast Air Quality Management District "CEQA Air Quality Handbook" is acceptable. Other methodologies are subject to District approval on a case-by-case basis. Sufficient information should be presented to allow the reproduction of any calculations used; complete calculations need not be presented.

District Contacts

If an address is not listed, please use the general address, to the attention of the listed individual.

AVAQMD General and Rulebook	Crystal Bates (661) 723-8070 Mailing and Physical Address: 43301 Division St., Suite 206 Lancaster, CA 93535-4649
AVAQMD Air Quality and Meteorological Data	Robert Ramirez (760) 245-1923
AVAQMD CEQA and Conformity	Alan De Salvio (760) 245-1661 x6122
AVAQMD Permitting	Barbara Weese (760) 245-1661 x1882

Appendix A – Basic Definitions of Major Air Pollutants

Technical and/or legal definitions exist for many of these pollutants, depending on context. The following definitions are for general, introductory purposes only:

Carbon Dioxide (CO_2) - Common product of combustion. Not a criteria pollutant, but considered an important "greenhouse gas." Important on a national or global scale.

Carbon Monoxide (CO) – Common product of incomplete combustion. A criteria pollutant with state and federal standards. Not a primary photochemical reaction compound, but involved in photochemical reactions. Dissipates rapidly, and is therefore only important on a local scale near sources.

Criteria Pollutants – Those air pollutants specifically identified for control under the Federal Clean Air Act (currently six: carbon monoxide, nitrogen oxides, lead, sulfur oxides, ozone and particulates).

Lead (Pb) – A heavy metal, present in the environment mainly due to historical use in motor vehicle fuel. Primarily associated with lead smelting operations. A criteria pollutant with state and federal standards. Primarily of concern near sources.

Oxides of Nitrogen (NO_x) – Common product of combustion in the presence of nitrogen. Includes NO_2, which is a criteria pollutant with state and federal standards. Locally and regionally important due to its involvement in the photochemical formation of ozone.

Oxides of Sulfur (SO_x) – Common product of combustion in the presence of sulfur. Associated primarily with diesel and coal burning. Includes SO_2, a criteria pollutant with state and federal standards. Primarily of concern near sources.

Ozone (O_3) – A gas mainly produced by a photochemical reaction between reactive organic gases and oxides of nitrogen in the presence of sunlight (also produced by molecular oxygen in the presence of ultraviolet light or electrical discharge). A strong oxidant that is damaging at ground level but necessary at high altitude (in the stratosphere, where it absorbs dangerous ultraviolet light). Also considered an important greenhouse gas. A criteria pollutant with state and federal standards.

Particulate Matter (TSP or PM_{30}) – Solid or liquid matter suspended in the atmosphere, excluding water. Includes aerosols and droplets that form in the atmosphere. Locally and regionally important.

Reactive/Volatile Organic Compounds/Gases (ROG, VOC, NMOG, NMOC) – A portion of total organic compounds or gases, excludes methane, ethane and acetone (due to low photochemical reactivity). "ROG" is generally used by the California Air Resources Board, "VOC" is generally used by the United States EPA, but all four terms are interchangeable for most uses. Regionally important due to its involvement in the photochemical reaction that produces ozone.

Respirable Particulate Matter (PM_{10}, and $PM_{2.5}$) – That portion of particulate matter that tends to penetrate into the human lung. The subscript refers to aerodynamic diameter. Criteria pollutants with state and federal standards. Locally and regionally important.

Total Organic Compounds/Gases (TOC or TOG) – Compounds containing at least one atom of carbon, except carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and metallic carbonates. Primarily methane in the atmosphere. Includes greenhouse gases (especially methane).

Alison Burton

CEQA

AIR QUALITY HANDBOOK

Guidelines for the Implementation of the

California Environmental Quality Act of 1970, as amended

prepared by

Imperial County Air Pollution Control District
150 South Ninth Street
El Centro, California

February 2005

TRANSMITTAL RECORD

- Planning Commission (each member)
- Imperial County Planning/Building Department
- City of Brawley
- City of Calexico
- City of El Centro
- City of Holtville
- City of Imperial
- City of Westmorland
- City of Calipatria
- The Coalition of Labor, Agriculture & Business (COLAB)

1. Purpose

According to the California Environmental Quality Act (CEQA) guidelines, each public agency is responsible for its own compliance with CEQA. To accomplish this, each public agency is to adopt objectives, criteria and specific procedures consistent with CEQA guidelines. The guidelines are specific as to the procedures that should be implemented by public agencies.

The intent of this document is to develop CEQA protocol for the Imperial County Air Pollution Control District (ICAPCD)[1]. This protocol has been created to assist lead agencies, planning consultants, air district staff, and project proponents in assessing the potential air quality impacts from residential and commercial developments. The protocol is designed to give the Imperial County specific guidelines that identify when an air quality analysis is necessary, the type of analysis that should be performed, the significance of the impacts predicted by the analysis, and the mitigation measures needed to reduce the overall air quality impacts. It is the intention of this document to make the preparation of the air quality analysis portion of any environmental document consistent with the rules and regulations governing this district and those found within the guidelines of the CEQA.

The provisions contained herein are not intended to replace the terms of CEQA or it's Guidelines. In the event that any of the following procedures conflict with the provisions of CEQA or the Guidelines, the provisions of CEQA or it's Guidelines shall control.

2. Introduction

Clean air is vital to the health and welfare of every citizen of this country. The residents of Imperial County have an inherent right to clean air. To answer the call of maintaining clean air, the legislature has given local air districts regional authority over the control of air pollution from all sources other than emissions from motor vehicles. Rightly so, the Air District has regulatory control over many stationary sources of air contaminants. These stationary sources are divided into point sources, such as factories, geothermal plants and rock quarries, and area sources, such as paved and unpaved roads, open areas, construction projects, which have emissions that fit a generalized category and are considerably too small to warrant permitting. Generally speaking, direct sources of air contaminants are required to obtain specific operational permits from the Air District while indirect sources are exempt. Indirect sources are facilities as well as land uses which do not emit a significant amount of pollution on their own but attract or generate motor vehicle trips which result

[1]Throughout this document the term Air District refers to the Imperial County Air Pollution Control District.

in emissions of ozone precursors, carbon monoxide and fine particulate matter.

For Imperial County, the department of Planning/Building, developed its CEQA "Rules and Regulations." Typically, the Planning/Building department acts as the lead agency for all residential and commercial development projects. The lead agency reviews all project applications subject to CEQA and makes the determination whether a project is categorically exempt or statutorily exempt from CEQA requirements. If the project is not exempt, the lead agency prepares an Initial Study to determine whether an Environmental Impact Report (EIR), a Mitigated Negative Declaration or a Negative Declaration must be prepared. According to CEQA statutes, sections 21153 and 15366.1, a lead agency is required to seek comments from each responsible agency and any public agency that has jurisdiction by law over resources that may be affected by a proposed project[2]. The Initial Study is presented to the Environmental Evaluation Committee (EEC) for review. The EEC will determine, by vote, whether an EIR, Mitigated Negative Declaration, or Negative Declaration, is required for the project and will cause the appropriate document to be prepared.

This handbook is designed to give lead agencies, EEC members, air district staff, and petitioners specific guidelines that identify when an air quality analysis is necessary, the type of analysis that should be performed, the significance of the impacts predicted by the analysis, and the mitigation measures needed to reduce the overall air quality impacts. As stated earlier, it is the intention of this document to make the preparation of the air quality analysis portion of any environmental document consistent with the rules and regulations governing this district and those found within the guidelines of CEQA. The air district's handbook is solely an air quality guidance document. To address the overall general CEQA process, the lead agencies, EEC members, air district staff, and petitioners should follow the Planning/ Building Department's guidance manual entitle "Rules and Regulations to Implement California Environmental Qaulity Act (CEQA) as Amended."

3 Role of the Air District within the CEQA Process

Typically, the Air District acts as a responsible agency or commenting agency under CEQA for residential and commercial projects. The Air District acts as a responsible agency when it has discretionary approval authority (as a member of the EEC) over a project, but does not have the primary responsibility for carrying out a project. The Air District acts as the responsible agency when development projects require general approval and an Air District Permit. As a responsible agency, the Air District may coordinate the environmental review process with the Air District's permitting process. During this coordinated process the Air District should provide comments to the lead agency regarding potential impacts and recommend mitigation measures. Conversely, the Air District acts as a commenting agency when it is not designated as a lead or responsible agency. Under the auspice of this title the Air District may have concerns about the air quality impacts of a proposed project. As a commenting agency, the Air District reviews environmental documents

[2]Health and Safety code section 40000 grants local and regional authorities the legal jurisdiction over control of air pollution from all sources, other than emissions from motor vehicles. The Imperial County Air Pollution Control District has the primary responsibility for the control of air pollution from all sources other than emissions from motor vehicles.

prepared for development proposals and provides significant comments to the lead agency as they pertain to air quality impacts and mitigation measures.

In all cases, the primary concern of the Air District is guidance. The guidance the Air District provides is primarily to mitigate adverse impacts to air quality from development projects within the Imperial County. For most urban development proposals, this typically involves projects where the vehicle trip generation is enough to potentially cause high emission levels which may hinder the Air District's efforts in attaining and maintaining the Federal and State ambient air quality standards.

4 Thresholds of Significance

Generally speaking, a proponent of a development project has to submit an application to the designated lead agency for a preliminary review. According to CEQA guidelines, if the lead agency can clearly determine, during the preliminary review process, that an EIR is required the agency may, under it's discretionary powers, skip further initial review and begin work directly on the EIR process[3]. However, under most circumstances, upon completion of the preliminary review the development of an Initial Study is conducted. The preparation of the Initial Study serves as an indicator for the need to develop an EIR, Mitigated Negative Declaration or a Negative Declaration[4]. If an EIR is required then the Initial Study serves to identify any significant effects upon the environment that are to be analyzed. This section describes the Air District's recommended thresholds of significance to be used to evaluate the air quality impact of a project when preparing an Initial Study. If the Initial Study indicates that any of the following thresholds may be exceeded, then an EIR should be prepared in order to more accurately evaluate the project impacts and to identify mitigation measures.

The procedures and thresholds of significance of this air quality guidance handbook do not apply to projects which are specifically exempt within the CEQA Guideline, Sections 15260-15285 (Statutory Exemptions) and 15300-15332 (Categorical Exemptions).

For determining the significance of project impacts the Air District has established four separate evaluation categories. CEQA requires full disclosure of the potential air pollutants and/or toxic air emissions from a project to properly assess these evaluations:

a) Comparison of calculated project emissions to Air District emission thresholds;
b) Consistency with the most recent Clean Air Plan for Imperial County[5];
c) Comparison of predicted ambient pollutant concentrations resulting from the project

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[3]Found in Article 5 section 15060 (d) of the CEQA guidelines.

[4]According to the CEQA guidelines another purpose for the Initial Study is to enable an applicant to qualify for a Negative Declaration by modifying a project through mitigation measures of adverse impacts before an EIR is prepared. CEQA guidelines section 15063(c)(2).

[5]Clean Air Plan or Clean Air Plans indicates the most recent PM10 and Ozone attainment Plans for Imperial County.

to state and federal health standards, when applicable; and

d) The evaluation of special conditions which apply to certain projects.

4.1 Thresholds of Significance for Project Operations

This section includes the recommended threshold criteria for determining whether an EIR or a Mitigated Negative Declaration should be prepared for a development project. From the Air District's perspective, the Initial Study of a development project should only consider long-term emissions or project operation emissions when determining the level of significance. Short-term emissions or construction emissions need not be considered to determine the level of significance of a project; however, the Initial Study should propose mitigation measures for those activities. Guidelines for analysis and mitigation measures for construction activities are presented in Section 7.1.

Table 1 provides general guidelines for determining the significance of impacts and the recommended type of environmental analysis based on the total emissions that are expected from a project operation .

Table 1, Thresholds of Significance for Project Operations

Pollutant	Tier I	Tier II
NOx and ROG	**Less than 55 lbs/day**	**55 lbs/day and greater**
PM10 and SOx	**Less than 150 lbs/day**	**150 lbs and greater**
CO	**Less than 550 lbs/day**	**550 lbs/day and greater**
Level of Significance	**Potentially Significant**	**Significant Impact**
Environmental Document	**Mitigated Negative Declaration**	**EIR**

Tier I Less than 55 lbs/day of NOx or ROG; less than 150 lbs/day of PM10 or SOx; or less than 550 lbs/day of CO

Any residential or commercial development project with a potential to emit less than 55 lbs/day of NOx or ROG; less than 150 lbs/day of PM10 or SO_2; or less than 550 lbs/day of CO could potentially have an adverse impact on the local air quality. From the Air District's perspective, residential and commercial developments with a potential to emit below this level will ***not*** be required to develop an EIR. However, the Initial Study should require implementation of all the standard mitigation measures listed in Section 7.2 in order to reduce the air quality impact to an insignificant level. It is important to note that the strategies identified in Section 7.2 do not represent a comprehensive list of all mitigation measures. The project proponent, the lead agency or the Air District may propose alternative mitigation measures that are capable of providing the same level of mitigation. The Air District requires that alternative mitigation measures be fully documented with a copy of the documentation attached to the Initial Study.

Tier II 55 lbs/day or greater of NOx or ROG; 150 lbs/day or greater of PM10 or SOx; or 550 lbs/day or greater of CO

Any residential or commercial development project with a potential to emit 55 lbs/day or greater of NOx or ROG; 150 lbs/day or greater of PM10 or SOx; or 550 lbs/day or greater of CO will have a significant impact on the local air quality. In this instance the Air District requires the preparation of an EIR. ***For projects exceeding any of these thresholds, the project proponent should select and implement all feasible discretionary mitigation measures in addition to the standard mitigation measures.*** Sections 7.2 and 7.3 both provide a set of standard and discretionary mitigation measures that a project proponent could implement in order to reduce the air quality impacts to an insignificant level. For large development projects in which emissions cannot adequately be mitigated solely with on-site mitigation measures, the project developer should propose to implement off-site mitigation measures in order to reduce potential air quality impacts to a level of insignificance. Section 7.4 provides a set of off-site mitigation measures that could be implemented by the project proponent. It is important to note that the strategies identified in Sections 7.2 through 7.4 do not represent a comprehensive list of all mitigation measures. The applicant may propose to implement alternative mitigation measures that are capable of providing the same level of mitigation[6]. The Air District requires that alternative mitigation measures be fully documented and attached to the EIR.

4.2 Thresholds of Significance for Construction Activities

Construction-related emissions are generally short-term in duration, but may still cause temporary adverse air quality impacts. With respect to construction activities particulate matter (PM10) is the pollutant of greatest concern which includes but is not limited to: excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle and equipment exhaust emissions. Construction-related emissions can cause substantial increases in localized concentrations of PM10. Construction emissions of PM10 can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions as well as other factors. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to significantly reduce PM10 emissions from construction activities.

The Air District's approach to CEQA analyses of construction impacts is to emphasize implementation of effective and comprehensive control measures rather than producing a detailed evaluation of the emissions. From the Air District's perspective, evaluation of construction emissions is not necessary (however this does not preclude a lead agency from electing to do so), unless the project is required to prepare an EIR. The EIR should quantify emissions from construction activities, such as fugitive PM10 and exhaust emissions from construction equipment. Mitigation measures should be proposed for these activities.

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[6] Elsewhere in the document applicant, project proponent, petitioner all refer to an individual who has a vested interest in a favorable outcome for a development project and who is physically submitting the appropriate paper work for approval of the project.

Regardless of size, the standard mitigation measures for construction equipment and fugitive PM10 control for construction activities should be implemented at all construction sites. In addition, all the discretionary mitigation measures for fugitive PM10 control should be implemented at construction sites greater than, or equal to, four (4) acres. Section 7.1 provides a set of standard and discretionary mitigation measures for construction equipment and fugitive PM10 control for construction activities that the project proponent could implement in order to reduce the air quality impacts to an insignificant level. The measures identified in Section 7.1 do not represent a comprehensive list of all mitigation measures. The project proponent or the lead agency may propose alternative mitigation measures that are capable of providing the same level of mitigation. The Air District requires documentation of all alternative mitigation measures and a copy of the documentation should be attached to the Initial Study.

Compliance with the requirements of this CEQA guidance does not preclude the project from compliance with the Imperial County Air Pollution Control District Rules and Regulations. Any project shall be required to comply with all the requirements of the district's rules and regulations, specifically the requirements of Regulation VIII for the construction phase.

4.3 Screening Criteria for Project Impacts

Project screening is intended to allow for accurate and rapid evaluation of a proposed project's potential to exceed the Air District's CEQA emission thresholds of significance. The lead agency may consult Table 2 for an indication as to whether the thresholds for EIR applicability requirements for a particular project might be exceeded. The criteria used to evaluate air emissions associated with residential and commercial projects is based primarily on the combustion emissions generated by motor vehicles and area source emissions (paved and unpaved roads, construction projects, open areas, etc). The URBEMIS model was used to evaluate the emissions associated to these projects[7]. The list is not comprehensive and should be used for general guidance only. The petitioner is encouraged to develop a more refined analysis of air quality impacts specific to a particular project, especially for those projects exceeding the screening thresholds. The latest URBIMIS model is recommended for use in the evaluation of air quality impacts.

For those development projects not included in Table 2, it is highly recommended that the lead agency and the Air District consult together on EIR applicability requirements for any given project or that a request is made to the petitioner for an estimate of the air emissions that will be generated by the project.

[7]URBEMIS is a planning tool for estimating vehicle travel, fuel use and resulting emissions related to land use projects. The model is used to calculate emissions of ROG, CO, NOX and PM10 from vehicle use associated with specific construction developments.

Table 2, Screening Criteria for Project Air Quality Impacts

Land Use	Units of Measure	Trip Generation Rate (1)	Project Size which Would Generate Air Emissions Greater than the Threshold Limit (2)
Single Family	Dwelling Unit	10.37	200 Units
Apartments	Dwelling Unit	5.93	340 Units
Condominiums	Dwelling Unit	5.40	350 Units
Mobile Home Park	Dwelling Unit	5.47	320 Units
Supermarket	1000 sq. ft	111.51	29.5 sq.ft.
Restaurant, Quality	1000 sq. ft	97.27	31 sq.ft.
Restaurant, Fast Food	1000 sq. ft	685.61	4.4 sq.ft.
Motel	No. Rooms	8.70	360 Rooms

(1) Trip generation rates in this table are from the Institute of Transportation Engineers (ITE) Trip Generation Rate Tables for Rural Areas.

(2) Emissions are defined as NOX, ROG, CO or PM10.

4.4 Consistency with the Most Recent Clean Air Plan for Imperial County

Within the CEQA guidelines, Section 15125 (b) requires that an EIR discuss consistency between the proposed project and the applicable regional plans. A consistency analysis with the Clean Air Plans is required for large residential developments and large commercial developments which are required to develop an EIR. The EIR should demonstrate compliance of the project with the most recent Ozone and PM10 Attainment Demonstration Plans. The EIR should also demonstrate compliance of the project with the Imperial County Rules and Regulations, as well as the State and Federal Regulations.

4.5 Comparison of Predicted Ambient Pollutant Concentrations to State and Federal Air Quality Standards.

To protect the public health and welfare, the State and Federal government established Ambient Air Quality Standards for certain pollutants, known as criteria pollutants. Large residential and commercial projects are sometimes required to develop air quality dispersion modeling if it is determined that the project emissions have the potential to cause an exceedance of the Ambient Air Quality Standards. A project is considered to have a significant impact if its emissions are predicted to cause or contribute to a violation of any Ambient Air Quality Standard. The petitioner should

identify in the EIR any on-site and off-site control measures which reduce the concentration of air emissions below the Ambient Air Quality Standards.

4.6 Special Conditions

Project impacts may also be considered significant if one or more of the following special conditions apply:

a. Development projects located in close proximity to sensitive receptors or with a potential to emit toxic or hazardous air pollutants, even at a very low level of emissions, may be considered significant because of the increased cancer risk for the affected population. Such projects may be required to prepare a health risk assessment to determine the potential level of risk associated with their operations. The Air District should be consulted on any project with the potential to emit toxic or hazardous air pollutants. In addition, pursuant to the requirements of California Health and Safety Code 42301.6 (AB 3205) and Public Resources Code Section 21151.8, subdivision (a)(2), any new school, or proposed industrial or commercial project site located within 1000 feet of a school must be referred to the Air District for review.

b. If a determination is made that a development project has the potential to cause a nuisance problem which impacts a considerable number of people the project may be considered as having a significant effect. There are projects that may emit pollutants in concentrations that would not otherwise be significant except as a nuisance, such as hydrogen sulfide.

If a project is proposed within the screening level distance in Table 3, the Air District should be contacted for information regarding potential odor problems. For projects that involve new receptors located near an existing odor source(s), a public information reviewing request should be submitted to the Air District for a review of any existing odor complaints and for the nearest odor emitting facility(ies).

Table 3, Project Screening Distances for Potential Odor Sources

Type of Operation	Project Screening Distance
Wastewater Treatment Plant	1 mile
Sanitary Landfill	1 mile
Composting Station	1 mile
Feedlot	1 mile
Asphalt Plant	1 mile
Painting/Coating Operations (auto body shops)	1 mile
Rendering Plant	1 mile

5 Methods for Calculating Project Emissions

Air pollutant emissions from an urban development can derive from a variety of sources, including but not limited to motor vehicles, natural gas, electric energy use, combustion-powered utility equipment, paints and solvents, equipment or operations used by various commercial and industrial facilities, construction and demolition equipment and operations, as well as various other sources. The amount and type of emissions produced, and their potential to cause significant impacts, depends on the type and level of development proposed. The following sections describe the recommended methods generally used to calculate emissions from residential and commercial projects.

5.1 Motor Vehicle Emissions

Motor vehicles are the primary source of long-term emissions caused by residential and commercial land uses. These land uses often do not directly emit significant amounts of air pollutants, but cause or attract motor vehicle trips that do produce emissions. Such land uses are referred to as indirect sources.

Motor vehicle emissions associated with indirect sources should be calculated for projects which exceed the screening criteria listed in Table 2, Screening Criteria for Project Air Quality Impacts. Calculations should be based on the most recent vehicle mission factors (EMFAC series) provided by the California Air Resources Board (ARRB), and trip generation factors published by the Institute of Transportation Engineers (ITE). These factors have been incorporated into a simple computer model called URBEMIS, originally developed by the ARB. URBEMIS incorporates the EMFAC emission factors and ITE trip rates.

URBEMIS is a planning tool for estimating vehicle travel, fuel use and resulting emissions related to land use projects. The model calculates emissions of ROG, CO, NOX and PM10 from vehicle use associated with new or modified development such as shopping centers, housing, commercial services and industrial land uses. URBEMIS allows users to compare motor vehicle emissions as a function of the number of vehicle trips associated with a given land use and the vehicle miles traveled for each particular type of trip taken. The calculated emissions can then be used as a basis for project screening.

User-specific inputs to the model include project type, year, season, trip speed and other parameters. The default values should be used when no other project specific information is available. If different values are used, justification and documentation for the inputs should be provided on the appropriate document. The Air District is currently working on incorporating the default values for Imperial County.

The Air District recommends using the most recent version of URBEMIS adopted by the Air Resources Board and the corresponding version of EMFAC. A link to the most recent version of URBEMIS can be accessed from the Air Resource Board website at www.arb.ca.gov. As an alternative, the petitioner may choose to manually evaluate the air emissions associated with a particular project.

A thorough emissions analysis should be performed on all relevant emission sources, using emission factors from EPA document AP-42 "Compliance of Air Pollutant Emission Factors", the latest version of ENFAC, or other approved source(s). The emission analysis should include calculations for estimated emissions of all criteria pollutants and toxic substances released from the project. Documentation of emission factors and all assumptions should be provided.

6. Preparing the Air Quality Analysis Section for Environmental Impact Reports

For large projects requiring the preparation of an EIR, a comprehensive air quality analysis is required as part of the EIR document. Such an analysis should address both the construction phase and the operational phase impacts of the project and include, as a minimum, the following information:

a. A description of existing air quality and emissions in the impact area, including the attainment status of the Air District relative to State and Federal air quality standards and any existing regulatory restrictions to development. Included should be data from the air quality monitoring station(s) closest to the project site. The most recent Clean Air Plans should be consulted for applicable information.

b. A thorough emission analysis should be performed on all relevant emission sources, using emission factors from EPA document AP-42 "Compliance of Air Pollutant Emission Factors", the latest version of ENFAC, or other approved source(s). The emission analysis should include calculations for estimated emissions of all criteria pollutants and toxic substances released from the anticipated land mix on a daily and yearly basis. Documentation of emission factors and all assumptions (i.e. anticipated land uses, average daily trip rate from generation studies, etc) should be provided as an appendix to the EIR.

c. The EIR should include a range of alternatives to the proposed project that could effectively minimize air quality impacts, if feasible. A thorough emissions analysis should be conducted for each of the proposed alternatives identified. The EIR author should contact the Air District if additional information and guidance is required. All calculations and assumptions used should be fully documented in an appendix to the EIR.

d. A diesel exhaust screening level health risk assessment should be performed in consultation with the Air District engineering staff for projects that will result in significant use of heavy-duty diesel equipment in areas with potential for human exposure, especially when exposures to sensitive receptors are likely. Factors that will be considered by the Air District staff when determining if a screening risk analysis is necessary should include the expected emissions from diesel equipment, location of the project and distance to sensitive receptors.

e. For those projects with a potential to generate heavy volumes of traffic and which can lead to high levels of CO, hot spot modeling should be used to determine compliance with the state CO standard at the intersections and/or roadway links that will be most impacted by the proposed project. The "hot spots" should be determined according to the traffic impact analysis. One of the most common models is CALINE4, developed by and available from the California Department of Transportation; however, any other APCD approved hot spot

model can be used. If the results from the air modeling indicates a significant impact, mitigation measures should be identified and incorporated into the EIR. The effectiveness of any proposed mitigation measure(s) should be quantified by estimating the effects of the measure(s) on the volume of traffic and/or speeds, and CO concentrations.

f. A cumulative impact analysis should be performed to evaluate the combined air quality impacts of any given project and the impacts from existing and proposed future developments in the area. This should encompass all planned construction activities within 1 mile of the project.

g. The EIR should evaluate the project for consistency with the Clean Air Plan and the District's Rules and Regulations.

h. Temporary construction impacts, such as fugitive dust and combustion emissions from construction and grading activities, should be quantified and mitigation measures proposed.

i. Mitigation measures should be recommended, as appropriate, following the guidelines of this handbook.

7. Mitigation Measures

An EIR should identify each significant air quality impact and propose feasible mitigation measures that would reasonably be expected to reduce impacts to below significant levels. In addition, a Mitigated Negative Declaration should identify measures included as part of the project to reduce impacts on air quality to less than significant.

This section contains a menu of mitigation measures that project proponents and local governments can use to select those measures that are feasible to mitigate the project's impact. According to CEQA Guidelines, Section 15364, feasible means capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors. Lead agencies are responsible for determining the feasibility of mitigation measures. In instances when a project has a significant impact, CEQA requires that feasible mitigation measures be applied to the project in order to reduce cumulative impacts and to reduce individually significant impacts. The district considers a project to be mitigated to a level of insignificance if its impact is mitigated below the threshold levels in Section 4. A project which incorporates all feasible mitigation measures and/or CEQA options for mitigation (refer to CEQA Guidelines, Section 15370 (a)(e)) is considered to have substantially mitigated air quality impacts pursuant to CEQA Guidelines, Section 15093 (b). However, if the project's emissions are still over the significance level and the agency decides to approve the project, the lead agency must prepare a Statement of Overriding Considerations pursuant to CEQA.

This section recommends feasible measures that can reasonably be expected to reduce air quality impacts from construction, indirect sources, localized carbon monoxide impacts, and cumulative impacts. The mitigation measures in this section are intended to reduce emissions of ROG, NOx, PM10, and CO.

The Standard Mitigation Measures for construction equipment and fugitive PM10 control for construction activities should be implemented at all construction sites, as appropriate and feasible, regardless of the size. In addition, discretionary mitigation measures for fugitive PM10 control should be implemented, as appropriate and feasible, at construction sites greater than, or equal to, four (4) acres.

7.1 Construction Equipment and Fugitive PM10 Mitigation Measures

Listed below are a number of fugitive dust mitigation measures which have been shown to significantly reduce emissions. It should be noted that the following examples are not considered exclusive. The Air District is aware that there are other mitigation measures with similar or better emission reduction potentials. Use of other mitigation measures may also be considered if the appropriate documentation is provided.

Standard Mitigation Measures for Construction Equipment

a. Maintain all construction equipment in proper tune according to manufacturer's specifications.
b. Fuel all off-road and portable diesel powered equipment, including but not limited to bulldozers, graders, cranes, loaders, scrapers, backhoes, generator sets, compressors, auxiliary power units, with ARB certified motor vehicle diesel fuel (non-taxed version suitable for use off-road).
c. Maximize to the extent feasible, the use of diesel construction equipment meeting the ARB's 1996 or newer certification standard for off-road heavy-duty diesel engines.
d. Install diesel oxidation catalysts (DOC), catalyzed diesel particulate filters (CDPF) or other District approved emission reduction retrofit devices.

Standard Mitigation Measures for Fugitive PM10 Control

a. The entire site shall be pre-watered for 48 hours prior to clearing and grubbing..
b. Reduce the amount of the disturbed area where possible.
c. Water at least twice daily or otherwise stabilize all active construction areas.
d. All dirt stock-pile areas should be sprayed daily as needed.
e. Pave, apply water three times daily, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
f. Haul trucks shall covered loads or maintain al least 6" of freeboard when traveling on public roads.
g. Pre-moisten, prior to transport, import and export materials that have a silt content of 5% or grater. Water all materials with a silt content of 5% or greater with a spray bar or cover trucks hauling dirt, sand, or loose materials. Empty trucks and trucks carrying asphalt material are excluded from this requirement.
h. Sweep streets at the end of each day if visible soil material is carried onto streets, or wash off truck and equipment leaving the site.

Discretionary Mitigation Measures for Fugitive PM10 Control

a. Use of water trucks or sprinkler system in sufficient quantities to prevent airborne dust from leaving the site. When wind speeds exceed 15 mph the operators shall increase watering frequency.
b. Apply chemical soil stabilizers or apply water to form and maintain a crust on inactive construction areas (disturbed lands within construction projects that are unused for at least four consecutive days).
c. Apply non-toxic binders (e.g. latex acrylic copolymer) to exposed areas after cut and fill operations and hydroseeded areas.
d. Plant vegetative ground cover in disturbed areas as soon as possible and where feasible.
e. Cover or apply water or chemical suppressants to form and maintain a crust on inactive storage piles.
f. All roadways, driveways, sidewalks, etc. to be paved should be completed as soon as possible. In addition, building pads should be laid as soon as possible after grading unless seeding or soil binders are used.
g. Vehicle speed for all construction vehicles shall not exceed 15 mph on any unpaved surface at the construction site.
h. Install wheel washers, rumble gates, provide a gravel pad or pave the area where vehicles enter and exit unpaved roads onto streets, or wash off trucks and equipment leaving the site.

7.2 Standard Mitigation Measures for Project Operations

The recommended standard air quality mitigation measures have been separated according to land use and mitigation type.

According to Table 1, Tier I, projects generating less than 55 lbs/day of NOx or ROG; less than 150 lbs/day of PM10 or SOx; or less than 550 lbs/day of CO han 55 lbs/day, the Initial Study should require implementation of all the Standard Mitigation Measures in order to reduce the air quality impact to an insignificant level.

According to Table 1, Tier II, projects generating* 55 lbs/day or greater of NOx or ROG; 150 lbs/day or greater of PM10 or SOx; or 550 lbs/day or greater of CO, the EIR *should select and implement all feasible and practicable measures from the discretionary list, in addition to the Standard Mitigation Measures.

Residential Projects

Standard mitigation recommendations for residential projects include the following site design and energy efficiency standards:

Standard Site Design Measures

a. Link cul-de-sacs and dead-end streets to encourage pedestrian and bicycle travel;
b. Allocate easements or land dedications for bikeways and pedestrian walkways; and
c. Provide continuous sidewalks separated from the roadway by landscaping and on-street

parking. Adequate lighting for sidewalks must be provided, along with crosswalks at intersections.

Standard Energy Efficiency Measures

a. Increase the building energy efficiency rating by 10% above what is required by Title 24 requirements. This can be accomplished in a number of ways (increasing attic, wall or floor insulation, etc.).

Commercial Projects

Standard mitigation recommendations for commercial and industrial projects include the following site design and energy efficiency standards:

Standard Site Design Measures

a. Provide on-site bicycle parking;
b. Provide on-site eating, refrigeration and food vending facilities to reduce lunchtime trips;
c. Provide shower and locker facilities to encourage employees to bike and/or walk to work.
d. Provide for paving a minimum of 100 feet from the property line for commercial driveways that access County paved roads as per County Standard Commercial Driveway Detail 410B (formerly SW-131A).

Standard Energy Efficiency Measures

a. Increase building energy efficiency rating by 10% above what is required by Title 24 requirements. This can be accomplished in a number of ways (increase attic, wall or floor insulation, etc).

7.3 Discretionary Mitigation Measures

The discretionary mitigation measures listed in this section have been separated according to land use and mitigation type. It is important to note that the strategies identified here do not represent a comprehensive list of all mitigation measures possible. Project proponents are encouraged to propose other alternatives that are capable of providing the same level of mitigation.

Residential Projects

Discretionary Site Design Measures

a. If the project is located on an established transit route, improve public transit accessibility by providing transit turnouts with direct pedestrian access to project.
b. Increase street tree planting.
c. Outdoor electrical outlets to encourage the use of electric appliances and tools.
d. Secure on-site bicycle parking for multi-family residential developments.
e. Increase the number of bicycle routes/lanes.

f. Provide pedestrian signalization and signage to improve pedestrian safety.

Discretionary Energy Efficiency Measures

a. Use roof material with a solar reflectance value meeting the EPA/DEO Energy Star® rating to reduce summer cooling needs.
b. Use high efficiency gas or solar water heaters.
c. Use built-in energy efficient appliances.
d. Use double-paned windows.
e. Use low energy street lighting (i.e. sodium).
f. Use energy efficient interior lighting.
g. Use low energy traffic signals (i.e. light emitting diode).
h. Install door sweeps and weather stripping if more efficient doors and windows are not available.

Commercial Projects

Discretionary Site Design Measures

a. Increase street tree planting
b. Shade tree planting in parking lots to reduce evaporative emissions from parked vehicles.
c. Increase number of bicycle routes/lanes.
d. If the project is located on an established transit route, improve public transit accessibility by providing transit turnouts with direct pedestrian access to protect or improve transit stop amenities.
e. Implement on-site circulation design elements in parking lots to reduce vehicle queuing and improve the pedestrian environment.
f. Provide pedestrian signalization and signage to improve pedestrian safety.

Discretionary Energy Efficiency Measures

a. Use roof material with a solar reflectance value meeting the EPA/DOE Energy Star® rating to reduce summer cooling needs.
b. Use built-in energy efficient appliances, where applicable.
c. Use double-paned windows.
d. Use low energy parking lot and street lights (i.e. sodium).
e. Use energy efficient interior lighting.
f. Use low energy traffic signals (i.e. light emitting diode).
g. Install door sweeps and weather stripping if more efficient doors and windows are not available.
h. Install high efficiency gas/electric space heating.

7.4 Off-site Mitigation Measures

Off-site mitigation measures are designed to offset emissions from large projects that cannot be fully mitigated with on-site measures. Off-site emissions reductions can result from either stationary or

mobile sources, but should relate to the on-site impacts from the project in order to provide proper "nexus" for the air quality mitigation. For example, NOX emissions from increased vehicle trips from a large residential development could be reduced by funding the expansion of existing transit services. The off-site strategies identified below provide a range of options available to mitigate significant emission impacts from large projects.

a. Retrofit existing homes in the project area with energy-efficient devices.
b. Retrofit existing businesses in the project area with energy-efficient devices.
c. Fund a program to buy and scrap older, higher emission passenger and heavy-duty vehicles.
d. Replace/repower transit buses.
e. Replace/repower heavy-duty diesel school vehicles (i.e. bus, passenger or maintenance vehicles).
f. Fund an electric lawn and garden equipment exchange program.
g. Retrofit or repower heavy-duty construction equipment, or on-road vehicles.
h. Repower or contribute to funding clean diesel locomotive main or auxiliary engines.
i. Install bicycle racks on transit buses.
j. Purchase particulate filters or oxidation catalysts for local school buses, transit buses or construction fleets.
k. Install or contribute to funding alternative fueling infrastructure (i.e. fueling stations for CNG, LPG, conductive and inductive electric vehicle charging, etc.).
l. Fund expansion of existing transit services.
m. Fund public transit bus shelters.
n. Subsidize vanpool programs.
o. Subsidize transportation alternative incentive programs.
p. Contribute to funding of new bike lanes.
q. Install bicycle storage facilities.
r. Provide assistance in the implementation of projects that are identified in a city or county Bicycle Master Plan.

El Dorado County APCD – CEQA Guide
Executive Summary

Purpose (Chapter 1). This document is a Guide, to be used during the Initial Study phase of the CEQA process, for determining whether a project will have "significant" air quality impacts. If significant air quality impacts are determined to exist, an Environmental Impact Report (EIR) must be prepared; if not, a Negative Declaration (or Mitigated Negative Declaration) can be prepared. This Guide will be used by the District for reviewing projects for which it is the Lead Agency; otherwise, the District will use it to provide comments as a Responsible Agency or Commenting Agency. The District recommends that the Guide be used by other county agencies in the Lead Agency role, and by project proponents.

Existing Air Quality Levels (Chapter 2). El Dorado County is divided among two air basins, Mountain Counties and Lake Tahoe. With two exceptions, the county is in attainment for all state and national ambient air quality standards (AAQS). The Mountain Counties portion of the County is a "severe" nonattainment area for the state and national 1-hour AAQS for ozone, and both the Mountain Counties and Lake Tahoe air basin portions of the county are nonattainment with respect to the state 24-hour PM_{10} AAQS.

Coordination With Other Air Districts (Chapter 2). This Guide is generally based on the criteria and technical approach being developed by all five air districts in the greater Sacramento area. In particular, it is coordinated with the Sacramento Region Ozone Air Quality Attainment Plan (AQAP).

Types of Emission Sources (Chapters 4, 5, and 6). Several types of emission sources need to be considered when evaluating the impacts of a project under CEQA. For many development projects, motor vehicle trips are the principal source of air pollution. Projects in this category, such as shopping centers, office buildings, arenas, and residential developments, are often referred to as "indirect sources." This is because they do not directly emit significant amounts of air pollutants from onsite activities, but cause additional emissions from motor vehicles traveling to and from the development.

Most development projects also generate "area source" emissions. Area sources are sources that individually emit fairly small quantities of air pollutants, but which cumulatively may represent significant quantities of emissions. Water heaters, fireplaces, lawn maintenance equipment, and application of paints and lacquers are examples of area source emissions.

Certain projects also may directly generate stationary or "point" source emissions from operations. Although most area sources discussed above are stationary, the term stationary or point source usually refers to equipment or devices operating at industrial and commercial facilities. Examples of facilities with stationary sources include manufacturing plants, quarries, print shops and gasoline stations.

Finally, consideration must be given to emissions from the operation of equipment and vehicles, as well as dust emissions, during the construction phase of a project. In some

cases, construction emissions, even though they are temporary, may be greater than emissions from subsequent operation of the project.

Quantitative Significance Criteria (Chapter 3). A project will be considered as having "significant" air quality impacts if any of the following quantitative conditions exist:

- **ROG and NOx.** The project will result in construction or operations emissions of either of the two primary precursors of ozone, reactive organic gases (ROG) or oxides of nitrogen (NOx), in excess of 82 lbs/day. These criteria are based on the emissions levels that trigger "offsets" for stationary sources under District Rule 523. Special requirements for determining significance may apply in the Lake Tahoe Air Basin, as imposed by the Tahoe Regional Planning Agency (TRPA) in interpreting its 0.08 ppm one-hour "significance threshold" for ozone.

- **Other Pollutants.** The project will result in construction or operation emissions of other pollutants (PM_{10}, CO, SO_2, NO_2, Sulfates, Lead) that could cause or contribute to violations of any applicable national or state AAQS (including visibility). The applicable AAQS are set forth in Appendix B. In the Lake Tahoe Air Basin, the TRPA visibility standard is applied.

- **Toxic Air Contaminants (Chapter 7).** The project will result in construction or operations emissions of toxic air contaminants (TACs) that cause a lifetime cancer risk greater than one in one million (10 in one million if best available technology for toxic air contaminants is applied), or ground-level concentrations of non-carcinogenic TACs with a Hazard Index greater than 1. Special attention is given to asbestos emissions and Diesel engine emissions.

- **Cumulative Impacts (Chapter 8).**

  – **ROG and NOx.** The project requires a change in the land use designation (e.g., general plan amendment or rezone) that increases ROG and NOx emissions compared to the prior approved use, and the increase in emissions exceeds the "project alone" significance levels shown above for ROG or NOx.

  – **CO.** Project CO emissions, if combined with CO emissions from other nearby projects, result in a "hotspot" that violates a state or national AAQS.

  – **Other Pollutants.** The project is primarily an industrial project and a modeling analysis indicates that the project's impacts would exceed Class III Prevention of Significant Deterioration (PSD) increments (Class II in Lake Tahoe) for PM_{10}, SO_2, or NO_2; or, the project is primarily a development project, and the emissions of ROG, NOx, or CO exceed the "project alone" significance criteria for those three pollutants noted above. (CO is used as a surrogate for other impacts in the latter case.)

– **TACs.** The project causes the risk analysis criteria above for "project alone" TACs to be exceeded when project emissions of TACS are considered in conjunction with TACs from other nearby projects.

Qualitative Significance Criteria (Chapter 3). In addition, the Guide considers a project significant if any of the following qualitative criteria are met:

- ξ **CEQA Guidelines Appendix G.** The project triggers any of the air quality significance criteria in Appendix G of the CEQA Guidelines.

- ξ **Odors.** The project results in excessive odors, as defined under the Health & Safety Code definition of an air quality nuisance.

- ξ **Sensitive Receptors.** The project results in land use conflicts with sensitive receptors, such as schools, elderly housing, hospitals or clinics, etc.

- ξ **District Rules and Regulations.** The project, as proposed, is not in compliance with all applicable District rules and regulations.

- ξ **Conformity (Chapter 9).** The project does not comply with U.S. EPA general and transportation "conformity" regulations.

Project Screening and Calculations (Chapters 4, 5, and 6). Screening or "de minimis" levels of emissions are identified that may allow a smaller project or project with minimal emissions to be classified as not significant without going through calculation procedures or emissions modeling, unless special considerations apply. Where screening does not apply (or where calculation of actual emissions is otherwise desired), the Guide contains specific methods and techniques for calculating emissions, with references to applicable emissions models where appropriate. Screening and calculation approaches are given separately for construction emissions (Chapter 4), ROG and NOx emissions from operation (Chapter 5), and other pollutants emitted during operation such as CO and PM_{10} (Chapter 6).

Mitigation (Chapters 4, 5, and 6). The Guide states that exceeding the significance criteria can be avoided by incorporating mitigation measures into a project prior to undertaking or completing the Initial Study. Various mitigation measures are listed both for project construction and operation.

PROTOCOL FOR REVIEW

LAND USE PERMITTING ACTIVITIES

Procedures for Implementing the California Environmental Quality Act

Prepared by the
Shasta County Air Quality Management District
1855 Placer Street, Suite 101
Redding, CA 96001

November 2003

This document fulfills California Environmental Quality Act (CEQA) and CEQA Guidelines requirements for agencies to adopt procedures and guidelines for implementing CEQA. Copies and updates are available from the SCAQMD Air Quality Division at (530) 225-5674. Questions on content should be addressed to the Air Pollution Control Officer.

Purpose

The purpose of this protocol document is to establish a methodology that can be utilized by the Shasta County Air Quality Management District (District) staff to review and comment on the air quality impacts of land use projects seeking approval through land use permitting process. The District will frequently be called upon to respond with suggested mitigation requirements as a responsible agency under an environmental review process associated with either local ordinances or the California Environmental Quality Act (CEQA). The environmental review process requires that agencies propose and track implementation of feasible mitigation measures that would mitigate significant adverse effects to the environment. Most often the planning agency with jurisdiction for the subject project will be functioning as a lead agency in this project review and permitting process.

Role of the District

Under state law (*California Health & Safety Code Section 40000*), the District has primary responsibility for control of air pollution from all sources, other than emissions from motor vehicles. This includes stationary sources of air contaminants as well as area wide emission sources. Additionally, the District has authority to adopt and enforce rules and regulations to achieve and maintain the state and federal ambient air quality standards in all areas affected by emission sources under their jurisdiction (*California Health & Safety Code Section 40001*). In developing plans and regulations to achieve the above-mentioned air quality standards, the District may consider the full spectrum of emission sources and focus particular attention on reducing the emissions from transportation and area wide emission sources (*California Health & Safety Code Section 40910*).

As part of the District's Attainment Plan developed to comply with *California Health & Safety Code Section 40918(a)(4),* the District has worked closely with the planning agencies of Shasta County, the City of Redding, the City of Anderson, and the City of Shasta Lake to formulate Air Quality Elements for each respective General Plan. These Air Quality Elements describe in detail the approach to be used by planning agency staff when coordinating with the District to review the indirect air quality impacts (those associated with motor vehicles and area wide emission sources) of the proposed project. Area wide emission sources may include, but are not limited to, multiple smaller emission sources such as water heaters, gas furnaces, wood stoves, architectural coatings, etc.

The District also coordinates closely with the Regional Transportation Planning Agency (RTPA) to ensure a coordinated approach in the development and implementation of transportation plans. This role will become more important as the District responds to the possibility of being classified as a federal non-attainment area with respect to the new 8-hour ozone standard proposed by the U.S. Environmental Protection Agency.

District As Lead Agency

The District may act as a lead agency when it has principal responsibility to carry out or approve a project. This function may be appropriate when the project would require District approval of a discretionary air quality permit and not requiring any discretionary action from any other agency.

District As Responsible Agency

The District acts as a responsible agency when it has discretionary power to approve some aspect of a project, but does not have the principal authority to carry out or approve the project in total. The District is often a responsible agency for development projects that require air pollution control permits. When functioning in this capacity, the District provides the lead agency with important guidance regarding the scope of potential environmental effects of the project on air quality. The District considers the EIR or Negative Declaration prepared by the lead agency and uses the resulting information and findings to prepare its own permit. To ensure that the environmental document is adequate for use, the District provides comments to the lead agency on the air quality analysis and mitigation measures incorporated in the CEQA analysis con-currently with the District's evaluation process for issuing an Authority to Construct. The methodology used in analyzing impacts under the CEQA environmental review process should be carefully coordinated with the parallel process that the District requires for evaluating emissions and impacts in its permitting process.

During the CEQA review process, the District may comment at three points:

Consultations Prior to Environmental Determination

The District may consult with other agencies prior to the lead agency making a determination as to whether a Negative Declaration or an EIR is required for a project. District policy is to respond to all referrals within the review period established by the lead agency. When it is not possible to meet the stated deadlines, the District will notify the lead agency and request additional time or explain why the deadline cannot be met.

Responses to the Notice of Preparation for an EIR

The District may provide written guidance on what aspects of a proposed project should be fully addressed in the Draft EIR document regarding air quality impacts.

Comments on a Draft EIR

The District may provide written comments on the air quality impact analysis and recommended mitigation measures discussed in the Draft EIR. The District should expect a written response (in the form of responses in the Final EIR or by separate letter) from the lead agency on any comments it has made on a Draft EIR.

District As Commenting Agency

The District may act as a commenting agency for any project that has the potential to impact air quality. Typically, the District will request that the planning agency make it a condition of the use permit for the applicant to obtain an Authority to Construct from the District. Specific mitigation measures to control direct or fugitive emissions of air contaminants may also be suggested as use permit conditions.

Data Needed For District Review

In order for the District to properly review a project, Lead Agencies should send a complete project description and location (preferably including a map), site plans, and tentative tract or parcel maps, if applicable; and data relative to direct and indirect (associated with motor vehicle trips) emissions associated with the project. For all EIRs prepared for projects in Shasta County, the District requests that it be sent the Notice of Preparation (NOP). If an air quality study is prepared for a project at the Initial Study level, it should be summarized and the results reported in the Initial Study and the entire air quality study should be provided to the District. All assumptions used in the modeling analysis for any project should be clearly stated.

The Draft EIR prepared for any project involving direct or indirect emissions of air contaminants should be sent to the District for review and comment. Where an air quality study is prepared for a project, it should be summarized and the results reported in the Draft EIR and the entire air quality study should be included as an appendix or as a separate report. All assumptions used in the modeling analysis for the project should be clearly stated. When the Draft EIR includes air quality mitigation measures, the required mitigation monitoring and reporting should be included in or with the Draft EIR.

Thresholds of Significance

Significant air quality impacts are defined to include situations where a proposed project "violates any ambient air quality standard, contributes substantially to an existing or projected air quality violation, or exposes sensitive receptors to substantial pollutant concentrations." Air quality impacts may be caused by direct emissions from stationary sources or by indirect emissions (associated with motor vehicles and/or area wide emission sources). Area sources are sources that individually emit small quantities of air pollutants, but which cumulatively may represent significant quantities of emissions. Water heaters, fireplaces, wood heaters, lawn maintenance equipment, and application of paints and lacquers are examples of area source emissions. Projects demonstrated to have

significant adverse impacts are required to mitigate impacts to levels considered less than significant or to prepare an environmental impact report (EIR).

A violation of air quality standards can be predicted for pollutants that can be modeled for atmospheric concentration. Typically, this modeling is done by a consulting firm with modeling expertise using EPA-approved dispersion models. Also, by comparing a project's daily or annual emissions with emission levels considered significant under local or state law, this impact can be evaluated. One such level is the stationary source emissions offset threshold required in a specific city or county Air Quality Element of the General Plan. With respect to toxic emissions, on November 14, 2000, the Shasta County Air Pollution Board approved a policy document establishing guidelines for toxic health risk assessments. Under these guidelines, the air pollution control officer (APCO) can approve a new source if the cumulative excess cancer risk to the nearest sensitive receptor is less than 10 in a million and the total hazard index (THI) is less than or equal to one.

The direct emissions from stationary sources will be calculated by District staff after receiving complete emission data from the applicant proposing the project. While District Rule 2:1-New Source Review establishes emission thresholds at which Best Available Control Technology (BACT) is to be required for new or modified emission sources, projects are usually not recognized as having a significant environmental impact unless the direct stationary source emissions of either oxides of nitrogen, reactive organic compounds, or inhalable particulate matter (PM_{10}) exceed 25 Tons/yr. The preparation of an EIR and the requirement of emission offsets (depending on policies stated in the Air Quality Element of the General Plan for the jurisdiction) may be requested of the applicant by the planning agency when emissions of the above-mentioned pollutants exceed the 25 Tons/yr. threshold.

Indirect emission sources are defined as any building, facility, structure, or property that attracts or generates mobile source activity (autos and trucks). For projects such as office parks, shopping centers, residential subdivisions, and other indirect sources, motor vehicles traveling to and from the projects represent the primary source of air pollutant emissions. With respect to indirect and area wide emissions of PM_{10} and ozone precursors, the District coordinates with the planning agency having jurisdiction over the proposed project to apply standard mitigation measures (SMMs) and best available mitigation measures (BAMMs) to the project as listed in the respective Air Quality Elements. SMMs are applied to all projects, while the list of BAMMs found in the respective Air Quality Element are reviewed by the planning agency staff for consideration of specific project applicability at two distinct indirect emission thresholds:

Level A	25 pounds per day of either oxides of nitrogen or reactive organic compounds 80 pounds per day of inhalable particulate matter (PM_{10})
Level B	137 pounds per day of either oxides of nitrogen, reactive organic compounds, or inhalable particulate matter (PM_{10})

The project's indirect and area wide emissions are estimated by planning agency staff using the latest version of the URBEMIS Model approved for use by the California Air Resources Board. All of the planning agencies have the latest version of this modeling program which predicts the indirect and

area wide emissions of various types of land uses. Generally, the planning staff is able to work directly with the project applicant in reviewing the lists of mitigation measures which may be appropriate for implementation on a specific project. If the project's indirect and area wide emissions are greater than the Level A thresholds but less than Level B thresholds, appropriate Level A mitigation as listed in the jurisdiction's Air Quality Element to the General Plan should be implemented by the project applicant. If the project's indirect and area wide emissions remain above the Level B threshold of 137 pounds per day (25 Tons/yr.) after applying all feasible mitigation measures, the project is considered to have a significant impact from an air quality perspective and an EIR is appropriate for the project.

Construction Impacts

A project's construction phase produces many types of emissions, but PM_{10} is the pollutant of greatest concern. PM_{10} emissions can result from a variety of construction activities, including excavation, grading, demolition, vehicle travel on paved and unpaved surfaces, and vehicle exhaust. Construction related emissions can cause substantial increases in localized concentrations of PM_{10}, as well as affecting PM_{10} compliance with ambient air quality standards on a regional basis. Particulate emissions from construction activities can lead to adverse health effects as well as nuisance concerns such as reduced visibility and soiling of exposed surfaces. Asbestos can also be of concern during demolition activity associated with construction. The use of diesel powered construction equipment produces ozone precursor emissions and combustion related particulate emissions.

The District's approach to minimizing construction PM_{10} impacts is to require implementation of effective and comprehensive control measures. PM_{10} emitted during construction can vary greatly depending on the level of activity, the specific operations taking place, the equipment being operated, local soils, weather conditions, and other factors, making quantification difficult. Despite this variability in emissions, experience has shown that there are a number of feasible control measures that can be reasonably implemented to significantly reduce PM_{10} emissions from construction. The District has provided planning jurisdictions with suggested mitigation measures to reduce PM_{10} impacts to a level considered less-than-significant.

Project construction sometimes requires the demolition of existing buildings at the project site. Buildings sometimes include materials containing asbestos. Airborne asbestos fibers pose a serious health threat if adequate control techniques are not carried out when the material is disturbed. The demolition, renovation, or removal of asbestos-containing materials is subject to the limitations of the National Emissions Standards for Hazardous Air Pollutants (NESHAP) regulations as listed in the Code of Federal Regulations requiring notification and inspection. Most demolitions and many renovations are subject to an asbestos inspection prior to start of activity. The Environmental Protection Agency (EPA) Region IX office has authority to implement the asbestos NESHAP in Shasta County and should be consulted by owners or contractors prior to commencing any demolition or renovation of any building to determine inspection and compliance requirements. Notification of the District and EPA Region IX is required for all projects involving the handling of asbestos-containing materials. Strict compliance with existing asbestos regulations will normally prevent asbestos from being considered a significant adverse impact.

Odor Impacts

Odor impacts can be judged significant based on the number of complaints expected for each type of odor producing process. While offensive odors rarely cause any physical harm, they can be very unpleasant, leading to considerable distress among the public and often generating citizen complaints to local governments and the District. Any project with the potential to frequently expose members of the public to objectionable odors will be deemed to have a significant impact. Odor impacts on residential areas and other sensitive receptors, such as hospitals, day-care centers, schools, etc., warrant the closest scrutiny, but consideration should also be given to other land uses where people may congregate, such as recreational facilities, work sites, and commercial areas. Analysis of potential odor impacts should be conducted for the following two situations:

Generators – projects that would potentially generate odorous emissions proposed to locate near existing sensitive receptors or other land uses where people may congregate, and

Receivers – residential or other sensitive receptor projects or other projects built for the intent of attracting people locating near existing odor sources.

The District has determined that the following facilities are examples of the type of facility that has the potential to produce odors and may require special attention in the environmental review process:

Wastewater Treatment Facilities
Sanitary Landfills
Transfer Stations
Composting Facilities
Asphalt Batch Plants
Chemical Manufacturing
Fiberglass Manufacturing
Polyester Resin Use
Painting/Coating Operations (e.g. auto body shops)
Food Processing Facilities
Rendering Plants

If a proposed project is determined to be a potentially significant odor source, mitigation measures should be required. For some projects, operational changes, add-on controls, or process changes, such as carbon absorption, neutralizing agents, incineration, or relocation of stacks/vents can reduce odorous emissions. In many cases, however, the most effective mitigation strategy is to provide a sufficient distance, or buffer zone, between the source and the receptor(s). Experience has shown that locating upwind from an odor source does not necessarily eliminate potential problems, since areas with reliable prevailing winds still experience days with light and variable winds and days with

winds opposite prevailing winds related to the passage of storms. Residents in these upwind areas, while exposed less frequently, may still experience odor impacts or be more sensitive to the odors.

Hazardous Air Pollutants (HAPs)

There are currently more than 900 substances classified as hazardous air pollutants by the ARB and EPA. All projects requiring air quality permits from the District are evaluated for HAP emissions. A screening health risk assessment is performed for any source emitting HAPs using estimated emission rates, stack exhaust flow rates, SCREEN 3 modeling, individual component substance risk factors, and distances to receptors. The thresholds of significance cited earlier are used as references in evaluating necessary mitigation.

Specific mitigation measures should be identified and considered for those projects that may release toxic or hazardous air pollutants to the atmosphere in amounts that may be injurious to nearby populations. Such mitigation measures should consider both routine and non-routine toxic air pollutant releases. Mitigation measures may involve handling, storage, and disposal methods that minimize release of the subject substances to the atmosphere. In some cases, air pollution control devices or process operation modifications can be employed. Furthermore, facilities that may release toxic or hazardous substances to the atmosphere should not be located adjacent to sensitive receptors such as residences, schools, day-care centers, extended-care facilities, and hospitals.

Lead Agencies should also be aware that many facilities such as dry cleaners and gasoline stations produce toxic emissions, but under most circumstances, existing controls reduce impacts to less than significant levels. Therefore, it would not be appropriate to automatically reject such facilities just because they are near a sensitive receptor. More detailed analysis to determine the potential risk and feasible control measures may be appropriate in these cases. Projects exceeding a one in one million excess cancer risk or a toxic hazard index of 1.0 are required to install Toxic Best Available Control Technology (T-BACT) in accordance with the District Toxics Health Risk Assessment Policy adopted on November 14, 2000.

The District must follow certain procedures outlined in Section 42301.6 of the California Health and Safety Code (CH&SC) for approval of permits for facilities that would have the potential to emit hazardous air pollutants within 1000 feet of a school. This usually involves conducting a screening health risk assessment and notification of surrounding receptors and the parents of the children attending the subject school(s).

Projects where significant numbers of diesel powered vehicles will be operating such as truck stops, transit centers, and warehousing may create risks from toxic diesel particulate emissions. These facilities and vehicles may not be subject to District permitting and so may need mitigation measures adopted by the Lead Agency to reduce this impact. Measures such as limiting idling, electrifying truck stops to power truck auxiliary equipment, use of diesel particulate filters, and use of alternative fuel heavy-duty trucks have been required by some jurisdictions.

Cumulative Emission Analysis

Individual project emissions are cumulatively significant when modeling shows that the combined emissions from the project and other existing and planned projects will exceed air quality standards. An adequate cumulative impact analysis considers a project over time and in conjunction with other related past, present, and reasonably foreseeable future projects whose impacts might compound or interrelate with those of the project being assessed. A single source of hazardous air pollutants (HAPs) may be insignificant, but when combined with emissions from neighboring sources could expose sensitive receptors to significant pollutant levels. Cumulative analysis of HAPs can be accomplished by identifying all sources of these pollutants near the project site and using a dispersion model to determine exposure levels from the combined emissions of all sources. Dispersion modeling, if indicated by initial screening, should include existing sources, the project, and any reasonably foreseeable projects.

Typical Projects Requiring District Permitting

District Rule 2:1A requires that any person who is building, erecting, altering, or replacing any article, machine, equipment or other contrivance which causes the issuance of air contaminants, shall first obtain written authority for such construction from the Air Pollution Control Officer (APCO). Examples of air contaminant emitting equipment and processes include (but are not limited to):

Agricultural products processing
Bulk material handling
Chemical blending, mixing, manufacturing, storage, etc.
Combustion equipment (boilers, engines, heaters, incinerators, etc.)
Metals etching, melting, plating, refining, etc.
Plastic and fiberglass forming and manufacturing
Petroleum production, manufacturing, storage, and distribution
Rock and mineral mining and processing
Solvent use (de-greasing, dry cleaning, etc.)
Surface coating and preparation (painting, blasting, etc.)
Lumber and wood products manufacturing
Motor Burnout Ovens

Land Use Conflicts and Sensitive Receptors

The location of a development project is a major factor in determining whether it will result in localized air quality impacts. The potential for adverse air quality impacts increases as the distance between the source of emissions and members of the public decreases. Impacts on sensitive receptors are of particular concern. Sensitive receptors are facilities that house or attract children, the elderly, people with illnesses, or others who are especially sensitive to the effects of air pollutants. Hospitals, schools, convalescent facilities, and residential areas are examples of sensitive receptors.

For each of the situations discussed below, the impacts generally are not limited only to sensitive receptors. *All* members of the population can be adversely affected by criteria pollutants, toxic air contaminants, odor, and dust. Therefore, any consideration of potential air quality impacts should include all members of the population. This discussion focuses on sensitive receptors, however, because they are most vulnerable to the effects of air pollution.

Air quality problems arise when sources of air pollutants and sensitive receptors are located near one another. There are several types of land use conflicts that should be avoided:

> Development projects with sensitive receptors in close proximity to a congested intersection or roadway with high levels of emissions from motor vehicles. High concentrations of carbon monoxide, fine particulate matter, or toxic air contaminants are the most common concerns.
>
> Development projects with sensitive receptors close to an industrial source of toxic air contaminants.
>
> Development projects with sensitive receptors close to a source of odorous emissions. Although odors generally do not pose a health risk, they can be quite unpleasant and often lead to citizen complaints to the District and to local governments.

Localized development-related air pollution impacts to sensitive receptors generally occur in one of two ways:

1) a (new) source of air pollutants is proposed to be located close to existing sensitive receptors; for example, an industrial facility proposed for a site near a school; or

2) a (new) development project with sensitive receptors is proposed near an existing source of air pollutants; for example, a hospital proposed for a site near a refinery.

Specific legislation has addressed the first concern with respect to evaluating potential impacts to schools. Section 42301.6 of the California Health and Safety Code (CH&SC) imparts certain evaluation and notification requirements for the District's approval of permits for facilities that would have the potential to emit hazardous air pollutants that would be located within 1000 feet of a school, and Section 39003 of the Education Code and Section 21151.4 of the PRC requires Lead Agencies to not approve Negative Declarations or Environmental Impact Reports for any new school facilities which are located within ¼ mile of any potential source of hazardous air emissions unless certain requirements are met.

For all development projects, preliminary consultation between project proponents, Lead Agency staff, and District staff can be helpful in avoiding or minimizing localized impacts to sensitive receptors. When evaluating whether a development proposal has the potential to result in localized impacts, the District should assist Lead Agency staff in considering the nature of the air pollutant emissions, the proximity between the emitting facility and sensitive receptors, the direction of prevailing winds, and local topography. Often, providing an adequate distance, or a buffer zone, between the source of emissions and the receptor(s) will mitigate the potential problem in many cases. This underscores the importance of addressing these potential land use conflicts as early as possible in the development review process.

Oatey
FLOW GUARD GOLD

MATERIAL SAFETY DATA SHEET
This Material Safety Data Sheet complies with the U.S. OSHA Hazard Communication Standard 29CFR 1910.1200

CODE: M/L040

PRODUCT: TARAMET STERLING® LEAD-FREE SOLDER

TARACORP

NFPA/HMIS HAZARD CODES: HEALTH: 1/1 FIRE: 0/0 REACTIVITY: 0/0 SPECIAL: NA

0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

SECTION I

MANUFACTURERS NAME: Taracorp
1690 Lowery Street
Winston-Salem, NC 27101

ISSUE DATE: October 2004

INFORMATION PHONE: 336-777-8600

SECTION II HAZARDOUS INGREDIENTS

INGREDIENT	CAS NO.	US-NIOSH RTECS NO.	US OSHA AL	US OSHA PEL	ACGIH TLV	WT. PERCENT
Tin	7440-31-5	XP7320000	NE	2.0mg/m3	2.0mg/m3	Balance
Copper	7440-50-8 (dust) (fume)	GL5325000	NE	1.0mg/m3 0.1mg/m3	1.0mg/m3 0.2mg/m3	4.0 – 5.0
Selenium	7782-49-2	VS7700000	NE	0.2mg/m3	0.2mg/m3	.04 - .2

NE=None Established AL=Action Level PEL=Permissible Exposure Limit TLV=Threshold Limit Value

SECTION III PHYSICAL DATA

APPEARANCE & ODOR (AT NORMAL CONDITIONS): Solid -Silver to silver-gray metallic metal-No odor
SPECIFIC GRAVITY: 7.38
MELTING POINT RANGE: (degrees F) 410-418
BOILING POINT: (degrees C) Information not available
SOLUBILITY IN WATER: Insoluble
PH: Not applicable

SECTION IV FIRE & EXPLOSION HAZARD DATA

FLASH POINT: Non-flammable
FLAMMABLE LIMITS: Not Applicable
EXTINGUISHING MEDIA: No specific agents recommended
SPECIAL FIRE FIGHTING PROCEDURES: If involved in fire, use full protective clothing and NIOSH/MSHA approved self-contained breathing apparatus operated in a positive-pressure mode.
UNUSUAL FIRE & EXPLOSION HAZARDS: The solid metal form is not a fire hazard. However, it is possible that dust generated from processing operations may present a moderate fire or explosion hazard.

SECTION V REACTIVITY DATA

STABILITY: Stable
CONDITIONS TO AVOID: Not Applicable
INCOMPATIBILITY: Chlorine, Turpentine, Magnesium, and Acetylene Gas
HAZARDOUS DECOMPOSITION PRODUCTS: At temperatures above the melting point metal oxide fumes may be evolved.
HAZARDOUS POLYMERIZATION: Will not occur.

SECTION VI HEALTH HAZARD DATA

NOTE: Exposure to the solid form of this product presents few health hazards in itself. However, normal handling or processing of this material may result in exposure to product components and/or decomposition products, which may present a health hazard.

ROUTES OF ENTRY: Dust/fume inhalation; dust ingestion.

SYMPTOMS & EFFECTS OF OVEREXPOSURE:

Chronic (prolonged) overexposure to **tin** can result in benign pneumoconiosis (stannous). This form of pneumoconiosis produces progressive x-ray changes of the lungs as long as exposure exists, but there is no distinctive fibrosis, no evidence of disability and no special complicating factors.

Acute (severe short-term) overexposure to **tin** can cause irritation of the eyes, skin, mucous membranes and respiratory system. Acute overexposure to **copper** dust/fume can cause irritation of the eyes, nose, throat and skin, and under severe fume overexposure can cause metal fume fever with flu-like symptoms such as sweet metal taste, dry throat, coughing, fever and chills, tight chest, dyspnea, headache, blurred vision, back pain, nausea, vomiting, fatigue. Symptoms usually disappear within 24 hours. Copper may cause skin and hair discoloration. Inhalation of copper dusts may cause changes in the gums and mucous lining of the mouth which is generally attributable to localized tissue effect rather than general toxicity.

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE: Pre-existing conditions of the lungs. Wilson's Disease (Genetic Trait)

CARCINOGENITY: Not listed as a carcinogen by NTP, IARC, OSHA, ACGIH

EMERGENCY & FIRST AID PROCEDURES:

SKIN: Normal hygiene and first aid procedures - wash with soap and water. If irritation develops or persists obtain medical attention get medical attention.

EYES: Flush well with running water to remove particulate. If irritation persists obtain medical attention.

ACUTE INHALATION: Remove from exposure. Obtain immediate medical attention. If breathing has stopped, initiate artificial resuscitation.

INGESTION: Give water; induce vomiting only in a conscious non-convulsing individual; Obtain immediate medical attention.

SECTION VII PROTECTION MEASURES

RESPIRATORY PROTECTION: Respiratory protection is required where airborne exposures exceed US-OSHA/ACGIH permissible air concentrations. Respirator selection shall be made in accordance with the U.S. OSHA Respiratory Protection Standard, 29CFR 1910.134.

VENTILATION: Ventilation, as described in "Industrial Ventilation, A Manual of Recommended Practice", by the American Conference of Governmental Industrial Hygienists, is recommended to maintain exposure levels below the permissible exposure limits (PEL's) or threshold limit values (TLV's) specified by US-OSHA or other local or state regulations.

PROTECTIVE GLOVES: Recommended for prolonged contact/heat.

EYE PROTECTION: Safety glasses or goggles are recommended where the possibility exists of getting dust particles in the eyes. Safety glasses or goggles with face-shield are recommended around molten metal.

OTHER PROTECTIVE EQUIPMENT: Safety equipment should be worn as appropriate for the work environment.

WORK/HYGIENIC PRACTICES: Do not permit eating, drinking, or the use of cosmetics or tobacco products while handling or processing material or in product work areas. Practice good personal hygiene procedures. Wash hands and face thoroughly before eating, drinking, applying cosmetics or using tobacco products. Avoid inhalation and ingestion of product, and activities, which generate dust or fume. Keep melting/soldering temperatures as low as possible to minimize the generation of fume.

SECTION VIII PRECAUTIONS FOR SAFE HANDLING & USE

PRECAUTIONS TO BE TAKEN IN HANDLING & STORING: Practice good housekeeping procedures to prevent dust accumulations. Keep material dry. Avoid storage near incompatible materials (See Section V). Keep product away from children and their environment and domestic animals.

OTHER PRECAUTIONS: Special attention is drawn to the requirements of the U.S. OSHA Respirator (1910.134) should airborne exposures exceed the U.S. OSHA PEL. Inadvertent contaminants to product such as moisture, ice, snow, grease or oil can cause an explosion when charged to a molten metal bath or melting furnace (preheating metal will remove moisture from the product).

SECTION IX SPILL OR LEAK PROCEDURES

SPILL OR LEAK PROCEDURES:

1. Material in dust form-minimize exposure. Clean up using dustless methods (i.e. HEPA Vacuum). Do not use compressed air.
2. Place in closed-labeled containers for recycling or disposal.
3. Keep out of waterways.

NOTE: Cleanup personnel should wear protective clothing and respiratory protection where significant dust/fume exposure exists.

OTHER PROCEDURES:
For large product users or involving large product quantities, we recommend that the purchaser establish a spill prevention, control and counter measure plan. This plan should include procedures for proper storage as well as clean up of spills or leaks. The procedures should conform to safe practices and provide for proper recovery and/or disposal. Depending on the quantity spilled, notification to the U.S. National Response Center (800-424-8802) may be required in case of hazardous substances. (See USEPA and USDOT regulations: also various state and local regulations.)
WASTE DISPOSAL METHODS: May have value on a recycled basis. If disposed of, dispose of in a permitted disposal site in accordance with all federal, state and local disposal or discharge regulations.

SECTION X UNITED STATES SARA TITLE III INFORMATION

This product/mixture contains the following toxic chemical(s) subject to the reporting requirements of Section 313 of title III of the U.S. Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. The percent by weight of each toxic chemical and its associated chemical abstract system (CAS) number are to be found in Section II of this Material Safety Data Sheet.

CHEMICAL NAME	EHS RQ (LBS) (*1)	EHS TPQ (LBS) (*2)	SEC.313 (*3)	313 CATEGORY (*4)	311-312 CATEGORIES (*5)
Copper	Not Applicable	Not Applicable	Yes	Copper	H-1

-FOOTNOTES-

*1= Reportable quantity of extremely hazardous substance, Section 302.
*2= Threshold planning quantity, extremely hazardous substance, Section 302.
*3= Toxic chemical list, Section 313
*4= Chemical category as required by Section 313 (40 CFR 372.42). Subject to annual release reporting requirements.
*5= Hazard category for SARA Section 311/312 reporting:

Health	H-1 = Immediate (ACUTE) Health Hazard	Physical	P-3 = Fire Hazard
	H-2 = Delayed (CHRONIC) Health Hazard		P-4 = Sudden Release of Pressure Hazard
			P-5 = Reactive Hazard

SECTION XI UNITED STATES CERCLA SECTION 103 INFORMATON

This product/mixture contains the following chemicals subject to the release reporting of Section 302.

CHEMICAL NAME	RQ (LBS)
Copper	5000 (*1)

-FOOTNOTES-

*1= Reportable quantity (RQ) under CERCLA Section 302. Spills to the environment exceeding the reportable quantity in any 24-hour period must be reported to the U.S. National Response Center (800) 424-8802. No reporting of releases of the hazardous substance(s) is required if the diameter of the pieces of the solid metal(s) released is equal to or exceeds 100 micrometers (0.004 inches).

SECTION XII TRANSPORTATION INFORMATION

PROPER SHIPPING NAME:	Non-regulated as shipped.
TECHNICAL NAME:	NA
HAZARD CLASS:	NA
UN NO.:	NA
PACKING GROUP:	NA
EMERGENCY RESPONSE GUIDE NUMBER:	NA
OTHER:	NA

SECTION XIII ADDITIONAL INFORMATION

NO ADDITIONAL INFORMATION

This Material Safety Data Sheet is offered solely for your information, consideration and investigation. Taracorp, Inc. provides no warranties, either express or implied, and assumes no responsibilities for the accuracy or completeness of the data contained in this document. The data in this Material Safety Data Sheet relates only to this product and does not relate to use in combination with any other material or in any process.

Plastic Pipe Cements

Primers, Cleaner & Accessories

SPECIFIC USES

Use Hercules plastic pipe cements, primers and cleaner for bonding rigid and flexible plastic pipe and fittings.

SPECIFIC APPLICATIONS*

All cements, primers and cleaner can be used on PVC, CPVC, ABS and styrene pipe and fittings as specified on individual tables.

WARNINGS OR CAUTIONS

- Plastic Pipe Cements and related products are necessarily formulated with flammable solvents and ingredients which are harmful or fatal if swallowed and hazardous when used with improper ventilation. Avoid contact with eyes or skin. Clear and detailed cautions appear on all labels of Hercules Plastic Pipe Cements and cleaner along with specific antidotes and recommended emergency treatment. It is suggested that all users familiarize themselves with the entire label, including precautions, prior to use. Use of respirator is recommended where ventilation is limited.
- Use of a respirator is recommended where ventilation is limited.
- Use splash goggles or other suitable eye protection.
- Containers should be kept tightly closed when not in use, and covered whenever possible during use.
- DO NOT mix cleaner or primer with cement.
- Do not use cement that is lumpy, curdled or thickened.
- Always keep this, and all other cements, out of reach of children.
- Plastic Pipe Cements, Primers and Cleaner should not be stored near heat or open flames, nor should they be allowed to freeze. Recommended temperature range for good shelf life should not go below 40°F nor above 100°F. If cements are subjected to freezing temperatures during shipment or for other reasons, they may thicken or gel. If placed in a warm (not hot) area, they will return to useable original condition.
- Hercules Plastic Pipe Cements are made to be used as received in the containers provided. Never attempt to change their viscosity by adding thinner.

DIRECTIONS FOR USE

1. Choose the cement appropriate for the pipe and fitting being used.
2. Stir or shake cement well before using. Wear protective gloves when using solvent cement. Do not use vinyl gloves.
3. Cut pipe square. If a pipe cutter is used, file off raised bead. Remove all burrs inside and outside pipe using a knife, file or reamer.
4. Wipe end of pipe and inside of fitting with clean cloth to remove dirt, grease and moisture. Moisture may slow cure. Dirt or grease may prevent adhesion. Cleaner (not to be confused with Primers) may be used for removal of grease and other foreign matter. Do not apply cement or primer until pipe is clean and dry.
5. Check dry fit of pipe and fitting. Pipe must enter at least 1/3 of the way for proper fit. If too tight, sand or file pipe to make good fit. Be sure pipe and/or fitting are not out of round. Pipe must bottom fully into fitting socket during final assembly with cement.
6. For PVC and CPVC connections, use Hercules Primer to remove gloss from pipe end and inside of fitting. Apply primer with its own dauber. (ABS pipe should only be wiped clean with a dry cloth.)
7. Apply a thin coat of the proper cement to outside of pipe and inside of fitting. Avoid getting excess cement past fitting socket. Then, quickly apply a liberal amount evenly on pipe end equal to socket depth. Since weather conditions affect priming and cementing action, repeated applications may be necessary before joining. In cold weather, more time is required for curing and full bond strength.
8. While the cement is still wet, insert pipe into fitting with a 1/4 turn twist until it bottoms.
9. Hold joint together 15 to 30 seconds (longer for larger pipe sizes) to prevent pipe from backing out of tapered socket. Check instructions on each specific cement for proper procedures.
10. After assembly, wipe excess cement from joint with a clean cloth. Avoid disturbing or moving the joint.
11. Allow sufficient time for good handling strength. This will depend on the temperature. On pressure lines, wait 24 hours or longer before applying full pressure. The presence of a strong solvent smell indicates the joint is not sufficiently cured. Short cure periods are satisfactory for high temperatures with low humidity, small pipe sizes and interference type fittings. Longer curing periods are necessary for low temperatures, larger pipe sizes, loose fits and high humidity. Do not try to speed up the cure by artificial means – this could cause porosity and blisters in the cement film.

For Delivery by Fax	Call 1-800-942-4636
Internet	See MSDS section of **www.herchem.com**
Mail	Contact Hercules at address below or any Hercules representative

* For special applications which may not be covered in this or other Hercules literature, please contact Hercules Technical Services Department by phone at 1-800-221-9330 or send a fax to 1-800-333-3456 or visit our web-site at www.herchem.com.

AVERAGE NUMBER OF JOINTS per 1 QT. HERCULES CEMENTS

Pipe Fitting Diameters	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"	3"	4"	6"	8"	10"	12"	15"
PVC Gray	340	260	180	130	100	76	44	36	12	8	6	4	2
PVC Clear Heavy Duty	340	260	180	130	100	76	44	36	12	8	6	4	2
PVC Clear Medium	300	200	140	96	70	54	36	30	10	6	-	-	-
PVC Clear Regular	260	180	120	90	64	50	30	26	8	-	-	-	-
PVC Clear "Below Zero"	260	180	120	90	64	50	30	26	8	-	-	-	-
ABS	300	200	140	96	70	54	36	30	10	6	-	-	-
CPVC	260	180	120	90	64	50	30	26	8	-	-	-	-
MULTI-PURPOSE	260	180	120	90	64	50	30	26	8	-	-	-	-
ABS/PVC	260	180	120	90	64	50	30	26	8	-	-	-	-
PRIMER	235	160	110	80	58	45	25	20	6	-	-	-	-

ISO 9001: 2000 Certified

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Solvent Weld Joint Failures

Pipe And Fitting Related

Loose Fitting Components:

Failure of the pipe and or fittings to conform to the dimensional tolerances required by the respective specifications, resulting in a fit that when tested dry is loose enough to provide less than adequate surface contact with the fitting.

Tight Fitting Components:

Failure of the pipe and or fittings to conform to the dimensional tolerances required by respective specifications, resulting in a fit that when tested dry is so tight as to prevent proper assembly in addition to squeezing out the cement from inside the joint when assembled.

Out Of Round Egg Shaped Components:

Failure of the pipe and or fittings to conform to the out of round requirements of respective specifications, resulting in gaps that cannot be filled by a cement meeting the resin content requirements. Given the very nature of solvent cements, in which the overwhelming portion is subject to evaporation resulting in substantial shrinkage of the cement layer, even a PVC cement with double the minimum amount of resin specified will not possess gap filling properties of any consequence.

Extrusion Aids On Mating Surfaces (Wax And Silicone):

Occasionally, some pipe compounds contain an excessive amount of extrusion aids, such as metallic stearates and waxes, which result in finished pipe where these components are integrated at high levels into the entire matrix of the pipe wall. Similarly, the presence of molding release agents used to facilitate removal of molded fittings during manufacture, such as silicone, while not integrated into the plastic matrix of that component, are sometimes found at high concentrations on the fitting surface.

In any event, the result is the presence of materials on the mating surface that are either difficult to remove by conventional cleaners or primers. These slick, waxy chemicals can provide a very effective barrier to the flow together mechanism so essential to the solvent welding process.

From time to time one may encounter pipe and or fitting surfaces that are exceptionally hard and consequently very resistant to penetration by the solvents used in cements to soften the mating surfaces. While this phenomenon can be found on any surface, it is most often encountered on the interior surface of the bell section of bell end pipe due to the post heating process by which the bell is formed. This situation may be aggravated when attempting to make welds involving such surfaces in cold temperatures, which inhibit solvent action even on normal surfaces.

Quality cements that fully meet or exceed testing requirements may fail to adequately soften such surfaces, therefore, the industry has recommended the use of primers to aid in the elimination of this problem.

Workmanship Related

Failure To Test Pipe With Fitting For Proper Fit

The proper snugness of the pipe and fitting selected is essential to a successful joint. Even using components that are individually within the dimensional tolerances prescribed by respective specifications, it is possible to mismatch an almost oversize socket with a piece of undersize pipe, the result being a very loose match. Conversely, the opposite over tight condition which causes squeezing out of the cement when assembled, may present itself by selection of an almost oversize pipe section to be used with a undersize fitting.

Even worse, pipe and fittings that are actually oversize or undersize may, from time to time, be found on the job site. Failure to test for dry fit will eventually result in the use of such mismatched components and consequently cause joint failures.

Failure To Cut Pipe Square

An unsquare cut results in a portion of the socket area not being in physical contact with the pipe surface. This substantially reduces the actual area of joined components in much the same way as failure to insert the pipe fully to the socket depth. A compounding factor in this cause of failure is that the area not in contact is the most critical needed area of the joint.

Failure To Remove Burrs or Raised Edges

The burrs created from the sawing of plastic pipe if not removed, can as the pipe is inserted, plough small grooves in the interface of the joining area. Such grooves can be the source of leaks. Alternately, the raised leading edge created by cutting plastic pipe with conventional pipe cutters, if not removed will have the effect of forcing the cement out in front of it as the pipe is inserted into the fitting. This results in a less than adequate amount of cement left inside the joint to melt and join the surfaces.

Failure To Clean Surfaces And Remove Foreign Materials

In manufacture, handling, storage, and transportation of the pipe, and to a lesser degree, the fittings, a concentration of foreign material that may inhibit the solvent action and or the flow together action of the joined surfaces may accumulate on the area to be solvent welded. This may vary in character from diesel exhaust residue on the pipe acquired during transportation, to atmospheric residues acquired during outside storage, or simply grease and oil from the hands of the assembler or his helpers. Also, there are often some residual extrusion aids waxy in character, and in the case of fittings some residual molds release agents slippery in character, not removed by the manufacturer. If not removed, these surface contaminants provide a serious jeopardy to the making of a successful joint.

Failure To Use Primer

The function of primer is to pre-soften the mating surfaces of the pipe and fitting. Thus allowing the surfaces to be easily softened by the solvents in the cements. While in most

cases the nature of the mating surfaces is such that the cement will provide an adequate weld by itself, conditions may exist that would require the use of a primer for adequate penetration. These include, but are not limited to, randomly encountering very hard pipe and fittings surfaces, along with cold weather cementing. Because these conditions are randomly encountered and are neither easily detected or predicted, and because a primer will always help and won't hurt, the use of a primer, especially on pressure systems is recommended. Remember, most codes call for the use of an approved primer during pressure installation. Always check with code authorities prior to eliminating the use of primer or other recommended procedures.

Failure To Assemble Joint While Cement Is Wet

The active ingredients of cements evaporate into the air very quickly. It is essential that these solvents be trapped within the assembled joint where they can actively soften the surfaces as a prerequisite to the desired flow together mating of the surfaces. Failure to work quickly enough, especially in the time frame between application of the cement and assembly of the joint, may result in the cement partially drying prior to assembly. This is one of the more common causes of joint failure, especially when working with larger diameter pipe and fittings in hot climates.

Failure To Apply An Adequate Layer Of Cement

A layer of cement of adequate proportions to fill any gaps or spaces that may exist between the pipe and fitting is

essential to a leak free joint. Failure to apply the cement in a manner consistent with this requirement will result in leaks due to voids or inadequate fusion of the mating surfaces because all components were not in direct physical contact at all joining areas. A study of joint failures suggests, this is perhaps the most common cause of joint failures.

Failure To Apply Cement Uniformly

Lack of uniformity in the cement layer will result in missed spots or areas that have less than the desired amount of cement or primers applied.

Failure To Insert Pipe To Full Socket Depth

In order to benefit by the entire socket area provided and to maximize the bond strength of the joint, the pipe must be inserted to the full depth of the socket. Failure to do so will result in a reduction of total bonded area. More importantly, due to the taper design of the socket, which causes it to be smaller in diameter at the shoulder than at the entrance, the reduction is in the most critical area of the joint.

Failure To Insert Pipe With A Twisting Action

The purpose of the twisting motion or the giving of a 1/4 turn while inserting the pipe into the socket insures the even distribution of the cement should any light or missed spots exist. Additionally, should there be any air bubbles present in the cement layer this will aid in their elimination. While failure to use a twisting motion may not be a direct cause of joint failures per se, use of the technique is helpful in eliminating other causes.

Failure To Hold Pipe In Place After Assembly

The taper design of the socket operating in conjunction with the pressures formed inside the joint by the swelling action of the cement, creates a strong tendency for the pipe to back out of the socket or fitting after assembly. This can and must be prevented by holding the assembly firmly until the cement has the opportunity to set. Failure to do so will result not only in a loss of total bonded area, but also a reduction in the most critical area of bonding surface. In addition, and just as important, backing out takes place as the cement is beginning to set, and movement at this stage can destroy any bonding and could cause joint failure.

Rough Handling Of Freshly Cemented Joints

Rough handling of an assembly that contains freshly cemented joints may result in enough movement at the interface of the mating surfaces to destroy the bond permanently. Rotation of only a few degrees of the socket on the pipe or any rough handling that results in a disruption of the cement resulting in a poor bond. A loose fitting socket, and especially one that is assembled during cold weather, is slower to set and consequently more subject to the harmful effects of rough handling.

Using Cement From A Can Left Open For A Prolonged Period

The active ingredients of any cement are very volatile and are subject to rapid evaporation into the atmosphere. A cement container left open when not in use, especially during hot weather, can lose enough of these key ingredients to

cause a complete imbalance of the formulated solvent blends. This would result in a cement that lacks the power to soften the pipe or fittings. A performance test should be applied to any questionable cement prior to application.

Pressure Testing Before Cement Has Adequately Cured

The application of pressure to an uncured joint may have the same effects as rough handling of a joint during the early stages of bond strength development. The stresses involved in even low pressure applications may be significant enough to cause the slight movement required to disrupt the welding process.

Selecting The Wrong Cement

Cements are produced in a variety of grades in an effort to tailor them for specific applications. Some contain a higher level of plastic than others and or slow evaporating solvents in the blends. These types of cements are designed for use on larger diameter pipe due to the requirement in situations for better gap filling properties and longer working time while the cement is being applied. Because of these differences, the use of cement not designed for a particular application can result in a failure caused by the cement drying prior to assembly, or less than required gap filling properties. Be safe, follow manufacturer's guidelines for selecting solvent cements.

Excess Solvent Cement

Excess cement will be forced out of the assembled joint as the pipe is inserted. Due to the tapered design of the socket

any excess that has been applied to the pipe end will be forced to the outside of the assembly where it can and should be wiped off. Any excess applied to the socket will be forced forward by the leading edge of the pipe to the inside of the assembly where it is inaccessible and will lie in a puddle or run down the inside of the pipe. The solvent penetration of the cement may in certain instances eat a hole in the wall of the pipe. This is commonly known as solvent weld pipe burn. This is especially a problem with thin wall pipe class 160 and below and bell end pipe where there is no shoulder provided as in the case of a molded fitting. In addition, the curve of the pipe where the base of the socket begins on a bell end consists of ordinary wall thickness pipe that has been stretched to form the bell. Stretching results in both a reduced thickness as well as a matrix that has less solvent resistance.

Use Of Hot Pipe Or Fittings

When exposed to the sunlight in a hot climate, the pipe surface temperature may reach 120-130 degrees Fahrenheit. Even in cooler temperatures the radiant energy of the sun will raise the exposed surface twenty or more degrees above the ambient conditions. Because application of cement to a hot surface may cause rapid flash off of the active ingredients resulting in partially dried cement at the time of assembly, this practice should be avoided. The pipe should be tested for surface temperature and if necessary, cooled down by a suitable method. One method is to wipe the surface with a wet cloth using caution to assure that the water is removed before cementing.

Stress On Joints

The practice of trying to bend the pipe around a slight curve in order to make it fit some pre-determined configuration rather than the use of a fitting that would provide the necessary offset, will result in a application of stress to fresh joints. This stress will of course result in a possible failure.

Failure to Snake Long Runs Of Pipe In A Ditch

Because of the expansion and contraction characteristics of most plastics, including PVC, long runs of pipe must be placed in a trench in a manner that will allow for contraction without placing undue stress on a freshly bonded joint. The method endorsed by the Plastic Pipe Industry is to snake the pipe in the ditch. Failure to do so may result in complete pullouts or enough disruption of the joint to result in leaks and joint failure.

Any one or a combination of these factors listed above can and most likely will cause leaks or failures. Solvent cements are not miracle workers. Follow all instructions, procedures, and manufacturer's recommendations when using any solvent cements, cleaners, and primers.
Solvent cements, cleaners, and primers are extremely flammable. Safety first, always use caution when working with these products.

Ineffective Solvent Cements, Cleaners, & Primers

Solvent cements are designed, formulated, and manufactured to soften PVC pipe and fittings for solvent welding. If solvent cements adequately soften the PVC surface it will make a

successful solvent welded joint. Characteristically solvent cements soften or it will not soften the pipe and fitting surfaces. In other words, if everything is equal during assembly application, and you make ten solvent welded joints, and you have only three that leak, it is most likely not the solvent cement. Some other variables have created the joint failures. That is not to say, solvent cement can not and will not it's strength. Evaporation and age are two common causes of strength loss in solvent cements. Solvent cements are formulated with resins, fillers, and aggressive solvents that evaporate very quickly. Each time the container is opened, solvents escape into the atmosphere, as the aggressive solvent evaporates the ratio of solvents to solids become unbalanced. This procedure alters the product viscosity causing it to become stringy, thick, and show signs of gelation. Solvent cements should not be applied when they show any of the altered descriptions above. Scrap test should be performed on any questionable solvent cement, cleaner, and primers before use in any application. These procedures are mentioned and outlined in ASTM D-2855 Standard Specifications for Making Solvent Cemented Joints. Like the pipe and fittings manufacturers' solvent cements and approved primers must meet or exceed ASTM testing standards.

Solvent cement formulations are tested, approved, and listed by several governing bodies. Products must be within these guidelines each and every time they are sampled and tested. Manufacturers' in violation or deviating from the original approved formulations could loose their product certification and listing. The test standards and approvals specifications for solvent cements and primers are listed below:

PVC SOLVENT CEMENTS	ASTM SPECIFICATION D-2564
CPVC SOLVENT CEMENTS	ASTM SPECIFICATION F-493
ABS SOLVENT CEMENTS	ASTM SPECIFICATION D-2235
ABS TO PVC CEMENTS	ASTM SPECIFICATION D-3138
PVC FLEX CEMENTS	ASTM SPECIFICATION D-2564
PRIMERS	ASTM SPECIFICATION F-656

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HOME

NEW HOUSING UNITS AND BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2004 (PRELIMINARY)

COUNTY	NEW HOUSING UNITS: SINGLE-FAMILY	NEW HOUSING UNITS: MULTI-FAMILY	NEW HOUSING UNITS: TOTAL NEW UNITS	RESIDENTIAL VALUATION ($1,000s): NEW SINGLE-FAMILY	RESIDENTIAL VALUATION ($1,000s): NEW MULTI-FAMILY	RESIDENTIAL VALUATION ($1,000s): TOTAL NEW	RESIDENTIAL VALUATION ($1,000s): RES. ALTER & ADDITS.	RESIDENTIAL VALUATION ($1,000s): TOTAL ALL RESID. VAL.
ALAMEDA	2271	3422	5693	$ 750249	$ 475595	$ 1225844	$ 307827	$ 1533671
ALPINE	22	0	22	$ 9988	$ 0	$ 9988	$ 177	$ 10165
AMADOR	312	131	443	$ 46507	$ 8691	$ 55198	$ 6857	$ 62055
BUTTE	1484	484	1968	$ 186653	$ 38973	$ 225626	$ 15064	$ 240690
CALAVERAS	825	6	831	$ 209659	$ 690	$ 210349	$ 9387	$ 219736
COLUSA	191	2	193	$ 36442	$ 181	$ 36623	$ 2245	$ 38868
CONTRA COSTA	4222	1261	5483	$ 1113574	$ 123332	$ 1236906	$ 233108	$ 1470014
DEL NORTE	121	75	196	$ 20336	$ 6257	$ 26593	$ 2228	$ 28821
EL DORADO	2055	141	2196	$ 558216	$ 13380	$ 571596	$ 33014	$ 604610
FRESNO	5381	1497	6878	$ 978176	$ 118771	$ 1096947	$ 60729	$ 1157676
GLENN	122	28	150	$ 18677	$ 1918	$ 20595	$ 4161	$ 24756
HUMBOLDT	494	115	609	$ 54142	$ 7288	$ 61430	$ 13928	$ 75358
IMPERIAL	1330	827	2157	$ 214229	$ 52657	$ 266886	$ 5702	$ 272588
INYO	16	0	16	$ 2612	$ 0	$ 2612	$ 1858	$ 4470
KERN	6653	802	7455	$ 951317	$ 48846	$ 1000163	$ 43234	$ 1043397
KINGS	723	126	849	$ 82537	$ 6530	$ 89067	$ 6356	$ 95423
LAKE	520	51	571	$ 92830	$ 4327	$ 97157	$ 8318	$ 105475
LASSEN	212	0	212	$ 31596	$ 0	$ 31596	$ 3619	$ 35215
LOS ANGELES	11752	15181	26933	$ 2923786	$ 1917063	$ 4840849	$ 1727799	$ 6568648
MADERA	1443	207	1650	$ 219596	$ 15291	$ 234887	$ 11983	$ 246870
MARIN	585	442	1027	$ 199084	$ 51040	$ 250124	$ 170556	$ 420680
MARIPOSA	175	0	175	$ 34940	$ 0	$ 34940	$ 2195	$ 37135
MENDOCINO	318	32	350	$ 27928	$ 1992	$ 29920	$ 14281	$ 44201
MERCED	2493	58	2551	$ 413137	$ 4589	$ 417726	$ 16224	$ 433950
MODOC	14	0	14	$ 2135	$ 0	$ 2135	$ 961	$ 3096
MONO	126	100	226	$ 44639	$ 24436	$ 69075	$ 5343	$ 74418
MONTEREY	1085	191	1276	$ 341618	$ 24115	$ 365733	$ 115296	$ 481029
NAPA	654	279	933	$ 197314	$ 25544	$ 222858	$ 37107	$ 259965
NEVADA	777	202	979	$ 138417	$ 25679	$ 164096	$ 23223	$ 187319
ORANGE	4380	4936	9316	$ 1204375	$ 543740	$ 1748115	$ 488020	$ 2236135
PLACER	4743	151	4894	$ 1127325	$ 14776	$ 1142101	$ 72769	$ 1214870
PLUMAS	262	8	270	$ 43751	$ 624	$ 44375	$ 2938	$ 47313
RIVERSIDE	29249	4697	33946	$ 5909185	$ 400726	$ 6309911	$ 135626	$ 6445537
SACRAMENTO	10185	2777	12962	$ 2107883	$ 260635	$ 2368518	$ 201428	$ 2569946
SAN BENITO	113	0	113	$ 21006	$ 0	$ 21006	$ 3582	$ 24588
SAN BERNARDINO	13991	4479	18470	$ 2580533	$ 357434	$ 2937967	$ 131079	$ 3069046
SAN DIEGO	9555	7751	17306	$ 2525652	$ 959610	$ 3485262	$ 390097	$ 3875359
SAN FRANCISCO	65	2303	2368	$ 29112	$ 374472	$ 403584	$ 315575	$ 719159
SAN JOAQUIN	6378	508	6886	$ 1303533	$ 34334	$ 1337867	$ 45742	$ 1383609
SAN LUIS OBISPO	1760	370	2130	$ 368866	$ 28515	$ 397381	$ 45130	$ 442511
SAN MATEO	556	478	1034	$ 261478	$ 48007	$ 309485	$ 269979	$ 579464
SANTA BARBARA	961	474	1435	$ 222091	$ 47331	$ 269422	$ 87502	$ 356924
SANTA CLARA	2688	2816	5504	$ 721272	$ 303085	$ 1024357	$ 381957	$ 1406314
SANTA CRUZ	739	65	804	$ 172603	$ 3522	$ 176125	$ 39913	$ 216038
SHASTA	888	151	1039	$ 153284	$ 8505	$ 161789	$ 21335	$ 183124
SIERRA	16	0	16	$ 2567	$ 0	$ 2567	$ 637	$ 3204
SISKIYOU	222	94	316	$ 40159	$ 7721	$ 47880	$ 7297	$ 55177
SOLANO	2418	604	3022	$ 461638	$ 43145	$ 504783	$ 42064	$ 546847
SONOMA	1343	346	1689	$ 302187	$ 35891	$ 338078	$ 80361	$ 418439
STANISLAUS	3934	497	4431	$ 678837	$ 33829	$ 712666	$ 47237	$ 759903
SUTTER	1271	25	1296	$ 220067	$ 1567	$ 221634	$ 6045	$ 227679
TEHAMA	628	12	640	$ 82670	$ 947	$ 83617	$ 3688	$ 87305
TRINITY	71	0	71	$ 10229	$ 0	$ 10229	$ 2178	$ 12407
TULARE	2384	367	2751	$ 346375	$ 25403	$ 371778	$ 15407	$ 387185
TUOLUMNE	367	28	395	$ 59871	$ 2157	$ 62028	$ 13101	$ 75129
VENTURA	1789	890	2679	$ 551767	$ 81554	$ 633321	$ 118022	$ 751343
YOLO	1697	518	2215	$ 371541	$ 47682	$ 419223	$ 29593	$ 448816
YUBA	1697	0	1697	$ 232819	$ 0	$ 232819	$ 3745	$ 236564
TOTAL	150726	61005	211731	$32013010	$ 6662397	$ 38675407	$ 5884827	$ 44560234

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 03/01/05

NONRESIDENTIAL AND TOTAL BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2004 (PRELIMINARY)

COUNTY	<------NONRESIDENTIAL BUILDING PERMIT VALUATIONS IN $1,000s------> COMMERCIAL	INDUSTRIAL	OTHER NEW	ALT. & ADD.	TOTAL	TOTAL ALL BUILDING *
ALAMEDA	$ 202776	$ 53261	$ 100467	$ 349230	$ 705734	$ 2239405
ALPINE	$ 0	$ 0	$ 429	$ 0	$ 429	$ 10594
AMADOR	$ 0	$ 0	$ 12695	$ 2032	$ 14727	$ 76782
BUTTE	$ 38502	$ 403	$ 15445	$ 17658	$ 72008	$ 312698
CALAVERAS	$ 880	$ 0	$ 10284	$ 5013	$ 16177	$ 235913
COLUSA	$ 5592	$ 0	$ 3542	$ 2176	$ 11310	$ 50178
CONTRA COSTA	$ 102547	$ 17422	$ 68105	$ 187109	$ 375183	$ 1845197
DEL NORTE	$ 559	$ 0	$ 5014	$ 649	$ 6222	$ 35043
EL DORADO	$ 36418	$ 0	$ 37807	$ 19253	$ 93478	$ 698088
FRESNO	$ 111012	$ 43490	$ 66219	$ 89310	$ 310031	$ 1467707
GLENN	$ 4012	$ 0	$ 2334	$ 2398	$ 8744	$ 33500
HUMBOLDT	$ 10012	$ 1802	$ 9144	$ 12030	$ 32988	$ 108346
IMPERIAL	$ 74747	$ 7688	$ 11813	$ 10487	$ 104735	$ 377323
INYO	$ 0	$ 0	$ 1336	$ 273	$ 1609	$ 6079
KERN	$ 59074	$ 20207	$ 80350	$ 92344	$ 251975	$ 1295372
KINGS	$ 10987	$ 996	$ 17637	$ 6878	$ 36498	$ 131921
LAKE	$ 4379	$ 0	$ 7223	$ 2313	$ 13915	$ 119390
LASSEN	$ 788	$ 0	$ 2730	$ 2826	$ 6344	$ 41559
LOS ANGELES	$ 987752	$ 178201	$ 615702	$ 1403743	$ 3185398	$ 9754046
MADERA	$ 8189	$ 1007	$ 17565	$ 6902	$ 33663	$ 280533
MARIN	$ 27921	$ 0	$ 19558	$ 46183	$ 93662	$ 514342
MARIPOSA	$ 2895	$ 0	$ 3636	$ 653	$ 7184	$ 44319
MENDOCINO	$ 4559	$ 1980	$ 7377	$ 8513	$ 22429	$ 66630
MERCED	$ 17328	$ 2357	$ 48888	$ 19635	$ 88208	$ 522158
MODOC	$ 390	$ 0	$ 2425	$ 208	$ 3023	$ 6119
MONO	$ 16363	$ 0	$ 1866	$ 424	$ 18653	$ 93071
MONTEREY	$ 54820	$ 4148	$ 20974	$ 52299	$ 132241	$ 613270
NAPA	$ 27620	$ 6405	$ 29406	$ 35885	$ 99316	$ 359281
NEVADA	$ 4998	$ 2566	$ 11347	$ 4821	$ 23732	$ 211051
ORANGE	$ 357016	$ 27374	$ 196685	$ 562826	$ 1143901	$ 3380036
PLACER	$ 148942	$ 13599	$ 73986	$ 95157	$ 331684	$ 1546554
PLUMAS	$ 2029	$ 0	$ 6186	$ 2204	$ 10419	$ 57732
RIVERSIDE	$ 561949	$ 202830	$ 332344	$ 222462	$ 1319585	$ 7765122
SACRAMENTO	$ 224417	$ 74741	$ 97515	$ 257734	$ 654407	$ 3224353
SAN BENITO	$ 4782	$ 0	$ 4319	$ 4982	$ 14083	$ 38671
SAN BERNARDINO	$ 329449	$ 435579	$ 174091	$ 205557	$ 1144676	$ 4213722
SAN DIEGO	$ 487584	$ 117124	$ 221350	$ 462072	$ 1288130	$ 5163489
SAN FRANCISCO	$ 36360	$ 0	$ 23297	$ 422265	$ 481922	$ 1201081
SAN JOAQUIN	$ 152400	$ 45090	$ 94159	$ 89341	$ 380990	$ 1764599
SAN LUIS OBISPO	$ 51627	$ 4389	$ 30706	$ 29219	$ 115941	$ 558452
SAN MATEO	$ 131712	$ 5541	$ 50866	$ 200250	$ 388369	$ 967833
SANTA BARBARA	$ 33626	$ 8263	$ 24774	$ 51989	$ 118652	$ 475576
SANTA CLARA	$ 179304	$ 45924	$ 90659	$ 600414	$ 916301	$ 2322615
SANTA CRUZ	$ 6210	$ 0	$ 10348	$ 21053	$ 37611	$ 253649
SHASTA	$ 31925	$ 4008	$ 32745	$ 16147	$ 84825	$ 267949
SIERRA	$ 0	$ 0	$ 871	$ 131	$ 1002	$ 4206
SISKIYOU	$ 7407	$ 0	$ 6049	$ 4435	$ 17891	$ 73068
SOLANO	$ 59480	$ 21827	$ 39527	$ 58326	$ 179160	$ 726007
SONOMA	$ 108733	$ 3875	$ 44114	$ 81847	$ 238569	$ 657008
STANISLAUS	$ 98854	$ 18013	$ 118998	$ 55564	$ 291429	$ 1051332
SUTTER	$ 23637	$ 14290	$ 10681	$ 6972	$ 55580	$ 283259
TEHAMA	$ 23694	$ 0	$ 10586	$ 5787	$ 40067	$ 127372
TRINITY	$ 184	$ 0	$ 2185	$ 783	$ 3152	$ 15559
TULARE	$ 62529	$ 3406	$ 64887	$ 32922	$ 163744	$ 550929
TUOLUMNE	$ 5445	$ 488	$ 10205	$ 2501	$ 18639	$ 93768
VENTURA	$ 126774	$ 45496	$ 62396	$ 118627	$ 353293	$ 1104636
YOLO	$ 30320	$ 19171	$ 23044	$ 33202	$ 105737	$ 554553
YUBA	$ 1663	$ 3881	$ 5210	$ 8114	$ 18868	$ 255432
TOTAL	$ 5103172	$ 1456842	$ 3094101	$ 6034128	$15688243	$ 60248477

*"TOTAL ALL BUILDING" IS THE SUM OF RESIDENTIAL AND NONRESIDENTIAL BUILDING PERMIT VALUATIONS.

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 03/01/05

NEW HOUSING UNITS AND BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2003

COUNTY	NEW HOUSING UNITS: SINGLE-FAMILY	MULTI-FAMILY	TOTAL NEW UNITS	RESIDENTIAL VALUATION ($1,000s): NEW SINGLE-FAMILY	NEW MULTI-FAMILY	TOTAL NEW	RES. ALTER & ADDITS.	TOTAL ALL RESID. VAL.
ALAMEDA	2087	2433	4520	$ 663584	$ 316355	$ 979939	$ 279936	$ 1259875
ALPINE	28	0	28	$ 12034	$ 0	$ 12034	$ 357	$ 12391
AMADOR	381	22	403	$ 46087	$ 1646	$ 47733	$ 6084	$ 53817
BUTTE	1493	332	1825	$ 181472	$ 26959	$ 208431	$ 15993	$ 224424
CALAVERAS	678	10	688	$ 161395	$ 1091	$ 162486	$ 9052	$ 171538
COLUSA	113	89	202	$ 23063	$ 5756	$ 28819	$ 2054	$ 30873
CONTRA COSTA	4965	1930	6895	$ 1263361	$ 190449	$ 1453810	$ 230430	$ 1684240
DEL NORTE	113	14	127	$ 18477	$ 1026	$ 19503	$ 1421	$ 20924
EL DORADO	1911	28	1939	$ 507970	$ 3525	$ 511495	$ 33497	$ 544992
FRESNO	4479	1520	5999	$ 766544	$ 105188	$ 871732	$ 60272	$ 932004
GLENN	91	51	142	$ 11576	$ 3567	$ 15143	$ 3104	$ 18247
HUMBOLDT	378	46	424	$ 40704	$ 2840	$ 43544	$ 12622	$ 56166
IMPERIAL	977	234	1211	$ 126112	$ 11749	$ 137861	$ 6911	$ 144772
INYO	19	0	19	$ 4036	$ 0	$ 4036	$ 2039	$ 6075
KERN	5529	583	6112	$ 776322	$ 31540	$ 807862	$ 34534	$ 842396
KINGS	835	143	978	$ 93243	$ 7033	$ 100276	$ 8327	$ 108603
LAKE	416	124	540	$ 73744	$ 8934	$ 82678	$ 9217	$ 91895
LASSEN	159	4	163	$ 23959	$ 436	$ 24395	$ 2775	$ 27170
LOS ANGELES	10217	11096	21313	$ 2584849	$ 1178702	$ 3763551	$ 1390128	$ 5153679
MADERA	1144	90	1234	$ 160975	$ 5790	$ 166765	$ 14808	$ 181573
MARIN	652	60	712	$ 173460	$ 8114	$ 181574	$ 160485	$ 342059
MARIPOSA	135	2	137	$ 24501	$ 257	$ 24758	$ 1646	$ 26404
MENDOCINO	378	4	382	$ 33062	$ 214	$ 33276	$ 15091	$ 48367
MERCED	2489	457	2946	$ 356228	$ 39491	$ 395719	$ 18198	$ 413917
MODOC	35	0	35	$ 3508	$ 0	$ 3508	$ 754	$ 4262
MONO	95	223	318	$ 33769	$ 35445	$ 69214	$ 5006	$ 74220
MONTEREY	1063	322	1385	$ 311006	$ 43397	$ 354403	$ 99349	$ 453752
NAPA	593	56	649	$ 182883	$ 4854	$ 187737	$ 45623	$ 233360
NEVADA	709	203	912	$ 116143	$ 21426	$ 137569	$ 20812	$ 158381
ORANGE	5565	3746	9311	$ 1314014	$ 352995	$ 1667009	$ 409967	$ 2076976
PLACER	4670	584	5254	$ 1037442	$ 51984	$ 1089426	$ 46182	$ 1135608
PLUMAS	260	3	263	$ 44022	$ 298	$ 44320	$ 2384	$ 46704
RIVERSIDE	25137	5224	30361	$ 4665678	$ 406483	$ 5072161	$ 106855	$ 5179016
SACRAMENTO	10493	3340	13833	$ 2078897	$ 303035	$ 2381932	$ 155496	$ 2537428
SAN BENITO	98	0	98	$ 14796	$ 0	$ 14796	$ 5330	$ 20126
SAN BERNARDINO	10820	1820	12640	$ 1958448	$ 138885	$ 2097333	$ 103903	$ 2201236
SAN DIEGO	9455	8859	18314	$ 2343804	$ 1007463	$ 3351267	$ 332540	$ 3683807
SAN FRANCISCO	73	1509	1582	$ 22502	$ 243960	$ 266462	$ 280360	$ 546822
SAN JOAQUIN	6727	225	6952	$ 1240994	$ 17239	$ 1258233	$ 38622	$ 1296855
SAN LUIS OBISPO	1943	279	2222	$ 386182	$ 19964	$ 406146	$ 41004	$ 447150
SAN MATEO	735	569	1304	$ 257900	$ 86890	$ 344790	$ 265317	$ 610107
SANTA BARBARA	1240	377	1617	$ 289781	$ 45067	$ 334848	$ 91382	$ 426230
SANTA CLARA	2320	5170	7490	$ 582542	$ 534711	$ 1117253	$ 349136	$ 1466389
SANTA CRUZ	654	548	1202	$ 151549	$ 48275	$ 199824	$ 38510	$ 238334
SHASTA	1064	274	1338	$ 174660	$ 13511	$ 188171	$ 14515	$ 202686
SIERRA	20	0	20	$ 2841	$ 0	$ 2841	$ 254	$ 3095
SISKIYOU	205	14	219	$ 35247	$ 1333	$ 36580	$ 5963	$ 42543
SOLANO	2134	544	2678	$ 424980	$ 36847	$ 461827	$ 34673	$ 496500
SONOMA	1388	951	2339	$ 322260	$ 86300	$ 408560	$ 75012	$ 483572
STANISLAUS	3884	284	4168	$ 641519	$ 20651	$ 662170	$ 38603	$ 700773
SUTTER	835	156	991	$ 145004	$ 11044	$ 156048	$ 7097	$ 163145
TEHAMA	417	13	430	$ 56256	$ 966	$ 57222	$ 5429	$ 62651
TRINITY	53	10	63	$ 5617	$ 403	$ 6020	$ 1604	$ 7624
TULARE	1993	397	2390	$ 285830	$ 24852	$ 310682	$ 14328	$ 325010
TUOLUMNE	354	2	356	$ 46126	$ 181	$ 46307	$ 9451	$ 55758
VENTURA	2342	1293	3635	$ 633559	$ 106971	$ 740530	$ 102056	$ 842586
YOLO	1110	653	1763	$ 195360	$ 52185	$ 247545	$ 18036	$ 265581
YUBA	611	0	611	$ 80072	$ 0	$ 80072	$ 2908	$ 82980
TOTAL	138762	56920	195682	$28211949	$ 5668277	$ 33880226	$ 5087442	$ 38967668

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 05/12/04

NONRESIDENTIAL AND TOTAL BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2003

COUNTY	<------NONRESIDENTIAL BUILDING PERMIT VALUATIONS IN $1,000s------> COMMERCIAL	INDUSTRIAL	OTHER NEW	ALT. & ADD.	TOTAL	TOTAL ALL BUILDING *
ALAMEDA	$ 144720	$ 36694	$ 122628	$ 304238	$ 608280	$ 1868155
ALPINE	$ 220	$ 0	$ 248	$ 26	$ 494	$ 12885
AMADOR	$ 232	$ 110	$ 9436	$ 5037	$ 14815	$ 68632
BUTTE	$ 26601	$ 622	$ 19829	$ 20725	$ 67777	$ 292201
CALAVERAS	$ 616	$ 0	$ 9489	$ 4946	$ 15051	$ 186589
COLUSA	$ 947	$ 0	$ 1177	$ 376	$ 2500	$ 33373
CONTRA COSTA	$ 128736	$ 33047	$ 53037	$ 197299	$ 412119	$ 2096359
DEL NORTE	$ 1805	$ 0	$ 1837	$ 268	$ 3910	$ 24834
EL DORADO	$ 22708	$ 1098	$ 29293	$ 15527	$ 68626	$ 613618
FRESNO	$ 123856	$ 52756	$ 72754	$ 108740	$ 358106	$ 1290110
GLENN	$ 1800	$ 0	$ 3397	$ 1464	$ 6661	$ 24908
HUMBOLDT	$ 13306	$ 1376	$ 5130	$ 12173	$ 31985	$ 88151
IMPERIAL	$ 31858	$ 1437	$ 10419	$ 9213	$ 52927	$ 197699
INYO	$ 605	$ 0	$ 1289	$ 967	$ 2861	$ 8936
KERN	$ 70955	$ 80107	$ 88972	$ 64611	$ 304645	$ 1147041
KINGS	$ 13776	$ 160	$ 13812	$ 9097	$ 36845	$ 145448
LAKE	$ 590	$ 0	$ 5155	$ 1804	$ 7549	$ 99444
LASSEN	$ 2611	$ 0	$ 2078	$ 2021	$ 6710	$ 33880
LOS ANGELES	$ 687650	$ 276412	$ 602068	$ 1365542	$ 2931672	$ 8085351
MADERA	$ 6393	$ 2364	$ 19357	$ 7832	$ 35946	$ 217519
MARIN	$ 13590	$ 0	$ 23858	$ 48478	$ 85926	$ 427985
MARIPOSA	$ 114	$ 0	$ 2590	$ 356	$ 3060	$ 29464
MENDOCINO	$ 1522	$ 6333	$ 8035	$ 8580	$ 24470	$ 72837
MERCED	$ 4587	$ 5117	$ 41514	$ 17874	$ 69092	$ 483009
MODOC	$ 0	$ 0	$ 1577	$ 276	$ 1853	$ 6115
MONO	$ 1875	$ 1678	$ 2986	$ 213	$ 6752	$ 80972
MONTEREY	$ 59830	$ 12281	$ 27267	$ 71326	$ 170704	$ 624456
NAPA	$ 23040	$ 2064	$ 34162	$ 27479	$ 86745	$ 320105
NEVADA	$ 5205	$ 973	$ 15611	$ 2505	$ 24294	$ 182675
ORANGE	$ 214483	$ 67720	$ 183489	$ 539855	$ 1005547	$ 3082523
PLACER	$ 104945	$ 9212	$ 61639	$ 80503	$ 256299	$ 1391907
PLUMAS	$ 840	$ 0	$ 3252	$ 1450	$ 5542	$ 52246
RIVERSIDE	$ 360709	$ 112707	$ 261795	$ 173166	$ 908377	$ 6087393
SACRAMENTO	$ 252948	$ 36574	$ 113666	$ 253857	$ 657045	$ 3194473
SAN BENITO	$ 4161	$ 0	$ 3059	$ 3525	$ 10745	$ 30871
SAN BERNARDINO	$ 293967	$ 244854	$ 130418	$ 142612	$ 811851	$ 3013087
SAN DIEGO	$ 412526	$ 131009	$ 226155	$ 399707	$ 1169397	$ 4853204
SAN FRANCISCO	$ 16683	$ 0	$ 41660	$ 320301	$ 378644	$ 925466
SAN JOAQUIN	$ 143748	$ 64076	$ 86465	$ 104580	$ 398869	$ 1695724
SAN LUIS OBISPO	$ 48459	$ 4476	$ 27186	$ 31390	$ 111511	$ 558661
SAN MATEO	$ 14481	$ 0	$ 52574	$ 168496	$ 235551	$ 845658
SANTA BARBARA	$ 57737	$ 5783	$ 35750	$ 47435	$ 146705	$ 572935
SANTA CLARA	$ 207972	$ 6506	$ 127719	$ 630726	$ 972923	$ 2439312
SANTA CRUZ	$ 4777	$ 0	$ 13189	$ 18636	$ 36602	$ 274936
SHASTA	$ 19045	$ 3483	$ 31814	$ 13577	$ 67919	$ 270605
SIERRA	$ 0	$ 0	$ 311	$ 88	$ 399	$ 3494
SISKIYOU	$ 3637	$ 0	$ 4823	$ 4036	$ 12496	$ 55039
SOLANO	$ 42988	$ 12857	$ 38527	$ 51786	$ 146158	$ 642658
SONOMA	$ 57874	$ 12448	$ 61151	$ 67677	$ 199150	$ 682722
STANISLAUS	$ 95487	$ 27844	$ 67170	$ 52839	$ 243340	$ 944113
SUTTER	$ 13865	$ 2606	$ 7460	$ 5485	$ 29416	$ 192561
TEHAMA	$ 9774	$ 0	$ 8588	$ 3976	$ 22338	$ 84989
TRINITY	$ 0	$ 0	$ 1411	$ 297	$ 1708	$ 9332
TULARE	$ 65663	$ 4997	$ 39899	$ 22392	$ 132951	$ 457961
TUOLUMNE	$ 13086	$ 0	$ 3804	$ 2978	$ 19868	$ 75626
VENTURA	$ 156243	$ 46672	$ 61757	$ 114809	$ 379481	$ 1222067
YOLO	$ 27698	$ 10518	$ 26023	$ 30232	$ 94471	$ 360052
YUBA	$ 6017	$ 1251	$ 4280	$ 5713	$ 17261	$ 100241
TOTAL	$ 4039561	$ 1320222	$ 2954039	$ 5601117	$13914939	$ 52882607

*"TOTAL ALL BUILDING" IS THE SUM OF RESIDENTIAL AND NONRESIDENTIAL BUILDING PERMIT VALUATIONS.

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 05/12/04

NEW HOUSING UNITS AND BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2002

COUNTY	NEW HOUSING UNITS: SINGLE-FAMILY	MULTI-FAMILY	TOTAL NEW UNITS	RESIDENTIAL VALUATION ($1,000s): NEW SINGLE-FAMILY	NEW MULTI-FAMILY	TOTAL NEW	RES. ALTER & ADDITS.	TOTAL ALL RESID. VAL.
ALAMEDA	2306	1266	3572	$ 699805	$ 145232	$ 845037	$ 241225	$ 1086262
ALPINE	26	36	62	$ 8654	$ 18206	$ 26860	$ 1093	$ 27953
AMADOR	311	4	315	$ 35889	$ 409	$ 36298	$ 4912	$ 41210
BUTTE	1136	49	1185	$ 135565	$ 3251	$ 138816	$ 12580	$ 151396
CALAVERAS	520	0	520	$ 114402	$ 0	$ 114402	$ 8613	$ 123015
COLUSA	41	0	41	$ 5765	$ 0	$ 5765	$ 1533	$ 7298
CONTRA COSTA	5076	729	5805	$ 1219608	$ 60105	$ 1279713	$ 213248	$ 1492961
DEL NORTE	73	6	79	$ 12656	$ 567	$ 13223	$ 3953	$ 17176
EL DORADO	1741	206	1947	$ 437737	$ 16484	$ 454221	$ 25825	$ 480046
FRESNO	3642	197	3839	$ 568460	$ 14234	$ 582694	$ 46577	$ 629271
GLENN	72	0	72	$ 7814	$ 0	$ 7814	$ 1871	$ 9685
HUMBOLDT	400	138	538	$ 42606	$ 8074	$ 50680	$ 9468	$ 60148
IMPERIAL	838	224	1062	$ 101642	$ 14353	$ 115995	$ 6044	$ 122039
INYO	13	4	17	$ 3236	$ 186	$ 3422	$ 977	$ 4399
KERN	4549	332	4881	$ 597933	$ 17897	$ 615830	$ 27936	$ 643766
KINGS	618	81	699	$ 64650	$ 4097	$ 68747	$ 4341	$ 73088
LAKE	301	12	313	$ 55655	$ 1434	$ 57089	$ 3792	$ 60881
LASSEN	125	0	125	$ 15455	$ 0	$ 15455	$ 1873	$ 17328
LOS ANGELES	8217	11147	19364	$ 2031609	$ 1094706	$ 3126315	$ 1172432	$ 4298747
MADERA	910	72	982	$ 123677	$ 6313	$ 129990	$ 7234	$ 137224
MARIN	288	152	440	$ 112514	$ 17696	$ 130210	$ 129407	$ 259617
MARIPOSA	88	0	88	$ 14997	$ 0	$ 14997	$ 2130	$ 17127
MENDOCINO	335	123	458	$ 29973	$ 12889	$ 42862	$ 13990	$ 56852
MERCED	1652	74	1726	$ 238432	$ 3008	$ 241440	$ 15148	$ 256588
MODOC	27	0	27	$ 3092	$ 0	$ 3092	$ 601	$ 3693
MONO	86	6	92	$ 24305	$ 512	$ 24817	$ 5256	$ 30073
MONTEREY	1054	169	1223	$ 250705	$ 10841	$ 261546	$ 74794	$ 336340
NAPA	610	584	1194	$ 166928	$ 43062	$ 209990	$ 35875	$ 245865
NEVADA	713	199	912	$ 121975	$ 20373	$ 142348	$ 16692	$ 159040
ORANGE	6423	5597	12020	$ 1529573	$ 480257	$ 2009830	$ 318293	$ 2328123
PLACER	5441	1747	7188	$ 1124221	$ 141165	$ 1265386	$ 45295	$ 1310681
PLUMAS	252	8	260	$ 33475	$ 509	$ 33984	$ 1083	$ 35067
RIVERSIDE	20591	2073	22664	$ 3670372	$ 165413	$ 3835785	$ 87846	$ 3923631
SACRAMENTO	10401	2453	12854	$ 1983716	$ 168373	$ 2152089	$ 145402	$ 2297491
SAN BENITO	146	2	148	$ 24946	$ 204	$ 25150	$ 3571	$ 28721
SAN BERNARDINO	9179	1437	10616	$ 1634018	$ 105965	$ 1739983	$ 92766	$ 1832749
SAN DIEGO	9749	5989	15738	$ 2499016	$ 678867	$ 3177883	$ 297225	$ 3475108
SAN FRANCISCO	88	1242	1330	$ 24829	$ 203464	$ 228293	$ 259393	$ 487686
SAN JOAQUIN	5781	499	6280	$ 990824	$ 32466	$ 1023290	$ 31357	$ 1054647
SAN LUIS OBISPO	1703	269	1972	$ 303083	$ 18496	$ 321579	$ 35097	$ 356676
SAN MATEO	653	770	1423	$ 267726	$ 97885	$ 365611	$ 221180	$ 586791
SANTA BARBARA	972	760	1732	$ 212732	$ 71635	$ 284367	$ 83867	$ 368234
SANTA CLARA	2057	2456	4513	$ 550179	$ 205133	$ 755312	$ 331993	$ 1087305
SANTA CRUZ	404	518	922	$ 97235	$ 44171	$ 141406	$ 37217	$ 178623
SHASTA	1168	181	1349	$ 171908	$ 11753	$ 183661	$ 12776	$ 196437
SIERRA	17	0	17	$ 2232	$ 0	$ 2232	$ 693	$ 2925
SISKIYOU	185	9	194	$ 32228	$ 705	$ 32933	$ 6127	$ 39060
SOLANO	1791	670	2461	$ 333454	$ 53017	$ 386471	$ 28367	$ 414838
SONOMA	1295	540	1835	$ 295768	$ 31113	$ 326881	$ 72699	$ 399580
STANISLAUS	2917	192	3109	$ 479085	$ 12839	$ 491924	$ 34343	$ 526267
SUTTER	652	6	658	$ 121672	$ 577	$ 122249	$ 3551	$ 125800
TEHAMA	294	4	298	$ 39124	$ 282	$ 39406	$ 5486	$ 44892
TRINITY	40	2	42	$ 5127	$ 115	$ 5242	$ 1058	$ 6300
TULARE	1830	158	1988	$ 246457	$ 10579	$ 257036	$ 13457	$ 270493
TUOLUMNE	291	9	300	$ 39791	$ 614	$ 40405	$ 10074	$ 50479
VENTURA	2228	279	2507	$ 618941	$ 30586	$ 649527	$ 90068	$ 739595
YOLO	1179	210	1389	$ 205153	$ 21208	$ 226361	$ 14070	$ 240431
YUBA	370	6	376	$ 40853	$ 547	$ 41400	$ 5933	$ 47333
TOTAL	123865	43896	167761	$24823477	$ 4101867	$ 28925344	$ 4379707	$ 33305051

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 05/19/03

NONRESIDENTIAL AND TOTAL BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2002

COUNTY	<------NONRESIDENTIAL BUILDING PERMIT VALUATIONS IN $1,000s------> COMMERCIAL	INDUSTRIAL	OTHER NEW	ALT. & ADD.	TOTAL	TOTAL ALL BUILDING *
ALAMEDA	$ 224762	$ 86495	$ 89132	$ 369881	$ 770270	$ 1856532
ALPINE	$ 0	$ 0	$ 696	$ 75	$ 771	$ 28724
AMADOR	$ 554	$ 0	$ 617	$ 473	$ 1644	$ 42854
BUTTE	$ 21583	$ 2593	$ 15418	$ 15008	$ 54602	$ 205998
CALAVERAS	$ 7890	$ 0	$ 6378	$ 4811	$ 19079	$ 142094
COLUSA	$ 1600	$ 1400	$ 2330	$ 426	$ 5756	$ 13054
CONTRA COSTA	$ 134263	$ 9316	$ 87957	$ 143626	$ 375162	$ 1868123
DEL NORTE	$ 3957	$ 0	$ 2504	$ 942	$ 7403	$ 24579
EL DORADO	$ 29743	$ 0	$ 27054	$ 13490	$ 70287	$ 550333
FRESNO	$ 128963	$ 55550	$ 67684	$ 61960	$ 314157	$ 943428
GLENN	$ 3403	$ 0	$ 5162	$ 1579	$ 10144	$ 19829
HUMBOLDT	$ 11452	$ 1005	$ 2978	$ 7569	$ 23004	$ 83152
IMPERIAL	$ 25760	$ 0	$ 10637	$ 10955	$ 47352	$ 169391
INYO	$ 0	$ 0	$ 728	$ 435	$ 1163	$ 5562
KERN	$ 110025	$ 17140	$ 114423	$ 59487	$ 301075	$ 944841
KINGS	$ 14350	$ 392	$ 8796	$ 5943	$ 29481	$ 102569
LAKE	$ 1175	$ 0	$ 3004	$ 515	$ 4694	$ 65575
LASSEN	$ 847	$ 0	$ 9059	$ 3410	$ 13316	$ 30644
LOS ANGELES	$ 951065	$ 225428	$ 446751	$ 1297057	$ 2920301	$ 7219048
MADERA	$ 1594	$ 2978	$ 15901	$ 6254	$ 26727	$ 163951
MARIN	$ 6553	$ 0	$ 13139	$ 57464	$ 77156	$ 336773
MARIPOSA	$ 700	$ 322	$ 2939	$ 999	$ 4960	$ 22087
MENDOCINO	$ 4989	$ 417	$ 9078	$ 7928	$ 22412	$ 79264
MERCED	$ 10034	$ 3462	$ 33480	$ 15704	$ 62680	$ 319268
MODOC	$ 500	$ 192	$ 1378	$ 82	$ 2152	$ 5845
MONO	$ 2702	$ 2359	$ 1118	$ 562	$ 6741	$ 36814
MONTEREY	$ 55278	$ 5533	$ 24403	$ 48166	$ 133380	$ 469720
NAPA	$ 37428	$ 7503	$ 25255	$ 32690	$ 102876	$ 348741
NEVADA	$ 3419	$ 1783	$ 14084	$ 3512	$ 22798	$ 181838
ORANGE	$ 477106	$ 61671	$ 114152	$ 555697	$ 1208626	$ 3536749
PLACER	$ 136902	$ 3858	$ 57149	$ 57144	$ 255053	$ 1565734
PLUMAS	$ 181	$ 0	$ 1414	$ 384	$ 1979	$ 37046
RIVERSIDE	$ 297959	$ 80881	$ 187516	$ 174787	$ 741143	$ 4664774
SACRAMENTO	$ 198223	$ 66979	$ 57408	$ 212553	$ 535163	$ 2832654
SAN BENITO	$ 3175	$ 923	$ 3793	$ 3750	$ 11641	$ 40362
SAN BERNARDINO	$ 221758	$ 243002	$ 142367	$ 124722	$ 731849	$ 2564598
SAN DIEGO	$ 423065	$ 128042	$ 221251	$ 396508	$ 1168866	$ 4643974
SAN FRANCISCO	$ 375484	$ 5000	$ 28070	$ 328956	$ 737510	$ 1225196
SAN JOAQUIN	$ 105803	$ 28535	$ 80774	$ 102444	$ 317556	$ 1372203
SAN LUIS OBISPO	$ 54697	$ 6642	$ 27073	$ 36080	$ 124492	$ 481168
SAN MATEO	$ 185883	$ 12421	$ 76720	$ 241588	$ 516612	$ 1103403
SANTA BARBARA	$ 31050	$ 7286	$ 55220	$ 45857	$ 139413	$ 507647
SANTA CLARA	$ 426458	$ 27501	$ 279261	$ 597340	$ 1330560	$ 2417865
SANTA CRUZ	$ 2901	$ 0	$ 11283	$ 15913	$ 30097	$ 208720
SHASTA	$ 33252	$ 3813	$ 30631	$ 14368	$ 82064	$ 278501
SIERRA	$ 0	$ 0	$ 454	$ 87	$ 541	$ 3466
SISKIYOU	$ 1287	$ 0	$ 4077	$ 4830	$ 10194	$ 49254
SOLANO	$ 53296	$ 38153	$ 27629	$ 37036	$ 156114	$ 570952
SONOMA	$ 129221	$ 8861	$ 43707	$ 62600	$ 244389	$ 643969
STANISLAUS	$ 56864	$ 12531	$ 71701	$ 61098	$ 202194	$ 728461
SUTTER	$ 5095	$ 1467	$ 8908	$ 4660	$ 20130	$ 145930
TEHAMA	$ 2774	$ 0	$ 9120	$ 1515	$ 13409	$ 58301
TRINITY	$ 33	$ 0	$ 1462	$ 608	$ 2103	$ 8403
TULARE	$ 31240	$ 6059	$ 33763	$ 16385	$ 87447	$ 357940
TUOLUMNE	$ 5409	$ 0	$ 9635	$ 7793	$ 22837	$ 73316
VENTURA	$ 103803	$ 31084	$ 56904	$ 96774	$ 288565	$ 1028160
YOLO	$ 23817	$ 29177	$ 20669	$ 18311	$ 91974	$ 332405
YUBA	$ 14023	$ 0	$ 8487	$ 2538	$ 25048	$ 72381
TOTAL	$ 5195348	$ 1227754	$ 2712681	$ 5393329	$14529112	$ 47834163

*"TOTAL ALL BUILDING" IS THE SUM OF RESIDENTIAL AND NONRESIDENTIAL BUILDING PERMIT VALUATIONS.

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 05/19/03

NEW HOUSING UNITS AND BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2001

COUNTY	NEW HOUSING UNITS: SINGLE-FAMILY	NEW HOUSING UNITS: MULTI-FAMILY	NEW HOUSING UNITS: TOTAL NEW UNITS	RESIDENTIAL VALUATION ($1,000s): NEW SINGLE-FAMILY	RESIDENTIAL VALUATION ($1,000s): NEW MULTI-FAMILY	RESIDENTIAL VALUATION ($1,000s): TOTAL NEW	RESIDENTIAL VALUATION ($1,000s): RES. ALTER & ADDITS.	RESIDENTIAL VALUATION ($1,000s): TOTAL ALL RESID. VAL.
ALAMEDA	1613	1623	3236	$ 473546	$ 192725	$ 666271	$ 239407	$ 905678
ALPINE	28	26	54	$ 12415	$ 12011	$ 24426	$ 929	$ 25355
AMADOR	235	4	239	$ 29485	$ 443	$ 29928	$ 4172	$ 34100
BUTTE	978	66	1044	$ 123303	$ 5009	$ 128312	$ 10017	$ 138329
CALAVERAS	566	4	570	$ 110482	$ 479	$ 110961	$ 3749	$ 114710
COLUSA	29	5	34	$ 4837	$ 225	$ 5062	$ 944	$ 6006
CONTRA COSTA	4152	984	5136	$ 917086	$ 81837	$ 998923	$ 171687	$ 1170610
DEL NORTE	56	0	56	$ 8124	$ 0	$ 8124	$ 950	$ 9074
EL DORADO	1470	704	2174	$ 350215	$ 56507	$ 406722	$ 24299	$ 431021
FRESNO	3558	405	3963	$ 535809	$ 23493	$ 559302	$ 36628	$ 595930
GLENN	68	0	68	$ 6728	$ 0	$ 6728	$ 1161	$ 7889
HUMBOLDT	385	160	545	$ 37233	$ 6800	$ 44033	$ 9555	$ 53588
IMPERIAL	558	198	756	$ 65218	$ 7963	$ 73181	$ 4925	$ 78106
INYO	20	0	20	$ 3847	$ 0	$ 3847	$ 1272	$ 5119
KERN	3473	164	3637	$ 445556	$ 10042	$ 455598	$ 24696	$ 480294
KINGS	664	4	668	$ 65697	$ 211	$ 65908	$ 4486	$ 70394
LAKE	118	0	118	$ 19455	$ 0	$ 19455	$ 2327	$ 21782
LASSEN	95	0	95	$ 11496	$ 0	$ 11496	$ 1633	$ 13129
LOS ANGELES	8184	10069	18253	$ 1947848	$ 1079129	$ 3026977	$ 972494	$ 3999471
MADERA	715	78	793	$ 93489	$ 6787	$ 100276	$ 5154	$ 105430
MARIN	188	187	375	$ 74883	$ 10401	$ 85284	$ 118565	$ 203849
MARIPOSA	95	0	95	$ 15471	$ 0	$ 15471	$ 1448	$ 16919
MENDOCINO	308	45	353	$ 24535	$ 2661	$ 27196	$ 8532	$ 35728
MERCED	1129	2	1131	$ 158898	$ 151	$ 159049	$ 9572	$ 168621
MODOC	10	0	10	$ 863	$ 0	$ 863	$ 845	$ 1708
MONO	103	207	310	$ 26824	$ 32706	$ 59530	$ 2137	$ 61667
MONTEREY	894	170	1064	$ 214151	$ 15730	$ 229881	$ 60757	$ 290638
NAPA	773	134	907	$ 209320	$ 7463	$ 216783	$ 36553	$ 253336
NEVADA	650	30	680	$ 110334	$ 2793	$ 113127	$ 11693	$ 124820
ORANGE	5925	2721	8646	$ 1384764	$ 246402	$ 1631166	$ 274155	$ 1905321
PLACER	4717	1257	5974	$ 947283	$ 101161	$ 1048444	$ 38812	$ 1087256
PLUMAS	191	0	191	$ 25340	$ 0	$ 25340	$ 334	$ 25674
RIVERSIDE	16556	2458	19014	$ 3051189	$ 174628	$ 3225817	$ 70852	$ 3296669
SACRAMENTO	7597	1837	9434	$ 1399728	$ 133507	$ 1533235	$ 128889	$ 1662124
SAN BENITO	300	40	340	$ 47337	$ 2321	$ 49658	$ 3449	$ 53107
SAN BERNARDINO	6825	1702	8527	$ 1216729	$ 129489	$ 1346218	$ 70322	$ 1416540
SAN DIEGO	9312	6326	15638	$ 2239860	$ 686834	$ 2926694	$ 241226	$ 3167920
SAN FRANCISCO	96	1723	1819	$ 28312	$ 350042	$ 378354	$ 253745	$ 632099
SAN JOAQUIN	4063	336	4399	$ 664185	$ 18769	$ 682954	$ 27225	$ 710179
SAN LUIS OBISPO	1687	338	2025	$ 302736	$ 23650	$ 326386	$ 29857	$ 356243
SAN MATEO	722	719	1441	$ 234591	$ 83239	$ 317830	$ 197899	$ 515729
SANTA BARBARA	935	178	1113	$ 207765	$ 16757	$ 224522	$ 60438	$ 284960
SANTA CLARA	1641	4319	5960	$ 439447	$ 329161	$ 768608	$ 282902	$ 1051510
SANTA CRUZ	398	204	602	$ 91169	$ 20371	$ 111540	$ 36032	$ 147572
SHASTA	1015	6	1021	$ 142787	$ 415	$ 143202	$ 11466	$ 154668
SIERRA	18	0	18	$ 2439	$ 0	$ 2439	$ 251	$ 2690
SISKIYOU	170	46	216	$ 26664	$ 2921	$ 29585	$ 4039	$ 33624
SOLANO	1821	739	2560	$ 326436	$ 50354	$ 376790	$ 30912	$ 407702
SONOMA	1646	933	2579	$ 307681	$ 69411	$ 377092	$ 71002	$ 448094
STANISLAUS	2942	253	3195	$ 499002	$ 16540	$ 515542	$ 27292	$ 542834
SUTTER	441	6	447	$ 73811	$ 611	$ 74422	$ 4890	$ 79312
TEHAMA	171	15	186	$ 23631	$ 731	$ 24362	$ 2084	$ 26446
TRINITY	47	0	47	$ 5184	$ 0	$ 5184	$ 1104	$ 6288
TULARE	1696	77	1773	$ 186889	$ 4920	$ 191809	$ 10335	$ 202144
TUOLUMNE	252	0	252	$ 34827	$ 0	$ 34827	$ 8037	$ 42864
VENTURA	3157	289	3446	$ 788672	$ 28931	$ 817603	$ 71535	$ 889138
YOLO	1236	64	1300	$ 187080	$ 6893	$ 193973	$ 12721	$ 206694
YUBA	210	0	210	$ 22923	$ 0	$ 22923	$ 2751	$ 25674
TOTAL	106902	41855	148757	$21005609	$ 4053624	$ 25059233	$ 3745143	$ 28804376

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 05/19/03

NONRESIDENTIAL AND TOTAL BUILDING PERMIT VALUATIONS BY COUNTY
DOLLAR AMOUNTS ARE IN THOUSANDS AND ARE NOT ADJUSTED FOR INFLATION
CALENDAR YEAR: 2001

COUNTY	<------NONRESIDENTIAL BUILDING PERMIT VALUATIONS IN $1,000s------> COMMERCIAL	INDUSTRIAL	OTHER NEW	ALT. & ADD.	TOTAL	TOTAL ALL BUILDING *
ALAMEDA	$ 351990	$ 89816	$ 41890	$ 539364	$ 1023060	$ 1928738
ALPINE	$ 0	$ 0	$ 520	$ 61	$ 581	$ 25936
AMADOR	$ 2213	$ 229	$ 4841	$ 1293	$ 8576	$ 42676
BUTTE	$ 39618	$ 1539	$ 25237	$ 11045	$ 77439	$ 215768
CALAVERAS	$ 3095	$ 0	$ 4042	$ 2498	$ 9635	$ 124345
COLUSA	$ 1150	$ 0	$ 7277	$ 1002	$ 9429	$ 15435
CONTRA COSTA	$ 262718	$ 8832	$ 88752	$ 164673	$ 524975	$ 1695585
DEL NORTE	$ 3090	$ 0	$ 1759	$ 379	$ 5228	$ 14302
EL DORADO	$ 75410	$ 0	$ 27014	$ 30533	$ 132957	$ 563978
FRESNO	$ 72924	$ 27826	$ 59514	$ 91645	$ 251909	$ 847839
GLENN	$ 822	$ 376	$ 3138	$ 498	$ 4834	$ 12723
HUMBOLDT	$ 8184	$ 180	$ 6210	$ 9494	$ 24068	$ 77656
IMPERIAL	$ 4280	$ 548	$ 5200	$ 5024	$ 15052	$ 93158
INYO	$ 0	$ 821	$ 1831	$ 846	$ 3498	$ 8617
KERN	$ 108093	$ 18248	$ 143835	$ 57628	$ 327804	$ 808098
KINGS	$ 2123	$ 22584	$ 4976	$ 6935	$ 36618	$ 107012
LAKE	$ 1177	$ 0	$ 1536	$ 818	$ 3531	$ 25313
LASSEN	$ 0	$ 0	$ 1374	$ 1194	$ 2568	$ 15697
LOS ANGELES	$ 1241821	$ 201926	$ 536897	$ 1558315	$ 3538959	$ 7538430
MADERA	$ 7577	$ 2896	$ 10699	$ 5499	$ 26671	$ 132101
MARIN	$ 38734	$ 3303	$ 12141	$ 45449	$ 99627	$ 303476
MARIPOSA	$ 1522	$ 0	$ 3735	$ 718	$ 5975	$ 22894
MENDOCINO	$ 13856	$ 4918	$ 9314	$ 7411	$ 35499	$ 71227
MERCED	$ 23439	$ 2258	$ 35643	$ 9190	$ 70530	$ 239151
MODOC	$ 0	$ 0	$ 794	$ 75	$ 869	$ 2577
MONO	$ 0	$ 245	$ 1458	$ 729	$ 2432	$ 64099
MONTEREY	$ 31552	$ 8580	$ 50580	$ 48177	$ 138889	$ 429527
NAPA	$ 80470	$ 7433	$ 23820	$ 45485	$ 157208	$ 410544
NEVADA	$ 7022	$ 0	$ 23657	$ 794	$ 31473	$ 156293
ORANGE	$ 565567	$ 90322	$ 172864	$ 520854	$ 1349607	$ 3254928
PLACER	$ 105419	$ 9918	$ 38524	$ 65855	$ 219716	$ 1306972
PLUMAS	$ 308	$ 180	$ 14	$ 347	$ 849	$ 26523
RIVERSIDE	$ 287069	$ 74767	$ 152852	$ 143351	$ 658039	$ 3954708
SACRAMENTO	$ 224161	$ 50829	$ 81187	$ 218751	$ 574928	$ 2237052
SAN BENITO	$ 6425	$ 990	$ 3853	$ 5623	$ 16891	$ 69998
SAN BERNARDINO	$ 221835	$ 330929	$ 98781	$ 113386	$ 764931	$ 2181471
SAN DIEGO	$ 470311	$ 94180	$ 174424	$ 454951	$ 1193866	$ 4361786
SAN FRANCISCO	$ 232290	$ 550	$ 33230	$ 417181	$ 683251	$ 1315350
SAN JOAQUIN	$ 99349	$ 63646	$ 67596	$ 66923	$ 297514	$ 1007693
SAN LUIS OBISPO	$ 31412	$ 6307	$ 22106	$ 24011	$ 83836	$ 440079
SAN MATEO	$ 362813	$ 29624	$ 31458	$ 215063	$ 638958	$ 1154687
SANTA BARBARA	$ 43921	$ 9404	$ 29598	$ 55192	$ 138115	$ 423075
SANTA CLARA	$ 739857	$ 203236	$ 219294	$ 1092436	$ 2254823	$ 3306333
SANTA CRUZ	$ 17993	$ 932	$ 9296	$ 19691	$ 47912	$ 195484
SHASTA	$ 30097	$ 6267	$ 21772	$ 10906	$ 69042	$ 223710
SIERRA	$ 0	$ 0	$ 267	$ 13	$ 280	$ 2970
SISKIYOU	$ 800	$ 2951	$ 4161	$ 3953	$ 11865	$ 45489
SOLANO	$ 39314	$ 19190	$ 50878	$ 42984	$ 152366	$ 560068
SONOMA	$ 90855	$ 22228	$ 41162	$ 57484	$ 211729	$ 659823
STANISLAUS	$ 72333	$ 11388	$ 66676	$ 69216	$ 219613	$ 762447
SUTTER	$ 18021	$ 2667	$ 7107	$ 5971	$ 33766	$ 113078
TEHAMA	$ 0	$ 1847	$ 9825	$ 1342	$ 13014	$ 39460
TRINITY	$ 194	$ 0	$ 1601	$ 539	$ 2334	$ 8622
TULARE	$ 20210	$ 17680	$ 29621	$ 30763	$ 98274	$ 300418
TUOLUMNE	$ 16987	$ 0	$ 5170	$ 2723	$ 24880	$ 67744
VENTURA	$ 86158	$ 76468	$ 51798	$ 94380	$ 308804	$ 1197942
YOLO	$ 26406	$ 22810	$ 15149	$ 38263	$ 102628	$ 309322
YUBA	$ 2383	$ 179	$ 6373	$ 2627	$ 11562	$ 37236
TOTAL	$ 6195368	$ 1552047	$ 2584321	$ 6421551	$16753287	$ 45557663

*"TOTAL ALL BUILDING" IS THE SUM OF RESIDENTIAL AND NONRESIDENTIAL BUILDING PERMIT VALUATIONS.

