

NOES QUESTIONNAIRE ITEM NO. 40
Chemicals Substituted as a Result of Government Inspection

Item

The intent of this question was to determine if the facility had substituted chemical materials within the past five years as a direct result of government inspection activity.

This item was displayed on the questionnaire as:

40. Were any of these substitutions made as a result of inspections of this facility by federal, state or local authorities?

- 1 Yes
2 No

Notes

An affirmative answer to this question was recorded only when chemical substitutions were made as a consequence of a regulatory visit.

Consultative visits or advice from private consultants, corporate staff, insurance carrier specialists or government employees which resulted in a chemical substitution were excluded.

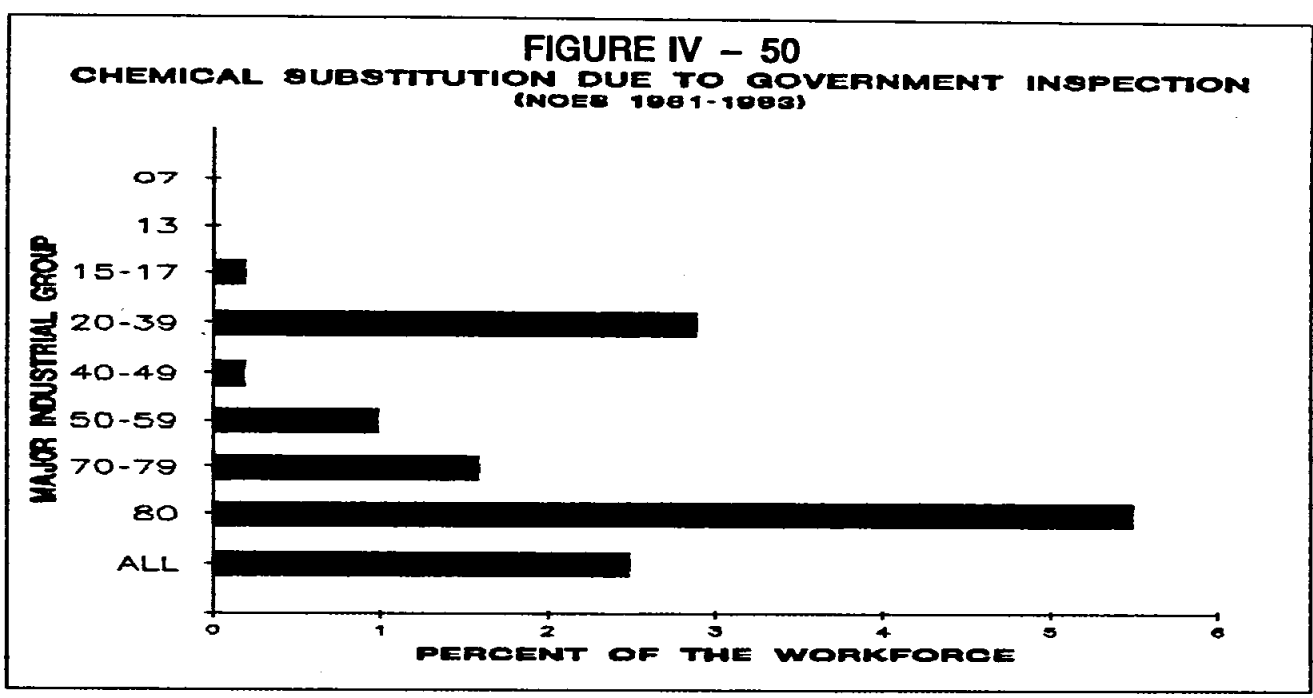
Analysis

One analysis of the responses to question 40 is presented.

Response 40.1 - Chemicals substituted as a result of government inspection

The estimates of the plants which substituted chemical materials within the past five years due to government inspection activity, and workers in those plants (by number and proportion of the total) are displayed in Figures IV-50, IV-51, IV-52, IV-53, IV-54, and IV-55, and Tables IV-45 and IV-46.

Figure IV-50	Chemical substitution due to government inspection (by major industrial group)
Figure IV-51	Chemical substitution due to government inspection (by 2-digit SIC)
Figure IV-52	Substitution of chemicals due to government inspection (by major industrial group)
Figure IV-53	Substitution of chemicals due to government inspection (by 2-digit SIC)
Figure IV-54	Workers in plants making chemical substitution due to government inspection
Figure IV-55	Plants making chemical substitutions due to government inspection
Table IV-45	Number and percent of plants and employees in plants which substituted chemicals as a result of government inspection (by major industrial group)
Table IV-46	Number and percent of plants and employees in plants which substituted chemicals as a result of government inspection (by 2-digit SIC)



NATIONAL OCCUPATIONAL EXPOSURE SURVEY (1981-1983) TABLE NO. IV-45

NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH
SUBSTITUTED CHEMICALS AS A RESULT OF GOVERNMENT INSPECTION

MAJOR GROUP	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
07	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...
15-17	20* (17) .0%	...	3* (4) 1.4%	23* (20) .0%	1683* (1410) .1%	...	5099* (5479) 2.2%	6782* (6629) .2%
20-39	1428* (430) .9%	631 (153) 2.0%	248* (75) 4.0%	2307 (454) 1.2%	41418* (16119) .9%	132381 (30809) 2.1%	388591 (17090) 4.7%	562391 (90726) 2.9%
40-49	152* (103) .3%	...	...	152* (103) .3%	6550* (4260) .5%	...	...	6550* (4260) .2%
50-59	...	84* (86) 3.2%	...	84* (86) .1%	...	14784* (15128) 3.6%	...	14784* (15128) 1.0%
70-79	821* (616) 1.1%	87* (78) 3.7%	13* (19) 3.8%	922* (636) 1.2%	12255* (9872) .9%	11669* (10488) 2.5%	10670* (15114) 3.1%	34594* (21661) 1.6%
80	...	149* (98) 6.9%	107* (45) 5.2%	257* (82) 3.6%	...	32897* (23412) 6.2%	167895* (61729) 5.6%	200792* (57729) 5.5%
ALL	2421* (758) .5%	952 (216) 1.9%	373 (89) 3.9%	3746 (798) .7%	61906* (19427) .6%	191731 (42850) 1.9%	572255 (100060) 4.6%	825893 (111014) 2.5%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.

