Federal Railroad Administration

[BS-AP-No. 2985]

Norfolk and Western Railway Co.; Change of Location of Public Hearing

The Norfolk and Western Railway Company has petitioned the Federal Railroad Administration (FRA) seeking approval of the proposed discontinuance and removal of the traffic control system from Arcadia, Ohio to Lima, Ohio, and from South Lima, Ohio, to Muncie, Indiana.

FRA has issued a public notice scheduling a public hearing in this matter to be held on November 14, 1990. The location of the public hearing to be held on that date has been changed. The new location is: Second Floor Joint Use Conference Room, Federal Courthouse, 1300 South Harrison Street, Fort Wayne, Indiana.

Issued in Washington, DC on October 10, 1990.

J. W. Walsh,

Associate Administrator for Safety.

[FR Doc. 90-24589 Filed 10-17-90; 8:45 am]

BILLING CODE 4910-06-M

National Highway Traffic Safety Administration

Denial of Motor Vehicle Defect Petition

This notice sets forth the reasons for the denial of a petition for a defect and recall determination submitted to NHTSA under section 124 of the National Traffic and Motor Vehicle Safety Act of 1966, as amended (15 U.S.C. 1381 *et seq.*).

Ms. M. Kristen Rand, Counsel for Consumer Union, submitted a petition dated June 21, 1990, requesting that NHTSA conduct an investigation into and order a recall of all Gerry Guardian model #643 child car seats manufactured by the Takata-Gerico Corporation.

The petition alleges that a defect exists in the design of the shoulder harness retractor mechanism which may retract too far and hinder removal of a child from the seat, especially in an emergency situation.

Consumers Union suggests that the design of the Gerry Guardian presents a safety hazard similar to that previously addressed by NHTSA in its investigation EA88-013, which involved the Fisher Price Model #9100 child safety seat which used an automatic locking retractor (ALR). The Fisher Price model 9100 child safety seat was subsequently voluntarily recalled. The Fisher Price model 9100 has a lever located next to the buckle which engages the ALR when the harness is buckled in place. The ALR then serves as a one way retractor, removing any slack from the system and not allowing any slack to be reintroduced. When the harness is unbuckled, the lever disengages the ALR allowing the harness to move freely in either direction. In the case of EA88-103, the lever could stick in the engaged position (due to foreign objects, dirt, clothing, etc., lodging in the mechanism) when the harness was unbuckled. In this condition, the harness cannot be released, possibly trapping a child. The remedy for this defect consisted of providing owners with a button-stop kit to be fastened onto one side of the harness webbing. This limited the amount of shoulder harness which could be retracted once the shield was unfastened.

The Gerry Guardian model #643, as well as all Guardian models manufactured since 1984 with an approximate population of 430,000, utilizes a web sensitive emergency locking retractor (ELR) which allows the occupant to move comfortably in the safety seat during normal driving, yet locks up during a crash. The ELR system is web sensitive and locks up when the level of webbing acceleration "trips" a centrifugal mechanism. When removing a child from the seat the possibility exists for momentarily locking the retractor if the shoulder harness is pulled out too swiftly; however, by pausing and allowing the shoulder harness to slightly retract, the retractor unlocks and releases the harness. This is described in the instruction booklet which accompanies the seat.

Analysis of the Office of Defects Investigation computer records of owner complaints for the subject child safety seat revealed one report alleging that the harness/shield retracted and locked hindering removal of a child. The agency has received additioal retractor-related concerns regarding this seat alleging use difficulties, i.e., the harness must be pulled slowly (as stated in the instruction manual) in order to avoid temporarily locking the restraint while removing the child from the seat; however, none allege a locking, non-releasable retractor. The agency continues to receive consumer concerns regarding the functioning of this seat's retractor, perhaps in part due to Consumers Union's continued publicity alleging similarity between the Gerry Guardian and the Fisher Price seat which was recalled for an unrelated problem.

Consumers Union was requested by letter dated July 23, 1990, to provide all supporting documentation available regarding the alleged defect. Consumers Union has not responded to this request.

In consideration of the available information there is no reasonable possibility that an order concerning the notification and remedy of a safety-related defect in relation to the petitioner's allegations would be issued at the conclusion of an investigation. Since no evidence of a safety-related defect trend was discovered, further commitment of resources to determine whether such a trend may exist does not appear to be warranted at this time. Therefore, the petition is denied.

This notice sets forth the reason for the denial of a petition submitted to NHTSA under section 124 of the National Traffic and Motor Vehicle Safety Act of 1966, as amended (15 U.S.C. 1381 *et seq.*).

Authority: Sec. 124, Pub. L. 93-492: 88 Stat. 1470 (15 U.S.C. 1410a); delegations of authority at 49 CFR 1.50 and 501.8.

Issue on October 5, 1990.

Michael B. Brownlee,

Acting Associate Administrator for Enforcement.

[FR Doc. 90-24590 Filed 10-17-90; 8:45 am]

BILLING CODE 4910-59-M

Sunshine Act Meetings

Federal Register
Vol. 55, No. 202
Thursday, October 18, 1990

This section of the FEDERAL REGISTER contains notices of meetings published under the "Government in the Sunshine Act" (Pub. L. 94-409) 5 U.S.C. 552b(e)(3).

COMMODITY FUTURES TRADING COMMISSION

"FEDERAL REGISTER" CITATION OF PREVIOUS ANNONCEMENT: 55 F.R. 41167.

PREVIOUSLY ANNOUNCED TIME AND DATE OF MEETING: 11:00 a.m., Tuesday, October 16, 1990.

CHANGE IN THE MEETING: The Commission has rescheduled the closed meeting to discuss enforcement matters for 1:00 p.m., Thursday, October 18, 1990.

CONTACT PERSON FOR MORE INFORMATION: Jean A. Webb, Secretary of the Commission

Jean A. Webb,

Secretary of the Commission.

[FR Doc. 90-24842 Filed 10-16-90; 3:57 pm]

BILLING CODE 6351-01-M

FEDERAL ELECTION COMMISSION

* * * * *

"FEDERAL REGISTER" NUMBER: 90-24144.

PREVIOUSLY ANNOUNCED DATE AND TIME: Thursday, October 18, 1990, 10:00 a.m. Meeting open to the public.

THE FOLLOWING ITEM HAD BEEN REMOVED FROM THE AGENDA: Advisory Opinion 1990-19, Gordon M. Strauss on behalf of the Suarez Corporation.

* * * * *

DATE AND TIME: Tuesday, October 23, 1990, 10:00 a.m.

PLACE: 999 E Street, NW., Washington, DC.

STATUS: This meeting will be closed to the public.

ITEMS TO BE DISCUSSED:

Compliance matters pursuant to 2 U.S.C. § 437g.
Audits conducted pursuant to 2 U.S.C. § 437g, § 438(b), and Title 26, U.S.C.
Matters concerning participation in civil actions or proceedings or arbitration.
Internal personnel rules and procedures or matters affecting a particular employee.

* * * * *

DATE AND TIME: Thursday, October 25, 1990, 10:00 a.m.

PLACE: 999 E Street, NW., Washington, DC (Ninth Floor).

STATUS: This meeting will be open to the public.

MATTERS TO BE CONSIDERED:

Correction and Approval of Minutes
Advisory Opinions:
1990-19—Gordon M. Strauss on behalf of the Suarez Corporation
1990-24—Representative Edward R. Madigan—Administrative Matters

* * * * *

PERSON TO CONTACT FOR INFORMATION: Mr. Fred Eiland, Press Officer, Telephone: (202) 376-3155.

Delores Harris,

Administrative Assistant; Office of the Secretariat.

[FR Doc. 90-24806 Filed 10-16-90; 3:11 pm]

BILLING CODE 6715-01-M

Corrections

Federal Register
Vol. 55, No. 202
Thursday, October 18, 1990

This section of the FEDERAL REGISTER contains editorial corrections of previously published Presidential, Rule, Proposed Rule, and Notice documents. These corrections are prepared by the Office of the Federal Register. Agency prepared corrections are issued as signed documents and appear in the appropriate document categories elsewhere in the issue.

DEPARTMENT OF COMMERCE

International Trade Administration

[A-122-605, et al.]

Initiation of Anti-Circumvention Inquiry on Antidumping Duty Orders on Color Picture Tubes From Canada A-122-605, et al.

Correction

In notice document 90-20093 beginning on page 34950, in the issue of Monday, August 27, 1990, make the following correction:

On page 34950, in the third column, in the **EFFECTIVE DATE:**, "August 24, 1990." should read "August 27, 1990."

BILLING CODE 1505-01-D

FARM CREDIT ADMINISTRATION

12 CFR Parts 613, 614, 615, 616, 618, and 619

RIN 3052-AA94

Eligibility and Scope of Financing; Loan Policies and Operations; Funding and Fiscal Affairs, Loan Policies and Operations, and Funding Operations; Coordination; General Provisions; Definitions

Correction

In the correction to rule document 90-13862 appearing on page 28511 in the issue of Wednesday, July 11, 1990, item 20 should have begun "On page 24883".

BILLING CODE 1505-01-D

FEDERAL EMERGENCY MANAGEMENT AGENCY

44 CFR Part 67

Final Flood Elevation Determinations; Alabama et al.

Correction

In rule document 90-18279 beginning on page 31837, in the issue of Monday, August 6, 1990, make the following correction:

On page 31838, in the first column, in the table, under "California", and the heading "Napa County" etc., in the first line of the fourth entry, "downstream" should read "upstream".

BILLING CODE 1505-01-D

federal register

Thursday
October 18, 1990

Part II

Department of Labor

Occupational Safety and Health Administration

29 CFR Part 1926

Concrete and Masonry Construction Safety Standards; Lift-Slab Construction Operations; Final Rule

DEPARTMENT OF LABOR

Occupational Safety and Health Administration

29 CFR Part 1926

[Docket No. S-301B]

RIN 1218-AA20

Concrete and Masonry Construction Safety Standards; Lift Slab Construction Operations

AGENCY: Occupational Safety and Health Administration (OSHA), U.S. Department of Labor.

ACTION: Final rule.

SUMMARY: This rule revises the Occupational Safety and Health Administration's (OSHA) Safety Standards for Lift Slab Construction Operations. This rulemaking updates specific requirements for lift-slab construction operations that were incorporated by reference in the existing standard from the American National Standards Institute's (ANSI) Safety Requirements for Concrete Construction and Masonry Work, ANSI A10.9–1970, and adds new requirements to provide additional protection for workers engaged in lift-slab construction operations. This revision eliminates ambiguities caused by incorporating the ANSI standard by reference and strengthens the lift-slab requirements by eliminating weaknesses or gaps in coverage that existed through the reference to the outdated ANSI standard.

EFFECTIVE DATE: This final rule shall become effective December 17, 1990.

ADDRESSES: In compliance with 28 U.S.C. 2112(a), the Agency designates for receipt of petitions for review of the standard, the Associate Solicitor for Occupational Safety and Health, Office of the Solicitor, room S–4004, U.S. Department of Labor, 200 Constitution Avenue NW., Washington, DC 20210.

FOR FURTHER INFORMATION CONTACT: Mr. James Foster, U. S. Department of Labor, Occupational Safety and Health Administration, Office of Information and Consumer Affairs, room N3647, 200 Constitution Avenue NW., Washington, DC 20210, Telephone (202) 523–8151.

SUPPLEMENTARY INFORMATION:

I. Background

Congress amended the Contract Work Hours Standards Act (40 U.S.C. 327 *et seq.*) in 1969 by adding a new section 107 (40 U.S.C. 333) to provide employees in the construction industry with a safer work environment and to reduce the frequency and severity of construction accidents and injuries. The amendment, commonly known as the Construction Safety Act (Pub. L. 91–54; August 9, 1969), significantly strengthened employee protection by providing for occupational safety and health standards for employees of the building trades and construction industry who worked on Federal and Federally-financed or Federally-assisted construction projects. Accordingly, the Secretary of Labor issued Safety and Health Regulations for Construction in 29 CFR part 1518 (36 FR 7340, April 17, 1971) pursuant to section 107 of the Contract Work Hours and Safety Standards Act.

The Occupational Safety and Health Act (OSH Act) (84 Stat. 1590; 29 U.S.C. 651 *et. seq.*), which was enacted by Congress in 1970, authorized the Secretary of Labor to adopt established Federal standards issued under other statutes, including the Construction Safety Act, as occupational safety and health standards. Accordingly, under section 6(a) of the OSH Act (36 FR 10466, May 29, 1971), the Secretary of Labor adopted the Construction Standards which were issued under the Construction Safety Act in 29 CFR part 1518. These Safety and Health Regulations for Construction, part 1518, were redesignated as part 1926 at the end of 1971 (36 FR 25232, December 30, 1971). The standard entitled Concrete, Concrete Forms, and Shoring, §§ 1926.700 through 1926.702, was adopted as an OSHA standard as part of this process. OSHA revised that standard—except for the section on lift-slab operations—on June 16, 1988 (53 FR 22612), based on an earlier proposal. The 1988 revision changed the title of Subpart Q to Concrete and Masonry Construction and added several sections (now §§ 1926.700 to 1926.706). The existing requirements for lift-slab operations—incorporated by reference from Section 11 of the ANSI A10.9–1970 standard—are located in § 1926.705.

The revision to the lift-slab requirements in OSHA's subpart Q began on September 16, 1985, when OSHA proposed to revise its construction industry safety standard addressing concrete and masonry construction (50 FR 37543). One section of this 1985 proposal on subpart Q contained requirements specific to lift-slab construction operations. Following the publication of the proposal, there was a period for receiving written comments which ended on December 16, 1985, and a public hearing was held in Washington, DC on June 17–18, 1986. The record on that proposal closed on December 8, 1986. From that point on, no further information could be entered into the rulemaking docket for consideration by OSHA in preparing a final rule, without a formal reopening of the record.

After the record closed, a tragic accident occurred in Bridgeport, Connecticut. On April 23, 1987, a building under construction collapsed, killing 28 workers and injuring many others. The collapse caused the highest death toll from a workplace accident in the United States since 51 employees were killed in 1978 during construction of a cooling tower at Willow Island, West Virginia. The Bridgeport building that collapsed was being erected using the lift-slab method of construction. After the collapse, it was apparent to OSHA that there would be a new body of information forthcoming and a multitude of questions about this unique method of construction. The use of the lift-slab method was very limited, accounting for only a small percentage—probably less than one percent—of all construction activity in the United States.

Some of that information would come from the OSHA accident investigation. OSHA conducted an investigation of the accident with the assistance of the National Bureau of Standards (NBS) (now called the National Institute of Standards and Technology) of the U.S. Department of Commerce. The NBS presented their findings in a report released in September 1987. In that report, "Investigation of L'Ambiance Plaza Building Collapse in Bridgeport, Connecticut, NBSIR 87–3640" (Ex. 34), NBS concluded the following:

> The most probable cause of the collapse was determined to be loss of support at a lifting jack in the west tower during placement of an upper level package of three floor slabs. The loss of support was likely due to excessive deformation of the lifting angle in a shearhead followed by a lifting nut slipping off the lifting angle of the shearhead. The postulated failure mechanism was duplicated in laboratory experiments. The local failure propagated as loads were redistributed. The remaining jack rods along column line E supporting the package of floor slabs slipped off the lifting angles and the slabs failed in flexure and shear. These slabs fell causing the lower level slabs to fail. (p. iii).

To ensure that the subpart Q rulemaking record adequately reflected the best available information on lift-slab construction, OSHA decided to withhold the on-going revision of the lift-slab section in subpart Q until it could reopen the record for the limited purpose of seeking additional information on lift-slab construction. The rulemaking on the remainder of the 1985 proposed revision to subpart Q was

completed as a final rule on June 16, 1988 (53 FR 22612). OSHA reopened the record on September 15, 1988, with the publication of a proposed rule that addressed just the hazards of lift-slab construction (53 FR 35972). Interested parties were given until November 14, 1988, to submit comments pertaining to the proposal. The notice of proposed rulemaking also informed the public of the opportunity to request an informal public hearing on the proposal. Subsequently, OSHA received a request for an extension of the comment period. OSHA published a notice in the Federal Register on November 8, 1988 (53 FR 45102) announcing that it was extending the period for comments and hearing requests until December 14, 1988. During that comment period, OSHA received another request to extend the comment period further and to allow ample opportunity for a complete and full response to the proposed provisions and the specific issues raised in the proposal. Once again, OSHA agreed and issued a notice in the Federal Register of December 13, 1988 (53 FR 50038), announcing that it was extending the period for written comments and requests for a hearing until February 12, 1989. Thus, the written comment period for this new proposal lasted 5 months.

Although only one comment to the record on lift-slab construction was received when the standard was first proposed for revision in 1985, and no testimony was presented on the topic at OSHA's 1986 public hearing, there were 26 written comments received in response to the 1988 proposed rule. In addition, two requests for a hearing were received. In response to the requests, OSHA held a public hearing in Washington, DC on June 29–30, 1989, to hear testimony on the proposed rule. Much of that testimony, like some of the written comment, did not relate directly to the merits of the proposed rule, but instead related to various theories as to why commenters felt the L'Ambiance Plaza in Bridgeport collapsed; or why they felt the NBS Report was incorrect; or why OSHA was wrong for proposing what they thought were "new" standards. While all of this information is in the rulemaking record, little of it will be discussed in this preamble because it does not address matters under consideration in this rulemaking. That is, the proposal addressed lift-slab construction operations, not the validity of the NBS Report.

By the time of the scheduled hearings, with the majority of the comments in the record, it was apparent that many of the commenters thought that OSHA did not have any requirements in effect for lift-slab construction operations at the time of the Bridgeport accident and that the proposal contained all "new" requirements. In the opening statement for the public hearing, OSHA made it clear that this was not the case. (Tr. 1–12 and Ex. 44). In particular, OSHA stated that it had not proposed any new requirements based specifically on the NBS Report. OSHA also noted that most of the proposed requirements were essentially the same as the requirements that the Agency had been enforcing since 1971. However, OSHA had proposed to change some provisions to reflect revisions made by ANSI in 1983 when that organization updated its ANSI A10.9–1970 standard—the standard that OSHA had previously adopted by reference in 1971 and which OSHA herein refers to as its "existing" standard.

In preparation for the proposed rule, OSHA met with its Advisory Committee on Construction Safety and Health (ACCSH) to discuss a draft of the lift-slab proposal. The ACCSH made three recommendations at their March 30, 1988, meeting, and those recommendations were discussed in the proposed rulemaking. (A copy of the transcript of that discussion can be found at Exhibit 35–2.) First, ACCSH recommended that OSHA include the building columns among the items that must be designed with a safety factor of at least 2.5. ACCSH was referring to the current ANSI standard that requires "* * * the threaded rods and other members that transmit loads to the jacks shall have a minimum factor of safety of at least 2.5."

Second, ACCSH recommended revising draft paragraph (a) by supporting a motion put forth by the ACCSH representative from the Building and Construction Trades Department of the AFL–CIO. That motion was to require the "Lift-slab operations to be designed, planned, and supervised by a professional engineer or architect, licensed in the state where the work is being performed."

The final recommendation was expressed when ACCSH members discussed their views with regard to employees working under loads, including working under slabs which were not yet secured. The ACCSH members passed a motion which stated that, as a general rule, they did not endorse employees working under any loads.

In the preamble to the proposed rule, OSHA invited commenters to compare the lift-slab construction technique with other building techniques. OSHA summarizes the resulting discussion here, by first setting forth an excerpt from the National Bureau of Standards report, *Investigation of L'Ambiance Plaza Building Collapse in Bridgeport, Connecticut (NBSIR 87–3640)* (Ex. 34) in which the lift-slab method was described as follows:

> In the lift-slab method of construction, floor and roof slabs are cast one on top of the other at ground level. The floors are usually two-way post-tensioned flat plates of either regular or lightweight concrete. After post-tensioning, the slabs are lifted to their positions by hydraulic jacks and are secured to the columns. (p. 1).

NBS also said that "By casting the slabs at ground level, lift-slab construction can eliminate 90 percent of the formwork required for cast-in-place and reduce labor requirements. Cost savings and speed of construction are two primary advantages claimed for lift-slab construction" (Ex. 34, p. 1).

In cast-in-place construction, formwork is used to support the weight of freshly placed concrete and it continues to provide support until the concrete has achieved the strength necessary to support itself and all superimposed loads. Under subpart Q workers are not prohibited from working in buildings under such loads during the time that the concrete is gaining its strength. However, OSHA does require in § 1926.703(a)(1) that the "Formwork shall be designed, fabricated, erected, supported, braced and maintained so that it will be capable of supporting, without failure, all vertical and lateral loads that may reasonably be anticipated to be applied to the formwork." Further, OSHA states in § 1926.703(a)(1) that employers who follow sections 6 and 7 of the ANSI A10.9–1983 standard will be deemed to be in compliance with the formwork requirements. The ANSI standard prescribes that allowable loads on formwork components are to be based on a factor of safety, which is usually 2.5, but can be as high as 3, depending on the type of shoring used.

In contrast, in the lift-slab method of construction, OSHA proposed to continue the existing requirement that workers not be permitted to work under slabs which have not been secured, nor under slabs that have been secured if other slabs on upper levels are being lifted (a process termed "jacking operations"). Of course, OSHA did not intend that this requirement apply to the workers who are essential to the task of controlling the jacking operations and securing the slabs.

The proposed provision to keep nonessential employees out of the building ranked as the most

controversial provision in the proposed rule. In fact, according to one lift-slab contractor, prior to the L'Ambiance Plaza collapse, it was common practice, worldwide, for even nonessential employees to work in buildings being constructed by the lift-slab method during jacking operations as long as the floor slab immediately above the employees had been secured. (Ex. 35–2, p. 150). This means that some floor slabs were "suspended on the jacks" while nonessential employees were working below. A failure of any component of the jacking system, not unlike a failure of the formwork system in cast-in-place construction, could result in other components being overloaded or in the dropping of a suspended floor which could, in turn, result in total collapse of the building. Such failures have occurred in both cast-in-place and in the lift-slab method of construction. As OSHA stated in the proposed rule, though, it has limited data on total building failures where the lift-slab method of construction was used. Indeed, OSHA is aware of only one lift-slab-constructed building failure since 1971, the year OSHA came into existence. That, of course, is the 1987 L'Ambiance Plaza failure. Published materials, however, describe several other types of failures (where the lift-slab method was used) that occurred in the years 1952, 1954, 1956, 1961, and 1962. (Reference: Feld, Jacob, *Construction Failure.* John Wiley & Sons, Inc., New York; 1968) (Ex. 35–1).

Further discussion on the proposed prohibition was made by a representative of Texstar Construction Corporation when he addressed the ACCSH Committee on March 30, 1988 (Ex. 35–2, p. 150). The representative stated:

> Another very important area of disagreement is our position that other trades be allowed to work inside a building under secured slabs while lifting is in progress on upper floors. This has been the normal practice around the world and really is not different that what is normal practice of other structural methods. Similar conditions exist on multi-story, cast-in-place concrete frames, during the pouring and curing of an upper floor.

Further in his comments, he said that:

> On precast frames or masonry frames, the same thing applies during the erection of those precast members. On steel frames, during the erection of the steel members and the pouring of the decks up above, workmen are allowed to do their trades below. We really do not see why our method should be restrained in the way proposed, from competing with other structural systems.

He concluded by comparing the risks of precast with lift-slab construction, remarking that, "* * * some of the precast members are very, very heavy and very large on multi-story buildings; there are trades working below. God forbid one lets go, there is going to be a catastrophe, there is no question about it * * *." (Ex. 35–2, p. 154).