CONSTRUCTION INDUSTRY RESEARCH BOARD. PRINT DATE: 05/19/03

BOARD MEETING DATE: January 7, 2005
AGENDA NO. 27

PROPOSAL:

Amend Rule 1168 - Adhesive and Sealant Applications

SYNOPSIS:

In addition to changes for clarity and consistency, the proposed amendments maintain the current VOC limits for PVC and CPVC welding, reduce the VOC limit for primers used in conjunction with PVC and CPVC welding, reduce the VOC limit for ABS cements, postpone the final limit for top and trim adhesives until January 1, 2007, and allow limited use of methylene chloride in adhesive formulations used in the solvent welding of hard acrylic, polycarbonate and polyethylene terephalate glycol plastics.

COMMITTEE:

Stationary Source, October 22 and November 19, 2004, Reviewed

RECOMMENDED ACTION:

Adopt the attached resolution:

1. Certifying the CEQA Subsequent Environmental Assessment (SEA) for Proposed Amended Rule 1168 - Adhesive and Sealant Applications; and
2. Amending Rule 1168 - Adhesive and Sealant Applications.

Barry R. Wallerstein, D.Env.
Executive Officer

Background

In part, the September 15, 2000 amendments to Rule 1168 included the a of sales and use prohibitions for non-compliant adhesives and sealants, ar phase-out of small use exemptions beginning September 15, 2001. These ı revisions affected several small businesses that apply adhesives in low vol One such industry is automotive and marine top and trim where typical ac include the recovering of door panels, seats, dashboards, convertible tops floor covering, as well as the installation of sunroofs and vinyl tops. The J 2002 amendments created a special category for top and trim adhesives a an interim volatile organic compound (VOC) limit of 540 grams per liter ui January 1, 2004, and a final VOC limit of 250 grams per liter thereafter. S performed a technology assessment in 2003 to determine the feasibility o grams of VOC per liter limit for top and trim applications. Based on the fi this evaluation, implementation of the January 1, 2004 limits was delayec January 1, 2005. The primary arguments for supporting a delay of the low limit were difficulties in application of waterborne top and trim adhesive: (precise tack time, low initial strength, and lesser heat resistance), coupl the market availability of acetone-containing adhesives meeting the 250 g VOC per liter limit. Both types of adhesives, as well as hot melt glues, we used at larger automotive conversion shops but there were performance a application concerns with water and acetone-based adhesives. Exempt co based replacement adhesives are still in development and to date have nc the necessary high heat and stain resistant characteristics that are neede performance demands of this industry.

Previous amendments to Rule 1168 in December 1992, April 1997, and Oct 2003 also postponed the technology forcing final VOC limits for adhesives primers used to weld plastic pipes and pipe-fittings together to allow mor for development of low-VOC formulations. Efforts to develop lower-VOC a technology has had limited success due to difficulties in substituting exem compounds for VOC solvents in polyvinyl chloride (PVC) and chlorinated p chloride (CPVC) welding formulations, obtaining other regulatory agency a product approval requirements, such as those of the National Sanitation Foundation (NSF), as well as conformity with specified strength requireme applicable American Society of Testing and Materials (ASTM) standards.

Also, as part of the June 7, 2003 amendment, the Board approved a ban c sale of adhesives and sealants containing toxic chemicals such as methyle chloride, perchloroethylene, ethylene dichloride, chloroform and trichloroethylene; completely phasing-out the use of these solvents by Ja 2005. The ban was justified by the availability of alternative compliant ac and sealants. One exception to the availability of non-methylene chloride

containing adhesives is solvent welding of hard acrylic, polycarbonate anc polyethylene terephalate glycol plastic fabrications. As a result, an additi year (and subsequent one-year sell-through provision) was provided to all the continued development of acceptable replacements for methylene ch formulations.

This amendment to Rule 1168 implements the findings of a technology as: regarding the feasibility of using low-VOC automotive and marine top and adhesives by January 1, 2005. It also addresses the viability of using non-methylene chloride-based solvent cements to weld certain hard plastic fabrications, and the feasibility of the January 1, 2005 VOC limits for PVC welding, CPVC welding, and their associated primer.

Although initial results on the availability and use of top and trim adhesiv meeting 250 grams VOC per liter by January 1, 2005 were promising, rece information revealed that additional time is required to develop acceptat performing products meeting this limit, and staff is recommending a two-extension of the current VOC limit of 540 grams per liter limit until Janua 2007. Sufficiently welding hard plastics, such as acrylic, polycarbonate, a polyethylene terephalate glycol (PETG), without chlorinated solvents is al technically feasible at this time. Staff is recommending a limited exempti the prohibition of sales of adhesives containing methylene chloride used f purposes, at a level that is health protective. In addition, staff believes it technically feasible to reduce the VOC content for PVC and CPVC solvent used to weld such plastic pipes and fittings together beyond the current r limits of 510 and 490 grams of VOC per liter, respectively. However, manufacturers have made some headway in reducing the VOC content of CPVC primers, as well as acrylonitrile butadiene styrene (ABS) welding pr that will help to partially offset the VOC emission reductions foregone wit retention of current VOC limits for PVC and CPVC welding.

Proposal

The staff proposal is summarized as follows:

- **Top and Trim Adhesives:**
  Extend the compliance date for the final VOC limit from January 1, January 1, 2007 and maintain the current VOC limit of 540 grams pe the interim in accordance with the results of a technology assessme

- **PVC and CPVC Welding**
  Retain the current VOC limits due to technical infeasibility to reduc VOC limits further.

- **Associated Adhesive Primer for PVC and CPVC Welding**
  Reduce the VOC limit from 650 grams per liter to 550 grams per lite 1, 2005 since compliant products are available and either currently will have prior to that date the required approvals from the other regulatory agencies.

- **ABS Welding**
  Reduce the VOC limit from 400 grams per liter to 325 grams per lite 1, 2005 since compliant products are, or will be available prior to tl

- **Solvent Welding of Polycarbonate, Acrylic and Polyethylene Tere Glycol Sheet Plastics**
  Provide exemption from the prohibition of sales and use provision t solvent welding formulations to a maximum of 60 percent by weigh methylene chloride and limit on a health protective basis facility-w of these materials to 20 gallons annually.

The total amount of VOC emission reduction foregone resulting from plas and pipefitting welding cements and associated primers is 0.6 tons per da postponement of 0.2 tons of VOC emissions per day will be recaptured by 1, 2007 from the use of lower-VOC automotive and marine top and trim adhesives.

AQMP and Legal Mandates

The California Health and Safety Code require the AQMD to adopt an AQM meet state and federal ambient air standards in the Basin. In addition, th California Health and Safety Code require that the AQMD adopt rules and regulations that carry out the objectives of the AQMP. Control Measure #(in the 1997 AQMP, as amended in 1999, calls for greater use of low-VOC, l solids, or multi-component adhesives to achieve further reductions in dail emissions. The VOC emissions reduction target for CTS-02E was 1.3 tons p for the 2010 planning inventory. The September 15, 2000 amendment of F 1168 achieved reductions of 8.0 tons per day for 2010 based on the planni inventory. When the limits under Rule 1168 cannot be achieved, the Boar find that it is infeasible to implement the measure by 2003. On June 7, 2(Board authorized a delay of the implementation of technology forcing lim PVC welding, CPVC welding, associated primers and for other plastic cem welding to January 1, 2005. The emission reductions delayed for these pr was 0.85 tons per day of VOC. The emission reductions delayed for top an adhesives as part of the October 3, 2003 amendment to Rule 1168 were calculated to be 0.2 tons per day of VOC, which is the same quantity of tl

proposal. Furthermore, if a limit is found to be technologically infeasible, AQMD may make up the shortfall through alternative measures within twc after implementation of Rule 1168 as it was amended in 1998. In this case shortfall has been more than compensated by the September 15, 2000 amendments to Rule 1168, which achieved year 2010 reductions of 8.0 toı day of VOC. These reductions are well in excess of the required 1.3 tons c reductions required from Control Measure CTS-02E in the 1997 AQMP, as a in 1999. Therefore, the emissions forgone by this amendment to Rule 116: tons per day from plastic cement welding and associated primers, and an additional 0.2 tons of VOC per day reductions that will be delayed until Ja 2007 for the automotive and marine top and trim industry, do not negativ affect our original commitment of the State Implementation Plan as amer 1999. Furthermore, the 2003 AQMP accounted for a total of 3 tons per da emissions to reflect potential reductions foregone due to an infeasibility f Therefore, the proposed action would not interfere with the attainment demonstration by 2010.

CEQA and Socioeconomic Analysis

Pursuant to the California Environmental Quality Act (CEQA) and the AQM Certified Regulatory Program (Rule 110), the AQMD prepared a Subsequen Environmental Assessment (SEA) for Proposed Amended Rule 1168 - Adhes Sealant Applications, which was released for a 45-day public review perio Revised Draft SEA was also later recirculated for a 45-day public review p One comment letter was received on the Draft SEA and no comments wer received on the Revised Draft SEA. A Final SEA has been prepared and is i as part of this Adoption Hearing package.

No significant socioeconomic impacts have been identified as a result of t proposed amendments.

Implementation Plan

Staff will continue to inspect facilities subject to Rule 1168.

Resource Impacts

Implementation of the proposed amendments will have limited impacts o and fiscal resources.

Attachments

A. Summary of Proposed Amendments
B. Rule Development Process

C. Key Contacts List
D. Resolution
E. Rule Language
F. Final Staff Report
G. Final Subsequent Environmental Assessment

/ / /

This page updated: December 30, 2004
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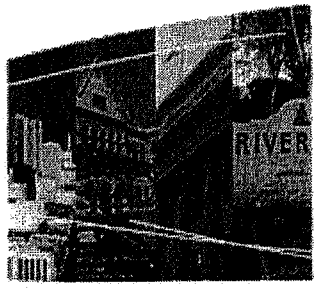

BOARD MEETING DATE: January 7, 2005
AGENDA NO. 27

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Amend Rule 1168 - Adhesive and Sealant Applications

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E. Rule Language
F. Final Staff Report
G. Final Subsequent Environmental Assessment

/ / /

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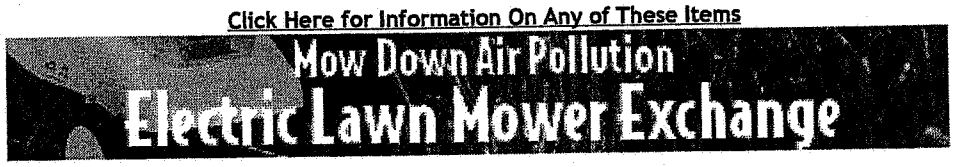

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ATTACHMENT A

SUMMARY OF PROPOSED AMENDMENTS

PROPOSED AMENDED RULE 1168

- **Top and Trim Adhesives:**
  Extend the compliance date for the final VOC limit from January 1, 2005 to January 1, 2007, and maintain the current VOC limit of 540 grams per liter in the interim in accordance with the results of a technology assessment.

- **PVC and CPVC Welding**
  Delete the technology forcing VOC limits, and retain the current VOC limits since formulations to reduce the VOC limits further with acceptable performance characteristics are not available with current adhesive chemistries.

- **Associated Adhesive Primer for PVC and CPVC Welding**
  Reduce the VOC limit from 650 grams per liter to 550 grams per liter on July 1, 2005 in lieu of the current rule's 250 grams per liter limit effective January 1, 2005, based on the availability of compliant products.

- **ABS Welding**
  Reduce the VOC limit from 400 grams per liter to 325 grams per liter on July 1, 2005 based on the availability of compliant products.

- **Solvent Welding of Polycarbonate, Acrylic and Polyethylene Terephalate Glycol Sheet Plastics**
  Exempt from the prohibition of sales and use provision solvent welding formulations containing a maximum of 60 percent by weight of methylene chloride and to be health protective, limit the use of the materials to 20 gallons annually per facility.

ATTACHMENT B

RULE DEVELOPMENT PROCESS

Proposed Amended Rule 1168 – Adhesive and Sealant Applications

PVC, CPVC, Associated Primer and MeCl Solvent Welding Manufacturer Status Report Meetings

March 13, 2003 and March 23, 2004

↓

Technology Assessment for Automotive and Marine Top and Trim Adhesives Commenced

May 2004

↓

Public Workshop

June 29, 2004

↓

CEQA Draft SEA for 45-Day Public Review

Released October 12, 2004

↓

CEQA Revised Draft SEA

45 Day Public Review

November 4, 2004

↓

Public Consultation Meeting

November 30, 2004

↓

Public Hearing

January 7, 2005

Total Time Spent in Rule Development: 21 Months

ATTACHMENT D

RESOLUTION NO. 2005

A Resolution of the Governing Board of the South Coast Air Quality Management District Certifying the Final Environmental Assessment for Proposed Amended Rule 1168 – Adhesive and Sealant Applications.

A Resolution of the Governing Board of the South Coast Air Quality Management District Amending Rule 1168 – Adhesive and Sealant Applications.

WHEREAS, the South Coast Air Quality Management District (AQMD) Governing Board finds and determines that the proposed amendments to Rule 1168 – Adhesive and Sealant Applications, are considered a "project" pursuant to the California Environmental Quality Act (CEQA); and

WHEREAS, the AQMD has had its regulatory program certified pursuant to Public Resources Code Section 21080.5 and has conducted CEQA review and analysis pursuant to such program (AQMD Rule 110); and

WHEREAS, AQMD staff has prepared a Subsequent Draft Environmental Assessment (SEA) and a Revised Draft SEA pursuant to its certified regulatory program and state CEQA Guidelines Section 15252, setting forth the potential environmental consequences of Proposed Amended Rule 1168 – Adhesive and Sealant Applications; and

WHEREAS, the Draft SEA and Revised Draft SEA were both circulated for public review, one comment letter was received on the Draft SEA and no comments were received on the Revised Draft SEA, and a Final SEA has been prepared; and

WHEREAS, it is necessary that the adequacy of the Final SEA including responses to comments received on the Draft SEA be determined by the Governing Board prior to its adoption; and

WHEREAS, it is necessary that the AQMD prepare a Statement of Findings and Statement of Overriding Considerations pursuant to CEQA Guidelines §§15091 and 15093, respectively, regarding adverse environmental impacts that cannot be mitigated to insignificance; and

WHEREAS, a Mitigation Monitoring Plan pursuant to Public Resources Code Section 21081.6, has not been prepared since no feasible mitigation measures have been identified; and

WHEREAS, the AQMD Governing Board voting on Proposed Amended Rule 1168 – Adhesive and Sealant Applications, has reviewed and considered the Final SEA prior to its certification; and

WHEREAS, the AQMD Governing Board has determined that a need exists to amend Rule 1168 – Adhesive and Sealant Applications, in order to both relax and tighten the rule in the following ways: (1) extend the compliance date for the final VOC limit from January 1, 2005 to January 1, 2007 and maintain the current VOC limit in the interim for automotive and marine top and trim adhesives, in accordance with the results of a technology assessment, (2) retain current VOC limits for PVC and CPVC welding, (3) reduce the VOC limit for primers used in association with PVC and CPVC welding on July 1, 2005, (4) reduce the VOC limit for ABS welding on July 1, 2005, and (5) exempt from the prohibition of sales and use provision solvent welding formulations used to weld certain hard plastics and containing a maximum of 60 percent by weight of methylene chloride and limit the use of the materials to 20 gallons annually, per facility, to be protective of public health; and

WHEREAS, the AQMD Governing Board obtains its authority to adopt, amend, or repeal rules and regulations from Sections 39002, 39650, 40000, 40001, 40440, 40441, 40702, 41508, and 41700 of the California Health and Safety Code; and

WHEREAS, the AQMD Governing Board has determined that Rule 1168 – Adhesive and Sealant Applications, as proposed to be amended, is written or displayed so that its meaning can be easily understood by the persons directly affected by it; and

WHEREAS, the AQMD Governing Board has determined that Rule 1168 – Adhesive and Sealant Applications, as proposed to be amended, is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, or state or federal regulations; and

WHEREAS, the AQMD Governing Board has determined that Rule 1168 – Adhesive and Sealant Applications, as proposed to be amended, does not impose the same requirements as any existing state or federal regulation, and the proposed amended rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the AQMD; and

WHEREAS, the AQMD Governing Board, in amending and adopting this regulation, references the following statutes which the District hereby implements, interprets, or makes specific: California Health and Safety Code Sections 40001(a), 40001(b), 40440(a), 40440(c), 41508, 41700, and Federal Clean Air Act Section 172(c)(1); and

WHEREAS, the AQMD Governing Board has determined that the proposed amendments to Rule 1168 - Adhesive and Sealant Applications does not reduce criteria pollutants and therefore the problem finding of Health and Safety Code Section 40001(c) does not apply; and

WHEREAS, the AQMD Governing Board finds that the proposed amendments to Rule 1168 provide additional relief to affected facilities by extending the compliance date while main maintaining the current VOC limit in the interim for automotive and marine top and trim adhesives, maintaining the current VOC limits for PVC and CPVC welding, reducing the VOC content of primers associated with the use of PVC and CPVC welding to the greatest extent possible, and by allowing the limited use and limited concentration of methylene chloride in products used to weld certain hard plastics. Such extensions and relaxations will not result in cost or other socioeconomic impacts; and

WHEREAS, the AQMD Governing Board determines that the current automotive and marine top and trim adhesives limit is infeasible to implement by January 1, 2005, and the proposed rule delays that implementation date by not more than two years; and

WHEREAS, a public hearing has been properly noticed in accordance with the provisions of Health and Safety Code Section 40725; and

WHEREAS, the AQMD Governing Board has held a public hearing in accordance with all the provisions of law; and

WHEREAS, the AQMD specifies the Manager of Rule 1168 – Adhesive and Sealant Applications as the custodian of the documents or other materials which constitute the record of proceedings upon which the adoption of this proposed amendment is based, which are located at the South Coast Air Quality Management District, 21865 Copley Drive, Diamond Bar, California; and

NOW, THEREFORE BE IT RESOLVED that the AQMD Governing Board hereby certifies, pursuant to the authority granted by law, the Final Subsequent Environmental Assessment for Proposed Amended Rule 1168 – Adhesive and Sealant Applications; and

BE IT FURTHER RESOLVED, that the AQMD Governing Board hereby approves the Statement of Findings and Statement of Overriding Considerations pursuant to CEQA Guidelines §§15091 and 15093, respectively, regarding adverse environmental impacts that cannot be mitigated to insignificance, which are included in Attachment 1, attached and incorporated herein by reference.

BE IT FURTHER RESOLVED, that the AQMD Governing Board does hereby amend, pursuant to the authority granted by law, Rule 1168 – Adhesive and Sealant Applications, as set forth in Attachment E and incorporated herein by this reference; and

BE IT FURTHER RESOLVED, that the AQMD Governing Board directs staff to solicit periodic reports from the manufacturers of top and trim adhesives on the actions they have taken and progress achieved in developing low-VOC formulations that comply with the limit to go into effect on January 1, 2007 and report the results, as appropriate.

Attachment

DATE:_____

_____
CLERK OF THE BOARD

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Attachment 1 to the Governing Board Resolution for Proposed Amended Rule 1168 – Adhesive and Sealant Applications:

Statement of Findings and Statement of Overriding Considerations

SCAQMD No. 041217JKK

December 22, 2004

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INTRODUCTION

The proposed amendments to Rule (PAR) 1168 – Adhesive and Sealant Applications, are a "project" as defined by the California Environmental Quality Act (CEQA) Guidelines (California Public Resources Code §§21000 et seq.). The South Coast Air Quality Management District (SCAQMD) is the lead agency for the proposed project and, therefore, has prepared a Subsequent Environmental Assessment (SEA) pursuant to CEQA Guidelines §15162 and §15252 and SCAQMD Rule 110.

The purpose of the SEA is to describe the proposed project and to identify, analyze, and evaluate any potentially significant adverse environmental impacts that may result from adopting and implementing the proposed project. A Draft SEA was released for a 45-day public review and comment period from October 13, 2004 to November 30, 2004. One comment letter was received from the public. During the review and comment period for the Draft SEA, PAR 1168 was modified to delay the VOC content limit requirement of 250 grams of VOC per liter for two years from January 1, 2005 to January 1, 2007. This delay was estimated to forego 414 pounds of VOC per day. While the modification was determined to be significant, its impact was disclosed as part of the CEQA alternatives, and therefore did not add significant new information. However, the Draft SEA was recirculated, because it did not clearly state that these alternatives could be adopted. Therefore, the Draft SEA was modified and released as a Revised Draft SEA. The Revised Draft SEA was circulated to the public for a 45-day review and comment period from November 5, 2004, to December 21, 2004. The SCAQMD did not receive any comments on the Revised Draft SEA during the 45-day public review and comment period. The Final SEA was prepared and will be presented to the Governing Board at its January 7, 2004 public hearing.

SUMMARY OF THE PROPOSED PROJECT

The SCAQMD proposes to amend Rule 1168 as follows: rescind the January 1, 2005 VOC content limit requirement for polyvinyl chloride (PVC) and chlorinated polyvinyl chloride (CPVC) cements and primers; and delay the VOC content limit requirement for top and trim adhesive for two years from January 1, 2005 to January 1, 2007. VOC content limit requirement for PVC and CPVC primers and acrylonitrile-butadiene-styrene (ABS) welding would be reduced on July 1, 2005. In addition, the proposal restores the limited usage of methylene chloride-based solvent welding systems used to bond hard acrylic, polycarbonate, and polyethylene trephalate glycol plastics. The new provision would rescind the January 1, 2005 requirement prohibiting methylene chloride use; but would limit the methylene chloride content in adhesives and establish a facility-wide maximum annual usage of methylene chloride in adhesives.

POTENTIAL SIGNIFICANT ADVERSE IMPACTS THAT CANNOT BE REDUCED BELOW A SIGNIFICANT LEVEL

The primary effects of the proposed amendments are expected to be the temporary loss of anticipated VOC emission reductions from top and trim adhesives totaling

0.21 ton (414 pounds) per day for two years resulting from retaining the interim VOC content limit of 540 grams per liter and delaying the final VOC content limit requirement of 250 grams per liter from January 1, 2005 to January 1, 2007. The January 1, 2005 VOC content limit requirements for PVC and CPVC cements of 285 and 270 grams per liter would be rescinded and the interim VOC content limit requirements of 510 and 490 grams per liter would be retained. Rescinding the PVC and CPVC cement VOC content limit would result in 0.60 ton (1,206 pounds) per day of VOC emission reductions permanently foregone. The January 1, 2005 VOC content limit requirement of 250 grams per liter for PVC and CPVC primers would be rescinded and the 650 grams per liter interim VOC content limit requirement would be kept; resulting in 0.51 ton (1,024 pounds) of VOC emission reductions foregone. On July 1, 2005, the proposed new VOC content limit requirement of 550 grams per liter for PVC and CPVC primers would become effective and the VOC emission reductions foregone would be reduced from 0.51 ton (1,024 pounds) to 0.38 ton (768 pounds) per day. In addition on July 1, 2005, the new VOC content limit requirement of 325 grams per liter (replacing the existing 400 gram per liter VOC content limit requirement) for acrylonitrile-butadiene-styrene (ABS) welding would become effective and 0.11 ton (220 pounds) of VOC emission reductions would occur.

On January 1, 2005, 1.05 tons (2,096 pounds) per day of VOC emission reductions would be foregone from delaying the top and trim adhesive VOC content limit requirements and rescinding PVC and CPVC welding and primers VOC content limit requirements. On July 1, 2005, the VOC emission reductions foregone would drop to 0.81 ton (1,620 pounds) per day when the PVC and CPVC primers and ABS welding VOC content limit requirements become effective. After January 1, 2007, the final VOC content limit for top and trip adhesive would become effective and the amount of VOC emission reductions foregone would be reduced to 0.60 ton (1,206 pounds) per day.

The VOC emission reductions foregone by this proposed amendment would exceed the SCAQMD's VOC significance threshold of 55 pounds per day. Amendments to Rule 1168 are proposed because compliant top and trim adhesive; PVC and CPVC cements; PVC and CPVC primers; and hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic cements are undergoing feasibility testing and are not anticipated to be commercially available by the January 1, 2005 compliance date as required by the existing version of Rule 1168. Consequently, there are no measures available to mitigate the significant adverse air quality impacts that would result from delaying the implementation date for use of compliant top and trim adhesives; PVC and CPVC cements; PVC and CPVC primers; and hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic cements.

Allowing the limited use of methylene chloride in hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic cements would result in a maximum carcinogenic risk of three in a million for residential receptors and two in a million for worker receptors, and noncarcinogenic health indices (acute and chronic) below

1.0. These risk values are below the SCAQMD's toxic significance thresholds of ten in a million for carcinogenic risk and 1.0 for and noncarcinogenic health indices (acute and chronic).

STATEMENT OF FINDINGS

Public Resources Code §21081 and CEQA Guidelines §15091(a) state that no public agency shall approve or carry out a project for which a CEQA document has been completed which identifies one or more significant adverse environmental effects of the project unless the public agency makes one or more written findings for each of those significant effects, accompanied by a brief explanation of the rationale for each finding. Additionally, the findings must be supported by substantial evidence in the record (CEQA Guidelines §15091(b)). As identified in the Final SEA and summarized above, the proposed project has the potential to create significant adverse air quality impacts as a result of future emission reductions foregone. The SCAQMD Governing Board, therefore, makes the following findings regarding the proposed project. The findings are supported by substantial evidence in the record as explained in each finding. This Statement of Findings will be included in the record of project approval and will also be noted in the Notice of Decision. The Findings made by the SCAQMD Governing Board are based on the following significant adverse impact identified in the Final SEA.

Potential VOC emission reductions foregone exceed the SCAQMD's significance thresholds and cannot be mitigated to insignificance.

Finding and Explanation: With respect to this proposed project, the air quality analysis concludes that the potential loss of anticipated permanent VOC emission reductions from top and trim adhesives, PVC and CPVC welding and primers may result in foregone emission reductions of VOCs that exceed the SCAQMD's daily CEQA significance threshold of 55 pounds per day. This air quality impact was the only significant adverse impact identified for the proposed project.

The Governing Board finds that no feasible mitigation measures have been identified to eliminate or minimize the potentially significant adverse impact to air quality. CEQA defines "feasible" as "capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors" (Public Resources Code §21061.1).

The Governing Board finds further that a Mitigation Monitoring Plan (pursuant to Public Resources Code § 21081.6) need not be prepared since no feasible mitigation measures were identified.

The Governing Board finds further that aside from the No Project Alternative, the Final SEA considered alternatives pursuant to CEQA Guidelines §15126.6, but no project alternatives would reduce to insignificant levels the significant air quality impacts identified for the proposed project and still achieve the objectives of the proposed project.

STATEMENT OF OVERRIDING CONSIDERATIONS

If significant adverse impacts of a proposed project remain after incorporating mitigation measures, or no measures or alternatives to mitigate the adverse impacts

are identified, the lead agency must make a determination that the benefits of the project outweigh the unavoidable adverse environmental effects if it is to approve the project. CEQA requires the decision-making agency to balance, as applicable, the economic, legal, social, technological, or other benefits of a proposed project against its unavoidable environmental risks when determining whether to approve the project (CEQA Guidelines §15093 [a]). If the specific economic, legal, social, technological, or other benefits of a proposed project outweigh the unavoidable adverse environmental effects, the adverse environmental effects may be considered "acceptable" (CEQA Guidelines §15093 [a]). Accordingly, a Statement of Overriding Considerations regarding potentially significant adverse air quality impacts resulting from the proposed project has been prepared. This Statement of Overriding Considerations is included as part of the record of the project approval for the proposed project. Pursuant to CEQA Guidelines §15093(c), the Statement of Overriding Considerations will also be noted in the Notice of Decision for the proposed project.

Despite the inability to incorporate changes into the proposed project that will mitigate potentially significant adverse air quality impacts to a level of insignificance, the SCAQMD's Governing Board finds that the following benefits and considerations outweigh the significant unavoidable adverse environmental impacts:

1. The analysis of potential adverse environmental impacts incorporates a "worst-case" approach. This entails the premise that whenever the analysis requires that assumptions be made, those assumptions that result in the greatest adverse impacts are typically chosen. This method likely overestimates the actual emission reductions temporarily foregone from the proposed project.

2. The proposed project allows additional time for feasibility testing, which will help ensure the availability of compliant adhesive products.

3. The long-term effect of PAR 1168, other SCAQMD rules, and AQMP control measures is the reduction of emissions district-wide, contributing to attaining and maintaining the state and federal ambient air quality standards. Rule 1168 will continue to reduce emissions from adhesive and sealant applications, albeit not to the scale proposed by the existing rule and over a longer period of time. The amendments will not increase emissions, but rather would delay originally anticipated emission reductions from top and trim adhesives, PVC and CPVC welding and primers, and methylene chloride use in hard plastic welding sources subject to the rule. The effect of the proposed amendments is a loss of anticipated VOC emission reductions of approximately 1.05 tons (2,096 pounds) per day between January 1, 2005 and July 1, 2005; 0.81 ton (1,620 pounds) per day between July 1, 2005 and January 1, 2007; and 0.61 tons (1,206 pounds) per day after January 1, 2007. The emission reductions foregone over each of these proposed compliance periods would exceed the SCAQMD's VOC significance threshold of 55 pounds per day.

4. The SIP settlement agreement (the Agreement) between the National Resources Defense Council, Coalition for Clean Air, and Communities for a Better Environment and the South Coast Air Quality Management District requires that when the limits under Rule 1168 are relaxed, the Board must find that it is infeasible to implement the measure by 2003. On June 7, 2002, the board authorized a delay of the implementation of technology forcing limits for top and trim adhesives, PVC welding, CPVC welding, associated primers and for other plastic cement welding to January 1, 2005. The emissions delayed were 1.06 tons (2,120 pounds) per day. Furthermore, if a limit is found to be technologically infeasible the SCAQMD may make up the shortfall through alternative measures within two years after implementation of the 1998 rule. In this case that shortfall has been more than compensated by the September 15, 2000 amendments to Rule 1168, which achieved year 2010 reductions of 8.0 tons per day of VOC. These reductions are well in excess of the required 1.3 tons of VOC reductions required from VOC reduction measures of the Agreement. Therefore, the VOC emissions forgone by this amendment to Rule 1168 of the 1.05 tons (2,096 pounds) per day of emission reductions foregone between January 1, 2005 and July 1, 2005; the 0.81 ton (1,620 pounds) per day between July 1, 2005 and January 1, 2007; and the 0.61 tons (1,206 pounds) per day of emission reductions foregone after January 1, 2007 do not negatively affect the Agreement.

   Further, air quality modeling performed for the 2003 AQMP demonstrated that all state ambient air quality standards except for ozone and PM10 are also expected to be attained by 2010. Therefore, the cumulative adverse air quality impacts from the proposed amendments to Rule 1168 as compared to the total future reduction in the VOC inventory overall as demonstrated the 2003 AQMP are not anticipated to be significant. This determination is consistent with the conclusion in the 2003 AQMP EIR that the overall cumulative air quality impacts from implementing all AQMP control measures are not expected to be significant (SCAQMD, 2003) because of the reduction in the overall VOC emissions inventory.

5. The SCAQMD's Governing Board finds that the above-described considerations outweigh the unavoidable significant effects to the environment as a result of the proposed project.

MITIGATION MONITORING PLAN

When making findings as required by Public Resources Code §21081 and CEQA Guidelines §15091, the lead agency must adopt a reporting or monitoring program for the changes to the project which it has adopted or made a condition of project approval in order to mitigate or avoid significant effects on the environment (Public Resources Code §21081.6 and CEQA Guidelines §15097[a]).

The Governing Board finds that, in the case of PAR 1168, a Mitigation Monitoring Plan need not be prepared since no feasible mitigation measures were identified.

(Adopted April 7, 1989)(Amended March 2, 1990)(Amended Feb. 1, 1991)
(Amended July 19, 1991)(Amended August 2, 1991)
(Amended December 4, 1992)(Amended December 10, 1993)
(Amended April 11, 1997)(Amended February 13, 1998)(Amended September 15, 2000)
(Amended June 7, 2002)(Amended July 12, 2002)(Amended October 3 2003)
(PAR 1168 January 7, 2005)

PROPOSED AMENDED RULE 1168. ADHESIVE AND SEALANT APPLICATIONS

(a) Purpose and Applicability

The purpose of this rule is to reduce emissions of volatile organic compounds (VOCs) and to eliminate emissions of chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene from the application of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers. This rule applies to all commercial and industrial sales and applications of adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primers, unless otherwise specifically exempted by this rule.

(b) Definitions

For the purpose of this rule, the following definitions shall apply:

(1) ACRYLIC is a thermoplastic polymer or copolymer of acrylic acid, methacrylic acid, esters of these acids, or acrylonitrile.

(2) ACRYLONITRILE-BUTADIENE-STYRENE (ABS) plastic is made by reacting monomers of acrylonitrile, butadiene, and styrene and is normally identified with an ABS marking.

(3) ADHESIVE is any substance that is used to bond one surface to another surface by attachment. Adhesives include, adhesive bonding primers, adhesive primers, adhesive primers for plastics, and any other primer.

(4) ADHESIVE BONDING PRIMER is an adhesive applied to a surface to improve the bond of subsequent adhesives and sometimes to inhibit corrosion.

(5) ADHESIVE PRIMER is a coating applied to a substrate, prior to the application of an adhesive, to provide a bonding surface.

(6) ADHESIVE PRIMER FOR PLASTIC is a material applied to a plastic substrate before applying an adhesive in order to obtain better adhesion.

(7) ADHESIVE PROMOTER is a coating applied to a substrate in a monomolecular thickness to promote wetting and form a chemical bond with the subsequently applied material.

(8) ADHESIVE SOLID is the nonvolatile portion of an adhesive that remains after heating a sample of the material at 110°C for one hour.

(9) AEROSOL ADHESIVE means any adhesive packaged as a aerosol product in which the spray mechanism is permanently housed in a nonrefillable can designed for hand-held application without the need for ancillary hoses or spray equipment. Aerosol adhesives include special purpose spray adhesives, mist spray adhesives, and web spray adhesives, as defined by the California Air Resources Board consumer products regulation found in Title 17 of the California Code of Regulations, beginning at Section 94507.

(10) AEROSOL SPRAY CAN is a hand held, pressurized, non-refillable container which expels adhesives from the container in a finely divided spray when a valve on the container is depressed.

(11) AEROSPACE COMPONENT is the fabricated part, assembly of parts, or completed unit of any aircraft or space vehicle (excluding tires), and includes models, mock-ups, prototypes, and test coupons.

(12) AIRCRAFT means any machine designed to travel through the air, without leaving the earth's atmosphere, whether heavier or lighter than air, including airplanes, balloons, dirigibles, helicopters, and missiles.

(13) AIRCRAFT TIRE REPAIR is the repair and retreading of used tires used on aircraft. This includes the repair of damage to the tire casing, removal of old tread rubber and tread reinforcing materials, and application of new tread and tread reinforcing materials.

(14) ARCHITECTURAL APPLICATION is the use of an adhesive, sealant, or adhesive or sealant primer on stationary structures, including mobile homes, and their appurtenances. Appurtenances to an architectural structure include, but are not limited to: hand railings, cabinets, bathroom and kitchen fixtures, fences, rain gutters and downspouts, and windows.

(15) ARCHITECTURAL SEALANT OR SEALANT PRIMER is any sealant or sealant primer applied to stationary structures, including mobile homes, and their appurtenances. Appurtenances to an architectural structure include, but are not limited to: hand railings, cabinets, bathroom and kitchen fixtures, fences, rain gutters and downspouts, and windows.

(16) CARPET PAD ADHESIVE is an adhesive used for the installation of a carpet pad (or cushion) beneath a carpet.

(17) CERAMIC TILE ADHESIVE is an adhesive used for the installation of ceramic tile products.

(18) CERAMIC TILES are a ceramic surfacing unit made from clay or a mixture of clay and other materials.

(19) CHLORINATED POLYVINYL CHLORIDE (CPVC) plastic is a polymer of the chlorinated polyvinyl monomer that contains 67% chlorine and is normally identified with a CPVC marking.

(20) COATING SOLID is the nonvolatile portion of a coating that remains after heating a sample of the material at 110oC for one hour.

(21) COMPUTER DISKETTE MANUFACTURING is the process where the fold-over flaps are glued to the body of a vinyl jacket.

(22) CONTACT ADHESIVE is an adhesive applied to two separate surfaces, allowed to dry, and brought together for adhesion and bonding with subsequent pressure.

(23) COVE BASE ADHESIVE is an adhesive used during the installation of cove base (or wall base), which is generally made of vinyl or rubber, on a wall or vertical surface at floor level.

(24) CYANOACRYLATE ADHESIVE is a single-component reactive diluent adhesive that contains at least 85 percent by weight ethyl, methyl, methoxymethyl or other functional groupings of cyanoacrylate.

(25) DRY WALL ADHESIVE is an adhesive used during the installation of gypsum dry wall to studs or solid surfaces.

(26) EXEMPT COMPOUNDS are as defined in Rule 102.

(27) FACILITY means any permit unit or grouping of permit units or other air contaminant-emitting activities which are located on one or more contiguous properties within the District, in actual physical contact or separated solely by a public roadway or other public right-of-way, and are owned or operated by the same person (or by persons under common control). Such above-described groupings, if not contiguous, but connected only by land carrying a pipeline, shall not be considered one facility.

(28) FIBERGLASS is fine filaments of glass.

(29) FOAM is a rigid or spongy cellular mass with gas bubbles dispersed throughout.

(30) GLUE is a hard gelatin obtained from hides, tendons, cartilage, bones, or other parts of animals.

(31) GRAMS OF VOC PER LITER OF ADHESIVE OR SEALANT, LESS WATER AND LESS EXEMPT COMPOUNDS is the weight of VOC per combined volume of VOC and adhesive or sealant solids, and can be calculated by the following equation:

Grams of VOC per Liter of Adhesive or Sealant, Less Water and Less Exempt Compounds =

$$\frac{W_s - W_w - W_{es}}{V_m - V_w - V_{es}}$$

Where:
- W_s = weight of volatile compounds, in grams
- W_w = weight of water, in grams
- W_{es} = weight of exempt compounds, in grams
- V_m = volume of material, in liters
- V_w = volume of water, in liters
- V_{es} = volume of exempt compounds, in liters

For adhesives or sealants that contain reactive diluents, the VOC content of the adhesive or sealant is determined after curing. The grams of VOC per liter of any adhesive or sealant, except a low solids adhesive or sealant shall be calculated by the following equation:

Grams of VOC per Liter of Adhesive or Sealant, Less Water and Less Exempt Compounds =

$$\frac{W_{rs} - W_{rw} - W_{res}}{V_{rm} - V_{rw} - V_{res}}$$

Where:
- W_{rs} = weight of volatile compounds not consumed during curing, in grams
- W_{rw} = weight of water not consumed during curing, in grams
- W_{res} = weight of exempt compounds not consumed during curing, in grams
- V_m = volume of material prior to reaction, in liters
- V_{rw} = volume of water not consumed during curing, in liters
- V_{res} = volume of exempt compounds not consumed during curing, in liters

(32) GRAMS OF VOC PER LITER OF MATERIAL is the weight of VOC per volume of material, to be used for a low-solids adhesive or sealant, and can be calculated by the following equation:

$$\text{Grams of VOC per Liter of Material} = \frac{W_s - W_w - W_{es}}{V_m}$$

Where: W_s = weight of volatile compounds, in grams
W_w = weight of water, in grams
W_{es} = weight of exempt compounds, in grams
V_m = volume of material, in liters

(33) HAND APPLICATION METHODS is the application of adhesive or sealant by manually held equipment. Such equipment includes paint brush, hand roller, trowel, spatula, dauber, rag, sponges, and mechanically- and/or pneumatic-driven syringes without atomization of the materials.

(34) HIGH-VOLUME, LOW-PRESSURE (HVLP) SPRAY is equipment used to spray a coating by means of a gun that operates between 0.1 and 10 pounds per square inch gauge (psig) air pressure.

(35) INDOOR CARPET ADHESIVE is an adhesive used during the installation of a carpet that is in an enclosure and is not exposed to ambient weather conditions during normal use.

(36) LIGHT CURABLE ADHESIVES and SEALANTS are single-component reactive adhesives and sealants that cure upon exposure to visible-light, ultra-violet light or to an electron beam.

(37) LOW-SOLIDS ADHESIVE is an adhesive which has less than one pound of solids per gallon of material (or 120 grams of solids per liter of material).

(38) LOW-SOLIDS ADHESIVE PRIMER is an adhesive primer which has less than one pound of solids per gallon of material (or 120 grams of solids per liter of material).

(39) MARINE DECK SEALANT is any sealant to be applied to wooden marine decks.

(40) MARINE DECK SEALANT PRIMER is any sealant primer to be applied to wooden marine decks.

(41) MODIFIED BITUMINOUS PRIMER consist of bituminous materials, and a high flash solvent used to prepare a surface by (1) improving the adhesion and (2) absorbing dust from the surface for adhesive, or flashing cement bitumen membrane.

(42) MODIFIED BITUMINOUS MATERIALS are materials obtained from natural deposit of asphalt or residues from the distillation of crude oil

petroleum or coal which consist mainly of hydrocarbons, and include, but are not limited to, asphalt, tar, pitch, and asphalt tile that are soluble in carbon disulfide.

(43) MULTIPURPOSE CONSTRUCTION ADHESIVE is any adhesive to be used for the installation or repair of various construction materials, including but not limited to: drywall, subfloor, panel, fiberglass reinforced plastic (FRP), ceiling tile, and acoustical tile.

(44) NONMEMBRANE ROOF ADHESIVE is any adhesive to be used for the installation or repair of nonmembrane roofs. This category includes plastic or asphalt roof cement, asphalt roof coatings, and cold application cement.

(45) NONMEMBRANE ROOF SEALANT is any sealant to be used for installation or repair of nonmembrane roofs. This category includes plastic or asphalt roof cement, asphalt roof coatings, and cold application cement.

(46) ORTHOTICS AND PROSTHETICS are medical devices designed and fabricated to address human neuromuscular and structural skeletal problems in order to activate, supplement, or replace weakened, atrophied, or missing limbs.

(47) OUTDOOR CARPET ADHESIVE is an adhesive used during the installation of carpet that is not in an enclosure and is exposed to ambient weather conditions during normal use.

(48) PANEL ADHESIVE is an adhesive used for the installation of plywood, pre-decorated hardboard (or tileboard), fiberglass reinforced plastic, and similar pre-decorated or non-decorated panels to studs or solid surfaces.

(49) PERCENT VOC BY WEIGHT is the ratio of the weight of the VOC to the weight of the material, expressed as a percentage of VOC by weight. The percent VOC by weight can be calculated as follows:

$$\% \text{ VOC weight} = \frac{W_v}{W} \times 100$$

Where: W_v = weight of the VOCs, in grams
W = weight of material, in grams

(50) PERSON is any individual, firm, association, organization, partnership, business, trust, corporation, company, contractor, supplier, installer, user

or owner, or any state or local governmental agency or public district or any other officer or employee thereof. Person also means the United States or its agencies to the extent authorized by Federal law.

(51) PLASTIC CEMENT WELDING is the use of adhesives made of resins and solvents which are used to dissolve the surfaces of plastic, except ABS, CPVC, and PVC plastic, to form a bond between mating surfaces.

(52) PLASTIC FOAM is a foam constructed of plastics.

(53) PLASTICS are synthetic materials chemically formed by the polymerization of organic (carbon-based) substances. Plastics are usually compounded with modifiers, extenders, and/or reinforcers. They are used to produce pipe, solid sheet, film, or bulk products.

(54) POLYCARBONATE is a thermoplastic resin derived from bisphenol A and phosgene, a linear polyester of carbonic acid, dihydroxy compound and any carbonate diester, or by ester interchange.

(55) POLYETHYLENE TEREPHALATE is a thermoplastic polyester formed from ethylene glycol by direct esterification or by catalyzed ester exchange between ethylene glycol and dimethyl terephalate.

(56) POLYETHYLENE TEREPHALATE GLYCOL (PETG) is a glycol modified polyethylene terephalate.

(57) POLYURETHANE FOAMS are plastic foams, as defined in "Whittington's Dictionary of Plastics," page 329, and may be either rigid or flexible.

(58) POLYVINYL CHLORIDE (PVC) plastic is a polymer of the chlorinated vinyl monomer that contains 57 percent chlorine.

(59) POROUS MATERIAL is a substance which has tiny openings, often microscopic, in which fluids may be absorbed or discharged. Such materials include, but are not limited to, wood, fabric, paper, corrugated paperboard, and plastic foam.

(60) PRIMER is a material applied to a substrate to improve adhesion of subsequently applied adhesive.

(61) PROPELLANT is a fluid under pressure which expels the contents of a container when a valve is opened.

(62) REACTIVE DILUENT is a liquid which is a VOC during application and one in which, through chemical and/or physical reactions, such as polymerization, 20 percent or more of the VOC becomes an integral part of a finished material.

(63) ROADWAY SEALANT is any sealant to be applied to public streets, highways, and other surfaces, including but not limited to curbs, berms, driveways, and parking lots.

(64) ROLL COATER is a series of mechanical rollers that form a thin coating or adhesive film on the surface roller, which is applied to a substrate by moving the substrate underneath the roller.

(65) RUBBER FLOORING ADHESIVE is an adhesive that is used for the installation of flooring material in which both the back and the top surface are made of synthetic rubber, and which may be in sheet or tile form.

(66) RUBBER FOAM is a foam constructed of natural or synthetic rubber.

(67) SEALANT is any material with adhesive properties that is formulated primarily to fill, seal, or waterproof gaps or joints between two surfaces. Sealants include sealant primers and caulks.

(68) SEALANT PRIMER is any product applied to a substrate, prior to the application of a sealant, to enhance the bonding surface.

(69) SHOE REPAIR, LUGGAGE AND HANDBAG ADHESIVE is an adhesive used to repair worn, torn or otherwise damaged uppers, soles, and heels of shoes, or for making repairs to luggage and handbags.

(70) SHEET-APPLIED RUBBER LINING OPERATION is the hand application of sheet rubber lining to metal or plastic substrates in order to protect the underlying substrate from corrosion or abrasion. These operations also include laminating sheet rubber to fabric.

(71) SINGLE-PLY ROOF MEMBRANE ADHESIVE is any adhesive sealant to be used for the installation or repair of single-ply roof membrane. Installation includes, but is not limited to attaching the edge of the membrane to the edge of the roof and applying flashings to vents, pipes, or ducts that protrude through the membrane.

(72) SINGLE-PLY ROOF MEMBRANE SEALANT is any sealant to be used for the installation or repair of single-ply roof membrane to the edge of the roof and applying flashings to vents, pipes, or ducts that protrude through the membrane.

(73) SOLVENT WELDING is the softening of the surfaces of two substrates by wetting them with solvents and/or adhesives, and joining them together through a chemical and/or physical reaction(s) to form a fused union.

(74) SPACE VEHICLE is a vehicle designed to travel beyond Earth's atmosphere.

(75) SPECIAL PURPOSE CONTACT ADHESIVE is a contact adhesive that is used to bond all of the following substrates to any surface: melamine covered board, metal, unsupported vinyl, Teflon, ultra-high molecular weight polyethylene, rubber and wood veneer 1/16 inch or less in thickness.

Deleted: to any porous or nonporous surface.

(76) STRUCTURAL GLAZING ADHESIVE is any adhesive to be used to adhere glass, ceramic, metal, stone, or composite panels to exterior building frames.

(77) STRUCTURAL WOOD MEMBER ADHESIVE is an adhesive used for the construction of any load bearing joints in wooden joists, trusses, or beams.

(78) SUBFLOOR ADHESIVE is an adhesive used for the installation of subflooring material over floor joists.

(79) THIN METAL LAMINATING is a process of bonding multiple layers of metal to metal or metal to plastic in the production of electronic or magnetic components in which the thickness of the bond line(s) is less than 0.25 mil.

(80) TIRE REPAIR is the expanding of a hole, tear, fissure, or blemish in a tire casing by grinding or gouging, applying adhesive, and filling the hole or crevice with rubber.

(81) TIRE RETREAD ADHESIVE is any adhesive to be applied to the back of precured tread rubber and to the casing and cushion rubber, or to be used to seal buffed tire casings to prevent oxidation while the tire is being prepared for a new tread.

(82) TOP AND TRIM ADHESIVE is an adhesive used during the installation of automotive and marine trim, including, but not limited to, headliners, vinyl tops, vinyl trim, sunroofs, dash covering, door covering, floor covering, panel covering and upholstery.

(83) TRAFFIC MARKING TAPE is preformed reflective to be applied to public streets, highways, and other surfaces, including but not limited to curbs, berms, driveways, and parking lots.

(84) TRAFFIC MARKING TAPE ADHESIVE PRIMER is any adhesive primer to be applied to surfaces prior to installation of traffic marking tape.

(85) TRANSFER EFFICIENCY is the ratio of the weight or volume of coating solids adhering to an object to the total weight or volume, respectively, of coating solids used in the application process, expressed as a percentage.

(86) VCT means vinyl composition tile and is a material made from thermoplastic resins, fillers and pigments.

(87) VISCOSITY is the internal friction of a liquid that makes it resistant to flow.

(88) VOLATILE ORGANIC COMPOUND (VOC) is as defined in Rule 102 - Definition of Terms.

(89) WOOD FLOORING ADHESIVE is an adhesive used to install a wood floor surface, which may be in the form of parquet tiles, wood planks, or strip-wood.

(90) WOOD PARQUET FLOORING is wood flooring in tile form constructed of smaller pieces of wood which are joined together in a pattern by the maker to form the tile.

(91) WOOD PLANK FLOORING is solid or laminated wood in plank form.

(c) Requirements

(1) Unless otherwise specified in paragraph (c)(2), a person shall not apply any adhesives, adhesive bonding primers, adhesive primers, or any other primer which have a VOC content in excess of 250 g/L less water and less exempt compounds.

(2) A person shall not apply adhesives, adhesive bonding primers, adhesive primers, sealants, sealant primers, or any other primer which have a VOC content in excess of the limits specified below:

VOC Limit*, Less Water and Less Exempt Compounds in Grams per Liter

Architectural Applications	Current VOC Limit
Indoor Carpet Adhesives	50
Carpet Pad Adhesives	50
Outdoor Carpet Adhesives	150
Wood Flooring Adhesive	100
Rubber Floor Adhesives	60
Subfloor Adhesives	50
Ceramic Tile Adhesives	65
VCT and Asphalt Tile Adhesives	50
Dry Wall and Panel Adhesives	50

Cove Base Adhesives	50
Multipurpose Construction Adhesives	70
Structural Glazing Adhesives	100
Single Ply Roof Membrane Adhesives	250

Specialty Applications	VOC Limits and Effective Dates**					
	Current VOC Limit			1-1-05	7-1-05	1-1-07
PVC Welding	510					
CPVC Welding	490					
ABS Welding	400				325	
Plastic Cement Welding	350			250		
Adhesive Primer for Plastic	650				550	
Computer Diskette Manufacturing	350					
Contact Adhesive	80					
Special Purpose Contact Adhesive	250					
Tire Retread	100					
Adhesive Primer for Traffic Marking Tape	150					
Structural Wood Member Adhesive	140					
Sheet Applied Rubber Lining Operations	850					
Top and Trim Adhesive	540					250

** The specified limits remain in effect unless revised limits are listed in subsequent columns.

For adhesives, adhesive bonding primers, or any other primer not regulated by the above two tables and applied to the following substrates, the following limits shall apply:

Substrate Specific Applications	Current VOC Limit
Metal to Metal	30
Plastic Foams	50
Porous Material (except wood)	50
Wood	30
Fiberglass	80

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If an adhesive is used to bond dissimilar substrates together the adhesive with the highest VOC content shall be allowed.

Sealants	Current VOC Limit
Architectural	250
Marine Deck	760
Nonmembrane Roof	300
Roadway	250
Single-Ply Roof Membrane	450
Other	420

Sealant Primers	Current VOC Limit
Architectural	
Non Porous	250
Porous	775
Modified Bituminous	500
Marine Deck	760
Other	750

* For low-solid adhesives or sealants the VOC limit is expressed in grams per liter of material as determined in paragraph (b)(32); for all other adhesives and sealants, VOC limits are expressed as grams of VOC per liter of adhesive or sealant less water and less exempt compounds as determined in paragraph (b)(31).

(3) Containers used to dispose of VOC-laden cloth or paper used in stripping cured adhesives or sealants shall be closed except when depositing or removing VOC-laden cloth or paper from the container.

(4) Solvent Cleaning Operations; storage and disposal of VOC-containing materials shall be conducted in accordance with the provisions of Rule 1171 - Solvent Cleaning Operations.

(5) Transfer Efficiency

A person shall not apply adhesives or sealants unless the adhesive or sealant is applied with properly operating equipment in accordance with operating procedures specified by either the equipment manufacturer or the Executive Officer. Application of adhesives or sealants shall be accomplished only by the use of one of the following methods:

(A) Electrostatic application; or

(B) Flow coat; or

(C) Dip coat; or

(D) Roll coater; or

(E) High-Volume, Low-Pressure (HVLP) spray; or

(F) Hand application methods; or

(G) Such other adhesive or sealant application methods as are demonstrated to the Executive Officer to be capable of achieving at least 65 percent transfer efficiency and for which prior written approval of the Executive Officer has been obtained; or

(H) For adhesives and sealants with a viscosity of 200 centipoise or greater, as applied, airless spray, air-assisted airless, and air-atomized spray may also be used.

(6) A person may comply with the provisions of paragraphs (c)(1), (c)(2), or (c)(5), or all three, by using approved air pollution control equipment, provided that the VOC emissions from such operations and/or materials are reduced by at least 80 percent overall, by weight.

(7) A person may comply with the provisions of paragraph (c)(1) and paragraph (c)(2) by means of an Alternative Emission Control Plan pursuant to Rule 108.

(8) If anywhere on the container of any adhesive or sealant, on any sticker or label affixed thereto, or in any sales or advertising literature, any representation is made that the adhesive or sealant may be used for any another source specific rule application, for which there is a lower VOC standard, then the lowest VOC standard shall apply.

(9) The VOC content of adhesives and sealants that are applied with the use of refillable pressurized containers are subject to the VOC limits of this rule.

(d) Recordkeeping Requirements

Notwithstanding provisions of subdivision (i), records shall be maintained pursuant to Rule 109.

(e) Methods of Analysis

(1) The VOC content of cleaning materials and adhesives or sealants shall be determined by using USEPA Reference Method 24 (Determination of

Deleted: (d) . Reporting Requirements¶ . Manufacturers that offer for sale and use PVC, CPVC, and other plastic cement welding products and associated primers in the District shall, beginning March 8, 2003, and at annual intervals thereafter, submit a status report that describes the progress toward the development of alternative products which satisfy future VOC limit compliance dates. These reports shall contain, at a minimum:¶
(1) . Manufacturer, product or test number, VOC content, and applicable material category for each of the test candidates;¶
(2) . Progress of candidates tested during this period relative to ASTM D-2564 standards, and National Sanitation Foundation (NSF) approval for use on potable water, sewer, drain, waste and vent systems. ¶
Once compliance with future VOC limits is achieved and a status report is submitted documenting such, no further reports need be submitted for that particular plastic cement welding product or primer, or alternative product.

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Volatile matter Content, Water Content, Density Volume Solids, and Weight Solids of Surface Coating, Code of Federal Regulations Title 40, Appendix A, utilizing Procedure B of ASTM Method D2369), or the SCAQMD Method 304.

(2) The exempt compound's content shall be determined by Methods 302 and 303 in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples" or ASTM Method D4457-85.

(3) The VOC content of PVC, CPVC, and ABS pipe cements, adhesive primer for plastic shall be determined by Method 316A in the South Coast Air Quality Management District's (SCAQMD) "Laboratory Methods of Analysis for Enforcement Samples."

(4) The VOC content of cyanoacrylate adhesives shall be determined by Method 316B in the South Coast Air Quality Management District's (SCAQMD) " Laboratory Methods of Analysis for Enforcement Samples."

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Q(f) Test Methods

(1) The efficiency of the control device and the VOC content measured and calculated as carbon in the control device exhaust gases shall be determined by USEPA'S Test Method 18, or Air Resources Board (ARB) Method 422 for the determination of emissions of Exempt Compounds and USEPA's Test Methods 25, 25A, SCAQMD's Method 25.1, or SCAQMD Test Method 25.3. (Determination of Total Gaseous Non-Methane Organic Emissions as Carbon) for the determination of total organic compound emissions. Emissions determined to exceed any limits established by this rule through the use of any of the above-referenced test methods shall constitute a violation of the rule.

(2) Viscosity will be determined by ASTM D 1084-88.

(3) The following classes of compounds: cyclic, branched, or linear, completely fluorinated alkanes; cyclic, branched, or linear, completely fluorinated ethers with no unsaturations; cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and sulfur-containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine, will be analyzed as exempt compounds for compliance with subdivision (c), only at such time as manufacturers specify which individual compounds are used in the coating formulations

and identify the test methods, which, prior to such analysis, have been approved by the USEPA and the SCAQMD, that can be used to quantify the amounts of each exempt compound.

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()(g) Prohibition of Specifications

(1) A person shall not solicit or require any other person to use, in the District, any adhesives or sealants or combination of adhesives or sealants in violation of the requirements of this rule.

(2) The requirements of this paragraph shall apply to all written or oral agreements executed or entered into after July 1, 1989.

(h) Prohibition of Sales and Use

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(1) On and after September 1, 2001, except as provided in subdivision (j), paragraphs (c)(6) and (c)(7), no person shall use, supply, sell, or offer for sale an adhesive, sealant, or adhesive or sealant primer for use in the District that at the time of sale exceeds the applicable VOC limits specified in paragraphs (c)(1) and (c)(2).

(2) On and after January 1, 2004, no person shall use, supply, sell, or offer for sale an adhesive, sealant, or adhesive or sealant primer for use in the District that contains chloroform, ethylene dichloride, methylene chloride, perchloroethylene, and trichloroethylene.

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(3) The prohibition of sales and use as specified in paragraphs (h)(1) and (h)(2) shall not apply to the following:

(A) Adhesives and sealants shipped, supplied or sold to persons for use outside the District;

(B) Any manufacturer of adhesives or sealants, provided that the manufacturer has complied with the labeling requirements of Rule 443.1 – Labeling of Materials Containing Organic Solvents, and the product is not sold directly to a user located in the District, or the product was sold to an independent distributor or a sales outlet located in the District that is not a subsidiary of, or under the control of the manufacturer, and was informed in writing by the manufacturer about the compliance status of the product with Rule 1168;

(C) Adhesives and Sealants that contain less than one percent by weight of methylene chloride; or

(D) Solvent welding formulations containing methylene chloride used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrications, provided

(i) The concentration of methylene chloride in any solvent welding formulation does not exceed 60 percent by weight; and

(ii) The purchase of all solvents welding products does not exceed 20 gallons per calendar year at a single facility, as demonstrated by purchase records and invoices of methylene chloride containing solvent welding formulations. Such records shall be made available to the Executive Officer or his representative upon request.

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(i) Rule 442 Applicability

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Any adhesive, sealant, adhesive or sealant application, operation, or person which is exempt from all or a portion of this rule, shall comply with the provisions of Rule 442.

(j) Exemptions

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(1) The provisions of paragraph (c)(1) and paragraph (c)(2) shall not apply to the following:

(A) Adhesives used in tire repair; or

(B) Adhesives and/or adhesive application processes in compliance with Rules 1104, 1106, 1128, 1130 and 1130.1.

(2) The provisions of this rule shall not apply to aerospace components that are subject to Rule 1124.

(3) The provisions of paragraph (c)(5) and subdivision (d) shall not be applied to the application of adhesives or sealants that contain less than 20 g/L of VOC per liter of adhesives, less water and less exempt compounds.

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(4) The provisions of this rule shall not apply to any facility that uses less than one pint of total adhesives and sealants in any one day so long as the products were purchased prior to September 15, 2000.

(5) The provisions of subdivision (c) shall not apply to research and development programs and quality assurance labs, provided that:

(A) A record is kept of:

(i) the date when the adhesives and sealants are used, and the type of application(s); and

(ii) the amount of adhesives and sealants used and the VOC content of such adhesives and sealants; and

(iii) the amount of solvents used and VOC content of such solvents; and

(iv) the manufacturer/suppliers identification and type of material; and

(B) Such records shall be retained in accordance with the provisions of subdivision (e) of this rule.

(6) The provisions of paragraph (c)(1) and paragraph (c)(2) shall not apply to a facility that demonstrates that the total volume of non-compliant adhesives, adhesive primers, adhesive bonding primers, sealants, and sealant primers is less than 55 gallons per facility per rolling 12-month period. On and after September 1, 2001, a facility may not use this paragraph to exclude non-compliant adhesives used in architectural applications, contact adhesives, special purpose contact adhesives, and adhesives used on porous substrates.

(7) The provisions of this rule, except paragraph (h)(2), shall not apply to adhesives used to glue flowers to parade floats.

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(8) The provisions of subdivision (c) shall not apply to solvent welding operations used in the manufacturing of medical devices.

(9) The provisions of this rule shall not apply to aerosol adhesives and primers dispensed from aerosol spray cans.

(10) The provisions of paragraph (c)(1) and paragraph (c)(2) shall not apply to any adhesive used exclusively for thin metal laminating operations, provided that the adhesive contains less than 780 grams of VOC per liter of adhesive, less water and less exempt compounds, as applied, and the facility uses a total of three gallons per day or less of these adhesives.

(11) The provisions of this rule, except paragraph (h)(2) and subdivision (d), shall not apply to light curable adhesives and sealants with a VOC content no more than 50 grams per liter, less water and less exempt compounds.

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(12) The provisions of this rule, except paragraph (h)(2), shall not apply to the use of cyanoacrylate adhesives.

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(13) The provisions of this rule shall not apply to adhesives and sealants subject to the California Air Resources Board consumer products regulation found

in Title 17 of the California Code of Regulations, beginning at Section 94507.

(14) Until October 1, 2003, the provisions of paragraph (c)(1) and paragraph (c)(2) shall not apply to solvent welding of flexible ductwork, at which time the VOC limit shall be 250 grams per liter, less water and less exempt compounds.

(15) A person may sell or apply a non-complying VOC-containing or methylene chloride-containing product for one year after the applicable effective date in paragraph (c)(2) for VOC-containing adhesives and sealants, and for one year after the applicable effective date of paragraph (h)(2) or subparagraph)(h)(3)(D) for methylene chloride-containing adhesives and sealants, provided:

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(A) The product complies with the previous applicable VOC limit,

(B) The product was manufactured prior to the effective date, and

(C) The date of manufacture or a code indicating that date is clearly displayed on the product.

(16) The provisions of this rule, except paragraph (h)(2), shall not apply to adhesives used to fabricate orthotics and prosthetics under a medical doctor's prescription.

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(17) The provisions of this rule, except paragraph (h)(2), shall not apply to shoe repair, luggage and handbag adhesives.

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SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

STAFF REPORT
PROPOSED AMENDED RULE 1168 – ADHESIVE AND SEALANT APPLICATIONS

December 2004

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APPENDIX A A-1

EXECUTIVE SUMMARY

The objective of this amendment to Rule 1168 – Adhesive and Sealant Applications is to implement the findings of a technology assessment on the feasibility of the automotive and marine top and trim adhesive volatile organic compound (VOC) limit of 250 grams of VOC per liter, the viability of using non-methylene chloride-based solvent cements to weld certain hard plastic fabrications, and the feasibility of the January 1, 2005 VOC limits for polyvinyl chloride (PVC) welding, chlorinated polyvinyl chloride (CPVC) welding, and associated primer.

Although initial results were promising on the availability and use of top and trim adhesives meeting the 250 grams VOC per liter standard by January 1, 2005, more recent information reveals that additional time will be required to develop acceptable products meeting that limit. Therefore, staff is recommending that the compliance date for the 250 grams of VOC per liter standard be moved to January 1, 2007 and the current limit of 540 grams of VOC per liter remain in effect until then. Welding hard plastics such as acrylic, polycarbonate, and polyethylene terephalate glycol (PETG) without methylene chloride as part of the formulation is not technically feasible, and staff is recommending a limited exemption from the prohibition of sales of adhesives used for these purposes at a level that is health protective. In addition, staff believes it is technically infeasible to reduce the VOC content for PVC and CPVC solvent cements used to weld such plastic pipes and fittings together beyond the current rule limits of 510 and 490 grams of VOC per liter respectively. However, manufacturers have made some headway in reducing the VOC content of PVC and CPVC primers, as well as acrylonitrile butadiene styrene (ABS) welding products that will help to partially offset the VOC emission reductions foregone with the retention of current VOC limits for PVC and CPVC welding.

BACKGROUND

In part, the September 15, 2000 amendments to Rule 1168 included the addition of sales and use prohibitions for non-compliant adhesives and sealants, and the phase-out of small use exemptions beginning September 15, 2001. These rule revisions affected several small businesses that apply adhesives in low volumes. One such industry is automotive and marine top and trim where typical activities include the recovering of door panels, seats, dashboards, convertible tops, and floor covering, as well as the installation of sunroofs and vinyl tops. The June 2002 amendments created a special category for top and trim adhesives and set an interim VOC limit of 540 grams per liter until January 1, 2004, and a final VOC limit of 250 grams per liter thereafter. Staff performed a technology assessment in 2003 to determine the feasibility of the 250 grams of VOC per liter limit for top and trim applications. Based on the findings of this evaluation, implementation of the January 1, 2004 limits was delayed to January 1, 2005. The primary arguments for supporting a delay of the lower VOC limit were difficulties in application of waterborne top and trim adhesives (precise tack time, low initial strength, and lesser heat resistance), coupled with the market availability of acetone-containing adhesives meeting the 250 grams of VOC per liter limit. Both types of adhesives, as well as hot melt glues, were being used at larger automotive conversion shops but there were performance and application concerns with water and acetone-based adhesives. Acetone based replacement adhesives are still in development and to date have not shown the necessary high heat and stain resistant characteristics that are needed for the performance demands of this industry.

In addition, previous amendments to Rule 1168 in December 1992, April 1997, and October 2003 postponed the technology forcing final emission limits for adhesives and primers used to weld plastic pipes and pipe-fittings together and allow more time for development of low-VOC formulations. Efforts to develop compliant low-VOC adhesive technology has had limited success due to difficulties in substituting exempt compounds for VOC solvents in PVC and CPVC welding formulations, obtaining other regulatory agency and product approval requirements, such as those of the National Sanitation Foundation (NSF), as well as conformity with specified strength requirements of applicable American Society of Testing and Materials (ASTM) standards.

Also, as part of the June 7, 2003 amendment, the Governing Board approved a ban on the sale of adhesives and sealants containing toxic chemicals such as methylene chloride, perchloroethylene, ethylene dichloride, chloroform and trichloroethylene; completely phasing-out the use of these solvents by January 1, 2005. The ban was justified by the availability of alternative compliant adhesives and sealants. One exception to the availability of non-methylene chloride containing adhesives is solvent welding of hard acrylic, polycarbonate and polyethylene terephalate glycol plastic fabrications. As a result, an additional year (and subsequent one-year sell-through provision) was provided to allow for the continued development of acceptable replacements for methylene chloride formulations.

Universe of Affected Sources

The types of industries included within the scope of these proposed amendments are installers of automotive and marine top and trim, plumbers and city/county public works municipalities, and several businesses related to fabricating numerous products such as display cases, signage, trophies and aquariums out of sheet plastic.

Nearly all the affected companies do not require written permits pursuant to Rule 219, because of low spray volumes, or hand applications of solvent cements and solvent welding solutions. The socioeconomic report in the June 7, 2002 amendment package estimates of the total number of affected companies by industry. These are listed in Table 1.

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Table 1: Numbers of Known Industries

Industry Type	Numbers of Operators
Automotive Top and Trim	752
Marine Top and Trim	40
Plumbers	8,000+
Plastic Fabricators	270

TECHNOLOGY REVIEW

(1) Top and Trim Adhesives

In the October 3, 2003 amendment to Rule 1168, staff recommended postponing the 250 grams of VOC per liter limit for top and trim adhesives by an additional year. This was primarily due

to the experimental nature of acetone-based contact adhesives in use in the automotive top and trim market, and the difficulties expressed by the industry in using waterborne adhesives. Since the October 2003 amendment, one large automotive converter transitioned to a new acetone-based adhesive designed initially for the aerospace industry. The performance and workability seemed to meet their specifications and complied with the future VOC limit of this specialty application. Staff also believed that small shops could also use this adhesive for their operations. However, staff has since confirmed that use of this acrylontrile rubber-based cement has been discontinued due to unacceptable heat resistance in the field and a staining problem with light colored vinyl top material. The 540 grams per liter product is easier to use and is demonstrated to work. Staff also believes that waterborne products available in the marketplace are viable as well and will work for certain applications but cannot be used as a single multipurpose top and trim adhesive. Staff believes that with more time, a multipurpose top and trim adhesive for all users will be developed and recommends that limit go into effect January 1, 2007.

Currently Compliant High-VOC Adhesives

The top and trim industry uses adhesives to attach various natural and synthetic materials to a variety of differing substrates including hard plastics and plastic foams, synthetic rubber, metal, and wood. Normally, these operations result in aftermarket trim including upholstery, carpeting, wood veneer, and dash covering, vinyl tops, convertible tops, headliners, door panels, seat covering, and sunroofs.

Several products are on the market and contain 490 to 540 grams of VOC per liter, less exempt compounds. They are multipurpose spray-grade contact adhesives that work for a variety of automotive and marine applications. They contain some exempt compounds, such as acetone (25 to 35 percent by weight), and have solids contents on the order of 22 to 25 percent by volume. The applied VOC emissions resulting from their use are approximately 340 to 385 grams per liter of material used (2.8 to 3.2 pounds per gallon), and are the mainstay for small business operators today, and cost approximately $10-$12 per gallon.

Waterborne Adhesives

Waterborne contact adhesives are available and are in use at a few top and trim facilities. These materials are formulated with the same neoprene rubber base, in water, with rosin acids and very little VOC (up to 80 grams per liter, less water), or as dispersions of acrylic resin and synthetic rubber in water with no VOC. These materials are much more expensive (up to $140 per 5-gallon pail) and require the use of gravity feed spray equipment which costs as little as $300, if the container can be placed above the article to be sprayed. If not, an HVLP gun with an activator pump will be needed for an additional cost of approximately $850. These products work well on foam and fabrics to foam, wood, supported vinyl, cardboard and other porous substrates. Some products may not perform well on direct spray overhead applications due to low initial green strength; however, some technical data sheets claim instant bond strength after application. Most waterborne top and trim adhesives have little or no tack and release capability, which may affect applications where materials need to be repositioned as in curvature bonding. Bonding to rubber, metal or plastic is also difficult. Some are prone to fabric staining through bleed-through; users should consult manufacturers' specification data to determine substrate compatibility.

Since the dry time of waterborne contact adhesives are longer, open time can be reduced by the addition of a salt activator. The increased costs of waterborne adhesives is somewhat offset by the increase in solids content (50 to 60 percent by volume). However, applied adhesive expense is about ten percent greater (approximately $28 per gallon), considering higher solids, when compared to a 540 grams of VOC per liter solvent-borne adhesive. It is generally true that when applying waterborne adhesive, one of the two adjoining substrates must be porous to allow the water to leave. 3M, Simalfa, and Casa Adhesive Systems manufacture a host of compliant waterborne adhesives that are being used in Original Equipment Manufacturer (OEM) facilities. The following company is using two of them today.

Known Conversion

✓ **El Kapitan Vans**

El Kapitan Vans is a van conversion facility located in Westminster, CA. Stock vans are customized to fit individual requirements. El Kaptitan uses both an activated waterborne polychloroprene and a single component latex adhesive to install various trim materials to metal, synthetic foam rubbers, and wood. Examples of this are the application of dense foam rubber padding to metal flooring and wheel wells and carpeting to the rubber padding, headliner material to molded plastic foam shells and various wood surfaces to foam backed vinyl or leather trim. In each case, at least one of the surfaces is porous.

The conversion to waterborne adhesives has not been simple as the glue is very aggressive and cannot be repositioned without reapplying adhesive. Precision placement of trim materials is necessary around contours. Cold day applications (increased tack time) are overcome with the addition of more activator. The polychloroprene adhesive works best when applied in a mist rather than higher or more complete coverage. This adhesive has been in use for nearly 3 years. The latex adhesive has been in use for a little less than a year, as they find it to work better than the activated product on their carpet applications. Incidental problem areas are addressed by hand-held aerosol spray adhesive. Hand-held aerosol adhesives are exempt from Rule 1168, but subject to the California Air Resources Board's Consumer Products Regulation.

Acetone-Based Adhesives

Acetone-based contact adhesives are still under development and one problem with current formulations is they tend to stain light colored materials. In addition, neoprene rubber-based cements, which display the necessary long-term heat resistance are not yet viable in the workplace at or below 250 grams of VOC per liter. Attempts to formulate low-VOC acetone-based adhesives with satisfactory performance have yet to be fruitful in all operations and for all colors of materials. To date, adhesive manufacturers have developed at least four products but have not achieved full marketability in the top and trim industry.

Sovereign Industrial Adhesives has tested several adhesives at a new vehicle convertible top converter in Ventura County[1]. However, these adhesives have not yet met all the customer performance requirements. Some of the formulations are zero VOC acetone-based. 3M also has an acetone product that is near zero VOC, which had shown promise, yet was ultimately

[1]Variance Progress Report to the Ventura County Air Pollution Control District, Robbins Auto Top, 5-27-03

found to be unsuitable by the end user. In addition, a canister adhesive (Westech HSC13) is available that has had some limited success, and the manufacturer claims it to be excellent for automotive headliners. The VOC content is less than 80 grams per liter. ITW TACC had formulated a high-solids adhesive in acetone but have made the business decision to stop production at this time. Unfortunately, the technical viability of these products is not yet proven, and manufacturers need more time for research, development, and performance testing of products with low-VOC content, but with high volumes of exempt compound.

Known Partial Conversion

- ✓ **Krystal Koach**

  Krystal Koach is a large limousine manufacturer that also manufactures a line of tour buses. The facility is subject to a VOC emission limit that forces them to use low-VOC adhesives and automotive coatings at their facility in Brea, CA, to maintain production schedules. They use a variety of hot melt, waterborne, pressure sensitive tapes and acetone-based adhesives for a variety of applications. The most difficult applications are headliner and vinyl top installations. Through August 2004, Krystal Koach bonded a zero VOC closed cell foam tape to the roof and followed that with the application of near zero VOC acetone-based contact adhesive to bond supported vinyl fabric to the closed cell foam to form a vinyl top. This adhesive was an acyrlonitrile butadiene rubber (NBR), which has inherently good heat resistance of 212°F. The product was described to be repositionable, have good tack time and very high strength when dry. However, due to staining of light colored vinyl top materials and insufficient long term heat resistance, Krystal Koach no longer uses this product. Kyrstal Koach continues to use activated waterborne neoprene cement and hot melt adhesives in applications where high heat resistance (220°F) is not a factor.

Hot Melts

Sprayable hot melts are in-use for light duty applications such as application of leather seating and door panel trim, and carpeting to metal, vinyl, fiberglass and other plastics. The adhesives are approximately $60 per equivalent gallon (100 percent solids) and are very cost effective compared to standard high-VOC contact adhesives. The material comes in 1¾" and 2" slugs that melt inside an accompanying spray tool that ranges in cost from $880 to $1,800. Materials display high heat resistance and are available with long and short tack times. Krystal Koach is using a pressure sensitive hot melt technology, but not for areas of the vehicle that are subject to the highest temperature swings.

Cost Issues for Top and Trim Facilities

Initially, staff believed that all top and trim facilities, including small shops, could use a mix of acetone-based adhesives on plastic and metal substrates and waterborne adhesives for all other substrates that would perform adequately and help to minimize the increase in cost of adhesives. Staff has reevaluated its assessment. Due to problems with the acetone-based adhesives, such as those at Krystal Koach, staff now believes that adhesive manufacturers need additional time to develop and field test the new formulations that will meet the high heat resistance and adhesive clarity requirements for this industry in a cost effective manner.

Staff addressed the increased costs to top and trim facilities in the 2002 amendment to Rule 1168. Staff believes that the future reformulation of high performance, high clarity sprayable exempt compound based adhesives for this industry will result in increases in adhesive costs to the industry. In addition, top and trim shops may have to purchase stainless steel spray equipment for waterborne adhesive use where applicable. Although it is impossible to predict the exact cost of new chemistries not yet marketed, staff will assume the same range of cost will be in-line with that of the acetone-based products recently developed for vinyl top applications. That adhesive cost was $49.00 per gallon, and required no spray equipment changes. Table 2 details the increased costs to small businesses based on the use of a 50/50 split of waterborne neoprene adhesive and a projected new adhesive chemistry applicable for high heat and non-staining applications, versus an existing 540 grams VOC per liter adhesive.

Table 2: Estimated Increased Costs to a Typical Small Top and Trim Shop

Adhesive Type	Gallons Used Per Year	Gallons of Solids Used Per Year	Costs Per Year
Existing 540 gm VOC/l Adhesive	120	28.2	$310/yr
Replacement Waterborne Adhesive (0 – 80 gm VOC /l)	28.2	14.1	$790yr
Replacement New Chemistry (≤250 gm VOC/l)	60	14.1	$2,940/yr
Stainless Steel Spray Gun (10-yr Cost Distribution)	-	-	$120
Typical Annual Cost Increase			$3,540/yr

(2) PVC and CPVC Welding

These products provide the mechanism for bonding same substrate materials such as plastic plumbing and electrical parts and plastic sheeting together by direct fusing to form a leak-tight continuous joint. Both plastic types typically require the use of a primer to soften the joint areas prior to the application of the cement. The finished plastic piping systems deliver drinking and irrigation water, discharge and vent sewage, transport liquid chemicals, and act as a conduit for electric and telephone wiring. Building and Uniform Plumbing codes mandate that International Association of Plumbing and Mechanical Officials (IAPMO) specifications be met. American Society for Testing and Materials (ASTM) and National Sanitation Foundation (NSF) requirements set the basis for IAPMO approval.

Since these products are exposed to drinking water, ASTM standards allow the use of only a few organic compounds; these are tetrahrydrofuran, methyl ethyl keytone, cyclohexanone, and acetone. Acetone, is an exempt compound and does reduce VOC content however, there are certain solubility limits that restrict the total volume of acetone that can be added to a specific formulation, which in turn limits the benefit of VOC content reduction once the volume of

acetone is subtracted out. High quantities of acetone cause surface crazing, a phenomenon that is not conducive to proper welding. Plastic pipe and pipefittings must be dissolved with a primer to soften the joint before application of the cement. Acetone is the only approved exempt compound under NSF ruling and it does not dissolve PVC or CPVC. Furthermore, in order for the joint to have durability, 20 to 25 percent of the reactive diluent must remain in the assembly to provide proper wetting. To date, newer formulations containing more acetone result in applications that do not meet ASTM requirements. This also applies to the primer. Solvent cement manufacturers have spent approximately 11 years trying to formulate low-VOC cements and primers that meet applicable standards with little avail.

During the June 7, 2002 amendment staff was hopeful that an adhesive technology (specifically epoxy) could replace solvent welding. Laboratory tests on such products show high bond strengths (lap shears) after 16 hours. However, there is no bite, into the PVC and this may interfere with long-term performance. Hydrostatic pressure burst testing also shows failure after two hours, indicative of failure under higher pressures. The requirement under ASTM 2564 standards is to withstand to pressure up to 400 pounds per square inch. In addition, they showed the potential for constricted flow paths due to the configuration of the designed taper of pipefittings and the relative high viscosity of the epoxy adhesive. Two-component mixes are also more challenging to work with compared to one component solvent cements offered today. To date, staff cannot identify lower-VOC adhesives that can be used to adequately bond PVC and CPVC pipes and pipefittings, that meet Rule 1168 technological forcing limits, and only slight reductions are available in primers.

Water-based formulations have also been tried and were found to lead to excessive dry times and low bond strength; water has a high surface tension while the surface tension of rigid plastic is low. Therefore, the ability of waterborne products to adequately wet the surface and provide the mechanism for welding is inadequate.

Staff has determined that the current limits of 510 grams of VOC per liter for PVC welding and 490 grams of VOC per liter for CPVC welding represent reasonably available control technology limits.

Previously, staff was told that PVC/CPVC primer and ABS cements at 550 and 325 grams of VOC per liter, respectively, will be available from the two largest manufacturers of these products for both industrial and architectural applications by the first of the year. Based on this information, staff proposed a compliance date of January 1, 2005, for the lower VOC primers and ABS cements. However, in mid November 2004, staff was informed that one of the manufacturers needed an additional six months to complete the certification process for its primer under the NSF standards and make it available in the marketplace. In order to ease the transition into the marketplace for both lower-VOC primer and ABS cement, staff now recommends establishing a compliance date of July 1, 2005, for the lower VOC limits for PVC/CPVC primer and ABS cement.

Although establishing a limit of 550 grams of VOC per liter falls short of the expected emission reductions from the current future limit of 250 grams of VOC per liter limit for PVC/CPVC primers, there are some emission reductions achieved. Combining this reduction with the

emission reduction achieved from the 325 grams of VOC per liter limit for ABS cements partially offsets the loss of expected emission reductions from PVC/CPVC welding and associated primers. A one-year sell-through and use of cements and primers meeting the existing limits will cover the transition period.

(3) Other Plastic Welding – Methylene Chloride

Acrylic, polycarbonate, and polyethylene terephalate glycol plastic (PETG) sheeting is used to build various plastic parts, including card deck shoes, food bins, aquariums, trophies and display cases of all kinds. Typical assemblies are cut from sheet acrylic, polycarbonate or PETG into specified geometries, dry fitted and welded in place with a syringe applicator. The solution, which contains large percentages of methylene chloride but is used in very small volumes, wicks under the adjoining surfaces, fusing them together. The process from welding to packaging takes 15 to 20 minutes. Exempt compounds, such as acetone, do not provide the degree of solvation that methylene chloride does and results in weak bonds. However, manufacturers have replaced some of the total mix with methyl acetate (an exempt compound) to result in lower concentrations of methylene chloride. The formulations now contain roughly 40 to 60 percent by weight of methylene chloride, depending on the viscosity of the applied cement (light, medium or heavily bodied cements).

In the July 7, 2002 amendment package, staff recognized that phasing out the use of methylene chloride based solvent cements for hard plastic may be difficult to achieve by reformulation. Efforts by manufacturers of these adhesives over the last two years have resulted in reducing the maximum methylene chloride content from 91 percent by weight to 40 to 60 percent. The inferior performance of substitute products compared to methylene chloride makes a complete phase out of methylene chloride in this specific application infeasible. However, the maximum annual use of such solvent welding products for each end user is quite small because a syringe full of solvent welding material can weld many parts. To limit health risk associated with the use of these products, staff proposes to limit the methylene chloride content of these adhesives to 60 percent by weight and proposes to restrict the sales to and use by any single facility to 20 gallons per year of methylene chloride containing products used for solvent welding of acrylic, polycarbonate and PETG plastics. This approximates the current maximum annual usage of larger fabricators. Emissions from existing sources at this level are well within current health-based standards using a worst-case scenario for an impacted receptor.

EMISSIONS INVENTORY AND NET EMISSION REDUCTIONS FOREGONE

The recommended action to retain the current VOC limits for PVC and CPVC welding, coupled with the reduction in VOC content for ABS welding and adhesive primers for plastic will result in net emissions reductions foregone. Table 3 below summarizes the inventory and the emissions foregone, resulting from these proposed amendments. This data was obtained through earlier revisions of Rule 1168, as supplied by the manufacturers. Today's emissions are estimated by assuming a two percent growth rate. Mileage does not play a major factor in solvent cement operations due to higher solids content. Future year estimated emissions are calculated based on the ratio of the lower VOC content to its higher VOC content predecessor, multiplied by the earlier inventory year, and increased by a two percent per year growth rate.

Table 3: Emissions Inventory and Emissions Foregone

Plastic Welding Type	*1/1/1993 VOC Limits (gpl)*	1/1/1993 Emission Inventory (Ton/Day)	Current VOC Limits (gpl)	Current Emission Inventory Projected at 2% Growth Rate Through 1/1/2005 (Ton/Day)	Proposed VOC Limits (gpl)	Emission Inventory Adjusted for Proposed Limits (Ton/Day)	1/1/2005 VOC Limits (gpl)	Emissions Inventory Based on 1/1/2005 VOC Limits (Ton/Day)
PVC	850	0.75	510	0.57	510	0.57	285	0.32
CPVC	850	0.24	490	0.18	490	0.18	270	0.10
ABS	850	0.99	400	0.59	325	0.48	400	0.59
Primer	650	0.66	650	0.84	550	0.71	250	0.32
Totals		2.64		2.17		1.93		1.33

Emissions Foregone Retaining All Current VOC Limits (Ton/Day)	Emissions Foregone at Proposed VOC Limits (Ton/Day)
0.84	0.60

Therefore, the net of emission reductions previously expected that will not be achieved will be 0.60 ton of VOC per day.

The following table estimates the emission reductions delayed until January 1, 2007. The previous rule development has estimated the use of automotive top and trim adhesives to be 65,194 gallons per year, as derived from manufacturer's data. The assumptions are that the solventborne 540 grams VOC per liter adhesive, less water and less exempt compounds (362 grams of VOC per liter, as applied including water and exempt compounds) has a solids content by volume of 23.5 percent, and that replacement low-VOC adhesives at the rule limit of 250 grams VOC per liter, less water and less exempt solvent will contain 35.0 percent solids by volume, and the total volume of solids to be applied to the same regardless of the VOC content of the adhesive.

Table 4: Automotive and Marine Top and Trim Emissions Delayed

Solventborne 540 grams VOC per liter	
Gallons Used per Year	65,194
Gallons of Solids	15,321
Emissions in Tons/Yr	98.6
Replacement Low-VOC Adhesive at 250 grams of VOCper liter	
Gallons Used Per Year	43,773
Gallons of Solids	15,321
Emissions in Tons Per Year	22.8
Emissions Delayed in Tons per Year	**75.8**
Emissions Delayed in Tons per Day	**0.21**

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METHYLENE CHLORIDE INVENTORY FOR SOLVENT WELDING AND TOXICITY ESTIMATION

There is one primary manufacturer of methylene chloride-based solvent welding products for use in the AQMD. Based on the company sales of methylene chloride cements to the acrylic, polycarbonate, and PETG plastic fabrication industries, methylene chloride emissions are estimated at 0.058 tons per day. A solvent substitution with the exempt compound methyl acetate has replaced another toxic compound trichloroethylene. Trichloroethylene is also scheduled for phase-out on January 1, 2005, and unlike methylene chloride, does not have one-year sell-through provision. The largest manufacturer of solvent welding products has reduced methylene chloride content in its lowest viscosity product by 34 percent, and by 23 percent on its heavier bodied cement. The company has performed tests on its products with reduced methylene chloride and has determined that these reductions are the maximum available reductions they can formulate without compromising the strength of the welded joint, while still maintaining reasonable production dry time.

In considering an exemption from the prohibition of sales of adhesives and sealants containing methylene chloride, as it relates to acrylic, polycarbonate and PETG welding, staff concludes that a limited exemption that limits both the concentration of methylene chloride in formulation and total throughput would minimize health risk to the maximum extent possible.

The individual risks and health indices can be established based on the Risk Assessment Procedures for Rules 1401 and 212, as published by the AQMD. The procedure may be extended to Rule 1402 evaluations, which sets the basis for AB2588 compliance. The attached table in Appendix A shows the various health risks associated with methylene chloride, as it is used by the plastic fabrication industries at a maximum of 20 gallons per year of 60 percent by weight of methylene chloride solvent welding formulations. The calculations show the maximum cancer risk would occur in West Los Angeles with a value of approximately 3 cases per million residents and 2 cases per million workers. The health indices for acute and chronic exposures (HIA and HIC (short and long term health exposure indices)) at this level are below

the allowable maximums of 3.0 and the cancer burden (increase of cancer cases with a population) is well below 0.5.

SIP SETTLEMENT AGREEMENT

The 1999 SIP settlement agreement (the Agreement) between the National Resources Defense Council, Coalition for Clean Air and Communities for a Better Environment and the South Coast Air Quality Management District requires that when the limits under Rule 1168 cannot be achieved, the Board must find that it is infeasible to implement the measure by 2003. On June 7, 2002, the Governing Board authorized a delay of the implementation of technology forcing limits for PVC welding, CPVC welding, associated primers and for other plastic cement welding to January 1, 2005. The emissions delayed for these products was 0.85 tons per day. The emissions delayed for top and trim adhesives as part of the October 3, 2003 amendment to Rule 1168 were calculated to be 0.2 tons per day, which is the same quantity of this proposal. Furthermore, if a limit is found to be technologically infeasible, the AQMD may make up the shortfall through alternative measures within two years after implementation of Rule 1168 as it was amended in 1998. In this case that shortfall has been more than compensated by the September 15, 2000 amendments to Rule 1168, which achieved year 2010 reductions of 8.0 tons per day of VOC. These reductions are well in excess of the required 1.3 tons of VOC reductions required from VOC reduction measures of the Agreement. Therefore, the emissions forgone by this amendment to Rule 1168 of 0.60 tons per day from plastic cement welding and associated primers, and an additional 0.2 tons of VOC per day reductions that will be delayed until January 1, 2007 for the automotive and marine top and trim industry, do not negatively affect the Agreement.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

Pursuant to the California Environmental Quality Act (CEQA) and the AQMD's Certified Regulatory Program (Rule 110), the AQMD has prepared a draft Environmental Assessment (EA) for Proposed Amended Rule 1168 – Adhesive and Sealant Applications. The draft EA was released for a 45-day public review period beginning on October 5, 2004 and a revised draft Subsequent Environmental Assessment (SEA) was released on November 4, 2005. Comments received during the review period were responded to and included in the Final EA. Copies of the draft EA can be obtained by calling the AQMD's Public Information Center at (909) 396-2039. A copy of the final SEA is included as an attachment to the adoption Board letter.

Subsequent to the release of the Revised Draft Subsequent Environmental Assessment (SEA) for PAR 1168, PAR 1168 was modified to delay the PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005. The Revised Draft SEA for PAR 1168 includes an alternative that delays the PVC and CPVC primer and ABS welding Final VOC content limit requirements for two years (Alternative B). Alternative B would result in 1,030 pounds per day of VOC emissions foregone from PVC and CPVC primer instead of the 773 pounds per day of VOC emissions foregone expected by the project. Alternative B would also not produce 220 pounds per day of VOC emission reductions from the new ABS welding VOC content requirement, because this requirement was not included in Alternative B.

While the emissions reductions foregone from the delay of PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005 is a modification to the previously proposed project, this modification is considered to be within the scope of the analysis of the environmental impacts resulting from implementing Alternative B. The Revised Draft SEA clearly presented Alternative B and the adverse environmental impacts from choosing Alternative B. The Revised Draft SEA also clearly states that the Governing Board can choose all or part of any of the alternative even if the alternative or portion of the alternative may generate environmental impacts that are significantly worst than those proposed in the project. Therefore, the Revised Draft SEA need not be recirculated, in this situation, since the adverse environmental impacts of Alternative B, and the ability of the Governing Board to choose this or other alternatives or parts of the alternatives were fully disclosed to the public in the Revised Draft SEA.

The Final SEA includes a detailed description and analysis of adverse environmental impacts from the delay the PVC and CPVC primer and ABS welding VOC content limit requirements from January 1, 2005, to July 1, 2005.

SOCIOECONOMIC ANALYSIS

Since there is no change to the current VOC limits for PVC and CPV welding as well as the associated primers, there is no additional cost for this provision. In the case of ABS solvent cements, the manufacturers reformulated by acetone substitution for VOC. The price of acetone is roughly the same as the VOC solvent, therefore no price increase of the reformulated ABS cement should occur. Likewise, the exempt solvents used to replace some of the methylene chloride in the formulation used to bond acrylic, polycarbonate and PETG plastics cost approximately the same. Staff has determined that the current VOC limits for automotive and marine top and trim adhesives are not technically feasible until 2007. However, all additional costs to the top and trim industry for the final limits have been accounted for in previous rule amendments. As such, there are no additional costs or other socioeconomic impacts for these proposed amendments.

Cost Effectiveness and Incremental Cost Effectiveness

Health and Safety Code Section 40920.6 requires an incremental cost effectiveness analysis when there is more than one control option to achieve the emission reduction objective of the proposed amendments, relative to ozone, CO, SOx, NOx, and their precursors. Since the proposal foregoes and delays scheduled emission reductions due to technical infeasibility, no additional control options are available and therefore there is no incremental cost effectiveness. As determined in the previous rule amendment, additional costs to a typical top and trim shop are expected to be $3,540 by January 1, 2008, on an annual basis, considering existing one-year sell-through and use provisions. No incremental cost increases are expected to occur for ABS cement and PVC/CPVC primer, since there are no other lower emission control options.

LEGISLATIVE AUTHORITY

The California Legislature created the AQMD in 1977 (The Lewis-Presley Air Quality Management Act, Health and Safety Code Section 40400 et seq.) as the agency responsible for developing and enforcing air pollution control rules and regulations in the Basin. By statute, the

AQMD is required to adopt an Air Quality Management Plan (AQMP) demonstrating compliance with all state and federal ambient air quality standards for the Basin [California Health and Safety Code Section 40460(a)]. Furthermore, the AQMD must adopt rules and regulations that carry out the AQMP [California Health and Safety Code Section 40440(a)].

REQUIREMENT TO MAKE FINDINGS

Before adopting, amending, or repealing a rule, the California Health and Safety Code Section 40727 requires the AQMD to adopt written findings of necessity, authority, clarity, consistency, non-duplication, and reference, based on relevant information presented at the public hearing and in the staff report. In addition, Section 40727.2 requires a written analysis comparing the proposed rule with existing federal regulations, and any other AQMD existing or proposed rules and regulations that apply to the same source type.

Comparison of Proposed Rule 1168 and Other Federal Regulations

There are no federal regulations regarding the use of adhesives and sealants. There are no other AQMD rules that apply to the same source type.

Findings

Necessity - The AQMD Governing Board has determined that a need exists to amend Rule 1168 – Adhesive and Sealant Operations, to account for the technical infeasibility of the final VOC limits for PVC welding, CPVC welding, and for solvent welding of acrylic, polycarbonate, and PETG plastic welding. This proposed amendment to Rule 1168 will also incorporate achieved reductions in VOC content for ABS welding products and for primers used in association with PVC and CPVC welding by July 1, 2005. The AQMD Governing Board has also determined that a need exists to delay final implementation of a 250 grams of VOC per liter limit until January 1, 2007, due to the unavailability of compliant automotive and marine top and trim adhesives.

Authority - The AQMD Governing Board obtains its authority to adopt, amend, or repeal rules and regulations from the California Health and Safety Code Sections 39002, 39650, 40000, 40001, 40440, 40702, 41508, and 41700 et seq.

Clarity - The AQMD Governing Board has determined that the proposed amendments to Rule 1168 are written or displayed so that persons that are directly affected by it can easily understand its meaning

Consistency - The AQMD Governing Board has determined that Proposed Amended Rule 1168 is in harmony with, and not in conflict with or contradictory to, existing statutes, court decisions, federal or state regulations.

Non-Duplication Rule 1168 does not impose the same requirements as any existing state or federal regulations, and the proposed amended rule is necessary and proper to execute the powers and duties granted to, and imposed upon, the AQMD.

Reference - In adopting this regulation, the AQMD Governing Board references the following statutes which the AQMD hereby implements, interprets or makes specific: California Health and Safety Code Sections 40440(a) (rules to carry out the Air Quality Management Plan), and

40440(c) (cost-effectiveness), 41508, 41700 (nuisance), and Federal Clean Air Act Section 172(c)(1) (RACT).

Problem - The AQMD Governing Board finds and determines that there is a problem that Proposed Amended Rule 1168 will alleviate, that is low-VOC adhesives that meet performance requirements, including those of other agencies, for PVC welding, CPVC welding, associated primers for PVC and CPVC welding do not exist and for solvent welding of acrylic, polycarbonate, and PETG plastic acceptable non-methylene chloride formulations are not available. The AQMD Governing Board also finds and determines that there is a problem that Proposed Amended Rule 1168 addresses, and seeks to alleviate, through further research, development, and performance testing by manufacturers of automotive and marine top and trim adhesives, to develop acceptable performing low-VOC adhesives for this industry by January 1, 2007.

CONCLUSIONS AND RECOMMENDATIONS

- ✓ Retain the VOC limit of 510 grams of VOC per liter for PVC welding.
- ✓ Retain the limit of 490 grams of VOC per liter for CPVC welding.
- ✓ Reduce the VOC limit for ABS welding from 400 grams of VOC per liter to 325 grams of VOC per liter. Products are available to meet this standard, and will be supplied by the largest makers of ABS welding products by July 1, 2005.
- ✓ Reduce the VOC limit for adhesive primers for plastic from 650 grams of VOC per liter to 550 grams of VOC per liter. Products are available to meet this standard, and will be supplied by the largest makers of primers for plastics by July 1, 2005
- ✓ Postpone compliance with the 250 grams of VOC per liter less water and less exempt compounds limit for automotive and marine top until January 1, 2007, and maintain the current limit of 540 grams of VOC per liter until then.
- ✓ Limit the concentration of methylene chloride in solvent welding formulations for welding acrylic, polycarbonate and PETG plastic fabrications to 60 percent by weight, and combine this with a purchase limitation of 20 gallons per year per facility, as demonstrated by purchase records and invoices of methylene chloride containing solvent welding formulations. Require such records to be made available to the Executive Officer upon request.
- ✓ Rearrange the low-solids material-based VOC content applicability from the bottom of the sealants table to a new subparagraph (c)(2)(A) for improved rule clarity.
- ✓ Add Table of Standards headings (Table 1, Table 2, Table 3 ...etc.) for easier reading and further clarity of their order of use by adding a new subparagraph (c)(2)(B).

COMMENTS AND RESPONSES

Industy Comments

Comment No. 1

Although a one-year sell through provision is allowed in Rule 1168 for PVC and CPVC primers and ABS cements, as one of the largest public water districts it is our policy not to rely solely on manufacturers performance data, but rather conduct testing on lower VOC content products at our own laboratory to ensure reliable water distribution. We will need an additional year to accomplish the necessary testing and gain NSF certification.

Response

Staff has contacted IPS Corp., the largest manufacturer of plastic pipe cements and primers for industrial use have obtained NSF certification. Both primer and ABS cement will be available in the marketplace by the end of this year. IPS has advised staff that the compliant products have been offered to the water district since July. The compliance date of July 1, 2005, will allow for the year of testing that the water district policy requires. Oatey, is yet another solvent cement manufacturer that will have products that are NSF certified also by the end of the year. Nonetheless, all users of primers and ABS cements can continue to purchase higher VOC products, compliant with the current limits, and manufactured before July 1, 2006 and use them as needed under the rule's one-year sell through and use provisions. The July 1, 2005 proposed compliance date is a six-month time extension of the January 1, 2005 compliance date in the original staff proposal. Staff believes that this amount of time should be adequate for all users to transition to compliant products, including those conducting NSF testing on their own behalf, despite the NSF certification obtained by the manufacturers.

Comment No. 2

As a supplier of top and trim adhesives to many small users in the field, our customers have limited resources and are neither aware of or have had the opportunity to evaluate the products cited in the Preliminary Draft Staff Report. We cannot find the acetone rich adhesives spoken of in the staff report through normal channels of distribution, thus rendering them not available or suitable for use in the top and trim industry. We manufacture a waterborne product ourselves but there are limitations of heat resistance, non-porous material adhesion, low green strength and dry time. There is a lack of discussion in the Staff Report as to the high heat resistance of the experimental adhesives cited.

We continue to invest in low-VOC technologies and have made some progress. We request additional time to perform trials at various top and trim shops in order to report our findings, and further recommend no change to the rule at this time until adequate performance testing and technical review is accomplished. We have gathered signatures of 29 end users that cite economic hardship to their businesses should the 250 grams of VOC per liter be initiated on January 1, 2005.

Response

Staff has previously identified in its May 2002 Staff Report that the main concerns with waterborne neoprene contact adhesives are that they do not display the same heat resistance as their high-VOC counterparts. Dry time is significantly longer (about twice as long), bonds to metal and plastic are more difficult, and the cost is higher. In addition, this report identifies

many of the drawbacks of waterborne contact adhesives, including non-porous material adhesion, low green strength and dry time. Following application guidelines is very important to achieve proper bonding. If waterborne adhesive is applied too thick, or recommended dry times are not met, pockets of unpolymerized or underpolymerized adhesive beneath the surface may leak out the perimeter at elevated ambient temperatures. There are no performance compromises when using waterborne emulsions over solventborne ones if applied properly. The final product, polychloroprene, is the same in either case. Polychloroprene has inherently high cohesive strength and good heat resistance, although solventborne formulations containing neoprene rubber display higher heat resistance to their waterborne counterparts. Waterborne emulsions come premixed and ready to use, or with an activator. Characteristics such as rate of cure, viscosity, elasticity, etc. are varied by the formulation, which includes initiators and chain-length modifiers. Therefore, application and performance characteristics are not insurmountable, particularly when a combination of two-part waterborne neoprene or single component acrylic copolymer formulations exist and are being used where extreme high heat resistance is not a factor. Staff admits that without reliable exempt compound-based adhesives, full conversion to low-VOC adhesives is not possible at this time, particularly where heat resistance is a factor. Waterborne adhesives cited in this report have been in the marketplace for years, successfully used in certain applications, and at substrate temperatures not typically exceeding 180°F. The acetone-based adhesive that had been cited in the Preliminary Draft Staff Report for use in vinyl top applications did not perform adequately in the field. Therefore, staff recommends extending the compliance date requiring the use of 250 grams of VOC per liter adhesives until January 1, 2007, and retaining the current 540 grams of VOC per liter of adhesives in the interim.

Comment No. 3
The following comment is a summary of the concerns expressed at the public workshop held on June 29, 2004.

Solvent-based adhesive at 540 grams of VOC per liter are the only adhesives available to make a proper bond. Some of the top and trim industry is still grappling with the use of these products. It is our experience as suppliers of adhesives for a variety of applications that waterborne contact adhesives used in the top and trim industry do not perform well. There is an increase in usage due to material waste, and therefore an increase in cost, and they stain by bleeding through light colored materials. Reducing the allowable VOC limit for these adhesives to 250 grams per liter will only exacerbate the problem. Acetone-based adhesives are based on SBR-(styrene-butadiene rubber) and lack sufficient heat resistance. All of these factors lead to downtime, repairs, and warranty work that add to the overall costs of a job. Both facilities cited as using low VOC adhesives are no longer using them at all.

We see a tremendous amount of black market and bootlegged adhesives that exceed the current VOC limit of 540 grams per liter. It is our opinion that this is a result of a lack of enforcement of Rule 1168 as it applies to the small business top and trim marketplace.

Response
As stated in the Preliminary Staff Report, starting on page 3, staff has identified applications where waterborne adhesives do work well. These are foam and fabric to foam, wood, supported vinyl, cardboard and other porous substrates. Staff also stated that there can be difficulties with

waterborne adhesives due to the potential for bleed through, low initial green strength and little or no tack and release capability, however, two-part (or activated) waterborne materials provide better adhesion and polymerization, and are being used today. One-part adhesives by Simalfa are also being used for trim, where applicable (Gulfstream Aerospace is an example). Careful application of waterborne adhesives maximize the mileage of high-solids adhesives. (See the response to comment number 2 for additional discussion).

The acetone-based adhesive cited that was being used at Krystal Koach and since discontinued is not an SBR product, it is an NBR (acrylonitrile-butadiene rubber) based adhesive. El Kapitan Vans continues to employ waterborne adhesives. Staff acknowledges that reapplication of adhesive may occur due to the learning curve of using such products, but this waste should be reduced over time as applicators become more proficient in applying and using them. Furthermore, staff re-visited the companies that are using low-VOC adhesives and re-verified their use as of August 2004. Upon learning and verifying the discontinuance of the use of acetone-based cement, staff concludes that additional time is necessary to further develop these products and now recommends delaying the the January 1, 2005 VOC limit of 250 grams per liter to January 1, 2007. Adhesive manufacturers are still engaged in finding a solution to a multipurpose top and trim adhesive and require more time to research and test these products before releasing them to the professionals in this business.

Comment [WM1]:

Comment [WM2R1]:

Comment [WM3R2]:

Comment [WM4R3]:

Comment [WM5R4]:

Comment [WM6R5]:

The issue of alleged non-compliance has been brought to the attention of compliance staff for follow-up.

EPA Comment

The rule revision contains significant relaxations to some VOC content limits. For EPA to approve such a revision SCAQMD must demonstrate compliance with Clean Air Act section 110(l), which prohibits SIP revision that interfere with attainment, reasonable further progress or any other provision of this Act.

AQMD Reponse

Under the 1997 SIP approved AQMP, the total emission reduction commitment under control measure CTS-02E – Further Emission Reductions from Adhesives – Rule 1168 was 1.3 tons/day on a summer planning inventory basis by the year 2010. The September 15, 2000 amendments to Rule 1168 were wide-sweeping and obtained 8.0 tons per day of reductions in VOC emissions on the same basis. Therefore, the 0.6 tons per day of emissions foregone on PVC, CPVC solvent cements and associated primer are more than compensated for with excess emission reductions of 6.7 tons of VOC per day achieved under the year 2000 revision to Rule 1168. Furthermore, the 2003 AQMP established a .3 ton per day set aside to account for emission reductions delayed or forgone resulting from future rule amendments reflecting technical infeasibilities.

APPENDIX A

Toxic Risk Assessment Table for Methylene Chloride Welding of Acrylic, Polycarbonate and PETG Plastic Fabrications

Air Monitoring Station	Q (max) tons per year of MeCl	Distance From source at which MICR becomes 1 x 10^{-6} (ft)	Unit Risk Factor	MICR (Resident) 25 ft	MICR (Worker) 25 ft	HIA (Acute)	HIC (Chronic)	Cancer Burden *(Increase of Cancer to a Population)*
Anaheim	0.07	27.22	1.00E-06	2.57E-06	1.69E-06	0.66	0.0064	0.03
Azusa	0.07	28.31	1.00E-06	2.39E-06	1.58E-06	0.66	0.0060	0.03
Banning	0.07	35.84	1.00E-06	1.61E-06	1.06E-06	0.66	0.0040	0.02
Burbank	0.07	33.52	1.00E-06	1.79E-06	1.18E-06	0.66	0.0045	0.02
Canoga Park	0.07	31.07	1.00E-06	2.03E-06	1.34E-06	0.66	0.0051	0.02
Compton	0.07	32.53	1.00E-06	1.88E-06	1.24E-06	0.66	0.0047	0.02
Costa Mesa	0.07	30.30	1.00E-06	2.12E-06	1.40E-06	0.66	0.0053	0.02
Downtown L.A.	0.07	37.20	1.00E-06	1.52E-06	1.00E-06	0.66	0.0038	0.02
El Toro	0.07	31.07	1.00E-06	2.03E-06	1.34E-06	0.66	0.0051	0.02
Fontana	0.07	28.31	1.00E-06	2.39E-06	1.58E-06	0.66	0.0060	0.03
Indio	0.07	30.05	1.00E-06	2.15E-06	1.42E-06	0.66	0.0054	0.02
King Harbor	0.07	32.53	1.00E-06	1.88E-06	1.24E-06	0.66	0.0047	0.02
La Canada	0.07	28.12	1.00E-06	2.42E-06	1.60E-06	0.66	0.0060	0.03
Lancaster	0.07	38.20	1.00E-06	1.46E-06	9.65E-07	0.66	0.0037	0.02
Lennox	0.07	31.63	1.00E-06	1.97E-06	1.30E-06	0.66	0.0049	0.02
Long Beach	0.07	34.24	1.00E-06	1.73E-06	1.14E-06	0.66	0.0043	0.02

Los Alamitos	0.07	32.22	1.00E-06	1.91E-06	1.26E-06	0.66	0.0048	0.02
Lynwood	0.07	32.53	1.00E-06	1.88E-06	1.24E-06	0.66	0.0047	0.02
Malibu	0.07	26.89	1.00E-06	2.63E-06	1.73E-06	0.66	0.0066	0.03
Newhall	0.07	36.28	1.00E-06	1.58E-06	1.04E-06	0.66	0.0040	0.02
Norco	0.07	29.36	1.00E-06	2.24E-06	1.48E-06	0.66	0.0056	0.03
Palm Springs	0.07	33.52	1.00E-06	1.79E-06	1.18E-06	0.66	0.0045	0.02
Pasadena	0.07	29.36	1.00E-06	2.24E-06	1.48E-06	0.66	0.0056	0.03
Pico Rivera	0.07	30.55	1.00E-06	2.09E-06	1.38E-06	0.66	0.0052	0.02
Pomona	0.07	26.42	1.00E-06	2.72E-06	1.79E-06	0.66	0.0068	0.03
Redlands	0.07	26.58	1.00E-06	2.69E-06	1.77E-06	0.66	0.0067	0.03
Reseda	0.07	30.30	1.00E-06	2.12E-06	1.40E-06	0.66	0.0053	0.02
Riverside	0.07	27.93	1.00E-06	2.45E-06	1.62E-06	0.66	0.0061	0.03
Santa Ana Cyn	0.07	26.28	1.00E-06	2.75E-06	1.81E-06	0.66	0.0069	0.03
Upland	0.07	32.85	1.00E-06	1.85E-06	1.22E-06	0.66	0.0046	0.02
Vernon	0.07	35.42	1.00E-06	1.64E-06	1.08E-06	0.66	0.0041	0.02
Walnut	0.07	32.53	1.00E-06	1.88E-06	1.24E-06	0.66	0.0047	0.02
West L.A.	0.07	25.19	1.00E-06	2.98E-06	1.97E-06	0.66	0.0075	0.03
Whittier	0.07	31.63	1.00E-06	1.97E-06	1.30E-06	0.66	0.0049	0.02

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT

Final Subsequent Environmental Assessment for:

Proposed Amended Rule 1168 – Adhesive and Sealant Applications

December 22, 2004

SCAQMD No. 041104JKK

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~~content limit is~~ are expected to eliminate VOC emission reductions originally anticipated in the 2002 amendments to Rule 1168. An additional VOC content limit reduction for ABS welding is included in PAR 1168. However, even with the additional VOC reductions for ABS welding, based on the volume of PVC/CPVC cement and primer sold and presumably used, the VOC emission reductions foregone are anticipated to exceed the SCAQMD's daily significance threshold and, thus, the proposed project is expected to have significant adverse air quality impacts. The following discussion also demonstrates that the proposed methylene chloride concentration limit of 60 percent by weight and the proposed facility limit of 20 gallons per year would prevent significant adverse air quality impacts from adhesive formulated with methylene chloride.

Significance Criteria

The project will be considered to have significant adverse air quality impacts if any one of the thresholds in Table 4-1 are equaled or exceeded.

Construction Emissions

PROJECT-SPECIFIC IMPACT: The implementation of the proposed amended rule will not trigger any construction activity. No add-on control equipment or additional employees will be required from the implementation of the proposed amendments. Additionally, no add-on control equipment will be used to reduce VOC or methylene chloride emissions at affected facilities. The primary effects of the proposed amendments are to allow the continued use of existing adhesive products that comply with the existing VOC content limit requirements of 540 grams per liter for top and trim adhesives, 510 grams per liter for PVC welding and 490 grams per liter for CPVC welding, which would rescind the future January 1, 2005 VOC content limit requirements of 285 grams per liter for PVC welding and 270 grams per liter for CPVC welding. The final VOC content limit of 250 grams per liter for top and trim adhesive would be delayed until January 1, 2007, during which time the interim VOC limit of 540 would remain in place. ~~New~~ A new VOC content limits requirement of 325 grams per liter (currently 400 grams per liter) for ABS cements effective July 1, 2005 would be established by PAR 1168.~~, and the~~ PAR 1168 would rescind the January 1, 2005 VOC content limit requirement of 250 grams per liter for PVC/CPVC primers. After January 1, 2005, the 650 grams per liter interim VOC content limit requirement for PVC/CPVC primers would remain in effect until July 1, 2007 when it would be replaced with a 550 grams per liter VOC content limit requirement. ~~(currently 650 grams per liter) for PVC/CPVC primers would replace the 250 gram per liter VOC content limit~~. Replacing the prohibition of methylene chloride in solvent welding formulations used to bond hard acrylic, polycarbonate, and polyethylene terephalate glycol plastic fabrication with concentration and facility limits would also not require additional construction.

Therefore, no construction and construction air quality impacts are anticipated for implementing PAR 1168.

Table 4-1
SCAQMD Air Quality Significance Thresholds

Mass Daily Thresholds		
Pollutant	**Construction**	**Operation**
NOx	100 lbs/day	55 lbs/day
VOC	75 lbs/day	55 lbs/day
PM10	150 lbs/day	150 lbs/day
SOx	150 lbs/day	150 lbs/day
CO	550 lbs/day	550 lbs/day
Lead	3 lbs/day	3 lbs/day
TAC, AHM, and Odor Thresholds		
Toxic Air Contaminants (TACs)	Maximum Incremental Cancer Risk (MICR) $\geq$ 10 in 1 million Hazard Index (HI) $\geq$ 1.0 (project increment) Hazard Index (HI) $\geq$ 3.0 (facility-wide)	
Odor	Project creates an odor nuisance pursuant to SCAQMD Rule 402	
Ambient Air Quality Thresholds for Criteria Pollutants		
NO_2 1-hour average Annual average	 20 $\mu g/m^3$ (= 1.0 pphm) 1 $\mu g/m^3$ (= 0.05 pphm	
PM10 24-hour average Annual Geometric Mean	 2.5 µg/m3 1.0 µg/m3	
Sulfate 24-hour average	 1.0 µg/m3	
CO 1-hour average 8-hour average	 1.1 mg/m^3 (= 1.0 ppm) 0.50 mg/m^3 (= 0.45 ppm)	

AHM = Acutely Hazardous Material; TAC = toxic air contaminant; mg/m^3 = milligram per cubic meter; $\mu g/m^3$ = microgram per cubic meter; pphm = parts per hundred million; ppm = parts per million

PROJECT-SPECIFIC MITIGATION: No mitigation required.

Operational Emissions

PROJECT-SPECIFIC IMPACT:

VOC Emissions

Implementation of PAR 1168 is expected to result in VOC emission reductions foregone. Retaining the current VOC content limits for top and trim, PVC and CPVC welding; coupled with the reduction in VOC content for ABS welding and adhesive primers for ~~plastic~~ PVC and CPVC, would forego the 2002 FEA VOC emission reductions. Tables 4-2, 4-3 and 4-4 below summarize the inventory and the emissions foregone, resulting from these proposed amendments. VOC emission limits, emissions inventory, emissions reductions, and emissions foregone for PVC, CPVC, and ABS welding; and PVC and CPVC primer are presented in Table 4-2. Proposed changes to these categories would become permanent if the proposed project is adopted. Top and trim inventory, VOC emission inventory and VOC emission reductions delayed are presented in Table 4-3. This delay in VOC emission reductions is temporary and would end on January 1, 2007. A summary VOC emission reduction foregone for all affected adhesives are presented in Table 4-4. The first column presents the VOC emission reductions foregone in tons per day if final VOC content limits for all affected adhesive categories are rescinded. The second column presents the VOC emission reductions foregone in tons per day that would occur ~~after~~ between January 1, 2005 and July 1, 2005, if the project were approved. The third column presents the VOC emission foregone between July 1, 2005 and January 1, 2007, if the project were approved. The last column presents the VOC emission reductions forgone in tons per day that would occur after January 1, 2007, if the project were approved. The remaining columns present the same information in pounds per day.

Table 4-2
VOC Emissions Limits, Emissions Inventory, and Emissions Foregone

	VOC Limits			VOC Emissions Inventory			Emissions Foregone	
Plastic Welding Type	Current VOC Content Limits (gram/liter)	1/1/2005 FEA VOC Content Limits (gram/liter)	Proposed VOC Content Limits (gram/liter)	Current Emission Inventory (ton/day)	Future Emissions Inventory Based on 1/1/2005 FEA VOC Content Limits[a] (ton/day)	Future Emission Inventory Based on 1/1/2005 Proposed VOC Content Limits[b] (ton/day)	Emissions Foregone Based on Rescinding FEA VOC Content Limits[c] (ton/day)	Emissions Foregone Based on Proposed VOC Content Limits[d] (ton/day)
PVC	510	285	510	0.569	0.569	0.318	-0.251	-0.251
CPVC	490	270	490	0.174	0.174	0.096	-0.078	-0.078
ABS	400	400	325	0.588	0.478	0.588	0.000	0.110
PVC/CPVC Primer	650	250	550	0.832	0.704	0.320	-0.512	-0.384
Totals				**2.163**	**1.925**	**1.322**	**-0.840**	**-0.600**

[a] Future emission inventory based on 1/1/2005 FEA VOC content limits, ton/day = Current emissions inventory x ((Proposed VOC content limits)/(Current VOC content limits))

[b] Future emission inventory based on 1/1/2005 Proposed VOC content limits, ton/day = Current emissions inventory x ((1/1/2005 FEA VOC content limits)/(Current VOC content limits))

[c] Emissions foregone based rescinding FEA VOC limits (tons/day) = Future emission inventory based on 1/1/2005 proposed limits (ton/day) - Current emission inventory (ton/day)

[d] Emissions foregone based proposed VOC limits (tons/day) = Future emission inventory based on 1/1/2005 proposed limits (ton/day) - Future emissions inventory based on 1/1/2005 FEA VOC limits (ton/day)

Table 4-3
Estimated Top and Trim Adhesives Inventory and VOC Emission Reductions Delayed

Adhesive Type Based on Range of VOC Content	VOC Content of Material less water/exempt compounds		VOC Content of Material, As Applied less water/exempt compounds		Adhesive Coverage	Estimated Annual Adhesive Inventory Based on Coverage[a]	Estimated VOC Emissions[b]	
	grams /liter	lb/gal	grams /liter	lb/gal	sq. ft./gal	gal/yr	lb/day	ton/day
Interim VOC Limit Adhesive (Current limit post-June 2002)	540	4.50	340	2.83	309	65,194	506	0.253
Final VOC Limit Adhesive (To be in effect January 1, 2007)	250	2.08	125	1.04	625	32,232	92	0.046
Total Estimated VOC Emission Reductions Delayed[c]							**414**	**0.299**

[a] To calculate the estimated annual adhesives usage based on adhesive coverage data, multiply the 'interim VOC adhesive' inventory by a ratio of the interim VOC adhesive coverage to the coverage for the material in question. For example, the calculation of the estimated annual adhesive usage for a compliant adhesive is as follows: 65,194 gal/yr x (309 sq. ft./gal / 625 sq. ft./gal) = 32,232 gal/yr of compliant adhesive

[b] To calculate the 'estimated VOC emissions', multiply the 'VOC content of material, as applied' by the 'estimated annual adhesive inventory based on coverage' and adjust for days and tons, as applicable. For example, for the 'interim VOC limit' adhesive category, the calculation of estimated VOC emissions is as follows: 1.04 lb VOC/gal x 65,194 gal/yr x 1 yr/365 days = 506 lb VOC/day x (1 ton/2000 lb) = 0.253 tons VOC / day

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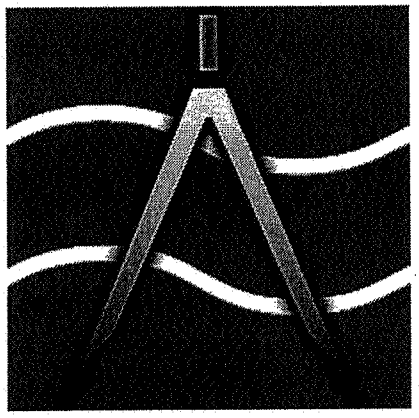

TECHNICAL NOTES

CEMENT USAGE FOR PVC, CPVC

For estimating solvent cement needs, refer to the chart below.
Allow two joints for each coupling, three joints for each tee, etc.

No. of Joints per inch:*	1/4"	3/8"	1/2"	3/4"	1"	1-1/4"	1-1/2"	2"
Pint	150	150	130	80	70	50	35	20
Quart	300	300	260	160	140	100	70	40
Gallon	1200	1200	1040	640	560	400	280	160

No. of Joints per inch:*	2-1/2"	3"	4"	5"	6"	8"	10"	12"
Pint	17	15	10	8	—	—	—	—
Quart	34	30	20	16	8	3	—	—
Gallon	136	120	80	64	32	12	10	6

* Each joint represents one socket in a fitting.

RELATED INFORMATION:

- Solvent Cementing for Schedule 80 PVC

1-800-848-1141

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T S3/9/1

3/9/1 (Item 1 from file: 332)
DIALOG(R)File 332:Material Safety Data Sheets -
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00056297
OHS/MDL Record Number : OHSIX119
MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL Information Systems, Inc.
14600 Catalina Street
San Leandro CA 94577
1-800-635-0064 (Toll Free) or
1-510-895-1313

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 in USA

EU Number(EINICS) : 231-592-0

SUBSTANCE: OATEY #11 LIQUID FLUX

TRADE NAME/SYNONYM(S): FLUX FOR COPPER PIPE; OHSIX119

CREATION DATE: 19950119 REVISED: 20041209

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

---

1) Component Substance: ZINC CHLORIDE
   Component Percent: 30-35 %
   CAS Registry Number: 7646-85-7
2) Component Substance: HYDROCHLORIC ACID
   Component Percent: 12-15 %
   CAS Registry Number: 7647-01-0
3) Component Substance: AMMONIUM CHLORIDE
   Component Percent: 4-8 %
   CAS Registry Number: 12125-02-9
4) Component Substance: WATER
   Component Percent: 45-55 %
   CAS Registry Number: 7732-18-5

SECTION 3 - HAZARDS IDENTIFICATION

NFPA Ratings (scale 0-4): Health=1 Fire=0 Reactivity=0

EMERGENCY OVERVIEW:
COLOR: yellow
PHYSICAL FORM: liquid
ODOR: faint odor
MAJOR HEALTH HAZARDS: harmful if swallowed, skin burns, mucous membrane burns, respiratory tract irritation, eye irritation, allergic reactions
POTENTIAL HEALTH EFFECTS
INHALATION:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: burns
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), allergic reactions
LONG TERM EXPOSURE: irritation (possibly severe), allergic reactions
EYE CONTACT:

SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation (possibly severe)
INGESTION:
SHORT TERM EXPOSURE: irritation (possibly severe), nausea,vomiting, death
LONG TERM EXPOSURE: burns, nausea, vomiting, bone disorders, coma

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 - FIRST AID MEASURES

INHALATION:
If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.
SKIN CONTACT:
Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.
EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.
INGESTION:
Never make an unconscious person vomit or drink fluids. Give large amounts of water. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.
NOTE TO PHYSICIAN:
For inhalation, consider oxygen.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard.
EXTINGUISHING MEDIA:
regular dry chemical, carbon dioxide, water, regular foam
Large fires: Use regular foam or flood with fine water spray.
FIREFIGHTING:
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. Use extinguishing agents appropriate forsurrounding fire. Do not get water directly on material. Large fires:Flood with fine water spray. Reduce vapors with water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: No data available.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
Do not touch spilled material. Stop leak if possible without personalrisk. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Small dry spills: Move containers away from spill to a safearea. Large

spills: Dike for later disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 - HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Notify State Emergency Response Commission for storageor use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a materialwith a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30). Keep separated from incompatible substances.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

ZINC CHLORIDE:

1 mg/m3 OSHA TWA (fume) 2 mg/m3 OSHA STEL (vacated by 58 FR 35338, June 30, 1993) 1 mg/m3 ACGIH TWA (fume) 2 mg/m3 ACGIH STEL (fume) 1 mg/m3 NIOSH recommended TWA 10 hour(s) (particulate) (fume) 2 mg/m3 NIOSH recommended STEL (fume) 1 mg/m3 UK OES TWA (fume) 2 mg/m3 UK OES STEL (fume)

MEASUREMENT METHOD: Particulate filter; Water; Flame atomic absorption spectrometry; OSHA # ID121 HYDROCHLORIC ACID: HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5 ppm (7 mg/m3) OSHA ceiling 2 ppm ACGIH ceiling 5 ppm (7 mg/m3) NIOSH recommended ceiling 7.6 mg/m3 (5 ml/m3) DFG MAK (peak limitation category - I, with excursion factor of 1) 10 ppm (15 mg/m3) EC OEL STEL 5 ppm (8 mg/m3) EC OEL TWA 5 ppm (8 mg/m3) UK OES STEL (gas) (mist) (ILV) 1 ppm (2 mg/m3) UK OES TWA (gas) (mist) (ILV) MEASUREMENT METHOD: Silica gel tube; Sodium bicarbonate/Sodium carbonate; Ion chromatography; NIOSH IV # 7903, Inorganic Acids AMMONIUM CHLORIDE: 10 mg/m3 OSHA TWA (particulate) (vacated by 58 FR 35338, June 30, 1993) 20 mg/m3 OSHA STEL (particulate) (vacated by 58FR 35338, June 30, 1993) 10 mg/m3 ACGIH TWA (fume) 20 mg/m3 ACGIH STEL (fume) 10 mg/m3 NIOSH recommended TWA 10 hour(s) (fume) 20 mg/m3NIOSH recommended STEL (fume) 10 mg/m3 UK OES TWA (fume) 20 mg/m3 UK OES STEL (fume) MEASUREMENT METHOD: Particulate filter; Water; Ion chromatography; OSHA # ID188

VENTILATION:

Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION:

Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING:

Wear appropriate chemical resistant clothing.

GLOVES:

Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES:

rubber

RESPIRATOR:

Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Respiratory protection is ranked in order from minimum to maximum. Consider warning properties before use. Any chemical cartridge respirator with acid gas cartridge(s). Any chemical cartridge

respirator with a full facepiece and acid gas cartridge(s). Any air-purifying respirator with a full facepiece and an acid gas canister.

For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: PHYSICAL STATE: liquid
COLOR: yellow
ODOR: faint odor
BOILING POINT: 208 F (98 C)
MELTING POINT: Not available
SPECIFIC GRAVITY: 1.14
pH: 2-3
VAPOR PRESSURE: Not available
VAPOR DENSITY: Not available
VOLATILITY: 60-65%
EVAPORATION RATE: Not available
ODOR THRESHHOLD: Not available
WATER SOLUBILITY: soluble

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:
Stable at normal temperatures and pressure.
CONDITIONS TO AVOID:
Avoid heat, flames, sparks and other sources of ignition. Dangerous gases may accumulate in confined spaces. May ignite or explode on contact with combustible materials.
INCOMPATIBILITIES:
bases, cyanides, metals, reducing agents, amines, metal carbide, oxidizing materials, acids, halo carbons, combustible materials, halogens, metal salts
OATEY #11 LIQUID FLUX:
No data available

HYDROGEN CHLORIDE (HYDROCHLORIC ACID):
ACETIC ANHYDRIDE: Violent reaction

ALCOHOLIC HYDROGEN CYANIDE: Explosive reaction
ALUMINUM: Explosion

ALUMINUM-TITANIUM ALLOYS: Ignites or incandesces when heated

2-AMINOETHANOL: Violent reaction

AMMONIUM HYDROXIDE: Violentreaction

BASES: Violent reaction

BRASS: Corrodes

BRONZE: Corrodes

CALCIUM CARBIDE: Reacts with incandescence

CALCIUM HYPOCHLORITE: Ignition

CESIUM ACETYLIDE: Ignites on contact

CHLORINE + DINITROANILINES: Vigorous reaction with release of flammable hydrogengas fumes

CHLOROSULFONIC ACID: Violent reaction

1,1-DIFLUOROETHYLENE: Extremely exothermic decomposition reaction

DOWICIL 100: Decomposes

ETHYLENE DIAMINE: Violent reaction

ETHYLENEIMINE: Violent reaction

FLUORINE: Ignites on contact

HEXALITHIUM DISILICIDE: Incandescesent

IRON: Corrodes with evolution of flammable hydrogen gas

MAGNESIUM BORIDE: Produces a spontaneously flammable gas

MERCURIC SULFATE: Violent reaction at 125 C

METAL ACETYLIDES: Violent reaction

METALS: Severe corrosion with evolutionof flammable hydrogen gas

OLEUM: Violent reaction

OXIDIZERS (STRONG): Violent reaction

OXYGEN + PLATINUM: Ignites on contact

PERCHLORIC ACID: Violent reaction

PLASTICS, RUBBER, COATINGS: Attacks

POTASSIUM PERMANGANATE: Explosion hazard

BETA-PROPIOLACTONE: Violent reaction

PROPYLENE OXIDE: Violent reaction

RUBIDIUM ACETYLIDE: Ignites on contact

SILICA (GEL): Incompatible

SODIUM: Vigorous or explosive reaction

SULFURIC ACID: Explosive reaction with release of toxic hydrogen chloride gas

TETRASELENIUM TETRANITRIDE: Explodes on contact

VINYL ACETATE: Violent reaction

AMMONIUM CHLORIDE:
ACIDS (STRONG): Evolves corrosive hydrogen chloride gas

ALKALIS AND THEIR CARBONATES: Incompatible

AMMONIUM NITRATE: Violent decomposition

BASES (STRONG): Evolves corrosive ammonia gas

BROMINE PENTAFLUORIDE: Violent reaction with ignition

BROMINE TRIFLUORIDE: May cause explosion

COPPER AND ITS COMPOUNDS: May be attacked

HYROGEN CYANIDE: Formation of explosive nitrogen trichloride

IODINE HEPTAFLUORIDE: Violent reaction

LEAD SALTS: Incompatible

METALS: May be corroded in the presence of moisture

POTASSIUM CHLORATE: Violent reaction or explosion

SILVER SALTS: Formation of explosive silver compounds

ZINC CHLORIDE:
BASES: Possible violent reaction

CYANIDES: Release of toxic hydrogen cyanide gas

POTASSIUM: Forms impact-sensitive mixture
SULFIDE SALTS: Release of toxic hydrogen sulfide gas

ZINC: Forms flammable mixture

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon, hydrocarbons, hydrochloric acid
POLYMERIZATION:
Will not polymerize.

SECTION 11 - TOXICOLOGICAL INFORMATION

OATEY #11 LIQUID FLUX:

LOCAL EFFECTS:
Irritant: inhalation, eye Corrosive: inhalation, skin, eye, ingestion
TARGET ORGANS:
immune system (sensitizer)
ZINC CHLORIDE:

TOXICITY DATA:
169 mg/kg oral-child TDLo; 4800 mg/m3/30 minute(s) inhalation-man TCLo; 350 mg/kg oral-rat LD50; 1960 mg/m3/10 minute(s) inhalation-rat LCLo; 58 mg/kg intraperitoneal-rat LD50; 3690 ug/kg intravenous-rat LD50; >1500 ul/kg intratracheal-rat LD; 329 mg/kg oral-mouse LD50; 24 mg/kgintraperitoneal-mouse LD50; 330 mg/kg subcutaneous-mouse LD50; 9090 ug/kg intravenous-mouse LD50; 11 mg/kg intravenous-rabbit LDLo; 200 mg/kg

oral-guinea pig LD50; 173 mg/kg intraperitoneal-guinea pig LDLo; 2.04 mg/kg oral-mouse TDLo; 9.3 mg/kg intraperitoneal-rat TDLo;5690 mg/kg/13 week(s) intermittent oral-rat TDLo; 910 mg/kg/26 week(s) intermittent oral-rat TDLo; 1680 mg/kg/14 day(s) intermittentoral-rat TDLo; 6875 mg/kg/39 week(s) intermittent oral-mammal TDLo; 21504 mg/kg/12 week(s) continuous oral-mouse TDLo; 595 mg/kg/2 week(s) continuous oral-rat TDLo; 3360 mg/kg/12 week(s) continuous oral-rat TDLo; 13440 mg/kg/12 week(s) intermittent oral-mouse TDLo; 76.44 mg/kg/14 week(s) intermittent oral-mouse TDLo; 109.2 mg/kg/20 week(s) intermittent oral-mouse TDLo; 218.4 mg/kg/20 week(s) intermittent oral-mouse TDLo; 40 mg/kg/2 day(s) intermittent subcutaneous-rat TDLo

LOCAL EFFECTS:

Corrosive: inhalation, skin, eye, ingestion

ACUTE TOXICITY LEVEL:

Toxic: ingestion

TARGET ORGANS:

immune system (sensitizer)

TUMORIGENIC DATA:

17 mg/kg parenteral-hamster TDLo; 15 mg/kg parenteral-chicken TDLo

MUTAGENIC DATA:

mutation in microorganisms - Salmonella typhimurium 90 mmol/L (-S9); phage inhibition capacity - Escherichia coli 3200 umol/L; specific locus test - Drosophila melanogaster oral 6 mmol/L; micronucleus test - non-mammalian species other cell types 170 ug/L 48 hour(s); DNA damage - human fibroblast 2 mmol/L; unscheduled DNA synthesis - human lymphocyte 180 umol/L; DNA inhibition - human lymphocyte 360 umol/L; other mutation test systems - human lymphocyte2 mg; cytogenetic analysis - human lymphocyte 300 umol/L; cytogeneticanalysis - rat Ascites tumor 700 mg/kg; DNA inhibition - mouse parenteral 16 mg/kg; cytogenetic analysis - mouse oral 18 gm/kg 30 day(s)-continuous; host-mediated assay - mouse Salmonella typhimurium6 mg/kg; morphological transformation - hamster embryo 180 umol/L

REPRODUCTIVE EFFECTS DATA:

155 mg/kg oral-rat TDLo 33 day(s) male; 6gm/kg oral-rat TDLo 77 day(s) male day(s) pre pregnancy/77 day(s) post pregnancy/21 day(s) continuous; 30 gm/kg intraperitoneal-rat TDLo 7-8 day(s) pregnant female continuous; 37500 ug/kg parenteral-rat TDLo 10 day(s) pregnant female continuous; 20500 ug/kgintraperitoneal-mouse TDLo 8 day(s) pregnant female continuous; 12500ug/kg intraperitoneal-mouse TDLo 11 day(s) pregnant female continuous; 29184 ug/kg intravaginal-rabbit TDLo 1 day(s) pre pregnancy continuous; 1.8 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 7.1 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 186 mg/kg oral-mouse TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 186 mg/kg oral-mouse TDLo multigenerations; 1.8 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous

HYDROCHLORIC ACID:

IRRITATION DATA:

5 mg/30 second(s) rinsed eyes-rabbit mild; 4 percent/24 hour(s) skin-human mild

TOXICITY DATA:

2857 ug/kg oral-man LDLo; 420 ul/kg oral-woman LDLo; 1300 ppm/30 minute(s) inhalation-human LCLo; 3000 ppm/5 minute(s) inhalation-human LCLo; 81 mg/kg unreported-man LDLo; 3124 ppm/1 hour(s) inhalation-rat LC50; 1108 ppm/1 hour(s) inhalation-mouse LC50; 40142 ug/kg intraperitoneal-mouse LD50; 900 mg/kg oral-rabbit LD50; 4413 ppm/30 minute(s) inhalation-rabbit LCLo;4413 ppm/30 minute(s) inhalation-guinea pig LCLo; 0.1 gm/m3 inhalation-mammal LC50; 5066 mg/m3/90 minute(s)

inhalation-rabbit LCLo; 5066 mg/m3/90 minute(s) inhalation-guinea pig LCLo; 6400 mg/m3/30 minute(s) inhalation-rabbit LCLo; 6400 mg/m3/30 minute(s) inhalation-guinea pig LCLo; 60938 mg/m3/5 minute(s) inhalation-rat LC50; 20487 mg/m3/5 minute(s) inhalation-mouse LC50; 7004 mg/m3/30 minute(s) inhalation-rat LC50; 3940 mg/m3/30 minute(s) inhalation-mouse LC50; 450 mg/m3/6 hour(s) inhalation-mammal TCLo; 7.3 mg/kg intratracheal-dog LDLo; 75 mg/m3 inhalation-human LCLo; 50 mg/m3 inhalation-human TCLo; 685 ug/m3/24 hour(s)-84 day(s) continuous inhalation-rat TCLo; 149 mg/m3/6 hour(s)-5 day(s) intermittent inhalation-rabbit TCLo; 150 mg/m3/6 hour(s)-50 day(s) intermittent inhalation-rabbit TCLo; 150 mg/m3/6 hour(s)-50 day(s) intermittent inhalation-cat TCLo

CARCINOGEN STATUS:
IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3; ACGIH: A4 -Not Classifiable as a Human Carcinogen

LOCAL EFFECTS:
Corrosive: inhalation, skin, eye, ingestion

ACUTE TOXICITY LEVEL:
Toxic: inhalation Moderately Toxic: ingestion

MUTAGENIC DATA:
DNA repair - Escherichia coli 25 ug/well; sex chromosone loss and non disjunction - Drosophila melanogaster inhalation 100 ppm 24 hour(s); sex chromosone loss and non disjunction - Drosophila melanogaster oral 100 ppm; cytogenetic analysis - grasshopper parenteral 20 mg; cytogenetic analysis - hamster lung 30 mmol/L; cytogenetic analysis -hamster ovary 8 mmol/L

REPRODUCTIVE EFFECTS DATA:
450 mg/m3 inhalation-rat TCLo/1 hour(s) 1 day(s) pre pregnancy continuous

AMMONIUM CHLORIDE:

IRRITATION DATA:
500 mg/24 hour(s) eyes-rabbit mild; 100 mg eyes-rabbit severe

TOXICITY DATA:
2 gm/kg oral-infant LDLo; 1650 mg/kg oral-rat LD50; 30 mg/kg intramuscular-rat LD50; 550 mg/kg unreported-rat LD50; 1300 mg/kg oral-mouse LD50; 485 mg/kg intraperitoneal-mouse LD50; 500 mg/kg subcutaneous-mouse LDLo; 358 mg/kg intravenous-mouse LD50; 200 mg/kg subcutaneous-rabbit LDLo; 78 mg/kg intravenous-rabbit LDLo; 72 mg/kg subcutaneous-guinea pig LDLo;220 mg/kg intravenous-guinea pig LDLo; 1500 mg/kg oral-domestic animal LDLo; 0.005 gm/kg oral-rabbit LDLo; 0.02 gm/kg oral-dog LDLo; 250 mg/kg intraperitoneal-mouse LDLo; 140 mg/kg intraperitoneal-rat LDLo; 51660 mg/kg/10 week(s) continuous oral-rat TDLo; 56100 mg/kg/170 day(s) intermittent oral-rat TDLo; 556 gm/kg/78 week(s) continuous oral-rat TDLo; 35.3 gm/kg/4 week(s) continuous oral-rat TDLo; 52.9 gm/kg/6 week(s) continuous oral-rat TDLo; 3500 mg/kg/1 week(s) continuous oral-rat TDLo; 29.4 gm/kg/4 week(s) continuous oral-rat TDLo; 455 gm/kg/130 week(s) continuous oral-rat TDLo; 44.1 gm/kg/6 week(s) continuous oral-rat TDLo

LOCAL EFFECTS:
Irritant: inhalation, eye

ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
kidney disorders

MUTAGENICDATA:
cytogenetic analysis - hamster fibroblast 400 mg/L

ADDITIONAL DATA:
Interactions with drugs may occur.

HEALTH EFFECTS
INHALATION:
OATEY #11 LIQUID FLUX (Oatey Company has reported the following): If heated, fumes may produce respiratory irritation, fever, chills, muscular pain, vomiting and sweating.

ACUTE EXPOSURE:
ZINC CHLORIDE:Fumes may be severely irritating to the upper respiratory tract and may cause a metallic taste, lacrimation, sore throat, loss of voice, hoarseness, coughing with copious sputum, a constrictive sensation inthe chest, strider, chest pain and soreness. Gastrointestinal disturbances including nausea, abdominal pain and severe gastritis with vomiting may occur. Fever, dyspnea and tachypnea, shortness or breath, listlessness, pale, gray cyanosis, rapid pulse, tachycardia and coma have also been reported. Respiratory effects may include severe inflammation of the upper respiratory tract, rhinitis, hemorrhagic alveolitis, severe pneumonitis, tracheobronchitis, diffuse pulmonary infiltrations, acute interstitial and advanced pulmonary fibrosis, pulmonary edema and bronchopneumonia. Death may be due to pulmonary edema, respiratory failure and bronchopneumonia. Autopsy revealed red and edematous mucous membrane and pulmonary necrosis, active fibroblastic proliferation and cor pulmonale.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Inhalation of fumes at levels of 5-35 ppm may cause irritation and burning of the throat, coughing and choking; 50-100 ppm may be barely tolerable for 1 hour. High levels may cause inflammation and occasionally ulceration of the nose, throat or larynx, bronchitis, pneumonia, palpitations and headache. Higher concentrations may cause necrosis of the tracheal and bronchial epithelium, nasoseptal perforation, atelectasis, emphysema, damage to pulmonary blood vessels and lesions of the liverand other organs. Death may be due to laryngeal spasm, bronchopneumonia or pulmonary edema. 1300-2000 ppm may be dangerous, even on brief exposures. Reproductive effects have been reported in animals.

AMMONIUM CHLORIDE: Inhalation of the dust may cause irritation with coughing, sore throat and difficult breathing. Laboratory animals exposed to 50 mg/m3 for 6 hours showed no signs ofintoxication. However, post mortem examination showed congestion of the trachea and bronchial mucosa; the lungs were distended and emphysematous with petechial hemorrhaging and hyperemia. Changes wereevident in the liver, spleen and adrenal medulla.

CHRONIC EXPOSURE:
ZINC CHLORIDE: Prolonged inhalation may result in ulceration of the nasal septum.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Repeated or prolonged exposure may cause erosion and discoloration of exposed teeth, chronic bronchitis and gastritis.
AMMONIUM CHLORIDE: No data available.
SKIN CONTACT:
OATEY #11 LIQUID FLUX (Oatey Company has reported the following): Maycause irritation, burns or dermatitis.

ACUTE EXPOSURE:
ZINC CHLORIDE: Dust, fumes or solutions may cause severe irritation, redness, pain, papular and primary dermatitis, chemical burns, of theskin, boils, and ulceration of the fingers, hands and forearms. Sensitization reactions in the form of eczematoid dermatitis have been

reported.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Contact may cause severe irritation, inflammation, ulceration, necrosis and chemical burns. Shock symptoms may develop including rapid pulse, sweating and collapse. Photosensitization reactions may occur in persons previously exposed.

AMMONIUM CHLORIDE: May cause irritation.

CHRONIC EXPOSURE:
ZINC CHLORIDE: Repeated or prolonged contact may cause boils, dermatitis or sensitization dermatitis in previously exposed persons. Repeated contact has produced fatigability, poor appetite, constipation and pains in the long bones of the legs.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Repeated or prolonged contact with vapors or dilute solutions may cause dermatitis. Photosensitization may occur.

AMMONIUM CHLORIDE: Repeated or prolonged contact may cause dermatitis.

EYE CONTACT:
OATEY #11 LIQUID FLUX (Oatey Company has reported the following): Maycause irritation or corneal damage.

ACUTE EXPOSURE:
ZINC CHLORIDE: Contact may cause severe irritation and pain, redness, blurred visionand injuries including corneal burns, ulceration and vascularization,conjunctivitis, dermatitis, and iritis. A splash in the eye caused, initially, some redness and persistent discomfort, but within 6 days it lead to a discrete stromal opacity in the lower part of the corneawith irregularities of the overlying epithelium. From an accidental instillation of a drop of 50% zinc chloride solution, the corneal epithelium became eroded, the lids red and swollen, and a mucopurulent discharge developed. Large folds developed in the Descemet's membrane, and the corneal stroma became turbid. This was accompanied by severe iritis with small hemorrhages in the iris. Deepand superficial vascularization of the cornea followed.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Contact may cause severe irritation, conjunctivitis, corneal necrosis and burns with impairment or permanent loss of vision. A drop of hydrochloric acid splashed in theeye and immediately washed out has produced a white coagulation of the corneal and conjunctival epithelium. Animals exposed to vapor concentrations of 1350 ppm for one and a half hours showed clouding of the cornea and 300 ppm for 6 hours showed slight erosion of the corneal epithelium.

