DATE OF NOTICE: July 11, 1985.

Rowland K. Quinn, Jr.

Executive Secretary, National Mediation Board.

[FR Doc. 85-17098 Filed 7-15-85; 3:57pm]

BILLING CODE 7550-01-M

6

PACFIC NORTHWEST ELECTRIC POWER AND CONSERVATION PLANNING COUNCIL

Notice of Cancellation of Previously-Announced Meeting

"FEDERAL REGISTER" CITATION OF PREVIOUS ANNOUNCEMENT: 50 FR 28303, July 11, 1985.

PREVIOUSLY ANNOUNCED TIME, DATE AND PLACE OF THE MEETING: 9:00 a.m., July 17-18, 1985, Council Offices, 850 SW. Broadway, Suite 1100, Portland, Oregon.

CHANGE IN THE MEETING: The Northwest Power Planning Council has cancelled the July 17-18 meeting it has previously announced. Public notice of this cancellation is being issued at the earliest practicable time. The possibility of such cancellation was indicated in the **Federal Register** notice published on July 11, and further notice of the cancellation is being provided to interested parties throughout the region by other means as well. The Council's next meeting will be held August 7-8 at the Council's office in Portland, Oregon.

FOR FORTHER INFORMATION CONTRACT: Ms. Bess Atkins, (503) 222-5161, or toll-free 1-800-222-3355 (Montana, Idaho or Washington) or 1-800-452-2324.

William R. Cook,

Associate Counsel.

[FR Doc. 85-17015 Filed 7-15-85; 9:44 am]

BILLING CODE 0000-00-M

7

POSTAL SERVICE

(Board of Governors)

Notice of Vote To Close Meeting

At its meeting on July 8, 1985, the Board of Governors of the United States Postal Service unanimously voted to close to public observation its meeting scheduled for August 5, 1985, in Anchorage, Alaska. The meeting will involve a discussion of personnel matters.

The meeting is expected to be attended by the following persons: Governors Camp, Griesemer, McKean, Peters, Ryan, Sullivan and Voss; Postmaster General Carlin; Deputy Postmaster General Strange; Secretary to the Board Harris; General Counsel Cox; and Counsel to the Governors Califano.

The Board of Governors has determined that, pursuant to section 552b(c)(6) of Title 5, United States, Code and § 7.3(f) of Title 39, Code of Federal Regulations, the discussion of personnel matters is exempt from the open meeting requirement of the Government in the Sunshine Act (5 U.S.C. 552b(b)), because it is likely to disclose information of a personal nature where disclosure would constitute a clearly unwarranted invasion of personal privacy. The Board also determined that the public interest does not require that the Board's discussion of this matter be open to the public.

In accordance with section 552b(f)(1) of Title 5, United States Code, and § 7.6(a) of Title 39, Code of Federal Regulations, the General Counsel of the United States Postal Service has certified that in his opinion the meeting to be closed may properly be closed to public observation, pursuant to section 552b(c)(6) of Title 5 United States Code, and § 7.3(f) of Title 39, Code of Federal Regulations.

David F. Harris,

Secretary.

[FR Doc. 85-7003 Filed 7-15-85; 8:56 am]

BILLING CODE 7710-12-M

8

RAILROAD RETIREMENT BOARD

Public Meeting

Notice is hereby given that the Railroad Retirement Board will hold a meeting on July 23, 1985, 9:00 a.m., at the Board's meeting room on the 8th floor of its headquarters building, 844 North Rush Street, Chicago, Illinois, 60611. The agenda for this meeting follows:

(1) Proposed Changes in the RUIA Regulations
(2) Canadian Service
(3) Part 261 of the Board's Regulations—Reopening Final Decisions Under the Railroad Retirement Act

The entire meeting will be open to the public. The person to contact for more information is Beatrice Ezerski, Secretary to the Board, COM No. 312-751-4920, FTS No. 387-4920.

Dated: July 12, 1985.

Beatrice Ezerski,

Secretary to the Board.

[FR Doc. 85-17055 Filed 7-15-85; 1:38 pm]

BILLING CODE 7905-01-M

federal register

Wednesday
July 17, 1985

Part II

Environmental Protection Agency

40 CFR Parts 414 and 416

Organic Chemicals and Plastics and Synthetic Fibers; Point Source Category Effluent Limitations Guidelines Pretreatment Standards; and Standards of Performance for New Sources; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Parts 414 and 416

[OW-FRL-2863-6]

Organic Chemicals and Plastics and Synthetic Fibers; Point Source Category Effluent Limitations Guidelines Pretreatment Standards; and Standards of Performance for New Sources

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice of Availability and Request for Comments.

SUMMARY: The EPA proposed regulations on March 21, 1983, to limit effluent discharges to waters of the United States and the introduction of pollutants into publicly owned treatment works from organic chemicals, plastics and synthetic fibers (OCPSF) manufacturing facilities (48 FR 11828). The comment period on the proposed regulations, originally scheduled to close on June 19, 1983, was extended to August 3, 1983, by the Agency to allow increased participation by interested parties (48 FR 24138). EPA announces today the availability for public review and comment of technical and economic data and related documentation received after proposal of the regulations. Pertinent portions of the public record include: (1) Definition and Subcategorization of the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category, (2) Technology Basis for BPT Regulatory Options and Derivation of Effluent Limitations, (3) Technology Basis for BAT Regulatory Options and Derivation of Effluent Limitations, (4) Technology Basis for PSES Regulatory Options and Derivation of Effluent Standards, (5) Costing Documentation and Notice of New Information Report, (6) Evaluation of the Validity of Using Form 2C Data to Characterize Process Wastewater, and (7) Calculation of Priority Pollutant Waste Loads.

Based upon this new information, EPA has conducted new analyses and presents the results of these analyses and several sets of regulatory options. The final regulations may incorporate any of these options, any of the options previously set forth in the notice of proposed regulations, or any combination of these options. EPA solicits comments on these regulatory options.

DATES: Comments must be submitted on or before October 15, 1985.

ADDRESS: Comments may be mailed to E.H. Forsht, Industrial Technology Division (WH-552), U.S. Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, Attention: ITD Docket Clerk, Organic Chemicals, Plastics and Synthetic Fibers (OCPSF) Rules; or delivered to the Docket Clerk, Room 911, East Tower, Waterside Mall, between the hours of 9:00 a.m. and 4:00 p.m. The Agency requests that commenters submit their comments and supporting documentation in triplicate. The supplementary information and data received and the revised technical and economic data evaluation summaries will be available for inspection and copying at the EPA Public Information Reference Unit, Room 2402 (Rear), Waterside Mall, 401 M Street, SW., Washington, DC 20460. The EPA information regulation (40 CFR Part 2) provides that a reasonable fee may be charged for copying.

FOR FURTHER INFORMATION CONTACT: E.H. Forsht (202) 382-7124 for information regarding the technical data, and Renee Rico (202) 382-5386 for information regarding the economic data. Copies of the draft economic analysis may be obtained by writing or calling Ms. Renee Rico, Analysis and Evaluation Division (WH-586), U.S. EPA, 401 M Street, SW., Washington, DC 20460.

SUPPLEMENTARY INFORMATION:

Organization of This Notice

I. Summary of Proposed Regulations

On March 21, 1983, EPA proposed regulations to control the discharge of wastewater pollutants from organic chemicals, plastics and synthetic fibers manufacturing operations to navigable waters and to publicly owned treatment works (POTWs) (48 FR 11828). The proposed regulations included effluent limitations based upon the best practicable control technology currently available (BPT), the best conventional pollutant control technology (BCT), the best available technology economically achievable (BAT), new source performance standards (NSPS), pretreatment standards for existing sources (PSES), and pretreatment standards for new sources (PSNS).

The notice of proposed rulemaking and the supporting technical development document explain the proposal fully. Below is a brief summary of key aspects of the proposal.

The proposed regulation separated the OCPSF industry into four subcategories for BPT, based predominately on the types of product/processes contributing to a plant's wastewater discharge. For BAT, proposed regulations were developed for two categories: one for the discharges from the manufacture of plastics and synthetic fibers (corresponding to the BPT Plastics Only subcategory) and the second for discharges from the manufacture of organic chemicals (corresponding to the other three BPT subcategories). The factors considered for subcategorization included raw materials used; products manufactured; production processes employed; wastewater characteristics and treatability; plant size, location and age; and treatment cost. Further discussion of the subcategorization scheme is presented in section IV(B) of this notice, Subcategorization.

The preamble to the proposed regulation and the development document presented a number of available control and treatment technologies which were generally practiced in the industry and considered in developing the proposed regulations. These technologies include in-process and end-of-pipe physical/chemical treatment systems and end-of-pipe biological treatment systems, as well as post-biological polishing ponds and physical/chemical treatment.

A. BPT

EPA based the proposed limitations on two technologies. The predominant technology used in the OCPSF industry, and thus the primary technology used as a basis for the proposed limitations, was biological treatment preceded by the necessary controls to protect the biota and otherwise assure that the biological system functions effectively and consistently. Activated sludge and aerated lagoons are the primary examples of such biological treatment. Other biological systems, such as aerobic lagoons, rotating biological contractors, and trickling filters, are also used effectively at a few plants and data from such plants were also used to develop the proposed BPT limitations.

The second BPT technology option considered in the proposed BPT regulations for the OCPSF industry was a biological system followed by a polishing pond or filter. This biological/polishing combination achieves effective treatment of BOD and TSS. In some cases, plants originally installed biological systems that had inadequate retention times or were otherwise not designed and operated to optimally treat conventional pollutants. When these plants were required in the late 1970s to upgrade to meet BPT permit limits (established by permit writers in the absence of guidelines on a case-by-case basis, using their best professional judgment), some chose to add polishing ponds or filters rather than to enlarge or otherwise improve their existing biological systems. EPA concluded that the biological/polishing combination thus constitutes an alternative method to meet the proposed BPT limitations.

B. BCT

The proposed BCT limitations are equivalent to BPT.

C. BAT

EPA refrained from specifying a particular set of controls as the basis for the BAT concentration-based limitations. Instead, the proposed BAT limitations were based on the levels of priority pollutant control that were actually achieved at various OCPSF plants using differing treatment configurations.

It was thus infeasible to specify that any particular technology is or is not a "BAT" technology or a "priority pollutant control" technology in the OCPSF industry. Rather, each plant wishing to control its priority pollutant discharges would employ a combination of controls and technologies that result in the desired reduction (see Section IV(D) of this notice for additional details).

D. NSPS

The proposed NSPS are equivalent to BPT for conventional pollutants and BAT for toxic pollutants.

E. PSES

EPA concluded for the OCPSF industry that the toxic metals and organic pollutants that would be regulated under the proposed PSES pass through publicly owned treatment works (POTWs). The proposed PSES are equivalent to BAT for these pollutants.

F. PSNS

The proposed PSNS are equivalent to PSES.

G. Pollutants Excluded From Regulation

Eighteen toxic pollutants were proposed for exclusion from these regulations (see 48 FR 11853, March 21, 1983, Appendix C) because they are pesticides which are not produced as products or co-products and are unlikely to appear as raw contaminants in OCPSF product/processes. Therefore, they are unlikely to be present in OCPSF process wastewater discharges.

Twenty-eight additional toxic pollutants were excluded from the PSES and PSNS regulations because they were determined not to pass through or interfere with, and are not otherwise incompatible with the operation of POTWs (see 48 FR 11853, March 21, 1983, Appendix D).

H. Cost and Economic Impacts

The methodology used to perform the economic assessment for the proposed regulation is presented in the document entitled *Economic Analysis of Proposed Effluent Standards and Limitations for the Organic Chemicals and Plastics, Synthetics, and Fibers Industry*, EPA 440/2–83–004. This report details the investment and annual costs for the industry as a whole and for typical plants covered by the proposed regulation. Compliance costs are based on engineering estimates of incremental capital requirements above the water pollution control equipment already in-place. The report assesses the impact of effluent control costs in terms of plant closures, employment effects, balance of trade effects and impacts on small businesses. These impacts are discussed for each of the regulatory levels examined by the Agency.

The economic analysis projected total capital costs, needed for about 1500 existing plants to comply with the proposed regulation, to be about $1.7 billion with annual costs of approximately $750 million, including depreciation and interest (1982 dollars). Twenty-one product/process closures were projected to occur as a result of the compliance cost projections. EPA estimated that eight plants may close. These shut-downs and closures were expected to cause a decrease of 493 jobs, less than 0.2 percent of a total employment of 295,000.

I. Non-Water Quality Impacts and Other Aspects of Proposed Regulations

Discussion of factual and policy findings supporting the proposal are presented at 48 FR 11847–50 and in the development document, and will not be repeated here.

J. Solicitation of Comments

The Agency also solicited additional comments and information on 30 specific issues as part of the notice of proposed rulemaking (refer to Section XIX, 38 FR 11850–51, March 21, 1983). These specific issues related to several general topics, including: (1) the generic process chemistry/unit operation basis for the subcategorization scheme, (2) the use of post-biological polishing ponds and filters as the technology basis for the BPT total suspended solids limitations, (3) the difficulty of meeting BPT limitations due to high or low ambient temperatures, (4) the methodology devised to determine which priority pollutants are likely to be discharged from particular product/processes (5) the technical and economic achievability of meeting the proposed BAT limitations for individual plants, (6) the suitability of not regulating all priority pollutants, (7) the methodology for excluding selected priority pollutants from PSES standards, (8) the unit costs and costing models used for developing BPT and BAT engineering compliance costs, (9) the analytical methods utilized to develop the priority pollutant data base, and (10) the economic impact analysis methodology.

II. Major Issues Raised in Comments

The Agency received numerous comments on the proposed regulation.

These comments criticized data and analyses that were fundamental to the regulation and prompted the Agency to reassess its data based and to reconsider many aspects of the regulation. Interested persons are advised to review the rulemaking record for a complete understanding of the many issues raised in comments. Listed below are those issues that appeared to be of greatest concern to commenters and that warranted further study by the Agency.

A. Adequacy of the Existing Data Base

Many comments disagreed with the Agency's conclusion that the existing data at the time of proposal could be considered representative of the entire industry for the purposes of establishing regulations, assessing costs of treatment required and resulting economic impacts or for assessing the scope of priority pollutant discharges. Some industry representatives questioned the validity of Agency models and assumptions used to extrapolate priority pollutant discharges, costs of additional treatment, and economic impacts from the existing data to the rest of the industry.

A few industry representatives asserted that the data were too old. Although some information was more current, the existing survey data generally characterized the industry in 1976 to 1977. Industry argued that significant advances in wastewater treatment practices have occurred since 1977. Most plants were issued NPDES permits during the period 1976–1977. Since national guidelines were not promulgated, these permits were based on State or EPA regional staffs exercising best professional judgment of limitations required by the Act. Any treatment installed to come into compliance with these permits was not reflected in the existing survey data. Industry argued that, if that treatment were considered, regulation of priority pollutants would not be necessary. However, commenters were also concerned that too much of the BPT data base was post-1977 and suggested that the more current data reflects better treatment than BPT.

B. Subcategorization

The proposed four-subcategory scheme was based on OCPSF generic process chemistry/chemical engineering unit operations and their potential to generate BOD_5 loadings. Industry commented that the proposed scheme is unworkable and arbitrarily groups chemical processes into non-homogeneous groups with respect to effluent treatability. They noted that the scheme is based on highly complex process chemistry and that minor changes in production or product mix could shift the applicable discharge subcategory. Industry commented that the within-subcategory variability was just as large as the between-subcategory variability. Many specific comments questioned whether specific product/processess or product groups were properly placed within the subcategorization scheme.

C. Treatment Effectiveness Data Base and Editing Rules

Many commenters disagreed with the Agency's technology and performance basis for BPT. They claimed that Congress intended BPT limitations to be developed ten to twelve years ago and implemented before 1977. Therefore, they argued that the current BPT data base should not include performance data from treatment systems that were installed or upgraded to meet NPDES permit requirements based upon best professional judgment of BPT technology and water quality considerations. Since many companies utilized various combinations of in-plant waste reduction techniques, water conservation programs, sewer segregation programs, and end-of-pipe biological treatment to meet "BPT" permit requirements, they claim the Agency penalized the OCPSF industry by continuing to use the "average of the best" treatment methodology. Many commenters believe that EPA unreasonably screened the data base for establishing "average of the best" by retaining only plants with 95 percent or better BOD_5 removal or plants with effluent BOD_5 of 50 mg/l or less. They suggested that the Agency should establish a more liberal indicator of BPT performance and should base BPT on biological treatment only.

Many commenters also disagreed with the Agency's technology and performance basis for toxic pollutant control. They suggested that the Agency relied on limited, unrepresentative, and inadequate data; did not accommodate the complexity and diversity of the OCPSF industry; ignored the toxic pollutant reduction progress made to date by treatment systems installed to meet best professional judgment BPT permit limitations; did not adequately accommodate the toxic pollutant analytical uncertainty inherent in part per billion measurements; and proposed too stringent limitations in many cases given available wastewater treatment technology.

D. Compliance Costs

Many commenters criticized the Agency's use of the CAPDET computer model for costing biological treatment systems. They suggested that since the CAPDET model is based on historic costs for municipal sewage treatment facilities, it should not be utilized for costing industrial wastewater treatment systems. They stated that the CAPDET default values and constants were not adequately modified to reflect OCPSF process wastewater characteristics and design parameters. Industry comments also criticized the Agency's methodology for extrapolating BPT costs for 169 individual plants to the entire industry.

Many commenters also criticized the Agency's use of the "55 generalized plant configurations" (GPCs) to model and characterize the industry as a whole for developing engineering costs for toxic pollutant control. Industry comments claim that few primary manufacturing facilities were characterized adequately by the 55 GPCs and they disagreed with the Agency's methodology of extrapolating GPC costs based on relationships among costs, flow and sales.

E. Economic Impact Methodology

EPA received numerous comments on the data base, methodology, and analysis used to estimate the economic impacts resulting from the proposed rules. The comments focused on the following major areas: quality of the plant data used to estimate plant effects, the method used to estimate plant closures, and the methods used in the small business analysis.

EPA received substantial comments that the economic data base used at proposal was inadequate and incomplete. Many dischargers who requested EPA's economic profile data told EPA that the data used were in error. Furthermore, commenters insisted that secondary producers of organics and plastics products also must be included in the analysis to properly evaluate the effect of these rules.

At proposal, EPA based its plant impact analysis on a treatment-cost-to-sales ratio to indicate whether a plant would close as a result of the proposed requirements. A plant's sales value was used to estimate wastewater flow (based on an algorithm developed from a subset of plants), and flow was used to estimate treatment costs (also based on an algorithm). Commenters properly noted that this analysis inevitably underestimated plant closures overall. Commenters also criticized EPA's four

percent cost-to-sales benchmark for plant closure.

Commenters also stated that the Small Business Analysis at proposal was inadequate in capturing the relative economic effects of the regulation among small and large manufacturers.

III. Data Gathering Efforts

A. Technical

In the preamble to the proposed regulation, the Agency recognized the need to gather additional data to assure that the regulation is based upon information that represents the entire industry and to assess wastewater treatment installed since 1977. Therefore, the Agency has conducted an extensive data gathering program to improve the coverage of all types of OCPSF manufacturers. This effort included mailing Section 308 surveys to all manufacturers of OCPSF products and conducting toxic pollutant sampling at 12 additional OCPSF facilities.

For the purposes of the survey, the OCPSF industry was defined generally as all establishments that manufacture: (1) Organic chemical products included within the U.S. Department of Commerce Bureau of the Census Standard Industrial Classification (SIC) major groups 2865 and 2869 and/or (2) plastics and synthetic fibers products included in SIC major groups 2821, 2823, and 2824. However, organic chemical compounds that are produced solely by extraction from natural materials, such as parts of plants and animals, or by fermentation processes are not included in this definition of the OCPSF industry even if classified in one of the OCPSF SIC classifications. Thus, any such products were considered non-OCPSF products for the purposes of the survey.

The questionnaire mailing list was compiled from many references that identify manufacturers of OCPSF products. These sources included the Economic Information Service, SRI Directory, Dun and Bradstreet, Moody's Industrial Manual, Standard and Poor's Index, Thomas Register, and Plastics Red Book as well as internal Agency sources such as the NPDES Permit Compliance System and the TSCA Inventory.

In October 1983, the Agency sent the General Questionnaire to 2,829 facilities to obtain information regarding individual plant characteristics, wastewater treatment efficiency, and the statutory factors expected to vary from plant to plant. The General Questionnaire consisted of three parts: Part I (General Profile), Part II (Detailed Production Information), and Part III (Wastewater Treatment Technology, Disposal Techniques, and Analytical Data Summaries).

Some plants that received the questionnaire had OCPSF operations that were a minor portion of their principal production activities and related wastewater streams. The data collected from these facilities allows the Agency to characterize properly the impacts of ancillary (secondary) OCPSF production. Generally, if a plant's 1982 OCPSF production was less than 50 percent of the total facility production (secondary manufacturer), then only Part I of the questionnaire was completed.

Part I identified the plant, determined whether the plant conducted activities relevant to the survey, and solicited general data (plant age, ownership, operating status, permit numbers, etc.). General OCPSF and non-OCPSF production and flow information was collected for all plant manufacturing activities. This part also requested economic information including data on shipments and sales by product groups, as well as data on plant employment and capital expenditures.

Part I determined whether a respondent needed to complete Parts II and III (i.e. whether the plant is a primary or secondary producer of OCPSF products, whether the plant discharges wastewater, and, for secondary producers, whether the plant segregates OCPSF process wastewaters). For those plants returning only the General Profile, Part I identified the amounts of process wastewater generated, in-place wastewater treatment technology, wastewater characteristics, and disposal techniques. Part II requested detailed 1980 production information for 249 specific OCPSF products, 99 specific OCPSF product groups, and any OCPSF product that constituted more than one percent of total plant production. Less detailed information was requested for the facility's remaining OCPSF and non-OCPSF production. Part II also requested information on the use or known presence of the priority pollutants for each OCPSF product/process or product group. Part III requested detailed information on plant wastewater sources and flows, treatment technology installed, treatment system performance and disposal techniques.

Responses to economic and sales items in Part I pertain to calendar year 1982, which were readily available since the plants were required to submit detailed 1982 information to the Bureau of the Census. This reduced the paperwork burden for responding plants. The rest of the questionnaire, however, requested data for 1980—a more representative production year. The Agency believed that treatment peformance in 1982 would be unrepresentative of treatment during more typical production periods. This is because decreased production normally results in decreased wastewater generation. With lower volumes of wastwater being treated, plants in the industry might be achieving levels of effluent quality that they could not attain during periods of higher production. The year 1980 was selected in consultation with industry as representative of operations during more normal production periods but recent enough to identify most new treatment installed by the industry since 1977. The industry representatives did not assert that significant new treatment had been installed since 1980.

The 2,829 section 308 questionnaires were mailed in October 1983. In February 1984, section 308 follow-up letters were sent to 914 nonrespondents.

A total of 981 OCPSF manufacturers were used in the analysis: 1,529 responses were from facilities not covered by the regulation (sales offices, warehouses, chemical formulators, etc.); 162 were returned by the Post Office; and 159 did not respond. A follow-up telephone survey of 52 nonrespondents concluded that less than 10 percent would be covered by the OCPSF regulations.

In addition, a Supplemental Questionnaire was sent to 84 facilities known to have installed selected wastewater treatment unit operations. Detailed design and cost information was requested for four major treatment components commonly used to treat OCPSF wastewaters (biological treatment, steam stripping, solvent extraction, and granular activated carbon) and summary design and cost information for other wastewater and sludge treatment components. The questionnaires also collected available treatment system performance data for in-plant wastewater control or treatment unit operations, influent to the main wastewater treatment system, intermediate wastestream sampling locations, and final effluent from the main wastewater treatment system. Unlike the General Questionnaire, it asked for individual daily data rather than summary data. Sixty-four plants responded with useful data and information.

The Agency conducted toxic pollutant field sampling activities at 12 OCPSF manufacturing plants between March 1983 and May 1984. Eight plants were sampled between 15 to 20 days each;

three plants, between 10 to 12 days; and one plant for one day. The analytical protocols used to measure the organic priority pollutants were Method 1624 for volatile organic compounds by purge and trap isotope dilution GC–MS and Method 1625 for semivolatile organic compounds by isotope dilution GC–MS. The field sampling program expands the coverage of priority pollutants, provides an additional basis for estimating wastewater treatment system variability, and increases the candidate toxic pollutant wastewater treatment technologies. In-plant controls sampled included steam stripping, coagulation/flocculation, metals precipitation, activated carbon and extended aeration biological systems; end-of-pipe controls sampled included activated sludge, extended aeration, pure oxygen, and powdered activated carbon (PAC) biological systems; and polishing ponds, filtration and activated carbon units.

B. Economic and Financial

In addition to the economic and financial data collected in the Section 308 questionnaires, EPA also gathered data on the industry from a number of public and private sources. The major efforts are described below. (See *Economic Impact for Notice of Data Availability for the Organic Chemicals, Plastics and Synthetic Fibers Industry* for full citing of sources.)

Macroeconomic and chemical industry profiles were obtained from Data Resources, Inc. Information from 1982 was collected to compare with survey responses received from the industry. Forecasts for 1988 were also obtained from Data Resources, Inc. These forecasts come from the Trendlong macro forecast, linked to the linear programming model for the chemicals and plastics industry. Other macroeconomic and industry profile data were obtained from the International Trade Commission, the Federal Trade Commission, and the Bureau of the Census. Further profile data on the chemical industry were obtained from the *Kline Guide*.

EPA also developed a corporate financial database by purchasing selected data from SEC 10k financial reports for the survey population from Compustat Services, by examining State Industrial Guides and the Moody Corporate Directory. Financial data from Robert Morris Associates and the FINSTAT database developed by the Small Business Administration were used to model plant financial characteristics.

IV. Preliminary Data Analysis—Technical

A. Industry Profile

The OCPSF Industry is large and diverse, and many plants in the industry are highly complex. The industry includes approximately 1000 facilities which generally manufacture products under the OCPSF SIC Groups—SICs 2821, 2823, 2824, 2865, and 2869.

Some plants produce chemicals in large volumes, while others produce only small volumes of "specialty" chemicals. Large-volume production tends toward continuous processes, while small volume production tends toward batch processes. Continuous processes are generally more efficient than batch processes in minimizing water use and optimizing the consumption of raw materials in the process.

Different products are made by varying the raw materials, chemical reaction conditions, and the chemical engineering unit processes. The products being manufactured at a single large chemical plant can vary on a weekly or even daily basis. Thus, a single plant may simultaneously produce many different products in a variety of continuous and batch operations, and the product mix may change frequently.

For the 981 facilities in the OCPSF industry data base, approximately 76 percent of the facilities are designated as primary OCPSF manufacturers (over 50 percent of their total plant production includes OCPSF products) and approximately 24 percent of the facilities are secondary OCPSF manufacturers. Approximately 32 percent of the plants are direct dischargers, approximately 42 percent are indirect dischargers (plants that discharge to a publicly owned treatment works) and the remaining facilities use zero or alternative discharge methods. The estimated average daily process wastewater flow per plant is 1.22 MGD (millions of gallons per day) for direct dischargers and 0.24 MGD for indirect dischargers. The remainder use dry processes, reuse their wastewater, or dispose of their wastewater by deep well injection, incineration, contract hauling, or evaporation or percolation ponds.

As a result of the wide variety and complexity of raw materials and processes used and of products manufactured in the OCPSF industry, an exceptionally wide variety of pollutants are found in the wastewaters of this industry. This includes conventional pollutants (pH BOD, TSS and oil and grease); toxic pollutants (both metals and organic compounds); and a large number of nonconventional pollutants (including the organic compounds produced by the industry for sale). EPA focused its attention on the conventional pollutants and on the 65 toxic pollutants and classes of pollutants required to be addressed in accordance with the court order in *NRDC* v. *Ruckelshaus*.

To control the wide variety of pollutants discharged by the OCPSF industry, OCPSF plants use a broad range of in-plant controls, process modifications and end-of-pipe treatment techniques. Most plants have implemented programs that combine elements of both inplant control and end-of-pipe wastewater treatment. The configuration of controls and technologies differs from plant to plant, corresponding to the differing mixes of products manufactured by different facilities. In general, direct dischargers treat their waste more extensively than indirect dischargers.

The predominant end-of-pipe control technology for direct dischargers in the OCPSF industry is biological treatment. The chief forms of biological treatment are activated sludge and aerated lagoons. Other systems, such as extended aeration and trickling filters, are also used, but less extensively. All of these systems reduce BOD and TSS loadings, and, in many instances, incidentally remove toxic and nonconventional pollutants. Biological systems biodegrade some of the organic pollutants, remove bio-refractory organics and metals by sorption into the sludge, and strip some volatile organic compounds into the air.

Other end-of-pipe treatment technologies used in the OCPSF industry include neutralization, equalization, polishing ponds, filtration and carbon adsorption. While most direct dischargers use these physical/chemical technologies in conjunction with end-of-pipe biological treatment, some direct dischargers use only physical/chemical treatment.

In-plant control measures employed at OCPSF plants include water reduction and reuse techniques, chemical substitution and process changes. Techniques to reduce water use include the elimination of water use where practicable and the reuse and recycling of certain streams, such as reactor and floor washwater, surface runoff, scrubber effluent and vaccum seal discharges. Chemical substitution is utilized to replace process chemicals possessing highly toxic or refractory properties by others that are less toxic or more amenable to treatment. Process change include various measures that reduce water use, waste discharges,

and/or waste loadings while improving process efficiency. Replacement of barometric condensers with surface condensers; replacement of steam jet ejectors with vacuum pumps; recovery of product or by-product by steam stripping, distillation, solvent extraction or recycle, oil-water separation and carbon adsorption; and the addition of spill control systems are examples of process changes that have been successfully employed in the OCPSF industry to reduce pollutant loadings while improving process efficiencies.

Another type of control widely used in the OCPSF industry is physical/chemical in-plant control. This treatment technology is generally used selectively on certain process wastewaters to recover products or process solvents, to reduce loadings that may impair the operation of the biological system or to remove certain pollutants that are not removed sufficiently by the biological system. In-plant technologies widely used in the OCPSF industry include sedimentation/clarification, coagulation, flocculation, equalization, neutralization, oil/water separation, steam stripping, distillation, and dissolved air flotation.

Many OCPSF plants also use physical/chemical treatment after biological treatment. Such treatment is used in the majority of situations to reduce solids loadings that are discharged from biological treatment systems. The most common post-biological treatment systems are polishing ponds and multimedia filtration.

At approximately 9 percent of the direct discharging plants surveyed, either no treatment or no treatment beyond equalization and neutralization is provided. At another 14 percent, only physical/chemical treatment is provided. The remaining 77 percent utilize biological treatment. Approximately 42 percent of biologically treated effluents are further treated by additional controls such as polishing ponds, filtration, or activated carbon.

At approximately 39 percent of the indirect discharging plants surveyed, either no treatment or no treatment beyond equalization and neutralization is provided. At another 47 percent, some physical/chemical treatment is provided. The remaining 14 percent utilize biological treatment.

B. Subcategorization

1. Summary

The Agency has developed revised subcategories based on the new Section 308 Questionnaire responses and field sampling data. The proposed four-subcategory approach for the conventional pollutant parameters regulated at BPT, BOD_5 and TSS, has been replaced by a new approach with eight subcategories. Also, the proposed two-subcategory scheme for toxic pollutants regulated at BAT has not been retained. Rather than establish subcategories for toxic pollutants, the Agency is establishing one subcategory together with a monitoring approach for identifying the toxic pollutants that are discharged by each plant and thus warrant the most rigorous set of controls at the plant. (see Section IV(L)).

Under the revised subcategorization scheme, a plant is classified in accordance with that fraction of its total annual OCPSF production volume (pounds) that is associated with particular types of OCPSF products. The eight subcategories are as follows:

i. *Rayon Fibers*—includes plants in which rayon fibers by the viscose-rayon process constitute at least 95% of total OCPSF production.

ii. *Other Man-Made Fibers*—includes plants in which other man-made fiber products constitute at least 95% of total OCPSF production and plants in which other man-made fiber products plus organic chemicals constitute at least 95% of total OCPSF production.

iii. *Thermosets*—includes plants in which thermosetting resins constitute at least 95% of total OCPSF production and plants in which thermosetting resins plus organic chemicals constitute at least 95% of total OCPSF production.

iv. *Thermoplastics*—includes plants in which thermoplastic materials constitute at least 95% of total OCPSF production.

v. *Thermoplastics and Organics*—includes plants in which thermoplastic materials and organic chemicals constitute at least 95% of total OCPSF production.

vi. *Commodity Organics*—includes plants in which organic commodity chemicals (those produced nationally at a level exceeding one billion pounds per year) constitute at least 75% of organic chemical production and in which plastics production is less than 5% of total OCPSF production.

vii. *Bulk Organics*—includes plants whose production is not classified as either commodity or specialty organics (those produced nationally at a level below 40 million pounds per year) but does include at least 95% organics.

viii. *Specialty Organics*—includes plants in which specialty organic chemicals production constitutes at least 75% of total organic chemicals and in which plastics production is less than 5% of total OCPSF production.

Eighty-nine percent of OCPSF plants can be uniquely assigned to these eight subcategories. Eleven percent cannot be so classified because their manufacturing operations include a variety of major product types, none of which predominate to the extent called for by the subcategory definitions (e.g., a plant with 80% thermoplastics and 20% thermosets). In such cases, the control authority will use a building-block approach (based on flow-proportioning) to derive a plant's limitation from those established in the regulation for two or more relevant subcategories.

2. Relationship of New Subcategorization Scheme to Proposed Subcategorization

At proposal, the Agency established OCPSF effluent guidelines in which industry was divided into four subcategories based on products produced and generic process chemistry/chemical engineering unit operations.

Industry provided comments on this subcategory scheme which, besides stating industry's general displeasure with the subcategories, also discussed the complexity and confusing nature of the subcategories, the relative size of between and within-subcategory variability, and the advantage of focusing attention on effluent BOD.

The revised subcategorization scheme is intended to address these concerns. The Agency decided to focus its attention on OCPSF products rather than the chemical processes used to produce those products. It is clear, however, that the chemical processes found at a plant are closely related to the products produced by the facility. By focusing on products produced, the Agency hopes to conform the subcategorization to the inherent economic structure of the industry as well as the basic wastewater similarities of plants with similar products.

Industry comments on the proposal also objected to the statistical technique used to analyze the data for subcategorization. In particular, these comments emphasized that the proposed subcategories had greater variability within a subcategory than between subcategories. The Agency has subjected the new subcategorization scheme to an analysis of variance to assure that the new subcategories are well-defined and exhibit less within-subcategory variability than between-subcategory variability.

Finally, the new subcategorization gives appropriate consideration to BOD effluent values, which industry comments correctly noted is a relevant

factor in determining suitable OCPSF subcategories.

3. Detailed Explanation

Using raw materials provided by organic chemical plants, plastic plants employ only a small subset of the chemistry practiced by the OCPSF industry to produce a limited number of products (approximately 200). Plants producing organic chemicals, on the other hand, utilize a much larger set of process chemistry and engineering unit operations to produce approximately twenty-five (25) thousand products.

Further divisions are appropriate within the two broad groupings of plastics and organic chemicals. Within the plastics group, Plastic Materials and Synthetic Resins (SIC 2821) manufacturers can be subdivided into Thermoplastic Materials (SIC 28213) producers and Thermosetting Resin (28214) producers. Rayon manufacturers (SIC 2823) and other Synthetic Organic Fiber (SIC 2824) manufacturers are also both unique. Process chemistry and engineering are consistent with these groupings.

The Organic Chemicals industry (SIC 2865 and 2869) produces many more products than does the Plastic/Synthetic Fibers industry and is correspondingly more complex. While it is possible to separate the organic chemicals industry into product groups, the number of such product groups is large. Moreover, with few exceptions, plants produce organic chemicals from several product groups and thus limit the utility of such a scheme.

For organic chemical production, an alternative to a product-based scheme is a scheme based on the type of manufacturing conducted at a plant. Large plants producing primarily high-volume commodity chemicals (the basic chemicals of the industry, e.g., ethylene, propylene, benzene) comprise the first group of plants. A second tier of plants comprises plants that produce high volume intermediates (bulk chemicals). Plants within this tier typically utilize the products of the commodity chemical plants (first tier plants) to produce more structurally complex chemicals. Bulk chemical plants are generally smaller than those in the first group but still may produce several hundred million pounds of chemicals per year (e.g., aniline, methylene dianiline, toluene diisocyanate). The third group comprises those plants that are devoted primarily to the manufacture of specialty chemicals—chemicals intended for a particular end use (e.g., dyes and pigments). Specialty chemical plants use the products of the Commodity and Bulk chemical plants as raw materials. Generally, specialty chemicals are more complex structurally than either commodity or bulk chemicals. Plants within this group tend to be much smaller, producing tens of millions of pounds of chemicals per year.

Based upon the above, EPA has defined the three organics-based subcategories—commodity, bulk, and specialty—on the basis of total industry production. Commodity chemicals are those chemicals produced by the industry in amounts greater than one-billion lbs./yr. Bulk chemicals are defined to be those chemicals produced in amounts less than one-billion lbs./yr. but more than 40-million lbs./yr. Specialty chemicals are those chemicals produced in amounts less than 40-million lbs./yr. Using these definitions, there are 37 commodity chemicals or commodity chemical groups and 221 bulk chemicals or bulk chemical groups. The remaining organic chemicals are classified as specialty chemicals.

The products and product groups classified under Rayon, Other Fibers, Thermosets, Thermoplastics, Commodity Organics, and Bulk Organics are listed in Tables K–1 through K–6 respectively, of Section IV(K)—Applicability and Definition of the Regulated OCPSF industry. The Specialty Organics are the remaining organic chemicals not listed as commodity or bulk chemicals.

The BPT subcategorization factors (manufacturing product/processes, raw materials, wastewater characteristics, facility size, geographic location, age of facility and equipment, treatability, and nonwater quality environmental impacts) were examined for significance in the development of the revised subcategorization scheme. In general, the revised subcategorization is based primarily on significant differences in wastewater characteristics. Variations in waste characteristics have been utilized to evaluate the appropriateness of using any of the other eight factors as a basis for subcategorization.

The ideal data base for evaluating the need for subcategorization and the development of individual subcategories would include raw wastewater and final effluent pollutant data for facilities which employ only one manufacturing process or multiple product plants which segregate and treat each process raw waste stream separately. In this manner, each factor could be evaluated independently. However, the OCPSF industry is primarily comprised of multi-product/process, integrated facilities. Wastewaters generated from each product/process are usually collected in combined plant sewer systems and treated in one main treatment facility. Therefore, each plant's overall raw wastewater characteristics are affected by all of the production processes occurring at the site at one time. The effects of each production operation on the raw wastewater characteristics cannot be isolated from all of the other site specific factors. Therefore, a combination of both technical and statistical methodologies were used to evaluate the significance of each of the subcategorization factors. The results of the technical analysis were compared to the results of the statistical efforts to determine the usefulness of each factor as a basis for subcategorization. Two major statistical techniques were used to determine an appropriate subcategorization scheme for the OCPSF industry: Analysis of Variance and the Spearman Rank Correlation. The details of the analysis are available in the EPA Public Information Reference Unit.

The analysis concludes that the revised subcategorization scheme is very effective when OCPSF process wasewater flow is the variable of interest. Flow relates to the size and construction costs of a plant's wastewater treatment system.

The analysis also shows that the revised subcategories effectively group plants by production volume (measured as annual pounds of all OCPSF products produced at a plant) homogeneously relative to the inherent variability of production throughout the industry. This indicates that size of plants has been successfully addressed in the subcategorization. Thus plants of similar economic viability are grouped together.

Geographic location (including ambient temperature) and age of facility and equipment were determined not to be appropriate bases for subcategorization of the OCPSF industry.

The analysis shows that the revised scheme is very effective in establishing homogeneous groups based on effluent BOD concentrations, but not as rigorous in establishing groups based on raw waste BOD concentration. As described below, all plants can use some combination of well-designed and operated treatment technology to meet lower effluent BOD targets. The predominant issue relates to the cost of the required treatment technology.

The effluent BOD concentration or treatability of a given wastewater is affected by the presence of inhibitory materials (toxics); availability of alternative disposal methods; and pollutant concentrations in, and variability of, the raw waste load. However, all of these factors can be mitigated by sound waste management.

treatment technology design, and operating practices. Examples of these are:

- The presence of toxic materials in the wastewater can be controlled by in-plant treatment methods. Technologies such as steam stripping, metals precipitation, activated carbon, reverse osmosis, etc., can eliminate the presence of materials in a plant's wastewater which may inhibit or upset biological treatment systems.
- Although plants may utilize deep well injection for disposal of highly toxic wastes to avoid treatment system upsets, other alternative disposal techniques such as contract hauling and incineration are available to facilities which cannot utilize deep well disposal. In addition, stricter groundwater regulations may eliminate the option of deep well disposal for some plants or make it uneconomical for others, forcing facilities to look more closely at these other options.
- Raw waste load variability can be controlled easily by the use of equalization basins. In some plants, "at process" storage and equalization is used to meter specific process wastewaters, on a controlled basis, into the plant's wastewater treatment system.
- Raw waste concentrations can be reduced with roughing biological filters or with the use of two-stage biological treatment systems.

OCPSF wastewaters can be treated by either physical-chemical or biological methods, depending on the pollutant to be removed. Also, depending on the specific composition of the wastewater, any pollutant may be removed to greater or lesser degree by a technology not designed for removal of this pollutant. For example, a physical-chemical treatment system designed to remove suspended solids will also remove a portion of the BOD of a wasewater if the solids removed are organic and biodegradable. It is common in the OCPSF industry to use a combination of technologies adapted to the individual wastewater stream to achieve desired results.

In general, the precent removals of BOD and TSS are consistent across all revised subcategories. It is also possible for plants in all revised subcategories to achieve high percent removals (greater than 95%) for both BOD and TSS. Therefore, based on the consistency of these removal data and the ability of plants in all revised subcategories to achieve high removals of pollutants, it is concluded that subcategorization based on treatability is not justified.

The Agency believes that there are several advantages associated with the revised subcategorization scheme. Plants are assigned to subcategories based on the relative production of OCPSF products using data that must be generated for the Bureau of Census. The procedure is relatively simple to apply to individual plants. Finally, most are uniquely covered by a single subcategory, leaving relatively few plants that need to be addressed by a "building block" approach using two or more subcategories. The Agency solicits comments and additional data related to the revised subcategorization scheme.

C. Technology Basis for BPT Options and Effluent Limitations

The Agency is considering three BPT technology options. EPA may promulgate BPT effluent limitations based on any of these three options. Therefore, we specifically invite comment on each of these.

These options focus again on the primary end-of-pipe technologies used in the industry. These technologies are widely used in the industry to control conventional pollutants. To varying extents, these technologies also remove toxic and nonconventional pollutants. However, it is not possible to calculate consistent removals of specific toxic and nonconventional pollutants across the industry without carefully considering a variety of process controls and in-plant treatment technologies that are more appropriately considered to be BAT controls and technologies. Therefore, the selected BPT technologies are end-of-pipe technologies that are designed primarily to address the conventional pollutants BOD and TSS, supplemented by those in-plant controls and technologies that are commonly used to assure the proper and efficient operation of the end-of-pipe technologies.

Option I: EPA bases the first BPT technology option on biological treatment preceded by the necessary controls to protect the biota and otherwise assure that the biological system functions effectively and consistently. Activated sludge and aerated lagoons are the primary examples of such biological treatment. Other biological systems, such as aerobic lagoons, rotating biological contactors, and trickling filters, are also used effectively at a few plants and data from such plants were also used to develop BPT limitations based on this option.

Option II: The second BPT technology option includes, in addition to Option I technology, biological systems followed by polishing ponds. In some cases, plants originally installed biological systems that had inadequate retention times or were otherwise not designed and operated to optimally treat conventional pollutants. When these plants were required in the late 1970s to upgrade to meet BPT permit limits (established by permit writers in the absence of guidelines on a case-by-case basis, using their best engineering judgment), some chose to add polishing ponds rather than to enlarge or otherwise improve their existing biological systems.

Option III: EPA bases the third BPT technology option on multimedia filtration as a basis for additional TSS control after biological treatment.

After selecting the BPT technology options, EPA proceeded to develop limitations that are associated with those technologies. To do this, EPA first needed to identify the "average-of-the-best" plants that use these technologies.

EPA developed a statistical criterion to segregate the better designed and operated plants from the poorer performers. This was done to assure that the plant data relied upon to develop BPT limitations reflected the average of the best existing performers. Since the data base includes many plants which are poor performers, it is necessary to develop appropriate criteria for differentiating poor plant performance from good plant performance. The criterion selected was to include in the data base any plant with a biological treatment system that, on the average (1) discharged 50 mg/l or less BOD after treatment, or (2) removed 95% or more of the BOD that entered the end-of-pipe treatment system. (Dilution of process wastewater by other wastewater was noted and effluent concentrations were adjusted accordingly.) This criterion reflects the performance level that is generally achieved by well-operated plants in the OCPSF industry that use the recommended BPT technologies.

These are the same performance criteria utilized at proposal. Many industry comments suggested that EPA unreasonably screened the data base for establishing "Average of the Best" BPT technology and suggested that a more liberal indicator of performance, such as 85 percent removal, should be used.

To assess this recomendation, the Agency evaluated the BOD_5 data from the 163 section 308 questionnaire full response plants in the direct discharge data base with biological treatment systems. After adjusting the data for nonprocess wastewater dilution, the median BOD_5 percent removal for all facilities is 95.4 percent and the median effluent concentration is 28 mg/l.

The more liberal editing rule suggested by industry was considered

for excluding plants with poorly operated or inadequate biological treatment systems. Using the industry's suggestion, plants would be retained for analysis if at least biological treatment was in-place and if, on the average, the treatment system removed 85 percent or more of the BOD_5 or discharged 100 mg/l or less BOD_5 after treatment. These criteria would retain 87 percent of all the biological treatment systems reporting BOD_5 data.

The "95 percent or more BOD_5 removal or 50 mg/l or less BOD_5 concentration after treatment" performance editing criteria retains 76 percent of all the biological treatment systems reporting BOD_5 data. The Agency calculated the subcategory BOD and TSS median values for both performance editing rules. Using the 95%/50 mg/l performance edit reduces the average subcategory BOD and TSS median values for Option I treatment technology approximately 10 and 16 percent, respectively, below those obtained using the 85%/100 mg/l edit. Similarly, the average median values for Option II treatment technology are reduced approximately 11 and 4 percent, respectively. The median BOD_5 percent removal for all facilities is 95.4 percent and the median effluent BOD_5 concentration is 28 mg/l. Based upon all these facts, the Agency believes that this "95%/50 mg/l BOD_5" performance editing criteria provides a reasonable determination of "average of the best" BPT performance.

The long-term BOD_5 and TSS averages for each subcategory, shown in Tables C–1 and C–2 for technology Options I and II, are based on the "95% removal/50 mg/l BOD_5" performance edit.

To establish maximum 30-day average and daily maximum BOD_5 and TSS effluent limitations for each technology option, the Agency determined variability factors for biological treatment systems. Daily data for BOD_5 and TSS were available from 69 facilities. Plant data were retained for variability factor analysis based on the following factors: (1) Non-process wastewater dilution was 25 percent or less at the effluent sampling point; (2) The sampling frequency was once or more per week for at least one year; (3) The NPDES permit contained only one set of limits applicable to both summer and winter operating periods; (4) The treatment system did not change during the period of record; and (5) The reported effluent data was uniquely associated with treatment systems with serial unit operations (e.g., combined sampling data from parallel activated sludge and activated carbon treatment systems were deleted). After these edits, data from 23 biological treatment systems were retained to calculate variability factors. The average BOD_5 maximum 30-day average and daily maximum variability factors are 1.41 and 3.91, respectively. The average TSS maximum 30-day average and daily maximum variability factors are 1.46 and 4.74, respectively.

Some plants rely exclusively upon end-of-pipe physical/chemical treatment. Some of these plants have low BOD and thus find physical/chemical treatment more effective in reducing TSS loadings. (Biological systems cannot function unless influent BOD is high enough to sustain their biota) Other plants have determined, based on an assessment of the types and volumes of pollutants that they discharge, that physical/chemical treatment is more economical, easier to operate, or otherwise more appropriate. Many of these plants can control conventional pollutants effectively without using the BPT biological treatment alternatives discussed above. Some plants do not have any end-of-pipe treatment in place at all. For plants that have not already achieved the long-term average BOD and/or TSS costing targets, compliance can be achieved by the installation of the recommended end-of-pipe BPT technologies listed in the costing documentation for plants without in-place biological treatment. In some cases, especially where only TSS noncompliance exists, solids control by physical/chemical means may suffice. For plants that comply with BOD but not with TSS targets, and presently have no biological treatment in place, EPA costed chemically assisted clarifiers, multimedia filters, or polishing ponds depending on existing in-place technology and geographic location.

Some industry commenters objected to the Agency's collection and use of post-1977 data to develop BPT limitations. Contrary to the assertions of some commenters, Congress did not intend that BPT performance would remain static based on performance levels attained before 1977. Congress intended for periodic review of BPT technology and performance. Thus, updated information on the effectiveness of BPT-level technologies may be used by the Agency. Furthermore, contrary to industry assertions, there has not been a substantial overall improvement of conventional pollutant wastewater treatment technology performance between the 1976/1977 and the 1983 Section 308 data collection efforts. A comparison of the BOD_5 performance data for plants within both data sets reveals the BOD_5 treatment improved for approximately 37 percent of the plants, remained about the same (± 1 percent removal) for approximately 27 percent of the plants, and deteriorated for the remaining 36 percent of the plants.

Many commenters suggested that the Agency should establish alternative cold weather limitations to accommodate the effects of cold weather conditions on biological treatment removal efficiencies. However, the Agency's assessment of this issue for subcategorization found that effluent BOD quality is statistically independent of location using degree-days as a surrogate for temperature. Furthermore, temperature is only one of several characteristics which affect the operation of the system. Changes in temperature (both seasonal and short term), raw waste load, product mix, flow, food to microorganism ratio, and dissolved and suspended solids, will all have some impact on treatment. Moreover, raw waste loads in the OCPSF industry are variable due to batch operations, product mix changes, and raw materials variations. It is thus difficult to isolate temperature effects from changes caused by variables other than temperature.

Technologies and operating techniques exist which, if properly applied, can overcome temperature effects. Specific means of mitigating temperature effects were discussed in the March 1983 Development Document.

The Agency accounted for any potential ambient temperature effects on biological treatment processes by adjusting engineering costs to accommodate cold weather conditions. These factors adjust biological treatment costs for cold weather design conditions. The Agency also accounted for potential warm ambient temperature effects which may interfere with solids control (e.g., algae blooms) from holding ponds and polishing ponds. Plants in states with average monthly temperature, over 25 °C, had filtration systems costed for solids control rather than polishing ponds.

The BPT effluent limitations for Options I and II are presented in Tables C–1 and C–2, respectively.

TABLE C-1.—OPTION I BPT LIMITATIONS BASED ON BIOLOGICAL TREATMENT WITHOUT POST-BIOLOGICAL CONTROLS

Subcategory	BOD_5 (mg/l)		Daily maximum	TSS (mg/l)		Daily maximum
	Long-term average	30-day averages		Long-term average	30-day average	
Rayon	19	27	74	40	58	190
Other fibers	11	16	43	25	37	119
Thermosets	14	20	55	46	67	218
Thermoplastics only	18	25	70	34	50	161
Thermoplastics and organics	28	39	109	52	76	246
Commodity organics	28	39	109	99	145	469
Bulk organics	25	35	98	40	58	190
Specialty organics	35	49	137	62	91	294

TABLE C-2.—OPTION II BPT LIMITATIONS BASED ON BIOLOGICAL TREATMENT WITH AND WITHOUT POST POLISHING PONDS

Subcategory	BOD_5 (mg/l)		Daily maximum	TSS (mg/l)		Daily maximum
	Long-term average	30-day average		Long-term average	30-day average	
Rayon	19	27	74	40	58	190
Other fibers	10	14	39	25	37	119
Thermosets	24	34	94	46	67	218
Thermoplastics only	18	25	70	29	42	137
Thermoplastics and organics	25	35	98	40	58	190
Commodity organics	28	39	109	99	145	469
Bulk organics	27	38	106	46	67	218
Specialty organics	35	49	137	62	91	294

An assessment of the long-term BOD and TSS averages in Tables C–1 and C–2, indicates that subcategory effluent quality does not necessarily improve when plants with biological treatment and polishing ponds are included in the subcategory averages. As noted above, these plants may have merely added polishing ponds to an inadequately designed or operated biological treatment system rather than enlarge or otherwise improve their existing biological treatment systems. The performance edits utilized to segregate the better designed and operated plants from the poorer performers was based on BOD performance only. The Agency has not yet conducted a performance edit based on TSS control, but intends to assess TSS performance for all plants prior to promulgation.

For example, in the case of the commodity organic chemicals subcategory, the long-term TSS values are 99 mg/l in both Tables C–1 and C–2. The eleven commodity organic chemical plants that utilize biological treatment (9 without polishing ponds and 2 with polishing) and that reported effluent data are located in North Carolina, Louisiana, and Texas. Application of the performance edit deletes the North Carolina plant and one Texas plant. Therefore, nine Louisiana and Texas facilities (7 without polishing and 2 with polishing) provide the basis for the subcategory averages. The Agency believes that many of these high TSS plant averages are due to periods of high ambient temperatures that may cause algae blooms in holding or polishing ponds. Many industry comments discuss this TSS control problem.

The Agency believes that a well operated biological treatment system even with polishing ponds does not necessarily ensure adequate solids control. In these cases where biological treatment provides inadequate TSS control, additional treatment such as filtration systems should provide the basis for effluent TSS limitations. Filtration has been a well-established technology for many years in both the OCPSF industry and many other industries.

Approximately 11 percent of the plants in the direct discharge data base utilize filtration in combination with either biological treatment or biological treatment and polishing ponds. If EPA decides to use this technology as the basis for final TSS standards, it would do so by deleting from the data base, for TSS purposes, those biological systems that are not followed by adequate physical/chemical solids control systems. Based upon the present data base on the performance of such biological/tertiary solids control systems, this approach would result in the TSS long-term averages and limitations shown in Table C–3. Since the BOD performance edit (95 percent/50 mg/l) retains only 16 facilities with tertiary solids control, TSS data for some subcategories would be pooled. The maximum 30-day average and daily maximum standards were calculated using the TSS variability factors established for BPT Options I and II.

EPA pooled the TSS filtration data for the plastics subcategories—rayon, other fibers, thermosets, and thermoplastics-only. EPA separately pooled the TSS filtration data for the three organic chemical subcategories. (EPA did not pool the data for the thermoplastics and organics subcategory because it has TSS filtration data from five plants in that subcategory.) EPA believes that the pre-filtration (i.e., Option II) TSS levels for plants within each of these broad groupings are within a sufficiently similar range to support pooling the filtration effluent data. EPA requests comments on this pooling approach and suggestions for any alternative approach to using the filtration data.

TABLE C-3.—OPTION III TSS LIMITATIONS (MG/L) BASED ON BIOLOGICAL TREATMENT WITH FILTRATION AND BIOLOGICAL TREATMENT WITH POLISHING AND FILTRATION

Subcategory	Long-term average	30-day average	Daily maximum
Rayon	27	39	128
Other fibers	27	39	128
Thermosets	27	39	128
Thermoplastics only	27	39	128
Thermoplastics and organics	37	54	175
Commodity organics	40	58	190
Bulk organics	40	58	190
Specialty organics	40	58	190

As noted in the engineering costing methodology in section IV(H) of this notice, plant-by-plant model BPT costs were developed based on reported effluent BOD_5 and TSS effluent concentrations and selected costing targets (i.e., predicted effluent limitations used for costing proposes). These costing targets were selected before the actual limits set forth in this notice were set and therefore were designed to encompass a broad range of potential subcategory long-term averages for BOD_5 and TSS. EPA selected three sets of costing targets for plastics and four sets of targets for organics. In fact, the calculated long-term averages for each of the three options discussed above span a much narrower range. (The chief difference among the options is a significant improvement in TSS control for the three organics subcategories by adding filtration in Option III.) The subcategory long-term BOD/TSS averages and the closest corresponding BPT costing BOD/TSS targets are listed in Table C–4.

TABLE C-4.—BPT SUBCATEGORY AVERAGES AND COSTING TARGETS (MG/L)

Subcategory	Option I—biological treatment only		Options II and III—biological only and biological with polishing ponds, and filters		
	Subcategory long-term BOD_5, TSS averages	Closest costing BOD_5, TSS targets	Subcategory long-term BOD_5 + TSS averages		Closest costing BOD_5, TSS targets
			Option II	Option III	
Rayon	19/40	15/30	19/40	19/27	15/30
Other fibers	11/25	10/15	10/25	10/27	10/15
Thermosets	14/46	10/15	24/46	24/27	15/30
Thermoplastics only	18/34	15/30	18/29	18/27	10/15
Thermoplastics and organics	18/52	20/20	25/40	25/37	20/20
Commodity Organic	28/99	20/20	28/99	28/40	20/20
Bulk organic	25/40	20/20	27/46	27/40	20/20
Specialty organics	35/62	20/20	35/62	35/40	20/20

The Agency has overestimated BPT compliance costs because it used effluent targets for costing purposes that differed from those subsequently presented in the three options. On average, the closest BOD and TSS costing targets for Options I and II were 27 percent and 60 percent below (i.e., more stringent than) the subcategory long-term averages, respectively. Similarly, the Options I and II TSS costing targets are, on average, 36 percent below the Option III subcategory TSS medians.

The BOD_5 and TSS pollutant loadings were calculated in a similar manner to costs. The loadings calculations also correspond to the predicted BOD_5/TSS targets listed in Table C-4; thus the technology options appear to have nearly identical pollutant loadings. For the same reason, the annual incremental BOD and TSS removals were overestimated. The Agency will correct the engineering cost and pollutant loading calculations before promulgations.

The similarity of estimated loadings and costs based upon target levels yields a correspondingly artificial similarity among total annual loadings and costs for the selected Options. For example, EPA estimates that the BPT limitations would result in annual incremental removals (beyond that achieved by current treatment) of 28.1 million pounds of BOD and 74.2 million pounds of TSS for the Option I loading targets and 28.2 million pounds of BOD and 74.4 million pounds of TSS for the Options II and III loadings targets. The corresponding costs of removal are summarized in section V(B) of this notice. The Agency anticipates that actual removals and costs will be lower than these estimates and that refined calculations based upon the actually developed limitations will reveal more substantial differences among the three options. The preliminary economic impact analysis for BPT based upon these cost estimates is summarized also in section V(B) of this notice.

D. Technology Basis for BAT Options and Effluent Limitations

Based on the analyses which are discussed in the following sections, EPA is considering three technology options as the basis of end-of-pipe BAT effluent limitations. In addition, as discussed below, EPA is considering setting prebiological limits for certain volatile and semi-volatile pollutants that are primarily air-stripped rather than degraded in biological treatment systems. EPA may promulgate BAT effluent limitations based on any of these options. Therefore, we specifically invite comment on each of them.

Due to the diversity of priority pollutants in the OCPSF industry, a variety of treatment technologies are employed by OCPSF plants to control priority pollutants as well as nonconventional pollutant discharges. Consequently, the selection of a particular set of BAT treatment technologies is plant-specific since the OCPSF industry is not amenable to any single BAT technology.

The range of technologies used to control priority pollutant discharges encompasses virtually the entire range of industrial wastewater treatment technology. Generally, this technology consists of a combination of in-plant control or treatment of specific wastestreams (sometimes from several different product/processes) by any of a variety of physical/chemical methods, biological treatment of combined wastestreams, and post-biological treatment.

In-plant controls frequently used by OCPSF plants for treatment of individual wastestreams include steam stripping (or distillation), carbon adsorption, chemical precipitation, solvent extraction and chemical oxidation. Biological treatment generally consists of some form of activated sludge (i.e., extended aeration, complete mix, pure oxygen) individually or in combination with other types of biological treatment, such as aerated lagoons, trickling filters, and aerobic and anerobic lagoons. Post-biological treatment for priority pollutants (and nonconventionals) is generally limited to granular activated carbon and multimedia filtration.

It should be noted that although some of the controls or technologies preceding the biological segment of the treatment system are installed for product recovery or to reduce priority pollutants, others are expressly designed into the treatment system to assure compliance with BPT effluent limitations by protecting the biological segment of the system from shock loadings and other forms of interference. Sampling results show that some plants remove certain toxic pollutants very effectively from the wastewater through in-plant control technologies. In these cases, the end-of-pipe systems are designed primarily for BOD_5 and TSS removal. However, other complete treatment systems have integrated both biological and post-biological components with in-plant components to control priority pollutants by utilizing the in-plant technologies as "roughing" controls to reduce toxic pollutant loadings to levels which can be handled by biological and post-biological technologies. It is thus inappropriate to specify any particular technology as a BAT technology in the OCPSF industry. Rather, each plant required to control priority pollutant discharges will employ a combination of in-plant controls and end-of-pipe treatment technologies that result in the desired effluent quality with respect to a wide variety of pollutant parameters of interest.

Based upon these considerations, EPA has refrained from specifying a particular set of controls as the basis for BAT. Rather, priority pollutant control will be based on removals achieved at OCPSF plants using differing treatment configurations. Unlike the BAT editing rules used in the proposed rulemaking, EPA is considering a technology-based editing rule for retaining plant data in calculating BAT limitations rather than a performance editing rule utilizing BPT effluent parameters. These rules are discussed in detail in the BAT effluent limitations portion of this section.

EPA has considered two general approaches for developing BAT effluent limitations. The first approach is concentration-based limitations (with appropriate requirements to prevent the substitution of dilution for treatment) based on end-of-pipe data (supported by performance data for selected in-plant control technologies) that reflect total treatment system performance. The second approach would set mass-based limitations based primarily on an

evaluation of the treatability of individual product/process streams by in-plant process controls, physical/chemical treatment and biological treatment. For the reasons discussed in the preamble to the proposed regulation and in section II of this Notice, EPA has selected the first approach. However, EPA will specify in the regulation that permitting authorities must establish mass-based permit limitations by multiplying the concentration limit by the plan's actual process wastewater flow.

Based on the considerations discussed above, EPA is considering these three end-of-pipe BAT technology options:

Option I—Concentration-based BAT effluent limitations based on the performance of only the biological treatment component, which is equal to the priority pollutant limitations attained when in compliance with BPT effluent limitations.

Option II—Concentration-based BAT effluent limitations based on the performance of the biological treatment component plus in-plant control technologies which remove priority pollutants prior to discharge to the end-of-pipe treatment system. These in-plant technologies include steam stripping to remove volatile and semi-volatile priority polluants, activated carbon for various base/neutral priority pollutants, chemical precipitation for metals and cyanide and possibly multi-stage biological treatment for removal of polynuclear aromatic (PNA) priority pollutants.

Option III—Concentration-based BAT effluent limitations based on the performance of biological treatment, in-plant controls and post-biological activated carbon adsorption for the remaining toxic pollutants.

There are both advantages and disadvantages to each of the technology options. Option I is a low cost option which reduces some toxic pollutants utilizing the technology installed for BTP—biological treatment. (However, some OCPSF facilities can comply with the BPT limitations for BOD_5 and TSS without the installation of biological treatment. These facilities can comply with Option I BAT effluent limitations only by installing the in-plant controls recommended in Option II, thereby incurring greater costs to meet Option I limitations than other discharges would incur.) However, this technology in some cases includes in-plant controls which have been installed to remove toxic pollutants which would interfere with or inhibit the biological treatment system's removal of BOD_5 and TSS. The need for such controls for BPT purposes is likely to vary; thus some BPT plants may not be able to achieve BAT Option I without additional technology at additional cost.

Option II controls reduce large amounts of toxic pollutants from wastewater prior to discharge to surface waters. Furthermore, the installation of in-plant controls under Option II would be particularly effective in reducing the levels of volatile and semi-volatile organic toxic pollutants in all environmental media. A large portion of volatile and semi-volatile organic toxic pollutants are emitted by biological systems into the surrounding air. Thus, while removing them from the wastewater, the typical biological system does not remove these pollutants from the environment but rather transfers a large portion of them to another environmental medium. The in-plant treatment of such pollutants by methods such as steam stripping reduces or eliminates the air emissions that otherwise would occur by the air stripping of the organic toxic pollutants in the biological system. Moreover, the installation of in-plant controls would also reduce the levels of certain priority pollutants which are not air stripped or otherwise removed from OCPSF wastewaters using only biological treatment. For example, the Agency's data base shows that bis(2-chloroisopropyl)ether, 2,4,6-trichlorophenol, and pentachlorophenol are not adequately removed by biological treatment systems. However, bis(2-chloroisopropyl)ether, a base/neutral compound, may be controlled through in-plant steam stripping. Similarly, 2,4,6-trichlorophenol and pentachlorophenol, acid compounds, may be controlled through in-plant carbon absorption systems.

Although more efficient in terms of toxic pollutant removal from all media (water and air) than Option I, Option II has higher costs associated with its implementation. This is also the case for Option III which provides slightly higher removals at even higher costs for some organic toxic pollutants such as 2,4-dimethyl phenol, napthalene, and phenol.

Calculation of Concentration-Based BAT End-of-Pipe Effluent Limitations

For all options, EPA has decided to develop end-of-pipe concentration-based BAT limitations for the entire industry based upon end-of-pipe data that reflect the best available technology. Depending on the option selected, the BAT technology used as the basis for limitations includes combinations of process controls, in-plant physical/chemical treatment and end-of-pipe treatment. The data base includes verification plants, CMA/EPA 5-plant study plants, and recent sampling study plants; the data has been edited both technically and analytically.

Prior to calculating concentration-based limitations, EPA considered whether the industry should be subcategorized for BAT purposes by evaluating the same subcategorization factors which were considered for BPT. EPA has decided to promulgate a single set of BAT limitations which would be applicable to all OCPSF facilities. (However, permits would tailor these requirements somewhat to account for the fact that most OCPSF plants routinely discharge only a subset of the pollutants covered by the BAT regulation—see Section IV(L) of this notice.) The available data for BAT show that plants in differing BPT subcategories can achieve similar low toxic pollutant effluent concentrations by installing the best available treatment components. Since all plants can achieve compliance with the same BAT limitations through some combination of demonstrated technology, the predominant issue relates to the cost of the required treatment technology. EPA has analyzed these costs and their associated impacts, as discussed in section V(C) of this notice. Therefore, the Agency believes that BAT subcategories do not appear to be necessary for effective, equitable regulation. However, EPA will continue to explore the possibility of subcategorizing the industry for BAT purposes and invites comments and supporting data on appropriate approaches.

Although EPA is not subcategorizing the industry for BAT, EPA is considering separate BAT effluent limitations for total zinc (but not other pollutants) for rayon manufacturers. During the comment period on the proposed regulations, raw waste and treated effluent data were submitted which showed elevated raw waste loadings of zinc as much as 100 times higher than other OCPSF facilities' loadings with correspondingly higher effluent levels. However, the Agency believes that in-plant chemical precipitation will significantly lower effluent levels of zinc down to levels comparable to other OCPSF facilities; EPA solicits performance data from rayon plants that employ in-plant chemical precipitation as well as additional comments and information on this issue.

Having concluded that in general only one set of BAT limitations for all OCPSF facilities should be developed, EPA then calculated the BAT effluent limitations for each technology option using data collected from different combinations of

BAT treatment systems during the verification, CMA/EPA 5 plant study, and current sampling program efforts as follows:

Option I—BAT effluent limitations will be calculated using sampling data from plants that have been determined to have well-operated biological treatment for the priority pollutants to be regulated. These plants may include in-plant toxic pollutant controls which were installed to ensure the performance of the biological treatment system.

Option II—BAT effluent limitations will be calculated using sampling data from plants included in Option I for certain priority pollutants. For pollutants not adequately controlled by BPT technology, limitations will be based on data from plants that have biological treatment plus in-plant controls and plants that have physical/chemical control technology applied at the end-of-pipe for the remaining priority pollutants to be regulated.

Option III—BAT effluent limitations will be calculated using sampling data from plants included in Options I and II for some pollutants plus, for certain other pollutants, plants that have been identified as have biological treatment, in-plant controls and post-biological activated carbon adsorption polishing.

The following sections discuss the procedures used to calculate the components necessary for the development of BAT effluent limitations.

BAT Data Base Editing—Certain editing rules were utilized in preparing the data base prior to calculation of individual plant long-term averages (LTA) and industry long-term medians (LTM). First, analytically suspect data were returned to the analytical laboratories for confirmation or correction. Next, influent and effluent data were matched by sample date and all non-matching data points were excluded from this analysis. These data points will be included in the analysis prior to promulgation if they can be paired with data that the analytical laboratories confirm or correct. Then, each matched influent-effluent data pair was examined and all pairs which produced a negative percent removal were excluded from the analysis.

It should be noted that certain plants have been sampled in more than one of the BAT sampling programs previously mentioned. For the purposes of calculation plant LTAs and industry LTMs, each sampling program at a particular plant was treated separately and had individual LTAs which are included in the calculation of the LTM for each pollutant (i.e., it is possible that LTAs have been calculated for both the verification and CMA sampling programs for a particular pollutant at a certain plant). This decision was made due to difference in time periods of each sampling program, the different analytical procedures employed, the possibility of changes in product mix and processes utilized during each time period and the fact that different sets of priority pollutants may have been analyzed for the same plant during different sampling program efforts.

Calculation of the Median of Long-Term Means—For each pollutant at each plant in each of the sampling efforts mentioned above, a long-term weighted average (LTA) effluent concentration was calculated using only effluent data points whose corresponding end-of-pipe influent data were greater than or equal to 20 ppb or to 100 ppb depending on the type of technology used to remove a pollutant at a particular plant. For plants using in-plant controls prior to discharge to the end-of-pipe treatment system, the 20 ppb level was selected for the treated pollutant; for other plants, the 100 ppb level was used. These edits were designed to retain in the calculation of the limit for that pollutant only those plants that had treatable levels of a pollutant in the raw waste. The nondetected values at the plant were assigned a nominal detection limit value (using detection limits associated with EPA analytical methods 1624 and 1625. See 49 FR 43234; October 26, 1984). The long-term weighted average was computed by a weighting scheme, which assumed that nondetected values should be weighted in accordance with the frequency with which nondetected values for the pollutant generally were found in the daily-data plants. Then, the pollutant median of the plants' long-term weighted averages was calculated for each pollutant. The amount of data was limited for certain pollutants. Pollutant medians were retained for further analysis only if at least one plant-pollutant combination had three or more influent/effluent data pairs.

Calculation of Daily Maximum and Four Day Variability Factors—After developing long-term medians for each pollutant, EPA proceeded to develop two variability factors for each pollutant—a daily maximum variability factor (VF1) and a four-day variability factor (VF4). These were developed by fitting a statistical distribution to the daily data for each pollutant at each plant; deriving a 99th percentile and a mean of the daily data distributions for each pollutant at each plant; deriving a 95th percentile and a mean of the distribution of the 4-day averages for each pollutant at each plant; dividing the 99th and 95th percentiles by the respective means of daily and 4-day average distributions to derive plant-specific variability factors for each pollutant; and averaging these plant-specific variability factors across all plants to derive VF1 and VF4 for each pollutant.

For certain pollutants, the amount of daily data was limited. For such pollutants, variability factors were interpolated from the variability factors for groups of pollutants expected to exhibit comparable treatment variability based upon a comparison of chemical structure and characteristics. Each pollutant in each chemical group was then assigned a VF1 and VF4 equal to the average of the VF1s and VF4s of any pollutants in the same group.

In response to comments on the statistical aspects of the proposed limitations development, EPA examined several statistical techniques for deriving limitations. The Agency found that a modification of the delta-lognormal procedures provides a reasonable approximation of the underlying empirical toxic pollutant data. The delta-lognormal distribution assumes that the data are a mixture of positive lognormally distributed values and zero values that occur with a definite probability. Consequently, zero concentration values are modeled by a point distribution, positive concentration values follow a lognormal distribution, and the mixture of these values forms the delta-lognormal distribution.

This method provides a reasonable approach for combining quantitative concentration values with information expressed only as a nondetect, which is more qualitative in nature. For the determination of variability factors, the delta-lognormal procedure was modified by placing the point distribution at the nominal detection limit. This approach is somewhat conservative since values reported as nondetect may actually be any value between zero and the detection limit. The detection limit used for each pollutant was the nominal detection limit published by the Agency for analytical methods 1624 and 1625. Assigning the detection limit to non-detected values in calculating both variability factors and long-term medians for this data base tends to result in slightly higher limitations than would be derived if lower values were assumed.

Calculation of BAT Effluent Limitations—Daily maximum and monthly averages based on four observations BAT effluent limitations were calculated for each pollutant by

multiplying its long-term median value by each of its two corresponding variability factors. If a pollutant had its own pair of variability factors, these were utilized rather than the pollutant group variability factors. With the exception of mercury, all priority pollutant four-day monthly average and daily maximum limitations were rounded up to the nearest 5 parts per billion. Mercury was rounded up to the nearest one-half part per billion. After rounding, if the four-day monthly average equaled the daily maximum value, then only the daily maximum limitation was listed.

In the case of nitrobenzene for Option II and III, the Agency deleted one of three plants from the calculation because its treatment system for nitrobenzene was considered to be out of control due to chemical spills. For bis(2-chloroisopropyl)ether, data were not available for an appropriate Option II and III treatment system. Therefore, the Agency has selected a treatability level for bis(2-chloroisopropyl)ether of 10 ppb based on the performance of steam stripping. The treatability level was determined using the methodology described later in this section for establishing in-plant, pre-biological limitations.

Since insufficient data were available to determine BAT Option I Halogenated Methane and Chlorinated C2 and C4 pollutant variability factors, the Chloroalkyl Ether variability factor was applied to these pollutants. (The term chlorinated C2 refers to a priority pollutant class of compounds with two carbon atoms. Likewise, C3 and C4 refers to pollutant classes with 3 and 4 carbon atoms respectively.) For BAT Option II, the average of the Halogenated Methane and Chlorinated C2 pollutant groups was applied to the Chlorinated C3 and C4 and Chloroalkyl Ether pollutants. For BAT Option III, the average of the Halogenated Methane and Chlorinated C2, and C3 pollutant groups was applied to Chlorinated C4 and Chloroalkyl Ether groups as well. Since insufficient data were available to determined variability factors for acrylonitrile (miscellaneous pollutant group) the average of the organic pollutant groups was applied to acrylonitrile.

EPA intends to promulgate daily maximum and monthly average limitations for the OCPSF industry. 40 CFR 122.45(d) provides that effluent limitations and standards in permits shall, unless impracticable, be expressed as maximum daily and average monthly discharge limitations. For purposes of estimating compliance monitoring costs that would be incurred to comply and demonstrate compliance with these regulations, EPA has assumed that, on average, small plants would monitor twice monthly and large plants would monitor four times monthly.

Sampling and analyzing for metals is considerably less expensive than for organics. Consequently, it is reasonable to monitor for metals more frequently than for organics. Accordingly, EPA has established 10-day monthly averages for metals in many recently promulgated effluent guidelines. Although the metals limitations set forth in this notice are based on a daily maximum and a monthly average based on four observations per month, EPA is considering setting monthly average limitations based on 10 observations per month for metals in the final regulation. If the Agency establishes 10-day monthly averages, it would utilize the modified delta-lognormal distribution, described earlier, to conduct on analogous assessment of 10-day averages rather than 4-day averages. EPA solicits comments on this approach.

The BAT effluent limitations for Options I, II, and III are presented in Tables D–1 through D–3, respectively. (Since different plant-pollutant combinations are assigned to each technology option, some pollutants are not regulated under every option.) EPA estimates that BAT limitations will result in annual incremental removals (beyond that acheived by BPT) of negligible amounts of priority pollutants for Option I, 260.00 pounds of toxic organics and 524,000 pounds of toxic metals for Option II, and 281,000 pounds of toxic organics and 526,000 pounds of toxic metals for Option III.

As noted earlier, a large portion of volatile and semivolatile organic toxic pollutants are emitted by biological treatment systems into the surrounding air. This transfer of pollutants from water to air takes place at some current treatment systems and at BAT Option I but would be greatly reduced by the use of appropriate in-plant technology as contemplated by Options II and III. Thus, the wastewater organic toxic pollutant removals presented above are somewhat misleading since they present only the removals of the pollutants from the wastewater and do not account for the transfer of these pollutants into the air in the current and BAT Option I loadings. Similarly, the removal estimates do not include the reduction of air emissions of volatile and semivolatile pollutants by using Option II in-plant steam stripping technology.

For example, in considering the current annual volatile pollutant loadings for direct dischargers, the Agency estimates that 33.7 of the 82.7 million pounds generated in the raw waste actually enter biological treatment systems. (This assumes that the volatile pollutants are evenly distributed among direct dischargers and that in-plant steam stripping and solvent recovery treatment systems currently being used totally remove the volatile pollutants. Therefore, 40.8 percent of the raw waste enters the biological treatment systems.) If only one-quarter of the volatile pollutants are stripped into the surrounding air from the aeration basins of biological treatment systems, then about 8.4 million pounds of volatile compounds enter the environment as air pollutants through current in-place treatment and through BPT treatment. The actual stripping rates through open biological treatment systems are pollutant specific and range from approximately zero percent stripped for highly water-soluble, chemically-reactive compounds such as acrylonitrile, up to over 50 percent stripped for compounds such as 1,2-dichloroethane, 1,1,1-trichloroethane, tetrachloroethylene, and 1,2-dichloropropane. Likewise, the prevalent removal mechanism in open biological treatment systems for benzene, carbon tetrachloride, and toluene is air stripping.

With these considerations in mind, the Agency has calculated the full benefits afforded by Option II in removing toxic pollutants from all environmental media. The BAT Option II limitations are estimated to result in annual incremental removals from air and water media (beyond that achieved by BPT) of 8.7 million pounds of toxic organic pollutants rather than 260,000 pounds. The Agency is conducting a volatile and semivolatile pollutant-by-pollutant assessment to establish more accurate estimates of the volatilization rates in open biological treatment systems and solicits additional data and information regarding air emissions of toxic pollutants from open wastewater treatment systems. As discussed later in this section, the Agency is considering establishing in-plant, pre-biological limitations to ensure control of these compounds.

The estimated capital and operation and maintenance costs and the preliminary economic impact analysis for BAT are summarized in section V(C) of this Notice.

As mentioned previously in this section, although Option I is based on the performance of the technology

installed to comply with BPT effluent limitations and therefore, had no incremental BAT costs developed for its implementation, the Agency believes that some nonbiological plants currently achieving BPT effluent limitations will incur costs to comply with BAT effluent limitations for Option I.