FIGURE IV - 51
CHEMICAL SUBSTITUTION DUE TO GOVERNMENT INSPECTION
 (NOES 1981-1983)

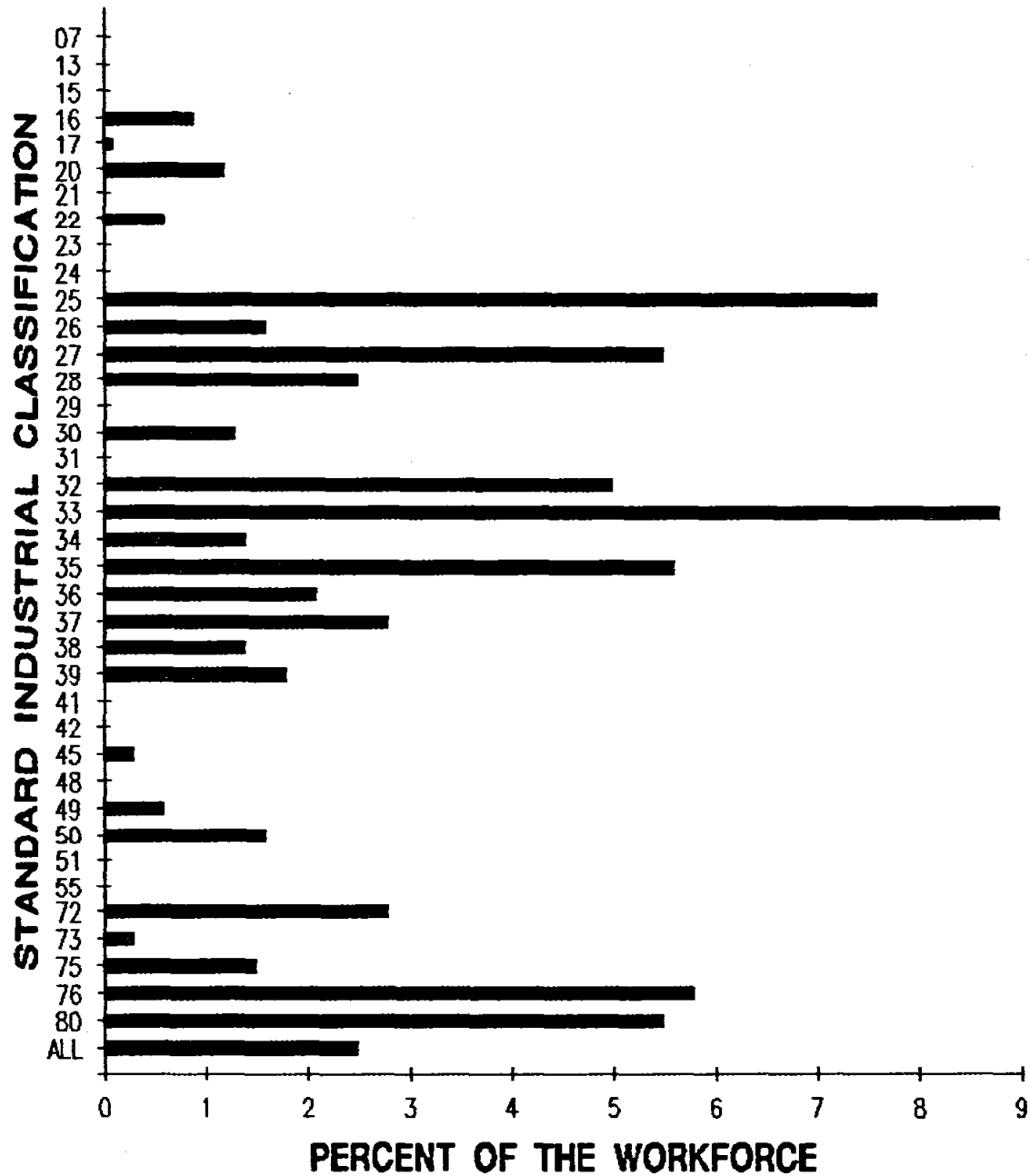


FIGURE IV - 52
SUBSTITUTION OF CHEMICALS DUE TO GOVERNMENT INSPECTION
(NOES 1981-1983)

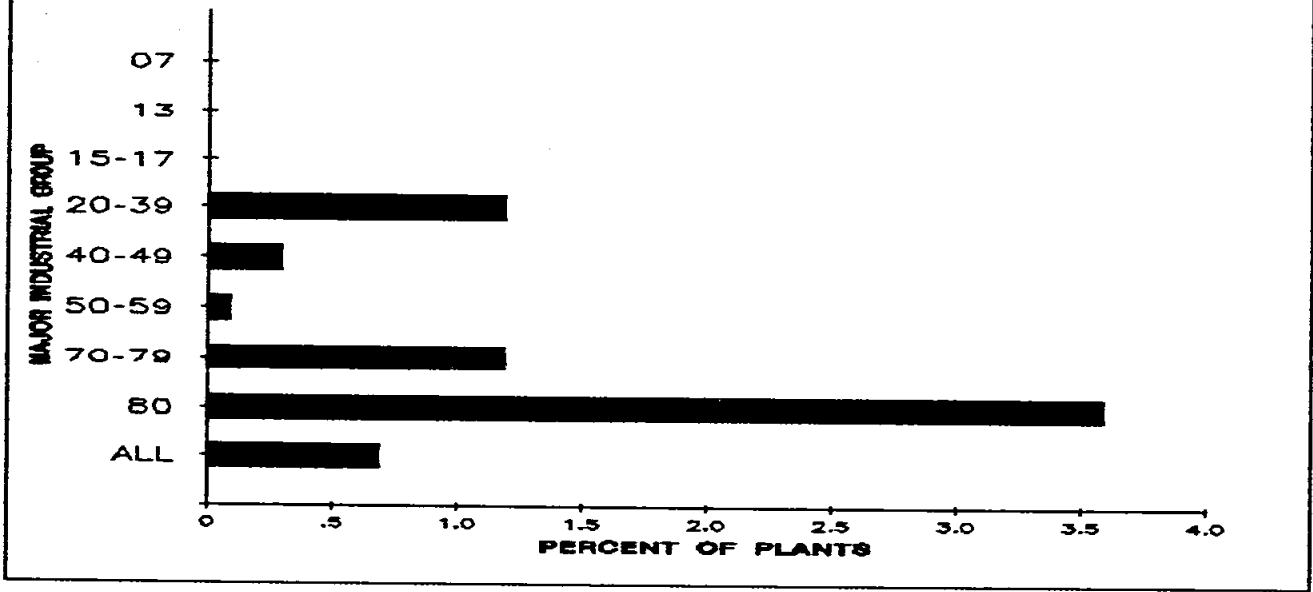
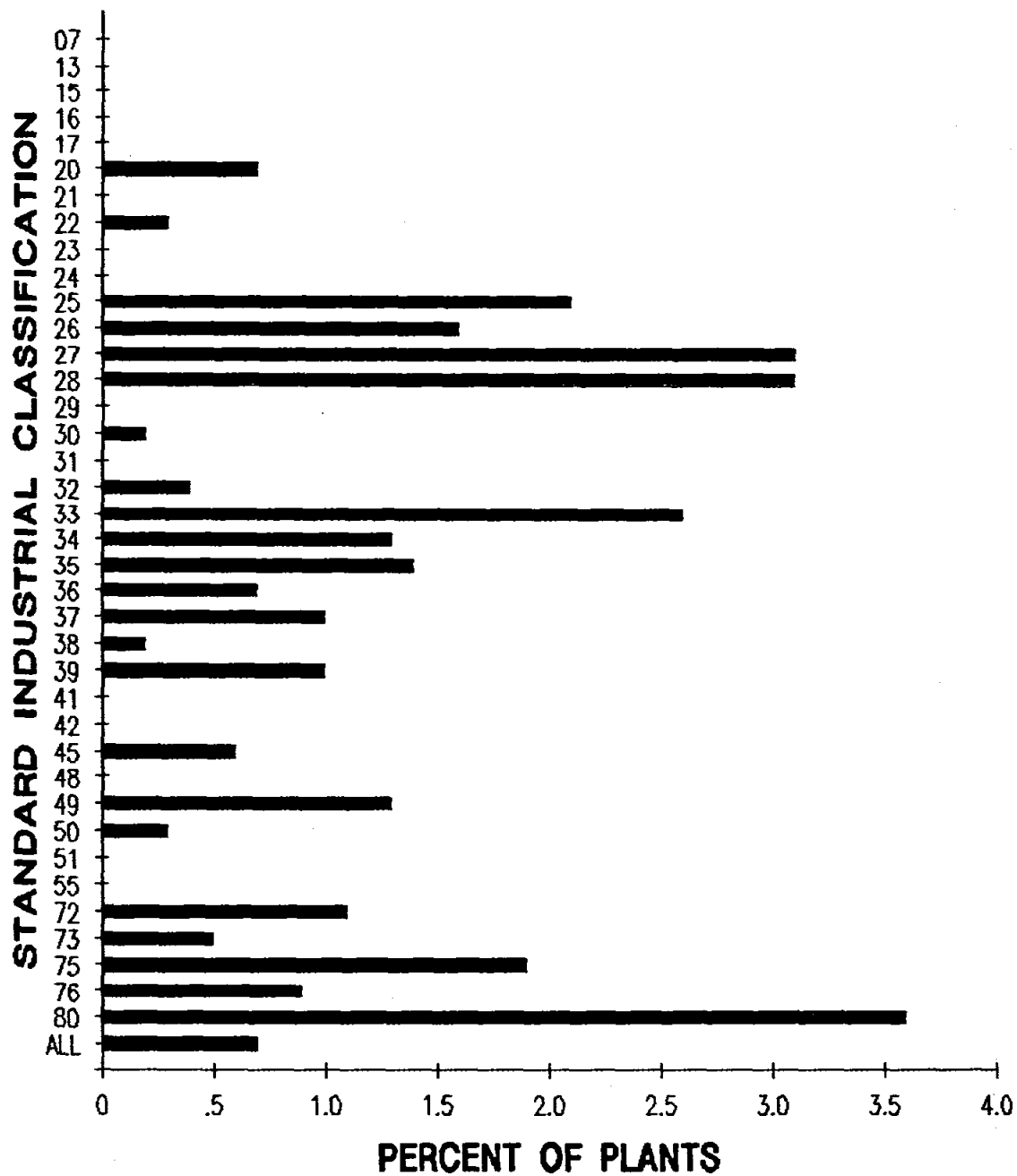