This statement prompted OSHA to ask for public comment in the proposed rule on whether or not employees working on precast or cast-in-place sites are exposed to the same type of hazard that is being addressed here for the lift-slab technique. Several commenters responded to the questions and their comments are discussed elsewhere in this preamble, under Issue #12.

Finally, OSHA would like to express its appreciation for the cooperation, assistance, and comments from all those who have participated in this rulemaking effort. In particular, OSHA acknowledges the assistance of Mr. Peter Vanderklaauw of Liftplate International, Inc., who welcomed the OSHA standards-writing team to visit a construction site while lifting was in progress, to allow first-hand observation of the hazards associated with the construction technique and see how one contractor addressed those hazards. OSHA also acknowledges the contributions of those in the engineering community who came together, sometimes at their own time and expense, to investigate the Bridgeport disaster and to make recommendations to OSHA and to other standards-making bodies (e.g., building code committees) in an effort to prevent the recurrence of such incidents. As OSHA stated in its closing remarks at the hearing, the Agency believes a final rule can be promulgated that provides a level of protection needed to ensure the safety of workers as intended by Congress, without taking away the livelihood of the very workers it seeks to protect (Ex. 44 and Tr. 6/29/89, p. 1–21).

II. Summary and Explanation of the Final Rule

The following discussion summarizes each of the provisions in the final rule and explains how they differ from the proposal and the existing rule. The discussion also includes an explanation of how the Agency arrived at its final decision.

OSHA requested comments on several specific issues in the preamble of the proposed rule (53 FR 35976) and in the hearing notice (53 FR 50038). All of these issues, and the comments received on them, are discussed in conjunction with the appropriate provisions of this final rule. Issues raised in the proposal that did not affect a provision in the final rule are discussed at the end of the discussion of the final rule provisions.

In general, this final rule differs from many of the final rules issued by OSHA in that currently it directly affects the operation of only two construction contractors in the United States and a small percentage of all the employees engaged in construction work. (Ex. 37, p. 35978). Additionally, OSHA recognizes that use of the lift-slab method of construction prevents employee exposure to some hazards that typically exist when other construction methods are used—methods such as steel construction, cast-in-place construction, and precast concrete construction. For example, these other construction methods require more work to be done at elevated locations, thereby exposing workers to fall hazards. (Tr. 6/30/89, pp. 2–185 to 186). (Note: The U.S. Department of Labor, based on data from the Bureau of Labor Statistics, lists falls as one of the leading causes of traumatic occupational death, accounting for 8% of all occupational fatalities in 1986. Data from NIOSH shows that from 1980–1985, falls represented about 10% of all traumatic occupational deaths for which a cause was identified and are one of the major causes of injuries to construction workers.) While OSHA currently has a rulemaking activity underway to address fall hazards in construction (Subpart M—Fall Protection) (51 FR 42718), it does not have rulemaking underway to address the hazards of collapse that may be associated with methods of construction other than lift-slab. In this rule, OSHA addresses the need to provide structural integrity to address the hazard of collapse.

The protection afforded by providing structural integrity may also need to be addressed where other construction techniques are being used and OSHA intends to investigate that need. Specifically, OSHA intends to gather information on issues such as the need to require contractors to address "structural integrity" of all structures while they are being built; the role of the general contractor versus that of the subcontractors; the need to ensure lateral stability during construction; and the need for on-site supervision at all construction sites.

Many of the written comments and testimony at the public hearing indicated a willingness among contractors, the engineering community, and other concerned individuals and organizations to work with OSHA to explore these important construction issues further. An example of this willingness to cooperate was evidenced at the hearing when James Hinckley, a licensed professional engineer with

James M. Hinckley Associates, made seven recommendations to OSHA for improving safety to employees. One of his recommendations was that an overlap of responsibilities between the owner, the architect, the engineer, the construction manager and the contractors be encouraged. Another was that complete investigations be made of collapses, and that the information be made available for use by architects/engineers and other professionals so that they can learn from failures "* * * so that each one of these things need not accept the loss of life, in its harsh reality, without being able to garner from that experience something that will improve the construction industry as a whole." (Tr. 6/30/89, pp. 2–138 to 2–140). Mr. Hinckley's investigation of the L'Ambiance collapse lead him to several conclusions, one of which was that rotation of the footings had occurred. Perhaps by way of example, he added, "I would like to get the word out not to put footings on top of reconstructed shotrock and fill, especially in the presence of a ground water situation." (Id. p. 2–141).

Additional evidence of forthcoming cooperation surfaced on cross examination when Mario Suarez commented to Hinckley that "I certainly want to congratulate you for your seven points of consideration for the future because I think that should be the concern of the engineering profession right now." (Tr. 6/30/89, p. 2–149). In the same vein, Professor Vanderklaauw of Liftplate International asked Matthew Burkart, the Chairman of the ANSI A10 Committee, if ANSI was being discriminatory in its rules with regard to keeping workers out of the building on lift-slab projects but not other concrete projects. Burkart responded that he was testifying with regard to the Committee's interpretation of the lift-slab provision only, but he added that it "might be worthy of consideration for the committee or another committee that is addressing reinforced concrete or other types of lifting or concreting operations" (Tr. 6/29/89, pp. 1–208 to 1–209).

Hinckley put it best when he said, "I think now would be an excellent time for the government to get involved to support this effort [for enhancing quality in construction] and with, certainly, their resources, which are far greater than any of those in the industry, to make a real difference." (Id. p. 2–141).

Section 1926.700(b) Definitions

OSHA proposed to add two terms to the definitions section of Subpart Q—Concrete and Masonry Construction. These terms, "jacking operation" and "qualified designer," are discussed below.

"Jacking operation." In paragraph (b)(9) of § 1926.700, OSHA is adding a definition for the term "jacking operation." OSHA used this term in the proposed rule and defined it to mean the task of lifting a slab (or groups of slabs, sometimes referred to as a "package" or "pick") vertically from one location to another, e.g., from the casting location to a temporary (parked) location, or from a temporary location to another temporary location, or to the final location of the slabs in the structure. The definition in the final rule is identical to the definition in the proposal. The existing rule did not contain a definition for the term "jacking operation."

OSHA did not receive any comments on the proposed definition. The Agency believes that the term, as applied to this standard, is approximately defined for its use and that no further revision to the definition is necessary in this final rule.

"Qualified designer." In the NPRM, OSHA proposed to define the term "qualified designer" because the term was used both in the proposed requirements for lift-slab operations and in the previously promulgated formwork requirements of the cast-in-place section of subpart Q (§ 1926.703(b)(8)(i)). OSHA did not define the term in the previously promulgated section of subpart Q because, as used in the formwork section, its meaning is clear. However, when OSHA proposed to use the term again in the lift-slab section, it was decided that the term should be defined in the new proposed rulemaking.

While there was no objection to the definition of "qualified designer," there was substantive objection to OSHA's use of that term in the standard. That objection was sufficiently supported in the rulemaking record, and OSHA has decided not to use the term "qualified designer" in the final rule. (See detailed discussion below, under § 1926.705(a), for the reasons why OSHA is not using the term "qualified designer".) Therefore, since the meaning of the term is clear in the formwork section, and the term will not appear in the final lift-slab section, there is no longer a need to define the term. Hence, the term "qualified designer" is not carried forth to the final rule.

Section 1926.705 Lift-Slab Operations

Section 1926.705 of the final rule contains specific requirements for lift-slab construction operations. Employers who have employees exposed to the hazards of lift-slab construction operations must comply with these specific requirements as well as the general requirements for all concrete construction contained in other sections of Subpart Q—Concrete and Masonry Construction in 29 CFR part 1926.

Paragraph (a) of the final rule requires that lift-slab operations be designed and planned by a registered professional engineer who has experience in lift-slab construction. It also requires that the employer implement all such designs and plans; that the designs and plans include detailed instructions and sketches indicating the prescribed method of erection; and that the plans and designs include provisions to ensure lateral stability of the structure while it is being constructed.

The language in the final rule varies from that used in the proposed rule in several ways. First, the term "qualified designer," which was used in the proposed rule, is replaced by the phrase "registered professional engineer, who has experience in lift-slab construction." Second, an obligation for the employer to ensure lateral stability of the structure during construction has been added to this provision.

In the NPRM, OSHA proposed that a *qualified designer* design and plan the lift-slab operations. That language was based on a provision for lift-slab operations in the latest ANSI standard for Concrete and Masonry Work, ANSI A10.9–1983, § 10.2. In proposing the language used in the 1983 ANSI standard, OSHA noted that it was different from the language used in the ANSI A10.9–1970 standard, which OSHA currently incorporates by reference. In particular, the 1970 ANSI standard prescribes that a qualified professional engineer or architect (rather than a "qualified designer" as prescribed in the 1983 ANSI standard) design and plan lift-slab operations. When OSHA discussed this proposed provision with the members of the ACCSH at their March 1988 meeting, the ACCSH recommended that OSHA use the term "professional engineer or architect registered in the state where the work is being done" instead of the term "qualified designer." ACCSH did not discuss why they believed that employees would be afforded a greater level of safety if OSHA adopted their phrase and did not propose the language of the most recent national consensus standard. (Ex. 35–2). Where a national consensus standard is in place, OSHA often uses that language in its proposed rules, with modifications as are considered necessary and appropriate. OSHA recognizes that national consensus standards, such as those developed by organizations like ANSI, represent the views of labor, industry,

and state and Federal governments, and that the consensus standards are usually a reflection of current industry practice and sound engineering principles. Evidence of this viewpoint can be found in the OSH Act itself, which states the following:

> Whenever a rule promulgated by the Secretary differs substantially from an existing national consensus standard, the Secretary shall, at the same time, publish in the Federal Register a statement of the reasons why the rule as adopted will better effectuate the purposes of this Act than the national consensus standard. (Section 6(b)(8)).

OSHA's proposed language for the provision in paragraph (a) reflected consideration of the 1983 ANSI consensus standard. However, since ACCSH recommended that OSHA require a professional engineer or architect, licensed in the state where the work was to be done, to be responsible for designing and planning lift-slab operations, instead of a *qualified designer*, OSHA raised a specific issue on this concern. In particular, in Specific Issue 1, OSHA asked the following questions: "Would employees be afforded a greater level of protection if OSHA revised this provision to require the work to be done by an 'engineer' or 'architect'." If so, OSHA asked, "What particular classification of engineer would afford the appropriate level of protection (e.g., structural, registered professional engineer)."

OSHA further explained in the proposal that, in addition to the ACCSH's recommendation pertaining to the substitution of the term professional engineer or architect for *qualified designer*, the ACCSH had also recommended that the provision be expanded so that the professional engineer or architect would be required to "supervise" the lift-slab operations.

Also in connection with paragraph (a), OSHA asked questions in Specific Issue #5 regarding the need to add requirements for the employer to address lateral stability during the construction phase. The comments and testimony addressing the proposed provision and the two specific issues related to this provision are discussed below.

Fifteen of the 26 written comments received on the proposal addressed this issue of engineer/architect versus qualified designer. Texstar Construction Corporation identified proposed provision (a) as one to which they objected when they requested a public hearing on the proposed rule (Ex. 38-15). In particular, Texstar stated that "The proposed rulemaking should be revised to read as follows: All lift-slab details shall be reviewed and approved by the architect/engineer of record and incorporated into the structural drawings. These drawings shall include details of erection and instruction regarding the prescribed lifting sequence." Texstar added that use of this language would insure an adequate check and balance system so as to insure a safe workplace for the employee. Texstar repeated this statement at the hearing (Tr. 6/30/89, p. 2-172).

A review of the record indicates that commenters varied widely in their positions on the proposed paragraph (a) provision. For example, David Wonder (P.E. and Chief Engineer for Texstar Construction Corporation, representing his own professional views) (Ex. 38-7) stated, "I agree with the wording qualified designer as having to plan and design the lift-slab operations." Wonder also stated that "The particular details associated with lift-slab are not familiar to most engineers and there is no single engineer which is both familiar with these details and is registered in each state that lift-slab is used." Wonder further noted that the Engineer of Record (EOR) is required to be licensed in the state for which the work is to be done and that the EOR should be sent all designs, details and lifting sequences for review and approval. On the issue of supervision, Wonder indicated that he agreed in principle to having the EOR or his representative oversee compliance with the structural drawings. But he added that ". . . singling out of the lift-slab method for this regulation seems politically motivated since other catastrophic failures have occurred with other types of construction methods, and no such requirement exists for them." (Id., p. 2). This position was expressed many times in the written comments and at the public hearing by other interested individuals. (Exs. 38-12, 38-14, 38-17, 38-20, 38-21, and 38-25). In his concluding remarks, Wonder cautioned OSHA that such a requirement, applicable only to lift-slab construction, would allow different levels of safety for different construction methods because "other types of construction would have more relaxed safety regulations." (Ex. 38-7).

Texstar Construction Corporation (Ex. 38-17), through their attorney David Turlington, made similar comments on this issue of qualified designer versus engineer/architect. He noted that "Employees would not be afforded a greater level of protection by requiring a specific classification of engineer or architect." Texstar noted that current industry practice required the use of "qualified designer." Like Wonder, Texstar (apparently in reference to the ACCSH recommendation that lifting operations be "supervised" by the professional engineer or architect who designs and plans the lifting operation) also objected to singling out lift-slab construction for inspection and recommended that all construction projects with building costs in excess of $1 million have jobsite inspection by a qualified inspector who would be selected by the design team (architect/engineer).

On the other hand, Donald Rubatino, a Registered Structural Engineer (Ex. 38-16), commented that "Licensed structural engineers should be involved in all lift-slab designs." Then, Rubatino went on to say, "I do not believe that a licensed engineer on the job during lifting would serve any useful purpose as the lead people during the lifting are generally far more aware of potential problems."

OSHA received the following comment from a practicing civil and structural engineer registered in several states—Dean P. Ratti (Ex. 38-19):

> Classic contractual arrangements between Owner-Architect/Engineer clearly prohibit the engineer from involvement in the means, methods, techniques, sequences, or construction procedures, or for safety precautions and programs, in that these are solely the responsibility of the Contractor under his contract with the Owner.

Mr. Ratti further commented that "It would seem more prudent to require qualification by direct experience with the technique ahead of local registration (which does not guarantee qualification for an operation as specialized as the lift-slab method)."

The National Society of Professional Engineers (NSPE) (Ex. 38-3), which represents 75,000 engineers and engineering students, commented that they oppose "any legislation or regulations which make engineers responsible for the action of others not under their direct supervision and control." NSPE further commented:

> Under provisions of contract, language, and court decision developed through many years and supported by engineers, architects, contractors, and owners, it is the contractor who has responsibility for controlling construction methods, means and safety. We, therefore, oppose the existing rule, the OSHA proposed change in language, and the Advisory Committee recommended changes as they relate to issue 1.
>
> NSPE would encourage the OSHA to incorporate language in the draft standard which would require the *contractor* to either retain the services of a licensed professional engineer or to maintain a licensed professional engineer on staff who possesses the necessary technical competence and expertise on issues of job site safety and construction methodology.

Finally, NSPE noted their preference for the term "registered professional

engineer" instead of the proposed term "qualified designer."

Another commenter, Joseph Cooke, P.E. (Ex. 38–23), stated that "We concur with OSHA in that the provision of requiring work to be done by a licensed professional engineer specializing in structures be used to plan and design any lift-slab project," noting that the construction workers deserve the safety afforded by having the aspects of lift-slab construction reviewed and modified if necessary by an individual who has the expertise in this field. Mr. Cooke also indicated his thoughts that the technical knowledge needed for lift-slab analysis would not normally be required of the architectural profession and that the engineer should be independent of the owner and project contractors. Mr. Cooke expressed support for requiring that the engineer be licensed in the state where the work is to be done. He noted that the conditions of construction differ in each state and that qualified engineers can easily obtain registration in other states. He supported his position with the following statement:

> State laws allow the registration of independent engineers as a protection to the people in that state and as such without circumventing the responsibilities of each state, these provisions should allow that the engineer responsible for the final design of the lift-slab construction be registered in the state of that construction and be responsible to the people of that state. (Id.).

Lastly, Mr. Cooke noted his objection to use of an engineer to "supervise" the work. Like other commenters, Mr. Cooke noted that supervision is a responsibility of the contractor. He did, however, believe it appropriate for the engineer to document the procedures to be used throughout the construction and expressed his support for requiring the engineer to visit the project on an interim basis to review contractor compliance with the criteria.

Another commenter, Mario Suarez, P.E. (Ex. 38–21), noting his acceptance of the proposed language in § 1926.705(a), stated that "The substitution of professional engineer licensed in the state where the work is to be done for qualified designer would afford a comparable level of protection to employees." Mr. Suarez, like Texstar and David Wonder, suggested that all designs, plans and/or details and procedures be submitted to the engineer of record for review and approval. He also agreed with the ACCSH recommendation regarding inspection (supervision of the lifting operation), but only if it applied to all construction projects (not just lift-slab) with a cost "greater than, say $1 million."

Michael Kennedy, writing on behalf of the Associated General Contractors of America (AGC) (Ex. 38–22), indicated that OSHA's proposal for a qualified designer was redundant and unnecessary. More specifically, Mr. Kennedy stated that "Current construction industry practices, and state and local building codes require a registered professional engineer to approve and stamp all structural drawings." Kennedy also commented that Connecticut and Texas, where engineering supervision is required for certain construction operations, have experienced a number of problems, some of which he lists in his written comments.

Michael Fraioli, President, Lift Frame Builders, Inc., (Ex. 38–1) commented that any competent registered engineer could design a lift-slab building and that the engineer of record should be on the jobsite conducting inspections.

NIOSH (Ex. 38–4) agreed with ACCSH on the use of the phrase "professional engineer or architect, licensed in the state where the work is to be done" instead of "qualified designer."

Representing Brown and Root, Inc., Charles Darnell (Ex. 38–6), commented that a professional structural engineer should plan and design the project and a civil or structural engineer should supervise the lift-slab operations.

Further comments on Issue #1 were received from Charles Hawkins, from the Associated Builders and Contractors, Inc. (ABC) (Ex. 38–26), who felt that architects and engineers should have the responsibility for planning and designing a safe lift-slab operation, noting that these are the professionals with the experience and qualifications. With regard to supervision of the lift-slab projects, Mr. Hawkins disagreed with ACCSH's recommendation and pointed to the superintendent or project supervisor, "* * * someone who is involved in the job and familiar with the details of a construction job site," as the person who should be responsible for the duty of supervision.

Joseph L. Hoffman, (Ex. 38–24), who noted in his comments that he was a member of a team of professional structural engineers engaged to study the L'Ambiance incident on behalf of Texstar, agreed with the use of the term "qualified designer" in § 1926.705(a). Mr. Hoffman stated that the term was appropriate and more than adequate, particularly since the term was well defined in the proposal. Supporting his comment, Mr. Hoffman made the observation that lift-slab construction requires specialized knowledge, yet registration can be obtained by professional engineers or architects without this specialized knowledge. Finally, Hoffman commented that "No other construction system requires the supervision of a professional engineer."

Doug Nunnelly of Diversified Design and Construction (Ex. 38–25) commented that the term "qualified designer" is meaningless, stating that "All state and local codes require that all structural design work be under the supervision of a registered professional engineer or architect." He also expressed his view that inspection is more adequate than supervision and that lift-slab construction should not be singled out for more specific inspection.

Finally, Mr. Peter Vanderklaauw, President of Liftplate International, Inc. (Ex. 38–20), suggested that the words "experienced in lift-slab construction" be used instead of "licensed in the state where work would be done." Mr. Vanderklaauw noted that the proposed language could require a lift-slab contractor to hire an inexperienced professional (to be in compliance with the OSHA standard); that is, one who is licensed in that state but who has no experience with the lift-slab method of construction and that "OSHA should recognize that an inexperienced professional is liable to cause more harm than good."

The testimony presented at the public hearing on Issue #1 and paragraph (a) of § 1926.705 echoes the written comments discussed above. Although the technical arguments for both terms are well stated, there is no clear discussion of the benefits to worker safety to be gained by requiring a qualified designer instead of a registered professional engineer or vice versa. In fact, since all states require that building plans be approved by the Engineer of Record (EOR) (who must be licensed in the state where the work is being done) it might at first appear, as Mr. Nunnelly said, that the requirement proposed by OSHA would be meaningless (Ex. 38–25). However, OSHA's requirement pertains to the lift-slab operation only. It is the Agency's intent that the lift-slab contractor be responsible for the lift-slab operations at the construction site. OSHA observes that the general contractor (who probably is not the lift-slab contractor) is generally responsible for the entire structure and the Engineer of Record is a representative of the owner or of the general contractor, not the lifting contractor. Therefore, it would appear that the recommendations that OSHA place responsibility for worker safety matters on the EOR, when it is known that the EOR will not be in the employ of the lifting contractor, would not provide adequate protection. OSHA

observes that the Agency's jurisdiction is based upon the employer/employee relationship.

OSHA has carefully and thoroughly evaluated all of the comments and testimony on this provision. There were a number of questions asked in regard to this provision and a number of recommendations appear in the record on several issues related to the language in the final rule. Rather than respond to every comment made, OSHA will highlight the substantive comments on various issues and discuss its views on those issues, specifically those that led to changes or amendments to the proposed language.

First, while many commenters noted support for the term "qualified designer," they also supported requiring the engineer of record to have some responsibility for reviewing the work of the qualified designer. OSHA does not believe this is an acceptable solution, since it would split the responsibilities for worker safety and could inadvertently place responsibilities on persons who are not in a position to control employee exposures to hazards; thus, OSHA questions the potential benefit to worker safety with this solution.

Additionally, the record shows that some of the commenters who objected to the term "qualified designer" pointed out that the definition proposed by OSHA limits the contractor to using only those individuals who had experience or knowledge regarding lift-slab construction. The commenters who objected expressed the belief this limitation is unfair and pointed out that lift-slab construction is within the scope of any professional engineer's ability, so OSHA should not have such a restriction. For these reasons discussed above, neither "qualified designer" nor "engineer of record" is used in the final rule.

Further, the record does not support using the term "architect." OSHA notes that it requested comment in the NPRM on the use of the term "architect," since that term is used in the ANSI A10.9–1970 standard which OSHA currently enforces. In particular, in section 11.2, the ANSI standard prescribes that a qualified professional engineer or "architect" design and plan the lift-slab operations. Additionally, ACCSH recommended that OSHA use the term "professional engineer or architect, registered in the state" in paragraph (a) in lieu of the term "qualified designer." However, there was very limited discussion or reference to the use of the term architect. Only one comment was received and that commenter remarked that the technical knowledge needed for lift-slab would not ordinarily be knowledge possessed by architects. OSHA notes that it did not propose to use the term "architect" and the record lacks evidence to support the ACCSH recommendation to revise the provision to require architects to design and plan lift-slab construction operations. OSHA further notes that this provision addresses only the planning and designing of the lift-operation, not the planning and designing of the building. Thus, the failure to include the term "architect" in the final provision does not preclude architects from designing buildings. Therefore, the term "architect" is not used in the final rule provision.

Thus, there is only one term that was mentioned in the proposed paragraph that remains for discussion—registered professional engineer. The record fully supports requiring that a registered professional engineer design and plan the lift-slab operations. The ACCSH suggestion that the requirement in paragraph (a) be expanded so that the registered professional engineer would also be required to "supervise" the lift-slab operation, however, is not supported by the record. The record does not support requiring the employer to hire a registered professional engineer to perform supervisory duties. The record indicates that if such a requirement were to be imposed for all methods of construction, not just on projects where the lift-slab method of construction is being used, that support would be forthcoming. OSHA observes that employers are currently required to "supervise" operations at the construction site (29 CFR 1926.16–.20) and this is usually accomplished through the employer's designated "competent person." The issue here is whether or not such responsibilities should be designated specifically to a "registered professional engineer." OSHA has determined that at this time there is insufficient support to add a new requirement for onsite supervision by the registered professional engineer. OSHA notes that commenters used the term "inspection" interchangeably with "supervision" in commenting on the ACCSH recommendation.