TABLE D-1.—OPTION I BAT EFFLUENT LIMITATIONS (PARTS PER BILLION)

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any 1 day
Halogenated Methanes (C1's)			
6. Carbon tetrachloride	10	20	50
23. Chloroform	10	20	50
44. Methylene chloride	11.1	25	55
47. Bromoform	10	20	50
Chlorinated C2's			
10. 1,2-Dichloroethane	10.3	25	50
12. Hexachloroethane	10	20	50
16. Chloroethane	50	100	245
30. 1,2-trans-Dichloroethylene	77.5	155	375
85. Tetrachloroethylene	118.9	235	575
Chlorinated C4's			
52. Hexachlorobutadiene	10	20	50
Chloroalkyl Ethers			
42. bis(2-chloroisopropyl)ether	1,463	2,860	7,035
Metals			
114. Antimony	65	85	125
115. Arsenic	17	30	60
119. Chromium	86.7	120	195
120. Copper	21.3	35	75
122. Lead	329	860	2,585
123. Mercury	0.2		0.5
124. Nickel	145	235	495
125. Selenium	12	20	45
128. Zinc	52.5	90	190
Miscellaneous			
3. Acrylonitrile	50	105	270
121. Cyanide	64.9	120	275
Aromatics			
4. Benzene	27.1	80	245
38. Ethylbenzene	10	35	125
86. Toluene	10	40	155
Polyaromatics			
1. Acenaphthene	10	35	105
39. Fluoranthene	13.2	45	140
55. Naphthalene	10	35	105
72. Benzo(a)anthracene	10	35	105
73. Benzo(a)pyrene	10	35	105
74. 3,4-Benzofluoranthene	10	35	105
76. Chrysene	10	35	105
77. Acenaphthylene	10	35	105
78. Anthracene	10	35	105
80. Fluorene	10	35	105
81. Phenanthrene	10	35	105
84. Pyrene	12.6	40	135
Chloroaromatics			
7. Chlorobenzene	23.1	65	185
8. 1,2,4-Trichlorobenzene	42.8	70	140
9. Hexachlorobenzene	10	20	40
25. o-Dichlorobenzene	23.9	40	75
26. m-Dichlorobenzene	21.3	25	35
27. p-Dichlorobenzene	10	20	40
Phthalate Esters			
66. bis(2-Ethylhexyl)phthalate	19.6	45	130
68. Di-n-butyl phthalate	22.2	40	80
70. Diethyl phthalate	44.4	90	215
71. Dimethyl phthalate	10	20	50
Nitroaromatics			
35. 2,4-Dinitrotoluene	952	1,360	2,450
36. 2,6-Dinitrotoluene	327	445	730
56. Nitrobenzene	351	950	2,965

TABLE D-1.—OPTION I BAT EFFLUENT LIMITATIONS (PARTS PER BILLION)—Continued

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any 1 day
Benzidines			
28. 3,3'-Dichlorobenzidene	262	320	450
Phenols			
34. 2,4-Dimethylphenol	10	20	35
65. Phenol	10	20	35
Nitrophenols			
57. 2-Nitrophenol	40.7	60	95
58. 4-Nitrophenol	50	75	125
59. 2,4-dinitrophenol	102	150	260
Chlorophenols			
21. 2,4,6-Trichlorophenol	65.9	115	260
24. 2-chlorophenol	10	35	125
31. 2,4-Dichlorophenol	16.9	45	130
64. Pentachlorophenol	50	65	100

TABLE D-2.—OPTION II BAT EFFLUENT LIMITATIONS (PARTS PER BILLION)

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any one day
Halogenated Methanes (C1's)			
6. Carbon tetrachloride	10	15	30
23. Chloroform	10	20	40
44. Methylene chloride	10	15	20
45. Methyl chloride	50	75	130
47. Bromoform	10	15	30
48. Bromodichloromethane	10	15	30
Chlorinated C2's			
10. 1,2-Dichloroethane	13.4	30	85
11. 1,1,1-Trichloroethane	10	25	65
12. Hexachloroethane	10	25	65
14. 1,1,2-Trichloroethane	10	25	65
16. Chloroethane	50	115	315
29. 1,1-Dichloroethylene	10	25	65
30. 1,2-trans-Dichlorcethylene	10	25	65
85. Tetrachloroethylene	10.7	25	70
87. Trichloroethylene	10	25	65
88. Vinyl chloride	10	25	65
Chlorinated C3's			
32. 1,2-Dichloropropane	59.4	110	265
33. 1,3-Dichloropropylene	36.9	70	165
Chlorinated C4's			
52. Hexachlorobutadiene	10	20	45
Chloroalkyl Ethers			
42. bis(2-chloroisopropyl)ether	10	20	45
Metals			
114. Antimony	158	200	305
115. Arsenic	25.1	50	115
119. Chromium	64.5	90	150
120. Copper	27.7	45	90
122. Lead	100	265	785
123. Mercury	2.03	2.5	3.0
124. Nickel	166	195	255
125. Selenium	12	20	40
128. Zinc	69.5	105	190
Miscellaneous			
3. Acrylonitrile	50	95	240
121. Cyanide	64.9	120	275
Aromatics			
4. Benzene	10	30	65
38. Ethylbenzene	10	30	100
86. Toluene	10	35	115
Polyaromatics			
1. Acenaphthene	10	35	105
39. Fluoranthene	13.2	45	140
55. Naphthalene	10	35	105

TABLE D-2.—OPTION II BAT EFFLUENT LIMITATIONS (PARTS PER BILLION)—Continued

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any one day
72. Benzo(a)anthracene	10	35	105
73. Benzo(a)pyrene	10	35	105
74. 3,4-Benzofluoranthene	10	35	105
76. Chrysene	10	35	105
77. Acenaphthylene	10	35	105
78. Anthracene	10	35	105
80. Fluorene	10	35	105
81. Phenanthrene	10	35	105
84. Pyrene	12.6	40	135
Chloroaromatics			
7. Chlorobenzene	15.9	40	115
8. 1,2,4-Trichlorobenzene	26.4	45	90
9. Hexachlorobenzene	10	20	40
25. o-Dichlorobenzene	52.3	80	145
26. m-Dichlorobenzene	21.3	25	35
27. p-Dichlorobenzene	10	20	40
Phthalate Esters			
66. bis(2-Ethylhexyl)phthalate	19.6	45	130
68. Di-n-butyl phthalate	22.2	40	80
70. Diethyl phthalate	44.4	90	215
71. Dimethyl phthalate	10	20	50
Nitroaromatics			
35. 2,4-Dinitrotoluene	219	310	540
36. 2,6-Dinitrotoluene	255	340	555
56. Nitrobenzene	206	285	480
Benzidines			
28. 3,3'-Dichlorobenzidine	262	320	450
Phenols			
34. 2,4-Dimethylphenol	10.6	20	35
65. Phenol	10	20	35
Nitrophenols			
57. 2-Nitrophenol	24.0	35	55
58. 4-Nitrophenol	50	70	120
59. 2,4-dinitrophenol	50	75	130
60. 4,6-Dinitro-o-cresol	20	30	50
Chlorophenols			
21. 2,4,6-Trichlorophenol	65.9	115	260
24. 2-chlorophenol	10	35	125
31. 2,4-Dichlorophenol	16.9	45	130
64. Pentachlorophenol	50	65	100

TABLE D-3.—OPTION III BAT EFFLUENT LIMITATIONS (PARTS PER BILLION)

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any 1 day
Halogenated Methanes (C1's)			
6. Carbon tetrachloride	10	15	30
23. Chloroform	10	20	40
44. Methylene chloride	10	15	20
45. Methyl chloride	50	75	130
47. Bromoform	10	15	30
48. Bromodichloromethane	10	15	30
Chlorinated C2's			
10. 1,2-Dichloroethane	13	30	85
11. 1,1,1-Trichloroethane	10	25	65
12. Hexachloroethane	10	25	65
14. 1,1,2-Trichloroethane	10	25	65
16. Chloroethane	50	115	315
29. 1,1-Dichloroethylene	10	25	65
30. 1,2-trans-Dichloroethylene	10	25	65
85. Tetrachloroethylene	10.2	25	65
87. Trichloroethylene	10	25	65
88. Vinyl chloride	10	25	65
Chlorinated C3's			
32. 1,2-Dichloropropane	36.1	50	70
33. 1,3-Dichloropropylene	36.9	50	70

TABLE D-3.—OPTION III BAT EFFLUENT LIMITATIONS (PARTS PER BILLION)—Continued

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any 1 day
Chlorinated C4's			
52. Hexachlorobutadiene	10	20	40
Chloroalkyl Ethers			
42. bis(2-chloroisopropyl)ether	10	20	40
Metals			
114. Antimony	158	200	305
115. Arsenic	25	40	80
119. Chromium	57.6	80	130
120. Copper	27.7	45	90
122. Lead	86.7	230	680
123. Mercury	2.03	2.5	3.0
124. Nickel	145	170	225
125. Selenium	12	20	40
128. Zinc	66.1	100	190
Miscellaneous			
3. Acrylonitrile	50	95	225
121. Cyanide	64.9	120	275
Aromatics			
4. Benzene	10	25	80
38. Ethylbenzene	10	30	90
86. Toluene	10	30	100
Polyaromatics			
1. Acenaphthene	10	35	105
39. Fluoranthene	13.2	45	140
55. Naphthalene	10	35	105
72. Benzo(a)anthracene	10	35	105
73. Benzo(a)pyrene	10	35	105
74. 3,4-Benzofluoranthene	10	35	105
76. Chrysene	10	35	105
77. Acenaphthylene	10	35	105
78. Anthracene	10	35	105
80. Fluorene	10	35	105
81. Phenanthrene	10	35	105
84. Pyrene	12.6	40	135
Chloroaromatics			
7. Chlorobenzene	11.3	25	70
8. 1,2,4-Trichlorobenzene	26.4	45	90
9. Hexachlorobenzene	10	20	35
25. o-Dichlorobenzene	23.8	40	70
26. m-Dichlorobenzene	11.3	25	35
27. p-Dichlorobenzene	10	20	35
Phthalate Esters			
66. bis(2-Ethylhexyl)phthalate	19.6	45	130
68. Di-n-butyl phthalate	22.2	40	80
70. Diethyl phthalate	44.4	90	215
71. Dimethyl phthalate	10	20	50
Nitroaromatics			
35. 2,4-Dinitrotoluene	108	150	255
36. 2,6-Dinitrotoluene	217	285	455
56. Nitrobenzene	206	285	480
Benzidines			
28. 3,3'-Dichlorobenzidine	262	320	450
Phenols			
34. 2,4-Dimethylphenol	11.1	20	40
65. Phenol	10	20	35
Nitrophenols			
57. 2-Nitrophenol	22.6	30	50
58. 4-Nitrophenol	50	70	120
59. 2,4-dinitrophenol	50	75	130
60. 4,6-Dinitro-o-cresol	20	30	50
Chlorophenols			
21. 2,4,6-Trichlorophenol	85.9	115	260
24. 2-chlorophenol	10	35	125
31. 2,4-Dichlorophenol	16.9	45	130
64. Pentachlorophenol	50	65	100

In-Plant, Pre-Biological Limitations

EPA is seriously considering promulgating in addition to the end-of-pipe limitations set forth above, in-plant, pre-biological limitations for a set of 20 volatile and semi-volatile organic pollutants. The purpose of these supplementary limitations would be to assure that these pollutants are not simply transferred to the air rather than treated by the wastewater treatment system.

As noted above, available information strongly indicates that biological treatment systems fail to treat substantial portions of volatile and semi-volatile pollutants but rather transfer them to the air. Section 304(b) of the Act requires EPA to consider non-water quality environmental impacts in establishing BAT limitations. Clearly, Congress was concerned that wastewater not be cleaned up at the expense of other environmental media. Therefore, it is appropriate to address in these regulations the substantial impacts that may result from volatile air emissions at OCPSF biological treatment plants.

In Options II and III, EPA has established a technological basis for controlling volatile and semi-volatile pollutants in a manner that also minimizes adverse impacts on air quality. In estimating compliance costs for Options II and III, EPA assumed that in-plant controls such as steam stripping would be used to treat volatile and semi-volatile pollutants, leaving only the residual levels after in-plant controls to be further removed from the wastewater by the end-of-pipe system. If plants install such in-plant controls, then the contemplated air-emission-reduction would be achieved.

However, as indicated by the data used to generate the Option I limitations, open biological treatment systems remove some volatile and semi-volatile pollutants from wasterwater without substantial in-plant controls. It may thus be possible, for example, for some plants to achieve Option II limitations without using the contemplated Option II in-plant controls. Air emissions could potentially be substantial, then, even if EPA promulgates end-of-pipe limitations under Option II or III.

For this reason, EPA believes that, to promulgate effluent limitations that reflect the best available technology for removing pollutants from wastewater while minimizing adverse impacts to the air, it may be necessary to establish in-plant limitations. In this case, EPA would establish limitations to be achieved prior to any biological treatment system and would require that control authorities require compliance monitoring prior to the biological system.

EPA is concerned that the in-plant limitations may not result in a significant reduction of air emissions. This may occur if sources choose to use in-plant control techniques other than steam stripping which meet the BAT limitations but do not result in any significant reduction of air emissions. Should this be the case and the level of air emissions warrant, EPA has other authority such as the Clean Air Act with which to address any problems.

Under the Clean Air Act EPA would be concerned about wastewater systems as sources of air toxic compounds as well as sources of volatile organic compounds which contribute to ozone formation. EPA Clean Air Act (CAA) authority to deal with air emissions problems includes: new source performance standards (CAA section 111); hazardous air pollutant emissions standards (CAA section 112); and provisions requiring attainment and maintenance of national ambient air quality standards (CAA sections 109, 110).

Comment is invited on the issue of whether sources will choose to use in-plant controls other than steam stripping, including the critical factors which may affect such a choice, e.g., control costs, product recovery credits, waste disposal, and potential air pollution controls.

EPA would establish such in-plant limitations based upon the available in-plant steam stripping performance data. For the steam stripping assessment, the organic priority pollutants were divided into three groups (high, medium, and low) based on their Henry's Law Constants. For aqueous mixtures, the distribution of a pollutant between the vapor phase and water can be expressed by Henry's Law. Compounds with high vapor pressures (high Henry's Law Constants) are easily stripped. By assuming that compounds in each group behave similarily, group median effluent values were calculated—a median of nondetect represents the high stripping group; 11.7 ppb, for the medium stripping group; and 1418 ppb, for the low stripping group.

The BAT in-plant limitations for Options II and III are listed in Table D-4. Based upon available information, the Agency believes that at least 20 percent of the influent mass of these compounds are air-stripped to the atmosphere in open biological systems. The Agency is conducting a volatile and semivolatile pollutant-by-pollutant assessment to establish more accurate determinations of which compounds are significantly stripped from wastewater treatment systems. The Agency solicits comments.

data, and information related to this issue.

TABLE D-4.—BAT IN-PLANT LIMITATIONS FOR OPTIONS II AND III (PARTS PER BILLION)

Pollutant or pollutant property by priority pollutant classes	Median of long-term weighted means	Monthly average shall not exceed	Maximum for any 1 day
Halogenated Methanes (C1's)			
6. Carbon tetrachloride	11.7	25	55
23. Chloroform	11.7	25	55
44. Methylene chloride	10	20	45
Chlorinated C2's			
10. 1,2-Dichloroethane	10	20	45
11. 1,1,1-Trichloroethane	11.7	25	55
12. Hexachloroethane	10	20	45
14. 1,1,2-Trichloroethane	10	20	45
29. 1,1-Dichloroethylene	11.7	25	55
30. 1,2-trans-Dichloroethylene	11.7	25	55
85. Tetrachloroethylene	11.7	25	55
87. Trichloroethylene	11.7	25	55
88. Vinyl chloride	11.7	25	55
Chlorinated C3's			
32. 1,2-Dichloropropane	10	20	45
Aromatics			
4. Benzene	11.7	25	50
86. Toluene	11.7	25	50
Chloroaromatics			
7. Chlorobenzene	11.7	25	50
9. Hexachlorobenzene	10	20	40
25. o-Dichlorobenzene	10	20	40
26. m-Dichlorobenzene	11.7	25	50
27. p-Dichlorobenzene	11.7	25	50

EPA assigns no incremental pollutant removals or costs to this regulatory approach. The approach is designed simply to assure that the technologies contemplated by Options II and III are applied to minimize adverse air impacts as well as remove toxic pollutants from the wastewater. Consequently, the removals and costs calculated for Options II and III already account for this regulatory approach. EPA welcomes comments on the above analysis.

E. Technology Basis for NSPS Options and Effluent Standards

The best available demonstrated technology provides the basis of NSPS. At new manufacturing plants, the opportunity exists to design the best and most efficient processes and wastewater treatment facilities. Therefore, EPA considers the best demonstrated process changes, in-plant controls, and end-of-pipe treatment technologies that reduce pollution to the maximum extent feasible.

The Agency is considering all three BPT and all three BAT technology options as the basis for NSPS. Priority pollutants considered for control by NSPS include those listed for each BAT option. BOD and TSS which are controlled by the BPT technology options, are considered for control by NSPS. The reader is therefore referred to Section IV(C), Tables C-1 to C-3 and section VI(D), Tables D-1 to D-4.

The technologies used to control conventional and priority pollutants at existing plants are fully applicable to new plants. EPA has not identified any technologies or combinations of technologies that are demonstrated for new sources that are different from those being considered to establish BPT and BAT limitations for existing sources.

F. Technology Basis and Standards for PSES

As discussed in section IV(D) for the BAT effluent limitations, the selection of a particular set for PSES treatment technologies is also plant-specific for indirect dischargers in the OCPSF industry. As with the direct dischargers subject to BAT effluent limitations, treatment technologies applicable to indirect dischargers subject to PSES can consist of in-plant control or treatment of specific (or combined) wastestreams by a number of physical/chemical methods sometimes in combination with biological treatment of combined wastestreams where effluent levels from in-plant control technologies still pass through, interfere with or inhibit publicly-owned treatment works. In-plant control and biological treatment technologies utilized by indirect dischargers are the same as those employed by direct dischargers as discussed in section IV(D) of this Notice.

Prior to proposal, sufficient priority pollutant removal data for in-plant control technologies which could be utilized to calculate PSES limitations for indirect discharges were not available since previous sampling efforts focused on complete end-of-pipe treatment systems rather than on individual technology components. However, as discussed in section III of this Notice, EPA initiated a new sampling program after proposal at 12 OCPSF facilities to collect toxic pollutant removal data for selected in-plant control technologies as well as end-of-pipe technologies which could be applied to indirect discharges. Data are available for certain in-plant controls as well as applicable end-of-pipe technologies for EPA to establish PSES limitations for certain toxic pollutants which pass through the POTW or interfere with the POTW operation.

As in the case for the BAT effluent limitations (see section IV(D) of this notice), EPA considered both concentration-based and mass-based PSES effluent limitations and for the same reasons mentioned previously, decided to establish concentration-based PSES effluent limitations.

Similarly, EPA considered whether the industry should be subcategorized for PSES purposes and, for the same reasons described above for BAT, decided to establish one set of PSES limitations which are applicable to all plants.

As in the proposal, EPA is continuing to consider setting PSES equal to BAT. Therefore, the PSES options span the entire range of BAT Options I–III. Similarly, EPA is considering establishing in-plant, prebiological PSES where necessary to avoid adverse air impacts.

As in the proposal, PSES will differ from BAT only with respect to the set of pollutants regulated. EPA is considering two major options for selecting pollutants to be regulated:

PSES Option I—Establish PSES limitations for pollutants failing EPA's standard pass-through analysis.

PSES Option II—Add to Option I a set of volatile and semi-volatile organic toxic pollutants based on POTW interference as well as pass-through.

EPA's general pass-through analysis for pretreatment standard setting purposes is to compare, on a pollutant-by-pollutant basis, the percentage of a pollutant removed by well-operated POTWs (those meeting secondary treatment requirements) with the percentage removed by direct dischargers complying with BAT. If BAT removes more of a pollutant than POTWs remove, the pollutant is deemed to pass through POTWs and a PSES limitation is established for the pollutant.

In the proposal, EPA slightly modified its procedure for assessing pass through. Cognizant of the analytical variability typical of organic toxic pollutants in POTWs and OCPSF plants, EPA determined that pass through occurs only if BAT removes at least 5 percent more than a well-operated POTW removes. This approach is additionally supported by the fact that POTW influent organic toxic pollutant concentrations are typically much lower than industry treatment system influent concentrations; many POTW effluent samples are below detection, precluding a complete accounting of all pollutants removed by the POTW. The Agency has therefore retained this approach in this notice. Table E-1 lists all pollutants that pass through using the 5 percent criterion. For illustrative purposes only, Table E-1 sets forth the limitations that would apply if EPA adopts BAT Option II. If a different BAT option is selected, PSES will be revised accordingly.

EPA is considering modifying the 5 percent approach to be 10 percent, using

the same general reasons as used to justify the 5 percent approach. Pollutants that would not be regulated at PSES Option I if this approach were adopted are highlighted (=) in Table E-1. The majority of these pollutants would be recaptured for regulation if EPA adopts PSES Option II. (See pollutants marked by asterisks in Table E-2.) The PSES Option II standards are also based on BAT Option II for illustrative purposes only. EPA requests comments on this approach.

EPA also solicits comments on its approach for determining pass through in the absence of adequate POTW data to compare POTW removals to BAT removals. In the proposal and in this notice, EPA has determined that pollutants pass through in such situations. The pollutants without adequate POTW removal data are highlighted (*) in Table E-1. However, the Agency believes that some of these pollutants may not warrant pretreatment standards based on pass through considerations. For example, EPA may not establish PSES for acrylonitrile, a chemically-reactive, unstable compound which may not pass through POTWs. Furthermore, the Agency believes that decisions, related to whether these pollutants actually pass through POTWs, can be made regarding some of these compounds based on POTW and/or direct discharge biological treatment removal data for chemically similar compounds. The Agency solicits comments and data regarding the efficacy of this approach.

Under PSES Option II, EPA would additionally regulate some volatile and semivolatile organic toxic pollutants (see Table E-2). These pollutants interfere with the normal operation of POTWs by presenting safety hazards due to volatilization of toxic organics in POTW's headworks. While the severity of such hazards may depend on a variety of factors, the potential for harm is considerable. For example, one State that has a large number of OCPSF plants submitted a comment on the proposal that attributed POTW employee deaths to the volatilization in POTW sewers of organic pollutants discharged by industrial contributors.

In addition to interference problems, EPA believes that the pollutants added in PSES Option II pass through POTWs. These pollutants, as discussed with respect to BAT in section IV(D) of this notice, volatilize to the atmosphere from biological treatment systems. Since POTWs are biological systems, large proportions of volatile and semi-volatile pollutants are removed from wastewaters entering POTWs by air stripping rather than treatment. Thus, the standard pass-through analysis comparing POTW and BAT removals is inappropriate here. For the same reason that EPA is considering establishing in-plant BAT limitations, EPA is also considering adopting PSES Option II to ensure that pollutants not adequately treated by biological treatment are properly pretreated. Thus PSES Option II is supported by considerations of pass through as well as interference.

If priority pollutant PSES are established on the basis of interference alone, the Agency would consider adopting a provision similar to that established for sulfides in the Leather Tanning and Finishing Industry Regulation (47 FR 52848; November 23, 1982). Such a provision would allow a POTW not to set pretreatment standards for volatile compounds if the POTW certifies that the discharge of these compounds do not interfere with POTW operation.

In its initial cost estimation activities for PSES for this notice, the Agency had based PSES costs on the installation of only in-plant control technologies such as steam stripping, activated carbon, and chemical precipitation. This was done based on the receipt of preliminary sampling data which indicated that pollutant removals for in-plant controls approximated pollutant removals obtained by BAT treatment systems. However, upon receipt of the entire toxic pollutant data base, it became apparent that for 13 of the 58 PSES Option II priority pollutants, demonstrated physical/chemical effluent concentrations were essentially higher than BAT treatment effluent concentrations. Additional treatment would be necessary to achieve BAT-level PSES for these 13 pollutants.

In an attempt to estimate the actual costs which will be incurred for compliance with the PSES effluent limitations and the associated economic impacts, the Agency has selected a random sample of 30 indirect dischargers. Each plant's estimated raw waste toxic pollutant loading was examined to determine the pollutants which would require additional treatment because the plant's effluent levels were greater than the PSES Option II effluent limitations. Since PSES II regulates more pollutants than PSES I, the use of PSES Option II provides the most conservative approach which would yield the highest potential costs and impacts. The costing scenario included in-plant treatment costs as well as costs for certain additional treatment technologies for the 13 pollutants—eight organic toxic pollutants, four toxic pollutant heavy metals and cyanide. For 5 of the 30 plants, biological treatment (activated sludge) was costed in addition to the appropriate in-plant controls because at least one of the eight organic toxic pollutants or cyanide appeared in the plant's effluent at greater than BAT effluent levels. Multi-media filtration was costed in addition to chemical precipitation for 19 plants because at least one of the four toxic pollutant heavy metals appeared above the BAT effluent levels. The average cost increases in adding the technologies for the 13 pollutants across the 30 plant sample are 226 percent for land costs, 56 percent for capital equipment, and 11 percent for operation and maintenance costs. Sludge costs are not projected to increase. These increases were applied for all plants. The estimated PSES costs and the preliminary economic impact analyses are presented in section V(D) of this notice.

For the organic toxic pollutants and cyanide, biological treatment plus in-plant controls forms the principal technology basis for BAT Option II and therefore, should accurately reflect the costs necessary to attain PSES. The addition of multi-media filtration after chemical precipitation is a proven method of reducing heavy metals concentrations in the metal finishing, inorganic chemicals and other industries which generate heavy metals in their raw wastewaters. Data from the metal finishing industry show incremental percent removals with the addition of filtration of 44 percent for total chromium, 55 percent for total copper, 32 percent for total lead, 42 percent for total nickel and 55 percent for total zinc. Therefore, the Agency feels that the costing of filtration is an adequate cost estimation technology which can lower the in-plant control effluent values for chemical precipitation to within an acceptable range of the BAT effluent levels.

For all other pollutants, as noted, EPA's costing procedures assumed that in-plant treatment would be sufficient to achieve compliance with PSES limitations. The treatment capability of steam stripping has already been discussed with respect to BAT in section IV(D) of this notice. For the activated carbon assessment, the organic priority pollutants were divided into three groups (high, medium, and low) based on their in-plant carbon usage rates—pounds of pollutant adsorbed per pound of carbon. By assuming that compounds in each group behave similarily, group median effluent values were calculated for costing purposes—a median of

nondetect represents both the high and medium adsorption groups since data was available for the medium group only and a median of 175 ppb represents the low adsorption group.

For the 52 organic toxic pollutants regulated at PSES Option II, the steam stripping and activated carbon assessment demonstrates that these controls alone can achieve the same or lower long-term concentrations for 33 organics, essentially the same concentrations (within 2 ppb) for 11 others (benzene, carbon tetrachloride, 1,1,1-trichloroethane, chloroform, 1,1-dichloroethylene, 1,2-trans-dichloroethylene, dichlorobromomethane, tetrachloroethylene, toluene, trichloroethylene, and vinyl chloride), and higher concentrations (ranging from 125 to 1,418 ppb) for the remaining 8 organics (2,4-dimethylphenol, 2-chlorophenol, 2,4-dinitrophenol, and 5 polyaromatics—benzo(a)anthracene, benzo(a)pyrene, 3,4-benzofluoranthene, chrysene, and pyrene). In the case of the polyaromatics, biological treatment may provide more cost-effective control than steam stripping or activated carbon (depending on the specific compound or combination of compounds in the wastewater)—at least one indirect discharge facility for which EPA has toxic pollutant data has installed biological treatment to achieve long-term effluent concentrations at or near the analytical method detection levels.

For cyanide and the 5 toxic pollutant metals regulated at PSES Option II, OCPSF physical/chemical performance data is available only for arsenic and zinc. Data for chemical precipitation demonstrates that physical/chemical treatment alone can achieve lower concentrations for arsenic than BAT control; however, for zinc, chemical precipitation performance is 39 ppb higher than the BAT long-term average.

EPA has not separately costed PSES Option I. Because fewer pollutants are regulated at Option I, EPA anticipates that Option I would result in the removal of fewer pollutants but cost less than Option II.

PSES Option II (assuming that BAT Option II is selected as the appropriate technology level), is anticipated to result in annual incremental removals (beyond current removals) of 100 million pounds of toxic organics and 5.7 million pounds of toxic metals.

Although the Agency is giving its most serious consideration to PSES Options I and II (each of which sets PSES equal to BAT for all pollutants regulated), an additional PSES Option III might be to set PSES at levels achievable by physical/chemical treatment alone. Under this option, PSES would equal BAT for most pollutants but would be higher (less stringent) for the 13 priority pollutants discussed above. Table E–3 sets forth the standards that would apply to these 13 pollutants. Estimated costs for PSES Option III are presented below in section V(E) of this notice. EPA solicits comments on this option.

The long-term averages for benzo(a) anthracene, chrysene and pyrene in Table E–3 are based on the steam stripping median value for the low Henry's Law constant pollutant group. For benzo(a)pyrene, 3,4-benzofluoranthene, 2,4-dimethylphenol, 2,4-dinitrophenol and 2-chlorophenol, the long-term averages are based on the in-plant carbon adsorption median value of the low carbon usage rate pollutant group. The zinc long-term average is based on the OCPSF industry chemical precipitation data. The long-term averages for lead, mercury, selenium and cyanide are based on chemical precipitation performance information from the inorganic chemicals, paint and ink, and steam electric power generating industries. The corresponding variability factors for the low Henry's Law Constant steam stripping systems are OCPSF industry averages transfered from 2,4,6-trichlorophenol and pentachlorophenol. The carbon adsorption variability factors for the low carbon usage group are transferred from nitrobenzene. The OCPSF industry zinc chemical precipitation variability factors were used for zinc, whereas averages for arsenic, chromium, copper and zinc were transferred to lead, mercury, selenium and cyanide.

TABLE E–1.—OPTION I PSES STANDARDS (PARTS PER BILLION)

Pollutant or pollutant property by priority pollutant classes	Monthly average shall not exceed	Maximum for any 1 day
Halogenated Methanes (C1's)		
6. Carbon tetrachloride	15	30
23. Chloroform	20	40
44. Methylene chloride	#15	20
48. Bromodichloromethane	15	30
Chlorinated C2's		
10. 1,2-Dichloroethane	30	85
12. Hexachloroethane	*25	65
16. Chloroethane	*115	315
85. Tetrachloroethylene	#25	70
88. Vinyl chloride	25	65
Chlorinated C4's		
52. Hexachlorobutadiene	*20	45

TABLE E–1.—OPTION I PSES STANDARDS (PARTS PER BILLION)—Continued

Pollutant or pollutant property by priority pollutant classes	Monthly average shall not exceed	Maximum for any 1 day
Chloroalkyl Ethers		
42. bis(2-chloroisopropyl)ether	*20	45
Metals		
115. Arsenic	50	115
122. Lead	265	785
123. Mercury	2.5	3.0
125. Selenium	*20	40
128. Zinc	105	190
Miscellaneous		
3. Acrylonitrile	*85	240
121. Cyanide	120	275
Polyaromatics		
39. Fluoranthene	45	140
55. Naphthalene	#35	105
72. Benzo(a)anthracene	*35	105
73. Benzo(a)	*35	105
74. 3,4-Benzofluoranthene	*35	105
76. Chrysene	*35	105
77. Acenaphthylene	*35	105
78. Anthracene	#35	105
80. Fluorene	*35	105
81. Phenanthrene	*35	105
84. Pyrene	40	135
Chloroaromatics		
9. Hexachlorobenzene	*20	40
27. p-Dichlorobenzene	#20	40
Phthalate Esters		
66. bis(2-Ethylhexyl)phthalate	45	130
68. Di-n-butyl phthalate	#40	80
70. Diethyl phthalate	#90	215
71. Dimethyl phthalate	20	50
Nitroaromatics		
35. 2,4-Dinitrotoluene	*310	540
36. 2,6-Dinitrotoluene	*340	555
56. Nitrobenzene	*285	480
Benzidines		
28. 3,3'-Dichlorobenzidine	*320	450
Phenols		
34. 2,4-Dimethylphenol	20	35
Nitrophenols		
57. 2-Nitrophenol	*35	55
58. 4-Nitrophenol	*70	120
59. 2,4-dinitrophenol	*75	130
60. 4,6,-Dinitro-o-cresol	*30	50
Chlorophenols		
21. 2,4,6-Trichlorophenol	*115	260
24. 2-chlorophenol	*35	125
31. 2,4-Dichlorophenol	45	130
64. Pentachlorophenol	65	100

# Denotes organic pollutants where the differences between industrial and POTW removals range between 5 and 10 percent.
* Denotes pollutants without POTW removal data.

TABLE E–2.—OPTION II PSES STANDARDS (PARTS PER BILLION)

Pollutant or pollutant property by priority pollutant classes	Monthly average shall not exceed	Maximum for any 1 day
Halogenated Methanes (C1's)		
6. Carbon tetrachloride	*15	30
23. Chloroform	*20	40
44. Methylene chloride	*15	20
48. Bromodichloromethane	15	30

TABLE E-2.—OPTION II PSES STANDARDS (PARTS PER BILLION)—Continued

Pollutant or pollutant property by priority pollutant classes	Monthly average shall not exceed	Maximum for any 1 day
Chlorinated C2's		
10. 1,2-Dichloroethane	*30	85
11. 1,1,1-Trichloroethane	*25	65
12. Hexachloroethane	25	65
14. 1,1,2-Trichloroethane	*25	65
29. 1,1-Dichloroethylene	*25	65
30. 1,2-trans-Dichloroethylene	*25	65
85. Tetrachloroethylene	*25	70
87. Trichloroethylene	*25	65
86. Vinyl chloride	*25	65
Chlorinated C3's		
32. 1,2-Dichloropropane	*110	265
Chlorinated C4's		
52. Hexachlorobutadiene	20	45
Chloroalkyl Ethers		
42. bis(2-chloroisopropyl)ether	20	45
Metals		
115. Arsenic	50	115
122. Lead	265	785
123. Mercury	2.5	3.0
125. Selenium	20	40
126. Zinc	105	190
Miscellaneous		
3. Acrylonitrile	95	240
121. Cyanide	120	275
Aromatics		
4. Benzene	*30	85
86. Toluene	*35	115
Polyaromatics		
39. Fluoranthene	45	140
55. Naphthalene	35	105
72. Benzo(a)anthracene	35	105
73. Benzo(a)pyrene	35	105
74. 3,4-Benzofluoranthene	35	105
76. Chrysene	35	105
77. Acenaphthylene	35	105
78. Anthracene	35	105
80. Fluorene	35	105
81. Phenanthrene	35	105
84. Pyrene	40	135
Chloroaromatics		
7. Chlorobenzene	*40	115
9. Hexachlorobenzene	*20	40
25. o-Dichlorobenzene	*80	145
26. m-Dichlorobenzene	*25	35
27. m-Dichlorobenzene	*20	40
Phthalate Esters		
66. bis(2-Ethylhexyl)phthalate	45	130
68. Di-n-butyl phthalate	40	80
70. Diethyl phthalate	90	215
71. Dimethyl phthalate	20	50
Nitroaromatics		
35. 2,4-Dinitrotoluene	310	540
36. 2,6-Dinitrotoluene	340	555
56. Nitrobenzene	285	480
Benzidines		
28. 3,3'-Dichlorobenzidine	320	450
Phenols		
34. 2,4-Dimethylphenol	20	35
Nitrophenols		
57. 2-Nitrophenol	35	55
58. 4-Nitrophenol	70	120
59. 2,4-Dinitrophenol	75	130
60. 4,6-Dinitro-o-cresol	30	50
Chlorophenols		
21. 2,4,6-Trichlorophenol	115	260
24. 2-Chlorophenol	35	125
31. 2,4-Dichlorophenol	45	130
64. Pentachlorophenol	65	100

* Denotes pollutants determined to interfere with POTW operations.

TABLE E-3. PSES STANDARDS (PARTS PER BILLION) BASED ON PHYSICAL/CHEMICAL CONTROLS FOR POLLUTANTS WITH HIGHER CONCENTRATION THAN BAT OR WITH TRANSFER PHYSICAL/CHEMICAL PERFORMANCE

Pollutant or pollutant property by priority pollutant classes	Long-term average	Monthly average shall not exceed	Maximum for any one day
Polyaromatics			
72. Benzo(a)anthracene	1,418	1,795	2,710
73. Benzo(a)pyrene	175	300	570
74. 3,4-Benzofluoranthene	175	300	570
76. Chrysene	1,418	1,795	2,710
84. Pyrene	1,418	1,795	2,710
Phenols			
34. 2,4-Dimethylphenol	175	300	570
Nitrophenols			
59. 2,4-Dinitrophenol	175	300	570
Chlorophenols			
24. 2-Chlorophenol	175	300	570
Metals			
122. Lead	122	215	495
123. Mercury	1	2	4.5
125. Selenium	162	285	660
126. Zinc	107	180	380
Miscellaneous			
121. Cyanide	46	85	190

G. Technology Basis and Standards for PSNS

The Agency is required to establish pretreatment standards for new sources (PSNS). These standards are intended to prevent the discharges of pollutants which pass through, interfere with or are otherwise incompatible with POTWs. New indirect dischargers, like new direct dischargers, have the opportunity to incorporate the best available demonstrated technologies including process changes, in-plant control measures, and end-of-pipe treatment, and to use plant site selection to ensure adequate treatment system installation.

Both PSES regulatory options are being considered for the basis of PSNS. The priority pollutants selected for regulation by PSNS will be the same as those selected for PSES. For the reasons discussed in the previous section, EPA has determined that these pollutants may pass through, interfere with or otherwise be incompatible with the POTW. The pretreatment standards selected as the basis for PSNS are also the same as those selected for PSES because EPA has not identified any technologies or combination of technologies that are demonstrated for new sources that are different from those being considered to establish PSES. These standards are the same as NSPS except that pollutants regulated by NSPS that do not pass through or interfere with POTWs are not regulated by PSNS.

H. Engineering Costing Methodology

The development of effluent limitations guidelines includes the identification of technologies available for the reduction of pollutant loadings in the OCPSF industry, quantifying the reduction of pollutants by a technology or group of technologies, and identifying the costs associated with the application of each technology or group of technologies. The results of these analyses are then used to determine the options that can be considered for regulation.

The engineering costing methodology has been revised since proposal. The Catalytic Costing Model was abandoned because the Agency's reassessment identified numerous technical deficiencies and problems related to several design modules, including activated sludge, chemical precipitation and activated carbon. The current OCPSF regulatory approach involves concentration-based effluent limitations. This approach reduced the value of the Catalytic Model in that it eliminated the need to determine treatment costs on an individual product/process basis. In addition, the Catalytic Model estimates the cost of building entirely new treatment systems. Actually, most in-place systems will simply be upgraded or expanded to achieve lower concentration limits. CAPDET, when modified to reflect industrial wastewater characteristics, is a better costing tool to estimate the cost of system upgrades. The use of a computer based design and costing model, such as the Catalytic Model, was determined to be unnecessary. Since current effluent quality is known for many of the plants to be costed and the technologies to upgrade the plant have been identified, a simpler approach can be used.

In order to assist in developing these cost methodologies, actual industry cost data were required to calibrate predictive cost models and benchmark the resulting cost algorithms. This information was obtained from the OCPSF industry using the statutory authority provided by Section 308 of the Clean Water Act. The Section 308 data collection effort included a Supplemental Questionnaire which was sent to 84 selected OCPSF manufacturers. This supplemental questionnaire requested detailed cost information regarding capital and operating costs for specific treatment unit operations. A total of 67 questionnaires were completed and returned. Some cost information was obtained for 48 biological treatment systems, 23 steam strippers, 13 metals

removal systems, 2 ion exchange units, 5 solvent extraction systems, 6 activated carbon systems, 4 polishing ponds and 1 filtration system. In order to derive costs associated with selected technology options, cost curves were developed for steam stripping, in-plant and end-of-pipe carbon adsorption, coagulation/flocculation, chemically assisted clarification, filtration, polishing ponds, contract hauling, sludge disposal (incineration), and monitoring. In addition, a cost model was developed for biological treatment upgrades, and CAPDET was used to cost activated sludge systems. The detailed development of the costs for each of these technologies is available in the public reading room.

Several general principles characterize the derivation of the cost curves. All costs are derived in 1982 dollars. Where data were collected for other years, they were corrected to 1982 dollars using the ENR index. Actual plant cost data were used, where possible, to derive the cost curves. Where they were not sufficient, the data that was available was used to benchmark the cost curves derived. CAPDET was used to derive costs or cost curves for biological treatment, biological treatment upgrades, activated carbon and filtration. The resultant cost curves were benchmarked with actual plant data. The design bases for filtration were based upon industry practice. The design bases for activated carbon were based on industry practice, and included priority pollutant removal data. Polishing ponds, coagulation/flocculation, chemically assisted clarification, contract hauling, sludge disposal (incineration) and monitoring costs were based on manufacturer quotations. Steam stripping costs are based on plant data.

Temperature Effects

In order to accommodate the ambient temperature effects on biological treatment processes, temperature correction factors were established for each state. These values are based upon the states actual minimum monthly average ambient temperature as reported by the National Ocean and Atmospheric Administration. A temperature correction factor was used to adjust the biological treatment system upgrade costs. In addition, minimum wastewater temperatrues were established on a state-by-state basis for use in the CAPDET Model.

Warm ambient temperatures can cause solids control problems due to algae blooms in polishing ponds. Therefore, plants in states with average maximum monthly temperatures over 25 °C had filtration systems rather than polishing ponds costed for solids control.

Low Flow Facilities

For plants with total OCPSF process wastewater flows of 500 gallons per day or less, contract hauling disposal costs were estimated in lieu of process wastewater treatments costs. For the purposes of estimating the contract hauling costs on a national basis, the process wastewater was assumed to be hazardous and the hauling distance was assumed to be 500 miles in radius from the plant site to the hazardous waste treatment/disposal facility.

Land Costs

The cost of land is a key element in establishing total costs of alternative effluent guidelines and standards. Therefore, each technology assessed has been assigned land requirements. Since land costs may vary widely from place to place, it is difficult to obtain a nationwide average figure. However, based on an industrial real estate market survey report (prepared by the Society of Industrial Realtors in 1983), the average land costs for suburban sites of each state were obtained. Average state land costs were utilized in developing wastewater treatment land costs.

Benchmark Assessment

Wherever sufficient industry engineering cost data were available, benchmark analyses were prepared for the treatment techology alternatives utilized in the engineering design and costing analysis for the OCPSF industry. Some individual plant comparisons were significantly different than the Agency's estimates due to site specific design factors which may relate to such items as selected materials of construction or planned excess design capacity. However in most cases, the Agency's estimates were, on average, similar to industry supplied costs information. For example, the Agency's steam stripping capital and operation and maintenance costs were on average, only 6 and 2 percent lower, respectively, than industry-supplied cost data. For chemical precipitation/clarification systems, the Agency's capital cost estimates were, on average, 102 percent higher than industry data. The Agency's chemically assisted clarification and tertiary filtration capital costs were, on average, 36 percent higher and 17 percent lower, respectively, than industrys' costs.

In the case of the activated sludge biological treatment capital and operation and maintenance costs, the Agency's estimates were, on average, 10 and 73 percent lower than industry supplied cost information. However, the Agency questions the accuracy and validity of O&M cost data provided by several of the 11 plants that submitted O&M cost information. For example, three 1.5 million-gallon-per-day activated sludge treatment systems reported requirements for 2, 8 and 31 operating labor personnel. The Agency believes that no more than 3 to 4 people should be required to operate this size system. By comparing industry's reported labor costs to the reported labor hours, industry's labor rates ranged from $10.39 to $69.52 with an average of $25.48 per hour. The Agency used an Operator Class II hourly rate of $9.94 for estimating operation costs and $17.76 per hour for maintenance labor. Other differences may be traced to variations in local power costs or for cases where capital improvements may be reported as O&M maintenance materials and labor costs.

Sufficient industry data were not available to conduct capital and O&M benchmark analyses for activated carbon or to conduct O&M assessments for chemical precipitation/clarification, chemically assisted clarification, and tertiary filtration systems. The Agency solicits detailed design descriptions, capital and O&M costs, and performance data for activated sludge, biological system up-grades, chemically assisted clarification, polishing ponds, tertiary filtration, steam stripping, in-plant and end-of-pipe activated carbon, chemical precipitation/clarification and in-plant filtration wastewater treatment systems.

Costing Procedures

The engineering costing methodology developed costs on a plant-by-plant model basis for selected BPT options for BOD_5 and TSS, and developed costs on a wastewater stream basis for selected BAT and PSES options for priority pollutants.

BPT Costing: Plant-by-plant BPT costs were developed based on reported BOD_5 and TSS effluent concentrations and selected costing targets. The three sets of BOD/TSS long-term average targets for "plastics" plants are 10/15, 15/30, and 20/50 mg/l. These apply to facilities classified under the first four subcategories—Rayon Fibers, Other Man-Made Fibers, Thermosets, and Thermoplastics. The BOD_5/TSS long-term average targets for "organics" plants are 20/20, 45/45, 70/70, and 100/100 mg/l. These apply to facilities classified under the remaining subcategories—Thermoplastics and

Organics, Commodity Organics, Bulk Organics and Speciality Organics.

Plants not having effluent BOD_5 or TSS data were costed using the median effluent values for all direct discharge plants in each cost group. These median effluent values were calculated for each cost group using data obtained from the 308 questionnaires.

The actual treatment system unit operations that were costed for each plant depended on the difference between the plant's reported current BOD_5 and TSS discharge data and the corresponding effluent costing targets. If the current discharge exceeded the target levels used for costing purposes, the Agency determined the treatment units that would be needed to achieve the target levels and calculated the cost of the treatment. The detailed procedure used for selecting technologies for costing are in the cost documentation report, which is located in the EPA public reading room.

For systems requiring full scale activated sludge treatment and/or second stage activated sludge, the CAPDET computer program was utilized. CAPDET default values were adjusted to reflect OCPSF wastewater characteristics. For example, average K-rates (biokinetic rate constants) and mixed liquor volatile suspended solids (MLVSS) for the plastics and organics groups were calculated using actual data taken from the 308 questionnaires and were used for those plastics and organics plants requiring full scale or second stage activated sludge treatment. For the organics plants' activated sludge systems, the K-rates ranged from 0.042 to 10.15 with an average of 3.200 inverse days; MLVSS ranged from 450 to 5,500 with an average of 3,700 mg/l. For the plastics plants' activated sludge systems, the K-rates ranged from 0.214 to 9.969 with an average of 2.301 inverse days; MLVSS ranged from 2,400 to 4,500 with an average of 3105 mg/l.

BAT Costing: The technology options considered for BAT include: (1) no additional treatment beyond BPT, (2) BPT plus appropriate in-plant physical chemical treatment for the removal of individual toxic pollutants, and (3) BPT plus in-plant controls and end-of-pipe activated carbon treatment.

EPA verification and EPA/CMA field sampling data, as well as Section 308 questionnaire data, were used where available for determining the toxics present in the plant's process wastewater. For plants with no current toxic pollutant data, estimates were obtained by matching each plant's product/processes with those contained in the verification sampling Master Process File. For those product/processes not specifically covered by the Master Process File, two approaches were followed: (1) Average toxic pollutant data from the Master Process File for a product, were used where applicable; or (2) Where product specific toxic pollutant data were unavailable, plants were assigned toxic pollutant data based on subcategory or costing group averages.

Based on the toxic pollutants present, the appropriate in-plant treatment technology was selected. Each pollutant had to be above a preselected trigger value before in-plant treatment would be required. No in-plant treatment technology was costed if it was already in-place. Steam stripping was costed for the removal of volatile organic pollutants. Activated carbon was used for semi-volatile organic pollutants. Both of these technologies are demonstrated technologies and have proven records in terms of removing priority pollutants from wastewaters in the OCPSF industry. Chemical precipitation was costed for metals removal.

For plants with product/process flows less than 500 gallons per day, only contract hauling was costed. Zero discharge wastestreams such as wastestreams which are disposed of by deep well disposal, incineration, land disposal, surface impoundment, were not included in the BAT analysis.

NSPS Costing: EPA used its BPT costing methods to cost entirely new treatment systems for new sources based on model flow sizes for each subcategory. BAT costs are used to estimate costs for new sources to control priority pollutant discharges.

PSES Costing: The procedures used to cost each plant were generally similar to the BAT method for costing appropriate treatment technologies. Section IV(F) of this notice discussed the PSES costing procedure in detail.

RCRA Baseline Costs for Surface Impoundments: In November 1984, Congress enacted the Hazardous and Solid Waste Act (Pub. L. 98–616) which among other things imposed new requirements on surface impoundments that treat, store and dispose of hazardous wastes. As a result of this new legislation, OCPSF manufacturing facilities were reviewed to determine what RCRA costs would be incurred. Plants without "Aggressive Biological Treatment" as described in the RCRA amendments (which exempts surface impoundments with such treatment from certain requirements) were included in the study.

EPA established the following criteria for the selection and inclusion of OCPSF facilities in the RCRA baseline costing analysis:

A. All plants in the industry were assigned a one-time site inspection cost which has an annual cost of less than $3,000.

B. All plants having aerobic and/or anaerobic lagoons were evaluated and assigned costs for installation of liners (high density polyethylene) and monitoring wells.

C. For facilities with primary clarification and/or equalization, EPA:

1. Randomly selected one-third of all direct and indirect discharge OCPSF facilities (which approximates the number of plants which have primary clarifiers and equalization basins which are not concrete structures or already double-lined) and determined monitoring costs, and

2. Randomly selected 15 percent of the above facilities (which approximates the number of plants which installed monitoring wells and determined that possible groundwater contamination is or could occur) and determined liner costs.

EPA's evaluation and subsequent costing analysis of the OCPSF facilities incurring liner costs were based on the assumption that that these facilities had detention times and depths similar to that of aerobic lagoons. The cost and preliminary economic impacts are discussed in section V(G) of this notice.

I. Conventional Pollutant Loadings

Conventional polluant loadings for BOD_5 and TSS were calculated on a plant-by-plant model basis for each of the BPT effluent targets which were costed (see section IV(C)) and for each plant's current BOD_5 and TSS effluent quality. BPT target loadings were calculated for each plant, depending on whether that plant was costed for that particular target (i.e., if a plant is already achieving a particular effluent target, a loading was not calculated for that target) by multiplying the BOD_5 and TSS effluent targets by the plant's process wastewater flow and a conversion factor. Current BOD_5 and TSS effluent loadings were calculated using actual BOD_5 and TSS concentration values for direct dischargers and multiplying these numbers by each plant's process wastewater flow and a conversion factor. For plants without either BOD_5 and TSS effluent values, median effluent concentrations for each plant's assigned subcategory were substituted for actual BOD_5 and TSS effluent data and current loadings were calculated as above.

The current in-place treatment BOD and TSS annual loadings are 49.9 and 103.8 million pounds per year, respectively. The annual BOD and TSS

BPT loadings, based on the Option I costing targets listed in Table C–4 of section IV(C), are 21.8 and 29.6 million pounds per year, respectively. The annual BOD and TSS BPT loadings, based on the Option II costing targets, are 21.7 and 29.4 million pounds per year, respectively. As noted in section IV(C), the Option III loadings are bracketed by Options I and II. Refined calculations based upon the actually developed limitations will reveal more substantial differences among the three options.

J. Toxic Pollutant Loadings

At the time of proposal, the Agency overstimated the annual discharges of toxic pollutants. Industry comments objected to these overestimates, argued that toxic pollutant discharges by the OCPSF industry are low, and questioned the need to establish BAT limitations on a wide range of toxic pollutants. These commenters suggested that the Agency rely on the NPDES permit application Form 2C toxic pollutant data for determining toxic pollutant loadings. They maintained that available NPDES permit application Form 2C data constitute the most appropriate and extensive data base for predicting the extent of occurrence of priority pollutants in the OCPSF industry. They argued that the Form 2C data submitted by trade association member companies indicate that only a few priority pollutants are detected in treated discharges and concluded that existing treatment systems, installed principally for the control of conventional pollutants, do an excellent job of controlling priority pollutant discharges. The Agency disagrees with these comments and, for the reasons discussed below, believes that OCPSF industries currently discharge significant amounts of toxic pollutants for which regulation beyond BPT is warranted.

Since the OCPSF regulations apply to process wastewater only, the Agency determined the relative contributions of process and nonprocess wastewater at the effluent sample sites. These data were used to calculate plant-by-plant "dilution factors" for use in adjusting or assessing analytical data at effluent sampling locations. This information was used to determine if reported section 308 and Form 2C final effluent concentration data could be used to adequately characterize actual process wastewater pollutant parameter concentrations. For example, if a pollutant was reported as 30 ppb at the final effluent sampling location with 1 MGD of process wastewater flow and 9 MGD of noncontaminated nonprocess cooling water flow, then the concentration of the pollutant in the process wastewater was actually 300 ppb. Similarly, if the same plant reported that another pollutant was not detected at the same sampling location and the analytical method detection limit was 10 ppb, then the other pollutant concentration in the process wastewater could be as high as 90 ppb without being detected in the diluted final effluent.

One-hundred-six plants reported Form 2C toxic pollutant data in the 1983 Section 308 Questionnaire. Of these, 70 plants diluted the process wastewater before the effluent Form 2C sampling point. The following table relates the number of plants with Form 2C data to the range of dilution at the effluent sampling point.

TABLE J–1.—RANGE OF PERCENT DILUTION FOR PLANTS WITH FORM 2C DATA

Range of dilution in percent	Number of plants with form 2C data (percent)
0	36(34)
>0 to 25	20(19)
>25 to 100	20(19)
>100 to 500	17(16)
>500 to 6,054	13(12)
Total	106(100)

The Agency was able to identify 13 facilities that reported measured toxic pollutant concentrations of treated process wastewater both before and after dilution with nonprocess wasterwater. In general, analyzing the diluted effluents yielded underestimated or undetected values for organic toxic pollutants that were measured in the undiluted process wastewater. However, this was not generally the case for cyanide and toxic pollutant metals such as cadmium, chromium, and lead. These compounds are commonly found in cooling water additives that may be utilized to inhibit biological growth or the formation of rust and scale in cooling equipment. The presence of a portion of these metals in the diluted effluent seems to be caused by the nonprocess cooling water. Therefore, the assumption that the nonprocess dilution wastewater is relatively clean seems to apply to the organic toxic pollutants but not necessarily to all of the toxic metal parameters.

Therefore, use of unqualified Form 2C data does not provide an adequate assessment of process wastewater toxic pollutant constituents and concentrations. Use of Form 2C data tends to underestimate organic toxic pollutant loadings in process wastewater and may actually overestimate metal toxic pollutant loadings.

The Agency developed a methodology to estimate industry toxic pollutant loadings which incorporates Form 2C data where appropriate as well as other available toxic pollutant analytical data.

The Agency has estimated raw and current effluent as well as projected BPT, BAT, and PSES effluent priority pollutant waste loadings for the OCPSF industries. These loadings have been calculated on a plant-by-plant model basis using both industry generated data (i.e. 1983 "308" Questionnaires data) as well as analytical data acquired by the Agency in various sampling studies. These loadings demonstrate that significant discharges of conventional and toxic pollutants currently occur and that the options for treating these discharges remove successively larger amounts of these pollutants.

Raw Waste Loads

The Agency used multiple sources of data and modeling techniques to determine, for the purpose of calculating loadings, which toxic pollutants are likely to be present at individual facilities as well as the corresponding raw waste loads as follows:

1. Where 308 toxic pollutant data were available, these data were used to calculate raw waste loads for those toxic pollutants.

2. Where the combined raw wastewaters of a plant had been sampled in either Phase I or Phase II Screening Studies, those toxic pollutant concentration data were used to calculate the raw waste loads from these plants after editing for analytical false positive values.

3. Raw waste loads were calculated using Master Process File toxic pollutant concentration data for product/process covered by the MPF. Where a product/process waste load could not be calculated at a plant, product specific waste loads were calculated using the "Product Averaged Master Process File."

4. For plants producing products that could not be calculated by the above methods, generic process raw waste loads were calculated using the "generic Process Average Master Process File."

Because the generic process method necessarily generated extraneous pollutants, raw waste loads from these plants were extensively reviewed; those pollutants that the Agency believes to be inconsistent with process chemistry practiced at a plant were deleted from the raw waste load file. The edited file was used for purposes of calculating loadings and costs.

BPT, BAT and Current Waste Load Calculation

BPT, BAT, and current waste load of individual plants were calculated for those toxic pollutants found in the raw waste load as follows:

1. Average toxic pollutant concentrations were calculated using the sampling data base (i.e., verification data, CMA 5-Plant, and new sampling data). Separate toxic pollutant concentrations were calculated by subcategory for both BPT and BAT plants (i.e. those plants currently meeting proposed BPT and BAT criteria, respectively).

2. For plants not in compliance with the toxic pollutant costing targets or BPT costing targets, it was assumed that the installation of BPT would treat a proportion of the toxic pollutants. This allowed EPA to project toxic pollutant loadings at BPT and then at BAT, in accordance with the extent to which additional BPT treatment would be required to meet BOD and TSS limits. Pollutant concentrations were adjusted for those plants which incurred BPT costs by the ratio of actual BOD to the target BOD for that subcategory (20 mg/l for rayon, other fibers, thermosets, and thermoplastics only; 45 mg/l for thermoplastics and organics, commodity organics, bulk organics, and specialty organics). Plants that did not incur BPT costs were assigned BPT toxic pollutant concentrations by subcategory. Plants that did not incur either BPT or BAT costs were assigned BAT toxic pollutant concentrations.

3. Effluent concentrations of toxic pollutants as derived above were multiplied by total process flow to calculate current waste load.

PSES, Waste Load Calculations

PSES waste loads were calculated in a manner analogous to current waste loads. If a plant was costed for PSES treatment, then toxic pollutant concentrations were considered to be equal to raw waste toxic pollutant concentrations. If a plant was not costed for PSES, then toxic pollutant concentrations were assumed to be equal to "current" toxic pollutant concentrations. Effluent concentrations of toxic pollutants as derived above were multiplied by total process flow to calculate PSES load.

Annualized Waste Load

Product/process flow data provided by the OCPSF industries in the 1983 "308" questionnaire are reported in millions of gallons per day when operating. The industry has also provided total annual production data and operating rate data by product/process. The Agency has calculated operating days for each product/process at each plant by dividing the annual product/process production by the product/process operating rate. Multiplication of daily product/process waste load by product/process operating days yields annualized product/process waste loads. Toxic pollutant waste loads from individual product/processes at a plant are than summed to yield total waste load for individual plants.

The projected direct and indirect discharge annual priority pollutant waste loadings are presented in Tables J-2 and J-3, respectively. As noted before, the BPT toxic pollutant loadings are based on one set of composite BOD targets rather than on each BPT option. Furthermore, the Agency believes that there would be negligible differences between the projected BPT composite and the BAT Option I priority pollutant loadings. The PSES loadings most closely correspond to PSES Option II, however, the estimates include incidental removals of pollutants which were determined not to pass through or interfere with POTW operations.

TABLE J-2.—DIRECT DISCHARGE—ANNUAL PRIORITY POLLUTANT LOADINGS

(1,000 lb per year)

	Volatiles	Semivolatiles	Metals and CN	Total
Raw waste	82,746	39,079	35,491	157,316
Current	248	208	730	1,186
BPT/BAT-I	218	180	628	1,026
BAT-II	59	80	104	243
BAT-III	56	62	102	220

TABLE J-3.—INDIRECT DISCHARGE—ANNUAL PRIORITY POLLUTANT LOADINGS

(1,000 lb per year)

	Volatiles	Semivolatiles	Metals and CN	Total
Raw waste	12,655	192,316	28,796	233,767
Current	4,313	96,180	6,309	106,802
PSES-II	133	44	588	765

K. Applicability and Definition of the Regulated OCPSF Industry

The Agency has received many requests for information on which facilities are covered by the OCPSF category regulations. The discussion below addresses this issue. EPA intends to include the essential points of this discussion in the Applicability Section of the final regulations.

The Agency has defined the Organic Chemicals Manufacturing industries to include all facilities within specific SIC codes: SIC 2865, Cyclic (Coal Tar) Crudes, and Cyclic Intermediates, Dyes, and Organic Pigments (Lakes and Toners); SIC 2869, Industrial Organic Chemicals Not Elsewhere Classified and SIC 2911, Liquified Refinery Gasses (including other aliphatics) made from purchased refinery products and other Finished Petroleum Products (aromatics) made from purchased refinery products. Likewise, the Agency has defined the Plastics/Synthetic Fibers industry to include all facilities within specific SIC codes: SIC 2821, Plastics Materials, Synthetic Resins, and Nonvulcanizable Elastomers; SIC 2823, Cellulosic Man-Made Fibers; and SIC 2824, Synthetic Organic Fibers, Except Cellulosic.

For some petroleum refineries and pharmaceutical manufacturers, process wastewater from some synthetic organic chemical products are specifically regulated under the Petrochemical and Integrated Subcategories of the Petroleum Refining Point Source Category (40 CFR 419, Subparts C and E) or the Chemical Synthesis Products Subcategory of the Pharmaceuticals Manufacturing Point Source Category (40 CFR 439, Subpart C). The petroleum refineries and pharmaceutical manufacturers that produce organic chemical products that generate process wastewaters treated in combination with petroleum refinery or pharmaceutical manufacturing wastewaters, respectively, should consider any such organic chemical products as non-OCPSF products. However, if petroleum refineries or pharmaceutical manufacturers produce organic chemical products that generate process wastewaters that are treated in a separate wastewater treatment system, then these facilities should consider any such organic chemical product as an OCPSF product.

The Agency has grouped the OCPSF industries into categories based on the products or product groups produced at a plant. These product groups are:

- Thermoplastic resins (Census product code 28213);
- Thermosetting resins (Census product code 28214);
- Rayon fibers (Census product code 2823);
- Other fibers (Census product code 2823 and 2824); and
- Organic chemicals (Census product code 2865, 2869, and 2911).

The organic chemicals group has been further divided into three groups of chemicals or chemical groups depending upon the total 1980 production volume of a chemical. These subgroups are:

- Commodity Chemicals—organic chemicals produced in amounts greater than one billion pounds per year. This

list includes 37 products or product groups.

• Bulk Chemicals—organic chemicals produced in amounts less than one billion pounds per year but more than 40 million pounds per year. This list comprises 221 products or product groups.

• Specialty Chemicals—all organic chemicals not defined as Commodity or Bulk Chemicals.

Organic chemical compounds that are produced solely by extraction from natural materials (e.g., plant and animal sources) or by fermentation processes are *not* considered to be OCPSF products. Thus, ethanol derived from natural sources (SIC 28095112) is *not* considered to be an OCPSF industry product; ethanol produced synthetically (hydration of ethene) *is* an OCPSF industry product. Similarly, cellophane (SIC 3079) which is produced by extrusion of viscose (chemically derived from the natural polymer cellulose) is being considered by the Agency to be an OCPSF industry product. (Both rayon and cellophane are manufactured by similar process, differing only in the extruded form. Therefore, cellophane manufacture will be included in the rayon subcategory for BPT.) The Agency solicits comments on this issue.

Certain products of SIC groups other than 2865, 2969, 2821, 2823, and 2824 are considered to be OCPSF products. Benzene, toluene, and mixed xylenes manufactured from purchased refinery products in SIC 29110582 (in contrast to benzene, toluene, and mixed xylenes manufactured in refineries—SIC 29110558) are considered to be OCPSF products. Similar considerations apply to aliphatic hydrocarbons manufactured from purchased refinery products—SIC 29116324.

Based on the information submitted to EPA as a result of the 1983 "308" Questionnaire, the Agency has compiled lists of chemicals and chemical groups by the industry segments discussed above. These industrial segments are integral parts of establishing and defining subcategories. Table K–1 lists rayon products. Table K–2 lists other fiber products and product groups. Thermosetting resin products and product groups are listed in Table K–3. Thermoplastic resin products and product groups are listed in Table K–4. Table K–5 lists commodity organic chemicals and chemical groups. Bulk organic chemicals and chemical groups are listed in Table K–6. The remaining organic chemicals and chemical groups not listed in Tables K–5 and K–6 are defined as specialty organic chemicals.

It should be emphasized that the placement of products and product groups shown in Tables K–1 through K–6 is not expected to be static: as production methods and processes change over time, specific chemicals and chemical groups may (and are expected to) also change. Furthermore, closely related chemical products may in some cases be in different subcategories because of production volume. For example, at present, benzene, toluene, and xylene are defined as commodity chemicals; BTX (a product which is a mixture of benzene, toluene, and xylene) is defined as a bulk chemical product. Therefore, Tables K–1 through K–6 should be seen as guidance. The formal definitions of the BPT subcategories should be referred to for precise determination of a plant's subcategory.

Table K–1.—Rayon Products

Rayon (Viscose Process)

Table K–2.—Other Fibers and Fiber Groups(*)

*Acrylic Fibers (85% Polyacrylonitrile)
*Cellulose Acetate Fibers
*Fluorocarbon (Teflon) Fibers
*Modacrylic Fibers
*Nylon 6 Fibers
Nylon 6 Monofilament
*Nylon 66 Fibers
Nylon 66 Monofilament
*Polyamide Fibers (Quiana)
*Polyaramid (Kevlar) Resin-Fibers
*Polyaramid (Nomex) Resin-Fibers
*Polyester Fibers
*Polyethylene Fibers
*Polypropylene Fibers
*Polyurethane Fibers (Spandex)

Table K–3.—Thermosetting Resins and Thermosetting Resin Groups(*)

*Alkyd Resins
Dicyanodiamide Resin
*Epoxy Resins
*Fumaric Acid Polyesters
*Furan Resins
Glyoxal-Urea Formaldehyde Textile Resin
*Keton-Formaldehyde Resins
*Melamine Resins
*Phenolic Resins
*Polyacetal Resins
Polyacrylamide
*Polyurethane Prepolymers
*Polyurethane Resins
*Urea Formaldehyde Resins
*Urea Resins

Table K–4.—Thermoplastic Resins and Thermoplastic Resin Groups(*)

*Abietic Acid—Derivatives
*ABS Resins
*ABS–SAN Resins
*Acrylate-Methacrylate Latexes
*Acrylic Latex
*Acrylic Resins
*Cellulose Acetate Butyrates
Cellulose Acetate Resin
*Cellulose Acetates
*Cellulose Acetates Propionates
Cellulose Nitrate
Cellulose Sponge
*Ethylene-Methacrylic Acid Copolymers
*Ethylene-Vinyl Acetate Copolymers
*Fatty Acid Resins
*Fluorocarbon Polymers
Nylon 11 Resin
*Nylon 6—66 Copolymers
*Nylon 6—Nylon 11 Blends
Nylon 6 Resin
Nylon 612 Resin
Nylon 66 Resin
*Nylons
*Petroleum Hydrocarbon Resins
*Polyvinyl Pyrrolidone—Copolymers
*Poly (Alpha) Olefins
Polyacrylic Acid
*Polyamides
*Polyarylamides
Polybutadiene
*Polybutenes
Polybutenyl Succinic Anhydride
*Polycarbonates
Polyester Film
*Polyester Resins
*Polyester Resins, Polybutylene Terephthalate
*Polyester Resins, Polyoxybenzoate
Polyethylene
*Polyethylene—Ethyl Acrylate Resins
*Polyethylene—Polyvinyl Acetate Copolymers
Polyethylene Resin (HDPE)
Polyethylene Resin (LPDE)
Polyethylene Resin, Scrap
Polyethylene Resin, Wax (Low M.W.)
Polyethylene Resin, Latex
Polyethylene Resins
*Polyethylene Resins, Compounded
*Polyethylene, Chlorinated
*Polyimides
*Polypropylene Resins
Polystyrene (Crystal)
Polystyrene (Crystal) Modified
*Polystyrene—Copolymers
*Polystyrene—Acrylic Latexes
Polystyrene Impact Resins
Polystyrene Latex
Polystyrene, Expandable
Polystyrene, Expanded
*Polysulfone Resins
Polyvinyl Acetate
*Polyvinyl Acetate—PVC Copolymers
*Polyvinyl Acetate Copolymers
*Polyvinyl Acetate Resins
Polyvinyl Alcohol Resin
Polyvinyl Chloride
Polyvinyl Chloride, Chlorinated
*Polyvinyl Ether-Maleic Anhydride
*Polyvinyl Formal Resins
*Polyvinylacetate—Methacrylic Copolymers
*Polyvinylacetate Acrylic Copolymers
*Polyvinylacetate-2-Ethylhexylacrylate Copolymers
Polyvinylidene Chloride
*Polyvinylidene Chloride Copolymers
*Polyvinylidene-Vinyl Chloride Resins
*PVC Copolymers, Acrylates (Latex)
*PVC Copolymers, Ethylene-Vinyl Choloride
*Rosin Derivative Resins
*Rosin Modified Resins
*Rosin Resins
*SAN Resins
*Silicones: Silicone Resins
*Silicones: Silicone Rubbers
*Styrene Maleic Anhydride Resins

Styrene Polymeric Residue
*Styrene-Acrylic Copolymer Resins
*Styrene-Acrylonitrile-Acrylates Copolymers
*Styrene-Butadiene Resins
*Styrene-Butadiene Resins (<50% Butadiene)
*Styrene-Butadiene Resins (Latex)
*Styrene-Divinyl Benzene Resins (Ion Exchange)
*Styrene-Methacrylate Terpolymer Resins
*Styrene-Methyl Methacrylate Copolymers
*Styrene, Butadiene, Vinyl Toluene Terpolymers
*Sulfonated Styrene-Maleic Anhydride Resins
*Unsaturated Polyester Resins
*Vinyl Toluene Resins
*Vinyl Toluene-Acrylate Resins
*Vinyl Toluene-Butadiene Resins
*Vinyl Toluene-Methacrylate Resins
*Vinylacetate-N-Butylacrylate Copolymers

Table K–5.—Commodity Organic Chemicals and Chemical Groups(*)

a. Aliphatic Organic Chemicals

Acetaldehyde
Acetic Acid
Acetic Anhydride
Acetone
Acrylonitrile
Adipic Acid
*Butylenes (Butenes)
Cyclohexane
Ethanol
Ethylene
Ethylene Glycol
Ethylene Oxide
Formaldehyde
Isopropanol
Methanol
Polyoxypropylene Glycol
Propylene
Propylene Oxide
Urea
Vinyl Acetate
1,2-Dichloroethane
1,3-Butadiene

b. Aromatic Organic Chemicals

Benzene
Cumene
Dimethyl Terephthalate
Ethylbenzene
m-Xylene (impure)
p-Xylene
Phenol
*Pitch Tar Residues
*Pyrolysis Gasolines
Styrene
Terephthalic Acid
Toluene
*Xylenes, Mixed
o-Xylene

c. Halogenated Organic Chemicals

Vinyl Chloride

Table K–6.—Bulk Organic Chemicals and Chemical groups(*)

a. Aliphatic Organic Chemicals

*Acetic Acid Esters
*Acetic Acid Salts
Acetone Cyanohydrin
Acetylene
Acrylic Acid
*Acrylic Acid Esters
*Alkoxy Alkanols
*Alkylates
*Alpha-Olefins
Butane (all forms)
*C-4 Hydrocarbons (Unsaturated)
Calcium Stearate
Caprolactam
Carboxymethyl Cellulose
Cellulose Acetate Butyrates
*Cellulose Ethers
Chlorinated Paraffins, 35–64 PCT. Chlorine
Citric Acid
Cumene Hydroperoxide
Cyclohexanol
Cyclohexanol, Cyclohexanone (Mixed)
Cyclohexanone
Cyclohexene
*C12-C18 Primary Alcohols
*C5 Concentrates
*C9 Concentrates
Decanol
Diacetone Alcohol
*Dicarboxylic Acids—Salts
Diethyl Ether
Diethylene Glycol
Diethylene Glycol Diethyl Ether
Diethylene Glycol Dimethyl Ether
Diethylene Glycol Monoethyl Ether
Diethylene Glycol Monomethyl Ether
*Dimer Acids
Dioxane
Ethane
Ethylene Glycol Monophenyl Ether
*Ethoxylates, Misc.
Ethylene Glycol Dimethyl Ether
Ethylene Glycol Monbutyl Ether
Ethylene Glycol Monoethyl Ether
Ethylene Glycol Monomethyl Ether
*Fatty Acids
Glycerine (Synthetic)
Glyoxal
Hexane
*Hexanes and Other C6 Hydrocarbons
Hydrogen Cyanide
Isobutanol
Isobutylene
Isobutyraldehyde
Isophorone
Isophthalic Acid
Isoprene
Isopropyl Acetate
Ligninsulfonic Acid, Calcium Salt
Maleic Anhydride
Methacrylic Acid
*Methacrylic Acid Esters
Methane
Methyl Ethyl Ketone
Methyl Methacrylate
Methyl Tert-Butyl Ether
Methylisobutyl Ketone
*N-Alkanes
N-Butyl Alcohol
N-Butylacetate
N-Butyraldehyde
N-Butyric Acid
N-Butyric Anhydride
*N-Paraffins
N-Propyl Acetate
N-Propyl Alcohol
Nitrilotriacetic Acid
Nylon Salt
Oxalic Acid
*Oxo Aldehydes—Alcohols
Pentaerythritol
Pentane
*Pentenes
*Petroleum Sulfonates
Pine Oil
Polyoxybutylene Glycol
Polyoxyethylene Glycol
Propane
Propionaldehyde
Propionic Acid
Propylene Glycol
Sec-Butyl Alcohol
Sodium Formate
Sorbitol
Stearic Acid, Calcium Salt (Wax)
Tert-Butyl Alcohol
1-Butene
1-Pentene
1,4-Butanediol
Isobutyl Acetate
2-Butene (Cis and Trans)
2-Ethyl Hexanol
2-Ethylbutyraldehyde
2,2,4-Trimethyl-1,3-Pentanediol

b. Amine and Amide Organic Chemicals

2,4-Diaminotoluene
*Alkyl Amines
Aniline
Caprolactam, Aqueous Concentrate
Diethanolamine
Diphenylamine
*Ethanolamines
Ethylamine
Ethylenediamine
Ethylenediaminetetracetic Acid
*Fatty Amines
Hexamethylene Diamine
Isopropylamine
M-Toluidine
Melamine
Melamine Crystal
*Methylamines
Methylene Dianiline
N-Butylamine
N,N-Diethylaniline
N,N-Dimethylformamide
*Nitroanilines
Polymeric Methylene Dianiline
Sec-Butylamine
Tert-Butylamine
Toluenediamine (Mixture)
*Toluidines
O-Phenylenediamine
2,6-Dimethylaniline
4-(N-Hydroxyethylethylamino)-2-Hydroxyethyl Analine
4,4'-Methylenebis(N,N'-dimethyl)-aniline
4,4'-Methylenedianiline

c. Aromatic Organic Chemicals

2-Chloro-5-Methylphenol (6-Chloro-m-cresol)
A-Methylstyrene
*Alkyl Benzenes
*Alkyl Phenols
*Alkylbenzene Sulfonic Acids, Salts
Aminobenzoic Acid (Meta and Para)
Aspirin
B-Napthalene Sulfonic Acid
Benzenedisulfonic Acid
Benzoic Acid
Bis(2-Ethylhexyl) Phthalate
Bisphenol A
BTX-Benzene,Toluene, Xylene (Mixed)
Butyl Octyl Phthalate
Coal Tar
*Coal Tar Products (Misc)
Creosote
*Cresols, Mixed
Cyanuric Acid

*Cyclic Aromatic Sulfonates
Dibutyl Phthalate
Diisobutyl Phthalate
Diisodecyl Phthalate
Diisooctyl Phthalate
Dimethyl Phthalate
Dinitrotoluene (Mixed)
Ditridecyl Phthalate
M-Cresol
Metanilic Acid
Methylenediphenyldiisocyanate
Naphthalene
*Naphthas, Solvent
Nitrobenzene
Nitrotoluene
Nonylphenol
P-Cresol
Phthalic Acid
Phthalic Anhydride
*Tars-Pitches
Tert—Butylphenol
*Toluene Diisocyanates (Mixture)
Trimellitic Acid
O-Cresol
1-Tetralol, 1-Tetralone Mix
2,4-Dinitrotoluene
2,6-Dinitrotoluene

d. Halogenated Organic Chemicals

1,4-Phenylenediamine Dihydrochloride
Allyl Chloride
Benzyl Chloride
Carbon Tetrachloride
Chlorobenzene
*Chlorobenzenes (Mixed)
Chlorodifluoroethane
Chloroform
*Chloromethanes
*Chlorophenols
Chloroprene
Cyanogen Chloride
Cyanuric Chloride
Dichloropropane
Epichlorohydrin
Ethyl Chloride
*Fluorocarbons (Freons)
Methyl Chloride
Methylene Chloride
Pentachlorophenol
Phosgene
Tetrachloroethylene
Trichloroethylene
Trichlorofluoromethane
Vinylidene Chloride
1,1-Dichloroethane
1,1,1-Trichloroethane
2,4-Dichlorophenol

e. Other Organic Chemicals

Adiponitrile
Carbon Disulfide
Dithiophosphates, Sodium Salt
Fatty Nitriles
*Organic-Tin Compounds
*Phosphate Esters
Tetraethyl Lead
Tetramethyl Lead
*Urethane Prepolymers
*Waxes, Emulsionis—Dispersions

L. Options for Identifying Plant-Specific BAT and PSES Toxic Pollutant Monitoring Requirements

Industry has for many years discussed the complexity of the OCPSF industry and the desirability of plant-specific permits or control requirements instead of national regulations (effluent limitations and standards). What follows is a preliminary monitoring program which would provide permitting and control authorities with accurate information on the toxic pollutants generated at an OCPSF plant. This information could then be used in one of several ways to develop tailored permitting requirements, as will be discussed further below.

Based on the efficacy of BPT systems for removal of residual toxic organics and the present utilization of Part 2–C data from NPDES permit applications for the Organic Chemicals Industry, the Agency believes that as much attention should be focused on reducing influent levels of toxic organic pollutants to biological treatment systems as on reducing the effluent levels. Based on economic and treatability considerations, focusing on influent to biological systems is an optimal approach. This method promotes in-plant controls and modifications which are typically far less costly than increasing the capacity of a biological system and, in the case of the OCPSF industry, highly effective in the control of toxic organics. As has become apparent from the data collected, with the exception of a few polluants such as the chlorophenols and chloroalkyl ethers, a BPT biological system will remove organic pollutants from wastewaters as long as the influent level is beneath a specific threshold and the influent levels have been stabilized through equalization.

Although treatment efficiencies are uniform throughout the industry, the specific toxics generated vary greatly among OCPSF plants. In order to properly implement the OCPSF effluent guidelines and mitigate the cost of regulating toxics, the following monitoring procedure has been developed.

For each BPT subcategory, EPA has developed a list of toxic pollutants that are likely to be present in the process wastewater (see Tables L–1 through L–8). These lists are based on the site-specific data collected for the OCPSF regulation, other industry data, and process chemistry. Thus for any OCPSF plant, an initial list of potential priority pollutants of concern can be generated based on the plants OCPSF subcategory and product mix.

To better define the pollutants of concern at a particular plant, EPA is considering requiring the collection, analysis, and reporting of six monthly samples at the influent to biological treatment (free of dilution by noncontact cooling water, scrubber blowdown, stormwater, other nonprocess wastewater, and process wastewater that are not derived from OCPSF production and are substantially free of BOD). The toxic pollutants to be analyzed are those listed in Tables L–1 through L–8 for the various subcategories of the OCPSF industry. If a pollutant appeared one or more times above 100 μ/l in the influent or was reported with a detection limit over 100 μ/l, it would be a pollutant of concern.

In addition, a one-time scan of all regulated pollutants would be conducted, again at the biological influent free of dilution. Any pollutant appearing above 100 μ/l or reported with a detection limit over 100 μ/l would be a pollutant of concern.

EPA is considering, and solicits comments on, several regulatory options for using the list of pollutants of concern to minimize unnecessary monitoring and reporting burdens on industry. The Agency may promulgate any of these options, or a variation or combination of them.

These include:

(1) Limiting all pollutants covered by the regulation in the permit and as a pretreatment standard, but requiring frequent monitoring only for pollutants of concern. Other pollutants would be monitored for compliance only occassionally (e.g., once or twice per year).

(2) Limiting only pollutants of concern in the permit and as a pretreatment standard and monitoring only for those pollutants. (New discharges of other pollutants for direct dischargers would be identified only as required by the notification requirements of 40 CFR 122.41(l) and 122.42(a)).

(3) Limiting only pollutants of concern in the permit and as a pretreatment standard but monitoring occasionally (e.g., once or twice per year) for other pollutants covered by the BAT regulation to detect process or other changes that result in the discharge of different pollutants. (Such pollutants could then be addressed by a direct discharge permit modification setting limits for the pollutants. See 40 CFR 122.44(e).)

The Agency solicits comments on these options and other possible options, including different approaches for plants falling into more than one OCPSF subcategory. Commenters should specifically comment on whether a specific option is more appropriate for existing or new sources or direct or indirect discharges.

The Agency estimates that $10,170 is the upper bound cost for conducting the analyses discussed above. This assumes

$1,695 per sample based on using isotope dilution GC–MS methods 1624 and 1625 for volatile and semivolatile organic priority pollutants and assuming an average need for six dilutions for one or more fractions, as well as provide methods for the priority pollutant metals and cyanide. No costs were assumed for the 16 pesticide and 7 PCB priority pollutants, asbestos, and dioxin since these pollutants likely will be excluded from national regulation under the terms of Paragraph 8 of the NRDC Settlement Agreement. The total application cost is calculated by multiplying the once-per-month sample cost by 6 months.

A review of the lists of potential toxic pollutants for each subcategory in Tables L–1 through L–8 indicates that the rayon, other man-made fibers, thermosetting resins, and thermoplastics-only facilities are likely to have much lower application monitoring costs than plants within other subcategories.

If the Agency selects the six month monitoring approach for establishing control requirements, the application information collection requirements will be submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 *et seq.* These requirements would not be effective without OMB's approval. If OMB's approval is not obtained until after promulgation, then a technical amendment to that effect would be published in the **Federal Register.**

Table L–1.—Rayon Subcategory—Potential Toxic Pollutants Present in the Process Wastewater

Acid Compounds

Phenol

Metals

Chromium
Lead
Zinc

Table L–2.—Other Man-Made Fibers Subcategory, Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Acrylonitrile
Benzene
1,1,1-Trichloroethane
Ethylbenzene Cyanide
Toluene

Acid Compounds

Phenol

Metals and Cyanide

Chromium
Copper
Cyanide
Zinc

Table L–3.—Thermosetting Resins Subcategory—Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Acrolein
Acrylonitrile
Benzene
Chlorobenzene
1,2-dichloropropane
Chloroform
1,2-dichloropropane
Methylene chloride
Toluene
Vinyl chloride

Acid Compounds

Phenol

Base/Neutral Compounds

1,2-dichlorobenzene
2,4-dinitrotoluene
Nitrobenzene
Bis(2-ethylhexyl)phthalate

Metals and Cyanide

Antimony
Arsenic
Cadmium
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Silver
Zinc

Table L–4.—Thermoplastics Only Subcategory—Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Acrolein
Acrylonitrile
Benzene
Ethylbenzene
Methylene chloride
Toluene
Vinyl chloride

Acid Compounds

2-chlorophenol
Phenol

Base/Neutral Compounds

Naphthalene
Bis(2-ethylhexyl)phthalate
Di-n-butyl phthalate
Di-n-octyl phthalate
Dimethyl phthalate

Metals

Antimony
Arsenic
Cadmium
Chromium
Copper
Lead
Mercury
Nickel
Selenium
Silver
Zinc

Table L–5.—Thermoplastics and Organics Subcategory—Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Acrolein
Acrylonitrile
Benzene
Carbon tetrachloride
1,2-dichloroethane
1,1,1-trichloroethane
1,1-dichloroethane
1,1,2-trichloroethane
Chloroethane
Chloroform
1,1-dichloroethylene
1,2-trans-dichloroethylene
1,2-dichloropropane
Ethylbenzene
Methylene chloride
Methyl chloride
Toluene
Trichloroethylene
Vinyl chloride

Metals and Cyanide

Antimony
Arsenic
Cadmium
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Silver
Zinc

Acid Compounds

2,4-dichlorophenol
2,4-dimethylphenol
Phenol

Base/Neutral Compounds

1,3-dichlorobenzene
Isophorone
Naphthalene
Bis(2-ethylhexy) phthalate
Acenaphthylene
Anthracene
Fluorene
Phenanthrene
Pyrene

Table L–6—Commodity Organic Chemicals Subcategory—Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Acroleine
Acrylonitrile
Benzene
Carbon Tetrachloride
Chlorobenzene
1,2-dichloroethane
1,1-dichloroethane
1,1,2-trichloroethane
Chloroethane
1,1-dichloroethylene
1,2-trans-dichloroethylene
1,2-dichloropropane
1,3-dichloropropylene
Ethylbenzene
Methlylene chloride
Methyl chloride

Toluene

Acid Compounds

2,4,6-trichlorophenol
p-chloro-m-cresol
2,4-dichlorophenol
2,4-dimethylphenol
2-nitrophenol
2,4-dinitrophenol
Phenol

Base/Neutral Compounds

Acenaphthene
Hexachlorobenzene
Hexachloroethane
1,2-dichlorobenzene
1,4-dichlorobenzene
2,4-dinitrotoluene
Fluoranthene
Isophorone
Naphthalene
Nitrobenzene
Bis(2-ethylhexyl) phthalate
Di-n-butyl phthalate
Dimethyl phthalate
3,4-benzofluoranthene
Benzo (k) fluoranthene
Chrysene
Acenaphthylene
Anthracene
Fluorene
Phenanthrene
Pyrene

Metals and Cyanide

Cadmium
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Zinc

Table L-7.—Bulk Organic Chemicals Subcategory—Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Arcolein
Acrylonitrile
Benzene
Carbon tetrachloride
Chlorobenzene
1,2-dichloroethane
1,1,1-trichloroethane
1,1-dichloroethane
1,1,2-trichloroethane
Chloroethane
Chloroform
1,1-dichloroethylene
1,2-trans-dichloroethylene
1,2-dichloropropane
Ethylbenzene
Methylene Chloride
Methyl chloride
Tetrachloroethylene
Toluene
Trichloroethylene

Acid Compounds

2,4,6-trichlorophenol
2-chlorophenol
2,4-dichlorophenol
2,4-dimethylphenol
2-nitrophenol
4-nitrophenol
2,4-dinitrophenol
4,6-dinitro-o-cresol
Phenol

Base/Neutral Compounds

Acenaphthene
1,2,3-trichlorobenzene
Hexachlorobenzene
1,2-dichlorobenzene
1,3-dichlorobenzene
1,4-dichlorobenzene
3,3'-dichlorobenzidine
2,4-dinitrotoluene
2,6-dinitrotoluene
Naphthalene
Nitrobenzene
N-nitroso-di-n-propylamine
Butyl benzyl phthalate
Di-n-butyl phthalate
Benzo(a) Pyrene
Chrysene
Acenaphthylene
Anthracene
Fluorene
Phenanthrene
Pyrene

Metals and Cyanide

Antimony
Arsenic
Cadmium
Chromium
Copper
Cyanide
Lead
Mercury
Nickel
Selenium
Zinc

Table L-8.—Specialty Organic Chemicals Subcategory—Potential Toxic Pollutants in the Process Wastewater

Volatile Compounds

Acrolein
Acrylonitrile
Benzene
Carbon tetrachloride
Chlorobenzene
1,2-dichloroethane
1,1,1-trichloroethane
1,1-dichloroethane
1,1,2-trichloroethane
Chloroethane
Chloroform
1,1-dichloroethylene
1,2-trans-dichloroethylene
1,2-dichloropropane
Ethylbenzene
Methylene chloride
Methyl chloride
Tetrachloroethylene
Toluene
Trichloroethylene
Vinyl chloride

Acid Compounds

2,4,6-trichlorophenol
2-chlorophenol
Phenol

Base/Neutral Compounds

1,2,3-trichlorobenzene
1,2-dichlorobenzene
1,4-dichlorobenzene
Naphthalene
Nitrobenzene
Di-n-butyl phthalate
Di-n-octyl phthalate
Diethyl phthalate
Dimethyl phthalate

Metals and Cyanide

Antimony
Arsenic
Cadmium
Chromium
Copper
Cyanide

V. Preliminary Data Analysis—Economic

This notice also makes available for comment the results of additional economic analysis. These results are summarized below and are discussed in detail in the *Economic Impact Analysis of Effluent Limitations and Standards for Notice of Data Availability for the Organic Chemicals, Plastics, and Synthetic Fibers Industry.* This report incorporates EPA's consideration of public comments, the collection efforts for economic and financial data, and the preliminary revisions to the estimated compliance costs based on the technical reanalysis discussed in Section IV, and the preliminary economic impacts.