FIGURE IV - 53
SUBSTITUTION OF CHEMICALS DUE TO GOVERNMENT INSPECTION
 (NOES 1981-1983)



NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH
SUBSTITUTED CHEMICALS AS A RESULT OF GOVERNMENT INSPECTION

SIC CODE	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
07	...	...	...	...	...	...	...	...
13	...	...	...	...	...	...	...	...
15	...	...	...	...	...	...	...	...
16	...	...	3* (4) 3.2%	3* (4) .0%	...	...	5099* (5479) 5.0%	5099* (5479) .9%
17	20* (17) .0%	...	...	20* (17) .0%	1683* (1410) .1%	...	...	1683* (1410) .1%
20	58* (67) .5%	50* (33) 1.6%	...	109* (81) .7%	3216* (3712) .8%	15542* (10670) 2.3%	...	18759* (11955) 1.2%
21	...	...	...	...	...	...	...	...
22	...	16* (37) 1.0%	...	16* (37) .3%	...	4232* (9994) 1.2%	...	4232* (9994) .6%
23	...	...	...	...	...	...	...	...
24	...	...	...	...	...	...	...	...
25	...	109* (99) 10.3%	3* (4) 2.7%	113* (99) 2.1%	...	18369* (16673) 7.2%	20917* (22806) 17.0%	39286* (29608) 7.6%
26	...	94* (70) 6.0%	...	94* (70) 1.6%	...	10061* (7518) 3.6%	...	10061* (7518) 1.6%
27	594* (287) 3.3%	...	41* (41) 12.8%	635* (291) 3.1%	10703* (4427) 2.2%	...	54795* (46537) 15.8%	65498* (47552) 5.5%
28	205* (191) 3.3%	19* (36) 1.6%	15* (23) 4.0%	238* (203) 3.1%	2046* (1909) 1.1%	6539* (12581) 2.5%	14435* (18899) 3.0%	23020* (23227) 2.5%
29	...	...	...	...	...	...	...	...
30	...	8* (19) .5%	13* (16) 5.7%	21* (14) .2%	...	2149* (5002) .7%	7904* (9778) 3.4%	10053* (7301) 1.3%
31	...	...	...	...	...	...	...	...
32	...	...	37* (28) 20.0%	37* (28) .4%	...	...	28732* (21763) 22.3%	28732* (21763) 5.0%
33	...	125* (106) 8.5%	28* (17) 8.3%	153* (121) 2.6%	...	19553* (16918) 6.3%	74734* (44776) 12.0%	94287* (53640) 8.8%

SIC CODE	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
34	228* (257) 1.2%	58* (34) 1.9%	2* (5) .7%	288* (262) 1.3%	2049* (2312) .4%	16148* (9672) 2.7%	2938* (6037) .8%	21134* (11062) 1.4%
35	235* (187) 1.0%	107* (47) 3.2%	47* (31) 6.0%	389* (201) 1.4%	14900* (14776) 2.5%	29989* (13080) 4.5%	88536* (42260) 8.0%	133425* (48805) 5.6%
36	40* (44) .6%	...	31* (26) 3.9%	71* (60) .7%	3746* (4136) 1.6%	...	37363* (18535) 3.2%	41109* (20347) 2.1%
37	8* (7) .2%	26* (31) 2.2%	22* (14) 5.2%	56* (36) 1.0%	241* (222) .2%	5007* (5891) 2.1%	47880* (26590) 3.2%	53127* (27989) 2.8%
38	...	...	10* (16) 2.4%	10* (16) .2%	...	...	10358* (16947) 2.2%	10358* (16947) 1.4%
39	60* (70) .9%	17* (47) 2.1%	...	77* (81) 1.0%	4516* (5239) 2.7%	4792* (13146) 3.2%	...	9309* (13716) 1.8%
41	...	...	...	...	...	...	...	...
42	...	...	...	...	...	...	...	...
45	23* (34) .7%	...	...	23* (34) .6%	1514* (2181) 2.0%	...	...	1514* (2181) .3%
48	...	...	...	...	...	...	...	...
49	129* (102) 1.6%	...	...	129* (102) 1.3%	5037* (4003) 1.9%	...	...	5037* (4003) .6%
50	...	84* (86) 4.7%	...	84* (86) .3%	...	14784* (15128) 5.2%	...	14784* (15128) 1.6%
51	...	...	...	...	...	...	...	...
55	...	...	...	...	...	...	...	...
72	227* (225) 1.1%	...	13* (19) 100.0%	240* (225) 1.1%	2725* (2701) .7%	...	10670* (15114) 100.0%	13395* (15254) 2.8%
73	100* (112) .6%	...	...	100* (112) .5%	3110* (3485) .7%	...	...	3110* (3485) .3%
75	494* (501) 1.9%	...	...	494* (501) 1.9%	6420* (6514) 1.6%	...	...	6420* (6514) 1.5%
76	...	87* (78) 70.8%	...	87* (78) .9%	...	11669* (10488) 47.9%	...	11669* (10488) 5.8%
80	...	149* (98) 6.9%	107* (45) 5.2%	257* (82) 3.6%	...	32897* (23412) 6.2%	167895* (61729) 5.6%	200792* (57729) 5.5%
ALL	2421* (793) .5%	952* (245) 1.9%	373 (81) 4.0%	3746 (834) .7%	61906* (19949) .6%	191731 (47115) 2.0%	572255 (69606) 4.6%	825893 (89959) 2.5%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.