Commenters Ratti and Vanderklaauw (Exs. 38–19 and 38–20), suggested that instead of requiring the engineer to be licensed in the state where the work is being done, OSHA should require the engineer to have experience in lift-slab construction. Similarly, as stated above, Joseph Cooke (Ex. 38–23) said that the engineer used for the lift-slab project should be someone who specializes in planning and designing those structures and cited worker safety as a reason. However, Cooke also strongly supported the need for registration in the state where the work is being done. And, finally, there was the comment by Joseph Hoffman (Ex. 38–24), who expressed the same concern that Professor Vanderklaauw did, that lift-slab construction requires specialized knowledge, yet registration can be obtained without that knowledge.

After careful and complete consideration of the record, OSHA has decided that the term Registered Professional Engineer (RPE) is the appropriate term to be used in the final rule, and that the RPE must have experience in lift-slab construction. The language of the final rule is consistent with recognized industry practice. Additionally, while it cannot be proven conclusively, it appears from the written comments and from the hearing testimony that the engineering profession holds its members to standards that go beyond even that for which OSHA has responsibility in the workplace. Thus, because of the complexity inherent in lift-slab operations, OSHA believes a higher level of safety will be afforded workers if it requires a Registered Professional Engineer to be responsible for planning and designing lift-slab operations. As mentioned above, both of the lift-slab contractors currently operating in the United States have a Professional Engineer on staff who is registered in one or more jurisdictions, further evidencing the importance of their role in lift-slab construction. The record does not provide any evidence that employees would be afforded a greater level of safety if the professional engineer is required to be registered in the state where the work is being performed. Therefore, OSHA has not included that portion of the ACCSH recommendation. And, as stated above, the record lacks support for a requirement that the registered professional engineer also be required to *supervise* the lift-slab operations.

The final portion of the provision in paragraph (a) requires the registered professional engineer to consider lateral stability and to incorporate provisions in the lift-slab plans and specifications to ensure lateral stability of the structure during construction. This is a new requirement and OSHA believes it will further the safety and health of workers at lift-slab construction sites.

OSHA raised a specific issue (Issue #5) asking whether or not specific requirements for lateral stability should become a part of the final rule and how employers currently addressed lateral stability.

The response to Issue #5 demonstrated that OSHA needed to include a requirement for the employer to address lateral stability in the final rule. However, the response in the record did not support an OSHA "specification" requirement that would prescribe how to achieve lateral stability. Many of the commenters noted that building codes already address lateral stability and that the engineer of record is responsible for incorporating lateral stability requirements in the building plans and specifications (Exs. 38–7, 38–12, 38–17, 38–19, and 38–25). OSHA notes that while it is true that the building codes address lateral stability of the "finished" or completed structure, building codes may not address hazards associated with the failure to ensure lateral stability during construction and the effect on the safety of employees performing the construction work. OSHA's intent was to address the need to add a specific requirement prescribing that the employer ensure lateral stability during the construction phase.

Commenting more directly on the issue of lateral stability during the construction phase was Mario Suarez, (Ex. 38–21), who noted that "Lateral stability requirements are an important part of any Building Code." He also stated that "They (the building codes) have to be complied with at all times, during all stages of erection as well as in the finished structure." Again, though, Mr. Suarez noted that the responsibility belongs to the Engineer of Record who would review and approve the erection contractor designs. Mr. Suarez, like other commenters (Exs. 38–7 and 38–25) noted that such a requirement should not be applicable to lift-slab contractors only. Texstar's comments (Ex. 38–17) were similar to those of Mr. Suarez.

On the other hand, Joseph Hoffman (Ex. 38–24) commented that he "* * * strongly recommends that such a requirement be incorporated. The responsibility for determining such stability should be placed on a specially trained design engineer(s) engaged by the Lifting Contractor." He further noted that the person who designs the system is the individual who should state the stability requirements during lifting, just as the Engineer of Record states the requirements for the slabs, columns and foundations, etc. in their final state of use. OSHA agrees with the comments and recommendations expressed by Mr. Hoffman and echoed by Mr. Joseph Cooke (Ex. 38–23), who added that lateral stability "* * * plays an important part of the design of any building particularly the lift slab project." OSHA believes workers will be afforded an appropriate level of safety by requiring the registered professional engineer who designs and plans the lift-slab operation to also address the need for lateral stability. The Agency believes this information is critical and must be communicated to the contractor. Consequently, this information is required to be included in the plans and specifications along with the other information required by the paragraph (a) provision. Therefore, based on the comments discussed above, OSHA promulgates paragraph (a) as revised.

Paragraph (b) of the final rule requires that jacks (lifting units) be marked to indicate the rated capacity established by the manufacturer. This is an existing requirement, found in § 1926.305(a)(1), which applies to all jacks used in construction activities. OSHA did not propose any substantive revision to this provision, but simply proposed to repeat it in the lift-slab operations section so that all requirements unique to lift-slab construction operations would appear in the same section of the construction safety and health standards. OSHA believes it is necessary for employers to ensure that each jack has the rated capacity marked so there will be no question as to what loads can be placed on the jacks.

There were no comments on this provision and OSHA promulgates paragraph (b) unchanged from the proposed rule, except that in recognition of industry nomenclature, the term "lifting units" has been added to the text as an alternative term for the term "jacks."

Paragraph (c) of the final rule requires that jacks (lifting units) not be loaded beyond the rated capacity established by the manufacturer. This, too, is an existing requirement from § 1926.305(a)(1), and was proposed to be repeated in the lift-slab section for the same reasons as explained in the discussion of paragraph (b) above. Again, OSHA did not propose any substantive revision to the existing requirement.

OSHA received one comment on the proposed provision. Rubatino Engineering (Ex. 38–16) commented that the "Jacking capacity of jacks definitely should not be exceeded" and noted that it is standard practice for safety concerns as well as maintenance. There were no other comments on this provision. OSHA believes the provision is appropriate as proposed, except the term "lifting units" has been added to the text for the reason discussed in paragraph (b) above. Therefore, OSHA promulgates paragraph (c) as revised.

Paragraph (d) of the final rule requires that jacking equipment be capable of supporting at least two and one-half times the load to be applied during lifting operations and that the jacking equipment not be overloaded. OSHA identifies components of the jacking equipment as the threaded rods, lifting attachments, lifting nuts, hook-up collars, T-caps, columns, shearheads, and footings, as well as any other load bearing component which is used to carry out the lifting operation(s).

The final rule differs from the proposed rule. In the NPRM, OSHA proposed the following:

> Jacking equipment shall not be overloaded and the threaded rods and other members (such as but not limited to the following: jacks and other lifting units, lifting angles, lifting nuts, hook-up collars, T-caps, shearheads, columns, and footings) that transmit loads to the jacks shall be capable of supporting at least two and one-half times the load to be applied.

The proposed language was developed by using both the ANSI A10.9–1970 and the ANSI A10.9–1983 standard that contained a similar provision. OSHA clarified the provision by identifying shearheads, columns, and footing as other members of the jacking equipment. These three components were not specifically mentioned in the ANSI standards but in a written interpretation to OSHA (Ex. 35–3) ANSI identified shearheads, columns, and footings as "other members" for the purposes of applying their standard.

Because there was controversy surrounding this provision, OSHA raised two special issues, Issue #2 and Issue #4, to ask specific questions on the following: how to word the provision; what components should be included in the provision; and, how OSHA should identify those components.

In response to the comments and testimony received on the paragraph (d) provision and on Issues #2 and #4, OSHA has rewritten paragraph (d) for the final rule. The final rule differs from the proposed rule in several ways. First, it defines and clarifies which members are considered to be jacking equipment for the purposes of the provision. Specifically, the provision has been reworded to identify components by name and to state that if the load being lifted is supported by components other than those mentioned by name, those other components must also be capable of supporting two and one-half times the load that will bear on them during jacking operations.

OSHA received two comments on Issue #4 that provided the impetus to require that "all load-bearing components added to the structure for the purpose of carrying out the lifting operations" as "other members" that should be able to support two and one-half times the load applied to them during lifting operations. NIOSH (Ex. 38–4) suggested that the language of the standard specifying minimum standards for jacking equipment refer to "load bearing components" of the lifting system and David Wonder (Ex. 38–7), suggested that the provision include the sentence, "This equipment is to include all components of the jacking system, which have been added to the structure, temporarily or permanently, for the sole purpose of lifting." While OSHA does not agree with the use of the term "sole" purpose of lifting, it does see merit in Mr. Wonder's suggested revision in terms of clarity. Therefore, OSHA has relied on the suggestion of Mr. Wonder in its revision.

Other clarifications were made to resolve other commenter concerns. For example, many commenters felt that OSHA was attempting to rewrite the building codes which have provisions that specify safety factors or "load factors." OSHA observes that while it is true that many building codes specify such factors, they apply only to finished structures. Further, those codes were not developed with specific emphasis on worker safety which is, of course, OSHA's primary concern. OSHA recognizes that while a structure is being constructed, it is most vulnerable to forces that can cause it to collapse, causing injury or death of the workers. Thus, OSHA's requirements first define the hazards associated with lift-slab operations and then specify solutions to control or eliminate those hazards.

OSHA believes additional clarification is achieved by explaining that the jacking equipment must be capable of supporting two and one-half times the "load being lifted during jacking operations" which makes it clear that the 2.5 factor applies to the load that the equipment will actually be lifting at any one time. OSHA believes that some individuals thought the 2.5 factor applied to all the live and dead loads of the structure, including some loads not being lifted. For the purpose of this provision, once the load (floor slabs) has been secured, it is considered to be "off the jacking equipment."

OSHA observes that compliance with local building codes may, in some cases, also put the contractor in compliance with the provision of this paragraph (d). However, compliance with this paragraph does not, in any manner, relieve the contractor from compliance with any other codes that may be required by state or local authorities having jurisdiction over the construction activity. OSHA further recognizes that columns, footings, and shearheads must also be designed using load factors associated with the completed structure which are specified by building codes. Thus, it may be necessary for the contractor to perform calculations sufficient to determine that the concerns of both OSHA and the local building code have been met.

Many commenters (Exs. 38–1, 38–7, 38–12, 38–17, 38–21, 38–22, 38–23, and 38–25) argued that OSHA should not include columns, shearheads, and footings because these members are designed in accordance with other codes, such as ACI, AISC, PTI, etc. However, as mentioned before, these codes pertain to the completed structure, whereas OSHA's requirement pertain to the loads being lifted during jacking operations. Thus, the commenters arguments do not address the merits of the provision and do not justify removal of columns, shearheads, and footings from the provision. OSHA is well aware that hazards facing construction workers during the building phase are different than the building code concerns for a completed, stable structure. OSHA's efforts are directed at ensuring that appropriate protection is afforded the workers during lifting operations, while the structure is being built.

In the proposed rule, OSHA indicated that it was aware of the controversy associated with this particular provision. OSHA also noted that this provision appeared in section 11.3.1 of the ANSI A10.9–1970 standard for Concrete and Masonry Work (incorporated by reference in existing § 1926.705) and was continued in the 1983 ANSI A10.9 standard in section 10.3.1. OSHA also noted that it had asked ANSI for an interpretation of this provision, asking them in particular, whether or not their standard required the building columns, shearheads and footings to be subject to the 2.5 safety factor. The ANSI Committee responsible for the standard clarified through correspondence to OSHA (see Ex. 35–3) and through oral testimony at the OSHA hearing on lift-slab operations (Tr. 6/29/89, pp. 1–199 to 1–223) that it was their intent to include the columns, shearheads and footings as "other members" for the purpose of their provision. In particular, Mr. Matthew Burkart, Chairman of the ANSI A10 Committee, presented testimony at the hearing in which he indicated that the proposed OSHA standard basically was the same as the ANSI standard and that OSHA's standard was consistent with ANSI's interpretation of what has been there since at least 1970. Mr. Burkart explained that the 2.5 safety factor was in the standard primarily to protect the workers who had to be under the slab during jacking operations. He further stated "For that reason and for those purposes, we feel that the 2.5 is a minimum requirement. The only logical interpretation of the items to be included in the lifting arrangement includes the columns and the footings and whatever else is sustaining loads during the time it's being lifted." Mr. Burkart added that ANSI realized the A10.9 standard presented different design criteria than what might be used for the permanent part of the structure but that their concern, like OSHA's, is with the temporary structure: "* * * if the column is used as a support, it becomes part of the temporary structure and should meet the safety requirements for the workers that are being exposed to this area."

Additional testimony was presented at the hearing from Dr. Neil Hawkins (Tr. 6/29/89, pp. 1–153 to 1–199) who testified that he did not believe the requirements for a 2.5 factor of safety on jacking equipment should include columns, footings or shearheads, while acknowledging that it was appropriate for jacks, lifting angles, and lifting nuts. Dr. Hawkins argued that it was not appropriate for columns, footings and shearheads since the design conditions for those items are governed by the standards of AISC and ACI. He also said, "It is already customary practice to use a factor of safety of three for calculating the allowable bearing pressure on soils or rocks below footings and for such soils or rocks the primary concern is usually not bearing capacity but the possibility of excessive settlement or rotation of the footing." (Id.)

Several commenters, including David Wonder, P. E. and Chief Engineer for Texstar (Ex. 38–7), stated that shearheads serve a dual purpose in lift-slab construction in that they are a "lifting component" as well as a member of the completed structure. OSHA believes these comments further evidence the need to include shearheads in this provision since they play a role in the "lifting" phase.

Texstar Construction Corporation also testified at the public hearing (Tr. 6/30/89, pp. 2–173) restating their written comments (Ex. 38–15), which argued against the need to include columns,

shearheads, and footings in the paragraph (d) provision. Texstar representatives noted that various codes set forth design criteria for these three elements and thus there is no need for OSHA to issue a different requirement. Again, OSHA notes that the organizations mentioned by Texstar—the American Concrete Institute (ACI) Building Code Requirements for Reinforced Concrete (ACI 318), the American Institute of Steel Construction (AISC), and the Post-Tensioning Institute (PTI) develop codes and specifications primarily with the finished structure in mind, while OSHA is concerned with the structure during the time it is being built. None of the codes mentioned were developed solely for the purpose of protecting the safety and health of workers during the construction phase.

Texstar also commented that the term "lifting attachment" should be used in lieu of "lifting angles" because other types of attachments were used and the term "lifting attachment" would encompass all types of lifting devices (Ex. 38–15 and Tr. 6/30/89, pp. 2–174 and 2–251).

Finally, Texstar's testimony (Tr. 6/30/89, p. 2–174) indicated their agreement with the application of the 2.5 to lifting items other than columns, shearheads and footings. They reasoned that "These lifting items are not specifically covered by a national consensus standard, and therefore, provide a safe workplace by requiring this higher factor of safety."

After reviewing these comments, OSHA believes that there was some misunderstanding of the proposal. Many commenters appeared to believe that OSHA was requiring jacking equipment to be capable of supporting 2.5 times the load factors calculated for the completed structure, particularly since columns, shearheads, and footings were considered jacking equipment in the rule. OSHA further believes it was that misunderstanding that led to the multitude of comments opposing the provision. In the opening statement (Ex. 44) of the public hearing, OSHA clarified its position that the Agency's intent was that the jacking equipment be capable of supporting 2.5 times the load that would be on the equipment during lifting and the negative comments diminished markedly. This is evidenced by the lack of testimony on the subject as compared to the substantial written comments received prior to the public hearing. In the final rule, OSHA has revised the language of this provision to make it clear that the "applied load" means the load being lifted. Once the load is secured (either temporarily or permanently) and "off the jack," that load is no longer an "applied load" for the purpose of this provision. OSHA wishes to emphasize that this standard is directed at lifting operations carried out during construction of the building and, again, nothing in this standard is to be construed to mean that compliance with local building codes is being changed or affected in any manner.

After full and complete consideration of all of the comments and testimony on the proposed provision in paragraph (d) and Issues #2 and #4, OSHA promulgates paragraph (d) as revised.

Paragraph (e) of the final rule requires that lifting units be installed and designed so that they will neither lift nor continue to lift when their rated capacity is exceeded. This requirement is essentially the same as the proposed and the existing requirement found in section 11.3.2 of the ANSI A10.9–1970 standard, and is also essentially the same as section 10.3.2 of the most current ANSI standard, A10.9–1983. There were no written comments or oral testimony presented with regard to this provision. OSHA believes the provision is appropriate as proposed and promulgates paragraph (e) as proposed except, as discussed above, that the term "lifting units" is used in conjunction with the term "jacks."

Paragraph (f) of the final rule requires that lifting units used in lift-slab construction be equipped with a safety device that will enable the lifting units to support the load in any position in the event any lifting unit malfunctions and loses its lifting ability. The final rule provision is essentially the same as the proposed requirement and the existing requirement in § 1926.305(b)(1). It is also essentially the same as both a provision in section 11.3.3 of the ANSI A10.9–1970 standard and to section 10.3.3 of the updated ANSI A10.9–1983 standard. The difference between the final rule requirement and the proposed and existing ANSI standard is that the term "lifting units" has been added for the reasons discussed above.

In the 1988 proposed rule, OSHA noted that it had received one comment on the 1985 proposed rule that pertained to this provision. That comment, from the Washington Metropolitan Area Construction Safety Association (WMACSA) (Ex. 14–29), suggested that OSHA add a requirement to install a safety device as required by this paragraph. WMACSA supported the need for this provision by pointing out that the ANSI A10.9 standard contained such a provision in its lift-slab section.

As OSHA observed in the 1988 proposed rule, and as stated above, the existing requirement in § 1926.305(b)(1), which is nearly identical to the ANSI requirement, already addresses this hazard. However, because OSHA believes it is important to locate all provisions unique to lift-slab construction in the same section of its regulations, it proposed that this provision and another provision specifically related to lift-slab lifting units in § 1926.305(b)(2) be relocated to the lift-slab operations section of the Concrete and Masonry Construction Standards. These two provisions are identified as paragraphs (f) and (h) of this final rule. There were no written comments or oral testimony presented on the proposed relocations. Therefore, OSHA promulgates paragraph (f) as proposed, except for the addition of the term "lifting units," which appears in the final rule provision.

Paragraphs (g), (h), and (i) of the final rule contain requirements that are essentially the same as the proposed provisions. They are also essentially the same as the existing requirements in section 11.4 of the ANSI A10.9–1970 standard, except that in paragraph (i), OSHA is requiring that the operator of the controls be experienced in lifting operations and experienced with the lifting equipment being used. The provisions in the final rule are also essentially the same as the provisions in Section 10.4 of the ANSI A10.9–1983 standard, except as noted above. In addition, in the ANSI document the three requirements are combined in one paragraph; whereas they are in separate paragraphs in this final rule. Also, as discussed above, paragraph (h) of the final rule contains essentially the same requirement as the existing provision in § 1926.305(b)(2). The intent of these requirements is to prevent subjecting the slab to stresses beyond the engineered limits. OSHA observes that a failure in the slab could result in collapse of the building which most likely would be accompanied by injury and death of workers.

Paragraph (g) requires the employer to synchronize lifting (jacking) operations in a manner that will ensure all points at which the slab is supported are kept within ½ inch of that needed to maintain the slab in a level position.

In the 1985 proposed rule, OSHA proposed a requirement very similar to this requirement, but it did not receive any comments in response to that proposal. However, there was a single written comment on the provision in paragraph (g) of the 1988 proposal. Regarding paragraph (g), NIOSH (Ex. 38–4) inquired of OSHA as to whether it would be appropriate for OSHA to add

the phrase "a component specifying a minimum linear horizontal displacement in which the ½-inch vertical distortion of the slab may be allowed" to this provision. Based on the evidence in the record, OSHA does not believe such a specification would provide any additional protection to the safety and health of lift-slab workers. Further, OSHA does not believe it would be practical to set a single specification limit which could be used on every structure that might be built using the lift-slab method. Further, such determinations are more appropriately the responsibility of the contractor who must determine how to meet the requirement of this provision for the structure being built under his or her control.

Paragraph (h) requires that where leveling is automatically controlled, the employer must install a device to stop the operation when the one-half inch leveling tolerance is exceeded or where there is a malfunction in the lifting (jacking) system.

Paragraph (i) requires that where leveling is maintained by manual controls, the employer must locate such controls in a central location and have a competent person attend the controls while lifting is in progress. Further, paragraph (i) contains new language which requires the competent person to be experienced in lifting operations and with the lifting equipment being used, in addition to meeting the criteria listed in the definition of a "competent person" in § 1926.32(f). The new language has been added to the final rule in response to a comment from Texstar Construction Corporation. That comment is discussed in more detail below.

In paragraph (i), OSHA proposed that a "competent person" be required to attend the controls while lifting is in progress and the leveling is maintained by manual controls. In the proposed rule, OSHA observed that the I970 ANSI standard prescribed that a "trained operator" attend the controls, whereas the 1983 ANSI A10.9 standard prescribes that a "qualified person" attend the controls. OSHA observes that the term "competent person" is used in many provisions of the construction safety and health standards to describe the minimum level of experience and authority needed to provide an acceptable level of safety for workers. OSHA defines the term competent person in § 1926.32(f) to mean "one who is capable of identifying existing and predictable hazards in surroundings or working conditions which are unsanitary, hazardous, or dangerous to employees, and who has authorization to take prompt corrective measures to eliminate them." The Agency maintains its belief that a competent person, as defined in § 1926.32(f), is the appropriate term to use to describe the qualification of the person who attends the control.

At the hearing, Texstar testified on paragraph (i) of the 1988 proposal, and recommended that the language of the proposed provision be modified to require that the competent person have experience in the lifting operation and with the lifting equipment in use (Tr. 6/30/89, p. 2–176). OSHA agrees with Texstar and notes that it would enhance worker safety to require the operator of the control to have experience not only in lifting operations but with the specific equipment being used. OSHA also notes, as discussed in paragraph (a) above, that others have indicated they find merit in requiring work to be performed by persons who have experience in the lift-slab construction technique. For these reasons, OSHA has amended the language of proposed paragraph (i).

Therefore, based on the record and for the reasons discussed above, OSHA promulgates paragraphs (g) and (h) essentially unchanged from the proposal, and paragraph (i) as revised.

Paragraph (j) of the final rule requires the employer to limit the maximum number of manually controlled jacks on one slab to a number that will permit the operator to maintain the slab level within the specified one-half inch tolerance of paragraph (g). Paragraph (j) further prescribes that the number of jacks cannot exceed 14. This provision is essentially the same as the proposed provision, except that OSHA has set a limit of 14 jacks. The final rule provision is similar to a provision in section 11.3.4 of the ANSI A10.9–1970 standard, and also to the provision in section 10.3.4 of the ANSI A10.9–1983 standard. Both of the ANSI standards specify that the number of jacks shall not exceed 14. ANSI further prescribes that in no event should the number be too great to permit the operator to maintain the slab level within specified tolerances.