A. The Revised Economic Impact Methodology

Based on comments received at proposal and the survey collection efforts, EPA has substantially revised the economic impact methodology. The economic analysis at proposal was driven by a product/process supply-demand analysis. This analysis fit well into the proposed subcategorization scheme based on generic product/processes. EPA now plans to use a plant-by-plant analysis as the prime analysis to estimate economic impacts. Three factors have led to this change: the substantial adverse public comments on the plant closure analysis at proposal, the availability of new plant-specific economic and financial data from the new survey, and the newly revised subcategorization scheme presented in this notice.

The revised economic analysis also reflects a change in the baseline year from 1985 to 1988. Three factors influenced this change. First, promulgation of these rules is expected in 1986, making a compliance date of 1988 realistic. Second, while the economic data collected from plants are based on 1982, this year was bad economically for the industry and not representative of likely future conditions. Based on the cyclical pattern of economic activity in this industry and

projected macroeconomic conditions, 1988 is projected to be a more representative year for the industry than 1982. Third, the compliance costs are estimated based on production and wastewater flows from 1980, a better year for the industry. Using 1982 data would overestimate the economic impact of these rules; using 1988 mitigates the potential of this happening.

The primary economic analysis is a discounted cash flow (DCF) analysis for estimating plant closures. Employment and production impacts are estimated from the DCF analysis. A DCF analysis compares expected net revenues over a ten year period to the value of liquidating plant assets today and investing the proceeds elsewhere. Numerous other analyses are also conducted: changes in plant profitability, increases to costs of production, liquidity analysis, firm-level analysis and a foreign trade assessment of production at risk. The product/process supply-demand analysis is used to profile industry conditions for the baseline.

EPA is also revising its analysis of the relative impacts among small and large businesses. No substantial economic impacts were projected at proposal; however, EPA is evaluating small business impacts by examining the relative impact between small and large facilities.

B. BPT

For BPT Option I (Biological Only), the Agency estimates that capital investment costs will total $277 million and total annualized costs $131 million for 304 affected direct dischargers (1982 dollars). Four plants are expected to close. Additionally, organics and plastics production lines at six other facilities are expected to shut down. The total expected employment loss at the ten affected plants equals 251 jobs, or 0.1 percent of industry employment.

For BPT Option II (Biological Treatment With and Without Polishing Ponds), EPA estimates that capital investment costs will total $294 million and total annualized costs, $139 million. Four plants are expected to close and the organics and plastics production lines at six additional facilities are expected to shut down. The total expected employment loss equals 251 jobs. (0.1 percent of industry employment). Separate impacts for Option III have not been estimated for this notice but are expected to be the same as those estimated for Option II.

C. BAT

Those direct dischargers that are required to install biological treatment to meet BPT limitations (for conventional pollutants) are not expected to incur any incremental costs under BAT Option I. A small number of direct dischargers will be able to meet the conventional pollutant limitations without installing biological or post-biological treatment. Less than 20 percent of the direct dischargers would need to install in-process treatment controls in order to meet priority pollutant limitations based on BPT/BAT Option I technology. The costs for these plants to meet BAT Option I limitations are now included under BAT Option II. Thus, the estimated costs of compliance and resulting economic impacts for BAT Option I are expected to be between those estimated for BPT Option II and BAT Option III.

The incremental compliance costs beyond BPT for BAT Option II are expected to equal $607 million in capital investment and $415 million in total annualized costs. Eleven additional plants are projected to close under BAT. In addition, the organics and plastics production lines at eleven other facilities are expected to shut down. The expected employment loss (incremental to BPT losses) is 3,966 jobs at the 22 affected plants, or 2.1 percent of industry employment.

For BAT Option III, the incremental capital investment costs beyond BPT Option II are expected to equal $1,437 million and total annualized costs, $677 million. Twenty plants beyond those closing at BPT are expected to close and the organics and plastics production lines at 19 other facilities are expected to shut down. The employment loss (incremental to BPT losses) at the 39 affected plants is estimated at 9,906 jobs, or 5.3 percent of industry employment.

D. PSES

The costs and impacts for PSES Option I are expected to be lower than for PSES Option II.

For PSES Option III, capital investment costs are expected to total $189 million and total annualized costs $135 million for 404 affected indirect dischargers. Sixteen plants are projected to close. In addition, organics and plastics production lines at 28 other facilities would be expected to shut down. The total expected employment loss at the 44 affected plants would equal 1,073 jobs, or 0.6 percent of industry employment.

For PSES II (which includes in-process treatment and either biological treatment or filtration for additional control of specific pollutants) EPA estimates that capital investment costs will total $304 million and total annual costs, $166 million. These capital and annual costs are 61 percent and 23 percent higher, respectively than the costs estimated for physical/chemical treatment alone (i.e., for PSES Option III). Nineteen plants are expected to close and the organic chemicals and plastics production lines at 37 other facilities are expected to shut down. The projected total employment loss at the 56 affected indirect dischargers equals 1,595 jobs, or 0.8 percent of industry employment.

E. PSNS and NSPS

For control of priority and nonconventional pollutants, the treatment options for direct and indirect new sources are identical to those being considered for existing sources. EPA anticipates that a more stringent requirement for new sources may be selected and, therefore, some incremental costs will be incurred above the costs existing sources are expected to face.

For the control of conventional pollutants in NSPS, EPA is considering the same three technology bases as for the BPT regulations; however BPT Option III (Biological Treatment Plus Filtration) is likely to be selected for NSPS, and thus require more stringent controls than for existing dischargers.

For all subcategories except Other Man-Made Fibers, EPA expects that limitations for Biological Treatment Plus Filtration will be more than those for BPT options I and II. The Agency has evaluated the impact of incremental costs of compliance with this NSPS option for model plants in each subcategory. The incremental costs to the model plants' estimated sales are very small, ranging from 0.07 to 0.5 percent of sales. The expected reductions in profitability range from 1.6 to 16.0 percent. The largest reductions would be incurred by producers in the Rayon Subcategory, followed by producers in the Specialty Organics subcategory.

For the control of priority pollutants in NSPS, EPA is considering the same technology bases as for existing sources; however, BAT Option III is more likely to be chosen for NSPS. The Agency have evaluated the impact of incremental costs of compliance with this NSPS option (assuming that existing direct dischargers will meet BAT Option II). (If NSPS equals BAT, significant barriers to entry would not be likely. Therefore, this analysis focuses on the case where NSPS is more stringent than BAT.) Because of the wide variety of products and processes in the industry, the

analysis is based on the incremental effects on existing dischargers.

EPA has evaluated the range of incremental profitability and liquidity reductions associated with going from BAT Option II to BAT Option III for direct dischargers. This analysis can describe the range of differential impacts that would be caused if the final selected new source option is based on BAT Option III.

The additional costs associated with BAT Option III have a wide range of effects on plant profitability. The additional cost of BAT Option III over expenditures for BAT Option II causes a median plant profit reduction of 15 percent. However, the range of profit reduction is zero to 79 percent for the tenth and ninetieth percentiles, respectively.

The results of the liquidity reduction analysis are somewhat similar. The incremental liquidity reductions in going from BAT Option II to BAT Option III range from a low of zero percent (10th percentile) to a high of 58 percent (90th percentile). The median liquidity reduction is nine percent. The range of values for the incremental liquidity measure does not appear to be correlated with the liquidity impacts at BAT Option II.

F. Regulatory Flexibility Analysis

Pub. L. 96-354 requires that a Regulatory Flexibility Analysis be prepared for regulations that are proposed after January 1, 1981 that have a significant impact on a substantial number of small entities. The analysis may be done in conjunction with, or as a part of, any other analysis conducted by the Agency. A preliminary small business analysis is included in the draft economic impact analysis accompanying this notice.

The Agency is redefining its definition of small businesses for this regulation. At proposal, the Agency set a definition of facilities with less than 50 employees. The new definition identifies as small those plants with annual OCPSF sales of less than $5 million. The Agency invites comment on the revised small business definition and the analytical approach used to derive it. (This approach is detailed in the draft report).

The analysis of the relative impacts between small and large plants shows that small plants may be significantly affected by the BPT and PSES regulations. The groups of plants most severely affected are the small organic chemical manufacturers except those falling under the Commodity Organics subcategory, and manufacturers of thermoplastic and thermosetting resins without significant production of organic chemicals.

Therefore, the Agency is considering alternative regulatory approaches for small businesses, primarily within these groups. The alternatives include either less stringent effluent limitations or exemptions entirely from the effluent limitations for small business.

In determining size cutoffs for either alternative, the Agency is examining different measures for small plants. First, the Agency believes that the small business definition of less than $5 million in OCPSF sales currently identifies the sector of small businesses that could be affected. However, in practice, this measure would not be appropriate in the long-term because the value of sales will increase over time because of inflation. Thus, fewer and fewer plants would fall into this category over time, rendering the exemption obsolete. Second, the Agency is considering using tons of OCPSF products manufactured annually as a measure. If this measure were to be used, the Agency would likely define different levels of production for cutoffs among segments of the industry with different unit values of production to ensure that the correct portion of the industry is being protected. A single production cutoff across the whole industry is unlikely. Third, the Agency is considering a wastewater flow size cutoff. The advantages of a flow cutoff are that the information needed by the permit writer to determine the size is readily available. However, as the Agency's work on attempting to set mass-based limitations in the past has shown, there is a generally weak correlation between production and wasterwater flow in this industry. Therefore, the exemption may not affect the particular segment of the industry in need of relief.

The Agency requests comments on the small business definition and whether the Agency should consider alternative regulatory levels for small businesses.

G. RCRA Baseline Analysis

Shortly before publication of this Notice, the economic impact analysis was run including all of the baseline RCRA costs described in section IV(H). (The impacts previously described included only the one time site inspection costs.) Because these costs are included in the baseline—the costs will be incurred regardless of the requirements of this regulation—the incremental closures associated with this effluent guideline have been reanalyzed. The impacts are lower for the effluent guideline when all the baseline costs are included because some plants now close in the baseline analysis of RCRA instead of closing as a result of the regulation.

The total RCRA baseline costs for this industry are projected to be $31 million in capital investment, and $13.8 million in total annualized costs.

At BPT, the six plants projected to close their organics and plastics production lines are the same. At BPT Option I, one plant less is projected to close at this option (three versus the four plants discussed above). At BPT Option II, one additional plant is expected to close, for a total of five plants. The employment impacts including all the RCRA baseline costs are 198 and 397 for BPT Option I and II respectively, compared to the 251 job losses described above.

For the BAT Options, the plant closure estimates are slightly smaller. Under BAT Option II, plant closures drop from 11 to 10, while under BAT Option III, plant closures drop from 20 to 18. Production line closures remain the same at either option. Because the set of plants closing under Options II with the RCRA costs included in the baseline are somewhat larger, the employment losses rise from 3,996 to 4,527 jobs even though one less plant closes. Under BAT Option III, the reduction in plant closures causes a drop in employment losses from 9,906 to 9,707 jobs.

For the PSES Options, the plant closures and employment losses increase slightly with the inclusion of the remaining RCRA baseline costs. Under PSES Option III, one additional plant is expected to close its organics and plastics production lines (29 versus 28) for an incremental employment loss of three jobs (1,076 versus 1,073). Under PSES Option II, the one additional production line closure (38 versus 37) is expected to cause an incremental employment loss of five jobs (1,600 versus 1,595). Plant closures are projected to remain at 16 and 19 plants for PSES Options III and II, respectively.

H. Cost-effectiveness Analysis

EPA has conducted an analysis of the incremental cost per pound-equivalent removed for the technology-based options. A pound-equivalent is calculated by multiplying the number of pounds of pollutants discharged by toxic weighting factor for that pollutant. The weighting factors give relatively more weight to removal of more highly toxic pollutants. Thus, for a given expenditure and pounds removed, the cost per pound-equivalent removed would be lower when a highly toxic pollutant is removed than if a less toxic pollutant is removed.

The methodology used in this analysis, unlike cost-effectiveness analyses for previous effluent guidelines, incorporates into the computations consideration of air emissions of volatile organic chemicals from process wastewaters. Removal of these pollutants is counted towards the cost-effectiveness of the regulation since the treatment technologies remove the substances from wastewaters. Furthermore, the toxic weighting factors (which are generally based solely on aquatic life criteria) also include proxy criteria for toxicity and carcinogenicity effects to humans through inhalation of volatile organic chemicals.

The cost-effectiveness analysis is included in the record of this rulemaking. The Agency invites comments on the analysis, particularly the inclusion of inhalation effects associated with the volatile organic chemicals.

IV. Executive Order 12291

Executive Order 12291 requires EPA and other agencies to perform regulatory impact analyses of major regulations. Major rules impose an annual cost to the economy of $100 million or more or meet other criteria. Implementation of the proposed regulation for the Organic Chemicals, Plastics and Synthetic Fibers Industry has been projected to cost over $100 million annually and thus is a major rule.

Water quality impacts have been analyzed (using treatment levels in this notice) for 81 direct discharge OCPSF facilities. EPA's published water quality criteria for priority pollutants are used to assess water quality impacts. The analyses project that under existing conditions, over 60 percent of the 81 OCPSF facilities exceed water quality criteria (depending on the criteria used). However, the projected exceedances of water quality criteria will be reduced by as much as 50 percent (depending on criteria used) by implementing the BAT levels in this notice.

In addition to the water-quality impact analyses at 81 OCPSF facilities, three site-specific assessments of the specific health and environmental benefits that may result from the proposed regulations are currently in progress. The results reported in the March 21, 1983 **Federal Register** for the Kanawha River (West Virginia) and Houston Ship Channel (Texas) case studies will be reexamined to incorporate the new 308 data, the new BPT and BAT options, and ozone reduction benefits from controlling the volatilization of volatile organic chemicals (VOCs) that photochemically react in the troposphere to form ozone (smog). Currently, a third case study on the Delaware River is being conducted. This case study will include recreational and other non-health benefits, health benefits, and potential ozone reduction benefits.

An analysis of the national magnitude and nature of the VOC intermedia transfer problem (removal of VOCs from the receiving water body through biological treatment may result in volatilization into the air from treatment ponds) will be conducted prior to promulgation.

VII. Solicitation of Comments

This notice announces the availability of a substantial body of new data gathered by EPA. EPA has expended considerable resources to collect this data to respond to comments that the data base used at proposal was not adequate to support the proposed regulations. EPA believes that its expanded data set provides an adequate basis for the regulations decribed in this notice. However, EPA continues to solicit data relevant to all aspects of this rulemaking. Such data, is submitted, should be accompanied by sufficiently detailed information to indicate its nature, origin, and quality.

This notice also presents many new analyses and regulatory options. EPA solicits comments on all of these analyses and options. Commenters should be aware that EPA may promulgate regulations that incorporate any of these options, variations on the options, or combinations of the options. Comments should be made with these possibilities in mind.

In addition to the solicitation of comments on technical data and regulatory options discussed throughout this notice, EPA solicits comments on the following economic issues.

(1) The economic impact analysis for this notice does not include baseline effects of CERCLA requirements in evaluating the economic achievability of these rules. EPA invites comments on the effect of the CERCLA taxes on the ability of this industry to afford the effluent guideline rules.

(2) The Agency requests comments on the economic impact analysis methodology. In particular, EPA requests comments on the plant closure analysis.

(3) EPA solicits comments on the financial data used to model the industry. Where the questionnaire data were unavailable, EPA used industry averages to estimate economic impacts. The Agency invites comments, supported by appropriate data.

(4) The Agency also requests comments on the plan to define small businesses as facilities with less than $5 million in annual shipments of OCPSF products—i.e., whether alternative levels or criteria more appropriately define small business in this industry.

(5) EPA asks for comments on the cost-effectiveness analysis for this industry, which incorporates consideration of air emission of volatile organic chemicals.

(6) EPA solicits comments on the foreign trade analysis performed for this analysis. In particular, commenters are requested to provide data on those products which would become less competitive as a result of these rules.

List of Subjects

40 CFR Part 414

Chemicals, Water pollution control, Waste treatment and disposal.

40 CFR Part 416

Plastics materials and synthetics, Water pollution control, Waste treatment and disposal.

Dated: July 1, 1985.

Edwin L. Johnson,

Acting Assistant Administrator for Water.

[FR Doc. 85-16589 Filed 7-16-85; 8:45 am]

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Federal Register

Wednesday
July 17, 1985

Part III

Department of Labor

Office of the Secretary

Recordkeeping Guidelines for Occupational Injuries and Illnesses Under the Occupational Safety and Health Act of 1970 and 29 CFR Part 1904; Request for Comment

DEPARTMENT OF LABOR

Office of the Secretary

Recordkeeping Guidelines for Occupational Injuries and Illnesses Under the Occupational Safety and Health Act of 1970 and 29 CFR Part 1904; Request for Comment

Background

On July 20, 1984 (49 FR 29484), the Bureau of Labor Statistics (BLS), U.S. Department of Labor, announced in the **Federal Register** in accordance with the Paperwork Reduction Act (44 U.S.C. Chapter 35) that it was proposing a revision in its recordkeeping package for the Log and Summary of Occupational Injuries and Illnesses (OSHA No. 200) and Supplementary Record of Occupational Injuries and Illnesses (OSHA No. 101). The proposal consisted of revised recordkeeping guidelines, Recordkeeping Guidelines for Occupational Injuries and Illnesses, which BLS made available to the public for comment. After reviewing the public comments, the BLS felt that further modifications were needed, and decided to substitute the guidelines which had been in effect since 1978, Report 412–3, "What Every Employer Needs to Know About OSHA Recordkeeping," as interim guidelines for the recordkeeping package. The Office of Management and Budget (OMB) subsequently approved the continued use of the existing log and summary (OSHA No. 200), supplementary record (OSHA No. 101), and Report 412–3, assigning approval number 1220–0029 to each of the forms, and to Report 412–3.

Subsequent Review Completed

BLS evaluated the comments received on the initial draft, and modified the document to address many of the expressed concerns. BLS also utilized input from: the Occupational Safety and Health Administration (OSHA); the Labor Department's Office of the Solicitor (SOL); the National Institute for Occupational Safety and Health, Department of Health and Human Services (NIOSH); and the BLS Business Research Advisory Council and Labor Research Advisory Council Committees on Occupational Safety and Health Statistics. In addition to modifying the detailed recordkeeping guidelines published previously, BLS developed an abbreviated version of the guidelines as a ready reference, and to assist employers with small-sized establishments or firms in low hazard industries.

Comments and Questions:

To facilitate public review both the long and short versions of the BLS recordkeeping guidelines are presented in their entirety in the sections that follow. Written comments or questions concerning either of these documents should be directed to William M. Eisenberg, Office of Occupational Safety and Health Statistics, U.S. Department of Labor, 601 D Street, N.W., Room 4014, Washington, D.C. 20212, telephone (202) 272–3467.

Dates:

Written comments must be submitted no later than October 15, 1985.

Signed at Washington, D.C. this 8th day of July, 1985.

Paul E. Larson,

Departmental Clearance Office.

SECTION I

Recordkeeping Guidelines for Occupation Injuries and Illnesses: Ready Reference

The Occupational Safety and Health Act of 1970 and 29 CFR 1904

U.S. Department of Labor, Bureau of Labor Statistics, 1985

Preface

The information in this pamphlet briefly explains the requirements of the Occupational Safety and Health Act of 1970 and 29 CFR Part 1904 for recording and reporting occupational injuries and illnesses. The Occupational Safety and Health Act of 1970 requires employers to prepare and maintain records of occupational injuries and illnesses. The Act made the Secretary of Labor responsible for the collection, compilation, and analysis of statistics of work-related injuries and illnesses. The Bureau of Labor Statistics (BLS) administers this recordkeeping and reporting system. In most States, a State agency cooperates with BLS in administering these programs.

Records of injuries and illnesses are necessary for carrying out the purposes of the Act. They provide a basis for a statistical program which produces reliable injury and illness data which are used by OSHA in directing the agency's efforts. The records are also helpful to employers and employees in identifying many of the factors which cause injuries or illnesses in the workplace. In addition, OSHA records are designed to assist safety and health compliance officers in making OSHA inspections.

This pamphlet summarizes the OSHA recordkeeping requirements of 29 CFR Part 1904, and provides basic instructions and guidelines to assist employers in fulfilling their recordkeeping and reporting obligations. Many specific standards and regulations of the Occupational Safety and Health Administration (OSHA) have additional requirements for the maintenance and retention of records of medical surveillance, exposure monitoring, inspections, accidents and other activities and incidents relevant to occupational safety and health, and for the reporting of certain information to employees and to OSHA. These additional requirements are not covered in this pamphlet. For information on these requirements, employers should refer directly to the OSHA standards or regulations or contact their OSHA Area Office.

Further information on the requirements outlined in this pamphlet is available in the free detailed report, Recordkeeping Guidelines for Occupational Injuries and Illnesses, which may be obtained by using the order form on the inside of the back cover. Assistance can also be obtained by contacting the BLS regional office for your area. These are also listed on the inside of the back cover.

The following government agencies are involved in OSHA recordkeeping:

A. *The Occupational Safety and Health Administration, U.S. Department of Labor.* The Occupational Safety and Health Administration is responsible for developing, implementing, and enforcing safety and health standards and regulations. OSHA works with employers and employees to foster effective safety and health programs which reduce workplace hazards.

B. *Bureau of Labor Statistics, U.S. Department of Labor.* The Bureau of Labor Statistics is responsible for administering and maintaining the OSHA recordkeeping system, and for collecting, compiling, and analyzing work injury and illness statistics. A list of BLS Regional Offices is provided inside the back cover of this pamphlet.

C. *State Agencies.* Many States cooperate with BLS in administering the OSHA recordkeeping and reporting programs. Some States have their own safety and health laws which may impose different or additional obligations. Employers should consult their State safety and health laws concerning these requirements.

These guidelines were prepared in the Office of Occupational Safety and Health Statistics, by Stephen Newell, under the general direction of William M. Eisenberg, Acting Associate Commissioner.

Contents

I. Employers Subject to the Recordkeeping Requirements of the Occupational Safety and Health Act of 1970

The recordkeeping requirements of the Occupational Safety and Health Act of 1970 apply to almost all private sector employers in all 50 States, the District of Columbia, Puerto Rico, the Virgin Islands, American Samoa, Guam, and the Trust Territories of the Pacific Islands.

A. Employers Who Must Keep OSHA Records

Employers with 11 or more employees in the following industries must keep OSHA records. The industries are identified by name and by the appropriate Standard Industrial Classification (SIC) code.

- Agriculture, forestry, and fishing (SIC's 07–09);
- Oil and gas extraction (SIC 13);
- Construction (SIC's 15–17);
- Manufacturing (SIC's 20–39);
- Transportation and public utilities (SIC's 40–49);
- Wholesale trade (SIC's 50–51);
- Building materials and garden supplies (SIC 52);
- General merchandise and food stores (SIC's 53 and 54);
- Hotels and other lodging places (SIC 70);
- Repair services (SIC's 75 and 76);
- Amusement and recreation services (SIC 79); and
- Health services (SIC 80).

If employers in agriculture, forestry, and fishing; oil and gas extraction; construction; manufacturing; transportation and public utilities; and wholesale trade have more than one establishment with combined employment of 11 or more employees, records must be kept for *each* individual establishment.

B. Employers Who Infrequently Must Keep OSHA Records

Employers in the industries listed below are normally exempt from OSHA recordkeeping. However, each year a small rotating sample of these employers is required to keep records and participate in a mandatory statistical survey of occupational injuries and illnesses. Their participation is necessary to produce national estimates of occupational injuries and illnesses for *all* employers (both exempt and nonexempt) in the private sector. If an employer who is regularly exempt is selected to maintain records and participate in the Annual Survey of Occupational Injuries and Illnesses, he will be notified in advance and supplied with the necessary forms and instructions. Employers who normally do not have to keep OSHA records include:

1. All employers with no more than 10 full- or part-time employers *at any one time* in the previous calendar year.

2. Employers in the following retail trade, finance, insurance and real estate, and services industries (identified by SIC codes):

- Automotive dealers and gasoline service stations (SIC 55);
- Apparel and accessory stores (SIC 56);
- Furniture, home furnishings, and equipment stores (SIC 57);
- Eating and drinking places (SIC 58);
- Miscellaneous retail (SIC 59);
- Banking (SIC 60);
- Credit agencies other than banks (SIC 61);
- Security, commodity brokers, and services (SIC 62);
- Insurance (SIC 63);
- Insurance agents, brokers, and services (SIC 64);
- Real estate (SIC 65);
- Combined real estate, insurance, etc. (SIC 66);
- Holding and other investment offices (SIC 67);
- Personal services (SIC 72);
- Business services (SIC 73);
- Motion pictures (SIC 78);
- Legal services (SIC 81);
- Educational services (SIC 82);
- Social services (SIC 83);
- Museums, botanical, zoological gardens (SIC 84);
- Membership organizations (SIC 86);
- Private households (SIC 88); and
- Miscellaneous services (SIC 89).

Even though recordkeeping requirements are reduced for employers in these industries, they, like nonexempt employers, must comply with OSHA standards, display the OSHA poster, and report to OSHA within 48 hours any accident which results in one or more fatalities or the hospitalization of five of more employees. Also, some State safety and health laws may require regularly exempt employers to keep injury and illness records.

C. Employers and Individuals Who Never Keep OSHA Records

The following employers and individuals do not have to keep OSHA injury and illness records:

- *Self employed individuals;*
- *Partners with no employees;*
- *Employers of domestics* in the employers' private residence for the purposes of housekeeping or child care, or both; and
- *Employers engaged in religious activities* concerning the conduct of religious services or rites. Employees engaged in such activities; include clergy, choir members, organists and other musicians, ushers, and the like. However, records of injuries and illnesses occurring to employees while performing secular activities must be kept. Recordkeeping is also required for employees of private hospitals and certain commercial establishments owned or operated by religious organizations.

State and Local Government Agencies are usually exempt from OSHA recordkeeping. However, in certain States, agencies of State and local governments are required to keep injury and illness records in accordance with State regulations.

D. Employers Subject to Other Federal Safety and Health Regulations

Employers subject to injury and illness recordkeeping requirements of other Federal safety and health regulations are not exempt from OSHA recordkeeping. However, records used to comply with other Federal recordkeeping obligations may also be used to satisfy the OSHA recordkeeping requirements. The forms used must be equivalent to the log and summary (OSHA No. 200) and the supplementary record (OSHA No. 101).

II. OSHA Recordkeeping Forms

Only two forms are used for OSHA recordkeeping. One form, the OSHA No. 200, serves as both the Log of Occupational Injuries and Illnesses, on which the occurrence and extent of cases are recorded during the year; and as the Summary of Occupational Injuries and Illnesses, which is used to summarize the log at the end of the year to satisfy employer posting obligations. The other form, the Supplementary Record of Occupational Injuries and

Illnesses, OSHA No. 101, provides additional information on each of the cases that have been recorded on the log.

A. The Log and Summary of Occupational Injuries and Illnesses, OSHA No. 200

The log is used for recording and classifying occupational injuries and illnesses, and for noting the extent of each case. The log shows when the occupational injury or illness occurred, to whom, the regular job of the injured or ill person at the time of the injury or illness exposure, the department in which the person was employed, the kind of injury or illness, how much time was lost, and the final determination of the case. The log consists of three parts: A descriptive section which identifies the employee and briefly describes the injury or illness; a section covering the extent of the injuries recorded; and a section on the type and extent of illnesses.

Usually, the OSHA No. 200 form is used by employers as their record of occupational injuries and illnesses. However, a private form equivalent to the log, such as a computer printout, may be used if it contains as much detail as the OSHA No. 200 and is as readable and comprehensible as the OSHA No. 200 to a person not familiar with the equivalent form. It is important that the columns of the equivalent form have the same identifying number as the corresponding columns of the OSHA No. 200 because the instructions for completing the survey of occupational injuries and illnesses refer to log columns by number. It is advisable that employers have private equivalents of the log form reviewed by BLS to insure compliance with the regulations.

The portion of the OSHA No. 200 to the right of the dotted vertical line is used to summarize injuries and illnesses in an establishment for the calendar year. Every nonexempt employer who is required to keep OSHA records must prepare an annual summary for each establishment based on the information contained in the log for each establishment. The summary is prepared by totaling the column entries on the log (or its equivalent) and signing and dating the certification portion of the form at the bottom of the page.

B. The Supplementary Record of Occupational Injuries and Illnesses, OSHA No. 101

For every injury or illness entered on the log, it is necessary to record additional information on the supplementary record, OSHA No. 101. The supplementary record describes how the accident or illness exposure occurred, lists the objects or substances involved, and indicates the nature of the injury or illness and the part(s) of the body affected.

The OSHA No. 101 is not the only form that can be used to satisfy this requirement. To eliminate duplicate recording, workers' compensation, insurance, or other reports may be used as supplementary records if they contain all of the items on OSHA No. 101. If they do not, the missing items must be added to the substitute or included on a separate attachment.

Completed supplementary records must be present in the establishment within six workdays after the employer has received information that an injury or illness has occurred.

III. Location, Retention, and Maintenance of Records

Ordinarily, injury and illness records must be kept by employers for *each* of their establishments. This chapter describes what is considered to be an establishment for recordkeeping purposes, where the records must be located, how long they must be kept, and how they should be updated.

A. Establishments

If an employer has more than one establishment, a separate set of records must be maintained for each one. The recordkeeping regulations define an establishment as "a single physical location where business is conducted or where services or industrial operations are performed." Examples include a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office.

The regulations specify that distinctly separate activities performed at the same physical location (for example, contract construction activities operated from the same physical location as a lumber yard) shall each be treated as a separate establishment for recordkeeping purposes. Production of dissimilar products; different kinds of operational procedures; different facilities; and separate management, personnel, payroll, or support staff are all indicative of separate activities and separate establishments.

B. Location of Records

Injury and illness records (the log, OSHA No. 200, and the supplementary record, OSHA No. 101) must be kept for every physical location where operations are performed. Under the regulations, the location of these records depends upon whether or not the employees are associated with fixed establishment. The distinction between fixed and nonfixed establishments generally rests on the nature and duration of the operation and not on the type of structure in which the business is located. A nonfixed establishment usually operates at a single location for a relatively short period of time. A fixed establishment remains at a given location on a long-term or permanent basis. Also, fixed establishments are generally places where clerical, administrative, or other business records are kept.

1. *Employees associated with fixed establishments.* Records for these employees should be located as follows:

a. Records for employees working at fixed locations, such as factories, stores, restaurants, warehouses, etc., should be kept at the work location.

b. Records for employees who report to a fixed location but work elsewhere should be kept at the place where the employees report each day. These employees are generally engaged in activities such as agriculture, construction, transportation, etc.

c. Records for employees whose payroll or personnel records are maintained at a fixed location, but who do not report or work at a single establishment, should be maintained at the base from which they are paid or the base of their firm's personnel operations. This category includes generally unsupervised employees such as traveling salespeople, technicians, or engineers.

2. *Employees not associated with fixed establishments.* Some employees are subject to common supervision, but do not report or work at a fixed establishment on a regular basis. These employees are engaged in physically dispersed activities that occur in construction, installation, repair, or service operations. Records for these employees should be located as follows:

a. Records may be kept at the field office or mobile base of operations.

b. Records may also be kept at an established central location. If the records are maintained centrally: (1) The address and telephone number of the place where records are kept must be available at the worksite; and (2) there must be someone available at the central location during normal business hours to provide information from the records.

C. Location Exception for the Log (OSHA No. 200)

Although the supplementary record and the annual summary must be located as outlined in the previous section, it is possible to prepare and maintain the *log* at an alternate location

or by means of data processing equipment, or both. Two requirements must be met: (1) Sufficient information must be available at the alternate location to complete the log within 6 workdays after receipt of information that a recordable case has occurred; and (2) a copy of the log updated to within 45 calendar days must be present at all times in the establishment. This location exception applies only to the log, and not to the other OSHA records. Also, it does not affect the employer's posting obligations.

D. Retention of OSHA Records

The log and summary, OSHA No. 200, and the supplementary record, OSHA No. 101, must be retained in each establishment for 5 calendar years following the end of the year to which they relate. If an establishment changes ownership, the new employer must preserve the records for the remainder of the 5-year period. However, the new employer is not responsible for updating the records of the former owner.

E. Maintenance of the Log (OSHA No. 200)

In addition to keeping the log on a calendar year basis, employers are required to update this form to include newly discovered cases and to reflect changes which occur in recorded cases after the end of the calendar year. Maintenance or updating of the log is different from the retention of records discussed in the previous section. Although all OSHA injury and illness records must be retained, only the log must be maintained by the employer.

If during the 5-year retention period, there is a change in the extent or outcome of an injury or illness which affects an entry on a previous year's log, then the first entry should be lined out and a corrected entry made on that log. Also, new entries should be made for previously unrecorded cases that are discovered or for cases that initially weren't recorded but were found to be recordable after the end of the year in which the case occurred. The entire entry should be lined out for recorded cases that are later found nonrecordable.

IV. Deciding Whether a Case Should Be Recorded and How To Classify It

This chapter presents guidelines for determining whether a case must be recorded under the OSHA recordkeeping requirements. These requirements should not be confused with recordkeeping requirements of various workers' compensation systems, internal industrial safety and health monitoring systems, the ANSI Z.16 standards for recording and measuring work injury and illness experience, and private insurance company rating systems. Reporting a case on the OSHA records should not affect recordkeeping determinations under these or other systems. Also,

Recording an injury or illness under the OSHA system does not necessarily imply that management was at fault, that the worker was at fault, that a violation of an OSHA standard has occurred, or that the injury or illness is compensable under workers' compensation or other systems.

A. Employees vs. Other Workers On Site

Employers must mantain injury and illness records for their own employees at each of their establishments, but they are *not* responsible for maintaining records for employees of other firms or for independent contractors, even though these individuals may be working temporarily in their establishment or on one of their jobsites at the time an injury or illness exposure occurs. Therefore, before deciding whether a case is recordable an employment relationship needs to be determined.

Employee status generally exists when the employer supervises not only the output, product, or result to be accomplished by the person's work, but also the details, means, methods, and processes by which the work is accomplished. Independent contractors are not considered employees; they are primarily subject to supervision by the using firm only in regard to the result to be accomplished or end product to be delivered.

Other Factors which should be considered in determining employee status are: (1) Whom the worker considers to be his or her employer; (2) who pays the worker's wages; (3) who withholds the worker's Social Security taxes; (4) who hired the worker; and (5) who has the authority to terminate the worker's employment.

B. Method Used for Case Analysis

The decisionmaking process consists of five steps:

1. Determine whether a case occurred; that is, whether there was a death, illness, or an injury;

2. Establish that the case was work related; that it resulted from an event or exposure in the work environment;

3. Decide whether the case is an injury or an illness;

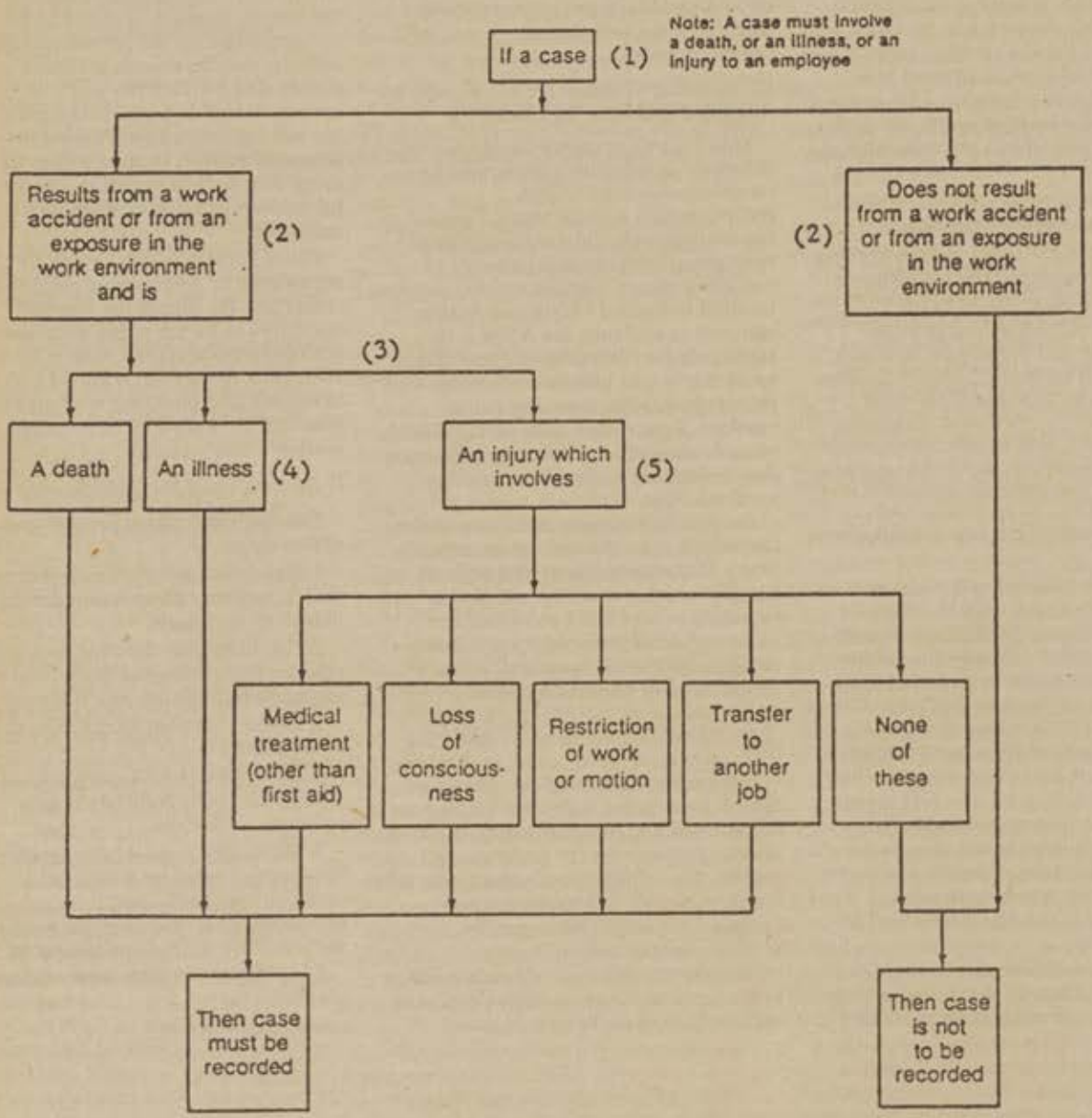
4. If the case is an illness, record it and check the appropriate illness category on the log;

5. If the case is an injury, decide if it is recordable based on a finding of medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job.

Chart 1 presents this methodology in graphic form.

BILLING CODE 4510-24-M

Chart 1. Guide to Recordability of Cases Under the Occupational Safety and Health Act



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C. Determining Whether a Case Occurred

The first step in the decisionmaking process is the determination of whether or not an injury or illness has occurred. Employees have nothing to record unless an employee has experienced a work-related injury or illness. In most instances, recognition of these injuries and illnesses is a fairly simple matter. However, some situations have troubled employers over the years. Two of these are:

1. *Hospitalization for observation.* If an employee goes to or is sent to a hospital for a brief period of time for observation, it is not recordable, assuming no medical treatment was given, or no illness was recognized. The determining factor is not that the employee went to the hospital or the length of the stay, but whether the incident is recordable as a work-related illness or as an injury requiring medical treatment or involving loss of consciousness, restriction of work or motion, or transfer to another job.

2. *Differentiating a new case from the recurrence of a previous injury or illness.* Employers are required to make new entries on their OSHA forms for each new recordable injury or illness. However, new entries should not be made for the recurrence of symptoms from previous cases, and it is sometimes difficult to decide whether or not a situation is a new case or a recurrence. The following guidelines address this problem.

a. *Injuries.* The aggravation of a preexisting injury almost always results from some movement by the employee. Consequently, when work related, these new incidents should be recorded as new cases.

b. *Illnesses.* Generally, each occupational illness should be recorded with a separate entry on the OSHA No. 200. However, certain illnesses, such as silicosis, may have prolonged effects which recur over time. The recurrence of these symptoms should not be recorded as new cases on the OSHA forms. The recurrence of symptoms of previous illnesses may require adjustment of entries on the log for previously recorded illnesses to reflect possible changes in the extent or outcome of the particular case.

D. Establishing Work Relationship

The Occupational Safety and Health Act of 1970 requires employers to record only those injuries and illnesses that are work related. *Work relationship is established under the OSHA recordkeeping system when the injury or illness results from an event or exposure in the work environment. The work environment is primarily composed of: (1) The employer's premises, and (2) other locations where employees are engaged in work-related activities or are present as a condition of their employment.* When an employee is off the employer's premises, work relationship must be established; when on the premises, this relationship is presumed. The employer's premises encompass the total establishment, including not only the primary work facility, but also such areas as company storage facilities and restricted company parking lots. In addition to physical locations, equipment or materials used in the course of an employee's work are also considered part of the employee's work environment.

1. *Injuries and illnesses resulting from events or exposures on the employer's premises.* Injuries and illnesses that result from an event or exposure on the employer's premises are generally considered work related. The employer's premises consist of the total establishment. They include the primary work facilities and other areas which are considered part of the employer's general work area.

However, the presumption of work relationship for activities on the employer's premises is rebuttable. Situations where the presumption would not apply include: (1) When a worker is on the employer's premises as a member of the general public and not as an employee, and (2) when employees have symptoms that merely surface on the employer's premises, but are the result of a nonwork-related event or exposure off the premises.

The following subjects warrant special mention:

a. Company restrooms, hallways, and cafeterias are all considered to be *part* of the employer's premises and constitute part of the work environment. Therefore, injuries occurring in these places are generally considered work related.

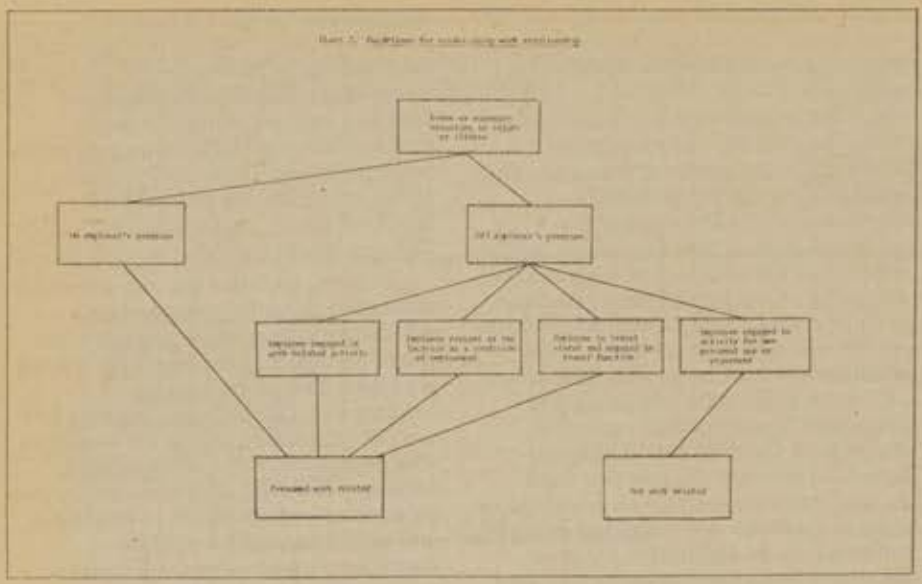
b. For OSHA recordkeeping purposes, the definition of work premises *excludes* employer controlled ball fields, tennis courts, golf courses, parks, swimming pools, gyms, and other similar recreational facilities which are *basically apart from the workplace and used primarily by employees during off-work hours.* However, recreational facilities located within the work environment are included as part of the work premises. These may include company controlled gymnasiums, handball courts, racketball courts, etc. *that are located within the work facility.*

c. Parking facilities that are generally accessible to both employees and members of the general public are *not* considered part of the employer's work premises. Therefore, injuries to employees on these public parking lots are not recordable unless the employee was engaged in some work-related activity. However, injuries to employees on parking lots restricted to employee and visitor use only would be considered on-premises and hence presumed work related.

2. *Injuries and illnesses resulting from events or exposures off the employers premises.* When an employee is off the employer's premises and suffers an injury or an illness exposure, work relationship must be established; it is not presumed. Injuries and illness exposures off premises are considered work related if the employee is engaged in a work activity or if they occur in the work environment. The work environment in these instances includes locations where employees are engaged in job tasks or work-related activities, or places where employees are present due to the nature of their job or as a condition of their employment.

Employees in travel status are treated somewhat differently than other employees working off premises. An employee in travel status is considered to be in the work environment 24 hours a day. All of the employee's activities required by the trip are considered to be work related. These include such necessary travel-related functions as working, eating, sleeping, and traveling. However, activities unrelated to the normal scope of the trip and solely for the employee's own personal use or enjoyment should not be recorded. Examples of these non-recordable events would be injuries on excursions, such as ski trips, or injuries which occur in public places when the employee is there only for recreational purposes.

Chart 2 provides a guide for establishing the work relationship of cases.



E. Distinguishing Between Injuries and Illnesses

Under the OSH Act, all work-related illnesses must be recorded, while injuries are recordable only when they require medical treatment (other than first aid), or involve loss of consciousness, restriction of work or motion, or transfer to another job. The distinction between injuries and illnesses, therefore, has significant recordkeeping implications.

Whether a case involves an injury or illness is determined by the nature of the original event or exposure which caused the case, not by the resulting condition of the affected employee. Injuries are caused by instantaneous exposures in the work environment. Cases resulting from anything other than instantaneous events are considered illnesses. This concept of illnesses includes acute illnesses which result from exposures of relatively short duration.

Some conditions may be classified as either an injury or an illness (but not both), depending upon the nature of the event that produced the condition. For example, a loss of hearing resulting from an explosion (an instantaneous event) is classified as an injury; the same condition arising from exposure to industrial noise over a period of time would be classified as an occupational illness.

F. Recording Occupational Illnesses

Employers are required to record the occurrence of all occupational illnesses, which are defined in the instructions of the log and summary as:

"Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact."

The instructions also refer to recording illnesses which were "diagnosed or recognized." Illness exposures ultimately result in conditions of a chemical, physical, biological, or psychological nature.

Occupational illnesses must be diagnosed to be recordable. However, they do not necessarily have to be diagnosed by a physician or other medical personnel. Diagnosis may be by a physician, registered nurse, or a person who by training or experience is qualified to make such a determination. Employers, employees, and others may be able to detect some illnesses such as skin diseases or disorders without the benefit of specialized medical training. However, a case more difficult to diagnose, such as silicosis, would require evaluation by properly trained medical personnel.

In addition to recording the occurrence of occupational illnesses, employers are required to record each illness case in 1 of the 7 categories on the front of the log. The back of the log form contains a listing of types of illnesses or disorders and gives examples for each illness category. These are only examples, however, and should not be considered as a complete list of types of illnesses under each category.

Recording and classifying occupational illnesses is difficult for employers, especially the chronic and long term latent illnesses. Many illnesses are not easily detected; and once detected, it is often difficult to determine whether an illness is work-related. Also, employees may not report illnesses because the symptoms may not be readily apparent, or because they do not think their illness is serious or work related.

The following material is provided to assist in detecting occupational illnesses and in establishing their work relationship.

1. *Detection and diagnosis of occupational illnesses.* An occupational illness is defined as any work-related abnormal condition or disorder (other than an occupational injury). Detection of these abnormal conditions or disorders, the first step in recording illnesses, is often difficult. When an occupational illness is suspected, employers may want to consider the following:

a. A routine medical examination of the employee's physiological systems:

- Head and neck;
- Eyes, ears, nose, and throat;
- Endocrine;
- Genitourinary;
- Musculoskeletal;
- Neurological;
- Respiratory;
- Cardiovascular;
- Gastrointestinal.

b. Observation and evaluation of behavior related to emotional status;

c. Specific examination for health effects of suspected or possible disease agents by competent medical personnel;

d. Comparison of date of onset of symptoms with occupational history;

e. Evaluation of results of any past biological or medical monitoring (blood, urine, other sample analysis) and previous physical examinations; and

f. Evaluation of laboratory tests: Routine (complete blood count, blood chemistry profile, urinalysis) and specific tests for suspected disease agents (e.g., blood and urine tests for specific agents, chest or other X-rays, liver function tests, pulmonary function tests.)

2. *Determining whether the illness is occupationally related.* The instructions on the back of the log define occupational illnesses as those "caused by environmental factors associated with employment." In some cases, such as contact dermatitis, the relationship between an illness and work-related

exposure is easy to recognize. In other cases, where the occupational cause is not direct and apparent, it may be difficult to determine accurately whether an employee's illness is occupational in nature. In these situations, it may help employers to ask the following questions:

a. Has an illness condition clearly been established?

b. Does it appear that the illness resulted from, or was aggravated by, suspected agents or other conditions in the work environment?

c. Are these suspected agents present (or have they been present) in the work environment?

d. Was the ill employee exposed to these agents in the work environment?

e. Was the exposure to a sufficient degree and/or duration to result in the illness condition?

f. Is the illness attributable to a nonoccupational exposure?

G. Deciding if Work-Related Injuries Are Recordable

Although the OSH Act requires that all work-related deaths and illnesses be recorded, the recording of injuries is limited to certain specific types of cases: Those which require medical treatment or involve loss of consciousness; restriction of work or motion; or transfer to another job. Minor injuries requiring only first aid treatment are *not* recordable.

1. *Medical treatment.* It is important to understand the distinction between medical treatment and first aid treatment since many work-related injuries are recordable only because medical treatment was given.

The regulations and the instructions on the back of the log and summary, OSHA No. 200, define medical treatment as any treatment, other than first aid treatment, administered to injured employees. Essentially, medical treatment involves the provision of medical or surgical care for injuries that are not minor through the application of procedures or systematic therapeutic measures.

The act also specifically states that work-related injuries which involve only first aid treatment need not be recorded. First aid is commonly thought to mean emergency treatment of injuries before regular medical care is available. However, first aid treatment has a different meaning for OSHA recordkeeping purposes. The regulations define first aid treatment as: "any one-time treatment, and any follow-up visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one-time treatment, and follow-up visit for the purpose of observation, is considered first aid even though provided by a physician or registered professional personnel."

The distinction between medical treatment and first aid depends not only on the treatment provided, but also on the severity of the injury being treated. First aid is: (1) Limited to one-time treatment and subsequent observation; *and* (2) involves treatment of only minor injuries, *not* emergency treatment of serious injuries. Injuries are *not* minor if:

a. They can be treated only by a physician or licensed medical personnel;

b. They impair bodily function (i.e., normal use of senses, limbs, etc.)

c. They result in damage or harm to the physical structure of a nonsuperficial nature (e.g., hairline fractures); or

d. They involve complications requiring follow-up medical treatment.

Physicians or registered medical professionals, working under the standing orders of a physician, routinely treat minor injuries. Such treatment may constitute first aid. Also, some visits to a doctor do not involve treatment at all. For example, a visit to a doctor for an examination or other diagnostic procedure to determine whether the employee has an injury does not constitute medical treatment. Conversely, medical treatment can be provided to employees by someone other than a physician or registered medical personnel.

The following classifications list certain procedures as either medical treatment or first aid treatment.

Medical Treatment

The following are generally considered medical treatment. Work-related injuries for which the type of treatment was provided or should have been provided are almost always recordable.

—Treatment of INFECTION
—Application of ANTISPETICS during second or subsequent visits to medical personnel
—Treatment of SECOND OR THIRD DEGREE BURN(S)
—Application of BUTTERFLY ADHESIVE DRESSING(S)
—Application of SUTURES (stitches)
—Removal of FOREIGN BODIES EMBEDDED IN EYE
—Removal of FOREIGN BODIES from wound; if procedure is COMPLICATED because of depth of embedment, size, or location
—Use of PRESCRIPTION MEDICATIONS
—Use of hot or cold SOAKING THERAPY during second or subsequent visit to medical personnel
—Application of hot or cold COMPRESS(ES) during second or subsequent visit to medical personnel
—CUTTING AWAY DEAD SKIN (surgical debridement)
—Application of HEAT THERAPY during second or subsequent visit of medical personnel
—Use of WHIRPOOL BATH THERAPY during second or subsequent visit of medical personnel
—POSITIVE X-RAY DIAGNOSIS (fractures, broken bones, etc.)
—ADMISSION TO A HOSPITAL or equivalent medical facility for treatment or prolonged observation

First Aid Treatment

The following are generally considered first aid treatment (e.g., one-time treatment and subsequent observation of minor injuries) and need not be recorded if the work-related injury does not involve loss of consciousness, restriction of work or mortion, or transfer to another job.

—Application of ANTISEPTICS during first visit to medical personnel
—Treatment of FIRST DEGREE BURN(S)
—Application of BANDAGE(S) during first visit to medical personnel
—Use of ELASTIC BANDAGE(S) during first visit to medical personnel
—Removal of FOREIGN BODIES NOT EMBEDDED IN EYE if only irrigation is required
—Removal of FOREIGN BODIES from wound, if procedure is UNCOMPLICATED, and is, for example, by tweezers or other simple technique
—Use of NONPRESCRIPTION MEDICATIONS
—SOAKING THERAPY ON INITIAL VISIT to medical personnel or removal of bandages by SOAKING
—Application of hot or cold COMPRESS(ES) during first visit to medical personnel
—Application of OINTMENTS to abrasions to prevent drying or cracking
—Application of HEAT THERAPY during first visit to medical personnel
—Use of WHIRLPOOL BATH THERAPY during first visit to medical personnel
—NEGATIVE X-RAY DIAGNOSIS
—BRIEF OBSERVATION of injury during visit to medical personnel

Note.—The administration of a TETANUS SHOT or BOOSTER, by itself, is not considered medical treatment. However, these shots are often given in conjunction with the more serious injuries. Therefore, injuries requiring tetanus shots may be recordable for other reasons.

2. *Loss of consciousness.* If an employee loses consciousness as the result of a work-related injury, the case must be recorded no matter what type of treatment was provided. The rationale behind this recording requirement is that loss of consciousness is generally associated with the more serious injuries.

3. *Transfer to another job.* Injuries requiring transfer of the employee to another job are also considered serious enough to be recordable regardless of the type of treatment provided. Transfers are seldom the sole criterion for recordability because injury cases are almost always recordable on other grounds, primarily medical treatment or restriction of work or motion.

4. *Restriction of work or motion.* Restricted work activity occurs when the employee, because of the impact of a job-related injury, is physically or mentally unable to perform all or any part of his or her normal assignment during all or any part of the workday or shift. The emphasis is on the employee's ability to perform normal job duties. Restriction of work or motion may result in either a lost worktime injury or a non-lost worktime injury, depending upon whether the restriction extended beyond the day of injury.

V. Categories For Evaluating the Extent of Recordable Cases

Once the employer decides that a recordable injury or illness has occurred, the case must be evaluated to determine its extent or outcome. There are three categories of recordable cases: Fatalities, lost workday cases, and cases without lost workdays. Every recordable case must be placed in only one of these categories.

A. Fatalities

All work-related fatalities must be recorded, regardless of the time between the injury and the death, or the length of the illness.

B. Lost Workday Cases

Lost workday cases occur when the injured or ill employee experiences either days away from work, days of restricted work activity, or both. In these situations, the injured or ill employee is affected to such an extent that: (1) Days must be taken off from the job for medical treatment or recuperation; or (2) the employee is unable to perform his or her normal job duties over a normal work shift, even though employee may be able to continue working.

1. Lost workday cases involving days away from work are cases resulting in days the employee would have worked but could not because of the job-related injury or illness. The focus of these cases is on the employee's inability, because of injury or illness, to be present in the work environment during his or her normal work shift.

2. Lost workday cases involving days of restricted work activity are those cases where, because of injury or illness, (1) the employee was assigned to another job on a temporary basis, or (2) the employee worked at a permanent job less than full time, or (3) the employee worked at his or her permanently assigned job but could not perform all the duties normally connected with it. Restricted work activity occurs when the employee, because of the job-related injury or illness, is physically or mentally unable to perform all or any part of his or her normal workday or shift. The emphasis is on the employee's inability to perform normal job duties over a normal work shift.

Injuries and illnesses are not considered lost workday cases unless they affect the employee beyond the day of injury or onset of illness. When counting the number of days away from work or days of restricted work activity, do not include the initial day of injury or onset of illness, or any days on which the employee would not have worked even though able to work.

C. Cases Not Resulting in Death or Lost Workdays

These cases consist of the relatively less serious injuries and illnesses which satisfy the criteria for recordability but which do not result in death or require the affected employee to have days away from work or days of restricted work activity beyond the date of injury or onset of illness.

VI. Employer Obligations for Reporting Occupational Injuries and Illnesses

This chapter focuses on the requirements of Section 8(c)(2) of the Occupational Safety and Health Act of 1970 and Title 29, Part 1904, of the Code of Federal Regulations for employers to make reports of occupational injuries and illnesses. It does not include the reporting requirements of other standards or regulations of the Occupational Safety and Health Administration (OSHA) or of any other State or Federal agency.

A. The Annual Survey of Occupational Injuries and Illnesses

The survey is conducted on a sample basis, and firms required to submit reports of their injury and illness experience are contacted by BLS or a participating State agency. A firm not contacted by its State agency or BLS need not file a report of its injury and illness experience. Employers should note, however, that even if they are not selected to participate in the annual survey for a given year, they must still comply with the recordkeeping requirements listed in the preceding chapters as well as with the requirements for reporting fatalities and multiple hospitalization cases provided in the next section of this chapter.

Participants in the annual survey consist of two categories of employers: (1) Employers who maintain OHSA records on a regular basis; and (2) a small, rotating sample of employers who are regularly exempt from OSHA recordkeeping. The survey procedure is different for these two groups of employers.

1. *Participation of firms regularly maintaining OSHA records.* When employers regularly maintaining OSHA records are selected to participate in the Annual Survey of Occupational Injuries and Illnesses, they are mailed the survey questionnaire in February of the year following the reference calendar year of the survey. (A firm selected to participate in the 1984 survey would have been contacted in February of 1985.) The survey form, the Occupational Injuries and Illnesses Survey Questionnaire, OSHA No. 200–S, requests information about the establishment(s) included in the report and the injuries and illnesses experienced during the previous year. Information for the injury and illness portion of the report form usually can be copied directly from the totals on the log and summary, OSHA No. 200, which the employer should have completed and posted in the establishment by the time the questionnaire arrives. The survey form also requests summary information about the type of business activity and number of employees and hours worked at the reporting unit during the reference year.

2. *Participation of normally exempt small employers and employers in low-hazard industries.* A few regularly exempt employers (those with fewer than 11 employees in the previous calendar year and those in designated low-hazard industries) are also required to participate in the annual survey. Their participation is necessary for the production of injury and illness statistics that are comparable in coverage to the statistics published in years prior to the exemptions. These employers are notified prior to the reference calendar year of the survey that they must maintain injury and illness records for the coming year. (A firm selected to participate in the 1984 survey would

have been contacted in December 1983). At the time of notification, they are supplied with the necessary forms and instructions. During the reference calendar year, prenotified employers make entries on the log, OSHA No. 200, but are not required to complete a Supplementary Record of Occupational Injuries and Illnesses, OSHA No. 101, or post the summary of the OSHA No. 200 the following February (like the regularly participating employers).

B. Reporting Fatalities and Multiple Hospitalizations

All employers are required to report accidents resulting in one or more fatalities or the hospitalization of five or more employees.

The report is made to the nearest office of the Area Director of the Occupational Safety and Health Administration, U.S. Department of Labor, unless the State in which the accident occurred is administering an approved State plan under Section 18(B) of the OSH Act. Those 18(B) States designate a State agency to which the report must be made.

The report must contain three pieces of information: (1) Circumstances surrounding the accident(s), (2) number of fatalities, and/or (3) the number of hospitalized injuries. If necessary, the OSHA Area Director may require additional information on the accident.

VII. Access to OSHA Records and Penalties for Failure To Comply With Recordkeeping Obligations

The preceding chapters describe recordkeeping and reporting requirements. This chapter covers subjects related to insuring the integrity of the OSH recordkeeping process—access to OSHA records and penalties for recordkeeping violations.

A. Access to OSHA Records

All OSHA records, which are being kept by employers for the 5-year retention period, should be available for inspection and copying by authorized Federal and State government officials. Employees, former employees, and their representatives are provided access to only the log, OSHA No. 200.

Government officials with access to the OSHA records include: Representatives of the Department of Labor, including OSHA safety and health compilance officers and BLS representatives; representatives of the Department of Health and Human Services while carrying out that department's research responsibilities; and representatives of States accorded jurisdiction for inspections or statistical compliations. "Representatives" may include Department of Labor officials inspecting a workplace or gathering information, officials of the Department of Health and Human Services, or contractors working for the agencies mentioned above, depending on the provisions of the contract under which they work.

Employee access to the log is limited to the records of the establishment in which the employee currently works or formerly worked. All current logs and those being maintained for the 5-year retention period must be made available for inspection and copying by employees, former employees, and their representatives. An employee representative can be a member of a union representing the employee, or any person designated by the employee or former employee. Access to the log is to be provided in a reasonable manner and at a reasonable time. Redress for failure to comply with the access provisions of the regulations can be obtained through a complaint to OSHA.

B. Penalties for Failure To Comply With Recordkeeping Obligations

Employers committing recordkeeping and reporting violations are subject to the same sanctions as employers violating other OSHA requirements such as safety and health standards and regulations.

Glossary of Terms

Annual summary.—Consists of a copy of the occupational injury and illness totals for the year from the OSHA No. 200, and the following information: The calendar year covered; company name; establishment address; certification signature, title, and date.

Annual survey.—Each year, BLS conducts an annual survey of occupational injuries and illnesses to produce national statistics. The OSHA injury and illness records maintained by employers in their establishments serve as the basis for this survey.

Bureau of Labor Statistics (BLS).—The Bureau of Labor Statistics is the agency responsible for administering and maintaining the OSHA recordkeeping system, and for collecting, compiling, and analyzing work injury and illness statistics.

Certification.—The person who supervises the preparation of the Log and Summary of Occupational Injuries and Illnesses, OSHA No. 200, certifies that it is true and complete by signing the last page of, or by appending a statement to that effect to, the annual summary.

Cooperative program.—A program jointly conducted by the States and the Federal Government to collect occupational injury and illness statistics.

Employee.—One who is employed in the business of his or her employer affecting commerce.

Employee representative.—Anyone designated by the employee for the purpose of gaining access to the employer's log of occupational injuries and illnesses.

Employer.—Any person engaged in a business affecting commerce who has employees; this does not include the United States Government or any State or political subdivision of a State.

Establishment.—A single physical location where business is conducted or where services or industrial operations are performed; the place where the employees report for work, operate from, or from which they are paid.

First aid.—Any one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such treatment and observation is considered first aid even though provided by a physician or registered professional personnel.

First report of injury.—A workers' compensation form which may qualify as a substitute for the supplementary record, OSHA No. 101.

Incidence rate.—The number of injuries, illnesses, or lost workdays related to a common exposure base of 100 full-time workers. The common exposure base enables one to make accurate interindustry comparisons, trend analysis over time, or comparisons among firms regardless of size. This rate is calculated as:

$$\frac{N}{EH} \times 200{,}000$$

where:

N = number of injuries and illnesses or lost workdays

EH = total hours worked by all employees during calendar year

200,000 = base for 100 full-time equivalent workers (working 40 hours per week 50 weeks per year).

Low-hazard industries.—Selected industries in retail trade; finance, insurance, and real estate; and services which are regularly exempt from OSHA recordkeeping. To be included in this exemption, an industry must fall within an SIC not targeted for general schedule inspections and must have an average lost workday case injury rate for a designated 3-year measurement period at or below 75 percent of the private sector average rate.

Log and Summary (OSHA No. 200).—The OSHA recordkeeping form used to list injuries and illnesses and to note the extent of each case.

Lost workday cases.—Cases which involve days away from work or days of restricted work activity, or both.

Lost workdays.—The number of workdays (consecutive or not), beyond the day of injury or onset of illness, the employee was away from work or limited to restricted work activity because of an occupational injury or illness.

(1) Lost workdays—away from work. The number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness.

(2) Lost workdays—restricted work activity.

The number of workdays (consecutive or not) on which, because of injury or illness: (1) The employee was assigned to another job on a temporary basis; or (2) the employee worked at a permanent job less than full time; or (3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of days away from work or days of restricted work activity does not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Medical treatment.—Includes treatment of injuries administered by physicians, registered professional personnel, or lay persons. Medical treatment does not include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

Occupational illness.—Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact, and which can be included in the categories listed below. The following categories should be used by employers to classify recordable occupational illnesses on the log in the columns indicated:

Column 7a. Occupational skin diseases or disorders.
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns or inflammations; etc.

Column 7b. Dust diseases of the lungs (pneumoconoioses).
Examples: Silicosis, asbestosis, coal worker's pneumoconiosis, byssinosis, and other pneumoconioses.

Column 7c. Respiratory conditions due to toxic agents.
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes, farmer's lung, etc.

Column 7d. Poisoning (systemic effects of toxic materials).
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins; etc.

Column 7e. Disorders due to physical agents (other than toxic materials).
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultra-violet rays, microwaves, sunburn); etc.

Column 7f. Disorders associated with repeated trauma.
Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

Column 7g. All other occupational illnesses.
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

Occupational injury.—Any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from a single instantaneous exposure in the work environment.

Note.—Conditions resulting from bites, such as insect or snake bites, and from one-time exposure to chemicals are considered to be injuries.

Occupational injuries and illnesses; extent and outcome.—All occupational injuries or illnesses result in either:

(1) Fatalities, regardless of the time between the injury and death, or the length of illness; or

(2) Lost workday cases, other than fatalities, that result in lost workdays; or

(3) Nonfatal cases without lost workdays.

Occupational Safety and Health Administration (OSHA).—OSHA is the Federal agency within the Department of Labor responsible for developing, implementing, and enforcing safety and health standards and regulations. OSHA works with employers and employees to foster effective safety and health programs which reduce workplace hazards.

Premises, employer's.—Consist of the employer's total establishment; they include the primary work facility and other areas in the employer's domain such as company storage facilities, cafeterias, restrooms, and restricted company parking lots.

Posting.—The annual summary of occupational injuries and illnesses must be posted at each establishment by February 1 and remain in place until March 1 to provide employees with the record of their establishment's injury and illness experience for the previous calendar year.

Recordable cases.—All work-related deaths and illnesses, and those work-related injuries which result in: Loss of consciousness, restriction of work or motion, transfer to another job, or require medical treatment beyond first aid.

Recordkeeping system.—Refers to the nationwide system for recording and reporting occupational injuries and illnesses mandated by the Occupational Safety and Health Act of 1970 and implemented by Title 29, Code of Federal Regulations, Part 1904. This system is the only source of reliable national statistics on job-related injuries and illnesses occurring in the private sector.

Regularly exempt employers.—Employers regularly exempt from OSHA recordkeeping include: (A) All employers with no more than 10 full- or part-time employees at any one time in the previous calendar year; and (B) all employers in retail trade; finance, insurance, and real estate; and services industries; i.e., SIC's 52–89 (except building materials and garden supplies, SIC 52, general merchandise and food stores, SIC's 53 and 54; hotels and other lodging places, SIC 70; repair services, SIC's 75 and 76; amusement and recreation services, SIC 79; and health services, SIC 80).

Report form.—Refers to survey form OSHA No. 200–S which is completed and returned by the surveyed reporting unit.

Restriction of work or motion.—Occurs when the employee, because of the result of a job-related injury or illness, is physically or mentally unable to perform all or any part of his or her normal assignment during all or any part of the workday or shift.

Small employers.—Employers with no more than 10 employees among all the establishments of their firm at any one time during the previous calendar year.

Standard Industrial Classification (SIC).—A classification system developed by the Office of Management and Budget, Executive Office of the President, for use in the classification of establishments by type of activity in which engaged. Each establishment is assigned an industry code for its major activity which is determined by the product or services rendered. Establishments may be classified in 2-, 3-, or 4-digit industries according to the degree of information available.

State (when mentioned alone).—Refers to a State of the United States, the District of Columbia, and U.S. territories and jurisdictions.

State agency.—State agency administering the OSHA recordkeeping and reporting system. Many States cooperate directly with BLS in administering the OSHA recordkeeping and reporting programs. Some States have their own safety and health laws which may impose different or additional obligations.

Supplementary Record (OSHA No. 101).—The form (or equivalent) on which additional information is recorded for each injury and illness entered on the log.

Title 29 of the Code of Federal Regulations, Parts 1900–1999.—The parts of the Code of Federal Regulations which contain OSHA regulations.

Workers' compensation systems.—State systems that provide medical benefits and/or indemnity compensation to victims of work-related injuries and illnesses.

Work environment.—Consists of the employer's premises and other locations where employees are engaged in work-related activities or are present as a condition of their employment. The work environment includes not only physical locations, but also the equipment or materials used by the employee during the course of his or her work.

U.S. Department of Labor

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*OSHA No. 101 Forms	
*Recordkeeping Guidelines for Occupational Injuries and Illnesses	
*Recordkeeping Guidelines for Occupational Injuries and Illnesses: Ready Reference	

Please complete this form and mail it to the appropriate BLS regional office.

SECTION II

Recordkeeping Guidelines for Occupational Injuries and Illnesses

The Occupational Safety and Health Act of 1970 and 29 CFR 1904

U.S. Department of Labor, Bureau of Labor Statistics, 1985

The Occupational Safety and Health (OSH) Act of 1970 requires covered employers to prepare and maintain records of occupational injuries and illnesses. The Bureau of Labor Statistics of the U.S. Department of Labor is responsible for administering the recordkeeping system established by the act. The recordkeeping regulations in 29 CFR 1904 provide specific recording and reporting requirements which comprise the framework of the OSH recording system.

Under this system it is essential that data recorded by employers be uniform

to assure the validity of the statistical data. To assure uniformity, BLS has issued guidelines which provide official agency interpretations, answers and explanations to questions employers most frequently ask about recordkeeping and reporting of accupational injuries and illnesses. On reviewing the guidelines, the Office of Management and Budget (OMB) has indicated that the guidelines are not regulations, but rather supplemental instructions to the OSHA recordkeeping forms (OSHA Nos. 200, 101, and 200–S). This document replaces all previous editions of the BLS recordkeeping guidelines.

For recordkeeping and reporting questions not covered in this publication, employers may contact the BLS regional office or the participating State agency serving their area. Addresses and telephone numbers for the regional offices are listed on the back cover; those for the State agencies are in appendix D. Recordkeeping forms can be obtained by completing the order form on page 94 and mailing it to the appropriate BLS regional office.

The information included here deals only with the requirements of the Occupational Safety and Health Act of 1970 and Part 1904 of Title 29, Code of Federal Regulations, for recording and reporting occupational injuries and illnesses. Some employers may be subject to additional recordkeeping and reporting requirements not covered in this report. Many specific standards and regulations of the Occupational Safety and Health Administration (OSHA) have additional requirements for the maintenance and retention of records for medical surveillance, exposure monitoring, inspections, and other activities and incidents relevant to occupational safety and health, and for the reporting of certain information to employees and to OSHA. For information on these requirements, which are not covered in this report, employers should refer directly to the OSHA standards or regulations or contact their OSHA regional office.

These guidelines were prepared in the Office of Occupational Safety and Health Statistics, by Stephen Newell, under the general direction of William M. Eisenberg, Acting Associate Commissioner.

User's Guide

This document is formatted to make the information on OSHA recordkeeping easy to access and comprehend. Recordkeeping requirements have been categorized into several major subject areas. Each subject area is divided into two parts: The first reviews relevant sections of the act or regulations and provides basic concepts of recordability; the second provides answers to questions most frequently asked about recording and reporting occupational injuries and illnesses. These questions and answers elaborate on the basic recordkeeping concepts and further define the subject matter in each section.

Chapter I. Provides information which should enable you to determine whether or not your establishment must keep OSHA records.

Chapter II. Describes which forms should be used and how the forms should be completed.

Chapter III. Outlines where the OSHA records must be located, how they should be updated, and the length of time they must be kept.

Chapter IV. Provides a brief description of the types of decisions employers make in the recordkeeping process. Also, this chapter shows how to distinguish between employees, whose injuries employers must record, and other workers at the establishment (such as independent contractors).

Chapter V. If you have any questions concerning whether or not a particular case should be recorded on the log, turn to Chapter V. This chapter provides guidelines for determining the key issues of recordability: which cases are work-related; what constitutes an occupational injury; how to distinguish medical treatment from first aid; criteria for detecting occupational illnesses; etc.

Chapter VI. Provides guidelines for determining the extent or outcome of recordable cases, and for making appropriate entries in columns 1–6 or 8–13 on the OSHA log.

Chapter VII. Describes employer obligations for reporting occupational injuries and illnesses. This reporting may be through the BLS annual survey, or in the case of a fatality or multiple hospitalization, it may be directly to an OSHA area office.

Chapter VIII. Discusses some of the checks and balances built into the system to ensure accurate recording and reporting of occupational injuries and illnesses.

The appendices provide a glossary of terms and sample recordkeeping and reporting forms. Appendix C lists illness conditions that have been associated with exposure in the workplace. Addresses and telephone numbers of participating State agencies and OSHA Regional Offices are listed in appendixes D and E. Appendix F provides capsule guidelines for distinguishing medical treatment from first aid.

Finally, included at the back of this publication is a detailed index which lists particular subjects in alphabetical order along with the page numbers where each topic may be referenced.

Contents

Chapter I. Employers Subject to OSHA Recordkeeping Requirements

The coverage of the Occupational Safety and Health Act of 1970 is very extensive. However, the requirements under the act for recording and reporting occupational injuries and illnesses have been modified by regulation to reduce the burden on employers and permit the focusing of safety and health efforts on high-risk industries and establishments. This chapter describes which industries and employers are subject to OSHA recordkeeping and reporting requirements.

A. Coverage of the Occupational Safety and Health Act

The OSHA Act covers nearly all employers in the private sector. Section 2(b) of the act describes its purpose as providing safe and healthful working conditions for "every working man and woman in the Nation." Section 4(a) defines the scope of the act's coverage:

> This Act shall apply with respect to employment performed in a workplace in a State, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, American Samoa, Guam, the Trust Territory of the Pacific Islands, Wake Island, Outer Continental Shelf Lands, defined in the Outer Continental Shelf Lands Act, Johnson Island, and the Canal Zone.

The act's coverage is defined in terms of two criteria: Work activities and geographic areas. The activities covered relate to "employment performed in a workplace." The boundaries of geographic coverage are limited to the United States and its territories.

The employment described in Section 4(a) is not limited to the execution of specific work assignments. Section 2 of the act addresses injuries and illnesses arising out of "work situations." Sections 2(b) (1), (2), and (4) of the act refer to "places of employment" and the provision of safe and healthful "working conditions." Section 2(b)(7) of the act deals with preventing employee illness as a result of their "work experience." These and other references in the act indicate that its coverage is intended to go beyond specific job tasks to encompass the total work environment. Also, the scope of employments covered is extensive. The act defines an employer in Section 3(5):

> The term "employer" means a person engaged in a business affecting commerce who has employees, but does not include the United States or any State or political subdivision of a State.

(See section E of this chapter for a special discussion of State and local government coverage.)

It should be noted the term "employer" applied to persons engaged in "a business affecting commerce," not just "interstate commerce." Therefore, the coverage of the act is extensive since there are few employers who do not affect commerce.

Part 1975.3(d) of the regulations also interprets the term "business" as:

> . . . any commercial or noncommercial activity affecting commerce and involving the employment of one or more employees. . . .

Part 1975.4(a) states:

> Any employer employing one or more employees would be an "employer engaged in a business affecting commerce who has employees" and, therefore, he is covered by the Act as such.

However, despite the broad coverage afforded by the act, the regulations have excluded the following groups of employers:

1. *Religious establishments.* The performance of, or participation in, religious services does not constitute employment under the act according to Part 1975.4(c) of the regulations. However, churches are considered employers when they employ one or more persons in secular activities.

2. *Employers of household workers.* Those who employ persons for ordinary domestic household tasks are not considered to be employers under Part 1975.6 of the regulations.

A–1. Q. Who is considered to be an employee under the OSH Act?

A. Section 3(6) of the act defines an employee as one who is employed in the business of his employer.

The traditional common law definition of an employer is one who has the right to control and direct his employees, not only regarding the result to be accomplished by the work, but also as to the details and means by which the work objective is accomplished.

The term "employee" has been broadly interpreted under the OSH Act.

Employee status involves a current employment relationship. Under the act, this status is generally limited to situations where the employee receives some sort of compensation (not necessarily money) from the employer for services rendered.

A–2. Q. Are volunteer workers considered employees under the Occupational Safety and Health Act?

A. Volunteer workers may or may not be considered employees under the act; their status would depend upon the facts of the particular situation.

Volunteers are generally not considered employees for recordkeeping purposes if they serve of their own free will and do not receive compensation. Compensation in this context may be wages or salaries, or it may consist solely of nonmoney benefits. The fact that paid workers may normally perform the same duties or functions has no bearing on this determination. Under these criteria, hospital volunteers are usually not considered to be employees for the purposes of the act; volunteer firemen are usually considered to be employees.

A–3. Q. Are people working in sheltered workshops considered employees? What about persons in job training programs?

A. If these workers receive some form of compensation and satisfy the criteria listed in question A–1, they are considered employees under the act.

A–1. Q. Are stockholders in a corporation considered employers?

A. No. The corporation is the employer. On the other hand, stockholders employed by the corporation are employees; these include managers and corporate officers.

A–5. Q. Two partners operate a small electrical contracting firm. They have no employees. Are they covered by the OSH Act?

A. No. Partners are not considered employees. A firm with no employees is not covered by the act and does not have to maintain OSHA records.

A–6. Q. Are activities of self-employed individuals covered by the Occupational Safety and Health Act?

A. No. These activities are not covered because self-employed individuals are not considered employers under the act. Part 1975.4(a) of the regulations limits employer status to those individuals employing one or more employees.

A–7. Q. Does the act cover persons employed by charitable and nonprofit organizations?

A. Yes. Whether or not an organization is operated at a profit is not important since Part 1975.4(b)(4) provides that ". . . any charitable or nonprofit organization which employs one or more employees is covered under the . . . Act. . . ."

A–8. Q. Since the OSH Act governs all establishments engaged in interstate commerce, how are such establishments identified? For example, would a local grain elevator or farm feed and seed retail store be covered?

A. Yes. These operations would be covered. Coverage of the OSH Act is *not* limited to establishments engaged in interstate commerce. The law says "affecting commerce," which is far broader than "engaged in interstate commerce." Section 3(3) of the act broadly defines the term "commerce" as meaning "trade, traffic, commerce, transportation, or communications. . . ." Use of equipment made out-of-State has been deemed sufficient.

A–9. Q. Are farmers covered under the OSH Act?

A. A very broad interpretation has been given to the coverage of the act. Farmers are included, according to Part 1975.4(b)(2) of the regulations, because they affect commerce. However, small farmers (those with fewer than 11 employees) have been exempt from recordkeeping requirements since 1976.

A–10. Q. Are the working family members of farmers or ranchers considered employees? Must the farmer maintain records to cover them?

A. No. Immediate family members of farm employers are not regarded as employees under Part 1975.4(b)(2) of the regulations, even though they may receive compensation. Consequently, OSHA records need not be maintained for them.

A–11. Q. How does the act apply to migrant labor camps? Is it the same as for other areas of the economy?

A. Yes. Migrant labor camps are covered the same as any other segment of the economy. (See question A–5 of chapter IV for an explanation of who must keep the OSHA records for migrant laborers.)

A–12. Q. Do records have to be maintained for employees traveling overseas on business?

A. No. Records need not be kept for these employees when they are outside the geographic scope of coverage prescribed by Section 4(a) of the act—the United States and its territories.

A–13. Q. What about airline employees working aboard airplanes? When are these activities covered?

A. These activities are covered under the act while the airplane is in the official air space of the United States and its territories.

A–14. Q. Are employers required to keep records of injuries and illnesses occurring to employees aboard ships? When are the employees engaged in these activities covered by the OSH Act?

A. The coverage of the Occupational Safety and Health Act is limited to the United States and its territories. Therefore, work activities would be covered aboard ships on inland and intercoastal waterways and up to the boundary of State jurisdiction, which is usually the 3-mile limit. (In Louisiana and Texas, the State boundaries extend 12 miles into the Gulf of Mexico.)

A–15. Q. Are churches or religious organizations required to keep records under the act if they employ persons in secular activities?

A. Yes. The act covers hospitals, schools, commercial establishments, and administrative or office personnel employed by religious organizations. Excluded from coverage are clergy and other participants in religious services.

A–16. Q. Do injury and illness records have to be kept for domestics?

A. No. According to Part 1975.6 of the regulations, employers of domestics in the employers' private residence for the usual purposes of housekeeping or child care, or both, are not required to keep records.

B. Employers Required To Keep OSHA Records

The recordkeeping requirements of the Occupational Safety and Health Act of 1970 apply to most private sector employers. Part 1904.1 of the regulations covers the purpose and scope of the recordkeeping regulations:

> These sections provide for recordkeeping and reporting by employers covered under the Act, as necessary or appropriate for enforcement of the Act, for developing information regarding causes and prevention of occupational accidents and illnesses, and for maintaining a program of collection, compilation, and analysis of occupational safety and health statistics.

Initially, the regulations for employer recordkeeping mirrored the broad coverage of the act as described in the preceding section. However, the regulations have been modified to exempt certain employers with historically low rates of injuries and illnesses.

B–1. Q. Must employers keep OSHA injury and illness records if they are not covered by the Occupational Safety and Health Act?

A. No. Employers must maintain OSHA records only if they are within the coverage of the Occupational Safety and Health Act of 1970. The scope of the OSHA recordkeeping regulations presently does not exceed the scope of the OSH Act.

C. Employers Regularly Exempt From OSHA Recordkeeping

Federal regulations have made the following employers regularly exempt from OSHA recordkeeping, i.e., from keeping the log of injuries and illnesses, completing a supplementary record, and filling our and posting an annual summary:

1. *Small employers.* Although subject to the overall coverage of the Occupational Safety and Health Act of 1970, most small employers are not required to keep injury and illness records because of their exemption in 29 CFR 1904.15. (A few States still require all small employers to maintain OSHA records. Check with your State.) This section of the regulations was promulgated to reduce the burden on employers after findings of relatively low levels of hazard in small establishments. Part 1904.15 states:

> An employer who had no more than ten (10) employees at any time during the calendar year immediately preceding the current calendar year need not comply with any of the requirements of this part except the following:
>
> (a) Obligation to report under Part 1904.8 concerning fatalities or multiple hospitalization accidents; and
>
> (b) Obligation to maintain a log of occupational injuries and illnesses under Part 1904.2 and to make reports under Section 1904.21 upon being notified in writing by the Bureau of Labor Statistics that the employer has been selected to participate in a statistical survey of occupational injuries and illnesses.

For the purposes of the small employer exemption, the employment figure refers to the calendar year immediately *preceding* the year for which records will be kept. Also, the test for the small employer exemption is the number of employees in the entire *firm*, not the number in an individual establishment. Therefore, a firm with two establishments, each of which had six employees during the previous calendar year, has to keep OSHA injury and illness records during the current year because the total employment of the firm was greater than 10. Partners, self-employed, and family members on a farm are not considered employees.