FIGURE IV - 54
WORKERS IN PLANTS MAKING CHEMICAL
SUBSTITUTIONS DUE TO GOVERNMENT INSPECTION
(NOES 1981-1983)

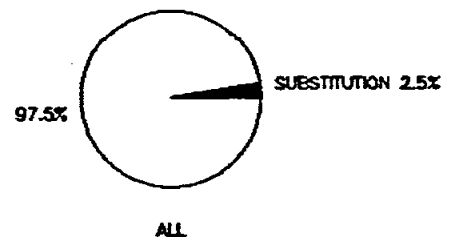
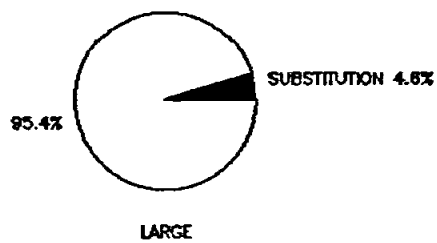
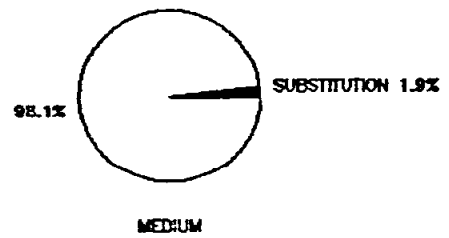
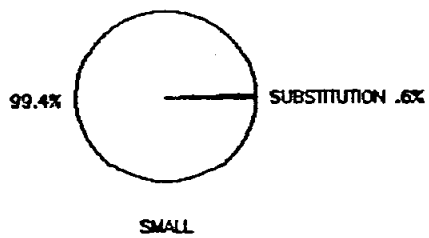
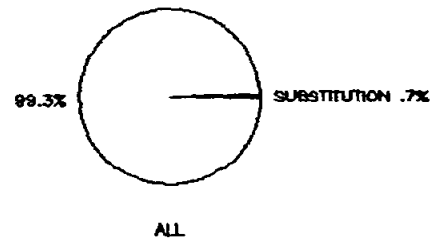
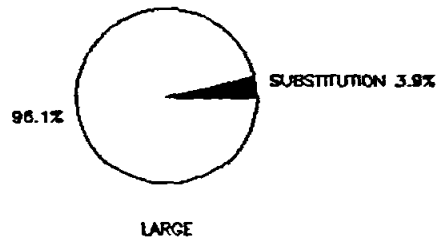
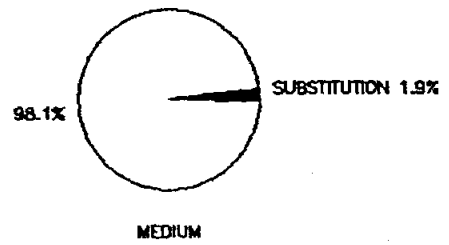
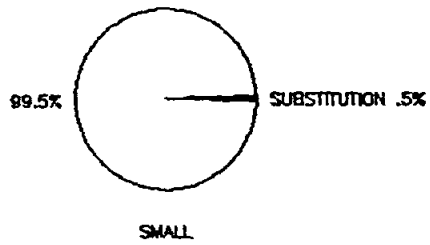


FIGURE IV - 55
PLANTS MAKING CHEMICAL SUBSTITUTIONS
DUE TO GOVERNMENT INSPECTION
(NOES 1981-1983)



NOES QUESTIONNAIRE ITEM NO. 41
Process or Equipment Modifications Made in the Past Five Years

Intent

The intent of this question was to determine if the facility had made major modifications of equipment or processes during the past five years.

This item was displayed on the questionnaire as:

41. Have any major equipment or process modifications been made withing the last 5 years?

- 1 Yes
- 2 No (Skip to Question 45)

Notes

A "major modification" was considered to be a change in machinery, process(es), equipment, or physical plant layout which was significant enough to change the potential occupational exposure(s) of workers to chemical, physical or biological agents.

Changes made to protect against injury, such as machine guards, were not considered to be major process or equipment modifications within the intent of this question.