AMMONIUM CHLORIDE: May cause irritation with redness and pain. Solutions less than 10% are generally well tolerated by the eye.

CHRONIC EXPOSURE:
ZINC CHLORIDE: Repeated and prolonged contact to dust or vapor may cause conjunctivitis.

HYDROGENCHLORIDE (HYDROCHLORIC ACID): Animals exposed to vapor at 100 ppm for6 hours daily for 50 days showed only slight unrest and irritation ofthe eyes, but no ocular injury. Effects are dependent upon concentration and duration of exposure. Conjunctivitis or effects similar to those for acute exposure may occur.

AMMONIUM CHLORIDE: Repeated or prolonged contact may cause conjunctivitis.

INGESTION:

OATEY #11 LIQUID FLUX (Oatey Company has reported the following): Maycause burns of the mouth and throat, vomiting, diarrhea, strictures, kidney disease, shock and death.

ACUTE EXPOSURE:

ZINC CHLORIDE: Ingestion may cause severe irritation of mucous membranes with corrosion, swollen lips, edema of the glottis, sore throat, chest pain and gastrointestinal disturbances including nausea, vomiting, bloody diarrhea, and abdominal pain. Perforation of the viscous may occur. Lethargy, bloody urine, albuminuria, gastritis and pyloric stenosis have been reported. Other effects may include cold skin, lowblood pressure, dyspnea and collapse with shock and hypocalcemia. Death has been reported. Delayed deaths have been ascribed to inanition following severe strictures of the esophagus and pyloris. Survivors of zinc salt ingestion may have residual nephritis.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): Ingestion of the acid may cause burns of the mouth, throat, esophagus and stomach with consequent pain, uneasiness, nausea, salivation, vomiting, diarrhea, chills, shock and intense thirst. Nephritis, fever and perforation ofthe intestinal tract, and circulatory collapse may occur. Death may be due to esophageal or gastric necrosis.

AMMONIUM CHLORIDE: May cause irritation of mouth and stomach with nausea or vomiting. Large doses may cause diuresis, systemic acidosis and ammonia poisoning.

CHRONIC EXPOSURE:

ZINC CHLORIDE: Reproductive effects have been reported in animals.

HYDROGEN CHLORIDE (HYDROCHLORIC ACID): No data available.

AMMONIUM CHLORIDE: Repeated ingestion may cause nausea, vomiting, acidosis, hypoproteinemia, demineralization of boney structures, and coma. Rabbits with damaged livers, and adrenals removed, were fed ammonium chloride for 120 days, resulting in permanent changes in the electroretinogram and degeneration of the ganglion cell layer of the retina.

SECTION 12 - ECOLOGICAL INFORMATION

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

SECTION 14 - TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:

PROPER SHIPPING NAME: Corrosive liquids, n.o.s. (zinc chloride, hydrogen chloride) ID NUMBER: UN1760 HAZARD IATA/ICAO CLASS: 8 PACKING GROUP: II LABELING REQUIREMENTS: 8

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

No classification assigned.

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 CLASS: 8 CLASSIFICATION CODE: C9 PACKING GROUP: II LABELS: 8

AIR TRANSPORTIATA/ICAO:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 IATA/ICAO CLASS: 8 LABELS: 8 UN PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 PACKING GROUP: II

SECTION 15 - REGULATORY INFORMATION

TSCA Status : Listed on inventory.
TSCA 12(b) export notification : Not listed.
SARA Section 302 (40 CFR 355.30) : HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 500 LBS TPQ (gas) TPQ
SARA Section 304 (40 CFR 355.40) : HYDROGEN CHLORIDE (HYDROCHLORIC ACID): 5000 LBS RQ (gas) RQ
California Prop 65 Status : Not regulated.
SARA ACUTE Hazard : Yes
SARA CHRONIC Hazard : Yes
SARA FIRE Hazard : No
SARA REACTIVITY Hazard : No
SARA SUDDEN RELEASE Hazard : No

SECTION 16 - OTHER INFORMATION

No other information is currently available for this record
?

T S3/9/3

3/9/3 (Item 3 from file: 332)
DIALOG(R)File 332:Material Safety Data Sheets -
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00053665
OHS/MDL Record Number : OHSIR549

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL Information Systems, Inc.
14600 Catalina Street
San Leandro CA 94577
1-800-635-0064 (Toll Free) or
1-510-895-1313

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 in USA

EU Number(EINICS) : 232-373-2

SUBSTANCE: OATEY #5 PASTE FLUX

TRADE NAME/SYNONYM(S): FLUX FOR COPPER PIPE; OHSIR549

CREATION DATE: 19950620 REVISED: 20041209

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

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1) Component Substance: PETROLATUM
   Component Percent: 65-75 %
   CAS Registry Number: 8009-03-8
2) Component Substance: ZINC CHLORIDE
   Component Percent: 20-25 %
   CAS Registry Number: 7646-85-7
3) Component Substance: AMMONIUM CHLORIDE
   Component Percent: 1-5 %
   CAS Registry Number: 12125-02-9

SECTION 3 - HAZARDS IDENTIFICATION

NFPA Ratings (scale 0-4): Health=3 Fire=0 Reactivity=0

EMERGENCY OVERVIEW:
COLOR: yellow
PHYSICAL FORM: paste
ODOR: faint odor
MAJOR HEALTH HAZARDS: harmful if swallowed, respiratory tract burns, skin burns, eye burns, mucous membrane burns, allergic reactions, suspect cancer hazard (in animals)

POTENTIAL HEALTH EFFECTS
INHALATION:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: burns
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), allergic reactions
LONG TERM EXPOSURE: irritation (possibly severe), allergic reactions, skin disorders
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), blurred vision

LONG TERM EXPOSURE: irritation (possibly severe)
INGESTION:
SHORT TERM EXPOSURE: irritation (possibly severe), nausea,vomiting, diarrhea, stomach pain, death
LONG TERM EXPOSURE: burns, nausea, vomiting, loss of appetite, bone disorders, coma

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 - FIRST AID MEASURES

INHALATION:
If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.
SKIN CONTACT:
Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.
EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.
INGESTION:
Never make an unconscious person vomit or drink fluids. Give large amounts of water. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.
NOTE TO PHYSICIAN:
For inhalation, consider oxygen.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard.
EXTINGUISHING MEDIA:
carbon dioxide, regular dry chemical, regular foam, water
FIREFIGHTING:
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Do not get water directly on material. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: 540 F (282 C)
FLAMMABILITY CLASS (OSHA): IIIB

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
Do not touch spilled material. Stop leak if possible without personalrisk. Small spills: Absorb with sand or other non-combustible material. Small dry spills: Collect spilled material in appropriate container for disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equalto RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at

(800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 - HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances. See original container for storage recommendations.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
OATEY #5 PASTE FLUX:

PARAFFIN WAX FUME:
2 mg/m3 OSHA TWA (vacated by58 FR 35338, June 30, 1993)
2 mg/m3 ACGIH TWA
2 mg/m3 NIOSH recommended TWA 10 hour(s)
2 mg/m3 UK OES TWA
6 mg/m3 UK OES STEL
MINERAL OIL MIST:
5 mg/m3 OSHA TWA
5 mg/m3 ACGIH TWA
10 mg/m3 ACGIH STEL
5 mg/m3 NIOSH recommended TWA 10 hour(s)
10 mg/m3 NIOSH recommended STEL
5 mg/m3 UK OES TWA (excluding metalworking fluids)
10 mg/m3 UK OES STEL (excluding metalworking fluids)
MEASUREMENT METHOD: Particulate filter; Carbon tetrachloride; Infrared spectrometry; NIOSH IV # 5026 ZINC CHLORIDE: 1 mg/m3 OSHA TWA (fume) 2 mg/m3 OSHA STEL (vacated by 58 FR 35338, June 30, 1993) 1 mg/m3 ACGIH TWA (fume) 2 mg/m3 ACGIH STEL (fume) 1 mg/m3 NIOSH recommended TWA 10 hour(s) (particulate) (fume) 2 mg/m3 NIOSH recommended STEL (fume) 1 mg/m3 UK OES TWA (fume) 2 mg/m3 UK OES STEL (fume) MEASUREMENT METHOD: Particulate filter; Water; Flame atomic absorption spectrometry; OSHA # ID121 AMMONIUM CHLORIDE: 10 mg/m3 OSHA TWA (particulate) (vacated by 58 FR 35338, June 30, 1993) 20 mg/m3 OSHA STEL (particulate) (vacated by 58 FR 35338, June 30, 1993)10 mg/m3 ACGIH TWA (fume) 20 mg/m3 ACGIH STEL (fume) 10 mg/m3 NIOSH recommended TWA 10 hour(s) (fume) 20 mg/m3 NIOSH recommended STEL (fume) 10 mg/m3 UK OES TWA (fume) 20 mg/m3 UK OES STEL (fume) MEASUREMENT METHOD: Particulate filter; Water; Ion chromatography; OSHA # ID188

VENTILATION:
Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION:
Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING:
Wear appropriate chemical resistant clothing.

GLOVES:
Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES:
rubber

RESPIRATOR:
No respirator is required under normal conditions of use. Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Any dust, mist, and fume respirator. Any air-purifyingrespirator with a high-efficiency particulate filter. Any powered, air-purifying respirator with a dust, mist, and fume filter. Any

powered, air-purifying respirator with a high-efficiency particulate filter.

For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: PHYSICAL STATE: liquid
COLOR: yellow
PHYSICAL FORM: paste
ODOR: faintodor
BOILING POINT: 639 F (337 C)
MELTING POINT: Not available
SPECIFIC GRAVITY: Not available
pH: Not available
VAPOR PRESSURE: Not available
VAPOR DENSITY: >1
VOLATILITY: 7-10%
EVAPORATION RATE: Not available
ODOR THRESHHOLD: Not available
WATER SOLUBILITY: almost insoluble
SOLVENT SOLUBILITY: Soluble: dichloromethane

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:
Stable at normal temperatures and pressure.
CONDITIONS TO AVOID:
Avoid heat, flames, sparks and other sources of ignition. May ignite or explode on contact with combustible materials.
INCOMPATIBILITIES:
No data available

ZINC CHLORIDE:
BASES: Possible violent reaction

CYANIDES: Release of toxic hydrogen cyanide gas

POTASSIUM: Forms impact-sensitive mixture

SULFIDE SALTS: Release of toxic hydrogen sulfide gas

ZINC: Forms flammable mixture

AMMONIUM CHLORIDE:
ACIDS (STRONG): Evolves corrosive hydrogen chloride gas

ALKALIS AND THEIR CARBONATES: Incompatible

AMMONIUM NITRATE: Violent decomposition

BASES (STRONG): Evolves corrosive ammonia gas

BROMINE PENTAFLUORIDE:Violent reaction with ignition

BROMINE TRIFLUORIDE: May cause explosion

COPPER AND ITS COMPOUNDS: May be attacked

HYROGEN CYANIDE: Formation of explosive nitrogen trichloride

IODINE HEPTAFLUORIDE: Violent reaction
LEAD SALTS: Incompatible

METALS: May be corroded in the presence of moisture

POTASSIUM CHLORATE: Violent reaction or explosion

SILVER SALTS: Formation of explosive silver compounds

PETROLATUM:
CALCIUM HYPOCHLRITE: Incompatible

CHLORINE (LIQUID): Incompatible

OXIDIZERS (STRONG): Fire and explosion hazard

OXYGEN (CONCENTRATED): Incompatible

SODIUM HYPOCHLORITE: Incompatible

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon, hydrochloric acid, hydrocarbons, smoke
POLYMERIZATION:
Will not polymerize.

SECTION 11 - TOXICOLOGICAL INFORMATION

PETROLATUM:

TOXICITY DATA:
>50 gm/kg intraperitoneal-mouse LD50; 100 ml/kg/30 day(s) intermittent skin-rabbit TDLo
CARCINOGEN STATUS:
IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3 (Highly refined oils); EC: Category 2
ACUTE TOXICITY LEVEL:
Insufficient Data.
ZINC CHLORIDE:

TOXICITY DATA:
169 mg/kg oral-child TDLo; 4800 mg/m3/30 minute(s) inhalation-man TCLo; 350 mg/kg oral-rat LD50; 1960 mg/m3/10 minute(s) inhalation-rat LCLo; 58 mg/kg intraperitoneal-rat LD50; 3690 ug/kg intravenous-rat LD50; >1500 ul/kg intratracheal-rat LD; 329 mg/kg oral-mouse LD50; 24 mg/kgintraperitoneal-mouse LD50; 330 mg/kg subcutaneous-mouse LD50; 9090 ug/kg intravenous-mouse LD50; 11 mg/kg intravenous-rabbit LDLo; 200 mg/kg oral-guinea pig LD50; 173 mg/kg intraperitoneal-guinea pig LDLo; 2.04 mg/kg oral-mouse TDLo; 9.3 mg/kg intraperitoneal-rat TDLo;5690 mg/kg/13 week(s) intermittent oral-rat TDLo; 910 mg/kg/26 week(s) intermittent oral-rat TDLo; 1680 mg/kg/14 day(s) intermittentoral-rat TDLo; 6875 mg/kg/39 week(s) intermittent oral-mammal TDLo; 21504 mg/kg/12 week(s) continuous oral-mouse TDLo; 595 mg/kg/2 week(s) continuous oral-rat TDLo; 3360 mg/kg/12 week(s) continuous oral-rat TDLo; 13440 mg/kg/12 week(s) intermittent oral-mouse TDLo; 76.44 mg/kg/14 week(s) intermittent

oral-mouse TDLo; 109.2 mg/kg/20 week(s) intermittent oral-mouse TDLo; 218.4 mg/kg/20 week(s) intermittent oral-mouse TDLo; 40 mg/kg/2 day(s) intermittent subcutaneous-rat TDLo
LOCAL EFFECTS:
Corrosive: inhalation, skin, eye, ingestion
ACUTE TOXICITY LEVEL:
Toxic: ingestion
TARGET ORGANS:
immune system (sensitizer)
TUMORIGENIC DATA:
17 mg/kg parenteral-hamster TDLo; 15 mg/kg parenteral-chicken TDLo
MUTAGENIC DATA:
mutation in microorganisms - Salmonella typhimurium 90 mmol/L (-S9); phage inhibition capacity - Escherichia coli 3200 umol/L; specific locus test - Drosophila melanogaster oral 6 mmol/L; micronucleus test - non-mammalian species other cell types 170 ug/L 48 hour(s); DNA damage - human fibroblast 2 mmol/L; unscheduled DNA synthesis - human lymphocyte 180 umol/L; DNA inhibition - human lymphocyte 360 umol/L; other mutation test systems - human lymphocyte2 mg; cytogenetic analysis - human lymphocyte 300 umol/L; cytogeneticanalysis - rat Ascites tumor 700 mg/kg; DNA inhibition - mouse parenteral 16 mg/kg; cytogenetic analysis - mouse oral 18 gm/kg 30 day(s)-continuous; host-mediated assay - mouse Salmonella typhimurium6 mg/kg; morphological transformation - hamster embryo 180 umol/L
REPRODUCTIVE EFFECTS DATA:
155 mg/kg oral-rat TDLo 33 day(s) male; 6gm/kg oral-rat TDLo 77 day(s) male day(s) pre pregnancy/77 day(s) post pregnancy/21 day(s) continuous; 30 gm/kg intraperitoneal-rat TDLo 7-8 day(s) pregnant female continuous; 37500 ug/kg parenteral-rat TDLo 10 day(s) pregnant female continuous; 20500 ug/kgintraperitoneal-mouse TDLo 8 day(s) pregnant female continuous; 12500ug/kg intraperitoneal-mouse TDLo 11 day(s) pregnant female continuous; 29184 ug/kg intravaginal-rabbit TDLo 1 day(s) pre pregnancy continuous; 1.8 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 7.1 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 186 mg/kg oral-mouse TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 186 mg/kg oral-mouse TDLo multigenerations; 1.8 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous
AMMONIUM CHLORIDE:

IRRITATION DATA:
500 mg/24 hour(s) eyes-rabbit mild; 100 mg eyes-rabbit severe
TOXICITY DATA:
2 gm/kg oral-infant LDLo; 1650 mg/kg oral-rat LD50; 30 mg/kg intramuscular-rat LD50; 550 mg/kg unreported-rat LD50; 1300 mg/kg oral-mouse LD50; 485 mg/kg intraperitoneal-mouse LD50; 500 mg/kg subcutaneous-mouse LDLo; 358 mg/kg intravenous-mouse LD50; 200 mg/kg subcutaneous-rabbit LDLo; 78 mg/kg intravenous-rabbit LDLo; 72 mg/kg subcutaneous-guinea pig LDLo; 220 mg/kg intravenous-guinea pig LDLo; 1500 mg/kg oral-domestic animal LDLo; 0.005 gm/kg oral-rabbit LDLo; 0.02 gm/kg oral-dog LDLo; 250 mg/kg intraperitoneal-mouse LDLo;140 mg/kg intraperitoneal-rat LDLo; 51660 mg/kg/10 week(s) continuousoral-rat TDLo; 56100 mg/kg/170 day(s) intermittent oral-rat TDLo; 556gm/kg/78 week(s) continuous oral-rat TDLo; 35.3 gm/kg/4 week(s) continuous oral-rat TDLo; 52.9 gm/kg/6 week(s) continuous oral-rat TDLo; 3500 mg/kg/1 week(s) continuous oral-rat TDLo; 29.4 gm/kg/4 week(s) continuous oral-rat TDLo; 455 gm/kg/130 week(s) continuous oral-rat TDLo; 44.1 gm/kg/6 week(s) continuous oral-rat TDLo
LOCAL EFFECTS:

Irritant: inhalation, eye
ACUTE TOXICITY LEVEL:
ModeratelyToxic: ingestion
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
kidney disorders
MUTAGENIC DATA:
cytogenetic analysis - hamster fibroblast 400 mg/L
ADDITIONAL DATA:
Interactions with drugs may occur.

HEALTH EFFECTS
INHALATION:
ACUTE EXPOSURE:
PETROLATUM: High concentrations may cause irritationof the respiratory tract.

ZINC CHLORIDE: Fumes may be severely irritating to the upper respiratory tract and may cause a metallic taste, lacrimation, sore throat, loss of voice, hoarseness, coughing with copious sputum, a constrictive sensation in the chest, strider, chest pain and soreness. Gastrointestinal disturbances including nausea, abdominal pain and severe gastritis with vomiting may occur. Fever, dyspnea and tachypnea, shortness or breath, listlessness, pale, gray cyanosis, rapid pulse, tachycardia and coma have also beenreported. Respiratory effects may include severe inflammation of the upper respiratory tract, rhinitis, hemorrhagic alveolitis, severe pneumonitis, tracheobronchitis, diffuse pulmonary infiltrations, acute interstitial and advanced pulmonary fibrosis, pulmonary edema and bronchopneumonia. Death may be due to pulmonary edema, respiratory failure and bronchopneumonia. Autopsy revealed red and edematous mucous membrane and pulmonary necrosis, active fibroblasticproliferation and cor pulmonale.

AMMONIUM CHLORIDE: Inhalation of thedust may cause irritation with coughing, sore throat and difficult breathing. Laboratory animals exposed to 50 mg/m3 for 6 hours showed no signs of intoxication. However, post mortem examination showed congestion of the trachea and bronchial mucosa; the lungs were distended and emphysematous with petechial hemorrhaging and hyperemia. Changes were evident in the liver, spleen and adrenal medulla.
CHRONIC EXPOSURE:
PETROLATUM: Rarely, prolonged or repeatedinhalation of mist has caused shortness of breath, cough and lipid pneumonia.

ZINC CHLORIDE: Prolonged inhalation may result in ulceration of the nasal septum.

AMMONIUM CHLORIDE: No data available.
SKIN CONTACT:
ACUTE EXPOSURE:
PETROLATUM: May cause slight irritation. Rarely, hypersensitivity reactions and dermatitis have been reported.

ZINC CHLORIDE: Dust, fumes or solutions may cause severe irritation, redness, pain, papular and primary dermatitis, chemical burns, of theskin, boils, and ulceration of the fingers, hands and forearms. Sensitization reactions in the form of eczematoid dermatitis have been reported.

AMMONIUM CHLORIDE: May cause irritation.

CHRONIC EXPOSURE:
PETROLATUM: Repeated or prolonged exposure from cosmetic use may result in acniform eruptions, irritation and pigmentation. Mice tested by twice-weekly application of 60 uL produced 5 papillomas but no cancer. The study showed no significant difference of papillomas when compared with controls.

ZINC CHLORIDE: Repeated orprolonged contact may cause boils, dermatitis or sensitization dermatitis in previously exposed persons. Repeated contact has produced fatigability, poor appetite, constipation and pains in the long bones of the legs.

AMMONIUM CHLORIDE: Repeated or prolonged contact may cause dermatitis.
EYE CONTACT:
ACUTE EXPOSURE:
PETROLATUM: May cause irritation.

ZINC CHLORIDE: Contact may cause severe irritation and pain, redness, blurred visionand injuries including corneal burns, ulceration and vascularization,conjunctivitis, dermatitis, and iritis. A splash in the eye caused, initially, some redness and persistent discomfort, but within 6 days it lead to a discrete stromal opacity in the lower part of the corneawith irregularities of the overlying epithelium. From an accidental instillation of a drop of 50% zinc chloride solution, the corneal epithelium became eroded, the lids red and swollen, and a mucopurulent discharge developed. Large folds developed in the Descemet's membrane, and the corneal stroma became turbid. This was accompanied by severe iritis with small hemorrhages in the iris. Deepand superficial vascularization of the cornea followed.

AMMONIUM CHLORIDE: May cause irritation with redness and pain. Solutions less than 10% are generally well tolerated by the eye.

CHRONIC EXPOSURE:
PETROLATUM: No data available.

ZINC CHLORIDE: Repeated and prolonged contact to dust or vapor may cause conjunctivitis.

AMMONIUM CHLORIDE:Repeated or prolonged contact may cause conjunctivitis.
INGESTION:
ACUTE EXPOSURE:
PETROLATUM: Large amounts may cause abdominal pain and diarrhea. Aspiration may result in chemical pneumonitis.
ZINC CHLORIDE: Ingestion may cause severe irritation of mucous membranes with corrosion, swollen lips, edema of the glottis, sore throat, chest pain and gastrointestinal disturbances including nausea, vomiting, bloody diarrhea, and abdominal pain. Perforation of the viscous may occur. Lethargy, bloody urine, albuminuria, gastritis andpyloric stenosis have been reported. Other effects may include cold skin, low blood pressure, dyspnea and collapse with shock and hypocalcemia. Death has been reported. Delayed deaths have been ascribed to inanition following severe strictures of the esophagus and pyloris. Survivors of zinc salt ingestion may have residual nephritis.

AMMONIUM CHLORIDE: May cause irritation of mouth and stomach with nausea or vomiting. Large doses may cause diuresis, systemic acidosis and ammonia poisoning.

CHRONIC EXPOSURE:

PETROLATUM: If the liquid form is taken continuously for therapeutic use, large amounts may impair the appetite, reduce the absorption of fat soluble vitamins and possibly cause changes in the liver and mesenteric lymph nodes. Rats fed various grades of petrolatum at 5% in the diet for 2 years showed no treatment-related tumor increase.
ZINC CHLORIDE: Reproductive effects have been reported in animals.

AMMONIUM CHLORIDE: Repeated ingestion may cause nausea, vomiting, acidosis, hypoproteinemia, demineralization of boney structures, and coma. Rabbits with damaged livers, and adrenals removed, were fed ammonium chloride for 120 days, resulting in permanent changes in theelectroretinogram and degeneration of the ganglion cell layer of the retina.

SECTION 12 - ECOLOGICAL INFORMATION

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

SECTION 14 - TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Corrosive liquids, n.o.s. (zinc chloride) ID NUMBER: UN1760 HAZARD IATA/ICAO CLASS: 8 PACKING GROUP: II LABELING REQUIREMENTS: 8
CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
No classification assigned.

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 CLASS: 8 CLASSIFICATION CODE: C9 PACKING GROUP: II LABELS: 8

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 IATA/ICAO CLASS:8 LABELS: 8 UN PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 PACKING GROUP: II

SECTION 15 - REGULATORY INFORMATION

TSCA Status	: Listed on inventory.
TSCA 12(b) export notification	: Not listed.
SARA Section 302 (40 CFR 355.30)	: Not regulated. TPQ
SARA Section 304 (40 CFR 355.40)	: Not regulated. RQ
California Prop 65 Status	: Not regulated.
SARA ACUTE Hazard	: Yes
SARA CHRONIC Hazard	: Yes
SARA FIRE Hazard	: No
SARA REACTIVITY Hazard	: No
SARA SUDDEN RELEASE Hazard	: No
WHMIS Classification	: Not regulated.

SECTION 16 - OTHER INFORMATION

No other information is currently available for this record
?

Subj: **flux composition**
Date: 4/1/2005 4:51:48 PM Pacific Standard Time
From: Phyllisfox
To: ASBritton

See if you can find the composition of flush used to solder copper pipe in drinking water systems. See page 44. I suggests finding a material safety data sheet, MSDS, for some typical fluxes. Fluxes are used to solder all kinds of things, so be sure you have one used for drinking water systems. I'm looking for percent organics.

http://64.90.169.191/applications/plumbing/techref/cth/handbook.pdf

T S3/9/3

3/9/3 (Item 3 from file: 332)
DIALOG(R)File 332:Material Safety Data Sheets -
(c) 2005 MDL Info Systems. All rts. reserv.

00053665
OHS/MDL Record Number : OHSIR549
MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MDL Information Systems, Inc.
14600 Catalina Street
San Leandro CA 94577
1-800-635-0064 (Toll Free) or
1-510-895-1313

FOR EMERGENCY SOURCE INFORMATION
CONTACT: 1-615-366-2000 in USA

EU Number(EINICS) : 232-373-2

SUBSTANCE: OATEY #5 PASTE FLUX

TRADE NAME/SYNONYM(S): FLUX FOR COPPER PIPE; OHSIR549

CREATION DATE: 19950620 REVISED: 20041209

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

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1) Component Substance: PETROLATUM
   Component Percent: 65-75 %
   CAS Registry Number: 8009-03-8
2) Component Substance: ZINC CHLORIDE
   Component Percent: 20-25 %
   CAS Registry Number: 7646-85-7
3) Component Substance: AMMONIUM CHLORIDE
   Component Percent: 1-5 %
   CAS Registry Number: 12125-02-9

SECTION 3 - HAZARDS IDENTIFICATION

NFPA Ratings (scale 0-4): Health=3 Fire=0 Reactivity=0

EMERGENCY OVERVIEW:
COLOR: yellow
PHYSICAL FORM: paste
ODOR: faint odor
MAJOR HEALTH HAZARDS: harmful if swallowed, respiratory tract burns, skin burns, eye burns, mucous membrane burns, allergic reactions, suspect cancer hazard (in animals)
POTENTIAL HEALTH EFFECTS
INHALATION:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: burns
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), allergic reactions
LONG TERM EXPOSURE: irritation (possibly severe), allergic reactions, skin disorders
EYE CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe), blurred vision

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LONG TERM EXPOSURE: irritation (possibly severe)
INGESTION:
SHORT TERM EXPOSURE: irritation (possibly severe), nausea,vomiting, diarrhea, stomach pain, death
LONG TERM EXPOSURE: burns, nausea, vomiting, loss of appetite, bone disorders, coma

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 - FIRST AID MEASURES

INHALATION:
If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.
SKIN CONTACT:
Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get immediate medical attention. Thoroughly clean and dry contaminated clothing and shoes before reuse. Destroy contaminated shoes.
EYE CONTACT:
Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.
INGESTION:
Never make an unconscious person vomit or drink fluids. Give large amounts of water. DO NOT induce vomiting. If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.
NOTE TO PHYSICIAN:
For inhalation, consider oxygen.

SECTION 5 - FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARD:
Negligible fire hazard.
EXTINGUISHING MEDIA:
carbon dioxide, regular dry chemical, regular foam, water
FIREFIGHTING:
Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Do not get water directly on material. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: 540 F (282 C)
FLAMMABILITY CLASS (OSHA): IIIB

SECTION 6 - ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL SPILL:
Do not touch spilled material. Stop leak if possible without personalrisk. Small spills: Absorb with sand or other non-combustible material. Small dry spills: Collect spilled material in appropriate container for disposal. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equalto RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at

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(800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 - HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Keep separated from incompatible substances. See original container for storage recommendations.

SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:

OATEY #5 PASTE FLUX:

PARAFFIN WAX FUME:
2 mg/m3 OSHA TWA (vacated by58 FR 35338, June 30, 1993)
2 mg/m3 ACGIH TWA
2 mg/m3 NIOSH recommended TWA 10 hour(s)
2 mg/m3 UK OES TWA
6 mg/m3 UK OES STEL
MINERAL OIL MIST:
5 mg/m3 OSHA TWA
5 mg/m3 ACGIH TWA
10 mg/m3 ACGIH STEL
5 mg/m3 NIOSH recommended TWA 10 hour(s)
10 mg/m3 NIOSH recommended STEL
5 mg/m3 UK OES TWA (excluding metalworking fluids)
10 mg/m3 UK OES STEL (excluding metalworking fluids)
MEASUREMENT METHOD: Particulate filter; Carbon tetrachloride; Infrared spectrometry; NIOSH IV # 5026 ZINC CHLORIDE: 1 mg/m3 OSHA TWA (fume) 2 mg/m3 OSHA STEL (vacated by 58 FR 35338, June 30, 1993) 1 mg/m3 ACGIH TWA (fume) 2 mg/m3 ACGIH STEL (fume) 1 mg/m3 NIOSH recommended TWA 10 hour(s) (particulate) (fume) 2 mg/m3 NIOSH recommended STEL (fume) 1 mg/m3 UK OES TWA (fume) 2 mg/m3 UK OES STEL (fume) MEASUREMENT METHOD: Particulate filter; Water; Flame atomic absorption spectrometry; OSHA # ID121 AMMONIUM CHLORIDE: 10 mg/m3 OSHA TWA (particulate) (vacated by 58 FR 35338, June 30, 1993) 20 mg/m3 OSHA STEL (particulate) (vacated by 58 FR 35338, June 30, 1993)10 mg/m3 ACGIH TWA (fume) 20 mg/m3 ACGIH STEL (fume) 10 mg/m3 NIOSH recommended TWA 10 hour(s) (fume) 20 mg/m3 NIOSH recommended STEL (fume) 10 mg/m3 UK OES TWA (fume) 20 mg/m3 UK OES STEL (fume) MEASUREMENT METHOD: Particulate filter; Water; Ion chromatography; OSHA # ID188

VENTILATION:
Provide local exhaust ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION:
Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING:
Wear appropriate chemical resistant clothing.

GLOVES:
Wear appropriate chemical resistant gloves.

PROTECTIVE MATERIAL TYPES:
rubber

RESPIRATOR:
No respirator is required under normal conditions of use. Under conditions of frequent use or heavy exposure, respiratory protection may be needed. Any dust, mist, and fume respirator. Any air-purifyingrespirator with a high-efficiency particulate filter. Any powered, air-purifying respirator with a dust, mist, and fume filter. Any

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powered, air-purifying respirator with a high-efficiency particulate filter.

For Unknown Concentrations or Immediately Dangerous to Life or Health - Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply. Any self-contained breathing apparatus with a full facepiece.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

DESCRIPTION: PHYSICAL STATE: liquid
COLOR: yellow
PHYSICAL FORM: paste
ODOR: faintodor
BOILING POINT: 639 F (337 C)
MELTING POINT: Not available
SPECIFIC GRAVITY: Not available
pH: Not available
VAPOR PRESSURE: Not available
VAPOR DENSITY: >1
VOLATILITY: 7-10%
EVAPORATION RATE: Not available
ODOR THRESHHOLD: Not available
WATER SOLUBILITY: almost insoluble
SOLVENT SOLUBILITY: Soluble: dichloromethane

SECTION 10 - STABILITY AND REACTIVITY

REACTIVITY:
Stable at normal temperatures and pressure.
CONDITIONS TO AVOID:
Avoid heat, flames, sparks and other sources of ignition. May ignite or explode on contact with combustible materials.
INCOMPATIBILITIES:
No data available

ZINC CHLORIDE:
BASES: Possible violent reaction

CYANIDES: Release of toxic hydrogen cyanide gas

POTASSIUM: Forms impact-sensitive mixture

SULFIDE SALTS: Release of toxic hydrogen sulfide gas

ZINC: Forms flammable mixture

AMMONIUM CHLORIDE:
ACIDS (STRONG): Evolves corrosive hydrogen chloride gas

ALKALIS AND THEIR CARBONATES: Incompatible

AMMONIUM NITRATE: Violent decomposition

BASES (STRONG): Evolves corrosive ammonia gas

BROMINE PENTAFLUORIDE:Violent reaction with ignition

BROMINE TRIFLUORIDE: May cause explosion

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COPPER AND ITS COMPOUNDS: May be attacked

HYROGEN CYANIDE: Formation of explosive nitrogen trichloride

IODINE HEPTAFLUORIDE: Violent reaction
LEAD SALTS: Incompatible

METALS: May be corroded in the presence of moisture

POTASSIUM CHLORATE: Violent reaction or explosion

SILVER SALTS: Formation of explosive silver compounds

PETROLATUM:
CALCIUM HYPOCHLRITE: Incompatible

CHLORINE (LIQUID): Incompatible

OXIDIZERS (STRONG): Fire and explosion hazard

OXYGEN (CONCENTRATED): Incompatible

SODIUM HYPOCHLORITE: Incompatible

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: oxides of carbon, hydrochloric acid, hydrocarbons, smoke
POLYMERIZATION:
Will not polymerize.

SECTION 11 - TOXICOLOGICAL INFORMATION

PETROLATUM:

TOXICITY DATA:
>50 gm/kg intraperitoneal-mouse LD50; 100 ml/kg/30 day(s) intermittent skin-rabbit TDLo
CARCINOGEN STATUS:
IARC: Human Inadequate Evidence, Animal Inadequate Evidence, Group 3 (Highly refined oils); EC: Category 2
ACUTE TOXICITY LEVEL:
Insufficient Data.
ZINC CHLORIDE:

TOXICITY DATA:
169 mg/kg oral-child TDLo; 4800 mg/m3/30 minute(s) inhalation-man TCLo; 350 mg/kg oral-rat LD50; 1960 mg/m3/10 minute(s) inhalation-rat LCLo; 58 mg/kg intraperitoneal-rat LD50; 3690 ug/kg intravenous-rat LD50; >1500 ul/kg intratracheal-rat LD; 329 mg/kg oral-mouse LD50; 24 mg/kgintraperitoneal-mouse LD50; 330 mg/kg subcutaneous-mouse LD50; 9090 ug/kg intravenous-mouse LD50; 11 mg/kg intravenous-rabbit LDLo; 200 mg/kg oral-guinea pig LD50; 173 mg/kg intraperitoneal-guinea pig LDLo; 2.04 mg/kg oral-mouse TDLo; 9.3 mg/kg intraperitoneal-rat TDLo;5690 mg/kg/13 week(s) intermittent oral-rat TDLo; 910 mg/kg/26 week(s) intermittent oral-rat TDLo; 1680 mg/kg/14 day(s) intermittentoral-rat TDLo; 6875 mg/kg/39 week(s) intermittent oral-mammal TDLo; 21504 mg/kg/12 week(s) continuous oral-mouse TDLo; 595 mg/kg/2 week(s) continuous oral-rat TDLo; 3360 mg/kg/12 week(s) continuous oral-rat TDLo; 13440 mg/kg/12 week(s) intermittent oral-mouse TDLo; 76.44 mg/kg/14 week(s) intermittent

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oral-mouse TDLo; 109.2 mg/kg/20 week(s) intermittent oral-mouse TDLo; 218.4 mg/kg/20 week(s) intermittent oral-mouse TDLo; 40 mg/kg/2 day(s) intermittent subcutaneous-rat TDLo

LOCAL EFFECTS:

Corrosive: inhalation, skin, eye, ingestion

ACUTE TOXICITY LEVEL:

Toxic: ingestion

TARGET ORGANS:

immune system (sensitizer)

TUMORIGENIC DATA:

17 mg/kg parenteral-hamster TDLo; 15 mg/kg parenteral-chicken TDLo

MUTAGENIC DATA:

mutation in microorganisms - Salmonella typhimurium 90 mmol/L (-S9); phage inhibition capacity - Escherichia coli 3200 umol/L; specific locus test - Drosophila melanogaster oral 6 mmol/L; micronucleus test - non-mammalian species other cell types 170 ug/L 48 hour(s); DNA damage - human fibroblast 2 mmol/L; unscheduled DNA synthesis - human lymphocyte 180 umol/L; DNA inhibition - human lymphocyte 360 umol/L; other mutation test systems - human lymphocyte2 mg; cytogenetic analysis - human lymphocyte 300 umol/L; cytogeneticanalysis - rat Ascites tumor 700 mg/kg; DNA inhibition - mouse parenteral 16 mg/kg; cytogenetic analysis - mouse oral 18 gm/kg 30 day(s)-continuous; host-mediated assay - mouse Salmonella typhimurium6 mg/kg; morphological transformation - hamster embryo 180 umol/L

REPRODUCTIVE EFFECTS DATA:

155 mg/kg oral-rat TDLo 33 day(s) male; 6gm/kg oral-rat TDLo 77 day(s) male day(s) pre pregnancy/77 day(s) post pregnancy/21 day(s) continuous; 30 gm/kg intraperitoneal-rat TDLo 7-8 day(s) pregnant female continuous; 37500 ug/kg parenteral-rat TDLo 10 day(s) pregnant female continuous; 20500 ug/kgintraperitoneal-mouse TDLo 8 day(s) pregnant female continuous; 12500ug/kg intraperitoneal-mouse TDLo 11 day(s) pregnant female continuous; 29184 ug/kg intravaginal-rabbit TDLo 1 day(s) pre pregnancy continuous; 1.8 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 7.1 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 186 mg/kg oral-mouse TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous; 186 mg/kg oral-mouse TDLo multigenerations; 1.8 gm/kg oral-rat TDLo 98 day(s) male day(s) pre pregnancy/98 day(s) post pregnancy/3 week(s) continuous

AMMONIUM CHLORIDE:

IRRITATION DATA:

500 mg/24 hour(s) eyes-rabbit mild; 100 mg eyes-rabbit severe

TOXICITY DATA:

2 gm/kg oral-infant LDLo; 1650 mg/kg oral-rat LD50; 30 mg/kg intramuscular-rat LD50; 550 mg/kg unreported-rat LD50; 1300 mg/kg oral-mouse LD50; 485 mg/kg intraperitoneal-mouse LD50; 500 mg/kg subcutaneous-mouse LDLo; 358 mg/kg intravenous-mouse LD50; 200 mg/kg subcutaneous-rabbit LDLo; 78 mg/kg intravenous-rabbit LDLo; 72 mg/kg subcutaneous-guinea pig LDLo; 220 mg/kg intravenous-guinea pig LDLo; 1500 mg/kg oral-domestic animal LDLo; 0.005 gm/kg oral-rabbit LDLo; 0.02 gm/kg oral-dog LDLo; 250 mg/kg intraperitoneal-mouse LDLo;140 mg/kg intraperitoneal-rat LDLo; 51660 mg/kg/10 week(s) continuousoral-rat TDLo; 56100 mg/kg/170 day(s) intermittent oral-rat TDLo; 556gm/kg/78 week(s) continuous oral-rat TDLo; 35.3 gm/kg/4 week(s) continuous oral-rat TDLo; 52.9 gm/kg/6 week(s) continuous oral-rat TDLo; 3500 mg/kg/1 week(s) continuous oral-rat TDLo; 29.4 gm/kg/4 week(s) continuous oral-rat TDLo; 455 gm/kg/130 week(s) continuous oral-rat TDLo; 44.1 gm/kg/6 week(s) continuous oral-rat TDLo

LOCAL EFFECTS:

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Irritant: inhalation, eye
ACUTE TOXICITY LEVEL:
ModeratelyToxic: ingestion
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:
kidney disorders
MUTAGENIC DATA:
cytogenetic analysis - hamster fibroblast 400 mg/L
ADDITIONAL DATA:
Interactions with drugs may occur.

HEALTH EFFECTS
INHALATION:
ACUTE EXPOSURE:
PETROLATUM: High concentrations may cause irritationof the respiratory tract.

ZINC CHLORIDE: Fumes may be severely irritating to the upper respiratory tract and may cause a metallic taste, lacrimation, sore throat, loss of voice, hoarseness, coughing with copious sputum, a constrictive sensation in the chest, strider, chest pain and soreness. Gastrointestinal disturbances including nausea, abdominal pain and severe gastritis with vomiting may occur. Fever, dyspnea and tachypnea, shortness or breath, listlessness, pale, gray cyanosis, rapid pulse, tachycardia and coma have also beenreported. Respiratory effects may include severe inflammation of the upper respiratory tract, rhinitis, hemorrhagic alveolitis, severe pneumonitis, tracheobronchitis, diffuse pulmonary infiltrations, acute interstitial and advanced pulmonary fibrosis, pulmonary edema and bronchopneumonia. Death may be due to pulmonary edema, respiratory failure and bronchopneumonia. Autopsy revealed red and edematous mucous membrane and pulmonary necrosis, active fibroblasticproliferation and cor pulmonale.

AMMONIUM CHLORIDE: Inhalation of thedust may cause irritation with coughing, sore throat and difficult breathing. Laboratory animals exposed to 50 mg/m3 for 6 hours showed no signs of intoxication. However, post mortem examination showed congestion of the trachea and bronchial mucosa; the lungs were distended and emphysematous with petechial hemorrhaging and hyperemia. Changes were evident in the liver, spleen and adrenal medulla.
CHRONIC EXPOSURE:
PETROLATUM: Rarely, prolonged or repeatedinhalation of mist has caused shortness of breath, cough and lipid pneumonia.

ZINC CHLORIDE: Prolonged inhalation may result in ulceration of the nasal septum.

AMMONIUM CHLORIDE: No data available.
SKIN CONTACT:
ACUTE EXPOSURE:
PETROLATUM: May cause slight irritation. Rarely, hypersensitivity reactions and dermatitis have been reported.

ZINC CHLORIDE: Dust, fumes or solutions may cause severe irritation, redness, pain, papular and primary dermatitis, chemical burns, of theskin, boils, and ulceration of the fingers, hands and forearms. Sensitization reactions in the form of eczematoid dermatitis have been reported.

AMMONIUM CHLORIDE: May cause irritation.

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CHRONIC EXPOSURE:

PETROLATUM: Repeated or prolonged exposure from cosmetic use may result in acniform eruptions, irritation and pigmentation. Mice tested by twice-weekly application of 60 uL produced 5 papillomas but no cancer. The study showed no significant difference of papillomas when compared with controls.

ZINC CHLORIDE: Repeated orprolonged contact may cause boils, dermatitis or sensitization dermatitis in previously exposed persons. Repeated contact has produced fatigability, poor appetite, constipation and pains in the long bones of the legs.

AMMONIUM CHLORIDE: Repeated or prolonged contact may cause dermatitis.

EYE CONTACT:

ACUTE EXPOSURE:

PETROLATUM: May cause irritation.

ZINC CHLORIDE: Contact may cause severe irritation and pain, redness, blurred visionand injuries including corneal burns, ulceration and vascularization,conjunctivitis, dermatitis, and iritis. A splash in the eye caused, initially, some redness and persistent discomfort, but within 6 days it lead to a discrete stromal opacity in the lower part of the corneawith irregularities of the overlying epithelium. From an accidental instillation of a drop of 50% zinc chloride solution, the corneal epithelium became eroded, the lids red and swollen, and a mucopurulent discharge developed. Large folds developed in the Descemet's membrane, and the corneal stroma became turbid. This was accompanied by severe iritis with small hemorrhages in`the iris. Deepand superficial vascularization of the cornea followed.

AMMONIUM CHLORIDE: May cause irritation with redness and pain. Solutions less than 10% are generally well tolerated by the eye.

CHRONIC EXPOSURE:

PETROLATUM: No data available.

ZINC CHLORIDE: Repeated and prolonged contact to dust or vapor may cause conjunctivitis.

AMMONIUM CHLORIDE:Repeated or prolonged contact may cause conjunctivitis.

INGESTION:

ACUTE EXPOSURE:

PETROLATUM: Large amounts may cause abdominal pain and diarrhea. Aspiration may result in chemical pneumonitis.

ZINC CHLORIDE: Ingestion may cause severe irritation of mucous membranes with corrosion, swollen lips, edema of the glottis, sore throat, chest pain and gastrointestinal disturbances including nausea, vomiting, bloody diarrhea, and abdominal pain. Perforation of the viscous may occur. Lethargy, bloody urine, albuminuria, gastritis andpyloric stenosis have been reported. Other effects may include cold skin, low blood pressure, dyspnea and collapse with shock and hypocalcemia. Death has been reported. Delayed deaths have been ascribed to inanition following severe strictures of the esophagus and pyloris. Survivors of zinc salt ingestion may have residual nephritis.

AMMONIUM CHLORIDE: May cause irritation of mouth and stomach with nausea or vomiting. Large doses may cause diuresis, systemic acidosis and ammonia poisoning.

CHRONIC EXPOSURE:

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PETROLATUM: If the liquid form is taken continuously for therapeutic use, large amounts may impair the appetite, reduce the absorption of fat soluble vitamins and possibly cause changes in the liver and mesenteric lymph nodes. Rats fed various grades of petrolatum at 5% in the diet for 2 years showed no treatment-related tumor increase.
ZINC CHLORIDE: Reproductive effects have been reported in animals.

AMMONIUM CHLORIDE: Repeated ingestion may cause nausea, vomiting, acidosis, hypoproteinemia, demineralization of boney structures, and coma. Rabbits with damaged livers, and adrenals removed, were fed ammonium chloride for 120 days, resulting in permanent changes in theelectroretinogram and degeneration of the ganglion cell layer of the retina.

SECTION 12 - ECOLOGICAL INFORMATION

SECTION 13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations.

SECTION 14 - TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Corrosive liquids, n.o.s. (zinc chloride) ID NUMBER: UN1760 HAZARD IATA/ICAO CLASS: 8 PACKING GROUP: II LABELING REQUIREMENTS: 8
CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
No classification assigned.

LAND TRANSPORT ADR/RID:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 CLASS: 8 CLASSIFICATION CODE: C9 PACKING GROUP: II LABELS: 8

AIR TRANSPORT IATA/ICAO:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 IATA/ICAO CLASS:8 LABELS: 8 UN PACKING GROUP: II

MARITIME TRANSPORT IMDG:
PROPER SHIPPING NAME: Corrosive liquid, n.o.s. UN NUMBER: UN1760 PACKING GROUP: II

SECTION 15 - REGULATORY INFORMATION

TSCA Status	: Listed on inventory.
TSCA 12(b) export notification	: Not listed.
SARA Section 302 (40 CFR 355.30)	: Not regulated. TPQ
SARA Section 304 (40 CFR 355.40)	: Not regulated. RQ
California Prop 65 Status	: Not regulated.
SARA ACUTE Hazard	: Yes
SARA CHRONIC Hazard	: Yes
SARA FIRE Hazard	: No
SARA REACTIVITY Hazard	: No
SARA SUDDEN RELEASE Hazard	: No
WHMIS Classification	: Not regulated.

SECTION 16 - OTHER INFORMATION

No other information is currently available for this record
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1.5 Liquefied Petroleum Gas Combustion

1.5.1 General[1]

Liquefied petroleum gas (LPG or LP-gas) consists of propane, propylene, butane, and butylenes; the product used for domestic heating is composed primarily of propane. This gas, obtained mostly from gas wells (but also, to a lesser extent, as a refinery by-product) is stored as a liquid under moderate pressures. There are three grades of LPG available as heating fuels: commercial-grade propane, engine fuel-grade propane (also known as HD-5 propane), and commercial-grade butane. In addition, there are high-purity grades of LPG available for laboratory work and for use as aerosol propellants. Specifications for the various LPG grades are available from the American Society for Testing and Materials and the Gas Processors Association. A typical heating value for commercial-grade propane and HD-5 propane is 90,500 British thermal units per gallon (Btu/gal), after vaporization; for commercial-grade butane, the value is 97,400 Btu/gal.

The largest market for LPG is the domestic/commercial market, followed by the chemical industry (where it is used as a petrochemical feedstock) and the agriculture industry. Propane is also used as an engine fuel as an alternative to gasoline and as a standby fuel for facilities that have interruptible natural gas service contracts.

1.5.2 Firing Practices[2]

The combustion processes that use LPG are very similar to those that use natural gas. Use of LPG in commercial and industrial applications may require a vaporizer to provide the burner with the proper mix of air and fuel. The burner itself will usually have different fuel injector tips as well as different fuel-to-air ratio controller settings than a natural gas burner since the LPG stoichiometric requirements are different than natural gas requirements. LPG is fired as a primary and backup fuel in small commercial and industrial boilers and space heating equipment and can be used to generate heat and process steam for industrial facilities and in most domestic appliances that typically use natural gas.

1.5.3 Emissions[1,3-5]

1.5.3.1 Criteria Pollutants -

LPG is considered a "clean" fuel because it does not produce visible emissions. However, gaseous pollutants such as nitrogen oxides (NO_x), carbon monoxide (CO), and organic compounds are produced as are small amounts of sulfur dioxide (SO_2) and particulate matter (PM). The most significant factors affecting NO_x, CO, and organic emissions are burner design, burner adjustment, boiler operating parameters, and flue gas venting. Improper design, blocking and clogging of the flue vent, and insufficient combustion air result in improper combustion and the emission of aldehydes, CO, hydrocarbons, and other organics. NO_x emissions are a function of a number of variables, including temperature, excess air, fuel and air mixing, and residence time in the combustion zone. The amount of SO_2 emitted is directly proportional to the amount of sulfur in the fuel. PM emissions are very low and result from soot, aerosols formed by condensable emitted species, or boiler scale dislodged during combustion. Emission factors for LPG combustion are presented in Table 1.5-1.

Table 1.5-1 presents emission factors on a volume basis (lb/10^3gal). To convert to an energy basis (lb/MMBtu), divide by a heating value of 91.5 MMBtu/10^3gal for propane and 102 MMBtu/10^3gal for butane.

Table 1.5-1. EMISSION FACTORS FOR LPG COMBUSTION[a]

EMISSION FACTOR RATING: E

Pollutant	Butane Emission Factor ($lb/10^3$ gal)		Propane Emission Factor ($lb/10^3$ gal)	
	Industrial Boilers[b] (SCC 1-02-010-01)	Commercial Boilers[c] (SCC 1-03-010-01)	Industrial Boilers[b] (SCC 1-02-010-02)	Commercial Boilers[c] (SCC 1-03-010-02)
PM[d]	0.6	0.5	0.6	0.4
SO_2[e]	0.09S	0.09S	0.10S	0.10S
NO_x[f]	21	15	19	14
N_2O[g]	0.9	0.9	0.9	0.9
CO_2[h,j]	14,300	14,300	12,500	12,500
CO	3.6	2.1	3.2	1.9
TOC	0.6	0.6	0.5	0.5
CH_4[k]	0.2	0.2	0.2	0.2

[a] Assumes emissions (except SO_x and NO_x) are the same, on a heat input basis, as for natural gas combustion. The NO_x emission factors have been multiplied by a correction factor of 1.5, which is the approximate ratio of propane/butane NO_x emissions to natural gas NO_x emissions. To convert from $lb/10^3$ gal to $kg/10^3$ L, multiply by 0.12. SCC = Source Classification Code.

[b] Heat input capacities generally between 10 and 100 million Btu/hour.

[c] Heat input capacities generally between 0.3 and 10 million Btu/hour.

[d] Filterable particulate matter (PM) is that PM collected on or prior to the filter of an EPA Method 5 (or equivalent) sampling train. For natural gas, a fuel with similar combustion characteristics, all PM is less than 10 µm in aerodynamic equivalent diameter (PM-10).

[e] S equals the sulfur content expressed in gr/100 ft^3 gas vapor. For example, if the butane sulfur content is 0.18 gr/100 ft^3, the emission factor would be (0.09 x 0.18) = 0.016 lb of $SO_2/10^3$ gal butane burned.

[f] Expressed as NO_2.

[g] Reference 12.

[h] Assuming 99.5% conversion of fuel carbon to CO_2.

[j] EMISSION FACTOR RATING = C.

[k] Reference 13.

2004
Area Designations for State Ambient Air Quality Standards
OZONE

Source Date:
October 2003
Emission Inventory Branch, PTSD

October 18, 2004

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THE QUALITY LINE

HARVEL PLASTICS, INC.

Engineering & Installation Guide

PVC and CPVC extruded pipe, duct, and machining stock.

Copper Tube Size (CTS) CPVC Pipe

Solvent Cement Joining Techniques

It is important to follow proper storage and handling, joining, assembly, and other installation techniques to ensure a quality system installation. A properly designed and installed CPVC plumbing system will provide years of trouble-free service, lasting much longer than metallic systems due to the products inherent corrosion resistance and other factors. The following information is provided as a general guide toward that end.

Harvel CTS CPVC pipe is joined by the solvent cementing process; a reliable joining technique field-proven for more than 30 years. When properly conducted, this method provides a strong, homogenous joining area in which the mating surfaces are chemically fused together, producing a strong, leak-tight seal when cured. Prior to solvent cementing, appropriate safety precautions should be taken:

- Use only CPVC cement conforming to ASTM F493
- Follow the solvent cement manufacturer's instructions
- Avoid breathing vapors
- Use only with adequate ventilation
- Avoid frequent contact with skin
- Avoid contact with eyes
- Eliminate all ignition sources
- Store primer and solvent cement in the shade between 40°F and 110°F
- Close containers tight when not in use, and cover as much as possible during use
- Follow all manufacturer-recommended precautions when using power tools
- Flush the system for a minimum of 10 minutes after pressure testing to remove trace amounts of solvents or other system components

Exercise special care when assembling Harvel CTS CPVC pipe in extremely low temperatures (below 40°F) or extremely high temperatures (above 80°F). Extra set and handling times must be allowed in colder temperatures. Make certain cement has not "gelled" when cementing pipe and fittings in colder temperatures. Make certain both surfaces being joined are wet with cement during assembly when working in extremely hot temperatures.

1. Cutting

Harvel pipe must be cut square to obtain the proper insertion depth and to provide the maximum bonding area for solvent cementing. Harvel pipe can easily be cut with a wheel-type plastic tubing cutter, ratchet-style cutter, fine-toothed hand saw (hack saw), or power saws. A miter box should be used when working with saws to ensure a square cut. If ratchet-style cutters are used, their blades must be sharpened regularly. The use of ratchet cutters with dull blades, or their use in cold weather, will tend to compress the pipe prior to cutting which can result in hairline fracturing. The raised bead left on the pipe O.D. after cutting must be removed prior to solvent cementing—see step number 2 regarding beveling. Any cuts, fractures, splits, or other damaged areas must be removed prior to joining. Cut off at least 2" beyond any visible fracture.

2. Beveling/Deburring

Burrs, filings, shavings etc. caused by the cutting process must be removed from the outside and inside of the pipe. Shavings and other debris will prevent proper contact of the joining surfaces and can lead to joint failure. Chamfering tools are available for this purpose, however, pocket knives or files are also suitable. A slight bevel is required on the pipe end to help ease entry into the fitting socket, and to prevent solvent cement from being pushed ahead of the pipe during the assembly process. Many chamfering tools designed for use with plastic are readily available. These tools are specifically designed to remove burrs and provide a proper bevel simultaneously.

3. Fitting Preparation

Wipe dirt, debris, and moisture from the pipe end and fitting socket using a clean, dry rag. Moisture will slow the cure time and reduce joint strength. Inspect piping and components for damage or irregularities prior to assembly. Do not use components that appear irregular or that do not fit properly; contact the appropriate manufacturer of the product in question to determine usability. Check the dry fit of the pipe and fitting prior to assembly. The pipe should enter the fitting socket easily one-quarter to three-quarters of the way.

4. Solvent Cement Application

USE ONLY CPVC CEMENT that conforms to ASTM F493. The use of the wrong cement can result in failure. Harvel recommends the use of IPS 713 CPVC cement, P-68 primer or IPS Low VOC one-step CPVC cement or equivalent. Two solvent cementing processes are available; the two-step solvent cement and primer process, and the one-step process. The two-step process utilizes the application of primer to the outside of the pipe and the interior fitting socket prior to applying the solvent cement. When using primer, it must be applied to both the pipe and fittings using the appropriate size applicator. A dauber or paint brush approximately half the size of the pipe diameter is appropriate. A rag must not be used. Apply primer to the fitting socket, then to the outside of the pipe end, re-dipping the applicator as necessary to ensure the entire joining surfaces are wet; apply solvent cement immediately after primer application while primed surfaces are tacky. Cement application for one- or two-step process: Apply a heavy, even coat of cement to the outside pipe end. Apply a medium coat to the fitting socket. A second application of cement should be applied to the pipe end if there was little or no interference when the dry fit was checked. Do not allow excess cement to puddle in the pipe or fitting.

5. Assembly

Immediately insert the pipe into the fitting while rotating the pipe one-quarter turn to help distribute cement. Properly align the fitting for installation at this time. Pipe must bottom completely to the stop in the fitting. Hold the assembly for 10 to 15 seconds to ensure initial bonding. A continuous bead of cement should be evident around the pipe and fitting juncture. If the bead is not continuous, it may indicate that insufficient cement was applied. If insufficient cement is applied the fitting must be cut out, discarded and begun again. Cement in excess of the bead should be wiped off with a rag.

6. Set and Cure Times

Assembled joints must be allowed to set and cure properly prior to testing the system. Set and cure times are a function of type of cement used, pipe size, temperature, humidity, and tightness of fit. Drying time is faster for drier environments, smaller sizes, higher temperatures and tighter fits. The assembly must be allowed to set without any stress on the joint for one to five minutes depending on the pipe size and temperature. Following the initial set period, the assembly can be handled carefully. FOLLOW THE CEMENT MANUFACTURER'S RECOMMENDED CURE TIMES PRIOR TO PRESSURE TESTING - FAILURE TO DO SO WILL RESULT IN JOINT FAILURE.

Minimum Cure Time Prior to Testing at 150 psi with Cold Water (based on use of IPS one-step CPVC cement and 713 two-step cement)

Pipe Size (in.)	Ambient Temperature During Cure Time >60°F	40°F - 60°F	<40°F
3/8	1 hr	2 hrs	4 hrs
1/2	1 hr	2 hrs	4 hrs
3/4	1 hr	2 hrs	4 hrs
1	1 hr	2 hrs	4 hrs
1-1/4	2 hrs	4 hrs	8 hrs
1-1/2	2 hrs	4 hrs	8 hrs
2	2 hrs	4 hrs	8 hrs

NOTE Wait 24 hours prior to putting system into hot water service when installed at cure temperatures above 60°F; wait 48 hours prior to putting system into hot water service when installed at cure temperatures below 40°F Solvent Cement Joining

Hangers & Supports

Proper support spacing is critical to ensure that deflection is kept to a minimum. Hangers used must have an adequate load bearing surface free of any rough or sharp edges that could damage the pipe during use. They must also not restrict linear movement of the system due to the effects of expansion and contraction; overtightening must be avoided.

Pipe Size (in.)	Maximum Hanger Support Spacing
3/8	3 ft
1/2	3 ft
3/4	3 ft
1	3 ft
1-1/4	4 ft
1-1/2	4 ft
2	4 ft

Wall Penetration

Building codes require that a fire-rated wall or floor must be sealed back to its original integrity when penetrated. Several sealants and materials are suitable for use with Harvel CTS CPVC pipe to construct an appropriate UL Classified penetration system (fire-rated penetration system). When installed properly, these systems will provide a two-hour fire rating. Consult local building code requirements.

CAUTION Certain fire-stopping sealants and components contain stress cracking agents and other chemicals which may cause damage to CPVC piping; contact the appropriate manufacturer for compatibility with CPVC prior to use.

NOTE When installing CPVC in areas where the system must be drained to protect it from freezing, the lines must be sloped to drain.

Transition Connections

Harvel CTS CPVC pipe can be connected to copper, brass, valves, and other piping materials using transition unions, compression fittings, specialty reinforced male and female adapters, and other readily available transition fittings. Follow the fitting manufacturer's installation instructions for the specific connection being used to ensure a proper leak-free joint. When using compression fittings utilizing brass ferrules, it is recommended that Teflon tape be wrapped around the ferrule prior to assembly to help compensate for differences in expansion rates between CPVC and metallics. Teflon tape is also the recommended thread sealant for threaded connections. Certain pipe joint pastes and sealant compounds contain substances which could be damaging to CPVC and result in system failure. If joint sealant other than Teflon® tape is used, contact the sealant manufacturer for compatibility with CPVC. Caution must be exercised to prevent overtightening of threaded connections and compression fittings.

Where water temperatures are 150°F or higher, use transition fittings incorporating rubber seals or other approved specialty transition fittings at the plastic to metal changeover. Follow appropriate safety precautions and manufacturer's recommendations when working with or near open flame during soldering operations. Extreme care must be used when soldering to prevent flame contact with CPVC tubing.

Water Heater Connections

Care should be used to prevent contact of the CPVC pipe with heat-producing sources. Gas water heaters require the use of a metallic nipple or appliance connector at least six inches long to be installed above the flue piping as a transition piece to prevent damage to the CPVC by excessive heat build-up from the flue. CPVC can be installed directly onto electric water heaters with special transition fittings. Some codes require metal connectors on electric water heaters; consult applicable code requirements prior to installation.

CONSTRUCTION INDUSTRY RESEARCH BOARD

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CHARACTERISTICS OF NEW HOMES SOLD
CALIFORNIA AND SELECTED COUNTIES, 1982-2001
20 YEARS OF DATA

PREPARED BY
CONSTRUCTION INDUSTRY RESEARCH BOARD

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CHARACTERISTICS OF NEW HOMES SOLD
STATE OF CALIFORNIA AND SELECTED COUNTIES, 1982-2001

This report compiles recent and historical California new-home prices and related data. It covers the twenty-year period from 1982 through 2001, and includes prices and sizes of new homes sold, and the distribution of sales by price range, by single-family, condominium and PUD, by detached and attached, and by number of bedrooms. Historical prices are not adjusted for inflation.

Data are shown for the state as a whole, and for 39 of the state's 58 counties. Unless indicated, the prices and other measures reported combine all types of new homes sold. Mobile homes, however, are not included in the data.

CALIFORNIA AND NATIONAL PRICES COMPARED

The median price of new homes sold in California in 2001 is $256,000, up 5.3% from 2000, and follows a 7.9% increase in 2000. Nationally, the median price is $174,100, up 3.0% from 2000. The California median price increased 135.7% from 1982 to 2001. That compares with a 79.6% increase in the California Consumer Price Index, and a 151.2% increase in the national median new-home price over the same period. The California median price is 47.0% above the national median price. (See Table 1, page 2.)

The average (mean) price of new homes sold in California in 2001 is $318,900. That is up 3.0% from 2000's average of $309,700, and follows a 9.7% increase in 2000. The national average new-home price is $211,900 in 2001, up 2.3% from 2000. California's average new-home price increased by 152.5% from 1982 to 2001. That is practically identical to the national increase over the period. California's average new-home price is 50.5% above the nation's in 2001. (See Table 1, following page.)

While California's new-home prices are well above the nation's, the gap narrowed in the 1990s, but began to widen again after 1998. In 1990, the state's median price was 54.5% above the nation's. In 1997 and 1998 that gap stood at 36.3% and 36.7%, respectively. It rose to 39.9% above the nation's in 1999, and stood 43.8%, and 47.0% above the national median in 2000 and 2001. Since 1990, California's median new-home price has increased 34.8%. Nearly 72.0% of that increase is in the past three years. Over the same period, the national median price rose 41.7%, but only 42.2% of that increase occurred in the past three years.

A shift in single-family housing production to lower-priced regions of the state has moderated price increases in California. The lower-priced Central Valley Region increased its share of single-family home production from 25.8% in 1997, to 32.4% in 2000, and 33.8% in 2001. That regional shift partly offset large price increases in 2000 and 2001, particularly in the San Francisco Bay Region, which has the highest prices of any region. The Bay Regions's share of single-family housing production declined from 19.8% of the state in 1997 to 11.8% in 2001.

TABLE 1

STATE OF CALIFORNIA AND UNITED STATES, 1982-2001

AVERAGE AND MEDIAN NEW-HOME PRICES AND PERCENT CHANGE FROM PRIOR YEAR

(NOT ADJUSTED FOR INFLATION)

	MEDIAN PRICES				AVERAGE PRICES			
YEAR	CALIF.	% CHANGE	U. S.*	% CHANGE	CALIF.	% CHANGE	U. S.*	% CHANGE
2001	$256,000	+ 5.3%	$174,100	+ 3.0%	$318,900	+ 3.0%	$211,900	+ 2.3%
2000	$243,000	+ 7.9%	$169,000	+ 5.0%	$309,700	+ 9.7%	$207,200	+ 5.9%
1999	$225,200	+ 8.0%	$161,000	+ 5.6%	$282,400	+ 8.0%	$195,600	+ 7.5%
1998	$208,500	+ 4.8%	$152,500	+ 4.4%	$261,600	+ 7.7%	$181,900	+ 3.2%
1997	$199,000	+ 4.8%	$146,000	+ 4.3%	$242,800	+ 8.9%	$176,200	+ 5.9%
1996	$189,900	+ 1.1%	$140,000	+ 4.6%	$223,000	- 0.5%	$166,400	+ 4.9%
1995	$187,900	+ 0.2%	$133,900	+ 3.0%	$224,100	+ 1.3%	$158,700	+ 2.7%
1994	$187,500	+ 3.0%	$130,000	+ 2.8%	$221,200	+ 1.7%	$154,500	+ 4.6%
1993	$182,000	- 2.1%	$126,500	+ 4.1%	$217,600	- 2.9%	$147,700	+ 2.5%
1992	$186,000	- 5.8%	$121,500	+ 1.2%	$224,100	- 9.1%	$144,100	- 2.1%
1991	$197,500	+ 4.0%	$120,000	- 2.2%	$246,600	+ 3.8%	$147,200	- 1.7%
1990	$189,900	+ 6.7%	$122,900	+ 2.4%	$237,600	+ 6.5%	$149,800	+ 0.7%
1989	$178,000	+12.7%	$120,000	+ 6.7%	$223,000	+15.8%	$148,800	+ 7.6%
1988	$158,000	+ 6.8%	$112,500	+ 7.7%	$192,600	+10.8%	$138,300	+ 8.7%
1987	$148,000	+10.5%	$104,500	+13.6%	$173,900	+12.9%	$127,200	+13.7%
1986	$133,900	+ 5.4%	$ 92,000	+ 9.1%	$154,000	+ 7.7%	$111,900	+11.0%
1985	$127,000	+ 7.6%	$ 84,300	+ 5.5%	$143,000	+ 6.0%	$100,800	+ 3.3%
1984	$118,000	+ 5.9%	$ 79,900	+ 6.1%	$134,900	+ 1.7%	$ 97,600	+ 8.7%
1983	$111,400	+ 2.6%	$ 75,300	+ 8.7%	$132,700	+ 5.1%	$ 89,800	+ 7.0%
1982	$108,600		$ 69,300		$126,300		$ 83,900	
(1982-01)	(+135.7%)		(+151.2%)		(+152.5%)		(+152.6%)	

*U.S. DATA FROM DEPT. OF COMMERCE, BUREAU OF CENSUS; CALIFORNIA DATA FROM CONSTRUCTION INDUSTRY RESEARCH BOARD USING DATA PROVIDED BY FNC, INC., COSTA MESA, CA (800)446-1099.

PRICE AND SIZE CHANGES, CALIFORNIA

California price increases from 1997 through 2001 contrast with declines or slight increases between 1992 and 1996. New home sizes (living area) continue to remain high compared with historical levels. The median size is 2,035 square feet in 2001, up 1.8% from 2000, while the average size is 2,170 square feet, unchanged from 2000, but up 2.4% from 1999. Average and median new-home sizes from 1998 through 2001 are larger than in any year over the 1982-through-2001 period shown in Table 2, following page. Part of the reason for smaller sizes in the early years of the study period is the larger share of sales in condominiums in those years.

Increases in new-home size moderate increases in price per square foot. Median new-home price rose 135.7% from 1982, median size, rose 38.4% over the same period, and median price per square foot rose 70.3%. Average price rose 152.5% from 1982, average size rose 34.8%, and average price per square foot rose 87.3% over the same period. Changes in price per square foot correspond more closely to the 79.6% increase in the California Consumer Price Index over the study period, than do changes in total price.

TABLE 2

PRICE AND SIZE OF NEW HOMES SOLD IN CALIFORNIA, AND PERCENT CHANGE FROM PRIOR YEAR, 1982-2001

(NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES					AVERAGE VALUES				
YEAR	MEDIAN PRICE	% CHANGE	LIV. AREA (SQ. FT.)	% CHANGE	PRICE PER SQ. FT.	AVERAGE PRICE	% CHANGE	LIV. AREA (SQ. FT.)	% CHANGE	PRICE PER SQ. FT.
2001	$256,000	+ 5.3%	2,035	+ 1.8%	$125.80	$318,900	+ 3.0%	2,170	0.0%	$146.96
2000	$243,000	+ 7.9%	2,000	+ 2.6%	$121.50	$309,700	+ 9.7%	2,170	+ 2.4%	$142.72
1999	$225,200	+ 8.0%	1,950	0.0%	$115.49	$282,400	+ 8.0%	2,120	+ 1.2%	$130.21
1998	$208,500	+ 4.8%	1,950	+ 2.9%	$106.92	$261,600	+ 7.7%	2,095	+ 2.4%	$124.87
1997	$199,000	+ 4.8%	1,895	+ 3.0%	$105.01	$242,800	+ 8.9%	2,045	+ 3.8%	$118.73
1996	$189,900	+ 1.1%	1,840	- 0.3%	$103.21	$223,000	- 0.5%	1,970	- 0.8%	$113.20
1995	$187,900	+ 0.2%	1,845	+ 0.3%	$101.84	$224,100	+ 1.3%	1,985	+ 0.8%	$112.90
1994	$187,500	+ 3.0%	1,840	+ 0.3%	$101.90	$221,200	+ 1.7%	1,970	+ 0.2%	$112.28
1993	$182,000	- 2.1%	1,835	- 1.1%	$ 99.18	$217,600	- 2.9%	1,965	- 0.8%	$110.74
1992	$186,000	- 5.8%	1,855	- 2.4%	$100.27	$224,100	- 9.1%	1,980	- 2.9%	$113.18
1991	$197,500	+ 4.0%	1,900	+ 1.9%	$103.95	$246,600	+ 3.8%	2,040	+ 2.0%	$120.88
1990	$189,900	+ 6.7%	1,865	+ 2.5%	$101.82	$237,600	+ 6.5%	2,000	+ 3.1%	$118.80
1989	$178,000	+12.7%	1,820	+ 3.4%	$ 97.80	$223,000	+15.8%	1,940	+ 2.6%	$114.95
1988	$158,000	+ 6.8%	1,760	+ 2.0%	$ 89.77	$192,600	+10.8%	1,890	+ 1.9%	$101.90
1987	$148,000	+10.5%	1,725	+ 7.1%	$ 85.80	$173,900	+12.9%	1,855	+ 5.7%	$ 93.75
1986	$133,900	+ 5.4%	1,610	+ 7.3%	$ 83.17	$154,000	+ 7.7%	1,755	+ 6.4%	$ 87.75
1985	$127,000	+ 7.6%	1,500	+ 0.3%	$ 84.67	$143,000	+ 6.0%	1,650	+ 1.2%	$ 86.67
1984	$118,000	+ 5.9%	1,495	+ 3.1%	$ 78.93	$134,900	+ 1.7%	1,630	+ 1.2%	$ 82.76
1983	$111,400	+ 2.6%	1,450	- 1.4%	$ 76.83	$132,700	+ 5.1%	1,610	0.0%	$ 82.42
1982	$108,600		1,470		$ 73.88	$126,300		1,610		$ 78.45
(1982-01)	(+135.7%)		(+38.4%)		(+70.3%)	(+152.5%)		(+34.8%)		(+87.3%)

*U.S. DATA FROM DEPT. OF COMMERCE, BUREAU OF CENSUS; CALIFORNIA DATA FROM CONSTRUCTION INDUSTRY RESEARCH BOARD USING DATA PROVIDED BY FNC, INC., COSTA MESA, CA (800)446-1099.

PRICE AND SIZE BY COUNTY

Tables 4, 5 and 6, pages 10 through 24, show price, size, and price per square foot for the state and 39 counties. Tables 4 and 5 show median, and average new-home prices, sizes, price per square foot and percent change in prices for years 1999, 2000 and 2001. Table 6, pages 12 through 24, shows median and average prices, sizes, and price per square foot by county from 1982 through 2001.

Of the 39 counties in Table 4 (page 10), twenty-eight had median-price increases greater than the 5.3% statewide increase in 2001. In 2000, twenty-one counties had median-price increases greater than that year's 7.9% median statewide increase.

In 2001, the counties with the largest median price increases were Stanislaus (+26.3%), San Francisco (+23.2%), Marin and San Benito (+21.8%), San Diego (+20.3%), Contra Costa (+20.0%), El Dorado (+19.0%), Sonoma (+17.6%), Tulare (+16.7%), Humboldt (+16.4%), Lake (+16.2%), and Sacramento (+16.1%) counties (Table 4, page 10).

Median new-home prices declined in six counties in 2001, compared with seven declines in 2000 (Table 4). Average prices declined in five counties in 2001, compared with three in 2000 (Table 5).

The ten counties with the highest median prices in 2001 are Marin ($670,000), San Francisco ($632,500), Santa Clara ($600,000), San Mateo ($570,500), Santa Cruz ($527,500), Alameda ($517,000), Orange ($407,700), El Dorado ($396,300), Ventura ($387,200), and Napa ($367,800). Six of the ten are in the Bay Area. (Table 4, page 10)

Among the 39 counties, the lowest median prices in 2001 are Madera ($120,500), Kings ($129,800), Tulare ($130,900), Shasta ($132,000), Sutter ($134,800), and Kern ($139,500). (Table 4, page 10)

While large price variations are found among counties, even larger variations may occur within counties. For example, in Los Angeles County, the North County, made up of the Antelope and Santa Clarita Valleys, has much lower new-home prices than the South County.

Los Angeles County's median price in 2001 is $318,700, up 7.1% from 2000. South County's median price is $390,000 in 2001, up 20.4%. Santa Clarita Valley's median price is $275,500, up 6.4%. The Antelope Valley's median price is $182,100, up 23.5% from 2000. The 7.1% increase in the county's median price contrasts with larger increases in Antelope Valley and South County. That is due to a growing share of sales in the lower-priced areas of the county.

LOS ANGELES COUNTY BY SUBREGION (NOT ADJUSTED FOR INFLATION)

	MEDIAN PRICES								% CHANGE
SUBREGION	1989	1995	1996	1997	1998	1999	2000	2001	2000-01
ANTELOPE VALLEY	$144,200	$123,700	$119,500	$125,000	$129,900	$142,600	$147,500	$182,100	+ 23.5%
STA. CLARITA VALLEY	$233,400	$219,500	$246,500	$257,000	$279,000	$300,000	$259,000	$275,500	+ 6.4%
SOUTH COUNTY	$310,000	$265,900	$272,800	$299,500	$337,500	$343,900	$324,000	$390,000	+ 20.4%
ALL LOS ANGELES CO.	$225,000	$222,000	$230,000	$257,000	$292,000	$295,800	$297,500	$318,700	+ 7.1%

	AVERAGE PRICES								% CHANGE
SUBREGION	1989	1995	1996	1997	1998	1999	2000	2001	2000-01
ANTELOPE VALLEY	$155,500	$133,600	$123,800	$133,100	$130,200	$146,600	$157,700	$188,000	+ 19.2%
STA. CLARITA VALLEY	$239,300	$227,000	$248,900	$267,400	$285,500	$307,600	$295,300	$306,800	+ 3.9%
SOUTH COUNTY	$378,800	$329,800	$319,600	$353,200	$392,500	$426,200	$445,800	$480,300	+ 7.7%
ALL LOS ANGELES CO.	$285,900	$291,200	$279,700	$315,400	$359,800	$382,300	$400,100	$416,900	+ 4.2%

DISTRIBUTION OF SALES BY PRICE RANGE

Table 3-A, following page, compares new-home sales by price range in California and the United States. Table 3-B shows the distribution of sales in California by price range for years 1990 through 2001. Table 3-C shows the distribution of sales in the highest ranges.

In California 3% of new homes sold are under $100,000. Nationally, 9% are under $100,000. In California, 68% of sales are priced above $200,000 compared with 39% nationally. (Table 3-A, page 5)

TABLE 3-A

COMPARISON: STATE OF CALIFORNIA AND UNITED STATES, 1990-2001

	STATE OF CALIFORNIA					UNITED STATES			
YEAR	UNDER $100,000	$100,000-$149,999	$150,000-$199,999	$200,000 and over	YEAR	UNDER $100,000	$100,000-$149,999	$150,000-$199,999	$200,000 and over
2001	3%	13%	16%	68%	2001	9%	28%	24%	39%
2000	4%	14%	18%	64%	2000	10%	30%	23%	37%
1999	5%	17%	20%	58%	1999	11%	32%	24%	33%
1998	6%	18%	23%	53%	1998	15%	33%	24%	28%
1997	7%	21%	22%	50%	1997	18%	34%	22%	26%
1996	9%	23%	22%	46%	1996	22%	34%	21%	23%
1995	7%	24%	24%	45%	1995	24%	36%	19%	21%
1994	7%	23%	25%	45%	1994	27%	35%	19%	19%
1993	7%	25%	26%	42%	1993	31%	34%	18%	17%
1992	6%	24%	26%	44%	1992	36%	31%	16%	17%
1991	6%	20%	25%	49%	1991	36%	30%	16%	18%
1990	7%	22%	25%	46%	1990	37%	28%	16%	19%

TABLE 3-B

STATE OF CALIFORNIA, 1990-2001

	DISTRIBUTION OF SALES BY PRICE RANGE							
YEAR	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
2001	0.1%	2.4%	13.1%	16.2%	16.1%	17.7%	13.6%	20.8%
2000	0.2%	4.0%	14.3%	17.8%	15.7%	15.9%	12.3%	19.8%
1999	0.3%	4.3%	17.2%	20.2%	14.9%	15.0%	12.1%	16.0%
1998	0.3%	5.5%	18.2%	22.8%	15.7%	13.7%	10.8%	13.0%
1997	0.6%	6.8%	20.7%	22.4%	16.2%	13.6%	9.3%	10.4%
1996	0.8%	7.9%	23.4%	22.0%	16.4%	14.8%	7.7%	7.0%
1995	0.4%	6.4%	24.3%	24.2%	16.2%	13.9%	7.7%	6.9%
1994	0.5%	6.2%	23.4%	25.2%	17.4%	14.0%	7.8%	5.5%
1993	0.5%	6.1%	25.4%	25.8%	16.4%	12.9%	7.6%	5.3%
1992	0.4%	5.6%	24.0%	25.7%	16.6%	13.6%	8.0%	6.1%
1991	0.7%	4.9%	20.2%	25.1%	16.9%	14.3%	9.4%	8.5%
1990	0.8%	6.5%	22.4%	24.5%	15.0%	13.4%	8.6%	8.8%

TABLE 3-C

STATE OF CALIFORNIA, 1996-2001 --- HIGHEST RANGES

	DISTRIBUTION OF SALES BY PRICE RANGE (HIGHEST RANGES)				
YEAR	UNDER $250,000	$250,000-$324,999	$325,000-$424,999	$425,000-$599,999	$600,000 and over
2001	47.9%	17.7%	13.6%	11.5%	9.3%
2000	52.0%	15.9%	12.3%	10.4%	9.4%
1999	56.9%	15.0%	12.1%	9.0%	7.0%
1998	62.5%	13.7%	10.8%	7.6%	5.4%
1997	66.7%	13.6%	9.3%	6.1%	4.3%
1996	70.5%	14.8%	7.7%	4.5%	2.5%

*U.S. DATA FROM DEPT. OF COMMERCE, BUREAU OF CENSUS; CALIFORNIA DATA FROM CONSTRUCTION INDUSTRY RESEARCH BOARD USING DATA PROVIDED BY FNC, INC., COSTA MESA, CA (800)446-1099.

In both 2001 and 2000 the highest price range, $425,000 and over, contains a greater percentage of sales than any other price range. (See Table 3-B above.) The $425,000 and over range contains 20.8% of year 2001 sales and 19.8% of 2000's. In 1999, 16.0% of sales were in the highest range, and in 1993 only 5.3% were in that range. Between 1987 and 1999, either the $100,000-to-$150,000 or $150,000-to-200,000 price ranges contained the highest percentage of sales among all ranges. (See Table 7-A, pages 25 through 35, for price distributions for the state and 39 counties.)

Table 3-C, page 5, recaps the distribution of sales by price range for the highest ranges. While 20.8% of 2001 sales are priced at $425,000 plus, 9.3% are $600,000 or more, or 44.8% of the $425,000-plus range. Table 7-B, pages 36 and 37, shows the state and the ten counties with the largest percentage of sales in the highest ranges. Those ten counties account for nearly 36.0% of all new-home sales in 2001, but 78.7% of all sales in the $425,000-plus range, and 89.2% of the sales in the $600,000-plus range. Marin, San Francisco, Santa Clara, and San Mateo counties have the highest percentage of new-home sales in the $600,000-plus range in 2001 with 61.8%, 58.0%, 51.3% and 40.0%, respectively.

SALES BY TYPE OF OWNERSHIP

*Tables 8-A through 8-K, pages 38 through 48, identify the average price and distribution of sales by type of ownership in years 1991 through 2001. Forms of ownership include single-family, condominium, and planned unit development (including de-minimus PUDs).**

Single-family ownership accounts for 61.6% of new-home sales in 2001, up from 60.2% in 2000, but down from 73.2% in 1991. PUDs and de-minimus PUDs are 27.7% of 2001 sales, down from 30.2% in 2000, but up from 13.1% in 1991. Condominiums increased to a 10.7% share in 2001, up from 9.6% in 2000, but down from 13.7% in 1991. (See following page.) Condominiums ranged between 27% to 31% of sales from 1982 through 1985.

**Definitions: A Condominium is that form of ownership in which each owner possesses title to the air space within the individual living unit. Common areas are owned in common with all others in the project. In Planned Unit Developments ownership title includes the individual living unit, the land under that unit, sometimes small unimproved land areas abutting the unit, and air rights above the parcel. It also includes ownership in common of areas such as recreation facilities, driveways, and landscaped areas. Each owner must belong to and abide by the rules of the Homeowners' Association. De-Minimus PUDs usually have single-family tract appearance and characteristics. Each owner has fee title to a separate detached dwelling (or rowhouse) plus the land parcel which usually fronts on a public street. There is minimal common area within the subdivision. Owners belong to a homeowners' association.*

In 2001, the average price of a new single-family home is $265,400, down from $266,000 in 2000, and is less than the $374,600 average for condominiums, and $416,000 for PUDs. For the state as a whole, the average condominium price is higher than the statewide single-family price because of the concentration of condominium sales in higher priced counties. (See Table 8-A, page 38.)

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
YEAR	AVERAGE PRICE	SIZE (SQ.FT.)	% SINGLE	AVERAGE PRICE	SIZE (SQ.FT.)	% CONDO	AVERAGE PRICE	SIZE (SQ.FT.)	% PUD
2001	$265,400	2,120	61.6%	$374,600	1,570	10.7%	$416,000	2,515	27.7%
2000	$266,000	2,115	60.2%	$316,100	1,530	9.6%	$394,800	2,485	30.2%
1999	$245,700	2,050	61.3%	$276,800	1,545	9.5%	$361,300	2,455	29.2%
1998	$231,200	2,060	60.2%	$248,700	1,510	9.7%	$326,400	2,355	30.1%
1997	$219,400	2,020	59.5%	$219,600	1,480	10.5%	$297,400	2,290	30.0%
1996	$201,600	1,965	59.9%	$208,200	1,410	12.0%	$275,000	2,220	28.1%
1995	$205,100	1,970	62.1%	$206,500	1,445	10.4%	$273,700	2,215	27.5%
1994	$207,000	1,970	65.2%	$197,200	1,400	10.0%	$268,300	2,205	24.8%
1993	$207,100	1,985	70.5%	$206,400	1,410	11.1%	$264,700	2,210	18.4%
1992	$213,500	2,025	72.0%	$213,100	1,410	12.6%	$283,000	2,240	15.4%
1991	$240,800	2,110	73.2%	$222,600	1,420	13.7%	$303,500	2,285	13.1%

Condominium prices are lower than single-family in all counties except Riverside County, where condominium sales are concentrated in higher-priced areas of the county. Counties with the highest percentage of condominium sales in 2001 are San Francisco (91.9%), Los Angeles (35.3%), Orange (34.4%), San Mateo (32.7%), Santa Clara (26.3%), and San Diego (20.0%). (Table 8-A, page 38)

SALES OF DETACHED AND ATTACHED HOMES

Tables 9-A through 9-K, pages 49 through 59, summarize price, size and distribution of new home sales between single-family detached and attached categories for the years 1991 through 2001.

Detached homes account for 88.8% of new homes sold in 2001, down from 89.4% in 2000, but up from 83.0% in 1991. The average price of new single-family-detached homes is $311,900 in 2001, up 1.0% from 2000. The average size of detached homes is 2,250 square feet in 2001, up from 2,245 in 2000. (See below, and tables, pages 49 through 59.)

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES		
YEAR	AVERAGE PRICE	SIZE (SQ. FT.)	% DETACHED	AVERAGE PRICE	SIZE (SQ. FT.)	% ATTACHED
2001	$311,900	2,250	88.8%	$373,900	1,545	11.2%
2000	$308,800	2,245	89.4%	$317,100	1,545	10.6%
1999	$284,000	2,195	88.9%	$270,100	1,520	11.1%
1998	$263,200	2,170	88.3%	$249,300	1,535	11.7%
1997	$246,200	2,125	86.7%	$220,700	1,510	13.3%
1996	$226,000	2,060	85.0%	$206,200	1,455	15.0%
1995	$227,000	2,065	85.4%	$206,900	1,510	14.6%
1994	$224,200	2,050	86.8%	$201,900	1,470	13.2%
1993	$219,200	2,045	85.9%	$207,500	1,460	14.1%
1992	$225,500	2,075	84.3%	$216,500	1,465	15.7%
1991	$251,200	2,155	83.0%	$223,900	1,460	17.0%

Attached homes (townhouses, rowhouses, flats, walk-ups, high-rises) account for 11.2% of 2001 sales, up from 10.6% in 2000, but down from 17.0% in 1991. The average price of attached homes is $373,900 in 2001, up 17.9% from 2000. Years 2001 and 2000 are the first years where the statewide average price of attached homes is higher than the statewide price of detached homes. This is due to large price increases in certain counties. (Compare Tables 9-A and 9-B with 9-C.) Still, in nearly all counties prices of attached homes are lower than detached-home prices in those counties.

Counties with the highest percentage of attached sales in 2001 are San Francisco (93.5%), San Mateo (38.2%), Santa Clara (38.2%), Los Angeles (32.6%), Orange (29.7%), and San Diego (20.7%).

SALES BY NUMBER OF BEDROOMS

Tables 10-A through 10-D, pages 60 through 63, show the average number of bedrooms and distribution of sales by number of bedrooms for years 1998 through 2001. Three-bedroom homes are the most common with 40.9% of new homes sold in 2001. Four-bedroom homes account for 35.8%; two-bedroom homes are 7.5%; and, five-or-more-bedroom homes are 14.8% of 2001 sales. The only county with a substantial percentage of sales with fewer than two bedrooms is San Francisco at 33.9% in 2001. The average number of bedrooms in new homes sold in 2001 in California is 3.58, up from 3.55 in 2000. In 2001, averages range from a low of 1.87 bedrooms in San Francisco to a high of 4.04 in Contra Costa County. (See Table 10-A, page 60.)

YEAR	AVERAGE BEDROOMS	DISTRIBUTION OF NEW-HOME SALES BY NUMBER OF BEDROOMS				
		< TWO	TWO	THREE	FOUR	5 OR MORE
2001	3.58	1.0%	7.5%	40.9%	35.8%	14.8%
2000	3.55	0.7%	7.7%	42.4%	35.3%	13.9%
1999	3.55	0.9%	7.0%	41.9%	38.0%	12.2%
1998	3.50	0.7%	7.7%	44.7%	35.8%	11.1%

Tables 11-A through 11-D, pages 64 through 67, show average price, size, and price per square foot for two-, three-, and four-bedroom homes for years 1998 through 2001. For the state as a whole, the average price is $328,300 for two-bedroom homes, $247,100 for three-bedroom, and $346,200 for four-bedroom. The average size is 1,420 square feet for two-bedroom homes, 1,770 for three-bedroom, and 2,410 for four-bedroom. The average price for two-bedroom homes is substantially (32.9%) higher than three-bedroom homes in 2001 statewide. (Table 11-A, page 64) That is due to a disproportionate number of two-bedroom homes in the highest priced counties.

YEAR	2-BEDROOM HOMES			3-BEDROOM HOMES			4-BEDROOM HOMES		
	AVERAGE PRICE	LIV. AREA (SQ. FT.)	PRICE PER SQ. FT.	AVERAGE PRICE	LIV. AREA (SQ. FT.)	PRICE PER SQ. FT.	AVERAGE PRICE	LIV. AREA (SQ. FT.)	PRICE PER SQ. FT.
2001	$328,300	1,420	$231.20	$247,100	1,770	$139.60	$346,200	2,410	$143.65
2000	$272,100	1,415	$192.30	$239,600	1,770	$135.37	$334,000	2,425	$137.73
1999	$228,800	1,375	$165.82	$218,100	1,735	$125.71	$309,600	2,375	$130.36
1998	$207,200	1,365	$151.80	$208,300	1,750	$119.03	$289,800	2,390	$121.26

HOUSING PRODUCTION

Tables 12-A, 12-B and 12-C, pages 68 through 70, summarize new single-family, multi-family, and total units in building permits issued by county for years 1989 through 2001. (Table notes are included on page 71.) New housing units, and in particular new single-family housing units, are a key indicator of the potential volume of new-home sales, though sales tend to lag permits issued.

New single-family units and total new units in building permits issued are summarized below by region for years 1997 through 2001. (Counties included in each region are listed on page 71.) A shift in single-family housing permits, and to a lesser extent in total units (includes multi-family), is apparent from 1997 to 2001, and that shift has moderated price increases for California as a whole. The lower-priced Central Valley Region increased its share of single-family home production from 25.8% in 1997, to 32.4% in 2000, and 33.8% in 2001. At the same time, San Francisco Bay's share of single-family housing production declined from 19.8% of the state in 1997 to 11.8% in 2001. That regional shift partly offset large price increases in 2000 and 2001, particularly in the San Francisco Bay Region. (See "Average New-Home Prices by Region", below.)

NEW SINGLE FAMILY UNITS AND % OF TOTAL BY REGION

REGION	1997	%	1998	%	1999	%	2000	%	2001	%
SAN FRANCISCO BAY	16790	19.8%	16823	17.8%	16399	16.1%	16090	15.2%	12582	11.8%
SOUTHERN CALIF.	41293	48.7%	45389	48.1%	50957	50.1%	49689	47.1%	53038	49.8%
CENTRAL VALLEY	21892	25.8%	27143	28.8%	28924	28.4%	34178	32.4%	36077	33.8%
BALANCE OF STATE	4805	5.7%	4943	5.3%	5431	5.4%	5638	5.3%	4915	4.6%
STATE TOTALS	84780	100.0%	94298	100.0%	101711	100.0%	105595	100.0%	106612	100.0%

TOTAL NEW UNITS (SINGLE- PLUS MULTI-FAMILY) AND % OF TOTAL BY REGION

REGION	1997	%	1998	%	1999	%	2000	%	2001	%
SAN FRANCISCO BAY	26675	23.9%	28547	22.7%	27283	19.5%	28652	19.3%	23569	15.9%
SOUTHERN CALIF.	54329	48.6%	58904	46.9%	72163	51.5%	74577	50.2%	77551	52.4%
CENTRAL VALLEY	24844	22.2%	32714	26.0%	34282	24.4%	38886	26.2%	41259	27.9%
BALANCE OF STATE	5868	5.3%	5542	4.4%	6409	4.6%	6425	4.3%	5668	3.8%
STATE TOTALS	111716	100.0%	125707	100.0%	140137	100.0%	148540	100.0%	148047	100.0%

AVERAGE NEW HOME PRICES BY REGION

REGION	1998	1999	2000	2001	PERCENT CHANGE 1999-00	PERCENT CHANGE 2000-01
SAN FRANCISCO BAY	$371,500	$403,300	$450,200	$487,000	+11.6%	+ 8.2%
SOUTHERN CALIF	$276,000	$307,100	$340,800	$350,600	+11.0%	+ 2.9%
CENTRAL VALLEY	$169,100	$178,800	$189,200	$207,500	+ 5.8%	+ 9.7%
BALANCE OF STATE	$236,100	$250,400	$297,300	$308,700	+18.7%	+ 3.8%
STATE AVERAGE	$261,600	$282,400	$309,700	$318,900	+ 9.7%	+ 3.0%

TABLE 4
NEW-HOME PRICES, SIZES AND PRICE CHANGE, 1999, 2000 and 2001
CALIFORNIA AND SELECTED COUNTIES

MEDIAN PRICES AND SIZES

	1999 SALES			2000 SALES			2001 SALES			PRICE CHANGE	
	Median Price	Liv. Area (Sq. Ft.)	Price/ Sq. Ft.	Median Price	Liv. Area (Sq. Ft.)	Price/ Sq. Ft.	Median Price	Liv. Area (Sq. Ft.)	Price/ Sq. Ft.	1999-00	2000-01
CALIFORNIA	$225,200	1,950	$115.49	$243,000	2,000	$121.50	$256,000	2,035	$125.80	+ 7.9%	+ 5.3%
SELECTED COUNTIES											
ALAMEDA	$392,700	2,190	$179.32	$441,000	2,190	$201.37	$517,000	2,220	$232.88	+12.3%	+17.2%
BUTTE	$158,000	1,770	$ 89.27	$157,300	1,780	$ 88.37	$179,500	1,860	$ 96.50	- 0.4%	+14.1%
CONTRA COSTA	$267,500	2,225	$120.22	$303,600	2,375	$127.83	$364,200	2,560	$142.27	+13.5%	+20.0%
EL DORADO	$255,000	2,365	$107.82	$333,000	2,660	$125.19	$396,300	2,990	$132.54	+30.6%	+19.0%
FRESNO	$139,000	1,810	$ 76.80	$140,400	1,725	$ 81.39	$143,600	1,775	$ 80.90	+ 1.0%	+ 2.3%
HUMBOLDT	$145,800	1,625	$ 89.72	$134,000	1,540	$ 87.01	$156,000	1,555	$100.32	- 8.1%	+16.4%
IMPERIAL	$142,000	1,690	$ 84.02	$140,000	1,520	$ 92.11	$152,000	1,595	$ 95.30	- 1.4%	+ 8.6%
KERN	$122,300	1,755	$ 69.69	$130,500	1,765	$ 73.94	$139,500	1,815	$ 76.86	+ 6.7%	+ 6.9%
KINGS	$117,800	1,530	$ 76.99	$116,500	1,500	$ 77.67	$129,800	1,645	$ 78.91	- 1.1%	+11.4%
LAKE	$146,800	1,780	$ 82.47	$142,000	1,610	$ 88.20	$165,000	1,500	$110.00	- 3.3%	+16.2%
LOS ANGELES	$295,800	2,130	$138.87	$297,500	1,935	$153.75	$318,700	2,155	$147.89	+ 0.6%	+ 7.1%
MADERA	$116,000	1,530	$ 75.82	$104,900	1,390	$ 75.47	$120,500	1,605	$ 75.08	- 9.6%	+14.9%
MARIN	$525,000	2,230	$235.43	$550,000	2,200	$250.00	$670,000	2,275	$294.51	+ 4.8%	+21.8%
MERCED	$122,100	1,480	$ 82.50	$136,100	1,565	$ 86.96	$144,700	1,495	$ 96.79	+11.5%	+ 6.3%
MONTEREY	$232,500	1,755	$132.48	$272,200	1,985	$137.13	$285,000	1,745	$163.32	+17.1%	+ 4.7%
NAPA	$320,400	1,920	$166.88	$335,900	2,060	$163.06	$367,800	2,175	$169.10	+ 4.8%	+ 9.5%
NEVADA	$245,000	1,835	$133.51	$270,000	2,015	$134.00	$305,000	2,260	$134.96	+10.2%	+13.0%
ORANGE	$347,300	2,285	$151.99	$396,600	2,345	$169.13	$407,700	2,270	$179.60	+14.2%	+ 2.8%
PLACER	$218,800	1,900	$115.16	$246,200	1,910	$128.90	$260,000	2,145	$121.21	+12.5%	+ 5.6%
RIVERSIDE	$184,700	2,030	$ 90.98	$225,500	2,540	$ 88.78	$239,100	2,470	$ 96.80	+22.1%	+ 6.0%
SACRAMENTO	$182,000	1,985	$ 91.69	$189,900	1,925	$ 98.65	$220,500	1,950	$113.08	+ 4.3%	+16.1%
SAN BENITO	$263,300	1,860	$141.56	$307,900	2,260	$136.24	$375,000	2,085	$179.86	+16.9%	+21.8%
SAN BERNARDINO	$183,800	2,115	$ 86.90	$200,500	2,215	$ 90.52	$212,500	2,280	$ 93.20	+ 9.1%	+ 6.0%
SAN DIEGO	$285,000	2,215	$128.67	$295,000	2,215	$133.18	$355,000	2,420	$146.69	+ 3.5%	+20.3%
SAN FRANCISCO	$396,000	1,425	$277.89	$513,500	1,255	$409.16	$632,500	1,170	$540.60	+29.7%	+23.2%
SAN JOAQUIN	$170,000	1,800	$ 94.44	$179,000	1,825	$ 98.08	$205,000	1,950	$105.13	+ 5.3%	+14.5%
SAN LUIS OBISPO	$224,000	1,760	$127.27	$277,000	1,940	$142.78	$309,000	1,925	$160.52	+23.7%	+11.6%
SAN MATEO	$446,000	1,995	$223.56	$592,500	1,895	$312.66	$570,500	1,915	$297.91	+32.8%	- 3.7%
SANTA BARBARA	$204,500	1,675	$122.09	$257,000	2,030	$126.60	$214,000	1,675	$127.76	+25.7%	-16.7%
SANTA CLARA	$460,800	2,185	$210.89	$587,500	2,385	$246.33	$600,000	1,955	$306.90	+27.5%	+ 2.1%
SANTA CRUZ	$372,500	1,965	$189.57	$480,000	2,070	$231.88	$527,500	2,160	$244.21	+28.9%	+ 9.9%
SHASTA	$128,500	1,630	$ 78.83	$135,000	1,555	$ 86.82	$132,000	1,445	$ 91.35	+ 5.1%	- 2.2%
SOLANO	$218,000	1,850	$117.84	$275,000	2,220	$123.87	$285,000	1,910	$149.21	+26.1%	+ 3.6%
SONOMA	$231,300	1,735	$133.31	$279,000	1,865	$149.60	$328,200	1,850	$177.40	+20.6%	+17.6%
STANISLAUS	$137,300	1,605	$ 85.55	$143,000	1,560	$ 91.67	$180,600	1,730	$104.39	+ 4.2%	+26.3%
SUTTER	$120,800	1,670	$ 72.34	$140,400	2,125	$ 66.07	$134,800	1,625	$ 82.95	+16.2%	- 4.0%
TULARE	$115,100	1,490	$ 77.25	$112,200	1,415	$ 79.29	$130,900	1,590	$ 82.33	- 2.5%	+16.7%
VENTURA	$369,500	2,585	$142.94	$392,900	2,620	$149.96	$387,200	2,425	$159.67	+ 6.3%	- 1.5%
YOLO	$218,300	2,115	$103.22	$253,500	1,880	$134.84	$244,800	1,720	$142.33	+16.1%	- 3.4%

Prepared by Construction Industry Research Board using samples of reported new-home sales including attached and detached, including condominiums. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 5
NEW-HOME PRICES, SIZES AND PRICE CHANGE, 1999, 2000 and 2001
CALIFORNIA AND SELECTED COUNTIES

AVERAGE PRICES AND SIZES

	1999 SALES			2000 SALES			2001 SALES			PRICE CHANGE	
	Average Price	Liv. Area (Sq. Ft.)	Price/ Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price/ Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price/ Sq. Ft.	1999-00	2000-01
CALIFORNIA	$282,400	2,120	$130.21	$309,700	2,170	$142.72	$318,900	2,170	$146.96	+ 9.7%	+ 3.0%
SELECTED COUNTIES											
ALAMEDA	$441,300	2,290	$192.71	$484,400	2,305	$210.15	$542,000	2,245	$241.42	+ 9.8%	+11.9%
BUTTE	$166,700	1,785	$ 93.39	$176,500	1,860	$ 94.89	$189,200	1,825	$103.67	+ 5.9%	+ 7.2%
CONTRA COSTA	$346,700	2,350	$147.53	$376,800	2,425	$155.38	$414,200	2,540	$163.07	+ 8.7%	+ 9.9%
EL DORADO	$272,800	2,395	$113.90	$324,300	2,660	$121.92	$387,500	2,795	$138.64	+18.9%	+19.5%
FRESNO	$152,800	1,915	$ 79.79	$158,100	1,910	$ 82.77	$161,100	1,890	$ 85.24	+ 3.5%	+ 1.9%
HUMBOLDT	$157,500	1,655	$ 95.17	$154,000	1,610	$ 95.65	$165,200	1,665	$ 99.22	- 2.2%	+ 7.3%
IMPERIAL	$143,600	1,705	$ 84.22	$152,300	1,685	$ 90.39	$151,400	1,670	$ 90.66	+ 6.1%	- 0.6%
KERN	$141,100	1,825	$ 77.32	$151,000	1,835	$ 82.29	$158,400	1,890	$ 83.81	+ 7.0%	+ 4.9%
KINGS	$118,600	1,555	$ 76.27	$115,100	1,505	$ 76.48	$130,500	1,665	$ 78.38	- 3.0%	+13.4%
LAKE	$152,800	1,840	$ 83.04	$160,700	1,760	$ 91.31	$174,200	1,610	$108.20	+ 5.2%	+ 8.4%
LOS ANGELES	$382,200	2,455	$155.68	$400,100	2,220	$180.23	$416,900	2,350	$177.40	+ 4.7%	+ 4.2%
MADERA	$121,500	1,585	$ 76.66	$121,200	1,620	$ 74.81	$135,600	1,690	$ 80.24	- 0.2%	+11.9%
MARIN	$637,500	2,340	$272.44	$735,500	2,335	$314.99	$748,500	2,300	$325.43	+15.4%	+ 1.8%
MERCED	$124,100	1,560	$ 79.55	$138,900	1,625	$ 85.48	$160,500	1,615	$ 99.38	+11.9%	+15.6%
MONTEREY	$286,400	1,835	$156.08	$335,400	2,110	$158.96	$346,800	1,930	$179.69	+17.1%	+ 3.4%
NAPA	$326,500	1,950	$167.44	$364,400	2,090	$174.35	$421,200	2,190	$192.33	+11.6%	+15.6%
NEVADA	$246,100	1,855	$132.67	$262,100	1,995	$131.38	$351,200	2,325	$151.05	+ 6.5%	+34.0%
ORANGE	$410,500	2,415	$169.98	$455,400	2,495	$182.53	$489,500	2,435	$201.03	+10.9%	+ 7.5%
PLACER	$243,100	2,060	$118.01	$273,300	2,145	$127.41	$278,800	2,185	$127.60	+12.4%	+ 2.0%
RIVERSIDE	$210,800	2,200	$ 95.82	$249,900	2,485	$100.56	$252,700	2,495	$101.28	+18.5%	+ 1.1%
SACRAMENTO	$199,700	2,090	$ 95.55	$201,700	1,985	$101.61	$233,600	2,055	$113.67	+ 1.0%	+15.8%
SAN BENITO	$272,700	1,920	$142.03	$331,200	2,160	$153.33	$396,900	2,090	$189.90	+21.5%	+19.8%
SAN BERNARDINO	$194,700	2,185	$ 89.11	$221,500	2,335	$ 94.86	$224,100	2,295	$ 97.65	+13.8%	+ 1.2%
SAN DIEGO	$336,000	2,335	$143.90	$371,200	2,285	$162.45	$420,600	2,480	$169.60	+10.5%	+13.3%
SAN FRANCISCO	$421,600	1,440	$292.78	$522,200	1,345	$388.25	$635,700	1,220	$521.07	+23.9%	+21.7%
SAN JOAQUIN	$177,600	1,870	$ 94.97	$188,600	1,900	$ 99.26	$224,100	2,010	$111.49	+ 6.2%	+18.8%
SAN LUIS OBISPO	$257,300	1,855	$138.71	$297,000	1,990	$149.25	$332,500	1,975	$168.35	+15.4%	+12.0%
SAN MATEO	$501,500	1,990	$252.01	$594,000	1,940	$306.19	$625,500	1,855	$337.20	+18.4%	+ 5.3%
SANTA BARBARA	$252,000	1,860	$135.48	$289,100	2,020	$143.12	$273,700	1,820	$150.38	+14.7%	- 5.3%
SANTA CLARA	$499,100	2,240	$222.81	$609,600	2,500	$243.84	$631,800	2,095	$301.58	+22.1%	+ 3.6%
SANTA CRUZ	$397,100	1,980	$200.56	$514,300	2,160	$238.10	$518,000	2,020	$256.44	+29.5%	+ 0.7%
SHASTA	$142,400	1,690	$ 84.26	$145,200	1,645	$ 88.27	$152,100	1,620	$ 93.89	+ 2.0%	+ 4.8%
SOLANO	$241,200	2,125	$113.51	$279,600	2,300	$121.57	$286,000	2,090	$136.84	+15.9%	+ 2.3%
SONOMA	$260,900	1,825	$142.96	$326,700	1,925	$169.71	$382,200	1,925	$198.55	+25.2%	+17.0%
STANISLAUS	$151,500	1,760	$ 86.08	$159,300	1,725	$ 92.35	$191,800	1,875	$102.29	+ 5.1%	+20.4%
SUTTER	$127,100	1,770	$ 71.81	$157,100	2,120	$ 74.10	$144,000	1,655	$ 87.01	+23.6%	- 8.3%
TULARE	$126,600	1,585	$ 79.87	$127,000	1,550	$ 81.94	$145,300	1,795	$ 80.95	+ 0.3%	+14.4%
VENTURA	$388,400	2,640	$147.12	$413,700	2,665	$155.23	$407,400	2,510	$162.31	+ 6.5%	- 1.5%
YOLO	$238,000	2,195	$108.43	$276,400	2,110	$131.00	$271,100	1,935	$140.10	+16.1%	- 1.9%

Prepared by Construction Industry Research Board using samples of reported new-home sales including attached and detached, including condominiums. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 6
MEDIAN AND AVERAGE PRICE, LIVING AREA, PRICE PER SQUARE FOOT
CALIFORNIA AND SELECTED COUNTIES (INCLUDES SALES OF DETACHED AND ATTACHED HOMES)
NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
CALIFORNIA						
2001	$256,000	2,035	$125.80	$318,900	2,170	$146.96
2000	$243,000	2,000	$121.50	$309,700	2,170	$142.72
1999	$225,200	1,950	$115.49	$282,400	2,120	$130.21
1998	$208,500	1,950	$106.92	$261,600	2,095	$124.87
1997	$199,000	1,895	$105.01	$242,800	2,045	$118.73
1996	$189,900	1,840	$103.21	$223,000	1,970	$113.20
1995	$187,900	1,845	$101.84	$224,100	1,985	$112.90
1994	$187,500	1,840	$101.90	$221,200	1,970	$112.28
1993	$182,000	1,835	$ 99.18	$217,600	1,965	$110.74
1992	$186,000	1,855	$100.27	$224,100	1,980	$113.18
1991	$197,500	1,900	$103.95	$246,600	2,040	$120.88
1990	$189,900	1,865	$101.82	$237,600	2,000	$118.80
1989	$178,000	1,820	$ 97.80	$223,000	1,940	$114.95
1988	$158,000	1,760	$ 89.77	$192,600	1,890	$101.90
1987	$148,000	1,725	$ 85.80	$173,900	1,855	$ 93.75
1986	$133,900	1,610	$ 83.17	$154,000	1,755	$ 87.75
1985	$127,000	1,500	$ 84.67	$143,000	1,650	$ 86.67
1984	$118,000	1,495	$ 78.93	$134,900	1,630	$ 82.76
1983	$111,400	1,450	$ 76.83	$132,700	1,610	$ 82.42
1982	$108,600	1,470	$ 73.88	$126,300	1,610	$ 78.45
SELECTED COUNTIES						
ALAMEDA						
2001	$517,000	2,220	$232.88	$542,000	2,245	$241.42
2000	$441,000	2,190	$201.37	$484,400	2,305	$210.15
1999	$392,700	2,190	$179.32	$441,300	2,290	$192.71
1998	$340,000	2,040	$166.67	$398,100	2,220	$179.32
1997	$303,500	2,095	$144.87	$349,900	2,200	$159.05
1996	$287,800	2,130	$135.12	$323,600	2,205	$146.76
1995	$293,000	2,125	$137.88	$334,300	2,235	$149.57
1994	$277,500	1,930	$143.78	$298,200	2,025	$147.26
1993	$282,500	1,960	$144.13	$299,600	2,090	$143.35
1992	$292,500	2,110	$138.62	$314,800	2,130	$147.79
1991	$325,000	2,115	$153.66	$332,200	2,155	$154.15
1990	$322,100	1,925	$167.32	$356,600	2,160	$165.09
1989	$270,000	1,765	$152.97	$299,900	1,910	$157.02
1988	$207,300	1,710	$121.23	$236,700	1,865	$126.92
1987	$175,900	1,645	$106.93	$196,200	1,805	$108.70
1986	$165,000	1,640	$100.61	$172,900	1,730	$ 99.94
1985	$146,000	1,550	$ 94.19	$159,400	1,670	$ 95.45
1984	$135,000	1,560	$ 86.54	$145,000	1,630	$ 88.96
1983	$116,400	1,330	$ 87.52	$128,400	1,480	$ 86.76
1982	$126,900	1,620	$ 78.33	$135,100	1,720	$ 78.55
BUTTE						
2001	$179,500	1,860	$ 96.50	$189,200	1,825	$103.67
2000	$157,300	1,780	$ 88.37	$176,500	1,860	$ 94.89
1999	$158,000	1,770	$ 89.27	$166,700	1,785	$ 93.39
1998	$152,100	1,750	$ 86.91	$165,700	1,835	$ 90.30
1997	$155,700	1,755	$ 88.72	$165,200	1,825	$ 90.52
1996	$146,000	1,735	$ 84.15	$154,100	1,840	$ 83.75
1995	$139,300	1,705	$ 81.70	$153,800	1,765	$ 87.14
1994	$147,300	1,725	$ 85.39	$153,600	1,740	$ 88.28
1993	$148,000	1,775	$ 83.38	$164,300	1,850	$ 88.81
1992	$142,000	1,750	$ 81.14	$154,100	1,780	$ 86.57
1991	$146,500	1,810	$ 80.94	$155,200	1,835	$ 84.58
1990	$142,600	1,800	$ 79.22	$152,800	1,870	$ 81.71
1989	$107,500	1,570	$ 68.47	$118,100	1,685	$ 70.09
1988	$ 98,500	1,565	$ 62.94	$109,000	1,675	$ 65.07
1987	$ 86,700	1,430	$ 60.63	$ 97,100	1,560	$ 62.24

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
CONTRA COSTA						
2001	$364,200	2,560	$142.27	$414,200	2,540	$163.07
2000	$303,600	2,375	$127.83	$376,800	2,425	$155.38
1999	$267,500	2,225	$120.22	$346,700	2,350	$147.53
1998	$272,500	2,275	$119.78	$330,500	2,350	$140.64
1997	$250,000	2,070	$120.77	$316,200	2,215	$142.75
1996	$260,500	2,040	$127.70	$300,500	2,225	$135.06
1995	$243,000	1,980	$122.73	$292,200	2,165	$134.96
1994	$216,400	1,970	$109.85	$262,600	2,130	$123.29
1993	$226,000	2,040	$110.78	$275,100	2,195	$125.33
1992	$223,600	2,020	$110.69	$271,800	2,150	$126.42
1991	$247,000	2,130	$115.96	$312,600	2,355	$132.74
1990	$265,400	2,050	$129.46	$317,000	2,200	$144.09
1989	$213,500	1,890	$112.96	$272,900	2,085	$130.89
1988	$209,000	1,955	$106.91	$251,500	2,110	$119.19
1987	$180,700	1,935	$ 93.39	$216,300	2,015	$107.34
1986	$162,000	1,820	$ 89.01	$184,400	1,870	$ 98.61
1985	$128,900	1,450	$ 88.90	$154,900	1,690	$ 91.66
1984	$124,000	1,490	$ 83.22	$147,500	1,655	$ 89.12
1983	$127,500	1,660	$ 76.81	$156,800	1,830	$ 85.68
1982	$147,500	1,850	$ 79.73	$166,100	1,980	$ 83.89
EL DORADO						
2001	$396,300	2,990	$132.54	$387,500	2,795	$138.64
2000	$333,000	2,660	$125.19	$324,300	2,660	$121.92
1999	$255,000	2,365	$107.82	$272,800	2,395	$113.90
1998	$249,700	2,390	$104.48	$260,000	2,395	$108.56
1997	$245,000	2,520	$ 97.22	$250,400	2,480	$100.97
1996	$229,000	2,390	$ 95.82	$235,700	2,360	$ 99.87
1995	$212,000	2,240	$ 94.64	$227,500	2,300	$ 98.91
1994	$207,500	2,130	$ 97.42	$214,900	2,100	$102.33
1993	$216,000	2,095	$103.10	$225,200	2,200	$102.36
1992	$230,000	2,385	$ 96.44	$243,900	2,390	$102.05
1991	$240,000	2,345	$102.35	$244,700	2,275	$107.56
1990	$227,500	2,205	$103.17	$245,700	2,305	$106.59
1989	$159,400	1,995	$ 79.90	$178,400	2,035	$ 87.67
1988	$133,900	1,725	$ 77.62	$140,400	1,820	$ 77.14
1987	$125,000	1,745	$ 71.63	$133,400	1,850	$ 72.11
FRESNO						
2001	$143,600	1,775	$ 80.90	$161,100	1,890	$ 85.24
2000	$140,400	1,725	$ 81.39	$158,100	1,910	$ 82.77
1999	$139,000	1,810	$ 76.80	$152,800	1,915	$ 79.79
1998	$138,200	1,835	$ 75.31	$151,200	1,945	$ 77.74
1997	$118,000	1,610	$ 73.29	$129,600	1,730	$ 74.91
1996	$125,000	1,670	$ 74.85	$134,800	1,770	$ 76.16
1995	$132,500	1,775	$ 74.65	$146,700	1,895	$ 77.41
1994	$142,500	1,890	$ 75.40	$154,400	1,990	$ 77.59
1993	$145,000	1,890	$ 76.72	$157,400	1,990	$ 79.10
1992	$140,500	1,870	$ 75.13	$158,400	1,990	$ 79.60
1991	$126,700	1,785	$ 70.98	$141,200	1,850	$ 76.32
1990	$116,600	1,750	$ 66.63	$128,200	1,830	$ 70.05
1989	$110,000	1,790	$ 61.45	$126,000	1,905	$ 66.14
1988	$107,500	1,765	$ 60.91	$121,500	1,905	$ 63.78
1987	$109,900	1,685	$ 65.22	$119,700	1,855	$ 64.53
1986	$ 85,700	1,550	$ 55.29	$ 97,600	1,690	$ 57.75
1985	$ 79,200	1,490	$ 53.15	$ 91,700	1,610	$ 56.96
1984	$ 86,000	1,580	$ 54.43	$ 96,600	1,690	$ 57.16
1983	$ 78,400	1,530	$ 51.24	$ 88,700	1,610	$ 55.09
1982	$ 69,600	1,420	$ 49.01	$ 77,500	1,530	$ 50.65

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
HUMBOLDT						
2001	$156,000	1,555	$100.32	$165,200	1,665	$ 99.22
2000	$134,000	1,540	$ 87.01	$154,000	1,610	$ 95.65
1999	$145,800	1,625	$ 89.72	$157,500	1,655	$ 95.17
1998	$128,500	1,505	$ 85.38	$147,400	1,670	$ 88.26
1997	$140,000	1,590	$ 88.05	$145,300	1,600	$ 90.81
1996	$137,900	1,605	$ 85.92	$145,200	1,580	$ 91.90
1995	$132,000	1,530	$ 86.27	$145,300	1,620	$ 89.69
1994	$123,500	1,455	$ 84.88	$139,000	1,580	$ 87.97
1993	$114,900	1,395	$ 82.37	$129,600	1,550	$ 83.61
1992	$122,000	1,525	$ 80.00	$137,400	1,605	$ 85.61
1991	$117,000	1,435	$ 81.55	$134,400	1,575	$ 85.33
1990	$103,800	1,335	$ 77.75	$112,600	1,435	$ 78.47
1989	$ 89,500	1,310	$ 68.32	$ 96,100	1,420	$ 67.68
1988	$ 83,900	1,415	$ 59.29	$ 87,400	1,425	$ 61.33
1987	$ 80,200	1,435	$ 55.89	$ 92,800	1,535	$ 60.46
IMPERIAL						
2001	$152,000	1,595	$ 95.30	$151,400	1,670	$ 90.66
2000	$140,000	1,520	$ 92.11	$152,300	1,685	$ 90.39
1999	$142,000	1,690	$ 84.02	$143,600	1,705	$ 84.22
1998	$138,300	1,700	$ 81.35	$142,400	1,765	$ 80.68
1997	$121,000	1,565	$ 77.32	$129,600	1,620	$ 80.00
1996	$125,000	1,640	$ 76.22	$133,000	1,690	$ 78.70
1995	$123,500	1,645	$ 75.08	$129,100	1,720	$ 75.06
1994	$130,000	1,635	$ 79.51	$132,500	1,710	$ 77.49
1993	$120,000	1,615	$ 74.30	$121,400	1,620	$ 74.94
1992	$110,500	1,550	$ 71.29	$115,500	1,595	$ 72.41
1991	$ 92,800	1,260	$ 73.65	$109,500	1,470	$ 74.49
1990	$ 98,000	1,440	$ 68.06	$106,300	1,535	$ 69.25
1989	$ 86,400	1,395	$ 61.94	$104,900	1,560	$ 67.24
1988	$ 66,900	1,250	$ 53.52	$ 73,200	1,325	$ 55.25
1987	$ 78,500	1,305	$ 60.15	$ 83,500	1,420	$ 58.80
KERN						
2001	$139,500	1,815	$ 76.86	$158,400	1,890	$ 83.81
2000	$130,500	1,765	$ 73.94	$151,000	1,835	$ 82.29
1999	$122,300	1,755	$ 69.69	$141,100	1,825	$ 77.32
1998	$120,000	1,755	$ 68.38	$133,600	1,800	$ 74.22
1997	$120,500	1,720	$ 70.06	$134,200	1,810	$ 74.14
1996	$118,500	1,710	$ 69.30	$128,900	1,785	$ 72.21
1995	$127,000	1,760	$ 72.16	$140,200	1,865	$ 75.17
1994	$126,300	1,730	$ 73.01	$139,400	1,845	$ 75.56
1993	$125,000	1,730	$ 72.25	$139,300	1,845	$ 75.50
1992	$133,000	1,830	$ 72.68	$143,600	1,885	$ 76.18
1991	$122,700	1,755	$ 69.91	$140,300	1,840	$ 76.25
1990	$109,500	1,630	$ 67.18	$122,900	1,725	$ 71.25
1989	$103,000	1,695	$ 60.77	$114,500	1,770	$ 64.69
1988	$ 97,200	1,630	$ 59.63	$109,400	1,715	$ 63.79
1987	$ 90,000	1,545	$ 58.25	$102,900	1,645	$ 62.55
1986	$ 82,500	1,515	$ 54.46	$103,700	1,670	$ 62.10
1985	$ 79,900	1,470	$ 54.35	$ 97,100	1,595	$ 60.88
1984	$ 93,000	1,680	$ 55.36	$110,100	1,750	$ 62.91
1983	$ 84,300	1,530	$ 55.10	$ 96,300	1,650	$ 58.36
1982	$ 72,700	1,360	$ 53.46	$ 81,500	1,450	$ 56.21

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
KINGS						
2001	$129,800	1,645	$ 78.91	$130,500	1,665	$ 78.38
2000	$116,500	1,500	$ 77.67	$115,100	1,505	$ 76.48
1999	$117,800	1,530	$ 76.99	$118,600	1,555	$ 76.27
1998	$104,300	1,340	$ 77.84	$109,400	1,380	$ 79.28
1997	$109,400	1,480	$ 73.92	$117,100	1,550	$ 75.55
1996	$111,700	1,550	$ 72.06	$117,600	1,570	$ 74.90
1995	$106,500	1,505	$ 70.76	$112,700	1,540	$ 73.18
1994	$117,000	1,523	$ 76.82	$123,600	1,610	$ 76.77
1993	$121,400	1,660	$ 73.13	$125,600	1,750	$ 71.77
1992	$117,500	1,690	$ 69.53	$126,300	1,785	$ 70.76
1991	$108,900	1,595	$ 68.28	$114,500	1,665	$ 68.77
1990	$113,500	1,930	$ 58.81	$124,000	1,965	$ 63.10
1989	$108,900	1,720	$ 63.31	$108,800	1,830	$ 59.45
1988	$ 83,900	1,620	$ 51.79	$ 87,500	1,650	$ 53.03
1987	$ 85,300	1,575	$ 54.16	$ 86,300	1,680	$ 51.37
LAKE						
2001	$165,000	1,500	$110.00	$174,200	1,610	$108.20
2000	$142,000	1,610	$ 88.20	$160,700	1,760	$ 91.31
1999	$146,800	1,780	$ 82.47	$152,800	1,840	$ 83.04
1998	$135,000	1,705	$ 79.18	$157,600	1,835	$ 85.89
1997	$139,000	1,675	$ 82.99	$148,900	1,820	$ 81.81
1996	$117,500	1,550	$ 75.81	$128,500	1,645	$ 78.12
1995	$123,000	1,660	$ 74.10	$152,900	1,825	$ 83.78
1994	$124,000	1,595	$ 77.74	$126,500	1,600	$ 79.06
1993	$118,000	1,530	$ 77.12	$126,100	1,610	$ 78.32
1992	$120,000	1,540	$ 77.92	$129,900	1,605	$ 80.94
1991	$135,500	1,645	$ 82.37	$142,000	1,725	$ 82.32
1990	$129,000	1,640	$ 78.66	$132,600	1,665	$ 79.64
1989	$ 86,000	1,415	$ 60.78	$ 92,400	1,435	$ 64.39
1988	$ 75,000	1,370	$ 54.74	$ 82,900	1,460	$ 56.78
1987	$111,000	1,595	$ 69.59	$102,500	1,685	$ 60.83
LOS ANGELES						
2001	$318,700	2,155	$147.89	$416,900	2,350	$177.40
2000	$297,500	1,935	$153.75	$400,100	2,220	$180.23
1999	$295,800	2,130	$138.87	$382,200	2,455	$155.68
1998	$292,000	2,160	$135.18	$359,800	2,435	$147.76
1997	$257,000	2,100	$122.38	$315,400	2,385	$132.24
1996	$230,000	2,020	$113.86	$279,700	2,200	$127.14
1995	$222,000	1,920	$115.63	$291,200	2,205	$132.06
1994	$233,000	1,920	$121.35	$299,800	2,220	$135.05
1993	$233,500	1,865	$125.20	$287,100	2,090	$137.37
1992	$230,500	1,775	$129.86	$310,700	2,090	$148.66
1991	$245,000	1,890	$129.63	$360,300	2,225	$161.93
1990	$257,000	1,990	$129.15	$347,200	2,205	$157.46
1989	$225,000	1,880	$119.68	$285,900	2,050	$139.46
1988	$193,900	1,810	$107.13	$242,600	2,010	$120.70
1987	$177,900	1,815	$ 98.02	$215,900	2,015	$107.15
1986	$146,100	1,605	$ 91.03	$188,600	1,860	$101.40
1985	$125,600	1,440	$ 87.22	$150,500	1,665	$ 90.39
1984	$123,000	1,490	$ 82.55	$144,400	1,685	$ 85.70
1983	$124,700	1,460	$ 85.41	$150,400	1,640	$ 91.71
1982	$118,600	1,520	$ 78.03	$139,500	1,670	$ 83.53

TABLE 6, CONT'D

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
MADERA						
2001	$120,500	1,605	$ 75.08	$135,600	1,690	$ 80.24
2000	$104,900	1,390	$ 75.47	$121,200	1,620	$ 74.81
1999	$116,000	1,530	$ 75.82	$121,500	1,585	$ 76.66
1998	$105,500	1,570	$ 67.20	$119,100	1,710	$ 69.65
1997	$112,500	1,670	$ 67.36	$120,600	1,750	$ 68.91
1996	$ 93,100	1,350	$ 68.96	$105,500	1,505	$ 70.10
1995	$121,200	1,640	$ 73.90	$126,500	1,735	$ 72.91
1994	$111,000	1,540	$ 72.08	$119,400	1,680	$ 71.07
1993	$105,000	1,530	$ 68.63	$121,500	1,740	$ 69.83
1992	$126,000	1,770	$ 71.19	$138,900	1,880	$ 73.88
1991	$107,000	1,535	$ 69.71	$108,700	1,615	$ 67.31
1990	$ 93,300	1,610	$ 57.95	$100,800	1,640	$ 61.46
1989	$ 78,600	1,490	$ 52.75	$ 91,200	1,555	$ 58.65
1988	$ 75,000	1,435	$ 52.26	$ 83,800	1,470	$ 57.01
1987	$ 74,900	1,515	$ 49.44	$ 91,700	1,575	$ 58.22
MARIN						
2001	$670,000	2,275	$294.51	$748,500	2,300	$325.43
2000	$550,000	2,200	$250.00	$735,500	2,335	$314.99
1999	$525,000	2,230	$235.43	$637,500	2,340	$272.44
1998	$545,500	2,200	$247.95	$613,800	2,535	$242.13
1997	$526,700	2,465	$213.67	$538,300	2,370	$227.13
1996	$447,500	2,310	$193.72	$531,300	2,325	$228.52
1995	$459,000	2,845	$161.34	$550,700	2,575	$213.86
1994	$426,800	2,355	$181.23	$607,500	2,620	$231.87
1993	$410,500	2,515	$163.22	$558,100	2,670	$209.03
1992	$431,000	2,365	$182.24	$541,200	2,580	$209.77
1991	$404,000	2,200	$183.64	$458,900	2,370	$193.62
1990	$415,000	1,835	$226.16	$423,600	2,070	$204.64
1989	$350,000	1,865	$187.67	$427,500	2,240	$190.85
1988	$319,000	2,220	$143.69	$347,700	2,215	$156.98
1987	$294,000	2,050	$143.41	$321,500	2,240	$143.53
MERCED						
2001	$144,700	1,495	$ 96.79	$160,500	1,615	$ 99.38
2000	$136,100	1,565	$ 86.96	$138,900	1,625	$ 85.48
1999	$122,100	1,480	$ 82.50	$124,100	1,560	$ 79.55
1998	$112,000	1,480	$ 75.68	$117,700	1,525	$ 77.18
1997	$105,500	1,470	$ 71.77	$109,500	1,520	$ 72.04
1996	$100,400	1,325	$ 75.77	$112,400	1,465	$ 76.72
1995	$111,000	1,405	$ 79.00	$119,600	1,560	$ 76.67
1994	$108,500	1,420	$ 76.41	$121,700	1,565	$ 77.76
1993	$107,000	1,440	$ 74.31	$114,300	1,515	$ 75.45
1992	$116,500	1,540	$ 75.65	$120,000	1,600	$ 75.00
1991	$138,500	1,795	$ 77.16	$141,100	1,780	$ 79.27
1990	$125,000	1,690	$ 73.96	$129,800	1,750	$ 74.17
1989	$ 96,500	1,525	$ 63.28	$102,000	1,555	$ 65.59
1988	$ 76,000	1,320	$ 57.58	$ 87,700	1,455	$ 60.27
1987	$ 78,200	1,515	$ 51.62	$ 88,200	1,530	$ 57.65
MONTEREY						
2001	$285,000	1,745	$163.32	$346,800	1,930	$179.69
2000	$272,200	1,985	$137.13	$335,400	2,110	$158.96
1999	$232,500	1,755	$132.48	$286,400	1,835	$156.08
1998	$213,000	1,840	$115.76	$247,000	1,860	$132.80
1997	$210,200	1,790	$117.43	$262,600	1,920	$136.77
1996	$190,000	1,690	$112.43	$225,300	1,755	$128.38
1995	$172,000	1,570	$109.55	$197,700	1,685	$117.33
1994	$191,600	1,630	$117.55	$206,400	1,750	$117.94
1993	$187,800	1,720	$109.19	$230,600	1,870	$123.32
1992	$201,000	1,825	$110.14	$232,400	1,875	$123.95
1991	$206,000	1,765	$116.71	$250,600	1,885	$132.94
1990	$196,300	1,690	$116.15	$236,500	1,875	$126.13
1989	$180,500	1,650	$109.39	$233,600	1,755	$133.11
1988	$148,000	1,385	$106.86	$190,500	1,615	$117.96
1987	$147,500	1,485	$ 99.33	$174,400	1,620	$107.65

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
NAPA						
2001	$367,800	2,175	$169.10	$421,200	2,190	$192.33
2000	$335,900	2,060	$163.06	$364,400	2,090	$174.35
1999	$320,400	1,920	$166.88	$326,500	1,950	$167.44
1998	$255,500	1,700	$150.29	$274,300	1,735	$158.10
1997	$224,500	1,600	$140.31	$252,000	1,720	$146.51
1996	$232,500	1,860	$125.00	$247,600	1,830	$135.30
1995	$260,000	1,955	$132.99	$294,600	2,070	$142.32
1994	$240,000	1,835	$130.79	$263,800	1,975	$133.57
1993	$220,000	1,800	$122.22	$258,500	1,925	$134.29
1992	$234,500	1,790	$131.00	$282,900	1,985	$142.52
1991	$267,200	2,165	$123.42	$300,700	2,190	$137.31
1990	$247,400	2,070	$119.52	$288,600	2,140	$134.86
1989	$167,600	1,625	$103.14	$187,900	1,775	$105.86
1988	$150,400	1,655	$ 90.88	$164,600	1,710	$ 96.26
1987	$131,100	1,735	$ 75.56	$144,000	1,715	$ 83.97
NEVADA						
2001	$305,000	2,260	$134.96	$351,200	2,325	$151.05
2000	$270,000	2,015	$134.00	$262,100	1,995	$131.38
1999	$245,000	1,835	$133.51	$246,100	1,855	$132.67
1998	$238,000	1,835	$129.70	$235,200	1,975	$119.09
1997	$183,300	1,975	$ 92.81	$207,800	2,010	$103.38
1996	$193,000	1,700	$113.53	$205,100	1,880	$109.10
1995	$205,500	1,795	$114.48	$228,500	1,940	$117.78
1994	$191,000	1,730	$110.40	$214,900	1,850	$116.16
1993	$181,500	1,715	$105.83	$197,000	1,765	$111.61
1992	$193,700	1,730	$111.96	$210,300	1,850	$113.68
1991	$179,500	1,820	$ 98.63	$221,700	1,945	$113.98
1990	$192,500	1,760	$109.38	$203,800	1,840	$110.76
1989	$147,500	1,640	$ 89.94	$167,000	1,785	$ 93.56
1988	$123,000	1,595	$ 77.12	$130,800	1,645	$ 79.51
1987	$116,500	1,585	$ 73.50	$120,900	1,690	$ 71.54
ORANGE						
2001	$407,700	2,270	$179.60	$489,500	2,435	$201.03
2000	$396,600	2,345	$169.13	$455,400	2,495	$182.53
1999	$347,300	2,285	$151.99	$410,500	2,415	$169.98
1998	$335,600	2,470	$135.87	$376,100	2,535	$148.36
1997	$249,700	2,070	$120.63	$301,800	2,275	$132.66
1996	$238,000	2,020	$117.82	$271,300	2,175	$124.74
1995	$245,000	2,020	$121.29	$274,300	2,175	$126.11
1994	$254,300	2,140	$118.83	$284,500	2,260	$125.88
1993	$245,000	2,085	$117.51	$276,400	2,170	$127.37
1992	$261,200	2,090	$124.98	$291,700	2,170	$134.42
1991	$283,500	2,090	$135.65	$322,800	2,250	$143.47
1990	$290,800	2,000	$145.40	$341,200	2,190	$155.80
1989	$294,000	1,825	$161.10	$335,700	2,150	$156.14
1988	$225,300	1,825	$123.45	$254,700	1,990	$127.99
1987	$175,900	1,695	$103.78	$197,900	1,815	$109.04
1986	$169,900	1,755	$ 96.81	$183,700	1,825	$100.66
1985	$139,200	1,510	$ 92.19	$159,300	1,665	$ 95.68
1984	$149,000	1,570	$ 94.90	$165,900	1,730	$ 95.90
1983	$127,100	1,390	$ 91.44	$164,000	1,650	$ 99.39
1982	$154,300	1,640	$ 94.09	$171,200	1,780	$ 96.18

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
PLACER						
2001	$260,000	2,145	$121.21	$278,800	2,185	$127.60
2000	$246,200	1,910	$128.90	$273,300	2,145	$127.41
1999	$218,800	1,900	$115.16	$243,100	2,060	$118.01
1998	$202,000	1,915	$105.48	$223,800	2,085	$107.34
1997	$191,800	1,965	$ 97.61	$215,900	2,085	$103.55
1996	$199,500	2,015	$ 99.01	$214,000	2,110	$101.42
1995	$188,700	2,025	$ 93.18	$206,700	2,130	$ 97.04
1994	$188,000	2,030	$ 92.61	$200,900	2,105	$ 95.44
1993	$183,700	1,985	$ 92.54	$199,700	2,055	$ 97.18
1992	$193,500	2,035	$ 95.08	$219,200	2,155	$101.72
1991	$214,500	2,205	$ 97.28	$238,200	2,260	$105.40
1990	$210,400	2,095	$100.43	$224,700	2,115	$106.24
1989	$155,300	1,885	$ 82.39	$177,700	2,010	$ 88.41
1988	$128,900	1,845	$ 69.86	$158,800	1,965	$ 80.81
1987	$131,400	1,865	$ 70.46	$150,700	1,940	$ 77.68
RIVERSIDE						
2001	$239,100	2,470	$ 96.80	$252,700	2,495	$101.28
2000	$225,500	2,540	$ 88.78	$249,900	2,485	$100.56
1999	$184,700	2,030	$ 90.98	$210,800	2,200	$ 95.82
1998	$170,100	2,000	$ 85.05	$181,800	2,080	$ 87.40
1997	$152,200	1,885	$ 80.74	$171,200	2,040	$ 83.92
1996	$148,000	1,810	$ 81.77	$163,400	1,955	$ 83.58
1995	$150,800	1,915	$ 78.75	$167,400	1,995	$ 83.91
1994	$151,500	1,875	$ 80.80	$171,600	2,000	$ 85.80
1993	$150,000	1,905	$ 78.74	$170,100	1,995	$ 85.26
1992	$160,000	2,010	$ 79.60	$179,900	2,060	$ 87.33
1991	$170,000	2,010	$ 84.58	$187,000	2,040	$ 91.67
1990	$176,000	1,895	$ 92.88	$193,200	1,975	$ 97.82
1989	$158,000	1,810	$ 87.29	$167,700	1,855	$ 90.40
1988	$139,900	1,800	$ 77.72	$149,400	1,850	$ 80.76
1987	$125,100	1,710	$ 73.16	$138,500	1,785	$ 77.59
1986	$114,900	1,620	$ 70.93	$128,300	1,735	$ 73.95
1985	$ 95,900	1,420	$ 67.54	$105,900	1,540	$ 68.77
1984	$ 87,700	1,420	$ 61.76	$106,600	1,500	$ 71.07
1983	$ 83,100	1,370	$ 60.66	$105,100	1,480	$ 71.01
1982	$ 81,900	1,410	$ 58.09	$106,600	1,470	$ 72.52
SACRAMENTO						
2001	$220,500	1,950	$113.08	$233,600	2,055	$113.67
2000	$189,900	1,925	$ 98.65	$201,700	1,985	$101.61
1999	$182,000	1,985	$ 91.69	$199,700	2,090	$ 95.55
1998	$162,100	1,840	$ 88.10	$181,200	1,935	$ 93.64
1997	$159,400	1,810	$ 88.07	$169,300	1,910	$ 88.64
1996	$152,500	1,815	$ 84.02	$166,500	1,895	$ 87.86
1995	$154,500	1,795	$ 86.07	$171,500	1,895	$ 90.50
1994	$160,000	1,780	$ 89.89	$174,400	1,900	$ 91.79
1993	$158,600	1,760	$ 90.11	$170,500	1,860	$ 91.67
1992	$155,000	1,730	$ 89.60	$174,900	1,860	$ 94.03
1991	$166,500	1,815	$ 91.74	$187,200	1,925	$ 97.25
1990	$162,500	1,910	$ 85.08	$179,800	1,965	$ 91.50
1989	$132,700	1,810	$ 73.31	$149,200	1,890	$ 78.94
1988	$123,900	1,795	$ 69.03	$138,100	1,865	$ 74.05
1987	$117,900	1,740	$ 67.76	$130,800	1,800	$ 72.67
1986	$ 93,100	1,540	$ 60.45	$106,000	1,615	$ 65.63
1985	$ 97,300	1,580	$ 61.58	$107,100	1,685	$ 63.56
1984	$ 83,800	1,490	$ 56.24	$ 95,300	1,570	$ 60.70
1983	$ 83,600	1,510	$ 55.36	$ 99,100	1,630	$ 60.80
1982	$ 74,100	1,430	$ 51.82	$ 83,700	1,520	$ 55.07

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
SAN BENITO						
2001	$375,000	2,085	$179.86	$396,900	2,090	$189.90
2000	$307,900	2,260	$136.24	$331,200	2,160	$153.33
1999	$263,300	1,860	$141.56	$272,700	1,920	$142.03
1998	$228,000	1,870	$121.92	$258,800	1,965	$131.70
1997	$218,000	1,920	$113.54	$235,700	1,995	$118.15
1996	$197,000	1,880	$104.79	$217,700	1,940	$112.22
1995	$186,500	1,690	$110.36	$194,500	1,835	$105.99
1994	$208,500	1,815	$114.88	$211,300	1,800	$117.39
1993	$195,000	1,740	$112.07	$213,800	1,860	$114.95
1992	$204,300	1,845	$110.73	$218,800	2,040	$107.25
1991	$220,000	2,350	$ 93.62	$248,100	2,240	$110.76
1990	$225,900	2,015	$112.11	$252,000	2,060	$122.33
1989	$235,500	2,060	$114.30	$236,200	2,020	$116.93
1988	$145,600	1,710	$ 85.15	$161,100	1,760	$ 91.53
1987	$131,900	1,590	$ 82.96	$141,000	1,630	$ 86.50
SAN BERNARDINO						
2001	$212,500	2,280	$ 93.20	$224,100	2,295	$ 97.65
2000	$200,500	2,215	$ 90.52	$221,500	2,335	$ 94.86
1999	$183,800	2,115	$ 86.90	$194,700	2,185	$ 89.11
1998	$162,000	2,015	$ 80.40	$172,800	2,070	$ 83.48
1997	$159,000	2,015	$ 78.91	$172,300	2,060	$ 83.64
1996	$143,000	1,975	$ 72.40	$168,700	1,995	$ 84.56
1995	$145,000	1,860	$ 77.96	$162,800	1,955	$ 83.27
1994	$161,000	1,875	$ 85.87	$174,600	1,930	$ 90.47
1993	$168,500	1,930	$ 87.31	$178,100	1,970	$ 90.41
1992	$181,000	1,935	$ 93.54	$185,900	1,995	$ 93.18
1991	$172,900	1,950	$ 88.67	$195,400	2,045	$ 95.55
1990	$168,600	1,895	$ 88.97	$188,100	1,965	$ 95.73
1989	$154,000	1,815	$ 84.85	$173,300	1,880	$ 92.18
1988	$134,000	1,710	$ 78.36	$143,200	1,780	$ 80.45
1987	$124,900	1,700	$ 73.47	$131,700	1,770	$ 74.41
1986	$ 92,200	1,580	$ 58.35	$109,000	1,700	$ 64.12
1985	$ 82,200	1,420	$ 57.89	$ 92,000	1,495	$ 61.54
1984	$ 79,500	1,330	$ 59.77	$ 89,100	1,470	$ 60.61
1983	$ 75,800	1,360	$ 55.74	$ 84,100	1,440	$ 58.40
1982	$ 70,000	1,310	$ 53.44	$ 78,800	1,390	$ 56.69
SAN DIEGO						
2001	$355,000	2,420	$146.69	$420,600	2,480	$169.60
2000	$295,000	2,215	$133.18	$371,200	2,285	$162.45
1999	$285,000	2,215	$128.67	$336,000	2,335	$143.90
1998	$266,900	2,230	$119.69	$315,000	2,345	$134.33
1997	$235,900	2,130	$110.75	$266,700	2,215	$120.41
1996	$230,000	2,070	$111.11	$250,900	2,155	$116.43
1995	$225,400	2,080	$108.36	$247,300	2,150	$115.02
1994	$221,600	2,040	$108.63	$242,700	2,105	$115.30
1993	$225,000	2,055	$109.49	$246,100	2,095	$117.47
1992	$225,000	2,020	$111.39	$256,200	2,100	$122.00
1991	$235,500	2,045	$115.16	$267,800	2,115	$126.62
1990	$242,500	2,000	$121.25	$273,700	2,070	$132.22
1989	$225,000	1,905	$118.11	$253,300	1,995	$126.97
1988	$174,000	1,780	$ 97.75	$203,300	1,900	$107.00
1987	$158,000	1,745	$ 90.54	$179,800	1,855	$ 96.93
1986	$145,000	1,710	$ 84.80	$158,700	1,790	$ 88.66
1985	$130,000	1,630	$ 79.75	$141,200	1,690	$ 83.55
1984	$120,000	1,500	$ 80.00	$131,900	1,615	$ 81.67
1983	$108,400	1,520	$ 71.32	$125,100	1,630	$ 76.75
1982	$112,700	1,580	$ 71.33	$129,500	1,690	$ 76.63