However, in keeping with OSHA's efforts to develop more performance-oriented standards, OSHA proposed to revise the existing requirement to eliminate the specific number "14" and instead require the employer to limit the number of jacks on one slab to a number that will permit the operator to maintain the slab level within specified tolerances. The Agency notes that it is unaware of the reasons why both the 1970 and 1983 ANSI standards specify the number 14 since, as OSHA stated in the proposed rule (53 FR 35975), it believes that common industry practice is to operate all jacks automatically, except in limited situations such as when setting wedges. During the wedge-setting phase, automatic jacking operations may cease while individual jacks are operated manually, as needed, to complete the wedge setting operation. This process normally involves the manual control of only one or two jacks at a time.

OSHA invited comments on whether or not it should continue to specify the maximum number of jacks as do the ANSI standards. Specifically, OSHA asked if employee safety would be enhanced if OSHA specified a maximum number of jacks that could be used on one slab. OSHA also questioned whether "14" was the appropriate number and, if not, what was the appropriate number and what were the reasons for recommending a number that differs from ANSI.

In response to the proposed provision, Texstar Construction Corporation (Ex. 38–15) listed this provision as one to which it objected in its request for a public hearing and supported ANSI's maximum of 14 jacks. Specifically, Texstar said that it had extensive experience in the operation of manually controlled jacks and it was their opinion that it is necessary to limit the number of jacks so as to ensure the proper monitoring of the lifting rate. Texstar further stated that "Exceeding the maximum of 14 jacks per console limits the ability of the operators to visually and physically control the console and the lifting process." (Id. p. 4).

This provision was also the subject of testimony at the public hearing. In particular, Professor Peter Vanderklaauw, President of Liftplate International, Inc., and a lift-slab contractor, stated that he disagreed with Texstar's comment that the number of jacks should be limited to 14 (Tr. 6/30/89, pp. 2–58 to 2–59). Professor Vanderklaauw said he thought the number of manually controlled jacks should be limited to seven. In support of his recommendation, he explained that "to operate 14 jacks by hand within reasonable tolerances, say ½ an inch, to us is extremely difficult. But it all depends on how fast the slab is being lifted." As an example, Professor Vanderklaauw noted that at 1 inch per minute, an operator could manipulate six or seven jacks by hand and that at half that speed, maybe it would be possible to operate 14 jacks. Professor Vanderklaauw concluded by pointing out that most jacking operations exceed 1 inch per minute. Later in the hearing (Tr. 6/30/89, pp. 2–260 to 2–262),

Professor Vanderklaauw questioned the Texstar panel about their comment on the number of manually controlled jacks and asked Texstar if they agreed that speed has a lot to do with the controllability of 14 jacks. Texstar responded that they had their own equipment in mind when they commented that the number of manually controlled jacks should be limited to 14. They suggested that another provision might be more appropriate for someone else's equipment. Professor Vanderklaauw's response was that the requirement is "Texstar specific" and it should be deleted or appropriately modified.

Based on a careful examination of the comments and testimony presented at the hearing, OSHA has decided to retain the provision in performance language but to set a limit of 14 on the maximum number of jacks that can be manually operated. OSHA believes the language of the final rule appropriately addresses the concerns raised by Professor Vanderklaauw, in that it requires the employer to determine how many jacks an operator can control and still be able to maintain the slab level with specified tolerances. OSHA agrees with Professor Vanderklaauw that the number of jacks the operator can manipulate depends on the rate of lift. Additionally, OSHA finds inadequate information in the record to specify a lower number as the maximum number of jacks that can be operated manually. However, the evidence in the record is sufficient to set an upper limit on the number of jacks that can be operated manually. OSHA emphasizes, however, that the employer must make a determination as to how many jacks can safely be operated after first considering the lifting operations, the equipment, and the operator of the equipment involved in the lift.

Based on the foregoing discussion, OSHA promulgates paragraph (j) as revised.

Paragraph (k) of the final rule requires the employer to prohibit employees, except those essential to the jacking operation, from being in the building while any lifting operation is taking place, unless the building/structure has been reinforced sufficiently to ensure its integrity during erection. The final rule defines the phrase "reinforced sufficiently to ensure its integrity" to mean that a registered professional engineer, independent of the engineer who designed and planned the lifting operation has determined that if there is a loss of support at any jack location, that loss will be confined to that jack location and the structure as a whole will remain stable. Such determination can be made by the independent registered professional engineer's own engineering analysis or through the independent engineer's review and approval of the engineering analysis which was performed by the registered professional engineer who designed and planned the lifting operation—see paragraph (a) of this section. In the final rule, paragraph (k) also prohibits, without exception, allowing nonessential employees to be immediately below a slab while it is being lifted. Finally, the provision clarifies that a lifting operation begins when a slab (or group of slabs) is lifted and ends when such slabs are secured with either temporary or permanent connections. An appendix to paragraph (k) describes one method that can be used to comply with the "structural integrity" provision of this paragraph.

The provisions in paragraph (k) of the final rule differ from both the proposed and existing rules. OSHA anticipated significant reaction to the proposed provision and, therefore, raised a specific issue in the proposed rule. In Issue #11, OSHA asked a series of questions in an effort to develop a complete record on the proposed prohibition. Specifically, OSHA asked for alternative solutions to its proposed prohibition of nonessential employees in the building/structure during jacking operations; for information on the need to identify, by job function, those workers who are "essential" to the jacking operation; and for a recommended distance away from the building/structure that nonessential employees should be during jacking operations if they are not permitted inside.

As anticipated, OSHA received substantial written comment and oral testimony on the proposed rule and the specific issue. That comment and testimony has led to a revision of the provision as originally proposed.

NIOSH suggested that OSHA consider a safety factor which was greater than 2.5 as a possible alternative to the proposed requirement to prohibit nonessential employees from being in the building during jacking operations. In particular, they suggested that if OSHA increased the safety factor to a higher number that employees should be allowed to work in the building while jacking operations are in progress. NIOSH was referring, of course, to the proposed requirement in paragraph (d) that jacking equipment be capable of supporting 2.5 times the load applied to it. NIOSH did not give a specific safety factor in their suggestion. However, their suggestion was explored at the public hearing during cross-examination. In particular, Dr. Neil Hawkins was asked to comment on the alternative recommended by NIOSH. He responded that:

> . . . you might say if I went to 10 on the jacks rods and the lifting nuts and so on . . . but I don't think that it ever will be. You know, it's rather like saying we're never going to have an oil tanker spill. A lot of things are caused by human error and we get to a certain level of safety represented by holding the stresses in the rods, in my opinion . . . (Tr. 6/29/89, pp. 1–184 to 1–185).

OSHA interprets these comments to show that Dr. Hawkins did not agree that imposing high safety factors would necessarily render the worksite safe. He did, however, indicate that additional steel in the slabs might be the alternative to the prohibition. (Tr. 6/29/89, p. 1–185).

The proposed paragraph was based on a provision contained in the lift-slab operations section of both the 1970 and 1983 versions of the ANSI A10.9–1970 standard on Concrete and Masonry Work. In the proposed rule, OSHA discussed that ANSI had provided to OSHA a written interpretation of two key provisions of the A10.9 requirements. One of those provisions was the provision originally proposed in paragraph (k). The ANSI interpretation stated that their provision means that no one is permitted anywhere below any slab being jacked, except employees who are essential to the jacking operation or to secure the slabs, nor are employees permitted to work below lower floor slabs that are secured temporarily or permanently while any upper floor slab is being jacked (ANSI interpretation—Ex. 35–3).

At the public hearing, Mr. Matthew Burkart, Chairman of the ANSI A10 Committee, confirmed the written interpretation when he stated (Tr. 6/29/89, pp. 1–203 to 1–207) that ANSI has always contended that people should be out from under the slab when it is being jacked because it is the most hazardous time during the lift-slab operation. He further testified that "No one had presented information to the committee since 1970 that there is a less hazardous way to go about the operation * * *" and therefore, ANSI maintained that people should be out from underneath the slab whenever the jacking operation is in progress. Under cross-examination, (Tr. 6/29/89, p. 1–207), Mr. Burkart clarified that "out from under the slab" meant "out of the building." Mr. Burkart also stated that the ANSI committee that developed the OSHA-adopted provision had representation from the American Concrete Institute and the

American Institute of Architects, as well as several engineers who represented public and government interests. He also stated that Texstar Construction Corporation made a presentation to the full ANSI Committee before it undertook a discussion of the provision and voted on the interpretation that was provided to OSHA. (Id. p. 1–206).

Other commenters and witnesses contended that OSHA was unfairly singling out the lift-slab construction method for more stringent regulation than any other method of construction, such as precast concrete placement, cast-in-place work, and steel erection. In particular, as discussed above, some participants noted that there are other methods of construction that expose the worker to a much greater probability of being injured or killed in a building collapse. (See testimony of Dr. Neil Hawkins, Tr. 6/29/89, pp. 1–60 to 1–161). Indeed, at the hearing Joseph Hoffman, a professional engineer, testified in the strongest terms that "* * * a much more dangerous construction situation is high-rise precast slab on bearing wall construction. It's a very unstable structure, very, very, unstable, and requires a great deal of bracing and a great deal of control." Mr. Hoffman went on to relate that he had served as the Engineer of Record on a 25-story, bearing-wall job and "* * * every single trade in the world [was] working on that job before they hit the 20th floor." In his testimony, he expressed his view that this type of construction was far more dangerous than lift-slab construction. (Tr. 6/30/89, pp. 2–91 to 2–92). Other witnesses emphasized the danger of precast concrete structures, saying that OSHA had not prohibited—or even proposed to prohibit—workers from being in the building while the precast members were being placed. (Tr. 6/30/89, pp. 2–5 to 2–260).

Texstar Construction Corporation, in their prehearing submission (Ex. 58), recommended that paragraph (k) be amended to require that certain criteria be satisfied before nonessential employees would be permitted in the building while jacking operations were taking place. One of the criteria was that:

> Bottom reinforcement be required in both directions in the slab column strips sufficient to enhance the transfer of load and increase the integrity of the structure. The amount of such reinforcement shall conform with recommendations provided by ACI [American Concrete Institute] and the PTI [Post-Tensioning Institute] unless engineering analysis shows lower values are appropriate. For the purpose of this section a minimum amount of at least two bars in each direction shall be continuous or spliced at the support. These bars shall pass over, thru or be attached to the shearhead. (p. 7)

Texstar stated that their recommended requirement was consistent with section 13.4.8.5 of the proposed revision to the ACI's Building Code Requirements for Reinforced Concrete (ACI 318–83, Revised 1986). The recommendation of Texstar's was referred to as the "integrity steel" concept at the hearing and was suggested by Texstar as an alternative to the OSHA proposed requirement which would have prohibited, without exception, allowing nonessential employees in the building during lifting operations.

Texstar commented that the primary goal of the recommended language was to provide for "unsurpassed worker safety" either by removing employees from the hazard or by providing extra means to enhance the structural integrity of the structure. (Id. p. 8). Finally, Texstar added that "Under no circumstances is any employee (except those essential to the lifting operations) to be allowed directly underneath the slab that is being lifted while the actual jacking operation is taking place." (Id.).

A review of the American Concrete Institute's Building Code Requirements for Reinforced Concrete (ACI 318–89) and Commentary (ACI 318R–89) reveals that the engineering community has emphasized the need to provide structural integrity, but has not specifically dealt with structural integrity of lift-slab constructed buildings. However, the commentary for the ACI building codes states:

> *R7.13—Requirements for structural integrity.* Experience has shown that the overall integrity of a structure can be substantially enhanced by minor changes in detailing of reinforcement. It is the intent of this section of the Code to improve the redundancy and ductility in structures so that in the event of damage to a major supporting element or an abnormal loading event, the resulting damage may be confined to a relatively small area and the structure will have a better chance to maintain overall stability.

The need for structural integrity is also addressed in the American National Standard—Minimum Design Loads for Buildings and Other Structures, ANSI A58.1–1982, which reads as follows:

> *Section 1.3—General Structural Integrity.* Through accident or misuse, structures capable of supporting safely all conventional design loads may suffer local damage, that is, the loss of load resistance in an element or small portion of the structure. In recognition of this, buildings and structural systems shall possess general structural integrity, which is the quality of being able to sustain local damage with the structure as a whole remaining stable and not being damaged to an extent disproportionate to the original local damage. The most common method of achieving general structural integrity is through an arrangement of the structural elements that gives stability to the entire structural system, combined with the provision of sufficient continuity and energy absorbing capacity (ductility) in the components and connections of the structure to transfer loads from any locally damaged region to adjacent regions capable of resisting these loads without collapse.

Dr. Neil Hawkins, in his testimony (Tr. 6/29/89, pp. 1–161), also directed comments to the prohibition in proposed paragraph (k). He recommended that for "comparability with competitive forms of construction," if the 2.5 factor were applied to all jacking equipment, then "* * * nonessential employees should be allowed below a slab that is permanently anchored or adequately temporarily anchored during jacking operations for the slabs above that so anchored."

On cross examination, Dr. Hawkins discussed the American Concrete Institute (ACI) Code and subsequently commented that "* * * integrity steel is steel placed in the bottom of the slab through the column * * *" (Tr. 6/29/89, 1–185). He further explained that in the case of a lift-slab, it would have to be bottom steel in the slab which would pass through the shearhead region or over the ends of the shearhead arms or be spliced to the steel coming out of the shearheads. Hawkins further explained that through calculations, one can determine how to reinforce a structure to keep the structure from collapsing if the support of a column is lost. In his post-hearing comment (Ex. 68), Dr. Hawkins further elaborated and suggested that paragraph (k) of the proposed rule be revised to read as follows:

> No employee (except those essential to the jacking operation) shall be permitted in the building while any jacking is taking place unless continuous bottom steel is provided in every slab and in both directions through every wall or column head area. The amount of bottom steel shall be established by assuming loss of support at a given lifting jack and then determining the steel necessary to carry, by catenary action over the span between surrounding supports, the slab service dead load plus any service dead loads likely to be acting on the slab during jacking * * * (Ex. 68, p. 2).

Dr. Hawkins defined "column head area" as the distance between lines that are one and one half times the thickness of the slab or drop panel and those lines are located outside opposite faces of the

outer edges of the shearhead sections (Id.) (See Figure 1).

Dr. Hawkins' proposed language received support from several other hearing participants, including Professor Peter Vanderklaauw, President, Liftplate International, Inc. (Ex. 67) who commented, "We want you to know that, although our company is not seriously affected by the rule not to permit employees in the building while jacking is taking place, we wholeheartedly support Dr. Hawkins' suggested revisions." Professor Vanderklaauw provided several reasons for Liftplate's support, including his comment that "We agree that integrity steel at the bottom of the slab, when properly designed, will indeed prevent progressive collapse and provide sufficient risk prevention." He added that "The application of integrity steel is a very logical engineering solution." Once again, Professor Vanderklaauw noted that the provisions of paragraph (k) should "* * * apply to all types of construction where heavy concrete slabs are being worked at higher levels." (Id.).

Mario Suarez, a participant at the hearing and a professional engineer, (Ex. 66) also supported Dr. Hawkins' post-hearing comment. However, Mr. Suarez suggested that while OSHA should follow the general recommendations made by Dr. Hawkins and state a general, performance type requirement, OSHA should "* * * let the specific code requirement be written by ACI Committee 318." (Id.).

Another area of concern to OSHA was how to identify those workers who would be considered "essential" and thus permitted in the building during jacking operation. However, the commenters concentrated their efforts on their opposition to the overall provision and did not, in general, comment on this specific concern. Thus, due to the limited amount of input to the record, the final rule does not identify, either by title or task, those workers who are essential to the lifting operation. Instead, appropriate compliance guidelines will be developed and compliance officers will have to determine at the time of an inspection, whether or not the workers in the building are essential to ensure that the lifting operation is accomplished safely.

Upon examination and evaluation of the record evidence in this matter, OSHA has determined that there is a reasonable alternative to its proposed prohibition of nonessential employees being in the building during jacking operations. That alternative is for the structure to be reinforced to ensure its integrity as described above. As brought forth in the record, and as supported by both the ACI 318 Building Code and the ANSI A58.1–1982 standard, OSHA agrees in principle with the recommendation made by Texstar Construction Corporation and supported by other expert commenters as discussed above.

OSHA also believes that the individual who makes the determination regarding structural integrity should be a registered professional engineer for the same reasons discussed in paragraph (a) above, and that person must make an independent engineering analysis or review the analysis performed by the registered professional engineer who designed and planned the lifting operation. OSHA observes that the benefits to worker safety and health to be gained by having a registered professional engineer perform certain tasks, which have been discussed at length under paragraph (a) also have application here, and are supported by the record. OSHA also notes that the use of peer review is an accepted practice within the engineering profession as a technique that promotes quality in design organizations and their services. In fact, at the hearing, during cross examination, Mario Suarez in response to a question on responsibilities of various engineers associated with a project, noted that having another qualified professional involved would not be a problem for him. (Tr. 6/30/89, p. 2–9). Published literature indicates that peer reviews are always performed by persons independent of the subject of review—in this case, the lift-slab project. (See *Quality in the Constructed Project*, Chapter 13 titled, "Peer Review." Volume 1, Preliminary Edition of the Manual of Professional Practice.) Because the lift-slab construction process is unique and not well documented in engineering texts and manuals, OSHA believes that peer review of plans and specifications is necessary to achieve an acceptable level of safety.

Therefore, to provide an appropriate level of safety to the workers, OSHA is requiring review by a registered professional engineer who is independent of the lift-slab designer/planner. This independent review may be made in advance of construction on the basis of lift-slab plans and specifications. Additionally, OSHA agrees with Mr. Suarez that the requirement should be written to state the desired performance; namely, reinforcement to ensure the integrity of the building, without specifying exactly how the employer is to comply with the requirement. However, to assist employers, OSHA has described at least one method of compliance in Appendix A to this section. The method described in the Appendix substantially reflects the recommendations made by Dr. Neil Hawkins.

OSHA acknowledges the role organizations such as the American Concrete Institute play in setting design criteria and promoting "structural integrity." Through such organizations, OSHA believes there exists the appropriate guidance for engineers to determine how to maintain the structural integrity of a building as required by paragraph (k).

Based on the preceding discussion, OSHA promulgates paragraph (k) as revised.

Paragraph (1) requires that all wedges be secured before the lifting rods are released at each column location and that when temporary connections are being made, the wedges shall be secured by tack welding, or an equivalent method of securing the wedges, to prevent them from falling out of position.

The final rule in paragraph (1) is essentially the same as the proposed provision, except that it has been rewritten to express the meaning of the rule more clearly. The change responds to comments made by Liftplate International and Texstar Construction Corporation (Exs. 38–15 and 38–20). At the hearing, Professor Peter Vanderklaauw of Liftplate International expressed concern that OSHA's proposed provision was very specific in that it only recognized tack welds as the proper method of securing wedges to keep them from falling out (Tr. 6/30/89, pp. 2–265 to 2–267). OSHA disagrees with this comment as the proposed rule did contain the phrase "or an equivalent method of securing." Nevertheless, OSHA has reworded the provision to state more clearly that employers do not have to tack weld, but if another method of securing the wedges is chosen, that method must be equal to tack welding in its ability to secure the wedge. In this regard, OSHA has determined that the use of chicken wire or tape to secure wedges is unacceptable. The provision is only directed at temporary connections because the lifting plans will specify the details for permanent connections, including any permanent weld on the wedges. The intent is to keep the wedges in position so they will not fall out. It is OSHA's position that if the wedges were to fall out, the slab could lose support at the location where the wedge was dislodged, and that loss of support could cause the slab to deflect, possibly with serious

consequences. In addition, OSHA proposed this requirement because it is aware of at least one incident where a lift-slab contractor inserted all the wedges, lowered the load onto the wedges, then released all the lifting rods to prepare for the next "pick" and not one single wedge had been tack welded or otherwise secured. OSHA believes this is an unsafe practice and has demonstrated its serious concern through the issuance of citations for such action.

Another point raised by Texstar Construction Corporation (Ex. 3–15 and Tr. 6/30/89, p. 2–182), was that wedges should be tack-welded *after* the load has been transferred from the jacks, rather than *before* the load is transferred from the jacks as the proposed rule required. OSHA agrees that load transfer from the jacks to the wedges could break the tack weld and that the language of the proposed rule needs to be changed. OSHA's intent is to require completion of the welding task at each column location before the lifting rods are released. The final rule has been rewritten to state clearly that the wedges must be secured before releasing the rods at that column location, regardless of whether it is a temporary or permanent connection.

In cross-examination at the hearing, Texstar Construction Corporation indicated that they ". . . keep the lifting nuts within an eighth of an inch of the lifting attachment so that they are still . . . in contact with that lifting angle." Additionally, when asked specifically about the lifting rods and whether they too were within an eighth of an inch, Mr. C. Geckler, Vice President of Texstar, stated "Well, just the fact that they're only released about an eighth of an inch, they can't move very far." (Tr. 6/30/89, p. 2–202). When questioned about the ability to support the slab if something went wrong [such as if a wedge fell out], Texstar's representative Russillo stated "So if, as you said, something were to go wrong, the slab would come down an eighth of an inch and re-engage into the rod with the nut. See, it's the rod." Finally, the record is clear when C. Geckler responded, "The tack welding is done. The person who is installing the wedges moves from that location to another location. Then the rods are lowered down." (Tr. 6/30/89, pp. 2–251 to 2–253).

After reviewing these comments, OSHA believes the revised language addresses the concerns of the commenters and also makes OSHA's intent more clear. Therefore, OSHA promulgates paragraph (l) as revised.

Paragraph (m) requires that all welding on temporary and permanent connections be performed by certified welders who are familiar with the welding requirements specified in the lift-slab plan and specifications. This paragraph is a new requirement and is identical to the proposed paragraph.

Comments and testimony in the record revealed that only certified welders are used. There were no objections to OSHA's codification of what is usual and customary practice in the industry. OSHA observes that certification can be demonstrated by possession of a certificate from a licensing board or school which certifies that the employee has demonstrated the ability to perform the type of welding required for the building/structure under construction. OSHA suggests that employers determine the welder's familiarity with the welding requirements specified in the lift-slab plans and specifications before permitting the welder to perform any welding tasks.

In connection with this provision, OSHA raised Specific Issue #14, under which the Agency asked a number of questions relating to the requirement to use only certified welders for structural welding tasks. OSHA noted that it was aware that current practice was to hire only certified welders for critical welding tasks and asked how welders demonstrate such certification. In response, several commenters indicated support for the proposed provision that certified welders be required for structural welding (Exs. 38–4, 38–7, 38–17, 38–21, and 38–23). Only one commenter (Ex. 38–26) actually responded to the concerns of how to determine certification.

Liftplate International, Inc. (Ex. 38–20), commented that they used certified welders as a matter of routine but that temporary welds are made only to keep wedges in place and have no structural value. In addition, they stated that if OSHA finalized the requirement, it should apply to other types of construction as well. While several commenters noted that welder qualification tests are set forth by the American Welding Society (AWS), the AWS does not conduct the tests nor issue certification cards. Charles Hawkins commenting on behalf of Associated Builders and Contractors, Inc. (ABC) (Ex. 38–26), stated that ABC supported the proposed requirement regarding certified welders for critical welds and noted that OSHA was correct in thinking that the industry practice was to hire only certified welders. ABC also made the following comment:

> To the extent that there is a confusion as to which certification should control, ABC recommends the American Society for Testing and Materials (ASTM) certification. In many cases the design and specifications will indicate an ASTM-grade weld is necessary. Relying on the ASTM certification would simplify this question and be consistent with practices already in place. (Id. p. 3).