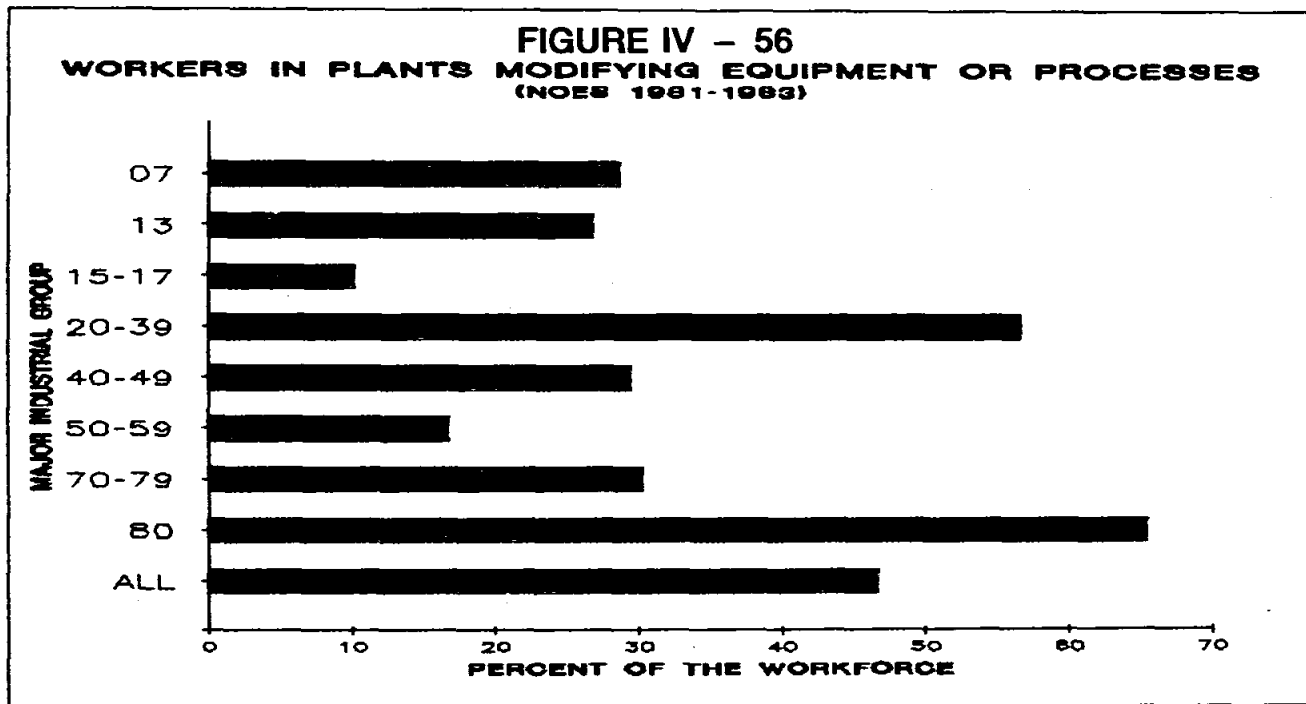
Analysis

One analysis of the responses to this question is presented.

Response 41.1 - Major process or equipment modifications made during the past five years

The estimates of the plants which made modifications to equipment or processes during the past five years which were significant enough to change potential worker occupational exposures, and workers in those plants (by number and proportion of the total) are displayed in Figures IV-56, IV-57, IV-58, IV-59, IV-60, and IV-61, and Tables IV-47 and IV-48.

Figure IV-56	Workers in plants modifying equipment or processes (by major industrial group)
Figure IV-57	Workers in plants modifying equipment or processes (by 2-digit SIC)
Figure IV-58	Plants which modified equipment or processes (by major industrial group)
Figure IV-59	Plants which modified equipment or processes (by 2-digit SIC)
Figure IV-60	Workers in plants which modified equipment or processes
Figure IV-61	Plants which modified equipment or processes by plant size
Table IV-47	Number and percent of plants and employees in plants which made equipment or process modifications in the past five years (by major industrial group)
Table IV-48	Number and percent of plants and employees in plants which made equipment or process modifications in the past five years (by 2-digit SIC)



NATIONAL OCCUPATIONAL EXPOSURE SURVEY (1981-1983) TABLE NO. IV-47

NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH
MADE EQUIPMENT OR PROCESS MODIFICATIONS IN THE PAST FIVE YEARS

MAJOR GROUP	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
07	720* (389) 12.9%	...	...	720* (389) 12.8%	31853* (18638) 30.7%	...	...	31853* (18638) 28.8%
13	1349* (577) 15.7%	394* (258) 38.7%	...	1743* (656) 18.0%	35457* (11632) 17.0%	76585* (38588) 44.0%	...	112042* (39717) 27.0%
15-17	6681 (1141) 7.1%	623* (249) 15.0%	24* (18) 9.7%	7328 (1118) 7.4%	165504 (26290) 7.9%	112166* (47451) 15.2%	37352* (23980) 15.8%	315022 (61892) 10.3%
20-39	37475 (2045) 24.5%	14665 (1150) 46.2%	4241 (223) 67.6%	56381 (2105) 29.5%	1303490 (63022) 28.2%	3103814 (246563) 48.6%	6519530 (302663) 78.9%	10926834 (465382) 56.7%
40-49	9085 (1681) 17.1%	1279* (478) 21.9%	165* (57) 35.2%	10528 (1982) 17.7%	328203 (73029) 22.9%	315940* (121927) 27.4%	291210* (96959) 50.8%	935352 (201343) 29.6%
50-59	9152 (1769) 15.7%	408* (242) 15.3%	...	9559 (1706) 15.7%	190565 (34415) 16.9%	68583* (41609) 16.8%	...	259148 (47959) 16.9%
70-79	13511 (2277) 18.5%	902 (214) 38.4%	227* (124) 64.1%	14640 (2361) 19.3%	273641 (61340) 19.6%	164410 (38959) 35.4%	230986* (108158) 68.0%	669036 (124624) 30.4%
80	1148* (453) 40.5%	771* (193) 35.6%	1426 (216) 69.2%	3345 (535) 47.3%	46728* (15061) 46.0%	222370 (54042) 41.6%	2131861 (253946) 70.5%	2400960 (247403) 65.6%
ALL	79120 (4161) 17.6%	19042 (1349) 38.1%	6082 (339) 64.4%	104243 (4355) 20.5%	2375442 (125111) 21.4%	4063867 (292523) 41.2%	9210940 (421624) 73.9%	15650249 (584735) 46.8%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.

FIGURE IV - 57
WORKERS IN PLANTS MODIFYING EQUIPMENT OR PROCESSES
 (NOES 1981-1983)