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
SAN FRANCISCO						
2001	$632,500	1,170	$540.60	$635,700	1,220	$521.07
2000	$513,500	1,255	$409.16	$522,200	1,345	$388.25
1999	$396,000	1,425	$277.89	$421,600	1,440	$292.78
1998	$318,000	1,300	$244.61	$327,700	1,350	$242.74
1997	$276,000	1,330	$207.52	$286,100	1,400	$204.36
1996	$245,000	1,215	$201.65	$252,900	1,250	$202.32
1995	$232,500	1,230	$189.02	$284,300	1,435	$198.12
1994	$225,000	1,080	$208.33	$258,600	1,280	$202.03
1993	$215,000	1,170	$183.76	$240,500	1,295	$185.71
1992	$235,000	1,010	$232.67	$258,500	1,225	$211.02
1991	$250,000	1,160	$215.52	$270,400	1,275	$212.08
1990	$272,000	1,305	$208.43	$328,200	1,505	$218.07
1989	$297,500	1,250	$238.00	$315,000	1,490	$211.41
1988	$233,500	1,470	$158.84	$321,900	1,610	$199.94
1987	$220,000	1,505	$146.18	$246,500	1,630	$151.23
1986	$153,000	1,500	$102.00	$193,900	1,480	$131.01
1985	$137,500	1,260	$109.13	$158,300	1,340	$118.13
1984	$130,700	1,000	$130.70	$141,800	1,195	$118.66
1983	$177,300	810	$218.89	$185,200	960	$192.92
1982	$167,300	680	$246.03	$180,700	810	$223.09
SAN JOAQUIN						
2001	$205,000	1,950	$105.13	$224,100	2,010	$111.49
2000	$179,000	1,825	$ 98.08	$188,600	1,900	$ 99.26
1999	$170,000	1,800	$ 94.44	$177,600	1,870	$ 94.97
1998	$175,100	1,865	$ 93.89	$182,300	1,930	$ 94.46
1997	$160,500	1,840	$ 87.23	$173,100	1,945	$ 89.00
1996	$159,500	1,815	$ 87.88	$164,400	1,885	$ 87.21
1995	$161,000	1,800	$ 89.44	$168,800	1,885	$ 89.55
1994	$157,400	1,665	$ 94.53	$164,400	1,765	$ 93.14
1993	$161,700	1,670	$ 96.83	$174,400	1,820	$ 95.82
1992	$162,300	1,765	$ 91.95	$182,500	1,895	$ 96.31
1991	$178,000	1,885	$ 94.43	$181,700	1,930	$ 94.15
1990	$176,400	1,890	$ 93.33	$186,100	1,940	$ 95.93
1989	$148,000	1,815	$ 81.54	$158,200	1,830	$ 86.45
1988	$128,600	1,840	$ 69.89	$138,800	1,895	$ 73.25
1987	$116,900	1,780	$ 65.67	$127,600	1,820	$ 70.11
1986	$ 90,700	1,470	$ 61.70	$104,600	1,580	$ 66.20
1985	$ 77,300	1,280	$ 60.39	$ 85,600	1,340	$ 63.88
1984	$ 78,700	1,390	$ 56.62	$ 88,800	1,495	$ 59.40
1983	$ 76,000	1,480	$ 51.35	$ 80,700	1,540	$ 52.40
1982	$ 76,600	1,430	$ 53.57	$ 83,800	1,470	$ 57.01
SAN LUIS OBISPO						
2001	$309,000	1,925	$160.52	$332,500	1,975	$168.35
2000	$277,000	1,940	$142.78	$297,000	1,990	$149.25
1999	$224,000	1,760	$127.27	$257,300	1,855	$138.71
1998	$210,000	1,760	$119.32	$224,600	1,800	$124.78
1997	$186,000	1,640	$113.41	$206,300	1,735	$118.90
1996	$183,000	1,695	$107.96	$198,800	1,760	$112.95
1995	$174,900	1,650	$106.00	$194,700	1,740	$111.90
1994	$179,900	1,650	$109.03	$195,900	1,700	$115.24
1993	$195,000	1,790	$108.94	$220,300	1,875	$117.49
1992	$205,000	1,800	$113.89	$244,300	2,025	$120.64
1991	$235,000	1,775	$132.39	$270,400	1,995	$135.54
1990	$240,000	1,780	$134.83	$267,100	1,935	$138.04
1989	$183,500	1,625	$112.92	$208,000	1,695	$122.71
1988	$135,000	1,560	$ 86.54	$158,700	1,615	$ 98.27
1987	$126,900	1,440	$ 88.12	$142,400	1,540	$ 92.47

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
SAN MATEO						
2001	$570,500	1,915	$297.91	$625,500	1,855	$337.20
2000	$592,500	1,895	$312.66	$594,000	1,940	$306.19
1999	$446,000	1,995	$223.56	$501,500	1,990	$252.01
1998	$400,000	1,880	$212.77	$468,700	1,990	$235.53
1997	$410,000	1,975	$207.59	$465,400	2,095	$222.15
1996	$295,300	1,630	$181.17	$378,100	1,850	$204.38
1995	$337,400	1,875	$179.95	$430,400	2,055	$209.44
1994	$380,000	2,205	$172.34	$508,700	2,445	$208.06
1993	$352,500	1,960	$179.85	$487,800	2,275	$214.42
1992	$322,000	1,885	$170.82	$420,000	2,085	$201.44
1991	$363,500	1,935	$187.86	$439,900	2,145	$205.08
1990	$380,500	1,950	$195.13	$436,400	2,140	$203.93
1989	$368,700	2,030	$181.63	$427,600	2,135	$200.28
1988	$270,000	1,750	$154.29	$300,300	1,880	$159.73
1987	$216,000	1,540	$140.26	$259,700	1,790	$145.08
1986	$221,200	1,690	$130.89	$239,000	1,855	$128.84
1985	$198,600	1,580	$125.70	$212,400	1,720	$123.49
1984	$160,400	1,440	$111.39	$212,900	1,695	$125.60
1983	$218,600	2,000	$109.30	$246,700	2,170	$113.69
1982	$184,700	1,900	$ 97.21	$222,300	2,080	$106.88
SANTA BARBARA						
2001	$214,000	1,675	$127.76	$273,700	1,820	$150.38
2000	$257,000	2,030	$126.60	$289,100	2,020	$143.12
1999	$204,500	1,675	$122.09	$252,000	1,860	$135.48
1998	$200,000	1,750	$114.29	$223,500	1,895	$117.94
1997	$191,700	1,685	$113.77	$221,500	1,805	$122.71
1996	$159,000	1,640	$ 96.95	$195,600	1,760	$111.14
1995	$155,000	1,565	$ 99.04	$201,200	1,755	$114.64
1994	$152,800	1,630	$ 93.74	$191,200	1,765	$108.33
1993	$153,500	1,530	$100.33	$203,300	1,680	$121.01
1992	$190,000	1,620	$117.28	$215,200	1,690	$127.34
1991	$165,000	1,555	$106.11	$239,400	1,770	$135.25
1990	$174,400	1,560	$111.79	$245,000	1,750	$140.00
1989	$169,500	1,680	$100.89	$235,600	1,860	$126.67
1988	$152,000	1,685	$ 90.21	$208,000	1,780	$116.85
1987	$148,200	1,595	$ 92.92	$183,500	1,685	$108.90
SANTA CLARA						
2001	$600,000	1,955	$306.90	$631,800	2,095	$301.58
2000	$587,500	2,385	$246.33	$609,600	2,500	$243.84
1999	$460,800	2,185	$210.89	$499,100	2,240	$222.81
1998	$372,000	1,985	$187.41	$440,100	2,130	$206.62
1997	$364,500	2,030	$179.56	$399,800	2,160	$185.09
1996	$320,000	1,920	$166.67	$368,900	2,075	$177.78
1995	$292,500	1,825	$160.27	$322,100	1,955	$164.76
1994	$280,000	1,785	$156.86	$318,600	1,930	$165.08
1993	$288,000	1,810	$159.12	$332,800	1,990	$167.24
1992	$278,000	1,770	$157.06	$328,600	1,910	$172.04
1991	$325,000	2,005	$162.09	$416,600	2,190	$190.23
1990	$390,000	2,160	$180.56	$441,600	2,285	$193.26
1989	$290,000	1,810	$160.22	$331,900	1,980	$167.63
1988	$206,400	1,705	$121.06	$267,300	1,930	$138.50
1987	$177,500	1,660	$106.93	$233,300	1,930	$120.88
1986	$151,300	1,560	$ 96.99	$186,200	1,735	$107.32
1985	$137,300	1,450	$ 94.69	$165,900	1,615	$102.72
1984	$135,300	1,470	$ 92.04	$157,100	1,590	$ 98.81
1983	$133,300	1,480	$ 90.07	$150,300	1,620	$ 92.78
1982	$138,200	1,760	$ 78.52	$165,300	1,880	$ 87.93

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
SANTA CRUZ						
2001	$527,500	2,160	$244.21	$518,000	2,020	$256.44
2000	$480,000	2,070	$231.88	$514,300	2,160	$238.10
1999	$372,500	1,965	$189.57	$397,100	1,980	$200.56
1998	$365,000	1,915	$190.60	$371,400	2,060	$180.29
1997	$303,200	1,800	$168.44	$327,100	1,935	$169.04
1996	$272,200	1,620	$168.02	$299,100	1,715	$174.40
1995	$260,200	1,605	$162.12	$280,200	1,725	$162.43
1994	$229,500	1,495	$153.51	$255,900	1,685	$151.87
1993	$248,500	1,585	$156.78	$279,500	1,795	$155.71
1992	$265,000	1,695	$156.34	$293,800	1,845	$159.24
1991	$300,000	2,035	$147.42	$328,600	2,115	$155.37
1990	$299,500	2,030	$147.54	$321,300	2,050	$156.73
1989	$269,000	1,670	$161.08	$310,200	1,940	$159.90
1988	$195,000	1,600	$121.88	$210,700	1,765	$119.38
1987	$165,000	1,545	$106.80	$190,400	1,785	$106.67
SHASTA						
2001	$132,000	1,445	$ 91.35	$152,100	1,620	$ 93.89
2000	$135,000	1,555	$ 86.82	$145,200	1,645	$ 88.27
1999	$128,500	1,630	$ 78.83	$142,400	1,690	$ 84.26
1998	$129,000	1,560	$ 82.69	$154,000	1,775	$ 86.76
1997	$126,000	1,565	$ 80.51	$142,200	1,725	$ 82.43
1996	$129,500	1,625	$ 79.69	$143,700	1,745	$ 82.35
1995	$132,500	1,570	$ 84.39	$151,800	1,770	$ 85.76
1994	$115,500	1,410	$ 81.91	$128,000	1,550	$ 82.58
1993	$125,000	1,550	$ 80.65	$146,500	1,690	$ 86.69
1992	$126,500	1,610	$ 78.57	$138,700	1,685	$ 82.31
1991	$120,000	1,635	$ 73.39	$137,300	1,685	$ 81.48
1990	$115,000	1,670	$ 68.86	$122,700	1,685	$ 72.82
1989	$ 96,500	1,580	$ 61.08	$ 99,700	1,570	$ 63.50
1988	$ 76,700	1,385	$ 55.38	$ 79,500	1,415	$ 56.18
1987	$ 75,500	1,385	$ 54.51	$ 79,100	1,453	$ 54.44
SOLANO						
2001	$285,000	1,910	$149.21	$286,000	2,090	$136.84
2000	$275,000	2,220	$123.87	$279,600	2,300	$121.57
1999	$218,000	1,850	$117.84	$241,200	2,125	$113.51
1998	$209,000	2,070	$100.97	$224,900	2,250	$ 99.96
1997	$194,000	2,010	$ 96.52	$202,200	2,120	$ 95.38
1996	$204,000	2,105	$ 96.91	$216,000	2,175	$ 99.31
1995	$180,000	1,840	$ 97.83	$198,100	1,945	$101.85
1994	$187,700	1,880	$ 99.84	$197,500	1,940	$101.80
1993	$196,800	1,965	$100.15	$207,100	1,995	$103.81
1992	$199,900	2,030	$ 98.47	$211,200	2,030	$104.04
1991	$225,000	2,025	$111.11	$227,100	2,090	$108.66
1990	$198,500	1,955	$101.53	$214,000	2,020	$105.94
1989	$180,000	2,010	$ 89.55	$189,800	2,040	$ 93.04
1988	$150,000	1,905	$ 78.74	$154,800	1,910	$ 81.05
1987	$136,900	1,795	$ 76.27	$139,700	1,840	$ 75.92
1986	$118,600	1,625	$ 72.98	$124,600	1,765	$ 70.59
1985	$119,500	1,460	$ 81.85	$123,900	1,615	$ 76.72
1984	$118,000	1,460	$ 80.82	$118,800	1,620	$ 73.33
1983	$126,600	1,610	$ 78.63	$126,600	1,720	$ 73.60
1982	$ 87,300	1,380	$ 63.26	$ 95,600	1,530	$ 62.48

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
SONOMA						
2001	$328,200	1,850	$177.40	$382,200	1,925	$198.55
2000	$279,000	1,865	$149.60	$326,700	1,925	$169.71
1999	$231,300	1,735	$133.31	$260,900	1,825	$142.96
1998	$236,200	1,820	$129.78	$259,700	1,915	$135.61
1997	$237,000	1,730	$136.99	$261,900	1,935	$135.35
1996	$220,000	1,750	$125.71	$242,800	1,855	$130.89
1995	$195,700	1,595	$122.70	$228,700	1,775	$128.84
1994	$213,000	1,810	$117.68	$228,000	1,850	$123.24
1993	$219,200	1,906	$115.01	$230,500	1,855	$124.26
1992	$232,900	1,980	$117.63	$250,500	2,020	$124.01
1991	$215,200	1,900	$113.26	$242,700	1,940	$125.10
1990	$211,800	1,830	$115.74	$249,700	1,880	$132.82
1989	$187,500	1,810	$103.59	$207,000	1,860	$111.29
1988	$156,800	1,860	$ 84.30	$176,900	1,875	$ 94.35
1987	$130,000	1,620	$ 80.25	$146,100	1,715	$ 85.19
1986	$108,500	1,475	$ 73.56	$123,000	1,565	$ 78.59
1985	$115,000	1,520	$ 75.66	$123,400	1,595	$ 77.37
1984	$108,000	1,620	$ 66.67	$122,600	1,640	$ 74.76
1983	$104,500	1,630	$ 64.11	$117,000	1,660	$ 70.48
1982	$107,000	1,560	$ 68.59	$109,600	1,600	$ 68.50
STANISLAUS						
2001	$180,600	1,730	$104.39	$191,800	1,875	$102.29
2000	$143,000	1,560	$ 91.67	$159,300	1,725	$ 92.35
1999	$137,300	1,605	$ 85.55	$151,500	1,760	$ 86.08
1998	$132,400	1,640	$ 80.73	$144,800	1,740	$ 83.22
1997	$122,500	1,545	$ 79.29	$127,900	1,580	$ 80.95
1996	$118,300	1,530	$ 77.32	$126,400	1,580	$ 80.00
1995	$124,200	1,550	$ 80.13	$135,700	1,625	$ 83.51
1994	$123,300	1,500	$ 82.20	$137,100	1,635	$ 83.85
1993	$125,000	1,495	$ 83.61	$137,300	1,610	$ 85.28
1992	$122,900	1,455	$ 84.47	$130,700	1,585	$ 82.46
1991	$147,300	1,745	$ 84.41	$157,400	1,795	$ 87.69
1990	$147,000	1,730	$ 84.97	$158,400	1,800	$ 88.00
1989	$123,000	1,670	$ 73.65	$133,000	1,770	$ 75.14
1988	$ 97,800	1,530	$ 63.92	$109,800	1,630	$ 67.36
1987	$ 87,200	1,420	$ 61.41	$ 95,400	1,525	$ 62.56
1986	$ 74,500	1,385	$ 53.79	$ 77,200	1,395	$ 55.34
1985	$ 71,500	1,300	$ 55.00	$ 79,000	1,400	$ 56.43
1984	$ 61,200	1,170	$ 52.31	$ 69,000	1,270	$ 54.33
1983	$ 67,500	1,300	$ 51.92	$ 70,400	1,350	$ 52.15
1982	$ 65,200	1,260	$ 51.75	$ 66,700	1,320	$ 50.53
SUTTER						
2001	$134,800	1,625	$ 82.95	$144,000	1,655	$ 87.01
2000	$140,400	2,125	$ 66.07	$157,100	2,120	$ 74.10
1999	$120,800	1,670	$ 72.34	$127,100	1,770	$ 71.81
1998	$120,500	1,865	$ 64.61	$130,200	1,885	$ 69.07
1997	$117,000	1,650	$ 70.91	$131,000	1,810	$ 72.38
1996	$121,500	1,845	$ 65.85	$134,000	1,920	$ 69.79
1995	$125,000	1,810	$ 69.06	$134,200	1,895	$ 70.82
1994	$126,500	1,650	$ 76.67	$127,400	1,750	$ 72.80
1993	$130,000	1,710	$ 76.02	$137,200	1,805	$ 76.01
1992	$138,000	1,755	$ 78.63	$148,000	1,865	$ 79.36
1991	$135,000	1,790	$ 75.42	$153,200	1,885	$ 81.27
1990	$130,000	1,770	$ 73.45	$133,000	1,820	$ 73.08
1989	$110,000	1,820	$ 60.44	$132,300	1,855	$ 71.32
1988	$100,800	1,795	$ 56.16	$116,000	1,895	$ 61.21
1987	$ 95,800	1,750	$ 54.74	$103,600	1,860	$ 55.70

TABLE 6, CONTINUED. NEW HOMES SOLD, 1982-2001 (NOT ADJUSTED FOR INFLATION)

	MEDIAN VALUES			AVERAGE VALUES		
	Median Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price Per Sq. Ft.
TULARE						
2001	$130,900	1,590	$ 82.33	$145,300	1,795	$ 80.95
2000	$112,200	1,415	$ 79.29	$127,000	1,550	$ 81.94
1999	$115,100	1,490	$ 77.25	$126,600	1,585	$ 79.87
1998	$114,000	1,490	$ 76.51	$124,100	1,630	$ 76.13
1997	$108,400	1,440	$ 75.28	$117,200	1,535	$ 76.35
1996	$106,400	1,445	$ 73.63	$113,700	1,490	$ 76.31
1995	$109,600	1,515	$ 72.34	$115,700	1,530	$ 75.62
1994	$110,000	1,515	$ 72.61	$119,500	1,550	$ 77.10
1993	$110,000	1,500	$ 73.33	$130,100	1,645	$ 79.09
1992	$110,000	1,520	$ 72.37	$129,800	1,640	$ 79.15
1991	$119,000	1,615	$ 73.68	$135,000	1,715	$ 78.72
1990	$108,900	1,600	$ 68.06	$122,400	1,670	$ 73.29
1989	$ 99,800	1,605	$ 62.18	$109,200	1,635	$ 66.79
1988	$ 85,000	1,515	$ 56.11	$ 90,500	1,525	$ 59.34
1987	$ 78,000	1,505	$ 51.83	$ 87,800	1,585	$ 55.39
VENTURA						
2001	$387,200	2,425	$159.67	$407,400	2,510	$162.31
2000	$392,900	2,620	$149.96	$413,700	2,665	$155.23
1999	$369,500	2,585	$142.94	$388,400	2,640	$147.12
1998	$302,100	2,245	$134.57	$322,100	2,340	$137.65
1997	$245,000	1,985	$123.43	$265,900	2,145	$123.96
1996	$253,000	2,160	$117.13	$279,200	2,290	$121.92
1995	$245,200	1,990	$123.22	$271,000	2,200	$123.18
1994	$246,000	2,010	$122.39	$263,300	2,155	$122.18
1993	$257,000	2,075	$123.86	$299,900	2,305	$130.11
1992	$285,000	2,150	$132.56	$312,200	2,355	$132.57
1991	$280,000	2,080	$134.62	$334,900	2,255	$148.51
1990	$295,000	2,090	$141.15	$352,500	2,220	$158.78
1989	$310,000	2,250	$137.78	$347,600	2,310	$150.48
1988	$259,500	2,325	$111.61	$278,100	2,375	$117.09
1987	$198,800	2,040	$ 97.45	$217,800	2,175	$100.14
1986	$163,500	1,705	$ 95.89	$176,900	1,915	$ 92.38
1985	$146,600	1,770	$ 82.82	$152,600	1,840	$ 82.93
1984	$139,000	1,750	$ 79.43	$149,200	1,870	$ 79.79
1983	$135,000	1,700	$ 79.41	$148,200	1,830	$ 80.98
1982	$120,000	1,540	$ 77.92	$128,100	1,660	$ 77.17
YOLO						
2001	$244,800	1,720	$142.33	$271,100	1,935	$140.10
2000	$253,500	1,880	$134.84	$276,400	2,110	$131.00
1999	$218,300	2,115	$103.22	$238,000	2,195	$108.43
1998	$183,400	1,860	$ 98.60	$192,100	1,940	$ 99.02
1997	$165,000	1,835	$ 89.92	$174,700	1,835	$ 95.20
1996	$167,500	1,815	$ 92.29	$178,300	1,900	$ 93.84
1995	$172,000	1,735	$ 99.13	$179,800	1,785	$100.73
1994	$170,000	1,660	$102.41	$188,800	1,755	$107.58
1993	$216,400	1,905	$113.60	$218,800	1,965	$111.35
1992	$210,000	1,890	$111.11	$232,900	1,985	$117.33
1991	$180,000	1,760	$102.27	$211,800	1,825	$116.05
1990	$148,000	1,570	$ 94.27	$180,100	1,690	$106.57
1989	$125,500	1,505	$ 83.39	$137,900	1,590	$ 86.73
1988	$124,600	1,510	$ 82.52	$125,800	1,640	$ 76.71
1987	$ 97,800	1,505	$ 64.98	$119,000	1,615	$ 73.68

Prepared by Construction Industry Research Board using samples of new-home sales (attached and detached, including condominiums). Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 7-A
DISTRIBUTION OF NEW-HOME SALES BY PRICE RANGE
(INCLUDES SALES OF DETACHED AND ATTACHED UNITS, INCLUDING CONDOS)
CALIFORNIA AND SELECTED COUNTIES, 1987-2001 (NOT ADJUSTED FOR INFLATION)

		DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)							
	MEDIAN PRICE	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
CALIFORNIA									
2001	$256,000	0.1%	2.4%	13.1%	16.2%	16.1%	17.7%	13.6%	20.8%
2000	$243,000	0.2%	4.0%	14.3%	17.8%	15.7%	15.9%	12.3%	19.8%
1999	$225,200	0.3%	4.3%	17.2%	20.2%	14.9%	15.0%	12.1%	16.0%
1998	$208,500	0.3%	5.5%	18.2%	22.8%	15.7%	13.7%	10.8%	13.0%
1997	$199,000	0.6%	6.8%	20.7%	22.4%	16.2%	13.6%	9.3%	10.4%
1996	$189,900	0.8%	7.9%	23.4%	22.0%	16.4%	14.8%	7.7%	7.0%
1995	$187,900	0.4%	6.4%	24.3%	24.2%	16.2%	13.9%	7.7%	6.9%
1994	$187,500	0.5%	6.2%	23.4%	25.2%	17.4%	14.0%	7.8%	5.5%
1993	$182,000	0.5%	6.1%	25.4%	25.8%	16.4%	12.9%	7.6%	5.3%
1992	$186,000	0.4%	5.6%	24.0%	25.7%	16.6%	13.6%	8.0%	6.1%
1991	$197,500	0.7%	4.9%	20.2%	25.1%	16.9%	14.3%	9.4%	8.5%
1990	$189,900	0.8%	6.5%	22.4%	24.5%	15.0%	13.4%	8.6%	8.8%
1989	$178,000	1.3%	7.9%	26.0%	24.4%	12.5%	12.3%	7.6%	8.0%
1988	$158,000	2.6%	11.6%	31.3%	23.7%	11.8%	8.8%	5.5%	4.7%
1987	$148,000	3.5%	13.2%	34.8%	24.1%	10.6%	7.2%	3.7%	2.9%
SELECTED COUNTIES									
ALAMEDA									
2001	$517,000	0.0%	0.0%	0.0%	2.5%	1.7%	8.5%	14.4%	72.9%
2000	$441,000	0.0%	0.0%	0.5%	4.2%	2.6%	7.3%	29.2%	56.2%
1999	$392,700	0.0%	0.0%	0.8%	1.6%	3.2%	19.8%	37.1%	37.5%
1998	$340,000	0.0%	0.0%	4.0%	4.0%	10.7%	26.8%	22.8%	31.7%
1997	$303,500	0.0%	0.0%	4.1%	10.0%	16.6%	25.8%	21.0%	22.5%
1996	$287,800	0.0%	0.0%	2.8%	7.5%	23.4%	29.4%	20.1%	16.8%
1995	$293,000	0.0%	0.5%	1.4%	7.6%	18.4%	33.7%	18.5%	19.9%
1994	$277,500	0.0%	0.7%	2.6%	11.5%	17.5%	36.8%	22.7%	8.2%
1993	$282,500	0.0%	3.4%	7.4%	7.8%	13.3%	33.3%	23.0%	11.8%
1992	$292,500	0.0%	0.5%	6.2%	5.3%	12.8%	36.7%	24.3%	14.2%
1991	$325,000	0.0%	1.1%	5.9%	11.8%	11.4%	19.5%	31.2%	19.1%
1990	$322,100	0.0%	0.6%	2.8%	4.6%	16.4%	25.9%	19.4%	30.3%
1989	$270,000	0.6%	1.8%	9.5%	12.1%	18.9%	23.4%	17.2%	16.5%
1988	$207,300	0.1%	0.8%	18.0%	27.5%	21.3%	12.2%	13.7%	6.4%
1987	$175,900	0.0%	2.2%	21.6%	39.9%	17.5%	13.1%	4.4%	1.3%
BUTTE									
2001	$179,500	0.0%	7.7%	26.9%	30.8%	15.4%	11.5%	7.7%	0.0%
2000	$157,300	0.0%	6.9%	36.2%	20.7%	27.6%	5.2%	3.4%	0.0%
1999	$158,000	0.0%	4.9%	40.7%	30.9%	18.5%	2.5%	2.5%	0.0%
1998	$152,100	0.0%	3.6%	44.6%	30.4%	12.5%	8.9%	0.0%	0.0%
1997	$155,700	3.8%	0.0%	36.6%	40.4%	15.4%	1.9%	1.9%	0.0%
1996	$146,000	2.3%	4.6%	45.4%	34.1%	6.8%	6.8%	0.0%	0.0%
1995	$139,300	0.0%	10.9%	45.3%	31.3%	6.3%	3.1%	3.1%	0.0%
1994	$147,300	0.0%	1.2%	49.4%	37.6%	9.4%	2.4%	0.0%	0.0%
1993	$148,000	0.0%	0.0%	52.7%	32.4%	6.8%	5.4%	2.7%	0.0%
1992	$142,000	1.5%	5.4%	49.6%	29.0%	12.2%	0.0%	2.3%	0.0%
1991	$146,500	6.2%	12.4%	32.0%	27.8%	14.4%	6.2%	1.0%	0.0%
1990	$142,600	4.0%	8.0%	46.7%	25.3%	8.7%	6.0%	0.7%	0.6%
1989	$107,500	8.8%	34.4%	36.0%	15.2%	3.2%	2.4%	0.0%	0.0%
1988	$ 98,500	12.1%	38.4%	41.4%	5.1%	2.0%	0.0%	0.0%	1.0%
1987	$ 86,700	6.2%	67.2%	17.2%	7.8%	1.6%	0.0%	0.0%	0.0%

TABLE 7-A, CONT'D

	MEDIAN PRICE	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION) UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
CONTRA COSTA									
2001	$364,200	0.0%	0.0%	0.0%	3.0%	8.1%	23.7%	35.9%	29.3%
2000	$303,600	0.0%	0.4%	0.4%	7.8%	17.5%	29.6%	21.8%	22.5%
1999	$267,500	0.0%	0.0%	1.6%	21.3%	17.8%	21.3%	14.0%	24.0%
1998	$272,500	0.0%	0.0%	3.8%	18.8%	20.1%	18.8%	14.2%	24.3%
1997	$250,000	0.0%	0.4%	7.0%	24.9%	17.1%	14.4%	15.6%	20.6%
1996	$260,500	0.0%	0.4%	6.8%	20.4%	17.0%	23.4%	12.4%	19.6%
1995	$243,000	0.0%	0.6%	8.9%	22.5%	22.5%	13.9%	15.8%	15.8%
1994	$216,400	0.0%	0.6%	9.9%	28.8%	20.8%	16.3%	15.0%	8.6%
1993	$226,000	0.0%	0.5%	7.1%	29.2%	20.2%	16.0%	14.8%	12.2%
1992	$223,600	0.2%	0.0%	5.7%	30.5%	23.6%	11.9%	16.4%	11.7%
1991	$247,000	0.0%	0.0%	3.4%	24.6%	23.7%	13.6%	21.1%	13.6%
1990	$265,400	0.0%	0.9%	6.4%	20.5%	18.5%	18.7%	16.7%	18.3%
1989	$213,500	0.1%	1.9%	16.4%	26.2%	15.4%	16.9%	9.5%	13.6%
1988	$209,000	0.1%	2.3%	22.6%	21.8%	18.0%	17.5%	6.5%	11.2%
1987	$180,700	0.2%	4.2%	28.7%	27.6%	12.2%	12.6%	8.0%	6.5%
EL DORADO									
2001	$396,300	0.0%	0.0%	1.7%	13.1%	4.9%	9.8%	26.2%	44.3%
2000	$333,000	0.0%	0.0%	2.9%	11.4%	15.7%	15.7%	38.6%	15.7%
1999	$255,000	0.0%	1.5%	3.0%	11.9%	29.8%	23.9%	26.9%	3.0%
1998	$249,700	0.0%	0.0%	6.0%	16.9%	27.7%	35.0%	10.8%	3.6%
1997	$245,000	0.0%	5.4%	1.1%	15.0%	34.4%	34.4%	4.3%	5.4%
1996	$229,000	0.0%	0.0%	11.6%	14.5%	37.7%	24.6%	10.1%	1.5%
1995	$212,000	0.0%	0.0%	7.3%	34.9%	35.8%	11.9%	6.4%	3.7%
1994	$207,500	0.0%	0.0%	13.8%	25.3%	43.7%	9.2%	6.9%	1.1%
1993	$216,000	0.0%	0.0%	11.1%	29.6%	30.9%	18.5%	8.7%	1.2%
1992	$230,000	0.0%	0.0%	9.8%	20.5%	37.7%	13.1%	16.4%	2.5%
1991	$240,000	0.0%	0.8%	16.8%	16.0%	21.6%	25.6%	17.6%	1.6%
1990	$227,500	0.0%	0.5%	7.8%	22.6%	32.4%	18.6%	15.2%	2.9%
1989	$159,400	0.0%	3.7%	32.7%	42.4%	9.1%	6.7%	4.2%	1.2%
1988	$133,900	0.4%	13.9%	62.6%	15.2%	2.6%	4.8%	0.0%	0.5%
1987	$125,000	0.0%	24.5%	57.9%	8.8%	0.0%	8.8%	0.0%	0.0%
FRESNO									
2001	$143,600	0.0%	7.8%	48.2%	27.7%	7.1%	6.4%	1.4%	1.4%
2000	$140,400	1.2%	14.5%	43.6%	23.9%	8.1%	6.4%	0.0%	2.3%
1999	$139,000	0.0%	18.7%	40.3%	22.2%	11.4%	5.7%	0.6%	1.1%
1998	$138,200	0.0%	20.6%	38.2%	25.8%	11.0%	0.8%	2.9%	0.7%
1997	$118,000	1.8%	24.2%	49.3%	18.3%	4.6%	0.9%	0.0%	0.9%
1996	$125,000	1.8%	23.1%	48.8%	17.3%	3.3%	4.3%	1.4%	0.0%
1995	$132,500	0.0%	17.3%	50.6%	18.6%	7.6%	4.2%	0.4%	1.3%
1994	$142,500	0.0%	14.0%	42.1%	30.3%	8.6%	2.7%	1.5%	0.9%
1993	$145,000	0.3%	10.6%	44.4%	30.1%	8.4%	3.8%	1.6%	0.8%
1992	$140,500	1.4%	14.2%	39.1%	31.1%	6.3%	3.5%	3.0%	1.4%
1991	$126,700	2.7%	15.4%	52.3%	20.3%	4.8%	2.7%	1.2%	0.6%
1990	$116,600	5.4%	24.6%	52.5%	9.7%	2.0%	3.8%	1.8%	0.2%
1989	$110,000	6.6%	30.1%	39.9%	15.7%	3.2%	2.8%	1.7%	0.0%
1988	$107,500	10.1%	34.1%	35.9%	14.9%	2.5%	1.8%	0.0%	0.7%
1987	$109,900	13.5%	32.8%	34.9%	12.0%	2.6%	1.6%	2.1%	0.5%
HUMBOLDT									
2001	$156,000	0.0%	0.0%	41.2%	35.3%	11.7%	5.9%	5.9%	0.0%
2000	$134,000	0.0%	0.0%	61.8%	23.5%	8.8%	5.9%	0.0%	0.0%
1999	$145,800	0.0%	3.6%	50.0%	28.6%	10.7%	7.1%	0.0%	0.0%
1998	$128,500	0.0%	11.5%	61.5%	7.7%	7.7%	7.7%	3.9%	0.0%
1997	$140,000	2.4%	7.1%	52.4%	30.9%	4.8%	2.4%	0.0%	0.0%
1996	$137,900	0.0%	13.5%	54.1%	18.9%	10.8%	2.7%	0.0%	0.0%
1995	$132,000	0.0%	8.7%	54.3%	30.4%	2.2%	4.4%	0.0%	0.0%
1994	$123,500	1.7%	10.2%	57.6%	22.0%	1.7%	5.1%	1.7%	0.0%
1993	$114,900	2.2%	2.2%	77.8%	8.9%	4.4%	4.5%	0.0%	0.0%
1992	$122,000	0.0%	8.3%	66.7%	12.5%	8.3%	4.2%	0.0%	0.0%
1991	$117,000	0.0%	9.4%	62.5%	18.8%	0.0%	6.2%	3.1%	0.0%
1990	$103,800	6.1%	34.9%	48.5%	4.5%	4.5%	1.5%	0.0%	0.0%
1989	$ 89,500	3.1%	68.7%	21.9%	6.3%	0.0%	0.0%	0.0%	0.0%
1988	$ 83,900	27.9%	48.9%	20.9%	2.3%	0.0%	0.0%	0.0%	0.0%
1987	$ 80,200	25.0%	52.1%	14.6%	6.2%	0.0%	2.1%	0.0%	0.0%

TABLE 7-A, CONT'D

	MEDIAN PRICE	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION) UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
IMPERIAL									
2001	$152,000	2.0%	4.1%	40.8%	42.9%	10.2%	0.0%	0.0%	0.0%
2000	$140,000	0.0%	12.2%	46.3%	22.0%	14.6%	4.9%	0.0%	0.0%
1999	$142,000	1.5%	10.4%	43.3%	38.8%	3.0%	3.0%	0.0%	0.0%
1998	$138,300	1.8%	20.4%	37.0%	29.6%	7.4%	1.9%	1.9%	0.0%
1997	$121,000	0.0%	32.3%	45.2%	14.5%	3.2%	4.8%	0.0%	0.0%
1996	$125,000	0.0%	25.3%	41.7%	28.6%	2.2%	2.2%	0.0%	0.0%
1995	$123,500	2.2%	15.0%	59.1%	21.5%	1.1%	1.1%	0.0%	0.0%
1994	$130,000	0.8%	17.6%	52.7%	25.9%	3.0%	0.0%	0.0%	0.0%
1993	$120,000	1.7%	31.6%	49.6%	12.8%	3.4%	0.9%	0.0%	0.0%
1992	$110,500	0.0%	42.6%	43.5%	13.0%	0.9%	0.0%	0.0%	0.0%
1991	$ 92,800	3.1%	55.4%	27.7%	9.2%	3.1%	1.5%	0.0%	0.0%
1990	$ 98,000	1.2%	54.2%	33.7%	10.9%	0.0%	0.0%	0.0%	0.0%
1989	$ 86,400	21.4%	39.3%	28.6%	3.6%	7.1%	0.0%	0.0%	0.0%
1988	$ 66,900	63.8%	34.1%	2.1%	0.0%	0.0%	0.0%	0.0%	0.0%
1987	$ 78,500	41.2%	47.1%	5.9%	5.8%	0.0%	0.0%	0.0%	0.0%
KERN									
2001	$139,500	0.6%	12.9%	48.3%	19.1%	10.1%	6.2%	1.1%	1.7%
2000	$130,500	0.5%	23.1%	38.2%	24.1%	6.6%	4.7%	1.9%	0.9%
1999	$122,300	0.5%	24.0%	50.0%	13.7%	5.6%	3.8%	1.9%	0.5%
1998	$120,000	1.3%	23.9%	45.3%	22.2%	3.4%	3.0%	0.5%	0.4%
1997	$120,500	1.6%	29.0%	47.6%	12.5%	3.3%	2.0%	3.6%	0.4%
1996	$118,500	4.9%	26.4%	48.0%	11.8%	4.5%	3.2%	0.8%	0.4%
1995	$127,000	2.2%	23.3%	46.5%	13.2%	7.9%	6.1%	0.4%	0.4%
1994	$126,300	3.2%	21.5%	44.7%	17.3%	7.1%	5.3%	0.3%	0.6%
1993	$125,000	3.6%	21.4%	44.9%	17.9%	6.6%	3.8%	1.0%	0.8%
1992	$133,000	0.9%	21.1%	43.9%	22.7%	6.6%	3.0%	0.2%	1.6%
1991	$122,700	3.1%	23.6%	40.6%	22.1%	4.4%	3.9%	1.5%	0.8%
1990	$109,500	3.8%	34.7%	41.4%	13.5%	3.3%	2.1%	0.9%	0.3%
1989	$103,000	9.2%	37.7%	36.8%	11.3%	3.2%	1.2%	0.6%	0.0%
1988	$ 97,200	14.8%	39.1%	31.6%	10.2%	1.6%	1.4%	1.3%	0.0%
1987	$ 90,000	17.4%	49.4%	19.9%	8.9%	2.4%	2.0%	0.0%	0.0%
KINGS									
2001	$129,800	0.0%	18.7%	64.6%	14.6%	0.0%	2.1%	0.0%	0.0%
2000	$116,500	3.1%	29.7%	53.1%	11.0%	3.1%	0.0%	0.0%	0.0%
1999	$117,800	1.8%	22.2%	63.0%	13.0%	0.0%	0.0%	0.0%	0.0%
1998	$104,300	1.9%	45.1%	41.2%	11.8%	0.0%	0.0%	0.0%	0.0%
1997	$109,400	1.4%	27.2%	54.3%	17.1%	0.0%	0.0%	0.0%	0.0%
1996	$111,700	1.3%	24.4%	60.2%	14.1%	0.0%	0.0%	0.0%	0.0%
1995	$106,500	3.1%	29.2%	53.9%	12.3%	0.0%	1.5%	0.0%	0.0%
1994	$117,000	2.3%	27.0%	52.8%	13.5%	2.2%	1.1%	1.1%	0.0%
1993	$121,400	2.8%	25.4%	47.9%	19.7%	4.2%	0.0%	0.0%	0.0%
1992	$117,500	0.0%	21.8%	57.7%	15.4%	3.8%	1.3%	0.0%	0.0%
1991	$108,900	4.4%	24.5%	62.2%	6.7%	2.2%	0.0%	0.0%	0.0%
1990	$113,500	0.0%	34.0%	46.0%	16.0%	0.0%	4.0%	0.0%	0.0%
1989	$108,900	5.0%	35.0%	52.5%	5.0%	2.5%	0.0%	0.0%	0.0%
1988	$ 83,900	33.9%	37.1%	27.4%	0.0%	0.0%	1.6%	0.0%	0.0%
1987	$ 85,300	32.4%	43.3%	24.3%	0.0%	0.0%	0.0%	0.0%	0.0%
LAKE									
2001	$165,000	0.0%	0.0%	38.1%	38.1%	19.0%	0.0%	4.8%	0.0%
2000	$142,000	0.0%	0.0%	63.2%	10.5%	21.0%	5.3%	0.0%	0.0%
1999	$146,800	0.0%	8.3%	41.7%	33.3%	16.7%	0.0%	0.0%	0.0%
1998	$135,000	0.0%	20.0%	45.0%	5.0%	5.0%	25.0%	0.0%	0.0%
1997	$139,000	0.0%	18.7%	40.6%	21.9%	9.4%	9.4%	0.0%	0.0%
1996	$117,500	0.0%	18.2%	68.2%	9.1%	0.0%	4.5%	0.0%	0.0%
1995	$123,000	3.7%	0.0%	63.0%	11.1%	11.1%	7.4%	3.7%	0.0%
1994	$124,000	5.9%	11.8%	61.7%	20.6%	0.0%	0.0%	0.0%	0.0%
1993	$118,000	5.1%	18.0%	53.8%	18.0%	5.1%	0.0%	0.0%	0.0%
1992	$120,000	0.0%	10.7%	70.2%	17.0%	0.0%	2.1%	0.0%	0.0%
1991	$135,500	5.1%	10.3%	43.6%	30.8%	7.7%	2.5%	0.0%	0.0%
1990	$129,000	5.4%	17.8%	51.8%	12.5%	12.5%	0.0%	0.0%	0.0%
1989	$ 86,000	5.9%	64.7%	29.4%	0.0%	0.0%	0.0%	0.0%	0.0%
1988	$ 75,000	21.7%	52.2%	21.7%	4.4%	0.0%	0.0%	0.0%	0.0%
1987	$110,000	11.1%	22.2%	66.7%	0.0%	0.0%	0.0%	0.0%	0.0%

TABLE 7-A, CONT'D

	MEDIAN PRICE	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
		DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)							
LOS ANGELES									
2001	$318,700	0.0%	0.0%	8.5%	14.1%	16.3%	12.4%	13.3%	35.4%
2000	$297,500	0.0%	0.9%	12.3%	18.1%	9.8%	15.3%	12.5%	31.1%
1999	$295,800	0.0%	3.4%	11.6%	15.3%	10.8%	15.5%	14.3%	29.1%
1998	$292,000	0.5%	3.4%	9.4%	17.7%	11.7%	11.3%	14.3%	31.7%
1997	$257,000	0.3%	2.8%	15.2%	18.7%	12.3%	13.6%	14.6%	22.5%
1996	$230,000	1.1%	7.0%	16.1%	17.9%	11.6%	16.2%	14.2%	15.9%
1995	$222,000	0.2%	4.5%	19.0%	19.2%	13.8%	13.8%	10.9%	18.6%
1994	$233,000	0.3%	1.8%	15.1%	21.0%	15.6%	16.8%	12.4%	17.0%
1993	$233,500	0.0%	1.5%	14.7%	21.9%	15.2%	19.9%	14.0%	12.8%
1992	$230,500	0.0%	1.0%	15.3%	22.4%	15.7%	16.0%	14.8%	14.8%
1991	$245,000	0.0%	0.8%	13.9%	20.6%	16.4%	14.9%	11.5%	21.9%
1990	$257,000	0.0%	0.3%	13.9%	22.4%	11.8%	16.6%	14.2%	20.8%
1989	$225,000	0.3%	2.1%	23.0%	17.5%	13.5%	17.2%	11.3%	15.1%
1988	$193,900	0.2%	4.9%	24.4%	23.1%	15.5%	13.2%	8.4%	10.3%
1987	$177,900	0.5%	5.9%	30.9%	23.3%	16.4%	9.9%	6.3%	6.8%
MADERA									
2001	$120,500	0.0%	30.8%	43.1%	18.4%	0.0%	4.6%	3.1%	0.0%
2000	$104.900	0.0%	48.9%	33.3%	8.9%	8.9%	0.0%	0.0%	0.0%
1999	$116,000	0.0%	39.4%	45.5%	9.1%	3.0%	0.0%	3.0%	0.0%
1998	$105,500	6.5%	37.0%	37.0%	10.9%	4.3%	4.3%	0.0%	0.0%
1997	$112,500	0.0%	37.2%	37.2%	21.6%	2.0%	2.0%	0.0%	0.0%
1996	$ 93,100	10.0%	44.0%	38.0%	6.0%	0.0%	2.0%	0.0%	0.0%
1995	$121,200	3.4%	27.6%	43.1%	19.0%	6.9%	0.0%	0.0%	0.0%
1994	$111,000	6.1%	34.8%	39.4%	12.1%	6.1%	1.5%	0.0%	0.0%
1993	$105,000	0.0%	42.6%	29.5%	24.6%	1.7%	1.6%	0.0%	0.0%
1992	$126,000	0.9%	27.7%	42.8%	17.9%	5.3%	3.6%	0.9%	0.9%
1991	$107,000	3.7%	40.8%	46.9%	7.4%	1.2%	0.0%	0.0%	0.0%
1990	$ 93,300	2.6%	60.5%	29.0%	5.3%	1.3%	1.3%	0.0%	0.0%
1989	$ 78,600	39.1%	30.4%	26.1%	2.2%	0.0%	2.2%	0.0%	0.0%
1988	$ 75,000	41.7%	38.1%	16.6%	1.2%	2.4%	0.0%	0.0%	0.0%
1987	$ 74,900	34.4%	47.6%	6.6%	4.9%	3.3%	1.6%	1.6%	0.0%
MARIN									
2001	$670,000	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	4.8%	90.5%
2000	$550,000	0.0%	0.0%	0.0%	0.0%	2.1%	17.0%	14.9%	66.0%
1999	$525,000	0.0%	1.7%	3.5%	3.5%	6.9%	8.6%	10.3%	65.5%
1998	$545,500	0.0%	0.0%	6.7%	4.5%	8.9%	4.4%	4.4%	71.1%
1997	$526,700	0.0%	1.6%	3.2%	11.3%	1.6%	6.5%	11.3%	64.5%
1996	$447,500	0.0%	0.0%	0.0%	2.7%	18.9%	2.7%	21.6%	54.1%
1995	$459,000	0.0%	0.0%	2.0%	4.1%	0.0%	2.1%	30.6%	61.2%
1994	$426,800	0.0%	0.0%	1.6%	1.6%	3.3%	18.1%	24.6%	50.8%
1993	$410,500	0.0%	0.0%	0.0%	0.0%	0.0%	8.7%	43.5%	47.8%
1992	$431,000	0.0%	0.0%	0.0%	2.2%	0.0%	22.2%	20.0%	55.6%
1991	$404,000	0.0%	0.0%	0.0%	4.3%	10.6%	17.0%	23.4%	44.7%
1990	$415,000	0.0%	0.0%	8.4%	7.0%	8.5%	14.1%	12.7%	49.3%
1989	$350,000	0.0%	0.0%	5.7%	6.5%	9.8%	21.1%	22.8%	34.1%
1988	$319,000	1.5%	0.8%	7.0%	7.7%	12.4%	23.3%	21.7%	25.6%
1987	$294,000	0.4%	1.3%	5.0%	5.9%	17.2%	30.8%	20.4%	19.0%
MERCED									
2001	$144,700	0.0%	5.9%	49.0%	19.6%	15.7%	9.8%	0.0%	0.0%
2000	$136,100	0.0%	14.0%	57.9%	19.3%	8.8%	0.0%	0.0%	0.0%
1999	$122,100	1.4%	20.0%	68.6%	4.3%	5.7%	0.0%	0.0%	0.0%
1998	$112,000	3.4%	22.0%	57.6%	17.0%	0.0%	0.0%	0.0%	0.0%
1997	$105,500	0.0%	43.1%	48.6%	8.3%	0.0%	0.0%	0.0%	0.0%
1996	$100,400	0.0%	47.0%	37.9%	10.6%	4.5%	0.0%	0.0%	0.0%
1995	$111,000	0.0%	25.4%	58.7%	12.7%	1.6%	1.6%	0.0%	0.0%
1994	$108,500	1.1%	33.7%	45.6%	16.3%	1.1%	2.2%	0.0%	0.0%
1993	$107,000	1.1%	38.0%	47.8%	12.0%	0.0%	0.0%	1.1%	0.0%
1992	$116,500	1.6%	24.2%	55.7%	16.1%	2.4%	0.0%	0.0%	0.0%
1991	$138,500	1.3%	16.0%	40.0%	34.7%	6.7%	1.3%	0.0%	0.0%
1990	$125,000	3.5%	15.7%	56.4%	19.8%	2.9%	1.7%	0.0%	0.0%
1989	$ 96,500	8.9%	46.5%	36.7%	6.9%	0.0%	1.0%	0.0%	0.0%
1988	$ 76,000	36.8%	36.8%	21.3%	3.7%	1.4%	0.0%	0.0%	0.0%
1987	$ 78,200	25.0%	50.0%	21.4%	3.6%	0.0%	0.0%	0.0%	0.0%

TABLE 7-A, CONT'D

	MEDIAN PRICE	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION) UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
MONTEREY									
2001	$285,000	0.0%	0.0%	0.0%	7.3%	16.4%	43.6%	18.2%	14.5%
2000	$272,200	0.0%	0.0%	4.4%	15.6%	16.7%	34.4%	12.2%	16.7%
1999	$232,500	0.0%	0.0%	5.9%	27.4%	28.6%	19.1%	7.1%	11.9%
1998	$213,000	0.0%	1.0%	13.3%	28.6%	26.7%	17.1%	3.8%	9.5%
1997	$210,200	0.0%	0.9%	22.4%	23.4%	18.7%	14.9%	7.5%	12.2%
1996	$190,000	0.0%	3.4%	18.2%	31.8%	15.9%	18.2%	7.9%	4.6%
1995	$172,000	0.0%	2.0%	31.3%	32.3%	16.2%	12.1%	2.0%	4.1%
1994	$191,600	0.0%	1.6%	28.2%	22.6%	30.6%	6.5%	6.5%	4.0%
1993	$187,800	0.0%	0.0%	28.4%	32.4%	23.0%	5.4%	4.0%	6.8%
1992	$201,000	0.0%	0.0%	20.2%	29.2%	25.9%	6.7%	11.3%	6.7%
1991	$206,000	0.0%	2.3%	16.4%	25.8%	30.5%	9.4%	7.8%	7.8%
1990	$196,300	0.0%	2.3%	15.8%	33.3%	31.1%	6.2%	2.8%	8.5%
1989	$180,500	0.0%	2.5%	29.1%	29.7%	16.5%	5.7%	7.0%	9.5%
1988	$148,000	0.0%	19.1%	32.2%	19.1%	5.3%	11.8%	6.6%	5.9%
1987	$147,500	0.0%	7.1%	44.7%	21.4%	12.5%	8.9%	5.4%	0.0%
NAPA									
2001	$367,800	0.0%	0.0%	3.8%	7.7%	3.8%	11.6%	42.3%	30.8
2000	$335,900	0.0%	0.0%	0.0%	8.9%	13.3%	24.4%	24.5%	28.9
1999	$320,400	0.0%	0.0%	0.0%	8.9%	17.1%	31.1%	25.0%	17.9
1998	$255,500	0.0%	0.0%	0.0%	8.7%	37.0%	28.2%	23.9%	2.2%
1997	$224,500	0.0%	0.0%	14.6%	9.8%	43.9%	7.3%	17.1%	7.3%
1996	$232,500	0.0%	0.0%	6.8%	11.4%	40.9%	31.8%	6.8%	2.3%
1995	$260,000	0.0%	0.0%	2.1%	12.2%	32.7%	28.6%	12.2%	12.2%
1994	$240,000	0.0%	0.0%	4.9%	18.0%	36.1%	14.8%	22.9%	3.3%
1993	$220,000	0.0%	0.0%	5.4%	32.5%	24.3%	16.2%	8.1%	13.5%
1992	$234,500	0.0%	0.0%	7.2%	14.3%	35.7%	21.4%	11.4%	10.0%
1991	$267,200	0.0%	2.0%	4.0%	16.0%	20.0%	22.0%	26.0%	10.0%
1990	$247,400	0.0%	0.0%	6.8%	22.7%	23.9%	11.4%	21.6%	13.6%
1989	$167,600	0.0%	0.0%	23.5%	52.9%	8.8%	11.8%	1.0%	2.0%
1988	$150,400	0.0%	2.6%	42.9%	45.4%	3.9%	0.0%	2.6%	2.6%
1987	$131,100	0.0%	9.3%	76.7%	7.1%	2.3%	0.0%	2.3%	2.3%
NEVADA									
2001	$305,000	0.0%	0.0%	0.0%	0.0%	20.0%	33.3%	33.3%	13.4%
2000	$270,000	3.5%	3.5%	6.9%	6.9%	10.3%	37.9%	31.0%	0.0%
1999	$245,000	0.0%	0.0%	17.4%	21.7%	17.4%	21.7%	21.8%	0.0%
1998	$238,000	0.0%	0.0%	11.1%	22.2%	29.7%	25.9%	11.1%	0.0%
1997	$183,300	0.0%	0.0%	29.4%	26.5%	17.7%	14.7%	8.8%	2.9%
1996	$193,000	0.0%	0.0%	24.2%	36.4%	24.3%	12.1%	0.0%	3.0%
1995	$205,500	0.0%	4.3%	17.0%	27.7%	27.7%	8.5%	4.2%	10.6%
1994	$191,000	0.0%	0.0%	20.3%	33.9%	30.5%	5.1%	5.1%	5.1%
1993	$181,500	0.0%	0.0%	25.9%	31.5%	22.2%	16.7%	3.7%	0.0%
1992	$193,700	0.0%	0.0%	21.8%	33.3%	19.2%	16.7%	7.7%	1.3%
1991	$179,500	0.0%	0.0%	17.0%	38.3%	17.0%	19.1%	4.3%	4.3%
1990	$192,500	0.0%	2.3%	20.7%	36.8%	23.0%	11.5%	4.6%	1.1%
1989	$147,500	1.3%	5.2%	49.3%	22.1%	13.0%	5.2%	2.6%	1.3%
1988	$123,000	7.9%	19.8%	48.5%	15.8%	4.0%	3.0%	1.0%	0.0%
1987	$116,500	4.5%	25.8%	51.5%	15.2%	1.5%	1.5%	0.0%	0.0%
ORANGE									
2001	$407,700	0.0%	0.0%	0.8%	1.9%	8.1%	17.4%	24.3%	47.5%
2000	$396,600	0.0%	0.2%	1.3%	7.9%	11.5%	14.7%	19.6%	44.8%
1999	$347,300	0.0%	0.0%	1.2%	7.6%	13.9%	22.2%	15.6%	39.5%
1998	$335,600	0.0%	0.4%	2.8%	10.9%	15.6%	18.0%	20.9%	31.4%
1997	$249,700	0.0%	0.8%	3.9%	16.6%	28.7%	19.0%	15.8%	15.2%
1996	$238,000	0.2%	1.3%	4.8%	19.8%	30.1%	22.2%	12.3%	9.3%
1995	$245,000	0.0%	0.0%	5.0%	18.8%	29.1%	23.8%	14.5%	8.8%
1994	$254,300	0.0%	0.4%	3.6%	15.8%	27.7%	27.5%	16.4%	8.6%
1993	$245,000	0.0%	0.1%	7.8%	21.1%	22.0%	23.2%	17.9%	7.9%
1992	$261,200	0.0%	0.0%	7.6%	16.1%	19.9%	28.8%	16.4%	11.2%
1991	$283,500	0.0%	0.0%	4.6%	15.1%	17.6%	26.7%	21.2%	14.8%
1990	$290,800	0.0%	0.2%	7.0%	15.3%	14.3%	22.3%	20.0%	20.9%
1989	$294,000	0.0%	0.5%	7.2%	11.5%	15.4%	23.9%	18.5%	23.0%
1988	$225,300	0.0%	1.3%	14.2%	25.2%	19.1%	17.9%	14.1%	8.2%
1987	$175,900	0.1%	3.6%	30.9%	28.0%	17.1%	12.0%	5.7%	2.6%

TABLE 7-A, CONT'D

	MEDIAN PRICE	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION) UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
PLACER									
2001	$260,000	0.0%	1.0%	6.6%	15.7%	20.3%	32.0%	13.7%	10.7%
2000	$246,200	0.3%	1.1%	3.2%	21.4%	25.0%	27.9%	11.8%	9.3%
1999	$218,800	0.0%	0.7%	6.8%	34.6%	22.3%	20.5%	10.3%	4.8%
1998	$202,000	0.0%	0.0%	10.2%	37.9%	25.6%	17.5%	6.3%	2.5%
1997	$191,800	0.4%	0.7%	16.7%	38.8%	18.1%	17.0%	5.4%	2.9%
1996	$199,500	0.0%	2.0%	10.6%	38.0%	23.5%	18.8%	6.3%	0.8%
1995	$188,700	0.0%	0.5%	10.5%	50.0%	20.2%	15.6%	1.8%	1.4%
1994	$188,000	0.0%	0.4%	14.1%	50.6%	17.0%	14.6%	2.9%	0.4%
1993	$183,700	0.0%	0.0%	19.6%	42.2%	26.7%	6.0%	3.0%	2.5%
1992	$193,500	0.0%	0.4%	12.9%	40.8%	25.3%	14.6%	2.1%	3.9%
1991	$214,500	0.4%	1.1%	7.4%	31.0%	32.5%	15.3%	6.3%	6.0%
1990	$210,400	0.0%	1.2%	19.4%	24.3%	26.9%	17.5%	6.9%	3.8%
1989	$155,300	0.0%	3.5%	42.8%	25.1%	16.3%	6.8%	4.4%	1.1%
1988	$128,900	0.0%	9.5%	59.8%	13.0%	8.1%	4.1%	3.5%	2.0%
1987	$131,400	0.0%	12.8%	54.9%	17.1%	6.7%	5.5%	1.8%	1.2%
RIVERSIDE									
2001	$239,100	0.2%	0.6%	7.2%	19.0%	30.3%	31.4%	6.6%	4.7%
2000	$225,500	0.2%	0.3%	12.8%	22.6%	29.1%	20.2%	7.1%	7.7%
1999	$184,700	0.8%	1.3%	25.0%	32.0%	19.0%	11.6%	4.9%	5.4%
1998	$170,100	0.2%	4.7%	29.5%	41.7%	15.3%	3.1%	2.9%	2.6%
1997	$152,200	0.5%	10.4%	36.8%	32.0%	11.7%	3.9%	1.7%	3.0%
1996	$148,000	0.7%	7.1%	44.0%	31.7%	10.2%	2.6%	1.3%	2.4%
1995	$150,800	0.0%	8.7%	39.9%	33.0%	9.2%	6.0%	1.1%	2.1%
1994	$151,500	0.3%	9.2%	38.9%	32.2%	10.3%	3.7%	2.7%	2.7%
1993	$150,000	1.0%	8.9%	39.1%	30.2%	11.7%	6.0%	1.7%	1.4%
1992	$160,000	0.1%	4.4%	33.0%	40.7%	12.0%	6.1%	1.4%	2.3%
1991	$170,000	0.1%	3.8%	29.4%	37.0%	17.7%	7.5%	3.0%	1.5%
1990	$176,000	0.4%	4.6%	24.6%	39.0%	16.3%	8.7%	3.8%	2.6%
1989	$158,000	0.3%	6.9%	35.2%	39.5%	10.5%	5.2%	1.4%	1.0%
1988	$139,900	0.8%	13.1%	47.5%	29.4%	5.2%	2.0%	1.3%	0.7%
1987	$125,100	3.6%	23.1%	45.6%	18.9%	4.0%	2.6%	0.9%	1.3%
SACRAMENTO									
2001	$220,500	0.0%	0.0%	8.1%	27.2%	32.1%	21.2%	9.7%	1.7%
2000	$189,900	0.0%	5.9%	11.2%	39.4%	24.7%	12.2%	6.1%	0.5%
1999	$182,000	0.0%	0.7%	20.9%	38.7%	21.6%	12.8%	4.3%	1.0%
1998	$162,100	0.3%	1.5%	33.5%	43.1%	9.9%	7.7%	2.2%	1.8%
1997	$159,400	0.6%	4.6%	34.0%	40.3%	13.9%	3.6%	3.0%	0.0%
1996	$152,500	0.4%	4.7%	42.0%	31.5%	14.1%	4.0%	3.0%	0.3%
1995	$154,500	0.0%	3.1%	42.7%	30.7%	14.6%	5.4%	2.6%	0.9%
1994	$160,000	0.2%	3.3%	38.9%	35.8%	11.9%	6.2%	2.5%	1.2%
1993	$158,600	0.0%	2.7%	41.2%	34.7%	13.4%	6.0%	1.1%	0.9%
1992	$155,000	0.0%	2.0%	41.6%	34.9%	10.4%	7.2%	2.9%	1.0%
1991	$166,500	0.7%	3.2%	30.4%	36.0%	14.7%	9.5%	3.8%	1.7%
1990	$162,500	0.7%	4.7%	32.4%	32.9%	15.2%	11.0%	2.4%	0.7%
1989	$132,700	2.5%	13.1%	47.5%	23.5%	6.9%	4.1%	1.7%	0.7%
1988	$123,900	3.1%	22.3%	43.9%	20.4%	6.1%	2.4%	1.3%	0.5%
1987	$117,900	4.7%	25.2%	46.3%	17.7%	2.9%	1.6%	1.2%	0.4%
SAN BENITO									
2001	$375,000	0.0%	0.0%	0.0%	0.0%	2.9%	32.3%	32.4%	32.4%
2000	$307,900	0.0%	0.0%	0.0%	0.0%	13.2%	47.4%	28.9%	10.5%
1999	$263,300	0.0%	0.0%	0.0%	5.9%	42.0%	38.4%	12.3%	1.4%
1998	$228,000	0.0%	0.0%	2.3%	14.0%	46.5%	20.9%	11.6%	4.7%
1997	$218,000	0.0%	0.0%	0.0%	33.3%	40.5%	14.3%	9.5%	2.4%
1996	$197,000	0.0%	0.0%	7.6%	43.4%	28.3%	11.3%	9.4%	0.0%
1995	$186,500	0.0%	2.4%	9.5%	54.8%	23.8%	7.1%	2.4%	0.0%
1994	$208,500	0.0%	0.0%	0.0%	43.6%	38.4%	15.4%	2.6%	0.0%
1993	$195,000	0.0%	0.0%	2.9%	51.4%	28.5%	8.6%	8.6%	0.0%
1992	$204,300	0.0%	0.0%	15.6%	28.1%	18.8%	28.1%	9.4%	0.0%
1991	$220,000	0.0%	0.0%	3.7%	18.5%	44.5%	11.1%	18.5%	3.7%
1990	$225,900	0.0%	0.0%	4.2%	31.2%	18.8%	22.9%	22.9%	0.0%
1989	$235,500	0.0%	0.0%	15.6%	21.9%	17.2%	31.2%	14.1%	0.0%
1988	$145,600	1.8%	0.0%	55.6%	25.9%	5.6%	9.3%	1.8%	0.0%
1987	$131,900	0.0%	0.0%	78.6%	21.4%	0.0%	0.0%	0.0%	0.0%

TABLE 7-A, CONT'D

DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)

	MEDIAN PRICE	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
SAN BERNARDINO									
2001	$212,500	0.0%	0.9%	17.4%	22.0%	28.2%	22.0%	6.2%	3.3%
2000	$200,500	0.0%	3.4%	20.8%	25.3%	23.4%	17.5%	5.1%	4.5%
1999	$183,800	0.3%	8.5%	24.9%	28.2%	19.5%	12.7%	3.1%	2.8%
1998	$162,000	1.6%	13.4%	25.6%	29.4%	17.5%	10.0%	1.3%	1.2%
1997	$159,000	0.8%	11.5%	30.5%	27.8%	17.3%	9.9%	1.1%	1.1%
1996	$143,000	0.8%	14.1%	38.3%	14.1%	18.2%	13.1%	0.6%	0.8%
1995	$145,000	1.9%	13.5%	36.8%	20.3%	15.9%	11.0%	0.6%	0.0%
1994	$161,000	0.4%	10.9%	31.5%	25.4%	20.6%	8.8%	1.5%	0.9%
1993	$168,500	0.2%	8.0%	30.7%	27.4%	20.3%	10.6%	2.2%	0.6%
1992	$181,000	1.1%	6.2%	29.3%	25.1%	22.4%	11.1%	4.4%	0.4%
1991	$172,900	0.6%	5.3%	29.2%	27.8%	17.5%	12.1%	5.6%	1.9%
1990	$168,600	1.0%	7.2%	29.3%	28.7%	15.4%	12.8%	3.5%	2.1%
1989	$154,000	1.5%	12.0%	32.9%	29.0%	11.8%	8.3%	2.6%	1.9%
1988	$134,000	3.3%	19.2%	41.1%	22.2%	10.6%	3.0%	0.3%	0.3%
1987	$124,900	10.3%	22.9%	39.8%	18.0%	6.0%	1.9%	0.7%	0.4%
SAN DIEGO									
2001	$355,000	0.0%	0.2%	0.7%	3.7%	12.7%	22.0%	24.9%	35.8%
2000	$295,000	0.0%	0.3%	1.2%	10.7%	19.8%	23.1%	17.2%	27.7%
1999	$285,000	0.1%	0.1%	1.3%	15.1%	20.7%	24.3%	18.0%	20.4%
1998	$266,900	0.0%	0.6%	2.7%	18.0%	21.6%	22.5%	16.9%	17.7%
1997	$235,900	0.1%	1.3%	8.0%	22.7%	23.7%	21.2%	13.6%	9.4%
1996	$230,000	0.2%	0.9%	8.2%	26.1%	23.4%	24.0%	11.2%	6.0%
1995	$225,400	0.0%	0.7%	7.6%	28.4%	23.4%	24.6%	9.9%	5.4%
1994	$221,600	0.1%	2.6%	8.7%	25.8%	30.4%	18.4%	8.6%	5.4%
1993	$225,000	0.0%	1.3%	7.8%	25.0%	33.1%	18.4%	9.0%	5.4%
1992	$225,000	0.0%	1.0%	8.3%	22.2%	33.6%	19.3%	8.7%	6.9%
1991	$235,500	0.0%	0.6%	7.1%	23.2%	26.3%	23.8%	10.9%	8.1%
1990	$242,500	0.0%	1.0%	6.9%	20.0%	25.3%	24.8%	13.5%	8.5%
1989	$225,000	0.3%	1.3%	9.9%	26.7%	22.3%	20.5%	11.9%	7.1%
1988	$174,000	0.1%	3.1%	28.9%	34.5%	15.0%	9.1%	5.7%	3.6%
1987	$158,000	0.1%	4.2%	38.7%	34.3%	10.2%	7.5%	2.8%	2.2%
SAN FRANCISCO									
2001	$623,500	0.0%	0.0%	0.0%	0.0%	0.0%	8.1%	12.9%	79.0%
2000	$513,500	0.0%	0.0%	3.3%	4.8%	4.8%	4.8%	12.9%	69.4%
1999	$396,000	0.0%	0.0%	0.0%	1.5%	1.5%	19.1%	35.3%	42.6%
1998	$318,000	0.0%	0.0%	0.0%	6.8%	13.7%	31.5%	32.9%	15.1%
1997	$276,000	0.0%	0.0%	1.0%	19.8%	14.6%	35.4%	25.0%	4.2%
1996	$245,000	0.0%	0.0%	8.0%	18.6%	23.9%	33.6%	15.0%	0.9%
1995	$232,500	0.0%	0.0%	15.7%	17.6%	21.3%	19.5%	13.9%	12.0%
1994	$225,000	0.0%	0.0%	10.5%	28.6%	19.0%	21.9%	13.3%	6.7%
1993	$215,000	0.0%	1.0%	5.1%	33.3%	26.3%	17.2%	14.1%	3.0%
1992	$235,000	0.0%	2.5%	10.7%	22.9%	23.8%	20.5%	13.9%	5.7%
1991	$250,000	0.0%	2.1%	6.2%	17.2%	22.1%	33.1%	13.8%	5.5%
1990	$272,000	0.0%	0.0%	2.4%	22.4%	17.6%	28.8%	10.4%	18.4%
1989	$297,500	0.0%	0.0%	3.7%	19.4%	11.2%	25.4%	25.4%	14.9%
1988	$233,500	0.0%	0.7%	9.4%	26.6%	16.5%	14.4%	10.1%	22.3%
1987	$220,000	0.0%	0.7%	13.7%	26.6%	21.6%	20.9%	7.2%	9.3%
SAN JOAQUIN									
2001	$205,000	0.0%	0.6%	9.9%	37.6%	22.8%	19.8%	7.4%	1.9%
2000	$179,000	0.0%	2.9%	22.2%	44.4%	17.3%	9.9%	2.9%	0.4%
1999	$170,000	0.0%	5.5%	25.7%	43.1%	14.2%	10.1%	1.4%	0.0%
1998	$175,100	0.0%	5.9%	23.0%	38.2%	21.7%	7.9%	2.0%	1.3%
1997	$160,500	0.7%	2.7%	33.8%	32.4%	23.7%	4.7%	1.3%	0.7%
1996	$159,500	0.8%	11.6%	27.1%	36.4%	20.2%	2.3%	1.6%	0.0%
1995	$161,000	0.0%	7.9%	33.8%	37.4%	13.0%	6.5%	0.7%	0.7%
1994	$157,400	0.0%	7.3%	34.9%	38.5%	9.9%	7.3%	2.1%	0.0%
1993	$161,700	0.0%	3.6%	32.3%	43.0%	12.7%	4.4%	3.2%	0.8%
1992	$162,300	0.0%	3.0%	23.7%	50.8%	11.1%	7.2%	2.7%	1.5%
1991	$178,000	0.0%	4.7%	18.0%	47.4%	22.2%	6.8%	0.9%	0.0%
1990	$176,400	0.3%	3.5%	25.9%	37.6%	20.8%	8.4%	3.2%	0.3%
1989	$148,000	0.0%	8.2%	43.1%	34.3%	9.7%	3.8%	0.3%	0.6%
1988	$128,600	2.5%	17.7%	53.1%	15.9%	5.8%	3.9%	1.1%	0.0%
1987	$116,900	4.8%	25.3%	51.2%	9.1%	4.8%	4.2%	0.6%	0.0%

TABLE 7-A, CONTINUED. (NOT ADJUSTED FOR INFLATION.)

		DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)							
	MEDIAN PRICE	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
SAN LUIS OBISPO									
2001	$309,000	0.0%	0.0%	2.7%	12.8%	15.6%	20.2%	24.8%	23.9%
2000	$277,000	0.0%	0.0%	2.9%	24.8%	14.6%	16.2%	28.4%	13.1%
1999	$224,000	0.0%	0.0%	6.8%	30.6%	21.8%	21.1%	12.2%	7.5%
1998	$210,000	0.0%	0.5%	11.5%	34.6%	22.0%	20.9%	9.4%	1.1%
1997	$186,000	0.6%	0.0%	17.0%	38.8%	21.2%	16.4%	3.6%	2.4%
1996	$183,000	0.0%	2.6%	16.2%	40.2%	21.4%	15.4%	3.4%	0.8%
1995	$174,900	0.0%	2.5%	21.4%	37.6%	19.7%	14.5%	4.3%	0.0%
1994	$179,900	0.0%	1.9%	24.1%	36.7%	16.5%	15.8%	4.4%	0.6%
1993	$195,000	0.0%	1.0%	22.1%	28.8%	8.7%	27.9%	9.6%	1.9%
1992	$205,000	0.0%	0.0%	14.8%	33.3%	13.9%	21.3%	6.5%	10.2%
1991	$235,000	0.0%	0.7%	8.8%	25.0%	17.7%	25.7%	10.3%	11.8%
1990	$240,000	0.4%	0.4%	3.8%	29.2%	18.7%	22.9%	14.0%	10.6%
1989	$183,500	0.0%	3.7%	33.8%	17.5%	17.5%	17.1%	7.5%	2.9%
1988	$135,000	0.7%	8.1%	47.8%	29.3%	8.1%	3.7%	1.9%	0.4%
1987	$126,900	0.0%	26.1%	36.5%	28.7%	5.2%	1.7%	0.9%	0.9%
SAN MATEO									
2001	$570,500	0.0%	0.0%	1.8%	1.8%	0.0%	0.0%	10.9%	85.5%
2000	$592,500	0.0%	0.0%	0.0%	0.0%	1.7%	3.3%	10.0%	85.0%
1999	$446,000	0.0%	0.0%	0.0%	2.1%	2.2%	7.5%	28.0%	60.2%
1998	$400,000	0.0%	0.0%	0.0%	1.0%	5.1%	23.2%	27.3%	43.4%
1997	$410,000	0.0%	0.0%	0.9%	3.5%	5.3%	26.6%	15.9%	47.8%
1996	$295,300	0.0%	0.0%	0.9%	11.9%	15.2%	33.0%	16.1%	22.9%
1995	$337,400	0.0%	0.0%	3.3%	8.9%	10.0%	24.4%	26.7%	26.7%
1994	$380,000	0.0%	0.0%	0.0%	4.9%	17.3%	12.3%	23.5%	42.0%
1993	$352,500	0.0%	0.0%	2.8%	8.3%	15.3%	18.0%	15.3%	40.3%
1992	$322,000	0.0%	0.0%	1.2%	1.3%	15.0%	33.7%	20.0%	28.8%
1991	$363,500	0.0%	0.8%	1.6%	4.0%	11.9%	20.6%	23.0%	38.1%
1990	$380,500	0.0%	0.5%	1.6%	6.8%	11.1%	15.3%	25.8%	38.9%
1989	$368,700	0.0%	0.0%	3.5%	8.8%	7.7%	14.1%	27.7%	38.2%
1988	$270,000	0.0%	0.5%	13.3%	14.8%	12.3%	27.6%	18.2%	13.3%
1987	$216,000	0.0%	3.0%	15.8%	23.6%	20.6%	18.8%	9.1%	9.1%
SANTA BARBARA									
2001	$214,000	0.0%	0.0%	0.0%	39.0%	31.7%	7.3%	9.8%	12.2%
2000	$257,000	0.0%	4.5%	0.0%	31.1%	13.3%	20.0%	17.8%	13.3%
1999	$204,500	0.0%	0.0%	24.5%	24.6%	8.8%	19.3%	12.3%	10.5%
1998	$200,000	0.0%	4.2%	22.5%	21.1%	24.0%	14.1%	8.5%	5.6%
1997	$191,700	0.0%	0.0%	15.7%	39.3%	20.2%	12.4%	4.5%	7.9%
1996	$159,000	1.3%	3.8%	31.6%	34.2%	11.4%	6.3%	7.6%	3.8%
1995	$155,000	0.0%	4.8%	38.1%	34.9%	4.8%	6.3%	6.3%	4.8%
1994	$152,800	0.0%	5.5%	37.0%	28.8%	12.3%	11.0%	2.7%	2.7%
1993	$153,500	0.0%	8.1%	37.1%	29.0%	9.7%	9.7%	1.6%	4.8%
1992	$190,000	0.0%	1.1%	22.1%	31.6%	21.0%	15.8%	4.2%	4.2%
1991	$165,000	0.0%	0.8%	17.5%	50.0%	10.8%	6.7%	7.5%	6.7%
1990	$174,400	0.0%	0.8%	23.2%	36.8%	8.8%	11.2%	7.2%	12.0%
1989	$169,500	0.0%	4.8%	29.4%	26.0%	9.6%	13.7%	6.2%	10.3%
1988	$152,000	0.6%	8.7%	37.3%	17.4%	11.2%	9.9%	5.6%	9.3%
1987	$148,200	0.0%	8.5%	45.1%	15.8%	12.2%	11.0%	3.7%	3.7%

TABLE 7-A, CONT'D

	MEDIAN PRICE	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION) UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
SANTA CLARA									
2001	$600,000	0.0%	0.0%	0.0%	1.3%	0.0%	1.3%	15.8%	81.6%
2000	$587,500	0.0%	0.0%	0.0%	0.6%	0.0%	5.4%	18.1%	75.9%
1999	$460,800	0.0%	0.0%	0.0%	0.9%	5.1%	14.6%	24.0%	55.4%
1998	$372,000	0.0%	0.0%	2.8%	3.1%	9.7%	21.7%	26.2%	36.5%
1997	$364,500	0.0%	0.0%	1.4%	5.7%	12.5%	22.1%	23.4%	34.9%
1996	$320,000	0.0%	0.6%	2.6%	16.3%	10.5%	21.0%	19.0%	30.0%
1995	$292,500	0.0%	1.1%	11.2%	12.3%	12.7%	20.2%	23.5%	19.0%
1994	$280,000	0.0%	1.4%	4.3%	15.2%	17.3%	25.5%	16.8%	19.5%
1993	$288,000	0.0%	0.3%	6.2%	15.8%	15.2%	26.0%	15.8%	20.7%
1992	$278,000	0.0%	0.3%	5.9%	12.1%	14.8%	32.7%	16.8%	17.4%
1991	$325,000	0.0%	0.0%	2.5%	9.1%	12.9%	24.8%	18.9%	31.8%
1990	$390,000	0.0%	1.0%	3.2%	8.5%	6.6%	16.4%	23.0%	41.3%
1989	$290,000	0.0%	1.4%	11.0%	19.9%	10.7%	17.1%	16.2%	23.7%
1988	$206,400	0.0%	2.8%	17.5%	27.2%	17.4%	11.8%	10.0%	13.3%
1987	$177,500	0.0%	1.8%	26.3%	30.9%	10.4%	12.8%	7.7%	10.1%
SANTA CRUZ									
2001	$527,500	0.0%	0.0%	0.0%	0.0%	0.0%	8.3%	25.0%	66.7%
2000	$480,000	0.0%	0.0%	0.0%	0.0%	5.0%	12.5%	17.5%	65.0%
1999	$372,500	0.0%	0.0%	0.0%	6.0%	4.5%	7.5%	49.2%	32.8%
1998	$365,000	0.0%	2.1%	2.1%	2.2%	8.5%	17.0%	31.9%	36.2%
1997	$303,200	0.0%	0.0%	0.0%	8.1%	14.5%	38.7%	22.6%	16.1%
1996	$272,200	0.0%	0.0%	2.0%	12.0%	20.0%	36.0%	16.0%	14.0%
1995	$260,200	0.0%	0.0%	0.0%	17.4%	21.7%	41.3%	10.9%	8.7%
1994	$229,500	0.0%	0.0%	6.6%	34.4%	21.3%	16.4%	14.7%	6.6%
1993	$248,500	0.0%	0.0%	11.1%	25.0%	13.9%	22.2%	19.5%	8.3%
1992	$265,000	0.0%	0.0%	3.9%	19.6%	19.6%	23.6%	23.5%	9.8%
1991	$300,000	0.0%	0.0%	2.0%	10.0%	14.0%	32.0%	24.0%	18.0%
1990	$299,500	0.0%	0.0%	1.2%	9.8%	7.3%	41.5%	28.0%	12.2%
1989	$269,000	0.0%	2.4%	2.4%	25.0%	17.9%	13.1%	19.0%	20.2%
1988	$195,000	0.9%	1.9%	27.1%	23.4%	20.6%	14.0%	8.4%	3.7%
1987	$165,000	1.9%	5.7%	24.5%	35.9%	9.4%	11.3%	9.4%	1.9%
SHASTA									
2001	$132,000	0.0%	5.4%	59.5%	21.6%	2.7%	8.1%	2.7%	0.0%
2000	$135,000	1.7%	6.8%	59.3%	22.0%	5.1%	1.7%	3.4%	0.0%
1999	$128,500	0.0%	8.6%	51.1%	24.3%	8.9%	5.7%	1.4%	0.0%
1998	$129,000	0.0%	15.6%	44.4%	15.6%	17.8%	4.4%	2.2%	0.0%
1997	$126,000	1.2%	30.0%	42.5%	15.0%	3.8%	2.5%	3.8%	1.2%
1996	$129,500	1.7%	10.2%	59.3%	15.2%	6.8%	5.1%	1.7%	0.0%
1995	$132,500	0.0%	11.7%	53.3%	16.7%	11.7%	5.0%	1.6%	0.0%
1994	$115,500	0.0%	18.6%	60.5%	13.9%	4.7%	2.3%	0.0%	0.0%
1993	$125,000	0.0%	11.4%	58.2%	16.5%	6.3%	5.1%	2.5%	0.0%
1992	$126,500	0.0%	14.5%	55.5%	19.7%	6.0%	4.3%	0.0%	0.0%
1991	$120,000	3.5%	13.8%	56.3%	12.6%	9.2%	3.4%	1.2%	0.0%
1990	$115,000	0.5%	33.5%	51.6%	9.1%	2.4%	2.9%	0.0%	0.0%
1989	$ 96,500	9.7%	48.8%	36.6%	3.7%	1.2%	0.0%	0.0%	0.0%
1988	$ 76,700	38.2%	44.7%	14.6%	2.5%	0.0%	0.0%	0.0%	0.0%
1987	$ 75,500	32.0%	60.0%	4.0%	4.0%	0.0%	0.0%	0.0%	0.0%
SOLANO									
2001	$285,000	0.0%	0.0%	0.0%	25.0%	20.0%	18.7%	28.8%	7.5%
2000	$275,000	0.0%	0.0%	3.4%	16.2%	22.2%	30.8%	21.4%	6.0%
1999	$218,000	0.0%	0.0%	5.4%	35.7%	26.4%	15.5%	11.6%	5.4%
1998	$209,000	0.0%	0.9%	7.1%	35.4%	29.2%	17.7%	7.9%	1.8%
1997	$194,000	0.9%	0.9%	8.1%	46.0%	25.2%	18.0%	0.9%	0.0%
1996	$204,000	2.4%	2.4%	3.5%	37.6%	29.4%	20.0%	1.2%	3.5%
1995	$180,000	2.4%	1.2%	18.1%	42.2%	18.1%	14.4%	2.4%	1.2%
1994	$187,700	0.6%	2.4%	12.7%	42.4%	23.7%	15.8%	2.4%	0.0%
1993	$196,800	0.0%	0.0%	12.4%	40.1%	26.7%	15.4%	4.9%	0.5%
1992	$199,900	0.0%	0.5%	10.9%	37.1%	30.6%	17.0%	3.9%	0.0%
1991	$225,000	0.0%	0.0%	6.3%	31.1%	31.6%	24.7%	5.8%	0.5%
1990	$198,500	0.0%	0.3%	9.1%	42.1%	27.6%	12.9%	7.2%	0.8%
1989	$180,000	0.0%	1.0%	19.1%	48.7%	16.1%	13.6%	1.5%	0.0%
1988	$150,000	0.0%	2.8%	47.0%	41.2%	8.1%	0.2%	0.7%	0.0%
1987	$136,900	0.0%	8.9%	58.3%	28.7%	4.1%	0.0%	0.0%	0.0%

TABLE 7-A, CONTINUED. (NOT ADJUSTED FOR INFLATION.)

	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)								
	MEDIAN PRICE	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
SONOMA									
2001	$328,200	0.0%	0.0%	0.0%	2.7%	8.2%	32.9%	23.3%	32.9%
2000	$279,000	0.0%	0.0%	0.0%	8.9%	26.8%	26.8%	22.0%	15.5%
1999	$231,300	0.0%	1.8%	8.9%	20.6%	24.1%	19.6%	17.0%	8.0%
1998	$236,200	0.0%	0.0%	10.9%	18.2%	28.2%	24.5%	10.9%	7.3%
1997	$237,000	0.0%	0.8%	8.3%	28.8%	17.4%	18.9%	12.9%	12.9%
1996	$220,000	0.0%	0.0%	7.6%	32.6%	18.2%	25.0%	14.4%	2.2%
1995	$195,700	0.0%	0.0%	9.9%	45.1%	19.1%	13.7%	6.1%	6.1%
1994	$213,000	0.0%	0.0%	12.0%	29.3%	26.2%	25.7%	3.7%	3.1%
1993	$219,200	0.0%	2.2%	10.0%	30.0%	22.8%	25.6%	7.2%	2.2%
1992	$232,900	0.0%	0.0%	2.6%	34.6%	24.6%	22.8%	10.1%	5.3%
1991	$215,200	0.0%	0.6%	3.0%	32.5%	30.8%	20.7%	7.7%	4.7%
1990	$211,800	0.0%	0.8%	7.0%	32.4%	29.5%	13.9%	7.8%	8.6%
1989	$187,500	1.5%	2.3%	14.6%	45.2%	19.2%	8.4%	4.2%	4.6%
1988	$156,800	0.6%	2.6%	41.9%	29.3%	13.4%	8.1%	3.2%	0.9%
1987	$130,000	2.8%	11.5%	50.7%	20.8%	8.3%	3.5%	2.1%	0.3%
STANISLAUS									
2001	$180,600	0.0%	0.0%	23.6%	39.1%	25.5%	8.2%	3.6%	0.0%
2000	$143,000	0.8%	1.5%	60.6%	26.5%	5.3%	3.0%	1.5%	0.8%
1999	$137,300	0.0%	4.5%	60.7%	23.2%	7.1%	2.7%	0.9%	0.9%
1998	$132,400	0.0%	9.6%	61.8%	19.1%	7.8%	0.0%	0.0%	1.7%
1997	$122,500	3.2%	16.8%	63.2%	11.6%	2.1%	3.1%	0.0%	0.0%
1996	$118,300	0.8%	13.6%	68.6%	13.6%	1.7%	1.7%	0.0%	0.0%
1995	$124,200	0.0%	18.0%	61.1%	13.9%	2.8%	1.4%	1.4%	1.4%
1994	$123,300	0.0%	8.3%	67.5%	16.7%	2.5%	4.2%	0.8%	0.0%
1993	$125,000	0.0%	10.6%	65.3%	21.1%	1.0%	0.0%	1.0%	1.0%
1992	$122,900	0.4%	15.3%	63.4%	18.1%	1.4%	0.0%	1.4%	0.0%
1991	$147,300	0.0%	2.7%	49.0%	40.6%	3.1%	0.8%	2.3%	1.5%
1990	$147,000	0.4%	3.8%	47.9%	35.9%	7.4%	2.5%	1.3%	0.8%
1989	$123,000	0.2%	22.1%	60.4%	11.3%	1.8%	1.6%	2.1%	0.5%
1988	$ 97,800	2.6%	51.7%	34.5%	6.8%	3.4%	1.0%	0.0%	0.0%
1987	$ 87,200	17.6%	50.5%	24.9%	4.8%	2.2%	0.0%	0.0%	0.0%
SUTTER									
2001	$134,800	0.0%	5.6%	61.1%	33.3%	0.0%	0.0%	0.0%	0.0%
2000	$140,400	0.0%	0.0%	52.9%	35.3%	11.8%	0.0%	0.0%	0.0%
1999	$120,800	0.0%	10.7%	75.0%	14.3%	0.0%	0.0%	0.0%	0.0%
1998	$120,500	0.0%	15.8%	71.1%	10.5%	0.0%	0.0%	2.6%	0.0%
1997	$117,000	0.0%	15.4%	53.8%	23.1%	7.7%	0.0%	0.0%	0.0%
1996	$121,500	0.0%	15.4%	53.8%	23.1%	7.7%	0.0%	0.0%	0.0%
1995	$125,000	0.0%	12.2%	61.2%	22.5%	0.0%	4.1%	0.0%	0.0%
1994	$126,500	0.0%	13.4%	70.2%	14.9%	1.5%	0.0%	0.0%	0.0%
1993	$130,000	1.4%	4.1%	65.3%	26.4%	1.4%	0.0%	1.4%	0.0%
1992	$138,000	0.0%	1.2%	60.5%	34.6%	2.5%	0.0%	0.0%	1.2%
1991	$135,000	0.0%	6.6%	55.3%	27.6%	5.3%	1.3%	2.6%	1.3%
1990	$130,000	4.7%	5.6%	68.9%	17.0%	1.9%	1.9%	0.0%	0.0%
1989	$110,000	2.6%	28.2%	53.8%	7.7%	2.6%	2.6%	0.0%	2.5%
1988	$100,800	0.0%	46.1%	43.6%	2.6%	5.1%	2.6%	0.0%	0.0%
1987	$ 95,800	2.3%	50.0%	43.2%	2.3%	2.2%	0.0%	0.0%	0.0%

TABLE 7-A, CONTINUED. (NOT ADJUSTED FOR INFLATION.)

	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)								
	MEDIAN PRICE	UNDER $70,000	$70,000-$99,999	$100,000-$149,999	$150,000-$199,999	$200,000-$249,999	$250,000-$324,999	$325,000-$424,999	$425,000 and over
TULARE									
2001	$130,900	0.0%	15.9%	46.2%	25.0%	8.3%	3.8%	0.8%	0.0%
2000	$112,200	0.0%	30.8%	50.0%	11.0%	4.1%	2.7%	0.7%	0.7%
1999	$115,100	1.4%	32.4%	46.0%	13.0%	2.2%	4.3%	0.7%	0.0%
1998	$114,000	1.6%	35.2%	45.6%	10.4%	4.8%	1.6%	0.8%	0.0%
1997	$108,400	2.0%	35.5%	49.3%	5.9%	6.6%	0.0%	0.7%	0.0%
1996	$106,400	1.2%	38.5%	46.5%	11.5%	1.7%	0.6%	0.0%	0.0%
1995	$109,600	2.0%	35.7%	47.4%	12.3%	2.0%	0.6%	0.0%	0.0%
1994	$110,000	5.1%	31.6%	45.4%	11.7%	4.1%	1.6%	0.5%	0.0%
1993	$110,000	2.9%	33.1%	41.0%	10.1%	6.5%	5.0%	0.7%	0.7%
1992	$110,000	4.8%	32.7%	37.5%	13.7%	6.5%	3.6%	0.0%	1.2%
1991	$119,000	6.8%	25.3%	36.4%	19.1%	6.8%	3.1%	2.5%	0.0%
1990	$108,900	4.3%	33.1%	43.5%	12.6%	2.9%	2.5%	1.1%	0.0%
1989	$ 99,800	11.5%	39.4%	40.4%	2.9%	1.9%	3.9%	0.0%	0.0%
1988	$ 85,000	18.9%	55.5%	23.2%	1.2%	1.2%	0.0%	0.0%	0.0%
1987	$ 78,000	38.0%	38.0%	16.4%	5.1%	2.5%	0.0%	0.0%	0.0%
VENTURA									
2001	$387,200	0.0%	0.0%	5.0%	9.2%	10.8%	15.0%	19.2%	40.8%
2000	$392,900	0.0%	0.0%	2.8%	5.5%	14.9%	15.4%	19.9%	41.5%
1999	$369,500	0.0%	0.0%	3.6%	8.2%	8.8%	14.4%	28.9%	36.1%
1998	$302,100	0.0%	0.0%	3.9%	13.0%	15.6%	20.8%	31.1%	15.6%
1997	$245,000	0.6%	0.6%	8.2%	17.6%	24.5%	28.9%	12.0%	7.6%
1996	$253,000	0.0%	1.4%	1.4%	13.0%	32.2%	31.5%	10.9%	9.6%
1995	$245,200	0.0%	0.0%	3.3%	24.7%	23.3%	31.3%	10.7%	6.7%
1994	$246,000	0.0%	0.0%	3.8%	23.1%	24.6%	31.5%	13.5%	3.5%
1993	$257,000	0.0%	0.0%	2.7%	17.1%	28.9%	26.7%	16.6%	8.0%
1992	$285,000	0.0%	0.0%	4.7%	9.4%	18.7%	33.9%	19.3%	14.0%
1991	$280,000	0.0%	0.0%	3.9%	9.2%	19.8%	33.3%	19.3%	14.5%
1990	$295,000	0.0%	0.0%	3.6%	10.8%	19.3%	21.1%	22.0%	23.2%
1989	$310,000	0.0%	0.0%	2.5%	13.8%	13.0%	25.2%	20.8%	24.7%
1988	$259,500	0.0%	0.4%	8.0%	18.7%	18.9%	30.0%	14.2%	9.8%
1987	$198,800	0.0%	1.9%	16.6%	32.6%	25.6%	12.5%	7.9%	2.9%
YOLO									
2001	$244,800	0.0%	0.0%	3.8%	32.7%	13.5%	13.5%	26.9%	9.6%
2000	$253,500	0.0%	0.0%	8.0%	28.0%	14.0%	22.0%	18.0%	10.0%
1999	$218,300	0.0%	0.0%	13.6%	28.4%	22.7%	17.1%	12.5%	5.7%
1998	$183,400	0.0%	1.3%	21.0%	44.7%	21.1%	5.3%	5.3%	1.3%
1997	$165,000	0.0%	0.0%	27.8%	51.1%	13.3%	6.7%	1.1%	0.0%
1996	$167,500	0.0%	0.0%	22.4%	55.2%	19.4%	1.5%	0.0%	1.5%
1995	$172,000	0.0%	6.8%	23.7%	39.0%	23.7%	1.7%	5.1%	0.0%
1994	$170,000	0.0%	3.1%	17.5%	49.5%	18.6%	6.2%	5.1%	0.0%
1993	$216,400	0.0%	0.0%	11.8%	33.8%	33.8%	10.3%	8.8%	1.5%
1992	$210,000	0.0%	0.0%	16.5%	29.1%	16.5%	17.7%	17.7%	2.5%
1991	$180,000	0.0%	8.0%	21.3%	29.3%	10.7%	13.3%	14.7%	2.7%
1990	$148,000	0.0%	4.6%	45.9%	21.1%	12.8%	9.2%	6.4%	0.0%
1989	$125,500	0.0%	22.7%	44.0%	25.8%	3.0%	1.5%	3.0%	0.0%
1988	$124,600	1.1%	38.6%	38.6%	13.7%	3.4%	4.6%	0.0%	0.0%
1987	$ 97,800	4.2%	58.3%	16.6%	12.5%	4.2%	4.2%	0.0%	0.0%

Prepared by Construction Industry Research Board using samples of reported new-home sales including attached and detached, including condominiums. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 7-B
DISTRIBUTION OF NEW-HOME SALES BY PRICE RANGE --- HIGHEST RANGES
(INCLUDES SALES OF DETACHED AND ATTACHED UNITS, INCLUDING CONDOS)
CALIFORNIA AND SELECTED COUNTIES, 1996-2001

	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)					
	MEDIAN PRICE	UNDER $250,000	$250,000-$324,999	$325,000-$424,999	$425,000-$599,999	$600,000 and over
CALIFORNIA						
2001 Sales	$256,000	47.9%	17.7%	13.6%	11.5%	9.3%
2000 Sales	$243,000	52.0%	15.9%	12.3%	10.4%	9.4%
1999 Sales	$225,200	56.9%	15.0%	12.1%	9.0%	7.0%
1998 Sales	$208,500	62.5%	13.7%	10.8%	7.6%	5.4%
1997 Sales	$199,000	66.7%	13.6%	9.3%	6.1%	4.3%
1996 Sales	$189,900	70.5%	14.8%	7.7%	4.5%	2.5%
SELECTED COUNTIES						
ALAMEDA						
2001 Sales	$517,000	4.2%	8.5%	14.4%	42.4%	30.5%
2000 Sales	$441,000	7.3%	7.3%	29.2%	33.8%	22.4%
1999 Sales	$392,700	5.6%	19.8%	37.1%	20.6%	16.9%
1998 Sales	$340,000	18.7%	26.8%	22.8%	12.5%	19.2%
1997 Sales	$303,500	30.7%	25.8%	21.0%	10.0%	12.5%
1996 Sales	$287,800	33.7%	29.4%	20.1%	10.3%	6.5%
CONTRA COSTA						
2001 Sales	$364,200	11.1%	23.7%	35.9%	17.2%	12.1%
2000 Sales	$303,600	26.1%	29.6%	21.8%	12.9%	9.6%
1999 Sales	$267,500	40.7%	21.3%	14.0%	11.2%	12.8%
1998 Sales	$272,500	42.7%	18.8%	14.2%	14.7%	9.6%
1997 Sales	$250,000	49.4%	14.4%	15.6%	10.9%	9.7%
1996 Sales	$260,500	44.6%	23.4%	12.4%	14.0%	5.6%
LOS ANGELES						
2001 Sales	$318,700	39.0%	12.4%	13.3%	16.0%	19.3%
2000 Sales	$297,500	41.1%	15.3%	12.5%	12.5%	18.6%
1999 Sales	$295,800	41.1%	15.5%	14.3%	12.0%	17.1%
1998 Sales	$292,000	42.7%	11.3%	14.3%	17.7%	14.0%
1997 Sales	$257,000	49.3%	13.6%	14.6%	11.8%	10.7%
1996 Sales	$230,000	53.7%	16.2%	14.2%	9.2%	6.7%
MARIN						
2001 Sales	$670,000	0.0%	4.7%	4.8%	28.6%	61.8%
2000 Sales	$550,000	2.1%	17.0%	14.9%	19.2%	46.8%
1999 Sales	$525,000	15.6%	8.6%	10.3%	19.0%	46.5%
1998 Sales	$545,500	20.1%	4.4%	4.4%	40.0%	31.1%
1997 Sales	$526,700	17.7%	6.5%	11.3%	30.6%	33.9%
1996 Sales	$447,500	21.6%	2.7%	21.6%	24.3%	29.8%
ORANGE						
2001 Sales	$407,700	10.8%	17.4%	24.3%	23.9%	23.6%
2000 Sales	$396,600	20.9%	14.7%	19.6%	24.3%	20.5%
1999 Sales	$347,300	22.7%	22.2%	15.6%	22.6%	16.9%
1998 Sales	$335,600	29.7%	18.0%	20.9%	19.4%	12.0%
1997 Sales	$249,700	50.0%	19.0%	15.8%	9.1%	6.1%
1996 Sales	$238,000	56.2%	22.2%	12.3%	7.0%	2.3%

TABLE 7-B, CONTINUED. (HIGHEST RANGES, NOT ADJUSTED FOR INFLATION.)

	DISTRIBUTION OF SALES BY PRICE RANGE (NOT ADJUSTED FOR INFLATION)					
	MEDIAN PRICE	UNDER $250,000	$250,000-$324,999	$325,000-$424,999	$425,000-$599,999	$600,000 and over
SAN DIEGO						
2001 Sales	$355,000	17.3%	22.0%	24.9%	19.0%	16.8%
2000 Sales	$295,000	32.0%	23.1%	17.2%	15.5%	12.2%
1999 Sales	$285,000	37.3%	24.3%	18.0%	10.2%	10.2%
1998 Sales	$266,900	42.9%	22.5%	16.9%	10.6%	7.1%
1997 Sales	$235,900	55.8%	21.2%	13.6%	7.3%	2.1%
1996 Sales	$230,000	58.8%	24.0%	11.2%	4.7%	1.3%
SAN FRANCISCO						
2001 Sales	$632,500	0.0%	8.0%	12.9%	21.0%	58.0%
2000 Sales	$513,500	12.9%	4.8%	12.9%	35.5%	33.9%
1999 Sales	$396,000	3.0%	19.1%	35.3%	33.8%	8.8%
1998 Sales	$318,000	20.5%	31.5%	32.9%	15.1%	0.0%
1997 Sales	$276,000	35.4%	35.4%	25.0%	3.1%	1.1%
1996 Sales	$245,000	50.5%	33.6%	15.0%	0.9%	0.0%
SAN MATEO						
2001 Sales	$570,500	3.6%	0.0%	10.9%	45.5%	40.0%
2000 Sales	$592,500	1.7%	3.3%	10.0%	36.7%	48.3%
1999 Sales	$446,000	4.3%	7.5%	28.0%	32.3%	27.9%
1998 Sales	$400,000	6.1%	23.2%	27.3%	23.2%	20.2%
1997 Sales	$410,000	9.7%	26.6%	15.9%	23.0%	24.8%
1996 Sales	$295,300	28.0%	33.0%	16.1%	10.2%	12.7%
SANTA CLARA						
2001 Sales	$600,000	1.3%	1.3%	15.8%	30.3%	51.3%
2000 Sales	$587,500	0.6%	5.4%	18.1%	27.7%	48.2%
1999 Sales	$460,800	6.0%	14.6%	24.0%	29.6%	25.8%
1998 Sales	$372,000	15.6%	21.7%	26.2%	14.8%	21.7%
1997 Sales	$364,500	19.6%	22.1%	23.4%	21.3%	13.6%
1996 Sales	$320,000	30.0%	21.0%	19.0%	16.6%	13.4%
VENTURA						
2001 Sales	$387,200	25.0%	15.0%	19.2%	24.2%	16.6%
2000 Sales	$392,900	23.2%	15.4%	19.9%	24.9%	16.6%
1999 Sales	$369,500	20.6%	14.4%	28.9%	25.3%	10.8%
1998 Sales	$302,100	32.5%	20.8%	31.1%	11.7%	3.9%
1997 Sales	$245,000	51.5%	28.9%	12.0%	5.1%	2.5%
1996 Sales	$253,000	48.0%	31.5%	10.9%	7.5%	2.1%

Prepared by Construction Industry Research Board using samples of reported new-home sales including attached and detached, including condominiums. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-A
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

2001

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$265,400	2,120	61.6%	$374,600	1,570	10.7%	$416,000	2,515	27.7%
SELECTED COUNTIES									
ALAMEDA	$551,600	2,245	26.3%	$310,800	1,255	16.1%	$602,300	2,520	57.6%
BUTTE	$189,200	1,825	100.0%	---	---	0.0%	---	---	0.0%
CONTRA COSTA	$381,100	2,665	77.3%	$320,800	1,290	4.5%	$578,100	2,320	18.2%
EL DORADO	$357,000	2,500	45.9%	*	*	1.6%	$411,200	3,040	52.5%
FRESNO	$158,100	1,880	93.6%	---	---	0.0%	*	*	6.4%
HUMBOLDT	$165,200	1,665	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$155,200	1,715	95.9%	*	*	4.1%	---	---	0.0%
KERN	$143,600	1,810	85.4%	---	---	0.0%	$244,800	2,355	14.6%
KINGS	$130,500	1,665	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$171,200	1,600	85.7%	---	---	0.0%	*	*	14.3%
LOS ANGELES	$396,700	2,510	42.3%	$386,700	1,860	35.3%	$502,700	2,825	22.4%
MADERA	$131,600	1,665	98.5%	---	---	0.0%	*	*	1.5%
MARIN	$912,900	2,460	47.6%	$377,300	1,360	14.3%	$682,200	2,450	38.1%
MERCED	$160,500	1,615	100.0%	---	---	0.0%	---	---	0.0%
MONTEREY	$294,500	1,765	87.3%	*	*	1.8%	*	*	10.9%
NAPA	$407,200	2,254	80.8%	*	*	3.8%	*	*	15.4%
NEVADA	$303,800	2,285	46.7%	---	---	0.0%	$392,700	2,360	53.3%
ORANGE	$498,300	2,795	6.9%	$305,300	1,570	34.4%	$596,300	2,895	58.7%
PLACER	$268,600	2,240	73.6%	*	*	3.0%	$330,700	2,165	23.4%
RIVERSIDE	$241,800	2,560	61.1%	$256,200	2,370	4.9%	$271,700	2,390	34.0%
SACRAMENTO	$225,200	2,030	61.7%	*	*	1.4%	$251,900	2,140	36.9%
SAN BENITO	$399,800	2,110	97.1%	---	---	0.0%	*	*	2.9%
SAN BERNARDINO	$217,500	2,310	81.8%	*	*	0.4%	$254,500	2,225	17.8%
SAN DIEGO	$398,300	2,455	21.2%	$345,700	1,510	20.0%	$454,200	2,820	58.8%
SAN FRANCISCO	*	*	8.1%	$636,200	1,160	91.9%	---	---	0.0%
SAN JOAQUIN	$222,752	2,000	80.2%	---	---	0.0%	$229,500	2,070	19.8%
SAN LUIS OBISPO	$325,300	1,985	64.2%	$203,300	1,075	5.5%	$371,500	2,120	30.3%
SAN MATEO	$679,900	2,140	49.1%	$508,800	1,295	32.7%	$688,800	2,105	18.2%
SANTA BARBARA	$237,600	1,830	78.0%	*	*	4.9%	$434,800	1,980	17.1%
SANTA CLARA	$707,800	2,445	52.6%	$458,600	1,395	26.3%	$658,400	2,100	21.1%
SANTA CRUZ	$590,100	2,240	41.7%	*	*	8.3%	$475,900	1,980	50.0%
SHASTA	$148,000	1,590	94.6%	*	*	2.7%	*	*	2.7%
SOLANO	$303,800	2,200	76.3%	*	*	1.2%	$230,200	1,730	22.5%
SONOMA	$363,500	1,855	80.8%	---	---	0.0%	$461,100	2,235	19.2%
STANISLAUS	$190,800	1,875	98.2%	---	---	0.0%	*	*	1.8%
SUTTER	$144,000	1,655	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$144,600	1,790	99.2%	---	---	0.0%	*	*	0.8%
VENTURA	$394,900	2,460	27.5%	$268,600	1,705	14.2%	$447,000	2,725	58.3%
YOLO	$250,600	1,870	84.6%	*	*	1.9%	*	*	13.5%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-B
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

2000

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$266,000	2,115	60.2%	$316,100	1,530	9.6%	$394,800	2,485	30.2%
SELECTED COUNTIES									
ALAMEDA	$481,500	2,260	29.2%	$276,700	1,260	5.2%	$502,100	2,405	65.6%
BUTTE	$178,000	1,865	91.4%	---	---	0.0%	*	*	8.6%
CONTRA COSTA	$334,900	2,445	75.7%	$320,900	1,510	2.9%	$532,100	2,475	21.4%
EL DORADO	$324,400	2,695	58.6%	---	---	0.0%	$324,200	2,610	41.4%
FRESNO	$147,800	1,850	90.1%	---	---	0.0%	*	*	9.9%
HUMBOLDT	$154,000	1,610	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$155,100	1,730	90.3%	*	*	7.3%	*	*	2.4%
KERN	$137,600	1,760	80.7%	---	---	0.0%	$207,200	2,150	19.3%
KINGS	$115,900	1,515	98.4%	---	---	0.0%	*	*	1.6%
LAKE	$159,600	1,700	89.5%	---	---	0.0%	*	*	10.5%
LOS ANGELES	$413,600	2,310	46.2%	$369,800	1,850	26.6%	$406,800	2,435	27.2%
MADERA	$114,800	1,540	93.3%	---	---	0.0%	*	*	6.7%
MARIN	$940,800	2,800	61.7%	$280,100	1,245	23.4%	$600,700	2,140	14.9%
MERCED	$138,900	1,625	100.0%	---	---	0.0%	---	---	0.0%
MONTEREY	$295,600	2,010	74.5%	*	*	2.2%	$480,900	2,520	23.3%
NAPA	$365,500	2,120	93.3%	*	*	4.5%	*	*	2.2%
NEVADA	$240,700	1,910	65.5%	*	*	3.5%	$325,700	2,260	31.0%
ORANGE	$567,500	2,845	9.2%	$232,400	1,360	21.5%	$509,900	2,800	69.3%
PLACER	$248,700	2,180	53.2%	*	*	3.6%	$316,700	2,200	43.2%
RIVERSIDE	$226,900	2,515	57.0%	$211,200	1,910	4.1%	$287,900	2,500	38.9%
SACRAMENTO	$199,600	2,010	71.5%	$ 85,900	970	6.1%	$240,100	2,185	22.4%
SAN BENITO	$328,400	2,185	92.1%	---	---	0.0%	*	*	7.9%
SAN BERNARDINO	$208,700	2,305	82.3%	*	*	1.1%	$290,200	2,530	16.6%
SAN DIEGO	$392,400	2,395	32.8%	$298,800	1,575	19.3%	$385,900	2,495	47.9%
SAN FRANCISCO	*	*	8.1%	$514,100	1,285	90.3%	*	*	1.6%
SAN JOAQUIN	$189,400	1,900	79.4%	*	*	0.8%	$185,900	1,925	19.8%
SAN LUIS OBISPO	$276,500	1,935	66.4%	*	*	4.4%	$351,800	2,175	29.2%
SAN MATEO	$687,800	2,810	15.0%	$504,700	1,360	40.0%	$642,200	2,165	45.0%
SANTA BARBARA	$280,700	2,150	73.3%	*	*	6.7%	*	*	20.0%
SANTA CLARA	$662,300	2,755	61.4%	$413,900	1,480	13.9%	$588,300	2,435	24.7%
SANTA CRUZ	$509,500	2,305	55.0%	*	*	5.0%	$525,200	2,080	40.0%
SHASTA	$141,900	1,620	98.3%	---	---	0.0%	*	*	1.7%
SOLANO	$280,700	2,325	82.9%	*	*	0.9%	$275,800	2,215	16.2%
SONOMA	$329,700	1,910	85.4%	---	---	0.0%	$309,400	2,010	14.6%
STANISLAUS	$159,200	1,725	98.5%	---	---	0.0%	*	*	1.5%
SUTTER	$157,100	2,120	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$120,600	1,505	96.6%	*	*	1.4%	*	*	2.0%
VENTURA	$335,800	2,240	24.9%	$276,200	1,770	17.1%	$487,600	3,115	58.0%
YOLO	$275,400	2,100	92.0%	*	*	2.0%	*	*	6.0%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-C
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1999

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$245,700	2,050	61.3%	$276,800	1,545	9.5%	$361,300	2,455	29.2%
SELECTED COUNTIES									
ALAMEDA	$482,900	2,495	46.4%	$244,800	1,290	10.1%	$442,500	2,295	43.5%
BUTTE	$167,800	1,795	90.1%	*	*	1.2%	*	*	8.6%
CONTRA COSTA	$309,500	2,360	72.1%	$300,900	1,485	3.9%	$465,900	2,465	24.0%
EL DORADO	$291,900	2,485	47.8%	*	*	4.4%	$268,100	2,400	47.8%
FRESNO	$152,300	1,925	86.4%	*	*	0.5%	$157,000	1,875	13.1%
HUMBOLDT	$157,500	1,655	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$143,600	1,705	100.0%	---	---	0.0%	---	---	0.0%
KERN	$134,500	1,775	83.5%	---	---	0.0%	$174,700	2,090	16.5%
KINGS	$118,600	1,555	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$157,900	1,830	62.5%	---	---	0.0%	*	*	37.5%
LOS ANGELES	$364,000	2,385	46.8%	$284,600	1,720	23.4%	$487,900	3,145	29.7%
MADERA	$120,200	1,575	97.0%	---	---	0.0%	*	*	3.0%
MARIN	$809,900	2,620	48.3%	*	*	5.2%	$472,400	2,130	46.5%
MERCED	$124,100	1,560	100.0%	---	---	0.0%	---	---	0.0%
MONTEREY	$266,900	1,810	90.5%	*	*	2.4%	*	*	7.1%
NAPA	$325,700	1,970	92.8%	*	*	3.6%	*	*	3.6%
NEVADA	$224,500	1,695	56.5%	---	---	0.0%	$274,100	2,055	43.5%
ORANGE	$355,800	2,345	13.5%	$254,000	1,525	23.6%	$481,100	2,760	62.9%
PLACER	$209,100	1,985	50.7%	*	*	1.0%	$281,700	2,160	48.3%
RIVERSIDE	$185,900	2,165	55.2%	$206,100	1,910	7.1%	$248,100	2,310	37.7%
SACRAMENTO	$194,100	2,050	75.2%	*	*	1.0%	$221,200	2,245	23.8%
SAN BENITO	$271,500	1,915	94.5%	---	---	0.0%	*	*	5.5%
SAN BERNARDINO	$182,900	2,165	87.3%	*	*	1.4%	$235,200	2,395	11.3%
SAN DIEGO	$341,500	2,410	28.7%	$253,500	1,595	20.4%	$336,000	2,590	50.9%
SAN FRANCISCO	$414,300	2,065	16.2%	$425,911	1,315	82.3%	*	*	1.5%
SAN JOAQUIN	$179,600	1,875	90.4%	*	*	0.4%	$159,100	1,875	9.2%
SAN LUIS OBISPO	$252,900	1,885	70.1%	*	*	3.4%	$280,600	1,850	26.5%
SAN MATEO	$557,100	2,345	34.4%	$386,900	1,385	28.0%	$536,000	2,115	37.6%
SANTA BARBARA	$230,600	1,890	50.9%	*	*	10.5%	$303,000	1,990	38.6%
SANTA CLARA	$562,200	2,530	62.2%	$309,800	1,225	13.7%	$443,900	2,065	24.0%
SANTA CRUZ	$405,100	2,080	74.6%	*	*	11.9%	*	*	13.5%
SHASTA	$142,700	1,695	98.6%	---	---	0.0%	*	*	1.4%
SOLANO	$244,000	2,190	82.9%	*	*	3.1%	$233,500	1,945	14.0%
SONOMA	$285,400	1,945	71.4%	*	*	1.8%	$201,400	1,525	26.8%
STANISLAUS	$151,300	1,765	97.3%	---	---	0.0%	*	*	2.7%
SUTTER	$127,100	1,765	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$126,600	1,585	99.3%	---	---	0.0%	*	*	0.7%
VENTURA	$340,200	2,380	28.9%	$232,300	1,690	17.0%	$463,200	3,080	54.1%
YOLO	$238,300	2,200	92.0%	*	*	2.3%	*	*	5.7%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-D
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1998

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$231,200	2,060	60.2%	$248,700	1,510	9.7%	$326,400	2,355	30.1%
SELECTED COUNTIES									
ALAMEDA	$457,300	2,570	41.5%	$192,700	1,205	13.4%	$404,600	2,195	45.1%
BUTTE	$167,100	1,850	91.1%	---	---	0.0%	*	*	8.9%
CONTRA COSTA	$305,400	2,415	68.2%	$217,000	1,425	4.6%	$412,700	2,340	27.2%
EL DORADO	$252,100	2,265	39.8%	*	*	2.4%	$267,200	2,495	57.8%
FRESNO	$148,600	1,940	87.5%	*	*	2.9%	$195,000	2,240	9.6%
HUMBOLDT	$147,400	1,670	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$144,200	1,785	94.4%	*	*	3.7%	*	*	1.9%
KERN	$126,400	1,755	84.6%	---	---	0.0%	$173,000	2,045	15.4%
KINGS	$109,400	1,380	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$148,500	1,765	75.0%	---	---	0.0%	*	*	25.0%
LOS ANGELES	$352,300	2,455	40.9%	$289,200	1,775	27.1%	$429,400	2,980	32.0%
MADERA	$119,500	1,715	97.8%	---	---	0.0%	*	*	2.2%
MARIN	$731,200	2,900	60.0%	*	*	4.4%	$443,800	2,075	35.6%
MERCED	$117,700	1,525	100.0%	---	---	0.0%	---	---	0.0%
MONTEREY	$220,300	1,885	76.2%	*	*	3.8%	$284,100	1,770	20.0%
NAPA	$272,800	1,700	89.1%	*	*	2.2%	*	*	8.7%
NEVADA	$244,200	2,010	74.1%	---	---	0.0%	$209,300	1,880	25.9%
ORANGE	$373,600	2,525	13.0%	$216,900	1,535	17.3%	$416,100	2,785	69.7%
PLACER	$201,000	2,175	46.7%	*	*	2.4%	$249,700	2,040	50.9%
RIVERSIDE	$165,600	2,085	60.9%	$159,000	1,610	4.5%	$213,100	2,130	34.6%
SACRAMENTO	$174,900	1,945	72.6%	*	*	0.3%	$199,600	1,920	27.1%
SAN BENITO	$250,200	1,915	95.4%	---	---	0.0%	*	*	4.6%
SAN BERNARDINO	$172,000	2,080	88.5%	*	*	3.4%	$185,200	2,160	8.1%
SAN DIEGO	$343,000	2,565	29.9%	$216,800	1,510	20.4%	$338,500	2,555	49.7%
SAN FRANCISCO	$320,900	1,830	20.5%	$344,700	1,160	65.8%	$256,600	1,540	13.7%
SAN JOAQUIN	$179,300	1,910	94.7%	---	---	0.0%	*	*	5.3%
SAN LUIS OBISPO	$212,700	1,765	71.2%	*	*	1.6%	$254,400	1,920	27.2%
SAN MATEO	$564,600	2,420	37.4%	$336,000	1,375	30.3%	$482,300	2,070	32.3%
SANTA BARBARA	$223,600	1,945	63.4%	*	*	7.0%	$230,700	1,910	29.6%
SANTA CLARA	$529,100	2,550	50.4%	$273,600	1,230	17.9%	$393,000	1,975	31.7%
SANTA CRUZ	$361,800	2,085	46.8%	*	*	10.6%	$397,000	2,200	42.6%
SHASTA	$154,300	1,775	97.8%	---	---	0.0%	*	*	2.2%
SOLANO	$227,100	2,315	87.6%	*	*	3.5%	*	*	8.9%
SONOMA	$267,900	1,975	80.9%	*	*	0.9%	$229,200	1,680	18.2%
STANISLAUS	$142,200	1,730	93.9%	---	---	0.0%	*	*	6.1%
SUTTER	$130,200	1,885	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$124,500	1,635	99.2%	---	---	0.0%	*	*	0.8%
VENTURA	$325,400	2,400	36.4%	$250,100	1,855	26.0%	$368,500	2,620	37.6%
YOLO	$194,200	1,960	97.4%	*	*	1.3%	*	*	1.3%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-E
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1997

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$219,400	2,020	59.5%	$219,600	1,480	10.5%	$297,400	2,290	30.0%
SELECTED COUNTIES									
ALAMEDA	$381,400	2,425	42.4%	$175,600	1,225	10.7%	$361,100	2,220	46.9%
BUTTE	$167,800	1,830	80.8%	*	*	1.9%	*	*	17.3%
CONTRA COSTA	$298,600	2,330	48.2%	$194,200	1,320	12.1%	$374,700	2,345	39.7%
EL DORADO	$232,200	2,320	54.8%	*	*	2.2%	$282,200	2,755	43.0%
FRESNO	$127,000	1,720	95.0%	---	---	0.0%	$179,700	1,890	5.0%
HUMBOLDT	$145,300	1,600	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$126,900	1,605	92.0%	*	*	4.8%	*	*	3.2%
KERN	$129,200	1,770	91.5%	---	---	0.0%	$188,200	2,255	8.5%
KINGS	$117,100	1,550	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$149,200	1,740	65.6%	---	---	0.0%	$148,300	1,970	34.4%
LOS ANGELES	$312,900	2,410	44.8%	$249,300	1,745	22.1%	$363,000	2,785	33.1%
MADERA	$120,700	1,745	88.2%	*	*	2.0%	*	*	9.8%
MARIN	$657,800	2,745	59.7%	*	*	12.9%	$415,500	2,095	27.4%
MERCED	$109,500	1,520	100.0%	---	---	0.0%	---	---	0.0%
MONTEREY	$251,900	1,930	79.4%	*	*	1.9%	$272,100	1,855	18.7%
NAPA	$246,700	1,665	61.0%	*	*	12.2%	$326,700	2,070	26.8%
NEVADA	$205,200	2,020	73.5%	---	---	0.0%	$215,300	1,990	26.5%
ORANGE	$357,200	2,680	6.0%	$198,800	1,550	19.9%	$325,100	2,440	74.1%
PLACER	$186,400	2,025	49.6%	*	*	1.5%	$249,600	2,185	48.9%
RIVERSIDE	$157,900	2,035	70.0%	$204,700	1,840	3.0%	$201,900	2,085	27.0%
SACRAMENTO	$165,200	1,920	77.9%	*	*	0.3%	$185,700	1,900	21.8%
SAN BENITO	$224,300	1,930	92.9%	---	---	0.0%	*	*	7.1%
SAN BERNARDINO	$170,400	2,055	84.6%	$142,900	1,495	2.5%	$187,900	2,190	12.9%
SAN DIEGO	$288,200	2,400	37.0%	$186,100	1,480	20.2%	$286,000	2,405	42.8%
SAN FRANCISCO	$298,600	2,045	15.6%	$300,400	1,210	67.7%	$216,400	1,565	16.7%
SAN JOAQUIN	$175,600	1,975	88.5%	*	*	1.4%	$157,500	1,745	10.1%
SAN LUIS OBISPO	$205,800	1,780	73.3%	*	*	1.2%	$204,400	1,630	25.5%
SAN MATEO	$598,300	2,680	41.6%	$319,800	1,340	29.2%	$421,900	2,005	29.2%
SANTA BARBARA	$207,800	1,795	41.5%	$226,800	1,395	19.1%	$233,500	2,015	39.4%
SANTA CLARA	$462,200	2,480	54.5%	$214,600	1,270	15.3%	$380,900	2,025	30.2%
SANTA CRUZ	$354,800	2,155	67.8%	$260,200	1,055	16.1%	$277,400	1,885	16.1%
SHASTA	$142,200	1,720	97.5%	---	---	0.0%	*	*	2.5%
SOLANO	$208,300	2,210	90.1%	*	*	0.9%	$156,200	1,380	9.0%
SONOMA	$270,700	2,000	86.4%	---	---	0.0%	$206,700	1,545	13.6%
STANISLAUS	$127,300	1,580	98.9%	---	---	0.0%	*	*	1.1%
SUTTER	$131,000	1,810	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$117,200	1,535	100.0%	---	---	0.0%	---	---	0.0%
VENTURA	$265,300	2,180	47.2%	$210,600	1,690	23.9%	$312,600	2,475	28.9%
YOLO	$177,400	1,880	94.4%	*	*	5.6%	---	---	0.0%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-F
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1996

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$201,600	1,965	59.9%	$208,200	1,410	12.0%	$275,000	2,220	28.1%
SELECTED COUNTIES									
ALAMEDA	$361,500	2,485	49.1%	$207,200	1,390	12.1%	$312,100	2,105	38.8%
BUTTE	$155,800	1,855	84.1%	*	*	2.3%	*	*	13.6%
CONTRA COSTA	$299,300	2,410	48.7%	$190,400	1,345	9.8%	$328,000	2,215	41.5%
EL DORADO	$231,800	2,345	60.9%	*	*	4.3%	$247,300	2,490	34.8%
FRESNO	$133,400	1,760	95.3%	*	*	0.4%	$159,800	1,905	4.3%
HUMBOLDT	$145,200	1,580	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$134,700	1,705	96.7%	*	*	3.3%	---	---	0.0%
KERN	$127,300	1,780	89.0%	---	---	0.0%	$141,200	1,795	11.0%
KINGS	$116,200	1,555	96.2%	---	---	0.0%	*	*	3.8%
LAKE	$129,800	1,605	63.6%	---	---	0.0%	*	*	36.4%
LOS ANGELES	$259,500	2,215	41.7%	$234,300	1,640	24.9%	$338,900	1,955	33.4%
MADERA	$105,400	1,500	98.0%	---	---	0.0%	*	*	2.0%
MARIN	$663,400	2,920	46.0%	*	*	10.8%	$443,500	1,955	43.2%
MERCED	$112,400	1,465	100.0%	---	---	0.0%	---	---	0.0%
MONTEREY	$226,000	1,800	80.7%	*	*	6.8%	$238,300	1,970	12.5%
NAPA	$237,900	1,785	72.7%	*	*	6.8%	$318,000	2,155	20.5%
NEVADA	$197,100	1,865	60.6%	*	*	3.0%	$225,200	1,990	36.4%
ORANGE	$330,300	2,575	7.9%	$198,100	1,530	20.9%	$286,200	2,315	71.2%
PLACER	$200,200	2,125	50.6%	*	*	2.3%	$234,900	2,155	47.1%
RIVERSIDE	$151,600	1,945	69.2%	$211,700	1,885	5.0%	$185,800	2,010	25.8%
SACRAMENTO	$162,500	1,905	74.2%	*	*	1.7%	$184,600	1,935	24.1%
SAN BENITO	$205,000	1,835	81.1%	---	---	0.0%	$272,300	2,390	18.9%
SAN BERNARDINO	$172,300	2,040	83.7%	$133,700	1,435	5.4%	$158,300	1,925	10.9%
SAN DIEGO	$259,200	2,275	37.0%	$172,800	1,410	20.7%	$281,900	2,410	42.3%
SAN FRANCISCO	$271,500	1,995	12.4%	$251,800	1,110	82.3%	*	*	5.3%
SAN JOAQUIN	$162,600	1,895	83.0%	*	*	1.5%	$179,800	1,885	15.5%
SAN LUIS OBISPO	$202,500	1,810	84.6%	*	*	4.3%	$190,900	1,585	11.1%
SAN MATEO	$599,700	2,695	23.7%	$244,200	1,280	44.9%	$402,100	2,025	31.4%
SANTA BARBARA	$189,500	1,755	51.9%	*	*	11.4%	$218,800	1,935	36.7%
SANTA CLARA	$447,800	2,465	47.2%	$214,400	1,280	26.8%	$384,900	2,180	26.0%
SANTA CRUZ	$334,600	1,970	44.0%	*	*	22.0%	$269,200	1,810	34.0%
SHASTA	$145,000	1,765	93.2%	*	*	1.7%	*	*	5.1%
SOLANO	$219,400	2,240	84.7%	*	*	4.7%	$251,700	2,225	10.6%
SONOMA	$254,900	1,935	75.0%	---	---	0.0%	$206,400	1,610	25.0%
STANISLAUS	$125,200	1,575	95.8%	---	---	0.0%	*	*	4.2%
SUTTER	$134,000	1,920	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$113,700	1,490	98.3%	---	---	0.0%	*	*	1.7%
VENTURA	$272,500	2,280	51.4%	$218,900	1,705	17.1%	$323,000	2,632	31.5%
YOLO	$178,600	1,910	98.5%	*	*	1.5%	---	---	0.0%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-G
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1995

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$205,100	1,970	62.1%	$206,500	1,445	10.4%	$273,700	2,215	27.5%
SELECTED COUNTIES									
ALAMEDA	$336,400	2,300	57.3%	$178,800	1,295	7.6%	$364,400	2,330	35.1%
BUTTE	$153,900	1,760	87.5%	---	---	0.0%	$153,000	1,790	12.5%
CONTRA COSTA	$281,300	2,225	52.9%	$165,300	1,215	4.4%	$318,800	2,185	42.7%
EL DORADO	$223,100	2,245	80.7%	*	*	2.8%	*	*	16.5%
FRESNO	$143,800	1,885	95.8%	---	---	0.0%	$213,300	2,145	4.2%
HUMBOLDT	$145,300	1,620	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$130,200	1,735	97.9%	*	*	2.1%	---	---	0.0%
KERN	$140,500	1,860	87.7%	---	---	0.0%	$138,700	1,895	12.3%
KINGS	$114,300	1,555	95.4%	---	---	0.0%	*	*	4.6%
LAKE	$164,700	1,805	48.1%	---	---	0.0%	$141,900	1,835	51.9%
LOS ANGELES	$265,500	2,200	40.0%	$209,500	1,535	28.2%	$396,300	2,815	31.8%
MADERA	$124,700	1,725	96.5%	---	---	0.0%	*	*	3.5%
MARIN	$589,500	2,695	77.6%	*	*	6.1%	$515,800	2,690	16.3%
MERCED	$119,600	1,565	98.4%	---	---	0.0%	*	*	1.6%
MONTEREY	$203,400	1,750	81.8%	*	*	6.1%	$165,400	1,615	12.1%
NAPA	$293,600	2,190	49.0%	---	---	0.0%	$295,500	1,960	51.0%
NEVADA	$200,900	1,760	51.1%	---	---	0.0%	$257,300	2,130	48.9%
ORANGE	$317,900	2,490	11.2%	$213,600	1,605	19.8%	$284,600	2,285	69.0%
PLACER	$184,300	2,030	67.4%	*	*	0.9%	$257,200	2,375	31.7%
RIVERSIDE	$159,800	1,965	61.9%	$181,500	1,770	3.7%	$179,400	2,065	34.4%
SACRAMENTO	$166,200	1,890	80.2%	*	*	0.9%	$197,600	1,960	18.9%
SAN BENITO	$196,900	1,820	97.6%	---	---	0.0%	*	*	2.4%
SAN BERNARDINO	$166,200	1,995	86.0%	*	*	4.7%	$146,600	1,865	9.3%
SAN DIEGO	$262,900	2,300	41.7%	$181,700	1,495	17.6%	$259,700	2,280	40.7%
SAN FRANCISCO	$432,900	2,590	18.5%	$253,900	1,165	77.8%	*	*	3.7%
SAN JOAQUIN	$170,800	1,905	88.5%	---	---	0.0%	$153,400	1,745	11.5%
SAN LUIS OBISPO	$197,500	1,780	84.6%	*	*	0.9%	$182,600	1,525	14.5%
SAN MATEO	$580,200	2,540	40.0%	$224,700	1,255	30.0%	$436,400	2,205	30.0%
SANTA BARBARA	$221,600	1,770	55.5%	*	*	4.8%	$178,500	1,805	39.7%
SANTA CLARA	$444,600	2,520	36.9%	$212,700	1,405	29.5%	$283,400	1,810	33.6%
SANTA CRUZ	$298,700	1,915	63.0%	*	*	15.2%	$228,300	1,615	21.8%
SHASTA	$150,600	1,775	93.3%	---	---	0.0%	*	*	6.7%
SOLANO	$200,700	1,995	86.8%	*	*	3.6%	$220,700	1,940	9.6%
SONOMA	$229,600	1,770	81.7%	*	*	3.0%	$239,200	1,895	15.3%
STANISLAUS	$134,900	1,615	94.4%	*	*	1.4%	*	*	4.2%
SUTTER	$134,200	1,895	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$116,000	1,535	98.7%	---	---	0.0%	*	*	1.3%
VENTURA	$246,700	2,095	59.3%	$222,600	1,785	16.7%	$364,800	2,740	24.0%
YOLO	$178,300	1,780	96.6%	---	---	0.0%	*	*	3.4%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-H
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1994

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$207,000	1,970	65.2%	$197,200	1,400	10.0%	$268,300	2,205	24.8%
SELECTED COUNTIES									
ALAMEDA	$328,600	2,245	52.8%	$172,600	1,165	14.5%	$304,700	2,045	32.7%
BUTTE	$154,400	1,760	85.9%	*	*	2.3%	$152,900	1,705	11.8%
CONTRA COSTA	$244,700	2,145	56.4%	$167,300	1,165	6.6%	$306,600	2,280	37.0%
EL DORADO	$215,700	2,110	96.5%	---	---	0.0%	*	*	3.5%
FRESNO	$150,900	1,990	95.5%	*	*	0.3%	$209,200	2,100	4.2%
HUMBOLDT	$139,000	1,580	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$132,900	1,715	99.2%	*	*	0.8%	---	---	0.0%
KERN	$142,100	1,880	88.2%	---	---	0.0%	$119,200	1,615	11.8%
KINGS	$124,300	1,615	98.9%	---	---	0.0%	*	*	1.1%
LAKE	$123,800	1,530	50.0%	---	---	0.0%	$129,200	1,670	50.0%
LOS ANGELES	$308,200	2,350	42.8%	$215,300	1,635	27.0%	$363,400	2,565	30.2%
MADERA	$115,100	1,610	83.3%	---	---	0.0%	$140,900	2,030	16.7%
MARIN	$751,200	2,995	67.2%	$233,300	1,310	9.8%	$347,100	2,090	23.0%
MERCED	$122,000	1,570	98.9%	---	---	0.0%	*	*	1.1%
MONTEREY	$194,900	1,705	88.7%	*	*	0.8%	$311,900	2,195	10.5%
NAPA	$262,300	2,005	90.2%	*	*	1.6%	$302,400	1,785	8.2%
NEVADA	$218,900	1,875	54.2%	---	---	0.0%	$210,300	1,820	45.8%
ORANGE	$347,500	2,630	14.5%	$197,000	1,485	18.4%	$294,800	2,390	67.1%
PLACER	$195,600	2,075	90.9%	---	---	0.0%	$253,500	2,410	9.1%
RIVERSIDE	$162,900	1,985	64.5%	$272,600	2,330	3.0%	$179,500	2,000	32.5%
SACRAMENTO	$167,500	1,855	79.2%	*	*	2.1%	$211,300	2,160	18.7%
SAN BENITO	$217,200	1,855	89.7%	---	---	0.0%	*	*	10.3%
SAN BERNARDINO	$175,200	1,955	90.1%	*	*	3.3%	$175,900	1,820	6.6%
SAN DIEGO	$262,500	2,300	49.8%	$163,800	1,320	18.4%	$257,500	2,255	31.8%
SAN FRANCISCO	$393,500	2,315	18.1%	$231,600	1,045	79.0%	*	*	2.9%
SAN JOAQUIN	$158,200	1,720	88.0%	*	*	1.0%	$213,200	2,085	11.0%
SAN LUIS OBISPO	$196,100	1,740	79.1%	*	*	3.8%	$196,700	1,605	17.1%
SAN MATEO	$657,300	3,010	48.1%	$269,600	1,315	21.0%	$439,700	2,335	30.9%
SANTA BARBARA	$207,300	1,900	53.4%	$187,700	1,150	8.2%	$169,600	1,705	38.4%
SANTA CLARA	$393,300	2,310	43.9%	$209,400	1,325	32.8%	$331,700	2,055	23.3%
SANTA CRUZ	$289,800	1,860	55.8%	*	*	9.8%	$228,400	1,655	34.4%
SHASTA	$128,200	1,555	97.7%	---	---	0.0%	*	*	2.3%
SOLANO	$203,100	2,005	78.2%	*	*	4.2%	$192,800	1,895	17.6%
SONOMA	$236,800	1,895	78.0%	*	*	2.6%	$204,900	1,750	19.4%
STANISLAUS	$138,100	1,645	96.7%	---	---	0.0%	*	*	3.3%
SUTTER	$127,900	1,755	98.5%	---	---	0.0%	*	*	1.5%
TULARE	$119,100	1,545	94.4%	---	---	0.0%	*	*	5.6%
VENTURA	$262,900	2,175	54.2%	$182,600	1,555	15.8%	$306,400	2,440	30.0%
YOLO	$192,600	1,770	95.9%	*	*	3.1%	*	*	1.0%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-I
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1993

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$207,100	1,985	70.5%	$206,400	1,410	11.1%	$264,700	2,210	18.4%
SELECTED COUNTIES									
ALAMEDA	$323,500	2,280	58.3%	$152,900	1,115	14.7%	$327,900	2,200	27.0%
BUTTE	$165,200	1,860	90.5%	---	---	0.0%	*	*	9.5%
CONTRA COSTA	$257,500	2,190	66.4%	$185,400	1,265	7.1%	$343,000	2,455	26.5%
EL DORADO	$213,400	2,115	87.7%	---	---	0.0%	*	*	12.3%
FRESNO	$152,400	1,970	94.8%	*	*	0.3%	$257,100	2,480	4.9%
HUMBOLDT	$129,600	1,550	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$121,700	1,620	98.2%	*	*	0.9%	*	*	0.9%
KERN	$140,400	1,855	94.6%	---	---	0.0%	$120,800	1,690	5.4%
KINGS	$125,600	1,750	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$127,800	1,640	71.8%	---	---	0.0%	$121,700	1,530	28.2%
LOS ANGELES	$324,100	2,380	49.3%	$232,000	1,630	35.7%	$296,800	2,220	14.9%
MADERA	$113,800	1,635	83.6%	*	*	1.6%	$169,800	2,405	14.8%
MARIN	$629,400	2,840	69.6%	*	*	8.7%	$433,800	2,600	21.7%
MERCED	$115,700	1,535	89.1%	---	---	0.0%	$102,500	1,380	10.9%
MONTEREY	$233,500	1,900	97.2%	*	*	1.4%	*	*	1.4%
NAPA	$271,800	2,030	78.4%	*	*	2.7%	*	*	18.9%
NEVADA	$191,600	1,740	68.5%	---	---	0.0%	$208,500	1,820	31.5%
ORANGE	$339,800	2,610	17.0%	$184,500	1,375	26.6%	$300,700	2,415	56.4%
PLACER	$192,700	2,020	88.9%	---	---	0.0%	$255,900	2,345	11.1%
RIVERSIDE	$167,500	1,980	76.4%	$240,200	2,000	3.2%	$169,000	2,050	20.4%
SACRAMENTO	$169,100	1,855	88.2%	*	*	0.2%	$182,600	1,890	11.6%
SAN BENITO	$216,600	1,885	97.1%	*	*	2.9%	---	---	0.0%
SAN BERNARDINO	$175,100	1,955	91.1%	*	*	2.4%	$211,100	2,230	6.5%
SAN DIEGO	$262,000	2,315	50.6%	$185,000	1,340	20.9%	$262,600	2,260	28.5%
SAN FRANCISCO	$284,700	2,190	21.2%	$242,300	1,030	64.6%	*	*	14.2%
SAN JOAQUIN	$164,400	1,760	78.5%	*	*	0.8%	$213,900	2,050	20.7%
SAN LUIS OBISPO	$220,700	1,870	73.1%	*	*	2.9%	*	*	24.0%
SAN MATEO	$667,800	2,965	54.2%	$259,200	1,320	36.1%	*	*	9.7%
SANTA BARBARA	$225,700	1,705	51.6%	$163,300	1,145	16.1%	$187,300	1,900	32.3%
SANTA CLARA	$416,800	2,415	44.6%	$207,100	1,285	34.0%	$357,700	2,225	21.4%
SANTA CRUZ	$306,200	1,955	75.0%	*	*	5.6%	$186,300	1,450	19.4%
SHASTA	$141,200	1,655	91.1%	---	---	0.0%	*	*	8.9%
SOLANO	$207,200	2,000	88.1%	---	---	0.0%	*	*	11.9%
SONOMA	$233,300	1,895	88.9%	*	*	3.9%	$264,600	1,905	7.2%
STANISLAUS	$138,200	1,615	92.5%	*	*	0.5%	*	*	7.0%
SUTTER	$137,200	1,805	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$130,600	1,650	96.4%	---	---	0.0%	*	*	3.6%
VENTURA	$316,800	2,465	51.9%	$210,000	1,610	23.0%	$347,200	2,620	25.1%
YOLO	$213,900	1,935	92.6%	---	---	0.0%	*	*	7.4%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-J
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1992

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$213,500	2,025	72.0%	$213,100	1,410	12.6%	$283,000	2,240	15.4%
SELECTED COUNTIES									
ALAMEDA	$348,200	2,325	58.4%	$181,100	1,215	13.7%	$310,600	2,170	27.9%
BUTTE	$155,200	1,790	90.8%	---	---	0.0%	*	*	9.2%
CONTRA COSTA	$261,000	2,165	62.5%	$174,100	1,255	7.8%	$320,100	2,350	29.7%
EL DORADO	$237,100	2,350	90.2%	---	---	0.0%	*	*	9.8%
FRESNO	$155,800	1,980	91.8%	*	*	0.3%	$192,100	2,095	7.9%
HUMBOLDT	$137,400	1,605	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$115,800	1,600	99.1%	*	*	0.9%	---	---	0.0%
KERN	$144,100	1,895	96.1%	*	*	0.2%	$132,100	1,675	3.7%
KINGS	$126,300	1,785	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$131,900	1,605	74.5%	---	---	0.0%	$124,200	1,610	25.5%
LOS ANGELES	$376,000	2,580	40.1%	$238,600	1,565	47.2%	$373,100	2,505	12.7%
MADERA	$133,100	1,850	95.5%	---	---	0.0%	*	*	4.5%
MARIN	$611,300	2,855	62.2%	*	*	4.5%	$447,800	2,225	33.3%
MERCED	$120,100	1,600	98.4%	---	---	0.0%	*	*	1.6%
MONTEREY	$230,000	1,870	83.2%	*	*	1.1%	$246,600	1,890	15.7%
NAPA	$299,900	2,090	82.9%	*	*	7.1%	*	*	10.0%
NEVADA	$207,900	1,895	55.1%	---	---	0.0%	$213,300	1,795	44.9%
ORANGE	$366,100	2,630	23.3%	$188,300	1,355	30.0%	$321,000	2,465	46.7%
PLACER	$214,500	2,125	91.8%	---	---	0.0%	$272,100	2,510	8.2%
RIVERSIDE	$171,200	2,030	80.8%	$222,000	1,920	3.6%	$215,200	2,245	15.6%
SACRAMENTO	$171,900	1,845	92.1%	*	*	0.7%	$218,200	2,140	7.2%
SAN BENITO	$226,800	2,085	78.1%	---	---	0.0%	$190,200	1,885	21.9%
SAN BERNARDINO	$183,800	2,000	89.4%	$167,300	1,500	3.0%	$217,700	2,150	7.6%
SAN DIEGO	$268,100	2,295	52.3%	$191,400	1,350	20.7%	$282,800	2,295	27.0%
SAN FRANCISCO	$337,600	2,255	18.8%	$223,400	850	69.7%	*	*	11.5%
SAN JOAQUIN	$177,900	1,855	88.5%	*	*	0.4%	$221,700	2,225	11.1%
SAN LUIS OBISPO	$252,300	2,120	83.3%	*	*	6.5%	*	*	10.2%
SAN MATEO	$527,700	2,455	55.0%	$248,700	1,370	23.8%	$322,600	1,925	21.2%
SANTA BARBARA	$205,600	1,815	44.2%	$242,400	1,430	29.5%	$201,000	1,770	26.3%
SANTA CLARA	$407,300	2,275	47.8%	$213,500	1,315	32.7%	$329,300	2,030	19.5%
SANTA CRUZ	$319,900	1,995	70.6%	*	*	3.9%	$240,100	1,515	25.5%
SHASTA	$143,000	1,735	85.5%	*	*	3.4%	$116,800	1,450	11.1%
SOLANO	$211,700	2,075	89.1%	*	*	3.5%	$246,200	2,035	7.4%
SONOMA	$251,300	2,040	88.6%	*	*	1.3%	$258,800	1,915	10.1%
STANISLAUS	$130,600	1,585	95.8%	---	---	0.0%	*	*	4.2%
SUTTER	$148,600	1,875	97.5%	---	---	0.0%	*	*	2.5%
TULARE	$130,000	1,645	99.4%	---	---	0.0%	*	*	0.6%
VENTURA	$323,500	2,475	53.2%	$224,400	1,715	24.0%	$378,000	2,745	22.8%
YOLO	$232,900	1,985	100.0%	---	---	0.0%	---	---	0.0%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 8-K
AVERAGE PRICE, LIVING AREA AND DISTRIBUTION OF NEW-HOME SALES
BY TYPE OF OWNERSHIP
CALIFORNIA AND SELECTED COUNTIES

1991

	SINGLE-FAMILY			CONDOMINIUM			PLANNED-UNIT DEVELOPMENT AND DE-MINIMUS PUD		
	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES	AVERAGE PRICE	LIVING AREA (S.F.)	% OF SALES
CALIFORNIA	$240,800	2,110	73.2%	$222,600	1,420	13.7%	$303,500	2,285	13.1%
SELECTED COUNTIES									
ALAMEDA	$373,400	2,420	65.1%	$167,900	1,080	16.9%	$337,900	2,190	18.0%
BUTTE	$156,900	1,845	95.9%	*	1,240	1.0%	*	*	3.1%
CONTRA COSTA	$314,100	2,415	72.6%	$201,400	1,415	7.8%	$351,600	2,515	19.5%
EL DORADO	$249,600	2,325	92.0%	*	1,410	1.6%	*	*	6.4%
FRESNO	$136,800	1,835	92.1%	---	---	0.0%	$192,200	2,040	7.9%
HUMBOLDT	$141,000	1,655	100.0%	---	---	0.0%	---	---	0.0%
IMPERIAL	$110,100	1,475	98.5%	*	*	1.5%	---	---	0.0%
KERN	$141,100	1,850	97.4%	*	*	0.3%	*	*	2.3%
KINGS	$114,500	1,660	100.0%	---	---	0.0%	---	---	0.0%
LAKE	$141,900	1,755	64.1%	---	---	0.0%	$142,100	1,665	35.9%
LOS ANGELES	$431,900	2,680	46.6%	$249,300	1,565	41.5%	$467,600	2,750	11.9%
MADERA	$108,300	1,610	98.8%	---	---	0.0%	*	*	1.2%
MARIN	$487,000	2,640	62.7%	$240,600	1,275	17.7%	$440,100	2,175	19.6%
MERCED	$141,900	1,785	98.7%	---	---	0.0%	$ 85,000	1,350	1.3%
MONTEREY	$249,600	1,905	88.3%	---	---	0.0%	$258,100	1,740	11.7%
NAPA	$313,800	2,300	88.0%	*	*	4.0%	*	*	8.0%
NEVADA	$220,900	1,910	78.7%	*	*	21.3%	---	---	0.0%
ORANGE	$391,100	2,720	31.6%	$203,600	1,360	30.0%	$359,700	2,550	38.4%
PLACER	$230,400	2,215	88.8%	*	1,650	0.4%	$305,800	2,635	10.8%
RIVERSIDE	$183,300	2,065	75.0%	$201,400	1,735	7.7%	$196,800	2,060	17.3%
SACRAMENTO	$185,100	1,925	93.5%	*	*	1.3%	$246,400	2,195	5.2%
SAN BENITO	$248,200	2,255	92.6%	---	---	0.0%	*	*	7.4%
SAN BERNARDINO	$193,000	2,045	92.4%	$164,900	1,445	1.7%	$240,500	2,230	5.9%
SAN DIEGO	$293,600	2,380	57.1%	$200,400	1,335	21.7%	$267,300	2,205	21.2%
SAN FRANCISCO	$351,100	2,160	10.3%	$260,200	1,170	89.0%	*	*	0.7%
SAN JOAQUIN	$185,100	1,955	91.9%	*	*	1.3%	*	*	6.8%
SAN LUIS OBISPO	$272,500	2,065	81.6%	*	*	7.3%	$300,900	1,865	11.0%
SAN MATEO	$506,300	2,390	65.9%	$258,500	1,395	23.0%	*	*	11.1%
SANTA BARBARA	$289,200	2,020	48.4%	$213,900	1,335	18.3%	$181,200	1,640	33.3%
SANTA CLARA	$482,200	2,460	66.0%	$211,700	1,260	20.1%	$401,800	2,260	13.9%
SANTA CRUZ	$344,700	2,215	74.0%	*	*	2.0%	*	*	24.0%
SHASTA	$139,200	1,715	92.0%	*	*	5.7%	*	*	2.3%
SOLANO	$227,300	2,100	93.1%	*	*	1.6%	*	*	5.3%
SONOMA	$247,500	1,985	91.1%	*	*	3.0%	*	*	5.9%
STANISLAUS	$157,900	1,800	99.2%	---	---	0.0%	*	*	0.8%
SUTTER	$153,200	1,885	100.0%	---	---	0.0%	---	---	0.0%
TULARE	$135,900	1,725	97.5%	---	---	0.0%	*	*	2.5%
VENTURA	$360,500	2,410	50.7%	$228,300	1,575	22.7%	$377,100	2,545	26.6%
YOLO	$214,000	1,850	90.7%	---	---	0.0%	*	*	9.3%