Based on the evidence and information in the record, OSHA has decided that it will not specify, in the final rule, how the welder should certify his ability to perform the welds as required in the lift-slab plans and specifications. However, at the time of an inspection, OSHA may require the employer to demonstrate that only certified welders are welding connections. For example, such certification can be demonstrated by producing evidence, such as a welder's certification card, that the welder has been certified by a state or local testing laboratory who complies with the testing procedures set forth by the American Welding Society (AWS) or that the welder has a certification card from the American Society for Testing and Materials (ASTM) as recommended by ABC. Therefore, it will be up to the employers to make sure that welders hired by them are certified in accordance with the requirements of a recognized organizations such as the ones named above. Therefore, OSHA promulgates paragraph (m) unchanged from the proposed rule.

Paragraph (n) of the final rule requires that load transfer from the lifting units to building columns not be executed until the welds on the column shear plates are cooled to air temperature. The requirement in the final rule is identical to the proposed requirement, except that the term "lifting units" has been inserted along with the term "jacks."

There were no written comments or oral testimony presented in support of or in opposition to this requirement. In the cross-examination of Texstar Construction Corporation at the public hearing, it was revealed that this provision had little or no bearing on their operation because the weld blocks are fabricated as part of the column and not added in the field (Tr. 6/30/89, pp. 2–266 to 2–269). OSHA believes the requirement is appropriate as proposed and is, therefore, promulgating paragraph (n) without change from the proposal, for the reasons stated in the NPRM (53 FR 35976).

Paragraph (o) of the final rule requires the employer to secure lifting units to the building columns so that the lifting units will not become dislodged or dislocated. This is a new requirement, added as a result of evidence submitted

in the record which substantiated the need for the provision. In Specific Issue #10 of the NPRM, OSHA asked for comment on the current industry practice and on the need to add such a provision to the standard.

Several commenters responded that measures are now being taken to prevent the lifting units from falling off the columns. In particular, Texstar (Ex. 38–17) noted that current industry practice provides that certain safeguards be followed. For examples, they noted that on certain types of shearheads, the rods are blocked and on other shearheads the key hole is now designed to lock the nut centering sleeve in place. (Id. p. 5). They also provided a chart to show the forces necessary to dislodge jacks under load. (Id. Ex. 4). David Wonder (Ex. 38–7) stated that ". . .there is virtually no chance of failure of the lifting assembly" and noted that the lifting rods "act as high bolts to secure the jack to the top of the column." Mario Suarez, (Ex. 38–21), referring to jacks falling off columns, stated "This should probably not be a problem." Doug Nunnelly (Ex. 38–25) of Diversified Design noted that ". . .the installation of the jacks by their lifting contractors has never presented the problem of a jack becoming dislodged." Mr. Cooke (Ex. 38–23) noted his belief that the amount of movement that can take place is questionable, but noted if OSHA was going to consider anything, it should be that the jacks or lifting devices should be secured so they will not become dislodged or dislocated. This was the language suggested by OSHA in the NPRM. Mr. Hoffman (Ex. 38–24) objected to the use of the word "secure" as "too imprecise" but did not suggest an alternative word.

OSHA believes the record supports the usefulness of requiring the employer to take positive action to ensure that jacks/lifting units are secured. However, the exact method of securing the jacks will be left up to the employer and not specified by OSHA. The Agency is aware, however, that at least one manufacturer offers a collar that is now in use for one type of jack. It is OSHA's belief that employee safety will be enhanced if measures are taken to prevent jacks from becoming dislodged or dislocated and possibly falling onto employees. The Agency notes that one method of lifting involves mounting jacks to the top of the columns. Thus, workers would face the risk that a jack could fall off the column and onto them. The record shows that this risk is not adequately addressed by existing standards nor is voluntary action—current industry practice—adequate to address the risk. OSHA believes the risk to workers will be eliminated if employers comply with the new provisions in paragraph (o). Therefore, OSHA is promulgating paragraph (o).

Paragraph (p) of the final rule requires the employer to use some method to ensure that the lifting rods do not slip out of position. Measures may include any type of locking or blocking devices that prevent the rods from accidental release. This is a new requirement, added as a result of information and evidence submitted to the record in response to Specific Issue #15. In that issue, OSHA asked if employers should be required to institute measures such as the use of locking nut caps, wedges or boards to ensure that the rods and nuts cannot slip out of position. OSHA also asked if such methods were now being used. The Agency noted that it was raising the question because in its report on the Bridgeport disaster, the NIST (formerly NBS) concluded that the rods slipped off the lifting angle.

In response, Texstar (Ex. 38–17) responded that they had redesigned the lifting angle to lock the rod in the keyhole and that other types of shearheads would be blocked in place. Mario Suarez (Ex. 38–21) commented that "* * * locking of the lifting rod nut in the shearhead is certainly an improvement and should be required."

On the other hand, Mr. Cooke (Ex. 38–23) noted that "The proposed suggestions of locking nut caps, wedges or boards would become extremely inconvenient in the field * * *"

OSHA believes that the record contains convincing evidence for adding a requirement to secure the lifting rods in position and prevent them from slipping or moving, since such slipping or moving could result in a subsequent loss of support at that column location. Such loss of support could have catastrophic consequences. Therefore, OSHA is promulgating this requirement in paragraph (p).

III. Discussion of Specific Issues Raised in the Proposed Rule But Not Discussed Above

Issue #1. Comments received in response to this issue (Engineer/Architect vs Qualified Designer) are discussed above along with other comments on § 1926.705(a).

Issue #2. Comments received in response to this issue (2.5 Safety Factor) are discussed above along with other comments on § 1926.705(d).

Issue #3. In this issue, OSHA asked if requiring the employer to prepare a certification record would increase employee safety. The Agency explained that a certification record would be signed by the employer and indicate the name of the person or organization who had determined that the jacking equipment was capable of supporting two and one-half times the load on it during lifting and the date when such determination was made.

In response, OSHA received several comments ranging from "Calibration data and material certification should be required by the PSE" (Brown & Root, Ex. 38–6) to "No benefit would come from requiring more paperwork" from David Wonder, an Engineer with Texstar (Ex. 38–7). Some commenters appeared to support a requirement for certification, as long as it only applied to what they termed "lifting equipment" (in other words, not to columns, footings, or shearheads). They added that this would not, however, provide additional safety to the workers (Exs. 38–17, 38–21, and 38–25). Charles Hawkins of the Associated Builders and Contractors, Inc. was concerned about paperwork burdens associated with the certification record, and then suggested that OMB review the proposed requirement (Exs. 38–26). In response, OSHA notes that OMB exempts certification records from their review under the Paperwork Reduction Act and, therefore, OMB approval would not be necessary. (See 5 CFR part 1320).

Professor Vanderklaauw of Liftplate International (Ex. 38–20) agreed that such a requirement would increase paperwork and he stated that it would do little to increase safety. He also stated that if such a provision was finalized, it should apply to cranes, hoists and construction elevators as well as lift-slab equipment. OSHA notes that it does currently require employers to prepare a certification record of tests and inspections performed on critical components of cranes and hoisting machinery.

Finally, Marshall Long, of Lift Slab International, testified at the public hearing that he would be willing to certify that whatever equipment he sold would meet the 2.5 requirement; however, he also acknowledged that he did not supply all the equipment used by all lift-slab contractors.

OSHA notes that preparation of a certification record as envisioned in this issue, would necessitate the certifier to know the loads that would be applied to the equipment. OSHA does not believe that the supplier could prepare such a certification at the time of the sale of equipment that would be used many times on many different jobs involving varying loads.

After careful review of the record, OSHA is not convinced that requiring a

certification record would lead to increased safety and, therefore, has not included a provision in the final rule to require such a certification. OSHA expects, however, that at the time of inspection, the employer will be able to provide necessary evidence that the equipment complies with the load requirement in paragraph (d).

Issue #4. The comments received in response to this issue (rewording proposed § 1926.705(d) to identify jacking equipment) are discussed above along with other comments received on § 1926.705(d).

Issue #5. The comments received in response to this issue (lateral stability) are discussed above along with other comments received on § 1926.705(a).

Issue #6. In this issue, OSHA solicited information on the need to require employers to maintain the building plumb during jacking operations, and asked what was the current industry practice. All five commenters who responded on this issue stated that the American Institute for Steel Construction sets the criteria for building plumbness and that industry practice is to follow their requirements (Exs. 38–7, 38–17, 38–21, 38–24, and 38–25).

Based on the information and evidence in the record, OSHA has decided that no new provisions are needed to address plumbness of the building during construction. As the commenters have noted, standard industry practice dictates compliance with criteria established by organizations such as AISC and ACI. OSHA has no reason to believe that industry practice will change and, therefore, does not believe any additional benefit to worker safety and health will result if additional provisions are added to the lift-slab standard.

Issues #7 and #8. In these issues, OSHA requested comment on the need to include new requirements to address access and egress during the construction of buildings where the lift-slab method of construction is being used.

Several commenters responded that there is no reason to believe that any special requirements are needed to address access and egress of buildings under construction by the lift-slab method and that there is no difference, in terms of the need to address access and egress, between buildings using the lift-slab method and those using, for example, precast concrete. (See Exs. 38–21, 38–24, and 38–25). Texstar (Ex. 38–17) commented that "Ladders are provided at all times. During lifting they are secured so as to slide on the slab edge. . Either stairs or semi-permanent ladders are installed when slabs are put in final position." David Wonder, an Engineer from Texstar, (Ex. 38–7) questioned OSHA's rationale and replied that "It is not logical to think that any specific regulation concerning access and egress could cover the wide variety of buildings that are built using lift-slab." He further noted that stairways are erected following the "critical path."

After careful evaluation of the record, OSHA has determined that there are no special needs regarding access and egress that require additional OSHA requirements. OSHA believes that its current rulemaking efforts for Subpart X—Stairways and Ladders will sufficiently address any hazard that may confront workers at lift-slab construction sites.

Issue #9. In this issue, OSHA asked about substituting the term "lifting units" for the term "jacks," or if it was commonly understood that the term "jacks" included other equipment.

In response, Brown and Root and Diversified Design (Exs. 38–6 and 38–25) commented that the term "jacks" is commonly understood. Two other commenters suggested that OSHA use the term "jacks" together with the phrase "other lifting devices" (Exs. 38–23 and 38–24). Texstar (Ex. 38–17) said the term "jack" is considered to mean the complete lifting unit, and that the term "lifting unit" could be more descriptive of a system using more than one jack with a common base or crosshead. They added that "The term jacking unit might be more descriptive." Mario Suarez (Ex. 38–21) responded that "Either way seems to be adequate." OSHA agrees with Mr. Suarez' comment. Because of the lack of clear support in the record for one term over the other, OSHA will use both terms—jacks and lifting units—to avoid any possible misunderstanding.

Issue. #10. The comments received in response to this issue (securing jacks to the columns) are discussed above along with other comments on new § 1926.705(o).

Issue #11. The comments received in response to this issue (working under the slab) are discussed above, along with other comments on § 1926.705(k).

Issue #12. In this issue, OSHA asked if there was a need to revise other requirements in the Construction Safety and Health Standards (Part 1926) to prohibit workers from being in buildings while precast members were being positioned and secured or while cast-in-place concrete was being cured. OSHA notes that this issue was raised in response to a comment made by a representative from Texstar at the March 30–April 1, 1988, ACCSH meeting. (Ex. 35–2). In his comment, he pointed out the dangers to workers when those methods of construction were being used, and asked why OSHA had not seen the need to regulate the hazard [workers being in the buildings and under the loads] where these other construction methods were used. As OSHA indicated earlier in this document, it intends to gather information on hazards associated with other construction methods.

OSHA received several comments which offered thought-provoking ideas in response to this issue. NIOSH (Ex. 38–4) commented that they were in support of an extension of the scope of the proposed requirement—to prohibit nonessential employees from being in the building—to cover cast-in-place concrete construction techniques. They explained that "The workers are at similar risk in both lift-slab and cast-in-place construction when allowed to work beneath a load that has not been permanently fixed in place and adequately cured."

T. W. Graham, Jr., with the Ceco Corporation (Ex. 38–10), commented, "No, the Construction Safety and Health Standards as they relate to cast-in-place concrete should not be revised due to the following reasons." Mr. Graham then listed several provisions in the existing Concrete and Masonry Construction Standard; namely, § 1926.703 (a)(1), (b)(8)(i), and (e)(1) and (2) that require the employer to take specific action to ensure that formwork (which includes shores and reshores) will support the loads on it without failure. Ceco further commented that cast-in-place concrete was significantly different from lift-slab and precast concrete construction techniques and pointed out the hazards presented by jacking operations or the movement and placement of large and heavy structural members. (Id.).

Marshall Long, P.E., President of International Lift Slab Corporation (Ex. 38–11) noted that "It is significant that for 39 years the lift-slab method of construction had not caused a single fatality, whereas conventional building methods had resulted in over 50,000 deaths during the same period of time." Mr. Long concluded with the statement that "International Lift Slab Corp. therefore rejects the need for imposing restraints on the lift-slab method of construction which are not also applied to all methods of construction." This latter statement was echoed by other commenters (Exs. 38–7, 38–17, 38–20, 38–21, 38–23, and 38–25).

Christopher Saccone, P. E. (Ex. 38–12), commented that "If this standard is to

be adopted for lift-slab construction, it should most certainly apply to cast-in-place and precast systems. The hazards are the same." John McGlenn, P.E., Vice President of Kramer, Chin & Mayo, Inc. (Ex. 38–14), also supported the need for uniformity and consistency and noted that "Rules should be developed in a manner so that they achieve uniformity with other components of the industry. For example, structural steel, precast concrete and lift-slab construction rules should all be promulgated in a consistent manner."

At the hearing, Texstar presented their recommended alternative of "integrity steel" to the proposed prohibition of nonessential workers in the building and noted that "We also feel that this form of enhanced structural integrity should be required on all forms of construction and not just the lift-slab method. If workers' safety is truly the issue, then workers on all types of building construction should enjoy the same level of safety assurance" (Tr. 6/30/89 p. 2–181).

As noted in the proposed rule, this issue was raised to generate information for future use, and no provisions can be added to the final rule on lift-slab construction operations to address hazards associated with other forms of construction. However, based on the comments and testimony received on this issue, OSHA plans to gather more information. Some of the concerns to be explored more fully include the risk to workers who remain in buildings/structures: (1) While precast members are being lifted, positioned, and secured; (2) while structural steel is being lifted, positioned, and secured overhead; and (3) while the concrete is achieving strength in cast-in-place structures; and (4) the risk to workers who remain in structures while any other method of construction is being used.

OSHA wishes to make it clear that the issue of consistency between lift-slab construction and other construction methods does not remove the need for OSHA to take action at this time on the issues raised in this lift-slab rulemaking.

Issue #13. In this issue, OSHA stated that the National Institute of Standards and Technology (NIST) (formerly known as the National Bureau of Standards) has recommended that OSHA specify fracture toughness values for rods used in lift-slab construction. NIST noted that such values are presently specified for steels used in other areas. OSHA then solicited information on whether it should specify such values and what those values should be.

Three parties submitted substantive comments—Texstar Construction Corporation, David Wonder, P.E. (Chief Engineer for Texstar), and Mario Suarez (Exs. 38–7, 38–17, and 38–21). Mr. Wonder expressed disagreement with trying to specify a specific toughness value and added that "Furthermore, assigning a safety factor above and beyond the normal values would be more than adequate to ensure safety," in apparent support of § 1926.705(d) of the proposed rule. Proposed paragraph (d) required that lifting equipment (which includes the rods) be capable of supporting 2.5 times the load to be applied, and Wonder implied that the provision would be, to use his words, "more than adequate to ensure safety." Texstar noted that "The NBS recommendation for testing of rods is not necessarily accepted as the proper test," and added that "The application of the 2.5 safety factor used in the lifting rods should be more than adequate." Mario Suarez, while acknowledging the need to subject rods to testing and quality control procedures, stated that "Quality control procedures on the production of the lifting rods may contain, but do not necessarily have to, toughness requirements."

At the hearing, in response to cross-examination, Dr. Neil Hawkins was asked to comment on the need for fracture toughness requirements in the rule. Dr. Hawkins responded that although he was not an expert in fracture toughness, he did not think it would be necessary to specify fracture toughness values, noting all of the things specified in the proposal and the 2.5 safety factor on the jacking equipment.

In conclusion, OSHA finds that the record provided very little information on this issue and did not demonstrate that a need exists for OSHA to promulgate a new requirement. Furthermore, NIST did not suggest a recommended value nor did they appear at the public hearing. Thus, OSHA was unable to solicit further information on the need to regulate in this area or the potential benefit to worker safety and health. Therefore, OSHA has decided not to specify fracture toughness values for rods.

Issue #14 and #15. The comments received in response to these issues (certified welders) and (locking and blocking of rods) led to new requirements in the final rule and are discussed above under §§ 1926.705 (o) and (p) respectively.

In the hearing notice OSHA raised two other issues that were not discussed above. One issue presented questions about the costs of the proposed standard and is discussed in Section IV—Regulatory Impact—below. The other issue was related to post-tensioning of slabs when the lift-slab method of construction is used. In particular, OSHA stated in the hearing notice that it had received a comment from a Professional Engineer, Frank X. LoSacco, who stated that when the lift-slab method of construction is being used, the *primary* method of reinforcing the slabs should not be the unbonded post-tensioning method. Mr. LoSacco suggested that OSHA add a provision to the final rule which would require the post-tensioning elements to be fully bonded when the post-tensioning method of reinforcement is used [for lift-slab construction].

Mr. LoSacco testified at the public hearing, and explained why he believed that the use of unbonded post-tensioning method of reinforcement caused the total failure at L'Ambiance Plaza. He stated that this method of reinforcement should never be used in the lift-slab method, primarily because the tendons cannot be placed through the steel columns on which the slabs "ride" and must instead be placed around the column, leaving unsupported areas at the column (Tr. 6/29/89, pp. 1–22 to 1–41). On cross-examination, Mr. LoSacco revealed that he had determined almost immediately (within days of the collapse) through visual inspection of the collapse site, that it was the use of the unbonded method of post-tensioning that led to the loss of structural integrity and subsequently, to the total collapse of the building. Using wooden beads, strung on a cord, Mr. LoSacco presented a demonstration to show how, in his opinion, support was lost. (The demonstration was videotaped and can be found at Ex. 45B).

There was no other support presented at the hearing or through written comment for the provision recommended by Mr. LoSacco. In fact, over half of the hearing participants, including engineers Vanderklaauw, Hawkins, Suarez, Russillo, Hinckley, and Freyermuth attempted to elicit further information from Mr. LoSacco, through cross examination, to debate the technical merits of his proposal. (Tr. 6/29/89, pp. 1–54 to 1–106). In each of these instances, Mr. LoSacco repeated his statement that many lives were lost because the unbonded method of post-tensioning had been used. During this questioning period, Mr. LoSacco clarified for the record, that the theory discussed was his own and was not known to be supported by any other engineer.

Mr. Freyermuth subsequently presented testimony stating that there was no technical evidence anywhere to indicate that any type of slab reinforcement would have had any

positive effect in reducing the extent of the L'Ambiance collapse. He further testified that:

> Without clear and convincing evidence supported by a broad base of engineering opinion and experience such as exists in the development of all national technical building code provisions and which has been partially reviewed in this testimony in favor of the use of unbonded tendons in lift-slab construction, there is considered to be no basis for the proposed exclusion of the use of unbonded tendons in lift-slab construction nor the requirement that bonded post-tensioning tendons should be bonded, grouted, prior to lifting of the slab. (Tr. 6/29/90, p. 1–127).

Mr. Freyermuth's testimony was accompanied with documentary evidence, including an article entitled "Structural Integrity of Buildings Constructed With Unbonded Tendons" which presented case studies of laboratory tests and construction incidents or accidents that have demonstrated the capability of unbonded tendons and structures containing unbonded tendons in resisting abnormal or catastrophic loadings. (Ex. 47). He also presented other exhibits to demonstrate the general suitability of unbonded tendons for use on lift-slab construction in preference to other means of reinforcement and to support his testimony with regard to the "very dependable performance of unbonded tendons under the catastrophic conditions of the L'Ambiance Plaza lift-slab building collapse" (Tr. 6/29/89, pp. 1–106—1–128).

Mario Suarez (Ex. 63) expressed his opposition to the recommendation by Mr. LaSocco when he commented that the recommendation had "* * * no technical justification whatsoever and negates a history of more than 30 years of successful use in buildings of all kinds, comprising approximately two billion square feet of floor framing reinforced with unbonded tendons." Mr. Suarez also stated that during their investigation of the L'Ambiance disaster, they observed hundreds of unbonded post-tensioning tendons and their anchorages after the collapse. He said the performance of the tendons as the reinforcing means in the structure was "excellent." Specifically, he noted that as a result of their inspection they concluded that the tendons

> * * * withstood the catastrophic loading condition involved in the collapse without failure of the casting, the wedge grips, or the stand within the area being held by the grips. (Id. p. 2).

He further expressed what he termed "our strong opinion" that no rule should be established limiting or banning the use of unbonded post-tensioning tendons in lift-slab construction or any other method of building construction. (Id. p. 2).

Upon evaluation of the evidence and testimony submitted on this issue, OSHA has determined that, at this time, there is no sound technical basis on which it can prohibit the use of unbonded post-tensioning as the primary method of ⅛reinforcement where the lift-slab construction technique is to be used. The record contains sufficient evidence to demonstrate that unbonded post-tensioning has been used with success. Further, the record indicates that use of this method of reinforcement has not been shown to reduce the level of safety for workers, and that no demonstrable benefit to the worker will result if OSHA were to adopt the language suggested by Mr. LoSacco. Therefore, without further information or evidence to demonstrate that workers are at risk, OSHA has determined that there is no need to regulate the method of reinforcing in structures where the lift-slab method of construction is being utilized.

IV. Regulatory Impact, Regulatory Flexibility and Environmental Impact Assessments

A. Introduction

The Occupational Safety and Health Administration (OSHA) has prepared this Final Regulatory Impact Assessment (RIA) in compliance with Executive Order 12291 and the Regulatory Flexibility Act of 1980 Public Law 96–353, 94 Stat. 1164 (5 U.S.C. 601 et seq.). In this Assessment, OSHA has determined that the revised lift-slab provisions of the Concrete and Masonry Standard are technologically and economically feasible and that the environmental impacts of the amendments are not significant. As the net effect of this Standard amendment is less than $100 million, this regulatory action does not constitute a "major rule".

B. Industry Profile

The lift-slab construction technique has been used in over 50 different countries since its development in 1948 for construction of a wide range of building types: medium and high rise housing, offices, warehouses, hotels, schools and hospitals. The total worldwide volume constructed using this method is estimated to exceed half a billion square feet. Other than the L'Ambiance Plaza collapse in Bridgeport, Connecticut on April 23, 1987, OSHA is aware of no fatal accidents involving this construction technique.

Lift-slab methods can be more economical than cast-in-place methods, particularly for buildings where the framing is similar on all floors. With lift-slab, forms are required only on the outside of the edge of the slab. Because the floor and roof slabs are all cast at ground level and jacked into position, the lift slab technique eliminates 90 percent of the formwork required for cast-in-place methods and reduces labor requirements. Cost savings and speed of construction are two primary advantages claimed for lift-slab construction particularly in areas with high labor costs.

Texstar is the company involved in a considerable volume of lift-slab construction, having completed about 800 buildings on 614 projects over the course of the 39 years (as of 1989) that they have used this technology [1]. These buildings have accounted for approximately 64 million square feet of lifted slab. Most recently, Texstar has been lifting about 2 million square feet of lift-slab per year on about 20 buildings in 10–15 projects. Of these projects, 40 percent are residential (apartments, condominiums, hotels, etc.) 50 percent are office buildings, 5 percent are parking structures and 5 percent are specialty buildings. Texstar represents 90 percent of the 5- to 20- story range lift-slab market [1].