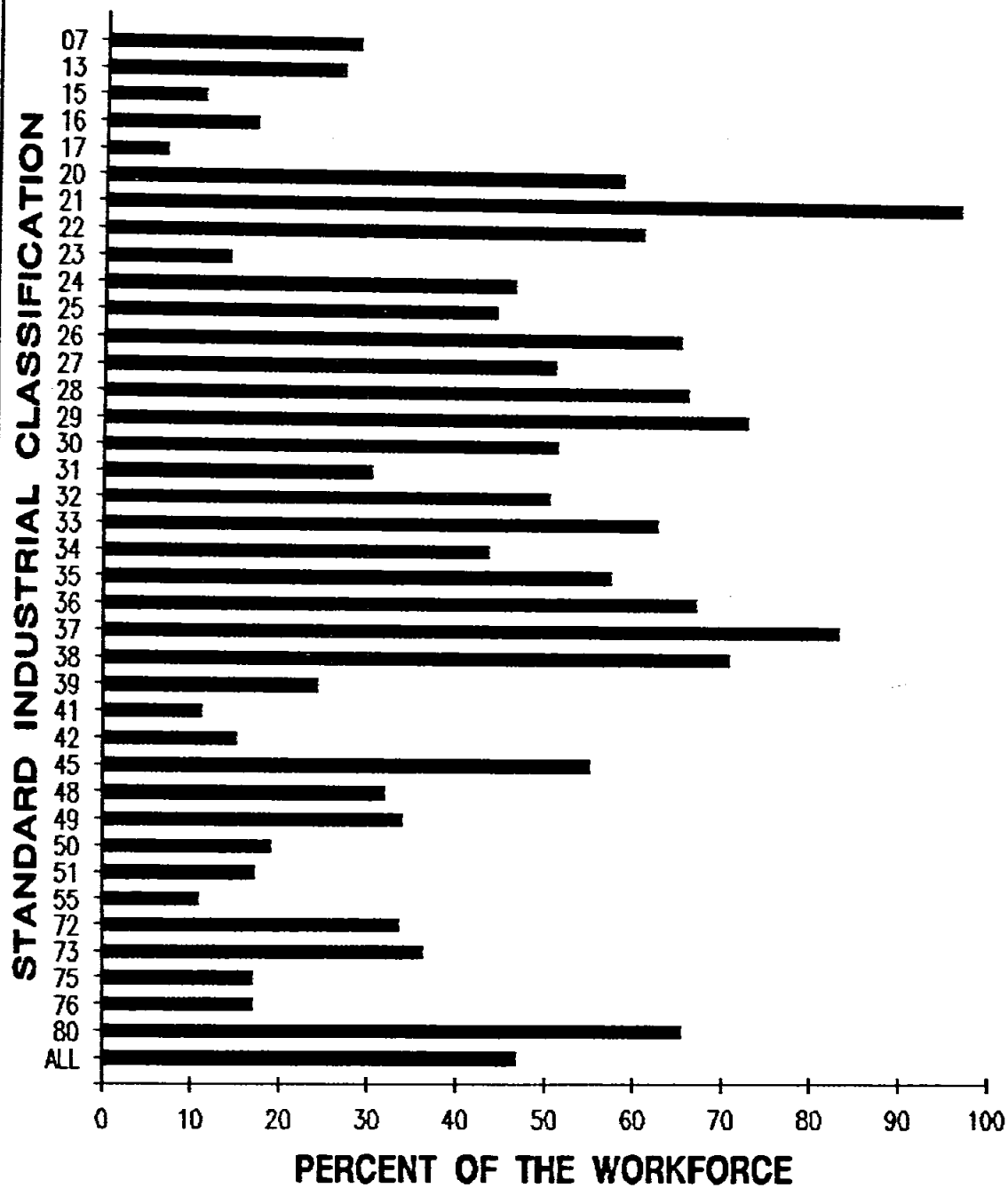
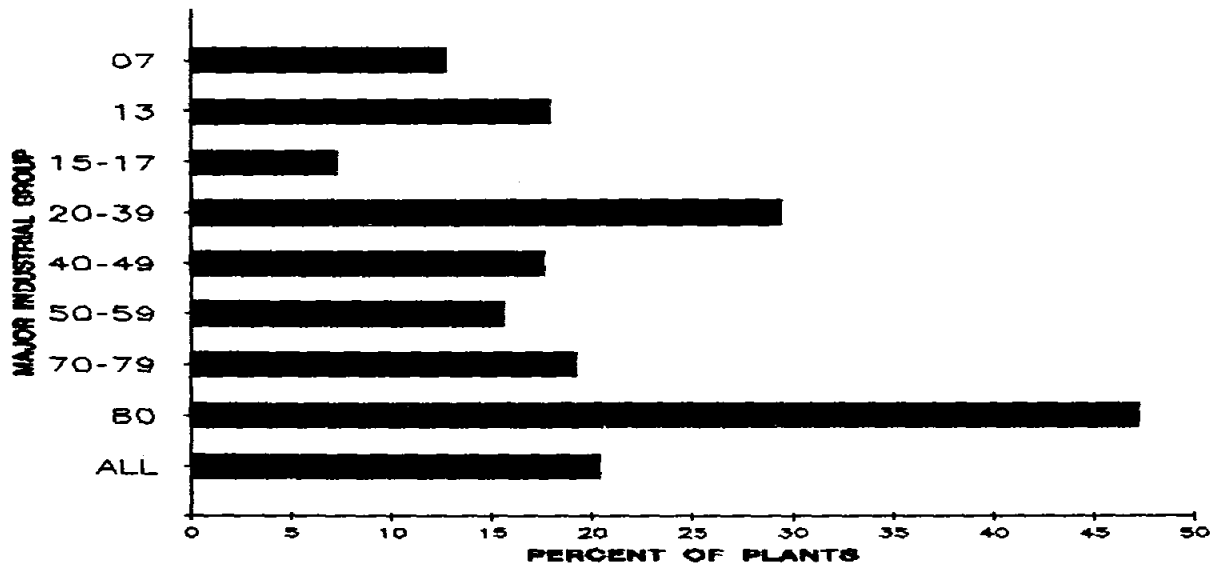


FIGURE IV - 58
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
(NOES 1981-1983)



NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH MADE EQUIPMENT OR PROCESS MODIFICATIONS IN THE PAST FIVE YEARS

SIC CODE	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)	TOTAL
07	720* (389) 12.9%	...	...	720* (389) 12.8%	31853* (18638) 30.7%	...	...	31853* (18638) 28.8%
13	1349* (577) 15.7%	394* (258) 38.7%	...	1743* (656) 18.0%	35457* (11632) 17.0%	76585* (38588) 44.0%	...	112042* (39717) 27.0%
15	2212 (472) 8.9%	56* (57) 5.0%	20* (17) 14.9%	2287 (480) 8.7%	47219 (8407) 8.4%	21769* (22236) 11.0%	32254* (22957) 23.9%	101242* (33639) 11.3%
16	1187* (521) 10.5%	342* (150) 30.6%	3* (4) 3.2%	1533* (574) 12.3%	39249* (23321) 13.8%	57668* (27260) 27.8%	5099* (5479) 5.0%	102016* (43823) 17.2%
17	3282* (908) 5.6%	226* (148) 11.8%	...	3507* (883) 5.8%	79035 (17453) 6.3%	32729* (22087) 9.9%	...	111765 (22060) 7.1%
20	3964 (681) 34.7%	1922 (317) 59.8%	379* (109) 67.7%	6265 (787) 41.3%	134189 (21062) 34.5%	417146 (63228) 61.9%	360405* (100962) 73.3%	911739 (111886) 58.7%
21	26* (42) 86.5%	...	72* (47) 91.5%	98* (58) 90.1%	1608* (2605) 86.2%	...	108745* (64516) 97.0%	110353* (63911) 96.8%
22	734* (223) 25.0%	787 (139) 49.6%	231* (78) 77.4%	1753 (290) 36.4%	36132* (11799) 34.1%	181499 (33390) 52.3%	218323* (96821) 83.6%	435955* (109595) 61.0%
23	950* (387) 7.6%	279* (93) 9.0%	94* (67) 38.7%	1323* (422) 8.3%	35686* (13848) 8.4%	64510* (24084) 10.6%	77750* (55025) 37.3%	177947* (54871) 14.3%
24	2153* (658) 20.1%	645 (154) 56.2%	104* (74) 100.0%	2902 (701) 24.3%	70563* (21329) 23.2%	107106* (26988) 58.3%	92355* (52501) 100.0%	270024 (66963) 46.6%
25	545* (203) 13.1%	428* (185) 40.3%	103* (74) 86.4%	1076* (274) 20.1%	21844* (8288) 15.7%	103327* (45297) 40.3%	105781* (63252) 86.0%	230951* (78228) 44.5%
26	1626* (484) 39.5%	687* (245) 43.8%	193* (67) 90.4%	2506 (503) 42.5%	66504 (14927) 48.3%	149143* (54751) 53.0%	193890* (61422) 93.7%	409537 (93711) 65.4%
27	4550 (959) 25.1%	997 (208) 53.2%	225* (85) 71.3%	5772 (954) 28.4%	131475 (27903) 27.5%	205631 (45610) 57.0%	271048 (66111) 78.4%	608154 (81997) 51.3%
28	1932 (397) 31.3%	712 (134) 61.4%	296 (67) 78.0%	2941 (397) 38.1%	69347 (15217) 38.4%	155542 (29583) 59.6%	383766 (72169) 80.6%	608656 (82214) 66.3%
29	609* (275) 60.2%	115* (43) 39.3%	77* (45) 76.1%	801* (285) 57.0%	31463* (14125) 76.8%	32727* (12685) 51.7%	97581* (73080) 83.0%	161770* (73159) 72.9%
30	1715* (606) 25.6%	618* (276) 40.2%	155* (69) 69.2%	2488* (686) 29.4%	63914* (19582) 28.4%	135274* (54985) 45.9%	189695* (75187) 81.2%	388883 (80181) 51.6%
31	273* (201) 29.3%	134* (81) 23.5%	22* (20) 87.3%	429* (220) 28.1%	7775* (5242) 31.2%	34433* (21440) 25.4%	11650* (10428) 74.4%	53858* (25924) 30.6%
32	2527* (755) 28.7%	629 (136) 62.2%	104* (54) 56.5%	3260 (747) 32.6%	89277 (19355) 37.6%	127341* (33561) 60.9%	75156* (39860) 58.3%	291774 (54804) 50.7%
33	2096 (406) 50.7%	701* (178) 47.8%	145* (51) 43.0%	2942 (457) 49.5%	86522 (12210) 62.5%	171807 (41484) 55.2%	415727 (71075) 66.9%	674056 (87051) 62.9%