*Insufficient number of sales in category to report average price or living area.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-A
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

2001

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$311,900	2,250	88.8%	$373,900	1,545	11.2%
SELECTED COUNTIES						
ALAMEDA	$588,500	2,460	80.5%	$350,000	1,360	19.5%
BUTTE	$189,200	1,825	100.0%	---	---	0.0%
CONTRA COSTA	$419,400	2,625	92.9%	$346,800	1,420	7.1%
EL DORADO	$385,400	2,775	96.7%	**	**	3.3%
FRESNO	$161,100	1,890	100.0%	---	---	0.0%
HUMBOLDT	$165,200	1,665	100.0%	---	---	0.0%
IMPERIAL	$155,200	1,715	95.9%	**	**	4.1%
KERN	$158,900	1,895	98.9%	**	**	1.1%
KINGS	$130,500	1,665	100.0%	---	---	0.0%
LAKE	$174,200	1,610	100.0%	---	---	0.0%
LOS ANGELES	$430,400	2,590	67.4%	$388,900	1,850	32.6%
MADERA	$136,000	1,695	98.5%	**	**	1.5%
MARIN	$835,700	2,530	81.0%	$378,000	1,315	19.0%
MERCED	$160,500	1,615	100.0%	---	---	0.0%
MONTEREY	$350,300	1,945	98.2%	**	**	1.8%
NAPA	$430,800	2,240	96.2%	**	**	3.8%
NEVADA	$351,200	2,325	100.0%	---	---	0.0%
ORANGE	$570,400	2,815	70.3%	$298,100	1,525	29.7%
PLACER	$289,600	2,275	92.9%	$137,400	1,030	7.1%
RIVERSIDE	$252,500	2,500	95.9%	$256,500	2,345	4.1%
SACRAMENTO	$235,200	2,070	98.6%	$120,800	1,025	1.4%
SAN BENITO	$396,900	2,090	100.0%	---	---	0.0%
SAN BERNARDINO	$224,100	2,295	99.6%	**	**	0.4%
SAN DIEGO	$442,700	2,735	79.3%	$336,000	1,515	20.7%
SAN FRANCISCO	**	**	6.5%	$636,500	1,190	93.5%
SAN JOAQUIN	$224,900	2,015	98.1%	**	**	1.9%
SAN LUIS OBISPO	$341,600	2,040	91.7%	**	**	8.3%
SAN MATEO	$690,300	2,180	61.8%	$520,600	1,330	38.2%
SANTA BARBARA	$273,000	1,855	95.1%	**	**	4.9%
SANTA CLARA	$722,800	2,490	61.8%	$484,400	1,455	38.2%
SANTA CRUZ	$527,200	2,180	83.3%	**	**	16.7%
SHASTA	$153,200	1,630	97.3%	**	**	2.7%
SOLANO	$287,100	2,095	98.8%	**	**	1.2%
SONOMA	$388,200	1,960	94.5%	**	**	5.5%
STANISLAUS	$191,800	1,875	100.0%	---	---	0.0%
SUTTER	$144,000	1,655	100.0%	---	---	0.0%
TULARE	$145,300	1,795	100.0%	---	---	0.0%
VENTURA	$430,300	2,640	85.8%	$268,600	1,705	14.2%
YOLO	$271,900	1,945	98.1%	**	**	1.9%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-B
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

2000

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$308,800	2,245	89.4%	$317,100	1,545	10.6%
SELECTED COUNTIES						
ALAMEDA	$499,300	2,390	91.7%	$319,900	1,380	8.3%
BUTTE	$176,500	1,860	100.0%	---	---	0.0%
CONTRA COSTA	$380,700	2,495	92.9%	$325,500	1,540	7.1%
EL DORADO	$324,300	2,660	100.0%	---	---	0.0%
FRESNO	$156,900	1,905	98.8%	**	**	1.2%
HUMBOLDT	$154,000	1,610	100.0%	---	---	0.0%
IMPERIAL	$157,100	1,720	92.7%	**	**	7.3%
KERN	$151,000	1,835	100.0%	---	---	0.0%
KINGS	$115,100	1,505	100.0%	---	---	0.0%
LAKE	$160,700	1,760	100.0%	---	---	0.0%
LOS ANGELES	$412,000	2,360	73.0%	$367,800	1,850	27.0%
MADERA	$121,200	1,620	100.0%	---	---	0.0%
MARIN	$874,700	2,670	76.6%	$280,100	1,245	23.4%
MERCED	$138,900	1,625	100.0%	---	---	0.0%
MONTEREY	$339,800	2,135	97.8%	**	**	2.2%
NAPA	$383,800	2,165	91.1%	**	**	8.9%
NEVADA	$273,800	2,065	93.1%	**	**	6.9%
ORANGE	$518,200	2,810	77.8%	$235,300	1,385	22.2%
PLACER	$279,300	2,190	96.1%	**	**	3.9%
RIVERSIDE	$249,300	2,190	96.4%	$267,800	2,215	3.6%
SACRAMENTO	$209,600	2,055	93.6%	$ 86,500	980	6.4%
SAN BENITO	$334,200	2,180	97.4%	**	**	2.6%
SAN BERNARDINO	$223,100	2,345	98.0%	**	**	2.0%
SAN DIEGO	$391,400	2,465	79.9%	$291,200	1,560	20.1%
SAN FRANCISCO	**	**	8.1%	$515,000	1,305	91.9%
SAN JOAQUIN	$188,700	1,900	98.8%	**	**	1.2%
SAN LUIS OBISPO	$301,000	2,020	93.4%	**	**	6.6%
SAN MATEO	$658,500	2,350	58.3%	$503,900	1,365	41.7%
SANTA BARBARA	$286,200	2,090	86.7%	**	**	13.3%
SANTA CLARA	$655,900	2,750	78.3%	$442,400	1,595	21.7%
SANTA CRUZ	$524,800	2,235	90.0%	**	**	10.0%
SHASTA	$145,200	1,645	100.0%	---	---	0.0%
SOLANO	$279,900	2,305	99.1%	**	**	0.9%
SONOMA	$334,100	1,975	94.3%	**	**	5.7%
STANISLAUS	$159,400	1,725	99.2%	**	**	0.8%
SUTTER	$157,100	2,120	100.0%	---	---	0.0%
TULARE	$126,400	1,545	99.3%	**	**	0.7%
VENTURA	$441,000	2,845	84.0%	$270,300	1,740	16.0%
YOLO	$279,700	2,135	98.0%	**	**	2.0%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-C
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1999

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$284,000	2,195	88.9%	$270,100	1,520	11.1%
SELECTED COUNTIES						
ALAMEDA	$469,300	2,425	87.1%	$252,200	1,350	12.9%
BUTTE	$167,100	1,790	98.8%	**	**	1.2%
CONTRA COSTA	$357,500	2,445	90.3%	$246,400	1,475	9.7%
EL DORADO	$280,000	2,445	95.5%	**	**	4.5%
FRESNO	$153,000	1,920	98.9%	**	**	1.1%
HUMBOLDT	$157,500	1,655	100.0%	---	---	0.0%
IMPERIAL	$143,600	1,705	100.0%	---	---	0.0%
KERN	$141,100	1,825	100.0%	---	---	0.0%
KINGS	$118,600	1,555	100.0%	---	---	0.0%
LAKE	$152,800	1,840	100.0%	---	---	0.0%
LOS ANGELES	$410,400	2,675	78.6%	$278,900	1,650	21.4%
MADERA	$121,500	1,585	100.0%	---	---	0.0%
MARIN	$768,400	2,615	70.7%	$321,800	1,680	29.3%
MERCED	$124,100	1,560	100.0%	---	---	0.0%
MONTEREY	$272,200	1,825	97.6%	**	**	2.4%
NAPA	$332,300	1,985	96.4%	**	**	3.6%
NEVADA	$246,100	1,855	100.0%	---	---	0.0%
ORANGE	$458,200	2,690	76.4%	$256,400	1,515	23.6%
PLACER	$245,700	2,080	97.6%	**	**	2.4%
RIVERSIDE	$210,700	2,225	92.9%	$213,000	1,880	7.1%
SACRAMENTO	$201,600	2,110	96.9%	**	**	3.1%
SAN BENITO	$273,500	1,925	98.6%	**	**	1.4%
SAN BERNARDINO	$194,900	2,190	98.9%	**	**	1.1%
SAN DIEGO	$359,900	2,545	78.6%	$248,300	1,575	21.4%
SAN FRANCISCO	**	**	11.8%	$420,400	1,365	88.2%
SAN JOAQUIN	$177,700	1,875	99.1%	**	**	0.9%
SAN LUIS OBISPO	$262,800	1,890	93.9%	**	**	6.1%
SAN MATEO	$556,400	2,265	67.7%	$386,300	1,410	32.3%
SANTA BARBARA	$254,300	1,930	82.5%	**	**	17.5%
SANTA CLARA	$549,200	2,495	78.1%	$320,600	1,325	21.9%
SANTA CRUZ	$405,700	2,075	83.6%	**	**	16.4%
SHASTA	$142,400	1,690	100.0%	---	---	0.0%
SOLANO	$242,300	2,145	95.3%	**	**	4.7%
SONOMA	$279,700	1,930	83.9%	$162,500	1,280	16.1%
STANISLAUS	$152,700	1,765	96.4%	**	**	3.6%
SUTTER	$128,500	1,780	96.4%	**	**	3.6%
TULARE	$126,600	1,585	100.0%	---	---	0.0%
VENTURA	$421,000	2,840	84.0%	$216,900	1,595	16.0%
YOLO	$243,500	2,245	93.2%	**	**	6.8%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-D
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1998

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$263,200	2,170	88.3%	$249,300	1,535	11.7%
SELECTED COUNTIES						
ALAMEDA	$440,300	2,415	80.8%	$220,600	1,385	19.2%
BUTTE	$165,700	1,835	100.0%	---	---	0.0%
CONTRA COSTA	$344,800	2,460	88.7%	$218,400	1,470	11.3%
EL DORADO	$261,100	2,400	97.6%	**	**	2.4%
FRESNO	$153,800	1,975	96.3%	**	**	3.7%
HUMBOLDT	$147,400	1,670	100.0%	---	---	0.0%
IMPERIAL	$144,500	1,785	96.3%	**	**	3.7%
KERN	$133,600	1,800	100.0%	---	---	0.0%
KINGS	$109,400	1,380	100.0%	---	---	0.0%
LAKE	$157,600	1,835	100.0%	---	---	0.0%
LOS ANGELES	$386,400	2,680	73.1%	$287,400	1,770	26.9%
MADERA	$119,100	1,710	100.0%	---	---	0.0%
MARIN	$723,000	2,840	77.8%	$231,300	1,475	22.2%
MERCED	$117,700	1,525	100.0%	---	---	0.0%
MONTEREY	$234,800	1,875	94.3%	**	**	5.7%
NAPA	$274,300	1,735	100.0%	---	---	0.0%
NEVADA	$236,700	1,975	96.3%	**	**	3.7%
ORANGE	$410,800	2,750	81.2%	$226,000	1,610	18.8%
PLACER	$226,600	2,105	96.5%	**	**	3.5%
RIVERSIDE	$182,800	2,100	95.5%	$158,600	1,640	4.5%
SACRAMENTO	$180,800	1,940	98.8%	**	**	1.2%
SAN BENITO	$258,800	1,965	100.0%	---	---	0.0%
SAN BERNARDINO	$173,100	2,080	97.5%	**	**	2.5%
SAN DIEGO	$340,200	2,555	79.7%	$215,800	1,520	20.3%
SAN FRANCISCO	$310,900	1,865	11.0%	$329,800	1,285	89.0%
SAN JOAQUIN	$182,600	1,935	99.3%	**	**	0.7%
SAN LUIS OBISPO	$225,400	1,820	96.3%	**	**	3.7%
SAN MATEO	$545,200	2,320	63.6%	$334,800	1,410	36.4%
SANTA BARBARA	$225,900	1,935	93.0%	**	**	7.0%
SANTA CLARA	$498,000	2,415	73.4%	$279,800	1,345	26.6%
SANTA CRUZ	$386,000	2,180	80.8%	**	**	19.2%
SHASTA	$154,300	1,775	97.8%	**	**	2.2%
SOLANO	$227,300	2,300	94.7%	**	**	5.3%
SONOMA	$266,500	1,960	89.1%	**	**	10.9%
STANISLAUS	$145,400	1,745	97.4%	**	**	2.6%
SUTTER	$130,200	1,885	100.0%	---	---	0.0%
TULARE	$124,100	1,630	100.0%	---	---	0.0%
VENTURA	$349,100	2,530	72.7%	$250,000	1,840	27.3%
YOLO	$193,700	1,955	98.7%	**	**	1.3%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-E
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1997

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$246,200	2,125	86.7%	$220,700	1,510	13.3%
SELECTED COUNTIES						
ALAMEDA	$387,100	2,410	80.1%	$200,300	1,365	19.9%
BUTTE	$166,200	1,840	94.2%	**	**	5.8%
CONTRA COSTA	$341,300	2,395	81.7%	$204,200	1,395	18.3%
EL DORADO	$254,200	2,510	97.8%	**	**	2.2%
FRESNO	$130,700	1,740	97.7%	**	**	2.3%
HUMBOLDT	$145,300	1,600	100.0%	---	---	0.0%
IMPERIAL	$131,600	1,640	95.2%	**	**	4.8%
KERN	$138,900	1,815	99.2%	**	**	0.8%
KINGS	$117,100	1,550	100.0%	---	---	0.0%
LAKE	$149,800	1,825	96.9%	**	**	3.1%
LOS ANGELES	$335,300	2,575	77.4%	$247,500	1,740	22.6%
MADERA	$121,400	1,755	98.0%	**	**	2.0%
MARIN	$655,300	2,740	72.6%	$228,800	1,405	27.4%
MERCED	$109,500	1,520	100.0%	---	---	0.0%
MONTEREY	$255,800	1,915	98.1%	**	**	1.9%
NAPA	$271,200	1,790	87.8%	**	**	12.2%
NEVADA	$209,300	2,035	97.1%	**	**	2.9%
ORANGE	$328,700	2,465	78.1%	$205,900	1,600	21.9%
PLACER	$217,800	2,105	98.5%	**	**	1.5%
RIVERSIDE	$170,500	2,050	96.3%	$188,800	1,775	3.7%
SACRAMENTO	$169,700	1,915	98.8%	**	**	1.2%
SAN BENITO	$235,700	1,995	100.0%	---	---	0.0%
SAN BERNARDINO	$172,900	2,075	96.7%	$154,900	1,680	3.3%
SAN DIEGO	$289,100	2,415	78.2%	$186,300	1,495	21.8%
SAN FRANCISCO	$261,600	1,855	11.5%	$289,300	1,340	88.5%
SAN JOAQUIN	$173,900	1,955	98.0%	**	**	2.0%
SAN LUIS OBISPO	$207,000	1,755	93.9%	$172,200	1,445	6.1%
SAN MATEO	$565,700	2,530	58.4%	$324,700	1,480	41.6%
SANTA BARBARA	$220,700	1,915	79.8%	$213,200	1,380	20.2%
SANTA CLARA	$443,300	2,370	77.7%	$248,700	1,430	22.3%
SANTA CRUZ	$339,900	2,105	83.9%	$260,200	1,055	16.1%
SHASTA	$142,200	1,725	100.0%	---	---	0.0%
SOLANO	$205,500	2,165	95.5%	**	**	4.5%
SONOMA	$271,400	2,000	91.7%	$158,200	1,250	8.3%
STANISLAUS	$127,900	1,580	98.9%	**	**	1.1%
SUTTER	$133,200	1,825	94.9%	**	**	5.1%
TULARE	$117,200	1,535	100.0%	---	---	0.0%
VENTURA	$302,000	2,420	63.5%	$203,100	1,670	36.5%
YOLO	$177,600	1,875	93.3%	**	**	6.7%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-F
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1996

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$226,000	2,060	85.0%	$206,200	1,455	15.0%
SELECTED COUNTIES						
ALAMEDA	$354,100	2,390	79.9%	$202,200	1,460	20.1%
BUTTE	$154,000	1,845	95.4%	**	**	4.6%
CONTRA COSTA	$324,300	2,400	79.3%	$209,600	1,555	20.7%
EL DORADO	$237,400	2,395	95.6%	**	**	4.4%
FRESNO	$135,500	1,775	98.2%	**	**	1.8%
HUMBOLDT	$145,200	1,580	100.0%	---	---	0.0%
IMPERIAL	$134,700	1,705	96.7%	**	**	3.3%
KERN	$128,600	1,780	99.5%	**	**	0.5%
KINGS	$117,600	1,570	100.0%	---	---	0.0%
LAKE	$128,500	1,645	100.0%	---	---	0.0%
LOS ANGELES	$297,300	2,405	73.8%	$230,300	1,635	26.2%
MADERA	$105,500	1,505	100.0%	---	---	0.0%
MARIN	$590,800	2,585	81.1%	**	**	18.9%
MERCED	$112,400	1,465	100.0%	---	---	0.0%
MONTEREY	$228,500	1,825	92.0%	**	**	8.0%
NAPA	$255,500	1,865	93.2%	**	**	6.8%
NEVADA	$207,600	1,910	97.0%	**	**	3.0%
ORANGE	$294,000	2,365	76.2%	$198,400	1,560	23.8%
PLACER	$216,900	2,140	97.6%	**	**	2.4%
RIVERSIDE	$161,100	1,960	93.5%	$196,800	1,915	6.5%
SACRAMENTO	$168,300	1,915	97.3%	**	**	2.7%
SAN BENITO	$217,700	1,940	100.0%	---	---	0.0%
SAN BERNARDINO	$172,200	2,040	91.8%	$129,300	1,500	8.2%
SAN DIEGO	$271,900	2,350	78.9%	$172,900	1,420	21.2%
SAN FRANCISCO	**	**	6.2%	$252,500	1,200	93.8%
SAN JOAQUIN	$165,300	1,895	98.4%	**	**	1.6%
SAN LUIS OBISPO	$204,300	1,815	90.6%	$145,500	1,200	9.4%
SAN MATEO	$504,800	2,390	50.9%	$247,000	1,290	49.1%
SANTA BARBARA	$202,300	1,835	87.3%	$149,100	1,230	12.7%
SANTA CLARA	$452,700	2,470	63.3%	$224,500	1,390	36.7%
SANTA CRUZ	$328,500	1,955	66.0%	$241,800	1,245	34.0%
SHASTA	$145,100	1,755	98.3%	**	**	1.7%
SOLANO	$223,000	2,235	95.3%	**	**	4.7%
SONOMA	$258,800	1,955	84.1%	$157,800	1,320	15.9%
STANISLAUS	$126,500	1,585	97.5%	**	**	2.5%
SUTTER	$135,200	1,930	97.4%	**	**	2.6%
TULARE	$113,900	1,495	99.4%	**	**	0.6%
VENTURA	$294,900	2,435	79.4%	$218,800	1,730	20.6%
YOLO	$178,600	1,910	98.5%	**	**	1.5%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-G
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1995

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$227,000	2,065	85.4%	$206,900	1,510	14.6%
SELECTED COUNTIES						
ALAMEDA	$359,500	2,390	82.9%	$211,400	1,485	17.1%
BUTTE	$153,800	1,765	100.0%	---	---	0.0%
CONTRA COSTA	$307,700	2,275	84.5%	$207,400	1,565	15.5%
EL DORADO	$229,500	2,325	96.3%	**	**	3.7%
FRESNO	$146,900	1,895	99.6%	$ 98,700	**	0.4%
HUMBOLDT	$145,300	1,620	100.0%	---	---	0.0%
IMPERIAL	$130,200	1,735	97.9%	**	**	2.1%
KERN	$140,200	1,865	100.0%	---	---	0.0%
KINGS	$113,600	1,545	98.5%	**	**	1.5%
LAKE	$156,900	1,855	96.3%	**	**	3.7%
LOS ANGELES	$326,200	2,490	69.3%	$212,300	1,570	30.7%
MADERA	$126,500	1,735	100.0%	---	---	0.0%
MARIN	$583,600	2,730	91.8%	**	**	8.2%
MERCED	$119,600	1,560	100.0%	---	---	0.0%
MONTEREY	$203,100	1,745	88.9%	$155,100	1,215	11.1%
NAPA	$296,800	2,080	98.0%	**	**	2.0%
NEVADA	$230,100	1,955	97.9%	**	**	2.1%
ORANGE	$294,300	2,345	75.3%	$213,400	1,645	24.7%
PLACER	$207,600	2,140	99.1%	**	**	0.9%
RIVERSIDE	$168,000	2,015	93.8%	$158,100	1,650	6.2%
SACRAMENTO	$173,000	1,910	97.1%	$122,700	1,350	2.9%
SAN BENITO	$196,000	1,850	97.6%	**	**	2.4%
SAN BERNARDINO	$165,000	1,990	94.2%	$125,500	1,365	5.8%
SAN DIEGO	$262,400	2,305	80.0%	$186,800	1,545	20.0%
SAN FRANCISCO	$482,200	2,645	10.2%	$261,900	1,300	89.8%
SAN JOAQUIN	$168,300	1,880	98.6%	**	**	1.4%
SAN LUIS OBISPO	$200,300	1,785	91.5%	$134,900	1,235	8.6%
SAN MATEO	$533,800	2,450	65.6%	$233,600	1,300	34.4%
SANTA BARBARA	$206,500	1,780	87.3%	$165,000	1,610	12.7%
SANTA CLARA	$438,000	2,475	46.6%	$220,800	1,500	53.4%
SANTA CRUZ	$285,500	1,850	78.3%	$261,100	1,275	21.7%
SHASTA	$150,400	1,765	96.7%	**	**	3.3%
SOLANO	$202,700	1,990	96.4%	$ 73,400	785	3.6%
SONOMA	$235,600	1,815	91.6%	$154,500	1,360	8.4%
STANISLAUS	$135,400	1,620	97.2%	**	**	2.8%
SUTTER	$134,200	1,895	100.0%	---	---	0.0%
TULARE	$115,700	1,530	100.0%	---	---	0.0%
VENTURA	$283,200	2,300	80.0%	$222,300	1,795	20.0%
YOLO	$186,100	1,840	91.5%	**	**	8.5%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-H
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1994

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$224,200	2,050	86.8%	$201,900	1,470	13.2%
SELECTED COUNTIES						
ALAMEDA	$325,700	2,215	78.1%	$200,100	1,350	21.9%
BUTTE	$155,200	1,760	95.3%	**	**	4.7%
CONTRA COSTA	$275,700	2,260	82.1%	$202,400	1,520	17.9%
EL DORADO	$214,900	2,100	100.0%	---	---	0.0%
FRESNO	$153,300	1,995	99.7%	**	**	0.3%
HUMBOLDT	$139,000	1,580	100.0%	---	---	0.0%
IMPERIAL	$132,900	1,715	99.2%	**	**	0.8%
KERN	$139,500	1,850	99.7%	**	**	0.3%
KINGS	$123,900	1,610	98.9%	**	**	1.1%
LAKE	$126,500	1,600	100.0%	---	---	0.0%
LOS ANGELES	$333,900	2,455	70.6%	$217,700	1,660	29.4%
MADERA	$117,900	1,660	98.5%	**	**	1.5%
MARIN	$714,900	2,915	75.4%	$278,300	1,730	24.6%
MERCED	$121,800	1,565	98.9%	**	**	1.1%
MONTEREY	$207,200	1,755	99.2%	**	**	0.8%
NAPA	$265,600	1,985	98.4%	**	**	1.6%
NEVADA	$216,100	1,865	98.3%	**	**	1.7%
ORANGE	$307,900	2,460	78.0%	$201,600	1,540	22.0%
PLACER	$200,900	2,105	100.0%	---	---	0.0%
RIVERSIDE	$169,300	2,000	95.4%	$218,900	2,010	4.6%
SACRAMENTO	$176,000	1,920	96.5%	$127,900	1,340	3.5%
SAN BENITO	$212,600	1,805	97.4%	**	**	2.6%
SAN BERNARDINO	$175,400	1,945	96.3%	$154,000	1,500	3.7%
SAN DIEGO	$262,200	2,290	80.2%	$164,200	1,355	19.8%
SAN FRANCISCO	$398,100	2,270	10.5%	$242,300	1,165	89.5%
SAN JOAQUIN	$164,200	1,760	99.0%	**	**	1.0%
SAN LUIS OBISPO	$198,300	1,745	90.5%	$173,300	1,290	9.5%
SAN MATEO	$610,200	2,900	70.4%	$267,800	1,375	29.6%
SANTA BARBARA	$191,500	1,820	91.8%	$187,700	1,150	8.2%
SANTA CLARA	$392,800	2,310	56.9%	$220,600	1,425	43.1%
SANTA CRUZ	$270,100	1,795	86.9%	$162,400	935	13.1%
SHASTA	$128,000	1,550	100.0%	---	---	0.0%
SOLANO	$205,300	3,030	89.1%	$133,900	1,180	10.9%
SONOMA	$238,900	1,910	85.9%	$161,600	1,480	14.1%
STANISLAUS	$137,100	1,635	100.0%	---	---	0.0%
SUTTER	$128,200	1,755	97.0%	**	**	3.0%
TULARE	$119,500	1,550	100.0%	---	---	0.0%
VENTURA	$282,400	2,295	80.4%	$184,800	1,590	19.6%
YOLO	$192,000	1,780	96.9%	**	**	3.1%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-I
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1993

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$219,200	2,045	85.9%	$207,500	1,460	14.1%
SELECTED COUNTIES						
ALAMEDA	$337,200	2,325	75.5%	$183,600	1,365	24.5%
BUTTE	$164,300	1,850	100.0%	---	---	0.0%
CONTRA COSTA	$285,700	2,310	85.6%	$211,500	1,520	14.4%
EL DORADO	$227,300	2,220	97.5%	**	**	2.5%
FRESNO	$157,500	1,995	99.7%	**	**	0.3%
HUMBOLDT	$129,600	1,550	100.0%	---	---	0.0%
IMPERIAL	$121,900	1,625	99.2%	**	**	0.8%
KERN	$139,300	1,845	100.0%	---	---	0.0%
KINGS	$125,600	1,750	100.0%	---	---	0.0%
LAKE	$126,100	1,610	100.0%	---	---	0.0%
LOS ANGELES	$319,800	2,350	63.0%	$231,300	1,640	37.0%
MADERA	$122,500	1,750	96.7%	**	**	3.3%
MARIN	$608,900	2,830	82.6%	**	**	17.4%
MERCED	$114,400	1,520	97.8%	**	**	2.2%
MONTEREY	$232,300	1,885	97.3%	**	**	2.7%
NAPA	$261,700	1,970	89.2%	**	**	10.8%
NEVADA	$197,000	1,765	100.0%	---	---	0.0%
ORANGE	$316,000	2,515	68.6%	$190,100	1,420	31.4%
PLACER	$200,400	2,065	99.0%	**	**	1.0%
RIVERSIDE	$167,700	2,000	95.7%	$224,200	1,950	4.3%
SACRAMENTO	$171,200	1,865	98.2%	$134,800	1,435	1.8%
SAN BENITO	$216,600	1,885	97.1%	**	**	2.9%
SAN BERNARDINO	$177,600	1,975	96.8%	$192,500	1,745	3.2%
SAN DIEGO	$263,000	2,305	77.7%	$187,400	1,370	22.3%
SAN FRANCISCO	$281,400	2,170	14.1%	$233,800	1,150	85.9%
SAN JOAQUIN	$174,700	1,820	99.2%	**	**	0.8%
SAN LUIS OBISPO	$221,600	1,890	94.2%	**	**	5.8%
SAN MATEO	$663,800	3,000	55.6%	$267,900	1,375	44.4%
SANTA BARBARA	$212,600	1,785	82.3%	$160,100	1,190	17.7%
SANTA CLARA	$426,800	2,490	54.2%	$221,500	1,395	45.8%
SANTA CRUZ	$284,300	1,870	88.9%	$241,000	1,210	11.1%
SHASTA	$145,100	1,680	97.5%	**	**	2.5%
SOLANO	$213,400	2,070	89.1%	$154,800	1,390	10.9%
SONOMA	$239,300	1,920	92.2%	$125,800	1,095	7.8%
STANISLAUS	$137,400	1,615	99.0%	**	**	1.0%
SUTTER	$138,900	1,820	95.8%	**	**	4.2%
TULARE	$130,100	1,645	100.0%	---	---	0.0%
VENTURA	$330,600	2,540	74.9%	$208,400	1,605	25.1%
YOLO	$224,300	2,005	94.1%	**	**	5.9%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-J
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1992

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$225,500	2,075	84.3%	$216,500	1,465	15.7%
SELECTED COUNTIES						
ALAMEDA	$346,300	2,320	77.4%	$206,800	1,475	22.6%
BUTTE	$155,800	1,790	95.4%	**	**	4.6%
CONTRA COSTA	$281,500	2,255	85.9%	$213,000	1,500	14.1%
EL DORADO	$247,800	2,430	96.7%	**	**	3.3%
FRESNO	$158,700	1,990	99.7%	**	**	0.3%
HUMBOLDT	$137,400	1,605	100.0%	---	---	0.0%
IMPERIAL	$115,800	1,600	99.1%	**	**	0.9%
KERN	$144,100	1,885	98.4%	**	**	1.6%
KINGS	$126,300	1,785	100.0%	---	---	0.0%
LAKE	$129,900	1,605	100.0%	---	---	0.0%
LOS ANGELES	$378,300	2,585	51.1%	$240,200	1,575	48.9%
MADERA	$139,200	1,880	99.1%	**	**	0.9%
MARIN	$624,500	2,820	71.1%	$335,900	1,990	28.9%
MERCED	$120,500	1,605	98.4%	**	**	1.6%
MONTEREY	$235,300	1,885	94.4%	**	**	5.6%
NAPA	$299,200	2,100	90.0%	**	**	10.0%
NEVADA	$210,300	1,850	100.0%	---	---	0.0%
ORANGE	$339,600	2,550	67.3%	$193,000	1,385	32.7%
PLACER	$219,200	2,155	100.0%	---	---	0.0%
RIVERSIDE	$179,000	2,075	95.1%	$198,000	1,820	4.9%
SACRAMENTO	$175,300	1,870	97.7%	$158,500	1,560	2.3%
SAN BENITO	$236,500	2,205	84.4%	**	**	15.6%
SAN BERNARDINO	$186,900	2,020	96.2%	$158,400	1,455	3.8%
SAN DIEGO	$274,100	2,300	77.5%	$194,700	1,415	22.5%
SAN FRANCISCO	$413,600	2,360	13.9%	$233,400	1,040	86.1%
SAN JOAQUIN	$182,600	1,900	98.9%	**	**	1.1%
SAN LUIS OBISPO	$250,000	2,105	89.8%	**	**	10.2%
SAN MATEO	$560,800	2,690	51.2%	$271,900	1,445	48.8%
SANTA BARBARA	$200,000	1,820	65.3%	$243,900	1,450	34.7%
SANTA CLARA	$409,900	2,320	54.3%	$232,200	1,430	45.7%
SANTA CRUZ	$304,800	1,900	82.4%	$304,800	1,595	17.6%
SHASTA	$140,400	1,705	95.7%	**	**	4.3%
SOLANO	$216,900	2,100	91.3%	$152,400	1,300	8.7%
SONOMA	$256,800	2,060	92.5%	$172,800	1,480	7.5%
STANISLAUS	$130,700	1,585	98.1%	**	**	1.9%
SUTTER	$148,100	1,865	98.8%	**	**	1.2%
TULARE	$129,800	1,640	100.0%	---	---	0.0%
VENTURA	$341,500	2,570	75.4%	$222,200	1,695	24.6%
YOLO	$236,000	2,005	96.2%	**	**	3.8%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 9-K
AVERAGE PRICE, SIZE AND DISTRIBUTION OF SALES
SINGLE-FAMILY DETACHED AND ATTACHED HOUSING
CALIFORNIA AND SELECTED COUNTIES

1991

	SINGLE-FAMILY DETACHED			ALL ATTACHED CATEGORIES*		
	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES	AVERAGE PRICE	AVERAGE SIZE (S.F.)	% OF SALES
CALIFORNIA	$251,200	2,155	83.0%	$223,900	1,460	17.0%
SELECTED COUNTIES						
ALAMEDA	$374,700	2,430	76.1%	$196,900	1,260	23.9%
BUTTE	$156,100	1,840	99.0%	**	**	1.0%
CONTRA COSTA	$329,800	2,500	84.8%	$216,300	1,540	15.2%
EL DORADO	$251,200	2,335	94.4%	**	**	5.6%
FRESNO	$141,300	1,850	99.1%	**	**	0.9%
HUMBOLDT	$141,000	1,655	100.0%	---	---	0.0%
IMPERIAL	$110,100	1,475	98.5%	**	**	1.5%
KERN	$140,600	1,845	98.7%	**	**	1.3%
KINGS	$114,500	1,660	100.0%	---	---	0.0%
LAKE	$143,000	1,735	97.4%	**	**	2.6%
LOS ANGELES	$448,600	2,745	55.5%	$250,100	1,575	44.5%
MADERA	$108,700	1,615	100.0%	---	---	0.0%
MARIN	$493,100	2,610	72.5%	$279,000	1,505	27.5%
MERCED	$141,100	1,780	100.0%	---	---	0.0%
MONTEREY	$253,400	1,905	97.7%	**	**	2.3%
NAPA	$308,300	2,270	94.0%	**	**	6.0%
NEVADA	$223,200	1,960	97.9%	**	**	2.1%
ORANGE	$384,200	2,705	63.7%	$215,000	1,450	36.3%
PLACER	$239,200	2,270	98.1%	**	**	1.9%
RIVERSIDE	$186,400	2,075	91.0%	$193,800	1,690	9.0%
SACRAMENTO	$189,500	1,950	96.9%	$116,000	1,240	3.1%
SAN BENITO	$252,300	2,280	96.3%	**	**	3.7%
SAN BERNARDINO	$196,200	2,060	97.7%	$159,100	1,435	2.3%
SAN DIEGO	$287,300	2,350	74.7%	$210,300	1,430	25.3%
SAN FRANCISCO	$360,400	2,245	11.0%	$259,200	1,155	89.0%
SAN JOAQUIN	$184,900	1,965	95.7%	**	**	4.3%
SAN LUIS OBISPO	$276,500	2,065	89.0%	**	**	11.0%
SAN MATEO	$553,900	2,620	57.1%	$287,900	1,515	42.9%
SANTA BARBARA	$245,100	1,875	77.5%	$219,800	1,405	22.5%
SANTA CLARA	$499,300	2,550	68.2%	$239,200	1,410	31.8%
SANTA CRUZ	$352,000	2,260	80.0%	$234,600	1,515	20.0%
SHASTA	$140,600	1,725	92.0%	**	**	8.0%
SOLANO	$229,900	2,110	97.4%	**	**	2.6%
SONOMA	$250,100	2,005	92.3%	$153,800	1,145	7.7%
STANISLAUS	$158,200	1,805	98.1%	**	**	1.9%
SUTTER	$153,500	1,890	98.7%	**	**	1.3%
TULARE	$135,200	1,720	99.4%	**	**	0.6%
VENTURA	$372,500	2,490	74.4%	$225,700	1,570	25.6%
YOLO	$231,800	1,980	82.7%	$116,300	1,100	17.3%

*Attached categories include for-sale housing in the following structure categories: townhouses, row-houses, flats, walk-ups, and high-rises.
**Insufficient sales in sample to report price or size.

Prepared by Construction Industry Research Board using a sample of reported sales. Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 10-A
DISTRIBUTION OF NEW-HOME SALES BY NUMBER OF BEDROOMS
CALIFORNIA AND SELECTED COUNTIES

2001

	AVERAGE NUMBER OF BEDROOMS	DISTRIBUTION OF SALES BY NUMBER OF BEDROOMS				
		LESS THAN TWO	TWO	THREE	FOUR	FIVE OR MORE
CALIFORNIA	3.58	1.0%	7.5%	40.9%	35.8%	14.8%
SELECTED COUNTIES						
ALAMEDA	3.75	4.2%	7.6%	27.1%	38.2%	22.9%
BUTTE	3.42	0.0%	0.0%	61.5%	34.6%	3.9%
CONTRA COSTA	4.04	0.0%	5.1%	23.7%	37.4%	33.8%
EL DORADO	3.79	0.0%	3.3%	41.0%	32.8%	22.9%
FRESNO	3.59	0.0%	2.1%	53.2%	29.1%	15.6%
HUMBOLDT	3.12	0.0%	5.9%	76.4%	17.7%	0.0%
IMPERIAL	3.35	2.0%	6.1%	51.0%	36.8%	4.1%
KERN	3.41	0.0%	1.1%	58.4%	38.8%	1.7%
KINGS	3.46	0.0%	0.0%	62.5%	29.2%	8.3%
LAKE	2.86	0.0%	23.8%	66.7%	9.5%	0.0%
LOS ANGELES	3.58	0.8%	9.4%	39.5%	34.3%	16.0%
MADERA	3.34	0.0%	0.0%	69.2%	27.7%	3.1%
MARIN	3.43	0.0%	19.0%	28.6%	42.9%	9.5%
MERCED	3.47	0.0%	2.0%	54.9%	37.2%	5.9%
MONTEREY	3.73	0.0%	0.0%	41.8%	45.5%	12.7%
NAPA	3.85	0.0%	7.7%	26.9%	38.5%	26.9%
NEVADA	3.07	0.0%	6.7%	80.0%	13.3%	0.0%
ORANGE	3.50	1.5%	13.5%	35.2%	34.4%	15.4%
PLACER	3.49	1.5%	14.7%	35.0%	32.0%	16.8%
RIVERSIDE	3.79	0.0%	6.8%	35.2%	35.0%	23.0%
SACRAMENTO	3.59	0.0%	4.5%	43.3%	41.1%	11.1%
SAN BENITO	3.74	0.0%	0.0%	35.3%	55.9%	8.8%
SAN BERNARDINO	3.82	0.0%	0.8%	34.4%	48.6%	16.2%
SAN DIEGO	3.74	0.5%	8.3%	30.7%	38.1%	22.4%
SAN FRANCISCO	1.87	33.9%	51.6%	9.7%	3.2%	1.6%
SAN JOAQUIN	3.70	0.0%	2.4%	41.4%	42.0%	14.2%
SAN LUIS OBISPO	3.21	1.8%	7.3%	59.7%	30.3%	0.9%
SAN MATEO	3.20	1.8%	23.6%	32.8%	38.2%	3.6%
SANTA BARBARA	3.46	0.0%	2.4%	48.8%	48.8%	0.0%
SANTA CLARA	3.51	0.0%	19.7%	29.0%	35.5%	15.8%
SANTA CRUZ	3.17	0.0%	20.8%	45.8%	29.2%	4.2%
SHASTA	3.11	0.0%	2.7%	83.8%	13.5%	0.0%
SOLANO	3.84	0.0%	7.5%	23.8%	46.2%	22.5%
SONOMA	3.25	0.0%	8.2%	60.3%	30.1%	1.4%
STANISLAUS	3.55	0.0%	1.8%	51.8%	37.3%	9.1%
SUTTER	3.28	0.0%	5.6%	61.1%	33.3%	0.0%
TULARE	3.38	0.0%	4.6%	59.8%	29.5%	6.1%
VENTURA	3.83	0.8%	4.2%	31.7%	40.8%	22.5%
YOLO	3.50	1.9%	7.7%	40.4%	38.5%	11.5%

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 10-B
DISTRIBUTION OF NEW-HOME SALES BY NUMBER OF BEDROOMS
CALIFORNIA AND SELECTED COUNTIES

2000

	AVERAGE NUMBER OF BEDROOMS	DISTRIBUTION OF SALES BY NUMBER OF BEDROOMS				
		LESS THAN TWO	TWO	THREE	FOUR	FIVE OR MORE
CALIFORNIA	3.55	0.7%	7.7%	42.4%	35.3%	13.9%
SELECTED COUNTIES						
ALAMEDA	3.84	1.0%	4.7%	29.2%	41.7%	23.4%
BUTTE	3.29	0.0%	0.0%	70.7%	29.3%	0.0%
CONTRA COSTA	3.88	0.0%	5.4%	25.0%	47.1%	22.5%
EL DORADO	3.76	0.0%	5.7%	32.8%	42.9%	18.6%
FRESNO	3.52	0.0%	1.7%	54.7%	33.1%	10.5%
HUMBOLDT	3.18	0.0%	0.0%	82.4%	17.6%	0.0%
IMPERIAL	3.42	0.0%	0.0%	58.5%	41.5%	0.0%
KERN	3.34	0.0%	2.4%	61.8%	34.9%	0.9%
KINGS	3.28	0.0%	1.6%	71.9%	23.4%	3.1%
LAKE	3.00	0.0%	15.8%	68.4%	15.8%	0.0%
LOS ANGELES	3.56	0.4%	8.1%	44.0%	32.4%	15.1%
MADERA	3.33	0.0%	0.0%	68.9%	28.9%	2.2%
MARIN	3.23	0.0%	25.5%	38.3%	25.5%	10.7%
MERCED	3.46	0.0%	1.7%	57.9%	35.1%	5.3%
MONTEREY	3.82	0.0%	4.4%	24.5%	56.7%	14.4%
NAPA	3.33	0.0%	6.7%	55.5%	35.6%	2.2%
NEVADA	2.83	0.9%	26.7%	58.6%	13.8%	0.0%
ORANGE	3.55	1.1%	14.5%	33.7%	30.7%	20.0%
PLACER	3.20	0.7%	26.1%	35.0%	30.7%	7.5%
RIVERSIDE	3.75	0.0%	4.9%	38.6%	35.5%	21.0%
SACRAMENTO	3.53	0.0%	8.5%	43.4%	34.8%	13.3%
SAN BENITO	3.76	0.0%	2.6%	34.2%	47.4%	15.8%
SAN BERNARDINO	3.79	0.0%	1.4%	34.6%	49.6%	14.4%
SAN DIEGO	3.60	0.3%	9.1%	36.0%	39.8%	14.8%
SAN FRANCISCO	1.87	37.1%	43.6%	14.5%	4.8%	0.0%
SAN JOAQUIN	3.58	0.0%	0.8%	51.0%	38.7%	9.5%
SAN LUIS OBISPO	3.12	2.2%	7.3%	69.3%	18.3%	2.9%
SAN MATEO	3.52	0.0%	31.7%	18.3%	26.7%	23.3%
SANTA BARBARA	3.78	0.0%	6.7%	53.3%	35.6%	4.4%
SANTA CLARA	3.89	0.0%	11.4%	21.7%	39.8%	27.1%
SANTA CRUZ	3.33	0.0%	7.5%	60.0%	25.0%	7.5%
SHASTA	3.29	0.0%	1.7%	67.8%	30.5%	0.0%
SOLANO	3.87	0.0%	1.7%	35.1%	41.0%	22.2%
SONOMA	3.39	0.0%	7.3%	50.4%	38.2%	4.1%
STANISLAUS	3.37	0.4%	3.4%	59.8%	31.1%	5.3%
SUTTER	3.82	0.0%	5.9%	11.7%	76.5%	5.9%
TULARE	3.26	0.0%	2.7%	70.5%	24.7%	2.1%
VENTURA	3.98	0.0%	2.2%	29.8%	36.5%	31.5%
YOLO	3.56	0.0%	2.0%	50.0%	38.0%	10.0%

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 10-C
DISTRIBUTION OF NEW-HOME SALES BY NUMBER OF BEDROOMS
CALIFORNIA AND SELECTED COUNTIES

1999

	AVERAGE NUMBER OF BEDROOMS	DISTRIBUTION OF SALES BY NUMBER OF BEDROOMS				
		LESS THAN TWO	TWO	THREE	FOUR	FIVE OR MORE
CALIFORNIA	3.55	0.9%	7.0%	41.9%	38.0%	12.2%
SELECTED COUNTIES						
ALAMEDA	3.73	2.4%	3.6%	29.9%	49.2%	14.9%
BUTTE	3.38	0.0%	1.2%	59.3%	39.5%	0.0%
CONTRA COSTA	3.83	0.0%	5.8%	28.3%	46.1%	19.8%
EL DORADO	3.64	0.0%	7.5%	31.3%	50.8%	10.4%
FRESNO	3.52	0.0%	0.6%	54.5%	36.9%	8.0%
HUMBOLDT	3.11	0.0%	3.6%	82.1%	14.3%	0.0%
IMPERIAL	3.48	0.0%	1.5%	50.7%	46.3%	1.5%
KERN	3.39	0.0%	1.9%	60.4%	34.4%	3.3%
KINGS	3.26	0.0%	1.8%	70.4%	27.8%	0.0%
LAKE	3.21	0.0%	8.3%	62.5%	29.2%	0.0%
LOS ANGELES	3.74	0.2%	7.7%	35.2%	35.9%	21.0%
MADERA	3.39	0.0%	0.0%	63.7%	33.3%	3.0%
MARIN	3.59	1.7%	12.0%	32.8%	32.8%	20.7%
MERCED	3.30	0.0%	2.9%	65.7%	30.0%	1.4%
MONTEREY	3.52	0.0%	2.4%	51.2%	38.1%	8.3%
NAPA	3.25	0.0%	10.7%	53.6%	35.7%	0.0%
NEVADA	2.87	0.0%	17.4%	78.3%	4.3%	0.0%
ORANGE	3.59	1.3%	10.5%	34.6%	36.7%	16.9%
PLACER	3.17	1.4%	27.0%	33.6%	30.1%	7.9%
RIVERSIDE	3.54	0.2%	4.9%	45.8%	39.9%	9.2%
SACRAMENTO	3.73	0.0%	3.1%	40.4%	38.9%	17.6%
SAN BENITO	3.71	1.4%	1.4%	27.4%	64.4%	5.4%
SAN BERNARDINO	3.74	0.0%	3.9%	33.6%	48.9%	13.6%
SAN DIEGO	3.70	0.1%	7.5%	33.1%	42.6%	16.7%
SAN FRANCISCO	2.09	39.7%	28.0%	19.1%	10.3%	2.9%
SAN JOAQUIN	3.63	0.0%	0.5%	48.6%	39.9%	11.0%
SAN LUIS OBISPO	3.16	0.0%	8.2%	68.0%	23.8%	0.0%
SAN MATEO	3.24	2.1%	22.6%	36.6%	28.0%	10.7%
SANTA BARBARA	3.26	0.0%	5.3%	64.9%	28.1%	1.7%
SANTA CLARA	3.64	2.2%	10.7%	29.2%	37.3%	20.6%
SANTA CRUZ	3.39	1.5%	10.4%	37.3%	49.3%	1.5%
SHASTA	3.30	1.4%	2.9%	60.0%	35.7%	0.0%
SOLANO	3.74	0.0%	7.0%	31.8%	42.6%	18.6%
SONOMA	3.20	0.9%	13.4%	52.7%	31.2%	1.8%
STANISLAUS	3.44	0.0%	2.7%	56.2%	35.7%	5.4%
SUTTER	3.39	0.0%	0.0%	67.9%	25.0%	7.1%
TULARE	3.27	0.0%	0.7%	73.4%	24.5%	1.4%
VENTURA	3.98	0.0%	3.1%	23.7%	46.9%	26.3%
YOLO	3.80	0.0%	2.3%	35.2%	43.2%	19.3%

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 10-D
DISTRIBUTION OF NEW-HOME SALES BY NUMBER OF BEDROOMS
CALIFORNIA AND SELECTED COUNTIES

1998

	AVERAGE NUMBER OF BEDROOMS	DISTRIBUTION OF SALES BY NUMBER OF BEDROOMS				
		LESS THAN TWO	TWO	THREE	FOUR	FIVE OR MORE
CALIFORNIA	3.50	0.7%	7.7%	44.7%	35.8%	11.1%
SELECTED COUNTIES						
ALAMEDA	3.59	2.2%	8.5%	33.9%	39.3%	16.1%
BUTTE	3.21	0.0%	5.3%	67.9%	26.8%	0.0%
CONTRA COSTA	3.80	0.0%	4.2%	33.0%	42.7%	20.1%
EL DORADO	3.59	1.2%	4.8%	37.4%	49.4%	7.2%
FRESNO	3.50	0.0%	3.7%	50.7%	37.5%	8.1%
HUMBOLDT	3.19	0.0%	0.0%	84.6%	11.5%	3.9%
IMPERIAL	3.52	0.0%	1.9%	48.1%	46.3%	3.7%
KERN	3.41	0.0%	1.3%	57.3%	40.6%	0.8%
KINGS	3.12	0.0%	3.9%	82.3%	11.8%	2.0%
LAKE	3.05	0.0%	0.0%	95.0%	5.0%	0.0%
LOS ANGELES	3.70	0.0%	5.3%	40.7%	36.1%	17.9%
MADERA	3.35	0.0%	0.0%	69.6%	26.1%	4.3%
MARIN	3.47	2.2%	6.7%	46.7%	31.1%	13.3%
MERCED	3.29	0.0%	1.7%	67.8%	30.5%	0.0%
MONTEREY	3.58	0.9%	3.8%	40.0%	46.7%	8.6%
NAPA	3.11	0.0%	13.0%	63.1%	23.9%	0.0%
NEVADA	3.00	0.0%	14.8%	70.4%	14.8%	0.0%
ORANGE	3.71	0.6%	7.5%	34.6%	35.9%	21.4%
PLACER	3.17	1.4%	23.9%	37.9%	30.5%	6.3%
RIVERSIDE	3.48	0.0%	9.0%	43.9%	38.3%	8.8%
SACRAMENTO	3.50	0.0%	3.7%	50.4%	39.1%	6.8%
SAN BENITO	3.51	0.0%	2.3%	46.5%	48.9%	2.3%
SAN BERNARDINO	3.64	0.0%	4.4%	40.3%	44.7%	10.6%
SAN DIEGO	3.71	0.2%	9.5%	29.7%	40.7%	19.9%
SAN FRANCISCO	2.23	24.7%	34.2%	30.1%	11.0%	0.0%
SAN JOAQUIN	3.51	0.0%	1.3%	54.6%	35.5%	8.6%
SAN LUIS OBISPO	3.13	0.5%	6.8%	72.8%	19.4%	0.5%
SAN MATEO	3.20	0.0%	25.3%	32.3%	39.4%	3.0%
SANTA BARBARA	3.38	0.0%	1.4%	64.8%	29.6%	4.2%
SANTA CLARA	3.50	4.1%	15.9%	27.9%	32.4%	19.7%
SANTA CRUZ	3.23	2.1%	10.7%	51.1%	34.0%	2.1%
SHASTA	3.13	0.0%	6.7%	73.3%	20.0%	0.0%
SOLANO	3.79	0.0%	5.3%	34.5%	40.7%	19.5%
SONOMA	3.30	0.0%	5.5%	61.8%	30.0%	2.7%
STANISLAUS	3.48	0.0%	5.2%	48.7%	39.1%	7.0%
SUTTER	3.45	0.0%	0.0%	57.9%	39.5%	2.6%
TULARE	3.32	0.0%	2.4%	69.6%	23.2%	4.8%
VENTURA	3.64	0.0%	3.9%	44.8%	37.0%	14.3%
YOLO	3.57	0.0%	2.6%	48.7%	38.2%	10.5%

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 11-A
AVERAGE PRICE, LIVING AREA, AND PRICE PER SQUARE FOOT
FOR NEW 2-, 3-, AND 4-BEDROOM HOMES
CALIFORNIA AND SELECTED COUNTIES

2001

	2-BEDROOM HOMES			3-BEDROOM HOMES			4-BEDROOM HOMES		
	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.
CALIFORNIA	$328,300	1,420	$231.20	$247,100	1,770	$139.60	$346,200	2,410	$143.65
SELECTED COUNTIES									
ALAMEDA	$314,600	1,190	$264.37	$458,400	1,820	$251.87	$603,600	2,460	$245.37
BUTTE	---	---	---	$152,200	1,555	$ 97.88	$256,000	2,310	$110.82
CONTRA COSTA	$291,600	1,275	$228.71	$327,400	1,875	$174.61	$445,500	2,575	$173.01
EL DORADO	---	---	---	$327,200	2,265	$144.46	$401,000	2,890	$138.75
FRESNO	---	---	---	$140,000	1,610	$ 86.96	$182,700	2,095	$ 87.21
HUMBOLDT	---	---	---	$143,300	1,475	$ 97.15	---	---	---
IMPERIAL	---	---	---	$136,000	1,505	$ 90.36	$175,400	1,965	$ 89.26
KERN	---	---	---	$141,100	1,695	$ 83.24	$184,100	2,180	$ 84.45
KINGS	---	---	---	$122,300	1,525	$ 80.20	$131,400	1,790	$ 73.41
LAKE	---	---	---	$190,900	1,695	$112.62	---	---	---
LOS ANGELES	$395,600	1,580	$250.38	$277,600	1,740	$159.54	$493,500	2,655	$185.88
MADERA	---	---	---	$127,400	1,550	$ 82.19	$146,800	1,955	$ 75.09
MARIN	---	---	---	$556,500	1,815	$306.61	$996,400	2,860	$348.39
MERCED	---	---	---	$152,700	1,430	$106.78	$163,400	1,765	$ 92.58
MONTEREY	---	---	---	$319,000	1,580	$201.90	$316,600	1,900	$166.63
NAPA	---	---	---	$405,300	1,895	$213.88	$433,800	2,395	$181.13
NEVADA	---	---	---	$312,800	2,205	$141.86	---	---	---
ORANGE	$329,700	1,380	$238.91	$391,800	2,000	$195.90	$571,200	2,845	$200.84
PLACER	$275,300	1,665	$165.35	$231,300	1,775	$112.06	$303,300	2,460	$123.37
RIVERSIDE	$222,200	1,895	$117.26	$234,400	2,065	$113.51	$264,700	2,655	$ 99.70
SACRAMENTO	$179,400	1,400	$128.14	$207,300	1,725	$120.17	$244,600	2,235	$109.44
SAN BENITO	---	---	---	$325,200	1,580	$205.82	$432,900	2,335	$185.40
SAN BERNARDINO	---	---	---	$198,900	1,935	$102.79	$228,000	2,385	$ 95.60
SAN DIEGO	$320,700	1,235	$259.68	$327,400	1,900	$172.32	$431,900	2,705	$159.67
SAN FRANCISCO	$704,300	1,235	$570.28	$701,700	1,415	$495.90	---	---	---
SAN JOAQUIN	---	---	---	$189,200	1,670	$113.29	$226,200	2,115	$106.95
SAN LUIS OBISPO	$293,400	1,410	$208.09	$317,400	1,890	$167.94	$382,500	2,335	$163.81
SAN MATEO	$459,100	1,170	$392.39	$591,500	1,730	$341.91	$768,700	2,330	$329.91
SANTA BARBARA	---	---	---	$248,900	1,615	$154.12	$298,800	2,075	$144.00
SANTA CLARA	$453,900	1,245	$364.58	$590,800	1,900	$310.95	$624,100	2,170	$287.60
SANTA CRUZ	---	---	---	$564,700	2,185	$258.44	$558,600	2,290	$243.93
SHASTA	---	---	---	$142,100	1,525	$ 93.18	$222,100	2,280	$ 97.41
SOLANO	---	---	---	$220,800	1,525	$144.79	$290,200	2,075	$139.86
SONOMA	---	---	---	$345,000	1,740	$198.28	$470,200	2,400	$195.92
STANISLAUS	---	---	---	$165,400	1,550	$106.71	$207,200	2,070	$100.10
SUTTER	---	---	---	$135,600	1,455	$ 93.20	$157,500	1,960	$ 80.36
TULARE	---	---	---	$125,800	1,530	$ 82.22	$170,800	2,155	$ 79.26
VENTURA	---	---	---	$306,400	1,900	$161.34	$404,400	2,550	$158.59
YOLO	---	---	---	$234,500	1,665	$140.84	$292,600	2,085	$140.34

NOTES: (1) "---" Indicates insufficient number of sales in category to report.
(2) Two-, three-, and four-bedroom homes account for 84.2% of all 2001 new-home sales. (7.5% are 2-bedroom homes, 40.9% are 3-bedroom homes, and 35.8% are 4-bedroom homes. The remaining 15.8% of sales are distributed among homes with fewer than two bedrooms (1.0%) and homes with 5-and-more bedrooms (14.8%).
(3) Prices are rounded to the nearest $100; square footage to the nearest 5 square feet.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 11-B
AVERAGE PRICE, LIVING AREA, AND PRICE PER SQUARE FOOT
FOR NEW 2-, 3-, AND 4-BEDROOM HOMES
CALIFORNIA AND SELECTED COUNTIES

2000

	2-BEDROOM HOMES			3-BEDROOM HOMES			4-BEDROOM HOMES		
	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.
CALIFORNIA	$272,100	1,415	$192.30	$239,600	1,770	$135.37	$334,000	2,425	$137.73
SELECTED COUNTIES									
ALAMEDA	$294,700	1,285	$229.34	$387,200	1,840	$210.43	$521,500	2,385	$218.66
BUTTE	---	---	---	$159,200	1,710	$ 93.10	$218,200	2,210	$ 98.73
CONTRA COSTA	$288,900	1,345	$214.80	$295,800	1,840	$160.76	$372,600	2,545	$146.40
EL DORADO	---	---	---	$251,600	2,115	$118.96	$345,300	2,815	$122.66
FRESNO	---	---	---	$130,300	1,620	$ 80.43	$166,500	2,020	$ 82.43
HUMBOLDT	---	---	---	$152,100	1,550	$ 98.13	---	---	---
IMPERIAL	---	---	---	$132,100	1,395	$ 94.70	$180,800	2,095	$ 86.30
KERN	---	---	---	$136,100	1,695	$ 80.30	$176,200	2,080	$ 84.71
KINGS	---	---	---	$108,200	1,410	$ 76.74	$125,400	1,695	$ 73.98
LAKE	---	---	---	$163,200	1,650	$ 98.91	---	---	---
LOS ANGELES	$284,100	1,390	$204.39	$312,700	1,795	$174.21	$392,600	2,380	$164.96
MADERA	---	---	---	$117,700	1,515	$ 77.69	$133,100	1,885	$ 70.61
MARIN	---	---	---	$686,800	2,145	$320.19	$957,400	2,980	$321.28
MERCED	---	---	---	$121,600	1,400	$ 86.86	$159,500	1,875	$ 85.07
MONTEREY	---	---	---	$293,400	1,740	$168.62	$328,000	2,070	$158.45
NAPA	---	---	---	$352,900	1,860	$189.73	$404,400	2,605	$155.24
NEVADA	---	---	---	$300,400	2,105	$142.71	$328,200	2,650	$123.85
ORANGE	$211,200	1,250	$168.96	$381,700	1,995	$191.33	$525,800	2,940	$178.84
PLACER	$260,900	1,680	$155.30	$227,300	1,900	$119.63	$307,600	2,585	$118.99
RIVERSIDE	$222,900	1,680	$132.68	$229,000	2,065	$110.90	$258,700	2,640	$ 97.99
SACRAMENTO	$118,900	1,100	$108.09	$180,800	1,705	$106.04	$223,700	2,280	$ 98.11
SAN BENITO	---	---	---	$289,800	1,705	$169.97	$358,800	2,385	$150.44
SAN BERNARDINO	---	---	---	$182,100	1,870	$ 97.38	$223,000	2,420	$ 92.15
SAN DIEGO	$280,600	1,430	$196.22	$310,800	1,925	$161.45	$404,200	2,520	$160.40
SAN FRANCISCO	$576,100	1,315	$438.10	$527,800	1,620	$325.80	---	---	---
SAN JOAQUIN	---	---	---	$162,300	1,580	$102.72	$202,500	2,095	$ 96.66
SAN LUIS OBISPO	$309,800	1,745	$177.54	$287,300	1,915	$150.03	$328,000	2,365	$138.69
SAN MATEO	$500,500	1,295	$386.49	$507,600	1,755	$289.23	$693,200	2,110	$328.53
SANTA BARBARA	---	---	---	$322,600	1,895	$170.24	$268,100	2,320	$115.56
SANTA CLARA	$417,600	1,415	$295.12	$452,100	1,720	$262.85	$647,200	2,660	$243.31
SANTA CRUZ	---	---	---	$454,800	2,075	$219.18	$613,200	2,385	$257.11
SHASTA	---	---	---	$129,100	1,470	$ 87.82	$185,800	2,070	$ 89.76
SOLANO	---	---	---	$224,800	1,740	$129.20	$293,900	2,410	$121.95
SONOMA	---	---	---	$286,500	1,595	$179.62	$375,900	2,375	$158.27
STANISLAUS	---	---	---	$139,200	1,460	$ 95.34	$172,500	1,980	$ 87.12
SUTTER	---	---	---	$112,500	1,635	$ 68.81	$156,900	2,100	$ 74.71
TULARE	---	---	---	$117,700	1,420	$ 82.89	$146,800	1,845	$ 79.57
VENTURA	---	---	---	$249,500	1,670	$149.40	$457,800	2,735	$167.39
YOLO	---	---	---	$212,800	1,675	$127.05	$339,000	2,450	$138.37

NOTES: (1) "---" Indicates insufficient number of sales in category to report.
(2) Two-, three-, and four-bedroom homes account for 85.4% of all 2000 new-home sales. (7.7% are 2-bedroom homes, 42.4% are 3-bedroom homes, and 35.3% are 4-bedroom homes. The remaining 14.6% of sales are distributed among homes with fewer than two bedrooms (0.7%) and homes with 5-and-more bedrooms (13.9%).
(3) Prices are rounded to the nearest $100; square footage to the nearest 5 square feet.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 11-C
AVERAGE PRICE, LIVING AREA, AND PRICE PER SQUARE FOOT
FOR NEW 2-, 3-, AND 4-BEDROOM HOMES
CALIFORNIA AND SELECTED COUNTIES

1999

	2-BEDROOM HOMES			3-BEDROOM HOMES			4-BEDROOM HOMES		
	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.
CALIFORNIA	$228,800	1,375	$165.82	$218,100	1,735	$125.71	$309,600	2,375	$130.36
SELECTED COUNTIES									
ALAMEDA	$232,200	1,160	$200.17	$380,600	1,910	$199.27	$472,900	2,440	$193.81
BUTTE	---	---	---	$149,500	1,585	$ 94.32	$194,700	2,115	$ 92.06
CONTRA COSTA	$293,900	1,480	$198.58	$249,500	1,785	$139.78	$378,400	2,470	$153.20
EL DORADO	---	---	---	$212,400	1,885	$112.68	$302,200	2,680	$112.76
FRESNO	---	---	---	$135,400	1,680	$ 80.60	$165,200	2,090	$ 79.04
HUMBOLDT	---	---	---	$158,800	1,635	$ 97.13	---	---	---
IMPERIAL	---	---	---	$129,000	1,450	$ 88.97	$159,400	1,995	$ 79.90
KERN	---	---	---	$127,300	1,690	$ 75.33	$154,100	1,990	$ 77.44
KINGS	---	---	---	$117,100	1,520	$ 77.04	$123,100	1,670	$ 73.71
LAKE	---	---	---	$139,800	1,740	$ 80.34	---	---	---
LOS ANGELES	$230,500	1,270	$181.50	$240,800	1,735	$138.79	$410,500	2,635	$155.79
MADERA	---	---	---	$132,900	1,630	$ 81.53	---	---	---
MARIN	---	---	---	$357,500	1,725	$207.25	$703,000	2,710	$259.41
MERCED	---	---	---	$115,300	1,425	$ 80.91	$145,200	1,875	$ 77.44
MONTEREY	---	---	---	$314,200	1,675	$187.58	$242,400	1,880	$128.94
NAPA	---	---	---	$308,200	1,800	$171.22	$358,900	2,295	$156.38
NEVADA	---	---	---	$261,100	1,960	$133.21	$409,000	2,850	$143.51
ORANGE	$227,700	1,365	$166.81	$349,800	1,975	$177.11	$474,100	2,755	$172.09
PLACER	$202,700	1,500	$135.13	$223,900	1,865	$120.05	$282,600	2,525	$111.92
RIVERSIDE	$207,100	1,715	$120.76	$192,400	1,895	$101.53	$221,500	2,425	$ 91.34
SACRAMENTO	$151,800	1,295	$117.22	$168,900	1,685	$100.24	$208,200	2,190	$ 95.07
SAN BENITO	---	---	---	$246,800	1,660	$148.67	$288,000	2,045	$140.83
SAN BERNARDINO	$ 99,800	1,160	$ 86.03	$163,000	1,770	$ 92.09	$203,600	2,355	$ 86.45
SAN DIEGO	$206,000	1,330	$154.89	$272,100	1,850	$147.08	$347,200	2,510	$138.33
SAN FRANCISCO	$444,100	1,255	$353.86	$472,600	1,710	$276.37	---	---	---
SAN JOAQUIN	---	---	---	$153,600	1,565	$ 98.15	$191,100	2,060	$ 92.77
SAN LUIS OBISPO	$203,500	1,345	$151.30	$241,500	1,755	$137.61	$321,100	2,310	$139.00
SAN MATEO	$372,500	1,395	$267.03	$499,800	1,955	$255.65	$539,300	2,260	$238.63
SANTA BARBARA	---	---	---	$238,300	1,745	$136.56	$294,500	2,195	$134.17
SANTA CLARA	$301,300	1,230	$244.96	$401,600	1,690	$237.63	$544,700	2,545	$214.03
SANTA CRUZ	---	---	---	$357,200	1,810	$197.35	$439,000	2,270	$193.39
SHASTA	---	---	---	$120,800	1,470	$ 82.18	$182,500	2,100	$ 86.90
SOLANO	$169,500	1,405	$120.64	$210,000	1,720	$122.09	$233,500	2,120	$110.14
SONOMA	---	---	---	$228,100	1,605	$142.12	$349,900	2,390	$146.40
STANISLAUS	---	---	---	$131,500	1,510	$ 87.09	$172,300	2,025	$ 85.09
SUTTER	---	---	---	$118,800	1,600	$ 74.25	$134,500	1,870	$ 71.93
TULARE	---	---	---	$119,100	1,490	$ 79.93	$145,300	1,845	$ 78.75
VENTURA	---	---	---	$270,800	1,875	$144.43	$400,100	2,710	$147.64
YOLO	---	---	---	$187,800	1,735	$108.24	$246,700	2,355	$104.76

NOTES: (1) "---" Indicates insufficient number of sales in category to report.
(2) Two-, three-, and four-bedroom homes account for 86.9% of all 1999 new-home sales. (7.0% are 2-bedroom homes, 41.9% are 3-bedroom homes, and 38.0% are 4-bedroom homes. The remaining 13.1% of sales are distributed among homes with fewer than two bedrooms (0.9%) and homes with 5-and-more bedrooms 12.2%.
(3) Prices are rounded to the nearest $100; square footage to the nearest 5 square feet.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 11-D
AVERAGE PRICE, LIVING AREA, AND PRICE PER SQUARE FOOT
FOR NEW 2-, 3-, AND 4-BEDROOM HOMES
CALIFORNIA AND SELECTED COUNTIES

1998

	2-BEDROOM HOMES			3-BEDROOM HOMES			4-BEDROOM HOMES		
	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.	Average Price	Liv. Area (Sq. Ft.)	Price per Sq. Ft.
CALIFORNIA	$207,200	1,365	$151.80	$208,300	1,750	$119.03	$289,800	2,390	$121.26
SELECTED COUNTIES									
ALAMEDA	$198,200	1,175	$168.68	$321,000	1,880	$170.74	$457,100	2,515	$181.75
BUTTE	---	---	---	$155,400	1,720	$ 90.35	$198,400	2,220	$ 89.37
CONTRA COSTA	$216,400	1,465	$147.71	$236,000	1,740	$135.63	$384,500	2,595	$148.17
EL DORADO	---	---	---	$226,100	2,170	$104.19	$279,300	2,525	$110.61
FRESNO	---	---	---	$130,700	1,665	$ 78.50	$181,800	2,280	$ 79.74
HUMBOLDT	---	---	---	$152,900	1,585	$ 96.47	---	---	---
IMPERIAL	---	---	---	$120,100	1,415	$ 84.88	$162,200	2,085	$ 77.79
KERN	---	---	---	$122,800	1,655	$ 74.20	$150,100	2,010	$ 74.68
KINGS	---	---	---	$107,700	1,340	$ 80.37	---	---	---
LAKE	---	---	---	$151,000	1,765	$ 85.55	---	---	---
LOS ANGELES	$201,300	1,350	$149.11	$266,100	1,805	$147.42	$377,200	2,605	$144.80
MADERA	---	---	---	$116,400	1,685	$ 69.08	$130,700	1,820	$ 71.81
MARIN	---	---	---	$393,600	2,025	$194.37	$778,900	3,040	$256.22
MERCED	---	---	---	$109,200	1,405	$ 77.72	$138,400	1,830	$ 75.63
MONTEREY	---	---	---	$257,100	1,690	$152.13	$241,100	1,950	$123.64
NAPA	---	---	---	$277,000	1,710	$161.99	$296,700	2,140	$138.64
NEVADA	---	---	---	$222,700	1,855	$120.05	$279,900	2,600	$107.65
ORANGE	$194,700	1,390	$140.07	$297,100	1,960	$151.58	$425,200	2,855	$148.93
PLACER	$193,000	1,505	$128.24	$200,700	1,830	$109.67	$256,800	2,640	$ 97.27
RIVERSIDE	$147,500	1,415	$104.24	$175,000	1,825	$ 95.89	$192,400	2,395	$ 80.33
SACRAMENTO	$143,200	1,345	$106.47	$165,600	1,640	$100.98	$184,100	2,135	$ 86.23
SAN BENITO	---	---	---	$225,400	1,675	$134.57	$288,000	2,205	$130.61
SAN BERNARDINO	$ 80,400	1,015	$ 79.21	$158,000	1,805	$ 87.53	$177,900	2,230	$ 79.78
SAN DIEGO	$218,500	1,455	$150.17	$245,300	1,820	$134.78	$323,600	2,495	$129.70
SAN FRANCISCO	$372,500	1,230	$302.85	$305,100	1,610	$189.50	$312,800	1,950	$160.41
SAN JOAQUIN	---	---	---	$166,000	1,685	$ 98.52	$205,200	2,195	$ 93.48
SAN LUIS OBISPO	---	---	---	$212,000	1,740	$121.84	$262,800	2,135	$123.09
SAN MATEO	$300,400	1,260	$238.41	$433,600	1,785	$242.91	$585,600	2,570	$227.86
SANTA BARBARA	---	---	---	$205,000	1,710	$119.88	$265,400	2,240	$118.48
SANTA CLARA	$280,100	1,345	$208.25	$353,900	1,695	$208.79	$510,600	2,480	$205.89
SANTA CRUZ	---	---	---	$373,900	2,030	$184.18	$411,400	2,460	$167.24
SHASTA	---	---	---	$131,200	1,595	$ 82.26	$225,300	2,465	$ 91.40
SOLANO	---	---	---	$179,700	1,910	$ 94.08	$227,300	2,285	$ 99.47
SONOMA	---	---	---	$235,200	1,710	$137.54	$317,900	2,380	$133.57
STANISLAUS	---	---	---	$125,700	1,505	$ 83.52	$160,000	1,915	$ 83.55
SUTTER	---	---	---	$131,900	1,760	$ 74.94	$128,300	2,035	$ 63.05
TULARE	---	---	---	$110,800	1,465	$ 75.63	$158,700	2,030	$ 78.18
VENTURA	---	---	---	$278,700	1,965	$141.83	$352,300	2,620	$134.47
YOLO	---	---	---	$178,300	1,735	$102.77	$195,100	2,080	$ 93.80

NOTES: (1) "---" Indicates insufficient number of sales in category to report.
(2) Two-, three-, and four-bedroom homes account for 88.2% of all 1998 new-home sales. (7.7% are 2-bedroom homes, 44.7% are 3-bedroom homes, and 35.8% are 4-bedroom homes. The remaining 11.8% of sales are distributed among homes with less two bedrooms and homes with 5-and-more bedrooms.
(3) Prices are rounded to the nearest $100; square footage to the nearest 5 square feet.

Prepared by Construction Industry Research Board using a sample of reported sales.
Original data provided by FNC, Inc., Costa Mesa, CA (800)446-1099.

TABLE 12-A
NEW SINGLE-FAMILY HOUSING UNITS IN BUILDING PERMITS ISSUED
STATE OF CALIFORNIA BY COUNTY AND YEAR

COUNTY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 PRELIM
ALAMEDA	3067	1633	1331	2337	2052	2352	2492	3102	4189	3774	3016	2893	1602
ALPINE	9	14	10	16	11	18	22	16	10	14	20	26	48
AMADOR	327	312	370	296	214	153	186	134	112	152	240	264	234
BUTTE	1481	1152	972	843	609	623	580	530	557	822	947	909	971
CALAVERAS	760	639	484	418	368	359	261	226	248	270	302	426	544
COLUSA	65	88	113	86	76	73	56	35	52	51	48	44	34
CONTRA COSTA	5462	3132	2684	3279	3006	3680	3047	3137	3093	3143	4081	4344	4088
DEL NORTE	111	168	108	97	96	111	55	51	45	34	33	44	56
EL DORADO	1995	1837	1478	1046	783	967	874	1106	1079	977	1212	1475	1470
FRESNO	4830	3871	3495	4158	3743	3712	3104	3052	2488	2742	2646	2988	3559
GLENN	38	84	102	109	78	74	42	78	100	50	54	42	68
HUMBOLDT	484	604	467	470	501	421	406	355	361	336	355	292	384
IMPERIAL	474	500	680	832	529	658	347	301	268	327	327	543	506
INYO	80	54	42	44	42	45	16	23	18	19	18	18	19
KERN	3918	4492	3107	3851	3082	2672	2702	2393	2384	3025	2832	2856	3467
KINGS	514	519	468	570	530	659	654	569	556	526	493	443	624
LAKE	422	524	446	375	261	192	134	101	79	80	161	135	124
LASSEN	98	142	138	91	46	65	91	117	74	83	114	103	86
LOS ANGELES	23794	8909	7319	6996	4375	4605	5400	5370	6788	6887	7858	8417	8181
MADERA	987	1364	1084	837	694	564	584	527	460	473	481	547	714
MARIN	884	353	260	259	221	318	337	348	420	604	699	479	184
MARIPOSA	145	173	140	126	111	84	76	78	58	71	74	85	95
MENDOCINO	455	491	462	357	306	266	243	206	221	250	268	250	311
MERCED	1587	1061	798	1383	1087	1040	765	837	857	960	1003	1454	1129
MODOC	15	8	17	16	11	10	10	7	7	10	14	20	10
MONO	113	139	74	75	54	65	56	50	74	58	107	106	103
MONTEREY	1815	1027	705	627	756	1301	1116	1160	1358	1167	1506	1492	890
NAPA	884	652	419	313	291	382	299	228	350	455	597	531	771
NEVADA	1115	1093	889	792	578	703	610	526	537	648	786	755	650
ORANGE	8029	3352	3589	3582	4507	7565	5663	7070	8219	7366	7686	6794	5931
PLACER	3314	2631	1445	1608	2006	2615	2441	2723	3011	3878	3875	4745	4728
PLUMAS	191	277	243	301	114	197	94	120	120	123	101	188	191
RIVERSIDE	22010	12171	6976	7607	7012	7690	6803	7021	8678	10758	12659	13630	16576
SACRAMENTO	10614	8442	4264	4830	4511	4562	3535	3593	3810	5172	5682	6403	7597
SAN BENITO	459	249	160	269	379	457	400	443	622	733	579	533	287
SAN BERNARDINO	16251	11013	5969	5882	5354	4585	3852	4703	5124	5602	6593	5865	6784
SAN DIEGO	10856	6621	5342	3762	4076	5247	4736	5816	8338	9160	9993	9167	9331
SAN FRANCISCO	147	161	195	70	82	107	106	201	210	184	114	79	96
SAN JOAQUIN	3864	2959	1912	2494	2545	2225	2156	2189	2166	3170	4034	5277	4063
SAN LUIS OBISPO	2356	1289	932	620	777	1011	917	1105	1261	1680	1578	1547	1687
SAN MATEO	1085	636	503	342	421	599	717	673	922	988	768	846	762
SANTA BARBARA	1386	872	693	537	495	561	605	695	546	798	601	731	886
SANTA CLARA	2548	1675	1663	1693	1822	2127	2199	4042	4367	3911	3333	2834	1614
SANTA CRUZ	724	396	306	279	278	418	379	385	529	453	372	430	398
SIERRA	17	11	20	25	15	20	17	16	9	10	14	19	18
SISKIYOU	163	164	129	157	152	130	143	115	128	121	133	143	169
SOLANO	5400	1763	1408	1609	1419	1380	946	1180	1456	1768	1430	2050	1821
SONOMA	3657	2647	2048	1817	1687	2117	1605	1389	1783	1996	2361	2034	1644
STANISLAUS	5123	3465	1452	2107	1835	1409	1307	1329	1408	1997	2246	3110	2941
SUTTER	551	756	518	677	604	459	418	279	218	200	183	247	388
TEHAMA	189	311	259	225	226	229	170	142	93	154	153	139	171
TRINITY	80	63	66	64	46	54	36	30	31	50	40	33	47
TULARE	1533	1893	1680	1736	1539	1734	1399	1341	1200	1387	1515	1565	1696
TUOLUMNE	644	705	398	357	247	222	182	154	164	261	194	276	251
VENTURA	3347	1360	1047	1166	1166	1649	1954	2130	2071	2811	3662	2995	3156
YOLO	702	708	550	373	723	547	583	680	704	841	696	1060	1233
YUBA	150	339	299	251	298	146	112	118	137	89	79	84	210
STATE TOTALS	162651	103819	73809	76187	69901	77115	68689	74923	84780	94298	101711	105595	106612

CONSTRUCTION INDUSTRY RESEARCH BOARD

TABLE 12-B
NEW MULTI-FAMILY HOUSING UNITS IN BUILDING PERMITS ISSUED
STATE OF CALIFORNIA BY COUNTY AND YEAR

COUNTY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 PRELIM
ALAMEDA	2961	1365	1299	741	515	776	458	796	2311	2123	1495	1315	1522
ALPINE	0	0	0	0	10	2	19	0	0	51	30	4	6
AMADOR	74	6	0	6	10	10	0	6	6	5	16	10	4
BUTTE	468	759	526	51	98	232	76	62	34	88	13	169	66
CALAVERAS	6	6	48	0	4	0	27	0	12	28	0	0	4
COLUSA	6	11	4	30	46	4	6	0	0	0	0	2	5
CONTRA COSTA	2208	1149	1268	620	427	189	307	415	421	1106	508	1295	927
DEL NORTE	18	38	2	6	16	38	42	0	0	16	2	0	0
EL DORADO	181	115	238	24	25	57	6	380	0	195	223	87	704
FRESNO	2274	1481	869	835	404	926	987	409	268	292	386	208	324
GLENN	2	9	49	4	14	6	0	0	0	0	0	0	0
HUMBOLDT	264	271	220	154	182	103	100	41	101	37	49	81	80
IMPERIAL	297	587	109	169	97	196	150	30	59	67	6	134	198
INYO	11	15	8	0	4	0	0	0	0	0	0	0	0
KERN	385	397	291	515	314	473	602	419	253	428	325	204	164
KINGS	18	108	126	49	13	13	13	85	227	231	0	0	46
LAKE	73	8	37	24	9	2	38	2	89	4	4	52	0
LASSEN	10	34	0	0	0	18	68	4	10	0	2	4	0
LOS ANGELES	24547	16136	8876	4911	2884	3016	3005	3237	3636	4805	6525	8654	10067
MADERA	190	194	46	206	105	123	271	92	45	160	138	101	81
MARIN	530	454	173	43	80	33	241	394	178	109	37	154	130
MARIPOSA	32	0	0	0	0	0	34	49	0	0	0	0	0
MENDOCINO	163	71	24	15	33	20	34	32	38	16	2	25	21
MERCED	105	117	188	77	20	12	102	34	153	72	0	99	2
MODOC	0	0	0	0	0	0	0	2	0	0	0	0	0
MONO	162	108	4	7	20	33	8	32	22	57	106	138	190
MONTEREY	416	356	226	109	113	165	207	336	355	11	575	210	174
NEVADA	27	52	74	32	82	34	120	73	108	20	29	92	30
ORANGE	8608	8627	2980	2361	1903	5079	2637	3137	4032	2735	4662	5573	2721
PLACER	1390	257	831	6	96	246	133	124	826	1328	1021	1634	1257
PLUMAS	25	20	0	0	8	0	2	0	0	0	0	0	0
RIVERSIDE	3692	3460	2380	599	287	596	143	478	1106	1735	1920	1780	2449
SACRAMENTO	2507	1980	598	951	554	567	328	277	529	1670	2061	1347	1837
SAN BENITO	71	33	7	96	25	34	22	0	8	12	2	8	40
SAN BERNARDINO	3700	2196	866	1356	498	145	101	311	469	511	479	715	1749
SAN DIEGO	7854	9175	2566	2297	1526	1688	1872	1052	3064	3013	6434	6760	6319
SAN FRANCISCO	1361	916	792	559	919	841	409	1277	1511	2152	3697	3286	1723
SAN JOAQUIN	315	229	237	255	83	51	165	220	309	59	12	46	336
SAN LUIS OBISPO	197	182	85	46	78	36	68	71	68	50	86	103	339
SAN MATEO	1335	191	331	596	89	301	707	432	597	1187	133	1471	679
SANTA BARBARA	155	397	344	182	54	139	187	80	357	228	314	193	382
SANTA CLARA	2311	3646	2102	1143	1617	1827	1285	3459	4443	3615	3677	4220	4211
SANTA CRUZ	244	156	105	357	67	91	124	151	222	186	134	157	204
SHASTA	284	513	142	43	189	92	123	138	64	65	64	182	6
SIERRA	0	0	0	0	0	0	0	0	0	0	0	0	0
SISKIYOU	70	11	4	30	12	14	33	38	10	4	21	4	0
SOLANO	833	551	34	194	50	121	169	557	86	436	523	296	739
SONOMA	861	997	160	159	252	334	322	75	338	968	691	521	922
STANISLAUS	1195	486	191	72	148	74	40	99	64	93	64	303	190
SUTTER	148	314	49	62	12	4	56	8	28	8	0	2	6
TEHAMA	46	8	72	81	43	22	63	12	2	0	2	82	15
TRINITY	4	2	0	0	0	0	0	2	0	0	6	0	0
TULARE	476	240	310	230	222	169	328	87	138	68	138	86	77
TUOLUMNE	97	143	163	6	4	8	3	0	82	152	0	2	0
VENTURA	1679	1252	1147	554	206	815	212	223	245	371	780	976	289
YOLO	118	576	565	233	148	136	126	118	10	750	769	156	66
YUBA	10	34	7	20	16	9	8	0	2	64	142	0	0
STATE TOTALS	75096	60494	32110	21220	14755	19932	16604	19360	26936	31409	38426	42945	41435

CONSTRUCTION INDUSTRY RESEARCH BOARD

TABLE 12-C
TOTAL NEW HOUSING UNITS IN BUILDING PERMITS ISSUED
STATE OF CALIFORNIA BY COUNTY AND YEAR

COUNTY	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001 PRELIM
ALAMEDA	6028	2998	2630	3078	2567	3128	2950	3898	6500	5897	4511	4208	3124
ALPINE	9	14	10	16	21	20	41	16	10	65	50	30	54
AMADOR	401	318	370	302	224	163	186	140	118	157	256	274	238
BUTTE	1949	1911	1498	894	707	855	656	592	591	910	960	1078	1037
CALAVERAS	766	645	532	418	372	359	288	226	260	298	302	426	548
COLUSA	71	99	117	116	122	77	62	35	52	51	48	46	39
CONTRA COSTA	7670	4281	3952	3899	3433	3869	3354	3552	3514	4249	4589	5639	5015
DEL NORTE	129	206	110	103	112	149	97	51	45	50	35	44	56
EL DORADO	2176	1952	1716	1070	808	1024	880	1486	1079	1172	1435	1562	2174
FRESNO	7104	5352	4364	4993	4147	4638	4091	3461	2756	3034	3032	3196	3883
GLENN	40	93	151	113	92	80	42	78	100	50	54	42	68
HUMBOLDT	748	875	687	624	683	524	506	396	462	373	404	373	464
IMPERIAL	771	1087	789	1001	626	854	497	331	327	394	333	677	704
INYO	91	69	50	44	46	45	16	23	18	19	18	18	19
KERN	4303	4889	3398	4366	3396	3145	3304	2812	2637	3453	3157	3060	3631
KINGS	532	627	594	619	543	672	667	654	783	757	493	443	670
LAKE	495	532	483	399	270	194	172	103	168	84	165	187	124
LASSEN	108	176	138	91	46	83	159	121	84	83	116	107	86
LOS ANGELES	48341	25045	16195	11907	7259	7621	8405	8607	10424	11692	14383	17071	18248
MADERA	1177	1558	1130	1043	799	687	855	619	505	633	619	648	795
MARIN	1414	807	433	302	301	351	578	742	598	713	736	633	314
MARIPOSA	177	173	140	126	111	84	110	127	58	71	74	85	95
MENDOCINO	618	562	486	372	339	286	277	238	259	266	270	275	332
MERCED	1692	1178	986	1460	1107	1052	867	871	1010	1032	1003	1553	1131
MODOC	15	8	17	16	11	10	10	9	7	10	14	20	10
MONO	275	247	78	82	74	98	64	82	96	115	213	244	293
MONTEREY	2231	1383	931	736	869	1466	1323	1496	1713	1178	2081	1702	1064
NAPA	966	707	756	417	415	394	316	232	350	483	720	535	905
NEVADA	1142	1145	963	824	660	737	730	599	645	668	815	847	680
ORANGE	16637	11979	6569	5943	6410	12644	8300	10207	12251	10101	12348	12367	8652
PLACER	4704	2888	2276	1614	2102	2861	2574	2847	3837	5206	4896	6379	5985
PLUMAS	216	297	243	301	122	197	96	120	120	123	101	188	191
RIVERSIDE	25702	15631	9356	8206	7299	8286	6946	7499	9784	12493	14579	15410	19025
SACRAMENTO	13121	10422	4862	5781	5065	5129	3863	3870	4339	6842	7743	7750	9434
SAN BENITO	530	282	167	365	404	491	422	443	630	745	581	541	327
SAN BERNARDINO	19951	13209	6835	7238	5852	4730	3953	5014	5593	6113	7072	6580	8533
SAN DIEGO	18710	15796	7908	6059	5602	6935	6608	6868	11402	12173	16427	15927	15650
SAN FRANCISCO	1508	1077	987	629	1001	948	515	1478	1721	2336	3811	3365	1819
SAN JOAQUIN	4179	3188	2149	2749	2628	2276	2321	2409	2475	3229	4046	5323	4399
SAN LUIS OBISPO	2553	1471	1017	666	855	1047	985	1176	1329	1730	1664	1650	2026
SAN MATEO	2420	827	834	938	510	900	1424	1105	1519	2175	901	2317	1441
SANTA BARBARA	1541	1269	1037	719	549	700	792	775	903	1026	915	924	1268
SANTA CLARA	4859	5321	3765	2836	3439	3954	3484	7501	8810	7526	7010	7054	5825
SANTA CRUZ	968	552	411	636	345	509	503	536	751	639	506	587	602
SIERRA	17	11	20	25	15	20	17	16	9	10	14	19	18
SISKIYOU	233	175	133	187	164	144	176	153	138	125	154	147	169
SOLANO	6233	2314	1442	1803	1469	1501	1115	1737	1542	2204	1953	2346	2560
SONOMA	4518	3644	2208	1976	1939	2451	1927	1464	2121	2964	3052	2555	2566
STANISLAUS	6318	3951	1643	2179	1983	1483	1347	1428	1472	2090	2310	3413	3131
SUTTER	699	1070	567	739	616	463	474	287	246	208	183	249	394
TEHAMA	235	319	331	306	269	251	233	154	95	154	155	221	186
TRINITY	84	65	66	64	46	54	36	32	31	50	46	33	47
TULARE	2009	2133	1990	1966	1761	1903	1727	1428	1338	1455	1653	1651	1773
TUOLUMNE	741	848	561	363	251	230	185	154	246	413	194	278	251
VENTURA	5026	2612	2194	1720	1372	2464	2166	2353	2316	3182	4442	3971	3445
YOLO	820	1284	1115	606	871	683	709	798	714	1591	1465	1216	1299
YUBA	160	373	306	271	314	155	120	118	139	153	221	84	210
STATE TOTALS	237747	164313	105919	97407	84656	97047	85293	94283	111716	125707	140137	148540	148047

CONSTRUCTION INDUSTRY RESEARCH BOARD

TABLE 12 NOTES

BUILDING CLASSIFICATION NOTES AND DEFINITIONS

The building classifications and definitions used in grouping the building-permit data in Table 12 are as follows:

SINGLE-FAMILY HOUSING: Includes detached, semi-detached, rowhouse and townhouse units. Rowhouses and townhouses are included when each unit is separated from the adjacent unit by an unbroken ground-to-roof party or fire wall. Condominiums are included in single-family when they are of zero-lot-line or zero-property-line construction, when units are separated by an air space, or, when units are separated by an unbroken ground-to-roof party or fire wall.

MULTI-FAMILY HOUSING: Includes duplexes, 3-4-unit structures and apartment-type structures with five units or more. Multi-family housing also includes condominium units in structures of more than one living unit that do not meet the above single-family housing definition.

COUNTIES BY MAJOR REGION

COUNTIES CONTAINED IN THE MAJOR REGIONS SUMMARIZED ON PAGE 9 ARE GROUPED AS FOLLOWS:

SAN FRANCISCO BAY REGION: ALAMEDA, CONTRA COSTA, MARIN, NAPA, SAN FRANCISCO, SAN MATEO, SANTA CLARA, SOLANO, SONOMA

SOUTHERN CALIFORNIA REGION: IMPERIAL, LOS ANGELES, ORANGE, RIVERSIDE, SAN BERNARDINO, SAN DIEGO, SAN LUIS OBISPO, SANTA BARBARA, VENTURA

CENTRAL VALLEY REGION: BUTTE, COLUSA, EL DORADO, FRESNO, GLENN, KERN, KINGS, MADERA, MERCED, PLACER, SACRAMENTO, SAN JOAQUIN, SHASTA, STANISLAUS, SUTTER, TEHAMA, TULARE, YOLO, YUBA

BALANCE OF STATE: ALPINE, AMADOR, CALAVERAS, DEL NORTE, HUMBOLDT, INYO, LAKE, LASSEN, MARIPOSA, MENDOCINO, MODOC, MONO, MONTEREY, NEVADA, PLUMAS, SAN BENITO, SANTA CRUZ, SIERRA, SISKIYOU, TRINITY, TUOLUMNE

Doug Hensel

From: Bill Staack
Sent: Tuesday, November 09, 2004 7:37 AM
To: Doug Hensel
Subject: RE: Adhesives product used

Thanks Doug.

-----Original Message-----
From: Doug Hensel
Sent: Tuesday, November 09, 2004 7:35 AM
To: Bill Staack
Subject: RE: Adhesives product used

I talked to Harry and he used 2 ½ pints of CPVC cement to do a 3bdrm, 3bath home. He was going to get back to me regarding the amount used for ABS and never did, my guess and experience is that about 1 ½ 16 oz containers would be used for the same house to do the drain, waste , and vent piping.

Doug Hensel
District Representative II
California Department of
Housing and Community Development
Division of Codes and Standards
(916)445-9471 ~ fax: (916)327-4712
dhensel@hcd.ca.gov

AIR QUALITY
FAX
RTD
FOX

From: Bob Raymer [rraymer@cbia.org]

Sent: Tuesday, March 01, 2005 5:08 PM

To: Bill Staack

Subject: Revised Data

The housing-start data that I sent you last year has been updated by the Construction Industry Research Board. At preser: CIRB is indicating that 211,000 dwelling units were constructed in 2004. This means that we produced homes at a rate of 5 : units per day.

If memory serves correctly, I had sent you data some time ago indicating a total of 201,000 units for the year which would h meant a rate of 550 per day. At this point, you can consider the 211,000 figure for 2004 to be very firm with little chance for further revision. I hope this is what you're looking for.

IPS WELD·ON

IMPORTANT

NOTICE!

MOST JOINT FAILURES ARE CAUSED BY "DRY JOINTS"!

"DRY JOINT" failures occur between plastic pipe and fittings when insufficient coatings of solvent cement are applied to pipe and fitting surfaces. It is our conservative estimate that 90% of joint failures reported to us would not have occurred if an adequate coating of cement had been applied.

3 REASONS WHY ADEQUATE LAYERS OF SOLVENT CEMENT ARE ESSENTIAL

1. Cement must be wet when joints are assembled. (A very thin layer of cement will dry very quickly, but a thicker layer will stay wet for thirty to ninety seconds depending on which cement is used.)
2. An adequate layer of cement ensures that sufficient solvent remains to soften (bite into) pipe and fitting so they will fuse together in tight parts of the joint.
3. It is necessary to have more than sufficient cement to fill the space between pipe and fitting.

A MAJOR CAUSE OF "DRY JOINTS" IS THE USE OF TOO SMALL AN APPLICATOR FOR THE SIZE OF PIPE AND FITTING – Too thin a layer too slowly applied = "Dry Joint"

BE SURE TO SELECT AN APPLICATOR BIG ENOUGH FOR THE JOB!

IPS WELD-ON APPLICATORS ARE RECOMMENDED FOR THE FOLLOWING PIPE SIZES:

Small ¾"dia. wool dauber cap (standard in our small applicator cans) ..... ⅜" thru 1¼"

Large 1½" dia. wool dauber cap ..... ¾" thru 3"

BCP-1 reusable 1" brush cap (interchangeable with caps on pt. & qt. cans) ..... ¾" thru 2"

3020 – 2" dia. "Roll-A-Weld" Roller for use on qt. TT (paint type) cans ..... 3" thru 6"

7020 – Giant 7" roller, 2" dia., for use with gal. F style, 2⅞" sc. cap cans ..... 6" thru 12"

4020 – Large cotton swab, 4" x 2" dia., for use with gal. F style, 2⅞" sc. cap cans .... 6" thru 12"

For addition information ask your cement supplier or contact us directly.

Product bulletins for specific Weld-On cements and detailed solvent cementing instructions are available.

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IPS CORPORATION · 455 W. VICTORIA · COMPTON, CA 90220 · (310) 898-3300 · P.O. BOX 379, GARDENA, CA 90248 U.S.A.

MANUFACTURERS AND FORMULATORS OF ADHESIVE CEMENTS FOR EPOXY • VINYLS • NYLONS • ACRYLICS • FIBRE GLASS • POLYESTER • ABS FOAMS • BUTYRATE • STYRENE • URETHANE • POLYETHYLENE FILM • RUBBER • WOOD • METAL • MASONRY • GLASS • CERAMICS • MANY OTHERS

pictures of grapes, San Francisco cable car, electronic organizer, city skyline, the Hollywood sign and cypress tree

FACILITY DETAILS

Facility Information

Facility Name : Ips Corp
Facility ID : 800367
Street : 17109 S Main St
SIC Code : 2891
City : Gardena
Zip : 90248 0
Phone : (310) 898-3300
County : Los Angeles
Air Basin : South Coast
District : South Coast Aqmd

Facility Prioritization	Inventory Year	Above High Threshold?	District Prioritization Threshold High	Low
Cancer Prioritization			10	1
Chronic Prioritization			10	1
Acute Prioritization			10	1

Prioritization scores determine whether a facility must conduct a risk assessment for the "Hot Spots" program. The scores themselves are not an accurate measurement of facility risk.

Health Risk Assessment	Inventory Year	Value	District Notification Level	District RRAP Level
Cancer Risk			>=10	25
Chronic Hazard Index			>1; lead THI >.5	3
Acute Hazard Index			>1; lead THI >.5	3

The facility health risk assessment (HRA) and prioritization score data were collected under the Air Toxic 'Hot Spots' Program. The risk data, submitted to the ARB, may not have been derived from the same toxic emission data that was reported to CEIDARS. Because the facility may have taken action to reduce risks pursuant to the risk assessment, the risk from the facility may have been substantially reduced since the risk assessment was conducted. To determine if more recent data is available, please contact the district.

Program Status :

Emissions Data

	Pollutant	Emissions	Unit
Data from 2002	TOG	21.5	Tons/Yr
Download CSV file	ROG	18.2	Tons/Yr
	CO	0	Tons/Yr
	NOX	0	Tons/Yr
	SOX	0	Tons/Yr
	PM	0	Tons/Yr
	PM10	0	Tons/Yr
	PM2.5	0	Tons/Yr
TOXIC DATA MAY COME FROM VARIOUS YEARS			
	Methylene Chlor	102	Lbs/Yr
Download CSV file	TCE	69.6	Lbs/Yr

The emission inventory data provided here may have been developed over several years and is the most recent information available at ARB for this inventory year. Many facilities are only required to update their toxic emission data if there has been an increase in emissions. Therefore, the toxic emission data presented here should generally be viewed as maximum emission values which may have decreased since this information was reported. If you have questions regarding data updates, please contact the local air district. Note: If this facility has diesel-fueled internal combustion engines, then a portion of the PM10 shown is considered to be diesel exhaust PM10.

[Start a new search] [Report an Error]

ARB Homepage

A department of the California Environmental Protection Agency

pictures of grapes, San Francisco cable car, electronic organizer, city skyline, the Hollywood sign and cypress tree

FACILITY DETAILS

Facility Information

Facility Name : Oatey Company
Street : 6600 Smith Avenue
City : Newark
Phone : (510) 797-4672
County : Alameda
Air Basin : San Francisco Bay Area
District : Bay Area Aqmd

Facility ID : 970
SIC Code : 2821
Zip : 94560

Facility Prioritization	Inventory Year	Above High Threshold?	District Prioritization Threshold High	Low
Cancer Prioritization			10	1
Chronic Prioritization			10	1
Acute Prioritization			10	1

Prioritization scores determine whether a facility must conduct a risk assessment for the "Hot Spots" program. The scores themselves are not an accurate measurement of facility risk.

Health Risk Assessment	Inventory Year	Value	District Notification Level	District RRAP Level
Cancer Risk			10	100
Chronic Hazard Index			>10	none
Acute Hazard Index			>10	none

The facility health risk assessment (HRA) and prioritization score data were collected under the Air Toxic 'Hot Spots' Program. The risk data, submitted to the ARB, may not have been derived from the same toxic emission data that was reported to CEIDARS. Because the facility may have taken action to reduce risks pursuant to the risk assessment, the risk from the facility may have been substantially reduced since the risk assessment was conducted. To determine if more recent data is available, please contact the district.

Program Status :

Emissions Data

	Pollutant	Emissions	Unit
Data from 2002	TOG	19.7	Tons/Yr
Download CSV file	ROG	16.7	Tons/Yr
	CO	0	Tons/Yr
	NOX	0	Tons/Yr
	SOX	0	Tons/Yr
	PM	0.3	Tons/Yr
	PM10	0.3	Tons/Yr
	PM2.5	0.3	Tons/Yr

The emission inventory data provided here may have been developed over several years and is the most recent information available at ARB for this inventory year. Many facilities are only required to update their toxic emission data if there has been an increase in emissions. Therefore, the toxic emission data presented here should generally be viewed as maximum emission values which may have decreased since this information was reported. If you have questions regarding data updates, please contact the local air district. Note: If this facility has diesel-fueled internal combustion engines, then a portion of the PM10 shown is considered to be diesel exhaust PM10.

[Start a new search] [Report an Error]

ARB Homepage

A department of the California Environmental Protection Agency

Doug Hensel

From: Bill Staack
Sent: Wednesday, November 03, 2004 3:21 PM
To: Doug Hensel
Subject: Adhesive used

Doug. Could you develop a simi-accurate estimate on the amount of adhesive would be used in a house to install CPVC water pipe and what is being used for Waste/Drain/Vent pipe. As an assumed example: the Waste/Drain/Vent pipe uses a 5 pound can of adhesive and CPVC would add another 1 pound can. That is what I am looking for.

Thanks.

Bill Staack, Esq., P.E.
Legal Affairs Division
Department of Housing and Community Development
(916) 323-7288
e-mail: BStaack@hcd.ca.gov

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RTD
FY

Doug Hensel

From: Bill Staack
Sent: Monday, November 08, 2004 7:34 AM
To: Doug Hensel
Subject: Adhesives product used

Doug. I if safe to say that approximately 2 pound of adhesives are would be used to glue a typical residences with CPVC?

Bill Staack, Esq., P.E.
Senior Staff Counsel
Legal Affairs Division
Department of Housing and Community Development
(916) 323-7288
e-mail: BStaack@hcd.ca.gov

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RTD
FOX

From: Harry Moos [mailto:Harry.Moos@Noveon.com]
Sent: Friday, December 03, 2004 8:45 AM
To: Doug Hensel
Subject: CPVC usage

Doug, this is the best estimate I could come up with:

1. Home many homes in California have CPVC in the years of :
   A. 2000, 2,000 homes
   B. 2001, 2,200 homes
   C. 2002, 2,200 homes.
   D. 2003, 2700 homes
   E. 2004, 12,000 homes base through November, this includes Multi-family.

2. Number of re-pipes for all materials in California including Copper, Pex, and Flowguard CPVC:

Since 2000 the average is approx 20,000 to 25,000 a year and most early on was copper and CPVC, Ace Dura Flow a company that coats the pipe is claiming they have been getting approx, 1,200 a year using their process. Pex is not the choice of re-pipers as it is to flexible and does not replace existing piping easy as CPVC or Copper.

Doug I hope this helps but these are very conservative figures above.

Noveon a Lubrizol Company
Harry Moos Consultant
4832 Cory Ct
Carmichael, Ca 95608
916-952-7238 Phone
916-484-0733 Fax.

harry.moos@noveon.com

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Low VOC (volatile organic compounds), dimethyl-2-piperidone solvent-based, PVC and CPVC pipe and component adhesives and primers containing minimal or no tetrahydrofuran

Inventor:

Patel, Naresh D., Northridge, CA

Otremba, Edward D., Orchard Park, NY

Siddiqi, Rashid H., South Pasadena, CA

Assignee:

IPS Corporation, (02), Gardena, CA

Examiner: Niland, Patrick D.

Combined Principal Attorneys: Collins, David W.

	Publication Number	Kind	Date	Application Number	Filing Date
Main Patent	US 6372821	A	20020416	US 2000651824	20000830
CIP	Abandoned		US 99255970	19990105	

Current US Classification (Main): 523219000 (X-ref): 524099000; 524356000; 524527000; 524567000

US Classification on document (Main): 523219 (X-ref): 524099; 524356; 524527; 524567

International Classification (Edition 1): C08J-009/32; C08K-005/34; C08K-005/07; C08L-027/00

Examiner Field of Search (US): 523218; 524099; 524356; 524527; 524567

Cited US Patents

Patent Number	Date(YYYYMM)	Main US Class	Assignee
US 4675354	198706	524099	Sperling
US 4687798	198708	524100	King
US 5384345	199501	523218	Naton
US 5422388	199506	524104	Patel
US 5470894	199511	523218	Patel
US 5817708	199810	524104	Congelio
US 5821289	199810	524104	Congelio

Cited non-Patent References:

- DuPont Nylon Intermediates and Specialties, Material Safety Data Sheet, H-16147-2.

Post Issue Legal Status:

Calculated Expiration Date: 20190105

Reassignment

Recorded: 20040804

Action: SECURITY AGREEMENT

Assignor: IPS CORPORATION, DATE SIGNED: 06/30/2004

Assignee: MADISON CAPITAL FUNDING LLC, AS AGENT, 30 S. WACKER DR., CHICAGO, ILLINOIS, 60606

Reel: 015667

Frame: 0221

Contact: WINSTON & STRAWN LLP, LAURA KONRATH, 35 W. WACKER DR., 33RD FLOOR, CHICAGO, IL 60601

Parent Case Text:

CROSS-REFERENCE TO RELATED APPLICATION

The present application is a continuation-in-part application of Ser. No. 09/255,970, filed on Jan. 5, 1999; now abandoned.

Abstract: Novel low VOC solvent-based adhesives are provided, comprising a mixture of low vapor pressure, isomeric dimethyl-2-piperidones (DMPD) blended with (1) a non-solvent diluent, specifically, acetone (a VOC-exempt compound), or with mixtures of acetone and other known ketonic solvents such as methyl ethyl ketone (MEK), diethyl ketone (DEK), methyl propyl ketone (MPK), and methyl iso-butyl ketone (MIBK), cyclohexanone, and (2) thermoplastic PVC or CPVC resins. Omission of the resin provides a novel primer for pipes. The blended mixture yields PVC or CPVC pipe adhesives and primers that: (1) result in low VOC formulas (e.g., less than 510 g/l for PVC pipe and less than 490 g/l for CPVC pipe); (2) are very economical in the industry; (3) yield strong, quick setting, durable pipe joints that meet the required standards and performance criteria (e.g., ASTM D-2564 lap shear for PVC); (4) yield stable, low viscosity solutions that, in the case of adhesives, can be readily adjusted with thixotropes (e.g., Aerosil 200) to give desirable flow characteristics and body, as well as primers for solvent welding PVC and CPVC pipe and components; and (5) can be formulated with minimal (10 wt %) or no cyclic ethers such as THF.

Summary of the Invention:

TECHNICAL FIELD

The present invention relates generally to thermoplastic pipe adhesive and primer compositions, and, more particularly, to adhesives and primers used for joining PCV (polyvinyl chloride) and CPVC (chlorinated PVC) pipe. Specifically, the PVC and CPVC pipe adhesives and primers disclosed and claimed herein are solvent-based, having an environmentally-acceptable VOC (volatile organic compounds) content.

BACKGROUND ART

Solvent-based adhesives, or cements, have been in use for joining thermoplastic pipe for over 30 years. The development of these adhesives is largely responsible for growth of the thermoplastic pipe industry. Several billion pounds of plastic pipe are produced each year in North America. Rapid-setting, solvent-based adhesives weld the pipes together in a timely manner. These rapid-setting adhesives allow for the testing and trouble-shooting of piping systems in a matter of hours while maintaining the long-term durability of the pipe itself. These characteristics, rapid set, ease of use, long-term durability along with low-cost, have made the joining of plastic pipe by solvent-based adhesives a practical and economic system.

The solvent-based adhesives work primarily by two means of action. First, the solvent portion of the formulation softens the outer surfaces of the pipe through solvation of the plastic. Subsequently, the adhesive joint "cures" (hardens) by means of the solvents evaporating to the surrounding atmosphere from the pipe. Secondly, the resin dissolved in the adhesive dries through solvent evaporation and provides continuity between the welded pipe surfaces which aid in preserving the integrity of the entire pipe system. These adhesives cure rapidly (within a matter of hours), often allowing piping systems to be tested the same day as constructed. However, perhaps the most important benefit of

these solvent-based adhesives is the maintenance of the integrity of the pipe itself. The resin is the same as the plastic pipe and/or fitting material. This provides a high degree of long-term durability for the piping system, often up to 30 to 40 years of useful life. This is essential for these systems which are built into the structures of homes and buildings, or are buried underground.

Thousands of miles of thermoplastic piping systems are constructed each day throughout the world, primarily by the means previously described. These systems are used in the transfer of potable water for drinking; residential hot and cold water systems; drain, waste, and vent (DWV) applications in home and industry; turf and agricultural sprinkler systems; jacuzzi, spa and tub connections, residential and commercial fire sprinkler systems; etc. These systems are crucial to the maintenance of safe and healthy means of transport of water and other chemicals throughout the world.

Evaporation of solvents from adhesives is a concern to an environmentally-concerned world, along with all other potential sources of air pollution. Typical solids (non-volatile) contents of plastic pipe adhesives are 10 to 20% for both PVC and CPVC. The balance of the formulation is solvent. By definition, the solvents normally used, e.g., tetrahydrofuran (THF), methyl ethyl ketone (MEK), and acetone are considered to be VOCs. That is, they are volatile compounds which contain the element carbon excluding methane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides and carbonates, ammonium carbonate, and exempt compounds, such as methylene chloride and 1,1,1-trichlorethane. While other solvents, such as cyclohexanone and dimethyl formamide (in the case of PVC) and cyclohexanone (in the case of CPVC), may also be used in such adhesives, the amount of such solvents are typically minor, considerably less than 15 wt % (in the case of PVC) and 10 wt % (in the case of CPVC) of the total adhesive concentration. Typical VOC values of present commercial PVC solvent adhesives range from 750 to 850 grams/liter and for CPVC solvent adhesives range from 775 to 850 g/l.

Regulations are being created throughout North America regarding allowable VOC levels in adhesive formulations. Federal, state, and local agencies are beginning to adopt strict measures to drastically reduce these levels. The South Coast Air Quality Management District (SCAQMD) in the Los Angeles area has been a leader of the establishment of rules governing VOCs, such as SCAQMD Rule 1168.

SCAQMD Rule 1168 specifies a VOC level for PVC adhesives of 510 g/l or less and for CPVC adhesives of 490 g/l or less, as determined by Method 316-A. All PVC and CPVC adhesives used after Jan. 24, 1994, are required to meet that maximum allowed level. More recently, acetone has been removed from the list of solvents and placed on the list of exempt solvents. Consequently, there is, at the present time, no legal limit to the amount of acetone that can be added to adhesive compositions.

Further, tetrahydrofuran (THF), which has been a major component of PVC and CPVC adhesive compositions (typically, 25 to 75 wt %), has been found by the National Toxicology Board to have a slight carcinogenicity in animal testing. As a result, THF is under extensive investigation, both with regard to worker health (exposure during pipe assembly) and potable water issues. Furthermore, THF is a high vapor pressure, fast-evaporating solvent that heavily contributes to the VOC level. It is highly desirable to reduce THF levels, but still maintain the adhesive-contributing properties that THF offers, i.e., fast-setting, durable pipe joints.

Also, many PVC and CPVC pipe adhesives are formulated with N-methyl pyrrolidone (NMP), a very effective solvent for PVC and CPVC resins. However, the hygroscopicity of this solvent results in milky white cured film joints, even in pigmented blue and gray formulas, and this is undesirable in many applications.

Other thermoplastic pipe adhesives are formulated with large amounts of low vapor pressure solvents blends, such as di-methyladipate (available from E. I. DuPont de Nemours as DBE-6) and NMP and/or alkyl-substituted naphthalene (U.S. Pat. No. 5,821,289, issued to C. D. Congelio et al) to reduce VOC levels, but generally these type of adhesives require longer set times before water pressure testing of the system can be made. Also, these slower setting adhesives are less effective in colder environments.

Still another method to formulate low VOC cements for thermoplastic pipe and other PVC and CPVC extruded articles is to incorporate higher amounts of resin(s). This does indeed reduces VOC levels, but is less cost effective and generally slower than cements containing lower weight percent of resin.

Thus, adhesives for joining PVC and CPVC pipes having a maximum VOC level of 510 g/l (for PVC) or 490 g/l (for CPVC) are required. Yet, such adhesive must also meet the required hydrostatic burst strength and other performance criteria set forth in ASTM F-493 and D-2846 and lap shear strength set forth in ASTM D-2564. (Test method 316A has been revised and the new acceptable VOC levels are shown above.)

DISCLOSURE OF INVENTION

In accordance with the present invention, novel low VOC solvent-based adhesives are provided, comprising a mixture of low vapor pressure isomeric dimethyl-2-piperidones (DMPD) blended with (1) a non-solvent diluent, specifically, acetone (a VOC-exempt compound), or with mixtures of acetone and other known ketonic solvents such as methyl ethyl ketone (MEK), diethyl ketone (DEK), methyl propyl ketone (MPK), and methyl iso-butyl ketone (MIBK), cyclohexanone, and (2) thermoplastic PVC or CPVC resins. Primers are also provided in accordance with the present invention by omitting the inclusion of the thermoplastic resin.

The novel adhesives described herein overcome the deficiencies described above for the prior art adhesives without compromising adhesive performance. The adhesives of the present invention comprise (for joining PVC pipes and components):

(a) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of PVC resin and acrylic resin ranging from about 10 to 35 wt %;

(b) about 5 to 80 wt % of low vapor pressure dimethyl-2-piperidone (DMPD);

(c) about 10 to 75 wt % of at least one ketone selected from the group consisting of (i) 0 to 75 wt % acetone, (i) 0 to about 75 wt % of at least one low boiling point ketone having a boiling point below 80[degree(s)], (iii) 0 to about 35 wt % of at least one medium boiling point ketone having a boiling point within a range of 80[degree(s)] to 130[degree(s)] C., (iv) 0 to about 35 wt % of at least one high boiling point ketone having a boiling point greater than 130[degree(s)] C., with the proviso that the total of the medium and high boiling point ketones is a maximum of 35 wt % of the adhesive or primer composition; and

(d) 0 to about 10 wt % tetrahydrofuran.

For joining CPVC pipes and components, the foregoing composition is modified only by replacing the resin component in (a) with about 5 to 25 wt % CPVC resin.

Inclusion of the resin component provides pipe adhesives, while omission of the resin component provides pipe primers.
DMPD, which is used in the novel adhesive of the present invention, is a true solvent for PVC and CPVC and exhibits a remarkable decrease in solution viscosity when blended with the non-solvent acetone or the other ketones (such as methyl ethyl ketone, diethyl ketone, methyl propyl ketone, cyclohexanone, methyl iso-butyl ketone, methyl amyl ketone, acetophenone, methyl iso-propyl ketone, methyl butyl ketone, methyl iso-amyl ketone, di-butyl ketone, ethyl amyl ketone, etc.), thereby allowing great latitude in formulation. Blends of DMPD can be adjusted for such parameters as set time, VOC content, cost, viscosity, flash point, solids content very readily with little effect on adhesive performance.
The adhesive in this invention may include filler, thixotropic agents, colorants, stabilizers, oligomeric and polymeric rheology additives, wetting agents and adhesion promoters.
The blended mixture yields PVC or CPVC pipe adhesives that:
(1) result in low VOC formulas (e.g., less than 510 g/l for PVC pipe and less than 490 g/l for CPVC pipe);
(2) are very economical in the industry;
(3) yield strong, quick setting, durable pipe joints that meet the required standards and performance criteria (e.g., ASTM D-2564 lap shear for PVC);
(4) yield stable, low viscosity solutions that can be readily adjusted with thixotropes (e.g., Aerosil 200) to give medium and high body adhesives, as well as low bodied adhesives and primers for solvent welding PVC and CPVC pipe and components; and
(5) can be formulated with minimal (10 wt % maximum) or no cyclic ethers such as THF.
Other objects, features, and advantages of the present invention will become apparent upon consideration of the following detailed description.

BEST MODES FOR CARRYING OUT THE INVENTION

Reference is now made in detail to a specific embodiment of the present invention, which illustrates the best mode presently contemplated by the inventors for practicing the invention. Alternative embodiments are also briefly described as applicable.
In accordance with the present invention, novel low VOC solvent-based adhesives are provided, comprising a mixture of low vapor pressure isomeric dimethyl-2-piperidones (DMPD) blended with (1) (a) a non-solvent diluent, specifically, acetone (a VOC-exempt compound), or (b) with mixtures of acetone and other known ketonic solvents such as methyl ethyl ketone (MEK), diethyl ketone (DEK), methyl propyl ketone (MPK), methyl iso-butyl ketone (MIBK), methyl amyl ketone (MAK), and cyclohexanone, or (c) with one or more of the foregoing ketonic solvents without acetone, and (2) thermoplastic PVC or CPVC resins.
The novel adhesives described herein overcome the deficiencies described above for the prior art adhesives without compromising adhesive performance. The adhesives of the present invention comprise (for joining PVC pipes and components):
(a) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of PVC resin and acrylic resin ranging from about 10 to 35 wt %;
(b) about 5 to 80 wt % of low vapor pressure dimethyl-2-piperidone (DMPD);
(c) about 10 to 75 wt % of at least one ketone selected from the group consisting of (i) 0 to 75 wt % acetone, (i) 0 to about 75 wt % of at least one low boiling point ketone having

a boiling point below 80[degree(s)] ,(iii) 0 to about 35 wt % of at least one medium boiling point ketone having a boiling point within a range of 80[degree(s)] to 130[degree(s)] C., (iv) 0 to about 35 wt % of at least one high boiling point ketone having a boiling point greater than 130[degree(s)] C., with the proviso that the total of the medium and high boiling point ketones is a maximum of 35 wt % of the adhesive or primer composition; and

(d) 0 to about 10 wt % tetrahydrofuran.

For joining CPVC pipes and components, the foregoing composition is modified only by replacing the resin component in (a) with about 5 to 25 wt % CPVC resin.

Inclusion of the resin component provides pipe adhesives, while omission of the resin component provides pipe primers.

Unless otherwise specified, the concentration of a particular component is with respect to the total adhesive or primer composition. The purity of all components is that employed in normal commercial practice in the field of PVC and CPVC adhesives and primers for joining pipes and other components together.

DMPD, which is used in the novel adhesive of the present invention, is a true solvent for PVC and CPVC and exhibits a remarkable decrease in solution viscosity when blended with the non-solvent acetone or the other ketones (such as methyl ethyl ketone, diethyl ketone, methyl propyl ketone, cyclohexanone, methyl iso-butyl ketone, methyl amyl ketone, acetophenone, methyl iso-propyl ketone, methyl butyl ketone, methyl iso-amyl ketone, di-butyl ketone, ethyl amyl ketone, etc.), thereby allowing great latitude in formulation. Blends of DMPD can be adjusted for such parameters as set time, VOC content, cost, viscosity, flash point, solids content very readily with little effect on adhesive performance. There are a number of isomers of DMPD, including 1,3-dimethyl piperidone, 1,4-dimethyl piperidone, 1,5-dimethyl piperidone, 2,3-dimethyl piperidone, 2,4-dimethyl piperidone, and 2,5-dimethyl piperidone, all of which alone or in any combination are useful in the practice of the present invention. One product that is commercially available comprises a mixture containing 64 to 71 wt % of 1,3-dimethyl piperidone and 29 to 36 wt % of 1,5-dimethyl piperidone and is available from E. I. du Pont de Nemours (Wilmington, Del.).

In general, acetone may be employed as the sole ketone in the range of about 15 to 75 wt % of the total adhesive or primer composition. Alternatively, a mixture of acetone and at least one of the other above-enumerated ketones may be employed, the total concentration falling within the same range. Finally, at least one of the enumerated ketones, other than acetone, may be used in the practice of the present invention.

In particular, the ketone component comprises about 10 to 75 wt % of the total adhesive or primer composition and is at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone; (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., such as methyl ethyl ketone (MEK); (3) 0 to 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., such as diethyl ketone (DEK), methyl propyl ketone (MPK), methyl iso-propyl ketone (MIPK), methyl iso-butyl ketone (MIBK), and methyl n-butyl ketone (MBK); and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., such as cyclohexanone, acetophenone, methyl amyl ketone, methyl iso-amyl ketone, di-iso-ketone, and ethyl amyl ketone, wherein the medium boiling ketone and the high boiling ketone have a total

maximum combined amount of 35 wt %. It will be evident to those skilled in this art that if, for example, no acetone is selected, then a suitable amount of another ketone or ketones must be added to provide at least 10 wt % ketone in the adhesive or primer composition, within the constraints listed above.

With regard to the PVC resin, its incorporation into the adhesive composition provides an adhesive for PVC pipe. In addition, acrylic resins may be included, as disclosed in U.S. Pat. No. 5,422,388, issued to Naresh D. Patel et al on Jun. 6, 1995. The acrylic resin, if employed, may comprise any combination of the known homopolymers, copolymers, and terpolymers commonly employed in adhesive compositions.

The concentration of PVC resin is in the range of about 5 to 25 wt % of the total adhesive composition.

The acrylic resin, if employed, is preferably in the range of about 2 to 25 wt %, with the concentration of the mixture of both PVC and acrylic resin ranging from about 10 to 35 wt % of the adhesive composition. (A minimum of 10 wt % resin is permitted under ASTM-2564.) A concentration of PVC beyond the maximum value of 25 wt % would not be shelf-stable. With regard to the acrylic resin, less than about 2 wt % does not result in the benefits provided to the adhesive by its presence in combination with the PVC resin, while greater than about 25 wt % is not soluble in the solvent system. Within the foregoing constraints, the total resin level in the PVC adhesive ranges from about 10 to 35 wt %, as indicated above. Less than about 10 wt % makes it difficult to achieve VOC levels (if formulated without acetone or significant levels of DMPD) less than the permitted maximum of 510 g/l, while greater than about 35 wt % is not shelf-stable.

Any of the PVC resins commonly employed in PVC adhesives may be used in the practice of the present invention. Particularly preferred are those PVC resins characterized by homopolymers as classified by inherent viscosity (I.V.) in the range of about 0.6 to 0.95. The inherent viscosity of a PVC resin is determined in accordance with ASTM D-1243. Inherent viscosity is a qualitative measure of molecular weight; that is, the higher the I.V., the higher the molecular weight. A non-limiting example of a suitable PVC resin employed in the practice of the present invention is Shintech SE-650, available from Shintech, Inc. (Freeport, Tex.).

The acrylic resins advantageously employed in the practice of the present invention are those homopolymers, copolymers, and terpolymers of methyl methacrylate. When characterized by inherent viscosity, as measured with a solution containing 0.25 g polymer in 50 ml methylene chloride at 20[degree(s)] C. using a No. 50 Cannon-Fenske Viscometer, the useful range in the practice of the present invention is 0.1 to 1.25. Alternatively, an acrylic resin having a melt flow rate as determined by ASTM D-1238 in the range of 1.6 to 24 is acceptable. Examples of acrylic resins suitably employed in the practice of the present invention include (1) the V series (VS, VM, VH) resins from Atohaas, (2) the Elvacite(R) and Lucite(R) acrylic resins, both available from ICI, and (3) Acriterm(R) HS resins from ICI.

With regard to the CPVC resin, its incorporation into the adhesive composition provides an adhesive for CPVC pipe. As indicated above, the CPVC resin is contained in the adhesive formulation in an amount ranging from about 5 to 25 wt %, preferably from about 5 to about 15 wt % of the total adhesive. If too small an amount of CPVC resin is used, it may not be possible to form an effective and durable pipe joint and VOC levels

will tend to increase, while, if the amount of CPVC resin too great, it may not all solubilize in the solvent(s) and thus tends to form an undesirable "gel" therewith.
CPVC resins useful in this invention may be prepared by chlorination of polyvinyl chloride homopolymers and copolymers starting materials by procedures known to those skilled in the art. Examples of useful polyvinyl chloride homopolymers and copolymers starting materials in this regard include those described in U.S. Pat. No. 5,384,345, which teachings are incorporated herein by reference. CPVC resins are typically supplied in powder form when obtained from commercial sources. The CPVC resins used in this invention may contain chlorine in any amount effective to impart adequate heat deflection resistance property to the adhesive composition for the intended use(s). The chlorine content of the CPVC resins used in the compositions of this invention will range from about 50 to about 80% by weight, and more specifically about 57 to about 70% by weight.
Particularly preferred are those CPVC resins characterized by an inherent viscosity (I.V.) ranging from about 0.60 to 0.95, and more preferably about 0.68 to about 0.92. A non-limiting example of a suitable CPVC resin employed in the practice of the present invention is BF Goodrich Temprite 677X670 with 67% chlorination, available from BF Goodrich (Cleveland, Ohio).
The adhesives of the present invention may include additional solids. Such additional solids that may be present include fillers, thixotropic agents, colorants, stabilizers, oligomeric and polymeric rheology additives, wetting agents, and adhesion promoters. Up to about 8 wt % of the adhesive may contain such additional additives and adjuvants. Any fillers, thixotropic agents, pigments, dyes, stabilizers oligomeric and polymeric rheology additives, wetting agents, and adhesion promoters that are commonly used in PVC and CPVC adhesives may be employed in the practice of the present invention.
Preferred fillers low specific gravity hollow spheres (glass, ceramic, or synthetic, e.g., PVC), and include solid particulate inorganic fillers such as calcium carbonate, aluminum trihydrate, calcium sulfate, and crystalline silica.
Preferred colorants include dyes and pigments, such as titanium dioxide, carbon black, aluminum Lake based-orange, and conventional red or yellow colorants.
Preferred thixotropic agents include fumed silica and precipitated silica (e.g., AEROSIL-200 available from Degussa Corporation, Cab-O-Sil MS available from Cabot Corporation, and HISIL T600) and treated bentonite clay (e.g., Bentone 27), and these may be used at low levels to obtain optimum flow properties, especially with regard to controlling spillage from the pipe upon application.
Preferred stabilizers include such additives as acid scavengers, antioxidants (e.g., hindered phenols) and tin stabilizers.
Preferred rheology additives include non-PVC or non-CPVC thermoplastic resins, such as one or more of thermoplastic PVC polymers (in the case of CPVC adhesives), acrylic polymers (in the case of CPVC adhesives), MBS polymers, ABS polymers, linear and core/shell polymers, and random and block polymers including elastomeric and rubber resins.
The blended mixture yields PVC or CPVC pipe adhesives that:
(1) result in low VOC formulas (e.g., less than 510 g/l for PVC pipe and less than 490 g/l for CPVC pipe);
(2) are very economical in the industry;

(3) yield strong, quick setting, durable pipe joints that meet the required standards and performance criteria (e.g., ASTM D-2564 lap shear for PVC);
(4) yield stable, low viscosity solutions that can be readily adjusted with thixotropes (e.g., Aerosil 200) to give desirable flow characteristics and body to adhesives, as well as primers for solvent welding PVC and CPVC pipe and components; and
(5) can be formulated with minimal (10 wt % maximum) or no (0 wt %) cyclic ethers such as THF.
A number of different, specific composition ranges are preferred. These include:
(a) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD; and
about 10 to 68 wt % acetone.
(b) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 10 wt % tetrahydrofuran.
(c) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 50 wt % MEK, where acetone and MEK together total about 10 to 68 wt % of the adhesive.
(d) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 35 wt % cyclohexanone, where acetone and cyclohexanone together total about 10 to 68 wt % of the adhesive.
(e) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 35 wt % of at least one of MPK and DEK, where acetone, MPK, and DEK together total about 10 to 68 wt % of the adhesive.
(f) about 5 to 25 wt % PVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % acetone; and
up to about 35% of at least one of cyclohexanone, MPK, and DEK, where acetone, MPK, DEK, and cyclohexanone together total about 10 to 68 wt % of the adhesive.
(g) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD; and
about 10 to 68 wt % methyl ethyl ketone.
(h) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % methyl ethyl ketone; and
up to about 10 wt % THF.
(i) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;

about 10 to 68 wt % methyl ethyl ketone; and up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone and cyclohexanone together total about 10 to 68 wt % of the adhesive.
(j) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % methyl ethyl ketone; and
up to about 35 wt % of at least one of MPK and DEK, wherein methyl ethyl ketone, MPK, and DEK together total about 10 to 68 wt % of the adhesive.
(k) about 5 to 25 wt % PVC resin or CPVC resin;
about 5 to 50 wt % DMPD;
about 10 to 68 wt % methyl ethyl ketone; and
up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone, MPK, DEK, and cyclohexanone together total about 10 to 68 wt % of the adhesive.
It is noted that the PVC or CPVC resin may have a concentration as low as 5 wt %. Such a formulation is still an adhesive, but it falls below the minimum of 10 wt % required to satisfy ASTM compliance.
The formulations provided above, if the solids (PVC or CPVC resin and solid additives) are omitted, are primers, and may be used as such with both PVC and CPVC pipes. Primers may be employed as part of a two-step process, comprising applying the primer to one or both surfaces of the pipes (or other objects) being joined, followed by applying the adhesive. The primer for joining PVC pipes and components or CPVC pipes and components comprises:
(a) 15 to 85 wt % dimethyl-2-piperidone;
(b) 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone, (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to about 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and
(c) 0 to about 10 wt % tetrahydrofuran.
Description of the Invention:
EXAMPLES
Examples 1-6; Comparative Examples 1,2
The compositions listed in Table I below exemplify some typical preferred compositions with low VOC values. SCAQMD Rule 1168 specifies a VOC level for PVC adhesives of 510 g/l or less. In Examples 1-3, DMND and MEK adhesives result in acceptable VOC levels; in Examples 4-6, the DMPD and acetone formulas evidence much lower VOC levels as a result of acetone being an exempt compound. Comparative Examples 1 and 2 in Table II show VOC levels exceeding 500 g/l for a typical THF/resin adhesive (Comparative Example 1) and for a typical commercial cement Weld-On 711 (Comparative Example 2). The viscosity for Examples 1-6 in Table I also exemplify the low values of these DMPD base adhesives, which are commercially desirable, since they can be readily increased using thixotropic agents such as fumed silica or rheology additives such as homo-, co-, or ter-polymeric methacrylate, MBS (methyl methacrylate-

butadiene-styrene), ABS (acrylonitrile-butadiene-stryene), etc. to give desirable flow characteristics and body to the adhesives.
(table - see patent image)
(table - see patent image)
Examples 7-15
The compositions listed in Table III exemplify the wide latitude in formulation with based adhesives with respect to adhesive performance. Formulas of DMPD with acetone (Examples 7, 8, 11, 13); DMPD with acetone, MEK, and cyclohexanone (Example 9); DMPD with MEK and cyclohexanone (Example 12); and DMPD and MEK (Example 15) all satisfy the minimum lap shear values for 2, 16, and 72 hours as required in ASTM D-2564 for PVC.
(table - see patent image)
Examples 7-15 clearly demonstrate to one skilled in the art that various changes and modifications may be used to adjust set-time, viscosity, VOC levels, bond strength and formulations costs and such changes and modifications are considered to fall within the scope of the invention. Likewise, one skilled in the art easily recognizes that these DMPD formulations can be made to include other known PVC and CPVC solvents such as THF, NMP, aliphatic and aromatic ketones to further adjust desired adhesive properties. Likewise, formulation comprising various molecular weight thermoplastic PVC and CPVC with DMPD blends would be obvious to one skilled in the art as exemplified in Example 13.
Examples 16-19
Table IV below lists the solution properties of adhesives containing PVC resins having I.V. values ranging from 0.68 to 0.90.
(table - see patent image)
Table IV illustrates that DMPD readily dissolves various PVC resins (of different I.V.) to give 10 wt % solutions with low viscosities. This is meant to show that cements can be formulated with a range of PVC molecular weights (based on I.V. value). While the DMPD concentration is higher than discussed earlier, it is listed here to show that although such compositions are very slow drying, nevertheless, the compositions are still good adhesives.
ASTM F-656 requires that a solvent/solvent blend is a primer if it can dissolve 10 wt % resin.
Examples 20-23
Table V below lists the hydrostatic burst strength of adhesives containing CPVC resins. The hydrostatic burst strengths were measured in accordance with ASTM-F493.
(table - see patent image)
Table V lists some specific examples of CPVC low VOC cement formulations containing DMPD, MEK, and acetone. These formulations show the solvency of DMPD/MEK/acetone combinations and their effectiveness as CPVC cements. It would be obvious to one skilled in this art that other solvent blends of DMPD/MEK/acetone and other ketones such as DEK, cyclohexanone, etc., as well as formulas with minimal amounts of THF, lend themselves as cements for CPVC articles such as pipes, fittings, etc.
INDUSTRIAL APPLICABILITY

The adhesives and primers disclosed herein are expected to find use in joining PVC and CPVC pipes and other such articles together.
Thus, there have been disclosed PVC and CPVC adhesives and primers. It will be readily apparent to those skilled in this art that various changes and modifications of an obvious nature may be made, and all such changes and modifications are considered to fall within the scope of the present invention, as defined by the appended claims.
What is claimed is:
1. An adhesive for joining PVC pipes and components or CPVC pipes and components comprising either:
(a1) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of said PVC resin and acrylic resin ranging from 10 to 35 wt %; or
(a2) about 5 to 25 wt % CPVC resin; and
(b) 5 to 80 wt % dimethyl-2-piperidone;
(c) 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone, (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to about 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and
(d) 0 to about 10 wt % tetrahydrofuran. (Main Claim)
2. The adhesive of claim 1 comprising said PVC resin, wherein said PVC resin has an inherent viscosity within a range of 0.6 to 0.95.
3. The adhesive of claim 1 comprising said PVC resin, wherein said acrylic resin comprises a homopolymer, a copolymer or a terpolymer of methyl methacrylate having an inherent viscosity ranging from 0.1 to 1.25 or a melt flow index ranging from 1.6 to 24.

4. The adhesive of claim 1 comprising said CPVC resin, wherein said CPVC resin has an inherent viscosity within a range of 0.6 to 0.85 and a chlorination within a range of 50 to 80 wt %.
5. The adhesive of claim 1 further comprising a filler selected from the group consisting of hollow ceramic spheres, hollow glass spheres, hollow synthetic spheres, calcium carbonate, alumina trihydrate, calcium sulfate, and crystalline silica.
6. The adhesive of claim 1 further comprising a thixotropic agent selected the group consisting of fumed silica, precipitated silica, and treated bentonite clay.
7. The adhesive of claim 1 wherein said low boiling ketone consists essentially of methyl ethyl ketone.
8. The adhesive of claim 1 wherein said at least one medium boiling ketone is selected from the group consisting of diethyl ketone, methyl propyl ketone, methyl iso-propyl ketone, methyl iso-butyl ketone, and methyl n-butyl ketone.
9. The adhesive of claim 1 wherein said at least one high boiling ketone is selected from the group consisting of cyclohexanone, acetophenone, methyl amyl ketone, methyl iso-amyl ketone, di-iso-butyl ketone, and ethyl amyl ketone.
10. The adhesive of claim 1 comprising:
(a) about 5 to 25 wt % PVC resin;

(b) about 5 to 50 wt % dimethyl-2-piperidone; and
(c) about 10 to 68 wt % acetone.
11. The adhesive of claim 10 further comprising up to about 10 wt % tetrahydrofuran.
12. The adhesive of claim 10 further comprising up to 50 wt % methyl ethyl ketone, where acetone and methyl ethyl ketone together total about 10 to 68 wt % of said adhesive.
13. The adhesive of claim 10 further comprising up to about 35 wt % cyclohexanone, where acetone and cyclohexanone together total about 10 to 68 wt % of said adhesive.
14. The adhesive of claim 10 further comprising up to about 35 wt % of at least one of methyl propyl ketone and diethyl ketone, where acetone, methyl propyl ketone, and diethyl ketone together total about 10 to 68 wt % of said adhesive.
15. The adhesive of claim 14 further comprising up to about 35% cyclohexanone, where acetone, methyl propyl ketone, diethyl ketone, and cyclohexanone together total about 10 to 68 wt % of said adhesive.
16. The adhesive of claim 1 comprising:
(a) about 5 to 25 wt % PVC resin or CPVC resin;
(b) about 5 to 50 wt % dimethyl-2-piperidone; and
(c) about 10 to 68 wt % methyl ethyl ketone.
17. The adhesive of claim 16 further comprising up to about 10 wt % tetrahydrofuran.
18. The adhesive of claim 16 further comprising up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone and cyclohexanone together total about 10 to 68 wt % of said adhesive.
19. The adhesive of claim 16 further comprising up to about 35 wt % of at least one of methyl propyl ketone and diethyl ketone, wherein methyl ethyl ketone, methyl propyl ketone, and diethyl ketone together total about 10 to 68 wt % of said adhesive.
20. The adhesive of claim 19 further comprising up to about 35 wt % cyclohexanone, wherein methyl ethyl ketone, methyl propyl ketone, diethyl ketone, and cyclohexanone together total about 10 to 68 wt % of said adhesive.
21. A primer for joining PVC pipes and components or CPVC pipes and components comprising:
(a) 15 to 85 wt % dimethyl-2-piperidone;
(b) 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to about 75 wt % acetone, (2) 0 to about 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to about 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to about 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and
(c) 0 to about 10 wt % tetrahydrofuran.
22. The primer of claim 21 wherein said at least one low boiling ketone consists essentially of methyl ethyl ketone.
23. The primer of claim 21 wherein said at least one medium boiling ketone is selected from the group consisting of diethyl ketone, methyl propyl ketone, methyl iso-propyl ketone, methyl butyl ketone, and methyl iso-butyl ketone.

24. The primer of claim 21 wherein said at least one high boiling ketone is selected from the group consisting of cyclohexanone, acetophenone, methyl amyl ketone, methyl iso-amyl ketone, di-iso-butyl ketone, and ethyl amyl ketone.

25. A method for reducing VOC emissions in adhesives for joining PVC pipes and components or CPVC pipes and components, said method comprising mixing together either (a) about 5 to 25 wt % PVC resin and 0 to about 25 wt % acrylic resin, the total of said PVC resin and acrylic resin ranging from 10 to 35 wt %, or (b) about 5 to 25 wt % CPVC resin; plus 5 to 80 wt % dimethyl-2-piperidone; 10 to 75 wt % of at least one ketone selected from the group consisting of (1) 0 to 75 wt % acetone, (2) 0 to 75 wt % of at least one low boiling ketone having a boiling point less than 80[degree(s)] C., (3) 0 to 35 wt % of at least one medium boiling ketone having a boiling point within a range of about 80[degree(s)] to 130[degree(s)] C., and (4) 0 to 35 wt % of at least one high boiling ketone having a boiling point greater than 130[degree(s)] C., wherein said medium boiling ketone and said high boiling ketone have a maximum amount of 35 wt %; and 0 to about 10 wt % tetrahydrofuran.

U.S. Patents Fulltext

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Dialog® File Number 654 Accession Number 4662614

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NSF Product and Service Listings

These Listings were Last Updated on **Sunday, April 10, 2005** at 4:15 AM Eastern Time. Please contact NSF International to confirm the status of any Listing, report errors, or make suggestions.

Warning: NSF is concerned about fraudulent downloading and manipulation of website text. If you have received this listing in hard copy, always confirm this certification/listing information by going directly to http://www.nsf.org/Certified/Plumbing/Listings.asp?MaterialType=CPVC&PlantState=CA& for the latest most accurate information.

NSF/ANSI STANDARD 14
Plastics Piping System Components and Related Materials

Click here for a list of End Use Code Designations.

DURA PLASTIC PRODUCTS, INC.

Cert-Link® (Click here to visit this Company's Website)

533 EAST THIRD STREET
P.O. BOX 2097
BEAUMONT, CA 92223
909-845-3161

Facility : BEAUMONT, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Fittings+	*CPVC*	*DURA*	*ASTM D2846*

90° Street Ell (Spg x S) CTS
1/2"

Cap (S) CTS
1/2", 3/4"

Coupling (S x S) CTS
>= 1/2"

Ell (S x S) CTS
1/2", 3/4"

Reducer Bushing (Spg x S) CTS
3/4" x 1/2"

Tee (S x S x S) CTS
1/2", 3/4", 1"

Tee Reducing (S x S x S) CTS
1" x 1" x 1/2" 1" x 1" x 3/4" 3/4" x 1/2" x 1/2" 3/4" x 3/4" x 1/2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

HARVEL PLASTICS, INC.

Cert-Link® (Click here to visit this Company's Website)

KUEBLER ROAD
P.O. BOX 757
EASTON, PA 18042-0757
610-252-7355

Facility : BAKERSFIELD, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
*Pipe** + 1/4" thru 16" Sch 40 1/4" thru 16" Sch 80	*CPVC 4120*	*HARVEL CPVC*	*ASTM F441*

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Pipe** + 1/4" thru 16" Sch 40 1/4" thru 16" Sch 80	*CPVC 4120*	Ⓗ	*ASTM F441*

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Pipe** + 3/4" thru 3" SDR 13.5	*CPVC 4120*	*HARVEL BLAZEMASTER®*	*ASTM F442*

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production

facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Pipe +* *CPVC 4120* Ⓗ *ASTM F442*
3/4" thru 3" SDR 13.5

* Sockets and gasketed bell ends are not tested or Listed by NSF for this production facility.
+ Material complies with NSF/ANSI Standard 61 health effects requirements.

IPS CORPORATION

17109 SOUTH MAIN
P.O. BOX 379
GARDENA, CA 90247
310-898-3352

Facility : GARDENA, CA

Joining Materials

Product Type	General Material	For Use With	Trade Name	Product Standard
Solvent Cement (1,2,3)	CPVC	PW	Weld-On "All Weather" Flowguard Gold Low-VOC CPVC*	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 2713 Green CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 2714 Beige, Gray or Orange Low-VOC CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 2714 Red or Tan Low-VOC CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 713 Orange CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 714 Orange or Gray CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 724 Gray or Orange CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On 724 Yellow CPVC	ASTM F493
Solvent Cement (1,2,3)	CPVC	PW	Weld-On Low-VOC Flowguard Gold 1-Step CPVC*	ASTM F493

* This cement is yellow color.

(1) This product was evaluated by NSF according to the requirements of NSF/ANSI Standard 61, Section 4.
(2) The compliance of this product with the health effect requirements of NSF/ANSI Standard 61 was determined based on the testing of pipe and fittings assembled using the cement and P-70 and P-72 Primers.
(3) This product is acceptable for use with pipe and fittings sized 1/2" and greater diameter.

KING BROS. INDUSTRIES

Cert-Link® (Click here to visit this Company's Website)

29101 THE OLD ROAD
VALENCIA, CA 91355
661-257-3262

Facility : VALENCIA, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Fittings, Elbow PW+	*CPVC 41xBrass C3600*	*KBI*	*ASTM D2846*

Drop Ear Ell (Brass Elbow) 1" CTS x 1" FIPT
Drop Ear Ell (Brass Elbow) 1/2" CTS x 1/2" FIPT
Drop Ear Ell (Brass Elbow) 3/4" CTS x 3/4" FIPT
Drop Ear Ell (CPVC Elbow) 1/2" CTS x 1/2" FIPT

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

*Transition Fittings PW+ ***	*CPVC 41xBrass C36000*	*KBI*	*ASTM D2846*

1 1/2" CTS X 1 1/2" FIPT
1 1/2" CTS X 1 1/2" MIPT
1 1/4" CTS X 1 1/4" FIPT
1 1/4" CTS X 1 1/4" MIPT
1" CTS x 1" FIPT
1" CTS x 1" MIPT
1/2" CTS x 1/2" FIPT
1/2" CTS x 1/2" MIPT
2" CTS X 2" FIPT
2" CTS X 2" MIPT
3/4" CTS x 3/4" FIPT
3/4" CTS x 3/4" MIPT
Drop Ear 1" CTS x 1" FIPT
Drop Ear 1/2" CTS x 1/2" FIPT
Drop Ear 3/4" CTS x 3/4" FIPT

+ Material complies with NSF/ANSI Standard 61 health effects requirements.
** CPVC Transition Fittings rate at 100 psi at 150°F.

Transition Fittings PW+	*CPVC 41xBrass C36000*	*KBI*	*ASTM F1807*

1/2" CTS x 1/2" PEX
3/4" CTS x 3/4" PEX

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

SPEARS MANUFACTURING COMPANY

Cert-Link® (Click here to visit this Company's Website)

15853 OLDEN STREET
P.O. BOX 9203
SYLMAR, CA 91342
818-364-1611

Facility : GARDENA, CA

Joining Materials

Product Type	General Material	For Use With	Trade Name	Product Standard
Solvent Cement	CPVC	PW	Blazemaster FS-3	ASTM F493
Solvent Cement	CPVC	PW	Blazemaster FS-4	ASTM F493
Solvent Cement	CPVC	PW	LW5 VOC Yellow One-Step CPVC Cement	ASTM F493
Solvent Cement	CPVC	PW	Low VOC One-Step FS-5	ASTM F493

SPEARS MANUFACTURING COMPANY

Cert-Link® (Click here to visit this Company's Website)

15853 OLDEN STREET
P.O. BOX 9203
SYLMAR, CA 91342
818-364-1611

Facility : SYLMAR, CA

Potable Water - Pipe and Fittings

Product Type	Material Type	Trade Name	Product Standard
Fittings+	*CPVC 41*	*SPEARS*	*ASTM F437*
45° Ell 819-xxx			
90° Ell 808-xxx			

Bushing
839-xxx

Cap
848-xxx

Coupling
830-xxx

Plug
850-xxx

Tee
805-xxx

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Fittings+	*CPVC 41*	*SPEARS*	*ASTM F439*
22 1/2° Ell 4216-xxx	816-xxx		
22 1/2° Street Elbow 4242-xxx	842-xxx		
30° Ell 815-xxx			
45° Ell 4217-xxx	817-xxx		
45° Street Elbow 827-xxx			
90° Ell 4206-xxx 809-xxx	4209-xxx	806-xxx	807-xxx
Adapter 835-xxx	836-xxx		
Cap 4247-xxx	847-xxx		
Coupling 4229-xxx	829-xxx		
Cross 4220-xxx	820-xxx		

Plug
849-xxx

Street Tee
4244-xxx 844-xxx

Tee
4201-xxx 801-xxx 802-xxx

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Fittings+	*CPVC 41*	*SPEARS MANUFACTURING CO.*	*ASTM F438*
22 1/2° Ell 816-xxx			
22 1/2° Street Elbow 4242-xxx	842-xxx		
45° Ell 417-xxx	4217-xxx		
90° Ell 406-xxx	409-xxx	4206-xxx	4209-xxx
Cap 4247-xxx	447-xxx		
Coupling 4229-xxx	429-xxx		
Cross 4220-xxx			
Street Tee 4244-xxx	844-xxx		
Tee 401-xxx	4201-xxx		

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Fittings+	*CPVC 41*	*SPEARS*	*ASTM D2846*
45° Ell (S x S) 1/2" thru 2" (4117-xxx)			
45° Street Ell (Spg x Soc) 1/2" thru 2" (4127-xxx)			

90° Ell (S x S)
1/2" thru 2" (4106-xxx)

90° Street Ell (S x FIPT)
1/2" thru 2" (4109-xxx)

Cap (Socket)
1/2" thru 2" (4147-xxx)

Coupling (S x S)
1/2" thru 2" (4129-xxx)

Male Adapter (Soc x MIPT)
1/2" thru 2" (4136-xxx)

Reducer Bushing (Spg x Soc)
1/2" thru 2" (4137-xxx)

Tee (S x S x S)
1/2" thru 2" (4101-xxx)

Transition Bushing (IPS x CTS)
1/2" thru 2" (4140-xxx)

Transition Coupling (IPS x CTS)
1/2" thru 2" (4141-xxx)

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Reinforced Male Thread+ *CPVC 41* *SPEARS* *ASTM D2846*

Transition Adapter
1/2" thru 2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.