Liftplate International, a Florida construction company, has erected a number of 2 and 3 story buildings and is the only other company known to OSHA to do actual lifting in the United States. Liftplate International has been in business for thirteen years with an annual volume of 750,000 square feet or the equivalent of 10 five-story buildings. They employ few but highly skilled workers and a typical lifting crew would consist of 4 workers compared with 15 to 16 on cast-in-place building technique. They lift a five story building in two weeks [3].

The two systems currently used by these respective companies vary primarily in the type of equipment and materials and their arrangement for the lifting operations. This difference in turn determines the maximum height of the building. For example, Liftplate International erects columns that are the full height of the building before lifting the concrete slabs; therefore, limiting overall building height to 10 stories [8]. Also, the jacking equipment is mounted on the side of the column initially at the ground level [3]. On the other hand, Texstar uses a series of three story column extensions allowing for taller

buildings. Their jacking equipment is mounted on the top of each column [2]. As construction progresses, another column is added, requiring the jack to be repositioned at the top of the newly spliced column.

The lift-slab method of construction constitutes a small fraction of all construction projects in the U.S. Although published estimates of the amount have ranged from between 3 and 10 percent of all commercial projects, these estimates appear too high. Based on data indicating the amount of floor space constructed by Texstar and Liftplate International, the lift-slab technique accounts for less than one percent of the 1,004 million square feet of commercial and industrial space construction during 1987 [1,3]. Although for certain building types and in certain regions the lift-slab method enjoys a cost advantage over other methods, its relatively small market share is primarily explained by lack of familiarity on the part of owners, designers and contractors. The lift-slab method of construction has declined in popularity over the years, accounting for no more than one percent of all construction. This decline is attributed to the fact that at one time lift-slab held a sharp cost advantage due to the relatively costly nature of formwork; but, in the intervening years, innovative formwork systems such as flying forms and whole floor systems, have declined in cost and become more widely used.

C. Costs

The final rule governing lift-slab construction contains provisions addressing elements of construction safety concerning: the integrity of the structure at design and erection stages; equipment utilized; and employees. Most of the provisions of the standard are existing requirements in the American National Standards Institute, ANSI, publication A10.9–1983, and are the same as the ANSI A10.9–1970 provisions referenced in OSHA's original Concrete and Masonry standard. There has been no indication from either industry or OSHA compliance staff that these requirements are other than current industry practice. Consequently, total industry costs of compliance were estimated on the basis of one major provision: prohibition of non-essential employees from working while slabs are being lifted.

The major change in the standard is the provision that prohibits all employees, except those doing the lifting or making connections, from being in a structure while slabs are being lifted unless a registered professional engineer other than the engineer who designed and planned the lifting operation, has determined that the structure has been reinforced sufficiently that a loss of support at any jack location will not result in total collapse of the structure. OSHA has determined that this alternative to its proposed prohibition of nonessential employees being in the building during jacking operations would provide the same level of employee safety. The overall integrity of the structure can be substantially enhanced by minor changes in detailing of reinforcement.

Without consideration of this alternative, it would be no longer cost effective to use the lift-slab technique for buildings of more than four stories. Officials from Texstar have estimated that the imposition of this provision without the option of hiring an engineer would result in the loss of 75 percent of their business [4]. Texstar's income statements from 1984 to 1986 reflect a direct correlation between percent of profit and the percent of revenue attributed to the construction of 5 or more story buildings. In their analysis of the effect of the imposition of this provision, Texstar estimated that it will result in an incremental cost to the general contractor due to the delay equivalent to the slab lifting period. This increase in time necessary to complete the project would incur additional equipment rental charges, interest payments, and overhead charges that would reduce profits by 50 percent and consequently, would make successful bidding by a lift slab contractor impossible [6]. Texstar indicated that since the L'Ambiance incident, they have only been involved in 1 to 4 story buildings and that they have already reduced their workforce from 24 to 7 employees as a result of this dropoff in business [1].

Contrary to the potential problem faced by Texstar, Liftplate International has indicated that this requirement would have absolutely no impact on their business or their ability to compete for jobs [3]. This firm primarily builds structures of 3 to 4 stories, where they lift for a week to a week-and-a-half and finish before the other trades enter.

It is, therefore, most likely that the alternative allowed by the provision would be selected for buildings over 4 stories. The cost of this alternative includes the engineer's cost (i.e. time required to analyze plans to determine structural integrity) and the material costs for reinforcement, if required. Based on information supplied during the public hearings, it was indicated that the engineer's rate would vary depending on the size of the structure and what the engineer requests for his services. Texstar testified that it would cost $500 to have an engineer analyze the plans to determine its structural integrity [1]. Of the 1.5 million to 2.5 million square footage completed annually, Texstar erects 0.9 million square feet of 5 or more story buildings or an average of 8 buildings [4]. If establishments decide to use the alternative of hiring an engineer, OSHA estimates total annual compliance cost for engineer's time under this provision would be $4,000.

Moreover, if employers choose the option provided for insuring structural integrity during erection, bottom steel may be required to prevent progressive collapse following a local loss of support. One method to comply with this provision is for the employer to ensure that bottom steel is provided in every slab and in both directions through every wall or column head area. The amount of steel shall be established by assuming loss of support at a given lifting jack and then determining the steel necessary to carry the slab service dead load plus any service dead loads likely to be acting on the slab during jacking. The cost for providing for the structural integrity of the building—the added steel—is estimated to increase costs of the lift-slab operation by about $0.35 per square foot [1]. For the erection of 0.9 million square feet per year, this translates to an additional cost of $315,000 annually. Therefore, total annual cost for this provision would be $319,000.

In the Preliminary Regulatory Analysis an estimate was made of the cost of keeping all nonessential employees out of the building. This was done from the perspective of the potential added cost to building owners. Lift-slab's cost advantage, although variable by region and size of building, averages about $2 per square foot [5]. If 75 percent of Texstar's current volume of business shifts to other construction methods in the future, this would translate into an increased annual cost of $1.4 million (0.9 million sq. ft. x .75 x $2) to 5 or more story building owners. OSHA does not believe, however, that firms will choose to keep non-essential employees out of the buildings when a lower cost alternative is available.

In addition to the provision noted above, there are new provisions in the revised standard that are different from the existing standard but for which there are no additional compliance costs. The standard requires that the registered professional engineer consider lateral stability and incorporate provisions in the lift-slab plans and specifications to

ensure lateral stability of the structure during construction. Design requirements for lateral stability are established by AISC and local building codes using safety factors that are universally accepted [12]. OSHA believes that "lateral stability" is already addressed in the plans and specifications developed for the lift-slab operations and, therefore, is a common industry practice and would not incur additional costs.

A second requirement in the revised rule addresses the loading of jacking equipment. It basically provides clarifications that the 2.5 safety factor applies to all jacking equipment, including columns, footings and shearheads in addition to the actual jacks, lifting angles, lifting nuts, etc. Apparently the existing requirement had not been interpreted by everyone to include columns, footings and shearheads. Both companies currently doing lifting have indicated that their components now meet the 2.5 safety factor for all listed items [8,9]. This provision therefore has been determined to be current industry practice and no costs of compliance are anticipated.

The requirements for welding include provisions that wedges be secured at each column location by tack welding or an equivalent method of securing the wedges when making temporary connection to support slabs, and that all welding connections be performed by certified welders. Both Texstar and Liftplate International testified that the welds are so critical to the overall integrity of the structure that well qualified welders are essential. They indicated that they use tack welding to secure the wedges and that they use only welders with papers which means that they use only certified welders [3,11].

Another addition to the standard is the requirement for securing jacks to building columns to prevent them from being dislodged or dislocated. Several commenters in the public hearings noted that measures are being taken to prevent jacks from falling off the columns. In particular, Texstar indicated that current industry practice provides certain safeguards to prevent jacks from being dislodged [6]. OSHA is also aware that at least one manufacturer offers a collar that is now in use for one type of jack [11].

The requirement that load transfer from lifting units to building columns not be executed until the welds on the column shear plates are cooled to air temperature has been recognized by the two lifting companies as a requirement for an outdated practice, not often used today, and one which would have no bearing on their current operations [1,3]. The provision that lifting rods not slip out of position so that a positive connection is provided between the lifting rods and attachments is a new requirement to prevent components from disengaging during lifting operations. Texstar indicated that since the L'Ambiance incident, they have redesigned the lifting angle to lock the rods and therefore they are in compliance with this requirement [6].

Another change in the standard is the requirement limiting the number of jacks manually controlled by one operator to a number which will permit the operator to maintain the slab level within the ½ inch tolerance. The existing provision limited the number of jacks operated by one person to 14. Texstar indicated that exceeding the maximum of 14 jacks would diminish the ability of the operator to visually and physically control the lifting process [11]. Therefore, OSHA believes that this modification would not affect the lift-slab companies in any way nor is it substantially different from the existing requirement.

All of the remaining provisions in the standard are existing requirements in the current ANSI A10.9 standard and there has been no indication from industry that these requirements are other than current industry practice. Therefore, the total annual cost of coming into compliance with the revised standard would be $319,000.

D. Benefits

The uncertainty surrounding the risks associated with the lift-slab construction technique makes it difficult to estimate the benefits that would be attributable to the changes in the standard. The only fatal lift-slab related accident known to occur over the 39 years (as of 1989) the method has been in use is the 1987 L'Ambiance Plaza collapse which resulted in the death of 28 workers. OSHA believes that the deaths associated with this accident could have been prevented if the changes in the final standard had been in effect at the time of the accident and, of course, that compliance with the standard had taken place.

Some of the hazards that workers are exposed to while performing lift-slab operations are the same as those found in conventional cast-in-place techniques. Texstar has indicated that lift-slab is a safe method as reflected by their worker's compensation experience modifier of 0.81 over the thirteen-year period from 1976 to 1987 [4]. For the same period, a total of 114 occupational injuries were recorded of which only 21 (18 percent of total "lift-slab" occupational injuries) were serious enough for the injured worker to lose worktime or to have experienced restricted work activity, or both. These cases resulted in a total injury incidence rate of 25.8 per 100 full-time workers. Of this, there was an incidence rate of 10.6 lost workdays per 100 full-time workers as compared with a rate of 142.2 lost workdays per 100 full-time workers for all of the construction industry during 1988 [4,7]. Moreover, Liftplate International has indicated that in their thirteen years of operation they have had no recordable injuries or fatalities related to lift-slab activities.

These company records do not represent the total risk picture for lift-slab operations because they do not account for fatalities and injuries to employees of other firms working on the same construction site. Of the 28 workers killed in the L'Ambiance Plaza accident, there were 7 carpenters, 7 ironworkers, 7 laborers, 3 plumbers, 1 electrician, 1 operating engineer, 1 bricklayer and 1 supervisor [8]. Texstar had only 17 employees on site and of these, 8 were killed and 2 injured. The lift-slab disaster is one of the five worst concrete building collapses over the past 15 years which involved considerable loss of life. This ranking is grossly disproportionate to the market share for this type of construction activity.

Nevertheless, industry commenters vigorously contend that restricting the availability of lift-slab methods would serve to increase the level of work-related risk by forcing workers who work on lift-slab jobs at ground level to be exposed to the more severe hazards associated with erecting formwork systems at heights. For example, in January 1988, two workers were killed and two were seriously injured when the topping lift pulled free of the boom on a mobile crane carrying formwork lumber to the second level of a building under construction. According to newspaper accounts, the lift-slab method had reportedly been considered for this project but was rejected due to safety concerns following the L'Ambiance failure.

In an ongoing analysis of structural failures, John Loss at the University of Maryland's Architectural and Engineering Performance Information Center has looked at many structural failures covering the period 1965 to present and has found none that involve the lift-slab method of construction. He states that "all construction is unsafe" and that "during construction the buildings are in their most critically unstable mode".

OSHA analyzed all the data in the record and found that all fatalities and injuries resulting from the L'Ambiance collapse are related to work practices which can be reduced by compliance with the standard while remaining cost effective. OSHA expects that the standard will enhance work safety by significantly reducing worker exposure to potentially catastrophic incidents. An annual estimate of fatalities avoided is not possible however since the L'Ambiance collapse provides the only data point. It can be stated that similar accidents with their associated fatalities will not occur in the future if firms comply with the revised standard.

Other Economic Effects

Environmental Impacts

The rule has been reviewed in accordance with the requirements of the National Environmental Policy Act (NEPA) of 1969 (42 U.S.C. 4231 *et. seq.*), the Regulations of the Council on Environmental Quality (CEQ) (40 CFR Part 1500), and OSHA's DOL/NEPA Procedures (29 CFR Part 11).

The OSHA standard contains provisions for work practices and procedures to enhance safety in the workplace. The provisions of the standard focus on eliminating the possibility of accidents or injuries by means of work practices and procedures and proper use and handling of equipment. Consequently, no impact is foreseen on air, water, or soil quality, plant or animal life, the use of land or aspects of the environment. Therefore, the Assistant Secretary of OSHA has determined that the provisions of this standard will have no significant environmental effects.

Regulatory Flexibility Certification

Although the establishments that will be most affected by this revised regulation are best described as small businesses, only two firms will be significantly impacted. Therefore, OSHA has determined that this regulation, if promulgated, will not have a significant economic impact on a substantial number of small entities.

References

1. Russillo, Michael. Testimony During Informal Public Hearing on Proposed Safety Standard on Concrete and Masonry Construction: Lift-Slab Construction. p. 2–170, 2–184, 2–209, 2–217, 2–254, 2–269.

2. US Department of Commerce, National Bureau of Standards, Investigation of L'Ambiance Plaza Building Collapse in Bridgeport, Connecticut, NBSIR 87–3640, Gaithersburg, MD September 1987.

3. Vanderklaauw, Peter. Testimony During Informal Public Hearing on Proposed Safety Standard on Concrete and Masonry Construction: Lift-slab Construction. p.2–56, 2–55, 2–68, 2–75, 2–269.

4. Benz, George, Texstar's Economic Evaluation of OSHA's Proposed Rulemaking. OSHA Docket No. S–301D, Exhibit 20.

5. Freyermuth, Clifford. Testimony During Informal Public Hearing on Proposed Safety Standard on Concrete and Masonry Construction: Lift-slab Construction. p. 1–140.

6. Texstar Construction Corporation submission to OSHA Docket No. S–301D, Exhibit 38–17.

7. Bureau of Labor Statistics, BLS reports on Survey of Occupational Injuries and Illnesses in 1988. November 1989.

8. PRIA for Lift-Slab, 1988.

9. Personal communication, Chris Geckler, Vice President, Texstar Construction Corp. with Saneya El-Mekawi, OSHA, Washington, D.C., March 11, 1990.

10. Personal communication, Marshall Long, President, International Lift Slab Corp. with Saneya El-Mekawi, OSHA, Washington, D.C., March 6, 1990.

11. Geckler, Chris. Testimony During Informal Public Hearing on Proposed Safety Standard on Concrete and Masonry Construction: Lift-Slab Construction. p. 2–177, 2–253.

12. Diversified Design and Construction submission to OSHA Docket No. S–301D, Exhibit 38–25.

V. OMB Approval under the Paperwork Reduction Act.

There are no collections of information in this section. Therefore, approval by OMB under the Paperwork Reduction Act is not necessary.

VI. State Plan Requirements

The 25 states with their own OSHA-approved occupational safety and health plans must adopt a comparable standard within 6 months of the publication date of the final rule or show OSHA why there is no need for action, e.g. because an existing standard covering this area is already "at least as effective" as the revised Federal standard. These states are: Alaska, Arizona, California, Connecticut (for state and local government employees only), Hawaii, Indiana, Iowa, Kentucky, Maryland, Michigan, Minnesota, Nevada, New Mexico, New York (for state and local government employees only), North Carolina, Oregon, Puerto Rico, South Carolina, Tennessee, Utah, Vermont, Virginia, Virgin Islands, Washington and Wyoming.

VII. Federalism

The Final Rule has been reviewed in accordance with Executive Order 12612 (52 FR 41685; October 30, 1987) regarding Federalism. The Order requires that agencies, to the extent possible, refrain from limiting state policy options, consult with states prior to taking any actions that would restrict state policy options, and take such actions only when there is clear constitutional authority and the presence of a problem of national scope. The Order provides for preemption of state law only if there is a clear Congressional intent for the agency to do so. Any such preemption is to be limited to the extent possible.

Section 18 of the Occupational Safety and Health Act (OSH Act), expresses Congress' clear intent to preempt state laws relating to issues with respect to which Federal OSHA has promulgated occupational safety and health standards. Under the OSH Act, a state can avoid preemption only if it submits, and obtains Federal approval of a plan for the development of such standards and their enforcement. Occupational safety and health standards developed by such Plan States must, among other things, be at least as effective in providing safe and healthful employment and places of employment as the Federal standards. Where such standards are applicable to products distributed or used in interstate commerce, they may not unduly burden commerce and must be justified by compelling local conditions, *see* section 18(c)(2).

The Federal standard on lift-slab construction operations addresses hazards which are not unique to any one state or region of the country. Nonetheless, states with occupational safety and health plans approved under Section 18 of the OSH Act will be able to develop their own state standards to deal with any special problems which might be encountered in a particular state. Moreover, because this standard is written in general, performance-oriented terms, there is considerable flexibility for state plans to require, and for affected employers to use, methods of compliance which are appropriate to the working conditions covered by the standard.

In brief, this Final Rule addresses a clear national problem related to occupational safety and health in the construction industry. Those states which have elected to participate under Section 18 of the OSH Act are not preempted by this standard, and will be able to address any special conditions within the framework of the Federal Act while ensuring that the state standards are at least as effective as that standard.

List of Subjects in 29 CFR Part 1926

Construction safety, Concrete construction, Lift-slab construction, Occupational safety and health, Precast concrete.

Authority

This document was prepared under the direction of Gerard F. Scannell, Assistant Secretary of Labor for

Occupational Safety and Health, U.S. Department of Labor, 200 Constitution Avenue, NW., Washington, DC 20210.

Accordingly, pursuant to sections 4, 6(b) and 8(c) of the Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, 657), section 107 of the Contract Work Hours and Safety Standards Act (40 U.S.C. 333), Secretary of Labor's Order No. 1–90 (55 FR 9033) and 29 CFR part 1911, 29 CFR part 1926 is amended as set forth below.

Signed at Washington, DC, this 12th day of October, 1990.

Gerard F. Scannell,

Assistant Secretary of Labor.

Part 1926 of title 29 of the Code of Federal Regulations is amended as follows:

PART 1926—[AMENDED]

Subpart I—Tools—Hand and Power

1. The authority citation for subpart I of part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6 and 8 Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, and 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), or 1–90 (55 FR 9033), as applicable; and 29 CFR part 1911.

§ 1926.305 [Amended]

2. By amending § 1926.305 to remove and reserve paragraph (b).

Subpart Q—Concrete and Masonry Construction

3. The authority citation for subpart Q of part 1926 is revised to read as follows:

Authority: Sec. 107, Contract Work Hours and Safety Standards Act (Construction Safety Act) (40 U.S.C. 333); Secs. 4, 6 and 8 Occupational Safety and Health Act of 1970 (29 U.S.C. 653, 655, and 657); Secretary of Labor's Order No. 12–71 (36 FR 8754), 8–76 (41 FR 25059), 9–83 (48 FR 35736), or 1–90 (55 FR 9033), as applicable; and 29 CFR part 1911.

4. By amending § 1926.700 to add a new paragraph (b)(9) to read as follows.

§ 1926.700 Scope, application and definitions applicable to this subpart.

* * * * *

(b) * * *

(9) *Jacking operation* means the task of lifting a slab (or group of slabs) vertically from one location to another (e.g., from the casting location to a temporary (parked) location, or from a temporary location to another temporary location, or to its final location in the structure), during the construction of a building/structure where the lift-slab process is being used.

5. By revising § 1926.705 to read as follows:

§ 1926.705 Requirements for lift-slab construction operations.

(a) Lift-slab operations shall be designed and planned by a registered professional engineer who has experience in lift-slab construction. Such plans and designs shall be implemented by the employer and shall include detailed instructions and sketches indicating the prescribed method of erection. These plans and designs shall also include provisions for ensuring lateral stability of the building/structure during construction.

(b) Jacks/lifting units shall be marked to indicate their rated capacity as established by the manufacturer.

(c) Jacks/lifting units shall not be loaded beyond their rated capacity as established by the manufacturer.

(d) Jacking equipment shall be capable of supporting at least two and one-half times the load being lifted during jacking operations and the equipment shall not be overloaded. For the purpose of this provision, jacking equipment includes any load bearing component which is used to carry out the lifting operation(s). Such equipment includes, but is not limited, to the following: threaded rods, lifting attachments, lifting nuts, hook-up collars, T-caps, shearheads, columns, and footings.

(e) Jacks/lifting units shall be designed and installed so that they will neither lift nor continue to lift when they are loaded in excess of their rated capacity.

(f) Jacks/lifting units shall have a safety device installed which will cause the jacks/lifting units to support the load in any position in the event any jack/lifting unit malfunctions or loses its lifting ability.

(g) Jacking operations shall be synchronized in such a manner to ensure even and uniform lifting of the slab. During lifting, all points at which the slab is supported shall be kept within 1/2 inch of that needed to maintain the slab in a level position.

(h) If leveling is automatically controlled, a device shall be installed that will stop the operation when the ½inch tolerance set forth in paragraph (g) of this section is exceeded or where there is a malfunction in the jacking (lifting) system.

(i) If leveling is maintained by manual controls, such controls shall be located in a central location and attended by a competent person while lifting is in progress. In addition to meeting the definition in § 1926.32(f), the competent person must be experienced in the lifting operation and with the lifting equipment being used.

(j) The maximum number of manually controlled jacks/lifting units on one slab shall be limited to a number that will permit the operator to maintain the slab level within specified tolerances of paragraph (g) of this section, but in no case shall that number exceed 14.

(k)(1) No employee, except those essential to the jacking operation, shall be permitted in the building/structure while any jacking operation is taking place unless the building/structure has been reinforced sufficiently to ensure its integrity during erection. The phrase "reinforced sufficiently to ensure its integrity" used in this paragraph means that a registered professional engineer, independent of the engineer who designed and planned the lifting operation, has determined from the plans that if there is a loss of support at any jack location, that loss will be confined to that location and the structure as a whole will remain stable.

(2) Under no circumstances, shall any employee who is not essential to the jacking operation be permitted immediately beneath a slab while it is being lifted.

(3) For the purpose of paragraph (k) of this section, a jacking operation begins when a slab or group of slabs is lifted and ends when such slabs are secured (with either temporary connections or permanent connections).

(4) Employers who comply with appendix A to § 1926.705 shall be considered to be in compliance with the provisions of paragraphs (k)(1) through (k)(3) of this section.

(l) When making temporary connections to support slabs, wedges shall be secured by tack welding, or an equivalent method of securing the wedges to prevent them from falling out of position. Lifting rods may not be released until the wedges at that column have been secured.

(m) All welding on temporary and permanent connections shall be performed by a certified welder, familiar with the welding requirements specified in the plans and specifications for the lift-slab operation.

(n) Load transfer from jacks/lifting units to building columns shall not be executed until the welds on the column shear plates (weld blocks) are cooled to air temperature.

(o) Jacks/lifting units shall be positively secured to building columns so that they do not become dislodged or dislocated.

(p) Equipment shall be designed and installed so that the lifting rods cannot slip out of position or the employer shall institute other measures, such as the use of locking or blocking devices, which will provide positive connection between the lifting rods and attachments and will prevent components from disengaging during lifting operations.