2. *Employers in low-hazard industries.* In most States, employers in low-hazard industries in retail trade; finance, insurance, and real estate; and services are exempt from OSHA recordkeeping under Part 1904.16 of the regulations:

An employer whose establishment is classified in SIC's 52–89, (excluding 52–54, 70, 75, 76, 79, and 80) need not comply, for such establishment, with any of the requirements of this part except the following:

(a) Obligation to report under Section 1904.8 concerning fatalities or multiple hospitalization accidents; and

(b) Obligation to maintain a log of occupational injuries and illnesses under Section 1904.2 and make reports under Section 1904.21 upon being notified in writing by the Bureau of Labor Statistics that the employer has been selected to participate in a statistical survey of occupational injuries and illnesses.

The Federal exemption applies to all employers in low-hazard industries in States under exclusive Federal jurisdiction. States with approved State plans under Section 18(b) of the act may continue to require employers in these industries to maintain records. The following States and territories currently operate their own OSHA programs under Section 18(b): Alaska, Arizona, California, Connecticut, Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, the Virgin Islands, Washington, and Wyoming. In these areas, employers should contact their respective State agency to determine if the low-hazard industry exemption has been adopted. State agency addresses and telephone numbers are listed in appendix D.

The exempt industries are identified and categorized according to the *Standard Industrial Classification Manual (SIC)*. They include:

Some retail trade industries (SIC's 55–59) which include establishments engaged in selling merchandise to the general public for personal or household consumption. Some of these retail trades are: automotive dealers, apparel and accessory stores, furniture and home furnishings stores, and eating and drinking places.

All finance, insurance, and real estate industries (SIC's 60–67) including establishments engaged in banking, credit other than banking, security dealings, insurance, and real estate.

Some service industries (SIC's 70–89, except 70, 75, 76, 79, and 80) including establishments with a variety of services for individuals, businesses, government agencies, and other organizations. Some of these service industries are: personal and business services in addition to legal, educational, social, and cultural services, and membership organizations.

In order to be included in this exemption, the major industry group has to meet two criteria: (1) The industry must fall within SIC's not now targeted for general schedule inspections; and (2) for a designated 3-year measurement period, the industry must have had an average lost workday case injury rate at or below 75 percent of the comparable private sector average.

Therefore, building materials and garden supplies (SIC 52); general merchandise and food stores (SIC's 53, 54); hotels and other lodging places (SIC 70); repair services (SIC's 75, 76); amusement and recreation services (SIC 79); and health services (SIC 80) were not included among the industries initially proposed for exemption. These industries, although not targeted for general schedule inspections, have lost workday case injury rate averages above 75 percent of the private sector average for the 3-year period.

C–1. Q. Is the small employer exemption determined by the number of employees currently working in the establishment?

A. No. The small employer exemption focuses on the number of employees working for the entire *firm* at any time during the *previous* calendar year.

C–2. Q. For the purposes of the small employer exemption, how do you distinguish between an establishment and a firm?

A. The distinction between an establishment and a firm refers to the structure of the business. An establishment is a single physical location where business is conducted or where services or industrial operations are performed. A firm consists of the entire business enterprise (the corporation, company, partnership, etc.) and may include one or more establishments.

C–3. Q. How is the number of employees determined for the small employer exemption? Do employers qualify if they had an average of no more than 10 employees during the previous calendar year?

A. No. The average number of employees is not the determining factor. To qualify, employers *must not have had more than 10 employees at any one time* in the previous calendar year.

C–4. Q. Two partners operate an automobile repair shop with nine employees. Does the small employer exemption apply to them?

A. Yes. The partners themselves are employers; therefore, the auto repair shop has only nine employees. As long as the firm has no more than 10 employees at any one time during the previous calendar year, it qualifies for the small employer exemption.

C–5. Q. How were the industries selected for the low-hazard industry exemption?

A. Safety statistics were examined for major industry groups. An industry group was exempted if it was not currently targeted for routine safety inspections and had a lost workday case rate for injuries at or below 75 percent of the private sector average for a designated 3-year period.

C–6. Q. How do employers determine the appropriate SIC code for their establishment to see if they qualify for the exemption of low-hazard industries?

A. First, employers should determine the principal activity of the establishment. If an establishment does more than one kind of business, it is classified in the category that generates the greatest dollar volume. Employers may then refer to the 1972 edition of the *Standard Industrial Classification Manual* (SIC) prepared by the Executive Office of the President, Office of Management and Budget. This publication is usually available in most corporate or public libraries or can be purchased from the Government Printing Office. Employers may also contact their State or BLS regional offices for assistance in making the proper SIC determination. Addresses and telephone numbers for the BLS regional offices are listed on the back cover; those for the State agencies are in appendix D.

C–7. Q. Must employers in the exempted low-hazard industries have written certification from BLS or OSHA that their firm is exempt from OSHA recordkeeping?

A. No. Written certification is not necessary since public notification was made in the **Federal Register**, news releases, etc.

C–8. Q. Does the exemption for low-hazard industries supply to all low-hazard establishments?

A. No. Only establishments in the specified major industry groups are exempt. The fact that an establishment in a high-risk industry has an excellent safety record or that its workers have jobs that seem as safe as those in the exempted industries does not mean that it is exempt.

C–9. Q. How do large employers with multiple establishments handle the exemption of low-hazard activities?

A. Large employers with multiple establishments may find that some of their establishments qualify for exemption while others do not. For exemple, an automobile manufacturer may have assembly plants and retail sales offices. The manufacturing establishments would not be exempt from OSHA recordkeeping; the sales offices would.

C–10. Q. Do recordkeeping exemptions apply uniformly in all States and territories?

A. The exemption for small employers is in effect in all States and territories except Wyoming and the Virgin Islands.

The recordkeeping exemption for low-hazard industries applies to all eligible workplaces under the jurisdiction of Federal OSHA and to establishments in many States with approved State plans under Section 18(b) of the act. However, some States with approved State plans have not adopted the low-hazard exemption. Employers in States with approved plans should contact their State agency to determine if it has adopted the exemptions. State agency addresses and telephone numbers are listed in appendix D, which also indicates those States with approved plans.

D. Exceptions to Exemption for Small Employers and Employers in Low-Hazard Industries

There are two exceptions to the exemption from OSHA recordkeeping for small employers and employers in low-hazard industries:

1. Although OSHA recordkeeping requirements are normally eliminated for small employers and employers in low-hazard industries, they must still comply with OSHA standards, display the OSHA poster, and report to OSHA within 48 hours any work-related accident which results in a fatality or the hospitalization of five or more employees. (Some States have more stringent catastrophic reporting requirements.)

2. A small percentage of the regularly exempt employers have to maintain records for 1 year if they are selected to participate in the Annual Survey of Occupational Injuries and Illnesses. As stated in Parts 1904.15(b) and 1904.16(b) of the regulations, each year BLS selects a rotating sample of small employers and employers in low-hazard industries to participate in the annual survey. These employers, required by law to participate, are notified prior to the beginning of the reference calendar year that they have been selected. They are required to maintain a log and summary (OSHA No. 200), but do not have to prepare any other OSHA injury and illness records. At the end of the calendar year, they must report their injury and illness experience on the survey questionnaire, the OSHA No. 200–S. They are not required to post a summary of their injury and illness experience at the end of the reference year.

D–1. Q. Why are some regularly exempt small employers and employers in low-hazard industries selected each year to keep records and participate in the Annual Survey of Occupational Injuries and Illnesses?

A. A small sample of these regularly exempt employers is required to participate each year so that their injury and illness experience can be incorporated in the BLS survey data. This is necessary to produce estimates which are comparable in coverage to estimates for pre-exemption years.

D–2. Q. How is the survey sample selected for the regularly exempt firms that will be required to keep records? If a regulary exempt firm is selected to participate 1 year, will it be required to participate every year thereafter?

A. The regularly exempt firms notified in advance that they must participate in the annual survey are selected on a random sample basis. Usually, other firms will be selected to participate in subsequent surveys. In some situations, however, a firm may be asked to participate more than once; i.e., when there are not enough firms in a particular industry or employment-size group to insure adequate coverage from a rotating sample.

E. State and Local Government

All States that operate their own safety and health plans require all employers, including State and local government agencies, to maintain records of injuries and illnesses. Part 1952.4(a) of the regulations provides:

> States must adopt recordkeeping and reporting regulations which are identical to 29 CFR Part 1904 "Recording and Reporting Occupational Injuries and Illnesses" except for Part 1904.13 of this chapter, which provides for variances.

Part 1956.10(i) requires these State and local government employers to maintain records and make reports in conformance with the standards and procedures required of private sector employers under the act. State and local government agencies are usually exempt in States which do not operate their own State plans.

E–1. Q. What is the legal basis for the requirement that certain State and local government agencies are required to participate in the recordkeeping and reporting provisions of the act?

A. Section 18(c)(6) of the Federal OSH Act requires States with approved State plans to have State and local government agencies participate in recordkeeping and reporting activities to the extent permitted by State law. Also, nonplan States may require recordkeeping under their own laws and regulations. Participating States, like private sector employers, may use their own recordkeeping forms as long as they are substantially the same as the Federal forms.

E–2. Q. Which States have plans requiring participation of State and local government agencies in OSHA recordkeeping and reporting?

A. The States and territories listed in section C of this chapter have approved plans requiring State and local government participation. These States are identified in appendix D.

E–3. Q. Must private universities and colleges keep records?

A. Although covered by the act, these institutions normally do not have to keep OSHA records because of the recordkeeping exemption discussed in section D above. However, as with other normally exempt industries, a small sample will have to keep records for 1 year if asked to participate. When this occurs, these private universities and colleges must keep records of injuries and illnesses for their employees; students are not included unless they are employed on a full- or part-time basis. Graduate students with paid teaching and research assignments are covered.

State and local government colleges and universities must keep OSHA records if their State has a plan approved for implementing the provisions of the act.

E–4. Q. Are employees of local school districts covered by the act?

A. These employees are covered only in States which have an approved State plan for implementing the provisions of the act.

F. Applicability of OSHA Recordkeeping Requirements to Employers Subject to Other Federal Safety and Health Regulations

Many employers subject to injury and illness recordkeeping requirements of other Federal safety and health regulations are not exempt from OSHA recordkeeping. However, records used to comply with other Federal recordkeeping obligations may also be used to satisfy the OHSA recordkeeping requirements. The forms and definitions used must be equivalent to the OSHA forms and definitions.

F–1. Q. To what extent are motor carriers covered by OSHA recordkeeping regulations since they are under Department of Transportation safety regulations?

A. Motor carriers must maintain injury and illness records in conformance with or equivalent to the OSHA records required by 29 CFR 1904.

F–2. Q. Is the mining industry, which generally comes under the inspection jurisdiction of the Mine Safety and Health Administration, required to participate in the OSHA recordkeeping program?

A. No. A recordkeeping and reporting system has been developed by the Mine Safety and Health Administration (in cooperation with the Bureau of Labor Statistics) whcih provides information on mining activities equivalent to the OSHA injury and illness statistics.

However, the injury and illness experience of some mining company employees working in establishments not related to mining will be maintained on OSHA records. For example, if a mining company has a company store, and the Mine Safety and Health Administration does not require that injury and illness records be kept for the store, it would fall under OSHA jurisdiction.

F–3. Q. Are railroad employers required to keep records of injuries and illnesses of their employees?

A. Yes. In recent years, the Federal Railroad Administration has adopted the definitions of the OSHA recordkeeping system. Railroad employers report occupational injury and illness data annually to the Federal Railroad Administration, which in turn provides the data to BLS for statistical purposes.

Chapter II. The Mechanics of OSHA Recordkeeping

Only two forms are used for OSHA recordkeeping. One form, the OSHA No. 200, serves two purposes: (1) As the Log of Occupational Injuries and Illnesses on which the occurrence, extent, and outcome of cases are recorded during the year; and (2) as the Summary of Occupational Injuries and Illnesses which is used to summarize the log at the end of the year to satisfy employer posting obligations. The other form, the Supplementary Record of Occupational Injuries and Illnesses, OSHA No. 101, provides additional information on each of the cases that have been recorded on the log. (These forms are provided in appendix B.)

A. The Log of Occupational Injuries and Illnesses, OSHA No. 200

The log is used for recording and classifying recordable occupational injuries and illnesses, and for noting the extent and outcome of each case. The log shows when the occupational injury or illness occurred, to whom, what the injured or ill person's regular job was at the time of the injury or illness exposure, the department in which the person was employed, the kind of injury or illness, how much time was lost, and the final determination of the case.

Part 1904.2 of the *Code of Federal Regulations* (CFR) provides the basic requirements for the Log and Summary of Occupational Injuries and Illnesses:

(a) Each employer shall except as provided in paragraph (b) of this section, (1) maintain in each establishment a log and summary of all recordable occupational injuries and illnesses for that establishment; and (2) enter each recordable injury and illness on the log and summary as early as practicable but no later than 6 working days after receiving information that a recordable injury or illness has occurred. For this purpose, form OSHA No. 200 or an equivalent which is as readable and comprehensible to a person not familiar with it shall be used. The log and summary shall be completed in the detail provided in the form and instructions on form OSHA No. 200.

(b) Any employer may maintain the log of occupational injuries and illnesses at a place other than the establishment or by means of data-processing equipment, or both. Under the following circumstances:

(1) There is available at the place where the log is maintained sufficient information to complete the log to date within 6 working days after receiving information that a recordable case has occurred as required by paragraph (a) of this section.

(2) At each of the employer's establishments, there is available a copy of the log which reflects separately the injury and illness experience of that establishment complete and current to a date within 45 calendar days.

The log consists of three parts: A descripitve section which identifies the employee and briefly describes the injury or illness; a section covering the extent of the injuries recorded; and a section on the type and extent of illnesses. A complete OSHA No. 200 log form is shown in appendix B.

While most of the columns seem self-explanatory, there are some important requirements to be considered when completing the log. The following information pertains to the descriptive section of the log shown on the following page.

Column A. Enter a number that is unique for each case. This is very important because each case must be identified and examined "separately. The simplest method of numbering may be the best; i.e. 1, 2, 3. Employers may also number cases by month, for example, 7–15 would indicate the 15th case occurring during July.

Column B. For occupational injuries, enter the date of the work accident which resulted in injury. For occupational illnesses, enter date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of absence attributable to the illness which was later diagnosed or recognized. Cases do not necessarily fall consecutively by date, because injuries and illnesses are recorded as an employer learns that a case has occurred.

Column C. Insert 1 of 2 entries: (1) First name, middle initial, and last name; or (2) first initial, middle initial, and last name.

Column D. Specify the injured or ill employee's regular job title even if the employee was working outside his or her regularly assigned occupation at the time of the injury or illness exposure.

Column E. State the department in which the injured or ill person *is regularly employed.* Enter the department in which the injury or illness exposure occurred only if it is the regularly assigned station. If an employee is regularly assigned in the maintenance department, but was injured while working in the shipping department, the correct entry would be "maintenance."

Column F. Briefly describe the nature of the injury or illness and part(s) of the body affected. For example, amputation—finger, is not sufficiently detailed. A correct entry would be amputation—second joint, forefinger, left hand. This tells which hand, which finger, and to what degree. The examples listed in the heading for column *F* on the log form are good indications of how entries should be made.

The injury portion of the log is reproduced on the following page. The following instructions concern entries made in this section.

Column 1. The date of death must be entered if an occupational injury results in a fatality. In some cases, an employee may be injured, but not die until several weeks or months later. It does not matter how much time has elapsed; if the injury was work-related, the entry on the log must be changed to reflect a fatality; the entries in columns 2 through 6 must be lined out, and the date of death entered in column 1.

Column 2. If a case involves lost workdays due to an injury, check this column. Lost workdays include both days away from work and days of restricted work activity, or both. The number of lost workdays should *not* include the day of injury or any days on which the employee would not have worked even though able to work (i.e., weekends, paid holidays, etc.).

BILLING CODE 4510-24-M

BILLING CODE 4510-24-C

Bureau of Labor Statistics
Log and Summary of Occupational Injuries and Illnesses

U.S. Department of Labor

For Calendar Year 19 ____ Page ____ of ____

Form Approved O.M.B. No. 1220-0029

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. (See posting requirements on the other side of form.)

RECORDABLE CASES: You are required to record information about every occupational death, every nonfatal occupational illness, and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). (See definitions on the other side of form.)

Company Name
Establishment Name
Establishment Address

Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness
Enter a nonduplicating number which will facilitate the review of this record with supporting documents.	Enter day, year.	Enter first name or initial, middle initial, last name.	Enter regular job title, not activity employee was performing when injured or ill even if ill/injured. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed (or a description of normal workplace) at which employee is assigned even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strained back; Contact dermatitis on both hands; Electrocution—body.
(A)	(B)	(C)	(D)	(E)	(F)
PAGE TOTALS					
TOTALS (Sum of all pages)					

Subject of and Duration of INJURY

Fatalities	Nonfatal injuries				
	Injuries With Lost Workdays				Injuries Without Lost Workdays
Injury Related	Enter DATE of death. Mo./Day/Yr.	Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if injury involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above.
(1)	(2)	(3)	(4)	(5)	(6)

Type, Extent of, and Outcome of ILLNESS

Type of Illness								Fatalities	Nonfatal Illnesses				
CHECK Only One Column for Each Illness (See other side of form for demonstrations or permanent transfers.)									Illnesses With Lost Workdays				Illnesses Without Lost Workdays
Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses		Enter DATE of Death. Mo./Day/Yr.	Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if illness involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in column 8 or 9.
(a)	(b)	(c)	(d)	(e)	(f)	(g)		(8)	(9a)	(9b)	(10)	(11)	(12)

INJURIES

ILLNESSES

Certification of Annual Summary Totals By _____ Title _____ Date _____

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

Column 3. Check if the injury involves days away from work.

Column 4. Enter the actual number of days away from work.

Column 5. Enter the actual number of days of restricted work activity.

Column 6. If no entry was made in columns 1 or 2, but the injury is recordable according to the guidelines in this report or the instructions on the OSHA No. 200, a check must be entered to indicate that it was an injury without lost workdays.

Extent of and Outcome of INJURY					
Fatalities	Nonfatal injuries				
Injury Related	Injuries With Lost Workdays				Injuries Without Lost Workdays
Enter DATE of death. Mo./day/yr.	Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if injury involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above.
(1)	(2)	(3)	(4)	(5)	(6)

The illness portion of the log follows on the next page with instructions relating to the columns in this section.

Column 7. For occupational illnesses, an entry should be placed in one of the columns 7a through 7g, depending upon which column is applicable. It is important to keep in mind that illnesses must be evaluated individually. For example, a sunstroke would require a check in column 7e; eczema or rash would require a check in column 7a, etc. The reserve side of the log form gives examples of cases under each illness category.

Column 8. The date of death must be entered if an occupational illness results in a fatality.

Column 9. Check if the illness involves days away from work or days of restricted work activity, or both.

Column 10. Enter a check if the illness involves days away from work.

Column 11. Enter the actual number of days away from work resulting from the illness.

Column 12. Enter the number of days of restricted work activity resulting from the illness.

Column 13. Enter a check if no entry was made in columns 8 or 9 since the illness did not involve lost workdays.

For illnesses only, when a termination or permanent transfer is involved, place an asterisk (*) to the right of the entry in columns 7a through 7g (type of illness).

A–1. Q. Who must maintain the log?

A. Every employer who is subject to the recordkeeping requirements of the OSH Act must maintain at each establishment a log of all recordable occupational injuries and illnesses which occur at the establishment.

A–2. Q. How must the log be maintained and retained?

A. The log must be maintained on a calendar (not fiscal) year basis. Logs must be kept current and retained for 5 years following the end of the calendar year to which they relate. If there is a change in the extent or outcome of a case entered on the log, the first entry should be lined out and a corrected entry made. An entry may be lined out if a case is later found to be nonrecordable. Entries should be made for previously unrecorded cases that are discovered or found to be recordable after the end of the year in which the case occurred. The new entry should be made on a log for the year in which the case occurred.

A–3. Q. When must an employer make an entry on the log?

A. Normally, an employer must make an entry on the log no later than 6 working days after receiving information that a recordable case has occurred.

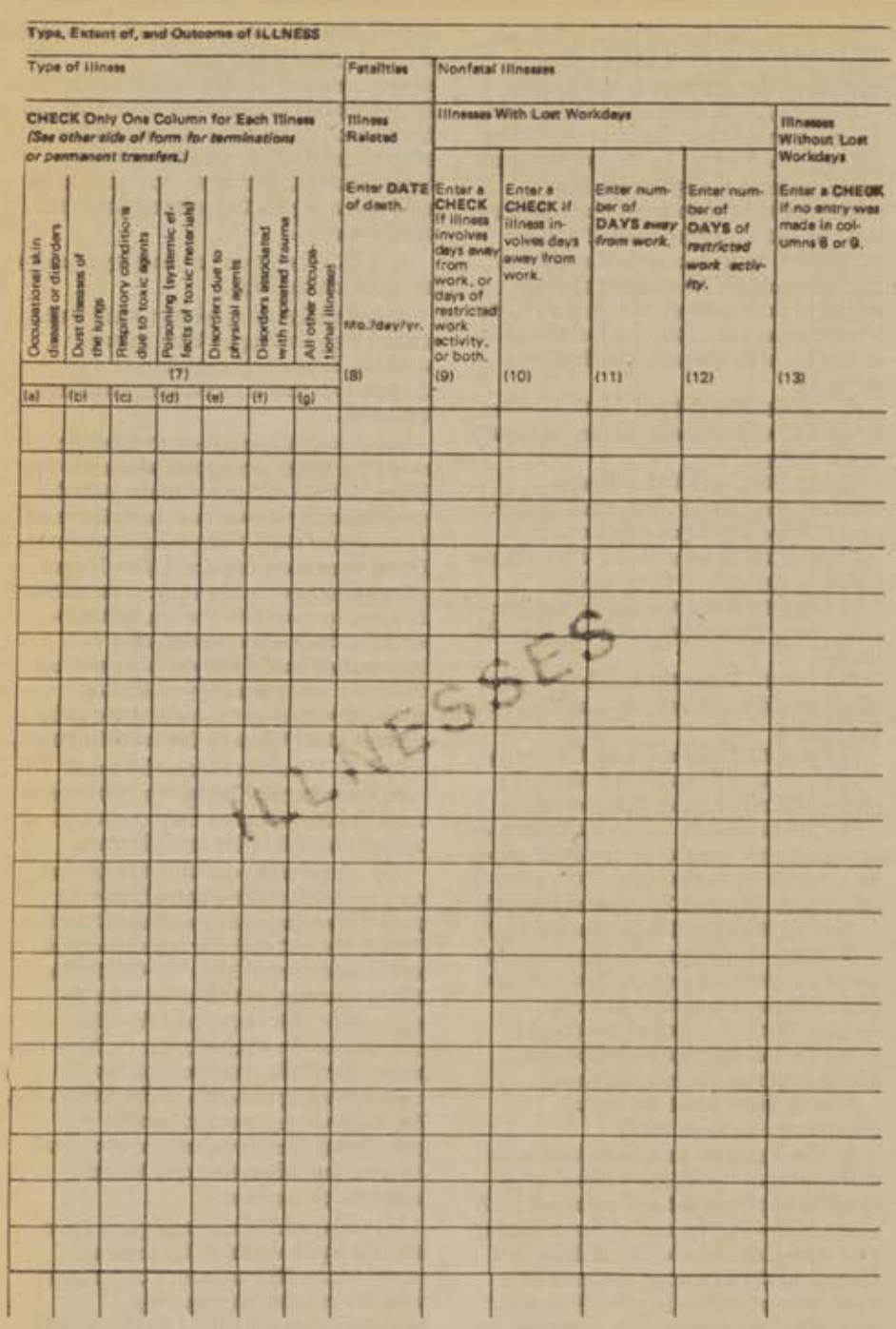
However, an exception to this rule exists for those situations where the log is maintained at a place other than the establishment or where it is maintained by means of data processing equipment. These situations require: (1) Sufficient information available at the alternative location to complete the log within 6 working days after receipt of information that a recordable case has occurred; and (2) a copy of the log updated within 45 calendar days to be present at all times in the establishment.

A–4. Q. What form must be used?

A. Usually, the OSHA No. 200 form is used by employers as their record of occupational injuries and illnesses.

Also, a private equivalent to the log, such as a computer printout, may be used if it contains as much detail as the OSHA No. 200 and if it is as readable and comprehensible as the OSHA No. 200 to a person not familiar with the equivalent. It is important that the columns of the equivalent form have the same identifying numbers as the corresponding columns of the OSHA No. 200 because the instructions for completing the survey of occupational injuries and illnesses refer to log columns by number.

It is advisable that employers have private equivalents of the log form reviewed by BLS to insure compliance with the regulation requiring comparability with the OSHA No 200.



Type, Extent of, and Outcome of ILLNESS												
Type of Illness							Fatalities	Nonfatal Illnesses				
CHECK Only One Column for Each Illness (See other side of form for terminations or permanent transfers.)							Illness Related	Illnesses With Lost Workdays				Illnesses Without Lost Workdays
Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses	Enter DATE of death. Mo./day/yr.	Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if illness involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 8 or 9.
(7)							(8)	(9)	(10)	(11)	(12)	(13)
(a)	(b)	(c)	(d)	(e)	(f)	(g)						

ILLNESSES

A–5. Q. Can additional information be included on private equivalents to the log?

A. Yes. Equivalents to the log may contain additional information if they retain the same identifying column numbers as the OSHA No. 200 and are as readable and comprehensible as the OSHA No. 200 to a person not familiar with the equivalent form.

A–6. Q. Is an employer required to have a log for any year in which there were no recordable cases?

A. No. An employer is not required to have a log for any year during which there were no recordable cases. However, the summary portion of the OSHA No. 200 should be completed with zero entries and retained for the 5-year period.

A–7. Q. Can OSHA records be kept on microfiche or magnetic tape?

A. Yes. If the information is always available during working hours and is retrievable upon demand, and if the format used to store the information is equivalent to the format of the OSHA forms.

B. The Summary of Occupational Injuries and Illnesses, OSHA No. 200

The portion of the OSHA No. 200 to the right of the dotted vertical line is used to summarize injuries and illnesses in an establishment for the previous calendar year. Every nonexempt employer who is required to keep OSHA records must prepare an annual summary for each establishment, based on the information contained in the log for each establishment. The summary is prepared by totaling the column entries on the log (or its equivalent) and signing and dating the certification portion of the form at the bottom of the page.

Part 1904.5 of the Code of Federal Regulations states the requirements for the annual summary of occupational injuries and illnesses:

(a) Each employer shall post an annual summary of occupational injuries and illnesses for each establishment. This summary shall consist of a copy of the year's totals from the form OSHA No. 200 and the following information from that form: calendar year covered, company name, establishment address, certification signature, title, and date. . . . If no injuries or illnesses occurred in the year, zeros must be entered on the totals line, and the form must be posted.

(b) The summary shall be completed by February 1, beginning with calendar year 1979.

(c) Each employer, or the officer or employee of the employer who supervises the preparation of the log and summary of occupational injuries and illnesses, shall certify that the annual summary of occupational injuries and illnesses is true and complete.

(d)(1) Each employer shall post a copy of the establishment's summary in each establishment in the same manner that notices are required to be posted under Section 1903.2(a)(1) of this chapter. The summary covering the previous calendar year shall be posted no later than February 1, and shall remain in place until March 1. . . .

(2) A failure to post a copy of the establishment's annual summary may result in the issuance of citations and assessment of penalties pursuant to Sections 9 and 17 of the Act.

Part 1903.2(a) of the regulations governs employer posting obligations. The following requirements pertain to posting the summary:

(a) Such notice or notices shall be posted by the employer in each establishment in a conspicuous place or places where notices to employees are customarily posted. Each employer shall take steps to insure that such notices are not altered, defaced, or covered by other material.

Before preparing the summary which is shown on the next page, the employer should review the log to be sure the entries are correct and current. Each case should be checked to make sure that it is in only one of the "extent" categories on the log (fatalities, lost workday cases, nonfatal cases without lost workdays). Any open case involving a loss of workdays which is continuing at the time the summary is prepared should be completed by estimating the number of future workdays the employee will lose. The estimated number of future lost workdays should be added to the number of workdays already lost, and the combined total entered on the log and included in the summary. (The log should be revised at a later date to reflect the number of days that were actually lost.)

The yearly totals on the log are all that is needed for posting. Employers may prepare the summary in 1 of 2 ways: (1) They can use the last page of the log they have been maintaining during the year by folding the log so that the portion to the left of the dotted line is turned under to conceal the names of the injured or ill employees; or (2) they can use a photocopy or separate form, such as a blank OSHA No. 200.

Completing the summary is a relatively simple procedure. The right hand portion of the log (to the right of the dotted fold line) is used for this purpose. Employers complete the top portion of the page by entering the year to which the records relate, the company name (and the establishment name, if different from the company), and the address. Then the entries in columns 1 through 13 are added vertically and totaled on the bottom line. Note that, although all the column entries for cases and lost workdays must be totaled, employers need not total the asterisks on the log signifying illnesses resulting in termination of employment or permanent transfer, since these are primarily for the information of authorized Federal or State officials. The summary is completed with the signature of the person responsible for the summary information and the date of that person's signature at the bottom of the page.

B–1. Q. What is supposed to be accomplished by posting an annual summary in the workplace?

A. Posting the annual summary: (1) Provides employees with their establishment's record of injuries and illnesses; (2) makes employers and employees more safety conscious; and (3) promotes joint labor-management safety and health efforts.

B–2. Q. What form must be used for the summary?

A. The OSHA No. 200 or a private equivalent may be used. Employers are allowed to use private equivalents if they are readable and comprehensible to persons not familiar with the equivalents. A blank copy of the OSHA No. 200 is often posted beside the equivalent for clear understanding by employees. Copies of the OSHA No. 200 can be obtained from BLS regional offices or from the BLS national office. (See back cover for BLS regional office addresses and telephone numbers.)

B–3. Q. How long must the summary be posted at each establishment?

A. The annual summary is to be posted by February 1 of each year and is to remain in place until March 1. It must be posted at each establishment in a conspicuous place where notices to employees are customarily posted.

B–4. Q. Who is responsible for the preparation of the annual summary?

A. The employer is ultimately responsible for preparation of the annual summary. However, in many instances an employee actually prepares and certifies the annual summary.

BILLING CODE 4510-24-M

U.S. Department of Labor

For Calendar Year 19 _____ Page ___of___

Company Name

Establishment Name

Establishment Address

Form Approved
O.M.B. No. 1220-0029

Extent of and Outcome of INJURY						Type, Extent of, and Outcome of ILLNESS												
Fatalities	Nonfatal Injuries					Type of Illness							Fatalities	Nonfatal Illnesses				
Injury Related	Injuries With Lost Workdays				Injuries Without Lost Workdays	CHECK Only One Column for Each Illness (See other side of form for terminations or permanent transfers.)							Illness Related	Illnesses With Lost Workdays				Illnesses Without Lost Workdays
Enter DATE of death. Mo./day/yr.	Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if injury involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above.	Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses	Enter DATE of death. Mo./day/yr.	Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if illness involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 8 or 9.
(1)	(2)	(3)	(4)	(5)	(6)	(7) (a)	(b)	(c)	(d)	(e)	(f)	(g)	(8)	(9)	(10)	(11)	(12)	(13)

INJURIES

ILLNESSES

Certification of Annual Summary Totals By _____ Title _____ Date _____

FOLD

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1.

BILLING CODE 4510-24-C

B–5. Q. What is meant by certification of the summary?

A. The summary must be signed and dated by the employer, or whoever is delegated responsibility for completing it, to certify that it is true and complete to the best of that person's knowledge.

B–6. Q. If no recordable cases occurred during a reporting period, must a summary be prepared?

A. Yes. Even though there were no recordable cases during the previous year, the summary portion of the OSHA No. 200 must be completed and posted in each establishment no later than February 1 and remain in place until March 1. Zeros should be entered in all categories on the "totals" line. All summaries must be retained for 5 years following the end of the year to which they relate.

B–7. Q. Can the summary at the end of the year be on a total company basis, or does it have to be completed for each establishment?

A. A summary must be prepared for each establishment and posted in each establishment.

B–8. Q. Must a copy of the annual summary be posted on evey bulletin board, or will the posting of only one copy comply with the requirements of the law?

A. It depends upon the particular establishment. The regulations state that the annual summary is to be posted "at each establishment in a conspicuous place where notices to its employees are posted customarily." In some circumstances, this may require more than one posting.

B–9. Q. How do workers review the annual summary when they don't work at a fixed worksite?

A. During the posting period, employers are required to present or mail a copy of the annual summary to employees with no fixed worksite.

B–10. Q. Is it necessary to post the annual summary if an establishment closes?

A. It is not necessary to post a summary in an establishment which has closed by the time the summary is prepared. The primary purpose of posting is to inform employees of the past year's injury and illness record.

B–11. Q. Must the employer post the annual summary at the jobsite of a seasonal operation if the site is shut down during the posting period?

A. Posting informs the employees of the past year's injury and illness experience for that establishment. Since posting in a vacated establishment would not accomplish this purpose, posting is not required. However, employers in these situations shall present or mail a copy of the annual summary to their permanent employees.

B–12. Q. When will an establishment have to send its annual summary to the Bureau of Labor Statistics?

A. Never. The employer must retain the recordkeeping forms, the log and summary, OSHA No. 200, and the supplementary record, No. 101, in the establishment for 5 years after the reference year of the records. Establishments selected to participate in the statistical survey will receive a survey reporting form in the mail. If an establishment does not receive a form, the employer need only maintain and retain the records according to the regulations.

B–13. Q. How is a lost workday case handled on the summary if it carries over into the next year? What if, for example, an employee is injured in December 1983 and is still out on January 31, 1984?

A. Two important considerations are involved: (1) The same case should not appear in the records for 2 years; and (2) it is important not to lose the count of the actual number of lost workdays, which is a measure of the severity of the case.

The original entry for this case should be on the 1983 log. At the end of calendar year 1983, the employer should estimate the number of workdays the employee is expected to lose in 1984 and add that to the count of workdays lost up to the time of making that estimate. That number should be entered in column 4 or column 11 of the 1983 log, depending on the type of case. When the employee returns to work and is able to perform all the duties of his or her regular job or the count of lost workdays is otherwise ended, the employer should verify the actual count of lost workdays (days away from work and any days of restricted activity) and correct the entry on the 1983 log as necessary. No entries should be made for this case on the 1984 log. Also, the summary for 1983 does not have to be corrected.

C. The Supplementary Record of Occupational Injuries and Illnesses, OSHA No. 101

For every injury or illness entered on the log, it is necessary to record additional information on the supplementary record, OSHA No. 101. The supplementary record describes how the accident or illness exposure occurred, lists the objects or substances involved, and indicates the nature of the injury or illness and the part(s) of the body affected.

Part 1904.4 of the *Code of Federal Regulations* provides the requirements for the supplementary record:

> In addition to the log of occupational injuries and illnesses provided for under Section 1904.2, each employer shall have available for inspection at each establishment within 6 working days after receiving information that a recordable case has occurred, a supplementary record for each occupational injury or illness for that establishment. The record shall be completed in the detail prescribed in the instructions accompanying Occupational Safety and Health Administration Form OSHA No. 101. Workmen's compensation insurance or other reports are acceptable alternative records if they contain the information required by Form OSHA No. 101. If no acceptable alternative record is maintained for other purposes, Form OSHA No. 101 shall be used or the necessary information shall be otherwise maintained.

Most items in the supplementary record shown on the next page are self-explanatory. However, the following items are highlighted:

The OSHA case or file number must be the same number used to identify the case or file number in column *A* of the log, OSHA No. 200.

Occupation (item 8) refers to the employee's *regular* job title. If an employee is working in a capacity other than the regular occupation at the time of an injury or illness exposure, item 8 must show the regular job title. This is the same title used in column *D* of the log.

Department (item 9) refers to the department or division in which the employee is *regularly* employed, even if an employee should be temporarily working in another department at the time of the injury or illness exposure. This is the same department named in column *E* of the log.

Premises (item 11) refers to whether the accident or exposure occurred on the employer's premises.

Injury or illness and part(s) of body affected (item 14) should be in agreement with the information entered in column *F* of the log.

C–1. Q. When must a supplementary record be prepared?

A. A supplementary record must be prepared for each case within the same time frame required for entering a case on the log—within 6 workdays after receipt of information that a recordable case has occurred.

C–2. Q. Must all employers complete the OSHA No. 101 or equivalent for any case entered on the log of occupational injuries and illnesses?

A. Yes, all employers regularly keeping OSHA records must complete a supplementary record for each entry on the log, OSHA No. 200.

However, there is one exception to this rule. As noted in section D, chapter

II, a small percentage of firms regularly exempt from OSHA recordkeeping is selected each year to participate in the Annual Survey of Occupational Injuries and Illnesses. Those selected are required to maintain a log of occupational injuries and illnesses but are not required to complete any other OSHA records.

C–3. Q. What form must be used as the supplementary record?

A. Either the OSHA No. 101 or any other form which contains the same information may be used. Employers are not required to prepare an OSHA No. 101 if they complete any other form which contains identical information. Many State workers' compensation first report of injury forms contain all the OSHA No. 101 items. In addition, many large employers prepare internal accident report forms which contain all the necessary items.

C–4. Q. Does this mean employers don't need to complete OSHA No. 101 if they presently use a State workers' compensation form?

A. It depends upon the particular workers' compensation form used. Workers' compensation first report of injury forms are acceptable if they contain all the items on the OSHA No. 101 or are supplemented to do so. Employers should be sure that all OSHA No. 101 items are on the first report forms; otherwise, missing items may be entered on a separate attachment. Many States have modified their first report forms to include this information. Employers should consult the State agency which is cooperating in the program with the Bureau of Labor Statistics or the BLS regional or national office to determine whether any items are missing from their State's form. The addresses and telephone numbers of these agencies and offices are listed in the appendix D and on the back cover of this report.

C–5. Q. Our State workers' compensation form lists only disabling injuries. How can we use this in place of OSHA No. 101?

A. If a State requires reports of disabling injuries only, the employer will have to complete additional forms to comply with the OSHA requirements. The OSHA No. 101 or some acceptable substitute such as an insurance form or internal accident report form may be used to record the nondisabling injuries.

C–6. Q. Who evaluates a State's first report of injury form to insure that it satisfies the requirements of the OSHA No. 101?

A. The Bureau of Labor Statistics is available to evaluate State first report of injury forms upon request.

C–7. Q. If a company's injury form, which is generally similar to OSHA No. 101, does not include information such as social security number, sex, etc., must the company apply to BLS for a variance?

BILLING CODE 4510-24-M

Bureau of Labor Statistics
Supplementary Record of
Occupational Injuries and Illnesses

U.S. Department of Labor

This form is required by Public Law 91-596 and must be kept in the establishment for *5 years.* Failure to maintain can result in the issuance of citations and assessment of penalties.

Case or File No.

Form Approved
O.M.B. No. 1220-0029

Employer

1. Name

2. Mail address *(No. and street, city or town, State, and zip code)*

3. Location, if different from mail address

Injured or Ill Employee

4. Name *(First, middle, and last)* | Social Security No.

5. Home address *(No. and street, city or town, State, and zip code)*

6. Age | 7. Sex: *(Check one)* Male ☐ Female ☐

8. Occupation *(Enter regular job title, not the specific activity he was performing at time of injury.)*

9. Department *(Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)*

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure *(No. and street, city or town, State, and zip code)*

11. Was place of accident or exposure on employer's premises? Yes ☐ No ☐

12. What was the employee doing when injured? *(Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)*

13. How did the accident occur? *(Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)*

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected. *(E.g., amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand, etc.)*

15. Name the object or substance which directly injured the employee. *(For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernias, etc., the thing he was lifting, pulling, etc.)*

16. Date of injury or initial diagnosis of occupational illness | 17. Did employee die? *(Check one)* Yes ☐ No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report	Prepared by	Official position

OSHA No. 101 (Feb. 1981)

A. No. Also, it is not mandatory that the OSHA form be used as the supplementary record; any other form may be used if it contains all of the OSHA No. 101 items or is supplemented to do so. In this case, a longhand entry concerning the individual's sex, social security number, and other missing information would satisfy the need. An alternative record which does not contain all of the OSHA No. 101 items can be supplemented by adding the missing items.

C–8. Q. Does information on the supplementary record (OSHA No. 101) need to be on one form? What if a company wants to split this information between the mailing department, safety department, and workers' compensation department?

A. Yes. This information must be on one form, either the OSHA No. 101 or a satisfactory substitute. Therefore, the information should not be split between different departments.

Chapter III. Location, Retention, and Maintenance of Records

Ordinarily, injury and illness records must be kept for each establishment covered by the Occupational Safety and Health Act. The regulations require that records be located and maintained at this level to assist government agencies in administering and enforcing the act, to increase employer-employee awareness, and to promote injury and illness prevention. This chapter describes requirements for location of records and employer responsibilities for records retention and maintenance.

A. Establishments Required To Keep and Maintain Records

The establishment is the basic organizational unit in the private sector among different firms and operations in different industries. It is the focus of the requirements for records location and maintenance, since the regulations require that records be kept at the establishment level. Therefore, it is imperative that everyone involved in the recordkeeping process have a clear understanding of what constitutes an establishment for recordkeeping purposes.

Part 1904.12(g)(1) of the regulations provides a concise definition of the term "establishment." An establishment is defined as a single physical location where business is conducted or where services or industrial operations are performed. The examples provided include a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office.

The regulations specify that distinctly separate activities performed at a single physical location (for example, where contract construction activities are operated from the same physical location, as a lumber yard), shall each be treated as a separate establishment for recordkeeping purposes.

A–1. Q. What is the definition of a "single physical location?"

A. While the regulations do not require that worksites be contiguous to comprise a single physical location, these sites should at least be in proximity to one another. This relationship is a matter of degree—depending upon the size and nature of the operations of the unit under consideration.

A–2. Q. Our company has several different operations at several different locations. For unemployment insurance purposes, these units have always been considered one establishment. In addition, we are mailed only one survey form for all these operations when we are selected to participate in the BLS Annual Survey of Occupational Injuries and Illnesses. Must we keep more than one set of injury and illness records for these operations?

A. Yes. The regulations require that injury and illness records be maintained for each establishment, which is defined as a single physical location where business is conducted or where operations are performed. The fact that employers may consolidate records for survey reporting and other purposes does not affect this requirement.

A–3. Q. Even though individual establishments must maintain individual records, may a company file a consolidated report of these operations to the Bureau of Labor Statistics in Washington or to the regional offices? If so, how do employers know which operations to include?

A. Reports of injuries and illnesses need not be filed with BLS unless the company is selected to participate in the BLS annual survey. If a company is selected to participate, it will be mailed a survey form on which to report its occupational injuries and illnesses. The form will identify which establishments are to be included in the report. Sometimes all establishments in a specified area, such as a county, are included; sometimes they are not.

A–4. Q. What is meant by the term, "a distinctly separate activity?"

A. There is no clear-cut definition of what constitutes a "distinctly separate activity." Production of dissimilar products; different kinds of operational procedures; different facilities; and separate management, personnel, payroll, or support staff are all indicative of separate activities and separate establishments.

A–5. Q. How many sets of records must be kept in the following case? At one location, workers in Division A make metal tools, while workers in Division B make wooden chairs.

A. If Divisions A and B are managed independently of each other, then they would be considered separate establishments and each division would keep its own records.

A–6. Q. What about auxiliary operations, such as personnel offices or medical facilities?

A. These may be either separate establishments or subunits, departments, or divisions within an establishment, depending on the nature of operations and degree of autonomy the particular unit has in relation to the main organization. (See question A–4 above.)

A–7. Q. Would a manufacturing operation with a warehouse attached need to keep separate records for the warehouse?

A. Only if the warehouse is a distinctly separate activity. Factors to consider include whether the warehouse is an integral part of the manufacturing operation and whether it stores materials for any operation other than the manufacturing facility. Other factors to evaluate are listed in question A–4.

A–8. Q. Do separate OSHA records have to be kept for trucking operations associated with manufacturing facilities?

A. If a trucking fleet is a distinctly separate activity, it requires separate OSHA records. There are, of course, situations where separate OSHA records for truckdrivers would not be kept. These involve operations with a limited number of trucks under the same supervision as the rest of the facility. In these situations, it is usually difficult to differentiate between truckdrivers and other employees in the employment records. Question A–4 of this section lists other considerations.

A–9. Q. A firm has several operational facilities at several locations, each having its own management. However, all facilities utilize one medical department and one personnel office. Are separate records required for each of these facilities or can one set of records be kept for all the facilities?

A. These facilities constitute separate establishments, and hence require separate records. The regulations require that records be maintained at the establishment level so that both management and employees have information on their injury and illness experience.

A–10. Q. How are records kept for a firm that rotates its employees among several different fixed establishments?

A. Separate records shall be kept for each separate establishment. Each establishment's records should reflect the injuries and illnesses which occurred in that particular establishment. (See chapter VI, question B–21, for recording lost workdays in these situations.)

A–11. Q. Must employers maintain separate records for exposure hours for each establishment in situations where the employees are rotated among the firm's different establishments?

A. Separate records for exposure hours do not necessarily have to be maintained. However, employers should at least be able to provide an estimate of the exposure hours worked at each establishment.

B. Location of Records

Injury and illness records (the log and summary, OSHA No. 200, and the supplementary record, OSHA No. 101) must be kept for every physical location where operations are performed. Under the regulations, the location of the records depends upon whether or not the employees are associated with fixed establishments.

1. *Employees associated with fixed establishments.* Records for these employees should be located as follows:

a. Records for employees working at fixed locations, such as factories, stores, restaurants, warehouses, etc., should be kept at the work location.

b. Records for employees who report to a fixed location but work elsewhere should be kept at the place to which the employees report each day. These employees are generally engaged in activities such as agriculture, construction, transportation, etc.

c. Records for employees whose payroll or personnel records are maintained at a fixed location, but who do not report or work at a single establishment, should be maintained at the base from which they are paid or the base of their firm's personnel operations. This category includes generally unsupervised employees such as traveling salespeople, technicians, or engineers.

2. *Employees not associated with fixed establishments.* Some employees are subject to common supervision, but do not report or work at a fixed establishment on a regular basis. These employees are engaged in physically dispersed activities that occur in construction, installation, repair, or service operations. Records for these employees should be located as follows:

a. Records may be kept at the field office or mobile base of operations.

b. Records may also be kept at an established central location. If the records are kept centrally: (1) The address and telephone number of the place where the records are kept must be available at the worksite; and (2) there must be someone available at the central location during normal business hours to provide information from the records.

B–1. Q. I manage a grocery store that is part of a supermarket chain. May we keep the OSHA records for our employees at our company's central administrative office?

A. No. The OSHA records for these employees should be maintained at the work location to satisfy the requirements of the regulations and to insure maximum effectiveness of the records in injury and illness prevention. However, even though the summary and supplementary records must be kept at the establishment, see the next section for the location exception for the log, OSHA No. 200.

B–2. Q. Our company employs several salesmen who operate within a limited geographic area on a commission basis. Where should the records for these people be located?

A. If these employees do not ordinarily report to a single location and are generally unsupervised in their daily work, the records should be kept at the location from which they are paid or the base of their firm's personnel operations.

If these employees report to a given location each day before beginning their sales activities, the records should be kept at the place to which they report.

B–3 Q. Do construction subcontractors and construction contractors have to keep OSHA records at each individual jobsite, or can the records be located at their regional or central office?

A. Location of the records depends upon the nature of the operation. If the employees report to a given place each day but work elsewhere, OSHA records should be kept at the location where they report. For example, if an employer is a plumbing contractor with trucks going from the shop to different sites each day, the establishment is the shop. This is the location where records must be kept. However, if the employees of a plumbing firm report directly to transient jobsites each day, the firm has discretion regarding where the rocords are kept. Records for employees subject to common supervision who do not report or work at a fixed establishment on a regular basis may be kept at either: (1) The field office or mobile base of operations; or (2) at an established central location, provided the employer satisfies the two requirements listed above for employees not associated with fixed establishments.

B–4. Q. How do you distinguish between fixed and nonfixed establishments for the purpose of determining where OSA records should be kept?

A. The distinction between these two types of establishments generally rests on the nature and duration of the operation and not on the type of structure in which the business is located.

A nonfixed establishment usually operates at a single location for a relatively short period of time. A fixed establishment remains at a given location on a long-term or permanent basis and often involves repetitious activities. Also, fixed establishments are generally places where clerical, administrative, or other business records are kept. For examle, a construction crew repairing a bridge for 2 months is considered working in a nonfixed establishment, while a crew repairing a bridge for a year and half is considered working at a fixed establishment.

C. Location Excaption for the Log (OSHA No. 200)

Although the supplementary record and the annual summary must be located as outlined in the previous section, it is possible to prepare and maintain the *log* at an althernate location or by means of data processing equipment, or both. Two requirements must be met: (1) Sufficient information must be available at the alternative location to complete the log within 6 workdays after receipt of information that a recordable case has occurred; and (2) a copy of the log updated to within 45 calendar days must be present at all times in the establishment. This location exception applies only to the log, and not to the other OSHA records. Also, it does not affect the employer's posting obligations.

C–1. Q. Can we maintain the logs for our different facilities in one central administrative office rather than in each individual establishment?

A. Yes. For centralized recordkeeping, the log, OSHA No. 200, may be maintained in some place other than the establishment, such as the central office. If that is done, the requirements listed above must be followed. Note, however, that separate records must be maintained for each establishment.

C–2. Q. To qualify for the location exception for the log, must I use a computer to maintain the records at the alternative location?

A. A computer may be used for this purpose, but it is not mandatory.

D. Retention of OSHA Records

The regulations require that the log and summary, OSHA No. 200, and the

supplementary record, OSHA 101, must be retained in each establishment for 5 calendar years following the end of the year to which they relate. This requirement pertains to the log and summary, OSHA No. 200, and to the supplementary record, OSHA No. 101.

D–1. Q. Must a new owner retain the OSHA records of an existing establishment he or she just purchased?

A. When a change in ownership of an establishment occurs, the new owner must retain OSHA injury and illness records of the previous owner for 5 years following the end of the year to which they relate. However, the new owner does not have to update these records.

D–2. Q. Must a construction company retain OSHA records for completed projects, such as completed buildings, bridges, etc., if the company's business continues at another location after the completion?

A. Yes. In these situations, the OSHA records must be retained by the company for the 5-year retention period.

D–3. Q. When a firm goes out of business, does the employer still have to retain the OSHA records?

A. In this situation, the firm ceases to exist at the time the employer closes down operations. The employer no longer has to retain the OSHA records once the firm ceases to exist.

D–4. Q. Must records still be retained if a firm undergoes a fundamental change in business structure, such as changing from a privately owned enterprise to a corporation?

A. Yes. The OSHA records must still be retained since the existence of the establishment remains unchanged.

D–5. Q. What is the employer's responsibility for retention of OSHA records if the establishment goes bankrupt?

A. The employer's responsibility in this situation depends upon the nature of the proceeding in bankruptcy. If the firm undergoes a reorganization in bankruptcy, the employer must retain the OSHA, records. If a firm undergoes a bankruptcy that results in liquidation, the employer's responsibility terminates upon liquidation. The difference between these two situations is that, in the former, the establishment continues to exist as an organization entity; in the latter, it does not.

D–6. Q. Does an establishment cease to exist for recordkeeping purposes when it seasonally closes down operations? Do these employers have to retain their OSHA records?

A. Just because a firm temporarily closes down operations on a seasonal or cyclical basis does not mean that it ceases to exist as an establishment. If the firm's operations are basically ongoing in nature, the employer is still required to retain the OSHA records. The retention requirement ceases only when the establishment permanently goes out of business.

D–7. Q. An employer with a number of establishments is dissolving her business. Some establishments are being transferred to another firm; some are being closed. What should be done with the OSHA records?

A. For those establishments in which there is a change of ownership, the occupational injury and illness records should be transferred to the new owner. The new owner must preserve those records for 5 years following the end of the year to which they relate; however, the new owner is not responsible for updating log entries. The new owner will, of course, be responsible for work injury and illness records subsequent to the takeover date.

For those establishments which are discontinued as part of a general dissolution, the obligation to preserve or maintain the injury and illness records is ended. If the employer's business were continuing, the injury and illness records for the discontinued establishments should be transferred to a central office (or another establishment if there is no central office) and maintained for the 5-year retention period.

E. Maintenance of the Log (OSHA No. 200)

In addition to keeping the log on a calendar year basis, employers are required to update this form to reflect changes which occur in recorded cases after the end of the calendar year. Maintenance or updating of the log is different from the retention of records discussed in the previous section. Although all OSHA injury and illness records must be retained, only the log must be maintained by the employer.

If, during the 5-year retention period, there is a change in the extent or outcome of an injury or illness which affects an entry on a previous year's log, then the first entry should be lined out and a corrected entry made on that log. Also, new entries should be made for previously unrecorded cases that are discovered or for cases that initially weren't recorded but were found to be recordable after the end of the year in which the case occurred.

E–1. Q. If a change in the ownership of an establishment occurs, does the new owner have to maintain the previous owner's log?

A. No. Although the new owner must retain the previous owner's OSHA records for 5 years, he or she is not responsible for maintaining the previous owner's log.

E–2. Q. Must the new owner maintain the previous owner's log when a change of ownership occurs during mid-year?

A. No. The new owner should retain the previous owner's records, but he doesn't have to maintain them. Instead he should prepare and maintain OSHA injury and illness records which begin with his assumption of ownership and go through the end of the calendar year.

E–3. Q. If an employer reorganizes the structure of his or her business from a private owned enterprise to a corporation, must he or she still maintain logs for the establishment prior to the reorganization?

A. It depends upon the degree of reorganization and the amount of control the original owner still exercises over the operation. New owners need not maintain a previous employer's records. However, records must still be maintained where a firm merely reorganizes its business structure while continuing under the direction and control of the original owner.

E–4. Q. When a firm goes out of business, does the employer have to maintain the OSHA log?

A. No. Employers no longer have to retain their OSHA records or maintain the OSHA log once the establishment goes out of business.

Chapter IV. Employer Decisionmaking

This chapter covers questions which often arise regarding recordkeeping decisions which must be made at the establishment level. It focuses on the legislative and regulatory assignment of decisionmaking authority to employers, and describes the safeguards built into the system to insure the integrity of the records and the validity of the statistics that the records provide.

A. Types of Decisions Employers Make in the Recordkeeping Process

1. *Distinguishing between employees and other workers on site.* The Occupational Safety and Health Act of 1970 and Part 1904 of the *Code of Federal Regulations* require employers to maintain injury and illness records for their own employees at each of their establishments. Employers are not responsible for maintaining records for employees of other firms or for independent contractors, even though these individuals may be temporarily at work in their establishment or on one of their jobsites at the time an injury or illness exposure occurs. Therefore, before deciding whether a case is recordable, an employment relationship needs to be determined.

2. *Deciding if injuries and illnesses occurring to employees are recordable. Employers decide which cases are to be entered on the OSHA records.* This decision must be made in good faith, according to the requirements of the act and Part 1904 of the regulations. Chapter V of this report provides a detailed description of these recordkeeping requirements and furnishes criteria for determining recordability. It presents an overview of the Department of Labor recordkeeping interpretations and guidelines which have been followed by most employers in making recordkeeping determinations since their original issuance in 1972.

3. *Determining the extent or outcome of recordable cases.* Employers must also determine the extent and outcome of the recordable cases. Part 1904.12(c) of the regulations provides the categories in which recordable cases must be classified. These categories are discussed at length in chapter VI.

A–1. Q. How do you differentiate between employees and independent contractors for recordkeeping purposes?

A. This should be evaluated on a case-by-case basis. Employee status generally exists when the employer supervises not only the output, product, or result to be accomplished by the person's work, but also the details, means, methods, and processes by which the work objective is accomplished.

Independent contractors are primarily subject to supervision by the using firm only in regard to the result to be accomplished or end product to be delivered.

Other factors which should be considered in determining employee status are: (1) Whom the worker considers to be his or her employer; (2) who pays the worker's wages; (3) who withholds the worker's Social Security taxes, (4) who hired the worker; and (5) who has the authority to terminate the worker's employment.

People considered independent contractors for other reasons may be considered employees for OSHA recordkeeping purposes.

A–2. Q. Sometimes, businesses use workers from temporary help supply services on a contract basis. Should the using firm record the injuries and illnesses of these temporary workers, or should the service?

A. If the temporary workers are being supplied for indefinite periods of time, or if they are subject to the supervision of the using firm, the temporary help supply service contractor is acting merely as a personnel department for the using firm, and the using firm must keep the records for the personnel supplied by the service.

If the temporary workers are supplied for short periods, and remain subject primarily to the supervision of the supply service, the records must be kept by the service. (See question A–1 above for other considerations.)

A–3. Q. If an employee working in a plant on a contract basis is injured, is the injury recorded on the plant's records or on the records of the contractor?

A. In most situations, the contractor supervises the employee's general work activities and is responsible for maintaining the employee's injury and illness records.

There are exceptional situations, however, where the contractor has no responsibility for supervision of the employee's day-to-day work activities. In these cases, the using firm assumes responsibility for recording his or her injury and illness experience on its records; hours worked for this group of employees should also be obtained.

A–4. Q. Are independent truckdrivers operating on a contract basis considered employees of the company for which they are hauling?

A. Generally, these workers are not considered employees of the using firm. However, see the preceding questions for other factors to be considered in making this evaluation.

A–5. Q. Who is responsible for maintaining records in migrant labor camps?

A. Employing farmers are responsible for maintaining these records if they exercise supervision over the day-to-day work activities of the migrant laborers.

However, if the migrant workers are supplied to the farmers on a purely contractual basis, the farm labor contractors should maintain OSHA records for the migrant laborers. (See question A–1 above for the other considerations in making this determination.)

B. Decisionmaking Authority for Recordkeeping Determinations

1. *Delegation of authority by the Occupational Safety and Health Act of 1970 and Part 1904 of the Code of Federal Regulations.* Both the recordkeeping portion of the act and Part 1904 of the regulations are explicit in assigning recordkeeping responsibilities to employers. Section 8(c)(1) of the act requires employers to complete and preserve records of occupational injuries and illnesses:

> Each employer shall make, keep and preserve, and make available to the Secretary or the Secretary of Health, Education, and Welfare, such records regarding his activities relating to this Act as the Secretary, in cooperation with the Secretary of Health, Education, and Welfare, may prescribe by regulation as necessary or appropriate for the enforcement of this Act or for developing information regarding the causes and prevention of occupational accidents and illnesses.

In addition, Part 1904.2(a) of the regulations carefully states employer recordkeeping obligations:

> Each employer shall, except as provided in paragraph (b) of this section, (1) maintain in each establishment a log and summary of all recordable occupational injuries and illnesses for that establishment; and (2) enter each recordable injury and illness on the log and summary as early as practicable. . . .

Parts 1904.4 and 1904.5 of the regulations describe employer responsibilities concerning the supplementary record and the annual summary.

2. Requirement of good faith. Although employers ultimately decide if and how a particular case should be recorded, their decision must not be an arbitrary one, but should be made in accordance with the requirements of the act, regulations, the instructions on the forms, and the guidelines in this report. Information from medical, hospital, or supervisors' records should be reviewed along with other pertinent information, and the employee should be interviewed to determine his or her medical condition and ability to perform normal job duties.

3. Checks and balances within the recordkeeping system. The validity of the records is enhanced by the involvement of all participants in the recordkeeping and reporting system. Employers need accurate and meaningful injury and illness information so that they can focus safety and health efforts on high-risk areas and activities to eliminate workplace hazards. Consequently, they should make every effort to accurately record their firm's injury and illness experience. In addition, OSHA periodically reviews workplace records to verify their accuracy. Further, the posting and access provisions in Part 1904 of the regulations allow employees to review the records to insure the validity of recordkeeping determinations. Chapter II of this report discusses the posting requirements; employee access is covered in chapter VIII.

4. Penalties for recordkeeping violations. Part 1904.9(a) provides the penalties for falsification of records or reports. This part incorporates the language of Section 17(g) of the act:

Whoever knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained pursuant to this Act shall, upon conviction, be punished by a fine of not more than $10,000, or by imprisonment, for not more than 6 months, or both.

Additional information is available on penalties for recordkeeping violations in chapter VIII.

B–1. Q. What entries, if any, need to be made in instances of employer-employee disputes involving State workers' compensation measures to determine the facts related to alleged injuries, illnesses, or deaths?

A. Workers' compensation determinations should not impact the OSHA recordability of cases under OSHA. Some cases may be covered by workers' compensation but are not recordable; others may be OSHA recordable but are not covered by workers' compensation. Cases should be evaluated solely on the basis of OSHA requirements.

B–2. Q. Who decides if an injured employee is capable of working?

A. This decision must be the employer's. There will be a few cases in which the employer and the employer's physician feel certain that an employee is perfectly able to work, but the employee disagrees. If the employer is absolutely certain about the case, it should not be entered on the log, OSHA No. 200. However, if the employer has any doubt about the case, it should be entered on the log and lined out later if it turns out that, in fact, the employee was able to perform his or her job. The employee may file a complaint if he disagrees with the employer's decision.

B–3 Q. Why does the employer always decide what is recordable? Why can't it be the company doctor since the doctor or the medical department usually decides whether an employee is capable of working after an injury?

A. The act says that the employer is responsible for keeping the records. The employer may delegate the responsibility to someone else, or may rely on the determination of a doctor. However, the decision is ultimately the employer's.

B–4. Q. Who has the legal liability for making recordkeeping determinations—the person who signs the forms, the local manager, or the company executive officer?

A. The liability belongs to the employer who is ultimately responsible for recording and reporting. Each of the aforementioned persons is a representative of the employer.

B–5. Q. The act states that whoever supplies false information is subject to penalty. Does this cover both the employer and the employee if either knowingly supplies false information?

A. Most of the penalty provisions in Section 17 of the act apply to "any employer," but the penalty for false statements applies to "whoever knowingly makes any false statement. . . ." This has been interpreted by the Occupational Safety and Health Review Commission to include both employers and employees.

B–6. Q. How are disagreements on recordability or the extent of a case resolved when a dispute arises between an employer and an employee, or between an employer and an OSHA compliance officer?

A. Employers have the final responsibility for making bona fide recordkeeping determinations. However, employers' decisions may be challenged. Persons challenging these decisions may contact OSHA, who, in turn, will contact the employer. If no resolution can be obtained through discussions, the following steps are involved: (1) After examining the records and investigating the work situation, an OSHA compliance officer may request that the employer make changes in his OSHA records; (2) if the employer refuses, the compliance officer may recommend to the OSHA Area Director that a citation be issued; (3) if a citation is issued, the employer has an opportunity for an informal conference with the OSHA Area Director to present his viewpoint (the OSHA Area Director may uphold or reduce the proposed penalty as a result of this conference); (4) if the dispute remains unresolved, the employer can still contest the citation; (5) contested cases are litigated before an administrative law judge of the Occpuational Safety and Health Review Commission; and (6) thereafter are subject to the statutory appeals process.

Employers and other parties interested in the enforcement process should contact their closest OSHA area office or their OSHA regional office. This process is described in detail in the OSHA pamphlet, *Employer Rights and Responsibilities Following an OSHA Safety Inspection.* Addresses and telephone numbers for OSHA regional offices are listed in appendix E of this report.

Chapter V. Analysis of Recordability of Cases

This chapter presents guidelines for determining whether a case must be recorded under the recordkeeping requirements of the Occupational Safety and Health Act of 1970, as well as how to classify recorded cases. These requirements should not be confused with recordkeeping requirements of various workers' compensation systems, internal industrial safety and health monitoring systems, the ANSI Z.16 standards for recording and measuring work injury and illness experience, and private insurance company rating systems. Reporting a case on the OSHA records should not affect recordkeeping determinations under these or other systems. Also:

Recording an injury or illness under the OSHA system does not necessarily imply that management was at fault, that the worker was at fault, that a violation of an OSHA standard has occurred, or that the injury or illness is compensable under worker's compensation or other systems.

At the outset, it should be noted that the scope of recordability of the OSHA system detailed in this chapter is broader and more inclusive than that of most other recordkeeping systems. Some injuries and illnesses are included that may not be "compensable" in the workers' compensation context, or "recordable" under individual company safety and health recordkeeping systems. These cases were included in order to make the system as simple and equitable as possible. The alternative of developing a detailed list of exceptions for not recording specific injuries and illnesses was felt to impose far greater administrative and reporting burdens on most employers than requiring that a relatively small number of borderline cases be recorded. The relatively simple OSHA recording boundaries assure a valid, consistent, and uniform recordkeeping system that is capable of producing reliable statistical information.

The OSH Act provides a basic description of which cases are to be recorded. The recordkeeping regulations in 29 CFR Part 1904 provide specific recording and reporting requirements which comprise the framework of the OSH recordkeeping system. The regulations also expand upon the basic definition of recordability in the act.

In a few situations, the criteria of the act, regulations, or the guidelines listed in this report may seem inappropriate. However, it would be virtually impossible to enact legislation, draft regulations, or issue guidelines that address every possible recordkeeping situation. The recordkeeping system currently encompasses over 5 million workplaces throughout the United States. Wide variations exist in the training of individuals making recordkeeping determinations and the resources firms can allocate to the recordkeeping process. Recordkeeping

criteria must be sufficient to meet the needs of safety and health professional maintaining complex programs, while also remaining comprehensible to those maintaining records without the benefit of specialized safety and health training (such as some employers with small-sized establishments) and the approximately 75 million employees involved in the recordkeeping process through the posting and access provisions of the regulations.

Although generally well intentioned, employers or trade associations are discouraged from formulating their own guidelines for recordability which differ in substance from these guidelines or deviate from the OSHA regulations. If employers follow different guidelines, differences in interpretation might be injected into the system which could jeopardize the uniformity of the records and the validity of the statistical data. The BLS guidelines represent official agency interpretations of employer recordkeeping requirements. They provide recordkeeping principles that were developed through a cooperative effort between government, business, and labor prior to and following the implementation of the act, and have been followed by most employers in making recordkeeping determinations since their issuance in 1972. The guidelines provide the Department of Labor's interpretation of the requirements of the OSH Act and regulations, and are considered supplemental instructions to the recordkeeping forms.

Employers with questions on OSHA recordkeeping and reporting not specifically addressed in this report should contact the State agency cooperating with BLS in administering the recordkeeping program or the BLS regional or National offices.

A. Method Used for Case Analysis

Sections 8(c)(2) and 24(a) of the Occupational Safety and Health Act provide the basic definition of the types of cases to be recorded:

> . . . work-related deaths, injuries and illnesses other than minor injuries requiring only first aid treatment and which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job.

Part 1904.12(c) of the *Code of Federal Regulations* contains a definition of recordable injuries and illnesses which follows this language and incorporates criteria for determining the extent or outcome of these cases. Under this part, injuries and illnesses are classified as deaths, lost-time cases, or non-lost-time cases.

The definition of a recordable case in the heading of the log (OSHA No. 200) reflects the language of the act and regulations:

> RECORDABLE CASES: You are required to record information about every occupational *death;* every nonfatal occupational *illness;* and those nonfatal occupational *injuries* which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid).

This definition provides sufficient guidance for the analysis of the vast majority of cases under the OSHA recordkeeping system. Chart I presents this methodology in graphic form and outlines the line of thought employers should apply in deciding whether or not to record a particular case. Only a very small proportion of the cases require additional criteria to determine recordability.

The decisionmaking process consists of five steps:

1. Determine whether a case occurred; that is, whether there was a death, illness, or an injury;
2. Establish that the case was work related; that it resulted from an event or exposure in the work environment;
3. Decide whether the case is an injury or an illness;
4. If the case is an illness, record it and check the appropriate illness category on the log;
5. If the case is an injury, decide if it is recordable based on a finding of medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job.

B. Determining Whether or Not a Case Occurred

The first step in the decisionmaking process is the determination of whether or not an injury or illness occurred. Employers have nothing to record unless an employee has experienced a work-related injury or unless a work-related illness is recognized. In most instances, recognition of these injuries and illnesses is a fairly simple matter. However, some of the following situations have troubled employers over the years.

B–1. Q. If an injury or illness occurs, does it matter for the purposes of recordability who was at fault in causing the accident or illness exposure?

A. No. Fault plays no role in the OSHA recordkeeping system. Injury and illness statistics produced by such a system would not accurately reflect overall worker experience (i.e., it would be missing those cases reported for which employers are not at fault) and consequently would not satisfy the coverage requirements of the Occupational Safety and Health Act of 1970. Section 2(b)(12) of the act states that one of its purposes is to provide for appropriate reporting procedures ". . . which will accurately describe the nature of the occupational safety and health problem." Sections 8(c)(2) and 24(a) of the act specifically define what is a recordable injury. They make no distinction between incidents that are compensable under State workers' compensation laws, incidents caused by employer neglect, incidents that are preventable, or the random incidents that seem to happen when no one is at fault.

In addition, there are serious practical limitations. Recording cases on the basis of fault would necessitate the introduction of extremely complex recording criteria to be evaluated by both employers and employees. And whose judgment would prevail as to who was at fault in causing the injury or illness? Such determinations would almost certainly result in employers and employees contesting a significant number of recordkeeping decisions.

The concept of fault has never been a consideration in any recordkeeping system of the Department of Labor, nor has it been incorporated into various State workers' compensation systems or statistical systems of other agencies such as the American National Standards Institute.

B–2. Q. Does it matter for OSHA recordkeeping purposes whether or not the injuries and illnesses are preventable?

A. No. Recording only those injuries and illnesses that are preventable would not produce sufficient information to meet the coverage requirements of the OSH Act and 29 CFR Part 1904, nor would it satisfy the needs of the Occupational Safety and Health Administration for comprehensive injury and illness information. Focusing on whether or not the injuries and illnesses experienced were preventable would result in employers and employees contesting a significant number of recordkeeping decisions, and would unduly complicate many recordkeeping determinations.

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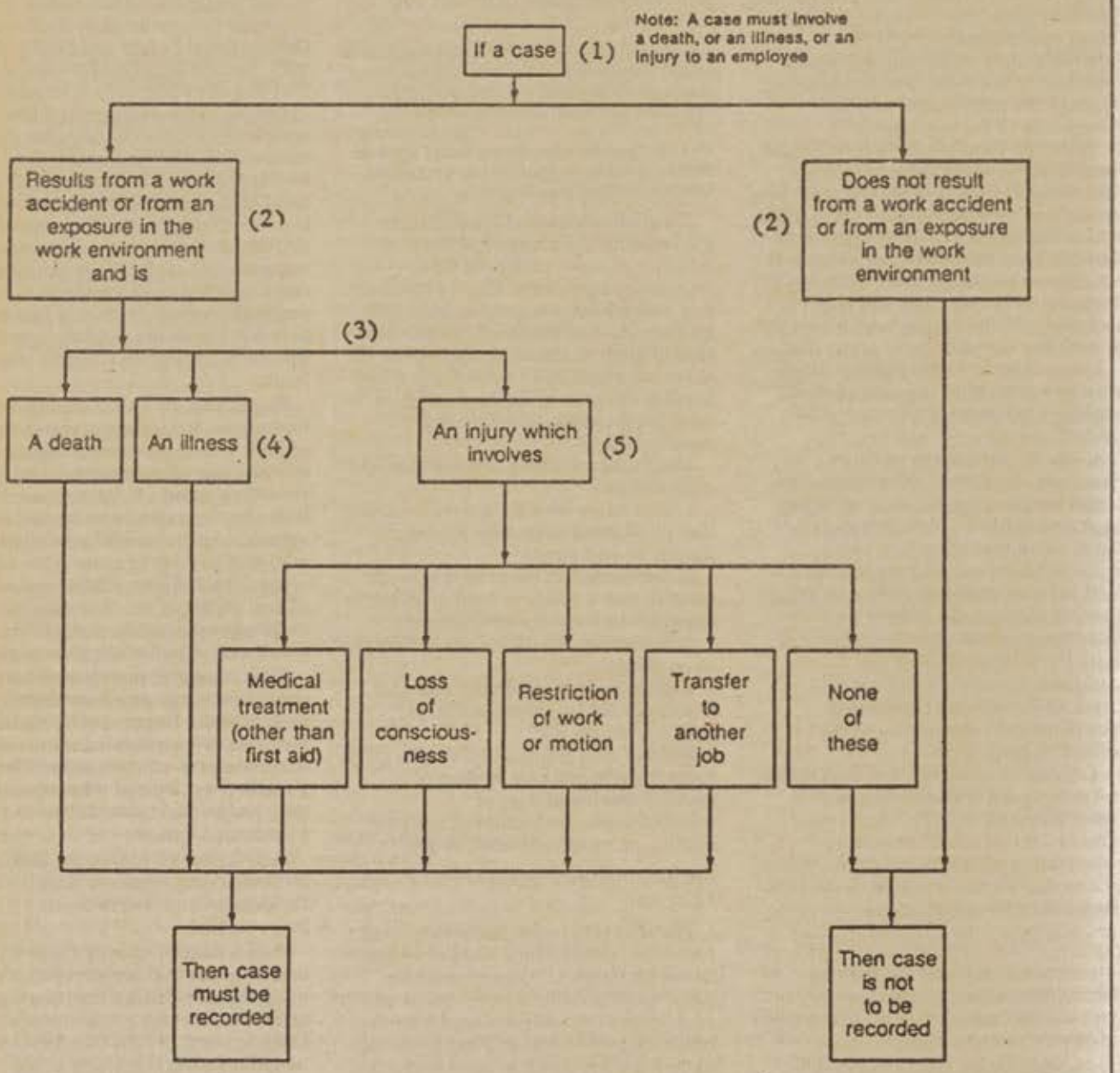
Chart 1. Guide to Recordability of Cases Under the Occupational Safety and Health Act



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B–3. Q. Must an employee be involved in a specific job task for an injury or illness to be recordable?

A. No. For a case to be recordable, the worker must have been an employee of the firm at the time of the injury or illness exposure. Workers are considered employees while in pay status. In this context, pay status refers to the overall employment relationship whereby the worker is receiving wages or some other form of compensation for the employer for services rendered. It does not mean that the worker must be involved in some specific job task at the time of the injury or illness exposure for the case to be recordable, or that cases are recordable only if they occur during hours for which wages are paid. (See section C of this chapter for a discussion of work relationship.)

B–4. Q. Are cases recordable if they are discovered after the injured or ill employee has been terminated or has retired?

A. These cases are recordable throughout the 5-year record retention period (see chapter III), so long as the employee was on active duty or in pay status when the injury or illness exposure occurred. The worker does not need to be an active employee or in pay status at the time the case is recorded. Such cases should be recorded on the log of the year of the injury or illness exposure.

B–5. Q. Are there time limits in recording cases. Suppose a worker says he hurt his back 2 weeks ago, but there was no record or report of it at that time. Is it subsequently recordable on this OSHA No. 200?

A. Yes. If it is established that a recordable back injury did occur, it must be included on the OSHA No. 200, even though the determination was made several weeks after the injury occurred. The actual date of injury should be entered in column *B* of the log.

Employers are required to make entries on the OSHA logs for all recordable injuries and illnesses experienced by their employees. This obligation exists not only during the year that the injury or illness exposure took place, but also throughout the 5-year maintenance and retention period. (See chapter III, sections D and E.)

B–6. Q. Are exposures to harmful substances recordable?

A. These exposures, in and of themselves, are not recordable under Part 1904 of the regulations. Entries on the log, OSHA No. 200, and on the supplementary record, OSHA No. 101, need be made only when the exposure results in a recordable work injury or illness.

However, in addition to the general recording requirements in Part 1904, some specific OSHA standards or State regulations may require the recording of exposures to particular substances. These requirements are not addressed in this report. Employers should consult the appropriate OSHA standards or State regulations to ascertain their additional recordkeeping obligations.

B–7. Q. Are permanent or temporary transfers to another job to remove employees from further exposure to hazards considered recordable cases for the purposes of OSHA recordkeeping?

A. If these transfers are preventive in nature, and if no work-related illness has occurred, they are not considered recordable events.

Employers usually make such transfers either: (1) To control the amount of employee exposure during a specific period of time, or (2) to remove an employee from an area to control adverse health effects.

B–8. Q. If a driver involved in an auto accident is sent for a physical examination without any specific injury, should the case be recorded?

A. This would be in the nature of preventive medicine and would not be recorded unless the examination reveals that a recordable injury resulted from the accident.

B–9. Q. If a hospital employee contracts an illness from a patient and all employees in the hospital unit are inoculated to prevent spread of the illness, is each person so treated considered a recordable case?

A. No. Such cases would not be recordable because the employees are receiving preventive care and are not injured or ill. Of course, the case of the hospital employee who contracted the illness should be recorded.

B–10. Q. Is hospitalization for observation recordable?

A. If an employee goes to or is sent to a hospital for a brief period of time for observation, it is not recordable, provided that no medical treatment was given, or no illness was recognized. While hospitalization for observation under these circumstances is not recordable on the OSHA 200 form, if 5 or more such hospitalizations occurs as the result of a single incident at a worksite, the incident shall be reported to OSHA within 48 hours. (See 29 CFR 1904.8, chapter VII, section B of these guidelines, or the OSHA Field Operation Manual Instructions.)

B–11. Q. What if the employee is admitted to the hospital or stays in the hospital for observation for several hours? Is this still not recordable?

A. These cases are recordable. The focus, however, is not on the length of the stay, but on whether medical treatment was provided or whether the incident is recordable on one of the other grounds. Prolonged hospital stays are usually associated with the more serious cases and often involve some form of medical treatment, even though they may be initiated for primarily diagnostic purposes.

B–12. Q. How do you differentiate between a new incident and the recurrence or further complication of a previous injury or illness? What is the difference between these two situations for OSHA recordkeeping purposes?

A. Employers are required to make new entries on their OSHA forms for each new recordable injury or illness. New entries should not be made for the recurrence of symptoms from previous cases.

Injuries. The aggravation of a preexisting injury almost always results from some movement by the employee. Consequently, when work-related, these new incidents should be recorded as new cases on the OSHA forms, assuming they meet the criteria for recordability described in sections C, D, and E of this chapter.

Illnesses. Deciding whether the emergence of illness symptoms constitutes a new event or the recurrence of a previous illness is more complex. Generally, each occupational illness should be recorded with a separate entry on the OSHA No. 200. However, certain illnesses, such as silicosis, may have prolonged effects which recur over time. The recurrence of these symptoms should not be recorded as a new case on the OSHA forms.

The recurrence of symptoms of previous illnesses may require adjustment of entries on the log for previously recorded illnesses to reflect possible changes in the extent or outcome of the particular case.

B–13. Q. Should an employee's pre-existing condition be taken into account in making OSHA recordkeeping determinations?

A. Pre-existing conditions are not considered relevant in making determinations of recordability under the OSH Act except for the recurrence of symptoms of work-related illnesses discussed in B–12 above. Employers should record each case resulting from an event (such as a slip, trip, fall, or overexertion) and each exposure that results in a recordable work injury or illness regardless of the employee's pre-existing condition. This is essential to the maintenance of a workable system that produces statistics that accurately reflect the incidence (and not

prevalence) of work injuries and illnesses.

B–14. Q. Does this mean that when an employee is hired with a known physical defect, such as a trick knee, a work accident partially attributable to this defect would result in a recordable case?

A. Yes. An employee's physical defect or pre-existing physical condition does not affect the determination of recordability. If such a case results from an event or exposure in the work environment and meets the other criteria for recordability, the employer must enter it on the OSHA forms without regard to the employee's pre-existing physical condition. If injury results *solely* from a physical defect (i.e., employee falls while walking when trick knee gives way AND there is no environmental factor), it is *not* occupational. However, if the work environment or a work event contributes (i.e., employee steps on stone or slips, trick knee gives way, and he falls), any resulting injury is occupational.

B–15. Q. Are there specific requirements for evaluating the occurrence of back or hernia cases?

A. No. Back and hernia cases should be evaluated in the same manner as any other case. Questions concerning the recordability of these cases usually revolve around: (1) The impact of a previous back or hernia condition on the recordability of the case, or (2) whether or not the back injury or hernia was work related.

Pre-existing conditions generally do not impact the recordability of cases under the OSHA system. (See preceding questions 13 and 14.)

For a back or hernia case to be considered work related, it must have resulted from a work-related event or exposure in the work environment. Employers may sometimes be able to distinguish between back injuries that *result* from an event in the work environment, and back injuries that are caused elsewhere and merely *surface* in the work environment. The former are recordable; the latter are not. (See section C of this chapter for a discussion of work relationship.)

B–16. Q. An employee's back goes out while performing routine activity at work. Assuming the employee was not involved in any stressful activity, such as lifting a heavy object, is the case recordable?

A. Particularly stressful activity is not required. If an event occurred in the work environment that caused or contributed to the injury, the case would be recordable, assuming it meets the other requirements for recordability.

B–17. Q. Must there be an identifiable event or exposure in the work environment for there to be a recordable case? What if someone experiences a backache, but cannot identify the particular movement which caused the injury?

A. Usually, there will be an identifiable event or exposure to which the employer or employee can attribute the injury or illness. However, this is not necessary for recordkeeping purposes. If it seems likely that an event or exposure in the work environment either caused or contributed to the case, the case is recordable, even though the exact time or location of the particular event or exposure cannot be identified.

If the backache is known to result from some nonwork-related activity outside the work environment and merely surfaces at work, then the employer need not record the case. In these situations, employers may want to document the reaons they feel the case is not work related.

B–18. Q. What about cases where the employee alleges that an injury or illness has occurred? Must employers record these cases without any medical verification?

A. Medical verification is not required for recordability. However, employers have ultimate responsibility for making good-faith recordkeeping determinations. If an employer doubts the validity of an employees' alleged injury or illness and there is no substantive or medical evidence supporting the allegation, the employer need not record the case.

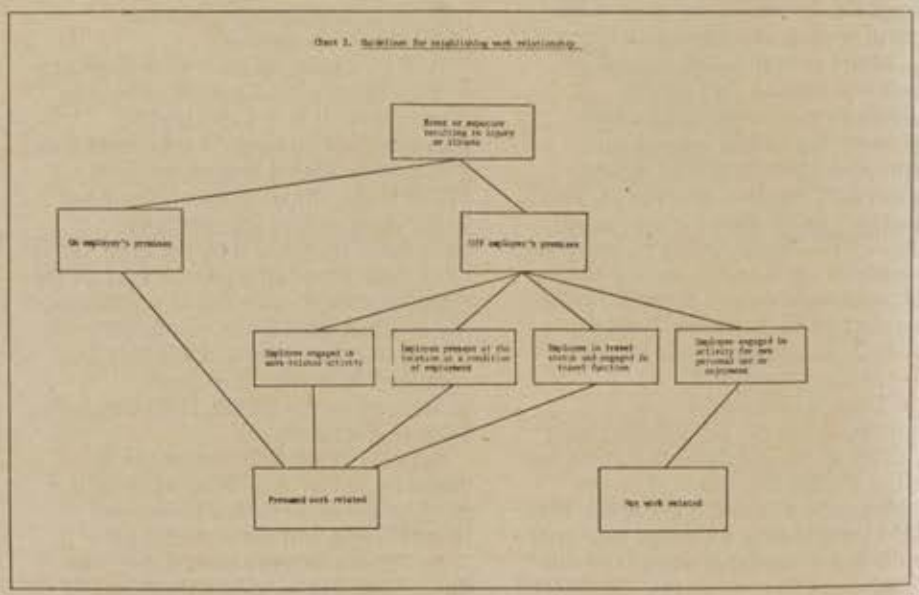
B–19. Q. Must occupational injuries and illnesses that are disputed be recorded?

A. Within 6 workdays after receiving information that an injury or illness has occurred, the employer must determine whether the case is recordable. Questionable cases should be entered on the log, OSHA No. 200, and lined out at a later date if they are found not recordable.