Stainless Steel+ [1] *CPVC 41* *SPEARS* *ASTM D2846*

Female Adapter
1/2" thru 2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.
[1] Reinforced

Stainless Steel+ [1] *CPVC 41* *SPEARS* *ASTM D2846*

90° Ell
1/2" thru 2"

+ Material complies with NSF/ANSI Standard 61 health effects requirements.
[1] Reinforced

NOTE: xxx = different size code designation

T. CHRISTY ENTERPRISES, INC.

403 WEST BRENNA LANE
ORANGE, CA 92667
213-321-6515

Facility : GARDENA, CA

Joining Materials

Product Type	General Material	For Use With	Trade Name	Product Standard
Solvent Cement (1,2,3)	CPVC	PW	Low VOC Big Orange CPVC	ASTM F493

(1) This product was evaluated by NSF according to the requirements of NSF/ANSI Standard 61, Section 4.
(2) The compliance of this product with the health effect requirements of NSF/ANSI Standard 61 was determined based on the testing of pipe andfittings assembled using the cement and Christy Red Hot Clear primer.
(3) This product is acceptable for use with pipe and fittings sized 1/2" and greater diameter.

Number of matching Manufacturers is 7
Number of matching Products is 117
Processing time was 1 seconds

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OSHA-Required Health And Safety Information!

This Material Safety Data Sheet (MSDS) was requested moments ago from Hercules Automated Fax Information System. Please forward it immediately to the person in charge of MSDS's, or retain it at the machine until claimed.

Section 1

MATERIAL SAFETY DATA SHEET # 61
Hercules CPVC Cement

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

Date Prepared: 3/27/1989 **Last Reviewed:** 2/11/2002

Meets OSHA 29 CFR 1910.1200

Hercules Chemical Company Inc.
111 South Street
Passaic NJ 07055
Phone (800) 221-9330
Fax (800) 333-3456

Section 2 - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s), CAS Numbers)	OSHA PEL	ACGIH TLV	Other Limits	Upper Bound Limit if SARA Reportable
Tetrahydrofuran (109-99-9)	200PPM	200PPM	N/A	- -
Cyclohexanone (108-94-1)	25PPM	25PPM	N/A	- -

HMIS Hazard Rating: Health: 3 Flammability: 4 Reactivity: 1 Personal Protection: G

Section 3 - Physical/Chemical Characteristics

Boiling Point (°C):	Specific Gravity (H2O = 1):	Vapor Density (Air = 1):	Vapor Pressure (mm Hg):
151° F Based on first boiling component-THF	0.935 ± 0.03	2.0 to 2.5	143 Based on first boiling component-THF

Melting Point (° F)	Evaporation Rate: (Butyl Acetate = 1)	Solubility in Water:
N/A	7-11	60% to 85%

Appearance And Color: Orange Viscous Liquid **Odor:** Ethereal & Acetone-like

Section 4 - Fire And Explosion Hazard Data

Flash Point:	Flammable Limits: LEL:	UEL:
6.0° F (T.C.C.) (Based on THF)	2%	11.8%

Extinguishing Media: Foam/Dry Chemical/Carbon Dioxide

Special Firefighting Procedures:
Handle as flammable liquid. wear self-contained breathing apparatus & chemical goggles. Water may be ineffective, but should be used to keep fire-exposed containers cool.

Unusual Fire And Explosion Hazards:
Vapor is heavier than air and travels considerable distance to source of ignition and flashback. On long standing may form peroxides which may cause violent reaction especially upon evaporation to dryness.

Continued on Next Page

Section 5 - Reactivity Data

Stability: Stable **Conditions To Avoid:** Keep in closed containers away from sparks & open flames.

Incompatability (Materials To Avoid): Strong oxidizing materials, Lithium Aluminum Hydride, Sodium Aluminum Hydroxide, Sodium & Potassium Hydroxides.

Hazardous Decomposition: Carbon dioxide and carbon monoxide are formed. Irritating peroxide fumes formed when heated to decomposition.

Hazardous Polymerization: Avoid excessive exposure to air and cationic initiators like Lewis Acids.

Section 6 - Health Hazard Data

Routes of Entry: **Inhalation** YES/Primary **Skin** YES/Primary **Ingestion** YES/Secondary

Health Hazards:

Corrosive to eyes & skin irritant. Severe overexposure can cause headache, dizziness, & narcosis. May cause dermatosis & dermatitis with prolonged repeated contact.

Carcinogenicity: **NTP** NO **IARC** NO **OSHA Regulated** NO

Signs And Symptoms of Exposure:

INGESTION: No effect of exposure expected. INHALATION: Will cause irritation of mucous membranes, nose, eyes, & throat coughing, difficulty of breathing. Exposure to high vapor concentration may cause headache, dizziness, nausea, narcosis. SKIN CONTACT: Prolonged contact causes common solvent defatting effect. EYE CONTACT: Vapors slightly uncomfortable, splashes irritating. Will cause painful burning or stinging of eyes and lids, watering of eyes and inflammation of conjunctiva.

Medical Conditions Generally Aggravated By Exposure:

No data found

Emergency And First Aid Procedures:

INGESTION: DO NOT INDUCE VOMITING. If conscious, dilute by giving two glasses of water. Call a physician immediately. INHALATION: Remove to fresh air, if not breathing; give artificial respiration preferably mouth to mouth. If breathing is difficult give oxygen. Call a physician. SKIN CONTACT: Wash affected skin area with soapy water. Remove contaminated clothing. EYE CONTACT: Immediately flush eyes with plenty of water for 15 minutes. Consult a physician.

Continued on Next Page

Section 7 - Precautions For Safe Handling And Use:

Steps To Be Taken In Case Material Is Released Or Spilled:

Eliminate sources of ignition. Absorb with sand or inert absorbing material and dispose of with solid waste according to federal, state and local regulations. Flush spill area with water, avoid flushing into confined areas.

Waste Disposal Method:

Incinerate in accordance with the federal, state and local regulations.

Precautions To Be Taken In Handling And Storing:

Store in cool place, well-ventilated area. Keep away from open flame and sources of ignition.

Other Precautions:

Use normal good personal hygiene

Section 8 - Control Measures:

Respiratory Protection:

In confined spaces or other circumstances where adequate ventilation cannot be assured use NIOSH-approved respirator, positive pressure airline mask, or self contained breathing apparatus.

Ventilation: **Local Exhaust** As required

Mechanical All ventilating devices must be located so they do not provide a source of ignition.

Special When using cements in an area of limited ventilation, use a ventilation device such as a fan or air mover to maintain a safe air concentration.

Gloves: PVA gloves.

Other: N/A

Eye Protection: Chemical safety goggles.

Other Protective Clothing: Apron, boots, eye bath, safety shower.

Work/Hygienic Practices Wash thoroughly after handling. Avoid ingestion of the cements. Do not eat or drink when using cements or in the vicinity where such cements are being used.

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

FACTS faxed FAST!

For Hercules Material Safety Data Sheets by fax anytime, day or night, just call 1-800-942-INFO (1-800-942-4636) from any Touch-Tone phone. Have your fax number ready. Checking the product label for the correct MSDS # will save time.

FACTS faxed FAST! SM

OSHA-Required Health And Safety Information!

This Material Safety Data Sheet (MSDS) was requested moments ago from Hercules Automated Fax Information System. Please forward it immediately to the person in charge of MSDS's, or retain it at the machine until claimed.

Section 1

MATERIAL SAFETY DATA SHEET # 95

Hercules CPVC Cement, "LOW VOC" Standard (Orange) or Gold

Date Prepared: 11/4/1996 **Last Reviewed:** 1/24/2002

Meets OSHA 29 CFR 1910.1200

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

Hercules Chemical Company Inc.
111 South Street
Passaic NJ 07055
Phone (800) 221-9330
Fax (800) 333-3456

Section 2 - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s), CAS Numbers)	OSHA PEL	ACGIH TLV	Other Limits	Upper Bound Limit if SARA Reportable
This MSDS is for LOW VOC Product (As shown on label) ONLY. For regular product see MSDS #61.				
Tetrahydrofuran (109-99-9)	200 PPM	200 PPM	N/A	–
Methyl Ethyl Ketone (78-98-3)	200 PPM	200 PPM	N/A	.35
Cyclohexanone (108-94-1)	25 PPM	25 PPM	N/A	–
Acetone (67-64-1)	750 PPM	750 PPM	N/A	–
N-Methyl Pyrrolidone (872-50-4)	None	None	N/A	15%

HMIS Hazard Rating: Health: 3 Flammability: 4 Reactivity: 1 Personal Protection: G

Section 3 - Physical/Chemical Characteristics

Boiling Point (°F):	Specific Gravity (H2O = 1):	Vapor Density (Air = 1):	Vapor Pressur (mm Hg):
133 Based on first boiling component-Acetone	0.920 ± 0.03	2.0 to 2.5	190 Based on first boiling component-Acetone

Melting Point (° F)	Evaporation Rate: (Butyl Acetate = 1)	Solubility in Water:
N/A	6-11	55% to 75%

Appearance And Color: Orange or Yellow/Gold Viscous Liquid **Odor:** Ethereal & Acetone-like

Section 4 - Fire And Explosion Hazard Data

Flash Point:	Flammable Limits	LEL:	UEL:
0-6° F (T.C.C.) (Based on Acetone)		2%	13%

Extinguishing Media: Drv chemical. Foam. Carbon dioxide

Special Firefighting Procedures:
Handle as flammable liquid. Wear self-contained breathing apparatus & chemical goggles. Water may be ineffective, but should be used to keep fire-exposed containers cool.

Unusual Fire And Explosion Hazards:
Vapor is heavier than air and travels considerable distance to source of ignition and flashback. On long standing may form peroxides which may cause violent reaction especially upon evaporation to dryness.

Continued on Next Page

Section 5 - Reactivity Data

Stability: Stable **Conditions To Avoid:** Keep in closed containers away from sparks and open flame.

Incompatability (Materials To Avoid): Strong oxidizing materials, Lithium Aluminum Hydride, Sodium Aluminum Hydroxide, Sodium and Potassium Hydroxides.

Hazardous Decomposition: CO2 and CO are formed. Irritating peroxide fumes form when heated to decomposition.

Hazardous Polymerization: Avoid excessive exposure to air and cationic initiators like Lewis Acids.

Section 6 - Health Hazard Data

Routes of Entry **Inhalation** Yes/Primary **Skin** Yes/Primary **Ingestion** Yes/Secondary

Health Hazards

Corrosive to eyes and skin irritant. Severe overexposure can cause headache, dizziness and narcosis. May cause dermatosis with prolonged repeated contact.

Carcinogenicity **NTP** NO **IARC** NO **OSHA Regulated** NO

Signs And Symptoms of Exposure:

INGESTION: No effects of exposure expected. INHALATION: Will cause irritation of mucous membranes, nose, eyes & throat, coughing, difficulty of breathing. Exposure to high vapor concentration may cause headache, dizziness, nausea, narcosis. SKIN CONTACT: Prolonged contact causes common solvent defatting effect. EYE CONTACT: Vapors slightly uncomfortable, splashes irritating. Will cause painful burning or stinging of eyes and lids, watering of eyes and inflammation of conjunctiva.

Medical Conditions Generally Aggravated By Exposure:

Emergency And First Aid Procedures:

INGESTION: Do not induce vomiting. If conscious, dilute by giving 2 glasses of water. Call a physician immediately. INHALATION: Remove to fresh air. If not breathing give artificial respiration preferably mouth-to-mouth. If breathing is difficult, give oxygen. Call a physician. SKIN CONTACT: Wash affected areas with soapy water. Remove contaminated clothing. EYE CONTACT: Immediately flush eyes with plenty of water for 15 minutes. Consult a physician.

Continued on Next Page

Section 7 - Precautions For Safe Handling And Use:

Steps To Be Taken In Case Material Is Released Or Spilled:

Eliminate sources of ignition. Absorb with sand or inert absorbing material and dispose of with solid waste according to Federal, State and local regulations. Flush spill area with water, avoid flushing into confined areas.

Waste Disposal Method:

Incinerate in accordance with Federal, State and local regulations.

Precautions To Be Taken In Handling And Storing:

Store in cool place, well-ventilated area. Keep away from open flame and sources of ignition.

Other Precautions:

Use normal good personal hygiene.

Section 8 - Control Measures:

Respiratory Protection:

In confined spaces or other circumstances where adequate ventilation cannot be assured use NIOSH-approved respirator, positive pressure airline mask, or self contained breathing apparatus.

Ventilation: **Local Exhaust** As required.

Mechanical All ventilating devices must be located so they do not provide a source of ignition.

Special When using cements in an area of limited ventilation, use a ventilation device such as a fan or air mover to maintain a safe air concentration.

Other: N/A

Gloves: PVA gloves.

Eye Protection: Chemical safety goggles.

Other Protective Clothing: Apron, boots, eye bath, safety shower.

Work/Hygienic Practices: Wash thoroughly after handling. Avoid ingestion of the cements. Do not eat or drink when using cements or in the vicinity where such cements are being used.

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

FACTS faxed FAST!

For Hercules Material Safety Data Sheets by fax anytime, day or night, just call 1-800-942-INFO (1-800-942-4636) from any Touch-Tone phone. Have your fax number ready. Checking the product label for the correct MSDS # will save time.

Plastic Pipe Cements

With plastic pipe use at an all-time high, professional contractors rely on Hercules plastic pipe cements, primers, and cleaners to join pipe and fittings securely and without leaks. Hercules plastic pipe cements are manufactured to very tight specifications to ensure consistently high performance.

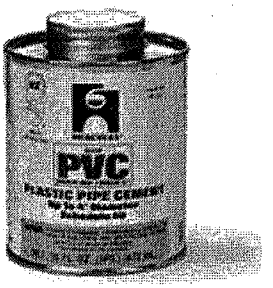
Cements for PVC

pvc cement

clear, regular body, medium set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 4" diameter. Schedule 40. Pink label. Meets ASTM D2564.

MSDS #53. Spec Sheet.



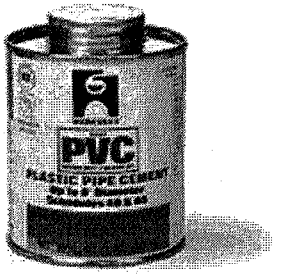
Prod. No.	Size	Pack	Note	Bar Code
60043	1/4 pt.	12	dauber in cap	032628600430
60053	1/2 pt.	12	dauber in cap	032628600539
60055	1 pt.	12	jumbo dauber in cap	032628600553
60060	1 qt.	12	jumbo dauber in cap	032628600607
60065	1 gal.	6	-	032628600652

pvc cement

clear, medium body, medium set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 6" diameter. Schedules 40 and 80. Blue label. Meets ASTM D2564.

MSDS #52. Spec Sheet.



Prod. No.	Size	Pack	Note	Bar Code
60003	1/4 pt.	12	dauber in cap	032628600034
60013	1/2 pt.	12	dauber in cap	032628600133
60015	1 pt.	12	jumbo dauber in cap	032628600157
60020	1 qt.	12	jumbo dauber in cap	032628600201
60025	1 gal.	6	-	032628600256

pvc cement

clear, medium body, fast set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 8" diameter. Schedules 40 and 80. Yellow label. Meets ASTM D2564.

MSDS #52. Spec Sheet.

Prod. No.	Size	Pack	Note	Bar Code
60103	1/4 pt.	12	dauber in cap	032628601031
60113	1/2 pt.	12	dauber in cap	032628601130
60115	1 pt.	12	jumbo dauber in cap	032628601154
60120	1 qt.	12	jumbo dauber in cap	032628601208
60125	1 gal.	6	-	032628601253

pvc cement

clear, heavy body, slow set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 15" diameter. Schedules 40 and 80. Tan label. Meets ASTM D2564.

MSDS #50. Spec Sheet.

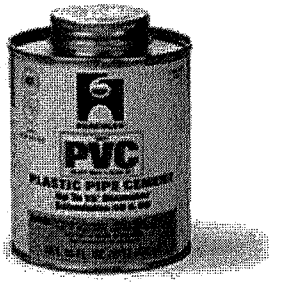
Prod. No.	Size	Pack	Note	Bar Code
60155	1/2 pt.	24	dauber in cap	032628601550
60160	1 pt.	12	jumbo dauber in cap	032628601604
60165	1 qt.	12	jumbo dauber in cap	032628601659

pvc cement

gray, heavy body, slow set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 15" diameter. Schedules 40 and 80. Gray label. Meets ASTM D2564.

MSDS #60. Spec Sheet.



Prod. No.	Size	Pack	Note	Bar Code
60210	1/2 pt.	24	dauber in cap	032628602106
60215	1 pt.	12	jumbo dauber in cap	032628602151
60220	1 qt.	12	jumbo dauber in cap	032628602205
60225	1 gal.	6	-	032628602250

below-zero pvc cement

clear, regular body, fast set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 6" diameter. Schedule 40. Withstands temperatures down to -10° F (-23° C). Orange label. Meets ASTM D2564.

MSDS #51. Spec Sheet.

Prod. No.	Size	Pack	Note	Bar Code
60142	1/2 pt.	24	dauber in cap	032628601420
60145	1 pt.	12	jumbo dauber in	032628601451

60148	1 qt.	12	cap jumbo dauber in cap	032628601482

wet set pvc cement

aqua blue, medium body, fast set

For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 8" diameter. Schedules 40 and 80. Formulated for applications where conditions are very wet and/or when quick pressurization is imperative. Ideal for lawn sprinkler and swimming pool installations. Aqua label. Meets ASTM D2564.
MSDS #76. Spec Sheet.

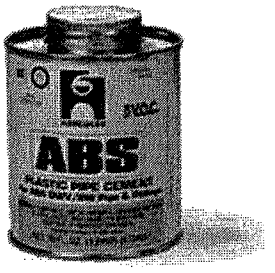
Prod. No.	Size	Pack	Note	Bar Code
60253	1/2 pt.	12	dauber in cap	032628602533
60255	1 pt.	12	jumbo dauber in cap	032628602557
60260	1 qt.	12	jumbo dauber in cap	032628602601
60265	1 gal.	6	-	032628602656

Cements for ABS

abs cement

black, medium body, fast set

For DWV and SW pipe and fittings up to 8" diameter. Schedules 40 and 80. Green label. Meets ASTM 2235.
MSDS #64. Spec Sheet.

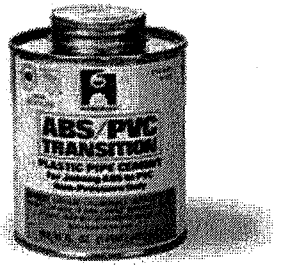


Prod. No.	Size	Pack	Note	Bar Code
60503	1/4 pt.	12	dauber in cap	032628605039
60513	1/2 pt.	12	dauber in cap	032628605138
60515	1 pt.	12	jumbo dauber in cap	032628605152
60520	1 qt.	12	jumbo dauber in cap	032628605206
60525	1 gal.	6	-	032628605251

abs/pvc transition cement

green, medium body, fast set

For joining ABS to PVC pipe and fittings up to 6" diameter. Schedules 40 and 80. Brown label. Meets ASTM D3138.
MSDS #65. Spec Sheet.



Prod. No.	Size	Pack	Note	Bar Code
60555	1/2 pt.	24	dauber in cap	032628605558
60560	1 pt.	12	jumbo dauber in cap	032628605602

Cements for CPVC

cpvc cement

orange, medium body, fast set

CPVC potable water pipe and fittings up to 8" diameter. All Schedules. Orange label. Meets ASTM F493.
MSDS #61. Spec Sheet.

Prod. No.	Size	Pack	Note	Bar Code
60303	1/4 pt.	12	dauber in cap	032628603035
60313	1/2 pt.	12	dauber in cap	032628603134
60315	1 pt.	12	dauber in cap	032628603158
60320	1 qt.	12	dauber in cap	032628603202

cpvc gold

gold, medium body, medium set

One step, low V.O.C. cement for use on all CPVC pipe and fittings including FlowGuard Gold (for use on specific brands of CPVC pipe, verify suitability with pipe manufacturer). Schedules 40 and 80. Yellow label. Meets ASTM F493.
MSDS #95. Spec Sheet.

Prod. No.	Size	Pack	Note	Bar Code
60353	1/4 pt.	12	dauber in cap	032628603530
60358	1/2 pt.	12	dauber in cap	032628603585
60360	1 pt.	12	dauber in cap	032628603608
60365	1 qt.	12	dauber in cap	032628603653

Specialty Cements

multi-purpose cement

milky, medium body, fast set

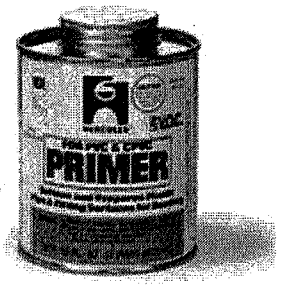
For potable water, DWV and SW pipe and fittings. For joining PVC, CPVC and ABS pipe and fittings up to 6" diameter. Schedules 40 and 80. Olive label. Meets ASTM D2564, D2235, F493.
MSDS #66. Spec Sheet.

Prod. No.	Size	Pack	Note	Bar Code
60703	1/4 pt.	12	dauber in cap	032628607033
60713	1/2 pt.	12	dauber in cap	032628607132
60715	1 pt.	12	jumbo dauber in cap	032628607156
60720	1 qt.	12	jumbo dauber in cap	032628607200
60725	1 gal.	6	-	032628607255

Primers and Cleaner

primer for pvc and cpvc

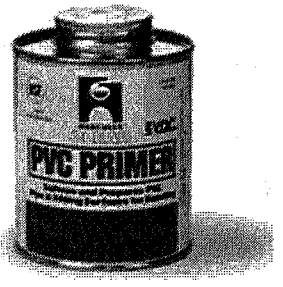
purple *[Note: For use where plumbing codes require purple, rather than clear, primers.]* Recommended method to soften and prepare surface of PVC and CPVC pipe and fittings (all sizes and Schedules except copper tube size CPVC before applying solvent cements. Purple label. Use caution: Purple primers contain a dye which is difficult or impossible to remove from many surfaces. Meets ASTM F656.
MSDS #62. Spec Sheet.



Prod. No.	Size	Pack	Note	Bar Code
60403	1/4 pt.	12	dauber in cap	032628604032
60413	1/2 pt.	12	dauber in cap	032628604131
60415	1 pt.	12	jumbo dauber in cap	032628604155
60420	1 qt.	12	jumbo dauber in cap	032628604209
60425	1 gal.	6	-	032628604254

pvc primer

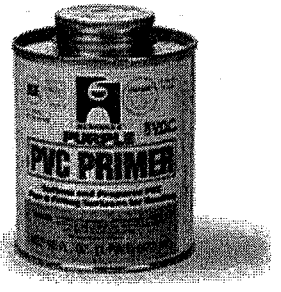
clear
Recommended method to soften and prepare surface of PVC pipe and fittings (all sizes and Schedules) before applying solvent cements. Red label. Meets ASTM F656.
MSDS #63. Spec Sheet.



Prod. No.	Size	Pack	Note	Bar Code
60453	1/4 pt.	12	dauber in cap	032628604537
60458	1/2 pt.	12	dauber in cap	032628604582
60460	1 pt.	12	jumbo dauber in cap	032628604605
60465	1 qt.	12	jumbo dauber in cap	032628604650
60470	1 gal.	6	-	032628604704

pvc primer

purple *[Note: For use where plumbing codes require purple, rather than clear, primers.]* Recommended method to soften and prepare surface of PVC pipe and fittings (all sizes and Schedules) before applying solvent cements. Use caution: Purple primers contain a dye which is difficult or impossible to remove from many surfaces. Lavender label. Meets ASTM F656.
MSDS #70. Spec Sheet.



Prod. No.	Size	Pack	Note	Bar Code
60473	1/4 pt.	12	dauber in cap	032628604735
60483	1/2 pt.	12	dauber in cap	032628604834
60485	1 pt.	12	jumbo dauber in cap	032628604858
60490	1 qt.	12	jumbo	032628604902

			dauber in cap	
60495	1 gal.	6	-	032628604957

plastic pipe and fittings cleaner

clear

For removing foreign matter and dirt from ABS, PVC, and CPVC, pipe and fittings. Yellow label.
MSDS #67. Spec Sheet.

Prod. No.	Size	Pack	Note	Bar Code
60652	1/4 pt.	12	dauber in cap	032628606524
60659	1/2 pt.	12	dauber in cap	032628606593
60664	1 pt.	12	jumbo dauber in cap	032628606647
60667	1 qt.	12	jumbo dauber in cap	032628606678
60669	1 gal.	6	-	032628606692

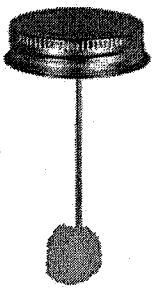
Accessories

plastic pipe cement brush

One inch wide, natural bristle brush. For larger size pipe and fitting to ensure a full and even application.

Prod. No.	Size	Pack	Note	Bar Code
50200	1"	36	-	032628502000

plastic pipe cement daubers



For clean, rapid application of cements and primers. Dauber extends to the bottom of the cans for which they were designed, so there is no wasted cement and no tipping of cans.

Prod. No.	Size	Pack	Note	Bar Code
50235	1 1/2" dia. for 1 pt.	48	-	032628502352
50245	1 1/2" dia. for 1 qt.	48	-	032628502451

"We've got to take care of our customers." That's been the Hercules cre since 1915 when founder Sam Wander opened our doors.

Contact us by phone, e-mail, fax or good ole US mail.

Hercules Chemical Company, Inc.
111 South Street
Passaic, NJ 07055 USA
(973) 778-5000
TEL 800-221-9330
FAX 800-333-3456
EMail: Info@herchem.com

Stay in touch, and we'll do the same.

CONTACT

Search Our Site

FACTS Faxed AST! SM

OSHA-Required Health And Safety Information!

This Material Safety Data Sheet (MSDS) was requested moments ago from Hercules Automated Fax Information System. Please forward it immediately to the person in charge of MSDS's, or retain it at the machine until claimed.

Section 1

MATERIAL SAFETY DATA SHEET # 67

Hercules Plastic Pipe Cleaner

HERCULES® MATERIAL SAFETY INFORMATION SERVICE™

Date Prepared: 3/24/1994 **Last Reviewed:** 1/24/2002

Meets OSHA 29 CFR 1910.1200

Hercules Chemical Company Inc.
111 South Street
Passaic NJ 07055
Phone (800) 221-9330
Fax (800) 333-3456

Section 2 - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s), CAS Numbers)	OSHA PEL	ACGIH TLV	Other Limits	Upper Bound Limit if SARA Reportable
Methyl Ethyl Ketone (78-93-3)	200PPM	200PPM	N/A	99%
Acetone (67-64-1)	1000PPM	750PPM	N/A	.95

HMIS Hazard Rating: Health: 3 Flammability:4 Reactivity: 1 Personal Protection: G

Section 3 - Physical/Chemical Characteristics

Boiling Point (°C):	Specific Gravity (H2O = 1):	Vapor Density (Air = 1):	Vapor Pressure (mm Hg):
133 (Based on first boiling component-Acet	0.79 ± 0.02	2.0 to 2.5	190 Based on first boiling component-Acetone

Melting Point (° F)	Evaporation Rate: (Butyl Acetate = 1)	Solubility in Water:
N/A	7-11	60% to 95%

Appearance And Color: Clear Liquid **Odor:** Ethereal & Acetone-like

Section 4 - Fire And Explosion Hazard Data

Flash Point:	Flammable Limits: LEL:	UEL:
0° F T.C.C. (Based on Acetone)	2%	13%

Extinguishing Media: Foam, Dry chemical, Carbon Dioxide

Special Firefighting Procedures:
Handle as flammable liquid, wear self-contained breathing apparatus and chemical goggles. Water may be ineffective but should be used to keep fire exposed containers cool.

Unusual Fire And Explosion Hazards:
Vapor is heavier than air and travels considerable distance to source of ignition and flashback.

Continued on Next Page

Section 5 - Reactivity Data

Stability: Stable **Conditions To Avoid:** Keep in closed containers away from sparks and open flame.

Incompatability (Materials To Avoid): Strong oxidizing materials, Lithium Aluminum Hydride, Sodium Aluminum Hydroxide, Sodium & Potassium Hydroxides.

Hazardous Decomposition: Carbon dioxide and carbon monoxide are formed. Irritating Peroxide fumes formed when heated to decomposition.

Hazardous Polymerization: Avoid excessive exposure to air and cationic initiators like Lewis Acids.

Section 6 - Health Hazard Data

Routes of Entry: **Inhalation** YES/Primary **Skin** YES/Primary **Ingestion** YES/Secondary

Health Hazards:

Corrosive to eyes and skin irritant. Severe overexposure can cause headache, dizziness and narcosis. May cause dermatosis and dermatitis with prolonged skin contact.

Carcinogenicity: **NTP** NO **IARC** NO **OSHA Regulated** NO

Signs And Symptoms of Exposure:

INGESTION: No effects of exposure expected. INHALATION: Will cause irritation of mucous membranes, nose, eyes, and throat, coughing, difficulty in breathing. Exposure to high vapor concentration may cause headache, dizziness, nausea, narcosis. SKIN CONTACT: Prolonged contact causes common solvent defatting effect. EYE CONTACT: Vapors slightly uncomfortable, splashes irritating. Will cause painful burning or stinging of eyes and lids, watering of eyes and inflammation of conjunctiva.

Medical Conditions Generally Aggravated By Exposure:

No data found

Emergency And First Aid Procedures:

INGESTION: DO NOT INDUCE VOMITING. If conscious, dilute by giving two glasses of water. Call a physician immediately. INHALATION: Remove to fresh air. If not breathing give artificial respiration, preferably mouth to mouth. If breathing is difficult give oxygen. Call a physician. SKIN CONTACT: Wash affected skin area with soapy water. Remove contaminated clothing. EYE CONTACT: Immediately flush eyes with plenty of water for 15 minutes. Consult a physician.

Continued on Next Page

Section 7 - Precautions For Safe Handling And Use:

Steps To Be Taken In Case Material Is Released Or Spilled:

Eliminate sources of ignition. Absorb with sand or inert absorbing material and dispose of with solid waste according to federal, state and local regulations. Flush spill area with water, avoid flushing into confined areas.

Waste Disposal Method:

Incinerate in accordance with federal, state and local regulations.

Precautions To Be Taken In Handling And Storing:

Store in cool place, well-ventilated area. Keep away from open flame and sources of ignition.

Other Precautions:

Use normal good personal hygiene

Section 8 - Control Measures:

Respiratory Protection:

In confined spaces or other circumstances where adequate ventilation cannot be assured use NIOSH-approved respirator, positive pressure airline mask, or self contained breathing apparatus.

Ventilation: **Local Exhaust** As required

Mechanical All ventilating devices must be located so they do not provide a source of ignition.

Special When using cements in an area of limited ventilation, use a ventilation device such as a fan or air mover to maintain a safe air concentration.

Gloves: PVA gloves.

Other: N/A

Eye Protection: Chemical safety goggles

Other Protective Clothing: Apron, boots, eye bath, safety shower.

Work/Hygienic Practices Wash thoroughly after handling. Avoid ingestion of the cements. Do not eat or drink when using cements or in the vicinity where such cements are being used.

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

FACTS faxed FAST!

For Hercules Material Safety Data Sheets by fax anytime, day or night, just call 1-800-942-INFO (1-800-942-4636) from any Touch-Tone phone. Have your fax number ready. Checking the product label for the correct MSDS # will save time.

Plastic Pipe Cements

Spec Sheet #S00032
July 2004

HERCULES®

Primers, Cleaner & Accessories

specifications

Plastic Pipe Cements

DESCRIPTION

Cements, Primers, Cleaner & Daubers

Application specific **solvent cements** for superior bonding strength on rigid or flexible PVC, CPVC and ABS plastic pipe and fittings. Regular, medium, heavy bodied cements for use on pipe and fittings up to 15" diameter. Ideal for use with hot or cold potable water pressure systems, irrigation, conduit, pool and spas, industrial piping, sewer, drain waste and vent systems. Clear and purple primers for softening and preparing surfaces of pipe and fittings before applying solvent cement and for code verification. Fast acting **Hercules cleaner** removes surface dirt, grease and grime on pipes and fittings. An assortment of daubers and a brush are also available.

Each product meets standards set by nationally recognized code-making standards and testing organizations. As designated on individual labels, these products meet standards set by the National Sanitation Foundation (NSF), the Uniform Plumbing Code of the International Association of Plumbing and Mechanical Officials (IAPMO) and the specifications of the American Society for Testing and Materials (ASTM). Cans of Hercules cements, primers and cleaner are available in sizes 1/4 pt. to 1 qt. and have dauber applicators for fast and easy installation. All Hercules cements, primers and cleaner are date-coded for shelf life and color-coded for easy selection.

CPVC/PVC Cements

Polyvinyl chloride (PVC) cements are used for solvent welding PVC pipe and socket-type fittings. Hercules offers 5 different types of pvc cements with various setting speeds and viscosities. Chlorinated polyvinyl chloride (CPVC) cements are used for solvent welding CPVC tubing, and socket-type fittings. Hercules offers 2 different types of CPVC formulations.

Cements for PVC

clear, regular body, medium set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 4" diameter. Schedule 40.
Meets ASTM D2564
MSDS #53

NSF UPC®

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60043*	1/4 pt.	12	4.3 lbs.
60053*	1/2 pt.	12	7.8 lbs.
60055**	1 pt.	12	14.7 lbs.
60060**	1 qt.	12	27.5 lbs.
60065	1 gal.	6	53.6 lbs.

pvc cement, blue label

clear, medium body, medium set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 6" diameter. Schedules 40 and 80.
Meets ASTM D2564
MSDS #52

NSF UPC®

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60003*	1/4 pt.	12	4.3 lbs.
60013*	1/2 pt.	12	7.8 lbs.
60015**	1 pt.	12	14.5 lbs.
60020**	1 qt.	12	27.5 lbs.
60025	1 gal.	6	53.2 lbs.

*Dauber in cap **Jumbo Dauber in cap

pvc cement, yellow label

clear, medium body, fast set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 8" diameter. Schedules 40 and 80.
Meets ASTM D2564
MSDS#52

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60103*	1/4 pt.	12	4.3 lbs.
60113*	1/2 pt.	12	7.8 lbs.
60115**	1 pt.	12	14.9 lbs.
60120**	1 qt.	12	27.5 lbs.
60125	1 gal.	6	53.0 lbs.

pvc cement, tan label

clear, heavy body, slow set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 15" diameter. Schedules 40 and 80.
Meets ASTM D2564
MSDS #50

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60155*	1/2 pt.	24	15.6 lbs.
60160**	1 pt.	12	14.6 lbs.
60165**	1 qt.	12	27.6 lbs.

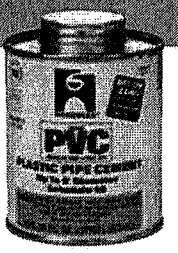
pvc cement, gray label

gray, heavy body, slow set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 15" diameter. Schedules 40 and 80.
Meets ASTM D2564
MSDS #60

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60210*	1/2 pt.	24	15.9 lbs.
60215**	1 pt.	12	14.7 lbs.
60220**	1 qt.	12	27.9 lbs.
60225	1 gal.	6	54.0 lbs.

below-zero pvc cement, orange label



clear, regular body, fast set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 6" diameter. Schedule 40.
Withstands storage temperatures down to -10°F (-23°C).
Meets ASTM D2564
MSDS #51

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60142*	1/2 pt.	24	15.4 lbs.
60145**	1 pt.	12	14.5 lbs.
60148**	1 qt.	12	27.5 lbs.

wet set pvc cement, aqua blue label

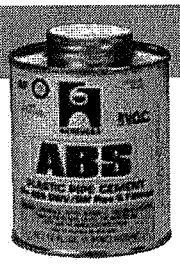
aqua blue, medium body,fast set
For PVC Types I & II, potable water, DWV, and SW pipe and fittings up to 8" diameter. Schedules 40 and 80.
Formulated for applications where conditions are very wet and/or when quick pressurization is imperative. Ideal for lawn sprinkler and swimming pool installations.
Meets ASTM D2564
MSDS#76

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60253*	1/2 pt.	12	7.4 lbs.
60255**	1 pt.	12	13.7 lbs.
60260**	1 qt.	12	28.7 lbs.
60265	1 gal.	6	54.2 lbs.

Cements for ABS

abs cement, green label



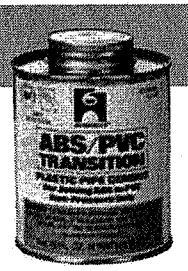
black, medium body, fast set
For ABS potable water and DWV and SW pipe and fittings up to 8" diameter. Schedules 40 and 80.
Meets ASTM 2235
MSDS #64

LOW V.O.C.

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60503*	1/4 pt.	12	4.1 lbs.
60513*	1/2 pt.	12	7.4 lbs.
60515**	1 pt.	12	13.6 lbs.
60520**	1 qt.	12	25.7 lbs.
60525	1 gal.	6	49.5 lbs.

abs/pvc transition cement, brown label



green, medium body, fast set
For joining ABS to PVC pipe and fittings up to 6" diameter, non pressure only. Schedules 40 and 80.
Meets ASTM D3138
MSDS #65

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60555*	1/2 pt.	24	15.5 lbs.
60560**	1 pt.	12	14.5 lbs.

*Dauber in cap **Jumbo Dauber in cap

Cements for CPVC

cpvc cement, orange label

orange, medium body, fast set
CPVC potable water pipe and fittings to 8" diameter. All schedules.
Meets ASTM F493
MSDS #61

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60303*	1/4 pt.	12	4.4 lbs.
60313*	1/2 pt.	12	8.0 lbs.
60315*	1 pt.	12	14.7 lbs.
60320*	1 qt.	12	28.0 lbs.

cpvc gold, yellow label

gold, medium body, medium set
One step, low V.O.C. cement for use on all CPVC pipe and fittings including FlowGuard Gold™ (for use on specific brands of CPVC pipe, verify suitability with pipe manufacturer). Schedules 40 and 80.
Meets ASTM F493. *MSDS #95*

LOW V.O.C.

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60353*	1/4 pt.	12	4.4 lbs.
60358*	1/2 pt.	12	8.0 lbs.
60360*	1 pt.	12	14.7 lbs.
60365*	1 qt.	12	28.0 lbs.

Specialty Cement

multi-purpose cement, olive label

milky, medium body, fast set
For potable water, DWV and SW pipe and fittings. For joining PVC, CPVC and ABS pipe and fittings up to 6" diameter. Schedules 40 and 80.
Meets ASTM D2564, D2235, F493 performance requirements.
MSDS #66

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60703*	1/4 pt.	12	4.4 lbs.
60713*	1/2 pt.	12	7.2 lbs.
60715**	1 pt.	12	13.1 lbs.
60720**	1 qt.	12	24.8 lbs.
60725	1 gal.	6	47.5 lbs.

Plastic Pipe and Fittings Cleaner

plastic pipe and fittings cleaner, yellow label

clear
For removing foreign matter and dirt from ABS, PVC, and CPVC pipe and fittings.
MSDS #67

LOW V.O.C.

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60652*	1/4 pt.	12	4.0 lbs.
60659*	1/2 pt.	12	7.2 lbs.
60664**	1 pt.	12	13.1 lbs.
60667**	1 qt.	12	24.7 lbs.
60669	1 gal.	6	47.5 lbs.

Primers

primer for pvc and cpvc, purple label

purple *[Note: For use where plumbing codes require purple, rather than clear primers.]* Recommended method to soften and prepare surface of PVC and CPVC pipe fittings (all sizes and schedules except copper tube size CPVC) before applying solvent cements. Use caution: Purple primers contain a dye which is difficult or impossible to remove from many surfaces. Meets ASTM F656. *MSDS #62*

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60403*	1/4 pt.	12	4.1 lbs.
60413*	1/2 pt.	12	7.4 lbs.
60415**	1 pt.	12	13.7 lbs.
60420**	1 qt.	12	25.9 lbs.
60425	1 gal.	6	49.8 lbs.

LOW V.O.C.

pvc primer, red label

clear Recommended method to soften and prepare surface of PVC pipe and fittings (all sizes and schedules) before applying solvent cements.
Meets ASTM F656.
MSDS #63

LOW V.O.C.

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60453*	1/4 pt.	12	4.1 lbs.
60458*	1/2 pt.	12	7.3 lbs.
60460**	1 pt.	12	13.4 lbs.
60465**	1 qt.	12	25.3 lbs.
60470	1 gal.	6	48.6 lbs.

pvc primer, lavender label

purple *[Note: For use where plumbing codes require purple, rather than clear primers.]* Recommended methods to soften and prepare surface of PVC pipe and fittings (all sizes and schedules) before applying solvent cements. Use caution: Purple primers contain a dye which is difficult or impossible to remove from many surfaces. Meets ASTM F656
MSDS #70

SIZES AND PACKING

STOCK NO.	SIZE	PACKING	WEIGHT/CASE
60473*	1/4 pt.	12	4.1 lbs.
60483*	1/2 pt.	12	7.3 lbs.
60485**	1 pt.	12	13.4 lbs.
60490**	1 qt.	12	25.3 lbs.
60495	1 gal.	6	48.6 lbs.

LOW V.O.C.

*Dauber in cap **Jumbo Dauber in cap

FACTS faxed FAST! SM

OSHA-Required Health And Safety Information!

This Material Safety Data Sheet (MSDS) was requested moments ago from Hercules Automated Fax Information System. Please forward it immediately to the person in charge of MSDS's, or retain it at the machine until claimed.

Section 1

MATERIAL SAFETY DATA SHEET # 70

Hercules Purple PVC Primer

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

Date Prepared: 3/24/1994 **Last Reviewed:** 1/24/2002

Meets OSHA 29 CFR 1910.1200

Hercules Chemical Company Inc.
111 South Street
Passaic NJ 07055
Phone (800) 221-9330
Fax (800) 333-3456

Section 2 - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s), CAS Numbers)	OSHA PEL	ACGIH TLV	Other Limits	Upper Bound Limit if SARA Reportable
Tetrahydrofuran (109-99-9)	200PPM	200PPM	N/A	- -
Methyl Ethyl Ketone (78-93-3)	200PPM	200PPM	N/A	.40
Cyclohexanone (108-94-1)	25PPM	25PPM	N/A	- -
Acetone (CAS67-64-1)	1000 PPM	750PPM		.45

HMIS Hazard Rating: Health: 3 Flammability: 4 Reactivity: 1 Personal Protection: G

Section 3 - Physical/Chemical Characteristics

Boiling Point (°C):	Specific Gravity (H2O = 1):	Vapor Density (Air = 1):	Vapor Pressure (mm Hg):
133 Based on first boiling component-Acet	0.820 ± 0.03	2.0 to 2.5	190 Based on first boiling component-Acetone

Melting Point (° F)	Evaporation Rate: (Butyl Acetate = 1)	Solubility in Water:
N/A	7-11	50% to 75%

Appearance And Color: Purple Liquid **Odor:** Ethereal & Acetone-like

Section 4 - Fire And Explosion Hazard Data

Flash Point:

0° to 6.0° F (TCC) (Based on acetone)

Flammable Limits:	LEL:	UEL:
	2%	13.0%

Extinguishing Media: Foam/Dry chemical/CO2

Special Firefighting Procedures:
Handle as flammable liquid. Wear self-contained breathing apparatus & chemical goggles. Water may be ineffective, but should be used to keep fire-exposed containers cool.

Unusual Fire And Explosion Hazards:
Vapor is heavier than air and travels considerable distance to sources of ignition and flashback. On long standing may cause peroxides which may cause violent reaction especially upon evaporation to dryness.

Continued on Next Page

Section 5 - Reactivity Data

Stability: Stable **Conditions To Avoid:** Keep in closed containers away from sparks & open flame.

Incompatability (Materials To Avoid): Strong oxidizing materials, Lithium Aluminum Hydride, Sodium Aluminum Hydroxide, Sodium & Potassium Hydroxides.

Hazardous Decomposition: Carbon dioxide and carbon monoxide are formed. Irritating Peroxide fumes are formed when heated to decomposition.

Hazardous Polymerization: Avoid excessive exposure to air and cationic initiators like Lewis Acids.

Section 6 - Health Hazard Data

Routes of Entry: **Inhalation** YES/Primary **Skin** YES/Primary **Ingestion** YES/Secondary

Health Hazards:

Corrosive to eyes and skin irritant. Severe overexposure can cause headache, dizziness and narcosis. May cause dermatosis and dermatitis with prolonged repeated contact.

Carcinogenicity: **NTP** NO **IARC** NO **OSHA Regulated** NO

Signs And Symptoms of Exposure:

INGESTION: No effects expected. INHALATION: Will cause irritation of mucous membranes, nose, eyes, & throat; coughing, difficulty of breathing. Exposure to high vapor concentration may cause headache, dizziness, nausea, narcosis. SKIN CONTACT: Prolonged skin contact causes common solvent defatting effect. EYE CONTACT: Vapors slightly uncomfortable. Splashes irritating. Will cause painful burning or stinging of eyes & lids, watering of eyes and conjunctiva.

Medical Conditions Generally Aggravated By Exposure:

No data found

Emergency And First Aid Procedures:

INGESTION: DO NOT INDUCE VOMITING. If conscious, dilute by giving 2 glasses of water. Call a physician immediately. INHALATION: Remove to fresh air. If not breathing, give artificial respiration, preferably mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. Call a physician. SKIN CONTACT: Wash affected area with soapy water. Remove contaminated clothing. EYE CONTACT: Immediately flush eyes with plenty of water for 15 minutes. Consult a physician.

Continued on Next Page

Section 7 - Precautions For Safe Handling And Use:

Steps To Be Taken In Case Material Is Released Or Spilled:

Eliminate sources of ignition. Absorb with sand or inert absorbing material. Dispose of with solid waste in accordance with all regulations. Flush spill area with water. Avoid flushing into confined areas.

Waste Disposal Method:

Incinerate in accordance with federal, state and local regulations.

Precautions To Be Taken In Handling And Storing:

Store in cool, well-ventilated area. Keep away from open flame and sources of ignition.

Other Precautions:

Use normal good personal hygiene.

Section 8 - Control Measures:

Respiratory Protection:

In confined spaces or other circumstances where adequate ventilation cannot be assured use NIOSH-approved respirator, positive pressure airline mask, or self contained breathing apparatus.

Ventilation: **Local Exhaust** As required

Mechanical All ventilating devices must be located so they do not provide a source of ignition.

Special When using cements in an area of limited ventilation, use a ventilation device such as a fan or air mover to maintain a safe air concentration.

Gloves: PVA gloves

Other: N/A

Eye Protection: Chemical Safety goggles.

Other Protective Clothing: Apron, boots, eye bath, safety shower

Work/Hygienic Practices Wash thoroughly after handling. Avoid ingestion of the cements. do not eat or drink when using cements or in the vicinity where such cements are being used.

HERCULES® MATERIAL SAFETY INFORMATION SERVICE

FACTS faxed FAST!

For Hercules Material Safety Data Sheets by fax anytime, day or night, just call 1-800-942-INFO (1-800-942-4636) from any Touch-Tone phone. Have your fax number ready. Checking the product label for the correct MSDS # will save time.

Air Resources Board

State of California

Governor Arnold Schwarzenegger

Review of the California Ambient Air Quality Standard For Ozone

Volume I of IV

Chapters 1-2

Appendix A—Proposed Amendments

Staff Report

Initial Statement of Reasons for Proposed Rulemaking

March 11, 2005

California Environmental Protection Agency

Air Resources Board

The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our Website: http://www.arb.ca.gov.

California Environmental Protection Agency

Alan C. Lloyd, Ph.D., Secretary

Printed on Recycled Paper

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Disclaimer

This report has been reviewed by the staff of the Air Resources Board and the Office of Environmental Health Hazard Assessment. Mention of trade names or commercial products does not constitute endorsement or recommendation for their use. To obtain this document in an alternative format, please contact the Air Resources Board ADA Coordinator at (916) 322-4505, TDD (916) 324-9531, or (800) 700-8326 for TDD calls from outside the Sacramento area. This report is available for viewing or downloading from the Air Resources Board internet site at
http://www.arb.ca.gov/research/aaqs/ozone-rs/ozone-rs.htm

This staff report, the Notice of Public Hearing to consider Amendments to Regulations for the State Ambient Air Quality Standard for Ozone, and all subsequent regulatory documents, including the FSOR, when completed, are available on the ARB Internet site for this rulemaking at www.arb.ca.gov/regact/ozone05/ozone05.htm
Electronic copies on compacts discs or paper copies of this report may be obtained from the Public Information Office, Air Resources Board, 1001 I Street, Visitors and Environmental Services Center, 1st Floor, Sacramento, CA 95814, (916) 322-2990.

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Abbreviations and Definitions

abscission	the normal separation, involving a layer of specialized cells, of flowers, fruits and leaves of plants
AOT40	accumulated exposure over threshold of 40 ppb ozone
AQDA	air quality data action
ARB	Air Resources Board
AVG	aminoethoxyvinyl glycine
BSA	Broader Sacramento Area
Ca^{2+}	calcium ion
canopy	a cover of foliage that forms when the leaves on the branches trees in a forest overlap during the growing season
CEC	controlled environment chamber
CFR	Code of Federal Regulations
CO_2	carbon dioxide
COPD	chronic obstructive pulmonary disease
d	day
edaphic	the physical, chemical, and biological characteristics of soil
ESPACE	European Stress Physiology and Climate Experiment
FACE	Free Air Carbon Enrichment system, a chamber-free, open-air fumigation design
FEF25-75%	forced expiratory flow rate between 25 and 75% of forced vital capacity
FEM	federal equivalent method (for air monitoring)
FEV1	forced expiratory volume in one second
fine roots	roots with a diameter between 0.5 to 3 mm
foliar	of or referring to a plant leaf
FRM	federal reference method (for air monitoring)
full-sib	seedlings that have the same parents, but not necessarily from seed produced in the same year
FVC	forced vital capacity
g	gram
GBVAB	Great Basin Valleys Air Basin
gdw	gram dry weight
GIS	geographic information system

gfw	gram fresh weight
hr	hour
ha	hectare (= 10,000 m^2; an area that is 100 m x 100 m)
half-sib	seedlings that have one parent in common
hm	hourly mean
HNO_3	nitric acid
homeostasis	the tendency toward maintaining physiological stability within an organism (plant or animal)
H&SC	Health and Safety Code
IPM	Integrated Pest Management.
Jeffrey pine	*Pinus jeffreyi* Grev. and Balf.
k	allometric growth coefficient describing the distribution of dry weight gain between competing plant parts, defined as the ratio of the relative growth rates of the competing plant parts
K^+	potassium ion
kg	kilogram (= 1,000 g = 2.205 pounds)
km	kilometer (= 1,000 m = 0.6214 miles)
L	liter
LCAB	Lake County Air Basin
LST	local standard time
LTAB	Lake Tahoe Air Basin
m	meter (= 3.28 feet)
m^2	square meter, an area that is 1 m x 1 m
MCAB	Mountain Counties Air Basin
MDAB	Mojave Desert Air Basin
mesophyll cells	the internal cells of a leaf, distinct from cells at the leaf surface or from cell layers immediately adjacent to the leaf surface
mixed conifer	forests with a tree-layer dominated by a mixture of conifer species
montane	of or relating to a mountain or mountainous area
mRNA	messenger RNA (ribonucleic acid)
mycorrhizae	a biological association of a fungus (e.g., *Pisolithus tinctorius*) with the root cells of a plant (e.g., ponderosa pine tree)
mycorrhizal trees	trees with roots associated a mycorrhizae fungus

n	sample size
NARSTO	a public/private partnership to coordinate research in Canada, Mexico and the United States on tropospheric air pollution (formerly the North American Research Strategy for Tropospheric Ozone)
NCAB	North Coast Air Basin
NCCAB	North Central Coast Air Basin
NCLAN	National Crop Loss Assessment Network, a national study of ozone impacts on crops, undertaken during the 1980s
NEPAB	Northeast Plateau Air Basin
ng	nanogram (= 0.000000001 g = 10^{-9} g)
NH_4N_3	ammonium nitrate
nL	nanoliter (10^{-9} L)
nm	nanometer, or one billionth of a meter
NO	nitric oxide, the primary nitrogen-containing by-product of combustion
NO_2	nitrogen dioxide
NO_X	nitrogen oxides (or oxides of nitrogen)
ns	not statistically significant at p =0.05
O_3	ozone; triatomic oxygen
OII	ozone injury index
OTC	open top field exposure chamber
PAR	photosynthetically active radiation (400 – 700 nm)
phloem	the plant tissue through which sugars and other organic materials are transferred to different parts of the plant
photosynthesis	the production by green plants of organic compounds from water and carbon dioxide using energy absorbed from sunlight
Pisolithus tinctorius	a mycorrhizae-forming fungus that forms root-associations with a wide variety of pine and other tree species
ppb	parts per billion by volume
ppb-hr	parts per billion hours (i.e., sum of concentration times duration), a measure of exposure to ozone
ppm	parts per million by volume
ppm-hr	parts per million hours (i.e., sum of concentration times duration), a measure of exposure to ozone

process rates	the degree or amount at which specific actions or activities occur (e.g., water vapor loss from leaves of plants)
QAS	Quality Assurance Section (of ARB)
R:S	ratio of root biomass (dry weight) to shoot biomass
RGR	relative growth rate, defined as the difference in the dry weight of a plant or plant part over a time period, divided by the initial dry weight and the length of the time period
RH	relative humidity
RuBisCO	ribulose bisphosphate carboxylase-oxygenase
RuBP	ribulose bisphosphate
SCCAB	South Central Coast Air Basin
SCOIAS	Sierra Cooperative Ozone Impact Assessment Study
SDAB	San Diego Air Basin
senescence	the onset of aging -- a phase in plant development from maturity to the complete loss of organization and function in plants
SFBAAB	San Francisco Bay Area Air Basin
shoot	the aboveground portion of the plant (e.g., leaves, stems, flowers, and fruits)
sieve cells	the primary type of cell found in the phloem of plants
SIP	State Implementation Plan
SJVAB	San Joaquin Valley Air Basin
SoCAB	South Coast Air Basin
SSAB	Salton Sea Air Basin
sucrose	a disaccharide (with 12 carbon atoms) commonly found in plants
(sucrose) translocation	the movement of sucrose (or other soluble organic food materials) through plant tissues – most commonly from leaves to stems/roots
SUM06	an ozone exposure metric involving concentration weighting, defined as the sum of all hourly mean ozone concentrations equal to or greater than 70 ppb
terrain-effect winds	air currents influenced by the geographic features of the land that it passes over
TREEGRO	a physiologically based computer simulation model of tree growth and development

Ulmus americana	the scientific name for "American Elm"
UN-ECE	United Nations Economic Commission for Europe
USD	United States dollars
USDA	United States Department of Agriculture
USDI	United States Department of the Interior
USEPA	United States Environmental Protection Agency
USV	Upper Sacramento Valley
V_d	deposition velocity, defined as deposition flux of ozone divided by its concentration in air (usually in cm/s or m/s)
VPD	vapor pressure deficit, a measure of evaporative demand of air
whorl	the arrangement of leaves, petals, etc., at about the same place on a stem
wk	week
yr	year
ZAP	zonal application system, a chamber-free, open-air exposure system
µg	microgram (= 0.000001 g = 10^{-6} g)
µm	micrometer or micron (= 0.000001 m = 10^{-6} m)

1 Executive Summary

The California Health and Safety Code in section 39606, requires the Air Resources Board to adopt ambient air quality standards at levels that adequately protect the health of the public, including infants and children, with an adequate margin of safety. Ambient air quality standards are the legal definition of clean air. In December 2000, as a requirement of the Children's Environmental Health Protection Act (Senate Bill 25, Escutia, Stats. 1999, Health and Safety Code 39606 (d)(1)), the Air Resources Board (ARB or Board), approved a report, "Adequacy of California Ambient Air Quality Standards" (ARB and OEHHA, 2000) that contained a brief review of all of the existing health-based California ambient air quality standards.

Following this review, the standard for ozone, currently set at 0.09 parts per million (ppm) for one hour, was prioritized to undergo full review after review of the standards for particulate matter and sulfates. Staff from ARB and the Office of Environmental Health Hazard Assessment (OEHHA) have reviewed the scientific literature on public exposure, atmospheric chemistry, health effects of exposure to ozone, and welfare effects. This Staff Report or Initial Statement of Reasons (Staff Report) presents the findings of the review and the staff recommendations to revise the ozone standard in order to adequately protect public health. The proposed amendments to the ambient air quality standard for ozone are based on the health effects review contained in Volume III of this Report and the recommendation of OEHHA, as required by Health and Safety Code section 39606(a)(2).

1.1 Summary of the Staff Report/Initial Statement of Reasons

1.1.1 Health Effects of Ozone

Scientific studies show that exposure to ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyperreactivity, and increased airway inflammation. Exposure to ozone is also associated with premature death, hospitalization for cardiopulmonary causes, emergency room visits for asthma, and restrictions in activity.

In controlled human exposure studies (see Chapter 9), exercising individuals exposed for 1 hour (hr) to an ozone concentration as low as 0.12 parts per million (ppm) or for 6.6 hours to a concentration as low as 0.08 ppm experienced lung function decrements and symptoms of respiratory irritation such as cough, wheeze, and pain upon deep inhalation. The lowest ozone concentrations at which airway hyperreactivity (an increase in the tendency of the airways to constrict in reaction to exposure to irritants) has been reported are 0.18 ppm ozone following 2-hour exposure in exercising subjects, 0.40 ppm following 2-hour exposure in resting subjects, and 0.08 ppm ozone in subjects exercising for 6.6 hr. Airway inflammation has been reported following 2-hour exposures to 0.20 ppm ozone and following 6.6-hour exposure to 0.08 ppm ozone.

Additional support for the exposure/response relationship for ozone health effects is derived from animal toxicological studies, which have shown that chronic ozone exposure can induce morphological (tissue) changes throughout the respiratory tract, particularly at the junction of the conducting airways and the gas exchange zone in the deep lung. In addition, the magnitude of ozone-induced effects is related to the inhaled dose (ozone concentration times breathing rate times exposure duration). Of these three factors ozone concentration is the most significant in predicting the magnitude of observed effects, followed by ventilation rate. Exposure duration has the least influence of the three factors.

Epidemiological studies (see Chapter 10) have shown positive associations between ozone levels and several health effects, including decreased lung function, respiratory symptoms, hospitalizations for cardiopulmonary causes, emergency room visits for asthma, and premature death. Children may be more affected by ozone than the general population due to effects on the developing lung and to relatively higher exposure than adults. There is little information available on the effects of ozone exposure on infants. Also, asthmatics may represent a sensitive sub-population for ozone. Since most California residents are exposed to levels at or above the current State ozone standard during some parts of the year, the statewide potential for significant health impacts associated with ozone exposure is large and wide-ranging.

1.1.2 Summary of Non-health Issues

The Staff Report contains reviews and discussions of non-health topics to provide a context for the health review and the staff recommendations for the State ozone standard. Almost all of the ozone in California's atmosphere results from reactions between substances emitted from sources including motor vehicles and other mobile sources, power plants, industrial plants, and consumer products. These reactions involve volatile organic compounds (VOC) and oxides of nitrogen (NO_X) in the presence of sunlight (Chapter 3). Ozone is a regional pollutant, as the reactions forming it take place over time, and downwind from the sources of the emissions. As a photochemical pollutant, ozone is formed only during daylight hours under appropriate conditions, but is destroyed throughout the day and night. Thus, ozone concentrations vary depending upon both the time of day and the location. Even in pristine areas there is some ambient ozone that forms from natural emissions that are not controllable (Chapter 4). This is termed "background" ozone. The average "background" ozone concentrations near sea level are in the range of 0.015 to 0.035 ppm, with a maximum of about 0.04 ppm.

The Staff Report includes an overview of statewide ozone precursor emissions that are involved in the formation of ozone (Chapter 5). The Staff Report also includes a discussion of the current ultraviolet photometry monitoring method, and a listing of approved samplers (Chapter 6). Although there are two measurement methods for ozone approved for use in the U.S. by the U.S. Environmental Protection Agency (USEPA), the method based on ultraviolet photometry is almost universally used in practice and is approved for use in California for state air quality standards.

The Staff Report includes a summary of current air quality in California, as well as long-term trends in statewide ozone concentrations (Chapter 7). Ozone is monitored continuously at approximately 175 sites in California. The highest number of exceedance days for both the State and federal 1-hour standards occurred in the San Joaquin Valley Air Basin and the South Coast Air Basin. Both areas had more than 115 State standard exceedance days and 31 or more federal standard exceedance days during each of the three years from 2001 through 2003. The Sacramento Metro Area, Mojave Desert Air Basin, and Salton Sea Air Basin all averaged more than 50 State standard exceedance days and averaged 6 or more federal standard exceedance days during 2001 through 2003. The remaining five areas (Mountain Counties Air Basin, San Diego Air Basin, San Francisco Bay Area Air Basin, South Central Coast Air Basin, and the Upper Sacramento Valley) averaged from 12 to 45 State standard exceedance days. The Upper Sacramento Valley area had no exceedances of the federal standard while the Mountain Counties Air Basin, San Diego Air Basin, San Francisco Bay Area Air Basin, and South Central Coast Air Basin each averaged 1 to 2 federal standard exceedance days for the three-year period.

The range of the measured maximum 1-hour concentrations tends to follow a similar pattern. The South Coast Air Basin showed the highest values, with measured concentrations of 0.169 ppm or higher during 2001 through 2003. The next highest 1-hour ozone concentrations occurred in the Salton Sea Air Basin and San Joaquin Valley Air Basin, which had concentrations of 0.149 ppm or higher during all three years. During 2001 through 2003, neither the State nor federal 1-hour standard was exceeded in the Lake County Air Basin, North Coast Air Basin, or Northeast Plateau Air Basin. Data for four additional areas, Great Basin Valleys Air Basin, Lake Tahoe Air Basin, North Central Coast Air Basin, and the Upper Sacramento Valley show exceedances of the State standard, but not the federal 1-hour standard (as described earlier, representative data for the Northeast Plateau Air Basin and Great Basin Valleys Air Basin are available for 2002 and 2003 only). Both the State and federal 1-hour standards were exceeded during at least two of the three years in all other areas.

Californians' indoor and personal exposures to ozone are largely determined by the outdoor ozone concentrations in their community. Nonetheless, some Californians experience a substantial exposure to ozone indoors, due to the increasing use of certain types of appliances and equipment that emit ozone. Children and those who are employed in outdoor occupations or exercise heavily outdoors, experience substantially greater exposures to ozone than the rest of the population, because they spend time outdoors during peak ozone periods.

A review of welfare effects, including effects of ozone on forest trees, agricultural crops, and materials is also discussed in this report (Chapter 8). Elevated concentrations of ozone can cause adverse effects on agricultural crops, forest trees and materials at current ambient levels, and the proposed health-based ozone standards should also provide protection to crops, forests and materials. In broad terms, impacts to crops are generally more severe than for forest trees owing to their inherently more vigorous rates of growth. Discussed in the

subsection on crops and the methods used to expose plants to ozone. This is followed by an examination of the physiological basis of ozone damage to plants, with special emphasis on carbon metabolism and the resulting impacts on crop growth and yield. Data collected since the 1950s on mixed conifer forests in the San Bernardino Mountains and the Sierra Nevada indicate that increasing numbers of ponderosa and Jeffrey pines exhibit ozone-specific needle damage due to the pollutant's cumulative effects. Also discussed are the impacts of ozone on materials, including building materials, rubber, paint, and fabrics. Although the proposed ozone standards are based on human health effects, progress toward attaining the proposed standards will provide welfare benefits.

1.2 Staff Recommendations for the Ozone Standard

California ambient air quality standards are defined in the Health and Safety Code section 39014, and 17 Cal. Code Regs. section 70101, and comprise four elements: (1) a definition of the air pollutant, (2) an averaging time, (3) a pollutant concentration, and (4) a monitoring method to determine attainment of the standard. The current California ambient air quality standard for ozone is 0.09 ppm averaged over one hour and was set by the Board in 1988. The data indicate that the current standard alone is not sufficiently protective of human health. Based on the review of the scientific literature and recommendations by OEHHA, the staff recommends that the following revisions be made to the California ambient air quality standard for ozone:

1. Ozone will continue to be the pollutant addressed by the standard.
2. Ozone 1-hour-average Standard – retain the current 1-hour-average standard for ozone at **0.09 ppm, not to be exceeded.**
3. Ozone 8-hour-average Standard – establish a new 8-hour-average standard for ozone at **0.070 ppm, not to be exceeded.**
4. Ozone Monitoring Method: retain the current monitoring method for ozone which uses the ultraviolet (UV) photometry method for determining compliance with the State ambient air quality standard for ozone. Incorporate by reference (17 Cal. Code Regs. section 70101) all federally approved UV methods (i.e., samplers) for ozone as "California Approved Samplers". This will result in no change in air monitoring equipment practices, but will align state monitoring requirements with federal requirements.

These recommendations are based on the following findings:

a. Reduced lung function and increased respiratory or ventilatory symptoms following 1-hour exposure to 0.12 ppm ozone with moderate to heavy exercise.

b. Increased airway hyperreactivity following 2-hour exposure to 0.18 ppm in exercising subjects.

c. Airway inflammation following 2-hour exposure to 0.20 ppm ozone in exercising subjects

d. Reduced lung function, increased respiratory and ventilatory symptoms, increased airway hyperreactivity, and increased airway inflammation following 6.6 to 8-hour exposure to 0.08 ppm ozone.

e. Evidence from epidemiological studies of several health endpoints including premature death, hospitalization, respiratory symptoms, and restrictions in activity and lung function.

f. Evidence from epidemiological studies of emergency room visits for asthma suggesting a possible threshold concentration between 0.075 and 0.11 ppm from analyses based on a 1-hour averaging time, and a possible threshold concentration between 0.070 and 0.10 ppm from analyses based on an 8-hour averaging time.

g. There is no evidence that children and infants respond to lower ozone concentrations than adults. Their risk is primarily related to their greater ventilation rate and greater exposure duration.

h. The dose-rate of ozone inhalation influences the magnitude of observed effects.

1.3 Other Recommendations

In light of the adverse health effects observed at current ambient concentrations and the lack of a demonstrated effect threshold for the population as a whole, staff makes the following comments:

1. Fund additional research investigating the responses of human subjects to multi-hour exposures to ozone concentrations between 0.04 and 0.08 ppm.
2. The standards should be revisited within five years, in order to re-evaluate the evidence regarding the health effects associated with ozone exposure.
3. In any air basin in California that currently attains the ambient air quality standards for ozone, air quality should not be degraded from present levels.

1.4 Estimated Health Benefits

Staff estimates that attainment of the proposed ozone standards throughout California would avoid a significant number of adverse health effects each year, specifically:

- 580 (290 – 870, probable range) premature deaths for all ages.
- 3,800 (2,200 – 5,400, 95% confidence interval (CI)) hospitalizations due to respiratory diseases for all ages.
- 600 (360 – 850, 95% CI) emergency room visits for asthma for children under 18 years of age.
- 3.3 million (430,000 – 6,100,000, 95% CI) school absences for children 5 to 17 years of age.

- 2.8 million (1.2 million – 4.6 million, 95% CI) minor restricted activity days for adults above 18 years of age.

As discussed in Appendix B, there are a several important assumptions and uncertainties in this analysis. Some have to do with study design, statistical methods, and choice of epidemiological studies used to develop the concentration-response (CR) functions used in the analysis. Few studies have investigated the shape of the CR function, or whether there is a population response threshold for health endpoints other than emergency room visits for asthma. Further uncertainty is added by assumptions in the statewide exposure assessment. It should also be noted that since several health effects related to acute exposure, and effects of chronic ozone exposure, are not included in the estimates, the health benefits associated with lowering ozone exposure are likely underestimated.

1.5 Public and Peer Review of the Staff Recommendations

The draft version of this Staff Report was released to the public on June 21, 2004 and presented for review and comment at public workshops during 2004 on July 14 in Sacramento, July 15 in El Monte, July 16 in Fresno, and August 25 in Sacramento.

The draft Staff Report was peer reviewed by the Air Quality Advisory Committee (AQAC). AQAC is a scientific peer review committee, appointed by the University of California, to independently evaluate the scientific basis of staff findings and recommendations in the draft Staff Report for revising the California ambient air quality standard for ozone. The AQAC held a public meeting to discuss its review of the draft Staff Report, comments submitted by the public, and staff responses to those comments. AQAC concluded that the report was well written and researched, and that the proposed revision to the State ozone standard was adequately supported. AQAC findings, public comments, and staff responses can be found in Appendices C-E. Following the meeting of the Air Quality Advisory Committee (AQAC), staff revised the draft Staff Report based on comments received from AQAC and the public.

1.6 Environmental and Economic Impacts

The proposed ambient air quality standards will in and of themselves have no environmental or economic impacts. Standards simply define clean air. Once adopted, local air pollution control or air quality management districts are responsible for the adoption of rules and regulations to control emissions from stationary sources to assure their achievement and maintenance. The ARB is responsible for adoption of emission standards for mobile sources and consumer products. A number of different implementation measures are possible, and each could have its own environmental or economic impact. These impacts must be evaluated when the control measure is proposed. Any environmental or economic impacts associated with the imposition of future measures will be considered if and when specific measures are proposed.

1.7 Environmental Justice Considerations

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies. The available literature suggests there appears to be no special vulnerability related to race, ethnicity or income level, although there may be higher exposure. Ambient air quality standards define clean air; therefore, all of California's communities will benefit from the proposed health-based standards.

1.8 Comment Period and Board Hearing

Release of this Staff Report opens the official 45-day public comment period required by the Administrative Procedure Act prior to the public meeting of the Air Resources Board to consider the staff's recommendations. Please direct all comments to either the following postal or electronic mail address:

Clerk of the Board
Air Resources Board
1001 "I" Street, 23rd Floor
Sacramento, California 95814
ozone05@listserve.arb.ca.gov

To be considered by the Board, written submissions not physically submitted at the hearing must be received at the ARB no later than 12:00 noon, April 27, 2005. Public workshops will be scheduled for April 2005 to present the final staff recommendations and receive public input on the Staff Report. Information on these workshops, as well as summaries of the presentations from past workshops and meetings are available by calling 1-916-445-0753 or at the following ARB website:
http://www.arb.ca.gov/research/aaqs/ozone-rs/ozone-rs.htm.

An oral report summarizing the staff recommendations for revising the ozone standard will be presented to the Board at a public hearing scheduled for April 28, 2005.

The staff recommends that the Board adopt the proposed amendments to the ambient air quality standards for ozone as stated above. The proposed amendments and their basis are described in detail in this Staff Report, which contains the findings of ARB and OEHHA staff's full review of the public health, scientific literature, and exposure pattern data for ozone in California. Due to the extensive nature of the literature review and the hundreds of studies reviewed, the Staff Report is divided into four volumes. Volume I contains the Executive Summary, Overview and Staff Recommendations, and Appendix A, the proposed amendments to the California Code of Regulations (amended regulatory text). Volumes II through IV present more detailed discussions of the material that is summarized in Volume I. Volume II includes background material on non-health topics, including chemistry of ozone formation and deposition, ozone precursor sources and emissions, ozone exposure and background levels, measurement methods, and welfare effects of ozone exposure. Volume III contains a summary

of ozone health effects and an in-depth discussion of the basis for the staff recommendation. Volume IV includes several appendices, including an analysis of the estimated health benefits associated with attainment of the proposed standards, summaries of Air Quality Advisory Committee and public comments and staff responses, and supplemental animal toxicologic data.

1.9 References

Air Resources Board and Office of Environmental Health Hazard Assessment (2000). Adequacy of California Ambient Air Quality Standards: Children's Environmental Health Protection Act. Staff Report. Sacramento, CA. Available at http://www.arb.ca.gov/ch/programs/sb25/airstandards.htm.

2 Overview and Staff Recommendations

Ozone (O_3) can damage human cells upon contact, and has been implicated in a variety of adverse health effects. Scientific studies show that exposure to ozone can result in reduced lung function, increased respiratory symptoms, increased airway hyperreactivity, and airway inflammation. Exposure to ozone is also associated with premature death, hospitalization for cardiopulmonary causes, emergency room visits for asthma, and restrictions in activity. Ozone forms in the atmosphere as the result of reactions involving sunlight and two classes of directly emitted precursors. One class of precursors includes nitric oxide (NO) and nitrogen dioxide (NO_2), collectively referred to as nitrogen oxides or NO_X. The other class of precursors includes volatile organic compounds (VOCs, also called reactive organic gases or ROG), such as hydrocarbons. Ozone forms in greater quantities on hot, sunny, calm days. In metropolitan areas of California and areas downwind, ozone concentrations frequently exceed existing health-protective standards in the summertime. The current California ambient air quality standard for ozone is 0.09 ppm for one hour.

The sources of ozone precursor emissions within California have been grouped into three major categories: point sources, which are distinct facilities such as power plants and factories; mobile sources, which includes cars, trucks, and off-road mobile equipment; and area-wide sources, which include agricultural and construction activities, and consumer products. VOCs are emitted from vehicles, factories, fossil fuels combustion, evaporation of paints, and many other sources. NO_X is emitted from high-temperature combustion processes, such as at power plants or in motor vehicle exhaust .

The concentrations of ozone measured in the air vary both regionally and seasonally throughout California. For example, the Los Angeles area and the San Joaquin Valley experience highest ozone levels in the state. Ozone concentrations are typically higher during the summer months than the winter months.

To help understand which sources contribute to high ozone levels, the ARB has developed and maintains detailed facility and source specific estimates of the overall estimated ozone precursor emissions. Only the precursor gases are estimated. As a complement to emission inventory and routinely collected air quality monitoring data, the ARB conducts atmospheric modeling, using these precursor emission inventories and other appropriate information, to estimate ozone levels

2.1 Setting California Ambient Air Quality Standards

Ambient air quality standards (AAQS) represent the legal definition of clean air. They specify concentrations and durations of exposure to air pollutants that reflect the relationships between the intensities and composition of air pollution and undesirable effects (Health and Safety Code section 39014). The objective of an AAQS is to provide a basis for preventing or abating adverse health or welfare effects of air pollution (17 Cal. Code Regs. section 70101).

Health and Safety Code section 39606(a)(2) authorizes the Air Resources Board (Board) to adopt standards for ambient air quality "in consideration of public health,

safety, and welfare, including, but not limited to, health, illness, irritation to the senses, aesthetic value, interference with visibility, and effects on the economy." Standards represent the highest pollutant concentration for a given averaging time that is estimated to be without adverse effects for most people. Standards are set to ensure that sensitive population sub-groups are protected from exposure to levels of pollutants that may cause adverse health effects. A margin of safety is added to account for possible deficiencies in the data and measuring methodology. Health-based standards are based on the recommendation of the Office of Environmental Health Hazard Health Assessment (OEHHA).

Recent legislation requires that infants and children be given special consideration when ambient air quality standards are adopted. As part of its recommendation to the ARB, the statute requires OEHHA to use current principles, practices, and methods used by public health professionals to assess the following considerations for infants and children:

1. Exposure patterns among infants and children that are likely to result in disproportionately high exposure to ambient air pollutants in comparison to the general population.
2. Special susceptibility of infants and children to ambient air pollutants in comparison to the general population.
3. The effects on infants and children of exposure to ambient air pollutants and other substances that have a common mechanism of toxicity.
4. The interaction of multiple air pollutants on infants and children, including the interaction between criteria air pollutants and toxic air contaminants.

The law also requires that the scientific basis or the scientific portion of the method used to assess these considerations be peer reviewed (Health and Safety Code section 39606(c)). The draft Staff recommendations and their bases, including OEHHA's assessment and recommendation, is peer reviewed by the Air Quality Advisory Committee (AQAC). AQAC is an external peer review committee established in accordance with section 57004 of the Health and Safety Code and appointed by the President of the University of California a University of California. The AQAC meets to independently evaluate the scientific basis of draft recommendations for revising the California ambient air quality standards.

Ambient air quality standards should not be interpreted as permitting, encouraging, or condoning degradation of present air quality that is superior to that stipulated in the standards. Rather, they represent the minimum acceptable air quality. An AAQS adopted by the Board is implemented, achieved, and maintained by numerous rules and regulations that limit pollution from specific sources of ozone precursors. These rules and regulations are primarily, though not exclusively, emission limitations established by the regional and local air pollution control and air quality management districts for stationary sources, and by the Board for vehicular sources and consumer products (see generally, Health and Safety Code sections 39002, 40000, and 40001).

2.2 Current California Ambient Air Quality Standard for Ozone

The current California ambient air quality standard for ozone, established in 1988, is 0.09 ppm (180 μg/m^3) for a one-hour average. This value is not to be exceeded. This standard was established based on the following most relevant effects, which are listed in the table of standards (17 Cal. Code Regs. section 70200):

a. Short-term exposures:

(1) Pulmonary function decrements and localized lung edema in humans and animals.

(2) Risk to public health implied by alterations in pulmonary morphology and host defence in animals.

b. Long-term exposures: Risk to public health implied by altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans.

c. Welfare effects:

(1) Yield loss in important crops and predicted economic loss to growers and consumers.

(2) Injury and damage to native plants and potential changes in species diversity and number.

(3) Damage to rubber and elastomers and to paints, fabric, dyes, pigments, and plastics.

The US EPA has set national ambient air quality standards, as noted in the table below. The federal one-hour standard will be phased out beginning in June 2005. The Federal Clean Air Act gives California authority to set its own ambient air quality standards in consideration of statewide concerns. California has the largest number of exceedances of the Federal 8-hour ozone standard in the United States, supporting California's need to address a significant statewide public health issue.

Current Ambient Air Quality Standards for Ozone

Averaging Time	California Standard	Federal Standard
1 Hour	0.09 ppm (180 μg/m^3)	0.12 ppm (235 μg/m^3)
8 Hour	—	0.08 ppm (157 μg/m^3)

2.3 History of Ozone/Oxidant Standards

The first state oxidant standard was set in December 1959 by the state Department of Public Health (DPH), which had the responsibility for setting air pollution standards before the creation of the ARB. This standard was set at 0.15 ppm, averaged for one hour. The standard was for oxidant, rather than ozone, because the monitoring method available at that time, the potassium iodide (KI) method, measured all ambient oxidant

gases, including ozone and other oxidants such as peroxyacetyl nitrate (PAN) nitrogen dioxide, photochemical aerosols, and other unknown oxidants.

In 1969, the newly-created ARB reviewed the oxidant standard set by DPH and revised the standard to a concentration of 0.10 ppm, averaged over one hour, not to be equaled or exceeded. The information considered by the Board in 1969 included adverse effects upon: (1) the health of humans and animals; (2) vegetation; (3) materials; and (4) visibility. Eye irritation was listed as the most relevant effect of oxidant.

In 1974, the Board introduced ultraviolet photometry as the monitoring method for the standard. However, since ultraviolet photometry measures only ozone, the Board changed the designation of the standard from "oxidant" to "oxidant (as ozone)." Because only ozone was to be measured, the Board changed the most relevant effect from: "eye irritation" (which is caused primarily by peroxyacyl nitrates or PANs) to "aggravation of respiratory disease" (which is caused primarily by ozone).

In 1988, the Board changed the designation of the standard from "oxidant (as ozone)" to "ozone", and revised the standard to a concentration of 0.09 ppm, averaged over one hour, to reflect that the listed relevant effects were related to ozone exposure, rather than to oxidants in general.

For comparison, in 2000, the World Health Organization established a guideline value for ozone in ambient air of 120 $\mu g/m^3$ (0.061 ppm) for a maximum period of 8 hours per day (WHO 2000).

2.4 Review of the California Ambient Air Quality Standards

The Children's Environmental Health Protection Act (Senate Bill 25, Escutia, Stats. 1999, ch. 731) required the ARB, in consultation with the OEHHA, to evaluate all health-based standards by December 31, 2000, to determine whether the standards were adequately protective of the health of the public, including infants and children (Health and Safety Code section 39606 (d)). At its December 7, 2000 meeting, the Board approved a report, "Adequacy of California Ambient Air Quality Standards: Children's Environmental Health Protection Act" (ARB, et al., 2000), prepared by ARB and OEHHA staffs. The Adequacy Report concluded that health effects may occur in infants and children and other potentially susceptible subgroups exposed to ozone at or near levels corresponding to the current standard. The report identified the standard for ozone as having the second highest priority for further detailed review and possible revision. The standard for PM10 (including sulfates) had the highest priority and was reviewed and revised in 2002, including establishment of a new standard for PM2.5.

2.5 Findings of the Standard Review

2.5.1 Chemistry and Physics

Most of the ozone in California's air results from reactions between substances emitted from sources including motor vehicles, power plants, industrial plants, consumer products, and vegetation. These reactions involve volatile organic compounds (VOCs, which the ARB also refers to as reactive organic gases or ROG) and oxides of nitrogen (NO_X) in the presence of sunlight. Ozone is a regional pollutant, as the reactions

forming it take place over time, and downwind from the precursor sources. As a photochemical pollutant, ozone is formed only during daylight hours under appropriate conditions, but is destroyed throughout the day and night. Thus, ozone concentrations vary depending upon both the time of day and the location. Ozone concentrations are higher on hot, sunny, calm days. In metropolitan and downwind areas of California, ozone concentrations frequently exceed regulatory standards during the summer.

2.5.2 Ozone Background

Even in pristine areas there is some ambient ozone that forms from natural emissions that are not controllable. This is termed "background" ozone. Overall, it appears that "background" ozone in California is dominated by natural tropospheric and stratospheric processes. The effects of occasional very large biomass fires and anthropogenic emissions are secondary factors. The foregoing discussion indicates that average "natural background" ozone near sea level is in the range of 0.015 to 0.035 ppm, with a maximum of about 0.04 ppm. Exogenous enhancements to "natural" levels generally are small (about 0.005 ppm), and are unlikely to alter peak concentrations.

At altitudes above 2 km stratospheric intrusions can push peak ambient concentrations to 0.045 to 0.050 ppm. The timing, spatial extent, and chemical characteristics of stratospheric air mass intrusions makes these events recognizable in air quality records, providing that the affected region has a fairly extensive monitoring network and that multiple air quality parameters (CO, VOC, PM, RH) are being measured as well.

Intermittent episodes of "natural" ozone from very large biomass fires in boreal forests (Alaska, Canada, Siberia) can produce short-lived pulses of ozone up to 0.020 ppm that may arrive during the North American ozone season. Present understanding suggests that these are infrequent events at latitudes below about 50N. There are no data documenting such an event in California. Long range transport of anthropogenic ozone may grow as Asian energy consumption increases the continent's NO_X emissions. Model studies indicate that the Asian ozone increment in North America could double over the next few decades. Assuming the temporal pattern of transport remains unchanged, such an impact could increase mean ozone concentrations by 0.002 to 0.006 ppm. The potential effect on peak transport events is unknown at this time.

2.5.3 Ozone Precursor Emissions

Ozone is an oxidant gas that forms photochemically in the atmosphere when nitrogen oxides (NO_X) and reactive organic gases (ROG) are present under appropriate atmospheric conditions (see Chapter 5). Carbon monoxide (CO) is also an ozone precursor. Both ROG and NO_X are emitted from mobile sources, point sources, and area-wide sources. ROG emissions from anthropogenic sources result primarily from incomplete fuel combustion, and from the evaporation of solvents and fuels, while NO_X and CO emissions result almost entirely from combustion processes.

2.5.4 Monitoring Method

Two measurement methods for ozone are approved for use in the U.S. by the USEPA: one is based on the chemiluminescence that occurs when ozone and ethylene react, and the other on the attenuation of ultraviolet (UV) radiation by ozone. The method based on UV spectrometry is almost universally used in practice. Specifications and

criteria for both methods exist in federal regulation. The UV photometry-based method is approved for use in California for state air quality standards. Both state and federal requirements are applied directly by the ARB and the air districts in the ozone monitoring network in California.

2.5.5 Exposure

During 2001 through 2003, neither the State nor federal 1-hour standard was exceeded in the Lake County Air Basin, North Coast Air Basin, or Northeast Plateau Air Basin. Data for four additional areas, Great Basin Valleys Air Basin, Lake Tahoe Air Basin, North Central Coast Air Basin, and the Upper Sacramento Valley show exceedances of the State standard, but not the federal 1-hour standard (as described earlier, representative data for the Northeast Plateau Air Basin and Great Basin Valleys Air Basin are available for 2002 and 2003 only). Both the State and federal 1-hour standards were exceeded during at least two of the three years in all other areas.

The highest 8-hour average values were found in the South Coast Air Basin and San Joaquin Valley Air Basin. Maximum 8-hour concentrations in the South Coast Air Basin ranged from 0.144 ppm to 0.153 ppm during 2001 through 2003, while maximum 8-hour concentrations in the San Joaquin Valley ranged from 0.120 ppm to 0.132 ppm during the same three-year period. Three other areas, the Mojave Desert Air Basin, the Sacramento Metro Area, and the Salton Sea Air Basin also had a maximum 8-hour concentration above 0.120 ppm during at least one of the three years.

With respect to the federal 8-hour ozone standard, Lake County Air Basin and North Coast Air Basin showed no exceedance days during 2001 through 2003. One area, the Lake Tahoe Air Basin, averaged only one exceedance day for the three-year period, while the North Central Coast Air Basin averaged three 8-hour exceedance days. In contrast, the San Joaquin Valley Air Basin showed the highest average number of exceedance days (123), followed by the South Coast Air Basin (99). The Sacramento Metro Area, Mojave Desert Air Basin, Mountain Counties Air Basin, and Salton Sea Air Basin each averaged between 42 and 68 exceedance days during 2001 through 2003. The remaining four areas averaged between 7 and 25 federal 8-hour exceedance days during the three-year period.

Californians' indoor and personal exposures to ozone are largely determined by the outdoor ozone concentrations in their community. Nonetheless, some Californians experience a substantial exposure to ozone indoors, due to the increasing use of certain types of appliances and equipment that emit ozone. Others, such as many children and those who are employed in outdoor occupations, may experience substantially greater exposures to ozone than the rest of the population, because they spend time outdoors during peak ozone periods.

2.5.6 Welfare Effects

A review of welfare effects, including effects of ozone on forest trees, agricultural crops, and materials is also discussed in this report (Chapter 8). Elevated concentrations of ozone can cause adverse effects on agricultural crops, forest trees and materials at current ambient levels, and the proposed health-based ozone standards should also provide protection to crops, forests and materials. In broad terms, impacts to crops are

generally more severe than for forest trees owing to their inherently more vigorous rates of growth. Discussed in the subsection on crops and the methods used to expose plants to ozone. This is followed by an examination of the physiological basis of ozone damage to plants, with special emphasis on carbon metabolism and the resulting impacts on crop growth and yield. Data collected since the 1950s on mixed conifer forests in the San Bernardino Mountains and the Sierra Nevada indicate that increasing numbers of ponderosa and Jeffrey pines exhibit ozone-specific needle damage due to the pollutant's cumulative effects. Also discussed are the impacts of ozone on materials, including building materials, rubber, paint, and fabrics. Although the proposed ozone standards are based on human health effects, progress toward attaining the proposed standards will provide welfare benefits.

2.5.7 Health Effects

Review of the controlled human exposure, animal toxicology and epidemiologic literature led to the following conclusions as to the health effects of ozone exposure:

1. The lowest ozone concentration at which reduced lung function and increased respiratory and ventilatory symptoms have been observed following 1-hour exposure is 0.12 ppm with moderate to heavy exercise.
2. The lowest ozone concentration at which increased airway hyperreactivity following 2-hour exposure has been reported is 0.18 ppm in exercising subjects.
3. The lowest ozone concentration at which airway inflammation following 2-hour exposure has been reported is 0.20 ppm ozone in exercising subjects
4. Reduced lung function, increased respiratory and ventilatory symptoms, increased airway hyperreactivity, and increased airway inflammation have been reported following 6.6- to 8-hour exposure to 0.08 ppm ozone.
5. Evidence from epidemiological studies of several health endpoints including premature death, hospitalization, respiratory symptoms, and restrictions in activity and lung function.
6. Evidence from epidemiological studies of emergency room visits for asthma suggests a possible threshold concentration between 0.075 and 0.11 ppm from analyses based on a 1-hour averaging time, and a possible threshold concentration between 0.070 and 0.10 ppm from analyses based on an 8-hour averaging time.
7. There is no evidence that children and infants respond to lower ozone concentrations than adults. Their risk is primarily related to their greater ventilation rate and greater exposure duration.
8. The dose-rate of ozone inhalation influences the magnitude of observed effects.

2.6 Summary of Recommendations

Following a detailed review of the scientific literature on the health and welfare effects of ozone, staff is proposing to revise the ambient air quality standard for ozone. The recommended ozone standards are based on scientific information about the health impacts associated with ozone exposure, recognizing the uncertainties in these data. The definition of California ambient air quality standards assumes a threshold below

which effects do not occur. However, the extremely wide range of individual responsiveness to ozone makes identification of a threshold on a population level somewhat problematic. In addition, the Children's Environmental Health Protection Act [Senate Bill 25, Escutia; Stats. 1999, Ch. 731, H&SC section 39606(d)(2)] requires a standard that "adequately protects the health of the public, including infants and children, with an adequate margin of safety." Recognizing the uncertainties in the database, staff makes the following recommendations.

1. Ozone will continue to be the pollutant addressed by the standard.

2. One-hour ambient air quality standard: staff recommends retaining the current 1-hour ozone standard at a concentration of **0.09 ppm**, not to be exceeded, based on several factors. First, at 0.12 ppm, in several studies 10 - 25% of the subjects experienced a decline of 10% of more in FEV1. In one study, these lung function changes were accompanied by increases in cough. At 0.24 ppm, increases were also observed in shortness of breath and pain on deep breath. These lung function and symptom outcomes have been demonstrated and replicated in several carefully controlled human exposure studies. The population at risk for these effects includes children and adults engaged in active outdoor exercise and workers engaged in physical labor outdoors. Thus, a margin of safety is necessary to account for variability in human responses. In addition, the chamber studies, by design, do not include potentially vulnerable populations (e.g., people with moderate to severe asthma, Chronic Obstructive Pulmonary Disease or COPD, and heart disease) who may be incorporated in the epidemiologic studies.

   Second, chamber studies indicate that bronchial responsiveness and pulmonary inflammation occur with 1-hour exposure to 0.18 to 0.20 ppm. Bronchial responsiveness can aggravate pre-existing chronic respiratory disease. The ultimate impact of the inflammatory response is unclear but repeated exposures to high ozone levels may result in restructuring of the airways, fibrosis, and possibly permanent respiratory injury. These latter outcomes are supported by animal toxicology studies, which also suggest the possibility of decreases in lung defense mechanisms.

   Third, epidemiological studies completed over the last 10 years indicate the potential for severe adverse health outcomes including premature death, hospitalizations, and emergency room visits. These studies include concentrations to which the public is currently being exposed. It is possible that some of these associations are due to relatively short-term exposures, for example less than two hours, since people at risk of experiencing these endpoints are unlikely to be engaged in multi-hour periods of moderate or heavy work or exercise outdoors. However, since there is high temporal correlation between 1-, 8-, and 24-hour average ozone concentrations, the averaging time of concern cannot be discerned from these studies.

   Viewing all of the evidence, staff recommends retention of the 1-hour standard of 0.09 ppm, not to be exceeded, as being protective of public health with an adequate margin of safety.

3. Eight-hour ambient air quality standard: We recommend establishing a new 8-hour average standard of **0.070 ppm**, not to be exceeded. Our recommendation for the 8-

hour standard is based primarily on the chamber studies that have been conducted over the last 15 years, supported by the important health outcomes reported in many of the epidemiologic studies. With exposure for 6.6 to 8-hours to an ozone concentration of 0.08 ppm, several studies have reported statistically significant group effects on lung function changes, ventilatory and respiratory symptoms, airway hyperresponsiveness, and airway inflammation in healthy, exercising individuals. A substantial fraction of subjects in these studies exhibited particularly marked responses in lung function and symptoms. Consequently, a concentration of 0.08 ppm ozone for an 8-hour averaging time can not be considered adequately protective of public health, and does not include any margin of safety, based on the definitions put forth in State law. The one published multi-hour study investigating a concentration below 0.08 ppm showed no statistically significant group mean decrement in lung function or symptoms at 0.04 ppm compared to a baseline of clear air. In addition, all individual subjects had changes in FEV1 of less than 10%. One unpublished multi-hour study at 0.06 ppm (Adams 1998) reported no statistically significant group mean changes, relative to clean air, in either lung function or symptoms including pain on deep inhalation and total symptom score. Therefore, staff has recommended an 8-hour concentration of 0.070 ppm. Many of the studies, and issues and concerns associated with the epidemiological studies listed above concerning the 1-hour standard are also relevant to the 8-hour standard. As discussed above, it may be that the health effects, often correlated with 1-hour exposures in the epidemiologic studies, are actually associated with 8-hour (or other) average exposures. Therefore, these epidemiologic findings were factored into the margin of safety for the 8-hour average.

It should be noted that the recommended 8-hour average concentration has three rather than two decimal places. Staff initially considered selection of 0.07 ppm. However, rounding conventions applied to air quality data (see Section 7.1.4) are such that any measured value up to and including 0.074 ppm would round down to 0.07 ppm. The available data suggested that selection of 0.07 ppm would not include an adequate margin of safety, as required by State law. The one available study at 0.06 ppm did not find a group mean effect. Staff is recommending that the 8 hour average standard have three decimal places, 0.070 ppm, to ensure an adequate margin of safety. Section 6.3 discusses issues related to precision and accuracy of the monitored data.

4. Monitoring method for ozone: Staff recommends retention of the current monitoring method for ozone which uses the ultraviolet (UV) absorption method for determining compliance with the state Ambient Air Quality Standard for ozone. Incorporate by reference all federally approved UV methods for ozone as California Approved Samplers for ozone. This will not change current air monitoring practices, but will align state monitoring requirements with federal requirements.

2.6.1 Consideration of Infants and Children

The Children's Environmental Health Protection Act [Health and Safety Code section 39606 (b)] requires that air pollution effects on children and infants be specifically considered in selection of ambient air quality standards. Children have a higher ventilation rate relative to body weight at rest and during activity than adults. Children

also tend to spend more time outside and be more active than adults. Consequently, virtue of their higher ventilation rates and outdoor behavior patterns, they are likely to inhale larger total doses of ozone than the general population. However, the chamber studies of exercising children suggest that they have responses generally similar to adults, pointing to a similar degree of responsiveness. Epidemiologic studies that have examined both children and adults do not show clear evidence for greater sensitivity in children. Studies in animals at high exposure concentrations (0.5 ppm and higher, 8 hrs/day for several consecutive days) indicate that developing lungs of infant animals are adversely affected by ozone. The recommended standards are well below that level of exposure. Two studies have shown evidence of lower lung function in young adults raised in high ozone areas (Kunzli et al. 1997; Galizia and Kinney 1999). The study by Kunzli et al. (1997) suggested that exposure to ozone prior to age 6 was associated with lower attained lung function. Examination of data for the Los Angeles basin from the early 1980s, show summer averages of the 1-hour maximum to be above 0.10 ppm. This is considerably above present levels and above the recommended 1-hour standard. There is also evidence that children who play three or more sports are at higher risk of developing asthma if they also live in high ozone communities in Southern California. This study needs to be repeated before the effect can be attributed to ozone exposure with greater certainty, but the finding is of concern. The warm season daily 8-hour maximum concentrations of ozone measured in these high ozone areas, over the four years of study, was 0.084 ppm. The proposed 8-hour standard of 0.070 ppm, therefore, should protect most children from asthma induction that may be associated with ozone exposure. Collectively, this body of evidence suggests that although children appear to be similarly responsive to a given dose of ozone as adults, they are at greater risk than adults of experiencing adverse responses to ozone by virtue of their higher level of outdoor activity, and consequently greater total exposure.

2.7 Estimated Health Benefits

It is estimated that attainment of the proposed ozone standards throughout California would avoid a significant number of adverse health effects each year, specifically:

- 580 (290 – 870, probable range) premature deaths for all ages.
- 3,800 (2,200 – 5,400, 95% confidence interval (CI)) hospitalizations due to respiratory diseases for all ages.
- 600 (360 – 850, 95% CI) emergency room visits for asthma for children under 18 years of age.
- 3.3 million (430,000 – 6,100,000, 95% CI) school absences for children 5 to 17 years of age.
- 2.8 million (1.2 million – 4.6 million, 95% CI) minor restricted activity days for adults above 18 years of age.

As discussed in Appendix B, there are a several important assumptions and uncertainties in this analysis. Some concern the study design, statistical methods, and choice of epidemiological studies used to develop the concentration-response (CR) functions used in the analysis. Few studies have investigated the shape of the CR function, or whether there is a population response threshold for health endpoints other

than emergency room visits for asthma. Further uncertainty is added by assumptions in the statewide exposure assessment. It should also be noted that since several health effects related to acute exposure, and effects of chronic ozone exposure, are not included in the estimates noted above, the health benefits associated with lowering ozone exposure are likely underestimated.

2.8 Public Outreach and Review

A draft Staff Report containing staff's preliminary findings was released to the public on June 21, 2004 titled, "Review of California Ambient Air Quality Standard for Ozone". Public outreach for the standard review involved dissemination of information through various outlets to include the public in the regulatory process. In an ongoing effort to include the public in the review of the ozone standard, the ARB and OEHHA integrated outreach into public meetings, workshop presentations, electronic "list serve" notification systems, and various web pages. Notification of release of the Staff Report, the schedule for public meetings and workshops, and invitations to submit comments on the Staff Report were made through the "list serve" notification system. Public workshops on the proposed ozone standard were held on July 14 – 16, 2004 in Sacramento, El Monte, and Fresno. An additional public workshop was held on August 24, 2004 in Sacramento.

Individuals or parties interested in signing up for an electronic e-mail "list serve" notification on the PM standards, as well as any air quality-related issue, may self-enroll at the following location: www.arb.ca.gov/listserv/aaqs/aaqs.htm. Additional information on the standards review process is also available at the ozone standards review schedule website at: www.arb.ca.gov/research/aaqs/ozone-rs/ozone-rs.htm.

2.9 Air Quality Advisory Committee Review

The Air Quality Advisory Committee, an external scientific peer review committee that was appointed by the President of the University of California, met January 11 and 12, 2005, in Berkeley, California to review the initial Staff Report and public comments, and to ensure that the scientific basis of the recommendations for the ozone standard are based upon sound scientific knowledge, methods, and practices. The AQAC held a public meeting, which provided time for oral public comments, and discussed their review of the draft Staff Report and the draft recommendations, and provided comments for improving the draft Staff Report. Final findings were received on February 24, 2005.

The AQAC determined that the staff recommendations were well founded on the scientific literature, and voted to endorse them. The Committee made suggestions for minor changes to the draft Staff Report to increase clarity, requested more detailed discussion of several topics, and inclusion of several additional scientific papers. The AQAC findings is included in this Initial Statement of Reasons as Appendix C, in Volume IV.

2.10 Environmental and Economic Impacts

The proposed ambient air quality standards are scientific in nature, and will in and of themselves have no environmental or economic impacts. Standards simply define clean air. Once adopted, local air pollution control or air quality management districts are

responsible for the adoption of rules and regulations to control emissions from stationary sources to assure their achievement and maintenance. The Board is responsible for adoption of emission standards for mobile sources. A number of different implementation measures are possible, and each could have its own environmental and/or economic impact. These impacts must be evaluated when the control measure is proposed. Any environmental or economic impacts associated with the imposition of future measures will be considered if and when specific measures are proposed.

2.11 Environmental Justice

State law defines environmental justice as the fair treatment of people of all races, cultures, and incomes with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies (Senate Bill 115, Solis; Stats 1999, Ch. 690; Government Code §65040.12(c)). The Board established a framework for incorporating environmental justice into the ARB's programs consistent with the directives of State law (ARB, 2001). The policies developed apply to all communities in California, but recognize that environmental justice issues have been raised more in the context of low-income and minority communities, which sometimes experience higher exposures to some pollutants as a result of the cumulative impacts of air pollution from multiple mobile, commercial, industrial, areawide, and other sources.

Because ambient air quality standards simply define clean air, all of California's communities will benefit from the proposed health-based standards, as progress is made to attain the standards. Over the past twenty years, the ARB, local air districts, and federal air pollution control programs have made substantial progress towards improving the air quality in California. However, some communities continue to experience higher exposures than others as a result of the cumulative impacts of air pollution from multiple mobile and stationary sources and thus may suffer a disproportionate level of adverse health effects. Since the same ambient air quality standards apply to all regions of the State, these communities will benefit by a wider margin and receive a greater degree of health improvement from the revised standards than less affected communities, as progress is made to attain the standards. Moreover, just as all communities would benefit from new, stricter standards, alternatives to the proposed recommendations, such as not proposing an eight-hour ozone standard, would adversely affect many communities.

While it is possible that residents in environmental justice communities may be particularly sensitive to ozone, only one study investigated whether socioeconomic status (SES) alters responses to ozone exposure, and those results were difficult to explain. Hence, the study did not allow inferences as to whether socioeconomic status impacts on sensitivity to ozone. Moreover, other controlled studies investigating whether gender, ethnicity or environmental factors contribute to the responses to ozone exposure could not convincingly demonstrate a link with responsiveness. Therefore, the database is insufficient to conclude whether differences in ozone susceptibility exist in environmental justice communities. These studies are discussed in more detail in Section 9.6.8.

Once ambient air quality standards are adopted, the ARB and the local air districts will

propose emission standards and other control measures designed to result in a reduction of ambient ozone levels. The environmental justice aspects of each proposed control measure will be evaluated in a public forum at this time.

As additional relevant scientific evidence becomes available, the ozone standards will be reviewed again to make certain that the health of the public is protected with an adequate margin of safety.

2.12 References

Adams WC. 1998. Dose-response effects of varied equivalent minute ventilation rates on pulmonary function responses during exposure to ozone. Final Report to the American Petroleum Institute. Washington D.C.

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Kunzli N, Lurmann F, Segal M, Ngo L, Balmes J, Tager IB. 1997. Association between lifetime ambient ozone exposure and pulmonary function in college freshmen – results of a pilot study. Environ Res 72:8-23.

McConnell R, Berhane K, Gilliland F, London SJ, Islam T, Gauderman WJ, Avol E, Margolis HG, Peters JM. 2002. Asthma in exercising children exposed to ozone: a cohort study. Lancet 359:386-391.

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Appendix A

PROPOSED AMENDMENTS TO CALIFORNIA CODE OF REGULATIONS

AND

AIR MONITORING QUALITY ASSURANCE MANUAL VOLUME IV, PARTS A, B, & C (DOCUMENT INCORPORATED BY REFERENCE)

[PROPOSED] REGULATION ORDER

Section 70100. Definitions

~~(g) Oxidant. Oxidant is a substance that oxidizes a selected reagent that is not oxidizable by oxygen under ambient conditions. For the purposes of this section, oxidant includes ozone, organic peroxides, and peroxyacyl nitrates but not nitrogen dioxide. Atmospheric oxidant concentrations are to be measured with ozone as a surrogate by ultraviolet photometry, or by an equivalent method.~~

(g~~h~~) Carbon Monoxide ...

(h~~i~~) Sulfur Dioxide ...

(i~~j~~) Suspended Particulate Matter (PM10). Suspended particulate matter (PM10) refers to atmospheric particles, solid and liquid, except uncombined water as measured by a (PM10) sampler which collects 50 percent of all particles of 10 mm aerodynamic diameter and which collects a declining fraction of particles as their diameter increases and an increasing fraction of particles as their diameter decreases, reflecting the characteristics of lung deposition. ~~Suspended particulate matter (PM10) is to be measured by a California Approved Sampler (CAS) for PM10, for purposes of monitoring for compliance with the Suspended Particulate Matter (PM10) standards. Approved samplers, methods, and instruments are listed in Section 70100.1(a) below. A CAS for PM10 includes samplers, methods, or instruments determined by the Air Resources Board or the Executive Officer to produce equivalent results for PM10 with the Federal Reference Method (40 CFR, part 50, Appendix M, as published in 62 Fed. Reg. 38763, July 18, 1997).~~

(j~~k~~) Fine Suspended Particulate Matter (PM2.5). Fine suspended particulate matter (PM2.5) refers to suspended atmospheric particles solid and liquid, except uncombined water as measured by a PM2.5 sampler which collects 50 percent of all particles of 2.5 mm aerodynamic diameter and which collects a declining fraction of particles as their diameter increases and an increasing fraction of particles as their diameter decreases, reflecting the characteristics of lung deposition. ~~Fine suspended particulate matter (PM2.5) is to be measured by a California Approved Sampler (CAS) for PM2.5 for purposes of monitoring for compliance with the Fine Particulate Matter (PM2.5) standards. Approved samplers, methods, and instruments are listed in Section 70100.1(b) below. A CAS for PM2.5 includes samplers, method, and instruments determined by the Air Resources Board or the Executive Officer to produce equivalent results for PM2.5 with the Federal Reference Method (40 CFR, part 50, Appendix L, as published in 62 Fed. Reg. 38763, July 18, 1997).~~

(k~~l~~) Visibility Reducing Particles ...

(l~~m~~) Hydrogen Sulfide ...

(m~~n~~) Nitrogen Dioxide ...

(n~~o~~) Lead (particulate) ...

(o~~p~~) Sulfates ...

(p~~q~~) Vinyl Chloride ...

(q~~r~~) Ozone ...

(r~~s~~) Extinction Coefficient ...

Section 70100.1. Methods, Samplers, and Instruments for Measuring Pollutants.

a) PM10 Methods. The method for determining compliance with the PM10 ambient air quality standard shall be the Federal Reference Method for the Determination of Particulate Matter as PM10 in the Atmosphere (40 CFR, Chapter 1, part 50, Appendix M, as published in 62 Fed. Reg., 38753, July 18, 1997). California Approved Samplers for PM10 are set forth in "Air Monitoring Quality Assurance Manual Volume IV, Part A: Monitoring Methods for PM10", adopted [insert date], which is incorporated by reference herein. Samplers, methods, or instruments determined in writing by the Air Resources Board or the Executive Officer to produce equivalent results for PM10 shall also be California Approved Samplers for PM10. These include those continuous samplers that have been demonstrated to the satisfaction of the Air Resources Board to produce measurements equivalent to the Federal Reference Method. ~~The following samplers, methods, and instruments are California Approved Samplers for PM10 for the purposes of monitoring for compliance with the Suspended Particulate Matter (PM10) standards:~~

~~(1) The specific samplers approved are:~~

~~(A) Andersen Model RAAS10-100 PM10 Single Channel PM10 Sampler, U.S. EPA Manual Reference Method RFPS-0699-130, as published in 64 Fed. Reg., 33481, June 23, 1999.~~

~~(B) Andersen Model RAAS10-200 PM10 Single Channel PM10 Audit Sampler, U.S. EPA Manual Reference Method RFPS-0699-131, as published in 64 Fed. Reg., 33481, June 23, 1999.~~

~~(C) Andersen Model RAAS10-300 PM10 Multi Channel PM10 Sampler, U.S. EPA Manual Reference Method RFPS-0669-132, as published in 64 Fed. Reg., 33481, June 23, 1999.~~

~~(D) Sierra (currently known as Graseby) Andersen/GMW Model 1200 High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-1287-063, as published in 52 Fed. Reg., 45684, December 1, 1987 and in 53 Fed. Reg., 1062, January 15, 1988.~~

~~(E) Sierra (currently known as Graseby) Andersen/GMW Model 321B High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-1287-064, as published in 52 Fed. Reg., 45684, December 1, 1987 and in 53 Fed. Reg., 1062, January 15, 1988.~~

~~(F) Sierra (currently known as Graseby) Andersen/GMW Model 321-C High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-1287-065, as published in 52 Fed. Reg., 45684, December 1, 1987.~~

~~(G) BGI Incorporated Model PQ100 Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-124, as published in 63 Fed. Reg., 69624, December 17, 1998.~~

~~(H) BGI Incorporated Model PQ200 Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-125, as published in 63 Fed. Reg., 69624, December 17, 1998.~~

~~(I) Rupprecht & Patashnick Partisol Model 2000 Air Sampler, U.S. EPA Manual Reference Method RFPS-0694-098, as published in 59 Fed. Reg., 35338, July 11, 1994.~~

~~(J) Rupprecht & Patashnick Partisol-FRM Model 2000 PM10 Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-126, as published in 63 Fed. Reg., 69625, December 17, 1998.~~

~~(K) Rupprecht & Patashnick Partisol Plus Model 2025 PM10 Sequential Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-127, as published in 63 Fed. Reg., 69625, December 17, 1998.~~

~~(L) Tisch Environmental Model TE-6070 PM10 High Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-0202-141, as published in 67 Fed. Reg., 15566, April 2, 2002.~~

~~(2) Continuous samplers:~~

~~(A) Andersen Beta Attenuation Monitor Model FH 62 C14 equipped with the following components: louvered PM10 inlet, volumetric flow controller, automatic filter change mechanism, automatic zero check, and calibration control foils kit*.~~

~~(B) Met One Beta Attenuation Monitor Model 1020 equipped with the following components: louvered PM10 size selective inlet, volumetric flow controller, automatic filter change mechanism, automatic heating system, automatic zero and span check capability*.~~

~~(C) Rupprecht & Patashnick Series 8500 Filter Dynamics Measurement System equipped with the following components: louvered PM10 size selective inlet, volumetric flow control, flow splitter (3 liter/min sample flow), sample equilibration system (SES) dryer, TEOM sensor unit, TEOM control unit, switching valve, purge filter conditioning unit, and palliflex TX40, 13 mm effective diameter cartridge*.~~

b) PM2.5 Methods. The method for determining compliance with the PM2.5 ambient air quality standard shall be the Federal Reference Method for the Determination of Particulate Matter as PM2.5 in the Atmosphere, 40 CFR, Chapter 1, part 50, Appendix L, as published in 62 Fed. Reg., 38714, July 18, 1997 and as amended in 64 Fed. Reg., 19717, April 22, 1999. The samplers listed in the Federal Reference Method must use either the WINS impactor or the U.S. EPA-approved very sharp cut cyclone (67 Fed. Reg., 15566, April 2, 2002) to separate PM2.5 from PM10. California Approved Samplers for PM2.5 are set forth in "Air Monitoring Quality Assurance Manual Volume IV, Part B: Monitoring

Methods for PM2.5", adopted [insert date], which is incorporated by reference herein. Samplers, methods, or instruments determined in writing by the Air Resources Board or the Executive Officer to produce equivalent results for PM2.5 shall also be California Approved Samplers for PM2.5. These include those continuous samplers that have been demonstrated to the satisfaction of the Air Resources Board to produce measurements equivalent to the Federal Reference Method. ~~The following samplers, methods, and instruments are California Approved Samplers for PM2.5 for the purposes of monitoring for compliance with the Fine Particulate Matter (PM2.5) standards:~~

~~(1) The specific samplers approved are:~~

~~(A) Andersen Model RAAS 2.5-200 PM2.5 Ambient Audit Air Sampler, U.S. EPA Manual Reference Method RFPS-0299-128, as published in 64 Fed. Reg., 12167, March 11, 1999.~~

~~(B) Graseby Andersen Model RAAS 2.5-100 PM2.5 Ambient Air Sampler, U.S. EPA Manual Reference Method RFPS-0598-119, as published in 63 Fed. Reg., 31991, June 11, 1998.~~

~~(C) Graseby Andersen Model RAAS 2.5-300 PM2.5 Sequential Ambient Air Sampler, U.S. EPA Manual Reference Method RFPS-0598-120, as published in 63 Fed. Reg., 31991, June 11, 1998.~~

~~(D) BGI Inc. Models PQ200 and PQ200A PM2.5 Ambient Fine Particle Sampler, U.S. EPA Manual Reference Method RFPS-0498-116, as published in 63 Fed. Reg., 18911, April 16, 1998.~~

~~(E) Rupprecht & Patashnick Partisol FRM Model 2000 Air Sampler, U.S. EPA Manual Reference Method RFPS-0498-117, as published in 63 Fed. Reg., 18911, April 16, 1998.~~

~~(F) Rupprecht & Patashnick Partisol Model 2000 PM-2.5 Audit Sampler, as described in U.S. EPA Manual Reference Method RFPS-0499-129, as published in 64 Fed. Reg., 19153, April 19, 1999.~~

~~(G) Rupprecht & Patashnick Partisol Plus Model 2025 PM-2.5 Sequential Air Sampler, U.S. EPA Manual Reference Method RFPS-0498-118, as published in 63 Fed. Reg., 18911, April 16, 1998.~~

~~(H) Thermo Environmental Instruments, Incorporated Model 605 "CAPS" Sampler, U.S. EPA Manual Reference Method RFPS-1098-123, as published in 63 Fed. Reg., 58036, October 29, 1998.~~

~~(I) URG-MASS100 Single PM2.5 FRM Sampler, U.S. EPA Manual Reference Method RFPS-0400-135, as published in 65 Fed. Reg., 26603, May 8, 2000.~~

~~(J) URG-MASS300 Sequential PM2.5 FRM Sampler, U.S. EPA Manual Reference Method RFPS-0400-136, as published in 65 Fed. Reg., 26603, May 8, 2000.~~

~~(K) BGI Inc. Model PQ200-VSCC PM2.5 Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-142, as published in 67 Fed. Reg., 15567, April 2, 2002.~~

~~(L) BGI Inc. Model PQ200A-VSCC PM2.5 Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-142, as published in 67 Fed. Reg., 15567, April 2, 2002.~~

~~(M) Rupprecht & Patashnick Partisol-FRM Model 2000 PM2.5 FEM Air Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-143, as published in 67 Fed. Reg., 15567, April 2, 2002.~~

~~(N) Rupprecht & Patashnick Partisol Model 2000 PM2.5 FEM Audit Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-144, as published in 67 Fed. Reg., 15567, April 2, 2002.~~

~~(O) Rupprecht & Patashnick Partisol-Plus Model 2025 PM-2.5 FEM Sequential Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-145, as published in 67 Fed. Reg., 15567, April 2, 2002.~~

~~(2) Continuous samplers:~~

~~(A) Andersen Beta Attenuation Monitor Model FH 62 C14 equipped with the following components: louvered PM10 size selective inlet, very sharp cut or~~

~~sharp cut cyclone, volumetric flow controller, automatic filter change mechanism, automatic zero check, and calibration control foils kit*.~~

~~(B) Met One Beta Attenuation Monitor Model 1020 equipped with the following components: louvered PM10 size selective inlet, very sharp cut or sharp cut cyclone, volumetric flow controller, automatic filter change mechanism, automatic heating system, and automatic zero and span check capability*.~~

~~(C) Rupprecht & Patashnick Series 8500 Filter Dynamics Measurement System equipped with the following components: louvered PM10 size selective inlet, very sharp cut or sharp cut cyclone, volumetric flow control, flow splitter (3 liter/min sample flow), sample equilibration system (SES) dryer, TEOM sensor unit, TEOM control unit, switching valve, purge filter conditioning unit, and palliflex TX40, 13 mm effective diameter cartridge*.~~

~~*Instrument shall be operated in accordance with the vendor's instrument operation manual that adheres to the principles and practices of quality control and quality assurance as specified in Volume I of the "Air Monitoring Quality Assurance Manual", as printed on April 17, 2002, and available from the California Air Resources Board, Monitoring and Laboratory Division, P.O. Box 2815, Sacramento CA 95814, incorporated by reference herein.~~

(c) Ozone Methods. The method for determining compliance with the ozone ambient air quality standard shall be the Federal Equivalent Method for the Determination of Ozone in the Atmosphere (40 CFR, part 53). California Approved Samplers for ozone are set forth in "Air Monitoring Quality Assurance Manual Volume IV, Part C: Monitoring Methods for Ozone", as adopted [insert date]. Samplers, methods, or instruments determined in writing by the Air Resources Board or the Executive Officer to produce equivalent results for ozone shall also be California Approved Samplers for ozone.

NOTE

Authority cited: Sections 39600, 39601 and 39606, Health and Safety Code. Reference: Sections 39014, 39606, 39701 and 39703(f), Health and Safety Code.

Section 70200. Table of Standards ***

Substance	Concentration and Methods*	Duration of Averaging Periods	Most Relevant Effects	Comments
Ozone	0.09 ppm** 0.070 ppm** ultraviolet photometry using California Approved Sampler as set forth in section 70100.1 (c)	1 hour 8 hour	a. Short-term exposures: (1) ~~Pulmonary function decrements and localized lung edema in humans and animals.~~ One-hour and multi-hour exposures: lung function decrements, and symptoms of respiratory irritation such as cough, wheeze, and pain upon deep inhalation. (2) Multi-hour exposures: airway hyperreactivity and airway inflammation. ~~(2) Risk to public health implied by alterations in pulmonary morphology and host defence in animals.~~ (3) excess deaths, hospitalization, emergency room visits, asthma exacerbation, respiratory symptoms and restrictions in activity b. Long-term exposures: ~~Risk to public health implied by altered pulmonary morphology in animals after long-term exposures and pulmonary function decrements in chronically exposed humans.~~ Ozone can induce tissue changes in the respiratory tract, and is associated with decreased lung function and emergency room visits for asthma. c. Welfare effects: (1) Yield loss in important crops and predicted economic loss to growers and consumers. (2) Injury and damage to forests ~~native plants and potential changes in species diversity and number.~~ ~~(3) Damage to rubber and elastomers and to paints, fabric, dyes, pigments, and plastics.~~	a. The standard is intended to prevent adverse human health effects. b. The standard, when achieved, will not prevent all injury to crops and other types of vegetation, but is intended to place an acceptable upper limit on the amount of yield and economic loss, as well as on adverse environmental impacts.

Suspended Particulate Matter (PM10)	50 μg/m^3 PM10** 20 μg/m^3 PM10** using California Approved Sampler as set forth in section 70100.1(a)	24 hour sample 24 hour samples, annual arithmetic mean	Prevention of excess deaths, illness and restrictions in activity from short-and long-term exposures. Illness outcomes include, but are not limited to, respiratory symptoms, bronchitis, asthma exacerbation, emergency room visits and hospital admissions for cardiac and respiratory diseases. Sensitive subpopulations include children, the elderly, and individuals with pre-existing cardiopulmonary disease.	This standard applies to suspended mater as measured by PM10 sampler, which collects 50% of all particles of 10 μm aerodynamic diameter and collects a declining fraction of particles as their diameter increases, reflecting the characteristics of lung deposition.

* The list of California Approved Samplers may be obtained from the Air Resources Board, Monitoring and Laboratory Division, P.O. Box 2815, Sacramento, CA 95814. Any equivalent procedure which can be shown to the satisfaction of the Air Resources Board to give equivalent results at or near the level of the air quality standard may be used.

** These standards are violated when concentrations exceed those set forth in the body of the regulation. All other standards are violated when concentrations equal or exceed those set forth in the body of the regulation.

*** Applicable statewide unless otherwise noted.

****These standards are violated when particle concentrations cause measured light extinction values to exceed those set forth in the regulations.

NOTE

Authority cited: Sections 39600, 39601(a) and 39606, Health and Safety Code. Reference: Sections 39014, 39606, 39701 and 39703(f), Health and Safety Code; and Western Oil and Gas Ass'n v. Air Resources Bd. (1984) 37 Cal.3d 502.

HISTORY

1. Amendment filed 9-18-89; operative 10-18-89 (Register 89, No. 39). For prior history, see Register 88, No. 27.
2. Amendment filed 6-29-92; operative 7-29-92 (Register 92, No. 27).
3. Amendment filed 6-5-2003; operative 7-5-2003 (Register 2003, No. 23).

(1) The method for determining compliance with the State PM10 ambient air quality standard shall be the Federal Reference Method (FRM) for the Determination of Particulate Matter as PM10 in the Atmosphere (40 CFR, Chapter 1, part 50, Appendix M, as published in 62 Fed. Reg., 38753, July 18, 1997). When employed according to the FRM, the following are California Approved Samplers:

(A) Andersen Model RAAS10-100 PM10 Single Channel PM10 Sampler, U.S. EPA Manual Reference Method RFPS-0699-130, as published in 64 Fed. Reg., 33481, June 23, 1999.

(B) Andersen Model RAAS10-200 PM10 Single Channel PM10 Audit Sampler, U.S. EPA Manual Reference Method RFPS-0699-131, as published in 64 Fed. Reg., 33481, June 23, 1999.

(C) Andersen Model RAAS10-300 PM10 Multi Channel PM10 Sampler, U.S. EPA Manual Reference Method RFPS-0669-132, as published in 64 Fed. Reg., 33481, June 23, 1999.

(D) Sierra (currently known as Graseby) Andersen/GMW Model 1200 High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-1287-063, as published in 52 Fed. Reg., 45684, December 1, 1987 and in 53 Fed. Reg., 1062, January 15, 1988.

(E) Sierra (currently known as Graseby) Andersen/GMW Model 321B High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-1287-064, as published in 52 Fed. Reg., 45684, December 1, 1987 and in 53 Fed. Reg., 1062, January 15, 1988.

(F) Sierra (currently known as Graseby) Andersen/GMW Model 321-C High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-1287-065, as published in 52 Fed. Reg., 45684, December 1, 1987.

(G) BGI Incorporated Model PQ100 Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-124, as published in 63 Fed. Reg., 69624, December 17, 1998.

(H) BGI Incorporated Model PQ200 Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-125, as published in 63 Fed. Reg., 69624, December 17, 1998.

(I) Rupprecht & Patashnick Partisol Model 2000 Air Sampler, U.S. EPA Manual Reference Method RFPS-0694-098, as published in 59 Fed. Reg., 35338, July 11, 1994.

(J) Rupprecht & Patashnick Partisol-FRM Model 2000 PM10 Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-126, as published in 63 Fed. Reg., 69625, December 17, 1998.

(K) Rupprecht & Patashnick Partisol-Plus Model 2025 PM10 Sequential Air Sampler, U.S. EPA Manual Reference Method RFPS-1298-127, as published in 63 Fed. Reg., 69625, December 17, 1998.

(L) Tisch Environmental Model TE-6070 PM10 High-Volume Air Sampler, U.S. EPA Manual Reference Method RFPS-0202-141, as published in 67 Fed. Reg., 15566, April 2, 2002.

(2) The following continuous Californian Approved Samplers have been demonstrated to the satisfaction of the Air Resources Board to produce measurements equivalent to the FRM:

(A) Andersen Beta Attenuation Monitor Model FH 62 C14 equipped with the following components: louvered PM10 inlet, volumetric flow controller, automatic filter change mechanism, automatic zero check, and calibration control foils kit*.

(B) Met One Beta Attenuation Monitor Model 1020 equipped with the following components: louvered PM10 size selective inlet, volumetric flow controller, automatic filter change mechanism, automatic heating system, automatic zero and span check capability*.

(C) Rupprecht & Patashnick Series 8500 Filter Dynamics Measurement System equipped with the following components: louvered PM10 size selective inlet, volumetric flow control, flow splitter (3 liter/min sample flow), sample equilibration system (SES) dryer, TEOM sensor unit, TEOM control unit, switching valve, purge filter conditioning unit, and palliflex TX40, 13 mm effective diameter cartridge*.

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*Instrument shall be operated in accordance with the vendor's instrument operation manual that adheres to the principles and practices of quality control and quality assurance as specified in Volume I of the "Air Monitoring Quality Assurance Manual", as printed on April 17, 2002, and available from the California Air Resources Board, Monitoring and Laboratory Division, P.O. Box 2815, Sacramento CA 95814, incorporated by reference herein.

(1) The method for determining compliance with the State PM2.5 ambient air quality standard shall be the Federal Reference Method (FRM) for the Determination of Particulate Matter as PM2.5 in the Atmosphere, 40 CFR, part 50, Appendix L, as published in 62 Fed. Reg., 38714, July 18, 1997 and as amended in 64 Fed. Reg., 19717, April 22, 1999. These must use either the WINS impactor or the U.S. EPA-approved very sharp cut cyclone (67 Fed. Reg., 15566, April 2, 2002) to separate PM2.5 from PM10. When employed according to the FRM, the following are California Approved Samplers:

(A) Andersen Model RAAS 2.5-200 PM2.5 Ambient Audit Air Sampler, U.S. EPA Manual Reference Method RFPS-0299-128, as published in 64 Fed. Reg., 12167, March 11, 1999.

(B) Graseby Andersen Model RAAS 2.5-100 PM2.5 Ambient Air Sampler, U.S. EPA Manual Reference Method RFPS-0598-119, as published in 63 Fed. Reg., 31991, June 11, 1998.

(C) Graseby Andersen Model RAAS 2.5-300 PM2.5 Sequential Ambient Air Sampler, U.S. EPA Manual Reference Method RFPS-0598-120, as published in 63 Fed. Reg., 31991, June 11, 1998.

(D) BGI Inc. Models PQ200 and PQ200A PM2.5 Ambient Fine Particle Sampler, U.S. EPA Manual Reference Method RFPS-0498-116, as published in 63 Fed. Reg., 18911, April 16, 1998.

(E) Rupprecht & Patashnick Partisol-FRM Model 2000 Air Sampler, U.S. EPA Manual Reference Method RFPS-0498-117, as published in 63 Fed. Reg., 18911, April 16, 1998.

(F) Rupprecht & Patashnick Partisol Model 2000 PM-2.5 Audit Sampler, as described in U.S. EPA Manual Reference Method RFPS-0499-129, as published in 64 Fed. Reg., 19153, April 19, 1999.

(G) Rupprecht & Patashnick Partisol-Plus Model 2025 PM-2.5 Sequential Air Sampler, U.S. EPA Manual Reference Method RFPS-0498-118, as published in 63 Fed. Reg., 18911, April 16, 1998.

(H) Thermo Environmental Instruments, Incorporated Model 605 "CAPS" Sampler, U.S. EPA Manual Reference Method RFPS-1098-123, as published in 63 Fed. Reg., 58036, October 29, 1998.

(I) URG-MASS100 Single PM2.5 FRM Sampler, U.S. EPA Manual Reference Method RFPS-0400-135, as published in 65 Fed. Reg., 26603, May 8, 2000.

(J) URG-MASS300 Sequential PM2.5 FRM Sampler, U.S. EPA Manual Reference Method RFPS-0400-136, as published in 65 Fed. Reg., 26603, May 8, 2000.

(K) BGI Inc. Model PQ200-VSCC PM2.5 Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-142, as published in 67 Fed. Reg., 15567, April 2, 2002.

(L) BGI Inc. Model PQ200A-VSCC PM2.5 Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-142, as published in 67 Fed. Reg., 15567, April 2, 2002.

(M) Rupprecht & Patashnick Partisol-FRM Model 2000 PM2.5 FEM Air Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-143, as published in 67 Fed. Reg., 15567, April 2, 2002.

(N) Rupprecht & Patashnick Partisol Model 2000 PM2.5 FEM Audit Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-144, as published in 67 Fed. Reg., 15567, April 2, 2002.

(O) Rupprecht & Patashnick Partisol-Plus Model 2025 PM-2.5 FEM Sequential Sampler, U.S. EPA Manual Equivalent Method EQPM-0202-145, as published in 67 Fed. Reg., 15567, April 2, 2002.

(2) The following continuous samplers have been demonstrated to the satisfaction of the Air Resources Board to produce measurements equivalent to the FRM:

(A) Andersen Beta Attenuation Monitor Model FH 62 C14 equipped with the following components: louvered PM10 size selective inlet, very sharp cut or sharp cut cyclone, volumetric flow controller, automatic filter change mechanism, automatic zero check, and calibration control foils kit*.

(B) Met One Beta Attenuation Monitor Model 1020 equipped with the following components: louvered PM10 size selective inlet, very sharp cut or sharp cut cyclone, volumetric flow controller, automatic filter change mechanism, automatic heating system, and automatic zero and span check capability*.

(C) Rupprecht & Patashnick Series 8500 Filter Dynamics Measurement System equipped with the following components: louvered PM10 size selective inlet, very sharp cut or sharp cut cyclone, volumetric flow control, flow splitter (3 liter/min sample flow), sample equilibration system (SES) dryer, TEOM sensor unit, TEOM control unit, switching valve, purge filter conditioning unit, and palliflex TX40, 13 mm effective diameter cartridge*.

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*Instrument shall be operated in accordance with the vendor's instrument operation manual that adheres to the principles and practices of quality control and quality assurance as specified in Volume I of the "Air Monitoring Quality Assurance Manual", as printed on April 17, 2002, and available from the California Air Resources Board, Monitoring and Laboratory Division, P.O. Box 2815, Sacramento CA 95814, incorporated by reference herein.

Air Monitoring Quality Assurance Manual

Volume IV

Part C: Monitoring Methods for Ozone

The method for determining compliance with the State ozone ambient air quality standard shall be the Federal Equivalent Method (FEM) for the Determination of Ozone in the Atmosphere (40 CFR, part 53). The FEM (ultraviolet photometry) is considered equivalent to the Federal Reference Method (chemiluminescence) as described in 40 CFR, Chapter 1, Part 50, Appendix D as published in FR 62, 38895, July 18, 1997. When employed according to the FEM (40 CFR, part 53), the following are California Approved Samplers:

(A) Dasibi Models 1003-AH, 1003-PC, or 1003-RS Ozone Analyzers, USEPA Automated Equivalent Method EQOA-0577-019, as published in FR 42, 28571, June 03, 1977.

(B) Dasibi Models 1008-AH, 1008-PC, or 1008-RS Ozone Analyzers, USEPA Automated Equivalent Method EQOA-0383-056, as published in FR 48, 10126, March 10, 1983.

(C) DKK-TOA Corp. Model GUX-113E Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0200-134, as published in FR 65, 11308, March 02, 2000.

(D) Environics Series 300 Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0990-078, as published in FR 55, 38386, September 18, 1990.

(E) Environnement S.A. Model $O_3$41M UV Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0895-105, as published in FR 60, 39382, August 02, 1995.

(F) Environnement S.A. Model $O_3$42M UV Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0206-148, as published in FR 67, 42557, June 24, 2002.

(G) Environnement S.A. SANOA Multigas Longpath Monitoring System, USEPA Automated Equivalent Method EQOA-0400-137, as published in FR 65, 26603, May 08, 2000.

(H) Horiba Instruments Models APOA-360 and APOA-360-CE Ozone Monitor, USEPA Automated Equivalent Method EQOA-0196-112, as published in FR 61, 11404, March 20, 1996.

(I) Monitor Labs/Lear Siegler Model 8810 Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0881-053, as published in FR 46, 52224, October 26, 1981.

(J) Monitor Labs/Lear Siegler Models ML9810, ML9811, or ML9812, Monitors Labs Model ML9810B, or Wedding & Associates Model 1010 Ozone Analyzers, USEPA Automated Equivalent Method EQOA-0193-091, as published in FR 58, 6964, February 03, 1993.

(K) Opsis Model AR 500 and System 300 Open Path Ambient Air Monitoring Systems for Ozone, USEPA Automated Equivalent Method EQOA-0495-103, as published in FR 60, 21518, May 02, 1995.

(L) PCI Ozone Corporation Model LC-12 Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0382-055, as published in FR 47, 13572, March 31, 1982.

(M) Philips PW9771 O3 Analyzer, USEPA Automated Equivalent Method EQOA-0777-023, as published in FR 42, 38931, August 01, 1977; FR 42, 57156, November 01, 1977.

(N) Teledyne-Advanced Pollution Instrumentation, Inc. Model 400E Ozone Analyzer, Advanced Pollution Instrumentation, Inc. Model 400/400A Ozone Analyzer, USEPA Automated Equivalent Method EQOA-0992-087, as published in FR 57, 44565, September 28; 1992, FR 63, 31992, June 11, 1998; FR 67, 57811, September 12, 2002.

(O) Thermo Electron/Thermo Environmental Instruments Models 49, 49C, USEPA Automated Equivalent Method EQOA-0880-047, as published in FR 45, 57168, August 27, 1980

Household Products Database

National Institutes of Health
National Library of Medicine
Specialized Information Services

Brand Information

Brand Name: Oatey H2O (5) Water Soluble Flux
Form: liquid
Product Category: Home maintenance >> Plumbing >> solder flux
Home maintenance >> Solder >> flux, water soluble
Customer Service No.: 800-321-9532
Date Entered: 2001-05-30
Related Items: Products with similar usage in this database

Manufacturer

Manufacturer: Oatey
Address: 4700 West 160th Street
City: Cleveland
State: OH
Zip Code: 44135
Telephone Number: 216-267-7100
Toll Free Number: 800-321-9532
Date Info Verified: 2004-02-16
Related Items: Products by this manufacturer

Health Effects

The following information (Health Effects, Handling/Disposal, and Ingredients) is taken from the product label and/or the Material Safety Data Sheet (MSDS) prepared by the manufacturer. The National Library of Medicine does not evaluate information from the product label or the Material Safety Data Sheet.

Acute Health Effects: From MSDS:
ENTRY ROUTE INHALE – YES; INGEST - YES; SKIN - YES; EYE – YES

GENERAL Zinc Chloride is corrosive to all body tissues and can cause severe burns.
INHALATION If heated, fumes may produce respiratory irritation, fever, chills, muscular pain, headache, vomiting and sweating.
SKIN Contact may cause irritation, burns or dermatitis.
EYE May cause irritation, burns or corneal damage.
INGESTION May cause burns of mouth, throat and gastrointestinal tract, vomiting, abdominal pain, diarrhea, strictures, kidney disease, shock or death.

TARGET ORGANS Eye, Skin, Central Nervous System, kidney, respiratory system, digestive system

Chronic Health Effects: MSDS: No information provided.
Carcinogenicity: MSDS: The ingredients in this product are not identified as carcinogens

by NTP, IARC and OSHA.

First Aid: MSDS: EMERGENCY AND FIRST AID PROCEDURES - 303/623-5716 COLLECT

SKIN: Wash thoroughly with soap and water. Remove contaminated clothing and wash before re-use. Seek medical attention if irritation persists.
EYES: If fumes cause irritation, move to fresh air and irrigate eyes with water for 15 minutes. If irritation persists, seek medical attention.
INHALATION: Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Keep victim quiet and warm. Call a poison control center or physician immediately.
INGESTION: Drink water. DO NOT INDUCE VOMITING and call a poison control center or physician immediately. Avoid alcoholic beverages. Never give anything by mouth to an unconscious person.

Health Rating: 2

Flammability Rating: 1

Reactivity Rating: 0

HMIS Rating Scale: 0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe;
N = No information provided by manufacturer; * = Chronic Health Hazard

MSDS Date: 2001-04-02

Handling/Disposal

Handling: MSDS: HANDLING AND STORAGE: Do not store near heat.

Disposal: MSDS: WASTE DISPOSAL
Dispose of according to local, state, and federal regulations.

Ingredients from MSDS/Label

Chemical	CAS No / Unique ID	Percent
Surfactant(s) (unspecified)	000000-00-4	20-50
Triethanolamine hydrochloride	000637-39-8	8-15
Zinc chloride	007646-85-7	2-8
Ammonium chloride	012125-02-9	0-3
Inert ingredients (unspecified)	999999-00-2	5-25

Note: Brand names are trademarks of their respective holders.
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Last updated: May 12, 2004

Melting Range
415°F - 455°F

No./No 50692

Gama de fusión
212°C - 235°C

H-20^{95}™ WATER SOLUBLE TINNING FLUX PLUMBING SOLDER KIT

WITH SAFE FLO® SILVER LEAD FREE SOLDER AND APPLICATOR BRUSH

H-20^{95}™ Water Soluble Tinning Flux is perfect for all climates, is water flushable and flux base meets ASTM B-813. H-20^{95}™ can be used for potable plumbing, copper fire sprinkler and hydronic heating systems. Safe FLo® Silver Lead Free Solder is a patented alloy of Tin, Silver, Copper and Bismuth. Safe Flo® Silver Lead Free Solder works as easy as 50 tin/50 lead solders to make joints that are even stronger. The working range of 415°-455° is easily reached and held with a standard propane torch.

DIRECTIONS: 1. Remove all corrosion, dirt and oil using Oatey abrasive cloth, utility brushes or nylon grit pads. Clean all surfaces until they are bright. **2.** Apply H-20^{95}™ Water Soluble Tinning Flux to all surfaces being soldered. Solder will not adhere to surfaces that have not been fluxed. Join parts together. **3.** Apply heat to the joint with a torch. Once flux bubbles; apply solder while maintaining heat. Allow to cool undisturbed. Remove any flux residue with a damp cloth.

SOLDER-HAZARDOUS INGREDIENTS: Tin 7440-31-5, Copper 7440-50-8, Bismuth 7440-69-9 and Silver 7440-22-4.
FLUX-HAZARDOUS INGREDIENTS: Zinc Chloride 7646-85-7 and Triethanolamine Hydrochloride 637-39-8.
FLUX-NON-HAZARDOUS INGREDIENTS: NJTSRN 80100453-5006, 5007, 5008, 5009, and 5010.

Eye/skin contact may cause intense irritation and injury. In case of eye/skin contact, flush/wash freely with water. Call physician or poison control center immediately. If swallowed, **DO NOT INDUCE VOMITING**, drink water and call a physician or poison control center immediately. Ingestion of this product could cause gastrointestinal distress. **KEEP OUT OF REACH OF CHILDREN.**

EQUIPO DE SOLDADURA PARA PLOMERÍA DE FUNDENTE PARA ESTAÑADO HIDROSOLUBLE H-20^{95}™

CON SOLDADURA DE PLATA SIN PLOMO SAFE FLO® Y CEPILLO APLICADOR

El fundente para estañado hidrosoluble H-20^{95}™ es ideal para todo tipo de clima, se enjuaga con agua y la base de fundente comple con ASTM B-813. H-20^{95}™ se puede utilizar para cañería de agua potable, cañería contra incendio de cobre y para sistemas de calefacción hidrónicos. La soldadura de plata sin plomo Safe Flo® es una aleación patentada de estaño, plata, cobre y bismuto. La soldadura de plata sin plomo Safe Flo® actúa con la facilidad de las soldaduras 50 estaño/50 plomo para hacer uniones que son aun más fuertes. La gama de fusión de 212°C - 235°C se alcanza y se mantiene fácilmente con un soplete estándar de propano.

INSTRUCCIONES: Elimine toda corrosión, polvo y aceite, utilizando tela abrasiva, cepillos utilitarios o esponjas de abrasión de nylon Oatey. Limpie hasta que las superficies estén brillantes. 2. Aplique el fundente para estañado hidrosoluble H-20^{95}™ a todas las superficies que deban soldarse. La soldadura no se adherirá a las superficies que no tengan fundente. Junte las partes. 3. Aplique calor a la junta con un soplete. Luego que el fundente burbejea, aplique la soldadura manteniendo el calor. Permita que la junta se enfríe sin interferencias. Elimine el exceso de fundente con un trapo húmedo.

INGREDIENTES PELIGROSOS DE LA SOLDADURA: Estaño 7440-31-5, cobre 7440-50-8, bismuto 7440-69-9 y plata 7440-22-4.
INGREDIENTES PELIGROSOS DEL FUNDENTE: Cloruro de zinc 7646-85-7 y hidrocloruro de trietanolamina 637-39-8.
INGREDIENTES NO PELIGROSOS DEL FUNDENTE: NJTSRN 80100453-5006, 5007, 5008, 5009 y 5010.

Contacto con los ojos y la piel puede causar irritación intensa y lesiones. En caso de contacto con los ojos y la piel, enjuague/lave con abundante cantidad de agua. Llame al médico o al centro de control de envenenanimento inmediatamente. En caso de ingestión, **NO PROVOQUE EL VOMITO**, beba agua y llame al médico o al centro de control de envenenanimento inmediatamente. La ingestión de este producto puede causar problemas gastrointestinales. **MANTENGA FUERA DEL ALCANCE DE LOS NIÑOS.**

FOR EMERGENCY FIRST AID HELP CALL 1-303-623-5716 COLLECT.
PARA PRIMEROS AUXILIOS, EN CASO DE EMERGENCIA LLAME "POR COBRAR" AL 1-303-623-5716.

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ORGANIC

Product:	**Triethanolamine Hydrochloride.**
CAS #:	637-39-8.
Synonyms:	Tris (hydroxyethyl) Amine Hydrochlorid Nitrilotriethanol Hydrochloride.
Molecular Formula:	$C_{16}H_{16}ClNO_3$.
Molecular Weight:	185.65.
Description:	Colourless to white crystalline powder,
Iron Content:	5 PPM max.
Lead Content:	5 PPM max.
Copper Content:	5 PPM max.
Cadmium Content:	5 PPM max.
Sulphated Ash:	0.01% max.
Moisture Content:	0.5% max.
Melting Point:	176.0 to 177.0°C.
Assay:	99.0% min.
Quantity Available:	30.0 MT. per month.
Packing:	25.0 kilos net, new, polylined HDPE dru
Delivery:	4 to 6 weeks from receipt of confirmat
Price:	Available on request.
Payment:	Negotiable.

AMINE

Office:
15/605-606 Mayuresh C.H.S., Majaswadi MHADA Colony, Off Mahakali Caves Road, Andheri (East), Mumbai-400 093. India.
Tel.: ++91.22.2820.1198 • ++91.22.2821.5596 Fax: ++91.22.2820.1201 Email: sales@garudachem.com

Factory:
B-46 M. I. D. C. Industrial Estate, Lote-Parshuram, Tal.: Khed, Dist.: Ratnagiri. Maharashtra. India.
Tel.: ++91.2356.27.2157 Email: factory@garudachem.com

Visit our website to find more information like MSDS, infra-red (IR), molfile, sdf file, structure, price, a catalog of over 130000 chemicals and over 150 chemical suppliers. You may also add your own catalog of chemicals for free.

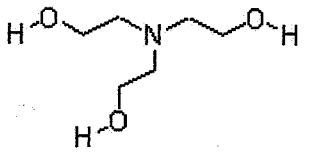
Triethanolamine hydrochloride

Synonyms: 2,2',2"-Nitrilotriethanol hydrochloride~Tris(2-hydroxyethyl)amine hydrochloride; triethanolamine hydrochloride gr; triethanolamine hcl; tris(2-hydroxyethyl) ammonium chloride; 2,2',2"-Nitrilotriethanol

Molecular Formula: $C_6H_{15}NO_3.HCl$

Formula Weight: 185.65

Registry number: 637-39-8



Registry number (RN, CAS): 637-39-8

Melting point (Mp): 177-179 °C

Safety Description

S24/25 Avoid contact with skin and eyes.