SIC CODE					EMPLOYEES			
	SMALL (8-99)	PLANTS MEDIUM (100-499)	LARGE (>500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)	TOTAL
34	5393 (951) 29.1%	1655 (239) 53.0%	140* (57) 40.4%	7187 (931) 32.7%	148787 (17433) 26.8%	312276 (50101) 52.3%	197685* (92613) 56.3%	658748 (111172) 43.8%
35	4753 (810) 21.0%	1647 (220) 48.4%	544 (59) 69.4%	6944 (944) 25.9%	162486 (20572) 26.8%	324862 (44166) 49.1%	887500 (116307) 79.7%	1374847 (125665) 57.7%
36	1097* (422) 15.4%	1024 (152) 38.1%	617 (135) 78.4%	2737 (423) 25.9%	47323* (18313) 20.5%	218625 (35693) 39.6%	1055776 (165039) 89.3%	1321724 (170238) 67.2%
37	648* (269) 16.3%	871 (138) 73.2%	382 (91) 91.8%	1901 (294) 34.1%	38759* (17218) 30.5%	175309 (31487) 73.3%	1354836 (239271) 89.5%	1568903 (232642) 83.4%
38	740* (297) 27.5%	465* (140) 48.6%	337* (107) 81.1%	1542 (384) 38.0%	29683* (10031) 28.4%	114094* (35578) 58.7%	396399* (106923) 86.1%	540176 (124836) 71.1%
39	1144* (522) 17.5%	349* (790) 43.8%	20* (17) 6.0%	1513* (925) 19.7%	30151* (12770) 18.2%	73162* (175015) 49.0%	25466* (19911) 12.2%	128779* (173402) 24.5%
41	273* (251) 6.2%	97* (83) 19.0%	...	370* (276) 7.5%	11472* (10554) 9.8%	11518* (9829) 14.1%	...	22990* (15488) 11.5%
42	2351* (685) 11.7%	160* (93) 10.8%	37* (27) 45.7%	2549* (666) 11.8%	59398 (13958) 12.2%	36654* (18757) 14.2%	30417* (21961) 40.6%	126470 (25863) 15.4%
45	...	249* (210) 42.2%	83* (43) 56.5%	332* (230) 8.3%	...	63345* (57328) 57.9%	186220* (85944) 70.5%	249565* (106080) 55.3%
48	4806* (1246) 32.7%	171* (97) 19.0%	3* (4) 10.1%	4981* (1254) 31.9%	170608* (63343) 40.1%	32922* (19527) 18.7%	13226* (14092) 18.9%	216756* (69683) 32.2%
49	1616* (822) 19.7%	524* (232) 28.1%	41* (25) 23.6%	2180* (910) 21.3%	84790* (42106) 31.5%	141544* (60575) 33.3%	61346* (34258) 41.9%	287680* (100551) 34.2%
50	4393 (947) 14.5%	408* (242) 22.6%	...	4801 (932) 14.9%	107827 (25773) 17.1%	68583* (41609) 24.2%	...	176410* (44211) 19.3%
51	2118* (836) 23.2%	...	...	2118* (836) 22.7%	36979* (12630) 20.0%	...	...	36979* (12630) 17.4%
55	2640* (998) 13.9%	...	...	2640* (998) 13.5%	45759* (15293) 14.8%	...	...	45759* (15293) 11.2%
72	5560 (1166) 27.0%	292* (127) 43.3%	13* (19) 100.0%	5865 (1196) 27.5%	111856 (26809) 29.4%	37125* (17808) 45.2%	10670* (15114) 100.0%	159652* (41193) 33.8%
73	1824* (750) 11.0%	523* (138) 35.1%	214* (116) 62.6%	2560* (772) 13.9%	65733* (30847) 15.6%	115616* (30563) 33.1%	220316* (103209) 67.0%	401664 (100166) 36.5%
75	4737 (1121) 18.1%	...	...	4737 (1121) 18.1%	72686* (20721) 17.6%	...	...	72686* (20721) 17.2%
76	1391* (1076) 14.3%	87* (78) 70.8%	...	1478* (1089) 15.0%	23365* (16477) 13.1%	11669* (10488) 47.9%	...	35034* (20874) 17.3%
80	1148* (453) 40.5%	771* (193) 35.6%	1426 (216) 69.2%	3345 (535) 47.3%	46728* (15061) 46.0%	222370 (54042) 41.6%	2131861 (253946) 70.5%	2400960 (247403) 65.6%
ALL	79081 (2783) 17.7%	18990 (1007) 38.3%	6082 (340) 64.5%	104152 (2983) 20.6%	2373507 (98995) 21.5%	4043000 (188985) 41.4%	9210940 (348803) 73.9%	15627446 (402744) 47.0%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.