Appendix to §1926.705—Lift-Slab Operations

(This Appendix is non-mandatory.)

In paragraph 1926.705(k), OSHA requires employees to be removed from the building/structure during jacking operations unless an independent registered professional engineer, other than the engineer who designed and planned the lifting operation, has determined that the building/structure has been sufficiently reinforced to insure the integrity of the building/structure. One method to comply with this provision is for the employer to ensure that continuous bottom steel is provided in every slab and in both directions through every wall or column head area. (Column head area means the distance between lines that are one and one half times the thickness of the slab or drop panel. These lines are located outside opposite faces of the outer edges of the shearhead sections—See Figure 1). The amount of bottom steel shall be established by assuming loss of support at a given lifting jack and then determining the steel necessary to carry, by catenary action over the span between surrounding supports, the slab service dead load *plus* any service dead and live loads likely to be acting on the slab during jacking. In addition, the surrounding supports must be capable of resisting any additional load transferred to them as a result of the loss of support at the lifting jack considered.

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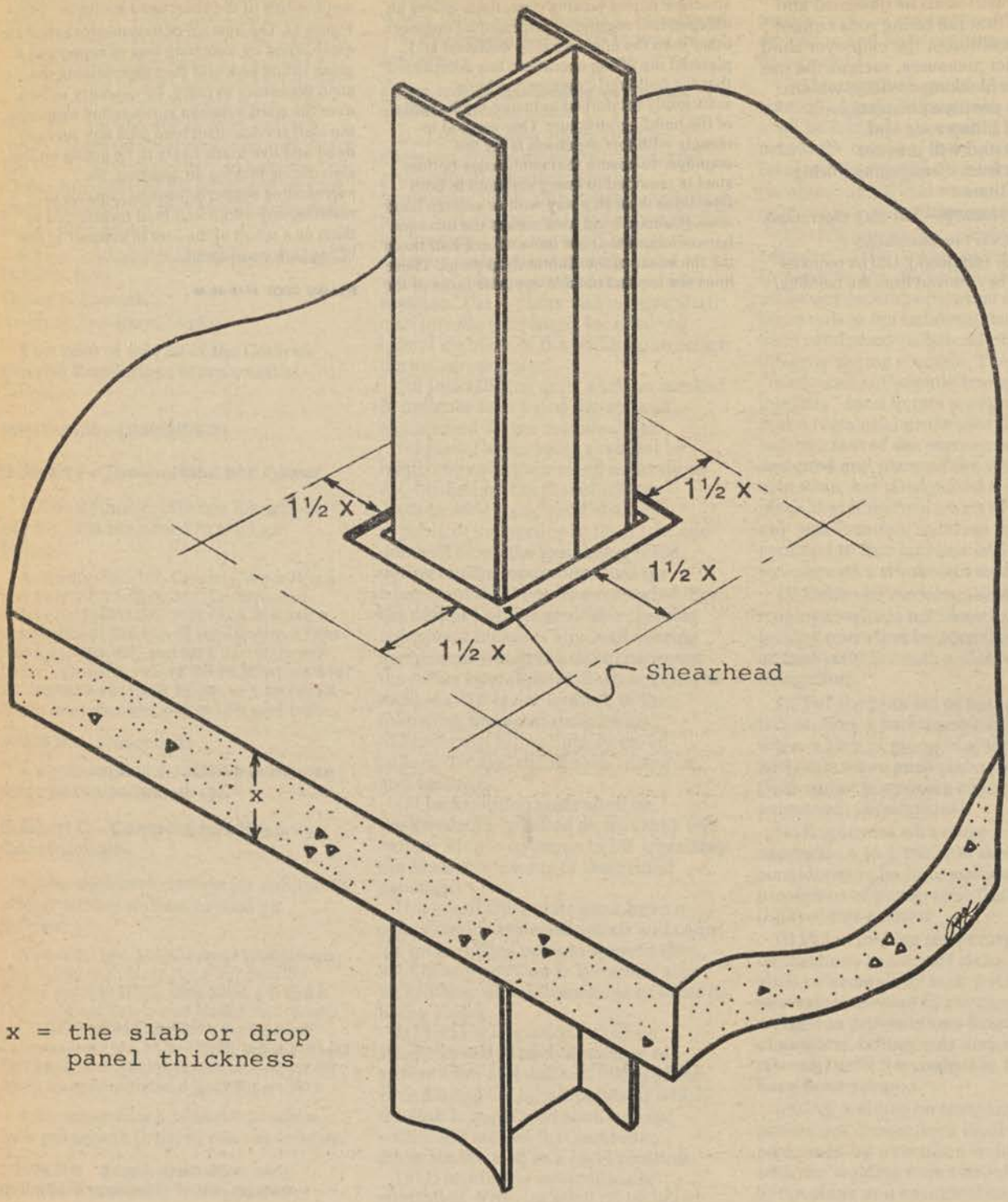

Figure 1--Column Head Area

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Thursday
October 18, 1990

Part III

Environmental Protection Agency

40 CFR Part 414

Organic Chemicals, Plastics and Synthetic Fibers Category Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards; Proposed Rule

ENVIRONMENTAL PROTECTION AGENCY

40 CFR Part 414

[FRL-3809-4]

Organic Chemicals, Plastics and Synthetic Fibers Category Effluent Limitations Guidelines, Pretreatment Standards, and New Source Performance Standards

AGENCY: Environmental Protection Agency (EPA).

ACTION: Proposed rule.

SUMMARY: EPA proposes several amendments to 40 CFR part 414, which limits effluent discharges to waters of the United States and the introduction of pollutants into publicly owned treatment works by existing and new sources in the organic chemicals, plastics, and synthetic fibers (OCPSF) point source category. EPA agreed to propose one of the amendments in a settlement agreement with W.R. Grace & Company (Grace), Koppers Company, Inc. (Koppers), E.I. DuPont de Nemours & Company (DuPont), and the Chemical Manufacturers Association (CMA). The agreement partially settled a dispute between those petitioners and EPA that was the subject of a petition for judicial review of the final OCPSF regulation promulgated by EPA on November 5, 1987 (52 FR 42522). The proposed amendment allows regulatory authorities to establish alternative cyanide limitations and standards based on best professional judgment for elevated levels of non-amenable cyanide that result from the unavoidable complexing of cyanide at the process source of cyanide-bearing waste streams.

As a result of separate negotiations with CMA and DuPont during the OCPSF litigation, EPA agreed to propose amendments to: (1) Allow regulatory authorities to establish alternative metals limitations and standards to accommodate low background levels of metals in non-"metal-bearing waste streams" that result from corrosion of construction materials or from contamination of raw materials, (2) specify in 40 CFR part 414 the method for determining five-day biochemical oxygen demand (BOD_5) and total suspended solids (TSS) effluent limitations for direct discharge plants that manufacture products in more than one subcategory, and (3) correct listing errors in appendices A and B of part 414.

Finally, as a result of additional EPA reviews of part 414 including those associated with evaluating various Category Determination Requests related to the applicability of the OCPSF regulations submitted pursuant to 40 CFR 403.6(a), EPA is proposing amendments to: (1) Revise the applicability sections of the Other Fibers, Thermoplastic Resins, and Thermosetting Resins Subcategories to correspond to the rulemaking record technical data and analyses, (2) delete one product and two product groups from coverage by this regulation, and (3) move the coverage of two products and one product group from the Bulk Organic Chemicals Subcategory (§ 414.70) to the Specialty Organic Chemicals Subcategory (§ 414.80).

After addressing comments received in response to this proposal, EPA intends to promulgate a final rule.

DATE: Comments on this proposal must be received by November 19, 1990.

ADDRESSES: Send comments to or obtain technical information from George M. Jett, Project Officer, Chemicals Branch, Industrial Technology Division (WH-552), Environmental Protection Agency, 401 M Street, SW., Washington, DC 20460, Attention ITD Docket Clerk, Organic Chemicals, Plastics, and Synthetic Fibers Industry (WH-552). The supporting information and all comments on this proposal will be available for inspection and copying at the EPA Public Information Reference Unit, Room 2404 (EPA Library Rear) PM-213.

FOR FURTHER INFORMATION CONTACT: George M. Jett at (202) 382-7151.

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I. Legal Authority

The amendments to 40 CFR part 414 described in this notice are proposed under authority of sections 301, 304, 306, 307, 308, and 501 of the Clean Water Act (the Federal Water Pollution Control Act Amendments of 1972, as amended (33 U.S.C. 1251 et seq.)), also referred to as "the Act."

II. Background

A. Prior Regulation and Litigation

EPA promulgated a regulation on November 5, 1987, establishing effluent limitations guidelines and standards for the OCPSF point source category based on the best practicable control technology currently available ("BPT"), the best available technology economically achievable ("BAT"), new source performance standards ("NSPS") for direct dischargers, and pretreatment standards for existing and new source indirect dischargers ("PSES" and "PSNS," respectively) (52 FR 42522; 40 CFR part 414, subparts A through J). The regulation initially controlled the discharge of 63 toxic and 3 conventional pollutants. The technology bases for these limitations and standards include steam stripping, chemical precipitation, chemical oxidation, activated carbon, biological treatment, and chemically assisted clarification.

Twenty-eight industry petitioners, comprised of trade associations and individual companies, and the Natural Resources Defense Council (NRDC) challenged this regulation in several circuits of the U.S. Court of Appeals. The consolidated cases were assigned to the Fifth Circuit Court of Appeals. The petitioners raised approximately 63 separate issues.

On March 30, 1989, the Fifth Circuit issued a decision that upheld the regulations against all industry challenges and all but two challenges brought by NRDC. With respect to two challenges brought by NRDC, the Court remanded the regulation to EPA for further rulemaking to determine whether the rule should be made more stringent in certain respects, but left the rule in effect pending further rulemaking. *Chemical Manufacturers Association* v. *Environmental Protection Agency*, 870 F.2d 177 (5th Cir. 1989).

Six petitioners or groups of petitioners filed petitions for rehearing on about 16

issues. On October 10, 1989, the Court granted rehearing in part and remanded two parts of the regulations to EPA for further rulemaking proceedings (885 F.2d 253 (5th Cir. 1989)). The first and more significant part consists of the effluent limitations for 19 of the 20 pollutants in BAT Subcategory 2 (40 CFR 414.101) that were based upon in-plant biological treatment technology. (The court left in effect the limitation for acrylonitrile that was based upon this technology.) This aspect of the remand in effect also remands the new source performance standards for these 19 pollutants for discharges that are subject to 40 CFR 414.101 limitations. In addition, it remands the PSES and PSNS standards for 13 pollutants that were based upon the remanded BAT Subcategory 2 limitations. The second remanded part of the regulation consists of limitations and standards for pollutants discharged from three metal-bearing waste streams that EPA had erroneously listed in part 414, appendix A.

In response to the Court's decision, EPA revoked on June 29, 1990 (55 FR 26691) the remanded limitations and standards and deleted two of the three metal-bearing waste streams remanded by the Court. The third metal-bearing waste stream had previously been deleted on June 29, 1989 (54 FR 27351). The Agency has initiated technical studies as a basis for future re-proposal of these deleted limitations and standards.

B. Partial Settlement Agreement

On March 29, 1989, petitioners Grace, Koppers, DuPont, and CMA and respondent EPA entered into a Partial Settlement Agreement which resolved all issues raised by these petitioners with respect to EPA's decision not to list any complexed-cyanide wastestreams in 40 CFR 414 appendix B. EPA agreed to propose specific preamble language and specific amendments to the OCPSF regulation and solicit comments regarding these proposed amendments.

C. Other Negotiations and Review of the OCPSF Regulation

During litigation of the OCPSF regulation, petitioners CMA and DuPont and respondent EPA achieved an understanding with respect to several issues. On June 22, 1988, EPA agreed to propose several regulatory changes which would: (1) Allow regulatory authorities to establish limitations and standards for incidental sources of metals in non-"metal-bearing wastestreams;" (2) modify appendix A to delete the listing of five wastestreams that were incorrectly listed as cyanide-bearing wastestreams and delete three lead-bearing wastestreams that contain complexed-lead; and (3) publish one technical amendment to the regulation to include the BPT production-proportioning formula that was set forth in the October 1987 OCPSF Development Document (page IX–10).

In addition, as the result of many questions by permit writers, control authorities, and individual companies related to the applicability of the OCPSF regulation, including Category Determination Requests submitted under the provisions of 40 CFR 403.6(a), EPA has carefully reviewed the general applicability of each subcategory as well as the corresponding product and product group listings for each subcategory. Based on these reviews, EPA is proposing corrections to the general applicability of three subcategories to reflect the rulemaking record and analyses, to delete one product and two product groups from coverage by this regulation, and to move the coverage of two products and one product group from the Bulk Organic Chemicals Subcategory (§ 414.70) to the Specialty Organic Chemicals Subcategory (§ 414.80).

III. Proposed Amendments to the OCPSF Point Source Category Regulations

A. Total Cyanide Limitations

The limitations for total cyanide contained in the OCPSF final rule (40 CFR part 414) are based on alkaline chlorination data from the metal finishing industry (see the discussion in 52 FR 42541, November 5, 1987). As recognized in the Development Document underlying the metal finishing limitations, alkaline chlorination "focuses upon oxidizing the cyanide which is amenable to chlorination" (see page VII–128 of the June 1983 "Development Document for Effluent Limitations Guidelines and Standards for the Metal Finishing Point Source Category," EPA 440/1–83/091). Cyanide not amenable to chlorination due to complexing with other compounds may not be treatable by alkaline chlorination. For this reason, the metal finishing regulations contain "amenable cyanide" limitations that may be used as an alternative to total cyanide limitations (see e.g., 40 CFR 433.13(b)).

During the OCPSF rulemaking, several commenters argued that the proposed cyanide limitations should be applied to amenable cyanide (i.e., non-complexed cyanide) only. However, EPA was not aware of specific data demonstrating that the actual levels of complexing, at the product/process sources of cyanide where treatment technology could be installed, would interfere with the ability of plants within the OCPSF industry to meet the total cyanide limitations. On the other hand, end-of-pipe data from some industry plants do show evidence of cyanide complexing.

One of the issues raised by several petitioners in the OCPSF litigation was the unachievability of the total cyanide limitations for certain OCPSF cyanide-bearing waste streams due to complexing with other compounds. EPA has reviewed this issue carefully and agrees with petitioners that cyanide complexing could interfere with the ability of several OCPSF plants to comply with the total cyanide limitations for certain waste streams. However, the type, degree and relative importance of cyanide complexing may vary among different product/processes. Therefore, plants with significant levels of complexed cyanide will differ in their ability to achieve the total cyanide limitations, and those plants which cannot achieve such limitations for particular waste streams may need to use different types of technologies and may be able to achieve different limitations. Thus the proposed rule would allow the permit writer (for direct dischargers) or control authority (for indirect dischargers) to establish alternate total or amenable cyanide limits for waste streams that cannot, due to complexing at the end-of-the-process source (i.e., prior to commingling with other waste streams or corroded piping downstream from the process), achieve the total cyanide limits set forth in the OCPSF rule. For purposes of this definition, "end-of-the-process source" is the earliest point at which cyanide destruction can be economically and technologically achieved.

EPA considered addressing the issue of complexed cyanide-bearing waste streams by listing those product/process waste streams determined by EPA to contain significant levels of complexed cyanide, but EPA believes that leaving that determination to the permit writer or control authority can better take into account the differences among complexed-cyanide-bearing waste streams.

Available information indicates that cyanide complexing, although somewhat limited, does exist in the OCPSF industry. Moreover, minor amounts of complexing due to modest amounts of complexing agents may not preclude compliance with the promulgated total cyanide limitations. Therefore, the proposed amendment requires the permit writer or control authority to assess the relevant information concerning the degree of complexing

and the extent to which it impacts the ability to achieve the limitations and to set forth such findings in writing; for direct dischargers, the analysis will be contained in the permit fact sheet. This will assure that the specific cases where significant cyanide complexing precludes compliance with the limitations can be appropriately addressed by the permit writer or control authority, while the limitations will continue to apply in all other cases.

B. Incidental Sources of Metals

The final rule contains concentration-based effluent limitations and standards for chromium, copper, lead, nickel and zinc. The limitations are applied only to the flows discharged from "metal-bearing process wastewater," defined in the regulation to consist of discharges from the product/processes listed in Appendix A to Part 414 (Non-Complexed Metal-Bearing Waste Streams and Cyanide-Bearing Waste Streams) plus any additional process wastewater streams identified by the permitting or control authority on a case-by-case basis as "metal-bearing" based upon a determination—(1) That such streams contain significant amounts of the pollutants identified above and that (2) the combination of such streams, prior to treatment, with the appendix A waste streams will result in substantial reduction of these pollutants (see e.g., §§ 414.75 and 414.91). As noted in § 414.11(f), discharges of chromium, copper, lead, nickel, and zinc in "complexed metal-bearing waste streams," listed in appendix B to part 414, are not subject to the requirements of part 414. The permitting or control authority will establish appropriate metals limitations and standards on a case-by-case basis for the discharges listed in appendix B (52 FR 42543).

The regulations proposed in March 1983 (48 FR 11828) and the July 1985 notice of availability of new information and request for comments (50 FR 29068), which both set forth end-of-pipe concentration limitations for nine metals, were severely criticized by industry commenters. They argued that most priority pollutant metals are not present in significant quantities in OCPSF wastewater. They also argued that to the extent that EPA found metals in OCPSF wastewater, these pollutants resulted not from OCPSF processes but rather from non-process wastewater or due to their presence in intake waters. The Agency agreed with their conclusions that the OCPSF rule should regulate only those metals present in OCPSF process wastewater as a result of the process use of the metals, applying the limits to that wastewater only (see 52 FR 42542–43).

Therefore, the final regulation established concentration-based limitations for five metals that apply only to the process wastewater discharges listed in Appendix A or otherwise identified as "metal-bearing." The permit writer or control authority shall establish metal mass limitations or standards for each individual plant by summing the flows of "metal-bearing wastewater" and multiplying it by the concentration limitation for each of the five metals (see e.g., §§ 414.25(b) and 414.26(b)) . Compliance can be monitored in-plant or, after accounting for dilution by non-"metal-bearing" process wastewater and nonprocess wastewater, at the outfall (52 FR 42542–43).

However, the final regulation provides no authority for the permit writer or control authority to establish allowances for unavoidable low background levels of metals in non-"metal-bearing process waste streams" which may be present due to corrosion of construction materials or from contamination of raw materials.

Successful operation of chemical manufacturing facilities and proper maintenance of equipment depend on the appropriate selection of construction materials to resist corrosion. However, in some chemical processing environments, the effects of corrosion cannot be prevented. They can only be minimized through the proper selection of corrosion-resistant materials of construction.

Many corrosion-resistant materials commonly used to fabricate chemical processing plants contain chromium, copper, lead, nickel, and zinc. For example, many steel alloys containing various amounts of nickel, copper, and chromium are used to construct strong, heat-resistant pipes and vessels. Copper and its alloys—brasses (copper-zinc), bronzes (copper-tin), and cupronickels—are commonly used in chemical manufacturing where heat and electrical conductivity are important factors. Cupronickels are often used to construct heat-exchanger tubing. Vessels constructed of steel with a bonded lining of lead are sometimes specified for high temperature, fluctuating temperature, or vacuum operating conditions. Also, some chemical process equipment contains steel pipes and valves with internal lead cladding or copper heating coils with external lead cladding. The wear and tear of some chemical manufacturing processes, induced by concurrent mechanical and chemical or electrochemical action, may result in low concentrations of these metals in product/process wastewater which may in some instances be at measurable levels.

Furthermore, other non-process sources such as raw material contamination may also unavoidably result in low concentrations of these metals in process wastewater which may in some instances be at measurable levels. Commercial or industrial grades of chemical feedstocks and solvents commonly contain 0.5 percent (5,000 mg/l) or more of impurities. These impurities, which may include metals, are often unavoidable due to the operating characteristics of commercial chemical manufacturing plants. (see pages V–49 to V–89 of the October 1987, "Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category," EPA 440/1–87/009)

The proposed amendment described below does not apply to intake water contamination which is already accommodated in 40 CFR 122.45(g) for the direct dischargers and 40 CFR 403.15 for the indirect dischargers.

EPA proposes to amend the OCPSF rule to allow permit writers and control authorities in appropriate circumstances to provide allowances for metals that are incidentally contributed by non-process related sources such as corrosion and contamination of raw materials. The proposal restricts such allowances to situations where actual sampling data demonstrates the presence of metals resulting from such incidental sources, rather than allowing reliance on mere assertions or "estimates" that such metals are being discharged as the result of such sources. This assures that increased metals discharge allowances will not be authorized without an adequate basis. Moreover, any case-by-case metals allowances would be based on the permit writer's or control authority's best professional judgment (BPJ). In no event would the permit authorize exceedance of the concentrations demonstrated to be in the wastestream, and the limitations also could not exceed the regulatory limits established in the regulation for metal-bearing wastestreams. (For zinc, the regulatory limits which may not be exceeded are those appearing in the tables in §§ 414.25, 414.35, 414.91, and 414.101, not the higher alternative limits for rayon fiber manufacture by the viscose process and acrylic fiber manufacture by the zinc chloride/solvent process set forth in footnote 2 to each of these tables.)

The proposed amendment also requires the permit writer or control authority to assess the relevant information concerning the plant operating conditions that generate the background levels of metals and the basis for the BPJ limits and to set forth such findings in writing. For direct dischargers, the analysis will be contained in the permit fact sheet; control authorities will make a comparable record of their determinations for indirect dischargers. This will ensure that specific sources of metals, such as poor plant maintenance (e.g., leaking heat exchangers) and inappropriate materials of construction (e.g., use of mild steel in corrosive chemical environments where stainless steel or plastic materials of construction may be more suitable), are not a basis for metals allowances.

The Agency is also considering issuing guidance or promulgating standards that accommodate background levels of metals, if present at measurable levels, in non-"metal-bearing waste streams." The guidance or standards would be based on the assessment, outlined below, of OCPSF field sampling metals data gathered during the Agency's verification and 12-plant sampling efforts.

Chromium, copper, lead, nickel, and zinc data are available from 41 facilities in the OCPSF data base. Background levels of metals at these facilities have been determined after deletion of data from plants with process sources of metals such as catalysts or raw materials or from plants with non-process sources of metals such as zinc or chromium from algaecides or scale inhibitors. Other editing rules include deletion of a plant data set for a metal if all reported values are below the analytical minimum level ("not detected") or if fewer than three values are above the analytical minimum level. If a plant was sampled more than once, then the most recent data set is used in the analysis. Based on these editing criteria, the long-term average background levels listed below reflect the median of plant averages:

Pollutant	Concentration (ppb)
Chromium	132
Copper	23
Lead	114
Nickel	258
Zinc	57

The Agency requests daily data and supporting information regarding background levels of chromium, copper, lead, nickel, and zinc in OCPSF process wastewater that do not include contributions from "metal-bearing" process and non-process waste streams and contaminated intake water. The supporting documentation should contain such items as the analytical methods including the quality assurance/quality control documentation and analytical method minimum detection levels; identification of the sampling point on a block diagram; listings of all sources of wastewater at the sampling point including each OCPSF product/process; and a complete explanation of the source(s) of each metal including raw material assay sheets.