C. Establishing Work Relationship

Work relationship is the next requirement for recordability. The Occupational Safety and Health Act of 1970 requires employers to record injuries and illnesses that are work related. *Work relationship is established under the OSHA recordkeeping system when the injury or illness results from an event or exposure in the work environment. The work environment is primarily composed of: (1) The employer's premises, and (2) other locations where employees are engaged in work-related activities or are present as a condition of their employment.* When an employee is off the employer's premises, work relationship must be established; when on the premises, this relationship is presumed. The employer's premises encompass the total establishment. This includes not only the primary facility, but also such areas as company storage facilities and restricted company parking lots. In addition to physical locations, equipment, or materials used in the course of an employee's work are also considered part of the employee's work environment.

Chart 2 provides a guide for establishing the work relationship of cases.



1. *Injuries and illnesses resulting from events or exposures on the employer's premises.* Generally, injuries and illnesses that result from an event or exposure on the employer's premises are considered work related. The employer's premises consist of the total establishment. They include the primary work facility and other areas which are considered part of the employer's general work area.

C–1. Q. Are injuries of employees in company restrooms, hallways, or cafeterias considered to be work related?

A. Yes. These areas are generally all considered to be part of the employer's premises and constitute part of the work environment. Injuries occurring in the work environment are considered work related. The specific activity the employee was engaged in at the time of the injury is not the controlling factor.

C–2. Q. Do the employer's premises include employer controlled recreational facilities such as company ball fields, golf courses, etc.?

A. For OSHA recordkeeping purposes, the definition of work premises excludes employer controlled ball fields, tennis courts, golf courses, parks, swimming pools, and other similar recreational facilities which are *basically apart from the workplace and dedicated primarily to employee use during off-work hours.* However, recreational facilities located within the work environment are included as part of the work premises. These may include company controlled gymnasiums, handball courts, racketball courts, etc. *that are located within the work facility.*

C–3. Q. Are company parking lots considered part of the employer's work premises?

A. Parking facilities that are generally accessible to both employees and members of the general public are not considered part of the employer's work premises. Therefore, injuries to employees on these public parking lots are not recordable unless the employee was engaged in some specific work activity. However, injuries to employees on parking lots restricted to employee and visitor use only would be considered on premises and hence presumed work related.

Visitor parking spaces are distinguished from parking for general public by the firm's ability to limit or revoke driver access.

C–4. Q. An employer neither owns nor leases the property on which he conducts his business operations. Under the regulations, would the property be considered part of the employer's premises?

A. The determination of whether a particular location constitutes part of the employer's premises depends upon whether the location is considered part of the employer's domain, not whether he owns or leases it. As a general rule, if the site is part of an establishment of the employer, it is considered part of his premises.

An establishment is a single physical location where business is conducted or where services or industrial operations are performed.

C–5. Q. Is a right-of-way used by a utility company considered to be part of the utility company's premises?

A. Yes. A utility company has a sufficient relationship to these rights-of-way to have them considered part of its premises. Injuries and illnesses occurring to utility workers in these areas are presumably work related.

C–6. Q. What about cases that occur on the premises during nonduty hours? If a case occurs either before or after normal work hours, or on the weekends and holidays when work is not scheduled, is it recordable?

A. Presence on the employer's premises is normally sufficient to establish work relationship. It does not matter whether or not the incident occurs during regular working hours if the worker is present to perform some job task or receive some employment benefit, or if his presence is in some way *related to his status as an employee.* (For further clarification, see the answers to questions C–9 and C–10.)

C–7. Q. Is every case resulting from an event or exposure on the employer's premises considered work related?

A. No. The general rule is that all injuries and illnesses which result from events or exposures occurring to employees on the employer's premises are presumed to be work related. Under the recordkeeping system, the premises include the total establishment. The nature of activity which the employee is engaged in at the time of the event or exposure, the degree of employer control over the employee's activity, the preventability of the incident, or the concept of fault do not affect the determination.

There are cases which occur on the employer's premises and which do not seem to have anything to do with the work but which must still be recorded to maintain the simplicity of the recording criteria and the integrity of the statistics. Some examples are: employee chokes while eating lunch in company cafeteria; injuries resulting from employee horseplay; and, an employee injured while playing basketball in the company gymnasium during lunch break. These are included to keep relatively simple recording boundaries necessary for maintaining a workable system which can be used by the 5 million employers and 75 million employees subject to the recordkeeping regulations.

C–8. Q. Under the OSHA recordkeeping system, work relationship is presumed when the employee is on the employer's premises. Is this presumption rebuttable? If so, describe some situations where the employee's presence on the premises would not be sufficient, by itself, to establish work relationship.

A. The presumption is rebuttable. One situation where the presumption would not apply would be where a worker is on the employer's premises as a member of the general public and not as an employee. (See question C–9, for a further description of these situations.) Another example would be a case, with symptoms that merely surface on the employer's premises, where the symptoms are the result of a nonwork-related event or exposure off premises. (See questions B–15 and B–17 for the application of this type of analysis to back cases.)

C–9. Q. How do you determine those situations where a worker is off duty and is on the employer's premises as a member of the general public and not as an employee? For example, a department store employee returns to the store during off-duty hours solely to shop and is injured. Is this case work related?

A. No. The case is not work related. For cases such as this to be recordable, there must be some relationship between the persons's presence on the premises and his or her status as an employee. Employers should ask themselves: Would the person have been on the premises but for the fact that he or she was an employee? It is important to note that the focus is on the *status* of the person as an employee, not on the activity the person was engaged in at the time of the event or exposure.

The example provided above is not recordable because the worker was present on the premises solely to shop; his presence on the premises had no relationship whatsoever to his status as an employee. Any member of the general public could come into the store to shop. This exclusion applies even if the employee is receiving some employment benefit such as an employee discount in a department store, or using public restrooms while on the employer's work facilities for

personal reasons, e.g., filling station employee working on his or her own car. Identical cases which occur when an employee is in work status would, however, be considered work related and hence recordable. The following situations illustrate cases where there is sufficient connection between an off-duty employee and the job to establish work relationship:

1. The employee is injured on the premises while going to or from a work shift.

2. The employee is injured on the premises while picking up a pay check during off-duty hours.

3. An employee is injured on the premises during lunch or coffee breaks.

C–10. Q. Please define "premises" for the trucking industry. Is the cab of the truck the premises? What about loading and unloading? Is the area about the truck used for loading and unloading considered part of the premises?

A. A truck on the road or loading and unloading away from its home base would be off the employer's premises. However, injury or illness exposures experienced during these activities would still be work related because the employees are engaged in work-related activities. The truck and its surroundings are considered part of the work environment even though they are not part of the employer's premises.

C–11. Q. Why record injuries and illnesses other than those that occur during the execution of a specific work assignment undertaken at the direction of management?

A. The stated purpose of the Occupational Safety and Health Act of 1970 requires a broader scope of coverage than "the execution of specific work assignments." Section 2 of the act addresses injuries and illnesses arising out of "work situations." Sections 2(b)(1), (2), and (4) of the act refer to "place of employment" and the provisions of safe and healthful "working conditions." Section 2(b)(7) of the act deals with preventing employee ill health as a result of the "work experience." Section 2(b)(12) states that one of the purposes of the act is to provide for appropriate reporting procedures ". . . which will accurately describe the nature of the occupational safety and health problem." These and other references throughout the act indicate that its coverage is intended to go beyond specific job tasks to encompass the total work environment.

In addition, the inclusion of these cases is necessary for the maintenance of a simple and equitable recordkeeping system capable of furnishing statistically reliable information.

C–12. Q. Do employers have to record an injury on the employer's premises that occurs to an employee as a result of horseplay? Would they have to record a case if it resulted from a robbery?

A. Yes. Both would be recordable. Activities on the employer's premises are presumed to be work related. The basis for determining work relationship for OSHA recordkeeping purposes is that the event occurred in the work environment.

Sections 8(c)(2) and 24(a) of the OSH Act specifically define recordable injuries and illnesses. They make no distinction between incidents that are compensable under State workers' compensation laws, incidents that are caused by worker negligence, incidents caused by employer neglect, incidents that are preventable, or the random incidents that seem to happen when no one is at fault.

2. *Injuries and illnesses resulting from events or exposures off premises.* When an employee is off the employer's premises and suffers an injury or an illness exposure, work relationship must be established; it is not presumed. Injuries and illness exposures off premises are considered work related if the employee is engaged in a work activity or if they occur in the work environment. The work environment in these instances includes locations where employees are engaged in job tasks or work-related activities, or places where employees are present due to the nature of their job or as a condition of their employment.

C–13. Q. Our employees participate in many off premises activities such as picnics, impromptu softball games at noon, bowling leagues at night, and a football team which plays its games on weekends. If any of our employees are injured in these activities and require medical treatment, should the injuries be recorded?

A. They need only be recorded if they are connected with the injured person's job. If the employees are paid for sports activities or are required by their employer to participate, any resulting injuries are work related and should be recorded. If not, the injuries which occur are not recordable, even though the employer may be providing uniforms and equipment.

C–14. Q. Is a case recordable if an employee is injured while walking to work on a public sidewalk from a public parking lot? What if an employee gets into a fight or is attacked in this situation?

A. These cases do not appear to be work related since the injuries did not occur in the work environment, and the employees were not engaged in work-related activities. Public places are generally not part of the work environment unless the employee has begun work and is performing a work-related activity, or is present at the public location as a condition of his or her employment. For example, the work environment for a route salesperson may include public streets, highways, sidewalks, etc.

C–15. Q. Would an injury which took place after a person checked into work, but occured while he or she was off the company permises on an errand be recordable?

A. This case is recordable if the employee was engaged in a work-related activity or if the person's presence at the location of the injury was required by his or her job. If the errand was personal in nature, the injury should not be recorded.

C–16. Q. Are the employee's activities off the employer's premises all deemed work related once the employee's work shift has begun?

A. No. Work relationship must be established for employee activities off premises—it is not presumed. To be engaged in a work-related activity off premises, the employee must have been performing some job, task, or sevice for the employer, or must have been present at the off-premises location in connection with his or her employment. If the employee is off the employer's premises, and leaves the normal area of operations entirely for his or her own purpose, then these activities would not be considered work related.

C–17. Q. Is an injury occuring during the lunch of an employee working off the employer's premises in nontravel status considered work related?

A. This case would be work related if it occurred in the off-premises work environment or if it was a work-related luncheon.

C–18. Q. Are injuries considered work related when they occur to employees who work on the employer's premises, but leave the premises for lunch and are injured?

A. No. Injuries occurring to employees while they are off the employer's premises and out of the work environment on lunch are not recordable unless the luncheon is in some way required by their job.

C–19. Q. How are employees in travel status handled differently?

A. All of the employee's activities required by the trip are considered to be work related. The rationale is that the traveling employee would not be exposed at this location but for the travel requirement of his or her job.

An employee's work-related activities on a business trip include such necessary travel-related functions as eating, sleeping and traveling. However, extraneous activities unrelated to the normal scope of the trip and solely for the employee's own personal use or enjoyment should not be recorded. Examples of these non-recordable events would be injuries on excursions, such as ski trips, or injuries which occur in public places when the employee is there for recreational purposes only.

C–20. Q. Are there any time limitations imposed on the work relationship designation for employees in travel status?

A. An employee in travel status is considered to be in the work environment 24 hours a day. However, see question C–19 above for the substantive limitations.

C–21. Q. When is work relationship first established for an employee in travel status? When he or she leaves home? At the airport, train station, etc.?

A. For recordkeeping purposes, work-related activities begin when the employee leaves home, assuming the employee did not intend to report to his or her office prior to beginning the trip. If the employee first reports to the office, travel status begins when the employee leaves the office to begin the trip. Travel status ends once the employee returns to the point of origin of the trip. (Employers should refer to questions A–12–14 in chapter I for a discussion of the geographic coverage limitations on travel status.)

C–22. Q. How do you differentiate between employees working off premises in nontravel status and employees in travel status?

A. Employees off premises in nontravel status still work within their normally scheduled hours and normal geographic area of operation. Employees in travel status must either be: (1) Outside their normal area of operation, or (2) working off premises for more than a normal workday (such as staying overnight).

D. Distinguishing Between Injuries and Illnesses

Under the OSH Act, all work-related illnesses must be recorded, while only those injuries which required medical treatment (other than first aid), or involve loss or consciousness, restriction of work or motion, or transfer to another job are recordable. The distinction between injuries and illnesses, therefore, has significant recordkeeping implications.

The determination of whether a case involves an injury or illness is determined by the nature of the original event or exposure which caused the case, not by the resulting condition of the affected employee. Injuries are caused by *instantaneous* exposures in the work environment. Cases resulting from anything other than instantaneous events are considered illnesses. This concept of illnesses includes acute illnesses which result from exposures of relatively short duration.

An occupational injury is defined on the back of the log and summary form, OSHA No. 200, as follows:

Occupational Injury is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.

Note.—Conditions resulting from animal bites, such as insect or snake bites, or from one-time exposure to chemicals are considered to be injuries.

A single incident involving a *one-time instantaneous* exposure to chemicals is classified as an injury. Occupational injuries are analyzed in detail in the following section of this chapter.

An occupational illness is defined on the back of the log and summary form, OSHA No. 200:

Occupational Illness of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

Some conditions may be classified as either an injury or an illness (but not both), depending upon the nature of the event that produced the condition. For example, a loss of hearing resulting from an explosion (an instantaneous event) is classified as an injury; the same condition arising from exposure to industrial noise over a period of time would be classified as an occupational illness. Similarly, irritation of the throat from exposure to chlorine gas fumes could be classified as either an injury or an illness. If the exposure was instantaneous and occurred when a cyclinder of gas ruptured, the case would be considered an injury. The case would be an illness if the employee was exposed to the agent over time, such as working in an area where chlorine fumes from a bleaching process were present.

This seeming inconsistency in recording certain types of cases has its foundation in industrial safety practice. The safety measures rquired to avoid instantaneous events are considered fundamentally different from those required to prevent exposures over a period of time which result in conditions of ill health. The classification of a case as an injury or an illness is intended to reflect this distinction.

D–1. Q. Should an adverse reaction to a tetanus shot given for a laceration be classified as an injury or an illness?

A. This should be classified as an injury because the classification is based on the original event—the laceration—not on the subsequent developments.

D–2. Q. Should the following two cases be recorded differently; if so, what is the rationale behind the differentiation?

a. Lacerations resulting from a chemical explosion.

b. A respiratory ailment resulting from a chemical explosion.

A. Both of these cases would be classified as injuries because of the nature of the original event, a chemical explosion.

D–3. Q. How do you distinguish an injury from an illness? For example, it appears that a burn can be one or the other.

A. The basic definition of an occupational injury includes those cases which result from a work accident or from an exposure involving a *single instantaneous incident* in the work environment. Contact with a hot surface or a caustic chemical which produces a burn in a single instantaneous moment of contact is an injury. Sunburn or welding flash burns which result from prolonged exposure to sunrays or welding flashes are considered illnesses. Similarly, a one-time blow which damages the tendons of the hand is considered an injury; while repeated trauma or repetitious movement which produces tenosynovitis is considered an illness.

The basic determinant is the single-incident concept. If the case resulted from something that happened in one instant, it is classified as an injury. If the case resulted from something that was not instantaneous, such as prolonged exposure to hazardous substances or other environmental factors, it is considered an illness.

D–4. Q. How should back cases be classified—as injuries or illnesses? What about a situation where an employee complains of his back hurting, but is unable to associate it with a single instantaneous event?

A. Back cases should be classified as injuries because they are usually triggered by an instantaneous event.

Classifying back cases as injuries is appropriate not only for cases resulting from identifiable events, but also for cases where the specific event cannot be pinpointed, since back cases are usually triggered by some specific movement. Such generalizations are necessary to keep recordkeeping

determinations as simple and equitable as possible.

D-5. Q. Should carpal tunnel syndrome be classified as an injury or an illness?

A. Carpal tunnel syndrome is a condition involving compression of the median nerve in the wrist which results in tingling, discomfort, and numbness in the thumb, index, and long fingers. Because carpal tunnel syndrome cases almost always result from repetitious movement, they should be classified as occupational illnesses. The entry for these cases should be in column 7(f) of the log for disorders associated with repeated trauma.

D-6. Q. Is the following case recordable? A chemical worker contracted a mild case of dermatitis on both hands while working in a solution for several hours. The employee was sent to the doctor, who recommended application of a topical lotion (a commercial, nonprescription remedy). The employee bought a bottle of the lotion and treated the rash for a few days until it disappeared. There were no subsequent visits to the doctor. The rash did not prevent the employee from performing all the duties of the job.

A. The case is a recordable occupational illness. The answer to this question is based on the distinction between an injury and an illness. If considered an injury, the case would not be recordable since no medical treatment was provided. However, since the case almost certainly did not involve a single instantaneous exposure, it should be classified as an occupational illness. Consequently, the kind of treatment given by the doctor (none in this case) is immaterial, since all occupational illnesses are recordable.

E. Recording Occupational Illnesses

The Occupational Safety and Health Act of 1970 and the recordkeeping regulations in 29 CFR Part 1904 require employers to record the occurrence of all occupational illnesses. However, neither the act nor the regulations provide a precise definition of what constitutes an occupational illness.

An occupational illness is defined in the instructions on the back of the log and summary form, OSHA No. 200:

> Occupational Illness of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The instructions also refer to recording illnesses which were "diagnosed or recognized."

Therefore, for OSHA recordkeeping purposes occupational illnesses include any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. Illness exposures ultimately result in conditions of a chemical, physical, biological, or psychological nature.

Occupational illnesses must be diagnosed to be recordable. However, they do not necessarily have to be diagnosed by a physician or other medical personnel. Diagnosis may be by a physician, registered nurse, or a person who by training or experience is qualified to make such a determination. Employers, employees, and others may be able to detect some illnesses, such as skin diseases or disorders, without the benefit of specialized medical training. However, a case more difficult to diagnose, such as silicosis, would require evaluation by properly trained medical personnel.

In addition to recording the occurrence of occupational illnesses, employers are required to record each illness case in 1 of the 7 categories on the front of the log.

The back of the log form contains a listing of types of illness or disorders and gives examples for each illnesses category. These are only examples, however, and should not be considered as a complete list of types of illnesses under each category. See Appendix A—Glossary of Terms for a list of these illness categories.

Recording and classifying occupational illnesses is difficult for employers, especially the chronic and long term latent illnesses. Many illnesses are not easily detected; and it is often difficult to determine whether an illness is work related. Also, employees may not report illnesses because the symptoms may not be readily apparent, or because they do not think their illness is serious or work related.

Lack of expertise in occupational medicine is not limited to employers and employees. Few doctors in private practice have adequate training in occupational medicine. Even physicians in the workplace have difficulty determining the influence of a job on a worker's health.

The following material is provided to *assist* in detecting occupational illnesses and in determining their work relationship.

1. Detection and diagnosis of occupational illnesses.

An occupational illness is defined in the instructions on the log as any work-related abnormal condition or disorder (other than an occupational injury). Detection of these abnormal conditions or disorders, the first step in recording illnesses, is often difficult. When an occupational illness is suspected, employers may want to consider the following:

a. A routine medical examination of the employee's physiological systems; e.g.,

- Head and neck;
- Eyes, ears, nose and throat;
- Endocrine;
- Genitourinary
- Musculoskeletal;
- Neurological;
- Respiratory;
- Cardiovascular; and
- Gastrointestinal.

b. Observation and evaluation of behavior related to emotional status;

c. Specific examination for health effects of suspected or possible disease agents by competent medical personnel;

d. Comparison of date of onset of symptoms with occupational history;

e. Evaluation of results of any past biological or medical monitoring (blood, urine, other sample analysis) and previous physical examinations; and

f. Evaluation of laboratory tests: routine (complete blood count, blood chemistry profile, urinalysis) and specific tests for suspected disease agents (e.g., blood or urine tests for specific agents, chest or other X-rays, liver function tests, pulmonary function tests).

In addition the National Institute for Occupational Safety and Health (NIOSH) has prepared a Sentinal Health Event (Occupational) List (SHEO) which encompasses disease conditions potentially linked to the workplace. A Sentinal Health Event is defined by NIOSH as a disease, disability, or untimely death which is occupationally related and whose occurrence may: 1) provide the impetus for epidemiologic or industrial hygiene studies; or 2) serve as a warning signal that materials substitution, engineering control, personal protection, or medical care may be required. The list includes only those conditions for which NIOSH found "objective documentation of an associated agent, industry, and occupation . . . in the scientific literature." NIOSH has indicated that the list will be expanded in the future.

Appendix C of this report contains a table of work-related illnesses based upon the NIOSH Sentinal Health Event List. The table is provided for information purposes only to *assist* employers in recognizing certain illnesses and diseases. The table lists illness conditions, the industry and/or

occupation where each condition is likely to occur, symptoms associated with each condition, the agent likely to cause the condition, and the appropriate illness column to be checked on the log. OSHA No. 200. *IT DOES NOT INCLUDE EVERY CONDITION, ILLNESS, OR DISEASE THAT MAY RESULT FROM AN EXPOSURE IN THE WORK ENVIRONMENT. FURTHER, IT SHOULD NOT BE INTERPRETED TO MEAN THAT A SPECIFIC CONDITION CAN ONLY BE CONTRACTED IN THE INDUSTRIES OR OCCUPATIONS LISTED. IT ALSO DOES NOT MEAN THAT EVERY CONDITION LISTED IS RECORDABLE IF EXPERIENCED BY EMPLOYEES IN THESE INDUSTRIES AND/OR OCCUPATIONS. FOR THE CASE TO BE OSHA RECORDABLE, EMPLOYERS MUST STILL ESTABLISH THAT THE CONDITION IS A RESULT OF AN EXPOSURE IN THEIR WORK ENVIRONMENT.*

2. Determining whether the illness is occupationally related.

The instructions on the back of the log define occupational illnesses as those "caused by environmental factors associated with employment". In some cases, such as contact dermatitis, the relationship between an illness and work-related exposure is easy to recognize. In other cases, where the occupational cause is not direct and apparent, it may be difficult to accurately determine whether an employee's illness is occupational in nature. In these situations it may help employers to ask the following questions:

a. Has an illness condition clearly been established?

b. Does it appear that the illness resulted from, or was aggravated by, suspected agents or other conditions in the work environment?

c. Are these suspected agents present (or have they been present) in the work environment?

d. Was the ill employee exposed to these agents in the work environment?

e. Was the exposure to a sufficient degree and/or duration to result in the illness condition?

f. Was the illness attributable to a non-occupational exposure?

Employers may want to check the "material data sheet" for those substances suspected of causing employee illnesses to verify the relationship between the exposure and the resulting symptoms.

E–1. Q. Should employers record only those occupational illnesses which require treatment beyond the initial day of onset of illness?

A. No. Any diagnosed occupational illness reported to the employer is recordable, whether or not medical treatment is given or lost workdays are involved.

E–2. Q. Do occupational illnesses have to be diagnosed by a physician to be recordable?

A. No. "Diagnosis" is commonly defined as the act or process of deciding the nature of a diseased condition by examination of the symptoms. Diagnosis may be by a physician, registered nurse, or a person who by training or experience is qualified to make such a determination.

E–3. Q. Does this mean that employers are capable of diagnosing occupational illnesses?

A. Yes. However, their ability to properly diagnose cases depends upon their training and experience and the nature of the particular illness in question. Employers, employees, and others may be able to detect various illnesses, such as skin diseases or disorders, without the benefit of specialized medical training. However, a case more difficult to diagnose, such as silicosis, would require evaluation by properly trained medical personnel.

E–4. Q. What is meant by an "abnormal condition or disorder"?

A. An "abnormal condition or disorder" is an atypical condition of the employee which may be of either a chemical, physical, biological, or psychological nature. These conditions are recordable when they result from exposure in the work environment.

E–5. Q. Are the illnesses listed in appendix C the only illnesses that need be recorded on the log, OSHA No. 200?

A. No. These are a listing of disease conditions of which NIOSH found objective documentation of association between occupation/industry/agent in the scientific literature. In addition to the Sentinel Health Event (Occupational) List, many other abnormal conditions or diseases may be OSHA recordable.

E–6. Q. Do employers record only those illnesses directly caused by work-related exposures, or is it sufficient for the work exposure to be a contributing factor to an illness or to aggravate a pre-existing illness condition?

A. Yes, it is sufficient for the exposure to be a contributing and/or aggravating factor to the illness.

E–7. Q. What are the reporting requirements for test results which indicate an elevated blood-lead level?

A. Employers are required to conduct surveillance and monitoring tests for employees working with hazardous substances, such as lead. However, test results showing elevated blood-lead levels are not recordable in and of themselves. See question E–10 below.

On the other hand, employers are still required to record cases where the worker: (1) Has symptoms of lead poisoning, such as colic, nerve, or renal damage, anemia, and gum problems; or (2) receives medical treatment for lead poisoning or to lower blood-lead levels. Usually, elevated blood-lead levels above 50 micrograms per 100 grams of whole blood are accompanied by some of the recordable symptoms of lead poisoning mentioned above.

Employers may want to reference the OSHA lead standard 29 CFR 1910.1025 for additional information.

E–8. Q. The chest X-ray of an employee is found to have an abnormality due to a prolonged exposure at work. However, the abnormality does not impair his lung function or cause him to lose workdays. Is this a recordable occupational illness?

A. Yes. An occupational illness is defined as any abnormal condition or disorder, other than one resulting from an injury, caused by exposure to environmental factors associated with employment. Any such abnormality reported to the employer is recordable, whether or not functional impairment is present or lost workdays are involved.

E–9. Q. Is fibrosis the only asbestos-related disorder that must be recorded on the OSHA No. 200?

A. No. Asbestos-related disease encompasses not only fibrosis, but also various cancers of the lung, stomach, and pleural lining and asbestos-induced pleural abnormalities (e.g., pleural plaques and calcifications).

E–10. Q. What is the basis for the distinction between the recordability of asbestos-related disorders and the nonrecognition of elevated blood-lead levels for recordkeeping purposes?

A. Identifiable asbestos-related abnormalities constitute abnormal conditions or disorders of the affected employee. Elevated blood-lead levels are considered a precursor to the illness, and are recordable if accompanied by any other conditions which are indicative of lead poisoning. The overall biological effect—lead toxicity—constitutes the illness that is recordable. (See question E–7 for other recordable symptoms of lead poisoning.)

E–11. Q. Is hearing loss recordable? If so, how should it be recorded?

A. Hearing loss should be evaluated solely on the existing criteria for recordability contained in the Occupational Safety and Health Act and 29 CFR Part 1904. Once work-related hearing loss is established, it may be classified as either an injury or an

illness, depending upon the type of event or exposure which caused the loss. If the hearing loss resulted from or was aggravated by an instantaneous exposure, it is considered an injury, and is recordable only if it involves medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job. If the hearing loss resulted from or was aggravated by anything other than an instantaneous exposure it should be classified as an occupational illness. All job-related illnesses are recordable.

E–12. Q. Is this case recordable? An employee goes to a doctor who informs her that prescription glasses must be worn as a result of work-related eye deterioration caused by the nature of her job.

A. Assuming that work relationship could be established, this case would be recordable as an occupational illness since it involves the recognition of an abnormal condition or disorder. However, employers should distinguish work-related eye problems from those due to aging or heredity factors unrelated to the job.

E–13. Q. How should a massive heart attack be classified?

A. Work-related heart attacks are classified as illnesses because they normally do not result from work accidents or single instantaneous incidents in the work environment. When they occur, an entry should be made in column 7(g) of the log under "All other occupational illnesses"

E–14. Q. Must a heart attack occur in the work environment to be recordable?

A. Heart attacks must satisfy the same requirements for work relationship as any other type of illness before they are recordable on the OSHA No. 200. Under the OSHA system, this does not mean that heart attacks are recordable if they occur in the work environment, but rather that they must result from an exposure in the work environment. (See section C of this chapter for an analysis of work relationship.)

E–15. Q. How should a work-related illness, diagnosed as stress, be classified? Is this a disorder associated with repeated trauma?

A. "Disorders associated with repeated trauma," column 7(f) of the log, OSHA No. 200, involve conditions caused by repeated contact or repetitious movement. Cases involving work-related stress should be classified as "All other occupational illnesses" in column 7(g) of the log.

E–16. Q. Is high blood pressure recordable?

A. High blood pressure is an abnormal condition or disorder. Consequently, it is recordable *if* it can be attributed to exposure in the work environment. Cases of high blood pressure should be classified as "All other occupational illnesses" in column 7(g) of the log.

E–17. Q. Does the difference in individual tolerances to specific substances affect decisions on recordability?

A. No. Variations in the characteristics of particular employees or their susceptibility to various illnesses should not affect decisions of recordability. If a recordable illness occurs, employers should enter it on the OSHA No. 200.

F. Deciding if Work-Related Injuries Are Recordable

Although the act requires that all work-related deaths and illnesses be recorded, it limits the recording of injuries to certain specific types of cases. Sections 8(c)(2) and 24(a) of the act refer to maintaining records for work injuries ". . . other than minor injuries requiring only first aid treatment, and which do not involve medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job." Consequently, a work-related injury must involve at least 1 of these 4 conditions before it is deemed recordable. Minor injuries requiring only first aid treatment are not recordable.

1. *Medical treatment.* It is important to understand the distinction between medical treatment and first aid treatment since may work-related injuries are recordable only because medical treatment was given.

Part 1904.12(d) of the regulations and the instructions on the back of the log and summary, OSHA No. 200, define medical treatment as any treatment, other than first aid treatment, administered to injured employees. Essentially, medical treatment involves the provision of medical or surgical care for injuries that are not minor through the application of procedures or systematic therapeutic measures.

The act also specifically states that work-related injuries which involve only first aid treatment must *not* be recorded. Therefore, the definition of first aid treatment has important implications for evaluating potential medical treatment cases. First aid is commonly thought to mean emergency treatment of injuries before regular medical care is available. However, first aid treatment has a different meaning for OSHA recordkeeping purposes. Part 1940.12(e) of the regulations defines first aid treatment as:

> any one-time treatment, and any followup visit for the purpose of observation, of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such one-time treatment, and followup visit for the purpose of observation is considered first aid even though provided by a physician or registered professional personnel.

The distinction between a medical treatment and first aid depends not only on the treatment provided, but also on the severity of the injury being treated. First aid is: (1) Limited to *one-time treatment* and subsequent observation; *and* (2) involves treatment of only *minor* injuries, *not* emergency treatment of serious injuries. Injuries are *not* minor if:

(a) They can be treated *only* by a physician or licensed medical personnel;

(b) They impair bodily function (i.e., normal use of senses, limbs, etc.);

(c) They result in damage or harm to the physical structure of a nonsuperficial nature (e.g., hairline fractures); or

(d) They involve complications requiring follow up medical treatment.

Physicians or registered medical professionals, working under the standing orders of a physician, routinely treat minor injuries. Such treatment constitutes first aid. Also, some visits to a doctor do not involve treatment at all. For example, a visit to a doctor for an examination or other diagnostic procedure to determine whether the employee has an injury does not constitute medical treatment. Conversely, medical treatment can be provided to employees by someone other than a physician or registered medical personnel.

The following classifications list certain procedures as either medical treatment of first aid treatment. These criteria are also listed in the one-page Recordkeeping Summary provided in appendix F.

The following are generally considered medical treatment. Work-related injuries for which this type of treatment was provided or should have been provided are almost always recordable.

—Treatment of INFECTION
—Application of ANTISEPTICS during second or subsequent visits to medical personnel
—Treatment of SECOND OR THIRD DEGREE BURN(S)
—Application of BUTTERFLY ADHESIVE DRESSING(S)
—Applications of SUTURES (stitches)
—Removal of FOREIGN BODIES EMBEDDED IN EYE
—Removal of FOREIGN BODIES from wound; if procedure is COMPLICATED because of depth of embedment, size, or location
—Use of PRESCRIPTION MEDICATIONS

—Use of hot or cold SOAKING THERAPY during second or subsequent visit to medical personnel
—Application of hot or cold COMPRESS(ES) during second or subsequent visit to medical personnel
—CUTTING AWAY DEAD SKIN (surgical debridgement)
—Application of HEAT THERAPY during second or subsequent visit to medical personnel
—Use of WHIRLPOOL BATH THERAPY during second or subsequent visit to medical personnel
—POSITIVE X-RAY DIAGNOSIS (fractures, broken bones, etc.)
—ADMISSION TO A HOSPITAL or equivalent medical facility for treatment or prolonged observation.

The following are generally considered first aid treatment (e.g., one-time treatment and subsequent observation of minor injuries) and need not be recorded if the work-related injury does not involve loss of consciousness, restriction of work or motion, or transfer to another job:
—Application of ANTISEPTICS during first visit to medical personnel
—Treatment of FIRST DEGREE BURN(S)
—Application of BANDAGE(S) during any visit to medical personnel
—Use of ELASTIC BANDAGE(S) during first visit to medical personnel
—Removal of FOREIGN BODIES NOT EMBEDDED IN EYE if only irrigation is required
—Removal of FOREIGN BODIES from wound, if procedure is UNCOMPLICATED, and is, for example, by tweezers or other simple technique
—Use of NONPRESCRIPTION MEDICATIONS
—SOAKING THERAPY ON INITIAL VISIT to medical personnel or removal of bandages by SOAKING
—Application of hot or cold COMPRESS(ES) during first visit to medical personnel
—Application of OINTMENTS to abrasions to prevent drying or cracking
—Application of HEAT THERAPY during first visit to medical personnel
—Use of WHIRLPOOL BATH THERAPY during the first visit to medical personnel
—NEGATIVE X-RAY DIAGNOSIS
—BRIEF OBSERVATION of injury during visit to medical personnel

The following procedure, by itself, is considered medical treatment:
—Administration of TETANUS SHOT(S or BOOSTER(S. However, these shots are often given in conjunction with the more serious injuries; injuries requiring tetanus shots may be recordable for other reasons.

2. *Loss of consciousness.* If an employee loses consciousness as the result of a work-related injury, the act requires that the case be recorded no matter what type of treatment was provided. The rationale behind this requirement is that loss of consciousness is generally associated with the more serious injuries.

3. *Transfer to another job.* Injuries requiring transfer of the employee to another job are also considered serious enough to be recordable regardless of the type of treatment provided. Transfers are seldom the sole criterion for recordability because injury cases are almost always recordable on other grounds, primarily medical treatment or restriction of work or motion.

4. *Restriction of work or motion.* Restriction of work or motion is the fourth criterion specified by the act for determining whether an injury is serious enough to be recorded. The decision that a case involves restricted work activity should be made solely on the rules set forth in Part 1904.12(f) of the *Code of Federal Regulations* and in the instructions to the Log and Summary of Occupational Injuries and Illnesses, OSHA No. 200. The central concept established in these sections is that restricted work activity occurs when the employee, because of the impact of a job-related injury or illness, is physically or mentally unable to perform *all* or *any part* of his or her normal assignment during *all* or *any part* of the workday or shift. The emphasis is on the employee's *ability* to perform normal job duties. Restriction of work or motion may result in either a lost worktime injury or a nonlost worktime injury, depending upon whether the restriction extended beyond the date of injury. This distinction is discussed at length in chater VI.

Restriction of work or motion sometimes is the sole reason for recording a case. For example, if an employee suffers a cut on a joint of the first finger and the wound requires only a small bandage, the bandage may prevent bending the finger. This case involves a work-related injury, but is it recordable? The employer can reasonably conclude that no medical treatment was involved nor was there any loss of consciousness or transfer to another job. The case would be recordable only if it involves restriction of work motion; that is if the motion that was limited affected the employee's ability to perform his or her normal job duties. It is important to differentiate that concept from limitation of motion in the abstract. In this situation, the case would be recordable if it involved a typist who was unable to type, but probably not if it involved an executive.

F-1. Q. Are all first aid injury cases nonrecordable?

A. Medical treatment is only one criterion for determining whether or not injuries are recordable. Injuries which require only first aid treatment are recordable if they involve loss of consciousness, restriction of work or motion, or transfer to another job.

F-2. Q. Our plant does not have a nurse available on the second and third shifts. Injuries on these shifts are sent to the hospital. If this is the only time the injury is treated, does it have to be recorded?

A. If medical treatment is administered, the case is recordable. If only first aid treatment is administered, then the case is not recordable. (See the definitions in the preceding narrative section.) The *kind of treatment* which is, or should have been, provided is the determining factor, not the place or person providing the treatment.

F-3. Q. Can medical treatment be provided by anyone other than a physician or trained medical personnel?

A. The regulations have been interpreted to mean that medical treatment may be administered by medical or nonmedical personnel. The treatment is the main factor to consider in distinguishing medical treatment from first aid, not the person who is administering it.

In distinguishing between medical treatment and first aid, Congress intended to foucs on the seriousness of the injury. Doctors or medical personnel often provide first aid treatment for minor injuries; nonmedical personnel often provide medical treatment for certain injuries that are relatively serious in nature.

F-4. Q. If an employee is treated in the medical department for an injury such as a cut, burn, etc., but does not need a doctor's care, does a report need to be made of the injury?

A. If the case comes under the definition of "medical treatment" rather than "first aid," a record would have to be maintained. On the other hand, first aid treatment would not be recorded, even if given by a doctor. Again, the key factor to be considered is the type of treatment which was, or should have been, provided, not the person administering it.

F-5. Q. Does the requirement for recording medical-treatment injuries encompass only those injuries where the treatment was actually provided to the individual?

A. This requirement focuses on whether the injury was serious enough that medical treatment was actually provided or should have been provided. Cases should be recorded where medical treatment was *clearly* required, but for one reason or another, was not actually provided.

F-6. Q. When are bruises experienced by employees considered recordable?

A. When they are serious enough to involve 1 of the 4 criteria for recording injuries—medical treatment, loss of consciousness, restriction of work or motion, or transfer to another job.

F-7. Q. How are fractures classified? What about a hairline fracture that is given no treatment and does not interfere with the employee's work activities?

A. Injuries resulting in fractures should be recorded because they are not minor in nature and ordinarily require medical treatment or involve restriction of work or motion. This is in keeping with the mandate of the Occupational Safety and Health Act of 1970 to record all injuries that are not minor.

F-8. Q. Are injuries that result in chipped or broken teeth recordable?

A. These injuries would normally be recordable due to their relative severity and the fact that they ordinarily require medical treatment.

F-9. Q. What about situations where an employee damages a prosthetic device, such as an artificial arm or leg? Is this recordable?

A. Generally, situations such as this are recordable if they involve either some form of medical treatment or restriction of work or motion.

F-10. Q. If there is more than one followup visit to a doctor for minor cuts or burns, is such an injury recordable?

A. If the second visit is simply for observation or to change an adhesive or small bandage, the injury would not be recorded. It would be recorded, however, if any medical treatment was provided.

F-11. Q. What if an employee is injured and loses worktime in traveling to or from a doctor's office for a medical examination? Does this loss of worktime constitute restriction of work or motion, and make the case recordable for OSHA purposes?

A. Injuries should be evaluated on the extent of medical treatment required, not on the amount of time spent seeking treatment. If the examination revealed that no medical treatment was required, the case would not be recordable. Restriction of work or motion concerns the employee's ability to perform normal job duties; it does not include loss of worktime for travel to or from a doctor's office.

F-12. Q. If an employee has a minor scratch but the doctor gives him a tetanus shot anyway, does this constitute medical treatment and make it a recordable case?

A. Such tetanus shots should not be regarded as medical treatment. Consequently, the case would not be recordable unless other treatment was provided.

F-13. Q. Do rabies vaccinations constitute medical treatment?

A. Yes. Rabies vaccinations constitute medical treatment since they are considered absolutely necessary and involve a series of injections far more extensive than the concept of first aid contemplated in the act and defined in the regulations.

F-14. Q. Is treatment given by chiropractors considered medical treatment?

A. Yes. This is considered medical treatment since it involves considerably more extensive treatment than first aid as defined in Part 1904.12(e) of the regulations.

F-15. Q. Is it considered medical treatment when prescription medications are given solely as prevention measures for minor injuries or for patient comfort?

A. The use of prescription medications is considered medical treatment. This is because prescription medications are normally used in connection with the more serious injuries. The use of nonprescription medications for minor injuries or solely preventive purposes doe not constitute medical treatment.

There may be a few situations where this distinction may seem inappropriate. However, the generalization is necessary to provide reasonable guidance while keeping the recording criteria as simple as possible.

F-16. Q. What about prescription drugs provided to employees soley for psychological care? Should this be considered medical treatment?

A. If the prescription medications are being provided in connection with job-related stress, the medical treatment issue would be irrelevant since the stress case would be considered an occupational illness. All occupational illnesses are recordable.

F-17. Q. Suppose a nonprescription medication is dispensed to an employee with a minor injury, who then suffers an adverse reaction. Is this recordable? If so, is it an injury or an illness?

A. This case should be considered an injury since the case determination must relate back to the original event. This is because the affected employee would not have suffered the adverse reaction to the medication *but for* the occupational injury. Initially, the case was not recordable because the provision of a nonprescription medication does not constitute medical treatment. *THE CASE MAY NOW BE RECORDABLE.* To be recordable, the adverse reaction must have been serious enough to require additional medical treatment or involve loss of consciousness, restriction of work or motion, or transfer to another job.

G. Relationship of OSHA Recordkeeping Requirements to Those of State Workers' Compensation Systems

OSHA recordkeeping and reporting requirements differ from those established under various State workers' compensation laws. Differences exist in both the mechanics of the recordkeeping process and in the criteria used for evaluating the recordability of individual cases. Section 4(b)(4) of the act states:

Nothing in this Act shall be construed to supersede or in any manner affect any workmen's compensation law or to enlarge or diminish or affect in any other manner the common law or statutory rights, duties, or liabilities of employers and employees under any law with respect to injuries, diseases, or death of employees arising out of or in the course of employment.

Consequently, recordkeeping determinations under the OSH Act should not affect the employer obligations under State workers' compensation systems. Also, workers' compensation criteria should not be substituted for OSHA definitions in determining whether or not a case should be recorded under the OSHA system. Although the OSHA system is fundamentally different from various compensation systems, qualifying workers' compensation first report forms may be substituted for the OSHA No. 101, the Supplementary Record of Occupational Injuries and Illnesses. To qualify for this purpose, the workers' compensation form must contain all of the items on the OSHA No. 101 or be supplemented to do so. This is permitted to eliminate duplicate recording whenever possible. Chapter III, section C of this report provides a detailed discussion of the requirements for potential substitutes for the supplementary record.

It should be stressed that allowance of the substitution of forms is in no way indicative of any comparability in the recordkeeping criteria between the two systems. In instances where State workers' compensation forms are being used in lieu of the OSHA No. 101, employers must still adhere to the

differences in recordkeeping definitions. There may be instances where the employer will have to prepare a form for an OSHA recordable case even though the State workers' compensation law does not require that a report be prepared or vice versa.

G–1. Q. Does a workers' compensation insurance carrier have any responsibility or liability under the OSH Act other than to its own employees?

A. No. Aside from recordkeeping obligations pertaining to its own employees, a workers' compensation insurance carrier has no responsibility for the OSHA recordkeeping of its clients.

G–2. Q. Is there any connection between OSHA records and reports and the reporting requirements of State workers' compensation acts?

A. No. The only relationship between the systems pertains to the forms used. To eliminate duplicate recordkeeping, most State workers' compensation agencies have revised their first report forms to make them acceptable as substitutes for the OSHA No. 101, the Supplementary Record of Occupational Injuries and Illnesses. See chapter II, section C for a discussion of the requirements for the supplementary record.

G–3. Q. What entries, if any, need to be made on the OSHA records in instances of employer-employee disputes involving contested cases under State workers' compensation systems?

A. Workers' compensation determinations have no direct bearing on the recordability of cases under OSHA. Some cases are covered by workers' compensation but are not OSHA-recordable; others are recordable under OSHA but are not covered by workers' compensation.

For example, many cases that do not involve lost worktime may be OSHA-recordable, but may not be recordable under State workers' compensation systems. Each case should be evaluated and recorded solely on the basis of OSHA recordkeeping criteria.

G–4. Q. Should employers wait to record cases on the OSHA forms if the cases are being contested under workers' compensation?

A. No. Employers are required to record cases on the OSHA forms no later than 6 working days after receipt of information that a recordable injury or illness has occurred. If a case is recordable under the OSHA system, an entry must be made on the OSHA records without any regard to the status of the case under workers' compensation.

G–5. Q. Won't recording a case on the OSHA records bias the outcome of contested workers' compensation cases?

A. No. Because of the significant differences between the two systems, recording injuries and illnesses on the OSHA forms should have no effect on cases litigated under workers' compensation. Section 4(b)(4) of the OSH Act provides that the provisions of the act will not affect workers' compensation liability.

Chapter VI. Evaluating of the Extent of Recordable Cases

Once the employer decides that a recordable injury or illness has occurred, the case must be evlauated to determine its extent or outcome. Part 1904.12(c) of the regulations provides the three categories of recordable cases: Fatalities, lost workday cases, and cases without lost workdays. Every recordable case must be placed in only one of these categories.

A. Fatalities

The Occupational Safety and Health Act of 1970 and part 1904 of the regulations require the recording of all work-related fatalities. Part 1904.12(c)(1) states that recordable occupational injuries and illnesses include fatalities, regardless of the time between the injury and the death, or the length of the illness.

A–1. Q. An employee has an occupational illness which keeps him away from work for 6 months. At the end of that time, he dies as a result of the illness. How should the case be recorded on the log?

A. Any entries in the lost workday illness columns 9 through 12 of the log should be lined out, and the date of death should be entered in column 8.

Injury-related fatalities that were initially recorded as lost worktime should be treated in a similar manner. Entries in the lost workday injury columns 2 through 5 should be lined out, and the date of death entered in column 7.

A–2. Q. Must an employee's death occur in the work environment for the case to be recorded as a work-related fatality?

A. No. Cases are recordable as work-related fatalities when the death results from an *event or exposure* that occurs in the work environment. The employee need not actually die in the work environment.

A–3. Q. Do employers have any recording or reporting obligations for fatalities other than making the appropriate entries on the OSHA No. 200?

A. Yes. Part 1904.8 of the regulations requires that employers report within 48 hours the occurrence of job-related fatalities to their OSHA area office. This subject is discussed in chapter VII.

A–4. Q. What constitutes death for OSHA recordkeeping purposes? What if a person suffers "brain death," but is maintained on life support systems?

A. For OSHA recordkeeping purposes, death occurs when the injured or ill employee's condition is such that a death certificate is issuable by the State or territory which has jurisdiction. In some States, a death certificate would be issued for cases involving "brain death," in others it would not.

A–5. Q. What is the appropriate date of death to be entered in these cases?

A. The date entered in column 1 or column 8 of the log should be the date of death entered on the death certificate.

B. Lost workday cases

Parts 1904.12(c)(2) and 1904.12(f) of the regulations provided the definition of lost workday cases. These cases are generally the most serious nonfatal injuries and illnesses. They occur when the injured or ill employee experiences either days away from work, days of restricted work activity, or both. In these situations, the injured or ill employee is affected to such an extent that: (1) Days must be taken off from the job for medical treatment or recuperation; or (2) the employee is unable to perform his or her normal job duties over a normal work shift, even though the employee may be able to continue working.

Injuries and illnesses are not considered lost workday cases unless they affect the employee *beyond* the day of injury or onset of illness. When counting the number of days away from work or days of restricted work activity, do not include: (1) The initial day of injury or onset of illness, or (2) any days on which the employee would not have worked even though able to work.

1. *Lost workday cases involving days away from work* are cases resulting in days the employees would have worked but could not because of the job-related injury or illness. The focus of these cases is on the employee's inability, because of injury or illness, to be present in the work environment during his or her normal work shift.

2. *Lost workday cases involving days of restricted work activity* are those cases where, because of injury or illness, (1) the employee was assigned to another job on a temporary basis, or (2) the employee worked at a permanent job less than full time, (3) the employee worked at his or her permanently assigned job but could not perform all the duties normally connected with it.

Restricted work activity occurs when the employee, because of the job-related injury or illness, is physically or mentally unable to perform *all* or *any part* of his or her normal assignment during *all or any part* of the normal workday or shift. The emphasis is on the employee's *inability* to perform normal job duties over a normal work shift.

B–1. Q. An employee is injured at the beginning of the normal work shift and misses the remainder of the workday. Is this a lost workday case?

A. This would not constitute a lost workday case unless the employee was unable to perform his or her normal work duties on a subsequent workday or work shift. Injuries and illnesses are not considered lost workday cases unless they affect the employee *beyond* the day of injury or onset of illness.

B–2. Q. Suppose an employee is injured on Thursday and is unable to return to work until the following Wednesday. How would the lost workdays be counted?

A. The count of lost workdays should not include the day of injury or onset of illness, or any days on which the employee would not have worked even though able to work. Therefore, assuming the employee normally worked Monday through Friday, this case would involve 3 lost workdays. Thursday would not be counted since it was the day of injury. Saturday and Sunday would not be counted because the employee does not normally work on the weekend. Friday, Monday, and Tuesday *would* be counted because they are normally scheduled workdays.

B–3. Q. If normal work schedules encompass overtime (6 days), are the overtime days counted as lost workdays?

A. Yes. If the employee would have worked the overtime days had he or she not been injured, then the days should be counted.

B–4. Q. How does the employer count lost workdays for employees who are off the job due to a work stoppage or strike?

A. Lost workdays include only those days in which the injured or ill employee would have worked but could not. Thus, no lost workdays are counted if he or she would not have worked because of a work stoppage.

B–5. Q. How is a lost workday case that carries over into the next year recorded? For instance, how should a case be recorded where an employee is injured in December 1984 and is still out on January 31, 1985?

A. Two important points are involved: (1) One case should not appear in the records for 2 different years; and (2) it is important not to lose the count of the number of lost workdays, which is a measure of the severity of the case.

On the 1984 log, the employer should estimate the number of workdays the employee is expected to lose in 1985 and add them to the count of workdays lost in 1984. When the employee returns to work and is able to perform all the duties of his or regular job or the count of lost workdays is otherwise ended, the actual count of lost workdays (days away from work and any days of restricted activity) should be verified, and the entry on the 1984 log should be corrected as necessary.

B–6. Q. An employee is injured on Wednesday and, due to the injury, is unable to work on Thursday and Friday of that week. The plant is closed for the next 2 weeks and all employees are on vacation. The employee is still injured and would not have been able to work if the plant had been in operation. Should the paid vacation time be counted as lost workdays for this employee?

A. No. In this case, the lost workdays consist of the 2 days beyond the day of injury or onset of illness during which the employee would normally have worked but could not do so. The employee was not scheduled to work during the period that the plant closed down for vacation. Any workdays lost due to the injury after the 2-week vacation period ended should also be counted as lost workdays.

B–7. Q. An employee suffers a work-related injury which renders him temporarily unable to work. If the employee elects to reschedule his vacation for time off to recuperate, in lieu of using sick leave, should the days away from work still be counted as lost workday?

A. Yes. These days should be counted as lost workdays if the vacation was not scheduled prior to the injury. The substitution of vacation leave for sick leave does not alter the fact that the employee was unable to work as a result of the injury.

B–8. Q. When do lost workdays cease to accumulate for injured employees who have long-term medical restrictions (i.e., such as no lifting over 30 pounds) but have returned to work?

A. If such restrictions prevent them from performing any of their normally assigned duties, then each day that they cannot perform all of their regular duties should be counted as a day of restricted work activity. However, if long-term restrictions result in permanent assignments to modified jobs, the count of days of restricted work activity ceases once the transfer or modification is made permanent.

B–9. Q. Should occupational illnesses be recorded differently than injuries when they result in termination or permanent transfer?

A. Yes. If workdays were lost, the case would be recorded as a lost workday illness case and identified as a termination or permanent transfer by placing an asterisk next to the check in the appropriate illness column. If no workdays were lost, the illness would still be identifed with an asterisk and be recorded as an illness without lost workdays. Terminations and permanent transfers are identified only for occupational illnesses.

B–10. Q. How are lost workday cases affected by termination of employment?

A. Termination of employment may stop the count of lost workdays if unrelated to the employee's injury or illness. However, if a termination results from an employee's injury or illness, the case would come within the definition of a lost workday case. (Days away from work are those days the employee would have worked but could not because of the injury or illness. Days of restricted work activity occur when the injury or illness renders the employee unable to perform all or any part of his or her normal assignment during all or any part of the workday or shift.) If an employee's unjury or illness results in his being terminated, the case should be recorded as a lost workday case and an estimate should be made of the total number of workdays that would have been lost had the employee not been terminated. This is necessary to provide an accurate measure of the severity of the case.

B–11. Q. How are lost workdays counted in cases where the injured or ill employee retires before resuming all of his or her normal duties?

A. These cases should be treated in the same manner as other termination cases. If the retirement was unrelated to the injury or illness, the count of lost workdays would normally stop upon the employee's scheduled retirement. If the retirement was a result of the injury or illness, the case should be recorded as a lost workday case and an estimate should be made of the total number of days that would have been lost had the employee not retired. This is necessary to provide an accurate measure of the severity of the case.

B–12. Q. How are lost workdays counted for cases that end in total disability?

A. Practical considerations govern the count of lost workdays in total disability cases. Lost workdays should be counted for these cases until a final determination is made that the injured or ill employee is totally disabled.

B–13. Q. An employee experiences a bona fide lost-time injury on a construction job. Before the employee is able to return to work, the project is completed and the construction firm moves on to another job. How is this recorded on the OSHA No. 200?

A. The case is recorded and the count of lost workdays continues until the employee is able to resume his normal job duties. The firm's movement to another construction site does not affect the employer's obligation.

B–14. Q. How should a case be recorded when the injured employee does not report back to work even though the company doctor and/or his doctor has given him permission to do so?

A. The concept of lost worktime focuses on the employee's *ability* to perform all of his or her normal duties for all of the normal work shift. Therefore, employers need not record lost workdays when an injured employee is able to resume work, but simply refuses to do so.

B–15. Q. How are lost workdays recorded in situations where the injured employees do not return to work or contact their employer after the day of injury?

A. If the injury was work-related, then lost workdays should be estimated and counted.

B–16. Q. In some areas, State or local health laws require employees to take time off from work when injured or once they are exposed to toxic substances. When this occurs, should this be recorded as lost worktime for the purposes of OSHA recordkeeping?

A. Whether or not a case is recordable as involving days away from work or days of restricted work activity centers on the employee's *ability* to perform all of his or her normal job duties. In some of these situations, the employee's inability to work is a result of the injury or illness. These cases *should* be recorded as lost time cases either involving days away from work or days of restricted work activity. In others, the lost time may be due solely to adherence to State and local health codes. These cases would clearly *not be* recordable as involving lost worktime. Each of these cases should be evaluated separately on its own merits.

B–17. Q. Suppose that an employee experiences a minor injury—requiring first aid only—but the injury is such that the person cannot perform normal duties for 2 or 3 days. Is the case recordable? If so, how should the case be recorded?

A. Such a case would be recordable because it meets 1 of the 4 requirements for recording injuries: *Restriction of work or motion.* Once recorded, the case should be classified as a lost workday case involving days of restricted work activity.

B–18. Q. Should time away from the job for visits to a doctor on days following the day of injury be recorded as lost worktime involving restricted work activity?

A. Restricted work activity occurs when the employee, because of a job-related injury or illiness, is physically or mentally unable to perform *all or any part* of his or her normal assignment during *all or any part* of the normal workday or shift. Since the emphasis is on the employee's *ability* to perform, time off to obtain medical attention is not considered to be restricted work activity. If an employee is able to perform all normal work duties during all normal workdays or shifts following the day of injury or onset of illiness, then absence from work for visits to doctors' offices or clinics to receive medical attention should *not* be recorded as a lost workday case involving restricted work activity.

The following hypothetical situations illustrate restricted work activity concepts. Assume that all cases are work related.

1. On Monday, an employee severely cuts his hand while on the job. He receives medical treatment on the date of injury. Tuesday morning, the employee goes to a doctor's office, is examined, and is released to return to work. He arrives at work 3 hours after his normal starting time and is able to complete the remainder of his shift. This case would be recorded as a nonfatal case without lost workdays. It would *not* be recorded as a restricted work activity case, even though the employee missed a portion of his normal work shift on Tuesday, because the employee's *ability* to perform his normal work duties on Tuesday was not impaired.

2. Assume another injury occurs with exactly the same facts as stated in number 1, except that the injury is such that the employee cannot perform *all* of his normal job functions on Tuesday. This case *would* be recorded as a lost time case involving restricted work activity. The employee's *inability* to perform at work was the key factor, not the time spent at the doctor's office.

3. Another injury occurs in the plant on Monday, with an employee severely straining her wrist. She receives medical treatment on the date of injury. Despite the injury, the employee can perform all her normal work duties on Monday. The employee reports to work on Tuesday, performs all her duties until her wrist begins to ache, then reports to the doctor's office in the afternoon where she is examined and sent home. This case *would* be recorded as a lost workday case involving restricted work activity. The employee was able to perform all her duties, but was unable to complete a full workday due to the effect of the injury. Her inability to perform all her duties over the subsequent *normal work shift* constitutes restricted work activity.

4. An employee working in a remote location was involved in an accident and was sent by the employer to get medical attention. The doctor examined and treated the employee. The employee spent the entire day following the accident traveling to and from the doctor's office. At all times, the employee was able to perform all the duties of his job. This is *not* a lost workday case since the loss of worktime was a function of the location of the worksite, not of the injury.

5. Assume facts identical to those in number 2 where the employee was unable to perform all of his normal job duties. However, in this case the employer directed the employee to report to the plant clinic on the day following the injury. He did not record the case as a lost workday case because he had heard that "time away from work to receive medical attention does not have to be recorded as restricted work activity." This case *should* be recorded as a lost workday case involving restricted work activity. Although time spent receiving medical attention is not considered lost worktime, the determining factor is the employee's inability *to perform his normal duties.* Employers may not avoid recording restricted work activity cases by sending employees to a health unit or doctor's office. Again, the focus of the analysis should center on the effect of the injury or illness on the employee's *ability* to perform his *normal job duties* for a *full work shift.*

B–19. Q. Why must lost workdays be recorded for an injured worker on light duty, when the employer still gets a day's work from the employee?

A. The workdays that are counted are those on which the employee was unable to contribute a full day's work on all parts of his or her permanent job. The definition was chosen to be simple and uniform, and to preclude concealment of significant injuries or illnesses by temporary assignment to nonproductive jobs. To evaluate the seriousness of lost workdays, they are separated into two classes—days away from work and days of restricted work activity.

B–20. Q. How are partial lost workdays recorded?

A. Cases involving the loss of less than a full workday or shift (beyond the day of injury or onset of illness) should be recorded as lost workday cases involving restricted work activity. Restricted work activity cases occur when the employee, because of the impact of a job-related injury or illness, is physically or menatally unable to perform all or any part of his or her normal work assignment *during all or any or any part of the normal workday or shift.*

For OSHA recordkeeping purposes, each partial workday lost is counted as one full day of restricted work activity. Fractions are not used.

B–21. Q. Where are lost workdays recorded for employees who normally rotate among several different establishments? For example, if an employee is injured in establishment A and as a result cannot report to his next scheduled shift in establishment B, which establishment records the lost workdays?

A. All lost workdays resulting from the injury in establishment A should be entered on the log for establishment A since injuries, illnesses, and lost workdays must be reflected in the records of the establishment in which the exposure occurs.

C. Cases not involving lost workdays

These cases consist of the relatively less serious injuries and illnesses which satisfy the criteria for recordability listed in chapter V, but which do not result in death or require the affected employee to have days away from work or days of restricted work activity beyond the date of injury or onset of illness.

C–1. Q. If nonfatal cases without lost workdays are not considered to be serious injuries or illnesses, why record them at all?

A. Although generally not considered the most serious injuries and illnesses, recognition and elimination of these cases were considered important by Congress when it initially promulgated the Occupational Safety and Health Act of 1970. Identification of these frequently occurring cases still has important safety and health implications, and is often linked to the prevention of more serious injuries.

C–2. Q. Is it possible for an employee to experience restricted work activity and have the case recorded only as a nonfatal case without lost workdays?

A. Yes, if the restriction does not go beyond the day of injury or onset of illness.

Chapter VII. Employer Obligations for Reporting Occupational Injuries and Illnesses

This chapter focuses on the requirements of Section 8(c)(2) of the Occupational Safety and Health Act of 1970 and Title 29, Part 1904, of the *Code of Federal Regulations* for employers to make reports of occupational injuries and illnesses. It does not include the reporting requirements of other standards or regulations of the Occupational Safety and Health Administration (OSHA) or of any other State or Federal agency.

A. The Annual Survey of Occupational Injuries and Illnesses

Section 8(c)(2) of the act requires employers to make periodic reports of deaths, injuries, and illnesses which have been recorded on the OSHA injury and illness records. This periodic reporting is accomplished through the Annual Survey of Occupational Injuries and Illnesses of the Bureau of Labor Statistics.

The annual survey provides measures of the occurrence and the extent of recordable occupational injuries and illnesses. Injuries and illnesses are reported as either fatalities, lost workday cases, or nonfatal cases without lost workdays. The survey produces national occupational injury and illness estimates at the 4-digit Standard Industrial Classification (SIC) level in most manufacturing industries and at the 2-digit SIC level in most nonmanufacturing industries. Estimates are produced at the 3-digit level for some high-risk nonmanufacturing industries such as construction. Equivalent data are provided for most States.

The measures produced by the system include incidence rates and numbers of occupational injuries and illnesses. Incidence rates relate the numbers of injuries, illnesses, or lost workdays to a common base of exposure. They show the equivalent number of injuries and illnesses or lost workdays per 100 full-time workers. This common base enables accurate interindustry comparisons, trend analyses over time, and comparisons among firms regardless of size.

Employer reporting obligations for the annual survey are provided in Part 1904.21 of the regulations:

> Upon receipt of an Occupational Injuries and Illnesses Survey Form, the employer shall promptly complete the form in accordance with the instructions contained therein, and return it in accordance with the aforesaid instructions.

The survey is conducted on a sample basis, and firms required to submit reports of their injury and illness experience are contacted by BLS or a participating State agency. A firm not contacted by its State agency or BLS need not file a report of its injury and illness experience. Employers should note, however, that even if they are not selected to participate in the annual survey for a given year, they must still comply with the recordkeeping requirements listed in the preceding chapters of these guidelines as well as with the requirements for reporting fatalities and multiple hospitalization cases provided in the next section of this chapter.

Participants in the annual survey consist of two categories of employers: (1) Employers who maintain OSHA records on a regular basis; and (2) a small, rotating sample of employers who are regularly exempt from OSHA recordkeeping. The survey procedure is different for these two groups of employers.

1. *Participation of firms regularly maintaining* OSHA *records.* When employers regularly maintaining OSHA records are selected to participate in the Annual Survey of Occupational Injuries and Illnesses, they are mailed the survey questionnaire in February of the year following the reference calendar year of the survey. (A firm selected to participate in the 1984 Survey would be contacted in February of 1985.) The survey form, the Occupational Injuries and Illnesses Survey Questionnaire, OSHA No. 200–S, requests information about the establishment(s) included in the report and the injuries and illnesses experienced during the previous year. Information for the injury and illness portion of the report from usually can be copied directly from the totals on the log and summary, OSHA No. 200, which the employer should have completed and posted in the establishment by the time the questionnaire arrives. The survey form also requests summary information about the type of business activity and number of employees and hours worked at the reporting unit during the reference year.

2. *Participation of normally exempt small employers and employers in low-hazard industries.* A few regularly exempt employers (those with fewer than 11 employees in the previous calendar year and those in designated low-hazard industries) are also required to participate in the annual survey. Their participation is necessary for the production of injury and illness statistics that are comparable in coverage to the statistics published in years prior to the

exemptions. These employers are notified *prior* to the reference calendar year of the survey that they must maintain injury and illness records for the coming year. (A firm selected to participate in the 1984 Survey would be contacted in December 1983.) At the time of notification, they are supplied with the necessary forms and instructions. During the reference calendar year, prenotified employers make entries on the log, OHSA No. 200.

Participating, regularly exempt firms are not required to complete a Supplementary Record of Occupational Injuries and Illnesses, OHSA No. 101, for each log entry. Also, they are *not* required to post the summary of the OSHA No. 200 in February following the year for which they kept records.

A–1. Q. Why must the Department of Labor conduct a survey of occupational injuries and illnesses? Can't it utilize workers' compensation data or information already available from other sources?

A. National work injury and illness statistics cannot be produced from workers' compensation records because workers' compensation systems are not uniform among States and do not cover some OSHA recordable cases. Injury and illness statistics produced by the BLS annual survey are not obtainable from any other data source.

A–2. Q. After receiving the OSHA No. 200–S survey package, how long do employers have to complete and return the survey questionnaire?

A. Employers should complete and return the questionnaire within 3 weeks after they receive the survey package.

A–3. Q. Why does the Department of Labor request information concerning the number of employee hours worked?

A. Information on the number of hours worked is needed to produce injury and illness incidence rates which relate the data to a common base of exposure, and thus enable interindustry comparisons, trend analysis, or comparisons among firms regardless of size.

A–4. Q. If information on employee hours worked is not readily available from payroll or other time records, how can it be estimated?

A. The hours-worked figure should be obtained from payroll or other time records whenever possible, and should exclude paid nonworktime such as vacations, sick leave, holidays, etc. If hours worked are not maintained separately from hours paid, employers should record their best estimate of the hours actually worked. If actual hours worked are unobtainable for certain types of employees (such as those paid on commission, salary, by the mile, etc.), hours worked may be estimated on the basis of scheduled hours, or on the basis of the average hours normally worked.

A–5. Q. Should the figure for hours worked include hours for situations where the employee's activities are deemed work related, even though the employee is not engaged in a specific job task or is outside a normal 8 hour work shift? For example, should hours worked include time for employees using on-premises exercise facilities or on travel status?

A. The figure for hours worked should reflect the actual hours of work-related exposure for all employees. If injuries and illnesses experienced during a particular activity are recordable, then the employee's time spent in the activity should be included in the hours estimate. Work-related exposures include most of the employers' activities on the employees' premises as well as situations off premises where the employees are engaged in job tasks or are there as a condition of employment.

Time spent using on-premises exercise facilities would be included in hours worked, because this is considered a work-related activity for OSHA recordkeeping purposes. (See chapter V, section C for a discussion of work relationship.)

For employees in travel status, the figure for hours worked should include all the empoyees' work-related activities and such necessary travel functions as eating, sleeping, and traveling. The figure for hours worked should *not* include hours spent on extraneous activities unrelated to the normal scope of the trip and solely for the employee's own personal use or enjoyment. (See question C–19 of chapter V for activities covered in travel status.)

A–6. Q. For the purposes of the Annual Survey of Occupational Injuries and Illnesses, how do employers report cases that are not yet resolved by the end of the calendar year?

A. Employers should report these cases based on their best estimate of the final case determination. The injury and illness portion of the OSHA No. 200–S survey form is completed by merely copying information from the summary lines of the log and summary, OSHA No. 200. In summarizing the log and summary, employers will have already made interim determinations on unresolved cases. (A sample survey form is provided in appendix B.)

A–7. Q. Will the information for a particular company reported on the OSHA No. 200–S survey form remain confidential?

A. Yes. Information for individual establishments and reporting units is kept strictly confidential.

A–8. Q. Are the regularly exempt employers who participate in the annual survey required to maintain their OSHA injury and illness records for 5 years like the participating employers regularly maintaining OSHA records?

A. No. Regularly exempt employers are not subject to the maintenance or retention requirements of Part 1904 of the regulations. However, these employers should keep their OSHA records for 3 months after they have completed the OSHA 200–S survey questionnaire since they may be needed for survey verification purposes.

B. Reporting Fatalities and Multiple Hospitalizations

All employers are required to report accidents resulting in one or more fatalities or the hospitalization of five or more employees by Part 1904.8 of the record-keeping regulations:

> Within 48 hours after the occurrence of an employment accident which is fatal to one or more employees or which results in hospitalization of five or more employees, the employer of any employees so injured or killed shall report the accident either orally or in writing to the nearest office of the Area Director of the Occupational Safety and Health Administration, U.S. Department of Labor. The reporting may be by telephone or telegraph. The report shall relate the circumstances of the accident, the number of fatalities, and the extent of any injuries. The Area Director may require such additional reports in writing or otherwise as he deems necessary, concerning the accident.

Employers with questions on these reporting requirements should contact their nearest OSHA area office. Additional guidelines are available in the OSHA Field Operations Manual.

B–1. Q. Do all States have the same reporting requirements under Part 1904.8 of the regulations?

A. No. All States under Federal jurisdiction must comply with the requirements of Part 1904.8. However, States with approved State plans under Section 18(b) of the act may have more strigent reporting requirements. Employers in these States should contact their State agency for specific reporting requirements. Addresses and telephone numbers for States with approved plans are provided in appendix D of this report.

B–2. Q. Part 1904.8 of the regulations requires that a report be made of a fatality or a multiple hospitalization case. To whom is the report made?

A. The report is made to the nearest office of the Area Director of the Occupational Safety and Health Administration, U.S. Department of Labor, *unless* the State in which the accident occurred is administering an

approved State plan under Section 18(b) of the act. Those States designate a State agency to which the report must be made. (See appendix D for States with approved State Plans.)

B–3. Q. When are accidents reportable under Part 1904.8 of the regulation?

A. Part 1904.8 is quite specific: Immediate reports must be made of accidents which result in a fatality or the hospitalization of five or more employees.

B–4 Q. What information must be reported?

A. The report must contain three pieces of information: (1) Circumstances surrounding the accident, (2) number of fatalities, and (3) number of hospitalized injuries. If necessary, the OSHA Area Director may require additional information on the accident.

B–5 Q. What is the purpose of the special reporting requirements for fatalities and multiple hospitalization cases in Part 1904.8?

A. The 48-hour reporting requirement of Part 1904.8 provides OSHA with sufficient notice to conduct immediate investigations of the accident scene to determine the causes of cases resulting in death or multiple hospitalizations.

B–6 Q. How can fatalities resulting from heart attacks or similar causes be reported within 48 hours when in most cases the employer cannot determine in that period whether or not it is occupationally related?

A. Heart attacks will generally not be reported under Part 1904.8 since the application of this portion of the regulations is limited to "accidents." When in doubt of the occupational origin of a fatal accident, employers should report it. OSHA will not investigate if it is determined that the case was not occupational in origin.

B–7 Q. Must all fatalities be reported to OSHA in accordance with the requirements of Part 1904.8?

A. Yes. All work-related accidents which result in death or the hospitalization of 5 or more employees must be reported in conformance with the 48-hour reporting requirement of Part 1904.8. The 48-hour reporting requirement has been interpreted to mean that employers must make their report within 48 hours after the occurrence of the accident or fatality. After receiving information that a fatality or multiple hospitalization has occurred, OSHA will evaluate the case to determine whether or not an inspection is warranted.

Chapter VIII. Access to OSHA Records and Penalties for Failure To Comply With Recordkeeping Obligations

The preceding chapters describe the recordkeeping and reporting requirements of the Occupational Safety and Health Act of 1970 and 29 CFR Part 1904. This chapter covers subjects related to insuring the integrity of the OSH recordkeeping process—access to OSHA records and penalties for recordkeeping violations.

A. Access to OSHA Records

Availability of the OSHA records for viewing, inspection, and copying is the focus of Part 1904.7 of the regulations:

(a) Each employer shall provide, upon request, records, provided for in sections 1904.2, 1904.4, and 1904.5 for inspection and copying by any representative of the Secretary of Labor for the purpose of carrying out the provisions of the Act, and by representatives of the Secretary of Health, Education, and Welfare during any investigation under section 20(b) of the Act or by any representative of a State accorded jurisdiction for occupational safety and health inspections or for statistical compilation under sections 18 and 24 of the act.

(b) (1) The log and summary of all recordable occupational injuries and illnesses (OSHA No. 200) (the log) provided for in section 1904.2 shall, upon request, be made available by the employer to any employee, former employee, and to their representatives for examination and copying in a reasonable manner and at reasonable times. The employee, former employee, and their representatives shall have access to the log for any establishment in which the employee is or has been employed.

(2) Nothing in this section shall be deemed to preclude employees and employee representatives from collectively bargaining to obtain access to information relating to occupational injuries and illnesses in addition to the information made available under this section.

(3) Access to the log provided under this section shall pertain to all logs retained under the requirements of section 1904.6.

This part of the regulations concerns only access to OSHA injury and illness records. It provides that all OSHA records, which are being kept for the 5-year retention period, be available for inspection and copying by authorized Federal and State government officials. Employees, former employees, and their representatives are provided access to only the log and summary, OSHA No. 200.

Government officials with access to the OSHA record include: Representatives of the Department of Labor including OSHA safety and health compliance officers and BLS representatives; representatives of the Department of Health, and Human Services (formerly the Department of Health, Education and Welfare) while carrying out the Department's research responsibilities; and representatives of States accorded jurisdiction for inspections or statistical compilations. "Representatives" may include Department of Labor officials inspecting a workplace or gathering information, officials of the Department of Health and Human Services, or contractors working for the agencies mentioned above, depending on the provisions of the contract under which they work.

Employees access to the log is limited to the records of the establishment in which the employee currently works or formerly worked. All current logs and those being maintained for the 5-year retention period must be made available for inspection and copying by employees, former employees, and their representatives.

An employee representative can be a member of a union representing the employee, or any person designated by the employee or former employee.

Access to the log is to be provided to employees, former employees, and employee representatives in a reasonable manner and at a reasonable time. Redress for failure to comply with the access provisions of the regulations can be obtained through a complaint to OSHA.

A–1. Q. Which OSHA records are subject to the access provisions of Part 1904.7 of the regulations?

A. Government representatives have access to all the OSHA forms—the Log and Summary of Occupational Injuries and Illnesses, OSHA No. 200; and the Supplementary Record of Occupational Injuries and Illnesses, OSHA No. 101.

Employees, former employees, and their representatives have access to only the log, and summary, OSHA No. 200.

A–2. Q. What is meant by the term "access" in Part 1904.7?

A. "Access" is the examination and copying of the relevant OSHA records at reasonable times and in a reasonable manner.

A–3. Q. Can employees gain access to any injury and illness records other than those specifically designated in Part 1904.7?

A. Yes. Employees can gain access to medical records through OSHA's standard on Access to Employee Exposure and Medical Records. For information on these provisions, refer directly to the standard or contact an OSHA area office. Also, employees can gain access to other injury and illness information through collective bargaining or other agreements made with employers. However, Part 1904.7

provides for access to only those records that are specified.

A–4. Q. Do the access provisions of the regulations allow employees to see the entire log, or only that portion containing an entry that specifically relates to them?

A. Employees or their representatives have access to the entire log and summary.

B. Penalties for Failure To Comply With Recordkeeping Obligations

Part 1904.9 of the regulations prescribes penalties for the falsification of OSHA records or the failure to keep the OSHA records or make OSHA reports. Part 1904.9(b) incorporates, by reference, Sections 9, 10, and 17 of the OSH Act pertaining to the issuance of citations, the procedures for enforcement, and the assessment of penalties. In doing so, it subjects employers committing recordkeeping and reporting violations to the same sanctions as employers violating other OSHA requirements such as safety and health standards and regulations. Part 1904.9 concerning falsification or failure to keep records or reports states:

(a) Section 17(g) of the Act provides that "Whoever knowingly makes any false statement, representation, or certification in any application, record, report, plan or other document filed or required to be maintained pursuant to this Act shall, upon conviction, be punished by a fine of not more than $10,000 or by imprisonment, for not more than 6 months or both."

(b) Failure to maintain records or file reports required by this part, or in the details required by forms and instructions issued under this part, may result in the issuance of citations and assessment of penalties as provided for in sections 9, 10, and 17 of the Act.

The OSHA records are an important source of information for all groups and individuals interested in promoting job safety and health. In addition, OSHA relies upon the information in these records to direct its resources to those industries and establishments where they are most needed. Consequently, the agency intends to vigorously pursue recordkeeping and rperoting violations to insure the continued integrity of the records and validity of the data produced.

B–1. Q. Does this mean that employers will be penalized under Part 1904.9(a) for every mistake they make in OSHA recordkeeping?

A. No. Part 1904.9(a) refers only to those who *knowingly* make false statements, representations, or certifications. However, employers notified of incorrect recordkeeping determinations by the Department of Labor representatives are also subject to these provisions.

B–2. Q. Can employers be penalized for failing to maintain OSHA records?

A. Yes. Part 1904.9(b) provides that the failure to maintain records as required by the regulations may result in the assessment of penalties as provided in Sections 9, 10, and 17 of the act.

B–3. Q. Are employers subject to any penalty for failing to respond to the BLS survey questionnaire on occupational injuries and illnesses, OSHA No. 200–S?

A. Yes. Part 1904.9(b) provides that failure to file reports may result in the penalties provided in Sections S9, 10, and 17 of the act.

Appendix A. Glossary of Terms

Annual summary.—Consists of a copy of the occupational injury and illness totals for the year from the OSHA No. 200, and the following information: The calendar year covered; company name; establishment address; certification signature, title, and date.

Annual survey.—Each year, BLS conducts an annual survey of occupational injuries and illnesses to produce national statistics. The OSHA injury and illness records maintained by employers in their establishments serve as the basis for this survey.

Bureau of Labor Statistics (BLS).—The Bureau of Labor Statistics is the agency responsible for administering and maintaining the OSHA recordkeeping system, and for collecting, compiling, and analyzing work injury and illness statistics.

Certification.—The person who supervises the preparation of the Log and Summary of Occupational Injuries and Illnesses, OSHA No. 200, certifies that it is true and complete by signing the last page of, or by appending a statement to that effect to, the annual summary.

Cooperative program.—A program jointly conducted by the States and the Federal Government to collect occupational injury and illness statistics.

Employee.—One who is employed in the business of his or her employer affecting commerce.

Employee representative.—Anyone designated by the employee for the purpose of gaining access to the employer's log of occupational injuries and illnesses.

Employer.—Any person engaged in a business affecting commerce who has employees; this does not include the United States Government or any State or political subdivision of a State.

Establishment.—A single physical location where business is conducted or where services or industrial operations are performed; the place where the employees report for work, operate from, or from which they are paid.

Federal Register.—The official source of information and public notification on OSHA's proposed rulemaking, standards, regulations, and other official matters, including amendments, corrections, insertions or deletions.

First aid.—Any *one-time* treatment and subsequent observation of *minor* scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care. Such treatment and observation is considered first aid even though provided by a physician or registered professional personnel.

First report of injury.—A workers' compensation form which may qualify as a substitute for the supplementary record, OSHA No. 101.

Incidence rate.—The number of injuries, illnesses, or lost workdays related to a common exposure base of 100 full-time workers. The common exposure base enables one to make accurate interindustry comparisons, trend analysis over time, or comparisons among firms regardless of size. This rate is calculated as:

$$\frac{N}{EH} \times 200{,}000$$

where:

N = number of injuries and illnesses or lost workdays

EH = total hours worked by all employees during calendar year

200,000 = base for 100 full-time equivalent workers (working 40 hours per week, 50 weeks per year).

Low-hazard industries.—Selected industries in retail trade; finance, insurance, and real estate; and services which are regularly exempt from OSHA recordkeeping. To be included in this exemption, an industry must fall within and SIC not targeted for general schedule inspections and must have an average lost workday case injury rate for a designated 3-year measurement period at or below 75 percent of the private sector average rate.

Log and summary (OSHA No. 200).—The OSHA recordkeeping form used to list injuries and illnesses and to note the extent of each case.

Lost workday cases.—Cases which involve days away from work or days of restricted work activity, or both.

Lost workdays.—The number of workdays (consecutive or not), beyond the day of injury or onset of illness, the employee was away from work or limited to restricted work activity

because of an occupational injury or illness.

(1) *Lost workdays—away from work* The number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness.

(2) *Lost workdays—restricted work activity*

The number of workdays (consecutive or not) on which, because of injury or illness: (1) The employee was assigned to another job on a temporary basis; or (2) the employee worked at a permanent job less than full time; or (3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of days away from work or days of restricted work activity does not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Medical treatment.—Includes Treatment of injuries administered by physicians, registered professional personnel, or lay persons. Medical treatment does not include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

Occupational illness.—Any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact, and which can be included in the categories listed below. The following categories should be used by employers to classify recordable occupational illnesses on the log in the columns indicated:

Column 7a. Occupational skin diseases or disorders.
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants; oil acne; chrome ulcers; chemical burns of inflammations; etc.

Column 7b. Dust disease of the lung (pneumoconioses).
Examples: Silicosis, asbestosis, coal worker's pneumoconiosis, byssinosis, and other peneumoconioses.

Column 7c. Respiratory conditions due to toxic agents.
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung; etc.

Column 7d. Poisoning (systemic effects of toxic materials).
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins, etc.

Column 7e. Disorders due to physical agents (other than toxic materials).
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultra-violet rays, microwaves, sunburn); etc.

Column 7f. Disorders associated with repeated trauma.
Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion vibration, or pressure.

Column 7g. All other occupational illnesses.
Examples: Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, coccidiodomycosis, etc.

Occupational injury.—Any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from a single instantaneous exposure in the work environment.

Note.—Conditions resulting from bites, such as insect or snake bites, or from one-time exposure to chemicals are considered to be injuries.

Occupational injuries and illnesses; extent and outcome.—All occupational injuries or illnesses result in either:

(1) Fatalities, regardless of the time between the injury and death, or the length of illness; or

(2) Lost workday cases, other than fatalities, that result in lost workdays; or

(3) Nonfatal cases without lost workdays.

Occupational Safety and Health Administration (OSHA).—OSHA is the Federal agency within the Department of Labor responsible for developing, implementing, and enforcing safety and health standards and regulations. OSHA works with employers and employees to foster effective safety and health programs which reduce workplace hazards.

Premises.—Consist of the employer's total establishment; they include the primary work facility and other areas in the employer's domain such as company storage facilities, cafeterias, restrooms, and restricted company parking lots.

Posting.—The annual summary of occupational injuries and illnesses must be posted at each establishment by February 1 and remain in place until March 1 to provide employees with the record of their establishment's injury and illness experience for the previous calendar year.

Recordable cases.—All work-related deaths, and illnesses, and those work-related injuries which result in: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment beyond first aid.

Recordkeeping system.—Refers to the nationwide system for recording and reporting occupational injuries and illnesses mandated by the Occupational Safety and Health Act of 1970 and implemented by Title 29, Code of Federal Regulations, Part 1904. This system is the only source of reliable national statistics on job-related injuries and illnesses occurring in the private sector.

Regularly exempt employers.—Employers regularly exempt from OSHA recordkeeping include: (a) All employers with no more than 10 full- or part-time employees at any one time in the previous calendar year; and (b) all employers in retail trade; finance, insurance, and real estate; and services industries—i.e., SIC's 52–89 (except building materials and garden supplies, SIC 52; general merchandise and food stores, SIC's 53 and 54; hotels and other lodging places, SIC 70; repair services, SIC's 75 and 76; amusement and recreation services, SIC 79; and health services, SIC 80).

Report form.—Refers to survey form OSHA No. 200–S which is completed and returned by the surveyed reporting unit.

Restriction of work or motion.—Occurs when the employee, because of the result of a job-related injury or illness, is physically or mentally unable to perform *all* or *any part* of his or her normal assignment during *all* or *any part* of the workday or shift.

Small employers.—Employers with no more than 10 employees among all the establishments of their firm at any one time during the previous calendar year.

Standard Industrial Classification (SIC).—A classification system developed by the Office of Management and Budget, Executive Office of the

President, for use in the classification of establishments by type of activity in which engaged. Each establishment is assigned an industry code for its major activity which is determined by the product or services rendered. Establishments may be classified in 2-, 3-, or 4-digit industries according to the degree of information available.

State (when mentioned alone).—Refers to a State of the United States, the District of Columbia, and U.S. territories and jurisdictions.