Products commercially available

Supplier	Name and purity	Qtt	Reference
abcr	Triethanolamine hydrochloride, 99%	250.00 g 1.00 kg 5.00 kg	AV15678 Get offer AV15678 Get offer AV15678 Get offer
Acros	Triethanolamine hydrochloride p.a. p.a.	5 GR 100 GR 500 GR	170050050 Get offer 170051000 Get offer 170055000 Get offer
acros	Triethanolamine hydrochloride 99% 99%	1 GR 100 GR 500 GR	421640010 Get offer 421641000 Get offer 421645000 Get offer
AlfaAesar	Triethanolamine hydrochloride, 99%	5000g 250g	A15678 Get offer A15678 Get offer
Alkemi	Triethanolamine hydrochloride, 99%	250 g 1 kg 5 kg	ALK19604 Get offer ALK19605 Get offer ALK19606 Get offer
chemos	Triethanolamine Hydrochloride	on request	FC49500 Get offer
lancaster	Triethanolamine hydrochloride 99+ 99+	250g 1kg	X03480G0250 X03480G1000
lancaster	Triethanolamine hydrochloride	250g 1kg	3480 3480
lobachem	triethanolamine hydrochloride gr	500 gm 100 gm	6362 Get offer 6362 Get offer
MatrixSwitzerland	Triethanolamine hydrochloride	semi bulk bulk	Get offer Get offer
molekula	Triethanolamine hydrochloride	100 g 100 GM	25559545 Get offer 3079T

MATERIAL SAFETY DATA SHEET

MSDS 0426

Section 1 -- PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Nokorode Aqua Flux

PRODUCT CODES
74044, 74046, 74047

CHEMICAL FAMILY:
Organic/Inorganic

USE
Soldering Flux

MANUFACTURER'S NAME
The RectorSeal Corporation
2601 Spenwick Drive
Houston, Texas 77055 USA

DATE OF PREPARATION
August 7, 2002

HMIS CODES	
Health	1
Flammability	1
Reactivity	0
PPI	B

EMERGENCY TELEPHONE NO.
Chemtrec 24 Hours
(800) 424-9300

TECHNICAL SERVICE TELEPHONE NO.
(800) 231-3345

Section 2 -- COMPOSITION/INFORMATION ON INGREDIENTS

% by WT	CAS No.	INGREDIENT		UNITS
10-25	7646-85-7	Zinc Chloride		
			ACGIH TLV	1 mg/m3
			OSHA PEL	1 mg/m3
10-25	12125-02-9	Ammonium Chloride		
			ACGIH TLV	10 mg/m3
			OSHA PEL	10 mg/m3
<10	111-42-2	Diethanolamine		
			ACGIH TLV	0.46 mg/m3-skin-
			OSHA PEL	3 mg/m3
70-90	8009-03-8	Pertrolatum		
			ACGIH TLV	N/D
			OSHA PEL	N/D
<10	2002-24-6	Ethanolamine Hydrochloride		
			ACGIH TLV	N/D
			OSHA PEL	N/D
<10	25322-68-3	Poly(ethylene oxide)		
			ACGIH TLV	N/D
			OSHA PEL	N/D

Section 3 -- HAZARDS IDENTIFICATION

SUMMARY OF ACUTE HAZARDS
Irritation to respiratory system from fumes evolved during soldering. Eye contact may cause intense irritation and injury.

ROUTE OF EXPOSURE, SIGNS AND SYMPTOMS

INHALATION
Irritation to respiratory system from fumes evolved during soldering.

EYE CONTACT
Contact may cause intense irritation and injury.

SKIN CONTACT
May cause skin irritation.

INGESTION
Nausea, vomiting, irritation to digestive system.

SUMMARY OF CHRONIC HAZARDS

Short term effects to liver and kidneys can occur. Chemical irritation from continued skin contact can occur. Continuous industrial use in small unventilated areas may result in sufficient inhalation of solder and flux fumes to cause lung damage and irritation of respiratory tract.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Individuals with pre-existing or chronic diseases of the eyes, skin, respiratory system, cardiovascular system, gastrointestinal system, liver, or kidneys may have increased susceptibility to excessive exposure.

Section 4 -- FIRST AID MEASURES

If INHALED:	If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention. Prompt action is essential.
If on SKIN:	Immediately wash with soap and water. Remove and wash any contaminated clothing.
If in EYES:	Flush eyes with large amounts of water for 15 minutes. Get medical attention if irritation persists.
If SWALLOWED:	If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Section 5 -- FIRE FIGHTING MEASURES

FLASH POINT	LEL	UEL
>400 F (204 C) SETA CC	N/D	N/D

EXTINGUSING MEDIA

Foam, dry chemical, carbon dioxide or water fog.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained full face piece breathing apparatus and other protective clothing. Hazardous decomposition products possible (see Section 10). May release ZnO and HCl fumes.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Heat may build up pressure and rupture closed containers.

Section 6 -- ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Wipe up spills to prevent footing hazard. Avoid flushing into sewers, drains, waterways and soil.Wear protective clothing during clean up.

Section 7 -- HANDLING AND STORAGE

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep container closed and upright when not in use. Store flux at ambient conditions. Wash thoroughly after handling to remove all residue.

OTHER PRECAUTIONS: Avoid prolonged or repeated contact with skin or clothing. Empty containers may contain residues; treat as if full and observe all products precautions. Do not reuse empty containers.

Section 8 -- EXPOSURE CONTROLS/PERSONAL PROTECTION

RESPIRATORY PROTECTION (SPECIFY TYPE): In confined, poorly ventilated areas, use NIOSH/MSHA approved air purifying or supplied air respirators during soldering operations until fumes have dissipated.

VENTILATION - LOCAL EXHAUST: Acceptable

SPECIAL: N/A

MECHANICAL (GENERAL): Acceptable

OTHER: N/A

PROTECTIVE GLOVES: Wear rubber gloves.
EYE PROTECTION: Safety glasses (ANSI Z-87.1 or equivalent)
OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Coveralls recommended.
WORK/HYGIENIC PRACTICES: Where use can result in skin contact, wash exposed areas thoroughly before eating, drinking, smoking, or leaving work area. Launder contaminated clothing before reuse.

Section 9 -- PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT:	N/A
SPECIFIC GRAVITY (H20 = 1):	0.98
VAPOR PRESSURE (mm Hg):	< 0.01 @ 68 F (20 C)
MELTING POINT:	120-150 F (52-66 C)
VAPOR DENSITY (AIR = 1):	N/A
EVAPORATION RATE (ETHYL ACETATE = 1):	N/A
APPEARANCE/ODOR:	Tan / Petroleum Odor
SOLUBILITY IN WATER:	Insoluble

Section 10 -- STABILITY AND REACTIVITY

STABILITY: Stable
CONDITIONS TO AVOID: None
INCOMPATIBILITY (MATERIALS TO AVOID): None known
HAZARDOUS DECOMPOSITION PRODUCTS: Toxic fumes of zinc, chlorine, and HCL may be evolved during soldering.
HAZARDOUS POLYMERIZATION: Will not occur.

Section 11 -- TOXICOLOGY INFORMATION

CHRONIC HEALTH HAZARDS
No ingredient in this product is an IARC, NTP or OSHA listed carcinogen.

TOXICOLOGY DATA
Ingredient Name

Zinc Chloride
Oral-Rat LD50:350 mg/kg
Inhalation-Rat LCLo:1960 mg/m3/10M

Ammonium Chloride
Oral-Rat LD50:1650 mg/kg
Inhalation-Rat LC50:N/D

Diethanolamine
Oral-Rat LD50:710 mg/kg
Inhalation-Rat LC50:N/D

Petrolatum
Oral-Rat LD50:N/D
Inhalation-Rat LC50:N/D

Ethanolamine Hydrochloride
Oral-Rat LD50:N/D
Inhalation-Rat LC50:N/D

Poly(ethylene oxide)
Oral-Rat LD50:32 g/kg
Inhalation-Rat LC50:N/D

Section 12 -- Ecological Information

ECOLOGICAL DATA
Ingredient Name

Zinc Chloride

Food Chain Concentration Potential	None
WATERFOWL TOXICITY	N/A
BOD	None
AQUATIC TOXICITY: 7.2 ppm/96 hr/medium bluegill/TLm	

Ammonium Chloride

Food Chain Concentration Potential	None
WATERFOWL TOXICITY	N/A
BOD	N/A
AQUATIC TOXICITY: 6 ppm/96 hr/sunfish TLm	

Diethanolamine

Food Chain Concentration Potential	N/D
WATERFOWL TOXICITY	N/D
BOD	10%
AQUATIC TOXICITY: 2100 ppm/24 hr/sunfish, bluegill/TLm	

Petrolatum

Food Chain Concentration Potential	None
WATERFOWL TOXICITY	N/D
BOD	N/D
AQUATIC TOXICITY:	N/D

Ethanolamine Hydrochloride

Food Chain Concentration Potential	None
WATERFOWL TOXICITY	N/D
BOD	N/D
AQUATIC TOXICITY:	N/D

Poly(ethylene oxide)

Food Chain Concentration Potential	None
WATERFOWL TOXICITY	N/D
BOD	N/D
AQUATIC TOXICITY:	N/D

Section 13 -- DISPOSAL CONSIDERATIONS

Waste Classification: Non-regulated solid waste
Disposal Method: Approved landfill
Waste from this product is not considered hazardous as defined under the Resource Conservation and Recovery Act (RCRA) 40 CFR 261. Dispose of in accordance with Federal, State, and Local regulation regarding pollution.

Section 14 -- TRANSPORTATION INFORMATION

DOT:	Non-Regulated
OCEAN (IMDG):	Non-Regulated
AIR (IATA):	Non-Regulated
WHMIS (CANADA):	Non-Regulated

Section 15 -- REGULATORY INFORMATION

REGULATORY DATA
Ingredient Name

Zinc Chloride

SARA 313	Yes
TSCA Inventory	Yes
CERCLA RQ	1000 lbs.
RCRA Code	N/A

Ammonium Chloride

SARA 313	No
TSCA Inventory	Yes
CERCLA RQ	N/A
RCRA Code	N/A

Diethanolamine

SARA 313	No
TSCA Inventory	Yes
CERCLA RQ	100 lbs.
RCRA Code	N/A

Petrolatum

SARA 313	No
TSCA Inventory	Yes
CERCLA RQ	N/A
RCRA Code	N/A

Ethanolamine Hydrochloride

SARA 313	Yes
TSCA Inventory	Yes
CERCLA RQ	N/A
RCRA Code	N/A

Poly(ethylene oxide)

SARA 313	No
TSCA Inventory	Yes
CERCLA RQ	N/A
RCRA Code	N/A

Section 16 -- OTHER INFORMATION

This document is prepared pursuant to the OSHA Hazard Communication Standard (29 CFR 1910.1200). The information herein is given in good faith, but no warranty, expressed or implied is made. Consult RectorSeal for further information: (713) 263-8001

NOKORODE® AQUA FLUX™
Water Washable Flux

Description | Characteristics | Applications | Packaging | Instructions | Precautions | Specifications | Limited Warranty

DESCRIPTION:

Nokorode® Aqua flux™ is a creamy, smooth paste formulated to meet ASTM B-813 specifications. Aqua Flux™ is water washable, so it may be flushed from the piping system and limit the corrosive effects found in other fluxes. It is lead-free and may be used with all types of soft solder, including 95/5, 60/40, 50/50 and 40/60 solders. Unlike other "gels" or liquid fluxes that meet ASTM B-813, Aqua Flux™ will not run or drip off acid brushes, pipes and fittings during application. The outstanding wetting characteristics of Aqua Flux™ assure a superior joint.

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CHARACTERISTICS:

- Conforms to ASTM B-813 specifications
- Water washable
- Produces excellent, lead free joint
- Superior wetting ability - allows solder to flow easily and uniformly into joints
- Pre-cleans
- Resists spattering
- Smooth paste for easy application
- Will not run or drip during application

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APPLICATIONS:

Nokorde® Aqua Flux™can be used with 95/5, 60/40, 50/50, and 40/60 solid wire solders.

Do not use on stainless steel, aluminum or for silver soldering.

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PACKAGING:

Code	Size	Qty. Per Case	Lbs. per Case	Cu. Ft Per Case
74044	2 oz. (57 g)	48 jars	10	.42
74047	4 oz. (114 g)	24 jars	8	.25
74046	16 oz. (454 g)1	2 jars	13	.48

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INSTRUCTIONS:

---

1. Clean surface before soldering

2. **Do not breathe vapor during soldering operations.**

3. Apply a small amount of flux evenly to both joining surfaces. Heat and apply solid wire solder in normal manner.

4. When joint has cooled, wipe outside with a wet rag, and flush inside surfaces thoroughly with water.

5. Flux paste may liquefy if stored under very hot conditions (usually greater than 120 degree F). Mix well before using.

For additional technical information, call Toll Free 1-800-231-3345.

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PRECAUTIONS:

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT,

CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

D A N G E R!

CAN CAUSE CHEMICAL BURNS - HARMFUL IF SWALLOWED OR INHALED

CONTAINS: Ammonium Chloride. PRECAUTIONS: Can cause burns to eyes, skin, digestive or respiratory system. Avoid direct contact, breathing of fumes, and ingestion. Wear adequate protective clothing and equipment. Use only with good ventilation. Wash thoroughly after use. **FIRST AID**: For any overexposure, get immediate medical attention after first aid is given. **Eyes** - Flush with clean water for 15 minutes. **Skin** - Wash with soap and water. **Inhalation** - Remove to fresh air. **Ingestion** - DO NOT INDUCE VOMITING. Only if conscious, give large amounts of water. **FIRE AND SPILLS**: For fire, use water fog, CO2, foam, or dry chemicals. Wipe up spills to prevent footing hazard. **STORAGE AND HANDLING**: Store in cool area. Keep container tightly closed. Do not reuse empty container. **KEEP OUT OF REACH OF CHILDREN.**

For additional information, refer to Material Safety Data Sheet.

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SPECIFICATIONS:

Wt/Gal @ 77 degree F	8.18 +- .5 lbs/gal.
Flash Point SETA CC	less than 400 degree F
Color	Yellowish Paste
Shelf Life	1 year

File No. 3708

Suggestions and recommendations covering the use of our products are based on our past experience and laboratory findings. However, as we have no control as to the methods and conditions of application, we only assume responsibility for the uniformity of our products within manufacturing tolerances.

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LIMITED WARRANTY:

RectorSeal® makes the Limited Express Warranty that when the instructions for storage and handling of our products are followed we warrant our products to be free from defects. THIS LIMITED EXPRESS WARRANTY IS EXPRESSLY IN LIEU OF ANY OTHER EXPRESS OR IMPLIED WARRANTIES, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND OF ANY OTHER OBLIGATION ON THE PART OF RECTORSEAL®. The sole remedy for breach of the Limited Express Warranty shall be the refund of the purchase price. All other liability is negated and disclaimed, and RectorSeal® shall not be liable for incidental or consequential damages.

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MANUFACTURED IN U.S.A. BY

RectorSeal®
2601 Spenwick Drive • Houston, TX 77055 USA
713-263-8001 • Fax 713-263-7577
Toll-free 800-231-3345 • Fax 800-441-0051

Back to Soldering Products

Section 01 Identification

Info furnished by:	Fry Technology
Address:	4100 Sixth Avenue Altoona, PA 16602
Date Effective:	2/16/99
Emergency Phone:	(814) 946-1611
Chemtrec:	800-424-9300 (Use only in the event of chemical emergencies involving a spill, leak, fire, exposure, or accident involving chemicals.)
Product or Trade Name:	Water Flow 2000 Paste Flux
Person to Contact:	Daren Cuppett - Jack Wagner

Section 02 Hazardous Constituents

Chem	CAS	%WT	Carcinogen	TLV ACGIH	OSHA PEL
Octylphenoxy-polyethoxyethanol Surfactant					
	9004-87-9	10-20	No	NE	NE
Ethoxylated Aliphatic Alcohol					
	9003-11-6	30-35	No	NE	NE
Amine Hydrochloride	2002-24-6	5-8	No	NE	NE

Section 03 Physical Data

Melting Point	NA
Boiling Point	NA
Vapor Pressure	NA
Vapor Density (air is 1)	NA
Solubility in Water	>90%
Appearance & Color	Off white to pale yellow color, paste
Specific Gravity	NA
Odor	Mild
% Volatile	NA
pH (5% Aqueous solution)	2.5
Evaporation Rate (nBuAc=1)	NA

Section 04 Fire & Explosion Hazard Data

Flash Point/Method Used	C.O.C. >200
Flammable Limits	UN
Extinguishing Media	Dry chemical or carbon dioxide
Fire-fighting Equipment	None

Section 05 Reactivity Data

Stability:	Stable
Conditions to avoid:	None
Hazardous Polymerization:	Will not occur
Conditions to avoid:	None
Incompatibility:	Strong oxidizing agents
Hazardous Decomposition Products:	Burning may produce carbon monoxide, carbon dioxide and unidentified organic compounds.

Section 06 Spill, Leak and Disposal Procedures

Action to take for Spills/Leaks:	Product is in paste form. Using protective gloves, wipe up and clean with soap and water.
Disposal Method:	Must be in accordance with Federal, State and Local Laws and Regulations.

Section 07 Health Hazard Data

Eye:	May cause irritation and possible corneal damage.
Skin Contact:	Contact may cause irritation such as rash, itching or redness.
Skin Absorption:	Not classified as a skin absorbent.
Ingestion:	Liver and kidney damage if ingested in large amounts
Inhalation:	May cause irritation to respiratory system when heated.

Section 08 First Aid Procedures

Eyes:	Flush with large amounts of water lifting upper and lower lids occasionally. Get medical attention.
Skin:	Wash exposed area with soap and water.
Ingestion:	Consult a physician. Never give anything by mouth to an unconscious person.
Inhalation:	If affected, remove individual to fresh air. Get medical attention.

Section 09 Special Handling Information

Ventilation:	Required to maintain TLV's.
Respiratory Protection:	If threshold limit value is exceeded, when heated, use appropriate MSHA/NIOSH approved respirator.
Eye Protection:	Safety glasses in compliance with OSHA regulations are advised. Provide eyewash near work site.
Skin Protection:	Wear resistant gloves such as rubber, neoprene or plastic.

Section 10 Special Precautions & Additional Information

Storage:	Keep container closed when not in use. Read all container labeling. Wash skin contact with soap and water. For industrial use only. Do not take internally.

Section 11 Hazard Rating

Based on NFPA and NPCA Systems
Health - 2
Flammability - 1
Reactivity - 0
Special Hazard - ACD

The information contained herein is based on data considered accurate and is offered at no charge. No warranty is expressed or implied regarding the accuracy of this data. Liability is expressly disclaimed for loss or injury arising out of use of this information of the use of any materials designated.

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7525: CPVC 1-STEP CEMENT 8 OZ.

MSDS Last updated: 01/04/1999

MSDS SHEET FOR CPVC 1-STEP CEMENT 8 OZ. #7525

*** SECTION 1 PRODUCT IDENTIFICATION ***

Manufacturer's Name:	Oatey Corp.
Manufacturer's Address:	4700 W. 160th Street P.O. Box 35906 Cleveland, Ohio 44135
Emergency Telephone:	(303) 623-5716 Collect
Distributor's Name:	Imperial Supplies LLC
Distributor's Address:	789 Packer Drive Green Bay, WI 54304
Information Telephone:	(800) 558-2808
Product Name:	CPVC 1-STEP CEMENT 8 OZ.
Imperial No.:	7525
Manufacturer No.:	31911

*** SECTION 2 HAZARDOUS INGREDIENTS ***

Ingredients	%	Cas #	Sec 313
Tetrahydrofuran (See Section 6)	40-50	109-99-9	No
Acetone	24-34	67-64-1	No
Cyclohexanone	5-10	108-94-1	No
Methyl Ethyl Ketone	<5	78-93-3	Yes
Non-Hazardous Ingredients			
CPVC Resin	13-16	68648-82-8	No
Amorphous Silica	25-3	112945-52-5	No
Proprietary	5-25		No

*** SECTION 3 HAZARDS IDENTIFICATION ***

Hazards	Yes	No	Hazards	Yes	No
Combustible Liquid		X	Skin Hazard	X	
Flammable Liquid	X		Eye Hazard	X	
Pyrophoric Material		X	Toxic Agent	X	
Explosive Material		X	Highly Toxic Agent		X
Unstable Material		X	Sensitizer		X
Water Reactive Material		X	Kidney Toxin	X	
Oxidizer		X	Reproductive Toxin	X	
Organic Peroxide		X	Blood Toxin		X
Corrosice Material		X	Nervous System Toxin	X	
Compressed Gas		X	Lung Toxin	X	
Irritant	X		Liver Toxin	X	
Carcinogen NTP/IARC/OSHA		X			

*** SECTION 4 REGULATIONS ***

Chemical:	Tetrahydrofuran	Acetone
TLV (TWA):	200 ppm, 590 mg/cu m	750 ppm, 1800 mg/cu m
PEL (Transitional Limits):	200 ppm, 590 mg/cu m	1000 ppm, 2400 mg/cu m
STEL:	250 ppm, 735 mg/cu m	1000 ppm, 2400 mg/cu m
Hazard Action Level:	N/A	N/A

Chemical:	Cyclohexanone	Methyl Etheyl Ketone
TLV (TWA):	25 ppm, 100 mg/cu m(skin)	200 ppm, 590 mg/cu m
PEL (Transitional Limits):	50 ppm, 200 mg/cu m	200 ppm, 590 mg/cu m
STEL:	100 ppm, 400 mg/cu m	300 ppm, 885 mg/cu m
Hazard Action Level:	N/A	N/A

Chemical:	Amorphous Silica
TLV (TWA):	10 mg/cu m
PEL (Transitional Limits):	20 mppcf
STEL:	N/A
Hazard Action Level:	N/A

*** SECTION 5 REGULATED IDENTIFICATION ***

DOT Proper Shipping Name:	Consumer Commodity ORM-D
DOT Hazard Class:	N/A
Shipping ID No.:	N/A
EPA Hazardous Waste ID No.:	D-001
EPA Hazard Waste Class:	Ignitable Waste

*** SECTION 6 EFFECTS OF EXPOSURE ***

Entry Route: Inhale- Yes Ingest- Yes Skin- Yes Eye- Yes

Inhalation: May cause irritation of mucous membranes, nose & throat, headache, dizziness, nausea, numbness of the extremities and narcosis in high concentrations. Has caused CNS depression & liver damage in animals, & high concentrations have caused retardation of fetal development in rats.

Tetrahydrofuran Warning: The National Toxicology Program has reported that exposure of mice and rats to Tetrahydrofuran (THF) vapor levels up to 1800 ppm 6 hr/day, 5 days/week for their lifetime caused an increased incidence of kidney tumors in male rats and liver tumors in female mice. The significance of these findings for human health are unclear at this time, and may be related to "species specific" effects. Elevated incidences of tumors in humans have not been reported for THF. THF is not listed as a carcinogen by NTP, IARC, or OSHA. One THF vendor has recommended a reduction in the "acceptable exposure limit" from 200 ppm to 25 ppm, 8 and 12 hour time weighted average.

Skin: Chronic contact may lead to irritation & dermatitis. Chronic exposure to vapors of high concentration may cause dermatitis. May possibly be absorbed through the skin.

Eye: Vapors or direct contact may cause irritation.

Ingestion: May be aspirated into the lungs or cause systemic effects described under inhalation.

Target Organs: Eye, Skin, Kidney, Lung, Liver, Central Nervous System

*** SECTION 7 FIRST AID MEASURES- (303)623-5716 COLLECT ***

Skin: If irritation arises, wash thoroughly with soap and water. Seek medical attention if irritation persists.

Eyes: If fumes cause irritation, move to fresh air and irrigate eyes with water for 15 minutes. If irritation persists, seek medical attention.

Inhalation: Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Keep victim quiet and warm. Call a poison control center or physician immediately.

Ingestion: Drink water and call a poison control center or physician immediately. Avoid alcoholic beverages. Never give anything by mouth to an unconscious person.

*** SECTION 8 PHYSICAL & CHEMICAL PROPERTIES ***

NFPA Hazard Signal:	Health 2 Stability 1 Flammability 3 Special None
Boiling Point:	151 Degrees F / 66 C
Melting Point:	N/A
Vapor Pressure:	145 mmHg @ 20 Degrees C

Vapor Density (Air=1):	2.5
Volatile Components:	70-80% WT.
Solubility in Water:	Negligible
PH:	N/A
Specific Gravity:	0.91 plus/minus 0.02
Evaporation Rate:	(BUAC=1) = 5.5-8.0
Appearance:	Gold Liquid
Odor:	Ether-Like
Will Dissolve In:	Tetrahydrofuran
Material Is:	Liquid

*** SECTION 9 FIRE & EXPLOSION HAZARD DATA ***

Flammability:	LEL=1.8 %Volume UEL=11.8 %Volume
Flashpoint & Method Used:	5-8 Degrees F. / PMCC
Stability:	Stable Conditions To Avoid: Heat, sparks and open flame. Hazardous Decomp. PDTS.: Carbon Monoxide / Carbon Dioxide / Hydrogen Chloride / Smoke.
Hazardous Polymerization:	Will Not Occur. Conditions To Avoid: None
Incompatibility/Mat. To Avoid:	Acids, oxidizing materials, alkalis, chlorinated inorganics (potassium, calcium and sodium hypochlorite), copper or copper alloys.
Special Fire Fighting Procedure:	For Small Fires: Use dry chemical, CO2, water or foam extinguisher. For Large Fires: Evacuate area and call Fire Department immediately.

*** SECTION 10 SPILL & DISPOSAL INFORMATION ***

Spill or Leak Procedures:	Ventilate area, stop leak if it can be done without risk. Take up with sand, earth, or other non-combustible absorbing material.
Waste Disposal:	Dispose of according to local, state, and Federal regulations.

*** SECTION 11 SAFE USAGE DATA ***

Protective Equipment Types:	Eyes: Safety glasses with side shields. Respiratory: NIOSH-approved cannister respirator in absence of adequate ventilation. Gloves: Rubber gloves. Other: Eye wash and safety shower should be available.
Ventilation:	General Mechanical: Exhaust ventilation capable of maintaining emissions at the point of use below PEL. Local Exhaust: Open doors & windows. If used in enclosed area, use exhaust fans.
Precautions:	Handling & Storage: Keep away from heat, sparks and flames; store in cool, dry place. Other: Containers, even empties will retain residue and vapors.

*** SECTION 12 DISCLAIMER ***

The information herein has been compiled from sources believed to be reliable, up-to-date, and is accurate to the best of our knowledge. However, Oatey cannot give any guarantees regarding information from other sources, and expressly does not make warranties, nor assumes any liability for its use.

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Welcome to California

Air Resources Board

Forecast Emissions by Summary Category Reports

2004 Almanac Data

Reactive Organic Gases Projected Emission Inventory

STATEWIDE

REPORT TYPE: GROWN AND CONTROLLED
SEASON: ANNUAL AVERAGE
BASE YEAR: 2003

All emissions are represented in Tons per Day and reflect the most current data provided to ARB
Download this data as a comma delimited file.

STATIONARY SOURCES										
SUMMARY CATEGORY NAME	1975	1980	1985	1990	1995	2000	2003	2005	2010	
FUEL COMBUSTION										
ELECTRIC UTILITIES	5.055	7.874	2.976	5.188	8.145	4.335	4.248	4.676	4.989	
COGENERATION	8.867	6.912	8.248	8.848	9.069	8.838	8.883	8.953	9.089	
OIL AND GAS PRODUCTION (COMBUSTION)	7.097	11.183	12.338	10.084	9.092	8.403	8.755	9.341	9.355	
PETROLEUM REFINING (COMBUSTION)	0.898	4.844	3.073	1.810	1.639	1.781	1.803	1.819	1.859	
MANUFACTURING AND INDUSTRIAL	16.238	24.868	14.592	11.667	9.196	9.011	9.370	9.571	10.132	1
FOOD AND AGRICULTURAL PROCESSING	5.641	5.496	5.424	5.433	5.374	5.261	5.224	5.198	5.141	
SERVICE AND COMMERCIAL	8.558	8.830	10.201	12.961	12.099	12.725	12.854	13.132	14.013	1
OTHER (FUEL COMBUSTION)	2.432	19.982	3.955	4.157	1.901	2.117	2.290	2.047	1.834	
*** TOTAL FUEL COMBUSTION**	54.786	89.988	60.807	60.148	56.516	52.472	53.429	54.736	56.412	5
WASTE DISPOSAL										
SEWAGE TREATMENT	0.675	0.000	0.001	0.338	0.555	0.427	0.442	0.451	0.478	
LANDFILLS	16.139	18.010	19.984	17.729	16.963	16.517	17.240	17.527	18.218	1
INCINERATORS	0.028	0.104	0.010	0.028	0.118	0.129	0.137	0.142	0.157	
SOIL REMEDIATION	0.001	[illegible]	[illegible].000	0.000	0.009	2.392	2.420	2.402	2.283	
OTHER WASTE	2.748	[illegible]	[illegible]13	3.035	2.897	3.231	3.294	3.332	3.441	

DISPOSAL)										
*** TOTAL WASTE DISPOSAL**	19.588	21.153	22.608	21.130	20.541	22.695	23.532	23.854	24.577	
CLEANING AND SURFACE COATINGS										
LAUNDERING	2.831	6.748	1.896	1.508	0.936	0.823	0.535	0.561	0.622	
DEGREASING	74.903	75.100	60.125	117.575	84.633	60.568	45.149	36.180	39.066	
COATINGS AND RELATED PROCESS SOLVENTS	251.996	245.586	272.315	178.961	116.925	118.619	126.128	129.777	147.639	
PRINTING	30.501	28.514	21.978	28.116	22.248	18.614	17.896	16.671	18.046	
ADHESIVES AND SEALANTS	48.098	55.723	61.175	63.407	26.155	24.397	19.834	19.903	20.322	
OTHER (CLEANING AND SURFACE COATINGS)	8.521	11.313	8.064	10.235	5.301	5.082	5.605	5.421	6.194	
*** TOTAL CLEANING AND SURFACE COATINGS**	416.850	422.983	425.552	399.801	256.199	228.103	215.147	208.512	231.890	
PETROLEUM PRODUCTION AND MARKETING										
OIL AND GAS PRODUCTION	609.122	698.867	583.832	158.078	62.698	52.447	51.336	50.235	49.203	
PETROLEUM REFINING	119.466	60.940	49.775	54.748	33.915	25.977	21.571	21.926	22.535	
PETROLEUM MARKETING	588.649	348.986	235.822	152.899	108.045	111.824	85.359	83.141	84.182	
OTHER (PETROLEUM PRODUCTION AND MARKETING)	21.622	49.373	10.833	11.681	6.284	0.553	0.405	0.410	0.403	
*** TOTAL PETROLEUM PRODUCTION AND MARKETING**	1338.859	1158.166	880.262	377.406	210.943	190.800	158.670	155.712	156.324	
INDUSTRIAL PROCESSES										
CHEMICAL	55.350	38.002	35.472	31.506	21.159	22.421	20.641	20.953	23.869	
FOOD AND AGRICULTURE	27.326	28.574	28.534	20.372	18.947	27.564	20.204	20.659	21.844	
MINERAL PROCESSES	3.964	3.203	3.069	5.385	5.898	5.668	6.057	6.266	6.906	
METAL PROCESSES	5.529	4.547	2.459	1.566	1.545	1.689	1.575	1.664	1.946	
WOOD AND PAPER	2.260	3.682	5.051	4.692	2.727	3.050	3.150	3.184	3.462	
GLASS AND RELATED PRODUCTS	0.287	0.033	0.057	0.068	0.102	0.392	0.394	0.399	0.435	
ELECTRONICS	0.062	0.000	0.115	0.072	0.075	0.736	0.757	0.771	0.809	
OTHER (INDUSTRIAL PROCESSES)	10.914	19.950	27.529	9.942	7.454	6.926	7.109	7.198	7.451	
*** TOTAL INDUSTRIAL PROCESSES**	105.691	97.990	102.285	73.605	57.906	68.446	59.888	61.096	66.724	
**** TOTAL STATIONARY SOURCES**	1935.773	1790.281	1491.515	932.089	602.106	562.516	510.666	503.910	535.927	
AREA-WIDE SOURCES										
SUMMARY CATEGORY NAME	197[illegible]	1980	**1985**	**1990**	**1995**	**2000**	**2003**	**2005**	**2010**	
SOLVENT EVAPORATION										
CONSUMER PRODUCTS	225.5[illegible]	[illegible]2.392	282.356	321.172	274.758	266.418	253.175	243.606	258.365	
ARCHITECTURAL										

COATINGS AND RELATED PROCESS SOLVENTS	185.838	186.827	176.269	126.290	108.826	120.778	105.414	103.483	88.817	
PESTICIDES/FERTILIZERS	65.533	65.533	65.533	65.533	70.977	59.381	58.249	55.922	50.375	
ASPHALT PAVING ROOFING	35.935	46.454	30.047	36.183	29.272	31.294	32.505	32.765	33.603	
*** TOTAL SOLVENT EVAPORATION**	512.888	551.206	554.205	549.178	483.833	477.873	449.344	435.776	431.161	
MISCELLANEOUS PROCESSES										
RESIDENTIAL FUEL COMBUSTION	44.096	48.898	52.530	57.997	55.351	55.726	56.129	56.381	56.541	
FARMING OPERATIONS	100.350	102.490	107.676	105.721	115.938	116.516	119.572	121.620	126.675	
CONSTRUCTION AND DEMOLITION	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
PAVED ROAD DUST	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
UNPAVED ROAD DUST	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
FUGITIVE WINDBLOWN DUST	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
FIRES	0.484	0.541	0.570	0.659	0.664	0.664	0.686	0.702	0.732	
WASTE BURNING AND DISPOSAL	74.230	72.792	74.001	71.152	71.966	76.180	77.617	77.956	78.859	
COOKING	2.816	3.795	4.388	4.996	4.824	5.314	5.548	5.708	6.071	
OTHER (MISCELLANEOUS PROCESSES)	0.348	0.346	0.346	0.370	0.277	0.287	0.306	0.310	0.328	
*** TOTAL MISCELLANEOUS PROCESSES**	222.324	228.863	239.512	240.894	249.021	254.687	259.858	262.677	269.205	
**** TOTAL AREA-WIDE SOURCES**	735.212	780.069	793.717	790.072	732.854	732.559	709.201	698.453	700.366	
MOBILE SOURCES										
SUMMARY CATEGORY NAME	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2003**	**2005**	**2010**	
ON-ROAD MOTOR VEHICLES										
LIGHT DUTY PASSENGER (LDA)	2443.314	2256.925	1948.316	1157.574	819.692	540.974	414.648	348.844	222.390	
LIGHT DUTY TRUCKS - 1 (LDT1)	572.485	457.301	389.432	331.919	255.296	174.724	146.369	131.204	96.857	
LIGHT DUTY TRUCKS - 2 (LDT2)	477.006	335.335	317.819	269.091	184.356	136.746	112.918	103.375	85.654	
MEDIUM DUTY TRUCKS (MDV)	70.753	56.712	48.843	77.904	91.152	74.078	61.622	56.701	47.810	
LIGHT HEAVY DUTY GAS TRUCKS - 1 (LHDV1)	64.490	91.013	123.778	120.672	89.803	38.210	23.182	18.419	13.155	
LIGHT HEAVY DUTY GAS TRUCKS - 2 (LHDV2)	19.860	17.168	16.031	10.789	6.610	5.024	4.899	4.943	4.681	
MEDIUM HEAVY DUTY GAS TRUCKS (MHDV)	86.620	112.790	136.009	102.814	57.205	34.976	29.420	26.339	19.121	
HEAVY HEAVY DUTY GAS TRUCKS (HHDV)	38.798	47.910	55.304	48.499	32.283	23.218	21.328	19.665	14.260	
LIGHT HEAVY DUTY										

DIESEL TRUCKS - 1 (LHDV1)	0.045	0.095	0.205	0.304	0.343	0.489	0.859	0.977	0.935	
LIGHT HEAVY DUTY DIESEL TRUCKS - 2 (LHDV2)	0.000	0.026	0.256	0.629	0.791	0.779	0.864	0.897	0.806	
MEDIUM HEAVY DUTY DIESEL TRUCKS (MHDV)	0.144	0.485	1.450	2.676	3.234	3.433	3.704	3.810	3.532	
HEAVY HEAVY DUTY DIESEL TRUCKS (HHDV)	14.539	25.776	39.630	35.557	27.044	22.757	22.397	21.773	17.773	1
MOTORCYCLES (MCY)	79.416	77.733	78.872	60.996	44.157	23.704	21.080	19.816	16.640	1
HEAVY DUTY DIESEL URBAN BUSES (UB)	0.989	1.120	1.381	1.711	1.955	2.260	2.249	2.163	2.110	
HEAVY DUTY GAS URBAN BUSES (UB)	11.230	10.215	9.201	8.167	7.425	6.448	6.197	6.083	5.689	
SCHOOL BUSES (SB)	6.941	6.716	6.114	3.505	2.339	1.820	1.638	1.529	1.464	
MOTOR HOMES (MH)	9.650	8.578	13.168	10.255	9.839	6.370	6.041	5.485	3.736	
*** TOTAL ON-ROAD MOTOR VEHICLES**	3896.280	3505.906	3185.810	2243.063	1633.522	1096.010	879.416	772.022	556.613	40
OTHER MOBILE SOURCES										
AIRCRAFT	43.785	45.749	40.876	45.841	34.936	34.941	36.239	37.140	38.143	4
TRAINS	7.560	7.551	7.542	6.888	7.713	8.565	8.913	8.809	8.136	
SHIPS AND COMMERCIAL BOATS	5.930	7.940	8.721	9.048	8.954	8.796	9.231	9.536	9.524	1
RECREATIONAL BOATS	42.972	57.717	77.906	103.587	133.785	137.699	122.861	107.714	76.156	5
OFF-ROAD RECREATIONAL VEHICLES	27.442	38.551	51.286	56.683	63.795	52.532	50.390	50.637	54.337	5
OFF-ROAD EQUIPMENT	263.650	281.330	296.890	319.084	278.850	238.394	202.304	171.658	131.475	11
FARM EQUIPMENT	26.664	33.022	23.887	25.252	23.361	20.527	19.035	17.369	13.604	
FUEL STORAGE AND HANDLING	63.698	67.067	71.896	81.599	85.545	89.438	60.421	29.860	25.256	2
*** TOTAL OTHER MOBILE SOURCES**	481.701	538.927	579.005	647.983	636.938	590.893	509.394	432.723	356.631	32
**** TOTAL MOBILE SOURCES**	4377.981	4044.833	3764.814	2891.046	2270.460	1686.903	1388.810	1204.745	913.244	73
NATURAL (NON-ANTHROPOGENIC) SOURCES										
SUMMARY CATEGORY NAME	**1975**	**1980**	**1985**	**1990**	**1995**	**2000**	**2003**	**2005**	**2010**	
NATURAL SOURCES										
GEOGENIC SOURCES	24.447	27.872	28.287	28.287	29.221	29.491	29.491	29.491	29.491	2
WILDFIRES	24.753	24.876	25.055	25.056	25.058	25.061	25.063	25.065	25.069	2
*** TOTAL NATURAL SOURCES**	49.199	52.748	53.342	53.343	54.280	54.552	54.554	54.556	54.561	5
**** TOTAL NATURAL (NON-ANTHROPOGENIC) SOURCES**	49.199	52.748	53.342	53.343	54.280	54.552	54.554	54.556	54.561	5
GRAND TOTAL FOR STATEWIDE	7098.166	6667.931	6103.388	4666.551	3659.700	3036.530	2663.232	2461.663	2204.098	209

* Emissions from natural sources are excluded.

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1997 Consumer and Commercial Products Survey
Summary of Sales and Emissions (as of 3/21/00)

				Adjusted Emissions*								
Cat. Code	Category Name	Sales (tpd)	Adjusted** Sales (tpd)	VOC (tpd)	PCBTF (tpd)	MeCl (tpd)	TCA (tpd)	VMS (tpd)	Acetone (tpd)	CO2 (tpd)	HFC-152a (tpd)	PERC (tpd)
2205	Solvent Parts Cleaner	3.38	3.72	1.63	0.00	0.02	0.22	0.00	0.01	0.00	0.00	0.00
2206	Tire Sealants and Inflators	3.95	4.34	0.89	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.81
2207	Undercoatings	0.71	**2.40**	0.71	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00
2208	Automotive Windshield Washer Fluids	11.53	**51.21**	8.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3101	Brush Cleaners	0.66	0.73	0.15	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00
3102	Grafitti Removers	1.18	1.30	0.18	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01
3103	Paint Removers or Strippers	5.49	**17.25**	6.30	0.00	7.62	0.00	0.03	1.01	0.01	0.00	0.01
3104	Paint Thinners	25.85	28.44	26.20	0.01	0.00	0.00	0.00	2.03	0.00	0.00	0.00
3201	Multipurpose Solvents	19.17	21.09	15.08	0.00	0.05	0.05	0.01	3.93	0.01	0.00	0.07
3202	Electronic Cleaner	0.79	0.86	0.19	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.01
3203	Adhesive Remover	0.60	0.66	0.34	0.00	0.03	0.00	0.00	0.02	0.00	0.00	0.01
4101	Disinfectants	1204.55	1325.01	6.71	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00
4102	Sanitizers	482.12	530.33	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4103	Sterilants (not including ethylene oxide	1.95	2.14	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4201	Non-selective Herbicides/Defoliants	1647.96	**2966.33**	4.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4202	Selective Herbicides/Defoliants	150.55	165.61	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4301	Flea and Tick Insecticide	1.61	1.77	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4302	Flying Insect Insecticide	6.05	6.65	0.70	0.00	0.00	0.09	0.00	0.00	0.00	0.01	0.00
4303	Wasp and Hornet Insecticide	2.24	2.47	1.43	0.00	0.00	0.01	0.00	0.00	0.04	0.00	0.00
4304	Lawn and Garden Insecticides	286.56	315.22	1.92	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00
4305	Crawling Bug Insecticides	74.77	82.25	3.91	0.00	0.00	0.41	0.00	0.00	0.09	0.00	0.00
4306	Insecticide Foggers	2.20	2.42	0.94	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
4401	Insect Repellants	2.91	3.20	2.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4402	Fungicides and Nematicides	57.43	63.18	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5101	Carpet and Upholstery Cleaners	1235.13	1358.65	1.13	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5102	Carpet Deodorizers	7.63	8.39	0.05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1997 Consumer and Commercial Products Survey
Summary of Sales and Emissions (as of 3/21/00)

Cat. Code	Category Name	Sales (tpd)	Adjusted** Sales (tpd)	Adjusted Emissions* VOC (tpd)	PCBTF (tpd)	MeCl (tpd)	TCA (tpd)	VMS (tpd)	Acetone (tpd)	CO2 (tpd)	HFC-152a (tpd)	PERC (tpd)
5103	Spot Removers	35.35	38.88	0.71	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
5104	Fabric Protectants	1.58	1.74	0.41	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
5201	Floor Wax Strippers	100.24	180.43	4.01	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
5202	General Purpose Cleaners	66942.81	73637.09	8.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07
5203	General Purpose Degreasers	209.75	230.73	2.31	0.00	0.01	0.00	0.00	0.00	0.01	0.06	0.08
5204	Glass Cleaners	92.66	101.92	3.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5205	Metal Polishes/Cleansers	4.40	4.84	0.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
5206	Oven Cleaners	11.60	12.76	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5207	Toilet Bowl Cleaners	98.95	108.84	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5208	Tub, Tile and Sink Cleaners	51.57	56.72	0.66	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5301	Laundry Prewash	37.89	41.68	0.23	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5302	Laundry Starches, Sizings, etc.	27.02	29.73	1.26	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5401	Dusting Aids	24.89	27.37	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5402	Flexible Floor Wax/Polish	45.61	50.17	1.34	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5403	Non-resilient Floor Wax/Polish	1.52	1.67	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5404	Wood Floor Wax/Polish	1.17	1.29	0.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5405	Furniture Waxes and Polishes	13.12	14.43	2.15	0.00	0.00	0.00	0.05	0.00	0.01	0.00	0.00
5406	Shoe Care Products	2.03	2.23	1.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00
5501	Multi-purpose Lubricant	13.26	14.59	4.66	0.00	0.02	0.00	0.00	0.00	0.16	0.00	0.07
5502	Silicone Based Multi-purpose Lubrican	0.93	1.02	0.84	0.00	0.01	0.00	0.01	0.00	0.02	0.00	0.03
5503	Penetrant	1.59	1.74	1.20	0.00	0.00	0.00	0.00	0.01	0.05	0.00	0.01
5504	Specialty Lubricant	12.18	13.40	0.37	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00
5601	Single Phase Aerosols Air Fresheners	0.69	0.75	0.23	0.00	0.00	0.00	0.00	0.20	0.00	0.06	0.00
5602	Dual Phase Aerosol Air Fresheners	13.76	15.14	4.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5603	Dual Purpose Air Freshener/Disinfecta	0.16	0.17	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5604	Liquid/Pump Spray Air Fresheners	41.37	45.51	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

1997 Consumer and Commercial Products Survey
Summary of Sales and Emissions (as of 3/21/00)

				Adjusted Emissions*								
Cat. Code	Category Name	Sales (tpd)	Adjusted** Sales (tpd)	VOC (tpd)	PCBTF (tpd)	MeCl (tpd)	TCA (tpd)	VMS (tpd)	Acetone (tpd)	CO2 (tpd)	HFC-152a (tpd)	PERC (tpd)
5605	Solid/Gel Air Fresheners	16.57	18.23	2.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5701	Charcoal Lighter Materials	7.34	**15.30**	4.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5702	Aerosol Cooking Sprays	3.17	3.48	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6101	Underarm Antiperspirants	20.82	22.91	2.30	0.00	0.00	0.00	6.50	0.01	0.00	0.72	0.00
6102	Underarm Deodorants	4.77	5.25	1.47	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.00
6201	Astringents/Toners	19.44	21.38	2.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6202	Hand and Body Lotions	46.77	51.44	0.30	0.00	0.00	0.00	0.14	0.00	0.00	0.00	0.00
6301	Personal Fragrance Product (<20% Fr	10.59	11.64	8.57	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00
6302	Personal Fragrance Product (>20% Fr	0.39	0.43	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6401	Hair Spray	40.52	51.87	40.13	0.00	0.00	0.00	0.03	0.00	0.01	0.89	0.00
6402	Hair Mousses	7.63	8.39	0.77	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00
6403	Hair Shines	0.41	0.45	0.22	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
6404	Hair Styling Gels	21.38	23.51	0.36	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
6501	Nail Polish	1.03	1.13	0.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6502	Base coats, Undercoats	0.15	0.16	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6503	Nail Polish Removers	2.76	4.06	0.85	0.00	0.00	0.00	0.00	2.25	0.00	0.00	0.00
6601	Rubbing Alcohol	15.47	17.02	10.71	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
6602	Shaving Creams	8.84	9.73	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6603	Shaving Gels	8.18	8.99	0.64	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6604	Foot Powders	0.42	0.46	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6605	Personal Hygiene Sprays	0.55	0.60	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals		**73508**	**82152**	**236.02**	**0.01**	**8.53**	**0.93**	**10.20**	**14.17**	**1.25**	**1.84**	**5.42**

*** Adjustment Factor is the Difference Between Adjusted Sales and Reported Sales**
**** All Values are Adjusted Assuming 90 Percent Market Coverage Unless Bolded. Adjustments for Bolded Values are Discussed in Cover**

SECTION 3.7

ADHESIVES AND SEALANTS

(Updated September 1990; Reissued October 1997)

EMISSION INVENTORY SOURCE CATEGORY
Cleaning and Surface Coatings / Other

EMISSION INVENTORY CODES AND DESCRIPTION
299-292-8202-0000 (83030) Adhesive and Sealant - Solvent-Based

299-292-8250-0000 (83063) Adhesive and Sealant - Water-Based

METHODS AND SOURCES

This category is an inventory of the total organic gas (TOG) emissions from solvents contained in adhesives and sealants used for construction, transportation and other industries. Two industries, packaging and wood converting (forest products), are assumed to be accounted for in the point source inventory and are not included in these estimates. The emissions from adhesives and sealants are broken into two subcategories: ***Solvent-Based*** (CES 83030) and ***Water-Based*** (CES 83063). Emission estimates for 1983 were updated to 1987 by using growth factors which are assumed to be representative of increases in emissions associated with the use of adhesives and sealants. [1]

Data for the emission estimates were taken from the Decision Resources article titled "Outlook for the U.S. Adhesives and Sealants Industry" [2] and from the SAIC report titled "Development and Improvement of Organic Compound Emissions Inventory for California." [3]

The Decision Resources article provided information on the 1983 national production of adhesives and sealants in construction, transportation, and all other industries. It was assumed that production equals usage. According to Henry J. Buccigross of Decision Resources, of the total amount of adhesives and sealants produced nationally in 1983, about 10 percent is solvent-based and 45 percent is water-based. The remainder of adhesives and sealants includes hot melts (25 percent) and other adhesives and sealants (20 percent) which have negligible emissions into the ambient air. [4] Based on the SAIC report, California's use of national production of adhesives and sealants was 12.3 percent.

The emission factors for TOG emissions from solvent-based adhesives and sealants for the transportation and other industries categories were based on 1980 data from the SAIC Report. The emission factors for TOG emissions from solvent-based adhesives and sealants used for the construction industry were based on the 1976 data from the EPA report. [5] The emission factors for TOG emissions from all water-based adhesives and sealants were based on data from Decision Resources. [2,4] The information from Decision Resources is the most recent and the most reliable data.

Table I shows the 1983 emission estimates for solvent-based adhesives. Table II shows emission estimates for water-based adhesives. Statewide emission estimates were distributed to counties based on construction trends of new non-residential and residential buildings in California [6] and are summarized in Table III and Table IV.

ASSUMPTIONS

1. Production of adhesives and sealants equals usage.

2. Data from Decision Resources and the SAIC report are reasonable bases for estimating usage of adhesives and sealants.

3. Two categories are accounted for in the point source inventory: packaging and wood converting (forest products).

4. Statewide emission estimates can be distributed to counties based on new non-residential and residential construction trend data for each county in California.

5. Emission factors derived from the SAIC report, the EPA report, the Decision Resources article, and a conversation with Henry J. Buccigross of Decision Resources are the most accurate and reliable data available at this time.

SAMPLE CALCULATIONS

1. Calculate national usage of solvent-based adhesives and sealants (assuming production equals usage):

$$\left(\text{National production of solvent-based adhesive} \times 10^{6}\ \text{lbs}\right) \times \text{\% solvent-based adhesive} \times \frac{1}{2{,}000\ \text{lbs/ton}}$$

= amount of solvent-based adhesives and sealants used in the U.S.

$$(1.320 \times 10^{6}\ \text{lbs}) \times 10\% \times \frac{1}{2{,}000\ \text{lbs/ton}} = 66{,}000\ \text{tons}$$

2. Calculate usage of solvent-based adhesives and sealants in California. According to the SAIC report, [3] California's fraction of the U.S. usage of solvent-based adhesives and sealants is 12.3 percent.

   66,000 tons x 12.3% = 8,118 tons

3. The emission factor for solvent-based adhesives and sealants was obtained by using a weighted average.

   $$950 \text{ lbs/ton} \times \frac{25{,}000 \text{ tons}}{66{,}000 \text{ tons}} + 1{,}400 \text{ lbs/ton} \times \frac{41{,}000 \text{ tons}}{66{,}000 \text{ tons}}$$

   = 1,230 lbs/ton

4. Calculate emissions from solvent-based adhesives and sealants in California.

   $$\text{Emissions} = \text{usage} \times \text{emission factor} \times \frac{1}{2{,}000 \text{ lbs/ton}}$$

   $$= \frac{8{,}118 \text{ tons} \times 1{,}230 \text{ lbs/ton}}{2{,}000 \text{ lbs/ton}}$$

   = 4,991 tons/year

   The statewide emissions are distributed based on California construction trends published by Security Pacific Bank in December 1983. [6] From this reference, the percent of new building construction value for each county relative to the state was estimated. If a county lies in two air basins, the split is made using population distribution. For example, to estimate emissions for Alameda County the calculation is as follows:

   Total CA TOG Emissions from Solvent-based emissions x % of New Building Valuation in Alameda County

   = TOG emissions in Alameda for solvent based adhesive

   = 4,991 tons/yr x 4.43% = 221.06 tons/yr

   The total emissions from solvent-based adhesives and sealants correspond to CES 83030. The same procedure of calculation is followed in estimating emissions from water-based adhesives and sealants corresponding to CES 83063.

REFERENCES

1. Air Resources Board. Technical Support Division, Emission Inventory Branch, Projections and Gridding Section. Growth Scenario TND85, Control Scenario CS1985 (February 23, 1990).

2. Barber, E. E., et al., Outlook for the U.S. Adhesives and Sealants Industry, Decision Resources (Feb. 1981).

3. Rogozen, M. B., et al., Development and Improvement of Organic Compound Emission Inventories for California, Draft Final Report, Systems Applications, Inc. for CARB Sacramento, CA contract no. A0-101-32 (1982).

4. Personal Communication with Henry L. Buccigross, Decision Resources (April 22, 1985) (617) 864-5770.

5. Johnson, W. L., Preliminary Draft of Industry Classification, Estimates of Adhesives Consumed, and Solvent Emissions. EPA Preliminary Draft, Research Triangle Park (1976).

6. Security Pacific Bank, 1983 "California Construction Trends" (Dec. 1983).

PREPARED BY

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December 1985

TABLE I

1983 CA Emission Estimates (tons TOG/yr) From
Solvent-Based Adhesives and Sealants

Industry	1983 U.S. Production ($x\ 10^6$)	% Solvent Based [1]	Amount of U.S. Solvent-Based (tons)	CA Use of National Production (tons)[3]	Emission Factors (lb/ton)	1983 CA Emissions (tons /yr)
Construction	500	10	25,000	12.3	950 [4]	1461
Transportation	410	10	20,500	12.3	1400 [3,5]	1765
All Others	410	10	20,500	12.3	1400 [3,5]	1765
Total	1,320		66,000			4991

TABLE II

1983 CA Emission Estimates (tons TOG/yr) From
Water-Based Adhesives and Sealants

Industry	1983 U.S. Production ($x\ 10^6$)	% Solvent Based [4]	Amount of U.S. Solvent-Based (tons)	CA Use of National Production (tons)[3]	Emission Factors (lb/ton)	1983 CA Emissions (tons /yr)
Construction	500	45	112,500	12.3	90	622.7
Transportation	410	45	92,500	12.3	90	512.0
All Others	410	45	92,500	12.3	90	512.0
Total	1,320		297,000			1,646.7

Table III
1987 Area Source Emissions
Activity: Manufacturing and Industrial
Process: Surface Coating
Entrainment: Adhesives Evap
Dimn: Adhesive
CES: 83030
Process Rate Unit: 1000 Gallons/Year

AB	County	Process Rate	TOG Emis. (Tons / Year)	CO Emis. (Tons / Year)	NOX Emis. (Tons / Year)	SOX Emis. (Tons / Year)	PM Emis. (Tons / Year)
GBV	ALPINE	0	0.00	0.00	0.00	0.00	0.00
	INYO	3	2.14	0.00	0.00	0.00	0.00
	MONO	0	0.00	0.00	0.00	0.00	0.00
LC	LAKE	39	24.72	0.00	0.00	0.00	0.00
LT	EL DORADO	11	7.15	0.00	0.00	0.00	0.00
	PLACER	6	4.51	0.00	0.00	0.00	0.00
MC	AMADOR	8	5.56	0.00	0.00	0.00	0.00
	CALAVERAS	19	12.05	0.00	0.00	0.00	0.00
	EL DORADO	26	16.50	0.00	0.00	0.00	0.00
	MARIPOSA	4	2.73	0.00	0.00	0.00	0.00
	NEVADA	21	13.67	0.00	0.00	0.00	0.00
	PLACER	10	6.94	0.00	0.00	0.00	0.00
	PLUMAS	10	6.26	0.00	0.00	0.00	0.00
	SIERRA	0	0.00	0.00	0.00	0.00	0.00
	TUOLUMNE	15	9.44	0.00	0.00	0.00	0.00
NC	DEL NORTE	4	2.95	0.00	0.00	0.00	0.00
	HUMBOLDT	17	10.66	0.00	0.00	0.00	0.00
	MENDOCINO	14	9.23	0.00	0.00	0.00	0.00
	SONOMA	26	16.24	0.00	0.00	0.00	0.00
	TRINITY	2	1.29	0.00	0.00	0.00	0.00
NCC	MONTEREY	90	55.33	0.00	0.00	0.00	0.00
	SAN BENITO	7	4.98	0.00	0.00	0.00	0.00
	SANTA CRUZ	83	51.02	0.00	0.00	0.00	0.00
NEP	LASSEN	4	2.94	0.00	0.00	0.00	0.00
	MODOC	2	1.22	0.00	0.00	0.00	0.00
	SISKIYOU	7	4.33	0.00	0.00	0.00	0.00
SC	LOS ANGELES	5304	3262.00	0.00	0.00	0.00	0.00
	ORANGE	4120	2533.80	0.00	0.00	0.00	0.00
	RIVERSIDE	1278	786.50	0.00	0.00	0.00	0.00
	SAN BERNARDINO	2118	1302.80	0.00	0.00	0.00	0.00
SCC	SAN LUIS OBISPO	130	80.20	0.00	0.00	0.00	0.00
	SANTA BARBARA	99	61.36	0.00	0.00	0.00	0.00
	VENTURA	246	151.38	0.00	0.00	0.00	0.00
SD	SAN DIEGO	1084	667.39	0.00	0.00	0.00	0.00
SED	IMPERIAL	22	13.78	0.00	0.00	0.00	0.00
	KERN	25	15.65	0.00	0.00	0.00	0.00
	LOS ANGELES	31	18.86	0.00	0.00	0.00	0.00
	RIVERSIDE	148	91.42	0.00	0.00	0.00	0.00
	SAN BERNARDINO	96	59.05	0.00	0.00	0.00	0.00
SF	ALAMEDA	58	142.71	0.00	0.00	0.00	0.00
	CONTRA COSTA	49	119.72	0.00	0.00	0.00	0.00
	MARIN	10	24.82	0.00	0.00	0.00	0.00
	NAPA	6	15.69	0.00	0.00	0.00	0.00
	SAN FRANCISCO	61	150.74	0.00	0.00	0.00	0.00
	SAN MATEO	21	52.56	0.00	0.00	0.00	0.00
	SANTA CLARA	91	223.01	0.00	0.00	0.00	0.00
	SOLANO	8	20.07	0.00	0.00	0.00	0.00
	SONOMA	4	8.76	0.00	0.00	0.00	0.00
SJV	FRESNO	147	90.55	0.00	0.00	0.00	0.00
	KERN	158	97.23	0.00	0.00	0.00	0.00
	KINGS	25	15.34	0.00	0.00	0.00	0.00
	MADERA	19	11.97	0.00	0.00	0.00	0.00
	MERCED	39	24.73	0.00	0.00	0.00	0.00
	SAN JOAQUIN	126	77.36	0.00	0.00	0.00	0.00
	STANISLAUS	64	39.86	0.00	0.00	0.00	0.00
	TULARE	66	40.80	0.00	0.00	0.00	0.00
SV	BUTTE	43	26.40	0.00	0.00	0.00	0.00
	COLUSA	2	1.99	0.00	0.00	0.00	0.00
	GLENN	3	2.21	0.00	0.00	0.00	0.00
	PLACER	84	51.85	0.00	0.00	0.00	0.00
	SACRAMENTO	340	209.74	0.00	0.00	0.00	0.00
	SHASTA	29	18.49	0.00	0.00	0.00	0.00
	SOLANO	18	11.20	0.00	0.00	0.00	0.00
	SUTTER	11	6.52	0.00	0.00	0.00	0.00
	TEHAMA	10	6.12	0.00	0.00	0.00	0.00
	YOLO	34	21.05	0.00	0.00	0.00	0.00
	YUBA	7	4.82	0.00	0.00	0.00	0.00
TOTAL		16665	10832.36	0.00	0.00	0.00	0.00

Fraction of Reactive Organic Gases (FROG): .8676
(Reactive Organic Gases (ROG) Emissions = TOG X FROG)
Fraction of PM10 (FRPM10):
(PM10 Emissions = PM X FRPM10)

Table IV
1987 Area Source Emissions
Activity:Manufacturing and Industrial
Process: Surface Coating
Entrainment: Water Based-Evap
Dimu: Adhesive
CES: 83063
Process Rate Unit: 1000 Gallons Per Year

AB	County	Process Rate	TOG Emis. (Tons / Year)	CO Emis. (Tons / Year)	NOX Emis. (Tons / Year)	SOX Emis. (Tons / Year)	PM Emis. (Tons / Year)
GBV	ALPINE	0	0.00	0.00	0.00	0.00	0.00
	INYO	16	0.75	0.00	0.00	0.00	0.00
	MONO	0	0.00	0.00	0.00	0.00	0.00
LC	LAKE	180	8.20	0.00	0.00	0.00	0.00
LT	EL DORADO	51	2.31	0.00	0.00	0.00	0.00
	PLACER	32	1.39	0.00	0.00	0.00	0.00
MC	AMADOR	40	1.85	0.00	0.00	0.00	0.00
	CALAVERAS	88	3.93	0.00	0.00	0.00	0.00
	EL DORADO	121	5.42	0.00	0.00	0.00	0.00
	MARIPOSA	19	0.87	0.00	0.00	0.00	0.00
	NEVADA	99	4.51	0.00	0.00	0.00	0.00
	PLACER	50	2.25	0.00	0.00	0.00	0.00
	PLUMAS	46	2.00	0.00	0.00	0.00	0.00
	SIERRA	0	0.00	0.00	0.00	0.00	0.00
	TUOLUMNE	69	3.15	0.00	0.00	0.00	0.00
NC	DEL NORTE	21	0.94	0.00	0.00	0.00	0.00
	HUMBOLDT	78	3.55	0.00	0.00	0.00	0.00
	MENDOCINO	67	3.08	0.00	0.00	0.00	0.00
	SONOMA	119	5.37	0.00	0.00	0.00	0.00
	TRINITY	9	0.39	0.00	0.00	0.00	0.00
NCC	MONTEREY	405	18.26	0.00	0.00	0.00	0.00
	SAN BENITO	36	1.66	0.00	0.00	0.00	0.00
	SANTA CRUZ	374	16.81	0.00	0.00	0.00	0.00
NEP	LASSEN	21	0.94	0.00	0.00	0.00	0.00
	MODOC	8	0.36	0.00	0.00	0.00	0.00
	SISKIYOU	32	1.36	0.00	0.00	0.00	0.00
SC	LOS ANGELES	4310	194.03	0.00	0.00	0.00	0.00
	ORANGE	3342	150.30	0.00	0.00	0.00	0.00
	RIVERSIDE	1040	46.88	0.00	0.00	0.00	0.00
	SAN BERNARDINO	1723	77.48	0.00	0.00	0.00	0.00
SCC	SAN LUIS OBISPO	587	26.41	0.00	0.00	0.00	0.00
	SANTA BARBARA	450	20.19	0.00	0.00	0.00	0.00
	VENTURA	1109	50.00	0.00	0.00	0.00	0.00
SD	SAN DIEGO	3143	141.45	0.00	0.00	0.00	0.00
SED	IMPERIAL	100	4.52	0.00	0.00	0.00	0.00
	KERN	114	5.15	0.00	0.00	0.00	0.00
	LOS ANGELES	138	6.25	0.00	0.00	0.00	0.00
	RIVERSIDE	670	30.12	0.00	0.00	0.00	0.00
	SAN BERNARDINO	433	19.49	0.00	0.00	0.00	0.00
SF	ALAMEDA	502	90.52	0.00	0.00	0.00	0.00
	CONTRA COSTA	421	75.92	0.00	0.00	0.00	0.00
	MARIN	87	15.69	0.00	0.00	0.00	0.00
	NAPA	55	9.85	0.00	0.00	0.00	0.00
	SAN FRANCISCO	530	95.26	0.00	0.00	0.00	0.00
	SAN MATEO	185	33.21	0.00	0.00	0.00	0.00
	SANTA CLARA	785	141.25	0.00	0.00	0.00	0.00
	SOLANO	70	12.77	0.00	0.00	0.00	0.00
	SONOMA	30	5.47	0.00	0.00	0.00	0.00
SJV	FRESNO	664	29.89	0.00	0.00	0.00	0.00
	KERN	712	32.05	0.00	0.00	0.00	0.00
	KINGS	111	5.04	0.00	0.00	0.00	0.00
	MADERA	87	3.95	0.00	0.00	0.00	0.00
	MERCED	181	8.21	0.00	0.00	0.00	0.00
	SAN JOAQUIN	568	25.59	0.00	0.00	0.00	0.00
	STANISLAUS	292	13.14	0.00	0.00	0.00	0.00
	TULARE	298	13.52	0.00	0.00	0.00	0.00
SV	BUTTE	193	8.76	0.00	0.00	0.00	0.00
	COLUSA	14	0.70	0.00	0.00	0.00	0.00
	GLENN	16	0.77	0.00	0.00	0.00	0.00
	PLACER	379	17.17	0.00	0.00	0.00	0.00
	SACRAMENTO	1537	69.26	0.00	0.00	0.00	0.00
	SHASTA	135	6.04	0.00	0.00	0.00	0.00
	SOLANO	82	3.70	0.00	0.00	0.00	0.00
	SUTTER	48	2.11	0.00	0.00	0.00	0.00
	TEHAMA	44	2.00	0.00	0.00	0.00	0.00
	YOLO	153	6.94	0.00	0.00	0.00	0.00
	YUBA	35	1.54	0.00	0.00	0.00	0.00
TOTAL		27354	1591.79	0.00	0.00	0.00	0.00

Fraction of Reactive Organic Gases (FROG): .9444
(Reactive Organic Gases (ROG) Emissions = TOG X FROG)
Fraction of PM10 (FRPM10):
(PM10 Emissions = PM X FRPM10)

Definitions of VOC and ROG

Last Revised September 2004

1. U.S. EPA Definition of VOC (Volatile Organic Compounds):

The U.S. Environmental Protection Agency (U.S. EPA) defines and uses the term Volatile Organic Compounds (VOC). The term VOC is defined in the Federal Register. The original definition of VOC made reference to the vapor pressure of the compounds (greater than 0.1 millimeter of mercury) as a determinant of volatility. However, the current definition relies solely on a list of exempted compounds having "negligible photochemical reactivity".

U.S. EPA periodically exempts additional compounds. A number of proposed exemptions are pending. A summary of petitions and rulemakings follows.

FINAL RULEMAKINGS AND OTHER ACTIONS:

- U.S. EPA exempted Methyl acetate, in response to petition from Eastman Chemical, April 9, 1998 (63 FR 17331), effective May 11, 1998.

- The Alliance for Responsible Atmospheric Policy, Arlington, Virginia, petitioned to exempt 22 compounds, primarily HFCs and HCFCs, but later withdrew five of these. U.S. EPA exempted 16 of the 17 requested compounds (excluding HCFC-150a). The final rule was published August 25, 1997 (62 FR 44900), effective September 24, 1997.

- In response to petitions, the U.S. EPA exempted HFC 43-10mee, HCFC 225ca, and HCFC 225cb. The final rule was published October 8, 1996 (61 FR 52848), and became effective November 7, 1996.

- Perchloroethylene was exempted by final rule published February 7, 1996 (61 FR 4588).

- Acetone was exempted by final rule published June 16, 1995 (60 FR 31633).

- U.S. EPA, OAQPS, held a workshop to evaluate aspects of its reactivity policy, such as a molar vs. gram basis for reactivity. The national workshop took place May 12-14, 1998 in North Carolina, and a Reactivity Research Working Group was formed to foster a public/private partnership to sponsor and guide scientific research regarding ozone reactivity.

PENDING RULEMAKINGS AND PETITIONS (as of June 18, 2004):

- Below is the list of Compounds for which U.S. EPA has Received Petitions Requesting VOC Exempt Status and for which U.S. EPA has Published no Final Action (as of June 18, 2004):

  1. **1-Bromopropane** (also known as **n-propyl bromide**) - submitted by Enviro Tech International, Alameda, CA (submitted 5/10/96). Petition also submitted by Albemarle Corp., Baton Rouge, LA (submitted November 18, 1997)

  2. **Methyl Bromide** - Chemical Manufacturers Association, Washington, DC (submitted (7/19/96)

  3. **n-Alkanes (C_{12} - C_{18})** - The Aluminum Association, Washington, DC (submitted 11/27/96)

  4. **Technical white oils** - The Printing Industries of America and Pennzoil Products Company (submitted 12/20/96)

  5. **t-Butyl Acetate** - ARCO Chemical Company [now Lyondell] (submitted 1/17/97) ***[Proposed September 30, 1999, see 64 FR 52731]***

  6. **Benzotrifluoride** - Occidental Chemical Company, Niagara Falls, NY (submitted 3/11/97). Also Kowa America Corp., New York, NY (submitted 7/29/02).

  7. **Carbonyl Sulfide (COS)** - E.I. du Pont de Nemours and Company (submitted 8/11/97). Petition also submitted by Texas Mid-Continent Oil & Gas Association (submitted December 5, 1997)

  8. **trans-1,2-dichloroethylene** - 3M Corporation, St. Paul, MN (submitted October 8, 1997)

9. **Dimethyl succinate** - Dibasic Esters Group, affiliated with the Synthetic Organic Chemical Manufacturers Association, Inc. (submitted October 14, 1997)

10. **Dimethyl glutarate** - Dibasic Esters Group, affiliated with the Synthetic Organic Chemical Manufacturers Association, Inc. (submitted October 14, 1997). Submitted in the same petition as for dimethyl succinate.

11. **Carbon Disulfide** - Texas Mid-Continent Oil & Gas Association, (submitted December 5, 1997)

12. **Acetonitrile** - BP Chemicals and GNI Chemicals Corporation, (submitted January 21, 1998)

13. **Toluene Diisocyanate (TDI)** - Chemical Manufacturers Association [The Diisocynate Panel of CMA reported the following members: ARCO Chemical Company, BASF Corporation, Bayer Corporation, The Dow Chemical Company, and ICI Americas, Inc.] (submitted January 22, 1998)

14. **HFC-227ea (1,1,1,2,3,3,3-heptafluoropropane)** - Great Lakes Chemical Corporation. (submitted February 18, 1998) ***[Proposed September 3, 2003, see 68 FR 52373]***

15. **Methylene Diphenyl Diisocyanate (MDI)** - Chemical Manufacturers Association [The Diisocynate Panel of CMA reported the following members: BASF Corporation, Bayer Corporation, The Dow Chemical Company, ICI Americas, Inc., and Lyondell Chemical Company], (submitted August 19, 1998)

16. **1,1,1,2,2,3,3-heptafluoro-3-methoxy-propane (n-$C_3F_7OCH_3$) (also known as HFE-7000)** - 3M Performance Chemicals and Fluids Division (submitted February 5, 1999) ***[Proposed September 3, 2003, see 68 FR 52373]***

17. **Propylene carbonate** - Huntsman Corporation, Austin, Texas (July 27, 1999)

18. **Methyl pivalate** - Exxon Chemical Company, Houston, TX (November 22, 1999)

19. **3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl) hexane (also known as HFE-7500 or L-15381)** - 3M Corporation, St. Paul, MN. (August 21, 2000). ***[Proposed September 3, 2003, see 68 FR 52373]***

20. **Methyl Formate** - Foam Supplies, Inc., Earth City, Missouri (February 12, 2002) ***[Proposed September 3, 2003, see 68 FR 52373]***

The complete federal definition and the list of exempted compounds to date are shown on the following page.

U.S. EPA Definition of VOC (as of September 2004): (based on final rules to date)

40 CFR Part 51 Section 51.100 Definitions.

(s) **Volatile organic compounds (VOC)** means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, which participates in atmospheric photochemical reactions.

(1) This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity:

methane;	[74-82-8]
ethane;	[74-84-0]
methylene chloride (dichloromethane);	[75-09-2]
1,1,1-trichloroethane (methyl chloroform);	[71-55-6]
1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113);	[76-13-1]
trichlorofluoromethane (CFC-11);	[75-69-4]
dichlorodifluoromethane (CFC-12);	[75-71-8]
chlorodifluoromethane (HCFC-22);	[75-45-6]
trifluoromethane (HFC-23);	[75-46-7]
1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114);	[76-14-2]
chloropentafluoroethane (CFC-115);	[76-15-3]
1,1,1-trifluoro-2,2-dichloroethane (HCFC-123);	[306-83-2]
1,1,1,2-tetrafluoroethane (HFC-134a);	[811-97-2]
1,1-dichloro-1-fluoroethane (HCFC-141b);	[1717-00-6]
1-chloro-1,1-difluoroethane (HCFC-142b);	[75-68-3]
2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124);	[2837-89-0]
pentafluoroethane (HFC-125);	[354-33-6]
1,1,2,2-tetrafluoroethane (HFC-134);	[359-35-3]
1,1,1-trifluoroethane (HFC-143a);	[420-46-2]
1,1-difluoroethane (HFC-152a);	[75-37-6]
parachlorobenzotrifluoride (PCBTF);	[98-56-6]
cyclic, branched, or linear completely methylated siloxanes;	[various]
acetone;	[67-64-1]
perchloroethylene (tetrachloroethylene);	[127-18-4]
3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca);	[422-56-0]
1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb);	[507-55-1]
1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC-43-10mee);	[138495-42-8]
difluoromethane (HFC-32);	[75-10-5]
ethylfluoride (HFC-161);	[353-36-6]
1,1,1,3,3,3-hexafluoropropane (HFC-236fa);	[690-39-1]
1,1,2,2,3-pentafluoropropane (HFC-245ca);	[679-86-7]
1,1,2,3,3-pentafluoropropane (HFC-245ea);	[24270-66-4]
1,1,1,2,3-pentafluoropropane (HFC-245eb);	[431-31-2]
1,1,1,3,3-pentafluoropropane (HFC-245fa);	[460-73-1]
1,1,1,2,3,3-hexafluoropropane (HFC-236ea);	[431-63-0]
1,1,1,3,3-pentafluorobutane (HFC-365mfc);	[406-58-6]
chlorofluoromethane (HCFC-31);	[593-70-4]
1-chloro-1-fluoroethane (HCFC-151a);	[1615-75-4]
1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a);	[354-23-4]
1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane ($C_4F_9OCH_3$);	[163702-07-6]
2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OCH_3$);	[163702-08-7]
1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane ($C_4F_9OC_2H_5$);	[163702-05-4]
2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ($(CF_3)_2CFCF_2OC_2H_5$);	[163702-06-5]
methyl acetate	[79-20-9]
and perfluorocarbon compounds which fall into these classes:	[various]

(I) Cyclic, branched, or linear, completely fluorinated alkanes;
(ii) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
(iii) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
(iv) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

(2) For purposes of determining compliance with emissions limits, VOC will be measured by the test methods in the approved State implementation plan (SIP) or 40 CFR Part 60, Appendix A, as applicable. Where such a method also

measures compounds with negligible photochemical reactivity, these negligibly-reactive compounds may be excluded as VOC if the amount of such compounds is accurately quantified, and such exclusion is approved by the enforcement authority.

(3) As a precondition to excluding these compounds as VOC or at any time thereafter, the enforcement authority may require an owner or operator to provide monitoring or testing methods and results demonstrating, to the satisfaction of the enforcement authority, the amount of negligibly-reactive compounds in the source's emissions.

(4) For purposes of Federal enforcement for a specific source, the EPA shall use the test methods specified in the applicable EPA-approved SIP, in a permit issued pursuant to a program approved or promulgated under Title V of the Act, or under 40 CFR Part 51, Subpart I or Appendix S, or under 40 CFR Parts 52 or 60. The EPA shall not be bound by any State determination as to appropriate methods for testing or monitoring negligibly-reactive compounds if such determination is not reflected in any of the above provisions.

- NOTE: Chemical Abstract Service (CAS) identification numbers have been included in brackets [ ] after the compounds for convenience.

2. California Air Resources Board's Definition of ROG (Reactive Organic Gases):

The California Air Resources Board's (ARB's) Emission Inventory Branch (EIB) uses the terms Total Organic Gases (TOG) and Reactive Organic Gases (ROG). California air pollution control districts report Total Organic Gases (TOG) to the Air Resources Board's emission inventory.

For each source category, the ARB derives a value for the Reactive Organic Gases (ROG) by multiplying the reported TOG by the Fraction of Reactive Organic Gases (FROG). Each source category is keyed to one of several hundred available chemical speciation profiles. For each category, the FROG value is calculated as the weight fraction of those species designated by the ARB as reactive in the speciation profile applicable to the category. The ARB's organic gas speciation profiles are available for download from the ARB's web site at http://www.arb.ca.gov or specifically at http://www.arb.ca.gov/ei/speciate/speciate.htm.

The relationships among these organic gas terms are summarized as follows:

TOG (Total Organic Gas)	-	**Exempt cmpds** [ARB list of methane, CFCs, etc.]	=	**ROG** (Reactive Organic Gas)
TOG (Total Organic Gas)	x	**FROG** (Fraction of Reactive Organic Gas)	=	**ROG** (Reactive Organic Gas)

Background Regarding Federal vs. State Exempt List: The original "Air Pollution Emission Inventory Program" manual, ARB, March 1982, listed the compounds which the ARB initially treated as exempted from ROG. The list differed somewhat from the U.S. EPA's list of exempted VOCs even at the time, in that ARB's definition of ROG did not exempt Ethane. As discussed in the prior section, U.S. EPA later exempted additional compounds from the federal definition of VOC as well.

Subsequently, the Air Resources Board was petitioned regarding exemptions from the ARB's regulations. The ARB staff formed a Reactive Organic Gas Technical Committee (ROGTC), made up of staff from the ARB's affected divisions and district representatives, to systematically evaluate the proposed exemption of these compounds. At a public hearing in September 1995, the Air Resources Board took action to revise the definition of "Volatile Organic Compounds" that is used in the consumer products regulations, based on the recommendations of the ROGTC. Methyl siloxanes were added to the list of exempted compounds, and parachlorobenzotrifluoride, acetone, and ethane were added to the list of exempted compounds with the qualifier that they are "low-reactive organic compounds which have been exempted by the U.S. EPA". Based on the ROGTC's analysis, the staff similarly modified the overall inventory definition of ROG to extend the Board's action on the consumer products regulation "VOC" definition to "ROG" for all inventory applications.

The Air Resources Board exempted Perchloroethylene from the definition of VOC in the consumer products regulations in November 1996. In response to industry petition, the Air Resources Board approved the exemption of Methyl acetate from the definition of VOC in the ARB's regulations for aerosol coatings, consumer products, and antiperspirants and deodorants at a public hearing on November 19, 1998.

As noted above, the ARB's list of compounds has two parts, including a second group of "low-reactive organic compounds which have been exempted by the U.S. EPA". This designation is used for compounds that are expected to have low, but not insignificant, ozone formation impacts in the near-term; however, their future new uses and emissions need to be tracked, and the exemption revisited, if necessary, to ensure there is no future degradation of air quality resulting from increased usage.

Likewise, some compounds that have been exempted from the definition of ROG or VOC may have other adverse impacts, such as toxicity, stratospheric ozone depletion potential, or greenhouse gas potential, that must be considered. Therefore, "exemption" from the definition of ROG or VOC is not an automatic endorsement for increased usage of a compound.

The complete definitions and the list of exempted compounds to date are shown on the following page

ARB's Definitions of TOG and ROG (as of September 2004):

Total Organic Gases (TOG) means compounds of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate.

Reactive Organic Gases (ROG) means any compound of carbon, excluding carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate, and excluding the following:

		CAS *	(TAC) **
(1)	methane;	[74-82-8]	
	methylene chloride (dichloromethane);	[75-09-2]	TAC
	1,1,1-trichloroethane (methyl chloroform);	[71-55-6]	TAC
	trichlorofluoromethane (CFC-11);	[75-69-4]	
	dichlorodifluoromethane (CFC-12);	[75-71-8]	
	1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113);	[76-13-1]	
	1,2-dichloro-1,1,2,2-tetrafluoroethane (CFC-114);	[76-14-2]	
	chloropentafluoroethane (CFC-115);	[76-15-3]	
	chlorodifluoromethane (HCFC-22);	[75-45-6]	
	1,1,1-trifluoro-2,2-dichloroethane (HCFC-123);	[306-83-2]	
	2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124);	[2837-89-0]	
	1,1-dichloro-1-fluoroethane (HCFC-141b);	[1717-00-6]	
	1-chloro-1,1-difluoroethane (HCFC-142b);	[75-68-3]	
	trifluoromethane (HFC-23);	[75-46-7]	
	pentafluoroethane (HFC-125);	[354-33-6]	
	1,1,2,2-tetrafluoroethane (HFC-134);	[359-35-3]	
	1,1,1,2-tetrafluoroethane (HFC-134a);	[811-97-2]	
	1,1,1-trifluoroethane (HFC-143a);	[420-46-2]	
	1,1-difluoroethane (HFC-152a);	[75-37-6]	
	cyclic, branched, or linear completely methylated siloxanes;	[various]	
	the following classes of perfluorocarbons:	[various]	
	(A) cyclic, branched, or linear, completely fluorinated alkanes;		
	(B) cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;		
	(C) cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and		
	(D) sulfur-containing perfluorocarbons with no unsaturations and with the sulfur bonds only to carbon and fluorine; and		
(2)	the following low-reactive organic compounds which have been exempted by the U.S. EPA:		
	acetone;	[67-64-1]	
	ethane;	[74-84-0]	
	methyl acetate;	[79-20-9]	
	perchloroethylene; and	[127-18-4]	TAC
	parachlorobenzotrifluoride (1-chloro-4-trifluoromethyl benzene).	[98-56-6]	

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* NOTE: Chemical Abstract Service (CAS) identification numbers have been included in brackets [ ] for convenience.

** NOTE: "TAC" indicates compounds that have been identified by the ARB as Toxic Air Contaminants (TAC). Their "exemption" from the definition of ROG or VOC is not an endorsement for their increased usage.

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California Air Toxics Program Background

This page updated August 12, 1999.

The Air Resources Board's (ARB/Board) statewide comprehensive air toxics program was established in the early 1980's. The Toxic Air Contaminant Identification and Control Act (AB 1807, Tanner 1983) created California's program to reduce exposure to air toxics. The Air Toxics "Hot Spots" Information and Assessment Act (AB 2588, Connelly 1987) supplements the AB 1807 program, by requiring a statewide air toxics inventory, notification of people exposed to a significant health risk, and facility plans to reduce these risks.

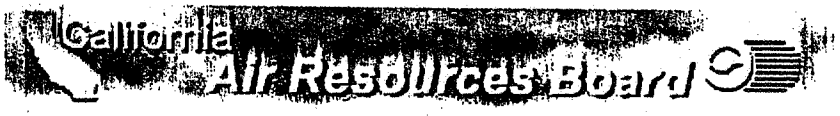
Under AB 1807, the ARB is required to use certain criteria in the prioritization for the identification and control of air toxics. In selecting substances for review, the ARB must consider criteria relating to "the risk of harm to public health, amount or potential amount of emissions, manner of, and exposure to, usage of the substance in California, persistence in the atmosphere, and ambient concentrations in the community" [Health and Safety Code Section 39666(f)]. AB 1807 also requires the ARB to use available information gathered from the AB 2588 program to include in the prioritization of compounds. This report includes available information on each of the above factors required under the mandates of the AB 1807 program. AB 1807 and AB 2588 are described in more detail below.

AB 1807 Program

In 1983, the California Legislature established a two-step process of risk identification and risk management to address the potential health effects from air toxic substances and protect the public health of Californians. During the first step (identification), the ARB and the Office of Environmental Health Hazard Assessment (OEHHA) determines if a substance should be formally identified as a toxic air contaminant (TAC) in California. During this process, the ARB and the OEHHA staff draft a report that serves as the basis for this determination. The ARB staff assesses the potential for human exposure to a substance and the OEHHA staff evaluates the health effects. A thorough public process assures accountability and public input. Public workshops are conducted to allow for direct exchanges of

Top of page | Air Toxics Program
Identification Program | Control Program

A department of the California Environmental Protection Agency.



Scientific Review Panel on Toxic Air Contaminants

This page updated August 11, 2003.

The Scientific Review Panel (SRP/Panel) is charged with evaluating the risk assessments of substances proposed for identification as toxic air contaminants by the Air Resources Board (ARB) and the Department of Pesticide Regulation (DPR). In carrying out this responsibility, the SRP reviews the exposure and health assessment reports and underlying scientific data upon which the reports are based, which are prepared by the ARB, DPR, and the Office of Environmental Health Hazard Assessment (OEHHA) pursuant to the sections 39660-39661 of the Health and Safety Code and sections 14022-14023 of the Food and Agriculture Code. These reports are prepared for the purpose of determining whether a substance or pesticide should be identified as a toxic air contaminant. For a directory of SRP members Click Here.

Scientific Review Panel Findings

- SRP findings on Metam Sodium and other Pesticidal Sources of Methyl Isothiocyanate. The findings were based on the Panel's review of the Department of Pesticide Regulation's draft report titled "Evaluation of Methyl Isothiocyanate (MITC) as a Toxic Air Contaminant" (MSWord 97 - 64KB) (PDF - 33KB).

- SRP findings based on our review of the Office of Environmental Health Hazard Assessment (OEHHA) report "Prioritization of Toxic Air Contaminants under the Children's Environmental Health Protection Act" (MSWord97 - 49 KB) or (PDF - 32KB).

- SRP letter to Air Resources Board: "Attachment 1, 'Health

Effects of Exposure to Methyl Tertiary Butyl Ether (MTBE)"
January 5, 2000 (MSWord97 - 21 KB) or (PDF - 4KB).

- SRP Pesticide Workshop Findings as adopted at the Panel's November 17, 1999 meeting (MSWord97 - 63KB) or (PDF - 56KB).

- SRP Findings on the Department of Pesticide Regulation's report: "Evaluation of Methyl Parathion as a Toxic Air Contaminant" as adopted at the Panel's September 16, 1999 meeting (MSWord97 - 65KB) or (PDF - 36KB).

- SRP Findings on the report: "Evaluation of S,S,S,-Tributyl Phosphorothithioate (DEF) as a Toxic Air Contaminant" as adopted at the Panel's April 13, 1999 meeting (PDF - 27K)

- SRP Findings on the report: "Proposed Identification of Diesel Exhaust as a Toxic Air Contaminant" as adopted at the Panel's April 22, 1998 meeting (WP6- 39K) or (PDF - 45K)

GoTo → **Notices of Public Meetings/Agendas and Meeting Transcripts**

The SRP welcomes written comments or submissions from all parties regarding a report, and in order to assure adequate review, the SRP does not accept written or oral comments from the public at its meetings. Comments and submissions should be submitted in advance to the ARB pursuant to the requirements specified in the notice of availability of a report for public review. These submissions are received and carefully reviewed and considered by the Panel members prior to the public meeting. For further information on the meeting or how to submit comments, please contact:

Jim Behrmann c/o Peter Mathews
Air Resources Board

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Fax: (916) 323-2393

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California Air Toxics Program

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A Department of the California Environmental Protection Agency

Toxic Air Contaminant Identification List - December 1999

This page updated November 28, 2000.

View the Toxic Air Contaminant List Now!
Substance by Category | Quick Reference

What is the list?

The Toxic Air Contaminant List ("List") is a list of 244 substances that have either been identified by the ARB as Toxic Air Contaminants (TACs) in California or are known or suspected to be emitted in California and have potential adverse health effects. The List is used by the ARB to identify which substances should be evaluated as toxic air contaminants in California and which TACs should be evaluated for health effects. The list categorizes by priority, the substances for review under the Assembly Bill 1807 Toxic Air Contaminant Program.

What is the purpose of the list of substances?

The purpose of the List is to assist the ARB staff with the selection of pollutants for review as TACs. In addition, the list fulfills the requirements of state law by setting priorities for the review of listed substances, informs the public of the substances under evaluation, and provides the public with the opportunity to comment.

How was the list of substances developed?

The process the ARB staff uses to update the List is comprehensive and includes setting priorities through a detailed ranking or scoring system. In addition, the process includes peer and public review of potential TACs with the Office of Environmental Health Hazard Assessment, Scientific Review Panel, Department of Pesticide Regulation, and local Air Pollution Control Districts.

How do I look at the list?

Toxic Air Contaminant Identification List

December 1999

This page updated March 16, 2001.

Quick Reference Format

I. TACs

II. Candidate TACs

I. Substances identified as Toxic Air Contaminants by the Air Resources Board, pursuant to the provisions of AB 1807** and AB 2728** (includes all Hazardous Air Pollutants listed in the Federal Clean Air Act Amendments of 1990).

Information within the square brackets refers to the corresponding subcategory on the Substances By Category version of the list. Click on a subcategory to go it.

Acetaldehyde [IIa]
Acetamide [IIa]
Acetonitrile [IVa]
Acetophenone [IVa]
2-Acetylaminofluorene [V]
* Acrolein [IIa]
Acrylamide [IIa]
Acrylic acid [IIa]
Acrylonitrile [IIa]
Allyl chloride [IIa]
4-Aminobiphenyl [V]
Aniline [IIa]
o-Anisidine [IVa]
Antimony compounds (Note 4) [IIa]
*+ Inorganic Arsenic and Arsenic compounds (Note 4) [IIa] (inorganic including arsine)
* Asbestos [IIa] [asbestiform varieties of serpentine (chrysotile), riebeckite (crocidolite), cummingtonite-grunerite

Ethylidene dichloride (1,1-Dichloroethane) [IIa]
Fine mineral fibers (Note 13) [IVa]
*+ Formaldehyde [IIa]
Glycol ethers (Note 7) [IIa]
Heptachlor [V]
Hexachlorobenzene [IIa]
Hexachlorobutadiene [V]
Hexachlorocyclopentadiene [V]
Hexachloroethane [IIa]
Hexamethylene-1,6-diisocyanate [IIa]
Hexamethylphosphoramide [V]
Hexane [IIa]
Hydrazine [IIa]
Hydrochloric acid [IIa]
Hydrogen fluoride (Hydrofluoric acid) [IIa]
Hydroquinone [IVa]
Isophorone [IIa]
* Inorganic Lead and Inorganic lead compounds (includes elemental lead) (Note 4 & 8) [IIa]
Lead and compounds (Note 4) [IIa]

(amosite), tremolite, actinolite, and anthophyllite]
- Benzene (including benzene from gasoline) [IIa]
- Benzidine [V]
- Benzotrichloride [V]
- Benzyl chloride [IIa]
- Beryllium Compounds (Note 4) [IIa]
- Biphenyl [IVa]
- Bis(chloromethyl)ether [IIa]
- Bis(2-ethylhexyl)phthalate (DEHP) [IIa]
- Bromoform [V]
- 1,3-Butadiene [IIa]
- Cadmium and cadmium compounds (Note 4) [IIa]
- (metallic cadmium and cadmium compounds)
- Calcium cyanamide [V]
- Caprolactam [V]
- Captan [VI]
- Carbaryl [VI]
- Carbon disulfide [IIa]
- Carbon tetrachloride (Tetrachloromethane) [IIa]
- Carbonyl sulfide [IVa]
- Catechol [IVa]
- Chloramben [V]
- Chlordane [V]
- Chlorinated dibenzo-p-dioxins and dibenzofurans (Note 5) [IIa]
- 2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) [IIa]
- Chlorine [IIa]
- Chloroacetic acid [IVa]
- 2-Chloroacetophenone [VI]
- Chlorobenzene [IIa]
- Chlorobenzilate [IVa]
- Chloroform [IIa]
- Chloromethyl methyl ether [V]
- Chloroprene [IVa]
- Chromium and Compounds (Note 4) [IIa]
- Chromium VI (Hexavalent chromium) [IIa]
- Cobalt Compounds (Note 4) [IIa]
- Coke Oven Emissions [V]
- Cresols/Cresylic acid (isomers and mixture) [IIa]
- m-Cresol [VI]

(does not include elemental lead)
- Lindane [IIa]
- Maleic anhydride [IIa]
- Manganese and compounds (Note 4) [IIa]
- Mercury and compounds (Note 4) [IIa]
- Methanol [IIa]
- Methoxychlor [VI]
- Methyl bromide (Bromomethane) [IIa]
- Methyl chloride (Chloromethane) [IVa]
- Methyl chloroform (1,1,1-Trichloroethane) [IIa]
- Methyl ethyl ketone (2-Butanone) [IIa]
- Methyl hydrazine [IVa]
- Methyl iodide (Iodomethane) [V]
- Methyl isobutyl ketone (Hexone) [IVa]
- Methyl isocyanate [V]
- Methyl methacrylate [IIa]
- Methyl tertiary butyl ether (MTBE) [IIa][IIIa]
- 4,4'-Methylene bis(2-chloroaniline) [IIa]
- Methylene chloride (Dichloromethane) [IIa]
- 4,4-Methylenedianiline [IIa]
- Methylene diphenyl diisocyanate (MDI) [IIa]
- Naphthalene [IIa]
- Nickel and compounds (Note 4) [IIa]
- (metallic nickel & inorganic nickel compounds)
- Nitrobenzene [IIa]
- 4-Nitrobiphenyl [V]
- 4-Nitrophenol [V]
- 2-Nitropropane [IIa]
- N-Nitroso-N-methylurea [V]
- N-Nitrosodimethylamine [IIa]
- N-Nitrosomorpholine [IIa]
- Parathion [V]
- Particulate emissions from diesel-fueled engines [IIa]
- Pentachloronitrobenzene (Quintozene) [IVa]
- Pentachlorophenol [IIa]
- Perchloroethylene (Tetrachloroethylene) [II]
- Phenol [IIa]
- p-Phenylenediamine [IVa]
- Phosgene [IIa]

o-Cresol [V]
p-Cresol [V]
Cumene [IVa]
+ Cyanide compounds (Note 4&11) [IIa]
+ 2,4-D, salts and esters [VI]
DDE (p,p-Dichlorodiphenyldichloroethylene) [V]
Diazomethane [V]
Dibenzofuran [IVa]
1,2-Dibromo-3-chloropropane (DBCP) [V]
Dibutylphthalate [IVa]
+ 1,4-Dichlorobenzene (p-Dicholorobenzene) [IIa]
3,3'-Dichlorobenzidene [IIa]
Dichloroethyl ether (Bis(2-chloroethyl) ether) [V]
+ 1,3-Dichloropropene (Telone)[IVa]
+ Dichlorvos (DDVP) [VI]
Diethanolamine (Note 6) [IIa]
N,N-Diethyl aniline (N,N-Dimethylaniline) [V]
Diethyl sulfate [V]
3,3'-Dimethoxybenzidine [V]
4-Dimethyl aminoazobenzene [V]
3,3-Dimethyl benzidine (o-Tolidine) [V]
Dimethyl carbamoyl chloride [V]
Dimethyl formamide [IIa]
1,1-Dimethyl hydrazine [IVa]
Dimethyl phthalate [IVa]
Dimethyl sulfate [IVa]
4,6-Dinitro-o-cresol, and salts [V]
2,4-Dinitrophenol [V]
2,4-Dinitrotoluene [V]
1,4-Dioxane (1,4-Diethyleneoxide) [IIa]
1,2-Diphenylhydrazine [V]
Epichlorohydrin (1-Chloro-2,3-epoxypropane) [IIa]
1,2-Epoxybutane [IIa]
Ethyl acrylate [IVa]
Ethyl benzene [IIa]
Ethyl carbamate (Urethane) [IIa]
Ethyl chloride (Chloroethane) [IIa]
• Ethylene dibromide (1,2-Dibromoethane) [IIa]
• Ethylene dichloride (1,2-Dichloroethane) [IIa]
Ethylene glycol [IIa]
Phosphine [IIa]
+ Phosphorus [IIa]
Phthalic anhydride [IIa]
Polychlorinated biphenyls (PCBs) [IIa]
Polycyclic organic matter (POM) (Note 9) [IIa][IIIa][IVa]
Benzo[a]pyrene (Note 10) [IIa]
1,3-Propane sultone [IIa]
beta-Propiolactone [V]
Propionaldehyde [IVa]
+ Propoxur (Baygon) [VI]
Propylene dichloride (1,2-Dichloropropane) [IVa]
+ Propylene oxide [IIa]
1,2-Propylenimine (2-Methyl aziridine) [IVa]
Quinoline [V]
Quinone [V]
Radionuclides (including radon) (Note 12) [IVa]
Selenium and compounds (Note 4) [IIa]
Styrene [IIa][IIIa]
Styrene oxide [IIa]
1,1,2,2-Tetrachloroethane [IIa]
Titanium tetrachloride [IVa]
Toluene [IIa]
2,4-Toluene diamine (2,4-Diaminotoluene) [V]
Toluene-2,4- diisocyanate [IIa]
o-Toluidine [V]
Toxaphene (Chlorinated camphene) [V]
1,2,4-Trichlorobenzene [IVa]
1,1,2-Trichloroethane [IIa]
• Trichloroethylene [IIa]
2,4,5-Trichlorophenol [V]
2,4,6-Trichlorophenol [IIa]
Triethylamine [IIa]
+ Trifluralin [VI]
2,2,4-Trimethylpentane [IVa]
Vinyl acetate [IIa]
Vinyl bromide [V]
• Vinyl chloride [IIa]
Vinylidene chloride (1,1-Dichloroethylene) [IIa]
+ Xylenes (isomers and mixture) [IIa]

Ethylene oxide (1,2-Epoxyethane) [IIa]
Ethylene thiourea [IIa]

m-Xylene [IIa]
o-Xylene [IIa]
p-Xylene [IIa]

II. Substances NOT identified as Toxic Air Contaminants, known to be emitted from stationary source facilities, which are being evaluated for entry into Category I. Factors considered in this evaluation include carcinogenic and noncarcinogenic health effects, emissions and exposure in California.

- Aluminum and Compounds (Note 4) [IVb]
- Ammonia [IIb]
- Ammonium nitrate [IVb]
- Ammonium sulfate [IVb]
- Barium and Compounds (Note 4) [IVb]
- Benzoyl chloride [IVb]
- Bis(2-ethylhexyl)adipate [IVb]
- Bromine and compounds (inorganic) (Note 4) [IVb]
- Butyl acrylate [IVb]
- n-Butyl alcohol [IVb]
- sec-Butyl alcohol [IVb]
- tert-Butyl alcohol [IVb]
- Butyl benzyl phthalate [IVb]
- Carbon black and Carbon black extracts [IVb]
- Chlorinated fluorocarbons [IVb]
- Chlorine dioxide [IIb]
- Chlorophenols [IVb]
- Chloropicrin [IIb]
- Copper and Compounds (Note 4) [IIb]
- Creosotes [IIb]
- Crystalline silica [IIIb]
- Cumene hydroperoxide [IVb]
- Cyclohexane [IVb]
- Decabromodiphenyl oxide [IVb]
- Dialkylnitrosamines [IVb]
- Diaminotoluene (mixed isomers) [IVb]
- Dicofol [IVb]
- Environmental Tobacco Smoke (Note 14) [IVb]
- Ethylene [IIb]
- Gasoline vapors [IVb]
- Glutaraldehyde [IVb]
- Hexachlorocyclohexanes [IIb]
- Hydrogen sulfide [IIb]
- Isopropyl alcohol [IIb]
- 4,4'-Isopropylidenediphenol [IVb]
- Michler's ketone [IIb]
- Molybdenum trioxide [IVb]
- Nitric acid [IIb]
- Nitrilotriacetic acid [IVb]
- Peracetic acid [IVb]
- 2-Phenylphenol [IVb]
- Phosphoric acid [IIb]
- Propene [IVb]
- Silver and Compounds (Note 4) [IIb]
- Sodium hydroxide [IIb]
- Sulfuric acid [IIb]
- Terephthalic acid [IVb]
- Thiourea [IVb]
- 1,2,4-Trimethylbenzene [IVb]
- Zinc and Compounds (Note 4) [IIb]

Footnotes

Substances which have already been identified by the Air Resources Board as Toxic Air Contaminants through a comprehensive AB 1807 risk assessment and which have health values developed by the Office of Environmental Health Hazard Assessment and approved by the Scientific Review Panel. A full risk assessment report is available

**	AB 1807, Statutes 1983, chapter 1047, Health & Safety Code sections 39650 et. seq. AB 2728, Statutes 1992, chapter 1161, Health & Safety Code sections 39655 et. seq.
a	To be listed as a Toxic Air Contaminant, these substances will go though a comprehensive AB 1807 risk assessment.
0	These substances have been nominated for the development of additional health values.
+	These substances are active ingredients in pesticides in California. For further information regarding the pesticidal uses of these compounds, please contact the Department of Pesticide Regulation.
Note4:	For all listings above which contain the word "compounds" and for glycol ethers, the following applies: Unless otherwise specified, these listings are defined as including any unique chemical substance that contains the named chemical (i.e, antimony, arsenic, etc.) as part of that chemical's infrastructure.
Note 5:	Chlorinated dibenzo-*p*-dioxins and dibenzofurans: The cancer potency value for 2,3,7,8-tetrachlorodibenzo-*p*-dioxin was determined for the identification of chlorinated dioxins and dibenzofurans as toxic air contaminants in 1986. At that time, the Board identified dibenzo-*p*-dioxins and dibenzofurans chlorinated in the 2,3,7, and 8 positions and containing 4,5,6, or 7 chlorine atoms as toxic air contaminants. Since 1986, International Toxicity Equivalency Factors (ITEFs) have been developed which are used to evaluate the cancer risk due to exposure to samples containing mixtures of chlorinated dibenzo-*p*-dioxins and dibenzofurans. ITEFs are numerical factors that express the toxicity of an individual chlorinated dibenzo-*p*-dioxin or dibenzofuran relative to the toxicity of 2,3,7,8-tetrachlorodibenzo-*p*-dioxin. ITEFs are listed for 16 chlorinated dibenzo-*p*-dioxins and dibenzofurans.
Note 6:	Diethanolamine: There is a 1997 draft report by the National Toxicology Program that shows evidence of carcinogenic activity in mice. (This may result in a change of the cancer classification.)
Note 7:	Glycol ethers: Includes mono- and di-ethers of ethylene glycol, diethylene glycol, and triethylene glycol (R $(OCH_2CH_2)_n$ -OR' where n = 1,2 or 3 R = alkyl or aryl groups R' = R,H, or groups which, when removed, yield glycol ethers with the structure: $R(OCH_2CH)_n$-OH. Polymers are excluded from the glycol category.
Note 8:	Inorganic Lead: Due to information on non-cancer health effects showing no identified threshold, no Reference Exposure Level has been developed. However, guidelines for assessing noncancer health impacts are currently being developed by ARB staff.
Note 9:	Polycyclic organic matter: Includes organic compounds with more than one benzene ring, and which have a boiling point greater than or equal to 100 ^{o}C
Note 10:	Benzo[a]pyrene: Potency Equivalency Factors (PEF) have been developed for 24 polycyclic aromatic hydrocarbons (PAHs). Using benzo[a]pyrene as a reference compound, a weighting scheme for PAHs was

developed in the 1994 Air Resources Board document entitled, *Benzo[a]pyrene as a Toxic Air Contaminant*. When a specific potency value is developed for a chemical, it should be used in place of the PEF.

Note 11: Cyanide compounds: X'CN where X=H' or any other group where a formal dissociation may occur. For example, KCN or $Ca(CN)_2$

Note 12: Radionuclides: A type of atom which spontaneously undergoes radioactive decay

Note 13: Fine mineral fibers: Includes mineral fiber emissions from facilities manufacturing or processing glass, rock, or slag fibers (or other mineral derived fibers) of average diameter 1 micrometer or less

Note 14: Environmental tobacco smoke: An AB 1807-type of health assessment for Environmental Tobacco Smoke was conducted by the Office of Environmental Health Hazard Assessment (OEHHA) and was approved by the Scientific Review Panel on June 19, 1997. The Air Resources Board accepted the report from OEHHA on October 23, 1997 and subsequently forwarded to the Department of Health Services' Tobacco Control Program for appropriate action.

Substance by Category Format | Final Staff Report | 1997 TAC Fact Sheets

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A department of the California Environmental Protection Agency

METHYL ETHYL KETONE

Methyl ethyl ketone is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 78-93-3 $C_2H_5COCH_3$

Molecular Formula: C_4H_8O

Methyl ethyl ketone is a flammable, colorless liquid with an acetone-like, sweet, pungent odor. It is soluble in four parts water and miscible with alcohol, ether, acetone, and benzene. It is lighter than water and may be expected to float while rapidly dissolving (HSDB, 1991).

Physical Properties of Methyl Ethyl Ketone

Synonyms: 2-butanone; ethyl methyl ketone; MEK; 2-oxobutane

Molecular Weight:	72.10
Boiling Point:	79.6 °C
Melting Point:	-86.35 °C
Flash Point:	-6 °C (21 °F) (closed cup)
Vapor Pressure:	90.6 mm Hg at 25 °C
Vapor Density:	2.41 (air = 1)
Density/Specific Gravity:	0.805 at -20/4 °C (water = 1)
Log/Octanol Partition Coefficient:	0.29
Henry's Law Constant:	1.05×10^{-5} atm-m^3/mole
Conversion Factor:	1 ppm = 2.95 mg/m^3

(HSDB, 1991; Merck, 1989; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Methyl ethyl ketone is used as a solvent for lacquers, adhesives, rubber cement, printing inks, and paint removers, in cleaning solutions, as a catalyst, and as a carrier. Cigarette smoke and gasoline exhaust are also sources of methyl ethyl ketone. Methyl ethyl ketone has been detected or quantified in motor vehicle exhaust by the Air Resources Board (ARB) (ARB, 1995e).

The primary stationary sources that have reported emissions of methyl ethyl ketone in

California are millwork, veneer, and plywood manufacturers, manufacturers of wood furniture, and manufacturers of rubber and plastic footwear (ARB, 1997b).

B. Emissions

The total emissions of methyl ethyl ketone from stationary sources in California are estimated to be at least 290,000 pounds per year, based on data reported under the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

Methyl ethyl ketone occurs naturally in volcanos, forest fires, products of biological degradation, and is a natural component of food (Howard, 1990).

AMBIENT CONCENTRATIONS

Methyl ethyl ketone is routinely monitored by the Air Resources Board statewide air toxics network. The network's mean concentration of methyl ethyl ketone from January 1996 to December 1996 is estimated to be 0.32 micrograms per cubic meter ($\mu g/m^3$) or 0.11 parts per billion (ppb) (ARB, 1997c).

The United States Environmental Protection Agency (U.S. EPA) has also compiled ambient concentration data for methyl ethyl ketone from several locations throughout the United States from 1972-87. A mean ambient concentration of 1.4 $\mu g/m^3$ (0.47 ppb) was derived from these data (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

No information about the indoor sources and concentrations of methyl ethyl ketone was found in the readily-available literature.

ATMOSPHERIC PERSISTENCE

If released to the atmosphere, methyl ethyl ketone will exist primarily in the gas phase. The dominant tropospheric loss process of methyl ethyl ketone appears to be reaction with the hydroxyl (OH) radical, with photolysis being unimportant. The calculated half-life and lifetime of methyl ethyl ketone due to reaction with the OH radical are 9 days and 13 days, respectively. The products of the OH radical reaction are acetaldehyde, formaldehyde and, in the presence of nitrogen dioxide (NO_2), peroxyacetyl nitrate (PAN) (Atkinson, 1994).

AB 2588 RISK ASSESSMENT INFORMATION

Although methyl ethyl ketone is reported as being emitted in California from stationary sources no health values (cancer or non-cancer) are listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to methyl ethyl ketone are inhalation, ingestion, and dermal contact (Sittig, 1991).

Non-Cancer: Exposure to methyl ethyl ketone vapors can cause eyes, nose, throat, and respiratory tract irritation. Methyl ethyl ketone is a central nervous system depressant. Methyl ethyl ketone enhances the neurotoxicity of n-hexane (U.S. EPA, 1994a).

The U.S. EPA has established a Reference Concentration (RfC) of 1.0 milligram per cubic meter for methyl ethyl ketone, based on decreased fetal birth weight in mice. The U.S. EPA estimates that inhalation of this concentration or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects. The U.S. EPA has established an oral Reference Dose (RfD) for methyl ethyl ketone of 0.6 milligrams per kilogram per day, based on decreased fetal birth weights in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects (U.S. EPA, 1994a).

No information was located on adverse reproductive effects of methyl ethyl ketone in humans. Retardation of fetal development and fetal malformations were reported in mice exposed to methyl ethyl ketone by inhalation (U.S. EPA, 1994a).

Cancer: No information is available regarding carcinogenic effects in humans from exposure to methyl ethyl ketone. The U.S. EPA has placed methyl ethyl ketone in Group D: Not classifiable as a carcinogen, based on lack of data in humans and animals (U.S. EPA, 1994a). The International Agency for Research on Cancer has not classified methyl ethyl ketone for carcinogenicity (IARC, 1987a).

State of California
AIR RESOURCES BOARD

Initial Statement of Reasons for Proposed Amendments to the California Aerosol Coating Products, Antiperspirants and Deodorants, and Consumer Products Regulations, Test Method 310, and Airborne Toxic Control Measure for Para-dichlorobenzene Solid Air Fresheners and Toilet/Urinal Care Products

Volume I:
Executive Summary

EXECUTIVE SUMMARY

A. INTRODUCTION

This report is the Initial Statement of Reasons for Proposed Rulemaking required by the California Administrative Procedure Act. In this report, the Air Resources Board (ARB/Board) staff presents the proposed amendments (the "2004 Amendments") to the California Regulation for Reducing Volatile Organic Compound (VOC) Emissions from Consumer Products (the "Consumer Products Regulation"), Regulation for Reducing Volatile Organic Compound Emissions from Antiperspirants and Deodorants ("Antiperspirants and Deodorants Regulation"), Regulation for Reducing the Ozone Formed from Aerosol Coating Product Emissions (the "Aerosol Coating Products Regulation") and to test Method 310. We are also proposing an Airborne Toxic Control Measure (ATCM) for Para-dichlorobenzene (PDCB) Solid Air Fresheners and Toilet/Urinal Care Products. Appendix A contains the proposed amendments.

The proposed 2004 Amendments are designed to meet the ARB's statutory requirement to achieve the maximum feasible reductions from consumer products, to meet the 2003 State and Federal State Implementation Plan for Ozone (SIP) commitments, and fulfill the requirements of a lawsuit settlement agreement with environmental groups regarding ARB's progress under the SIP (U.S. District Court, Central District of CA, Case No. CV-97-6916 JSL (SHx)).

In this Executive Summary, we provide a discussion of the staff's proposed amendments (the "2004 Amendments") to the Consumer Products Regulation, the Antiperspirants and Deodorants Regulation, the Aerosol Coating Products Regulation and test Method 310, and explain the rationale for the proposed changes. We also summarize the proposed ATCM for PDCB. A more detailed discussion in Chapter V of the Technical Support Document is intended to satisfy the requirements of Government Code section 11346.2(a)(1), which requires that a noncontrolling "plain English" summary of the regulation be made available to the public.

B. HISTORY AND BACKGROUND

1. Consumer Products Emissions

A consumer product is defined as a chemically formulated product used by household and institutional consumers. Consumer products include, but are not limited to: detergents; cleaning compounds; polishes; floor finishes; cosmetics; personal care products such as antiperspirants and hairsprays; home, lawn and garden products; disinfectants; sanitizers; automotive specialty products; and aerosol paints. Emissions from other paint products, such as furniture or architectural coatings, are not part of ARB's consumer products program because local air districts regulate them.

Consumer products are a significant source of VOC emissions in California and contribute to the formation of both ozone and particulate matter pollution. Although each consumer product may seem to be a small source of emissions, the cumulative use of these products by over 35 million Californians results in significant emissions. Consumer products accounted for approximately 267 tons per day (tpd) of VOC emissions in the year 2000, which comprised about eight percent of the total man-made VOC emissions statewide. Even with significant reductions from control measures adopted by ARB factored in, due to growth, consumer products emissions are projected to be 260 tpd by 2010 and at that time make up about 12 percent of the VOC emissions projected to be emitted. Further reductions in VOC emissions from consumer products and other VOC sources are needed if ozone standards are to be achieved.

As a result of several regulations adopted by the ARB over the last fifteen plus years, emissions from consumer products and aerosol coatings have decreased significantly, and continued reductions are projected through 2005. As a result of these measures, emissions statewide from consumer products will have been reduced by over 130 tpd VOC (40 percent reduction) by 2005. Due to population growth, and without additional controls, staff expects the trend of emissions reductions to reverse once the last of the already adopted standards takes effect in 2005.

2. Consumer Product Regulations Adopted to Date

In 1988, the Legislature enacted the California Clean Air Act (CCAA or "the Act"), which declared that attainment of the California state ambient air quality standards is necessary to promote and protect public health, particularly of children, older people, and those with respiratory diseases. The Legislature also directed that these standards be attained by the earliest practicable date.

The CCAA added section 41712 to the California Health and Safety Code (HSC), which requires the ARB to adopt regulations to achieve the maximum feasible reduction in reactive organic compounds (ROCs) emitted by consumer products (note: ROC is equivalent to VOC). As part of the regulatory adoption process, the ARB must determine that adequate data exist for it to adopt the regulations. The ARB must also find that the regulations are necessary, technologically and commercially feasible, and do not eliminate a product form. In enacting section 41712, the Legislature gave the ARB clear new authority to control emissions from consumer products, an area that had previously been subject to very few air pollution control regulations.

To date, the Board has adopted the following regulations to fulfill the requirements of the California Clean Air Act as it pertains to consumer products:

- Antiperspirants and Deodorants Regulation
- Consumer Products Regulations
- Alternative Control Plan
- Aerosol Coating Products Regulation
- Hairspray Credit Program Regulation

Details pertaining to each of the above listed regulations can be found in Appendix B of the Technical Support Document for this rulemaking.

3. California's SIP and Consumer Products

On October 23, 2003, the ARB adopted *the Proposed 2003 State and Federal Strategy for the California State Implementation Plan* (Statewide Strategy) which reaffirms the ARB's commitment to achieve the health-based air quality standards through specific near-term actions and the development of additional longer-term strategies. The Statewide Strategy identifies the Board's near-term regulatory agenda to reduce ozone and particulate matter by establishing enforceable targets to develop and adopt new measures for each year from 2003 to 2006, including commitments for the Board to consider 19 specific measures. It also sets into motion a concurrent initiative to identify longer-term solutions to achieve the full scope of emission reductions needed to meet federal air quality standards in the South Coast and San Joaquin Valley by 2010. In addition to meeting federal requirements, this Statewide Strategy ensures continued progress towards California's own health-based air quality standards.

The ARB and local air districts are in the process of updating the California SIP to show how each region in the state will meet the federal air quality standards. The measures outlined in the adopted Statewide Strategy are being incorporated into these SIP revisions. The South Coast's 2003 Air Quality Management Plan was adopted by the South Coast Air Quality Management District Governing Board on August 1, 2003. The ARB approved the local SIP element on October 23, 2003, and on January 9, 2004, the ARB submitted to the United States Environmental Protection Agency (U.S. EPA) both the Statewide Strategy and the 2003 South Coast SIP as revisions to the California SIP. The new SIP updates all elements of the approved 1994 SIP and includes additional consumer products measures. Upon approval by U.S. EPA, the 2003 SIP will replace the State's commitments in the 1994 SIP. The ARB is currently working with the San Joaquin Valley Unified Air Pollution Control District on a revision to the San Joaquin Valley's ozone SIP. The revised San Joaquin Valley SIP is scheduled for consideration by the District's Governing Board and by the ARB later this year.

Together with significant reductions from stationary industrial facilities, mobile sources, and other areawide sources, the reductions in the consumer products element of the SIP are an essential part of California's effort to attain the air quality standards. Two specific measures and one longer term, less specific measure from the Statewide Strategy and the 2003 South Coast SIP are intended to reduce emissions from consumer products:

- **Measure CONS-1: Set New Consumer Products Limits for 2006.** The ARB committed to develop a measure to be proposed to the Board between 2003 and 2004, and implemented by 2006, that would achieve VOC emission reductions from consumer products of at least 2.3 tons per day (tpd) in the South Coast Air Basin in

2010. Statewide, this measure would achieve 5.3 tpd in emission reductions by 2010.

- **Measure CONS-2: Set New Consumer Products Limits for 2008-2010.** The ARB committed to develop new consumer product category limits to be proposed to the Board between 2006 and 2008, with implementation in 2008 and 2010, that would achieve VOC emission reductions from consumer products of between 8.5 tpd and 15 tpd in the South Coast Air Basin in 2010. Statewide, this measure would achieve 20-35 tpd in emission reductions by 2010.

- **Further Reductions from Consumer Products.** In addition, it is expected that further emission reductions will be needed from all source categories, including consumer products, to meet the long-term emission reduction targets included in the South Coast SIP. As such there is an ongoing commitment to pursue additional technologically and commercially feasible reductions in consumer product emissions.

The proposed amendments to the Consumer Products Regulation presented in this report are intended to fulfill the commitment for SIP measure CONS-1.

On April 15, 2004, U.S. EPA designated all or parts of 35 counties nonattainment for the new eight-hour ozone standard effective June 15, 2004. Many of these areas are already nonattainment for the federal one-hour standard. New nonattainment areas include a number of rural Sierra foothill counties and additional parts of the Sacramento Valley. This action starts the transition from the one-hour standard to the eight-hour standard. The one-hour standard will be revoked on June 15, 2005, one year after the effective date of the designation, and SIPs showing how each area will meet the eight-hour standard are due by 2007. In order to maintain progress towards clean air, the federal Clean Air Act prohibits backsliding on the control program. Since the eight-hour standard is more health-protective than the federal one-hour standard, ARB expects that California will need to reduce emissions beyond the existing one-hour SIP targets.

4. SIP Lawsuit and Settlement

In 1997, three environmental groups (Communities for a Better Environment, the Coalition for Clean Air, and the Natural Resources Defense Council) filed a complaint in the United States District Court for the Central District of California. The lawsuit was filed against the ARB, the South Coast Air Quality Management District, and the U.S. EPA related to California's progress in achieving the 1994 SIP commitments. The ARB reached a settlement agreement with these groups in January 1999 which was amended in December 1999 and June 2003 (U.S. District Court, Central District of CA, Case No. CV-97-6916 JSL (SHx)). Although the 2003 SIP revision is intended to replace the State's original commitments under the 1994 SIP for the South Coast, the settlement agreement will remain in place until the ARB fulfills its obligations under the agreement.

The agreement includes a list of measures to be considered by the ARB and a schedule. In one of the specific measures, the ARB staff committed to propose to the Board by June 30, 2004, a control measure for a 2 tpd VOC emission reduction in the South Coast Air Basin, if feasible. The implementation period for the control measure is 2006. The amendments proposed in this report are intended to fulfill this commitment and to partially fulfill the remaining VOC reduction commitment in the lawsuit settlement agreement.

C. SUMMARY OF PROPOSED AMENDMENTS

1. Why are we proposing amendments to the Consumer Products Regulation?

We are proposing amendments to meet our SIP commitment for 2004, termed "CONS-1," and to fulfill the conditions of a SIP lawsuit settlement agreement. These two commitments are discussed in Subsection B of this Executive Summary. Specifically, the 2004 Amendments will fulfill CONS-1, achieving at least 5 tpd VOC emission reduction statewide by 2006, and it will achieve a 2 tpd emission reduction in the South Coast Air Basin by 2010. The proposed ATCM for Para-dichlorobenzene, although being proposed to reduce the exposure of Californians to a Toxic Air Contaminant (TAC), will also result in VOC emission reductions.

2. What product categories are covered under the proposed 2004 Amendments?

The proposed 2004 Amendments will affect 18 consumer product categories. As shown in Table 1 below, these include 14 new categories, including subcategories, for which new product category definitions and VOC limits are proposed, one previously regulated category for which a more restrictive VOC limit is proposed, and two previously regulated categories for which additional requirements are proposed. Not shown in Table 1 is an additional category, Energized Electrical Cleaner, that would be subject to reporting requirements.

Table 1
Product Categories Covered by Proposed 2004 Amendments

New Categories with VOC Limits for Regulation	
Adhesive Remover – 4 subcategories	Footwear or Leather Care Product
Anti-Static Product	Hair Styling Product[1]
Electrical Cleaner	Graffiti Remover
Electronic Cleaner	Shaving Gel
Fabric Refresher	Toilet/Urinal Care Product
	Wood Cleaner
Previously Regulated Category with More Restrictive Limit	
Contact Adhesive[2]	
Previously Regulated Categories with Additional Requirements	
Air Fresheners	General Purpose Degreasers

[1]After 2006, this product category will incorporate Hair Styling Gel and include additional forms of hair styling products (i.e., liquid, semi-solid, and pump spray) but does not include Hair Spray Product or Hair Mousse.
[2]This product category has been separated into 2 subcategories: General Purpose and Special Purpose

3. What are the proposed VOC limits for the 15 categories?

The proposed VOC limits are shown in Table 2. Except for two categories, the effective date is December 31, 2006. Where reformulation is expected to be especially challenging, we are providing additional time in two categories, either December 31, 2008, or December 31, 2009, to comply with limits. Also, note that in the case of Shaving Gel, we are proposing a two-tiered limit to reflect technology and production challenges. Staff also proposes to perform a detailed technical and cost assessment of manufacturers' progress towards meeting the 4 percent VOC limit for Shaving Gel at least one year prior to the effective date of the second-tier limit.

4. What are the emission reduction benefits from the proposed 2004 Amendments?

The statewide VOC emissions reductions from full implementation of the proposed limits for 15 categories is estimated to be about 6.0 tpd in California by December 31, 2006. In the South Coast, the reductions will be about 2.8 tpd. These reductions meet our SIP and lawsuit settlement commitments of 5 tpd statewide by 2006. By 2010 the total expected statewide emission reductions will be about 6.9 tpd.

Table 2 summarizes the staff's proposal and the emission reductions to be achieved. Except for product categories where use of certain TACs will be prohibited, the proposed limits generally represent category VOC emission reductions from about 20 percent to 80 percent. Some of the categories affected by the TAC prohibition, may have slight VOC emission increases. The proposed ATCM for PDCB will also result in an over 95 percent emission reduction. Significant VOC emission reductions, of over 95 percent, from toilet/urinal care products and solid air fresheners will be achieved by

replacement with non-toxic, low-VOC alternative products. Total emissions from the categories proposed for regulation would be 9.5 tpd in 2006. The proposal reduces these emissions by about 65 percent upon full implementation in 2009. Further, the proposal significantly reduces emissions of several TACs. The total TAC reductions will be about 4.9 tpd in 2006 and about 5.1 tpd by 2009 statewide.

Table 2
Proposed VOC Limits and Reductions Achieved

Product Category	Product Form	Proposed VOC Limit (wt%)	VOC Emission Reductions (TPD)[1]	TAC Emission Reductions (TPD)[2]
Adhesive Removers:				
Gasket or Thread Locking Adhesive Remover	All	50	*-0.011*[3]	
Floor or Wall Covering Adhesive Remover	All	5	0.630	*0.99*
General Purpose Adhesive Remover	All	20	0.258	
Specialty Adhesive Remover	All	70	0.138	
Air Freshener[4]	--	--	0.624	*0.624*[7]
Anti-Static Product	Aerosol	80	0.057 (12/31/08)	--
	Non-aerosol	11	0.000	
Contact Adhesive:				
Contact Adhesive - General Purpose	All	55	0.003	*0.007*
Contact Adhesive - Special Purpose	All	80	0.000[5]	
Electrical Cleaner	All	45	0.070	*0.48*[8]
Electronic Cleaner	All	75	0.049	--
Fabric Refresher	Aerosol	15	0.221	--
	Non-aerosol	6	0.220	
Footwear or Leather Care Product	Aerosol	75	0.008	*<0.001*
	Solid	55	0.039	
	All Other Forms	15	0.060	
Graffiti Remover	Aerosol	50	0.014	*0.055*[8]
	Non-aerosol	30	0.071	
Hair Styling Product	Aerosol, Pump Spray	6	0.404	--
	All Other Forms	2	0.163	
Shaving Gel	All	7	0.124	--
		4	0.435 (12/31/09)	
Toilet/Urinal Care Product	Aerosol	10	PD[6]	*2.716*[7]
	Non-aerosol	3	2.709	
Wood Cleaner	Aerosol	17	0.019	--
	Non-aerosol	4	0.232	
Total Reductions 2006			**6.05**	4.87
Total Reductions 2008			**6.28**	5.01
Total Reductions 2009			**6.81**	5.09

1 Survey emissions adjusted for market coverage as discussed in Volume II, Chapter IV; reduction on the effective date of limits which is December 31, 2006, except where otherwise noted.
2 Based on survey emissions; reduction on the effective date of limits which is December 31, 2006.
3 VOC emission increase as result of prohibition on use of certain specified TACs.
4 Currently a regulated category; with elimination of the exemption for 98% para-dichlorobenzene (PDCB) products, additional reductions will be achieved from replacement with lower VOC air fresheners.
5 No reductions; Contact Adhesive was separated into two subcategories and the existing 80% VOC limit was retained for this subcategory.
6 PD = Protected Data; reductions omitted to protect manufacturers' confidential information.
7 PDCB emissions are also included in VOC Emission Reductions.
8 Trichloroethylene emissions are also included in VOC Emission Reductions.

5. **What other amendments to the Aerosol Coating Products Regulation, the Antiperspirants and Deodorants Regulation, the Consumer Products Regulation, and test Method 310 are being proposed?**

We are proposing to make changes to the most restrictive limit, product date coding, reporting requirements, and sell-through provisions, certain category definitions, test methods, and other minor changes. All of these proposals are designed to improve enforceability of the regulation and ensure that anticipated emission reductions are achieved and maintained.

a. Most Restrictive Limit

The current most restrictive limit provision only applies to representations made on the principal display panel (typically the front label) of the product. Staff proposes that for products manufactured on or after January 1, 2007, category determinations be made based on representations made anywhere on the label, packaging, and all affixed labels or stickers. This proposed language is consistent with a similar provision in the Aerosol Coating Products Regulation.

b. Product Date Coding

Under the current language of the Consumer Products Regulation, products are required to clearly display the date of manufacture or a code indicating the date on all containers. Staff is proposing to require that companies use either the date of manufacture, a specified code, or annually provide an explanation of the code designating the date of manufacture. In addition, an updated explanation would need to be provided any time a code-date is changed. This is proposed such that sell-through products are clearly identified and removed from shelves as appropriate. The options for date coding are included to provide flexibility to the industry. Staff is also proposing that all date codes are public information that may not be claimed as confidential.

c. Reporting Requirements

The proposed amendments would clarify that when information is not submitted by a primary responsible party, any person who holds that information is required to submit it to ARB upon request. This provision ensures complete data are obtained to estimate emissions or set new VOC limits.

d. Sell-through Notification

A written notification provision is proposed that would add a requirement that any person who sells or supplies regulated consumer products during the sell-through period, must notify the purchaser of the product in writing of the date on which the sell-through period for that product will end. However, this notification is required only if the

product is non-compliant and sold or supplied to a distributor or retailer within the last six months of the sell-through period.

e. Definitions

In addition, modifications to several existing definitions are proposed. For example, we have expanded some of the product category definitions to include additional products (e.g., Hair Spray and Hair Styling Product). For other definitions, we are proposing to exclude certain products because those products have been included in their own separate category (e.g., some solid air fresheners are now under the definition of Toilet/Urinal Care Product).

Staff is also proposing to modify the definition of "Deodorant" in section 94501(d), of the Antiperspirants and Deodorants Regulation and propose a new definition in section 94508 of the Consumer Products Regulation for "Deodorant Body Spray." The "Deodorant" definition would be modified to specify that a deodorant is any product that indicates on the label that it can be used under the arm to provide a scent or minimize odor. The proposed definition for "Deodorant Body Sprays" would clarify that these products are personal fragrance products, unless the product label implies it can be used under the arm. Any Deodorant Body Spray label which indicates or depicts that it is suitable for use in the human axilla would be considered a "Deodorant" as defined in section 94501(d). Because the proposed modifications to the Deodorant definition may require some products' labels to be modified, staff is also proposing that the definition would not become effective until January 1, 2006. Staff intends to survey the proposed category "Deodorant Body Spray" to obtain 2003 calendar year formulation and sales data later this year. Staff will use the survey data to determine the most appropriate regulatory strategy. Until such time as an appropriate regulatory strategy is determined, Deodorant Body Sprays will continue to be required to meet a 75 percent by weight VOC limit, equivalent to the limit for "Personal Fragrance Products" containing 20 percent or less by weight fragrance.

f. Test Methods

We are also proposing minor amendments to test Method 310 to include updates to test method citations and dates. Within the Test Methods section of the Aerosol Coating Products Regulation, the Antiperspirants and Deodorants Regulation, and the Consumer Products Regulation, we are proposing to update the date on which Method 310 was last amended. Because Method 310 is proposed for amendment in this rulemaking, within the "Test Method" sections a placeholder for the new effective date for ARB Method 310 is provided. An additional amendment in the Aerosol Coating Products Regulation would update the method whereby acid content in aerosol coatings is determined.

g. Other Minor Changes

Several other minor changes are being proposed that would not substantially affect parties subject to the Regulation, but serve to simplify, clarify, or better organize the Regulation.

6. Will the proposed amendments reduce emissions of Toxic Air Contaminants?

Yes. The proposed regulatory action will also prohibit the use of three TACs, methylene chloride, perchloroethylene, and trichloroethylene in seven categories. The seven categories are Adhesive Removers (including subcategories); Contact Adhesive; General Purpose Degreasers; Electrical Cleaner; Electronic Cleaner; Footwear or Leather Care Product; and Graffiti Remover. However, for safety reasons, the prohibition will not apply to electrical cleaner products used exclusively for cleaning energized equipment. This prohibition will result in TAC emission reductions of about 559 tons per year in 2006. Reductions in VOC TACs are also expected. The proposed action will also prohibit use of a fourth TAC, para-dichlorobenzene.

7. Why are we also proposing an Airborne Toxic Control Measure (ATCM) for Para-dichlorobenzene?

PDCB is a chlorinated benzene compound designated by the International Agency for Research on Cancer to be possibly carcinogenic to humans (Group 2B). It is also a California TAC and a federal Hazardous Air Pollutant (HAP). As such, PDCB has potential carcinogenic and non-cancer health effects. The compound is widely used primarily as an air freshener in toilet and urinal deodorant blocks, as a solid air freshener, and also as the main ingredient in moth balls. Many entities have a policy against the purchase or use of PDCB products in their facilities, including the City of Seattle, Washington; Erie County, New York; the New York Department of Corrections; and the Fire Department of New York City. The state of Vermont has banned its state agencies from purchasing PDCB products. In addition, the New York State Legislature is currently considering a statewide ban on the sale or use of PDCB products in any location open to access by the public.

a. Exposure

As PDCB products are widely used as air fresheners, humans are exposure to PDCB could be substantial. Also, the use of toilet/urinal blocks leads to the ubiquitous presence of PDCB in sewage waters, and surface and ground waters. As wastewater treatment plants aerate sewage in order to promote biodegradation, as well as to strip toxic compounds from the water, the majority of the PDCB that entered the treatment plant is transferred to the air, and may affect communities in the vicinity of the treatment plant. Measurable levels of PDCB are found in breath, blood, urine and even breast milk samples and adipose tissue of most persons sampled.

Outdoor air concentrations of PDCB range from non-detectable in rural areas away from sources to measureable levels outside of homes or in urban areas where air freshener products are used. ARB in 1993, measured atmospheric concentrations of PDCB in the major populations centers of California, with average concentrations of 0.142 parts per billion (ppb). This value is consistent with other measurements done in Los Angeles during 1993 that ranged from nondetectable to 0.349 ppb and in 8 locations around the U.S. with a range of 0.020 to 0.290 ppb.

Indoor air concentrations of PDCB tend to be significantly higher than ambient air concentrations. Because its major uses are for indoor air freshening and as an insect repellant, PDCB is found almost ubiquitously in indoor air. Concentrations of PDCB in a bathroom with one deodorizer block measured by Scuderi, 1986, ranged from 78 ppb to 126 ppb. A bathroom with one urinal deodorizer block and one toilet deodorizer block measured 116 to 220 ppb.

In addition, the Consumer Products Safety Commission in consultation with the U.S. EPA suggests that PDCB products be placed in trunks or other containers that can be stored in areas that are separately ventilated from the home (CPSC Document #450).

b. Regulatory Authority

The California Toxic Air Contaminant Identification and Control Program (program), established under California law by Assembly Bill 1807 (Stats. 1983, Ch. 1047) and set forth in Health and Safety Code (HSC) section 39650-39675, requires the ARB to identify and control TACs in California. Following the identification of a substance as a TAC, HSC Section 39665 requires the ARB, with the participation of the air pollution and air quality management districts and in consultation with affected sources and interested parties, to prepare a report on the need and appropriate degree of regulation for that substance. HSC Section 39665(b) requires that this "needs assessment" address, among other things, the technological feasibility of proposed ATCMs and the availability, suitability, and relative efficacy of substitute products or processes of a less hazardous nature. Once the ARB has evaluated the need and appropriate degree of regulation for a TAC, HSC Section 39666 requires the ARB to adopt regulations to reduce emissions of the TAC. For a TAC where the ARB has not specified a threshold exposure level below which no significant adverse health effects are anticipated, HSC section 39666(c) requires that the ATCM be designed to reduce emissions to the lowest level achievable through the application of best available control technology or a more effective control method. Cost; health risk; substitutes; environmental impacts; and other specified factors must be taken into account when designing the control measure.

Staff is not proposing to ban PDCB use in mothballs. The Department of Pesticide Regulation (DPR), a part of the California Environmental Protection Agency, registers PDCB use as a pesticide for control of clothes moths. ARB does not have

regulatory authority, under HSC Sections 39650-39675, to control registered pesticides and therefore, we are not addressing this use of PDCB in moth balls.

Proposed Requirements

The proposed ATCM will ban the use of PDCB in toilet/urinal blocks and solid air fresheners. Under the proposal, effective December 31, 2006, no person shall sell, supply, offer for sale, or manufacture for use in California any solid air fresheners or toilet/urinal care products that contain PDCB. Solid air fresheners or toilet/urinal care products that contain PDCB that were manufactured prior to December 31, 2006, may be sold, supplied, or offered for sale until December 31, 2007, so long as the product clearly displays the date on which the product was manufactured, or a code indicating such date. A one year sell through is proposed rather than a longer time frame, in order to reduce public exposure as soon as possible. A number of viable alternatives to PDCB toilet/urinal blocks have been brought to the market. There are also complying solid air fresheners available that do not contain PDCB.

c. Emission Reductions and Environmental Impacts

There are environmental benefits of the proposed ATCM. The first benefit is that emission reductions of 1,219 tons per year of PDCB in 2006 would be achieved. The second benefit will be a reduction in public exposure to PDCB. The risk assessment analysis that we conducted for a generic wastewater treatment plant estimated that the highest potential cancer impact, of approximately 9 per million persons , was found 20 meters downwind from the perimeter of the dechlorination process area. The best case effect on exposure, because of the ATCM, is a reduction in potential cancer risk of 9 excess cases per million people from outdoor exposure and potential cancer risk of 145 excess cancer cases per million from indoor exposure. The complete analysis is found in Chapter VII.

d. Cost

The PDCB blocks generally cost less than their non-PDCB counterparts, as little as half as much, but substantial overlap in price was seen, especially when the blocks were sold contained within a urinal screen. A review of online retailers reveal a typical PDCB 12 pack of four ounce blocks, each which will last for 30 days, with prices in the $5 to $8 range. Comparable prices for the non-PDCB block, albeit with screen included, average $17 for a 12 pack with each individual block also lasting for about 30 days.

Rim hanging blocks showed similar price differentials, with a PDCB 12 pack selling for about $9 and a non-PDCB 12 pack selling for about $18. The price for non-PDCB blocks, though, is not always higher, with some manufacturers selling PDCB blocks saturated with an alternate fragrance, such as cherry, and contained within a screen, in the $20 range for a 12 pack. Enzyme-containing non-PDCB blocks tend to be the most expensive, with prices running in the $25 range for a 12 pack. As a result

of the proposed ban on PDCB in solid air fresheners and toilet/urinal care products, producers of PDCB (no California producers) may see an overall reduction in sales of as high as three percent. However, most manufacturers and distributors of PDCB products also provide the alternatives, so as a result, they should not be significantly impacted.

e. Availability of Alternatives and Technological Feasibility of the ATCM

The proposed ATCM would prohibit the use of PDCB in solid air fresheners and toilet/urinal care products. Compliance with the proposal will not be difficult. Numerous non-PDCB toilet/urinal care products are already available and well accepted by consumers.

As with the toilet/urinal care products, there are many non-PDCB air fresheners available. The traditional room air fresheners that are available are fragrance pearls and potpourri. There are also solid/gel room air fresheners available at stores for general consumers and for janitorial supplies.

8. Who would be affected by these proposed amendments?

The proposed 2004 Amendments would apply to anyone who sells, supplies, offers for sale, or manufactures consumer products for use in the state of California that are subject to the proposed amendments. The primary impact would be on manufacturers and marketers of consumer products, which will have to reformulate some of their products. There may also be an impact on distributors and retailers, who must ensure that they are selling or supplying complying products. In addition, since some products will have to be reformulated, suppliers of chemicals, propellants, containers, valves, and other components may be impacted, depending on whether there is an increased or decreased demand for their products. Finally, consumers may have to pay more for some consumer products, or may have to make some adjustments to their use of the reformulated products.

9. Will the provisions in the existing Consumer Products Regulation apply to the product categories?

Yes. The existing provisions in the Consumer Products Regulation (such as the low vapor pressure VOC exemption, innovative products provision, and variance provision) will apply to the categories proposed for regulation.

10. Will the Alternative Control Plan (ACP) be available to the proposed product categories?

Yes. The ACP will allow manufacturers to submit plans to "average" the emissions from any combination of consumer products subject to the VOC limits in section 94509 of the Consumer Products Regulation, including the proposed new product categories. However, manufacturers cannot submit plans which include both

consumer products, subject to section 94509 "Innovative Products Provision," or aerosol coating products (aerosol paints) subject to section 94522.

D. REGULATORY DEVELOPMENT PROCESS AND EVALUATION OF ALTERNATIVES

1. How did ARB staff develop the Proposed 2004 Amendments?

In 2002, a subcommittee of the Consumer Products Working Group, the Consumer Products Regulation Workgroup (CPRWG) was formed to serve as a forum for communication during the survey and 2004 Amendments development process. Participation was open to any member of the public.

ARB staff began the process to develop the 2004 Amendments with a comprehensive survey of select categories of consumer products, the "2001 Consumer and Commercial Products Survey" (2001 Survey). Numerous meetings were held with the CPRWG while developing the 2001 survey.

This survey collected sales and formulation information on about 48 different consumer product categories and provided ARB staff with technical information that was used to develop the proposed 2004 Amendments. Four public meetings of the CPRWG were conducted from March 2003 through March 2004 while developing the 2004 Amendments. During the first workgroup meeting, we discussed the results of the 2001 Survey, and discussed an initial prioritization of consumer product categories for regulation development. At the next three workgroup meetings, staff discussed various regulatory proposals. On March 11, 2004, ARB held a public workshop for the 2004 Amendments. A chronology of the meetings and public workshop held is shown in Table 3.

To solicit additional information and comments, staff held or participated in numerous individual meetings, teleconferences, and video conferences with industry representatives. Staff also analyzed survey data, performed shelf surveys, and researched technical literature, patents, and trade journals during the development of the proposed amendments.

Table 3
Chronology of Public Meetings and Workshops

Date	Meeting	Location
March 11, 2003	1st Public Workgroup Meeting for the CPRWG	Sacramento, CA with teleconference available
October 21, 2003	2nd Public Workgroup Meeting for the CPRWG	Sacramento, CA with teleconference available
December 16, 2003	3rd Public Workgroup Meeting for the CPRWG	Sacramento, CA with teleconference available
March 10, 2004	4th Public Workgroup Meeting for the CPRWG	Sacramento, CA with teleconference available
March 11, 2004	Public Workshop on the proposed amendments	Sacramento, CA with videoconference available

2. Who has actively participated in the process?

Consumer product manufacturers, chemical producers, and marketers, and their trade associations, have been the most active in the process. The trade associations include the following:

- Consumer Specialty Products Association
- Cosmetic, Toiletry, and Fragrance Association
- National Paint and Coatings Association
- Adhesives and Sealants Council
- Chlorobenzene Producers Association
- American Beauty Association
- International Sanitary Supply Association
- Automotive Specialty Products Association
- Soap and Detergent Association
- Automotive Aftermarket Industry Association
- American Pet Products Manufacturers

In addition, representatives from local air districts and agencies, including the South Coast Air Quality Management District and the Los Angeles County Sanitation District, and U.S. EPA as well as many other individual consumer product manufacturers were involved in the process.

ARB staff maintains a mailing list of over 3,000 companies and interested parties, including environmental organizations, which received information throughout the development of the proposed amendments. In addition, we have established an electronic list serve to allow subscribers to receive pertinent information with over 650 subscribers.

3. How did ARB staff evaluate alternatives and choose the product categories proposed for regulation?

ARB staff began the selection process by reviewing all the consumer product categories included in the 2001 Survey, including both unregulated categories and previously regulated categories. Staff then eliminated from consideration: (1) categories where very little or no potential for emission reductions existed, (2) categories where adequate data were not obtained for pursuing emission reductions, and (3) categories where the technical justification for setting new VOC limits could not be completed in the required timeframe. The remaining 20 categories were proposed for regulation at the first public workgroup meeting.

At the second, third, and fourth public workgroup meetings, staff presented regulatory proposals for discussion. After each workgroup meeting, staff modified the proposals, as appropriate, based on the comments and technical information received from industry and staff investigations. During this process, several categories were postponed for consideration for the reasons given above. As mentioned previously, the current proposal would affect 18 categories, including 14 new categories, including subcategories, for which new product category definitions and VOC limits are proposed; one previously regulated category for which a more restrictive VOC limit is proposed; two previously regulated categories for which additional requirements are proposed; and an additional category, Energized Electrical Cleaner, that would be subject to reporting requirements.

4. How were the proposed VOC limits in the proposed 2004 Amendments established?

The proposed VOC limits are the product of extensive research and analysis of data by staff and interaction with the affected consumer products industry, as discussed in the response to question number three. Although the proposed limits were based on factors unique to each individual category, the following general guiding principles were applied:

- technological and commercial feasibility - assuring that reformulation technologies will be available by the effective date for each proposed limit and that the basic consumer market demand can be met on that date;

- emission reductions achieved - assuring that our overall proposal will achieve the maximum feasible reduction as required by state law;

- preservation of product forms - assuring that each existing product form (e.g. liquid, semi-solid, solid, aerosol) is able to reformulate to meet the proposed VOC limit; and,

- minimize potential for use of Toxic Air Contaminants - assuring that the proposed limit can be met with formulations that do not rely on the increased use of Toxic Air Contaminants.

E. COMPLIANCE WITH THE PROPOSED 2004 AMENDMENTS

1. How will manufacturers comply with the proposed 2004 Amendments?

Manufacturers of non-complying products will need to reformulate their products to meet the applicable VOC limits. Manufacturers have the flexibility to choose any formulation that meets the applicable VOC limits, and the reformulation options vary with each product category (see Chapter VI of the Technical Support Document). In general, VOC solvents or propellants will need to be replaced, or partially replaced, with non-VOC ingredients. This may require switching to a water-based formulation using acetone or another exempt solvent, increasing product solids, or formulating with a non-VOC propellant. Manufacturers may also need to change the valve, container, delivery system, or the other components of the consumer product depending on the individual formulation. ARB staff has proposed VOC limits that can be met without the increased use of TACs.

2. Are there alternative compliance options to the proposed VOC limits?

Yes. Manufacturers can comply with the proposed amendments through the use of the Innovative Products Provision (IPP), or the Alternative Control Plan (ACP). The IPP allows manufacturers of "innovative products" to comply with the Consumer Products Regulation if they demonstrate through clear and convincing evidence that their product will result in less VOC emissions than a complying product that meets the applicable VOC limit. The innovative product may result in less emissions due to some characteristic of the product formulation, design, delivery system, or other factors.

The ACP allows manufacturers to average the emissions from products above and below the applicable VOC limits, as long as the overall emissions are less than or equal to the emissions that would have occurred had all the products complied with the VOC limits. Manufacturers must submit an application which includes the VOC content of the products in the plan, a method of verifying the sales of each product in the plan, and other information necessary to track overall emissions.

3. Are the VOC limits for the proposed amendments technologically and commercially feasible?

As explained in detail in Chapters III and VI of the Technical Support Document, all the VOC limits proposed are technologically and commercially feasible. The proposed limits were targeted towards the lowest VOC content technology within a product category which would adequately perform the intended function. In doing this,

we ensured that the various product forms within each category would be preserved, and the proposed limits could be met without the use of TACs. ARB staff will track manufacturers' progress in meeting the proposed VOC limits, as we have done in past regulatory efforts for consumer products. If manufacturers encounter unanticipated but insurmountable difficulties, we will consider proposing amendments to the Consumer Products Regulation to address them.