C. Revisions to Appendices A and B of 40 CFR 414

1. Cyanide-Bearing Waste Streams

One petitioner commented that five isocyanate processes associated with the manufacture of hexamethylene diisocyanate, methylene diphenylisocyanate, tolylene diisocyanate, polyurethane resins, and polyurethane fibers (Spandex) were incorrectly listed among the 42 cyanide-bearing wastestreams listed in appendix A to part 414. The petitioner stated that the five isocyanate processes were not known to use cyanide and isocyanates cannot produce cyanide, except through combustion.

These five wastestreams were originally listed as cyanide-bearing wastestreams based on information provided in responses to the 1983 OCPSF Section 308 Questionnaire—at least one manufacturer of these product/processes affiliated cyanide with the process. However, based on a reassessment of the process chemistry, the Agency agrees that cyanide is not associated with these product/processes and proposes to delete these five wastestreams from the appendix A list of cyanide-bearing wastestreams. The diisocyanate and polyurethane manufacturing processes are not primary sources of wastewater because water must be rigorously excluded from the chemical processes. To maintain water-free processing equipment, manufacturers would not use water washes for cleaning. However, these processes could be an indirect source of wastewater through, for example, the discharge from a caustic scrubber used to capture isocyanate-laden emissions from the polyurethane process. The isocyanates captured by the scrubber would react with the water to form carbon dioxide and amines, not cyanide.

2. Non-Complexed Metal-Bearing Waste Streams

As noted in item II.A above, several petitioners in the OCPSF litigation also noted that the listing of tetraethyl lead and tetramethyl lead waste streams as appendix A non-complexed metal-bearing waste streams contradicted other public record information which correctly characterizes tetraethyl and tetramethyl lead waste streams as containing complexed lead (see pages VII–21 to 22 of the October 1987 "Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics, and Synthetic Fibers Point Source Category," EPA 440/0–87/009). During the litigation, EPA reviewed this issue and agreed that these waste streams contain complexed lead and, therefore, should be moved from appendix A (Non-Complexed Metal-Bearing Waste Streams) to appendix B (Complexed Metal-Bearing Waste Streams). In response to the Fifth Circuit remand in *Chemical Manufacturers Association* v. *EPA*, 885 F.2d 253 (5th Cir. 1989), EPA deleted the tetraethyl lead and tetramethyl lead waste streams from appendix A (55 FR 26691, June 29, 1990). Today, EPA proposes to add these waste streams to the appendix B listing of Complexed Metal-Bearing Waste Streams.

D. BOD_5 and TSS Limitations

Since promulgation of the regulations, members of the public have expressed concern that the BPT and NSPS portions of the OCPSF regulation do not include provisions that describe how to apportion BOD_5 and TSS concentration limitations for different subcategories to a multi-subcategory plant. They were concerned that permit writers may fail to use a production-proportioning approach as directed by the preamble (52 FR 42533, column 3; November 5, 1987), and as set forth in formulas and a detailed example in Section IX (pages IX–9 to IX–12) of the October 1987 "Development Document for Effluent Limitations Guidelines and Standards for the Organic Chemicals, Plastics and Synthetic Fibers Point Source Category" (EPA 440/1–87/009). To avoid any potential confusion on the matter, EPA proposes to add a paragraph to the applicability section of the regulation (§ 414.11) that mandates use of the production-proportioning formula for derivation of limitations for facilities with production in two or more subcategories.

Pursuant to this formula, any existing or new source direct discharge point source subject to two or more of

subparts B through H must achieve BOD_5 and TSS discharges not exceeding the quantity (mass) determined by multiplying the total OCPSF process wastewater flow subject to subparts B through H times the OCPSF production-proportioned BOD_5 and TSS concentration limitations. The plant-specific production-proportioned concentration limitation is derived by summing the products of the OCPSF production-proportion for each subcategory and the applicable subcategorical limitation.

E. Revisions to the Applicability of 40 CFR Part 414

1. Correction of Subparts C, D and E Applicability Sections

The applicability sections of the Other Fibers, Thermoplastic Resins, and Thermosetting Resins Subcategories (subparts C, D and E, respectively) are defined in terms of four- and five-digit Standard Industrial Classification (SIC) codes. However, these sections, as presently promulgated, incorrectly restrict the applicability of the subcategory limitations and standards only to the wastewater discharges from the manufacture of the specific products and product groups listed in §§ 414.30, 414.40, and 414.50. For the reasons summarized below, the applicability sections for these three SIC-code-based subcategories should be based on SIC code definitions alone; the lists of products and product groups do not contain all of the products included in the subcategorization analysis, the cost of compliance engineering analysis, and the economic impact analysis and should serve only as illustrations of the principal products and product groups within the SIC codes covered by the subcategories.

The Agency's October 1983 Clean Water Act Section 308 Survey (OMB Control Number 2040-0043)—the primary source of production information in the OCPSF rulemaking record—generally collected production and related technical and economic information based on SIC codes with selected production and technical information based on individual products and product groups. In general, only those respondents that were primary manufacturers of OCPSF products (i.e., OCPSF products comprised one-half or more of the weight of the plant's total production) reported individual product and product group information, and only for those products that comprised more than one percent of total plant production (part II, question B01). Aggregated information for the remaining OCPSF products were grouped using five-digit SIC codes (part II, question B03). Respondents that were secondary manufacturers of OCPSF products (i.e., OCPSF products comprised less than one-half of the weight of the plant's total production) reported aggregated production information grouped by eight-digit Census product SIC codes (part I, question 9).

The subcategorization analyses established the applicability of each subcategory. The data collection activities and the subsequent subcategorization analyses were designed to include all products and product groups within the five SIC codes of the OCPSF industry—SIC 2821 (Plastic Materials, Synthetic Resins, and Nonvulcanizable Elastomers, further subdivided into SIC 28213 and SIC 28214 for the thermoplastic resins and thermosetting resins, respectively), SIC 2823 (Cellulosic Man-Made Fibers), SIC 2824 (Synthetic Organic Fibers, Except Cellulosic), SIC 2865 (Cyclic Crudes and Intermediates, Dyes, and Organic Pigments), and SIC 2869 (Industrial Organic Chemicals, Not Elsewhere Classified). The applicability sections of the Commodity, Bulk, and Specialty Organic Chemicals subcategories (subparts F, G, and H, respectively) which cover the organic chemicals segment of the industry (SIC codes 2865 and 2869) correctly reflect the subcategorization analysis. Subpart F and G cover specified SIC 2865 and 2869 chemicals, while subpart H operates as a "catch-all," regulating all other SIC 2865 and 2869 organic chemicals not specifically covered by subparts F and G. However, as stated above the applicability sections to subparts C, D, and E incorrectly limit coverage to the specifically listed products and product groups. To accurately reflect the subcategorization analysis, the applicability sections of the plastics and synthetic fibers subcategories should be amended to cover all of the products included within SIC codes 2821 (28213 and 28214), 2823, and 2824 (except for cases where the general applicability provisions of § 414.11 modify such coverage).

The proposed amendments to the Other Fibers, Thermoplastic Resins, and Thermosetting Resins subcategories correct the applicability sections to accurately reflect the supporting analyses in the rulemaking record.

2. Deletion of Specific Products

The Agency proposes to delete one erroneous thermoplastic resin product listing (cellulose sponge) under § 414.40 and two erroneous bulk organic chemical product listings (sodium salts of dithiophosphates, and wax emulsions and dispersions) under § 414.70. These amendments are the result of extensive Agency review of the applicability of the OCPSF regulation prompted by several OCPSF litigation issues and the evaluation of Category Determination Requests submitted by several Industrial Users and POTWs as provided by 40 CFR 403.6(a).

i. Cellulose sponge (and cellophane), classified under SIC 3079 as Miscellaneous Plastics Products, were initially considered OCPSF products because the cellulosic resin raw material for both products was produced by the viscose process—a situation analogous to rayon fiber manufacture by the viscose process (SIC 2823). However, during the course of assessing public comments and developing the final OCPSF rulemaking data base of 939 plants, the Agency deleted cellophane (52 FR 42524; November 5, 1987) and intended to delete cellulose sponge from coverage as OCPSF products. Even though cellulose sponge, cellophane, and rayon use regenerated cellulose as a raw material, each product uses a different combination of additional raw materials and unit processes to manufacture the final product for sale in different markets. The OCPSF technical, cost, and economic impact data gathering efforts did not focus on manufacturing activities under SIC 3079. As a result EPA lacks cost and economic information from plants that report cellulose sponge production under SIC 3079. Even though the applicability section of the OCPSF regulation, § 414.11, provides for coverage of products classified by SIC codes 2821, 2823, 2824, 2865, and 2869 only, the Agency erroneously left the cellulose sponge listing in subpart D. Cellulose sponge is not listed by any plant in the final OCPSF data base.

ii. Dithiophosphate sodium salts are industrial inorganic chemicals, listed under SIC 2819, that were incorrectly listed as subpart G bulk organic chemical products. Consequently EPA is deleting the dithiophosphate sodium salts product group from subpart G.

iii. Wax emulsions and dispersions, which are formulated products, were incorrectly listed as subpart G bulk organic chemical products. The final regulations apply to wastewater discharges from the manufacture of OCPSF product/processes (40 CFR 414.11(a)). OCPSF manufacture consists of chemical syntheses such as esterification and oxidation and chemical engineering processes such as distillation and extraction. In contrast,

the regulation does not apply to the formulation of chemical products, such as wax emulsions and dispersions, through blending and mixing operations (54 FR 27351).

3. Transfer of Specific Product Listings

The Agency proposes to transfer the citric acid, aspirin, and fatty acid listings from the Bulk Organic Chemicals Subcategory (§ 414.70) to the Specialty Organic Chemicals Subcategory (§ 414.80). Like the proposed deletions in section III.E.2, above, these amendments are the result of extensive Agency review of the applicability of the OCPSF regulation prompted by several OCPSF litigation issues and the evaluation of Category Determination Requests submitted by several Industrial Users and POTWs as provided by 40 CFR 403.6(a).

Individual SIC 2865 and 2869 organic chemical products and product groups were assigned to the commodity, bulk, and specialty organic chemical subcategories based on total United States production volume of each product or group. The Commodity Organic Chemicals Subcategory includes products produced nationally in amounts greater than or equal to one billion pounds per year. The Bulk Organic Chemicals Subcategory includes products produced nationally in amounts less than one billion but more than 40 million pounds per year. The Specialty Organic Chemicals Subcategory includes products produced nationally in amounts less than or equal to 40 million pounds per year. (52 FR 42531–32; November 5, 1987) For the reasons described below, the Agency believes that most of the citric acid, aspirin, and fatty acids manufacture is excluded from coverage by the OCPSF regulation. Therefore, these products are more appropriately covered by the Specialty Organic Chemicals Subcategory.

i. Citric acid, listed under SIC 2869, is produced commercially by mycological fermentation using crude sugar solutions or extracted from citrus fruits and from pineapple wastes. However, under 40 CFR 414.11(e), the OCPSF regulations are not applicable to the manufacture of organic chemical compounds by fermentation processes or solely by extraction from plant and animal raw materials. Moreover, citric acid production is regulated by the Fermentation Products Subcategory of the Pharmaceutical Manufacturing regulation, 40 CFR part 439. Because the Agency is not aware of any significant commercial citric acid production through chemical synthesis by OCPSF plants, such production should not be included in the Bulk Organic Chemicals Subcategory. The Agency therefore proposes to regulate any chemical synthesis or by-product recovery of citric acid under the Specialty Organic Chemicals Subcategory.

ii. Aspirin or acetyl salicylic acid may be classified under more than one SIC code depending on its end use. Medicinal grade aspirin is included under SIC 2833 Medicinal Chemicals and Botanical Products (as a medicinal grade salicylic acid derivative) and regulated under the Chemical Synthesis Subcategory of the Pharmaceutical Manufacturing Regulations, 40 CFR part 439. Under the provisions of 40 CFR 414.11(d), medicinal grade aspirin manufacture is not regulated by the OCPSF regulation because previously promulgated regulations apply.

Since the Agency is not aware of any significant industrial grade aspirin production reported under SIC 2869, it is proposing to regulate industrial grade aspirin production under the Specialty Organic Chemicals Subcategory, rather than the Bulk Organic Chemicals Subcategory.

iii. Fatty acids may be classified under more than one SIC code depending on the source of raw materials or manufacturing process. The Agency did not include fatty acids derived from natural materials, classified under SIC 2899, as an OCPSF product group in its section 308 data gathering efforts because these fatty acids were outside of the scope of the study. However, higher-molecular weight, synthetic fatty acids are included in SIC 2869 and are thus within the scope of the OCPSF regulation.

Today, the Agency is clarifying that coverage of the OCPSF regulation does not include the fatty acids listed under SIC 2899—Chemicals and Chemical Preparations, Not Elsewhere Classified. Like some OCPSF products, these fatty acids are synthetically derived from naturally occurring raw materials. They are generally derived from animal, marine, and plant fats and oils by hydrolysis—a chemical reaction in which water reacts with another substance to form two or more new substances. Despite these similarities, the OCPSF technical, cost, and economic impact data gathering efforts did not focus on manufacturing activities under SIC 2899. As a result EPA lacks cost and economic information from plants that report fatty acid production under SIC 2899.

Moreover, under 40 CFR 414.11(d), the OCPSF regulations are not applicable if previously promulgated regulations apply. A significant portion of the fatty acid manufacture classified under SIC 2899 is already regulated by the Fatty Acid Manufacturing by Fat Splitting Subcategory of the Soap and Detergent Manufacturing regulations, 40 CFR part 417. The provisions of this subcategory "are applicable to discharges resulting from the splitting of fats to fatty acids by hydrolysis and the subsequent processing of the fatty acids (e.g., refining and hydrogenation) to produce a suitable feed material for manufacture of soap by fatty acid neutralization" (40 CFR 417.20).

Since synthetically derived fatty acids, such as branched chain synthetic aliphatic monocarboxylic acids, are classified under SIC 2869 and since the Agency is not aware of any significant fatty acid production reported under SIC 2869, the Agency proposes to regulate synthetic fatty acids under the Specialty Organic Chemicals Subcategory rather than the Bulk Organic Chemicals Subcategory.

IV. Solicitation of Technical Data and Comment on These Proposed Amendments

EPA invites and encourages public participation in this rulemaking. The Agency asks that any alleged deficiencies in the record of this proposal be identified with specificity and requires that suggested revisions or corrections be supported by relevant data and information.

V. Executive Order 12291

Executive Order 12291 requires EPA and other agencies to perform regulatory analyses of major regulations. Major rules are those which impose a cost on the economy of $100 million or more annually or have certain other economic impacts. This regulation is not a major rule because it merely clarifies the applicability of the regulation, corrects listing errors and establishes flexibility in implementing an existing regulation by allowing regulatory authorities to accommodate site specific factors relating to complexed-cyanide and unavoidable background levels of metals in non-metal-bearing waste streams. Today's proposed amendments do not impose significant new requirements; thus, they meet none of the criteria of a major rule as set forth in section 1(b) of the Executive Order. This rule was submitted to the Office of Management and Budget for review.

VI. Regulatory Flexibility Analysis

The Regulatory Flexibility Act, 5 U.S.C. 601 et seq., requires EPA and other agencies to prepare an initial regulatory flexibility analysis for all

proposed regulations that have a significant impact on a substantial number of small entities. No regulatory flexibility analysis is required, however, where the head of the Agency certifies that the rule will not have a significant economic impact on a substantial number of small entities. Based on the reasons discussed in the preceding paragraph, I hereby certify, pursuant to 5 U.S.C. 605(b), that this regulation will not have a significant impact on a substantial number of small entities.

VII. Paperwork Reduction Act

In accordance with the Paperwork Reduction Act of 1980, 44 U.S.C. 3500 et seq., EPA must submit a copy of any rule that contains a collection-of-information requirement to the Director of the Office of Management and Budget for review and approval. This proposal contains no additional information-collection requirements beyond those already required by 40 CFR part 403 and 40 CFR part 122, and therefore the Paperwork Reduction Act is not applicable.

List of Subjects in 40 CFR Part 414

Organic chemicals manufacturing, plastics manufacturing, synthetic fibers manufacturing, water pollution control, water treatment and disposal.

Dated October 9, 1990.

William K. Reilly,

Administrator.

For the reasons set out in the preamble, 40 CFR part 414 is proposed to be amended as set forth below.

PART 414—ORGANIC CHEMICALS, PLASTICS, AND SYNTHETIC FIBERS

1. The authority citation for part 414 continues to read as follows:

Authority: Secs. 301, 304, 306, 307, and 501, Pub. L. 92–500, 86 Stat. 816, Pub. L. 95–217, 91 Stat. 156, Pub. L. 100–4, 101 Stat. 7 [33 U.S.C. 1311, 1314, 1316, 4317, and 1361).

2. 40 CFR 414.11 is proposed to be amended by adding paragraphs (g), (h), and (i) to read as follows:

§ 414.11 Applicability.

* * * * *

(g) *Non-amendable Cyanide.* Discharges of cyanide in "cyanide-bearing waste streams" (listed in appendix A to this part) are not subject to the cyanide limitations and standards of this part if the permit writer or control authority: (1) Determines that the cyanide limitations and standards are not achievable due to elevated levels of non-amenable cyanide (i.e., cyanide that is not oxidized by chlorine treatment) that result from the unavoidable complexing of cyanide at the process source of the cyanide-bearing waste stream and (2) establishes an alternative total cyanide or amenable cyanide limitation that reflects the best available technology economically achievable. The determination must be based upon a review of relevant engineering, production, and sampling and analysis information, including measurements of both total and amenable cyanide in the waste stream. An analysis of the extent of complexing in the waste stream, based on the foregoing information, and its impact on cyanide treatability shall be set forth in writing and, for direct dischargers, be contained in the fact sheet required by 40 CFR 124.8.

(h) *Allowances for non-metal-bearing waste streams.* Discharge limitations for chromium, copper, lead, nickel, and zinc or discharge standards for lead and zinc may be established for waste streams not listed in appendix A and not otherwise determined to be "metal-bearing waste streams" if the permit writer or control authority determines that the wastewater metals contamination is due to unavoidable background levels from sources such as corrosion of construction materials or contamination of raw materials. (Intake water contamination is not subject to this paragraph. Rather it is subject to the provisions of 40 CFR 122.45(g) for direct dischargers and 40 CFR 403.15 for indirect dischargers.) The determination must be based upon a review of relevant plant operating conditions, process chemistry, engineering, and sampling and analysis information. An analysis of the sources and levels of the metals, based on the foregoing information, shall be set forth in writing; for direct dischargers, the analysis shall be contained in the fact sheet required by 40 CFR 124.8. For direct dischargers, the permit writer may establish limitations for chromium, copper, lead, nickel, and zinc for non-"metal-bearing waste streams" between zero (0) and the concentrations of such metals present in the wastestreams, but not to exceed the applicable limitations contained in §§ 414.91 and 414.101. (For zinc, the applicable limitations which may not be exceeded are those appearing in the tables in §§ 414.91 and 414.101, not the alternative limitations for rayon fiber manufacture by the viscose process and the acrylic fiber manufacture by the zinc chloride/solvent process set forth in footnote 2 to each of these tables.) For indirect dischargers, the control authority may establish standards for lead and zinc for non-"metal-bearing waste streams" between zero (0) and the concentration of such metals present in the wastestreams, but not to exceed the applicable standards contained in §§ 414.25, 414.35 414.45, 414.55, 414.65, 414.75, and 414.85. (For zinc, the applicable standards which may not be exceeded are those appearing in the tables in the above referenced sections, not the alternative standards for rayon fiber manufacture by the viscose process set forth in footnote 2 to the table in § 414.25, or the alternative standards for acrylic fiber manufacture by the zinc chloride/solvent process set forth in footnote 2 to the table in § 414.35.)

(i) *BOD_5 and TSS limitations for plants with production in two or more subcategories.* Any existing or new source direct discharge point source subject to two or more of subparts B through H must achieve BOD_5 and TSS discharges not exceeding the quantity (mass) determined by multiplying the total OCPSF process wastewater flow subject to subarts B through H times the following "OCPSF production-proportioned concentration": For a specific plant, let w_j be the proportion of the plant's total OCPSF production in subcategory j. Then the plant-specific production-proportioned concentration limitations are given by:

$$\text{Plant } BOD_5 \text{ Limit} = \sum_{j=B}^{H} (w_j)(BOD_5 \text{ Limit}_j) \text{ and}$$

$$\text{Plant TSS Limit} = \sum_{j=B}^{H} (w_j)(\text{TSS Limit}_j).$$

The "BOD_5 $Limit_j$" and "TSS $Limit_j$" are the respective subcategorical BOD_5 and TSS Maximum for Any One Day or Maximum for Monthly Average limitations.

3. In appendix A to part 414 under the heading "Cyanide" the following entries are removed:

Hexamethylene diisocyanate/ Hexamethylene diamine (1,6-Diaminohexane) + phosgene.
Methylene Diphenylisocyanate (MDI)/ Phosgenation of methylene dianiline from Aniline + Formaldehyde.
Polyurethane resins/Diisocyanate + Polyoxyalkylene glycol.
Polyurethane fibers (Spandex)/ Polyoxyalkylene glycol + Tolylene diisocyante + dialkylamine," and
Tolylene diisocyanate (isomeric mixture)/ Tolylene diamines + Phosgene

4. Appendix B to part 414 is proposed to be amended by adding the following entries under the heading "lead"

Tetraethyl lead/Alkyl halide + sodium-lead alloy" and "Tetramethyl lead/Alkylhalide + sodium-lead alloy"

§§ 414.21, 414.31, 414.41, 414.51, 414.61, 414.71 and 414.81 [Amended]

5. In each of §§ 414.21, 414.31, 414.41, 414.51, 414.61, 414.71 and 414.81, the first sentence which reads "Except as provided in 40 CFR 125.30 through 125.32, any existing point source subject to this subpart must achieve discharges not exceeding the quantity (mass) determined by multiplying the process wastewater flow subject to this subpart times the concentration listed in the following table." is revised to read "Except as provided in 40 CFR 125.30 through 125.32, and in 40 CFR 414.11(i) for point sources with production in two or more subcategories, any existing point source subject to this subpart must achieve discharges not exceeding the quantity (mass) determined by multiplying the process wastewater flow subject to this subpart times the concentration listed in the following table."

6. Section 414.30 is proposed to be amended by revising the first sentence to read as follows:

§ 414.30 Applicability, description of the other fibers subcategory.

The provisions of this subpart are applicable to the process wastewater discharges resulting from the manufacture of products classified under SIC 2823 cellulosic man-made fibers, except Rayon, and SIC 2824 synthetic organic fibers including those fibers and fiber groups listed below."

7. Section 414.40 is proposed to be amended by revising the first sentence and by removing the entry for "Cellulose Sponge" from the list to read as follows:

414.40 Applicability description of the thermoplastic resins subcategory.

The provisions of this subpart are applicable to the process wastewater discharges resulting from the manufacture of the products classified under SIC 28213 thermoplastic resins including those resins and resin groups listed below. * * *

8. Section 414.50 is proposed to be amended by revising the first sentence to read as follows:

§ 414.50 Applicability, description of the thermosetting resins subcategory.

The provisions of this subpart are applicable to the process wastewater discharges resulting from the manufacture of the products classified under SIC 28214 thermosetting resins including those resins and resin groups listed below. * * *

§ 414.70 [Amended]

9. Section 414.70(a) is proposed to be amended by removing the entries "Citric Acid" and "Fatty Acids".

§ 414.70 [Amended]

10. Section 414.70(c) is proposed to be amended by removing the entry for "Aspirin".

§ 414.70 [Amended]

11. Section 414.70(e) is proposed to be amended by removing entries "Dithiophosphates, Sodium Salt" and "* Waxes, Emulsions—Dispersions".

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