State agency.—State agency administering the OSHA recordkeeping and reporting system. Many States cooperate directly with BLS in administering the OSHA recordkeeping and reporting programs. Some States have their own safety and health laws which may impose different or additional obligations.

Supplementary Record (OSHA No. 101).—The form (or equivalent) on which additional information is recorded for each injury and illness entered on the log.

Title 29 of the Code of Federal Regulations. Part 1900–1999.—The parts of the *Code of Federal Regulations* which contain OSHA regulations.

Volunteers.—Workers who are not considered to be employees under the act when they serve of their own free will without compensation.

Workers' compensation systems.—State systems that provide medical benefits and/or indemnity compensation to victims of work-related injuries and illnesses.

Work environment.—Consists of the employer's premises and other locations where employees are engaged in work-related activities or are present as a condition of their employment. The work environment includes not only physical locations, but also the equipment or materials used by the employee during the course of his or her work.

Appendix B. OSHA Recordkeeping Forms

1. The Log and Summary of Occupational Injuries and Illnesses, OSHA No. 200.

2. The Supplementary Record of Occupational Injuries and Illnesses, OSHA No. 101.

3. The Annual Occupational Injuries and Illnesses Survey Covering Calendar Year 1983, OSHA No. 200–S.

BILLING CODE 4510-24-M

Bureau of Labor Statistics
Log and Summary of Occupational Injuries and Illnesses

U.S. Department of Labor

For Calendar Year 19____ Page ____ of ____

Form Approved O.M.B. No. 1220-0029

NOTE: This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain and post can result in the issuance of citations and assessment of penalties. (See posting requirements on the other side of form.)

RECORDABLE CASES: You are required to record information about every occupational death, every nonfatal occupational illness, and those nonfatal occupational injuries which involve one or more of the following: loss of consciousness, restriction of work or motion, transfer to another job, or medical treatment (other than first aid). (See definitions on the other side of form.)

Company Name

Establishment Name

Establishment Address

Case or File Number	Date of Injury or Onset of Illness	Employee's Name	Occupation	Department	Description of Injury or Illness	Extent of and Outcome of INJURY: Fatalities	Nonfatal Injuries: Injuries With Lost Workdays: Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both	Enter number of DAYS away from work	Enter number of DAYS of restricted work activity	Injuries Without Lost Workdays: Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above	Type of Illness: CHECK Only One Column for Each Illness (See other side of form for terminations or permanent transfers.)	Fatalities	Nonfatal Illnesses: Illnesses With Lost Workdays: Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both	Enter a CHECK if illness involves days away from work	Enter number of DAYS away from work	Enter number of DAYS of restricted work activity	Illnesses Without Lost Workdays: Enter a CHECK if no entry was made in columns 8 or 9
Enter a nonduplicating number which will facilitate comparisons with supplementary records.	Enter Mo./Day.	Enter first name or initial, middle initial, last name.	Enter regular job title, not activity employee was performing when injured or at onset of illness. In the absence of a formal title, enter a brief description of the employee's duties.	Enter department in which the employee is regularly employed or a description of normal workplace to which employee is assigned even though temporarily working in another department at the time of injury or illness.	Enter a brief description of the injury or illness and indicate the part or parts of body affected. Typical entries for this column might be: Amputation of 1st joint right forefinger; Strain of lower back; Contact dermatitis on both hands; Electrocution—body.	Enter DATE of death. Mo./Day/Yr.	Enter a CHECK if injury involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if injury involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 1 or 2 but the injury is recordable as defined above.	Occupational skin diseases or disorders; Dust diseases of the lungs; Respiratory conditions due to toxic agents; Poisoning (systemic effects of toxic materials); Disorders due to physical agents; Disorders associated with repeated trauma; All other occupational illnesses.	Enter DATE of death. Mo./Day/Yr.	Enter a CHECK if illness involves days away from work, or days of restricted work activity, or both.	Enter a CHECK if illness involves days away from work.	Enter number of DAYS away from work.	Enter number of DAYS of restricted work activity.	Enter a CHECK if no entry was made in columns 8 or 9.
(A)	(B)	(C)	(D)	(E)	(F)	(1)	(2)	(3)	(4)	(5)	(6)	(7a) (7b) (7c) (7d) (7e) (7f) (7g)	(8)	(9)	(10)	(11)	(12)
					PREVIOUS PAGE TOTALS →												
					TOTALS (Carry totals to other side of form.) →													

INJURIES

OSHA No. 200

Certification of Annual Summary Totals By _____ Title _____ Date _____

FOLD

OSHA No. 200

POST ONLY THIS PORTION OF THE LAST PAGE NO LATER THAN FEBRUARY 1

I. Log and Summary of Occupational Injuries and Illnesses

Each employer who is subject to the recordkeeping requirements of the Occupational Safety and Health Act of 1970 must maintain for each establishment a log of all recordable occupational injuries and illnesses. This form (OSHA No. 200) may be used for that purpose. A substitute for the OSHA No. 200 is acceptable if it is as detailed, easily readable, and understandable as the OSHA No. 200.

Enter each recordable case on the log within six (6) workdays after learning of its occurrence. Although other records must be maintained at the establishment (or which they refer), it is possible to prepare and maintain the log at another location, using data processing equipment if desired. If the log is prepared elsewhere, a copy updated to within 45 calendar days must be present at all times in the establishment.

Logs must be maintained and retained for five (5) years following the end of the calendar year to which they relate. Logs must be available (normally at the establishment) for inspection and copying by representatives of the Department of Labor, or the Department of Health and Human Services, or States accepted jurisdiction under the Act. Access to the log is also provided to employees, former employees and their representatives.

II. Changes in Extent of or Outcome of Injury or Illness

If, during the 5-year period the log must be retained, there is a change in an extent and outcome of an injury or illness which affects entries in columns 1, 2, 6, 8, 9, or 10, the first entry should be lined out and a new entry made. For example, if an injured employee at first required only medical treatment but later lost work days away from work, the check in column 6 should be lined out, and checks entered in columns 2 and 3 and the number of lost workdays entered in column 4.

In another example, if an employee with an occupational illness lost work days, returned to work, and then died of the illness, any entries in columns 9 through 12 should be lined out and the date of death entered in column 8.

The entire entry for an injury or illness should be lined out if later found to be nonrecordable. For example, an injury which at later determined not to be work related, or which was mistakenly thought to involve medical treatment but later was determined to have involved only first aid.

III. Posting Requirements

A copy of the totals and information following the last line of the last page for the year must be posted at each establishment in the place or places where notices to employees are customarily posted. This copy must be posted no later than **February 1 and must remain in place until March 1.**

Even though there were no injuries or illnesses during the year, zeros must be entered on the totals line, and the form posted.

The person responsible for the **annual summary totals** shall certify that the totals are true and complete by signing at the bottom of the form.

IV Instructions for Completing Log and Summary of Occupational Injuries and Illnesses

Column A. – CASE OR FILE NUMBER. Self-explanatory.

Column B – DATE OF INJURY OR ONSET OF ILLNESS.
For occupational injuries, enter the date of the work accident which resulted in injury. For occupational illnesses, enter the date of initial diagnosis of illness, or, if absence from work occurred before diagnosis, enter the first day of the absence attributable to the illness which was later diagnosed or recognized.

Columns C through F – Self-explanatory.

Columns 1 and 8 – INJURY OR ILLNESS-RELATED DEATHS. Self-explanatory.

Columns 2 and 9 – INJURIES OR ILLNESSES WITH LOST WORKDAYS. Self-explanatory.

Any injury which involves days away from work, or days of restricted work activity, or both must be recorded since it always involves one or more of the criteria for recordability.

Columns 3 and 10 – INJURIES OR ILLNESSES INVOLVING DAYS AWAY FROM WORK. Self-explanatory.

Columns 4 and 11 – LOST WORKDAYS—DAYS AWAY FROM WORK.
Enter the number of workdays (consecutive or not) on which the employee would have worked but could not because of occupational injury or illness. The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.
NOTE: For employees not having a regularly scheduled shift, such as certain truck drivers, construction workers, farm labor, casual labor, part-time employees, etc., it may be necessary to estimate the number of lost workdays. Examples of lost workdays shall be based on such work history of the employee AND days worked by employees, not ill or injured, working in the department and/or occupation of the ill or injured employee.

Columns 5 and 12 – LOST WORKDAYS—DAYS OF RESTRICTED WORK ACTIVITY.
Enter the number of workdays (consecutive or not) on which because of injury or illness:
(1) the employee was assigned to another job on a temporary basis, or
(2) the employee worked at a permanent job less than full time, or
(3) the employee worked at a permanently assigned job but could not perform all duties normally connected with it.

The number of lost workdays should not include the day of injury or onset of illness or any days on which the employee would not have worked even though able to work.

Columns 6 and 13 – INJURIES OR ILLNESSES WITHOUT LOST WORKDAYS. Self-explanatory.

Columns 7a through 7g – TYPE OF ILLNESS.
Enter a check in only one column for each illness.

TERMINATION OR PERMANENT TRANSFER.—Place an asterisk to the right of the entry in columns 7a through 7g (type of illness) which represented a termination of employment or permanent transfer.

V. Totals

Add number of entries in columns 1 and 8.
Add number of checks in columns 2, 3, 6, 7, 9, 10, and 13.
Add number of days in columns 4, 5, 11, and 12.
Yearly totals for each column (1-13) are required for posting. Running or page totals may be generated at the discretion of the employer.

If an employer's log of workdays is continuing at the time the totals are summarized, estimate the number of future workdays the employee will lose and add that estimate to the workdays already lost and include the figure in the annual totals. No further entries are to be made with respect to such cases on the next year's log.

VI. Definitions

OCCUPATIONAL INJURY is any injury such as a cut, fracture, sprain, amputation, etc., which results from a work accident or from an exposure involving a single incident in the work environment.
NOTE: Conditions resulting from animal bites, such as insect or snake bites or from one-time exposure to chemicals are considered to be injuries.

OCCUPATIONAL ILLNESS of an employee is any abnormal condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases which may be caused by inhalation, absorption, ingestion, or direct contact.

The following listing gives the categories of occupational illnesses and disorders that will be utilized for the purpose of classifying recordable illnesses. For purposes of information, examples of each category are given. These are typical examples, however, and are not to be considered the complete listing of the types of illnesses and disorders that are to be counted under each category.

7a. Occupational Skin Diseases or Disorders
Examples: Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or dermatitis due to poisons, oils, solvents or chemical burns or inflammations, etc.

7b. Dust Diseases of the Lungs (Pneumoconioses)
Examples: Silicosis, asbestosis and other asbestos-related diseases; coal worker's pneumoconiosis; byssinosis; siderosis; and other pneumoconioses.

7c. Respiratory Conditions Due to Toxic Agents
Examples: Pneumonitis, pharyngitis, rhinitis or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung, etc.

7d. Poisoning (Systemic Effect of Toxic Materials)
Examples: Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins, etc.

7e. Disorders Due to Physical Agents (Other than Toxic Materials)
Examples: Heatstroke, sunstroke, heat exhaustion, and other effects of environmental heat; freezing, frostbite, and effects of exposure to low temperatures; caisson disease; effects of ionizing radiation (isotopes, X-rays, radium); effects of nonionizing radiation (welding flash, ultraviolet rays, microwaves, sunburn), etc.

7f. Disorders Associated With Repeated Trauma
Examples: Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.

7g. All Other Occupational Illnesses.
Examples: Anthrax, brucellosis, infectious hepatitis, mumps; and benign tumors, food poisoning, histoplasmosis, coccidioidomycosis, etc.

MEDICAL TREATMENT includes treatment (other than first aid) administered by a physician or by registered professional personnel under the standing orders of a physician. Medical treatment does NOT include first aid treatment (one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, and so forth, which do not ordinarily require medical care) even though provided by a physician or registered professional personnel.

ESTABLISHMENT: A single physical location where business is conducted or where services or industrial operations are performed (for example: a factory, mill, store, hotel, restaurant, movie theater, farm, ranch, bank, sales office, warehouse, or central administrative office). Where distinctly separate activities are performed at a single physical location, such as construction activities operated from the same physical location as a lumber yard, each activity shall be treated as a separate establishment.

For firms engaged in activities which may be physically dispersed, such as agriculture, construction, transportation, communications, and electric, gas, and sanitary services, records may be maintained at a place to which employees report each day.

Records for personnel who do not primarily report or work at a single establishment, such as traveling salesmen, technicians, engineers, etc., shall be maintained at the location from which they are paid or the base from which personnel operate to carry out their activities.

WORK ENVIRONMENT is composed of the physical location, equipment, materials processed or used, and the kinds of tasks one performs in the course of an employee's work, whether on or off the employer's premises.

Bureau of Labor Statistics
Supplementary Record of
Occupational Injuries and Illnesses

U.S. Department of Labor

This form is required by Public Law 91-596 and must be kept in the establishment for 5 years. Failure to maintain can result in the issuance of citations and assessment of penalties.

Case or File No.

Form Approved
O.M.B. No. 1220-0029

Employer

1. Name

2. Mail address (No. and street, city or town, State, and zip code)

3. Location, if different from mail address

Injured or Ill Employee

4. Name (First, middle, and last)

Social Security No.

5. Home address (No. and street, city or town, State, and zip code)

6. Age

7. Sex (Check one) Male ☐ Female ☐

8. Occupation (Enter regular job title, not the specific activity he was performing at time of injury.)

9. Department (Enter name of department or division in which the injured person is regularly employed, even though he may have been temporarily working in another department at the time of injury.)

The Accident or Exposure to Occupational Illness

If accident or exposure occurred on employer's premises, give address of plant or establishment in which it occurred. Do not indicate department or division within the plant or establishment. If accident occurred outside employer's premises at an identifiable address, give that address. If it occurred on a public highway or at any other place which cannot be identified by number and street, please provide place references locating the place of injury as accurately as possible.

10. Place of accident or exposure (No. and street, city or town, State, and zip code)

11. Was place of accident or exposure on employer's premises? Yes ☐ No ☐

12. What was the employee doing when injured? (Be specific. If he was using tools or equipment or handling material, name them and tell what he was doing with them.)

13. How did the accident occur? (Describe fully the events which resulted in the injury or occupational illness. Tell what happened and how it happened. Name any objects or substances involved and tell how they were involved. Give full details on all factors which led or contributed to the accident. Use separate sheet for additional space.)

Occupational Injury or Occupational Illness

14. Describe the injury or illness in detail and indicate the part of body affected. (E.g., amputation of right index finger at second joint; fracture of ribs; lead poisoning; dermatitis of left hand; etc.)

15. Name the object or substance which directly injured the employee. (For example, the machine or thing he struck against or which struck him; the vapor or poison he inhaled or swallowed; the chemical or radiation which irritated his skin; or in cases of strains, hernia, etc., the thing he was lifting, pulling, etc.)

16. Date of injury or onset of illness

17. Did employee die? (Check one) Yes ☐ No ☐

Other

18. Name and address of physician

19. If hospitalized, name and address of hospital

Date of report | Prepared by | Official position

OSHA No. 101 (Feb. 1981)

SUPPLEMENTARY RECORD OF OCCUPATIONAL INJURIES AND ILLNESSES

To supplement the Log and Summary of Occupational Injuries and Illnesses (OSHA No. 200), each establishment must maintain a record of each recordable occupational injury or illness. Worker's compensation, insurance, or other reports are acceptable as records if they contain all facts listed below or are supplemented to do so. If no suitable report is made for other purposes, this form (OSHA No. 101) may be used or the necessary facts can be listed on a separate plain sheet of paper. These records must also be available in the establishment without delay and at reasonable times for examination by representatives of the Department of Labor and the Department of Health and Human Services, and States accorded jurisdiction under the Act. The records must be maintained for a period of not less than five years following the end of the calendar year to which they relate.

Such records must contain at least the following facts:

1) *About the employer*—name, mail address, and location if different from mail address.

2) *About the injured or ill employee*—name, social security number, home address, age, sex, occupation, and department.

3) *About the accident or exposure to occupational illness*—place of accident or exposure, whether it was on employer's premises, what the employee was doing when injured, and how the accident occurred.

4) *About the occupational injury or illness*—description of the injury or illness, including part of body affected, name of the object or substance which directly injured the employee, and date of injury or diagnosis of illness.

5) *Other*—name and address of physician; if hospitalized, name and address of hospital; date of report; and name and position of person preparing the report.

SEE *DEFINITIONS* ON THE BACK OF OSHA FORM 200.

• U.S. GOVERNMENT PRINTING OFFICE: 1982 — 380-271/3303

1983 OSHA No. 200-S

Annual Occupational Injuries and Illnesses Survey Covering Calendar Year 1983

U.S. Department of Labor
Bureau of Labor Statistics for the Occupational Safety and Health Administration

The information collected on this form will be used for statistical purposes only by the BLS, OSHA, and the cooperating State Agencies.

THIS REPORT IS MANDATORY UNDER PUBLIC LAW 91 596. FAILURE TO REPORT CAN RESULT IN THE ISSUANCE OF CITATIONS AND ASSESSMENT OF PENALTIES.

O.M.B. No. 1220-0045
Approval Exp. 12/31/84

St. Sch. No. Ck. Suf.

SIC

EDIT

Complete this report whether or not there were recordable occupational injuries or illnesses.

PLEASE READ THE ENCLOSED INSTRUCTIONS

Complete and return ONLY THIS FORM within 3 weeks

I. ANNUAL AVERAGE EMPLOYMENT IN 1983

Enter the average number of employees who worked during calendar year 1983 in the establishment(s) covered by this report. Include all classes of employees: full-time, part-time, seasonal, temporary, etc. See the instructions for an example of an annual average employment calculation. *(Round to the nearest whole number.)*

II. TOTAL HOURS WORKED IN 1983

Enter the total number of hours actually worked during 1983 by **all** employees covered by this report. DO NOT include any non-work time even though paid such as vacations, sick leave, etc. If employees worked low hours in 1983 due to lay offs, strikes, fires, etc., explain under Comments (section VII). *(Round to the nearest whole number)*

III. NATURE OF BUSINESS IN 1983

A. Check the box which best describes the general type of activity performed by the establishment(s) included in this report.

- ☐ Agriculture
- ☐ Forestry
- ☐ Fishing
- ☐ Mining
- ☐ Construction
- ☐ Manufacturing
- ☐ Transportation
- ☐ Communication
- ☐ Public Utilities
- ☐ Wholesale Trade
- ☐ Retail Trade
- ☐ Finance
- ☐ Insurance
- ☐ Real Estate
- ☐ Services
- ☐ Public Administration

B. Enter in order of importance the principal products, lines of trade, services or other activities. For each entry also include the approximate percent of total 1983 annual value of production, sales or receipts.

_____ %

_____ %

_____ %

C. If this report includes any establishment(s) which perform services for other units of your company, indicate the primary type of service or support provided. *(Check as many as apply.)*

1 ☐ Central administration
2 ☐ Research, development and testing
3 ☐ Storage (warehouse)
4 ☐ Other (specify)

IV. MONTH OF OSHA INSPECTION

If the establishment(s) covered by this report had either a Federal or State OSHA compliance inspection during calendar year 1983, please enter the name of the month in which the *first* inspection occurred.

_____

(Leave this box blank.)

V. RECORDABLE INJURIES AND ILLNESSES

Did the establishment(s) have any recordable injuries or illnesses during calendar year 1983?

1 ☐ No (Please complete section VII)

2 ☐ Yes (Please complete sections VI and VII)

SEE REVERSE

REPORT LOCATION AND IDENTIFICATION

Complete this report for the establishment(s) covered by the description below

Please indicate any address changes below.

RETURN REPORT TO:

For Information Call:

OSHA No. 200-S (Rev. April 1983)

VI. OCCUPATIONAL INJURY AND ILLNESS SUMMARY (Covering Calendar Year 1983)

- ***Complete this section by copying totals from the annual summary of your 1983 OSHA No. 200.***
- Remember to reverse the carbon insert before completing this side
- Leave section VI blank if there were no OSHA recordable injuries or illnesses during 1983
- *Note: First aid even when administered by a doctor or nurse is not recordable.*
- Please check your figures to be certain that the sum of entries in columns (7a) + (7b) + (7c) + (7d) + (7e) + (7f) + (7g) = the sum of entries in columns (8) + (9) + (13).
- If you listed fatalities in columns (1) and/or (8), please give a brief description of the object or event which caused each fatality in the "Comments" section.

OCCUPATIONAL INJURY CASES

INJURY RELATED FATALITIES** (DEATHS)	INJURIES WITH LOST WORKDAYS				INJURIES WITHOUT LOST WORKDAYS*
	Injury cases with days away from work and/or restricted workdays	Injury cases with days away from work	Total days away from work	Total days of restricted activity	
Number of DEATHS in col. 1 of the log (OSHA No. 200)	Number of CHECKS in col. 2 of the log (OSHA No. 200)	Number of CHECKS in col. 3 of the log (OSHA No. 200)	Sum of the DAYS in col. 4 of the log (OSHA No. 200)	Sum of the DAYS in col. 5 of the log (OSHA No. 200)	Number of CHECKS in col. 6 of the log (OSHA No. 200)
(1)	(2)	(3)	(4)	(5)	(6)
DEATHS					

OCCUPATIONAL ILLNESS CASES

TYPE OF ILLNESS

Enter the number of checks from the appropriate columns of the log (OSHA No. 200).

Occupational skin diseases or disorders	Dust diseases of the lungs	Respiratory conditions due to toxic agents	Poisoning (systemic effects of toxic materials)	Disorders due to physical agents	Disorders associated with repeated trauma	All other occupational illnesses
(7)						
(a)	(b)	(c)	(d)	(e)	(f)	(g)

ILLNESS RELATED FATALITIES** (DEATHS)	ILLNESSES WITH LOST WORKDAYS				ILLNESSES WITHOUT LOST WORKDAYS*
	Illness cases with days away from work and/or restricted workdays	Illness cases with days away from work	Total days away from work	Total days of restricted activity	
Number of DEATHS in col. 8 of the log (OSHA No. 200)	Number of CHECKS in col. 9 of the log (OSHA No. 200)	Number of CHECKS in col. 10 of the log (OSHA No. 200)	Sum of the DAYS in col. 11 of the log (OSHA No. 200)	Sum of the DAYS in col. 12 of the log (OSHA No. 200)	Number of CHECKS in col. 13 of the log (OSHA No. 200)
(8)	(9)	(10)	(11)	(12)	(13)
DEATHS					

* WITHOUT LOST WORKDAYS- CASES (WITH NO DAYS LOST) RESULTING IN EITHER DIAGNOSIS OF OCCUPATIONAL ILLNESS, LOSS OF CONSCIOUSNESS, RESTRICTION OF WORK OR MOTION, TRANSFER TO ANOTHER JOB, OR MEDICAL TREATMENT BEYOND FIRST AID.

VII. REPORT PREPARED BY (Please type or print)

NAME _____

TITLE _____

SIGNATURE _____

AREA CODE _____ PHONE _____

DATE _____

**IF YOU LISTED FATALITIES IN COLUMNS (1) AND/OR (8) PLEASE GIVE A BRIEF DESCRIPTION OF THE OBJECT OR EVENT WHICH CAUSED EACH FATALITY IN THE "COMMENTS" SECTION BELOW.

COMMENTS _____

SURVEY REPORTING REGULATIONS

Title 29, Part 1904.20-22 of the Code of Federal Regulations requires that each employer shall return the completed survey form, OSHA No. 200-S, within 3 weeks of receipt in accordance with the instructions shown below.

INSTRUCTIONS FOR COMPLETING THE OSHA NO. 200-S FORM 1983 OCCUPATIONAL INJURIES AND ILLNESSES SURVEY (Covering Calendar Year 1983)

Change of Ownership—When there has been a change of ownership during the report period, only the records of the current owner are to be entered in the report. Explain fully under **Comments** (Section VII), and include the date of the ownership change and the time period this report covers.

Partial-Year Reporting—For any establishment(s) which was not in existence for the entire report year, the report should cover the portion of the period during which the establishment(s) was in existence. Explain fully under Comments (Section VII), including the time period this report covers.

ESTABLISHMENTS INCLUDED IN THE REPORT

This report should include only those establishments located in, or identified by, the Report Location and Identification designation which appears next to your mailing address. This designation may be a geographical area, usually a county or city, or it could be a brief description of your operation within a geographical area. If you have any questions concerning the coverage of this report, please contact the agency identified on the OSHA No. 200-S report form.

DEFINITION OF ESTABLISHMENT

An **ESTABLISHMENT** is defined as a single physical location where business is conducted or where services or industrial operations are performed. (For example: a factory, mill, store, hotel, restaurant, movie theatre, farm, ranch, bank, sales office, warehouse, or central administrative office.)

For firms engaged in activities such as construction, transportation, communication, or electric, gas and sanitary services, which may be physically dispersed, reports should cover the place to which employees normally report each day.

Reports for personnel who do not primarily report or work at a single establishment, such as traveling salespersons, technicians, engineers, etc., should cover the location from which they are paid or the base from which personnel operate to carry out their activities.

SECTION I. ANNUAL AVERAGE EMPLOYMENT IN 1983

Enter in Section I the **average** (not the total) number of full and part time employees who worked during calendar year 1983 in the establishment(s) included in this report. If more than one establishment is included in this report, add together the annual average employment for each establishment and enter the sum. Include all classes of employees—seasonal, temporary, administrative, supervisory, clerical, professional, technical, sales, delivery, installation, construction and service personnel, as well as operators and related workers.

Annual Average employment should be computed by summing the employment from all pay periods during 1983 and then dividing that sum by the total number of such pay periods throughout the entire year, including periods with no employment. For example, if you had the following monthly employment—Jan. 10, Feb. 10, Mar. 10, Apr. 5, May 5, June 5, July 5, Aug. 0, Sept. 0, Oct. 0, Nov. 5, Dec. 5—you would sum the number of employees for each monthly pay period (in this case, 60) and then divide that total by 12 (the number of pay periods during the year) to derive an annual average employment of 5.

SECTION II. TOTAL HOURS WORKED IN 1983

Enter in Section II the **total** number of hours actually **worked** by all classes of employees during **1983.** Be sure to include **ONLY** time on duty. **DO NOT include any non-work time** even though paid, such as vacations, sick leave, holidays, etc. The hours worked figure should be obtained from payroll or other time records wherever possible. If **hours worked** are not maintained separately from **hours paid**, please enter your best estimate. If actual hours worked are not available for employees paid on commission, salary, by the mile, etc., hours worked may be estimated on the basis of scheduled hours or 8 hours per workday.

For example, if a group of 10 salaried employees worked an average of 8 hours per day, 5 days a week, for 50 weeks of the report period, the total hours worked for this group would be 10 × 8 × 5 × 50 = 20,000 hours for the report period.

SECTION III. NATURE OF BUSINESS IN 1983

In order to verify the nature of business code, we must have information about the specific economic activity carried on by the establishment(s) included in your report during calendar year 1983.

Complete Parts A, B and C as indicated in Section III on the OSHA No. 200-S form. Complete Part **C only** if supporting services are provided to other establishments of **your** company. Leave Part C blank if a) supporting services are not the primary function of any establishment(s) included in this report or b) supporting services are provided but only on a **contract or fee basis** for the general public or for other business firms. **(Instructions continued on page 2.)**

NOTE: If more than one establishment is included, information in Section III should reflect the combined activities of all such establishments. One code will be assigned which best indicates the nature of business of the group of establishments as a whole.

SECTION IV. MONTH OF OSHA INSPECTION

Enter the name of the first month in 1983 during which your establishment(s) had an OSHA compliance inspection. Include inspections under the Federal or State equivalents of the Occupational Safety and Health Act by Federal or State inspectors and other inspections which may result in penalties for violations of safety and health standards. Do not include inspections limited to elevators, boilers, fire safety or those which are consultative in nature.

SECTION V. RECORDABLE INJURIES OR ILLNESSES

Check the appropriate box. If you checked "Yes," complete Sections VI and VII on the back of the form. If you checked "No," complete only Section VII.

SECTION VI. OCCUPATIONAL INJURY AND ILLNESS SUMMARY

This section can be completed easily by copying the totals from the annual summary of your **1983** OSHA No. 200 form (Log and Summary of Occupational Injuries and Illnesses). Please note that if this report covers **more** than one establishment, the final totals on the "Log" for each must be added and the sums entered in Section VI.

Leave Section VI **blank** if the employees covered in this report experienced no recordable injuries or illnesses during 1983.

If there were recordable injuries or illnesses during the year, please review your OSHA No. 200 form for each establishment to be included in this report to make sure that all entries are correct and complete before completing Section VI. Each recordable case should be included on the "Log" in only **one** of the six main categories of injuries or illnesses:

1. INJURY—related deaths (Log column 1)
2. INJURIES with days away from work and/or restricted days (Log column 2)
3. INJURIES without lost workdays (Log column 6)
4. ILLNESS—related deaths (Log column 8)
5. ILLNESSES with days away from work and/or restricted days (Log column 9)
6. ILLNESSES without lost workdays (Log column 13)

[redacted]

Also review each case to ensure that the appropriate entries have been made for the other columns if applicable. For example, if the case is an injury with Lost Workdays, be sure that the check for an injury involving **days away from work** (Log column 3) is entered if necessary. Also verify that the correct number of days away from work (Log column 4) and/or days of restricted work activity (Log column 5) are recorded. A similar review should be made for a case which is an illness with Lost Workdays (including Log columns 10, 11 and 12). Please remember that if your employees' loss of workdays is still continuing at the time the annual summary for the year is completed, you should estimate the number of future workdays they will lose and add this estimate to the actual workdays already lost. Each partial day away from work, other than the day of the occurrence of the injury or onset of illness, should be entered as one full restricted workday.

Also, for each case which is an illness, make sure that the appropriate column indicating Type of Illness (Log columns 7a-7g) is checked.

After completing your review of the individual case entries on the "Log," please make sure that the "Totals" line has been completed by summarizing Columns 1 through 13 according to the instructions on the back of the "Log" form. Then, copy these "Totals" onto Section VI of the OSHA No. 200-S form. If you entered fatalities in columns (1) and/or (8), please include in the "Comments" section a brief description of the object or event which caused each fatality.

FIRST AID

Finally, please remember that all injuries which, in your judgement, required **only First Aid Treatment**, even when administered by a doctor or nurse, should not be included in this report. First Aid Treatment is defined as one-time treatment and subsequent observation of minor scratches, cuts, burns, splinters, etc., which do not ordinarily require medical care.

SECTION VII. COMMENTS AND IDENTIFICATION

Please complete all parts including your area code and telephone number. Then return the OSHA No. 200-S form in the pre-addressed envelope. **KEEP** your file copy.

Dear Employer:

The Occupational Safety and Health Act of 1970 requires the Secretary of Labor to collect, compile, and analyze statistics on occupational injuries and illnesses. This is accomplished through a joint Federal/State survey program with States that have received Federal grants for collecting and compiling statistics. Establishments are selected for this survey on a sample basis with varying probabilities depending upon size. Certain establishments may be included in each year's sample because of their importance to the statistics for their industry.

You have been selected to participate in the nationwide Occupational Injuries and Illnesses Survey for 1983. Under the Occupational Safety and Health Act, your report is mandatory.

The following items are enclosed for your use: (1) Instructions for completing the form; (2) The OSHA No. 200-S form and a copy for your files; and (3) An addressed return envelope. Please complete the OSHA No. 200-S form and return it within three weeks in the envelope provided.

If you have any questions about this survey, contact the survey collection agency indicated on the OSHA No. 200-S form.

Thank you for your cooperation with this important survey.

Sincerely,

THORNE G. AUCHTER
Assistant Secretary for
Occupational Safety and Health

BILLING CODE 4510-24-C

Appendix C.—Selected Illnesses Which May Result From Exposure in the Work Environment

The following table is included *for information purposes only, to assist* employers in recognizing certain occupational illnesses and diseases. It does not include every condition, illness, or disease that may result from an exposure in the work environment.

The table is based upon a Sentinel Health Event List (Occupational) (SHEO), initially prepared by the National Institute for Occupational Safety and Health (NIOSH), which encompassed 50 disease conditions linked to the workplace. A Sentinal Health Event is defined by NIOSH as a disease, disability, or untimely death which is occupationally related and whose occurrence may: 1) provide the impetus for epidemiologic or industrial hygiene studies; or 2) serve as a warning signal that materials substitution, engineering control, personal protection, or medical care may be required. The list included only those conditions for which NIOSH found "objective documentation of an associated agent, industry, and occupation. . . . in the scientific literature." NIOSH has indicated that the list will be expanded in the future.

The following table lists illness conditions, the industry and/or occupation where each condition is likely to occur, symptoms associated with each condition, the agent likely to cause the condition, and the appropriate illness column to be checked on the log, OSHA No. 200.

Recording illnesses has historically been a problem for employers, especially chronic or long term latent illnesses. This table is furnished to assist employers in making accurate illness determinations. *The table should not be interpreted to mean that a specific condition can only be contracted in the industries or occupations listed. It also does not mean that every condition listed is recordable if experienced by employees in these industries and/or occupations.* For the case to be OSHA recordable, employers must still establish that the condition is a result of an exposure in *their* work environment. For guidelines for determining work relationship, see Chapter V, Section C.

Condition	Industry and/or occupation	Symptoms	Agent	Log column
Pulmonary tuberculosis	Physicians, medical personnel, medical laboratory workers.	Tuberculous lesion; chest pain; coughing; bloody and pus-like sputum; hectic fever; weight loss; or night sweats.	Mycobacterium tuberculosis	7c
Silico-tuberculosis	Quarrymen, sandblasters, silica, processors, mining, metal foundries, ceramic industry.	Decrease in maximum breathing capacity; massive fibrosis; pronounced, energetic or labored respiration with low oxygen content in arteries producing bluish skin and mucous membrane discolorations; bloodstained sputum; attacks of bronchopneumonia; malaise; disturbed sleep; anorexia; chest pains; or hoarseness.	S:02, Mycobacterium tuberculosis	7b
Plague	Shepherds, farmers, ranchers, hunters, field geologists, medical laboratory workers.	Acutely inflamed and painful lymph nodes; pulmonary lesions; cough; chills; 103°–106 °F temperature; rapid and thready pulse, hypertension; restlessness; delirium; confusion; incoordination; headache; vomiting; or diarrhea.	Yersinia pestis via bite of infected flea, wild rodents, or inhalation.	7g
Tularemia	Hunters, fur handlers, sheep industry workers, cooks, veterinarians, ranchers, veterinary pathologists, forestry workers, farmers, butchers, laboratory workers.	Ulcer at bite site followed by inflammation of regional lymph nodes; a nonspecific rash; headache; muscle pains; chills; nausea; vomiting and rapid rise in temperature to 103°–104 °F with severe prostration; extreme weakness; and drenching sweats—all symptomatic of a typhoid-like state; bacteremia; and atypical pneumonia.	Francisella tularensis via bite of flies, fleas, ticks, and lice or handling infected animals.	7g
Anthrax (diagnosis often hinges upon determination of occupation).	Shepherds, farmers, butchers, handlers of imported hides or fibers, veterinarians, veterinary pathologists, weavers.	*Cutaneous Form:* Red-brown papule skin eruption which enlarges with red patches of variable size and shape; pus-like pimples; and hardening of tissue. Progressive ulceration follows with blood and pus bursting from the pimples and dead tissue forming. Local lymph node enlargement is accompanied by general feeling of illness; muscle pain; headache; fever; nausea; and vomiting. *Pulmonary Form:* Symptoms are insidious, suggesting an influenza-like illness. Increased fever is followed in 1–3 days by severe respiratory distress with bluish-purplish discoloration of mucous membranes and skin; shock; and coma.	Bacillus anthracis	7g
Brucellosis	Farmers, shepherds, veterinarians, laboratory workers, slaughterhouse workers.	Remittant undulatory evening fever for 1–5 weeks; headaches and back-of-neckaches; morning sweats with lowered fever; weakness and aching without localizing findings. Is repetitive with remissions over months or years. Cervical pain; constipation; occasional diarrhea; anorexia; weight loss; irritability; insomnia; mental depression; emotional instability. Enlarged spleen and lymph nodes may occur.	Brucella abortus, suis	7g
Tetanus	Farmers, ranchers	Lockjaw; spasms, primarily of masseter and neck muscles and secondarily of the back muscles; stiffness of the jaw; restlessness; irritability; constipation; stiff neck; difficulty in swallowing; stiff arms or legs; headache; fever; sore throat; chilliness; painful convulsions.	Clostridium tetani	7g
Rubella	Medical personnel, intensive care personnel.	Pale pink rash or measles-like eruptions following slight fever and inflammation of mucous membranes of head, nose, throat; sore throat; pains in limbs; cough; intense intolerance of light.	Rubella virus	7g
Hepatitis A (infectious)	Day care center staff, orphanage staff, mental retardation institution staff, medical personnel.	Anorexia; fever; liver enlargement and tenderness; generalized debilitation; drowsiness; nausea; headache; occasionally jaundice.	Hepatitis A virus	7g
Hepatitis B (serum)	Nurses and aides, anesthesiologists, orphanage and mental institution staff, medical laboratory personnel, general dentists, oral surgeons, physicians.	Flu-like feeling; weakness; drowsiness; anorexia; nausea; abdominal discomfort; fever; headache; definite jaundice.	Hepatitis B virus	7g
Non-A, non-B hepatitis (toxic)	As above for hepatitis A & B	Nausea; vomiting; jaundice; stupor; coma; toxic effects on kidney, brain, or bone marrow may be more conspicuous.	Unknown; suspected drugs and chemicals include: carbon tetrachloride, insecticides, industrial solvents, and various metallic compounds (arsenic, gold, mercury iron).	7g

Condition	Industry and/or occupation	Symptoms	Agent	Log column
Rabies	Veterinarians, animal and game wardens, lab researchers, farmers, ranchers, trappers, cave explorers, delivery personnel.	Malaise or general feeling of illness or discomfort; depression of spirits; swelling of lymphatics around wound; choking; spasmodic catching of breath, succeeded by increasing spasms, especially of the muscles of respiration and swallowing, which are increased by attempts to drink water or even by sight of water. Also, fever, headache, mental derangement, nausea; vomiting; profuse secretion of a sticky saliva; and albumin in the urine. Usually fatal within 2-5 days.	Rabies virus	7g
Ornithosis	Psittacine bird (parrot and parakeet) breeders, pet shop staff, poultry producers, veterinarians, zoo employees, taxidermists, laboratory and hospital personnel.	Chills; headache; dry cough; feverish with slow pulse; lethargy; insomnia; abnormal fear of light; sore throat; nausea; vomiting; diarrhea; protein in urine; anorexia; abnormal white blood cell count; enlarged but non-tender liver; and commonly, inflammation of lungs. Severe cases include muscle pain with stiffness and spasms; delirium and stupor.	Chlamydia psittaci	7g
Hemangiosar-coma of the liver	Vinyl chloride polymerization industry, vintners (winemaker).	A malignant tumor composed of cancerous thin and flat scale-like cells forming vessel-like spaces in some instances.	Vinyl Chloride Monomer; arsenical pesticides.	7g
Malignant neoplasm of nasal cavities.	Woodworkers, cabinet and furniture makers, boot and shoe industry, radium chemists and processors, dial painters, chromium producers, processors, users, nickel-smelting and refining.	Malignant tumor; headache; pain; paralysis of the lateral rectus muscle of the eye.	Hardwood dusts; unknown; radium; chromates; nickel.	7g
Malignant neoplasm of larynx	Asbestos industries and utilizers.	Hoarseness; acute laryngitis, polyp of a vocal cord; dropped voice pitch which becomes monotone; voicelessness; difficult or labored breathing.	Asbestos	7g
Malignant neoplasm of trachea, bronchus, and lung.	Asbestos industry and utilizers, topside coke oven workers, uranium fluorspar miners, chromium producers and processors, users, nickel smelters, processors, users, smelters, mustard gas formulators, ion exchange resin makers, chemists.	Chronic cough; localized wheeze; collapsed portion of lung with shrinkage of chest wall and diminution of chest movement and breath sounds; scanty and mucoid sputum unless an infection away from bronchial obstruction occurs; occasional spitting of blood or bloody sputum; severe, constant, nonpleuritic, unilateral pain; sometimes a remote metastasis, especially in the brain, occurs; advanced state-weight loss, anorexia, weakness, hoarseness, bone pain.	Asbestos; coke oven emissions; radon daughters; chromates; nickel; arsenic mustard gas; bis(chloromethlyl) ether chloromethyl methyl ether.	7g
Mesothelioma (MN of peritoneum) (MN of pleura).	Asbestos industries and utilizers.	Primary tumor composed of cells similar to those forming lining of the peritoneum, pericardium, or pleura.	Asbestos	7g
Malignant neoplasm of bone	Dail painters, radium chemists, and processors.	Fracture may be first clue to bone cyst, pain swelling.	Radium	7g
Malignant neoplasm of scrotum	Automatic lathe operators, metalworkers; coke oven workers; petroleum refiners, tar distillers, chimney sweeps.	Scrotal mass progressively increasing in size; sometimes associated with pain; minor trauma; hemorrhaging may produce extreme local pain and tenderness.	Mineral/Cutting Oils; soots and tars, tar distillates.	7g
Malignant neoplasm of bladder	Rubber and dye workers.	Discharge of blood or pus-filled urine; pain or burning while urinating; colicky pain accompanying obstruction; frequent urination.	Benzidine, alpha and beta naphthylamine, auramine, magenta, aminobiphenyl, 4-Nitrophenyl.	7g
Malignant neoplasm of kidney, other, and unspecified urinary organs.	Coke oven workers.	Pain; malignant mass or tumor of the connective tissues, muscles, urogenital system, vascular system, and epithelial lining of the coelom; discharge of bloody urine; fever; anorexia; nausea; vomiting; hypertension.	Coke oven emissions	7g
Lymphoid leukemia, acute	Rubber industry, radiologists.	Abrupt onset of fever with secondary infection of mouth, throat, or lungs; joint pains; thrombocytopenia (decrease in absolute number of platelets below normal) may cause minute rounded spots of hemorrhage on skin, mucous membrane, or organ, and discoloration of skin due to blood vessel rupture, plus bleeding from mouth, nose, kidneys, and bowel. Moderate enlargement of liver, spleen, and lymph nodes and progressive weakness and pallor.	Unknow; ionizing radiation	7g
Myeloid leukemia, acute	Occupations with exposure to benzene; radiologists.	Fatigue; weakness; anorexia; weight loss; moderately enlarged spleen causing epigastric stress or a heavy feeling; sternal tenderness reflects hypercelluarity of the marrow; minor lymph node enlargement; thrombocytopenia (decrease in absolute number of blood platelets below normal) followed by hemostasis (arrest of a flow of blood or hemorrhage).	Benzene; inoizing radiation	7g
Erythroleukemia	Occupations with exposure to benzene.	Rare form of leukemia in which multiple hemorrhages, especially from the base of the tongue and gums occur; plus an uninterrupted fall of both the white and red blood cell count of the blood; fever; aplastic anemia.	Benzene	7g
Hemolytic Anemia, nonautoimmune.	Whitewashing and leather industry; electrolytic processes, arsenical ore smelting; plastics industry; dye, celluloid, resin industry.	Weakness; vertigo; headache; tinnitus; spots before the eyes; easy fatigability; drowsiness; irritability; euphoria; psychotic behavior; occasionally amenorrhea (absence of menstruation); loss of libido; or low-grade fever; gastrointestinal complaints and congestive heart failure. Characterized by jaundice; enlargement of the spleen; and evidence of accelerated blood destruction. Hemolytic crises are accompanied by malaise, chills, and fever; aching in the extremities, back, and abdomen; and the presence of hemoglobin and methoglobin in the urine which is diminished in the amount excreted over 24 hrs. if the blood destruction is intravacular. In chronic hemolytic anemia, liver enlargement and pigment gallstones as well as chronic leg ulcers are often seen.	Copper sulfate; arsine; trimellitic anhydride; Naphthalene.	7d
Aplastic anemia	Explosives manufacturer, occupations with exposure to benzene, radiologists, radium chemists and dial painters.	Usually insidious, but can be explosive in development. Waxy pallor of skin and mucous membranes. Chronic cases show brown skin pigmentation. If decrease in absolute number of platelets is below normal (thrombocytopenia), blood may rupture into mucous membrances and skin. Hemorrhages into ocular fundi are frequent. Severe sore throat associated with sharp reduction in number of granulocytes (agranulocitic angina) may occur. Spleen enlargement is absent.	TNT; Benzene; ionizing radation	7d 7e

Condition	Industry and/or occupation	Symptoms	Agent	Log column
Agranulocytosis or neutropenia	Occupations with exposure to benzene, explosives and pesticide industries, pesticides, pigments, pharmaceuticals.	Acute disease characterized by marked leukopenia and neutropenia (below normal number of leukocytes and neutrophils per unit volume of peripheral blood) and with ulcerative lesions of the throat and other mucous membranes, of the gastrointestinal tract and of the skin. Two or three days of fatigue or overpowering weakness is followed by general ill feeling, chills, high fever, rapid weak pulse, sore throat, difficulty in swallowing, ulcers of the oral mucosa, and ulcerations of the pharyngeal and buccal mucosae. Prostration is extreme. Regional lymph disease but no enlargement of nodes, liver, or spleen. Fatal.	Benzene; phosphorus; inorganic arsenic.	7a
Methemoglobinemia (attacks usually develop some hours after employee has left plant and rarely during work.).	Explosives and dye industries.	The oxidized form of hemoglobin, in which the iron atom is trivalent, and which is not able to combine reversibly with oxygen. Formation of large amounts of methemoglobin prevents the normal function of hemoglobin, that of transporting oxygen in the body thus causing asphyxia of the tissues. When large amounts are present, the blood becomes chocolate-brown in color. The skin takes on a bluish-gray color varying in intensity from lilac to a deep leaden hue, and quite different from the bluish-purple color of cyanosis due to a lack of oxygen. This distinctive tint is most noticeable on the cheeks, ears, tip of the nose, and fingernails. Sensation of weakness in the knees and a staggering gait follow. If destruction of the red blood cells is severe, anemia occurs and there may also be injuries to the kidney and liver. Jaundice and enlargement of the spleen may occur.	Aromatic amino and nitro compounds (aniline, TNT, nitroglycerin).	7a
Toxic encephalitis (noninfectious).	Battery, smelter, and foundry workers, electrolytic chlorine production, battery makers, fungicide formulators.	Rapid onset of fever; depression; loss of consciousness or coma; seizures; meningeal symptoms and signs may be accompanied by cerebral disorder, including alterations of consciousness, personality change, convulsions, tremor, muscle weakness of one side of the body (hemiparesis), and cranial nerve abnormalities, progressing within a few days to coma and death.	Lead; inorganic and organic mercury.	7d
Parkinson's Disease (secondary).	Manganese processing, battery makers, welders, internal combustion engine industries.	Listlessness and sleepiness by day but insomnia by night; muscular pains, including cramps in the calves; unsteady gait; weakness and stiffness of the limbs; involuntary movements of the arms, legs, trunk, jaw, and head which may be severe enough to shake the bed; occasionally uncontrollable laughter or crying; impulsive acts such as running, dancing, singing, and uncontrolled talking; or forced movements such as falling without being able to catch oneself. Also, absentmindedness; mental confusion; hallucinations; and attacks of aggressiveness; irritability and euphoria; handwriting is tremulous, letters and words cramped, and micrographia is common; speech disturbances include run-on words and sentences, monotone voice, loss of speech (aphonia); impaired swallowing; maskilke face; excessive salivation and sweating.	Manganese; carbon monoxide.	7g
Cerebellar ataxia	Chemical industry using toluene, electrolytic chlorine production, battery makers, fungicide formulators.	Unsteadiness in walking; arm tremors; pyramidal tract involvement or posterior column disorder may be present; the motor neurons or peripheral nerves may be affected; sometimes optic atrophy, retinitis pigmentosa, paralysis of the eye muscles (ophthalmoplegia), nerve deafness, or mental deterioration. Skeletal changes (scoliosis or spinal curvature and pedal or foot abnormalities) are common.	Toluene; organic mercury.	7g
Inflammatory and toxic neuropathy.	Pesticides, pigments, pharmaceuticals, furniture refinishers, degreasing operations, plastic-coated-fabric workers, explosives industry, rayon manufacturing, plastics, hydraulics, coke industries, battery, smelter, and foundary workers, dentists, chloralkali workers, chloralkali plants, fungicide makers, battery makers, plastics industry, paper manufacturing.	Numbness, tingling, and burning of feet and hands, followed by muscular weakness. There may also be a decrease in touch, pain, and temperature sensation in the feet and hands, and tendon reflexes may be diminished or absent.	Arsenic and arsenic compounds; hexane; methyl N-butyl ketone; TNT; CS2; tri-o-cresyl phosphates; inorganic lead; inorganic mercury; organic mercury; acrylamide.	7g
Cataract	Microwave and radar technicians; explosives industries; radiologists; blacksmiths, glass blowers, bakers; moth repellant formulators, fumigators; explosives, dyes, herbicide and pesticide industries.	Progressive, painless loss of vision unless the cataract swells and produces secondary glaucoma. Well-advanced cataracts appear as gray opacities in the lens. Small ones stand out as dark defects in the red reflex.	Microwaves; Ionizing radiation; Infrared radiation; Napthalene, Dinitrophenol, dinitro-o-cre sol	7e 7e 7e 7g 7g
Noise effects on inner ear	Any industry and/or occupation involving exposure to excessive noise.	Tinnitus—hissing, ringing, buzzing, humming, thumping, whistling, or roaring in the ear—may be constant or intermittent and often accompanied by hearing loss. Clicking; cracking; or ticking sounds or abnormal or pathological sounds, originating within the patient's body (by a muscle contraction, etc.) in region of the ear and audible to others as well as to the patient.	Excessive noise	7f
Raynaud's phenomenon (secondary).	Lumberjacks, chain sawyers, grinders, chippers, vinyl chloride polymerization industry.	Intermittent pallor and sometimes bluish-purplish discoloration (cyanosis) of the skin precipitated by exposure to cold, without clinical evidence of blockage of the large peripheral vessels and with nutritional lesions (if present at all, limited to the skin). Blanching and numbing when exposed to chilling weather or emotional upsets with probable loss of muscular control and reduction of sensitivity to heat, cold, and pain are main symptoms. Cyanosis and pain are rare. Gangrene and serious complications are very rare if, indeed, they occur at all.	Whole body or segmental vibration; vinyl chloride monomer.	7f
Extrinsic allergic alveolitis	Farmer's lung, baggassosis, bird fancier's lung, suberosis, malt worker's lung, mushroom worker's lung, maple bark disease, cheese washer's lung, coffee worker's lung, fish-meal worker's lung, furrier's lung, sequoiosis, wood worker's lung, miller's lung.	Difficult or labored breathing (dyspnea); fever; and oxygen deficiency (hypoxia) during acute phase lasting several weeks. Cough with scanty, black, stringy, occasionally bloody sputum; bluish-purple discoloration of mucous membranes (cyanosis); patchy infiltrates in the lung can also occur.	Various agents (usually a fungus or mold and dusty substances).	7g

Condition	Industry and/or occupation	Symptoms	Agent	Log column
Extrinsic asthma or allergic asthma.	Jewelry, alloy and catalyst makers, polyurethane, adhesive, paint workers, alloy, catalyst, refinery workers, solderers, plastic, dye, insecticide makers, foam workers, latex makers, biologists, printing industry, nickel plasters, bakers, plastics industry, woodworkers, furniture makers, detergent formulators.	Sudden onset after exposure to an allegen. Sense of tightness in the chest due to spasmodic contraction of the bronchi; difficult or labored breathing (dyspnea); wheezing. Symptoms may subside in one hour or less, continue for several hours, or persist as status asthmaticus for many days. End of attack is marked by pronounced coughing with expectoration of thick, tenacious sputum, immediately followed by a sensation of relief and "clearing" of the air passages. Physical signs consist of prolongation of expiration and the presence of sonorous and sibilant rales throughout the chest; normal but labored respiration; markedly distended chest; bluish-purplish discoloration of skin and mucous membrances (cyanosis). Between attacks breathing may be quiet, but forced expiration will produce sonorous or sibilant rales. Frequency and severity of attacks may be greatly influenced by secondary factors (e.g., changes in temperature and humidity); by exposure to noxious fumes; by fatigue; by endocrine changes (puberty, menstruation, pregnancy, menopause); by emotional stress. Since these secondary factors may perpetuate attacks, attention should be directed to their control.	Platinum; isocyanates; chromium and cobalt; aluminum soldering flux; phthalic anhydride; formaldehyde; gum arabic; NiSO4; flour; trimellitic anhydride; red cedar and other wood dusts; bacillus-derived Exoenzymes.	7e
Coalworkers pneumoconiosis	Coal miners	Black spit increasing in quantity as diseases advances; jet-black nodules and cavities of the lung; chest becomes barrel-shaped and there may be clubbing of the fingers; right heart failure or silico-tuberculosis may supervene to cause death; disease is visualized by X-ray as fine, discrete pinhead mottling or nodulation or dense conglomerate shadows resembling angel's wings, eventually large fibrotic masses develop and difficult or labored breathing with cough may ensue.	Coal dust	7b
Asbestosis	Asbestos industries and utilizers	Progressive difficult or labored breathing (dyspnea), non-productive cough (little or no sputum), unless pulmonary TB is present yielding bloodstained sputum; slight pain between shoulders, under shoulder blades, or sternum; visualized by X-ray as fine pulmonary fibrosis enmeshed with asbestos bodies giving a ground glass appearance; increased susceptibility to lung cancer; pleural plaques and calcifications are often present in the fibrous tissues and emphysema is extensive, but localized to lower and apical parts of the lungs.	Asbestos	7b
Silicosis	Quarrymen, sandblasters, silica processors, mining, metal and ceramic industries.	Discrete nodulation in the absence of emphysema is usually asymptomatic. It is the massive conglomerate fibrosis resulting from the coalescence of nodules that yields symptoms: difficult or labored breathing (dyspnea) which is progressively deeper and faster; dry cough; malaise; disturbed sleep; anorexia; chest pains; hoarseness; bluish discoloration of skin and mucous membranes (cyanosis); and bloodstained sputum with bronchopneumonia and subsequent bronchiectasis developing. TB often develops. Fever is rare. Physical signs (and loud pulmonic valve component of S2 hear sound, decreased chest expansion and excursion of diaphragm, breath sounds) are few or absent. Right heart failure or pus-producing bronchopneumonia will result in death.	Silica	7b
Talcosis	Talc processors	Difficult or labored breathing (dyspnea), X-ray yields nodular shadows distributed over both lungs; nodules show whorling different from silicosis and contain fiber-like structures arranged singly and in clumps.	Talc	7b
Chronic beryllium disease of the lung.	Beryllium alloy workers, ceramic and cathode ray tube makers, nuclear reactor workers (onset may be 5 years after exposure).	Morbid condition of the lungs, more rarely of the skin (conjunctivitis and dermatitis), subcutaneous tissue, lymph nodes liver, and other structures, characterized by formation of granulomas (tumors). Chronic granulomatous pneumoconiosis with thickening of alveolar walls. An acute transient inflammation of respiratory tract (nasal passages and pharynx) yielding nosebleeds, bronchitis or pneumonitis. Symptoms of respiratory insufficiency with diffusion difficulty (weakness, anorexia, weight loss, malaise, dyspnea or difficult or labored breathing, hyperpnea or deeper and faster breathing, cyanosis or bluish discoloration of skin or mucous membranes, and cough) are most prominent and out of proportion to physical or X-ray signs. Resembles miliary TB or pulmonary sarcoidosis.	Beryllium	7b
Byssinosis (develops over 10-year period working with raw or waste cotton.)	Cotton industry workers	Periodic bronchoconstriction or Monday morning fever with wheezing and difficult or labored breathing upon return to work after 2-day absence. Later develops into severe airway obstruction and impaired elastic recoil due to chronic bronchitis, and emphysema. Patient has overdistended lungs but no characteristic X-ray pattern or recognizable lung fibrosis or infiltration are seen. Diagnosis is established by measuring the patient's ventilatory capacity before he starts work on Monday and again no more than 1 hour after his work shift.	Cotton, flax, hemp, cotton-synthetic dusts.	7b
Acute, bronchitis, pneumonitis, and pulmonary edema due to fumes and vapors.	Refrigeration, fertilizer, oil refining industries, alkali and bleach industries, silo fillers, arc welders, nitric acid industry, paper and refrigeration industry, oil refining, cadmium smelters, processors, plastics industry.	Acute inflammation of the tracheo bronchial tree. Symptoms are those of acute URI: Inflammation of the mucous membranes of the nose, usually marked by sneezing, nasal airway congestion, and discharge of watery mucous (coryza); malaise; chilliness; slight fever; back and muscle pain; sore throat. Dry nonproductive cough signals bronchitis, later yielding a glutinous and mucous with pus-filled sputum. Fever to 101 or 102 F occurs for 3-5 days. Persistent occasional sibilant or crackling pulmonary sounds may suggest complications. Pulmonary edema: asthmatic wheezing; difficultry breathing except in upright position (orthopnea); pallor; sweating, bluish discoloration of skin and mucous membranes (cyanosis); frothy or pinkish sputum.	Ammonia; chlorine; nitrogen oxides; sulfur dioxides; cadmium; trimellitic anhydride.	7c

Condition	Industry and/or occupation	Symptoms	Agent	Log column
Toxic hepatitis	Solvent utilizers, dry cleaners, plastics industry, explosives and dye industries, fire and waterproofing additive formulators, plastics formulators, fumigators, gasoline, fire extinguisher formulators, disinfectant, fumigant, synthetic resin formulators.	Nausea; vomiting; jaundice; stupor; and coma may follow exposure. Toxic effects on kidney, brain, or bone marrow may be more conspicuous than the hepatic involvement.	Carbon tet- rachloride, chloroform, tetrachloroethane, trichloroethylene; phosphorus TNT; chloronaphthalenes; methylene-dianiline; ethylene dibromide, cresol.	7d
Acute or chronic renal failure	Battery makers, plumbers, solderers, electrolytic processes, arsenical ore smelting, battery makers, jewelers, dentists, fluorocarbon formulators, fire extinguisher makers, antifreeze manufacture.	Failure to void; lumbar pain and tenderness; and analysis of urinary volume and the character of the urinary sediment is extremely valuable in differential diagnosis of acute renal failure. In *obstruction*, urinary sediment is scanty, with only occasional red and white blood cells or hyaline and granuline casts. Proteinuria is minimal or absent. In *prerenal failure*, occasional hyatine and granular casts are found and proteinuria is minimal. Urinary sp. gr. is usually >1.020 and urinary sodium concentration <15 m Eq/L. In *acute tubular necrosis* numerous renal epithelial cells, cell casts, and coarsely granular casts are present. Hb and RBC casts are seen occasionally. Proteinuria is minimal or moderate. Urinary sp. gr. is usually <1.018 and sodium concentration >20 m Eq/L. In *acute glomerulonephritis and collagen diseases*, hematuria and RBC casts are characteristic and protein excretion is usually moderate or heavy.	Inorganic lead, arsine, inorganic, mercury; carbon tetrachloride; ethylene glycol.	7d
Infertility, male	Formulators, DBCP producers, formulators, and applicators.	Physical examination and semen analysis are necessary to diagnosis and should include work history.	Kepone; dibromochloropropane	7d
Contact and allergic dermatitis	Leather tanning, poultry dressing plants, fish packing, adhesives and sealants industry, boat building and repair.	Transient redness to severe swelling and blister (bulla) formation; itching and vesiculation are practically always present. Vesicles and bullas rupture, ooze, and crust; followed by scaling and some temporary thickening of skin. Secondary infection, excoriation (skin abrasions), and reaction to treatment may complicate and induce a chronic eczematous dermatitis.	Irritants (e.g. cutting oils, solvents, phenol acids, alkalis, detergents); allergens (e.g., nickel, chromates, formaldehyde, dyes, rubber products).	7a

Rutstein DD, Mullan RJ, Frazier TM, Halperin, WE, Melius JM, Sestito JP. Sentinel health events (occupational): a basis for physician recognition and public health surveillance. Amer J. Public Health 1983; 73(9):1054-1062.

Appendix D. Participating State Agencies

Agencies preceded by an asterisk (*) are those in which, as of January 1, 1978, a State safety and health plan under section 18(b) of the act was in operation. This agency may be contacted directly for specific information regarding regulations in the State.

Alabama Department of Labor, 600 Administrative Building, Montgomery, Alabama 36130, Phone: 205-261-3460

*Alaska Department of Labor, Research and Analysis Section, Post Office Box 1149, Juneau, Alaska 99802, Phone: 907-465-4520

Territory of American Samoa, Department of Manpower Resources, Government of American Samoa, Pago Pago, American Samoa 96799, Phone: 633-5849

*Industrial Commission of Arizona, Division of Administration/Research and Statistics Section, 1601 W. Jefferson St., Post Office Box 19070, Phoenix, Arizona 85005, Phone: 602-255-3739

Arkansas Department of Labor, OSH Statistics, Room 502, 1022 High St., Little Rock, Arkansas 72202, Phone: 501-371-2770

*California Department of Industrial Relations, Labor Statistics and Research, Post Office Box 603, San Francisco, California 94901, Phone: 415-557-1466

*Colorado Department of Labor and Employment, Division of Labor, 1313 Sherman St., Room 323, Denver, Colorado 80203, Phone: 303-866-3748

*Connecticut Department of Labor, 200 Folly Brook Boulevard, Wethersfield, Connecticut 06109, Phone: 203-566-4380

Delaware Department of Labor, Division of Industrial Affairs, 820 N. French Street, 6th Floor, Wilmington, Delaware 19801, Phone: 302-571-2888

Florida Department of Labor and Employment Security, Division of Workers' Compensation, 2551 Executive Center Circle West, Tallahassee, Florida 32301-5014, Phone: 904-488-3044

Guam Department of Labor, Bureau of Labor Statistics, Post Office Box 23548, Guam Main Facility, Agana, Guam 96921, Phone: 477:9241

*State of Hawaii, Department of Labor and Industrial Relations, Research and Statistics Office, Post Office Box 3680, Honolulu, Hawaii 96811, Phone: 808-548-7638

*Indiana Division of Labor, Department of Statistics, State Office Building—Room 1013, 100 N. Senate Avenue, Indianapolis, Indiana 46204, Phone: 317-232-2665

*Iowa Bureau of Labor, 307 East 7th Street, Des Moines, Iowa 50319, Phone: 515-281-5151

Kansas Department of Health and Environment, Division of Policy and Planning, Occupational Safety and Health, Topeka, Kansas 66620, Phone: 913-862-9360 Ext. 280

*Kentucky Labor Cabinet, Occupational Safety and Health Program, U.S. 127 South Building, Frankfort, Kentucky 40601, Phone: 502-564-3100

Louisiana Department of Labor, Office of Employment Security—OSH, 1001 North 23rd and Fuqua, Baton Rouge, Louisiana 70804, Phone: 504-342-3126

Maine Department of Labor, Bureau of Labor Standards, Division of Research and Statistics, State Office Building, Augusta, Maine 04330, Phone: 207-289-3331

*Maryland Department of Licensing and Regulation, Division of Labor and Industry, 501 St. Paul Pl., Baltimore, Maryland 21202, Phone: 301-659-4202

Massachusetts Department of Labor and Industries, Division of Industrial Safety, 100 Cambridge Street, Boston, Massachusetts 02202, Phone: 617-727-3593

*Michigan Department of Labor, 7150 Harris Drive, Secondary Complex, Post Office Box 30015, Lansing, Michigan 48909, Phone: 517-322-1848

*Minnesota Department of Labor and Industry IMSD, 444 Lafayette Road, 5th Floor, Saint Paul, Minnesota 55101, Phone: 612-296-4893

Mississippi State Department of Health, Division of Public Health Statistics, Post Office Box 1700, Jackson, Mississippi 39205, Phone: 601-354-7233

Missouri Department of Labor and Industrial Relations, Division of Workers' Compensation, Post Office Box 58, Jefferson City, Missouri 65102, Phone: 314-751-4231

Montana Department of Labor and Industry, Workers' Compensation Division, 5 South Last Chance Gulch,

Helena, Montana 59601, Phone: 406–444–6515

Nebraska Workers' Compensation Court, State Capitol, 12th Floor, Lincoln, Nebraska 68509–4967, Phone: 402–471–3547

*Nevada Department of Industrial Relations, Division of Occupational Safety and Health, 1370 South Curry St., Carson City, Nevada 89710, Phone: 702–885–5240

New Jersey Department of Labor and Industry, Division of Planning and Research, C N 056, Trenton, New Jersey 08625, Phone: 609–292–3997

*New Mexico Health and Environment Department, Environmental Improvement Division, Occupational Health and Safety, Post Office Box 968—Crown Building, Sante Fe, New Mexico 87504–0968, Phone: 505–827–5271 Ext. 230

New York Department of Labor, Division of Research and Statistics, 2 World Trade Center, New York, New York 10047, Phone: 212–488–4661

*North Carolina Department of Labor, Division of Statistics, 4 West Edenton Street, Raleigh, North Carolina 27601, Phone: 919–733–4940

Ohio Department of Industrial Relations, OSHA Survey Office, Post Office Box 12355, Columbus, Ohio 43212, Phone: 614–466–7520

Oklahoma Department of Labor, Supplemental Data Division, 118 State Capitol Building, Oklahoma City, Oklahoma 73105, Phone: 405–521–2461

*Oregon Workers' Compensation Department, Research and Statistical Section, Labor and Industries Building, Salem, Oregon 97310, Phone: 503–378–8254

Pennsylvania Department of Labor and Industry, Office of Employment Security, 7th and Forster Sts., Labor and Industry Building, Harrisburg, Pennsylvania 17121, Phone: 717–787–1918

*Puerto Rico Department of Labor and Human Resources, Bureau of Labor Statistics, 505 Munoz Rivera Avenue, San Juan, Puerto Rico 00918, Phone: 809–754–5339

Rhode Island Department of Labor, Division of Workers' Compensation, 220 Elmwood Avenue, Providence, Rhode Island 02907, Phone: 401–277–2731

*South Carolina Department of Labor, Division of Technical Support, Post Office Box 11329, Columbia, South Carolina 29211, Phone: 803–758–8507

*Tennessee Department of Labor, Research and Statistics, 501 Union Building, 2nd Floor, Nashville, Tennessee 37219, Phone: 615–741–1748

Texas Department of Health, Division of Occupational Safety, 1100 West 49th Street, Austin, Texas 78756, Phone: 512–458–7287

*Utah Industrial Commission, OSH Statistical Section, 160 East 300 South, Salt Lake City, Utah 84110–5800, Phone: 801–530–6827

*Vermont Department of Labor and Industry, State Office Building, Montpelier, Vermont 05602, Phone: 802–828–2765

*Virgin Islands Department of Labor, Post Office Box 818, St. Thomas, Virgin Islands 00801, Phone: 809–776–3700

*Virginia Department of Labor and Industry, Research and Statistics, 205 North 4th Street, Post Office Box 12064, Richmond, Virginia 23241, Phone: 804–786–2384

*State of Washington, Department of Labor and Industries, Division of Industrial Safety and Health, Post Office Box 2589, Olympia, Washington 98504, Phone: 206–753–4013

West Virginia Department of Labor, Division of Labor Statistics, Room B437, Building Six, Capitol Complex, 1900 Washington Street East, Charleston, West Virginia 25305, Phone: 304–348–7890

Wisconsin Department of Industry, Labor, and Human Relations, Workers' Compensation Division/Research Section, 201 E. Washington Avenue, Post Office Box 7901, Madison, Wisconsin 53707, Phone: 608–266–7850

*Wyoming Department of Labor and Statistics, Herschler Building, Cheyenne, Wyoming 82002, Phone: 307–777–6370

Appendix E. United States Department of Labor, Occupational Safety and Health Administration—Regional Offices

The list below gives addresses and telephone numbers for OSHA Regional Offices. Complete information on field locations may be obtained from any OSHA Regional Office.

Region I: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
1 Dock Square Building, 4th Floor, 16–18 North Street, Boston, Massachusetts 02109, Phone: 617–223–6710

Region II: New Jersey, New York, Puerto Rico, Virgin Islands
1515 Broadway, Room 3445, New York, New York 10036, Phone: 212–944–3432

Region III: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, West Virginia
Gateway Building, Suite 2100, 3535 Market Street, Philadelphia, Pennsylvania 19104, Phone: 215–596–1201

Region IV: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee
1375 Peachtree Street, N.E., Suite 587, Atlanta, Georgia 30367, Phone: 404–881–3573

Region V: Illinois, Indiana, Michigan, Minnesota, Ohio, Wisconsin
230 South Dearborn Street, Room 3244, Chicago, Illinois 60604, Phone: 312–353–2220

Region VI: Arkansas, Louisiana, New Mexico, Oklahoma, Texas
555 Griffin Square Building, Room 602, Dallas, Texas 75202, Phone: 214–767–4731

Region VII: Iowa, Kansas, Missouri, Nebraska
911 Walnut Street, Room 406, Kansas City, Missouri 64106, Phone: 816–374–5861

Region VIII: Colorado, Montana, North Dakota, South Dakota, Utah, Wyoming
Federal Building, Room 1554, 1961 Stout Street, Denver, Colorado 80294, Phone: 303–837–3061

Region IX: Arizona, California, Hawaii, Nevada, American Samoa, Guam, Trust Territory of the Pacific Islands
450 Golden Gate Avenue, Box 36017, San Francisco, California 94102, Phone: 415–556–7260

Region X: Alaska, Idaho, Oregon, Washington
Federal Office Building, Room 6003, 909 First Avenue, Seattle, Washington 98174, Phone: 206–442–5930

Recordkeeping Summary

Basic recordkeeping concepts and guidelines are included with instructions on the back of form OSHA No. 200. The following summarizes the major recordkeeping concepts and provides additional information to aid in keeping records accurately.

General Concepts of Recordability

1. An injury or illness is considered work related if it results from an event of exposure in the work environment. The work environment is primarily composed of: (1) The employer's premises, and (2) other locations where employees are engaged in work-related activities or are present as a condition of their employment. *When an employee is off the employer's premises, work relationship must be established; when on the premises, this relationship is presumed.* The employer's premises encompass the total establishment. This includes not only the primary facility, but also such areas as company storage facilities and company parking lots. In addition to physical locations, equipment or materials used in the

course of an employee's work are also considered part of the employee's work environment.

2. All work-related fatalities are recordable.

3. All recognized or diagnosed work-related illnesses are recordable.

4. All work-related injuries requiring medical treatment or involving loss of consciousness, restriction or work or motion, or transfer to another job are recordable.

Analysis of Injuries

Recordable and nonrecordable injuries. Each case is distinguished by the treatment provided; i.e., if the injury was such that *medical treatment* was provided or should have been provided, it is recordable; if only first aid was required, it not recordable. *However, medical treatment is only one of several criteria for determining recordability.* Regardless of treatment, if the injury involved loss of consciousness, restriction of work or motion, transfer to another job, or termination of employment, the injury is recordable. (See chart 1 on p. 28.)

Medical treatment. The following procedures are generally considered medical treatment. Injuries for which this type of treatment was provided or should have been provided are almost always recordable if the injury is work related.

—Treatment of infection.
—Application of antiseptics during SECOND OR SUBSEQUENT VISITS to medical personnel.
—Treatment of second or third degree burn(s).
—Application of butterfly adhesive dressing(s).
—Application of sutures (stitches).
—Removal of foreign bodies embedded in eye.
—Removal of foreign bodies from wound; if procedure is complicated because of depth of embedment, size, or location.
—Use of prescription medications.
—Use of hot or cold soaking therapy during SECOND OR SUBSEQUENT VISIT to medical personnel.
—Application of hot or cold compress(es) during SECOND OR SUBSEQUENT VISIT to medical personnel.
—Cutting away dead skin (surgical debridement).
—Application of HEAT THERAPY during second or subsequent visit to medical personnel.
—Use of WHIRLPOOL BATH THERAPY during second or subsequent visit to medical personnel.
—Positive x-ray diagnosis.
—Admission TO HOSPITAL FOR OBSERVATION or equivalent medical facility for treatment or prolonged observation.

First aid treatment. The following procedures are generally considered first aid treatment (e.g., one-time treatment and subsequent observation of minor injuries) and need not be recorded if the work-related injury does not involve loss of consciousness, restriction of work or motion or transfer to another job.

—Application of antiseptics during FIRST VISIT to medical personnel.
—Treatment of FIRST DEGREE burn(s).
—Application of bandage(s) during any visit to medical personnel.
—Use of elastic bandage(s) during first visit to medical personnel.
—Removal of foreign bodies not embedded in eye if only irrigation is required.

Removal of foreign bodies from wound if procedure is UNCOMPLICATED, and is, for example, by tweezers or other simple technique.

—Use of nonprescription medications.
—Soaking therapy on initial visit to medical personnel or removal of bandages by soaking.
—Application of hot or cold compress(es) during FIRST VISIT to medical personnel.
—Application of ointments to abrasions to prevent drying or cracking.
—Application of HEAT THERAPY during first visit to medical personnel.
—Use of WHIRLPOOL BATH THERAPY during first visit to medical personnel.
—Negative X-ray diagnosis.
—Brief observation of injury during visit to medical personnel.

The following procedure, by itself, is not considered medical treatment:

—Administration of tetanus shot(s) or booster(s). However, employers should note that these shots are often given in conjunction with the more serious injuries. Consequently, injuries requiring tetanus shots may be recordable for other reasons.

Reminder: Work-related injuries requiring only first aid treatment and that do not involve any of the conditions in item 4 above, are not recordable.

The following is a list of subjects that will constitute the index when this document is published in final form. The list has been included to allow for comment on the substantive issues listed. Page numbers have not been included because this version has been formatted for inclusion in the **Federal Register**. However, page numbers will appear in the final version of this document.

ORDER FORM

Address Label,

Type/Print

Name/Firm _____
Street Address _____
City, State, Zip Code _____

	Quantity
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July 17, 1985

Part IV

Environmental Protection Agency

40 CFR Part 761

Polychlorinated Biphenyls in Electrical Transformers; Final Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 761

[OPTS 62035D; TSH FRL 2835-6]

Polychlorinated Biphenyls in Electrical Transformers

AGENCY: Environmental Protection Agency (EPA).

ACTION: Final rule.

SUMMARY: This final rule amends portions of an existing EPA rule concerning the use of polychlorinated biphenyls (PCBs) by placing additional restrictions and conditions on the use of PCB Transformers (Electrical transformers containing 500 parts per million or greater PCBs). This rule: (1) Prohibits the use of higher secondary voltage (480 volts and above) network PCB Transformers in or near commercial buildings after October 1, 1990, (2) requires, by October 1, 1990, the installation of enhanced electrical protection on lower secondary voltage network PCB Transformers and higher secondary voltage radial PCB Transformers in use in or near commercial buildings, (3) prohibits further installation of PCB Transformers in or near commercial buildings after October 1, 1985, (4) requires the registration, by December 1, 1985, of all PCB Transformers with fire response personnel and building owners, (5) requires the marking, by December 1, 1985, of the exterior of all PCB Transformer locations, and (6) requires the removal, by December 1, 1985, of stored combustibles located near PCB Transformers.

EPA is also requiring that owners of PCB Transformers involved in fire-related incidents immediately notify the National Response Center, and, take measures as soon as practically and safely possible to contain any potential releases of PCBs or incomplete combustion products to water.

DATES: In accordance with 40 CFR 23.5 (50 FR 7271), this rule shall be promulgated for purposes of judicial review at 1 p.m. Eastern Daylight Time on July 24, 1985. These amendments shall be effective on August 16, 1985.

FOR FURTHER INFORMATION CONTACT: Edward A. Klein, Director, TSCA Assistance Office (TS-799), Office of Toxic Substances, Environmental Protection Agency, Rm. E-543, 401 M St., SW., Washington, D.C. 20460. Toll free: (800-424-9065). In Washington, D.C.: (554-1404). Outside the USA: (Operator-202-554-1404).

SUPPLEMENTARY INFORMATION: OMB Control Number: 2070-0073.

I. Background

Section 6(e) of the Toxic Substances Control Act (TSCA) generally prohibits the use of PCBs after January 1, 1978. The statute does, however, set forth two exceptions under which EPA may, by rule, allow a particular use of PCBs to continue. Under section 6(e)(2) of TSCA, EPA may allow PCBs to be used in a "totally enclosed manner." A "totally enclosed manner" is defined by TSCA to be "any manner which will ensure that any exposure of human beings or the environment to a polychlorinated biphenyl will be insignificant, as determined by the Administrator by rule." TSCA also allows EPA to authorize the use of PCBs in a manner other than a totally enclosed manner if the Agency finds that the use "will not present an unreasonable risk of injury to health or the environment."

EPA promulgated a rule, which was published in the **Federal Register** of May 31, 1979 (44 FR 31514), to implement section 6(e) (2) and (3) of TSCA. This rule is listed in the Code of Federal Regulations under 40 CFR Part 761. The rule, among other provisions, designated all intact, nonleaking capacitors, electromagnets, and transformers, other than railroad transformers, as "totally enclosed," thus permitting their use without specific authorizations or conditions. The Environmental Defense Fund (EDF) petitioned the U.S. Court of Appeals for the District of Columbia Circuit to review a number of provisions of the rule, including the portion of the rule that designated all intact and nonleaking capacitors, electromagnets, and transformers as "totally enclosed" (*Environmental Defense Fund, Inc.* v. *Environmental Protection Agency*, 636 F.2d 1267).

On October 30, 1980, the court, among other things, decided that there was insufficient evidence in the record to support the Agency's classification of transformers, capacitors, and electromagnets as totally enclosed. The court invalidated this portion of the rule, as well as other provisions, and remanded the rule to EPA for further action.

As a consequence of the October 1980 decision, EPA undertook a number of rulemaking actions. The rule relevant to the subject of today's final rule was published in the **Federal Register** of August 25, 1982 (47 FR 37342) (hereafter, PCB Electrical Use Rule). This rule amended the May 1979 rule by authorizing the continued use of PCB Transformers (electrical transformers containing greater than 500 ppm PCBs) in facilities involved in handling of food or feed items until October 1, 1985, and by authorizing the use of all other categories of non-railroad electrical transformers containing or contaminated with PCBs for the remainder of their useful lives. In its August 1982 decision, EPA made a determination that authorizing the use of these tranformers for the remainder of their useful lives did not present an unreasonable risk to public health or the environment for the following reasons:

1. EPA determined that if it did not authorize the use of PCBs in transformers, the costs to the public and United States industry would be billions of dollars, primarily as a result of the disruption of electrical service. EPA determined that the resulting reduction in risk would not outweigh these substantial costs.

2. EPA determined that the inspection and maintenance programs required under the rule reasonably reduced the exposure risks associated with the use of PCBs in PCB Transformers, and the servicing conditions prevented further PCB contamination of transformers.

3. EPA determined that releases of PCBs to the environment and exposure to humans and biological organisms from mineral oil transformers are minimal. EPA estimated that these transformers contain less than 0.15 percent of all the PCBs used in tranformers and release less than one half of a percent of these PCBs on annual basis.

4. EPA determined that the costs associated with other risk reduction measures such as accelerated phase-out, reducing the PCB concentration in the dielectric fluid, or providing containment for tranformers were not reasonable when compared to the potential reduction in release of PCBs achieved.

In evaluating the risks posed by the continued use of electrical transformers containing PCBs for the August 1982 PCB Electrical Use Rule, EPA considered exposures resulting from leaks and spills of PCB-containing dielectric fluid as constituting the principal route of release of PCBs to the environment from this equipment.

However, EPA has learned that fires involving transformers also can be responsible for the release of PCBs, and, that PCBs released from transformers in fire situations can be volatilized and converted into materials which are orders of magnitude more toxic than PCBs. For example, on February 5, 1981, in the Binghamton State Office Building in Binghamtom, New York, a PCB

Transformer was involved in a fire in the basement of the building. PCBs and oxidation products were distributed throughout the 18-story office building via two vertical ventilation shafts that ran the length of the building and opened into the transformer vault in the basement. Monitoring, completed after the fire, indicated that PCBs, polychlorinated dibenzofurans (PCDFs) (including the toxic congener 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF)), and polychlorinated dibenzodioxins (PCDDs) (including the toxic congener 2,3,7,8,-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)) were distributed throughout the interior of the building. From laboratory studies, it appears that PCDFs are formed from both the oxidation of PCBs and the oxidation of chlorinated benzenes in combustion situations. PCDDs, however, appear to be formed only from the oxidation of chlorinated benzenes. (Tri- and Tetra-chlorinated benzenes often make up 30–35 percent of PCB askarel dielectic fluid, and can be present at low levels as contaminants in other fluids.)

At the time of promulgation of the August 25, 1982 PCB Electical Use Rule, EPA believed that PCB Transformer fires were very rare, isolated events. Thus, although EPA made determinations that the use of electrical transformers containing PCBs did not pose unreasonable risks to public health or the environment, EPA did not directly consider the public health and environmental risks posed by fire-related events. EPA also did not evaluate the cost of implementing risk reduction measures to mitigate the risks posed by fires involving this equipment or factor into its economic assessment certain now-identified costs associated with the continued use of these transformers, principally, the very high costs of cleanup following more serious incidents. These costs reduce the benefits associated with the continued use of these transformers.

After the promulgation of the PCB Electrical Use Rule, additional information came to EPA's attention that indicated that PCB Transformer fires may occur more frequently than previously expected, and that transformer fire-related hazards are not restricted solely to transformers located inside buildings. On May 15, 1983, in the One Market Plaza complex in San Francisco, California, a PCB Transformer was involved in a smoky transformer vault fire. Monitoring completed after the fire indicated the presence of PCBs, PCDFs, and PCDDs, in soot from this fire. Although the vault housing the transformer was located exterior to the building itself (in a sidewalk vault), unsealed conduits from the vault to the basement and outside air intake vents drew contaminated smoke into the building.

The San Francisco incident, and four more recent incidents, in the First National Bank Building in Chicago, Illinois, in September 1983; in Tulsa, Oklahoma, in December 1983 and May 1984; and in Miami, Florida, in May 1984, have prompted EPA to reassess its earlier position on the expected frequency of fire-related incidents involving transformers that contain PCBs.

EPA issued an Advance Notice of Proposed Rulemaking (ANPR), which was published in the **Federal Register** of March 23, 1984 (49 FR 11070), to solicit additional information on the risks posed by fires involving transformers containing PCBs, their frequency of occurrence, the costs of cleanup following these incidents, and the effectiveness and costs associated with regulatory control measures. At that time, EPA indicated that it would use the new information to reconsider the use authorization issued in the August 1982 PCB Electrical Use Rule for the continued use of most electrical transformers containing PCBs.

In the ANPR, EPA solicited comments on a wide range of potential regulatory control measures, including the phaseout of PCB Transformers, increased electrical protection, fire and smoke control technologies, and fire hazard inspection programs. EPA also solicited comments on the relative risks posed by PCB Transformer fires in commercial buildings such as office buildings, versus the risks posed by fires in industrial facilities and outdoor electrical substations. EPA suggested in the ANPR that the risks posed by PCB Transformer fires in commercial buildings may be greater than those posed by transformer fires in industrial facilities and outdoor electrical substations.

EPA received over 50 comments on the ANPR during the public comment period, which closed on May 22, 1984. EPA received information from a number of different sources, including the insurance industry, fire departments, building owners, industrial transformer users, and utilities. (The comments on the ANPR are summarized in: "PCB Transformer Fires: Comments on the Advance Notice of Proposed Rulemaking" (September 1984).) Several comments were received following the close of the comment period, and EPA reserved these comments for consideration following the issuance of the Proposed Rules.