As shown in Table 4, our survey results demonstrate that products are available that comply with the proposed limits for most of the product categories. While there are no complying products currently available in the market place for Gasket or Thread Locking Adhesive Remover, Aerosol Graffiti Remover, Aerosol Hair Styling Product, Pump Spray Toilet/Urinal Care Product and Aerosol Wood Cleaners, lower emission technology exists for achieving the proposed weight percent VOC limits. The complying market shares listed in Table 4 vary widely with each category (as in previous regulations) because the proposed limits were developed after considering a variety of factors unique to each category. These factors include the availability of reformulation options that may not be used in current products, the variety of product types in a given category, patents that may restrict some reformulation options, and economic issues.

Also note that we are providing until December 31, 2006, to allow time for reformulation in all categories, except Aerosol Anti-static Product and the second-tier limit for Shaving Gel (see Table 2 of this Executive Summary). To comply with challenging VOC limits, the Aerosol Anti-static Product category will be given until December 31, 2008, and Shaving Gel products will be given until December 31, 2009. In addition, staff will also perform a detailed technical assessment of manufacturers progress in meeting the 4 percent VOC limit for Shaving Gels at least one year prior to the effective date of the second-tier limit.

Table 4
Summary of Complying Products

Product Category	Product Form	Proposed VOC Limit (wt%)	Number of Complying Products/ Total	Complying Market Share (%)[1]
Adhesive Removers:				
Gasket or Thread Locking Adhesive Remover	All	50	0/15	0
Floor or Wall Covering Adhesive Remover	All	5	9/28	42
General Purpose Adhesive Remover	All	20	4/43	11
Specialty Adhesive Remover	All	70	3/19	6
Air Freshener[2]	--	--		
Anti-Static Product	Aerosol	80	3/8	2
	Non-aerosol	11	13/13	100
Contact Adhesive:				
Contact Adhesive - General Purpose	All	55	5/13	80
Contact Adhesive - Special Purpose	All	80	12/12	100
Electrical Cleaner	All	45	22/88	7
Electronic Cleaner	All	75	47/106	52
Fabric Refresher	Aerosol	15	2/16	1
	Non-aerosol	6	47/61	97
Footwear or Leather Care Product	Aerosol	75	11/17	82
	Solid	55	19/25	39
	All Other Forms	15	113/162	87
Graffiti Remover	Aerosol	50	0/35	0
	Non-aerosol	30	4/30	11
Hair Styling Product	Aerosol	6	PD/1	PD
	Liquid	2	81/113	57
	Pump Spray	6	92/126	62
	Semi-solid	2	348/390	97
	Solid	2	61/99	99
Shaving Gel	All	7	15/27	34
		4	1/27	0
Toilet/Urinal Care Product	Aerosol	10	PD/1	PD
	Foam	3	PD/2	PD
	Gel	3	PD/2	PD
	Liquid	3	123/141	98
	Pump Spray	3	PD/2	PD
	Solid	3	73/116	59
	Other	3	2/2	100
Wood Cleaner	Aerosol	17	0/4	0
	Non-aerosol	4	32/40	90

PD = Protected Data; data omitted to protect manufacturers' confidential information.
[1] Complying market share is based on sales rather than number of products.
[2] We are not proposing a new limit for the category.

F. ECONOMIC IMPACTS

1. Will the proposed amendments be cost-effective?

Cost-effectiveness is one measure of a regulation's efficiency in reducing a given amount of pollutant (often reported in "dollars (to be) spent per pound of pollutant reduced"). The determination of cost-effectiveness is well-established and often used to compare a proposed regulation's cost-efficiency with those of other regulations. To determine the cost-effectiveness of the proposed regulation, we relied on specific formulation data from the "2001 Consumer and Commercial Products Survey," industry journals/literature such as the Chemical Market Reporter for ingredient unit prices, discussions with industry representatives, and the cost analyses conducted for the existing ARB consumer products program. Based on our analyses, we estimate the cost-effectiveness of the proposed VOC limits is about $2.00 per pound of VOC reduced. This estimated cost-effectiveness value is consistent with existing ARB regulations and control measures. For example, for the 1997 Hairspray Regulation, and the 1995 Aerosol Coating Products Regulation the cost-effectiveness was about $2.25 and $3.00 per pound of VOC reduced, respectively. Further, the cost-effectiveness of the recent Inboard Marine and Transit Bus Measures were each determined to be approximately $2.00 per pound of ozone precursor reduced. In our proposal we have included a second tier limit of 4 percent VOC for Shaving Gel effective December 31, 2009. This second tier limit would increase the overall cost effectiveness of the regulation to about $2.40 per pound of VOC reduced. Because staff believes that the second tier limit is challenging, and may require significant effort for industry to comply, we commit to perform a detailed technical assessment of the proposed limit at least one year prior to the December 31, 2009, effective date. Based on the results of the technical assessment, staff may consider modifying the second tier proposal.

We estimate that the total cost incurred by industry to comply with this regulation is about $8 million per year. The second tier Shaving Gel limit would increase the overall cost of the regulation to about $10 million. These cost estimates are based on assumptions specific to each category depending on reformulation needs. For some categories it was assumed that manufacturers would either drop certain products or undergo minor product formulation changes, and for other categories manufacturers would undergo complete production line overhaul and equipment replacement rather than simple re-tooling.

2. Will consumers have to pay more for consumer products subject to the 2004 Amendments?

Consumers may have to pay more for some products subject to the proposed amendments, depending on the extent to which manufacturers are able to pass along their costs to consumers. As explained in Chapter VIII of the Technical Support Document, the average increase in cost per unit to the manufacturer is estimated to be about $0.16. These estimated cost per unit values are consistent with existing ARB regulations and control measures. For example, for the 1989 Antiperspirants and

Deodorants Regulation, and the 1995 Aerosol Coatings Products Regulation, the increased cost to manufacturers were about $0.25 and $0.30 respectively.

3. What are the expected economic impacts of the proposed regulation on businesses?

In our economic impacts analysis, we evaluated the proposed VOC limits for potential impacts on profitability and other aspects of businesses subject to the limits (with particular attention to California businesses), the cost-effectiveness of the limits, and the estimated cost impacts to consumers. To conduct our analysis, we relied on a combination of publicly available financial databases *(Dun and Bradstreet, Ward's Business Directory of U.S. Manufacturing Industries*), the ARB's 2001 Consumer and Commercial Products Survey, industry journals/literature such as the *Chemical Market Reporter*, discussions with industry representatives, and the cost analyses conducted for the existing ARB consumer products program.

Based on our analysis, we expect most manufacturers to be able to absorb the added costs of the proposed regulation without an adverse impact on their profitability. In addition, as explained in more detail below, we found that the proposed amendments are cost-effective relative to similar ARB regulations or measures, and the impacts to consumers are consistent with existing ARB regulations.

We estimated the change in "return-on-owners equity" (ROE) as an indicator of the limits' potential impacts on business profitability. The cost to comply with the proposed regulation, through increased research and development, equipment purchase and other investment costs, is presumed to impact a business' ROE and therefore its profitability. The cost to reformulate non-complying products for a typical company was used to determine total annual reformulation costs. Our analysis indicates the estimated change in ROE can vary from essentially no change to 6.9 percent change. The average change in ROE is about 0.7 percent, relative to the ROE before the proposed amendments would take effect. This estimated change in ROE is well within the change in ROE estimated for ARB's existing consumer products and motor vehicle programs.

Our ROE analysis for the proposed limits may overestimate the impact on business because it assumes that all of the costs of the proposed limits will be absorbed by manufacturers. In reality, we expect that at least some of the investment costs to comply with the proposed limits will be passed on to consumers. The analysis also does not quantify the extent of cost mitigation due to "technology-transfer" between product lines and from third-party manufacturers (i.e., contract fillers) who fill essentially equivalent products for a number of competing businesses.

While we expect that most businesses will be able to absorb the costs of the proposed amendments without significant adverse impacts on their profitability, there is the possibility that some individual businesses will be adversely affected by this regulatory action. Therefore, it is possible that the proposed amendments may have a

significant adverse impact on some businesses that are not in a market position to invest monies to develop new low VOC products, or to absorb the increased cost resulting from their compliance with the proposed regulation.

Based on our analysis, we do not expect the proposed amendments to have a significant impact on employment, or business creation, elimination, or expansion. We also do not expect the regulation to have a significant impact on the competitiveness of California businesses compared with those outside of California. This is because all companies that sell these products in California would have to meet the proposed requirements, whether located in California or outside of California.

The VOC limits in the proposed amendments will primarily impact consumer product manufacturers and marketers (companies which contract out the manufacturing of their products). However, we recognize that other industries could also be impacted to a lesser amount which is difficult to quantify. These industries include distributors, retailers, and "upstream" suppliers who supply containers, valves, solvents, propellants, and other chemicals used in consumer products.

Distributors and retailers could be impacted if some manufacturers decide to carry a dual inventory of products (one for California and one for the rest of the nation). However, most manufacturers have indicated that they will not manufacture California and 49-state products because dual-distribution systems are expensive to establish and maintain. Another potential cost to distributors or retailers would be the implementation of procedures to ensure that non-complying products are not sold past the three year "sell-through period." However, based on retail sell-through data obtained during the development of ARB's existing consumer products regulations, we believe the existing three year sell-through period should provide ample time to allow for the sale of non-complying products.

Upstream suppliers could be impacted because manufacturers will be purchasing some different solvents, propellants, and other materials for their reformulated products. They may also purchase different containers, valves, or other components for their reformulated products. However, we do not expect these changes to result in a major impact on the affected industries because chemical companies generally supply many different industries, and because many of the upstream suppliers also provide the alternative products which will be used in the reformulated products. In fact, we expect some upstream suppliers will benefit since the proposed limits are likely to create new or increased demand for materials to be used in compliant formulations.

G. ENVIRONMENTAL IMPACTS

1. What are the expected environmental benefits of reducing VOCs in the 2004 Amendments?

One of the environmental benefits of the 2004 Amendments will be a reduction in the formation of ground level ozone because the proposed VOC limits result in

reductions of ozone precursors (VOC) of 6.8 tpd statewide by December 31, 2009, based on the 2001 survey results. We also expect no adverse impact and most likely a positive impact on secondary organic aerosol formation. VOCs are a source of particulate matter (PM), namely secondary organic aerosols, either through condensation of the VOCs or complex reactions of VOCs with other compounds in the atmosphere. In general, depending on reformulation options chosen, secondary organic aerosols will be reduced.

2. Will Toxic Air Contaminants be reduced?

Another benefit of these amendments would be a reduction in TACs emissions of 1,778 tons per year in 2006. Due to the prohibition of use of methylene chloride, perchloroethylene, and trichloroethylene in seven categories, we estimate that there will be a reduction of 559 tons per year of these TACs. Para-dichlorobenzene emissions will be reduced by 1,219 tons per year in 2006 as the result of this rulemaking.

3. Will this proposal reduce the cancer health risk?

Yes. Staff estimates that in the seven categories where staff proposes prohibitions of methylene chloride, perchloroethylene, and trichloroethylene, for a given category, up to 64 chances of potential excess cancer cases per million persons would be avoided statewide. As for para-dichlorobenzene, we estimate that 9 potential excess cancers per million persons would be avoided statewide. These estimates are based on outdoor, near-source, exposure over a 70 year lifetime. Further, for reductions of para-dichlorobenzene, we estimate that there would be 145 potential excess cancer cases per million avoided as a result of indoor exposure.

4. How would the 2004 Amendments proposal reduce the risk to public health by reducing VOCs?

While we cannot accurately assess potential risk reduction due to reducing VOC and PM emissions, it has long been known that exposure to ground level ozone and PM have adverse impacts on public health. Research has shown that, when inhaled, ozone and PM can cause respiratory problems, aggravate asthma, and impair the immune system. Any reduction in PM or ozone precursors, namely VOCs, results in improving health in California.

5. Are there any potential negative environmental impacts?

We examined the potential effect of the proposed regulation on global warming, stratospheric ozone depletion, the use of TACs, and the impacts on water quality and solid waste disposal. Based on our analysis, as detailed in Chapter IX of the Technical Support Document, we do not expect any significant adverse environmental impacts to result from the proposed 2004 Amendments. Staff does acknowledge a slight erosion of VOC emissions reductions due to the prohibition of methylene chloride, perchloroethylene, and trichloroethylene. Also there is a possibility of a slight increase

in global warming potential of certain aerosol products if hydrofluorocarbon (HFC) 152a is used as a reformulation option.

6. How does the proposal relate to ARB's goals on environmental justice?

This proposal is consistent with the ARB's Environmental Justice Policy to reduce health risks in all communities, including low-income and minority communities. Generally, use of consumer products is fairly uniform across the State, tracking with housing units, and their emissions are spread over the course of a day, rather than concentrated at a particular time of day. For these reasons, we do not believe that people of any given race, culture, or income would be more impacted than any others would. All Californians should benefit equally from the reduction in VOC emissions from the consumer product categories proposed for regulation, as well as from the prohibition on use of chlorinated solvents that are TACs in the categories containing them.

Because the proposed limits for toilet/urinal care products effectively prohibit the use of PDCB, we would expect to nearly eliminate PDCB from waste water influent and effluent levels. As a result, PDCB concentrations in the air near Publicly Owned Treatment Works (POTWs) will be reduced. The lowering of PDCB levels in effluents from POTWs across the state would provide an environmental benefit to the communities where they are located.

H. FUTURE PLANS

During the summer of 2004, staff will begin developing the 2003 Consumer and Commercial Products Survey (2003 Survey). The 2003 Survey will be comprehensive in nature and will be used as the basis for upcoming rulemakings in 2005 and 2006. In addition, staff has committed to another survey in 2006 for the 2005 sales year, which will be used as the basis for another rulemaking in 2008. For each of these future activities staff will consult with interested parties through the same workgroup process (see Chapter II) used to develop the 2004 Amendments.

I. RECOMMENDATION

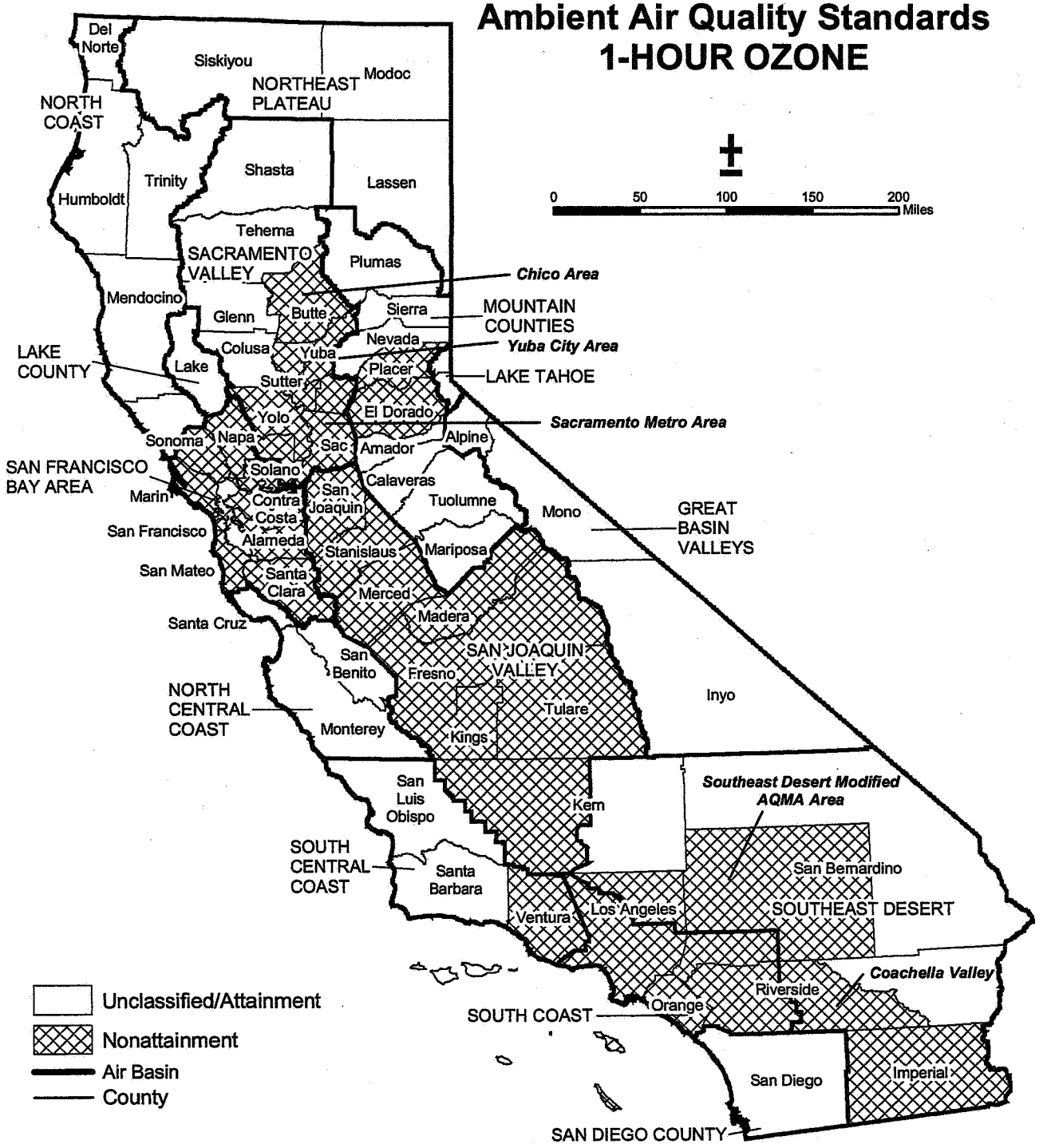
We recommend that the Board adopt the proposed 2004 Amendments to the three Consumer Products Regulations, the ATCM for para-dichlorobenzene, and the revisions to test Method 310.

REFERENCES

Consumer Products Safety Commision and Environmental Protection Agency, The Guide to Indoor Air Quality, CSPC Document #450.
http://www.cpsc.gov/cpscpub/pubs/450.html (CSPC Document #450)

Settlement Agreement, with amendments, in *Coalition for Clean Air, Inc. et al. v. South Coast Air Quality Management District, et al.* (U.S. District Court, Central District of CA, Case No. CV-97-6916 JSL (SHx))

Area Designations for National Ambient Air Quality Standards 1-HOUR OZONE



Source Date:
October 2003
Emission Inventory Branch, PTSD

October 19, 2004

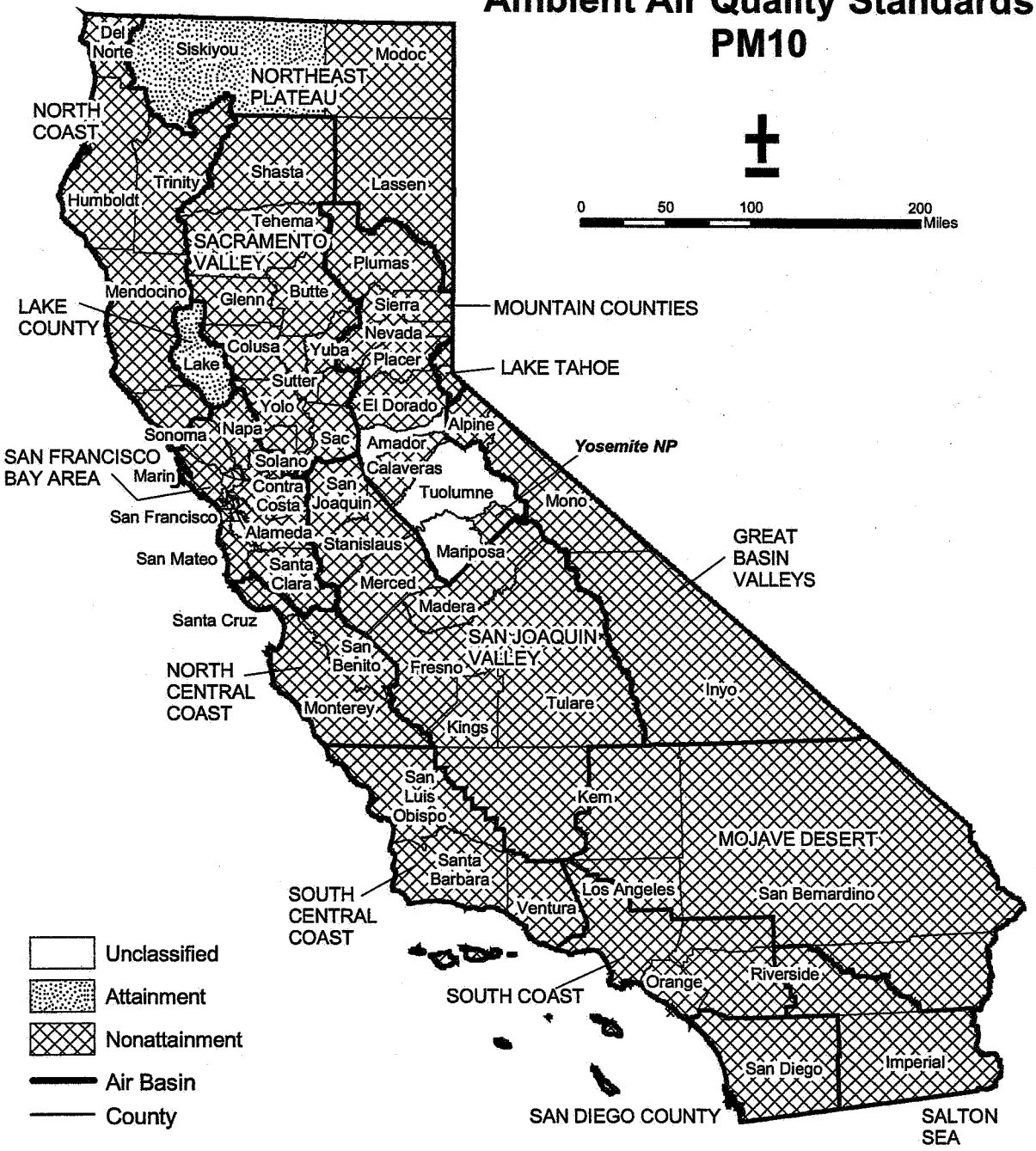
Area Designations for National Ambient Air Quality Standards 8-HOUR OZONE

Source Date:
October 2003
Emission Inventory Branch, PTSD

October 19, 2004

California's Air Basins & Counties

2004
Area Designations for State Ambient Air Quality Standards
PM10



Source Date:
October 2003
Emission Inventory Branch, PTSD

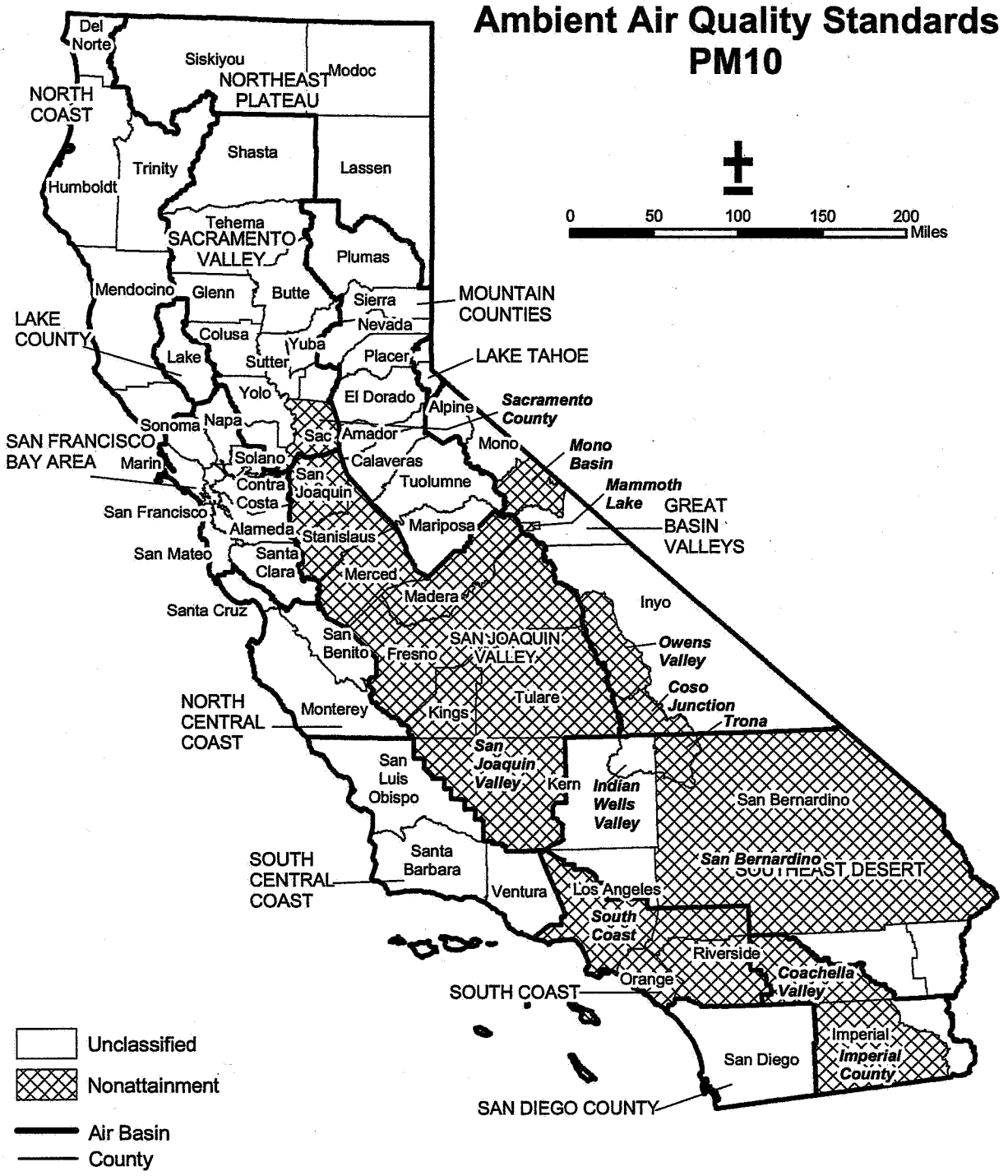
October 18, 2004

2004
Area Designations for State Ambient Air Quality Standards
NITROGEN DIOXIDE

Source Date:
October 2003
Emission Inventory Branch, PTSD

October 18, 2004

Area Designations for National Ambient Air Quality Standards PM10



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October 19, 2004

2004
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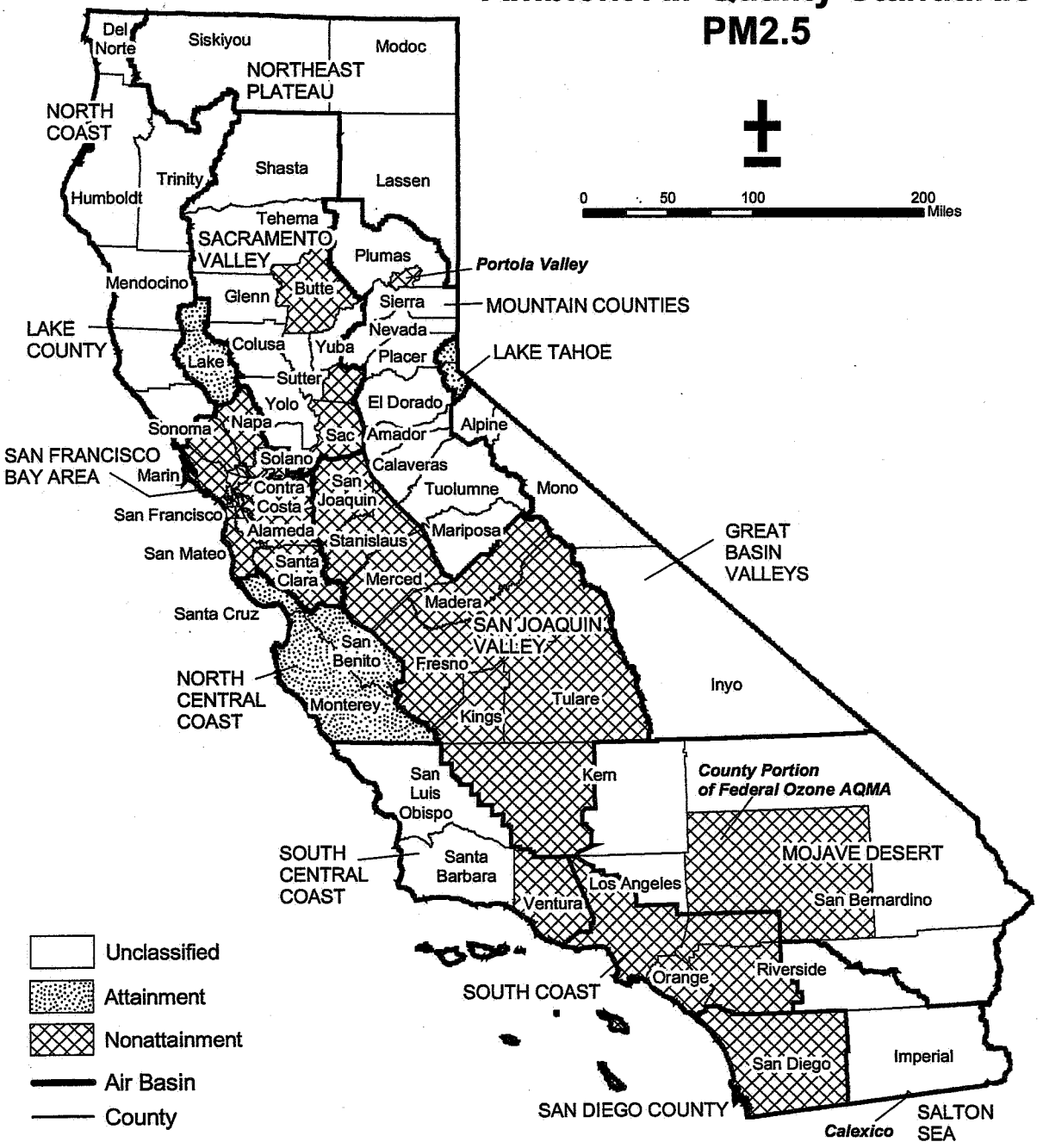
PM2.5



Source Date:
October 2003
Emission Inventory Branch, PTSD

October 18, 2004

INCOMPLETE

HARRINGTON

Industrial Plastics, Inc

ENGINEERING HANDBOOK

For Industrial Plastic Piping Systems

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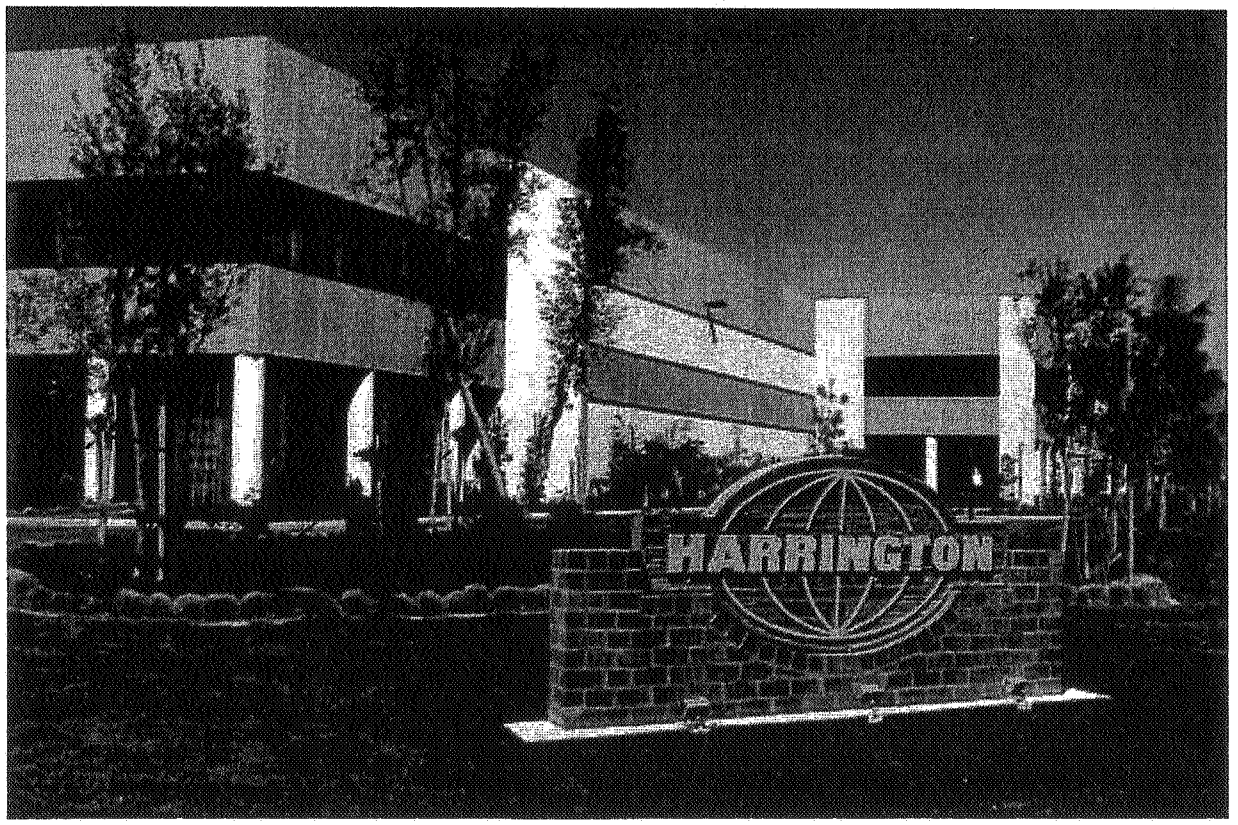


Harrington's corporate office in Chino, CA

MATERIAL DESCRIPTION

POLYVINYLS

PVC (POLYVINYL CHLORIDE) has a relatively high tensile strength and modulus of elasticity and therefore is stronger and more rigid than most other thermoplastics. The maximum service temperature is 140°F for Type 1. PVC has excellent chemical resistance to a wide range of corrosive fluids, but may be damaged by ketones, aromatics, and some chlorinated hydrocarbons. It has proved an excellent material for process piping (liquids and slurries), water service, and industrial and laboratory chemical waste drainage. Joining methods are solvent welding, threading (Schedule 80 only), or flanging.

CPVC (CHLORINATED POLYVINYL CHLORIDE) is particularly useful for handling corrosive fluids at temperatures up to 210°F. In chemical resistance, it is comparable to PVC. It weighs about one-sixth as much as copper, will not sustain combustion (self-extinguishing), and has low thermal conductivity. Suggested uses include process piping for hot, corrosive liquids; hot and cold water lines in office buildings and residences; and similar applications above the temperature range of PVC. CPVC pipe may be joined by solvent welding, threading, or flanging.

POLYOLEFINS

POLYPROPYLENE (HOMOPOLYMER) is the lightest thermoplastic piping material, yet it has considerable strength, outstanding chemical resistance, and may be used at temperatures up to 180°F in drainage applications. Polypropylene is an excellent material for laboratory and industrial drainage piping where mixtures of acids, bases, and solvents are involved. It has found wide application in the petroleum industry where its resistance to sulfur-bearing compounds is particularly useful in salt water disposal line, chill water loops, and demineralized water. Joining methods are coil fusion and socket heat welding.

COPOLYMER POLYPROPYLENE is a copolymer of propylene and polybutylene. It is made of high molecular weight copolymer polypropylene and possesses excellent dielectric and insulating properties because of its structure as a nonpolar hydrocarbon polymer. It combines high chemical resistance with toughness and strength at operating temperatures from freezing to 200°F. It has excellent abrasion resistance and good elasticity, and is joined by butt and socket fusion.

POLYETHYLENE, although its mechanical strength is comparatively low, polyethylene exhibits very good chemical resistance and is generally satisfactory when used at temperatures below 120°F. Types I and II (low and medium density) polyethylene are used frequently in tanks, tubing, and piping. Polyethylene is excellent for abrasive slurries. It is generally joined by butt fusion.

FLUOROPOLYMERS

PVDF (POLYVINYLIDENE FLUORIDE) is a strong, tough, and abrasion-resistant fluoroplastic material. It resists distortion and retains most of its strength to 280°F. As well as being ideally suited to handle wet and dry chlorine, bromine, and other halogens, it also withstands most acids, bases, and organic solvents. PVDF is not recommended for strong caustics. It is most widely recognized as the material of choice for high purity piping such as deionized water. PVDF is joined by thermal butt, socket, or electrofusion.

HALAR is a durable copolymer of ethylene and chlorofluoroethylene with excellent resistance to a wide variety of strong acids, chlorine, solvents, and aqueous caustics. Halar has excellent abrasion resistance, electric properties, low permeability, temperature capabilities from cryogenic to 340°F, and radiation resistance. Halar has excellent application for high purity hydrogen peroxide and is joined by thermal butt fusion.

TEFLON

There are three members of the Teflon family of resins.

PTFE TEFLON is the original Teflon resin developed by DuPont in 1938. This fluoropolymer offers the most unique and useful characteristics of all plastic materials. Products made from this resin handle liquids or gases up to 500°F. The unique properties of this resin prohibit extrusion or injection molding by conventional methods. When melted PTFE does not flow like other thermoplastics and it must be shaped initially by techniques similar to powder metallurgy. Normally PTFE is an opaque white material. Once sintered it is machined to the desired part.

FEP TEFLON was also invented by DuPont and became a commercial product in 1960. FEP is a true thermoplastic that can be melt-extruded and fabricated by conventional methods. This allows for more flexibility in manufacturing. The dielectric properties and chemical resistance are similar to other Teflons, but the temperature limits are -65°F to a maximum of 300°F. FEP has a glossy surface and is transparent in thin sections. It eventually becomes translucent as thickness increases. FEP Teflon is the most transparent of the three Teflons. It is widely used for its high ultraviolet light transmitting ability.

Caution: While the Teflon resin family has great mechanical properties and excellent temperature resistance, care must be taken when selecting the proper method of connections for your piping system. Generally, Teflon threaded connections will handle pressures to 120 PSIG. Loose ferrule connections are limited to 60 PSIG at ambient temperatures. Teflon loses it's ability to bear a load at elevated temperatures quicker than other thermoplastics. When working with the PTFE products shown in this catalog external ambient temperatures ranging from -60°F to 250°F (-51°C to 121°C) may be handled safely. Fluid or gas temperatures inside the product should be limited to -60 to 400°F (-51°C to 204°C) unless otherwise noted. Always use extreme care when working with chemicals at elevated temperatures.

MATERIAL DESCRIPTION

PFA TEFLON, a close cousin of PTFE, was introduced in 1972. It has excellent melt-processability and properties rivaling or exceeding those of PTFE Teflon. PFA permits conventional thermoplastic molding and extrusion processing at high rates and also has higher mechanical strength at elevated temperatures to 500°F. Premium grade PFA Teflon offers superior stress and crack resistance with good flex-life in tubing. It is generally not as permeable as PTFE.

DURAPLUS

ABS (ACRYLONITRILE-BUTADIENE-STYRENE)

There are many possibilities for polymer properties by combining these resins. For our purposes we will limit it to two products. One is the less expensive ABS resin used in drain, waste, and vent applications. The other resin for more stringent industrial applications has a different combination of the three polymers that make up the copolymer. The Duraplus product is made from this copolymer and has outstanding impact resistance even at low temperatures. The product is very tough and abrasion resistant. Temperature range is 40°F to 176°F.

RYTON (PPS) POLYPHENYLENE SULFIDE remains quite stable during both long and short term exposure to high temperatures. The high tensile strength and flexural modulus typical of PPS compounds, decrease with an increase in temperature. PPS is also highly resistant to chemical attack. Relatively few chemicals react to this material even at high temperatures. Its broad range of chemical resistance is second only to that of Teflon (PTFE). Ryton is used primarily for precision pump parts.

ELASTOMERS

VITON (FLUOROCARBON) is inherently compatible with a broad spectrum of chemicals. Because of this extensive chemical compatibility which spans considerable concentration and temperature ranges, Viton has gained wide acceptance as a sealing for valves, pumps, and instrumentation. Viton can be used in most applications involving mineral acids, salt solutions, chlorinated hydrocarbons, and petroleum oils.

EPDM (EPT) is a terpolymer elastomer made from ethylene-propylene diene monomer. EPDM has good abrasion and tear resistance and offers excellent chemical resistance to a variety of acids and alkalies. It is susceptible to attack by oils and is not recommended for applications involving petroleum oils, strong acids, or strong alkalies.

HYTREL is a multipurpose polyester elastomer similar to vulcanized thermoset rubber. Its chemical resistance is comparable to Neoprene, Buna-N and EPDM; however, it is a tougher material and does not require fabric reinforcement as do the other three materials. Temperature limits are -10°F minimum to 190°F maximum. This material is used primarily for pump diaphragms.

THERMOSETS

FIBERGLASS REINFORCED PLASTICS (FRP) including epoxy, polyester, and vinylester have become a highly valuable process engineering material for process piping.

FRP has been accepted by many industries because it offers the following significant advantages:
(a) moderate initial cost and low maintenance; (b) broad range of chemical resistance; (c) high strength-to-weight ratio; (d) ease of fabrication and flexibility of design; and (e) good electrical insulation properties.

EPOXY pipe and fittings have been used extensively by a wide variety of industries since 1960. It has good chemical resistance and excellent temperatures to pressure properties (to 300°F). Epoxy has been used extensively for fuel piping and steam condensate return lines.

POLYESTER pipe and fittings have been used by the industry since 1963. It has a proven resistance to most strong acids and oxidizing materials. It can be used in applications up to 200°F. Polyester is noted for its strength in both piping and structural shapes.

VINYLESTER resin systems are recommended for most chlorinated mixtures as well as caustic and oxidizing acids up to 200°F. Vinylester for most service has superior chemical resistance to epoxy or polyester.

NYLONS are synthetic polymers that contain an amide group. Their key characteristics are: (a) excellent resistance and low permeation to fuels, oils, and organic solvent, including aliphatic, aromatic, and halogenated hydrocarbons, esters, and ketones; (b) outstanding resistance to fatigue and repeated impact; and (c) wide temperature range from -30°F to 250°F.

Caution: Acids will cause softening, loss of strength, rigidity, and eventual failure.

POLYURETHANES

There are essentially two types of polyurethanes: polyester based and polyether based. Both are used for tubing applications.

POLYESTER based is the toughest of the two, having greater resistance to oil and chemicals. It does not harden when used with most oils, gasoline, and solvents. Polyurethane is extremely resistant to abrasives making it ideal for slurries, solids and granular material transfer. Temperature limit is 170°F.

Caution: Polyester based polyurethanes may be subject to hydrolysis under certain conditions, high relative humidity at elevated temperatures, aerated water, fungi, and bacteria. Where these potentials exist, we recommend polyether-based polyurethane.

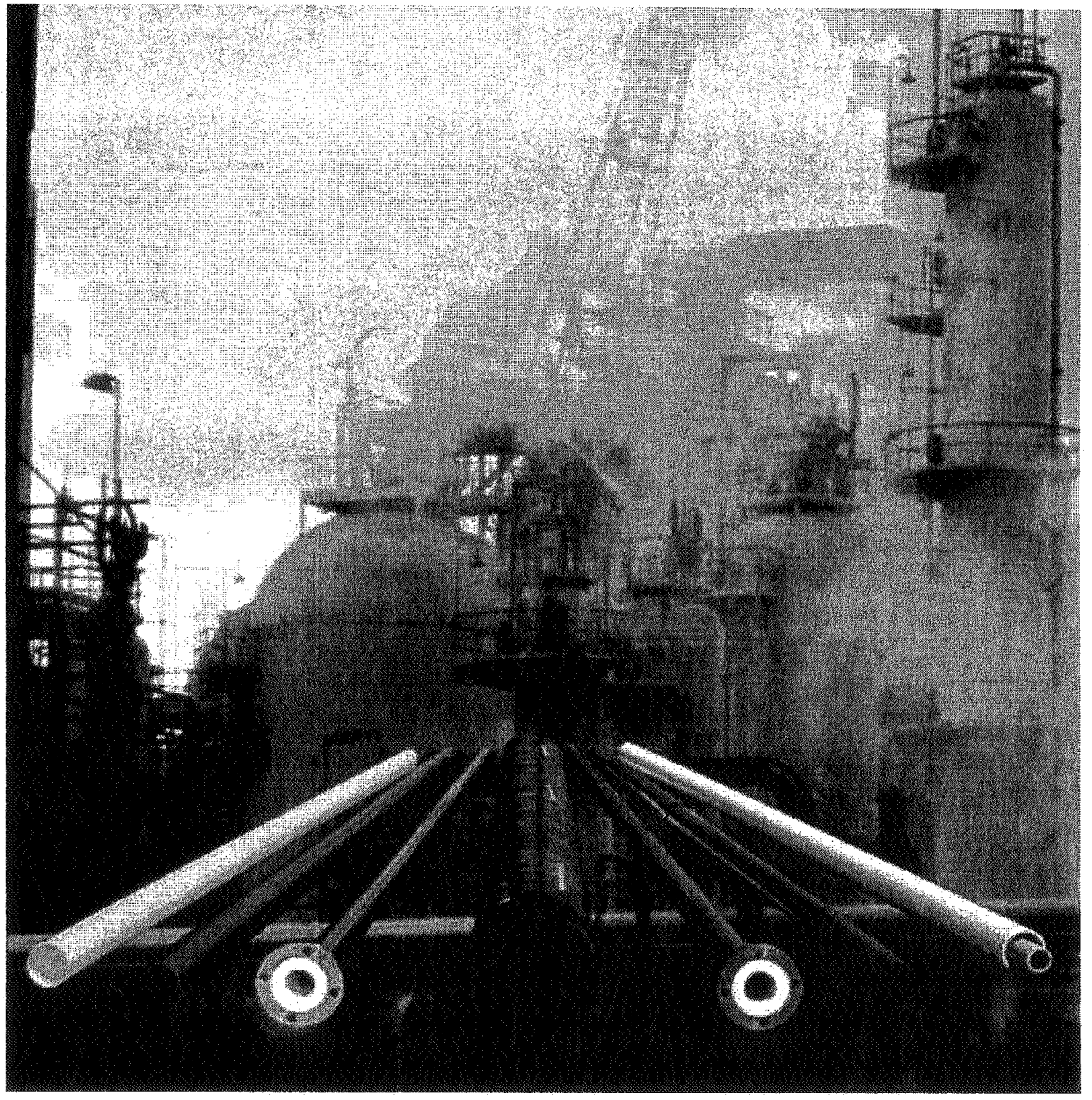
POLYETHER-based polyurethane possesses better low temperature properties, resilience and resistance to hydrolytic degradation than the polyester previously discussed.

MATERIAL DESCRIPTION

Accelerated testing indicates that polyether-based polyurethanes have superior hydrolytic stability as compared to polyester based material. Made with no plasticizers and with a low level of extractables, polyether is ideal for high purity work. It will not contaminate laboratory samples and is totally non-toxic to cell cultures. Compared with PVC tubing, polyurethanes have superior chemical resistance to fuels, oils, and some solvents. Its excellent tensile strength and toughness make it suitable for full vacuums. This tubing can withstand temperatures from -94°F to 200°F.

PTBP

Polybutylene terephthalate is a little known specialty material belonging to the polyimide group; It has excellent mechanical properties and good mechanical stress properties under corrosive environments. PTBP is used mainly for valve actuators, and bonnet assemblies.



INDUSTRY STANDARDS

The standards referenced herein, like all other standards, are of necessity minimum requirements. It should be recognized that two different plastic resin materials of the same kind, type, and grade will not exhibit identical physical and chemical properties. Therefore, the plastic pipe purchaser is advised to obtain specific values or requirements from the resin supplier to assure the best application of the material not covered by industry specifications; this suggestion assumes paramount importance.

ANSI

American National Standards Institute, Inc.
655 15th St. N.W.
300 Metropolitan Square
Washington, DC 20005
Phone (202) 639-4090

ANSI PRESSURE CLASSES
ANSI Class 125 means 175 PSIG at 100°F
ANSI Class 150 means 285 PSIG at 100°F
ANSI Class 300 means 740 PSIG at 100°F
ANSI A119.2 - 1963
ANSI B72.2 - 1967
ANSI B31.8 - 1968
ANSI Z21.30 - 1969

The following ASTM standards have been accepted by ANSI and assigned the following designations.

Table 1

ANSI Designation	ASTM Designation	ANSI Designation	ASTM Designation
B72.1	D 2239	B 72.11	D 2412
B72.2	D 2241	B 72.12	D 2446
B72.3	D 2282	B 72.13	D 2447
B72.4	D 1503	B 72.16	D 2564
B72.5	D 1527	B 72.17	D 2657
B72.6	D 1598	B 72.18	D 2661
B72.7	D 1785	B 72.19	D 2662
B72.8	D 2104	B 72.20	D 2672
B72.9	D 2152	B 72.22	D 2740
B72.10	D 2153	B 72.23	D 2235

ASTM

American Society of Testing and Materials
1916 Race Street
Philadelphia, Pennsylvania 19103

Plastic Pipe Specifications:

D	1785	Polyvinyl chloride (PVC) plastic pipe, schedules 40, 80, and 120
F	441	Chlorinated poly (vinyl chloride)(CPVC) plastic pipe, schedules 40 and 80
D	2241	Polyvinyl chloride (PVC) plastic pipe (SD - PR)
D	2513	Thermoplastic gas pressure pipe, tubing and fittings
D	2665	PVC plastic drain, waste, and vent pipe and fittings
D	2672	Bell-ended PVC pipe
D	2729	PVC sewer pipe and fittings
D	2846	Chlorinated (CPVC) plastic hot water distribution system
D	2949	3" thin wall PVC plastic drain, waste, and vent pipe and fittings
D	3034	Type PSM PVC sewer pipe and fittings

Plastic Pipe Fittings Specifications:

D	2464	Threaded PVC plastic pipe fittings, Schedule 80
F	437	Threaded chlorinated polyvinyl chloride (CPVC) plastic pipe fittings, Schedule 80
D	2466	Socket-type PVC plastic type fittings, Schedule 40
D	2467	Socket-type PVC plastic type fittings, Schedule 80
F	439	Socket-type chlorinated polyvinyl chloride (CPVC) plastic pipe fittings Schedule 80
D	3036	PVC plastic pipe lined couplings, socket type

Plastic Pipe Solvent Cement Specifications

D	2564	Solvent cements for PVC plastic pipe and fittings
F	493	CPVC solvent cement

Plastic Lined Steel Piping Specifications:

ASTM A-587	Standard specification for electric-welded low carbon steel pipe for the chemical industry
ASTM A-53	Standard specification for pipe, steel, black and hot-dipped, zinc-coated, welded and seamless
ASTM A-105	Standard specification for forgings, carbon steel, for piping components
ASTM A-125	Standard specification for steel springs, helical, heat-treated
ASTM A-126	Standard specifications for gray iron castings for valves, flanges, and pipe fittings
ASTM A-395	Standard specification for ferritic ductile iron pressure retaining castings for use at elevated temperatures
ASTM A-216	Standard specification for carbon steel castings suitable for fusion welding for high temperature service
ASTM A-234	Standard specification for piping fittings of wrought carbon steel and alloy steel for moderate and elevated temperatures
ANSI B-16.1	Cast iron pipe flanges and flanged fittings Class 25, 125, 150, 250 and 800
ANSI B-16.42	Ductile iron pipe flanges and flanged fittings Class 150 and 300

INDUSTRY STANDARDS

ANSI B-16.5	Steel pipe flanges and flanged fittings Class 150, 300, 400, 600, 900, 1500 and 2500
A-587	Standard specification for electric-welded low carbon steel pipe for the chemical industry
A-53	Standard specification for pipe, steel black and hot-dipped, zinc-coated, welded and seamless
A-105	Standard specification for forgings, carbon steel, for piping components
A-125	Standard specification for steel springs, helical, heat-treated
A-126-73	Standard specification for gray iron castings for valves, flanges, and pipe fittings
A-395-77	Standard specification for ferritic ductile iron pressure retaining castings for use at elevated temperatures
A-216-77	Standard specification for carbon steel castings suitable for fusion welding for high temperature service

Methods of Test Specifications:

D	256	Test for impact resistance of plastics and electrical insulating materials
D	543	Test for resistance of plastics to chemical reagents
D	570	Test for water absorption of plastics
D	618	Conditioning plastics and electrical insulating materials for testing
D	621	Tests for deformation of plastics under load
D	635	Test for flammability of self-supporting plastics
D	638	Test for tensile properties of plastics
D	648	Test for deflection temperature of plastics under load
D	671	Tests for repeated flexural stress of plastics
D	757	Test for flammability of plastics, self-extinguishing type
D	790	Test for flexural properties of plastics
D	883	Nomenclature relating to plastics
D	1180	Test for bursting strength of round, rigid plastic tubing
D	1598	Test for time to failure of plastic pipe under long-term hydrostatic pressure
D	1599	Test for short-time rupture strength of plastic pipe, tubing and fittings
D	2122	Determining dimensions of thermoplastic pipe and fittings
D	2152	Test for quality of extruded PVC pipe by acetone immersion
D	2412	Test for external loading properties of plastic pipe by parallel-plate loading
D	2444	Test for impact resistance of thermoplastic pipe and fittings by means of a tup (falling weight)
D	2837	Obtaining hydrostatic design basis thermoplastic pipe materials
D	2924	Test for external pressure resistance of plastic pipe

RECOMMENDED PRACTICES

D	2153	Calculating stress in plastic pipe under internal pressure
D	2321	Underground installation of flexible thermoplastic sewer pipe
D	2657	Heat joining of thermoplastic pipe and fittings
D	2749	Standard definitions of terms relating to plastic pipe fittings
D	2774	Underground installation of thermoplastic pressure pipe
D	2855	Making solvent cemented joints with PVC pipe and fittings

ASTM STANDARDS FOR PLASTIC MATERIALS REFERENCED IN PLASTIC PIPE, FITTINGS, AND CEMENT STANDARDS

D	1784	PVC compounds and CPVC compounds

BOCA

Building Officials Conference of America
1313 East 60th Street
Chicago, Illinois 60637

BOCA Basic Plumbing Code

INDUSTRY STANDARDS

Table 2

Group	Commercial Standard or Product Standard	ASTM Standard or Tentative Specification
A	PS10	D2104
B	PS11	D2238
C	PS12	D2447
D	PS18	D1527
E	PS19	D2282
F	PS21	D1785
G	PS22	D2241
H	CS228	D2852
I	CS270	D2661
J	CS272	D2665

COMMERCIAL AND PRODUCT STANDARDS
Supt. of Documents
U.S. Government Printing Office
Washington, DC 20402

CS 272	PVC-DWV pipe and fittings
PS 21	PVC plastic pipe (Schedules 40, 80, 120) supersedes CS 207-60
PS 22	PVC plastic pipe (SDR) supersedes CS 256

CSA
Canadian Standards Association
178 Rexdale Boulevard
Rexdale, Ontario, Canada

B	137.0	Defines general requirements and methods of testing for thermoplastic pressure pipe
B	137.3	Rigid polyvinyl chloride (PVC) pipe for pressure applications
B	137.4	Thermoplastic piping systems for gas service
B	137.14	Recommended practice for the installation of thermoplastic piping for gas service
B	181.2	Polyvinyl chloride drain, waste, and vent pipe and pipe fittings
B	181.12	Recommended practice for the installation of PVC drain, waste, and vent pipe fittings
B	182.1	Plastic drain and sewer pipe and pipe fittings for use underground
B	182.11	Recommended practice for the installation of plastic drain and sewer pipe and pipe fittings

DEPARTMENT OF AGRICULTURE
U.S. Department of Agriculture
Soil Conservation Service
Washington, DC 20250

SCS National Engineering Handbook, Section 2, Part 1, Engineering Practice Standards

SCS432-D	High pressure underground plastic irrigation pipelines
SCS432-E	Low head underground plastic irrigation pipelines

DEPARTMENT OF DEFENSE MILITARY STANDARDS
Commanding Officer
Naval Publications and Forms Center
5108 Tabor Avenue
Philadelphia, Pennsylvania 19120

MIL-A-22010A(1)	Adhesive solvent-type, polyvinyl chloride amendment
MIL-C-23571A(YD)	Conduit and conduit fittings, plastic, rigid
MIL-P-14529B	Pipe, extruded, thermoplastic
MIL-P-19119B(1)	Pipe, plastic, rigid, unplasticized, high impact, polyvinyl chloride
MIL-P-22011A	Pipe fittings, plastic, rigid, high impact, polyvinyl chloride, (PVC) and poly 1, 2 dichlorethylene
MIL-P-28584A	Pipe and pipe fittings, glass fiber reinforced plastic for condensate return lines
MIL-P-29206	Pipe and pipe fittings glass fiber reinforced plastic for liquid petroleum lines

DOT - OTS
Department of Transportation, Hazardous Materials Regulation Board, Office of Pipeline Safety, Title 49, Docket OPS-3 and amendments, Part 192. Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards, Federal Register, Vol, 35, No. 161, Wednesday, August 19, 1980. Amendments to date are 192-1, Vol. 35, No. 205, Wednesday, October 21, 1970; 19-2, Vol. 35, No. 220, Wednesday, November 11, 1970; and 192-3, Vol. 35, No. 223, Tuesday, November 17, 1970.

FEDERAL SPECIFICATIONS

Specifications Activity
Printed Materials Supply Division
Building 197, Naval Weapons Plant
Washington, DC 20407

L-P-320a	Pipe and fittings, plastic (PVC, drain, waste, and vent)
L-P-1036(1)	Plastic rod, solid, plastic tubes and tubing, heavy walled; polyvinyl chloride

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

HANDLING & STORAGE PLASTIC PIPE

Normal precautions should be taken to prevent excessive mechanical abuse. However, when unloading pipe from a truck, for example, it is unwise to drag a length off the tailgate and allow the free end to crash to the ground. Remember, too, that SCRATCHES AND GOUGES ON THE PIPE SURFACE CAN LEAD TO REDUCED PRESSURE-CARRYING CAPACITY. Standard pipe wrenches should not be used for making up threaded connections since they can deform or scar the pipe. Use strap wrenches instead. When using a pipe vise or chuck, wrap jaws with emery cloth or soft metal.

Pipe should be stored on racks that afford continuous support and prevent sagging or draping of longer lengths. Burrs and sharp edges of metal racks should be avoided. Plastic fittings and flanges should be s˚Á„Bê4˚ÁÂ'∑ «?Ëkÿ4*ùÍ◊∑3)›Ì À1ÀPÔ ¸ 0ôé≈¬.rÚ$\+›jÛ%+)qïÛ¡›&Â7Û^...$GÆ
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FIELD STACKING

During prolonged field storage of loose pipe, its stacks should not exceed two feet in height. Bundled pipe may be double-stacked providing its weight is distributed by its packaging boards.

HANDLING

Care should be exercised to avoid rough handling of pipe and fittings. They should not be pushed or pulled over sharp projections, dropped or have any objects dropped upon them. Particular care should be taken to avoid kinking or buckling the pipe. Any kinks or buckles which occur should be removed by cutting out the entire damaged section as a cylinder. All sharp edges on a pipe carrier or trailer that could come in contact with the pipe should be padded; i.e., can use old fire hose or heavy rubber strips. Only nylon or rope slings should be used for lifting bundles of pipe; chains are not to be used.

INSPECTION

Before installation, all lengths of pipe and fittings should be thoroughly inspected for cuts, scratches, gouges, buckling, and any other imperfections which may have been imparted to the pipe during shipping, unloading, storing, and stringing. Any pipe or pre-coupled fittings containing harmful or even questionable defects should be removed by cutting out the damaged section as a complete cylinder.

JOINING TECHNIQUES

FOR THERMOPLASTIC PIPE

There are six recommended methods of joining thermoplastic pipe and fittings, each with its own advantages and limitations:

SOLVENT CEMENTING

The most widely used method in Schedule 40 PVC, Schedule 80 PVC and CPVC piping systems as described in ASTM D-2855-93. The O.D. of the pipe and the I.D. of the fitting are primed, coated with special cement and joined together, as described in detail below. Knowledge of the principles of solvent cementing is essential to a good job. These are discussed in the Solvent Welding Instructions Section.

NOTE: The single most significant cause of improperly or failed solvent cement joints is lack of solvent penetration or inadequate primer application.

THREADING

Schedule 80 PVC, CPVC, PVDF, and PP can be threaded with special pipe dyes for mating with Schedule 80 fittings provided with threaded connections. Since this method makes the piping system easy to disassemble, repair, and test, it is often employed on temporary or take-down piping systems, as well as systems joining dissimilar materials. However, threaded pipe must be derated by 50 percent from solvent-cemented systems. **(Threaded joints are not recommended for PP pressure applications.)**

FLANGES

Flanges are available for joining all thermoplastic piping systems. They can be joined to the piping either with solvent-cemented or threaded connections. Flanging offers the same general advantages as threading and consequently is often employed in piping systems that must frequently be dismantled. The technique is limited to **150 psi working pressure.**

BUTT FUSION

This technique us used to connect all sizes of Polypropylene (Proline), PVDF (Super Proline) and large diameter Fuseal. Butt fusion is an easy, efficient fusion method especially in larger diameters.

SOCKET FUSION

This technique is used to assemble PVDF and polypropylene pipe and fittings for high-temperature, corrosive-service applications. (See each material Design Data section for recommended joining technique.)

FUSEAL HEAT FUSION

R & G Sloane's Fuseal is a patented method of electrically fusing pipe and fitting into a single homogenous unit. This advanced technique is used for GSR Fuseal polypropylene corrosive waste-handling systems.

FUSEAL MECHANICAL JOINT

Mechanical Joint polypropylene drainage system is used extensively for accessible smaller sized piping areas. The system, as the name implies, is a mechanical sealed joint that consists of a seal-ring, grab-ring, and nut. It is quick and easy to install and can be disconnected just as easily. You will find it most suitable for under sink and under counter piping.

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS
BASIC PRINCIPLES OF SOLVENT CEMENTING

SAFETY PRECAUTIONS

Cements contain highly volatile solvents which evaporate rapidly. Avoid breathing the vapors. If necessary, use a fan to keep the work area clear of fumes. Avoid skin or eye contact. Do not use near heat, sparks, or open flame. Do not pressure test with compressed air or gas! Severe damage or bodily injury can result.

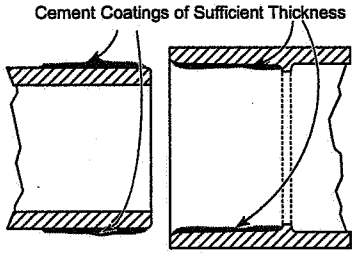
Solvent cementing is a preferred method of joining rigid PVC (Polyvinyl Chloride) and CPVC (Chlorinated Polyvinyl Chloride) pipe and fittings providing a chemically fused joint. The solvent-cemented joint is the last vital link in the installation process. It can mean the success or failure of the whole system. Accordingly, it requires the same professional care and attention that is given to the other components of the system. Experience shows that most field failures of plastic piping systems are due to improperly made solvent-cemented joints.

There are step-by-step procedures on just how to make solvent-cemented joints shown on the following pages. However, we feel that if the basic principles involved are first explained and understood, better quality installation can result with ease. To consistently make good joints, the following basics should be clearly understood by the installer.

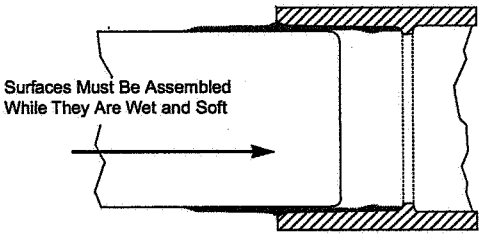
1. The joining surfaces must be clean, then softened and made semi-fluid.
2. Sufficient cement must be applied to fill the gap between pipe and fittings.
3. Assembly of pipe and fittings must be made while the surfaces are still wet and fluid.
4. Joint strength develops as the cement dries. In the tight part of the joint the surfaces will tend to fuse together. In the loose part the cement will bond to both surfaces.

Penetration and softening should be achieved with a suitable primer such as P70. Primer will penetrate and soften the surfaces more quickly than cement alone. Primer also provides a safety factor for the installer, as he can know under various temperature conditions when he has achieved sufficient softening of the material surfaces. For example, in cold weather more time and additional applications of primer will be required.

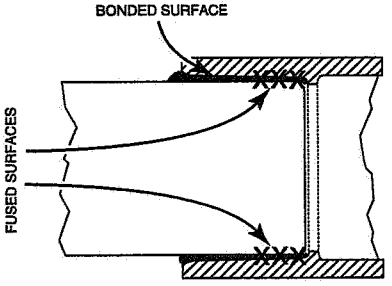
More than sufficient cement to fill the loose part of the joint must be applied. Besides filling the gap, adequate cement layers will penetrate the surface and also remain wet until the joint is assembled. Prove this for yourself. Apply on the top surface of a piece of pipe two separate layers of cement. First, flow on a heavy layer of cement, then alongside it a thin brushed out layer. Test the layers every 15 seconds or so by a gentle tap with your finger. You will note that the thin layer becomes tacky and dries quickly (probably within 15 seconds). The heavy layer will remain wet much longer. Now check for penetration a few minutes after applying these layers. Scrape them with a knife. The thin layer will have achieved little or no penetration, the heavy one much more penetration.



If the cement coating on the pipe and fittings are wet and fluid when assembly takes place, they will tend to flow together and become one cement layer. Also, if the cement is wet the surface beneath them will be soft, and these softened surfaces in the tight part of the joint will tend to fuse together.



As the solvent dissipates, the cement layer and the softened surfaces will harden with a corresponding increase in joint strength. A good joint will take the required pressure long before the joint is fully dry and final strength is obtained. In the tight (fused) part of the joint, strength will develop more quickly than in the loose (bonded) part of the joint. Information about the development of the bond strength of solvent-cemented joints is available on request.



JOINING EQUIPMENT AND MATERIALS

- **Cutting Tool (Saw or Wheel cutter)**
- **Deburring Tool (knife or file)**
- **Applicator Can or Bucket**
- **Solvent Cement**
- **Notched Boards**
- **Rags (nonsynthetic, i.e., cotton)**
- **Cement and Primer Applicators**
- **Purple Primer**
- **Tool Tray**

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

Before commencing work, this entire section should be studied and thoroughly understood. It is important that workers making joints be knowledgeable of these instructions and follow them carefully. Do not take shortcuts or omit any of the detailed steps.

KNOW YOUR MATERIAL

There are two general types of rigid vinyl materials, PVC and CPVC. Fitting are made of both materials and in both Schedule 40 and Schedule 80 weights.

Because of the difference in socket dimensions between the Schedule 40 and Schedule 80 fittings, more care must be taken with the Schedule 80 fittings and the cure schedules are different. Determine before proceeding with the job which type of vinyl plastic you are working with and which weight of fitting.

HANDLING CEMENTS AND PRIMERS

Cements and primers contain highly volatile solvents which evaporate rapidly. Avoid breathing the vapors. If necessary, use a fan to keep the work area clear of fumes. Avoid skin or eye contact. Keep cans closed when not actually in use. Solvent cements are formulated to be used "as received" in the original containers. If the cement thickens much beyond its original consistency, discard it. Cement should be free flowing, not jelly-like. Do not attempt to dilute it with thinner, as this may change the character of the cement and make it ineffective. Caution: Solvent cement has limited shelf life, usually one year for CPVC and two years for PVC. Date of manufacture is usually stamped on the bottom of the can. Do not use the cement beyond the period recommended by the manufacturer. Always keep solvent cements and primers out of the reach of children.

SELECTION OF CEMENTS, PRIMERS AND APPLICATORS

1. Obtain the correct primer and solvent cement for the product being installed. (See Harrington's Catalog for detailed information on solvent cements and primers.)

PVC

(a) Use #P-70 purple primer for all sizes of PVC pipe and fittings.
(b) Use #710 clear, light-bodied cement with PVC Schedule 40 fittings having an interference fit through 2" size. Not for use on Schedule 80.
(c) Use #705 clear, medium-bodied cement with PVC Schedule 40 fittings having an interference fit though 6" size. Not for use on Schedule 80.
(d) Use #711 gray, heavy-bodied cement with PVC Schedule 80 fittings through 8" and Schedule 40 fittings 6" and 8" size.
(e) Use #719 gray, extra-heavy-bodied cement for Schedule 40, 80, and all class or schedule sizes over 8" size.

CPVC

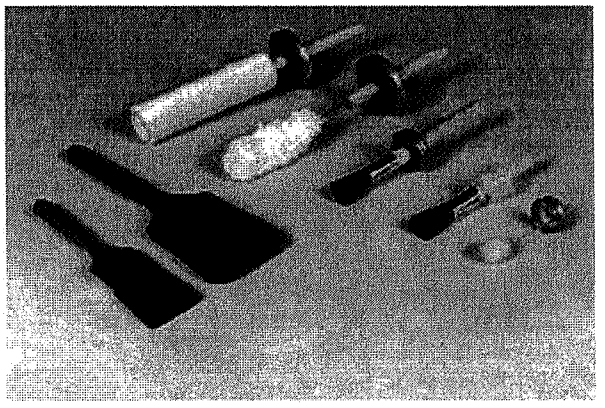
(a) Use #P-70 purple primer for all sizes of CPVC pipe and fittings except copper tube size CPVC (which requires #P-72 or 729).
(b) Use #714 orange or gray, heavy-bodied cement for all sizes of CPVC pipe and fittings.

2. Obtain the correct primer applicators. (See Harrington's Catalog for applicators.) Generally, the applicator should be about 1/2 the pipe diameter.

(a) Use #DP-75, 3/4" diameter, dauber (Supplied with pint size cans of P-70 primer.) for pipe sizes thru 1 1/4".
(b) Use #DP-150, 1 1/2" diameter, dauber for pipe sizes through 3".
(c) Use #4020 cotton string mop for pipe sizes 4" and larger.

Low VOC 724 cement for hypochlorite service.
Weld-on 724 CPVC low VOC cement is a gray, medium bodied, fast setting solvent cement used for joining CPVC industrial piping through 12" diameter, and is specially formulated for services that include caustics and hypochlorites.

3. Obtain the correct solvent cement applicators. Generally, the applicator should be about 1/2 the pipe diameter.



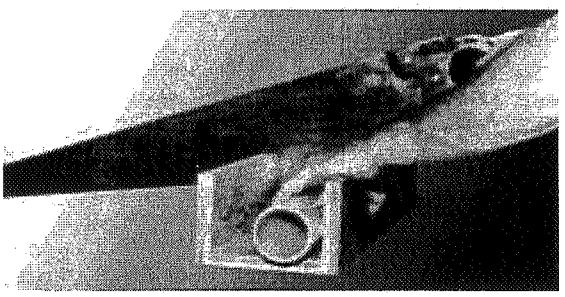
(a) Use #DP-75 3/4" diameter dauber or a natural bristle brush for pipe sizes 1/2" through 1-1/4"
(b) Use #DP-150 1-1/2" diameter dauber for pipe sizes 3/4" through 3". (1" natural bristle brush may be used for pipe sizes up to 2".).
(c) Use #3020, 2" diameter, "Roll-A-Weld" roller for 3" through 6" pipe sizes.
(d) Use #7020 7" long roller or #4020 large cotton swab for 6" through 12" pipe sizes.
(e) Use extra-large natural bristle paint brush to flow cement onto pipe larger than 12".

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

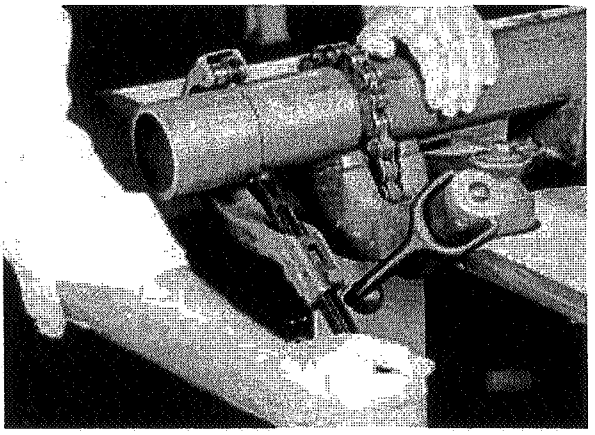
SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

PREPARATION

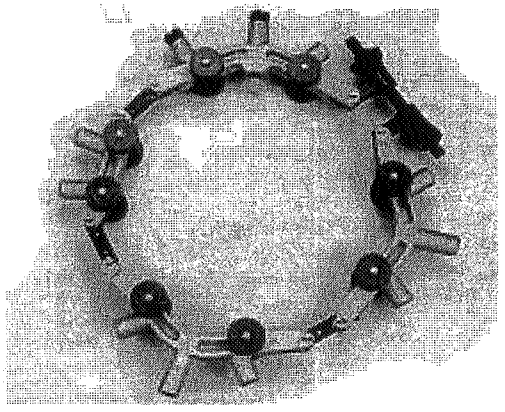
Condition pipe and fittings to the same temperature.



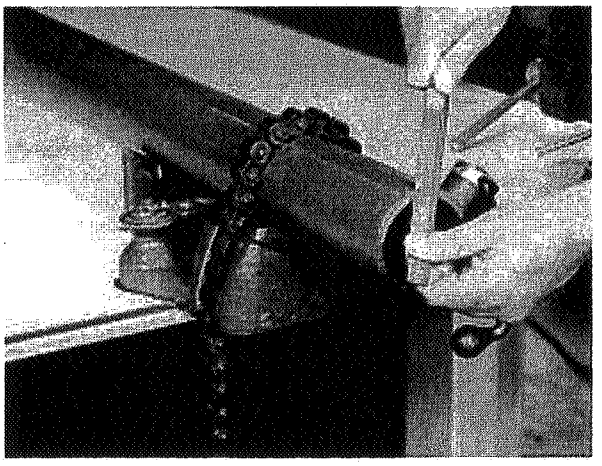
1. Cut pipe square to desired length using a hand saw and miter box or mechanical cutoff saw. A diagonal cut reduces the bonding area in the most effective part of the joint.



2. Plastic tubing cutters may also be used for cutting plastic pipe. However, most produce a raised bead at the end of the pipe. This must be removed with a file, knife, or beveling tool. A raised bead will wipe the cement away when the pipe is inserted into the fitting.

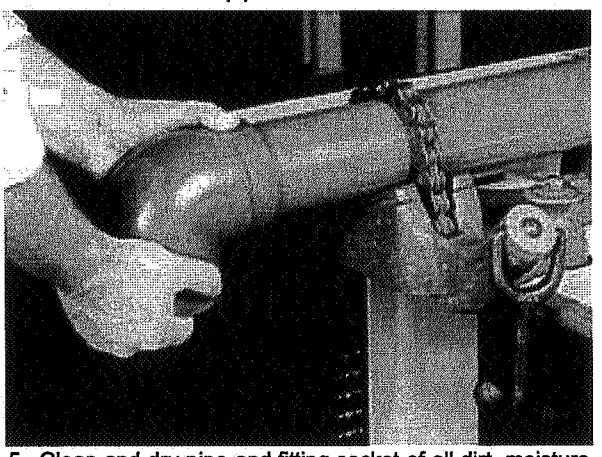


3. Large diameter pipe should be cut and chamfered with appropriate power tools. See Harrington's Products Catalog for tools.



- For 3/8" to 8" pipe - 1/16" to 3/32"
- For 10" to 30" pipe - 1/4" to 5/8"

4. Chamfer end of the pipe as shown above.



5. Clean and dry pipe and fitting socket of all dirt, moisture, and grease. Use a clean, dry rag.

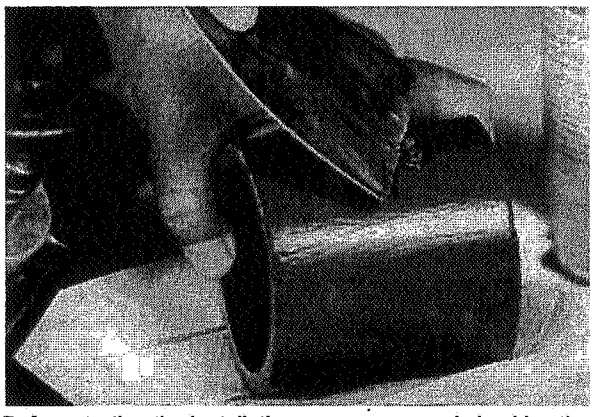
Check pipe and fitting for fit (dry) before cementing. For proper interference fit, the pipe must go into the fitting 1/3 to 3/4 of the way to the stop. Too tight of a fit is not desirable. You must be able to fully bottom the pipe into the socket after it has been softened with primer. If the pipe and fitting are not out of round, a satisfactory joint can be made if there is a "net" fit. That is, the pipe bottoms in the fitting socket with no interference, but without slop. All pipe and fitting must conform to ASTM or other standards.

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

PRIMING

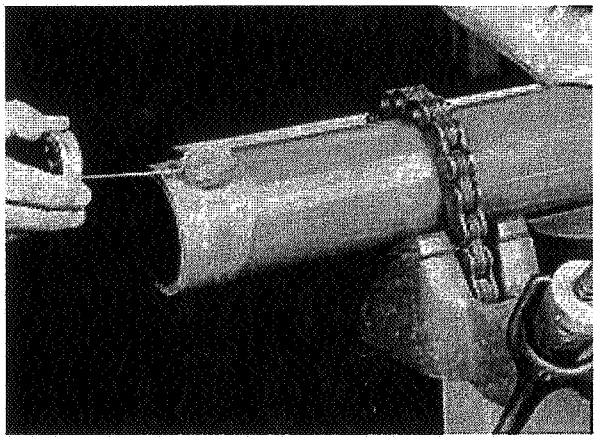
7. The purpose of the primer is to penetrate and soften the surfaces so that they can fuse together. The proper use of the primer and checking of its softening effect provides assurance that the surfaces are prepared for fusion in a wide variety of temperatures and working conditions.



Before starting the installation, we recommend checking the penetration and softening effect of the primer on a scrap piece of the material you will be working with. This should be done where the temperature and environmental conditions are the same as those where the actual installation will take place. The effect of the primer on the surface will vary with both time and temperature. To check for proper penetration and softening, apply primer as indicated in step number 9. After applying primer, use a knife or sharp scraper and draw the edge over the coated surface. Proper penetration has been made if you can scratch or scrape a few thousandths of an inch of the primed surface away.

8. Using the correct applicator as previously mentioned, apply primer freely with a scrubbing motion to the fitting socket, keeping the surface and applicator wet until the surface has been softened. This usually requires 5-15 seconds. More time is needed for hard surfaces (found in belled-end pipe and fittings made from pipe stock) and in cold weather conditions. Redip the applicator in the primer as required.

When the surface is primed, remove any puddles of primer from the socket. Puddles of primer can weaken the pipe and/or joint itself.

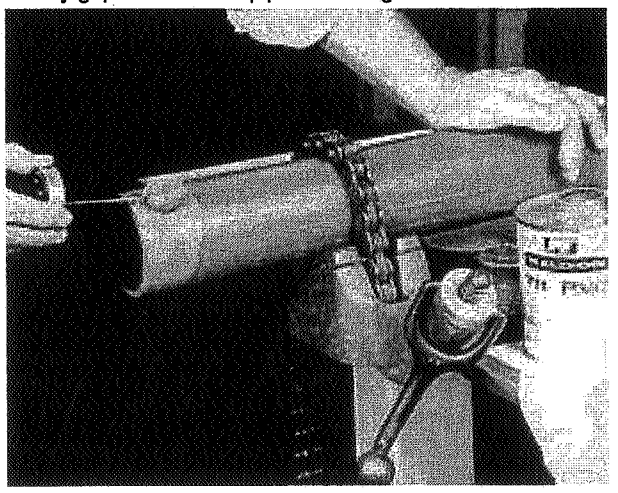


9. Apply the primer to the end of the pipe equal to the depth of the fitting socket. Application should be made in the same manner as was done to the fitting socket. Be sure the entire surface is well dissolved or softened.

10. Apply a second application of primer to the fitting socket and immediately, while the surfaces are still wet, apply the appropriate solvent cement. Time becomes important at this stage. Do not allow cement or primer to dry or start forming film on the surface.

CEMENTING

11. Apply a liberal coat of solvent cement to the male end of the pipe. Flow the cement on with the applicator. **Do not** brush cement out to a thin paint-type layer that will dry in a few seconds. The amount should be more than sufficient to fill any gap between the pipe and fitting.

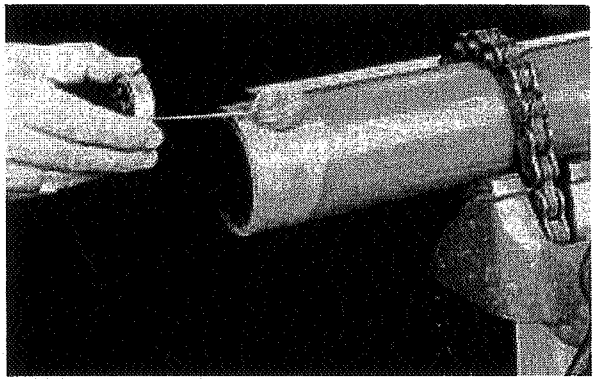


INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

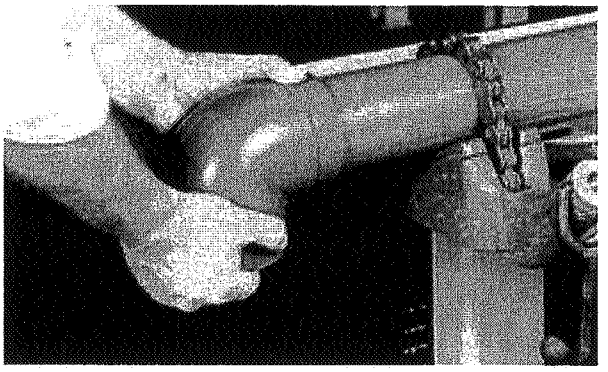
12. Apply a medium layer of solvent cement to the fitting socket; avoid puddling cement in the socket. On bell-end pipe do not coat beyond the socket depth or allow cement to run down in the pipe beyond the bell.

13. Apply a second full, even coat of solvent cement to the male end of the pipe. There must be sufficient cement to fill any gap in the joint. The cement must be applied deliberately but without delay. It may be necessary for two men to work together when cementing three inch and larger pipe.

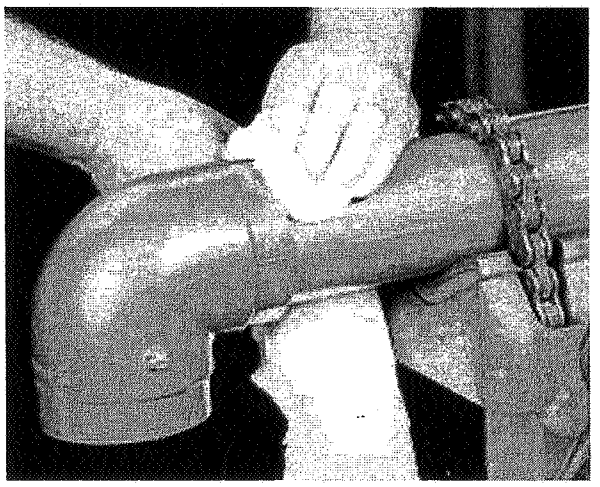


14. While both the inside of the socket and the outside surface of the male end of the pipe are soft and wet with cement, forcefully bottom the male end of the pipe into the socket. Give the male end of the pipe a one-quarter turn if possible. This will help drive any air bubbles out of the joint. The pipe must go into the bottom of the socket and stay there. Hold the joint together until both soft surfaces are firmly gripped. (Usually less than 30 seconds on small diameter piping, larger sizes will require more time.) Care must be used since the fitting sockets are tapered and the pipe will try to push out of the fitting just after assembly.

When solvent cementing large diameter (8 inch and above) pipe and fittings proper equipment should be used. We recommend using straps and come-alongs as shown. See the tool section of the Harrington catalog.



15. After assembly a properly made joint will normally show a ring or bead of cement completely around the juncture of the pipe and fitting. Any gaps at this point may indicate a defective assembly job, due to insufficient cement or the use of light bodied cement on larger diameters where heavy bodied cement should have been used.



16. Without disturbing the joint, use a rag and remove excess cement from the pipe at the end of the fitting socket. This includes the ring or bead noted earlier. This excess cement will not straighten the joint and may actually cause needless softening of the pipe and additional cure times.

17. Handle newly assembled joints carefully until initial set has taken place. Recommended setting time allowed before handling or moving is related to temperature. See initial set times (Table 70).

18. Allow the joint to cure for adequate time before pressure testing. Joint strength development is very rapid within the first 48 hours. Short cure periods are satisfactory for high ambient temperatures with low humidity, small pipe sizes, and interference-type fittings. Longer cure periods are necessary for low temperatures, large pipe sizes, loose fits, and relatively high humidity. See Table 71 for recommended cure times.

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

Table 70

INITIAL SET TIMES

TEMPERATURE RANGE DURING INITIAL SET TIME	SET TIME FOR PIPE SIZES 1/2" TO 1 1/4"	SET TIME FOR PIPE SIZES 1 1/2" TO 3"	SET TIME FOR PIPE SIZES 4" TO 8"	SET TIME FOR PIPE SIZES 10" TO 14"	SET TIME FOR PIPE SIZES 16" TO 24"
60° TO 100° F	15 MIN.	30 MIN.	1 HR.	2 HR.	4 HR.
40° TO 59° F	1HR.	2 HR.	4 HR.	8 HR.	16 HR.
0° TO 39° F	3 HR.	6 HR.	12 HR.	24 HR.	48 HR.

* In damp or humid weather allow 50% more cure time.

The following cure schedules are suggested as guides. They are based on laboratory test data and should not be taken to be the recommendation of all cement manufacturers. Individual manufacturers' recommendations for their particular cement should be followed. These cure schedules are based on laboratory test data obtained on net fit joints. (Net fit—in a dry fit the pipe bottoms snugly in the fitting socket without meeting interference.) If a gap joint is encountered in the system, double the following cure times.

Table 71

JOINT CURE SCHEDULE
FOR PVC/CPVC PIPE AND FITTINGS

RELATIVE HUMIDITY 60% OR LESS* TEMPERATURE RANGE DURING ASSEMBLY AND CURE TIME	CURE TIME FOR PIPE SIZES 1/2" TO 1 1/4		CURE TIME FOR PIPE SIZES 1 1/2" TO 3"		CURE TIME FOR PIPE SIZES 4" TO 8"		CURE TIME FOR PIPE SIZES 10" TO 14"	CURE TIME FOR PIPE SIZES 16" TO 24"
	Up To 180 psi	Above 180 to 370 psi	Up To 180 psi	Above 180 to 315 psi	Up To 180 psi	Above 180 to 315 psi	Up to 180 psi	Up to 100 psi
60° TO 100° F	1 Hr.	6 Hr.	2 Hr.	12 Hr.	6 Hr.	24 Hr.	24 Hr.	48-72 Hr.
40° TO 59° F	2 Hr.	12 Hr.	4 Hr.	24 Hr.	12 Hr.	48 Hr.	72 hrs	5 Days
0° TO 39° F	8 Hr.	48 Hr.	16 Hr.	96 Hr.	48 Hr.	8 Days	8 Days	10-14 Days

TROUBLESHOOTING AND TESTING SOLVENT CEMENT JOINTS

DO NOT TEST WITH AIR OR COMPRESSED GAS.

DO NOT TAKE SHORTCUTS. Experience has shown that shortcuts from the instructions given above are the cause of most field failures. Don't take a chance.

Solvent cemented joints correctly assembled with good cement under reasonable field conditions should never blow apart when tested, after the suggested cure period under recommended test pressures.

Good solvent cemented joints exhibit a complete dull surface on both surfaces **when cut in half and pried apart.** Leaky joints will show a continuous or an almost continuous series of shiny spots or channels from the bottom to the outer lip of the fitting. No bond occured at these shiny spots. The condition can increase to the point where the entire cemented area is shiny, and the fitting can blow off at this point.

Shiny areas can be attributed to one or a combination of the following causes:

1. Cementing surface not properly primed and dissolved prior to applying solvent cement.
2. Use of too small an applicator for primer or cement in comparison to pipe and fitting diameter.
3. Use of a cement which has partially or completely dried prior to bottoming the pipe into the fitting.
4. Use of jelled cement which will not bite into the pipe and fitting surface due to loss of the prime solvent.
5. Insufficient cement or cement applied only to one surface.
6. Excess gap which cannot be satisfactorily filled.
7. Excess time taken to make the joint after start of the cement application. In many of these cases, as well as condition No. 2, examination will show that it was impossible to bottom the fitting, since the lubrication effect of the cement had dissipated.
8. Cementing with pipe surfaces above 110°F has evaporated too much of the prime solvent.
9. Cementing with cement which has water added by one means or another, or excess humidity conditions coupled with low temperatures.
10. Joints that have been disturbed and the bond broken prior to the firm set, or readjusted for alignment after bottoming.

INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

JOINING PLASTIC PIPE IN HOT WEATHER

There are many occasions when solvent cementing plastic pipe in 95°F temperatures and over cannot be avoided. If special precautions are taken, problems can be avoided. Solvent cements for plastic pipe contain high-strength solvents which evaporate faster at elevated temperatures. This is especially true when there is a hot wind blowing. If the pipe is stored in direct sunlight, surface temperatures may be 20°F to 30°F above the air temperature. Solvents attack these hot surfaces faster and deeper, especially inside the joint. Thus it is very important to avoid puddling inside the socket and to wipe off excess cement outside the joint.

By following our standard instructions and using a little extra care as outlined below, successful solvent cemented joints can be made even in the most extreme hot weather conditions.

JOINING PLASTIC PIPE IN COLD WEATHER

Working in freezing temperatures is never easy, but sometimes the job is necessary. If that unavoidable job includes solvent cementing of plastic pipe, it can be done.

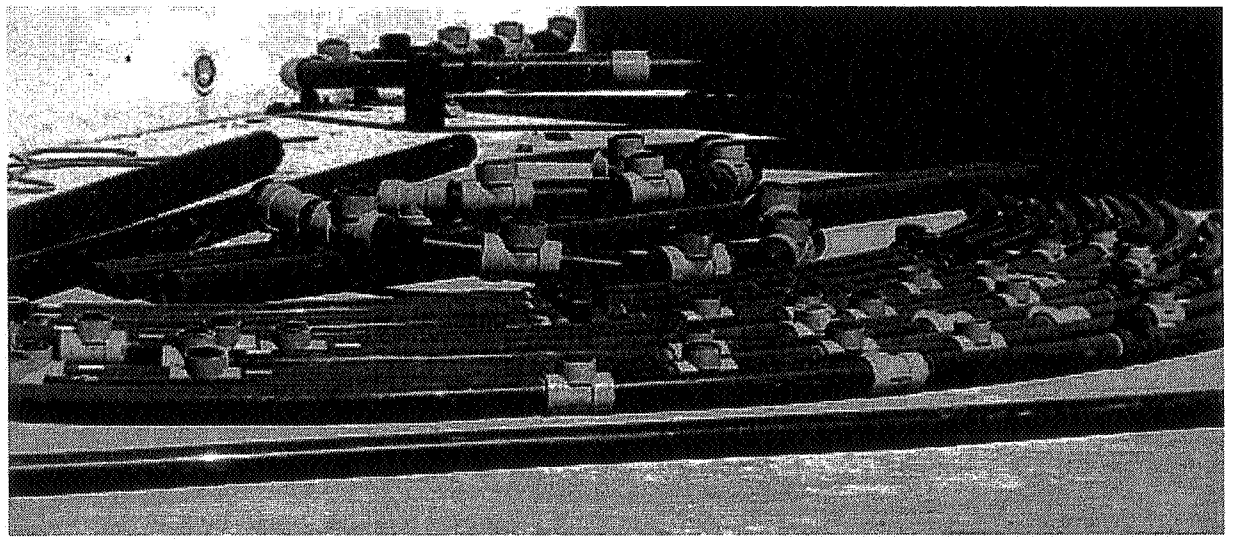
GOOD JOINTS CAN BE MADE AT SUB-ZERO TEMPERATURES

By following our standard instructions and using a little extra care and patience, successful solvent cemented joints can be made at temperatures even as low as -15°F. In cold weather solvents penetrate and soften the surfaces more slowly than in warm weather. Also, the plastic is more resistant to solvent attack. Therefore, it becomes more important to presoften surfaces with primer.

Because solvents evaporate slower in cold weather, a longer cure time will be required. The cure schedule printed in Table 71 already allows a wide margin for safety. For colder weather, simply allow more cure time.

TIPS TO FOLLOW WHEN SOLVENT CEMENTING IN HIGH TEMPERATURES:

1. Store solvent cements and primers in a cool or shaded area prior to use.
2. If possible, store fittings and pipe, or at least the ends to be solvent cemented, in a shady area before cementing.
3. Cool surfaces to be joined by wiping with a damp rag. Be sure that surface is dry prior to applying solvent cement.
4. Try to do the solvent cementing in the cooler morning hours.
5. Make sure that both surfaces to be joined are still wet with cement when putting them together. With large size pipe, more people on the crew may be necessary.
6. Use one of our heavier bodied, high viscosity cements since they will provide a little more working time.
7. Be prepared for a greater expansion-contraction factor in hot weather.



INSTALLATION OF THERMOPLASTIC PIPING SYSTEMS

SOLVENT CEMENTING INSTRUCTIONS FOR PVC AND CPVC PIPE AND FITTINGS

TIPS TO FOLLOW IN SOLVENT CEMENTING DURING COLD WEATHER:

1. Prefabricate as much of the system as is possible in a heated working area.
2. Store cements and primers in a warmer area when not in use and make sure they remain fluid.
3. Take special care to remove moisture, including ice and snow.
4. Use extra primer to soften the joining surfaces before applying cement.
5. Allow a longer initial set and cure period before the joint is moved or the system is tested.
6. Read and follow all of our directions carefully before installation.

Regular cements are formulated to have well-balanced drying characteristics and to have good stability in sub-freezing temperatures. Some manufacturers offer special cements for cold weather because their regular cements do not have that same stability.

For all practical purposes, good solvent cemented joints can be made in very cold conditions with our existing products, providing proper care and a little common sense are used.

PHYSICAL DATA
P-70 PRIMER FOR PVC AND CPVC

BOILING POINT (°F) Based on 1st boiling Comp. THF.	151°F	SPECIFIC GRAVITY (H_20=1)	0.870 ±0.010
VAPOR PRESSURE (mm Hg.) THF @ 25	190	PERCENT, VOLATILE BY VOLUME (%)	100%
VAPOR DENSITY (AIR = 1) APPROX.	2.49	EVAPORATION RATE (BUAC = 1) APPROX.	5.5 - 8
SOLUBILITY IN WATER 100%			
APPEARANCE AND ODOR - Purple Color, - Etheral Odor			

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (T.C.C.) 6°F	FLAMMABLE LIMITS	Left 1.8	Used 11.8

EXTINGUISHING MEDIA
Dry chemical,Carbondioxide - Foam - Ansul "Purple K" National Aero-O-Foam

SPECIAL FIREFIGHTING PROCEDURES
Close or confined quarters require self contained breathing apparatus. Positive pressure hose mask or airline masks.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Fire hazard because of low flash point, high volatility and heavy vapor.

PHYSICAL DATA
705 CLEAR OR GRAY CEMENT FOR PVC

BOILING POINT (°F) Based on 1st boiling Comp. THF.	151°F	SPECIFIC GRAVITY (H_20=1)	0.920 ±0.02
VAPOR PRESSURE (mm Hg.) THF @ 25°C	190	PERCENT, VOLATILE BY VOLUME (%) APPROX	85 to 90%
VAPOR DENSITY (AIR = 1) APPROX.	2.49	EVAPORATION RATE (BUAC = 1) APPROX.	5.5 to 8
SOLUBILITY IN WATER Solvent portion PVC resin & filler - Precipates			
APPEARANCE AND ODOR - Clear,Thin syrupy liquid, Etheral odor			

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (T.O.C.)10°F	FLAMMABLE LIMITS	Left 1.8	Used 1.8

EXTINGUISHING MEDIA
Dry chemical,Carbondioxide - Foam - Ansul "Purple K" National Aero-O-Foam

SPECIAL FIREFIGHTING PROCEDURES
Close or confined quarters require self contained breathing apparatus. Positive pressure hose mask or airline masks.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Fire hazard because of low flash point, high volatility and heavy vapor.

PHYSICAL DATA
711 GRAY CEMENT FOR PVC

BOILING POINT (°F) Based on 1st boiling Comp. THF.	151°F	SPECIFIC GRAVITY (H_20=1)	0.958± 0.008
VAPOR PRESSURE (mm Hg.) THF @ 25°C	190	PERCENT, VOLATILE BY VOLUME (%)APPROX.	90%
VAPOR DENSITY (AIR = 1) APPROX.	2.49	EVAPORATION RATE (BUAC = 1) APPROX.	5.0 to 8
SOLUBILITY IN WATER Solvent portion PVC resin & filler - Precipates			
APPEARANCE AND ODOR - Gary color, medium syrupy liquid - Etheral Odor			

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (T.O.C.) 8°F	FLAMMABLE LIMITS % in Air	Left 2.0	Used 11.8

EXTINGUISHING MEDIA
Dry chemical, Carbondioxide - Foam - Ansul "Purple K" National Aero-O-Foam

SPECIAL FIREFIGHTING PROCEDURES
Close or confined quarters require self contained breathing apparatus. Positive pressure hose mask or airline masks.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Fire hazard because of low flash point, high volatility and heavy vapor.

PHYSICAL DATA
719 GRAY CEMENT FOR PVC

BOILING POINT (°F) Based on 1st boiling Comp. THF.	151°F	SPECIFIC GRAVITY (H_20=1)	0.009 ±0.004
VAPOR PRESSURE (mm Hg.) THF @	190	PERCENT, VOLATILE BY VOLUME (%)	80%
VAPOR DENSITY (AIR = 1) APPROX.	2.49	EVAPORATION RATE (BUAC = 1) APPORX. Initial	5 - 8
SOLUBILITY IN WATER Solvent portion PVC resin & filler - Precipates			
APPEARANCE AND ODOR - Gray color, paste like, Etheral Odor			

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (T.C.C.)8°F	FLAMMABLE LIMITS	Left 2	Used 11.8

EXTINGUISHING MEDIA
Carbondioxide, Dry chemicals

SPECIAL FIREFIGHTING PROCEDURES
Close or confined quarters require self-contained breathing apparatus. Positive pressure hose mask or airline masks.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Fire hazard because of low flash point, high volatility and heavy vapor.

PHYSICAL DATA
714 GRAY CEMENT FOR CPVC

BOILING POINT (°F) The lowest boiling point	151°	SPECIFIC GRAVITY (H_20=1)	
VAPOR PRESSURE (mm Hg.) THF @ 25	190	PERCENT, VOLATILE BY VOLUME (%)	85-90%
VAPOR DENSITY (AIR = 1) APPROX.	2.49	EVAPORATION RATE (BUAC = 1) Initially	8.0
SOLUBILITY IN WATER Resin precipates			
APPEARANCE AND ODOR -Gray color, Medium syrupy liquid - Etheral Odor			

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (T.O.C.) 6°F	FLAMMABLE LIMITS	Left 1.8 %	Used 11.8%

EXTINGUISHING MEDIA
Dry chemical, Carbondioxide - Foam - Ansul "Purple K" National Aero-O-Foam

SPECIAL FIREFIGHTING PROCEDURES
Close or confined quarters require self contained breathing apparatus. Positive pressure hose mask or airline masks

UNUSUAL FIRE AND EXPLOSION HAZARDS
Fire hazard because of low flash point, high volatility and heavy vapor.

Low VOC 724 cement for hypochlorite service

weld-on 724 CPVC low VOC cement is a gray, medium bodied, fast-setting solvent cement used for joining CPVC industrial piping through 12" diameter and is specially formulated for services that include caustics and hypochlorites.

INDUSTRY STANDARDS

FHA
Architectural Standards Division
Federal Housing Administration
Washington, DC 20412

FHA UM-41	PVC plastic pipe and fittings for domestic water service
FHA UM-49	ABS and PVC plastic drainage and vent pipe and fittings, FHA 4550.49
FHA UM-53a	Polyvinyl chloride plastic drainage, waste and vent pipe and fittings
FHA MR-562	Rigid chlorinated polyvinyl chloride (CPVC) hi/temp water pipe and fittings
FHA MR-563	PVC plastic drainage and vent pipe and fittings
FHA Minimum	Property standards interim revision No. 31

IAPMO
International Association of Plumbing and Mechanical Officials
5032 Alhambra Avenue
Los Angeles, California 90032

Uniform Plumbing Code

IAPMO IS8	Solvent cemented PVC pipe for water service and yard piping
IAPMO IS9	PVC drain, waste, and vent pipe and fittings
IAPMO IS10	Polyvinyl chloride (PVC) natural gas yard piping
IAPMO PS27	Supplemental standard to ASTM D2665; polyvinyl chloride (PVC) plastic drain, waste, and vent pipe and fittings

(NOTE: IS = installation standard; PS = property standard)

NSF
National Sanitation Foundation
School of Public Health
University of Michigan
Ann Arbor, Michigan 48106

NSF
Standard No. 14: Thermoplastic Materials, Pipe, Fittings, Valves, Traps, and Joining Materials

NSF
Seal of Approval: Listing of Plastic Materials, Pipe, Fittings, and Appurtenances for Potable Water and Waste Water (NSF Testing Laboratory).

NSPI
National Swimming Pool Institute
2000 K Street, N.W.
Washington, DC 20006

T.R.-19 The Role of Corrosion-Resistant Materials in Swimming Pools, Part D, The Role of Plastics in Swimming Pools.

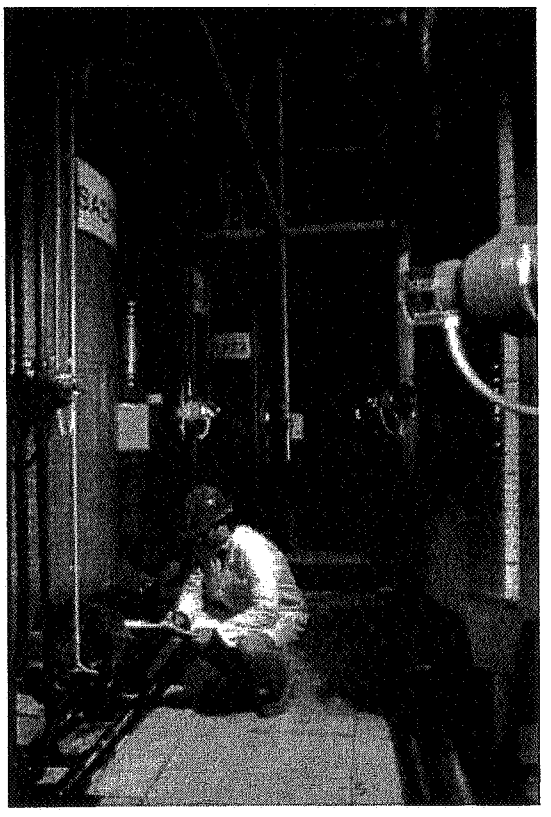
PHCC
National Association of Plumbing-Heating-Cooling Contractors
1016 20th Street, N.W.
Washington, DC 20036
National Standard Plumbing Code

SBCC
Southern Building Code Congress
1166 Brown-Marx Building
Birmingham, Alabama 35203
SBCC Southern Standard Plumbing Code

SIA
Sprinkler Irrigation Association
1028 Connecticut Avenue, N.W.
Washington, DC 20036
Minimum Standards for Irrigation Equipment

WUC
Western Underground Committee, W.H. Foote
Los Angeles Department of Water and Power
P.O. Box 111
Los Angeles, California 90054
Interim Specification 3.1: Plastic Conduit and Fittings

UL
Underwriters Laboratories, Inc.
207 East Ohio Street
Chicago, Illinois 60611
UL 651 Rigid Nonmetallic Conduit (September 1968)
UL 514 Outlet Boxes and Fittings (March 1951 with Amendments of 22-228-67)



INDUSTRY STANDARDS

NEMA
National Electrical Manufacturers' Association
2101 "L" St. N.W.
Washington, DC 20037

Type 1 — General Purpose - Indoor: This enclosure is intended for use indoors, primarily to prevent accidental contact of personnel with the enclosed equipment in areas where unusual service conditions do not exist. In addition, they provide protection against falling dirt.

Type 2 — Dripproof - Indoor: Type 2 dripproof enclosures are for use indoors to protect the enclosed equipment against falling non-corrosive liquids and dirt. These enclosures are suitable for applications where condensation may be severe such as encountered in cooling rooms and laundries.

Type 3 — Dusttight, Raintight, Sleet (Ice) Resistant Outdoor: Type 3 enclosures are intended for use outdoors to protect the enclosed equipment against windblown dust and water. They are not sleet (ice) proof.

Type 3R — Rainproof and Sleet (Ice) Resistant Outdoor: Type 3R enclosures are intended for use outdoors to protect the enclosed equipment against rain and meet the requirements of Underwriters Laboratories Inc., Publication No. UL 508, applying to "Rainproof Enclosures." They are not dust, snow, or sleet (ice) proof.

Type 3S — Dusttight, Raintight, and Sleet (Ice) Proof-Outdoor: Type 3S enclosures are intended for use outdoors to protect the enclosed equipment against windblown dust and water and to provide for its operation when the enclosure is covered by external ice or sleet. These enclosures do not protect the enclosed equipment against malfunction resulting from internal icing.

Type 4 — Watertight and Dusttight - Indoor and Outdoor: This type is for use indoors or outdoors to protect the enclosed equipment against splashing and seepage of water or streams of water from any direction. It is sleet-resistant but not sleet-proof.

Type 4X — Watertight, Dusttight and Corrosion-Resistant - Indoor and Outdoor: This type has same provisions as Type 4 and, in addition, is corrosion-resistant.

Type 5 — Superseded by Type 12 for Control Apparatus.

Type 6 — Submersible, Watertight, Dusttight, and Sleet (Ice) Resistant - Indoor and Outdoor: Type 6 enclosures are intended for use indoors and outdoors where occasional submersion is encountered, such as in quarries, mines, and manholes. They are required to protect equipment against a static head of water of 6 feet for 30 minutes and against dust, splashing or external condensation of non-corrosive liquids, falling or hose directed lint and seepage. They are not sleet (ice) proof.

Type 7 — Class I, Group A, B, C, and D-Indoor Hazardous Locations - Air-Break Equipment: Type 7 enclosures are intended for use indoors, in the atmospheres and locations defined as Class 1 and Group A, B, C or D in the National Electrical Code. Enclosures must be designed as specified in Underwriters' Laboratories, Inc. "Industrial Control Equipment for Use in Hazardous locations," UL 698. Class I locations are those in which flammable gases or vapors may be present in explosive or ignitable amounts. The group letters A, B, C, and D designate the content of the hazardous atmosphere under Class 1 as follows:

Group A
Atmospheres containing acetylene.

Group B
Atmospheres containing hydrogen or gases or vapors of equivalent hazards such as manufactured gas.

Group C
Atmospheres containing ethyl ether vapors, ethylene, or cyclopropane.

Group D
Atmospheres containing gasoline, hexane, naphtha, benzene, butane, propane, alcohols, acetone, lacquer solvent vapors and natural gas.

CTS PLUMBING
Code Approvals
Dimensions
Specifications
Testing
Water Heater Connections

Installation
Hangers and Supports
Joining Techniques
Thermal Expansion
Transition Connections
Wall Penetration

Warranty

Literature Request
Quote Request
Contact Information
Harvel Home

Copper Tube Size (CTS)

CTS Piping For Hot and Cold Water Plumbing Applications

JOINING TECHNIQUES

It is important to follow proper storage and handling, joining, assembly, and other installatio to ensure a quality system installation. A properly designed and installed CPVC plumbing s provide years of trouble-free service, lasting much longer than metallic systems due to the inherent corrosion resistance and other factors. The following information is provided as a toward that end.

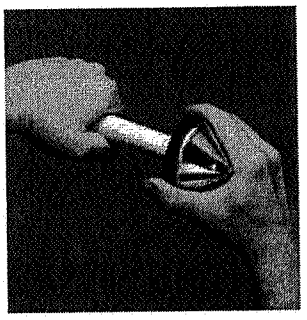
Harvel CTS CPVC pipe is joined by the solvent cementing process; a reliable joining techni proven for more than 30 years. When properly conducted, this method provides a strong, h joining area in which the mating surfaces are chemically fused together, producing a strong seal when cured. Prior to solvent cementing, appropriate safety precautions should be take

- Use only CPVC cement conforming to ASTM F493
- Follow the solvent cement manufacturer's instructions
- Avoid breathing vapors
- Use only with adequate ventilation
- Avoid frequent contact with skin
- Avoid contact with eyes
- Eliminate all ignition sources
- Store primer and solvent cement in the shade between 40°F and 110°F
- Close containers tight when not in use, and cover as much as possible during use
- Follow all manufacturer-recommended precautions when using power tools
- Flush the system for a minimum of 10 minutes after pressure testing to remove trace amo solvents or other system components

Exercise special care when assembling Harvel CTS CPVC pipe in extremely low temperatu 40°F) or extremely high temperatures (above 80°F). Extra set and handling times must be colder temperatures. Make certain cement has not "gelled" when cementing pipe and fitting temperatures. Make certain both surfaces being joined are wet with cement during assemb working in extremely hot temperatures.

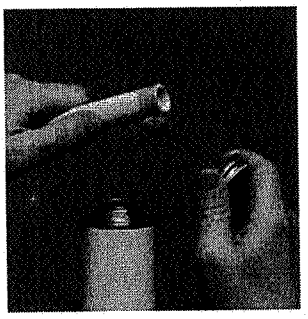
1. Cutting
Harvel pipe must be cut square to obtain the proper insertior to provide the maximum bonding area for solvent cementing. pipe can easily be cut with a wheel-type plastic tubing cutter, style cutter, fine-toothed hand saw (hack saw), or power saw box should be used when working with saws to ensure a squ ratchet-style cutters are used, their blades must be sharpene The use of ratchet cutters with dull blades, or their use in col will tend to compress the pipe prior to cutting which can resu fracturing. The raised bead left on the pipe OD after cutting r removed prior to solvent cementing - see step number 2 reg beveling. Any cuts, fractures, splits, or other damaged areas removed prior to joining. Cut off at least 2" beyond any visibl

2. Beveling/Deburring

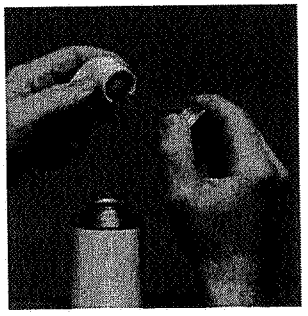


Burrs, filings, shavings etc. caused by the cutting process mu removed from the outside and inside of the pipe. Shavings a debris will prevent proper contact of the joining surfaces and joint failure. Chamfering tools are available for this purpose, pocket knives or files are also suitable. A slight bevel is requ pipe end to help ease entry into the fitting socket, and to prev cement from being pushed ahead of the pipe during the asse process. Many chamfering tools designed for use with plastic available. These tools are specifically designed to remove bu provide a proper bevel simultaneously.

3. Fitting Preparation
Wipe dirt, debris, and moisture from the pipe end and fitting s using a clean, dry rag. Moisture will slow the cure time and re strength. Inspect piping and components for damage or irreg prior to assembly. Do not use components that appear irregu do not fit properly; contact the appropriate manufacturer of th in question to determine usability. Check the dry fit of the pip prior to assembly. The pipe should enter the fitting socket ea quarter to three-quarters of the way.



4. Solvent Cement Application
USE ONLY CPVC CEMENT that conforms to ASTM F493. T the wrong cement can result in failure. Harvel recommends t IPS 713 CPVC cement, P-68 primer or IPS Low VOC one-st cement or equivalent. Two solvent cementing processes are the two-step solvent cement and primer process, and the on process. The two-step process utilizes the application of prin outside of the pipe and the interior fitting socket prior to appl solvent cement. When using primer, it must be applied to bot and fittings using the appropriate size applicator. A dauber o brush approximately half the size of the pipe diameter is app rag must not be used. Apply primer to the fitting socket, then outside of the pipe end, re-dipping the applicator as necessa ensure the entire joining surfaces are wet; apply solvent cem immediately after primer application while primed surfaces a Cement application for one- or two-step process: Apply a hea coat of cement to the outside pipe end. Apply a medium coat fitting socket. A second application of cement should be appl pipe end if there was little or no interference when the dry fit checked. Do not allow excess cement to puddle in the pipe c



5. Assembly
Immediately insert the pipe into the fitting while rotating the p quarter turn to help distribute cement. Properly align the fittin installation at this time. Pipe must bottom completely to the s fitting. Hold the assembly for 10 to 15 seconds to ensure initi A continuous bead of cement should be evident around the p fitting juncture. If the bead is not continuous, it may indicate t insufficient cement was applied. If insufficient cement is appl fitting must be cut out, discarded and begun again. Cement i the bead should be wiped off with a rag.

6. Set and Cure Times
Assembled joints must be allowed to set and cure properly p testing the system. Set and cure times are a function of type used, pipe size, temperature, humidity, and tightness of fit. D is faster for drier environments, smaller sizes, higher temper

tighter fits. The assembly must be allowed to set without any the joint for one to five minutes depending on the pipe size a temperature. Following the initial set period, the assembly ca handled carefully. FOLLOW THE CEMENT MANUFACTURE RECOMMENDED CURE TIMES PRIOR TO PRESSURE TE FAILURE TO DO SO WILL RESULT IN JOINT FAILURE.

Minimum Cure Time Prior to Testing at 150 psi with Cold Water (based on use of IPS one CPVC cement and 713 two-step cement)

Pipe Size (in)	Ambient Temperature During Cure Time	
	>60°F	40°F - 60°F
3/8	1 hr	2 hrs
1/2	1 hr	2 hrs
3/4	1 hr	2 hrs
1	1 hr	2 hrs
1 1/4	2 hrs	4 hrs
1 1/2	2 hrs	4 hrs
2	2 hrs	4 hrs

Note: Wait 24 hours prior to putting system into hot water service when installed at cure te above 60°F; wait 48 hours prior to putting system into hot water service when installed at c temperatures below 40°F

Harvel Plastics, Inc., Easton, Pennsylvania, USA • 610-252-7355 • 610-253-4436 (fax) • Privacy Policy |

ATTACHMENT IV

CONTAINS NO CBI

MRI REPORT

Polychlorinated Dibenzo-*p*-Dioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) Analysis of Chlorinated PVC Samples

For The BF Goodrich Company
Technical Center
Moore and Walker Road
P.O. Box 122
Avon Lake, OH 44012

Attn: Dr. John Nikora

MRI Project No. 6415-A

December 17, 1991

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MIDWEST RESEARCH INSTITUTE 425 Volker Boulevard, Kansas City, MO 64110-2299 • (816) 753-7600

PREFACE

This report provides the polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) results from the analysis of five chlorinated PVC samples. The results for corresponding quality control samples including a laboratory method blank and duplicate matrix spikes are also presented.

The samples were prepared for analysis by Mr. Mark Clapp under the direction of Ms. Kathy Boggess, and the HRGC/HRMS analyses were performed by Mr. Mark Horrigan. Ms. Boggess performed the data reduction and prepared this report.

MIDWEST RESEARCH INSTITUTE

Kathy E. Boggess

Kathy E. Boggess
Chemist

John S. Stanley, Ph.D.
Head
Analytical Chemistry Section

Approved:

John E. Going, Ph.D.
Director
Chemical Sciences Department

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   - Data reduction 5
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Attachment 2 - 23. PP

SECTION 1

INTRODUCTION

Midwest Research Institute (MRI) was contracted by the BF Goodrich Company to determine the levels of 2,3,7,8-substituted tetra- through octachlorinated polychlorinated dibenzo-*p*-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) in five chlorinated PVC samples. The samples included bar stock, compound cubes, pipe, and two chlorinated PVC resins.

This report presents the sample receipt, experimental approach, and results of the PCDDs and PCDFs analysis of the chlorinated PVC samples and corresponding quality control samples.

SECTION 2

SAMPLE RECEIPT

MRI received the five chlorinated PVC samples on August 27, 1991, enclosed in a cardboard shipping container at ambient temperature. The samples were stored at room temperature in a locked facility until sample preparation was initiated.

The samples were designated as follows, as described in a letter to Kathy Boggess from Dr. John Nikora, dated August 22, 1991.

Sample Code	Description
163-90-86-1	Bar Stock (grey color)
163-90-86-2	Compound Cubes (grey color)
163-90-86-3	Chlorinated PVC Resin (white)
163-90-86-4	Pipe (ivory color)
163-90-86-5	Chlorinated PVC Resin (white)

SECTION 3

EXPERIMENTAL APPROACH

This section of the report describes the experimental approach used to prepare and analyze the samples for PCDDs and PCDFs. The analytical procedures used for sample preparation included particle size reduction of the bar stock and pipe samples. Solvent compatibility studies were conducted to determine the most appropriate solvent for extracting the PCDDs and PCDFs from the various matrices.

Hexane was chosen as the most appropriate solvent and the five chlorinated PVC samples were Soxhlet-extracted with hexane. The subsequent extract cleanup procedures and high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) analysis procedures were modifications of EPA Method 8290.

PARTICLE SIZE REDUCTION

Particle size reduction of the bar stock (163-90-86-1) and pipe (163-90-82-4) samples was necessary before the samples were extracted. These samples were received in three sections with lengths from 3 to 4 in. The resin samples (163-90-86-3 and 163-90-86-5) were a powder consistency and required no further size reduction prior to their extraction. The particle sizes of the compound cubes (163-90-86-2) were approximately 3 mm x 3 mm x 3 mm, and further particle size reduction was not necessary.

The bar stock and pipe samples were reduced on a lathe and shaved particles were collected in a plastic bag. The metal parts of the lathe were precleaned with hexane before contact with the samples. The approximate size of the shaved particles was 1 mm x 5 mm.

SOLVENT COMPATIBILITY STUDIES

Before samples were prepared for PCDDs and PCDFs analyses, solvent compatibility studies were conducted. The objective of these studies was to identify an extraction solvent that would accomplish a slight swelling of the

material without dissolving the material in the sample extract. Ideally, a solvent that met this objective would accomplish a more exhaustive extraction than if only the surface areas of the various materials were extracted.

At ambient temperatures, methylene chloride and toluene appeared to be appropriate extraction solvents. However, initial attempts to extract the five chlorinated PVC samples with a mixture of toluene and methylene chloride proved unsuccessful. The resins were partially dissolved by the solvent, and attempts to solvent-exchange the extracts to hexane for extract cleanup resulted in precipitation of a white solid mass. This observation was attributed to the presence of methylene chloride which was used to promote swelling of the materials. Subsequent attempts to extract the resin samples with toluene and with hexane/methylene chloride mixtures were also unsuccessful. The resin material fused into a solid mass in the extraction thimble.

The first steps of the cleanup procedures, including partitioning with concentrated sulfuric acid and concentrated base solutions, did not remove the precipitated material from the sample extracts.

Extraction of the samples with hexane was then evaluated and no problems were encountered with the matrix. MRI's plans to extract the samples with hexane were discussed with Dr. John Nikora on October 24, 1991. Dr. Nikora suggested an evaluation of a mixture of isopropyl alcohol and hexane. The swelling potential of a hexane and isopropyl alcohol mixture was evaluated with a cube of sample 163-90-86-2 and no swelling was observed. Because the hexane/isopropyl mixture appeared to have no advantages over hexane, the samples were prepared for analysis using hexane as the extraction solvent.

SAMPLE PREPARATION

Sample aliquots (10 g weighed to the nearest 0.0001 g) of the bar stock and pipe- shaved particles, the compound cubes, and the resin samples were mixed with 10 g quartz sand and transferred to Soxhlet extraction thimbles. The samples were spiked with an internal quantitation standard (IQS) spiking solution containing 15 $^{13}C_{12}$-labeled PCDDs and PCDFs at the concentrations shown in Table 1. For matrix spike samples, duplicate aliquots of resin sample 163-90-86-3 were prepared and spiked with native 2,3,7,8-substituted PCDDs and PCDFs at the concentrations shown in Table 2 in addition to the IQS spiking solution.

The samples were Soxhlet-extracted for 24 hr with hexane. The hexane extracts were concentrated, and matrix interferences were removed by partitioning against 20% (w/v) aqueous KOH and concentrated sulfuric acid followed by

elution through a series of chromatography columns including acid/neutral silica gel, neutral alumina, and Carbopack C/Celite.

After the final cleanup, each extract was concentrated under prepurified nitrogen to 100 µl, and 10 µl of a recovery standard (RS) was added that contained $^{13}C_{12}$-1,2,3,4-TCDD and 1,2,3,7,8,9-HxCDD at concentrations of 10 pg/µl in tridecane. The evaporation was continued until a final volume of 10 µl was reached. The extracts were transferred to refrigerated storage until ready for HRGC/HRMS analysis.

Matrix interferences were observed during the preliminary analysis of the bar stock sample and additional cleanup was necessary. The sample extract was put through a second Carbopack C/Celite column cleanup for reanalysis by HRGC/HRMS.

HRGC/HRMS ANALYSIS

The sample extracts were analyzed using a 60-m DB-5 fused silica chromatography column and VG70 250S HRMS with mass resolution > 10,000. The day that samples were analyzed began with mass calibration of the mass spectrometer followed by the analysis of a window-defining mix which was used to set appropriate retention times for the PCDD and PCDF analytes and to calculate the separation of the 2,3,7,8-TCDD isomer from other closely eluting TCDD isomers. The 2,3,7,8 isomer was resolved from other TCDD isomers with a valley of < 25%.

The initial calibration of the instrument consisted of a series of seven standards over the concentration ranges shown in Table 3. The criterion for an acceptable calibration curve was a relative standard deviation of < 20%. The criterion for continuing daily calibration was that the daily response factor (RF) must be within ±20% of the mean from the initial calibration curve. The initial calibration curve and continuing calibration criteria were met.

After the analysis of the daily calibration standard, a tridecane solvent blank was analyzed to ensure a clean system. The chlorinated PVC samples and quality control samples were then analyzed followed by an end-of-the-day calibration standard to ensure instrument stability.

DATA REDUCTION

The data reduction procedures for the analysis of the chlorinated PVC samples included qualitative criteria for identification of a peak as a 2,3,7,8-substituted PCDD or PCDF isomer and quantitation procedures for peaks positively

identified. The quantitation ions, theoretical ion abundance ratio criteria, and calculation formulas are specified in EPA Method 8290.

An automatic data reduction program was used to calculate the responses of analytes in the appropriate mass windows with ion abundance ratios within ±15% of the theoretical ratios. Detected peaks were also required to be within relative retention time windows established from the analysis of the calibration standards. The retention times of the native 2,3,7,8-substituted PCDD or PCDF analytes were required to be within ±3 sec of the corresponding $^{13}C_{12}$-2,3,7,8 substituted internal quantitation standards.

For peaks that passed the qualitative criteria, the computer program calculated an extract concentration, and then sample weights and extract volumes were taken into account to arrive at a final sample concentration.

For compounds not positively identified, a calculated detection limit (cdl) was determined based on the concentration of the lowest instrument calibration standard. In some cases responses were noted at retention times characteristic of 2,3,7,8- substituted PCDDs or PCDFs, but the qualitative ratio criteria were not met. For these situations, a detection limit was determined based on the maximum possible concentration (MPC) for the observed peak.

SECTION 4

RESULTS

The preliminary results from the analysis of the resin samples, the compound cubes, and the pipe samples were discussed with Dr. John Nikora on November 12, 1991. During that discussion, the results for the bar stock sample were not available because the bar stock sample required additional cleanup. Additional cleanup was performed for the bar stock sample, and the results for this sample and the other chlorinated PVC samples are summarized in Table 4. The 2,3,7,8-substituted PCDDs and PCDFs are presented first followed by the total homolog concentrations. Resin sample 163-099-86-3 contained higher concentrations of PCDFs than the other samples, and concentrations of PCDDs were much lower than the PCDFs.

Quality control (QC) samples prepared and analyzed with the chlorinated PVC samples including a laboratory method blank and duplicate resin matrix spikes samples are summarized in Table 5. Background levels of 1,2,3,4,6,7,8-HpCDD and OCDD were detected in the method blank at concentrations slightly above the calculated detection limits.

The accuracy and precision of the duplicate matrix spike samples are also summarized in Table 5. The spike levels, concentrations in unspiked samples, and concentrations found in matrix spike samples are shown followed by the percent accuracy and relative percent difference precision. The accuracy of the matrix spike was determined by subtracting the amount found in the unspiked sample from the amount found in the spiked sample and then dividing the difference by the theoretical amount spiked. For some of the analytes, including 2,3,7,8-TCDF, 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, and 1,2,3,6,7,8-HxCDF, the amounts found in the unspiked sample were significantly higher than the amount spiked by a factor ranging from 3 to 30 and these results are footnoted. For the remaining analytes, the accuracy and precision results were very good.

An additional quality control activity included monitoring the absolute method recoveries of the $^{13}C_{12}$-labeled IQSs that were added to the samples before extraction. The IQS recoveries shown in Table 6 indicate very good precision for the analytical method (14% to 27% relative standard deviation), and recoveries were generally within the Method 8290 suggested range of 40% to 120%. Some recoveries were slightly outside the 40% to 120% range, and these data are footnoted in Table 6.

Table 1. INTERNAL QUANTITATION STANDARD SPIKING SOLUTION

Compound	Concentration[a] (pg/µL)	Amount spiked (total pg)
$^{13}C_{12}$-2,3,7,8-TCDF	0.5	100
$^{13}C_{12}$-2,3,7,8-TCDD	0.5	100
$^{13}C_{12}$-1,2,3,7,8-PeCDF	0.5	100
$^{13}C_{12}$-2,3,4,7,8-PeCDF	0.5	100
$^{13}C_{12}$-1,2,3,7,8-PeCDD	0.5	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	0.5	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	0.5	100
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	0.5	100
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	0.5	100
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	0.5	100
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	0.5	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	0.5	100
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	0.5	100
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	0.5	100
$^{13}C_{12}$-OCDD	1.0	200

[a] Prepared in isooctane, 200 µL was added to each sample before extraction.

Table 2. NATIVE STANDARD SPIKING SOLUTION

Compound	Concentration[a] (pg/µL)	Amount spiked (total pg)
2,3,7,8-TCDF	0.77	31
2,3,7,8-TCDD	0.76	30
1,2,3,7,8-PeCDF	0.70	28
2,3,4,7,8-PeCDF	0.57	23
1,2,3,7,8-PeCDD	0.75	30
1,2,3,4,7,8-HxCDF	1.9	76
1,2,3,6,7,8-HxCDF	1.7	66
2,3,4,6,7,8-HxCDF	1.8	73
1,2,3,7,8,9-HxCDF	2.0	79
1,2,3,4,7,8-HxCDD	2.0	79
1,2,3,6,7,8-HxCDD	1.8	71
1,2,3,7,8,9-HxCDD	1.9	75
1,2,3,4,6,7,8-HpCDF	1.8	74
1,2,3,4,7,8,9-HpCDF	1.9	75
1,2,3,4,6,7,8-HpCDD	1.8	71
1,2,3,4,6,7,8,9-OCDF	3.5	140
1,2,3,4,6,7,8,9-OCDD	3.6	145

[a] Prepared in isooctane, 40 µL was added to method spike sample before extraction.

Table 3. PCDD AND PCDF CALIBRATION STANDARDS

Compound	Concentration (pg/µL)						
Native analytes							
2,3,7,8-TCDF	0.1	0.25	0.5	2.5	10	25	50
2,3,7,8-TCDD	0.1	0.25	0.5	2.5	10	25	50
1,2,3,7,8-PeCDF	0.1	0.25	0.5	2.5	10	25	50
2,3,4,7,8-PeCDF	0.1	0.25	0.5	2.5	10	25	50
1,2,3,7,8-PeCDD	0.1	0.25	0.5	2.5	10	25	50
1,2,3,4,7,8-HxCDF	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,6,7,8-HxCDF	0.25	0.625	1.25	6.25	25	62.5	125
2,3,4,6,7,8-HxCDF	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,7,8,9-HxCDF	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,4,7,8-HxCDD	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,6,7,8-HxCDD	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,7,8,9-HxCDD	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,4,6,7,8-HpCDF	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,4,7,8,9-HpCDF	0.25	0.625	1.25	6.25	25	62.5	125
1,2,3,4,6,7,8-HpCDD	0.25	0.625	1.25	6.25	25	62.5	125
OCDF	0.5	1.25	2.5	12.5	50	125	250
OCDD	0.5	1.25	2.5	12.5	50	125	250
Internal Quantitation Standards							
^{13}C-2,3,7,8-TCDF	10	10	10	10	10	10	10
^{13}C-2,3,7,8-TCDD	10	10	10	10	10	10	10
^{13}C-1,2,3,7,8-PeCDF	10	10	10	10	10	10	10
^{13}C-2,3,4,7,8-PeCDF	10	10	10	10	10	10	10
^{13}C-1,2,3,7,8-PeCDD	10	10	10	10	10	10	10
^{13}C-1,2,3,4,7,8-HxCDF	10	10	10	10	10	10	10
^{13}C-1,2,3,6,7,8-HxCDF	10	10	10	10	10	10	10
^{13}C-2,3,4,6,7,8-HxCDF	10	10	10	10	10	10	10
^{13}C-1,2,3,7,8,9-HxCDF	10	10	10	10	10	10	10
^{13}C-1,2,3,4,7,8-HxCDD	10	10	10	10	10	10	10
^{13}C-1,2,3,6,7,8-HxCDD	10	10	10	10	10	10	10
^{13}C-1,2,3,4,6,7,8-HpCDF	10	10	10	10	10	10	10
^{13}C-1,2,3,4,7,8,9-HpCDF	10	10	10	10	10	10	10
^{13}C-1,2,3,4,6,7,8-HpCDD	10	10	10	10	10	10	10
^{13}C-OCDD	20	20	20	20	20	20	20
Recovery Standards							
^{13}C-1,2,3,4-TCDD	10	10	10	10	10	10	10
^{13}C-1,2,3,7,8,9-HxCDD	10	10	10	10	10	10	10

Table 4. CONCENTRATIONS (PG/G) OF PCDDs AND PCDFs IN CHLORINATED PVC SAMPLES

COMPOUND	Sample ID Matrix	Method Blank a	163-90-86-1 Barstock	163-90-86-2 Compound cubes	163-90-86-3 Resin	163-90-86-4 Pipe	163-90-86-5 Resin
2378TCDF		ND(.10 cdl) b	14.2	0.725	91.7	ND(.10 cdl)	ND(.10 cdl)
2378TCDD		ND(.11 cdl)	5.31	ND(.093 cdl)	ND(.11 cdl)	ND(.12)	ND(.14 mpc)
12378PECDF		ND(.093 cdl)	8.42	0.215	24.7	ND(.25 mpc)	ND(.098 cdl)
23478PECDF		ND(.089cdl)	5.10	ND(.14 mpc) c	16.2	0.356	2.9
12378PECDD		ND(.11 cdl)	ND(.28 cdl)	ND(.10 cdl)	ND(.11 cdl)	ND(.15)	0.14
123478HXCDF		ND(.25 cdl)	14.1	ND(.23 cdl)	19.1	0.661	8.11
23678HXCDF		ND(.25 cdl)	3.32	ND(.24 cdl)	3.72	ND(.21cdl)	2.1
234678HXCDF		ND(.25 cdl)	ND(.97 cdl)	ND(.24 cdl)	2.52	ND(.23 cdl)	2.3
123789HXCDF		ND(.25cdl)	ND(1.05 cdl)	ND(.25 cdl)	ND(.25 cdl)	ND(.29 mpc)	ND(.26 cdl)
123478HXCDD		ND(.22 cdl)	ND(.90 cdl)	ND(.22 cdl)	ND(.22 cdl)	ND(.26 cdl)	ND(.24 cdl)
123678HXCDD		ND(.26 cdl)	ND(.85cdl)	ND(.25 cdl)	ND(.25 cdl)	ND(.22 cdl)	ND(.26 cdl)
123789HXCDD		ND(.22 cdl)	ND(.90 cdl)	ND(.22 cdl)	ND(.22 cdl)	ND(.26 cdl)	ND(.24cdl)
1234678HPCDF		ND(.30 cdl)	3.26	ND(.30 cdl)	4.00	0.454	11.6
1234789HPCDF		ND(.28 cdl)	2.20	ND(.30 cdl)	1.61	ND(.28 cdl)	2.29
1234678HPCDD		0.373	1.65	0.39	0.404	0.781	ND(.50 mpc)
12346789OCDF		ND(.60 cdl)	7.65	ND(.66 cdl)	2.85	1.2	13.3
12346789OCDD		1.70	10.9	1.91	3.60	ND(3.62 mpc)	2.15
Homologs							
TCDF		ND(.10 cdl)	52.0	1.35	133	4.24	2.73
TCDD		ND(.11 cdl)	6.24	ND(.093 cdl)	0.223	ND(.12)	0.136
PeCDF		ND(.093 cdl)	48.3	0.713	110	2.42	49.6
PeCDD		ND(.089 cdl)	0.372	ND(.10cdl)	ND(.11 cdl)	ND(.15)	0.14
HxCDF		ND(.25 cdl)	30.2	ND(.23 cdl)	35.8	0.976	34.7
HxCDD		ND(.26 cdl)	1.97	ND(.25 cdl)	ND(.25cdl)	ND(.22 cdl)	ND(.26cdl)
HpCDF		ND(.30 cdl)	8.37	ND(.30 cdl)	9.86	0.911	25.9
HpCDD		0.373	3.09	0.646	0.695	1.32	0.326

a- For comparison to samples concentrations in method blank were based on a10 g sample size.
b- Compound not detected. Value in parenthesis is calculated detection limit (cdl) based on lowest calibration standard.
c- Compound not detected. Value in parenthesis is maximum possible concentration (mpc) for a peak that did not meet the qualitative ratio criteria.

Table 5. QUALITY CONTROL SAMPLE RESULTS

COMPOUND	Field ID Extract ID	Blank pg/g (a)	163-90-86-3 Unspiked Resin pg/g	Nominal Spike Level pg/g	163-90-86-3 Resin Matrix Spike pg/g	163-90-86-3 Resin Matrix Spike Duplicate pg/g	163-90-86-3 Resin Matrix Spike % Accuracy (c)	163-90-86-3 Resin Matrix Spike Duplicate % Accuracy	RPD (e)
2378TCDF		ND(.10 cdl) b	91.7	3.1	95.0	71.2	NC(d)	NC(d)	29
2378TCDD		ND(.11 cdl)	ND(.11 cdl)	3.1	2.57	2.79	88.8	93.2	4.8
12378PECDF		ND(.093 cdl)	24.7	2.8	26.4	25.4	NC(d)	NC(d)	3.9
23478PECDF		ND(.089 cdl)	16.2	2.3	18.2	17.4	NC(d)	NC(d)	4.5
12378PECDD		ND(.11 cdl)	ND(.11 cdl)	3.0	2.38	3.16	83.1	107	25
123478HXCDF		ND(.25 cdl)	19.1	7.6	24.0	22.0	NC(d)	NC(d)	8.7
23678HXCDF		ND(.25 cdl)	3.72	6.6	10.2	9.94	103	95.4	7.5
234678HXCDF		ND(.25 cdl)	2.52	7.3	8.89	8.91	91.6	88.9	3.0
123789HXCDF		ND(.26cdl)	ND(.25 cdl)	7.9	5.89	6.23	78.0	79.8	2.3
123478HXCDD		ND(.22 cdl)	ND(.22 cdl)	7.9	6.47	7.38	86.5	95.5	9.9
123678HXCDD		ND(.26 cdl)	ND(.25 cdl)	7.1	6.07	6.62	89.6	94.5	5.3
123789HXCDD		ND(.22 cdl)	ND(.22 cdl)	7.5	5.70	6.28	80.1	85.3	6.3
1234678HPCDF		ND(.30 cdl)	4.00	7.4	10.9	10.4	98.7	88.6	11
1234789HPCDF		ND(.28 cdl)	1.61	7.5	7.72	7.75	85.6	83.2	2.8
1234678HPCDD		0.373	0.404	7.1	6.59	7.03	91.4	94.7	3.5
12346789OCDF		ND(.60 cdl)	2.85	14	14.0	14.6	83.8	85.4	1.9
12346789OCDD		1.70	3.60	15	13.7	14.6	73.2	77.1	5.2

a- For comparison to samples concentrations in method blank were based on 10 g sample size.
b- Compound not detected. Value in parenthesis is calculated detection limit based on lowest calibration standard.
c- % Accuracy = ((Amount found in spiked sample- amount in unspiked resin)/Amount Spiked) X 100 %
d-Not calculated. The accuracy of the matrix spike sample was affected by high concentrations in the unspiked sample
RPD= Relative Percent Difference of Duplicate Matrix Spike Samples. Where accuracy was not calculated
e to high concentrations in the unspiked sample, the precision was calculated based on the the total amount found.

CECATS\TRIAGE TRACKING DBASE ENTRY FORM

CECATS DATA
Submission # 8EHQ-0292-2291 SEQ. A

TYPE: (INT) SUPP FLWP

SUBMITTER NAME: B. F. Goodrich Company

SUB. DATE: 2/25/92 OTS DATE: 2/26/92 CSB DATE: 3/3/92

INFORMATION REQUESTED: FLWP DATE:
0501 NO INFO REQUESTED
0502 INFO REQUESTED (TECH)
0503 INFO REQUESTED (VOL ACTIONS)
0504 INFO REQUESTED (REPORTING RATIONALE)

DISPOSITION:
(0639) REFER TO CHEMICAL SCREENING
0678 CAP NOTICE

VOLUNTARY ACTIONS:
(0400) NO ACTION REPORTED
0402 STUDIES PLANNED/UNDERWAY
0403 NOTIFICATION OF WORKER/OTHERS
0404 LABEL/MSDS CHANGES
0405 PROCESS/HANDLING CHANGES
0406 APP/USE DISCONTINUED
0407 PRODUCTION DISCONTINUED
0408 CONFIDENTIAL

BFG CPVC Compound #88998

CHEMICAL NAME:	CASR
Dioxins, chlorinated	none
~~Dioxins, Dibenzo-para~~	~~none~~
D.benzofurans, chlorinated	none
misc. chemicals	none

9002-86-2 Polyvinyl chloride

polyvinyl chloride, post-c

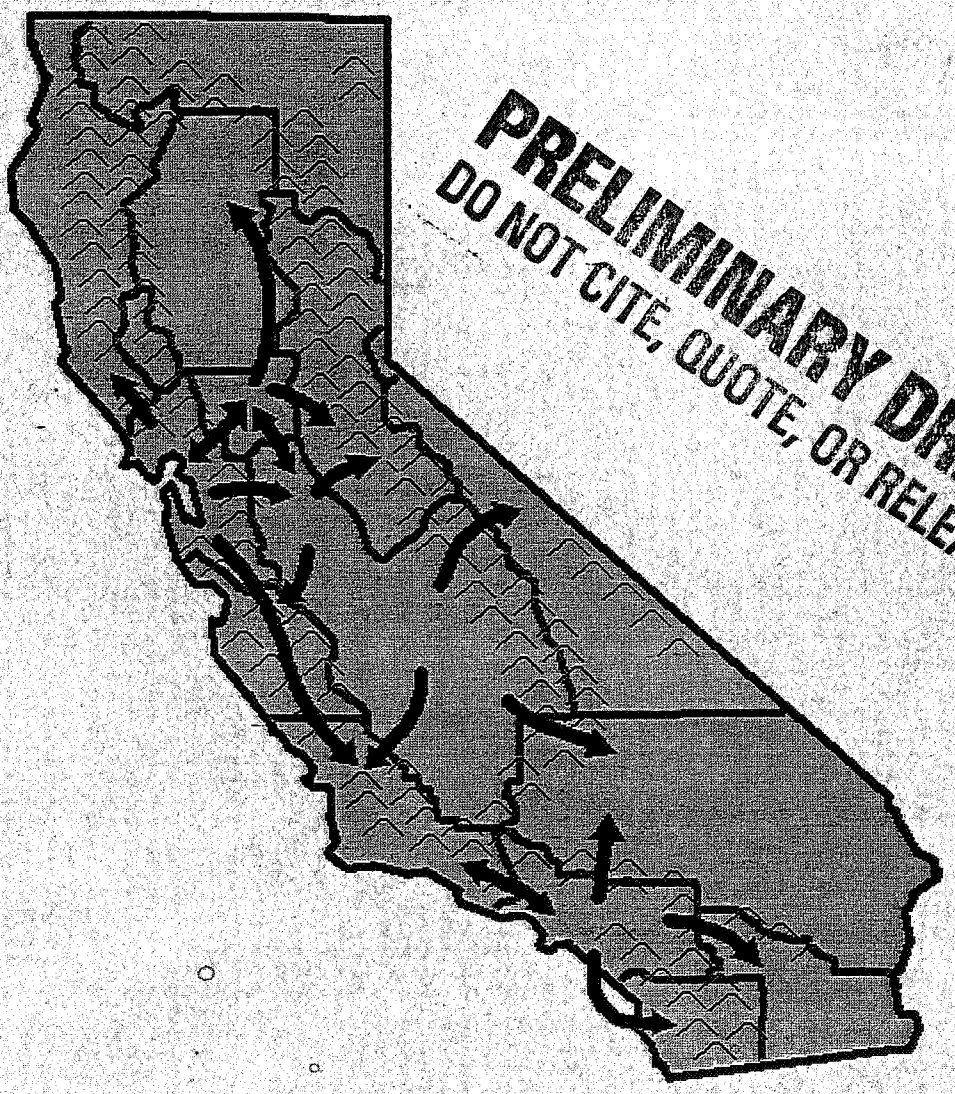
~~Compound 88998~~

INFORMATION TYPE:		P F C	INFORMATION TYPE:		P F C	INFORMATION TYPE:		P F C
0201	ONCO (HUMAN)	01 02 04	0216	EPI/CLIN	01 02 04	0241	IMMUNO (ANIMAL)	01 02 04
0202	ONCO (ANIMAL)	01 02 04	(0217)	HUMAN EXPOS (PROD CONTAM)	01 02 04	0242	IMMUNO (HUMAN)	01 02 04
0203	CELL TRANS (IN VITRO)	01 02 04	0218	HUMAN EXPOS (ACCIDENTAL)	01 02 04	0243	CHEM/PHYS PROP	01 02 04
0204	MUTA (IN VITRO)	01 02 04	(0219)	HUMAN EXPOS (MONITORING)	01 02 04	0244	CLASTO (IN VITRO)	01 02 04
0205	MUTA (IN VIVO)	01 02 04	0220	ECO/AQUA TOX	01 02 04	0245	CLASTO (ANIMAL)	01 02 04
0206	REPRO/TERATO (HUMAN)	01 02 04	0221	ENV. OCCC/REL/FATE	01 02 04	0246	CLASTO (HUMAN)	01 02 04
0207	REPRO/TERATO (ANIMAL)	01 02 04	0222	EMER INCI OF ENV CONTAM	01 02 04	0247	DNA DAM/REPAIR	01 02 04
0208	NEURO (HUMAN)	01 02 04	0223	RESPONSE REQEST DELAY	01 02 04	(0248)	PROD/USE/PROC	01 02 04
0209	NEURO (ANIMAL)	01 02 04	(0224)	PROD/COMP/CHEM ID	01 02 04	0251	MSDS	01 02 04
0210	ACUTE TOX. (HUMAN)	01 02 04	0225	REPORTING RATIONALE	01 02 04	0299	OTHER	01 02 04
0211	CHR. TOX. (HUMAN)	01 02 04	0226	CONFIDENTIAL	01 02 04			
0212	ACUTE TOX. (ANIMAL)	01 02 04	0227	ALLERG (HUMAN)	01 02 04			
0213	SUB ACUTE TOX (ANIMAL)	01 02 04	0228	ALLERG (ANIMAL)	01 02 04			
0214	SUB CHRONIC TOX (ANIMAL)	01 02 04	0239	METAB/PHARMACO (ANIMAL)	01 02 04			
0215	CHRONIC TOX (ANIMAL)	01 02 04	0240	METAB/PHARMACO (HUMAN)	01 02 04			

TRIAGE DATA: NON-CBI INVENTORY	ONGOING REVIEW	SPECIES	TOXICOLOGICAL CONCERN:	USE:	PRODUCTION:
(YES (CONTINUE))	YES (DROP/REFER)		LOW	Plastic	
NO (DROP)	NO (CONTINUE)		MED		
DETERMINE	REFER:		HIGH		

COMMENTS:

Ozone Transport:
2001 Review



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California Environmental Protection Agency

Air Resources Board

April 2001