After considering the comments received in response to the ANPR, and after completing further analyses of available data, EPA issued a Proposed Rule, which was published in the **Federal Register** of October 11, 1984 (49 FR 39966), to address the risks posed by fires involving transformers that contain PCBs. The Proposed Rule presented EPA's determination that additional regulatory control measures were warranted on the use of PCB Transformers. At the same time, EPA reaffirmed its August 1982 determination that the indefinite use of PCB-Contaminated transformers does not present unreasonable risks to public health or the environment. EPA's determinations were based on analyses of the risks posed by fires involving electrical transformers containing PCBs, the benefits of PCBs and the availability of substitutes, and the costs and benefits of control measures designed to mitigate or eliminate the fire-associated risks posed by the equipment.

EPA received over 130 comments on the Proposed Rule during the public comment period, which closed on February 11, 1985. On January 14, 15, and 16, 1985, EPA held a public hearing in Washington, D.C., where 15 parties provided testimony on various provisions of the Proposed Rule.

EPA has considered all the comments received in response to the Proposed Rule (as well as the comments received after the close of the ANPR comment period), and has modified the rule where appropriate. Further, EPA has prepared a support document for this rulemaking which addresses all substantive comments on the Proposed Rule and includes EPA's responses to comments which did not result in the actual modification of the rule. This document, entitled: "Response to Comments on the PCB Transformer Fires Proposed Rule (July 1985)," is available by contacting the Toxic Substances Control Act Assistancce Office (see **FOR FURTHER INFORMATION CONTACT**).

II. Summary of the Final Rule

Under section 6(e)(2)(B) of TSCA, EPA can authorize a use of PCBs provided that the use "will not present an unreasonable risk of injury to health or the environment." EPA's August 1982 decision to allow the continued use of electrical transformers containing PCBs was based on the reported low frequency of leaks and spills of PCBs from this equipment compared to the high costs associated with replacing this equipment with substitute transformers

or requiring secondary containment to limit the spread of spilled materials.

EPA subsequently undertook an evaluation of the fire-related risks posed by the continued use of PCB Transformers, and the costs and benefits of measures designed to reduce those risks. On October 11, 1984, EPA issued a Proposed Rule which contained EPA's determination that PCB Transformer fires (fires involving transformers containing greater than 500 ppm PCBs), particularly fires which occur in or near buildings, do present risks to human health and the environment. EPA reached this determination after considering the extreme toxicity of materials which can be formed and released during fires involving this equipment, as well as the potential for human and environmental exposures to these compounds from a single incident, and the expected frequency of incidents over the remaining useful life of this equipment.

EPA further determined that the continued use of PCB Transformers without additional restrictions does present an unreasonable risk of injury to health and the environment. EPA reached this determination after considering the risks posed, the costs of cleanup following these incidents, the availability of adequate substitute materials, and the costs and benefits associated with risk reduction measures. EPA did, therefore, propose additional regulatory controls on the use of this equipment.

EPA proposed to require: (1) The immediate registration of all PCB Transformers with appropriate fire department jurisdictions, and the immediate registration with building owners of all PCB Transformers located in or near buildings, (2) the immediate marking of the exterior of the vault door, machinery room door, means of egress, or grate(s) accessing a PCB Transformers with PCB identification labels, (3) the immediate removal of stored combustibles from PCB Transformers locations, (4) the installation, by July 1, 1988, of additional electrical protective devices on PCB Transformers in or near buildings in high secondary voltage systems (480/277 volt systems), and (5) the isolation, by July 1, 1988, of all PCB Transformers in or near buildings from building ventilation systems, building ductwork, and openings in construction to reduce the widespread contamination of structures and the environment by smoke and soot in the event of a PCB Transformer fire. In addition, to facilitate monitoring compliance with the isolation requirements, EPA proposed that PCB Transformer owners maintain records of their efforts in isolating transformers through the completion of PCB Smoke Spread Reduction Plans (PCB–SSRPs).

Finally, in the event of a PCB Transformer fire, EPA proposed to require PCB Transformer owners to take immediate measures to contain potential water discharges, and to report all PCB Transformer fire-related incidents to the National Response Center (NRC) prior to the initiation of cleanup efforts.

This final rule modifies and clarifies some of the requirements presented in the Proposed Rule as a result of information and comments provided to the Agency during public comment periods and at the public hearing. In developing the Proposed Rule, EPA evaluated the risks posed by PCB Transformer fires in or near buildings by using an office building setting to evaluate generically the nature of an potential for human and environmental exposures to PCBs and incomplete combustion products. EPA determined that additional control measures, principally the isolation of PCB Transformers from building ventilation equipment and ductwork, were necessary to reduce the risks posed by the continued use of this equipment.

During the public comment period for the Proposed Rule, EPA received extensive comments in three specific areas, and has modified the final rule accordingly. First, many comments received in response to the Proposed Rule suggested that EPA consider evaluating separately the fire-related risks posed by the continued use of PCB Transformers in industrial locations versus the fire-related risks posed by the use of PCB Transformers in or near buildings such as office buildings, stores, hospitals and schools (hereafter, all non-industrial, non-substation buildings will be referred to as "commercial buildings"). This final rule adopts this suggestion and addresses the use of PCB Transformers in or near industrial buildings separately from the use of PCB Transformers in or near commercial buildings.

Second, many comments on the Proposed Rule discussed the probability of PCB Transformer failures and fires, and suggested that certain types of PCB Transformer installations, network installations with higher secondary voltages (secondary voltages of 480 volts and above, including 480/277 volt secondaries), may be particularly likely to be involved in fire-related incidents. These comments suggest that if EPA were to pursue additional restrictions on the use of PCB Transformers, these installations should be the subject of more stringent control measures. In response to these comments, this final rule considers factors such as the relative probabilities of failures and fires in different types of PCB Transformer installations and places more stringent controls on those transformers which EPA believes pose higher risks of failures and fires.

Finally, in response to comments on the Proposed Rule, in this final rule, EPA has increased its emphasis of the prevention of PCB Transformer fires through increased electrical protection, and decreased its emphasis on the use of isolation measures to minimize the spread of already formed and/or released contaminants.

This final rule prohibits:

1. The continued use of higher secondary voltage network PCB Transformers (network PCB Transformers with secondary voltages at or above 480 volts, including 480/277 volt systems) in or near commercial buildings beyond October 1, 1990.

2. The further installation of PCB Transformers (which have been placed into storage for reuse) in or near commercial buildings.

This final rule also requires:

1. The installation, by October 1, 1990, of enhanced electrical protection on lower secondary voltage network PCB Transformers and on higher secondary voltage radial PCB Transformers (radial PCB Transformers with secondary voltages at or above 480 volts, including 480/277 volt systems) used in or near commercial buildings.

2. The registration, by December 1, 1985 of all PCB Transformers with fire departments or fire brigades with primary response function, and the registration, by December 1, 1985, of all PCB Transformers located in or near buildings with building owners.

3. The marking, by December 1, 1985, of the exterior of all PCB Transformer locations (excluding grates and manhole covers).

4. The removal, by December 1, 1985, of combustible materials stored within a PCB Transformer enclosure, within 5 meters of a PCB Transformer enclosure, or within 5 meters of an unenclosed PCB Transformer.

This rule also requires the immediate notification of the National Response Center in the event of a PCB Transformer fire-related incident; and, that PCB Transformer owners take measures as soon as practically and safely possible to contain any potential water releases associated with a PCB Transformer fire-related incident. These measures include, but are not limited to,

the blocking of floor drains, the containment of water runoff, and the control and treatment of cleanup water prior to discharge.

Fire events involving the rupture of PCB Transformers can lead to contamination of sewers, sewage treatment systems, sewage sludges and bodies of water. Liquid PCBs and incomplete combustion products such as dioxins or furans may be conveyed through drains into storm or sanitary sewer systems. This process is facilitated when water is used in firefighting operations or is present as a result of the rupture of water pipes. Disruption of sewage treatment processes can also be caused, and eventually contaminants may be discharged into receiving waters poorly treated or not treated at all.

Contamination of receiving waters presents a risk of long lasting adverse effects on aquatic life and bottom sediment, as well as threats to public health through contamination of drinking water supplies and direct public contact with contaminated water.

The cost of cleaning up contaminated sewer systems and associated treatment facilities may be very high. Sludge contaminated with PCBs, dioxins and furans may be required to be handled and disposed of as hazardous waste under the resource Conservation and Recovery Act (RCRA) and pursuant to the PCB regulations under the Toxic Substances Control Act (TSCA). Clean up of water bodies and bottom sediments, if possible, would also be very expensive. Data indicating water and sewer treatment system contamination following the Binghamton fire confirm that water treatment facility sludge can become contaminated with PCBs as a result of releases during PCB Transformer fires.

For these reasons, it is important that sewer systems and treatment plant operators have as much notice as possible of a PCB Transformer fire event. The sooner this information is available, the sooner action can be taken to isolate or contain contaminants (if possible), to limit their spread and to assure proper handling.

Fire departments are required to be notified pursuant to § 761.30(a)(1)(vi) of this regulations as to the location of PCB Transformers. Fire departments generally maintain good information for response to emergencies and have plans and a coordinating capacity for dealing with fires involving hazardous materials. EPA therefore strongly urges fire departments, on a voluntary basis, to contact storm and sanitary sewer system and treatment plant operators in the areas served by the fire department, once the information required to be submitted to the fire departments under § 761.30(a)(1)(vi) is available. EPA also urges the fire department to work wih sewer system and treatment plant operators to develop contingency plans for handling contamination entering the sewers as a result of PCB Transformer fire events.

EPA also urges owners of PCB Transformers and owners of buildings in which those transformers are located to plan ahead for a fire event. Building owners, working with other parties, should plan their best course of action to prevent or limit release of PCBs and other contaminants in the event of a fire. These plans should give special consideration to the location of individual PCB Transformers, the location of drains near these transformers, and methods for closing the drains in the event of a PCB Transformer fire.

To support this voluntary cooperative effort, EPA will develop guidance for use by owners and operators of sanitary sewer systems and treatment facilities, pointing out the availability at local fire departments of information on the location of transformers and the potential impact of the release of PCBs and other contaminants into the sewer system in the event of a fire. EPA will also evaluate the possible roles of organizations such as the Water Pollution Control Federation, the Association of State and Interstate Water Pollution Control Authorities, the American Public Works Association, and the National Fire Protection Association in distributing information, and may request their cooperation in this effort.

For purposes of this rule, commercial building is defined as a non-industrial (non-substation) building which is typically accessible to both members of the general public and employees. Commercial buildings include: (1) Public assembly properties, (2) educational properties, (3) institutional properties, (4) residential properties, (5) stores, (6) office buildings, and (7) transportation centers (i.e., airport terminal buildings, subway stations, bus stations, and train stations). For purposes of this rule, "in or near" a commercial building is defined as: (1) Within the interior of a commercial building, (2) on the roof of a commercial building or attached to the exterior wall of a commercial building, (3) in the parking area of a commercial building, or (4) located within 30 meters of a commercial building.

An industrial building is defined as a building directly used in manufacturing or technically productive enterprises. Industrial buildings are not generally or typically accessible to other than workers. Industrial buildings include buildings used directly in the production of power, the manufacture of products, the mining of raw materials, and the storage of textiles, petroleum products, wood and paper products, chemicals or plastics, and metals.

EPA has determined that requiring the removal of particularly high risk PCB Transformers from use and adding conditions and restrictions on the use of the remaining PCB Transformers (including enhanced electrical protection, registration, and labeling) will significantly reduce the fire-related risks posed by the use of PCB Transformers. EPA has determined that the continued use of PCBs in PCB Transformers which comply with the conditions and requirements described above do not present unreasonable risks to public health or the environment. Further, after considering the risks posed by fires involving transformers containing less than 500 ppm PCBs, and the costs of regulatory control measures, EPA is reaffirming its August 1982 determination that the continued use of PCB-Contaminated transformers and non-PCB transformers (transformers containing 50–500 ppm PCBs, and less than 50 ppm PCBs respectively) do not present unreasonable risks to public health and the environment.

The enhanced electrical protection requirements for higher secondary voltage radial PCB Transformers consist of the installation of protection against transformer failures from sustained low current faults. EPA has determined that the enhanced protection of these PCB Transformers is necessary to reduce the fire-related risks posed by the continued use of these transformers in commercial locations. This protection will reduce the frequency of PCB Transformer fires in these types of transformers by allowing for rapid deenergization in the event of a sustained low current fault.

While EPA is aware of at least five basic types of radial installations (simple radial systems, expanded radial systems, primary selective systems, primary loop systems, and secondary selective systems), existing data do not indicate that the probability of low current fault-related failures would be significantly different among these five types of radial installations. Thus, EPA has required enhanced electrical protection on all commercial higher secondary voltage radial PCB Transformers.

EPA recognizes, however, that additional experience and further research into the causes of PCB Transformer failures and fires may

result in the development of data by industry which would indicate that there are significant differences in the probabilities of fault-related failures among the different types of radial systems. If these data are developed, they should be submitted to EPA for consideration. Based on the timely submission of new information, that is, within 2 years of the date of promulgation of this final rule, EPA may choose to revisit this particular requirement.

The remainder of this preamble describes the basis for the determinations reached in this final rule.

III. Use Authorizations Under Section 6(e)

In order to authorize a use of PCBs under section 6(e)(2)(B) of TSCA, EPA must find that such use "will not present an unreasonable risk of injury to health or the environment." To determine whether a risk is unreasonable, EPA must balance the probability that harm will occur from the use against the benefits to society of allowing the continued use. In completing this assessment for the use of PCB containing electrical transformers, EPA has considered the following factors for each of four categories of electrical transformers containing PCBs (PCB Transformers located in or near commercial buildings, PCB Transformers located in or near industrial facilities, PCB Transformers located outdoors (away from commercial buildings), and PCB Contaminated transformers):

1. The effects of PCBs and their incomplete combustion products on human health and the environment.

2. The magnitude of human and environmental exposure to PCBs and their incomplete combustion products.

3. The benefits of using PCBs and the availability of substitutes.

4. The economic impact resulting from the rule upon the national economy, small business, technological innovation, the environment, and public health.

These are the same types of considerations listed in section 6(c) of TSCA, which describes factors EPA must consider in deciding whether a chemical presents an unreasonable risk under section 6(a) of TSCA.

The remaining units of this preamble will discuss these key factors in the unreasonable risk determinations made in this rule, and the basis for EPA's determination to allow the continued use of PCB-containing transformers with certain additional conditions and restrictions.

IV. Transformer Fire-Related Risks

A. Toxicity of PCBs and Incomplete Combustion Products

In earlier rulemakings, EPA has already concluded that, based upon available information persons exposed to PCBs can develop chloracne; and, that based on animal data, there is a potential for reproductive effects and developmental toxicity as well as oncogenicity in humans exposed to PCBs. While fires involving PCB-containing transformers have resulted in the release of large quantities of PCBs, these incidents have also resulted in the formation of toxic products of incomplete combustion.

Many other compounds of potential toxicological significance, including PCDFs, PCDDs, and polychlorinated biphenylenes, were measured in soot samples following fires involving PCB Transformers. However, the bulk of toxicity testing of PCDF and PCDD congeners has been completed on what are anticipated to be the most toxic species, the 2,3,7,8 substituted PCDFs and PCDDs. EPA has evaluated the risks posed by PCB Transformer fires through an evaluation of: (1) The toxicities of PCBs, 2,3,7,8-TCDF, and 2,3,7,8-TCDD; (2) the toxicities and potential toxicities of other PCDF and PCDD congeners; and (3) the potential for exposure to these materials as a result of a fire.

While the majority of toxicological testing has been completed on PCBs, 2,3,7,8-TCDF and 2,3,7,8-TCDD, this does not mean that human and environmental exposures to other congeners of PCDFs and PCDDs as well as polychlorinated biphenylenes pose little risk of toxic effects. For example, limited testing of 1,2,3,7,8-pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD), 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD), and 1,2,3,7,8,9-hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD) suggest that these congeners are qualitatively similar in their toxic action to 2,3,7,8-TCDD for observed effects. However, they are less toxic for the observed effects than the 2,3,7,8-TCDD congener. EPA expects that similar structure-activity relationships would exist between 2,3,7,8-TCDF and 1,2,3,7,8-PeCDF, 1,2,3,7,8,9-HxCDF, and 1,2,3,6,7,8-HxCDF. However, EPA also believes that reducing exposures to the extremely toxic congeners, 2,3,7,8-TCDD and 2,3,7,8-TCDF, will also reduce exposures to these other compounds of potential toxicological significance.

According to EPA's February 1984 Ambient Water Quality Criteria (AWQC) for 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), 2,3,7,8-TCDD is one of the most toxic substances known to man. It exhibits delayed biological response in many species and is highly lethal, at low doses, to aquatic organisms, birds, and mammals. It has been shown to be acnegenic, fetotoxic, teratogenic, mutagenic (limited evidence), carcinogenic, and adversely affects the immune response in mammals.

The AWQC lists the acute LD50 for 2,3,7,8-TCDD for several species. The oral LD50 values ranges from 0.6 microgram per kilogram (kg) body weight (bw) for guinea pigs to 5,051 micrograms per kilogram body weight for hamsters. The AWQC presents the acceptable daily intake (ADI) value for a 70 kg man as 2.2×10^{-7} micromoles 2,3,7,8-TCDD per day. This ADI is based on the lowest-observed-adverse-effect levels (LOAEL) in rats, and has been calculated in accordance with the National Academy of Science's guidelines for calculating an ADI based on a LOAEL.

Although the ADI value presented above is very low, it still may not be sufficiently protective of human health. This ADI level does not take into account the demonstrated carcinogenic effects of 2,3,7,8-TCDD in laboratory animals. The AWQC concludes that 2,3,7,8-TCDD is an animal carcinogen and that the epidemiological findings are consistent with the conclusions drawn from animal studies that 2,3,7,8-TCDD is a probable human carcinogen.

The carcinogenic potency of 2,3,7,8-TCDD using the linearized multistage model has been estimated relative to 53 other chemicals which EPA's Cancer Assessment Group (CAG) has evaluated as suspect carcinogens. This relative potency index is 5×10^{7} per millimole (mmol) per kg per day (137 per ug per kg per day), making 2,3,7,8-TCDD the most potent carcinogen that the CAG has evaluated. CAG ranks 2,3,7,8-TCDD as a 2–A carcinogen, which means that there are sufficient laboratory animal data indicating its carcinogenicity as well as suggestive human evidence.

The limited data on other PCDD congeners indicate that they are qualitatively similar in their toxic action to 2,3,7,8-TCDD when comparisons are made in a single species. This is illustrated in mice, where 2,3,7,8-TCDD has an LD50 value of 0.88 micromoles (umol) per kg and 1,2,3,7,8-peCDD; 1,2,3,6,7,8-HxCDD and 1,2,3,7,8,9-HxCDD have LD50 values of 0.94, 3.19, and 3.67 umol/kg, respectively.

Toxicological testing of PCDFs, specifically, 2,3,7,8-TCDF, has been more limited than testing of 2,3,7,8-TCDD. The acute oral LD50 in the guinea pig is reported to be 5

micrograms per kg bw (as compared with the acute oral LD50 for 2,3,7,8-TCDD in this species which is reported to be 0.6 microgram per kg bw). Subchronic testing of 2,3,7,8-TCDF in rhesus macaques indicated that this compound is extraordinarily toxic. Based upon EPA's review of this study, the No Observed Effect Level (NOEL) for 2,3,7,8-TCDF is expected to be below 5.0 parts per billion (ppb). The author of this study concluded that continued daily oral intake of small amounts of 2,3,7,8-TCDF gave monkeys a disease which is clinically and morphologically similar to acute or chronic ingestion of 2,3,7,8-TCDD. The clinical course is marked chiefly by weight loss, swelling of the eyelids, dryness and granularity of the skin, hair loss and reduced physical activity. For most of the observed biological effects, the potency of the two compounds are within an order of magnitude of each other, with 2,3,7,8-TCDF being somewhat less toxic than 2,3,7,8-TCDD. Some scientists have estimated that in laboratory animals, 2,3,7,8-TCDF is 2 to 33 percent less toxic than 2,3,7,8-TCDD, depending upon the particular endpoint in question. Further, the toxicity of 2,3,7,8-TCDF in rhesus macaques has been estimated to be about 20 times that of 3,4,4',5'-tetrachlorobiphenyl and 1,000 times more toxic than PCB Aroclor 1248.

Based on its assessment of available literature on the toxicity of 2,3,7,8-TCDF and the structural similarity of 2,3,7,8-TCDF to 2,3,7,8-TCDD, EPA has concluded that it is prudent to assume that exposures to 2,3,7,8-TCDF would pose risks of similar toxic effects as exposures to 2,3,7,8-TCDD. Further, based on structure-activity relationships and limited in-vitro studies, EPA assumes that other PCDF congeners, particularly 1,2,3,7,8-PeCDF, 2,3,4,7,8-PeCDF, 1,2,3,4,7,8-HxCDF, 1,2,3,6,7,8-HxCDF, and 1,2,3,7,8,9-HxCDF may also pose risks of similar toxic effects as exposures to 2,3,7,8-TCDF (and 2,3,7,8-TCDD).

Following the Binghamton fire, several researchers completed toxicological testing of soot samples in guinea pigs. Based on these studies, using Binghamton State Office Building (BSOB) soot, EPA has concluded that exposures to soot from PCB Transformer fires have the potential to produce toxicity in the thymus, the hematopoietic system, the salivary gland duct epithelium and, possibly, the liver.

It is worth noting that thymic atrophy, bone marrow depletion, and diminished body weight gain, all effects of the subchronic administration of the BSOB soot, have been routinely demonstrated in acute studies in guinea pigs using PCDFs and PCDDs. In addition, the group of guinea pigs dosed with 231.1 ppm BSOB soot (in feed) in the subchronic study exhibited symptoms characteristic of acute exposure to 2,3,7,8-TCDD and 2,3,7,8-TCDF, which include skeletal muscle degeneration, fatty changes in hepatocytes, and degeneration of gastrointestinal tract epithelium.

One paper stated that the oral LD50 of the BSOB soot in guinea pigs is 410 milligrams per kilogram body weight, which would classify this material as very toxic.

For more in-depth analyses of the toxicities of PCBs, PCDFs, and PCDDs see documents 2, 3, 4, 5, 6, 8, and 13 in Unit X.B.

B. The Formation of Oxidation Products From PCBs

There is direct evidence of the formation of PCDFs and PCDDs from heating and burning commercial mixtures of PCBs and diluents from: (1) Chemical analyses of materials at the sites where fires were known to involve transformers that contained PCBs and chlorinated benzenes, and (2) laboratory experiments published in chemical and other literature. PCBs, PCDFs, and PCDDs were found in some soot specimens from both the Binghamton and San Francisco fires. Data submitted to EPA following the issuance of the Proposed Rule indicate that PCDFs and PCDDs were also measured in samples taken following the Miami and Chicago fires.

Laboratory studies provide the best available information on the conversion of pure PCBs to PCDFs. In these studies, a number of different PCB congeners and mixtures of congeners have been heated and the resulting materials analyzed for PCDFs and PCDDs. A specific PCB compound reacts to form a limited number of PCDFs. The formation of PCDFs involves intramolecular elimination of three kinds of diatomic molecules, with or without some rearrangement of chlorine atoms on the phenyl rings in the product dibenzofuran. From the products obtained in the PCB reactions, the diatomic molecules, hydrogen, hydrogen chloride, and chlorine, are formed from hydrogen and chlorine atoms in ortho positions on each of the two phenyl rings in the original polychlorinated biphenyl molecule. The optimum temperature range for the published laboratory experiments was 600 °C. Yields of PCDFs have been reported in the literature to be as high as 10 percent (calculated on the amount of PCB decomposed) for reaction temperatures from 550 °C to 600 °C, but drop off to tenths of a percent at temperatures below 500 °C and above 650 °C.

EPA-sponsored studies of the formation of PCDFs and PCDDs indicate that the optimum conditions for the formation of PCDFs from (neat) PCBs are 675 °C for 0.8 second or longer, with 8 percent excess oxygen. Under these conditions, a 3 percent conversion efficiency (PCBs to PCDFs) was observed for askarel fluid. Under the same conditions, PCDFs were also formed from PCBs present at concentrations of 5, 50, and 500 ppm in mineral oil and silicone oil. The EPA study of the formation of PCDFs PCDDs from PCB-containing mineral oil and silicone oil indicates a 4 percent conversion efficiency of PCBs to PCDFs when PCBs are present in these materials at concentrations of 5, 50, and 500 ppm. Statistical analysis showed a linear relationship between the amount of PCB present and the amount of PCDFs formed.

PCB dielectric fluid may also contain chlorinated benzenes as diluents or contaminants, as a result of past servicing activities. Laboratory experiments in the published literature have shown the formation of PCDDs in addition to PCDFs from the pyrolysis of mixtures of chlorobenzenes. Amounts of PCDFs ranged as high as several tenths of a percent for mixtures of trichlorobenzenes. Tetrachlorobenzene and pentachlorobenzene mixtures formed amounts of PCDFs and PCDDs which were two orders of magnitude smaller than the amounts of these compounds formed by trichlorobenzene. These reactions are bimolecular and the experimental concentrations of chlorobenzenes were high.

EPA-sponsored studies of the incomplete combustion of chlorinated benezenes indicate that PCDFs, and to a lesser extent PCDDs, are formed from the incomplete combustion of trichlorobenzene dielectric fluid containing no detectable PCBs. EPA also studied the incomplete combustion of tetrachloroethylene (perchloroethylene) and high temperature hydrocarbons (both of which are potential PCB substitutes) to determine whether PCDFs and PCDDS would be formed from these materials in fire situations. EPA's preliminary study indicates that PCDFs and PCDDs are formed from the incomplete combustion of tetrachloroethylene fluid. The two high temperature hydrocarbon fluids did not produce PCDFs or PCDDs under the experimental conditions.

The presence of low concentrations of chlorobenzenes as contaminants in

dielectric fluids that also contain PCBs are not expected to lead to substantial increases in the amounts of PCDFs formed from burning or heating the PCBs, but, may result in the formation of some PCDDs. EPA believes that the PCDD levels found in the Binghamton soot samples resulted from the pyrolysis or incomplete combustion of chlorobenzenes. The low level PCDDs found following the San Francisco fire could have been associated with the presence of chlorobenzenes in that fluid as well.

For further discussions of the formation of incomplete combustion products from PCBs and other potential substitute fluids, see the EPA-sponsored studies completed by the Midwest Research Institute, documents 10 and 11 in Unit X.R.

The description and characterization of the chemical reactions occurring in a fire in which aroclors (or any other commercial mixtures of many PCB compounds) are burned are far more complex than the laboratory experiments. However, EPA believes that reactions observed in the laboratory should also occur in fire situations where the reactants and reactions conditions are similar to laboratory reaction conditions. Data from actual PCB Transformer fires confirm the relatively high rates of conversion of PCBs to PCDFs in actual PCB Transformer fires.

PCDFs and PCDDs have also been detected following high temperature incineration. High temperatures incineration is required by EPA regulations to dispose of PCBs in oil. However, the levels of PCDFs and PCDDs measured following high temperature incineration have been substantially less than those measured following the above described laboratory experiments. This is because of high temperature incineration requires a 1200 °C temperature, a 2-second residence time, and sufficient oxygen to sustain complete combustion. As explained above, laboratory experiments indicate that the reaction temperature for the formation of PCDFs is optimized at around 600 °C. It is probable that yields of PCDFs from PCBs are reduced at higher temperatures because of increased destruction efficiency and ease of combustion.

C. Causes of PCB Transformer Fire-Related Failures

PCB Transformer fire-related incidents can occur from many causes, including overloading, overheating, electrical faults (overcurrent conditions or low current faults either in the transformer itself or external to the transformer in associated electrical equipment), and fires near transformers, involving building components or stored materials. PCB Transformer fires can also occur as a result of mechanical failures which can lead to electrical faults, and then, to fires. Of the well-documented PCB Transformer fires, many have reportedly occurred as a result of electrical faults, which led to transformer failures and fires. Electrical faults are of two basic categories: faults characterized by high current or excessive current flow (high current faults), and faults characterized by low current flow (low current faults).

Electrical faults can occur in transformers themselves or in associated electrical equipment. Faults in associated electrical equipment are of equal concern to faults inside transformers, first, because these faults can ultimately cause transformer failure, and second, because most faults occur external to the transformers themselves, in associated electrical equipment. Thus, as a general rule, the more associated electrical equipment present, the higher the probability of a fault occurring. Further, electrical faults are more likely to be self-sustained rather than self-extinguishing when voltages are higher.

1. *Mechanisms of failure*—a. *Excessive current flow.* The first failure mechanism is excessive current flow of the transformer. This is termed an overcurrent condition or simply, "overcurrent". Prolonged overcurrent conditions can lead to fires inside a transformer. If the overcurrent condition is due to a fault in the transformer itself, then there is a high energy arc in the transformer's insulating fluid. Failure to extinguish quickly high current arcs in a transformer will result in rapid transformer failure, involving the rupture of the transformer casing and loss of dielectric fluid. If the overcurrent condition is due to a fault in the associated electrical equipment, then there is high energy fault in the associated electrical equipment. Faults are more likely to occur externally, in associated electrical equipment, than in the transformer itself. However a high current fault in associated electrical equipment can draw excessive current from the transformer, heat the solid insulation, increase the discharge activity in the transformer and cause transformer failure (rupture and release of dielectric fluid).

According to comments on the Proposed Rule, electrical faults which occur on the load side or secondary side of a transformer (in the low voltage winding, low voltage leads, or in other associated switchgear and equipment) are more likely to be self-sustaining rather than self-extinguishing when the secondary or load side voltage is higher. That is, self-sustained high current faults in the secondary (the low voltage side) are more likely in higher voltage secondaries (i.e., 480 volt secondaries) than in lower voltage secondaries (i.e., 208 volt secondaries).

Current-limiting fuses or energy-limiting devices and overcurrent protective relays are the types of electrical protective devices which can be used to quickly extinguish high current arcs inside the transformer casing, as well as high current faults which occur external to the transformer in associated electrical equipment. PCB Transformer fires which occur as a result of overcurrent conditions occur when overcurrent electrical protective devices (fuses and/or circuit breakers) are not present; when overcurrent protection is not set sensitive enough to deenergize the transformer before high temperatures or pressures are reached; and when overcurrent protection simply fails to operate when called upon.

b. *Low current faults.* The second failure mechanism is the widely recognized (in written comments on the Proposed Rule and in testimony at the public hearing) possibility that low current faults may occur in a transformer itself, or external to a transformer, in its associated electrical equipment, and not activate conventional overcurrent protective devices (the fuses and circuit breakers discussed earlier). For a low current fault in a transformer to release sufficient energy to lead to tank rupture, the fault must first produce a pressure rise in the transformer tank. In contrast to the short time involved from the occurrence of a sustained high energy (high current) arc to the reputure of a transformer, low current faults may take some time to release sufficient energy to cause tank rupture.

Low current faults can also occur external to a transformer, in associated electrical equipment such as network protectors (circuit breakers which are typically installed on the secondary side of network transformers) and network collector buswork. Sustained or prolonged low current faults external to a transformer can ultimately involve the transformer itself, causing rupture and release of PCBs.

As was the case for high current faults, comments on the Proposed Rule indicate that when the secondary voltage of a transformer is higher, low current faults which occur in the secondary (in the low voltage winding, low voltage leads, or associated equipment) have a greater likelihood of

being self-sustained rather than self-extinguishing. That is, low current faults in 480 volt secondaries have a greater likelihood of being sustained than low current faults in 208 volt secondaries.

Protecting against sustained low current arcing faults in a transformer involves the use of appropriate sensors and disconnect equipment. The sensors are designed to detect a pressure rise in the transformer tank and/or a temperature rise in the lower voltage transformer winding. Protection against sustained low current arching faults in external associated electrical equipment (which can ultimately involve the transformer) involves placing heat or ultraviolet sensors in this equipment. When the sensors detect an abnormal condition, (i.e., a rise in pressure or temperature) the transformer is rapidly deenergized, either automatically or manually (following the receipt of an audio or visual signal at a control center).

2. *Protection currently provided against common mechanisms of fault-related failures.* Comments submitted in response to the Proposed Rule and testimony supplied at the public hearing indicate that PCB Transformers are currently equipped with electrical protection to reduce the frequency of transformer failure; but, that the level and type of electrical protection provided varies depending upon the nature of the transformer installation. Certain transformers and installations are better protected against fault-related failures than other types of transformers and installations. For purposes of this section, it is sufficient to divide the applications into two types.

The first application includes all arrangements in which the PCB Transformer can be energized only from the primary winding. These transformers are termed radial PCB Transformers. (There are, however, five basic types of radial installations, simple radial systems, expanded radial systems, primary selective systems, primary loop systems, and secondary selective systems.)

The second application includes those arrangements in which the PCB Transformer can be energized from either the primary winding or the secondary winding. The secondary winding is the winding from which energy flows during normal operation. In these systems, the primary winding can be energized from the secondary winding under abnormal conditions. These transformers are termed network PCB Transformers. There are two basic types of network installations, grid networks and spot networks.

Functionally, there are two types of electrical protection devices. One type interrupts the flow of current by vaporizing a segment of the conductor if the current exceeds a predetermined level. Fuses and distribution cutouts operate in this manner. The second type of electrical protection device operates by opening a switch. A circuit breaker opens a switch in response to a temperature rise in the device due to the current flowing in the circuit. A ground fault interrupter opens switch contacts in response to an unbalanced current flow. A network protector opens switch contacts in response to a reversal of the current flow.

"Non electrical" protection devices are also available. Devices such as pressure sensors open (or close) relay contacts to switches when the pressure (or rate of rise of pressure) exceeds a predetermined level. Temperature sensors and fluid level sensors operate in a similar manner.

a. *Radial PCB Transformers.* According to comments submitted in response to the Proposed Rule, radial PCB Transformers are typically equipped with overcurrent protection (on the high voltage side) in the form of either a current-limiting fuse or circuit breaker, and, often, with fuses and/or circuit breakers on the low voltage side or the load side. The overcurrent protection on the primary is set at a predetermined level to clear high current faults on the primary and is typically set sensitive enough to clear downstream high current faults in the secondary as well. These fuses/circuit breakers are set to operate quickly enough to avoid transformer failure in the event of high current faults in the primary or secondary.

Radial transformers are not, however, typically protected against low current arcing faults; these faults do not activate conventional overcurrent protective devices. Low current arcing faults can occur in areas such as the secondary winding and low voltage leads of radial transformers and can progress unseen by existing overcurrent protection, leading to transformer failure. Radial transformers with higher secondary voltages are more likely to experience a low current arcing fault on the secondary which is self-sustained than radial transformers with lower secondary voltages.

According to comments on the Proposed Rule, many radial PCB Transformers used in industrial applications are equipped with temperature and pressure relays and circuit breakers on-site which can be manually operated to actuate transformer deenergization in the event of a sustained fault. However, if on-site control of a radial transformer is not possible (through the use of a manually operable circuit breaker), which is more likely the case in commercial installations, deenergization would involve contacting the utility substation to deenergize the substation primary feeder. Comments on the Proposed Rule indicate that this is a difficult thing for a utility to do, because deenergizing the primary feeder results in the deenergization of all transformers served from that primary feeder. This results in the loss of electric power to many buildings served by this same primary feeder.

b. *Network PCB Transformers.* According to comments on the Proposed Rule, network transformers are typically equipped with the least sensitive overcurrent protection of all utility distribution transformers. While radial transformers are typically equipped with overcurrent protection on the primary (which is set sensitive enough to clear high current faults on the primary as well as downstream high current faults in the secondary), network transformers are not typically equipped with current-limiting or energy-limiting devices on the primary circuit. Electrical protection for high current faults on the primary (in the primary feeder, the high voltage leads, and switchgear) is typically provided by relays to a primary feeder circuit breaker at the utility substation. The relays to the primary feeder breaker cannot detect downstream sustained high current faults in the secondary.

Further, while the relays to the substation primary feeder breaker on network transformers will operate for sustained high current faults in the primary (allowing for deenergization), deenergization may not occur quickly enough to avoid switchgear and/or transformer rupture. Thus, switchgear rupture and transformer failure can occur in network transformers from high current faults on the primary.

Unlike radial transformers, network transformers are equipped with network protectors, which are circuit breakers located on the secondary side of network transformers. The network protector is set to operate when it senses a reverse power flow. Thus, it operates to prevent power being fed back into the transformer in the event that the primary feeder breaker has been activated. The network protector operates in a coordinated fashion with the substation breaker relays to isolate a faulted network transformer. By isolating the faulted network transformer, service continues to be

supplied to the load by other transformers in the network.

According to comments on the Proposed Rule, current-limiting fuses are used in the secondary of higher secondary voltage network transformers (in the services and in the network protector). These fuses operate when high current faults occur downstream from these areas. However, the presence of these fuses does not mean that the entire secondary is protected against high current faults. There is a zone in the secondary in network transformers which is currently "unprotected," where high current faults can occur and not be seen by the relays to the primary feeder breaker or by these fuses in the services and the network protector. High current faults in this area can result in transformer failures and fires. Network transformers with higher secondary voltages are more likely to experience high current faults in the secondary which are self-sustaining, than network transformers with lower secondary voltages.

Like radial transformers, network transformers are not typically protected against low current arcing faults. Further, in network transformers, there is typically more associated electrical equipment where these faults can occur. Low current arcing faults in network transformers can occur in the network protector and (for spot network transformers) in the network collector bus as well as in the secondary winding and low voltage leads. Again, these faults are more likely to be self-sustaining rather than self-clearing when the secondary voltage is higher.

Unlike industrial transformers, commercial transformers, particularly network transformers are not typically equipped with primary circuit breakers on site. The deenergization of a commercial network transformer after failure from a sustained (undetected) low current or high current fault would typically require the manual opening of the utility substation primary feeder breaker, after the utility has been contacted about a malfunction in the equipment. As indicated earlier, utilities are generally hesitant to open primary feeder breakers because of their desire for continuity of service to their customers.

3. *Conclusions.* Comments on the Proposed Rule suggest that there are ways in which both radial and network PCB Transformer installations could be better protected to minimize the likelihood of fault-related failures and fires. Several comments on the Proposed Rule discussed the role of high current faults in PCB Transformer failures and fires, the level of protection currently provided against these faults in different types of transformer installations, and ways in which PCB Transformers could be better protected to minimize the chance of failure from these types of faults. Network PCB Transformers are currently the least well-protected against high current faults of all distribution class PCB Transformers in use. According to comments submitted in response to the Proposed Rule, the Tulsa PCB Transformer fire was associated with this type of fault in the high voltage switchgear of a 208/120 volt network PCB Transformer.

Many comments on the Proposed Rule, however, focused on sustained low current arcing faults in PCB Transformers as the culprit in the number of documented PCB Transformer fires. These comments discussed the level of protection currently provided against these faults in PCB Transformer installations and ways in which PCB Transformers could be better protected to avoid low current fault-associated failures and fires. The San Francisco fire, the Chicago fire, and the Miami fire have been associated with these types of faults in 480/277 volt network PCB Transformers.

Simply stated, sustained low current arcing faults can occur in PCB Transformers and associated electrical equipment, and with existing levels of conventional protection, progress undetected and unseen, resulting in transformer failure and fire. According to comments submitted in response to the Proposed Rule, low current arcing faults can occur in the secondaries of all types of transformer installations, radial transformers, lower secondary voltage network transformers, and higher secondary voltage network transformers. They are, however, more likely to occur in installations with more, as opposed to less, associated electrical equipment and are more likely to be sustained in transformer secondaries when the secondary voltage is higher. This is because faults are more likely to "restrike" or be sustained at higher voltages than be self-extinguishing or self-clearing.

All types of PCB Transformers typically lack the sensors (pressure and/or temperature sensors) necessary for the early detection of low current arcing faults. Further, many commercial PCB Transformers are typically unequipped with on-site primary circuit breakers to actuate transformer deenergization. This means that low current arcing faults can progress unseen in these transformers, and that these transformers cannot be easily deenergized, even after transformer rupture has occurred.

Deenergization of commercial PCB Transformers (when disconnect equipment is not present on site) typically requires the opening of the primary feeder breaker at the electric utility substation, which is often miles away from a transformer installation. According to testimony at the public hearing, the opening of a primary feeder breaker at an electrical substation is a very difficult thing for a utility to do, because opening the primary feeder breaker for a malfunction in a single PCB Transformer will also result in other (well-functioning) transformers in the distribution system being deenergized.

D. Potential for Exposure

Toxicity and exposure are the two basic components of risk. In Unit IV.A, EPA addressed the toxicity of PCBs, PCDFs, and PCDDs. The following summarizes EPA's evaluation of the potential for human and environmental exposures to PCBs, PCDFs, and PCDDs from transformer fires.

As discussed in Unit IV.C, high current faults and low current faults in electrical transformers and/or associated equipment, as well as the ignition of combustible or flammable materials in a transformer location, can all lead to the rupturing of a transformer, the volatilization of PCBs, and the formation of incomplete combustion products. Sustained high temperatures in the area of a ruptured transformer increase the potential for the formation of toxic products of incomplete combustion, including PCDFs, 2,3,7,8-TCDF, PCDDs, and 2,3,7,8-TCDD. These high temperatures can either occur as a result of the initial malfunction or as a result of prolonged arcing associated with an inability to deenergize the transformer completely. Smoke and soot from a high temperature fire involving a PCB Transformer can contain high concentrations of volatilized PCBs and oxidation products.

The most extensive monitoring data on PCB, 2,3,7,8-TCDF and 2,3,7,8-TCDD levels in buildings following PCB-Transformer fires were obtained from the Binghamton State Office Building site. A composite soot sample from this fire indicated the presence of 7,200 ppm PCBs, 231 ppm 2,3,7,8-TCDF, and 2.9 ppm 2,3,7,8-TCDD. For a full description of PCB, PCDF, and PCDD levels measured following transformer fires, see the quantitative exposure assessment completed for this final rule, support document 1 in Unit X.B.

EPA believes that the levels of PCBs and oxidation products measured in soot samples following the Binghamton

fire are values which are representative of situations in which combustion conditions are conducive to the formation and/or release of PCBs and oxidation products. Therefore, in this rule, EPA has used these values to estimate human and environmental exposures to PCBs, PCDFs, and PCDDs from PCB Transformer fires and fires involving PCB Contaminated transformers.

In the Proposed Rule, EPA evaluated the likelihood and nature of human and environmental exposures from transformer fires in or near buildings by analyzing likely exposures from a PCB Transformer fire in or near an office building. A number of comments received in response to the Proposed Rule suggested that EPA evaluate separately the expected exposures from transformer fires in or near industrial facilities and the costs of control measures for these transformers. Comments suggested that the use of PCB Transformers in industrial facilities pose lower fire-related risks than the use of PCB Transformers in commercial buildings and that the costs of the proposed transformer isolation requirement would be substantially greater for industrial facilities than for commercial buildings.

EPA agrees that industrial facilities should be evaluated separately from commercial buildings. Accordingly, EPA has evaluated the potential for human and environmental exposures for the following categories of PCB Transformer fires: (1) A PCB Transformer fire in or near a commercial building (both before the implementation of risk reduction measures and after the implementation of risk reduction measures); (2) a PCB Transformer fire in an industrial facility; (3) a PCB Transformer fire in an outdoor electrical substation; and (4) a PCB Contaminated transformer fire in or near a commercial building.

The first step in evaluating the potential for human exposures to PCBs and oxidation products is to determine the populations that are likely to experience these exposures. EPA has identified six populations that may be at risk of exposure to PCBs and oxidation products in the event of a fire involving a transformer containing PCBs. These are: (1) Persons present in a building or possibly in an adjacent building at the time of a fire in or near a building; (2) firemen and other emergency response personnel responding to a fire; (3) onlookers present during the extinguishing of a fire and members of the general public in the vicinity of the fire; (4) persons involved in sampling and cleanup operations following the fire; (5) persons returning to the building following cleanup; and, (6) persons exposed to equipment, automobiles, etc. that may have been contaminated during or after the fire. Human exposures to PCBs and oxidation products from transformer fires would be expected to occur principally through the inhalation and dermal routes.

1. *PCB Transformer fires in or near commercial buildings*—a. *Nature of installations and operation.* PCB Transformers serving commercial buildings are typically located in basements, in machinery rooms on the first few floors of buildings, or in sidewalk or underground vaults adjacent to buildings. Commercial PCB Transformers may also be located on roof-tops or near buildings in outside locations such as parking areas or loading docks. Electrical transformers used in or near commercial buildings are most typically located in areas which are not easily accessible or visible to building occupants. Based on the results of the Equitable Life Assurance survey of commercial transformer locations, EPA estimates that 69 percent of commercial transformers located on lower floors of buildings are vaulted, and that transformers located on interior upper floors are generally located in separate mechanical rooms. The majority of transformers located exterior to commercial buildings are also vaulted. According to utility representatives, in many cases, more than one PCB Transformer is located in a vault. Typically, two to four PCB Transformers are located within a single vault.

While commercial buildings may have janitorial crews on duty for building maintenance, electrical equipment operations are not typically closely supervised or monitored by trained electrical engineers or technicians. Maintenance and testing of these transformers would, in general, be expected to be less than that provided for utility substation equipment or industrial transformers. Further, disconnect equipment (i.e., circuit breakers) is generally not present in commercial installations, and there is typically no one present on site who is trained in disconnecting the equipment, even if such equipment were provided.

Comments on the Proposed Rule and EPA's analysis of available information indicates that there are approximately 77,568 PCB Transformers used in or near commercial buildings. Of these 77,568 PCB Transformers, EPA estimates that approximately 29 percent are network PCB Transformers and 71 percent are radial PCB Transformers. Further, of the estimated 7,600 480 volt network PCB Transformers in use (those transformers with a particularly high probability of fault-failure), EPA believes that over 97 percent of these transformers are used in or near commercial buildings.

b. *Frequency of PCB Transformer fires.* In the Proposed Rule, EPA estimated that 0.003 to 0.004 percent of nonsubstation PCB Transformers are involved in "serious" PCB Transformer fires (PCB Transformer fires involving smoke spread into buildings) each year. Within the category of "serious" fires are fires with moderate smoke distribution and fires with extensive smoke distribution. EPA used data from the National Fire Incident Reporting System (NFIRS) for 1982 on the frequency of structure-related electrical transformer fires, data from the NFIRS on the frequency of structure-related transformer fires with smoke spread beyond the room of origin of the fire, limited data from the NFIRS on the make, model, and year of transformers involved in these fires, and data supplied by various sources in response to the ANPR to develop this estimate. While EPA received several comments on this estimate (some indicating that EPA had severely underestimated the frequency of occurrence and other indicating that EPA had significantly overestimated the frequency of occurrence), little additional quantitative data were submitted to support modifying EPA's estimate of the frequency of occurrence of serious PCB Transformer fires. Thus, EPA believes that its estimate of 50 serious PCB Transformer fires over the remaining useful life of PCB Transformers is a reasonable estimate of the future frequency of serious PCB Transformer fires.

Since many comments on the Proposed Rule suggested that EPA evaluate separately the risks posed by PCB Transformers in or near industrial facilities, EPA has developed estimates of the frequency of PCB Transformer fires in industrial facilities and in commercial buildings.

As discussed in Unit IV.C, EPA believes that the probability of PCB Transformer fault-related failure varies depending upon the type of PCB Transformer installation (and includes such considerations as the amount of associated electrical equipment present, the secondary voltage of the transformers, and the current level of protection provided against sustained high current faults and sustained low current faults). Based on this analysis, and available empirical data on installation types in documented PCB

Transformer fires, EPA has developed estimates of the relative probabilities of failure for different types of PCB Transformer installations (high and low secondary voltage network transformers versus high and low secondary voltage radial transformers). EPA has used these estimates and available data on the distribution of these installation types in commercial locations and industrial locations to estimate the frequency of serious PCB Transformer fires both in commercial buildings and in industrial facilities.

EPA believes that 480 volt network PCB Transformers would have a particularly high probability of failure; that lower secondary voltage network PCB Transformers and 480 volt radial PCB Transformers would have a lower probability of failure (compared to 480 volt network transformers); and that lower secondary voltage radial PCB Transformers would have the lowest probability of fault-related failures.

EPA estimates that 44 of the 50 structure-related serious PCB Transformer fires which will occur over the remaining useful life of PCB Transformers will occur in or near commercial buildings. This estimate is supported by electrical engineering theory concerning the mechanisms of PCB Transformer fault-related failures and the likelihood of failures in different types of installations as well as by available empirical data. The PCB Transformer fires in Binghamton, San Francisco, Chicago, Miami, and Tulsa all occurred in or near commercial buildings; specifically, in office buildings.

Further, the San Francisco fire, the Chicago fire, and the Miami fire all reportedly occurred in 480 volt network PCB Transformers. Three other fire-related incidents in commercial buildings in the Boston area also reportedly involved 480 volt network PCB Transformers. A total of 6 out of 10 known PCB Transformer fires have occurred in higher secondary voltage network PCB Transformers (in 480 volt network installations). This is particularly dramatic when one considers that there are only an estimated 7,600 480 volt network PCB Transformers in use.

c. *Exposure assessment.* EPA has evaluated likely exposures from a serious PCB Transformer fire in or near a commercial building by using reasonable yet environmentally conservative assumptions. EPA assumes that a PCB Transformer fire in a commercial building would involve sustained high temperatures in the transformer location, the rupture of the transformer casing, the release of PCBs, the volatilization of PCBs, and the widespread distribution of PCBs and oxidation products throughout the interior of a densely populated building (i.e., an office building), into the ambient air, and into waterways. EPA assumes that smoke and soot containing PCBs and oxidation products are spread throughout a large office building during peak use hours, that emergency response personnel are unaware that certain precautions should be taken to minimize exposures, and, that reoccupancy occurs only after the removal of visible traces of soot by cleanup crews.

EPA assumes that a PCB Transformer fire in or near a commercial building would involve the rupture of the transformer and sustained high temperatures in the transformer location for up to 4 hours. EPA has assumed this because transformers located in or near commercial buildings are more likely to be located in inaccessible, low visibility areas, where malfunctions would not be readily identified. Further, EPA has assumed that the transformer will not be deenergized automatically and that the transformer will not have the capability to be deenergized manually from an on-site location. EPA made these assumptions because many PCB Transformers located in or near commercial buildings are network transformers, which are currently less well-protected electrically, and, are less likely to be able to be deenergized manually from an on-site location.

EPA's assessment of the potential for human exposures to PCBs and oxidation products from a PCB Transformer fire in a commercial building serves as the baseline for subsequent assessments of the expected effectiveness of fire hazard risk reduction measures in these locations. This assessment is also used in assessing likely human exposures from PCB Transformer fires in industrial settings and in outdoor locations (away from commercial and residential areas), and for estimating likely human exposures from PCB-Contaminated transformer fires in or near commercial buildings.

A PCB Transformer fire which occurs in or near a commercial building during a period of peak use may expose hundreds to thousands of building occupants to smoke and soot from the fire during the evacuation of the building. The potential for exposures of large numbers of building occupants to this smoke and soot is increased if the transformer involved in a fire is located near building ventilation equipment and ductwork. EPA estimates that evacuation times will be on the order of 6 to 8 minutes, and, that during these 6 to 8 minutes, building occupants will be exposed to smoke and soot, primarily through inhalation.

Emergency response personnel, unaware that the smoke and soot from the fire may contain PCBs and toxic products of incomplete combustion, may be exposed to these materials through inhalation, and may incur some dermal exposure to facial areas. EPA estimates that 30 to 60 emergency response personnel may be exposed for up to 4 hours during the extinguishing of a PCB Transformer fire. Dermal and inhalation exposures of firefighters and other emergency response personnel may continue during the completion of equipment maintenance procedures and during the cleaning of personal clothing and firefighting equipment after the fire.

EPA has developed quantitative estimates of exposures by cleanup crews, firefighters, building occupants, and members of the general public to PCBs, PCDFs, and PCDDs. EPA developed these estimates primarily to evaluate relative exposures among these populations for different types of PCB Transformer fires and not to define in an absolute sense expected human exposures. In developing quantitative exposure estimates, EPA must make assumptions about parameters such as the concentration of PCBs, PCDFs, and PCDDs present in soot, the amount of soot generated, the distribution of soot in the interior of a building, the duration of exposure, the frequency of exposure, and the expected routes of exposure. As would be expected, the assumptions selected for use in quantitative exposure assessments can strongly influence the final exposure estimates. Recognizing this, EPA tends to routinely adopt more environmentally conservative assumptions for the different parameters of the exposure assessment.

EPA's quantitative estimates of potential firefighter exposures (assuming that respiratory protection is not worn during a PCB Transformer fire of 4 hours duration, as well as other assumptions detailed in support document 1 in Unit X.B.) in terms of estimated lifetime average daily doses (LADD) is 8,006 picograms per kilogram per day (pg/kg/day) PCBs, 98 pg/kg/day 2,3,7,8-TCDF, 56 pg/kg/day other TCDFs, 319 pg/kg/day other PCDFs, 5.1 pg/kg/day 2,3,7,8-TCDD, 0.98 pg/kg/day other TCDDs, and 45 pg/kg/day other PCDDs.

Building occupants also may incur additional exposures (above those which may occur during building evacuation), if these parties remain nearby, as onlookers during the extinguishing of the fire. Further, there is an increased potential for these

additional exposures when emergency response personnel (the principal authority figures at the scene of a fire) are unaware of the nature of risks posed by exposures to smoke and soot from these fires.

The rupture of a PCB Transformer and the release of potentially hundreds of gallons of PCBs (and potentially PCDFs and PCDDs) into floor drains in transformer locations could result in the contamination of waterways. Further, if water is used to extinguish the fire, or if water pipes rupture due to high temperatures caused by the fire, water runoff could ultimately result in contamination of surface waters and drinking water. Members of the general public, in addition to fish and wildlife, in the vicinity of a PCB Transformer fire may be exposed to PCBs and oxidation products through the ingestion of residues. While comments on the ANPR suggest that water is not frequently used in extinguishing an electrical transformer fire, EPA believes that there is a potential for contamination of water from the rupture of the transformer, burst water pipes, the extinguishing of ignited materials in the area (other than electrical equipment) and from cleanup efforts.

The presence of a floor drain leading to a storm sewer in a transformer location provides a readily accessible pathway for the contamination of surface waters, and potentially, drinking water supplies. Water contaminated with soot containing PCBs, PCDFs, and PCDDs can enter these drains as a result of firefighting operations, burst water pipes, and cleanup operations. Very large amounts of water can be used in the cleanup process. For example, during the first year of cleanup at the Binghamton site, over 160,000 gallons of water were used, treated by charcoal filtration and secondary treatment, and discharged to surface waters. The nearest drinking water intake downstream is 45 miles away and serves 16,500 persons.

Atmospheric transport of PCBs and oxidation products in an urban area could also be responsible for exposing many members of the general population who live or work in the vicinity of a fire. In the Binghamton, New York incident, 2,585 people lived within 3 to 4 kilometers of the building. While inhalation exposures by the general public as a direct result of a PCB Transformer fire would be unlikely to occur for an extended period of time, soot fallout from a PCB Transformer fire may contaminate surface soil and surface water, in addition to outdoor furniture, automobiles, and other types of materials which are commonly stored outside. Contamination of surface soil and surface water may result in exposures to fish and wildlife as well. Thus, dermal, inhalation, and even oral exposures to the general population in the vicinity of a fire may occur on a continuing basis long after the initial incident.

Exposures at the site of a fire to soot containing PCBs and oxidation products may also continue long after the extinguishing of the fire. Cleanup crews, dispatched to the scene by a building owner who is unaware of the nature of risks posed by a PCB Transformer fire, may not be initially equipped with respiratory protection or protective clothing. Inhalation and dermal exposures would be expected to occur as these crews work to remove soot from surfaces inside the building. Soot particles are likely to become airborne as a result of cleanup efforts, and would be expected to be inhaled by workers. In addition, because of the strenuous nature of cleanup work, these workers would be expected to have a high respiration rate, further increasing exposures to PCBs and oxidation products through inhalation.

EPA's quantitative estimates of potential exposures to cleanup crews (assuming a 4-hour fire, the lack of protective clothing, and the superficial cleanup of a building, as well as other assumptions detailed in support document 1 in Unit X.B.) is 13,784 pg/kg/day PCBs, 34 pg/kg/day 2,3,7,8-TCDF, 19.9 pg/kg/day other TCDFs, 109 pg/kg/day other PCDFs, 1.8 pg/kg/day 2,3,7,8-TCDD , 0.33 pg/kg/day other TCDDs, and 15.7 pg/kg/day other PCDDs.

Even if respiratory protection and protective clothing are utilized by cleanup crews, EPA expects that some level of exposure to these materials may occur both dermally and through inhalation because of the expected prolonged period of exposure. Cleanup crews may work long hours for extended periods of time. For example, in the Binghamton incident, 40 to 70 workers were involved in cleanup operations for 7 hours a day for over 250 days.

Finally, depending upon the level of knowledge of the building owner, emergency response personnel, the utility, and local public health authorities about the nature of risks posed by PCB Transformer fires, building occupants may be allowed to return prematurely to a building following the removal of only visible traces of soot. Exposures may occur to faces, hands, and lower arms for 8 hours a day over the course of 250 working days in a year. EPA also expects that inhalation exposures would occur as a result of the circulation of airborne contaminants by the building's ventilation system. Further, these exposures may continue for an indefinite period of time because these materials are expected to the quite persistent, and resistant to degradation. Residual concentrations may remain on interior building surfaces for several years. EPA's quantitative estimates of potential building occupant exposures (assuming that the fire burns for 4 hours, that the building is occupied at the time of the fire, and that reoccupancy occurs following cleanup to visible traces of soot in the buildings, as well as other assumptions detailed in support document 1 in Unit X.B.) is 39,593 pg/kg/day PCBs, 65 pg/kg/day 2,3,7,8-TCDF, 65 pg/kg/day other TCDFs, 277 pg/kg/day other PCDFs, 1.2 pg/kg/day 2,3,7,8-TCDD, 0.76 pg/kg/day other TCDDs, and 35 pg/kg/day other PCDDs.

EPA has prepared additional quantitative estimates of potential human exposures to PCBs, PCDFs, 2,3,7,8-TCDF, PCDDs, and 2,3,7,8-TCDD from a reasonable worst-case PCB Transformer fire in a commercial building. These estimates are presented in support document 1 in Unit X.B.

2. *PCB Transformer fires in or near commercial buildings with risk reduction measures in place.* In order to evaluate the effectiveness of risk reduction measures in reducing exposures to PCBs and oxidation products, EPA has assessed expected exposures to these materials from a PCB Transformer fire in a commercial building, assuming the implementation of certain risk reduction measures.

In the Proposed Rule, EPA evaluated the expected exposures associated with a PCB Transformer fire in or near a commercial building with certain risk reduction measures in place. The risk reduction measures addressed in the Proposed Rule were transformer isolation from building ventilation equipment and ductwork, the control of potential water releases, the reporting of the fire to the National Response Center, the registration of the transformer with the responding fire department and the building owner, and the labeling of the exterior of the transformer location. EPA assumed that most PCB Transformers could be deenergized within 15 minutes of failure (without the installation of additional protection), and, for those transformers that EPA believed could not be deenergized completely, EPA proposed requiring additional electrical protection on the secondary side of the transformers.

Thus, in evaluating the effectiveness of transformer isolation, registration, labeling, and reporting of PCB Transformers fires, EPA assumed that all but a subset of PCB Transformers could be easily deenergized within 15 minutes of failure. For that subset, EPA required increased electrical protection on the secondary side of the transformers.

Comments on the Proposed Rule, however, indicate that: (1) Many PCB Transformers in commercial buildings are not capable of being easily deenergized after failures; (2) PCB Transformers in commercial buildings could be equipped with enhanced electrical protection which would reduce the probability of transformer failures from electrical faults; and, (3) while the proposed additional electrical protective measures (for a subset of the PCB Transformer population) would have avoided some failures in this equipment, failures in these transformers from other common mechanisms of failure could still occur.

Many comments on the Proposed Rule suggested that EPA increase its emphasis on the reduction of risk through the prevention of PCB Transformer fault-related failures and decrease its emphasis on the use of isolation measures to reduce structure and environmental contamination. These comments indicate that while transformer isolation can reduce exposures in the event of a PCB Transformer fire (by reducing widespread structure and environmental contamination), if a transformer cannot be easily deenergized after failure occurs, then substantial quantities of smoke and soot can be generated. The longer a transformer remains energized, the less likely it is that isolation will be an effective risk reduction measure.

EPA agrees that measures designed to prevent PCB Transformer failures are preferred over measures designed to contain and control already released and/or formed incomplete combustion products. Further, EPA's evaluation of mechanisms of transformer failure, commercial installation characteristics and operations, and the current levels of electrical protection in commercial PCB Transformer installations indicates that many of these PCB Transformers could be better protected electrically to reduce the frequency of fault-related failures and fires. Thus, in this final rule, EPA has focused on increased electrical protection rather than transformer isolation as the preferred measure for reducing the frequency of serious PCB Transformer fires.

Since electrical protective devices are subject to malfunction, EPA has also assessed expected exposures to PCBs and oxidation products in the event that transformer failure occurs despite the presence of increased electrical protection; but, has assumed that measures are taken to control water releases; that the incident is reported to the National Response Center; and, that the transformer is registered with both the responding fire department and the building owner. In addition, EPA assumes that the exterior of the transformer location is marked with PCB identification labels.

a. *Frequency of serious PCB Transformer fires with risk reduction measures in place.* EPA has used data from transformer and electrical equipment reliability studies to evaluate the probability of electrical protective device malfunction; and thereby, to estimate the effectiveness of electrical protection in avoiding serious PCB Transformer fires. For purposes of this rule, EPA defines electrical protective device malfunction as the failure of a device to operate when called upon to operate. It is difficult to develop a precise estimate of the expected rate of failure of specific combinations of electrical protective devices such as those which appear in this final rule. However, based upon available information on the failure rate of circuit breakers, current-limiting fuses, and heat and fluid level sensors, EPA expects the failure rate to be low, below 3 percent. Further, according to data on the failure modes of circuit breakers, only 9 percent of circuit breaker failures are failures to operate when called upon to open. The majority of circuit breaker failures are characterized by the operation of a circuit breaker when it should not have operated or opened. That is, circuit breaker failure typically involves deenergization without cause rather than failure to deenergize when called upon to open.

EPA has assumed that enhanced electrical protective systems will function to avoid between 97 and 99 percent of the serious PCB Transformer fires (about 43 fires) which would be expected to occur in commercial buildings over the remaining useful life of this equipment (this assumes that electrical protection can be implemented immediately). Electrical protection for commercial transformers phased in over a 5-year period is expected to avoid about 36 serious PCB Transformer fires. EPA expects that one to two serious PCB Transformer fires will occur over the remaining useful life of this equipment as a result of the failure of the enhanced electrical protective systems to operate.

b. *Exposure assessment.* The potential for the volatilization of large amounts of PCBs, and the formation of products of incomplete combustion from PCB Transformer fires is reduced if efforts are made to control combustion conditions in the transformer location. EPA believes that the removal of stored combustibles from a PCB Transformer location will reduce the likelihood of a fire occurring external to a PCB Transformer resulting in transformer failure. More importantly, the installation of enhanced electrical protection on commercial PCB Transformers is expected to reduce substantially the frequency of PCB Transformer fault-related failures in this equipment.

Comparing the circumstances surrounding well-documented PCB Transformer fires indicates that the sooner a faulted transformer is deenergized, the less likely it is that significant quantities of PCDFs and PCDDs will be formed. Experience from actual incidents indicates that EPA is correct in its belief that there are practical means available for successfully controlling combustion conditions in PCB Transformer locations. Certain measures, once implemented, would reduce the likelihood of fault-related failures and sustained high temperatures. These measures are expected to reduce significantly the fire-related risks posed by the continued use of these transformers.

Analyses of the levels of electrical protection currently provided for many commercial PCB Transformer locations indicate that these PCB Transformers could be better protected electrically to reduce the frequency of transformer failures from electrical faults. Comments on the Proposed Rule suggest that many of the well-documented PCB Transformer fires could have been avoided if transformer failure had been avoided through the use of enhanced electrical protection, such as current-limiting devices, sensors, and disconnect equipment.

Enhanced electrical protection, that is, the installation of overcurrent protection on transformers which lack such protection, and sensors and disconnect equipment to avoid sustained low current faults will reduce the likelihood of PCB Transformer fault-related failures. These systems are intended to actuate complete deenergization of transformers when abnormal conditions are sensed. While abnormal conditions are expected to be typically caused by sustained high and low current faults, the low current fault protection system

in particular would also function to avoid sustained high temperatures and changes in internal pressure from other causes as well. Finally, the final rule requires the removal of stored combustibles near PCB Transformers to reduce the likelihood of a PCB Transformer fire occurring from an external source of combustion.

If transformer failure and fire occurs despite the presence of the required electrical protection system and the removal of stored combustibles, the nature and magnitude exposures to PCBs and oxidation products by building occupants, firefighters, cleanup crews, and members of the general population could be equivalent to that described above, in Unit IV.C.1.c. However, the presence of disconnect equipment on site (which can be manually operated) for many PCB Transformers will provide for more rapid deenergization than is currently the case.

Registration, labeling, containment of potential water releases, and notification of the National Response Center would also be expected to reduce exposures to these populations in the event that transformer failure occurred despite the presence of increased electrical protection. Advance knowledge on the part of fire departments and building owners about the contents of a transformer and the notification of EPA in the event of a fire would be expected to reduce exposures to building occupants, in addition to reducing exposures to firefighters and other emergency response personnel. EPA expects that firefighters, aware of the nature of risks posed by a transformer fire, would be more likely to wear respiratory protection and protective clothing and would be more protective of bystanders and onlookers. Building owners who are aware that a transformer fire involves a PCB Transformer would be less likely to dispatch unprotected cleanup crews to the site, and would be less likely to allow building occupants to return unprotected to an involved building.

If PCB Transformer owners take measures as soon as practically and safely possible to contain any spilled PCBs and or PCDFs/PCDDs (released as a result of a fire-related incident) and water potentially contaminated with PCBs, PCDFs, and PCDDs, EPA expects that potential releases to waterways will be substantially reduced. The blocking of floor drains in a transformer location as soon as practically and safely possible, and the containment of all water associated with the incident (including cleanup water) should reduce the potential for the release of PCBs and untreated water into surface waters. Finally, by requiring the reporting of all PCB Transformer fire-related incidents to the National Response Center (NRC), EPA will be able to monitor cleanup efforts and the treatment and discharge of water, to insure that safe levels are not exceeded.

3. *Industrial PCB Transformer fires*—a. *Nature of installations and operations.* PCB Transformers used in industrial applications may be located indoors or outdoors, depending upon variables such as the service being supplied by the unit, the size of the unit, and the geographic location of the facility. According to comments submitted in response to the Proposed Rule, many (but not all) industrial transformers are located in production areas, near motors, machinery, and other equipment. These transformers are typically unvaulted and readily visible to facility workers during the routine conduct of their work. This is in contrast to the typical commercial PCB Transformer installation, which is generally inaccessible and less visible to employees.

Comments on the Proposed Rule indicate that in many industrial facilities, the performance of transformers in monitored during production shifts by engineers, electricians, or other similarly trained personnel. Further, comments indicate that industrial transformer owners reportedly utilize visual inspections, monitoring, and electrical testing of transformer function on a routine basis. Electrical equipment failure and fire in an industrial facility means loss of production time, which can have severe economic impacts. Thus, industrial transformer owners have this incentive to provide for transformer maintenance and testing on a routine basis to avoid fault-related failures and for providing disconnect equipment on site to provide for rapid deenergization in the event of a fault-related failure.

EPA's analysis indicates that there are approximately 26,700 PCB Transformers used in or near industrial facilities. Of these 26,700 PCB Transformers, EPA estimates that 98 percent are radial PCB Transformers, and, that 2 percent are network PCB Transformers. Of the estimated 7,600 480 volt network PCB Transformers in use, EPA estimates that only 3 percent (or 179 PCB Transformers) are used in or near industrial facilities.

b. *Frequency of PCB Transformer fires.* EPA estimates that 6 out of the expected 50 serious PCB Transformer fires which will occur over the remaining useful life of PCB Transformers will occur in or near industrial facilities. Four of these fires are expected to occur after October 1, 1990. This estimate was derived by considering available information on the number and type of PCB Transformers used in or near industrial facilities and available information on the probability of PCB Transformer fault-related failure for each type of transformer installation.

EPA has very little data on PCB Transformer fires which have actually occurred in industrial facilities. Limited data were submitted by the American Paper Institute (API) regarding two PCB Transformer fire-related incidents in forest industry facilities. According to the results of an API survey, during an 8.5 year period, between January 1976 and March 1984, there were two PCB Transformer fires (which involved smoke spread into buildings) out of an estimated 3,509 PCB Transformers used by the surveyed companies. API indicates that none of these incidents approached "Binghamton" proportions, and could be classified as moderate incidents on the spectrum of PCB Transformers fires.

c. *Exposure assessment.* EPA has little data on the circumstances surrounding actual PCB Transformer fires in industrial facilities. However, EPA has used environmentally conservative yet reasonable assumptions in evaluating likely human and environmental exposures from a PCB Transformer fire in a typical industrial facility. EPA recognizes that PCB Transformer fires may occur in atypical industrial facilities, where the exposures may be somewhat greater than those described here. However, based on comments on the Proposed Rule, EPA believes that there are fundamental differences between the potential for human exposures to PCBs, PCDFs and PCDDs from the use of PCB Transformers in industrial facilities versus their use in commercial buildings.

EPA assumes that a PCB Transformer fire in an industrial facility would involve an indoor PCB Transformer, sustained high temperatures in the transformer location, the rupture of the transformer, the release of PCBs, the volatilization of PCBs, and the distribution of PCBs and oxidation products into the interior of an industrial facility, into the ambient air, and into waterways. EPA assumes that smoke and soot containing PCBs and oxidation products are spread throughout the interior of an industrial facility during peak use hours, worker evacuation occurs during the early stages of the fire, an on-site fire brigade makes the initial

response, and, that reoccupancy of the facility by workers occurs after the removal of visible traces of soot.

EPA assumes that a PCB Transformer fire in an industrial facility will involve the rupture of the transformer and sustained high temperatures in the transformer location for up to 0.5 hour (in contrast to a 4-hour burn time assumed for commercial buildings). EPA has assumed this reduced burn time because comments on the Proposed Rule and available data indicate that transformers used in or near industrial facilities are more likely to be located in higher visibility areas, where malfunctions would be more rapidly identified. This is in contrast to the typical commercial PCB Transformer installation, which is not readily accessible or visible to employees. Further, EPA has assumed that once a malfunction has been identified, the transformer can be more easily deenergized in industrial facilities by on-site trained personnel. EPA made this assumption because comments indicate that industrial use PCB Transformers are typically equipped with primary disconnect equipment on site. Further, comments indicate that many industrial facilities employ electrical engineers or technicians during duty hours to monitor electrical equipment operations. This too is in contrast to the typical commercial installation, which is not equipped with primary disconnect equipment on site. Further, commercial PCB Transformer operations are not typically monitored.

An industrial PCB Transformer fire which occurs during a period of peak use may expose hundreds of workers to smoke and soot from the fire during the evacuation of the facility. However, EPA expects that worker evacuation times may be quicker than those assumed for commercial buildings. First, industrial facilities are not typically high-rise buildings. Second, there are typically fewer people to be evacuated. Finally, industrial workers would be expected to be more educated about the potential risks posed by any type of fire in an industrial location, and about proper evacuation procedures. EPA has assumed that exposures by workers to residual levels of PCBs and oxidation products would, however, continue following reoccupancy. EPA's estimate of potential exposures to industrial workers (assuming a 0.5 hour burn time and cleanup to visible traces of soot, as well as other assumptions detailed in support document 1 in Unit X.B.) is 2,888 pg/kg/day PCBs, 6.7 pg/kg/day 2,3,7,8-TCDF, 3.8 pg/kg/day other TCDFs, 22 pg/kg/day other PCDFs, 0.36 pg/kg/day 2,3,7,8-TCDD, 0.06 pg/kg/day other TCDDs, and 3.1 pg/kg/day other PCDDs.

Many industrial facilities have fire brigades on site to handle initial emergency response situations. According to comments on the Proposed Rule, these fire brigades are typically well-trained and well-equipped to handle industrial accidents and fires, including PCB Transformer fires. A PCB Transformer located in an industrial facility would likely be less confined than in a commercial building, and, therefore, would provide easier access to firefighters than a commercial location. Firefighting time may be reduced by the accessibility of the transformer, the capability to deenergize the equipment on site, and the level of site-specific training of industrial fire brigades.

EPA assumes that a 10-man fire brigade would respond to a PCB Transformer fire in an industrial facility, and that brigade members would be more likely to wear appropriate protective clothing and respirators. (Other assumptions are detailed in support document 1 in Unit X.B.) EPA's estimate of potential exposures to these firefighters is 45 pg/kg/day PCBs, 0.11 pg/kg/day 2,3,7,8-TCDF, 0.068 pg/kg/day other TCDFs, 0.37 pg/kg/day other PCDFs, 0.006 pg/kg/day 2,3,7,8-TCDD, 0.001 pg/kg/day other TCDDs, and 0.05 pg/kg/day other PCDDs. Additional exposures following the fire may, however, occur during the cleanup of turnout gear and firefighting equipment. EPA expects that industrial fire brigade personnel would take appropriate precautions to limit further exposures.

If water is used to extinguish the fire, or if water pipes rupture due to high temperatures, water runoff could ultimately result in contamination of surface waters and drinking water supplies. Industrial facilities typically have many floor drains, which are readily accessible pathways for the release of PCBs and oxidation products to waterways.

Atmospheric transport of PCBs and oxidation products in a metropolitan area could also be responsible for exposing many people who live or work in the vicinity of an industrial plant to PCBs and oxidation products. Higher ventilation rates in industrial facilities may lead to more rapid distribution of PCBs and oxidation products into the ambient air than would be the case for a fire in a commercial building. However, the shorter burn time for the fire would decrease the total amount of PCBs volatilized and incomplete combustion products formed and released.

Cleanup following an industrial PCB Transformer fire could be as time-consuming as an indoor commercial PCB Transformer fire. The cleaning and decontamination of valuable machinery and equipment would be very time-consuming. The cleanup of the structure itself may be less involved than for a high-rise office building. Industrial facilities are more open and building surfaces are generally more accessible to cleaning and decontamination. In addition, higher ventilation rates in industrial facilities would encourage the distribution of smoke and soot into the ambient air outside the facility. Further, the ability to deenergize the transformer from an on-site location would reduce both the amount of PCBs volatilized and the amount of incomplete combustion products formed and released.

In facilities which operate around the clock (24 hours per day operations), electrical equipment operations would be expected to be monitored during the entire operating time. However, smaller industrial facilities may operate only 8 hours per day, leaving electrical equipment operations unmonitored for 16 hours per day.

A PCB Transformer fire in an industrial facility after normal hours of operation could, therefore, burn longer than the assumed 0.5 hour. Electrical equipment operations are not typically monitored by operating personnel during off-shift hours. While occasional security patrols would inspect the area, a PCG Transformer fire could progress in much the same manner as a PCB Transformer fire in a commercial building. Deenergization of the transformer, even when on-site disconnect equipment is available, would take longer in these cases, because personnel trained in disconnecting the equipment would most likely not be on site during off-shift hours.

An industrial PCB Transformer fire during off-hours would be more likely to expose volunteer and municipal salaried firefighters than fires during normal operating hours, when company fire brigades would have primary responsibility for initial emergency response. Exposures to members of the general population in the vicinity of the fire would be expected to be higher for fires during off-hours, as would exposures to cleanup crews. Exposures to workers, however, would only be expected to occur following reoccupancy of the building, from contact with residual materials on building surfaces and in the air.

4. *Outdoor fires involving PCB Transformers*—a. *Nature of*

installations and operations. PCB Transformers which are used in outdoor applications may be located on the tops of utility poles, pad-mounted in urban, metropolitan, and rural areas, or in electric utility substations. The operation of these transformers is not typically monitored by on-site personnel. Electric utility substation PCB Transformers are typically fenced off to restrict access to authorized personnel, and their operation may be monitored by personnel in control rooms at utility transmission stations and/or generating stations.

EPA estimates that there are about 17,000 PCB Transformers used in outdoor applications. EPA expects that the majority of these transformers are in radial installations.

b. *Frequency of PCB Transformer fires.* Based on estimates of the frequency of "serious" PCB Transformer fires in radial transformer installations, and the estimated number of PCB Transformers located in outdoor electrical substations, EPA estimates that outdoor PCB Transformer fires with smoke generation will occur at a frequency of about 0.0014 percent per year, or, about 3 incidents over the remaining useful life of this equipment.

c. *Exposure assessment.* Fires involving PCB Transformers located in outdoor locations, away from commercial buildings, are expected to result in lower human exposures to PCBs and oxidation products in fire situations than transformer fires in or near buildings. First, because combustion conditions in an outdoor PCB Transformer fire are not expected to be as conducive to the volatilization of spilled PCBs and the formation of large quantities of PCDFs, 2,3,7,8-TCDF, PCDDs, or 2,3,7,8-TCDD as would be the case with transformers located in machinery rooms or vaults. Generally, combustible materials are not present near outdoor PCB Transformers and some of the heat generated from arcing or fires would be expected to dissipate in the environment.

Further, outdoor utility substations in particular are generally fenced to restrict access to authorized personnel only, thus limiting the number of people at immediate risk of exposure in the event of a fire. In contrast to the smoke and soot produced from transformer fires in or near buildings, any smoke or soot produced in an outdoor transformer fire, away from commercial buildings, is expected to be more widely dispersed in the environment. EPA has developed a model for the release of PCBs and the formation of PCDFs and/or PCDDs from an outdoor PCB Transformer fire. EPA has estimated the expected exposures from releases to air from an outdoor fire and has found that exposures decrease with increasing distance, and that at a distance of 200 meters from a fire, inhalation exposures from a typical fire would be expected to be relatively low.

While there is a potential that emergency response personnel and cleanup crews responding to such fires may be exposed to some PCDFs, 2,3,7,8-TCDF, PCDDs, and 2,3,7,8-TCDD, exposures to PCBs would be more likely to occur. Firefighting equipment and protective clothing may become contaminated with PCBs, and may result in exposures to firefighters during equipment cleanup and maintenance.

Fires involving outdoor PCB Transformers near commercial buildings (i.e., within 30 meters of commercial buildings) could result in more people being exposed to higher levels of PCBs and any oxidation products produced. For this reason, EPA has included outdoor PCB Transformers located within 30 meters of commercial buildings within the definition of PCB Transformers located in or near commercial buildings.

5. *Fires involving transformers containing less than 500 ppm PCBs*—a. *Nature of installations and operations.* EPA estimates that there are over 20 million mineral oil transformers in the electric utility industry and about 5 million in all other applications. These mineral oil transformers may contain low levels of PCBs (less than 500 ppm PCBs) as a result of contamination from past servicing activities. EPA estimates that approximately 18 million of these mineral oil transformers are used in nonsubstation applications, in or near commercial buildings, industrial facilities and outdoors on utility poles. These transformers are installed in both radial and network configurations.

b. *Exposure assessment.* PCB Transformers typically contain 65 percent PCBs, or about 1,300 times the maximum amount of PCBs present in PCB Contaminated transformers (and 13,000 times the amount of PCBs present in transformers containing 50 ppm PCBs). EPA has assessed the potential for exposures to PCBs, PCDFs, 2,3,7,8-TCDF, PCDDs, 2,3,7,8-TCDD from fires involving PCB-Contaminated equipment by assuming that the transformer present in the Binghamton State Office Building was a PCB-Contaminated transformer, and, by assuming reasonable worst-case values for other parameters. Based on the results of EPA's study of the incomplete combustion of PCB-Contaminated transformer fluids, EPA has assumed that the formation of PCDFs and PCDDs in a PCB-Contaminated transformer would be linearly related to the amount of PCBs present in the transformer. Given this situation, PCB, PCDF, 2,3,7,8-TCDF, PCDD, and 2,3,7,8-TCDD levels in the soot from such a fire would be expected to be reduced by a factor of 1,300, compared to levels actually measured in Binghamton. Similarly, human exposures to these materials are assumed to be reduced by the same factor.

6. *Conclusions—Risks posed by fires involving transformers that contain PCBs.* Toxicity and exposure are the two basic components of risk. In earlier units of this preamble, EPA evaluated the toxicity of PCBs, PCDFs, 2,3,7,8-TCDF, PCDDs, and 2,3,7,8-TCDD and presented assessments of the potential for human exposure to these materials from transformer fires. EPA concluded that both 2,3,7,8-TCDD and PCBs are probable human carcinogens, based upon studies in laboratory animals. Further, since 2,3,7,8-TCDF is structurally and chemically similar to 2,3,7,8-TCDD, EPA has concluded that it is prudent to assume that an oncogenic potential exists in 2,3,7,8-TCDF and perhaps in other PCDD and PCDF congeners as well.

EPA has determined that relatively large quantities of these compounds can be formed and released during a PCB Transformer fire, particularly a fire which occurs in or near a commercial building. Sustained high temperatures in these transformer locations are more likely than in industrial or outdoor locations because of the nature of commercial PCB Transformer installations. Many commercial transformers are network transformers (which are the least well protected distribution (transformers). Further, malfunctions in commerical PCB Transformers are more likely to progress into more serious incidents because these transformers are typically located in low visibility areas, and because these locations typically lack on-site electrical technicians and necessary disconnect equipment to insure complete deenergization in the event of a sustained fault or failure.

Finally, there are many routes through which commercial building occupants, emergency response personnel, cleanup crews, onlookers, and the general public can be exposed to these materials, once generated. Building evacuation times for large commercial buildings can be relatively long, reoccupancy may occur before adequate cleanup has been completed, emergency response personnel may lack necessary protective equipment, cleanup crews may be dispatched without proper protection,

onlookers may be unaware of the risks posed, and members of the general population in the vicinity of the fire may incur inhalation exposures and dermal exposures during the fire, and for extended periods after the fire from contamination of waterways, drinking water supplies and outdoor materials with PCBs, PCDFs, and PCDDs.

EPA has concluded that fires involving PCB Transformers in or near commercial buildings can pose significant risks of human and environmental exposures to PCBs and oxidation products. EPA believes that 44 of the estimated 50 structure-related serious incidents over the remaining useful life of PCBs Transformers will occur in or near these buildings. Further, based on its analysis of the relative probabilities of PCB Transformer failures and fires, EPA has concluded that many of these fires will involve 480 volt network PCB Transformers.

Given that a single serious PCB Transformer fire in or near a commercial building can potentially expose thousands of people to PCBs and oxidation products in soot in air, water, or on surfaces, EPA has concluded that PCB Transformer fires in or near commercial buildings can pose significant risks to human health and the environment. However, EPA also believes that reducing the potential for the release of PCBs and the potential for the formation and release of PCB oxidation products from PCB Transformers substantially reduce the fire-related risks posed by the continued use of this equipment.

EPA has determined that sustained high temperatures in industrial PCB Transformer locations and in outdoor substation PCB Transformers are less likely than for commercial PCB Transformers because of the nature of these installations. Many of these transformers are radial transformers (which are typically better protected against sustained faults and failures than network transformers). Further, malfunctions in industrial PCB Transformers which go undetected by existing electrical protection are less likely to progress into more serious incidents because of the location of these transformers in higher visibility areas, and because industrial facilities reportedly have on-site electrical engineers and technicians and necessary disconnect equipment to provide for complete deenergization. Finally, the suggested higher frequency of maintenance, inspection, and testing of industrial transformers and utility substation transformers would further decrease the likelihood of fire-related failures in this equipment.

EPA estimates that up to 6 out of the expected 50 serious PCB Transformer fires over the remaining useful life of PCB Transformers will occur in or near industrial facilities, and that less than 3 PCB Transformer fires with smoke distribution will occur in outdoor PCB Transformer locations.

While exposures to workers, emergency response personnel, cleanup crews and the general population may occur from an industrial PCB Transformer fire, the magnitude of exposure associated with a PCB Transformer fire in a typical industrial facility would be anticipated to be greatly reduced (when compared to a commercial PCB Transformer fire) as a result of several factors. First, EPA expects that the duration of industrial PCB Transformer fire-related incidents would be significantly less than the duration of commercial PCB Transformer fires, because of the presence of trained personnel and disconnect equipment on site. The reduced duration would reduce exposures to all populations potentially at risk of exposures. Second, there are generally fewer workers present in industrial facilities than in commercial buildings, and worker evacuation times would be expected to be less for industrial facilities than for commercial buildings. This is because of the single-story nature of many industrial facilities, and the expected increased level of education of industrial workers about workplace hazards. Third, according to comments on the Proposed Rule, industrial facilities often utilize well-trained, well-equipped fire brigades for initial emergency response, rather than local volunteer or salaried municipal firefighters. Emergency response personnel as a group, then, would be expected to incur lower exposures in responding to industrial PCB Transformer fires than would be the case for commercial PCB Transformer fires.

A comparison of estimated exposures from a commercial PCB Transformer fire to an industrial PCB Transformer fire indicates that exposures by building occupants to PCRs, 2,3,7,8-TCDF, other TCDFs, other PCDFs, 2,3,7,8-TCDD, other TCDDs, and other PCDDs could be as much as an order of magnitude higher for commercial building fires than for industrial building fires.

EPA recognizes that exposures from PCB Transformer fires in atypical industrial facilities could be higher than described earlier. However, EPA's estimate of the frequency of industrial PCB Transformer fires is 6 fires over the remaining useful life of industrial PCB Transformers. Even if EPA were to assume that all 6 of these fires resulted in individual exposures of the same order of magnitude suggested for commercial PCB Transformer fires, there are fewer people at risk of these exposures in industrial locations when compared to commercial buildings.

One could consider the overall fire-related risk posed by the continued use of PCB Transformers and compare the different frequencies of occurrence of fires in commercial buildings versus industrial facilities (assuming as a worst-case, that the risks posed by commercial PCB Transformer fires and industrial PCB Transformer fires are equivalent). This analysis indicates that 88 percent of the fire-related risk posed by the continued use of PCB Transformers (in locations in or near buildings) are associated with their use in or near commercial buildings and 12 percent of the total risks are associated with their use in industrial locations.

EPA has further determined that outdoor PCB Transformer fires, (away from commercial buildings) and fires involving PCB-Contaminated transformers pose lower risks than PCB Transformer fires in or near commercial buildings. While EPA expects that outdoor PCB Transformer fires may result in the release of PCBs, EPA expects that outdoor PCB Transformer fires would be less likely to result in the volatilization of large amounts of PCBs and less likely to lead to the formation and release of large amounts of PCDFs and PCDDs. Further, PCBs and oxidation products released from outdoor PCB Transformer fires would be expected to be more widely dispersed in the environment. Although PCBs may be released and oxidation products may be formed during the PCB-Contaminated transformer fires, the amounts of these materials formed and released are expected to be significantly reduced compared to the amounts formed and released from PCB Transformers.

IV. Benefits of PCB-Transformers and the Availability of Substitutes

As part of the unreasonable risk determination, EPA must consider both the benefits of PCBs and the availability of substitute materials. The unreasonable risk determination requires EPA to balance the risks posed by the use of PCBs against the availability of adequate substitute materials and the costs associated with regulatory control measures.

A. Benefits of PCBs

PCBs were originally used as dielectric fluid in electrical transformers primarily because of their fire-resistance properties. Generally, PCB Transformers were placed in locations where concerns for fire safety were paramount. Other dielectric fluids, such as mineral oil, have superior electrical properties to PCBs, but their fire resistance properties are not as good as PCBs.

Monsanto Company has had in progress for over a year a study assessing and comparing fire risks of PCBs and of mineral oil. The Monsanto-sponsored study indicates that the average frequency of a fire spreading beyond the transformer room is 300 times greater for a mineral oil transformer than for a PCB Transformer containing 50 percent PCBs and 50 percent chlorinated benzenes. The report further indicates that there is a significant decrease in the risk of fatalities when a mineral oil transformer is replaced by a PCB Transformer containing 50 percent PCBs and 50 percent chlorinated benzenes.

B. Substitute Transformers

In its August 1982 PCB Electrical Use Rule, EPA concluded that adequate substitutes exist for PCBs in indoor transformer locations. There are two basic categories of transformers, fluid-filled and dry. There are six general types of fluid-filled substitutes for PCBs in transformers: Silicones; high-temperature hydrocarbon (HTH); chlorinated hydrocarbons; non-PCB askarels; fluorocarbons; and mineral oil. EPA summarized available data on these substitute fluids in the Proposed Rule and concluded that adequate substitutes exist for PCBs for indoor transformer locations, including silicone-filled transformers and dry transformers.

As discussed earlier, EPA-sponsored studies indicate that PCDFs and PCDDs can be formed from the incomplete combustion of chlorinated benzenes. Similarly, an EPA-sponsored study indicates that PCDFs can be formed from the incomplete combustion of tetrachloroethylene (perchloroethylene).

The replacement of PCB dielectric fluid with substitute fluids which in fire situations may also lead to the formation of PCDFs and PCDDs should be carefully considered in light of the Agency's decision in this rule to place additional conditions and restrictions on the use of PCB Transformers. EPA's evaluation of the risks posed by the incomplete combustion of PCB dielectric fluid and the frequency of occurrence of PCB Transformer fires indicate that the fire-related risks posed by the use of a dielectric fluid which can be transformed into PCDFs and/or PCDDs can be significant. EPA will study this issue further and evaluate the need for additional EPA action.

C. Retrofilling PCB Transformers

1. *Introduction.* Two general types of substitutes for PCBs in transformers stand out as the best retrofill candidates. These fluids are silicones and high temperature hydrocarbons (HTH). The principal questions to be considered are the cost of retrofill versus the value of the remaining life of the transformer and the qualification of the fluid as "less flammable" for insurance purposes. A related question is the potential for the formation of toxic products of incomplete combustion from the retrofill fluid and remaining residual concentration of PCBs. Other fluids, such as chlorinated hydrocarbons, fluorocarbon, and mineral oil, are used in new transformers but are inappropriate for retrofilling because the design of the PCB Transformers does not fit the properties of the fluids.

Experience with retrofilling to date indicates that reclassification of askarel PCB Transformers to non PCB status is often not cost-effective. Reclassification to PCB Contaminated status, however, has been accomplished in a cost-effective manner for a number of askarel PCB Transformer units. Testimony at the public hearing, however, indicates that retrofill technology continues to evolve, and, that cost-effective reclassification of askarel PCB Transformers to non PCB status may be on the horizon.

2. *Silicones.* There are six silicone fluids sold by six different companies for use as dielectric fluid. Four of the six fluids have been approved by Factory Mutual Research Corporation (FMRC) as "less flammable" fluids. Silicones have a higher viscosity than PCBs and are therefore not quite comparable to PCBs as a coolant. For this reason, it is possible that transformers retrofilled with silicone would have to be derated. According to one silicone fluid manufacturer, if the transformer were fully loaded, a derating not exceeding 5 percent could be necessary. (Derating means lowering the maximum level of electrical load that the transformer can handle.)

It has been mentioned in the literature that a leaking problem could be created because silicone fluids are not compatible with silicone rubber gaskets and the coefficient of expansion of silicone fluids is 50 percent greater than that of PCBs. In actual practice, however, the silicone gaskets are replaced during retrofilling. (Further, even though the coefficient of expansion is greater than that for PCBs, the greater solubility of the filler gas (nitrogen) in silicone eliminates the expected increase in pressure.)

3. *HTHs.* There are six HTH fluids sold by five companies that may be used as transformer dielectric fluids. There are also two products sold by two other companies that when mixed with other products may be used as HTH transformer fluids. Three of the six fluids are paraffinic based oils and three are esters. As mentioned earlier, the three esters are more specialized for use in railroad transformers.

The other three fluids are more viscous than the silicones at lower temperatures, but thin more rapidly at higher temperatures. According to an HTH manufacturer, this property allows the transformers to be retrofilled with HTH without any derating. At lower normal load temperatures, however, the transformers do run hotter. These fluids are completely compatible with the materials that make up PCB Transformers, and they are soluble in PCBs. Two of these fluids are approved by FMRC as "less flammable transformer fluids," and the fire point of the third is over 300 °C.

Because the paraffinic HTHs have high convective and radiant heat release rates, the owner's insurance company may recommend more stringent installation requirements.

V. Benefits and Costs of Regulatory Options

A. Introduction

This unit presents an analysis of the effectiveness and economic impact of various regulatory options for reducing the fire-related risks posed by the continued use of PCB Transformers. For a full analysis of the expected economic impacts see the regulatory analysis for this final rule, support document 7 in Unit X.B. The analysis considers separately, the effectiveness and costs of five major regulatory control options for four categories of PCB Transformers: (1) PCB Transformers in or near commercial buildings, (2) PCB Transformers in or near industrial locations, (3) PCB Transformers in outdoor electrical substations, and (4) PCB Contaminated Transformers. The regulatory control measures considered are: (1) Placing no additional conditions or restrictions on the use of PCB Transformers; (2) requiring the registration and additional labeling of PCB Transformers, the removal of stored combustibles, the containment of potential water releases and the

reporting of PCB Transformer fires to the National Response Center; (3) requiring the isolation of PCB Transformers to reduce widespread structure and environmental contamination with PCBs and products of incomplete combustion; (4) requiring the installation of increased electrical protection on PCB Transformers to avoid PCB Transformer failures; and, (5) requiring the removal or retrofill of PCB Transformers. The analysis includes a consideration of the expected savings in cleanup costs as a result of implementing these measures.

Given the well-established toxicity of PCBs, and the presence of materials that are much more toxic than PCBs in the soot from a fire involving a PCB Transformer, owners of PCB Transformers involved in PCB Transformer fires have invested more than $20 million dollars each to ensure the safety of persons returning to occupy these buildings. These costs, for sampling, cleanup and removal of contaminated materials containing PCBs, PCDFs, and PCDDs can be factored into the economic analysis of the benefits of the continued use of PCB Transformers. Earlier analyses of the benefits of the continued use of these transformers, completed in support of the August 1982 PCB Electrical Use Rule, did not take into consideration the costs of cleanup in the event of PCB Transformer fires.

B. Summary of Benefits and Costs

The removal or retrofill of PCB Transformers is both the most effective, and, the most costly measure for reducing the frequency of serious PCB Transformer fires. This measure, once implemented, gives the greatest assurance that PCB Transformer fires will be avoided, regardless of initiating cause. However, it is also the measure which, as a practical matter, would require the longest time for implementation. Concerns such as the availability of PCB disposal capacity, transformer manufacturing capacity, and avoiding the disruption of electrical service make phaseout and/or retrofill more difficult to implement quickly than other risk reduction measures. Based upon EPA's analysis of the frequency of PCB Transformer fires, it is likely that serious PCB Transformer fires will occur in the interim, between the date of promulgation of any phaseout requirement and the actual date of the removal of PCB Transformers from use.

Providing enhanced electrical protection is anticipated to be very effective in avoiding serious PCB Transformer fires, through the prevention of PCB Transformer fault-related failures. Studies of the causes of PCB Transformer failures and fires and the level of protection currently provided indicate that many PCB Transformers could be better protected to avoid fires caused by more common mechanisms of failure, electrical faults. The effectiveness of increased electrical protection is expected to approach that of phaseout/retrofill, although EPA recognizes that electrical protective devices are subject to some (low) rate of malfunction, and, that PCB Transformer fires can also result from less common mechanisms of failure. Requiring a certain level of redundancy in the type of sensors used and the placement of sensors provide increased assurance of a higher level of effectiveness. Further, as a practical matter, this control measure could be implemented more quickly than phaseout/retrofill, because availability of PCB disposal capacity and transformer manufacturing capacity are not primary concerns. Further, this measure would be less disruptive to electrical service than phaseout/retrofill.

Increased electrical protection can be costly, however, compared to other risk reduction measures (other than phaseout/retrofill). Further, while electrical protection systems are expected to have a high degree of reliability in avoiding failures, there is the potential for false outages. These are circumstances in which a transformer is mistakenly deenergized when a sustained fault condition does not in fact exist. While EPA acknowledges the potential economic impact of false outages, EPA has not attempted to quantify this impact.

The isolation of PCB Transformers is expected to be effective in avoiding serious PCB Transformer fires by avoiding widespread structure and environmental contamination. The effectiveness of isolation in actually avoiding more serious PCB Transformer fires depends, however, to a great degree on the capability of a failed transformer to be deenergized within 15 minutes of failure. Isolation is not expected to be very effective for transformers which cannot be easily deenergized after failure occurs. Isolation is expected to be effective in minimizing the distribution of PCBs and incomplete combustion products in circumstances where a transformer has the capability to be deenergized within 15 minutes of failure.

As was the case for the installation of increased electrical protection, isolation measures can be implemented more quickly than PCB Transformer phaseout/retrofill, because availability of PCB disposal capacity and transformer manufacturing capacity are not primary concerns. However, implementation of transformer isolation requirements would be, in general, more complex than providing enhanced electrical protection in a transformer installation. This is because the isolation of transformers would typically require negotiation between building owners and transformer owners for necessary structural changes to buildings. While transformer isolation is costly, it would be in many cases less expensive than either phaseout/retrofill or increased electrical protection.

The registration of PCB Transformers with building owners and fire departments, the labeling of the exterior of PCB Transformer locations, the containment of potential water releases, and the reporting of PCB Transformer fires to the NRC are measures which are expected to reduce exposures in the event of a serious PCB Transformer fire. However, these measures will not be effective in avoiding any of projected 50 serious building fires, or the estimated 3 outdoor PCB Transformer fires from occurring. The effectiveness of these risk reduction measures depends, to a large extent, on the implementation of voluntary measures based on knowledge about the contents of a transformer involved in a fire-related incident. These measures are the least costly control measures that EPA considered.

C. Regulatory Options and Economic Impacts

1. *PCB Transformers in or near commercial buildings*—a. *Summary table.* The following table (Table 1) summarizes the real costs, benefits, and net costs (after a consideration of savings in cleanup costs from avoided fires) of the major regulatory control measures considered for commercial PCB Transformers. For a full discussion of the assumptions made for this analysis, see support document 7 in Unit X.B.

TABLE 1.—COSTS AND BENEFITS OF CONTROL MEASURES FOR COMMERCIAL PCB TRANSFORMERS

Option	Real cost (millions)	Expected fires	Avoided fires	Net cost (millions)
No action	N/A	44	0	[1] $399
Labeling and registration	$7.3	44	[2] 0	7.3
Enhanced E. protection, 5-years	590	9	35	343
Removal:				
5-years	953	8	36	704
10-years	640	15	29	470
Removal of 480 network 5-years	168	19	25	[3] -4.7

TABLE 1.—COSTS AND BENEFITS OF CONTROL MEASURES FOR COMMERCIAL PCB TRANSFORMERS—Continued

Option	Real cost (millions)	Expected fires	Avoided fires	Net cost (millions)
Removal of 480 network & E protection of remaining (5-years)	628	9	35	390

[1] Fire-related cleanup expense over remaining useful life.
[2] Would be expected to reduce exposures.
[3] Avoided cleanup costs exceed real cost of measure.

b. *Take no additional action.* The first regulatory option that EPA considered for PCB Transformers located in or near commercial buildings was to take no further regulatory action at this time to restrict the use of these transformers. This would allow the continued use of PCBs in or near buildings such as office buildings, shopping centers, apartment buildings, and hospitals without additional restrictions above the requirements of the August 1982 PCB Electrical Use Rule. That rule authorized the continued use of transformers containing PCBs (that pose no exposure risk to human food or animal feed) for the remainder of their useful lives subject to certain recordkeeping and inspection requirements, based on the concentration of PCBs in the equipment.

There are no costs to transformer owners associated with EPA's allowing the continued use of these transformers, other than the potential future costs associated with cleanup and liability suits following fires involving this equipment. If the use of PCB Transformers in or near commercial buildings were authorized indefinitely, without additional restrictions, EPA expects that 44 additional incidents will occur over the remaining useful life of this equipment.

For purposes of this analysis, these 44 incidents would be expected to require cleanup efforts whose cost would approach $20 million each (1985 dollars) or an estimated $399 million over the remaining useful life of this equipment.

c. *Labeling and registration programs.* The registration of PCB Transformers located in or near commercial buildings with fire departments and building owners, in combination with the labeling of the exterior of transformer locations with PCB identification labels may be effective in reducing exposures to firemen, building occupants, and bystanders. Compared to the other regulatory alternatives under consideration (other than the alternative of taking no additional action), the cost of this option is relatively low. EPA believes that in addition to registration with fire departments, the labeling of the exterior of transformer locations is necessary to insure that emergency response personnel arriving at the scene of a fire know that the fire involves a transformer that contains PCBs. EPA expects that the costs of labeling the exterior of PCB Transformer locations will be about $76.00 per location. EPA estimates that the total cost of labeling the exterior of commercial PCB Transformer installations will be about $3.5 million.

The costs of registering commercial PCB Transformers are also expected to be minimal, since the location of all PCB Transformers should already be known by the owners of this equipment. The costs to transformer owners of forwarding this information to all building owners and to fire departments with primary jurisdiction is expected to be minimal, on the order of $50.00 per transformer. EPA estimates that total costs of this registration program for commercial PCB Transformers would be approximately $3.8 million. The total real costs of registration and labeling of commercial PCB Transformers would be on the order of $7 million.

While transformer registration and labeling programs would be expected to reduce human and environmental exposures to PCBs, and oxidation products, they will not reduce the frequency of serious PCB Transformer fires.

d. *Smoke control technologies.* Certain design techniques or changes in commercial PCB Transformer locations may be effective in reducing the likelihood of widespread structure and environmental contamination from a failed PCB Transformer. The effectiveness of transformer isolation as a control measure depends to a large extent, however, on the type of PCB Transformer installation and the ease of actuating deenergization.

Unlike the ventilation systems for other oil-filled transformers, the ventilation systems for PCB Transformers were not designed for the purpose of fire isolation but rather were designed only to keep the ambient temperature at or below 30° Centigrade (C). However, the removal or alteration of existing ventilation systems could result in higher operating temperatures which shorten transformer operating lives and may increase the likelihood of equipment failure.

Thus, the design of alternative ventilation or cooling systems may be necessary to reduce the potential for building contamination. Ventilation alternatives include air conditioners, redirected venting, and heat exchangers, or simply limiting the contamination potential of the existing system by reducing the ventilation cooling effectiveness.

The objective of isolation is to reduce the widespread contamination of structures and the environment by smoke and soot from a transformer fire. These techniques often include the modification of the ventilation system serving the transformer location and/or sealing cracks or openings which would permit smoke to escape freely into occupied areas and the environment. In the more serious transformer incidents, the presence of building ventilation systems, building ductwork, and openings in construction in transformer locations have been responsible for the dispersion of toxic contaminants into buildings.

While transformer isolation can reduce exposures in the event of a failure and fire involving a PCB Transformer (by reducing the spread of contaminants), if a transformer cannot be easily deenergized within 15 minutes after a sustained fault occurs, then substantial quantities of smoke and soot can be generated. The longer a transformer remains energized after a serious fault occurs, the less likely it is that isolation will be effective in reducing exposures to PCBs and incomplete combustion products.

Although specific design changes and costs of isolation techniques are dependent on the individual transformer location, EPA has developed some general cost estimates. A firm involved in survey and design projects for PCB Transformers estimates that in 85 to 90 percent of all cases where isolation is the desired alternative, the costs are about $8,000 per transformer location.

For purposes of the cost-effectiveness analysis, an average cost of $8,000 per location is assumed for all locations where some form of suitable transformer enclosure is already present. For nonenclosed transformers, an estimated cost of $15,000 is assumed for retrofit of an enclosure that provides for smoke containment.

In order to facilitate compliance monitoring efforts, EPA would require the development of written PCB Smoke Spread Reduction Plans (PCB–SSRPs). The development of PCB–SSRPs involves documenting measures taken to isolate PCB Transformers from building ventilation equipment, ductwork, and openings in construction. EPA expects that maintaining these records would create a minimal additional burden on PCB Transformer owners (above the burden created by requiring transformer isolation procedures).

The total real costs of isolation procedures for commercial PCB Transformers implemented over a 5-year period are $318 million. Avoidance of cleanup costs through transformer isolation depends to a great extent on the ability to deenergize a transformer rapidly. EPA has limited data on the number of commercial transformers which can be rapidly deenergized (i.e., which currently have the capability to be deenergized within 15 minutes of a sustained fault); these transformers would be the group most likely to derive benefits from isolation in the event of PCB Transformer failure. Available data suggest that most commercial PCB Transformers are not capable of being rapidly deenergized in the event of a sustained fault. This severely reduces the effectiveness of PCB Transformer isolation alone, without increased electrical protection, as a mechanism for avoiding serious PCB Transformer fires in or near commercial buildings.

e. *Increased electrical protection.* Avoidance of serious PCB Transformer fires in commercial buildings through increased electrical protection involves the installation of appropriate sensors and disconnect equipment to detect common causes of transformer failures and to allow for deenergization. The disconnect equipment would either be automatically activated in response to sensed abnormal conditions (with a provision for manual deenergization), or, manually opened following the receipt of an audio or visual signal (indicating abnormal conditions) at an on-site manned control center. Devices which respond to overcurrent conditions and sensors which respond to low current faults would protect against failures from two basic mechanisms of fault-related transformer failures. Low current fault protection in the form of heat and pressure sensors and associated disconnect equipment would also provide deenergization following high temperatures and changes in pressure from other causes, such as mechanical failures or external fires.

As discussed in Unit IV.C, transformer failures can occur as a result of excessive current flow of a transformer. Of the 77,568 PCB Transformers used in or near commercial buildings, approximately 21,000 PCB Transformers (the network transformers) are currently without overcurrent protection on the primary side (the high voltage side) of the transformers. Second, virtually none of the 77,568 PCB Transformers in or near commercial buildings are currently equipped with sensors to detect low current faults. Finally, virtually none of the 21,000 network PCB Transformers in use have disconnect equipment (in the form of a primary circuit breaker or equivalent technology) on site to allow for rapid deenergization, and, EPA expects that many of the 55,000 commercial radial PCB Transformers do not utilize primary circuit breakers for high current fault protection.

The installation of certain safety equipment to detect sustained high current and low current faults on PCB Transformers which currently lack such protection would reduce the probability of failures, fires, and explosions in commercial PCB Transformers, particularly events resulting from electrical malfunctions. Electrical malfunctions, specifically electrical faults, have been implicated in many known PCB Transformer fires.

The highest reduction in the probability of PCB Transformer fault-related failure is attained when protection is provided against both basic mechanisms of transformer fault-related failures. Installation of overcurrent protection without protection against low current faults will avoid only those PCB Transformer fires which occur as a result of overcurrent conditions.

Electrical faults in general are more likely in network transformers than radial transformers because network transformers have more associated electrical equipment (on the secondary side of transformers); network transformers have network protectors and network buswork for faults to occur in. This does not mean that faults will not occur in radial transformers; it simply means that when radial installations are compared to network installations, one would expect more electrical faults in general to occur in network installations.

When the secondary voltage of a transformer is higher, any faults which occur in the secondary are more likely to be sustained rather than self-clearing or self-extinguishing. Sustained faults cause PCB Transformer failures and fires. Thus, higher secondary voltage network PCB Transformers would have the highest probability of failure from faults. Using the same logic, low secondary voltage radial PCB Transformers would have the lowest probability of failure from faults.

According to comments on the Proposed Rule, historically, utilities have installed high current fault protection on the primaries and secondaries of radial transformer installations. Network installations, however, have been less well protected against high current faults.

The cost of installing increased protection on commercial PCB Transformers depends both on the form of protection selected, and, whether the device involves a retrofit of the transformer. High current fault protection is much less costly than low current fault protection. Low current fault protection involves the installation of disconnect equipment as well as the installation of appropriate sensors. High current fault protection involves the installation of current-limiting or energy limiting fuses.

Since comments on the Proposed Rule and EPA's analysis indicate that the probability of a transformer failure from electrical faults is influenced by the type of transformer installation, not all of the above protection would be warranted on a cost/benefit basis for all types of commercial PCB Transformer installations.

Under the option of increased electrical protection, EPA would require that all commercial PCB Transformers be equipped with overcurrent protection to avoid transformer failures as a result of high current faults. Current-limiting fuses are relatively inexpensive, and would avoid failures from high current faults in the primary and secondary areas of transformers. The cost of installing current-limiting fuses (on the estimated 22,191 commercial network PCB Transformers which currently lack such protection) is estimated at $53 million. The installation of these devices on the approximately 15,072 lower secondary voltage network transformers is estimated at $35 million.

EPA would also require that all commercial PCB Transformers with higher secondary voltages be equipped with protection against sustained low current faults. This is because transformers with higher secondary voltages are more likely to experience sustained rather than self-clearing faults. While 480 volt network PCB Transformers may have a particularly high probability of sustained low current faults (because of the high secondary voltage and the presence of more associated electrical equipment), when a low current fault occurs in a higher secondary voltage radial PCB Transformer (in the voltage winding, low voltage leads, or other equipment), it too will be sustained and can result in transformer failure.

For the majority of these higher secondary voltage commercial PCB Transformers, protection against failures from low current faults would mean the installation of a primary circuit breaker on site as well as the installation of non-electrical sensors, such as pressure sensors and temperature sensors in the transformer. For high secondary voltage

network PCB Transformers, fault sensors would also be needed in the network protector and the network bus as well. Requiring the installation of both pressure and temperature sensors in the transformer tank and fault sensors in the network protector and network bus of high secondary voltage network PCB Transformers provides a level of redundancy in the protection system; this increases the reliability of electrical protection, and provides increased assurance that increased electrical protection would actually avoid PCB Transformer failures and fires.

The cost of protection against low current faults is principally the cost associated with the installation of disconnect equipment such as circuit breakers on site. The cost of the indicated sensors is a fraction of the cost of the installation of a primary circuit breaker.

The total real costs associated with requiring the installation of high current fault protection on all commercial PCB Transformers and low current fault protection on higher secondary voltage commercial PCB Transformers over a 5-year period is estimated at $590 million. EPA expects that the installation of these electrical protection systems will avoid about 97 percent of serious PCB Transformer fires in commercial buildings which would have otherwise occurred, or, 35 serious PCB Transformer fires over the remaining useful life of this equipment. The net cost of this control measure, after adjusting for avoided cleanup costs is estimated at $343 million.

The increased electrical protection requirement which appeared in the Proposed Rule required installation in 3 years, by October 1, 1988. Based on comments submitted in response to the Proposed Rule concerning the type of electrical protection needed, the higher costs of this protection (compared to the proposed electrical protection requirement and the proposed isolation requirement), and the larger number of PCB Transformers which require additional electrical protection, EPA believes that it is reasonable to allow a longer phasein period for this control measure than was proposed. Further, EPA recognizes that many PCB Transformer owners may choose PCB Transformer removal in lieu of enhanced electrical protection, and that this will place additional burdens on PCB disposal capacity. Requiring the installation of enhanced electrical protection on a schedule which recognizes both the fact that many PCB Transformer owners have chosen or will choose removal rather than electrical protection and that there are constraints on PCB disposal capacity will encourage PCB Transformer owners who have voluntary 5-year phaseout programs in place to continue and may stimulate other owners to initiate such programs. Thus, EPA has allowed 5 years for the implementation of the requirement for enhanced electrical protection.

f. *Retrofilling.* Retrofilling of commercial PCB Transformers to reduce the PCB concentration to below 500 ppm would be expected to reduce human and environmental exposures to PCBs and their oxidation products in the event of a fire. This would be accomplished through a substantial reduction in the amount of PCBs present in the transformers. EPA has completed an analysis of the costs of retrofilling commercial PCB Transformers to reduce PCB concentrations to below 500 ppm. EPA estimates that retrofill costs will range from $15,505 for a 50 KVA transformer to $32,034 for a 3,000 KVA transformer. These estimates include the costs of disposal of PCB fluid, but do not include any consideration of a loss of efficiency or derating as a result of the retrofill.

An estimate of the total resource costs of retrofilling all commercial PCB Transformers (77,568 at end of 1984) to below 500 ppm is about $1.2 billion. Although the retrofilling of PCB Transformers reduces the risks to humans posed by the transformer in the event of a fire (by reducing the amount of PCBs present, the amount of PCBs released, and the amount of PCDF formed and released), it is difficult to estimate the effectiveness of this option in avoiding cleanup costs from fire incidents, since PCDFs and PCDDs may still be formed.

g. *Phaseout of commerical PCB Transformers.* The removal of all PCB Transformers from locations in or near commercial buildings or the removal of particularly high risk PCB Transformers from locations in or near commercial buildings would give increased assurance that future serious PCB Transformer fires from all causes will be avoided. The following table uses a population of 77,568 units (EPA's estimate of the number of PCB Transformers in or near commercial buildings that will be in use at the end of 1984) and a population of 7,420 units (EPS's estimate of the number of high secondary network PCB Transformers in use). EPA uses an estimate of equipment life of 30 years, and presents total real costs of phase-out over 5- and 10-year periods of all commercial PCB Transformers, and phaseout over a 5-year period of higher secondary network PCB Transformers, as well as estimates of the number of PCB Transformer fires avoided, and the net costs, after a consideration of avoided cleanup costs. (EPA did not evaluate an immediate ban because comments indicated that manufacturing capacity was insufficient to allow for this option.) For a full description of the assumptions used in the following analysis, and for a more detailed analysis of phaseout costs versus cleanup costs avoided, see the regulatory analysis for the final rule, support document 7 in Unit X.B.

TABLE 2—PHASEOUT COST COMPARISON

Group	Regular option	Cost ($ millions)	PCB fires avoided	Net cost ($ millions)
All commercial	10-year phaseout	640	29	470
All commercial	5-year phaseout	953	36	704
Commercial 480 Network	5-year phaseout	168	25	−47

2. *PCB Transformers in or near industrial facilities*—a. *Summary table.* The following table (Table 3) summarizes the real costs, the benefits, and the net costs (after deducting avoided cleanup costs) of the major regulatory options for industrial PCB Transformers.

TABLE 3—COSTS AND BENEFITS OF CONTROL MEASURES FOR INDUSTRIAL PCB TRANSFORMERS

Option	Real cost (millions)	Expected fires	Avoided fires	Net cost (millions)
No action	N/A	6	0	$64
Labeling & Registration	$2.5	6	0	2.5
Enhanced E. protection 5-years	170	2	4	136
Removal 5-years	319	2	4	285

b. *Take no additional action.* This option would allow the continued use of PCB Transformers in or near facilities such as chemical manufacturing plants, electric power generating plants, forest products processing plants, and warehouses without additional restrictions above the requirements of the August 1982 PCB Electrical Use Rule. There are no costs associated with EPA's allowing the continued use of these transformers, other than the potential future costs associated with cleanup and liability suits following fires involving this equipment. If the use of PCB Transformers in or near industrial facilities were authorized indefinitely, without additional restrictions, EPA expects that up to six PCB Transformer fires with smoke

spread will occur over the remaining useful life of this equipment.

c. *Labeling and registration programs.* The registration of PCB Transformers located in or near industrial facilities with fire departments or fire brigades and the registration with building owners (when the PCB Transformer is not owned by the building owner), in combination with the labeling of the exterior of PCB Transformer locations would cost approximately $2.5 million, assuming that there are about 26,700 industrial PCB Transformers.

While labeling and registration programs would be expected to reduce exposures in the event of a PCB Transformer fire, they will not reduce the frequency of occurrence of these fires.

d. *Smoke control technologies.* Since many industrial PCB Transformers are currently unenclosed, the costs associated with industrial PCB Transformer isolation would be, on the average, higher than for PCB Transformers located in or near commercial buildings. For purposes of the cost-effectiveness analysis, EPA assumes that the cost of the isolation of industrial PCB Transformers will approach $30,000 per transformer location. Assuming that there are 26,700 industrial PCB Transformers, and that there are, on average, 2 PCB Transformers per location, the total cost of the isolation of industrial PCB Transformers over a 5-year period is estimated at $109 million.

The isolation of industrial PCB Transformers (which are typically capable of being more rapidly deenergized than commercial PCB Transformers) would be effective in reducing the relatively low fire-related risks posed by the use of PCB Transformers in industrial facilities even further. Since the majority of PCB Transformers located in or near industrial facilities are capable of being deenergized from an on-site location, isolation of these transformers would be expected to be effective in reducing the spread of any volatilized PCBs or oxidation products released before deenergization could occur.

e. *Increased electrical protection.* For industrial PCB Transformers, increased electrical protection would (typically) involve the installation of appropriate heat and pressure level sensors to detect low current faults and the connection of these sensors to existing primary circuit breakers to allow for automatic deenergization in the event of abnormal conditions. Since industrial PCB Transformers reportedly have primary circuit breakers which provide these transformers with the capability to be deenergized from an on-site location, the costs of increased electrical protection of these transformers would be the costs of installing heat sensors in the secondary winding, and pressure sensors in the transformer tank and connecting these sensors to provide automatic or rapid manual deenergization of the equipment.

For some industrial PCB Transformers, new circuit breakers would have to be installed to allow for the use of these sensors and automatic deenergization.

During plant operating hours, these sensors would reduce the time between the occurrence of a low current fault (or mechanical failure) and the deenergization of the transformer, and, during plant off-hours/non-operational periods, would reduce the probability of a serious incident occurring. Increased electrical protection of industrial transformers (phased-in over a 5-year period) would be expected to avoid four serious PCB Transformer fires which would otherwise occur in these facilities.

The costs associated with the installation of this protection on industrial PCB Transformers would be approximately $170 million for the estimated 26,700 industrial PCB Transformers (phased in over a 5-year period). After adjusting for avoided cleanup costs, the net costs would be estimated at $136 million.

f. *Retrofilling of industrial PCB Transformers.* Retrofilling of industrial PCB Transformers would be expected to reduce even further the fire-related risks posed by the continued use of PCB Transformers in industrial facilities, by reducing the amount of PCBs present for potential release and for conversion to oxidation products. The costs associated with immediately retrofilling the 26,700 industrical PCB Transformers for purposes of reclassification to PCB Contaminated status is estimated at $489 million.

g. *Phaseout of industrial PCB Transformers.* The removal of PCB Transformers from industrial facilities would eliminate the relatively low fire-related risks posed by the continued use of these transformers. Phaseout of industrial PCB Transformers over a 5-year period would avoid up to four industrial PCB Transformer fires with smoke spread at a total cost of $319 million. After adjusting for avoided cleanup costs, the total net cost would be $286 million. Phaseout of industrial PCB Transformers over a 10-year period would avoid about three serious PCB Transformer fires at a total cost of $215 million. After adjusting for avoided cleanup costs, the total net cost would be $192 million.

3. *PCB Transformers in outdoor electrical substations*—a. *Take no additional action.* EPA has few data on PCB Transformer fires which have occurred in outdoor electrical substations. However, EPA has evaluated the potential risks posed by such fires and has developed an estimate of the frequency of these fires. This estimate is based on available information on the probability of serious PCB Transformer fires in or near buildings, and the probability of failures in different types of installations. EPA estimates that up to three outdoor electrical substation fires (with some PCB volatilization and smoke distribution) will occur over the remaining useful life of this equipment.

Since EPA believes that an outdoor PCB Transformer fire will not typically result in the formation of large amounts of incomplete combustion products which would require cleanup, EPA has assumed that cleanup from these incidents will involve primarily the cleanup of spilled PCBs. This type of cleanup operation is significantly less costly than cleanup following a PCB Transformer fire in or near a building.

b. *Labeling and registration programs.* The labeling of the exterior of outdoor PCB Transformer locations, and the registration of these transformers with appropriate fire department jurisdictions is expected to reduce exposures to firefighters and cleanup crews. The cost associated with this registration and labeling program for 17,000 outdoor PCB Transformers is approximately $1.6 million.

c. *Isolation of outdoor PCB Transformers.* Outdoor PCB Transformers could be enclosed to reduce the spread of PCBs and any incomplete combustion products formed. However, enclosing these transformers could create conditions more conducive to the formation of incomplete combustion products. Heat is more likely to be retained rather than dissipated when transformers are enclosed. Thus, while enclosing these transformers would decrease the spread of PCBs following fire-related failures, it could increase the amount of PCBs converted into dibenzofurans from outdoor PCB Transformer fires.

The costs associated with enclosing 17,000 outdoor PCB Transformers over a 5-year period would be on the order of $69 million.

d. *Increased electrical protection.* Outdoor PCB Transformers are typically radial installations, which are already equipped with current-limiting fuses.

The cost of the installation of low current fault protection on the higher secondary voltage outdoor PCB Transformers (over a 5-year period) would be on the order of $108 million. Increased electrical protection would be expected to avoid up to three outdoor PCB Transformer fires.

e. *Retrofilling.* EPA has estimated the costs associated with requiring the immediate retrofilling of the approximately 17,000 outdoor PCB Transformers. These costs are estimated to be $270 million.

f. *Phaseout.* EPA has estimated the costs associated with requiring the removal of an estimated 17,000 PCB Transformers in outdoor locations, over 5- and 10-year periods. A 5-year phaseout is estimated to cost $203 million, and a 10-year phaseout is estimated to cost $137 million.

4. *PCB Contaminated transformers.* EPA has also estimated the costs associated with requiring additional controls on the use of PCB Contaminated transformers. The costs range from over $8 billion for the testing of transformer fluids for PCB concentration and the registration and labeling of PCB Contaminated transformers, to over $263 billion for removal within 5 years. Registration and labeling of PCB Contaminated transformers would reduce the low PCB fire-related risks posed by the use of this equipment; and, removal would eliminate these risks.

VI. Risk/Benefit Assessment

1. *Use of PCB Transformers in or near commercial buildings.* PCBs can be released in fires involving PCB Transformers, and, (depending upon the contents of the transformer and the combustion conditions), 2,3,7,8-TCDF, PCDFs, 2,3,7,8-TCDD, and PCDDs can be formed. Laboratory studies on the formation of PCDFs from PCBs, and PCDDs from chlorinated benzenes, as well as sampling data from actual PCB Transformer fire sites confirm that PCBs can be released and 2,3,7,8-TCDF and 2,3,7,8-TCDD (as well as other PCDF and PCDD congeners) can be formed and released from fires involving PCB Transformers.

EPA believes that PCBs are both toxic and persistent, and, that PCDFs and PCDDs are orders of magnitude more toxic than PCBs. PCB Transformers that remain energized after sustained faults or following failures as a result of fires from external sources are more likely to result in the volatilization of large amounts of PCBs and the formation of large amounts of PSDFs, 2,3,7,8-TCDF, PCDDs and 2,3,7,8-TCDD through incomplete combustion than PCB Transformers that are able to be deenergized rapidly and completely when an arc or fault occurs.

PCB Transformers can become involved in fires from many causes including sustained low current faults, sustained high current faults, and fires external to transformers involving stored combustibles or building materials followed by an inability to deenergize the transformer. The fire-related risks posed by the continued use of PCB Transformers in or near commercial buildings are much higher than the fire-related risks posed by the continued use of PCB Transformers in outdoor locations and industrial facilities. The overall probability of PCB Transformer fault-related failure is higher in commercial buildings than in other PCB Transformer locations and the risks posed are also higher in the event of a PCB Transformer fire.

The fire-related risks posed by the continued use of higher secondary voltage network PCB Transformers in commercial buildings are particularly high, because these transformers have the highest probability of failure from both high and low current faults, and, they are typically used in more densely populated commercial buildings, specifically, in locations such as high-rise office buildings.

The benefit of removing commercial PCB Transformers from use is the complete assurance that PCB Transformer fires will no longer occur in or near commercial buildings. Serious PCB Transformer fires which would have otherwise occurred will definitely be avoided. PCB Transformer fires in or near commercial buildings pose particularly high risks to human health, because sustained high temperatures are more likely in these locations (leading to the volatilization of large amounts of PCBs and the formation of large amounts of incomplete combustion products), and building occupants, cleanup crews, and fire response personnel are more likely to incur these higher exposures. In addition, the lack of knowledge on the part of commercial building occupants, firefighters, and cleanup crews about the potential risks posed make exposures even more likely.

There are an estimated 77,568 PCB Transformers located in or near commercial buildings, and 7,420 of these transformers are expected to be higher secondary voltage network PCB Transformers. The 77,568 PCB Transformers used in commercial buildings represent 64 percent of all PCB Transformers in use. The immediate removal of these transformers from use is not possible because of considerations such as PCB disposal capacity, transformer manufacturing capability, and disruption of electrical service. The cost of removing all of these PCB Transformers from use over the next 5 years is estimated at $953 million. Five years may not be an adequate amount of time for the removal and disposal of this many transformers. There are currently only four EPA-approved commercial PCB incinerators. According to comments on the Proposed Rule, PCB disposal capacity is such that the cost of PCB disposal has significantly jumped (almost doubled) over the last year. Disposal capacity will continue to be of concern over the next few years, since existing EPA regulations require the removal of PCB Transformers in use in food and feed processing facilities by October 1, 1985 and a limited phaseout of PCB Capacitors by October 1, 1988.

The removal of all commercial PCB Transformers by 1990 would, however, avoid an estimated 36 serious PCB Transformer fires in commercial locations. The removal of all commercial PCB Transformers by 1995 is estimated to cost on the order of $640 million for the avoidance of an expected 29 serious PCB Transformer fires.

The costs of removing the particularly high risk 7,420 commercial higher secondary voltage network PCB Transformers from use over the next 5 years is estimated at $168 million. The removal of these particularly high risk PCB Transformers from use by 1990 would be expected to avoid an estimated 25 serious PCB Transformer fires, or about 70 percent of all PCB Transformer fires in commercial buildings which EPA expects would otherwise occur. The removal of higher secondary voltage network PCB Transformers from use by October 1, 1990 will avoid an estimated 70 percent of serious commercial PCB Transformer fires for about 17 percent of the cost associated with the removal of all commercial PCB Transformers from use by this same date.

EPA believes that it is prudent to require the removal of commercial higher secondary voltage network PCB Transformers from use as soon as possible, taking into consideration factors such as PCB disposal capacity and continuity of electrical service. EPA believes that the soonest practical date for requiring the removal of this equipment is by October 1, 1990. Testimony at the public hearing, comments on the Proposed Rule, and EPA's analysis overwhelmingly support a determination that these transformers are of particularly high risk. EPA expects that 25 serious commercial PCB

Transformer fires will be avoided by the removal of these PCB Transformers (over a 5-year period) for a total real cost of less than $7 million per avoided incident. Cleanup costs alone for a single incident in a commercial building would be expected to exceed this $7 million figure substantially.

While EPA has decided to require the removal of these particularly high risk PCB Transformers from use, it believes that less costly yet highly effective measures can be implemented to reduce the remaining fire-related risks posed by the continued use of other commercial PCB Transformers. Namely, EPA has determined that enhanced electrical protection systems will be effective in avoiding many fires in these remaining commercial installations. Electrical protection can be very effective in avoiding PCB Transformer failures and fires through the early detection of common mechanisms of failure and the rapid deenergization of transformers.

EPA is requiring all commercial PCB Transformers to be protected against failures from sustained high current faults in the primary and secondary areas of the transformers. Further, EPA is requiring that all commercial higher secondary voltage radial PCB Transformers be equipped with protection against sustained low current faults as well.

EPA has determined that all commercial PCB Transformers should be registered with fire departments and building owners and that commercial PCB Transformer locations should be labeled on the exterior. Finally, EPA has determined that stored combustible materials should be removed from all commercial PCB Transformer locations, that all fire-related incidents should be reported to the National Response Center, and that measures be taken to contain all potential releases to water associated with a fire-related incident.

The real cost of requiring registration, labeling, and removal of stored combustibles for all commercial PCB Transformers and enhanced electrical protection for 56,605 commercial PCB Transformers (over a 5-year period) is estimated at $459 million. The expected incremental benefit of these measures (for other than higher secondary voltage network PCB Transformers) is the avoidance of an additional 10 serious PCB Transformer fires which would have otherwise occurred, or about 30 percent of all commercial PCB Transformer fires which EPA expects would otherwise occur over the remaining useful life of these transformers.

Increased electrical protection and the removal of stored combustibles is expected to avoid sustained high temperatures in commercial PCB Transformer locations; thus, significantly reducing the likelihood of PCB volatilization and the formation of large amounts of incomplete combustion products. Reducing the likelihood of PCB Transformer failures in commercial locations reduces potential exposures to building occupants, cleanup crews, and emergency response personnel. PCB Transformer fires may occur through less likely mechanisms and electrical protection systems are subject to some (low) rate of malfunction. The requirement for the registration and labeling of commercial PCB Transformers will reduce exposures in the event that sustained high temperatures occur despite the presence of increased electrical protection.

EPA has selected the option of the removal of commercial higher secondary voltage network PCB Transformers from use by October 1, 1990, the immediate registration, labeling, and removal of stored combustibles for all commercial PCB Transformers, and enhanced electrical protection (by October 1, 1990) for a large majority of the remaining 70,000 commercial PCB Transformers currently in use. EPA is also requiring the reporting of all PCB Transformer fire-related incidents to the National Response Center, and, that measures be taken as soon as practically (and safely) possible to contain any potential releases to water in the event of a PCB Transformer fire-related incident. The total real cost of this program to reduce the fire-related risks posed by the continued use of PCB Transformers in commercial locations is estimated at $635 million and is expected to avoid 35 serious PCB Transformer fires which would have otherwise occurred over the remaining useful life of commercial PCB Transformers, or about $17 million per serious PCB Transformer fire avoided. The net cost, after deducting for avoided cleanup costs, is estimated at $390 million,or about $10 million per serious PCB Transformer fire avoided.

EPA has also banned the further installation of PCB Transformers in locations in or near commercial buildings. EPA recognizes that the costs associated with PCB Transformer removal include the costs of physically removing PCB Transformers as well as providing replacement transformers. The costs associated with not installing a PCB Transformer (which has been placed into storage for reuse) in a commercial building are minimal. Further, even with increased electrical protection, there is some level of risk posed by the use of PCB Transformers in or near commercial buildings. While EPA has selected increased electrical protection for many commercial PCB Transformers, it has determined that the installation of PCB Transformers (which have been placed into storage for reuse) in or near commercial buildings presents an unreasonable risk. Thus, EPA has banned the new installation of PCB Transformers in or near commercial buildings.

2. *Use of PCB Transformers in or near industrial facilities.* PCBs can be released in fires involving industrial PCB Transformers, and, depending upon combustion conditions, incomplete combustion products can be formed. PCB Transformers that remain energized for prolonged periods after sustained faults occur or following failures as a result of fires external to the PCB Transformers are more likely to result in the volatilization of PCBs and the formation of incomplete combustion products than PCB Transformers that are able to be deenergized rapidly and completely when a fault or failure occurs.

Based on comments on the Proposed Rule, EPA believes that PCB Transformers located in or near industrial facilities are less likely to be involved in fires involving sustained high temperatures than PCB Transformers located in or near commercial buildings. This is because these transformers, as a group, are typically equipped with more protection from failures than commercial PCB Transformers, and, are typically able to be deenergized from an on-site location. Thus, the probability of industrial PCB Transformer fault-related failure and fire is lower in industrial facilities than in commercial buildings, and the risks posed in the event of a fault-related failure and fire are also expected to be less.

EPA recognizes that exposures from PCB Transformer fires in atypical industrial facilities (where deenergization does not occur as rapidly) could be higher than the exposure previously described. However, EPA's estimate of the frequency of industrial PCB Transformer fires indicates that up to 6 PCB Transformer fires (with smoke spread into industrial facilities) are expected to occur over the remaining useful life of this equipment. Four industrial PCB Transformer fires would be expected to occur after October 1, 1990. Even if EPA were to assume as a worst-case that the risks posed by PCB Transformer fires in industrial facilities were equivalent to the risks posed by PCB Transformer fires in commercial buildings, EPA expects that only 4 serious industrial

PCB Transformer fires could be avoided by requiring the removal or enhanced electrical protection of industrial PCB Transformers by 1990.

The costs, however, of the removal of these industrial PCB Transformers from use by 1990 is estimated at $319 million. The removal of industrial PCB Transformers from use by 1990 would avoid about four PCB Transformer fires involving smoke spread into buildings. The real cost per avoided serious fire is almost $80 million. Enhanced electrical protection of these transformers by 1990 would be expected to avoid about the same number of incidents at a total real cost of $170 million, or, $43 million per avoided incident. Isolation of these transformers by 1990 would be expected to reduce building contamination; thereby, reducing potential exposures to workers, cleanup crews, and fire response personnel at a total cost of $109 million, or, $27 million per incident.

The benefit of removing these transformers or protecting these transformers by 1990 is the avoidance of up to four industrial PCB Transformer fires. PCB Transformer fires involving the formation of large amounts of incomplete combustion products are less likely in industrial facilities than in or near commercial buildings. Sustained high temperatures are less likely in these locations due to equipment visibility and deenergization capability, and, as a result, building occupants (workers), cleanup crews, fire response personnel, and members of the general population are less likely to incur high exposures. Further, there are generally fewer people at risk of incurring these exposures from fires in industrial facilities than from fires in commercial buildings.

The cost of requiring the registration, increased labeling, and removal of stored combustibles from industrial PCB Transformer locations is estimated at $1.9 million. While these measures will not reduce the frequency of serious industrial PCB Transformer fires, they should reduce any exposures to workers, cleanup crews, and fire response personnel.

EPA has selected the option of the registration, external labeling, and removal of stored combustibles from industrial PCB Transformer locations for the estimated 26,700 industrial PCB Transformers in use or in storage for reuse in industrial locations. This is a relatively inexpensive measure which will reduce exposures in the event of a PCB Transformer fire. EPA is also requiring the reporting of all PCB Transformer fire-related incidents to the National Response Center, and, that measures be taken as soon as practically and safely possible to contain any potential release to waterways. These requirements are not burdensome, and will reduce further any human and environmental exposures following industrial PCB Transformer fires.

3. *Use of PCB Transformers in outdoor locations.* EPA's evaluation of the risks posed by PCB Transformer fires indicates that the use of PCB Transformers in outdoor locations away from commercial areas poses less risk to public health and the environment than the use of this equipment in or near buildings. First, combustion conditions in outdoor locations may not be so conducive to the volatilization of PCBs and the formation of incomplete combustion products as combustion conditions in enclosed areas such as sidewalk vaults and machinery rooms.

Second, EPA believes that fewer people are generally present near outdoor PCB Transformer locations, and, that many of these areas are fenced in to restrict access to authorized personnel. Further, if PCBs were volatilized and dispersed into the environment, individual human exposures to PCBs and potential oxidation products from such a fire are expected to be much lower than from fires in or near buildings. EPA expects fewer than three outdoor PCB Transformer fires (with smoke spread) over the remaining useful life of this equipment.

There are an estimated 17,000 PCB Transformers in outdoor locations. The total real cost of the removal of these PCB Transformers from use by 1990 is estimated at $207 million, or, $69 million per avoided incident. The total real cost of installing increased electrical protection on these transformers is $36 million, or, $12 million per avoided incident.

EPA believes, however, that it is prudent to require registration and increased labeling of outdoor PCB Transformers, the containment of all potential releases to water, and the reporting of all PCB Transformer fire-related incidents to the NRC. These measures will reduce exposures of emergency response personnel to spilled PCBs (which is anticipated to be the more prevalent situation in outdoor locations) and would serve to limit the spread of these materials into the environment.

4. *PCB Contaminated transformers.* A fire involving a PCB Contaminated transformer can result in the formation and/or release of PCBs and oxidation products. Thus, the use of these transformers does pose some level of risk in a fire-related incident. However, the level of risk posed is considerably less than the risks posed by the use of PCB Transformers. Further, there are an estimated 20 million PCB Contaminated transformers in use. Even the least costly regulatory alternative, the registration and external labeling of PCB Contaminated transformers, would cost more than $8 billion.

Thus, EPA has determined that the continued use of PCB Contaminated transformers without additional controls will not present unreasonable risks to public health or the environment.

VII. Findings on the Use of PCBs in Electrical Transformers

1. Based on the analyses presented in Unit VI, EPA has determined that the use of PCBs in electrical transformers does not pose unreasonable risks to public health or the environment, provided, that in addition to the inspection, recordkeeping, and servicing requirements of the August 25, 1982 Electrical Equipment Rule:

a. Higher secondary voltage network PCB Transformers (network PCB Transformers with secondary voltage at or above 480 volts, including 480/277 volt network PCB Transformers) in or near commercial buildings are removed from use, reclassified, placed into storage for disposal or disposed by October 1, 1990.

b. By October 1, 1990, higher secondary voltage radial PCB Transformers (radial PCB Transformers with secondary voltages at or above 480 volts, including 480/277 volts radial PCB Transformers) and lower secondary voltage network PCB Transformers used in or near commercial buildings are equipped with sensors to detect electrical faults and insure rapid deenergization prior to transformer failure.

c. All PCB Transformers are registered with appropriate fire response organizations and PCB Transformers located in or near buildings are also registered with building owners.

d. The vault door, machinery room door, or means of access (other than grates and manhole covers) to PCB Transformers are labeled with PCB identification labels.

e. PCB Transformer locations are cleared of stored combustibles.

f. In the event of a PCB Transformer fire, measures are taken to contain water releases.

g. In the event of a PCB Transformer fire, the National Response Center is immediately notified.

2. The use of PCBs in transformers that comply with: (1) The inspection, recordkeeping, and servicing

requirements of the August 25, 1982 Electrical Use Rule; and (2) the fire hazard risk reduction measures described above, does not pose unreasonable risks to public health or the environment for the following reasons:

a. If EPA immediately banned the continued use of PCB Transformers it would cost the public and United States industry billions of dollars, primarily as a result of the disruption of electrical service. There are over 120,000 PCB Transformers currently in use and an estimated 20 million PCB Contaminated transformers currently in use. The resulting reduction in risk from an immediate ban, after considering both the risks posed by spills and leaks of PCBs as well as the risks posed by fires involving this equipment, would not outweigh these substantial costs.

b. The required inspection, maintenance, and servicing requirements under the August 25, 1982 Electrical Use Rule, and the fire hazard risk reduction measures listed above (including the required removal of commercial higher secondary voltage network PCB Transformers from use by October 1, 1990) reasonably reduce the exposures associated with the use of PCBs in PCB Transformers. The required fire hazard risk reduction measures and the required 5-year phaseout of commercial higher secondary voltage network PCB Transformers are measures which are much less costly than a total ban on the use of PCBs but are of similar effectiveness in reducing the overall fire-related risks posed by the use of these transformers.

c. The costs of phaseout and retrofilling of all PCB Transformers are not reasonable when considering the potential reduction in release of PCBs and the reduction in the risks posed by PCB Transformer fires if these measures were required for all PCB Transformers. EPA has targeted phaseout requirements for those PCB Transformers which EPA has concluded pose particularly high risks of failure and fire.

d. Releases of PCBs to the environment and exposures to humans and biota from the use of PCB-Contaminated and non-PCB transformers are minimal. Further, the risks posed by fires involving this equipment are substantially less than the risks posed by fires involving PCB Transformers, and the costs of any control measures to reduce these low risks further are very high.

VIII. Amendments to the PCB Electrical Equipment Rule

A. Registration/Labeling/Removal of Stored Combustibles

EPA has required the registration of all PCB Transformers by December 1, 1985, with fire departments with primary response jurisdiction. This means that each PCB Transformer in use or in storage for reuse must be registered with the fire department(s) which would be called upon for the initial response to a fire involving the equipment. The information to be supplied to the fire department(s) includes the address of the building in which the transformer is located (or the nearest building for PCB Transformers located near buildings, or, the nearest intersection for outdoor PCB Transformers); the location of the transformer within the building or near the building (e.g., third floor east end, or, west side of the building); and the principal constituent of the dielectric fluid in the transformer (e.g., PCBs, mineral oil, silicone oil). For industrial PCB Transformers, this may mean only the registration of the transformers with the industrial fire brigade on site.

EPA has also required the registration, by December 1, 1985, of PCB Transformers located in or near buildings with building owners. Each owner of a PCB Transformer(s) is responsible for registering the transformer(s). This means that all PCB Transformers located in or near buildings must be registered with appropriate building owners. For PCB Transformers located inside buildings, this means the registration of the transformer(s) with the building owner of record. For PCB Transformers located "near" buildings, this means the registration of the PCB Transformer(s) with all building owners whose buildings are located within 30 meters of the PCB Transformer(s).

EPA has required the labeling of the exterior of all PCB Transformers with the Mark M_L. This means that doors, fences, hallways, and other easily markable means of access to PCB Transformer locations must be marked with PCB identification labels. These labels must be prominently displayed and visible to emergency response personnel in the event of a fire involving this equipment. The exterior of sidewalk and underground vaults, that is, grates and manhole covers, are not required to be marked (because of difficulties in maintaining the mark over time).

EPA has required the removal of stored combustibles from all PCB Transformer locations. This means that materials such as paints, solvents, paper, rubber, and sawn wood must not be stored within a PCB Transformer enclosure, within 5 meters of a PCB Transformer enclosure, or within 5 meters of a PCB Transformer. A PCB Transformer enclosure is defined as a confined area such as a vault, machinery room, partitioned area or fenced-in area that contains a PCB Transformer.

The objective of requiring the removal of stored combustibles is to avoid, to the extent possible and practical, PCB Transformer involvment in fires initiated by the combustion of stored materials and to eliminate a potential source of fuel for a fire initiated by an electrical fault or malfunction in a transformer.

B. Phaseout of Commercial Higher Secondary Voltage Network PCB Transformers

EPA has prohibited the use of all network PCB Transformers with secondary voltages at or above 480 volts (this includes 480 volt network PCB Transformers, 480/277 volt network PCB Transformers and other network PCB Transformers with secondary voltages at or above 480 volts) in or near commercial buildings beyond October 1, 1990, and has required that these transformers be placed into storage for disposal or disposed (or be reclassified to PCB Contaminated or non PCB status).

Commercial buildings are defined as non industrial (non substation) buildings which are generally or typically accessible to both members of the general public and employees. These buildings include: public assembly properties (e.g., arenas, stadiums, libraries, museums, restaurants, theaters, etc.); educational properties (e.g., schools, colleges, universities, etc.); institutional properties (e.g., nursing homes, hospitals, prisons, etc.); residential properties (e.g., apartments, hotels, dormitories, etc.); stores (e.g., supermarkets, clothing stores, malls, etc.); offices (e.g., general business offices (including those located on industrial sites), banks, municipal office buildings, etc.); and, transportation centers (e.g., airport terminal buildings, subway stations, bus stations, train stations, etc.).

An industrial building is defined as a building directly used in manufacturing or technically productive enterprises. Industrial buildings are not generally or typically readily accessible to other than workers. Industrial buildings include buildings used directly in the production of power, the manufacture of products, the mining of raw materials, and the storage of textiles, petroleum products,

wood and paper products, chemicals or plastics, and metals.

A PCB Transformer located in or near a commercial building is located within the interior of the building, on the roof of the building or attached to the exterior wall of the building, in the parking area serving the building, or located within 30 meters of the building.

EPA has required the removal of PCB Transformers located near commercial buildings (in addition to those located inside commercial buildings) because incidents like the San Francisco fire indicate that PCB Transformers located near commercial buildings can result in building contamination. Several comments on the Proposed Rule requested that EPA define the term "near" in a more quantitative manner; such as, within 25, 50 or 100 feet of a commercial building. EPA recognizes the desirability of defining the term "near" in a quantitative manner—this would facilitate monitoring compliance with the rule and make the rule more easily understood by the regulated community.

In adopting this suggestion, EPA has three objectives: (1) to facilitate compliance by industry with the rule, (2) to facilitate EPA's monitoring of compliance with the rule, and (3) to insure that any PCB Transformer which poses a real risk of commercial building contamination is covered by the rule. EPA is somewhat hesitant to dictate an absolute distance at which a PCB Transformer would be considered to pose little risk of significant building contamination. Local climactic and geographic conditions could greatly influence the potential for building contamination from PCB Transformer fires in locations such as sidewalk and underground vaults. However, the benefits of establishing a numerical standard, in terms of ease of compliance with the rule and ease of enforcement, are great.

In urban locations, sidewalk vaults and underground vaults are typically located within 15 to 30 meters of buildings, with many located immediately adjacent to exterior walls. It is EPA's intent to include all of these transformers within the definition of PCB Transformers located "near" commercial buildings. Further, outdoor pad-mounted and pole top PCB Transformers located within 15 to 30 meters of commercial buildings are also covered within the definition of PCB Transformers located "near" commercial buildings.

EPA expects that in general very few vaulted PCB Transformers in urban and metropolitan areas are located at distances greater than 30 meters from commercial buildings. However, EPA has also evaluated the potential for building contamination from vaulted PCB Transformers located at distances greater than 30 meters from commercial buildings. EPA believes that the potential for commercial building contamination from a PCB Transformer fire in a vault located more than 30 meters from a building can be greatly influenced by factors such as wind velocity, wind direction, and plume height. While EPA has defined the term "near" by establishing a distance of 30 meters from commercial buildings, EPA recognizes that in certain geographic locales, vaulted PCB Transformers located more than 30 meters from a commercial building could also present a risk of building contamination. EPA suggests that owners of vaulted PCB Transformers located more than 30 meters from commercial buildings individually evaluate the potential for commerical building contamination from fires involving these transformers as well. Factors considered in this evaluation could include average wind velocity for the region and normal wind direction.

C. Increased Electrical Protection

EPA has required the installation of enhanced electrical protection on many of the remaining commercial PCB Transformers (i.e., other than higher secondary voltage network PCB Transformers) by October 1, 1990. The electrical protection requirements are intended to avoid PCB Transformer fires by allowing for the early detection of faults and the complete deenergization of PCB Transformers prior to failure (rupture and/or release of PCBs). The installation of current-limiting fuses or other equivalent energy limiting devices on PCB Transformers is intended to avoid failures from high current faults. In order to be effective in avoiding PCB Transformer failures from high current faults, these current-limiting devices must (in accordance with good engineering practices) be properly installed, appropriately placed, maintained, and set sensitive enough to provide for complete deenergization within several power cycles or several tenths of a second of the occurrence of a sustained high current fault.

The installation of heat and pressure sensitive detectors in higher secondary voltage commercial radial PCB Transformers (and appropriate disconnect equipment) is intended to avoid PCB Transformer failures from sustained low current faults. Equivalent technology that accomplishes the same goal, that is, the early detection of sustained low current faults and complete deenergization prior to failure, is acceptable. In order to be effective in avoiding PCB Transformer failures, these devices must be maintained, and set sensitive enough to allow for complete deenergization within 30 seconds to 1 minute of detection of a sustained low current fault. In addition, if these sensors are electrically powered, they must be provided with a secondary source of power configured to deenergize the transformer on failure (fail-safe).

The disconnect equipment may be set either to open automatically upon the sensing of abnormal conditions (e.g., temperature or pressure), or, it may be set to send a signal to an on-site manned control center where deenergization must occur (during facility operating hours) within 1 minute of the receipt of an audio or visual signal indicating abnormal conditions. Automatically operated circuit breakers must also have the capability to be opened manually.

EPA received several comments on the Proposed Rule which suggested that EPA should give PCB Transformer owners the option of implementing risk reduction measures on shorter schedule (such as enhanced electrical protection by 1990) or PCB Transformer removal on a longer schedule (such as PCB Transformer removal by 1992). EPA did not adopt this suggestion because, without additional reporting requirements (including the reporting to EPA of the address and location of each PCB Transformer and the option selected by the owner), EPA believes that its ability to effectively enforce the shorter term risk reduction measures would be compromised.

D. Prohibition on the Installation of PCB Transformers

EPA has prohibited the new installation of PCB Transformers in or near commercial buildings. PCB Transformers must not be newly installed in or near commercial buildings after October 1, 1985. This means that PCB Transformers which have been placed into storage for reuse cannot be taken out of storage for reuse and placed in use in or near commercial buildings.

While EPA has placed restrictions on the installation of PCB Transformers (by prohibiting the placement of the equipment in or near commercial buildings), owners of PCB Transformers which are in storage for reuse still have many available options. Owners of PCB Transformers which are in storage for reuse may use these transformers in industrial applications and in any outdoor location where there is no real risk of commercial building

contamination. These transformers may also be reclassified to PCB Contaminated status or non-PCB status and be placed in any desired location.

E. Reporting of Fire-Related Incidents and Containments of Potential Water Releases

EPA has required the reporting of all PCB Transformer fire-related incidents to the National Response Center. A fire-related incident is defined as any incident in which high temperatures or high pressures in a transformer location lead to the rupture of a transformer and/or the release of PCBs. PCB Transformer fire-related incidents must be immediately reported to the NRC. The information to be reported must include the type of PCB Transformer installation involved in the fire-related incident, and reasonably ascertainable information on the cause of the fire-related incident.

EPA has required that owners of PCB Transformers involved in fire-related incidents take measures as soon as practically and safely possible to contain any potential releases of PCBs and oxidation products to waterways. This means that measures must be taken to prevent further environmental release and contamination of waterways as soon as there is no immediate danger of injury from the fire itself. These measures include, but are not limited to the blocking of floor drains, the containment of runoff, and the containment and treatment of cleanup water prior to release. If there is evidence of the release of PCBs, PCDFs, and PCDDs down floor drains, the PCB Transformer owner should also notify the sewer system and water treatment system operators as soon as possible to prevent further environmental release.

IX. Compliance and Enforcement

EPA recognizes that technology is constantly evolving in areas such as the development of electrical protection systems. Thus, EPA has allowed some flexibility on the part of transformer owners in the selection of appropriate enhanced electrical protection systems. Further, by requiring electrical protection for commercial PCB Transformers, EPA implicitly allows the replacement of all commercial PCB Transformers with substitute equipment, and the retrofilling and reclassification of PCB Transformers to PCB Contaminated or non-PCB status.

EPA has, however, required the installation of protection against failures from high current faults and low current faults in all commercial higher secondary voltage radial PCB Transformer installations. The installation of protection against high current faults alone without protection against low current faults in these installations constitutes a violation of the PCB Transformer use authorization. For lower secondary voltage commercial PCB Transformer installations, EPA has required protection against failures from high current faults.

Failure to install properly and maintain protection which is set sensitive enough, based on good engineering judgment, to prevent PCB Transformer failures from sustained high and low current faults (for higher secondary voltage radial PCB Transformers) and PCB Transformer failures from high current faults (for lower secondary voltage PCB Transformers) constitutes a violation of the PCB Transformer use authorization.

X. Official Record of Rulemaking

A. Previous Rulemaking Records

(1) Official rulemaking record from "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibition Rule" published in the **Federal Register** of May 31, 1979, (44 FR 31514).

(2) Official rulemaking record from "Polychlorinated Biphenyls (PCBs); Disposal and Marking Final Regulation" published in the **Federal Register** of February 17, 1978, (43 FR 7150).

(3) Official rulemaking record from "Polychlorinated Biphenyls (PCBs); Manufacture, Processing, Distribution, and Use in Closed and Controlled Waste Manufacturing Processes" published in the **Federal Register** of October 21, 1982, (47 FR 46980).

(4) Official rulemaking record from "Polychlorinated Biphenyls (PCBs); Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Equipment" published in the **Federal Register** of August 25, 1982, (47 FR 37342).

(5) Official record from "Polychlorinated Biphenyls (PCBs); Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Transformers" Advance Notice of Proposed Rulemaking, published in the **Federal Register** of March 23, 1984, (49 FR 11070).

(6) Official record from "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce and Use Prohibitions; Use in Electrical Transformers" Proposed Rule, published in the **Federal Register** of October 11, 1984, (49 FR 39966).

B. Support Documents

(1) USEPA, OPTS, EED, Versar, Inc., "Exposure Assessment for Polychlorinated Biphenyls (PCBs), Polychlorinated Dibenzofurans (PCDFs), and Polychlorinated Dibenzodioxins (PCDDs) Released During Transformer Fires" (June 1985).

(2) USEPA, OPTS, HERD, "HERD Work for Proposed Polychlorinated Biphenyl (PCB) Transformer Fires Rulemaking" (August 1, 1984).

(3) USEPA, OPTS, HERD, "Addendum to August 1, 1984 HERD Work for Proposed Polychlorinated Biphenyl (PCB) Transformer Fires Rulemaking" (October 1, 1984).

(4) USEPA, OPTS HERD, "Response to Comments on Health Effects of PCBs Submitted by the Chemical Manufacturers Association and the Edison Electric Institute" (August 19, 1982).

(5) USEPA, OW, "Ambient Water Quality Criteria for 2,3,7,8-Tetrachlorodibenzo-p-dioxin" (February 1984).

(6) USEPA, ORD, OHEA, ECAO, "(DRAFT) Health Assessment Document for Polychlorinated Dibenzo-p-dioxins" (May 1984).

(7) USEPA, OPTS, ETD, Putnam, Hayes and Bartlett, Inc. "Regulatory Impact Analysis of the Final Rule for PCB Transformers" (June 1985).

(8) Kimbrough, Renate, D., *et al.* "Health Implications of 2,3,7,8-Tetrachlorodibenzodioxin (TCDD) Contamination of Residential Soil," Journal of Toxicology and Environmental Health (in press).

(9) USEPA, OPTS, EED, "NFIRS Data for 1982" (April 1984).

(10) USEPA, OPTS, EED, Midwest Research Institute, "Thermal Degradation Products from Dielectric Fluids" (December 1984).

(11) USEPA, OPTS, EED, Midwest Research Institute, "Products of Thermal Degradation of Dielectric Fluids" (January 28, 1985).

(12) National Bureau of Standards, "Factors To Be Considered Regarding Hazard Reduction Strategies for Fires Involving Electrical Transformers Containing Polychlorinated Biphenyls" (March 1985).

(13) USEPA, Barnes and Bellin, "Health Hazard Assessment for Chlorinated Dioxins and Dibenzofurans Other Than 2,3,7,8-TCDD" (October 1984).

(14) USEPA, EED, Versar, "Summary of Comments on the PCB Transformer Fires Proposed Rule" (June 1985).

(15) USEPA, EED, "Response to Comments on the PCB Transformer Fires Proposed Rule" (June 1985)

XI. Executive Order 12291

Under Executive Order 12291, issued February 17, 1981, EPA must judge

whether a rule is a "major rule" and, therefore, subject to the requirement that a Regulatory Impact Analysis be prepared. EPA believes that this amendment to the PCB rule is a major rule as the term is defined in section 1(b) of the Executive Order. Therefore, EPA has prepared a Regulatory Impact Analysis.

While the rule places additional restrictions and conditions on the use of PCB Transformers, it is worth noting that this regulation allows the continued uses of PCBs in electrical transformers that would otherwise be prohibited by section 6(e) of TSCA. This rule avoids the severe disruption of electric service to the public and industry that would occur if the use of this equipment were immediately prohibited. It also avoids the economic impact that would result from a requirement to replace the equipment as soon as possible.

This rule was submitted to the Office of Management and Budget (OMB), as required by the Executive Order.

XII. Regulatory Flexibility Act

Under section 605(b) of the Regulatory Flexibility Act, 5 U.S.C. 605(b), the Administrator may certify that a rule will not, if promulgated have a significant impact on a substantial number of small entities and, therefore, does not require a regulatory flexibility analysis.

In general, this rule will reduce the burden on small businesses that would otherwise be encountered if an immediate ban on PCB-containing transformers were to take effect. If an immediate ban on the use of PCBs in transformers were imposed, large costs would be incurred by all producers and users of electricity, including small businesses.

I certify that this rule will not have a significant economic impact on a substantial number of small entities.

XIII. Paperwork Reduction Act

The information collection requirements of this rule have been submitted for approval to the Office of Management and Budget (OMB) under the Paperwork Reduction Act of 1980, 44 U.S.C. 3501 et seq. In response to the information collection requirements associated with the proposed rule, OMB commented that the Agency should resubmit the information collection requirements with the final rule showing how EPA has reduced the burdens by limiting the rule's applicability to transformers which because of location or installation type are of higher risk. Based on this comment and other comments made during the public comment period, EPA has segmented transformers for variable treatment based on type and location. The Office of Management and Budget has approved the information collection requirements of this rule under OMB Control Number: 2070–0073.

List of Subjects in 40 CFR Part 761

Hazardous substances, Labeling, Polychlorinated biphenyls, Recordkeeping and reporting requirements, Environmental protection.

Dated: July 1, 1985.

A. James Barnes,

Acting Administrator.

PART 761—[AMENDED]

Therefore, 40 CFR Part 761 is amended as follows:

1. The authority citation for Part 761 is revised to read as follows:

Authority: 15 U.S.C. 2605, 2607, and 2611.

2. In § 761.3, the following paragraphs are alphabetically added to read as follows:

§ 761.3 Definitions.

* * * * *

"In or Near Commercial Buildings" means within the interior of, on the roof of, attached to the exterior wall of, in the parking area serving, or within 30 meters of a non-industrial non-substation building. Commercial buildings are typically accessible to both members of the general public and employees, and include: (1) Public assembly properties, (2) educational properties, (3) institutional properties, (4) residential properties, (5) stores, (6) office buildings, and (7) transportation centers (e.g., airport terminal buildings, subway stations, bus stations, or train stations).

* * * * *

"Industrial buildings" means a building directly used in manufacturing or technically productive enterprises. Industrial buildings are not generally or typically accessible to other than workers. Industrial buildings include buildings used directly in the production of power, the manufacture of products, the mining of raw materials, and the storage of textiles, petroleum products, wood and paper products, chemicals, plastics, and metals.

* * * * *

"Manned Control Center" means an electrical power distribution control room where the operating conditions of a PCB Transformer are continuously monitored during the normal hours of operation (of the facility), and, where the duty engineers, electricians, or other trained personnel have the capability to deenergize a PCB Transformer completely within 1 minute of the receipt of a signal indicating abnormal operating conditions such as an overtemperature condition or overpressure condition in a PCB Transformer.

* * * * *

"On site" means within the boundaries of a contiguous property unit.

* * * * *

"Rupture of a PCB Transformer" means a violent or non-violent break in the integrity of a PCB Transformer caused by an overtemperature and/or overpressure condition that results in the release of PCBs.

* * * * *

3. In § 761.30, the introductory text of paragraph (a) and paragraph (a)(1) are revised and OMB Control Number 2070–0073 is added to read as follows:

§ 761.30 Authorizations.

* * * * *

(a) *Use in and servicing of transformers (other than railroad transformers).* PCBs at any concentration may be used in transformers (other than in railroad locomotives and self-propelled railroad cars) and may be used for purposes of servicing including rebuilding these transformers for the remainder of their useful lives, subject to the following conditions:

(1) *Use conditions.* (i) As of October 1, 1985, the use and storage for reuse of PCB Transformers that pose an exposure risk to food or feed is prohibited.

(ii) As of October 1, 1990, the use of network PCB Transformers with higher secondary voltages (secondary voltages equal to or greater than 480 volts, including 480/277 volt systems) in or near commercial buildings is prohibited. Network PCB Transformers with higher secondary voltages which are removed from service in accordance with this requirement must either be reclassified to PCB Contaminated or non PCB status, placed into storage for disposal, or disposed.

(iii) As of October 1, 1985, the installation of PCB Transformers (which have been placed into storage for reuse or which have been removed from another location) in or near commercial buildings is prohibited.

(iv) As of October 1, 1990, all radial PCB Transformers and lower secondary voltage network PCB Transformers (network transformers with secondary voltages below 480 volts) in use in or near commercial buildings must be equipped with electrical protection to

avoid transformer failures caused by high current faults. Current-limiting fuses or other equivalent technology must be used to detect sustained high current faults and provide for complete deenergization of the transformer within several tenths of a second of detection, before transformer failure occurs. The installation, setting, and maintenance of current-limiting fuses or other equivalent technology to avoid PCB Transformer failures from sustained high current faults must be completed in accordance with good engineering practices.

(v) As of October 1, 1990, all radial PCB Transformers with higher secondary voltages (480 volts and above, including 480/277 volt systems) in use in or near commercial buildings must (in addition to the requirements of paragraph (a)(1)(iv) of this section) be equipped with protection to avoid transformer failures caused by sustained low current faults.

(A) Pressure and temperature sensors (or other equivalent technology which has been demonstrated to be effective in the early detection of sustained low current faults) must be used in these transformers to detect sustained low current faults.

(B) Disconnect equipment must be provided to insure complete deenergization of the transformer in the event of a sensed abnormal condition (e.g., an overpressure or overtemperature condition in the transformer), caused by a sustained low current fault. The disconnect equipment must be configured to operate automatically within 30 seconds to 1 minute of the receipt of a signal indicating an abnormal condition from a sustained low current fault, or can be configured to allow for manual deenergization from a manned on-site control center upon the receipt of an audio or visual signal indicating an abnormal condition caused by a sustained low current fault. Manual deenergization from a manned on-site control center must occur within 1 minute of the receipt of the audio or visual signal indicating an abnormal condition caused by a sustained low current fault. If automatic operation is selected and a circuit breaker is utilized for disconnection, it must also have the capability to be manually opened if necessary.

(C) The enhanced electrical protective system required for the detection of sustained low current faults and the complete and rapid deenergization of transformers must be properly installed, maintained, and set sensitive enough (in accordance with good engineering practices) to detect sustained low current faults and allow for rapid and total deenergization prior to PCB Transformer rupture (either violent or non violent rupture) and release of PCBs.

(iv) As of December 1, 1985, all PCB Transformers (including PCB Transformers in storage for reuse) must be registered with fire response personnel with primary jurisdiction (that is, the fire department or fire brigade which would normally be called upon for the initial response to a fire involving the equipment). Information required to be provided to fire response personnel includes:

(A) The location of the PCB Transformer(s) (the address(es) of the building(s) and the physical location of the PCB Transformer(s) on the building site(s) and for outdoor PCB Transformers, the location of the outdoor substation).

(B) The principal constituent of the dielectric fluid in the transformer(s) (e.g., PCBs, mineral oil, or silicone oil).

(C) The name and telephone number of the person to contact in the event of a fire involving the equipment.

(vii) As of December 1, 1985, PCB Transformers in use in or near commercial buildings must be registered with building owners. For PCB Transformers located in commercial buildings, PCB Transformer owners must register the transformers with the building owner of record. For PCB Transformers located near commercial buildings, PCB Transformer owners must register the transformers with all owners of buildings located within 30 meters of the PCB Transformer(s). Information required to be provided to building owners by PCB Transformer owners includes but is not limited to:

(A) The specific location of the PCB Transformer(s).

(B) The principal constituent of the dielectric fluid in the transformer(s) (e.g., PCBs, mineral oil, or silicone oil).

(C) The type of transformer installation (e.g., 208/120 volt network, 280/120 volt radial, 208 volt radial, 480 volt network, 480/277 volt network, 480 volt radial, 480/277 volt radial).

(viii) As of December 1, 1985, combustible materials, including, but not limited to paints, solvents, plastics, paper, and sawn wood must not be stored within a PCB Transformer enclosure (i.e., in a transformer vault or in a partitioned area housing a transformer); within 5 meters of a transformer enclosure, or, if unenclosed (unpartitioned), within 5 meters of a PCB Transformer.

(ix) A visual inspection of each PCB Transformer (as defined in the definition of "PCB Transformer" under § 761.3) in use or stored for reuse shall be performed at least once every 3 months. These inspections may take place any time during the 3-month periods: January-March, April-June, July-September, and October-December as long as there is a minimum of 30 days between inspections. The visual inspection must include investigation for any leak of dielectric fluid on or around the transformer. The extent of the visual inspections will depend on the physical constraints of each transformer installation and should not require an electrical shutdown of the transformer being inspected.

(x) If a PCB Transformer is found to have a leak which results in any quantity of PCBs running off or about to run off the external surface of the transformer, then the transformer must be repaired or replaced to eliminate the source of the leak. In all cases any leaking material must be cleaned up and properly disposed of according to disposal requirements of § 761.60. Cleanup of the released PCBs must be initiated as soon as possible, but in no case later than 48 hours of its discovery. Until appropriate action is completed, any active leak of PCBs must be contained to prevent exposure of humans or the environment and inspected daily to verify containment of the leak. Trenches, dikes, buckets, and pans are examples of proper containment measures.

(xi) If a PCB Transformer is involved in a fire-related incident, the owner of the transformer must immediately report the incident to the National Response Center (toll-free 1–800–424–8802; in Washington, D.C. 202–426–2675). A fire-related incident is defined as any incident involving a PCB Transformer which involves the generation of sufficient heat and/or pressure (by any source) to result in the violent or non-violent rupture of a PCB Transformer and the release of PCBs. Information must be provided regarding the type of PCB Transformer installation involved in the fire-related incident (e.g., high or low secondary voltage network transformer, high or low secondary voltage simple radial system, expanded radial system, primary selective system, primary loop system, or secondary selective system or other systems) and the readily ascertainable cause of the fire-related incident (e.g., high current fault in the primary or secondary or low current fault in secondary). The owner of the PCB Transformer must also take measures as soon as practically and safely possible to contain and control any potential releases of PCBs and incomplete combustion products into

water. These measures include, but are not limited to:

(A) The blocking of all floor drains in the vicinity of the transformer.

(B) The containment of water runoff.

(C) The control and treatment (prior to release) of any water used in subsequent cleanup operations.

(xii) Records of inspection and maintenance history shall be maintained at least 3 years after disposing of the transformer and shall be made available for inspection, upon request by EPA. Such records shall contain the following information for each PCB Transformer:

(A) Its location.

(B) The date of each visual inspection and the date that leak was discovered, if different from the inspection date.

(C) The person performing the inspection.

(D) The location of any leak(s).

(E) An estimate of the amount of dielectric fluid released from any leak.

(F) The date of any cleanup, containment, repair, or replacement.

(G) A description of any cleanup, containment, or repair performed.

(H) The results of any containment and daily inspection required for uncorrected active leaks.

(xiii) A reduced visual inspection frequency of at least once every 12 months applies to PCB Transformers that utilize either of the following risk reduction measures. These inspections may take place any time during the calendar year as long as there is a minimum of 180 days between inspections.

(A) A PCB Transformer which has impervious, undrained, secondary containment capacity of at least 100 percent of the total dielectric fluid volume of all transformers so contained or

(B) A PCB Transformer which has been tested and found to contain less than 60,000 ppm PCBs (after 3 months of in service use if the transformer has been serviced for purposes of reducing the PCB concentration).

(xiv) An increased visual inspection frequency of at least once every week applies to any PCB Transformer in use or stored for reuse which poses an exposure risk to food or feed. The user of a PCB Transformer posing an exposure risk to food is responsible for the inspection, recordkeeping, and maintenance requirements under this section until the user notifies the owner that the transformer may pose an exposure risk to food or feed. Following such notification, it is the owner's ultimate responsibility to determine whether the PCB Transformer poses an exposure risk to food or feed.

* * * * *

[The recordkeeping requirements of paragraphs (a)(1) (vi), (vii), and (xi) were approved by the Office of Management and Budget under OMB Control Number 2070-0073. The recordkeeping requirements of paragraph (xii) were approved by the Office of Management and Budget under OMB Control Number 2070-0007.]

4. In § 761.40, paragraph (j) is added to read as follows:

§ 761.40 Marking requirements.

* * * * *

(j) As of December 1, 1985, the vault door, machinery room door, fence, hallway, or means of access (others than grates and manhole covers) to a PCB Transformer must be marked with the mark M_L. The mark must be placed so that it can be easily read by firemen fighting a fire involving this equipment.

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