FIGURE IV - 59
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
(NOES 1981-1983)

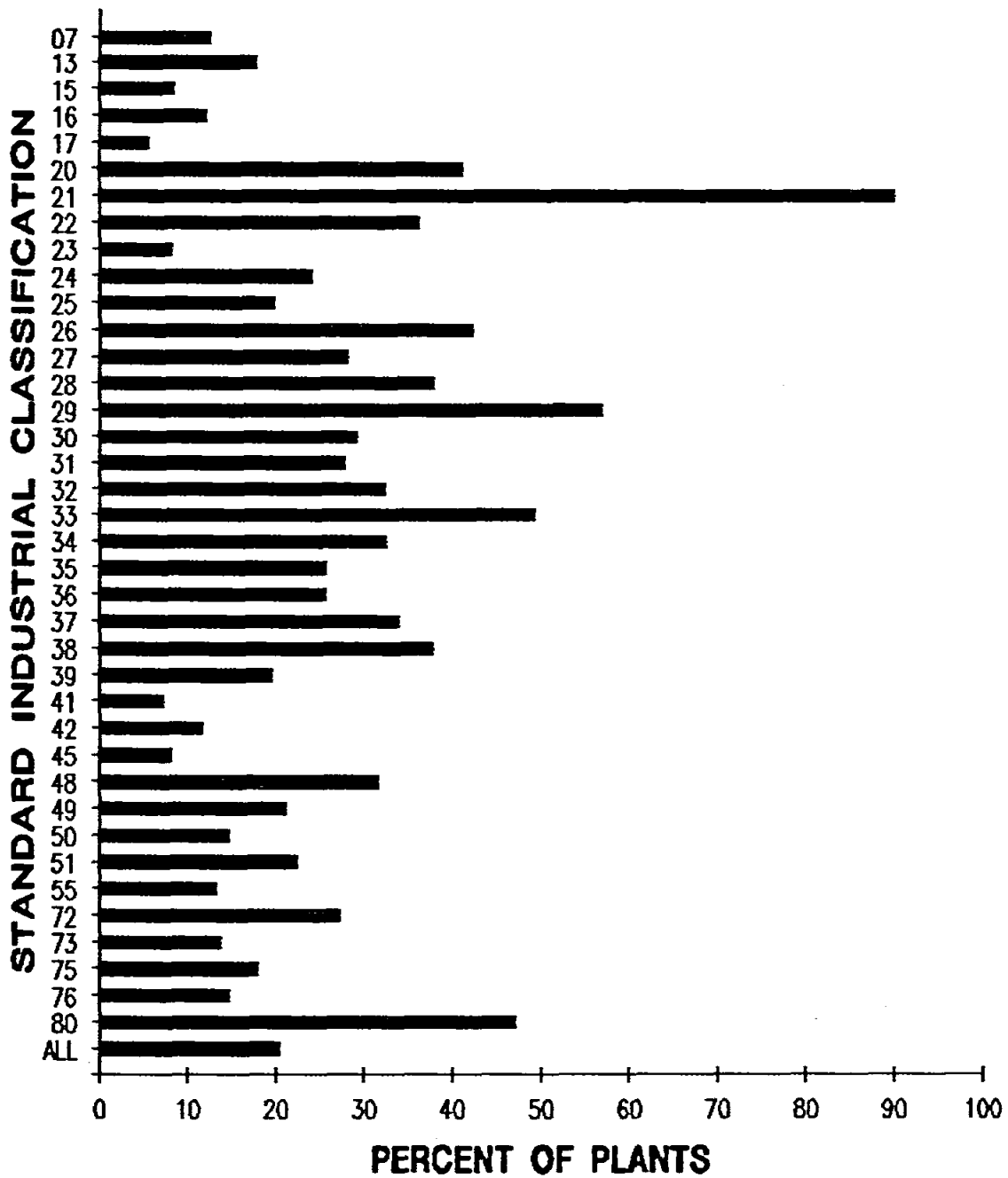
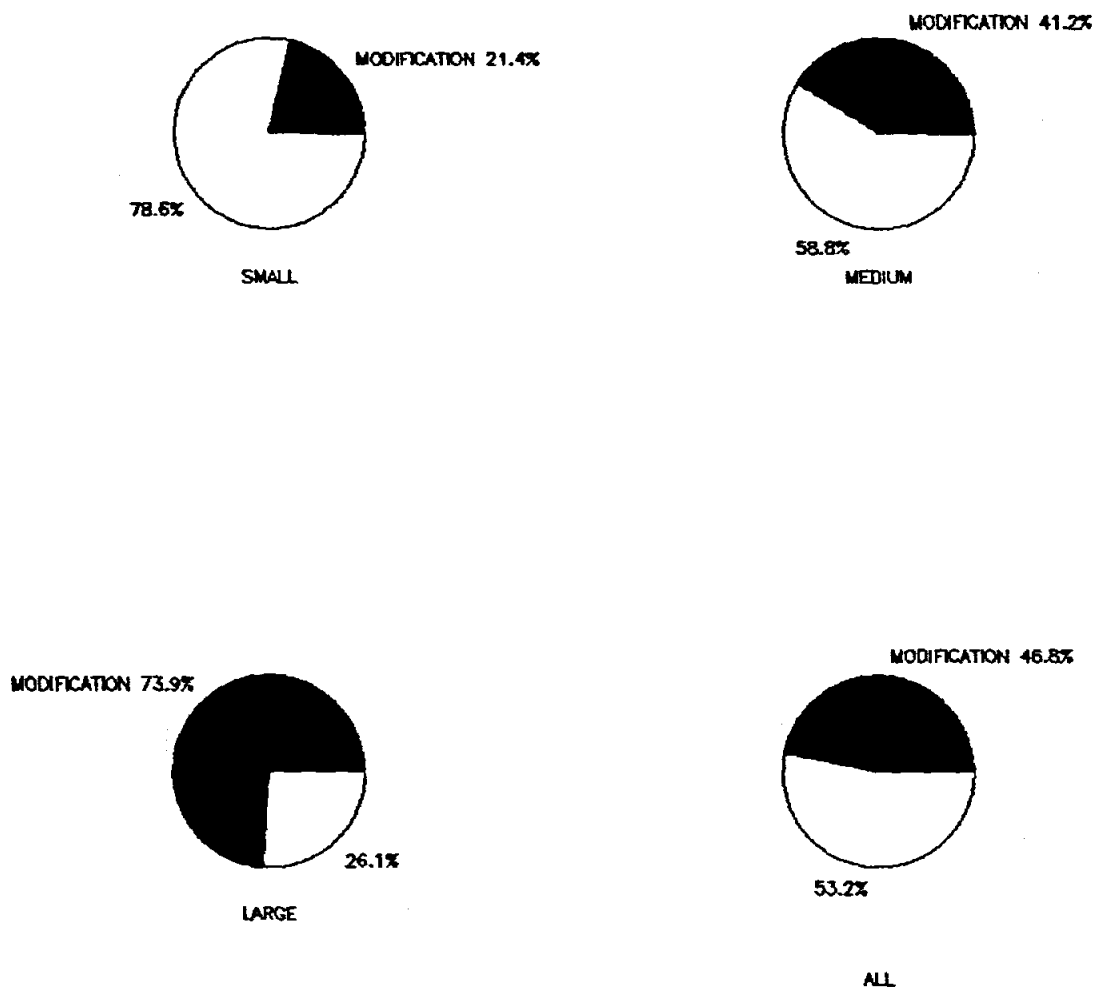
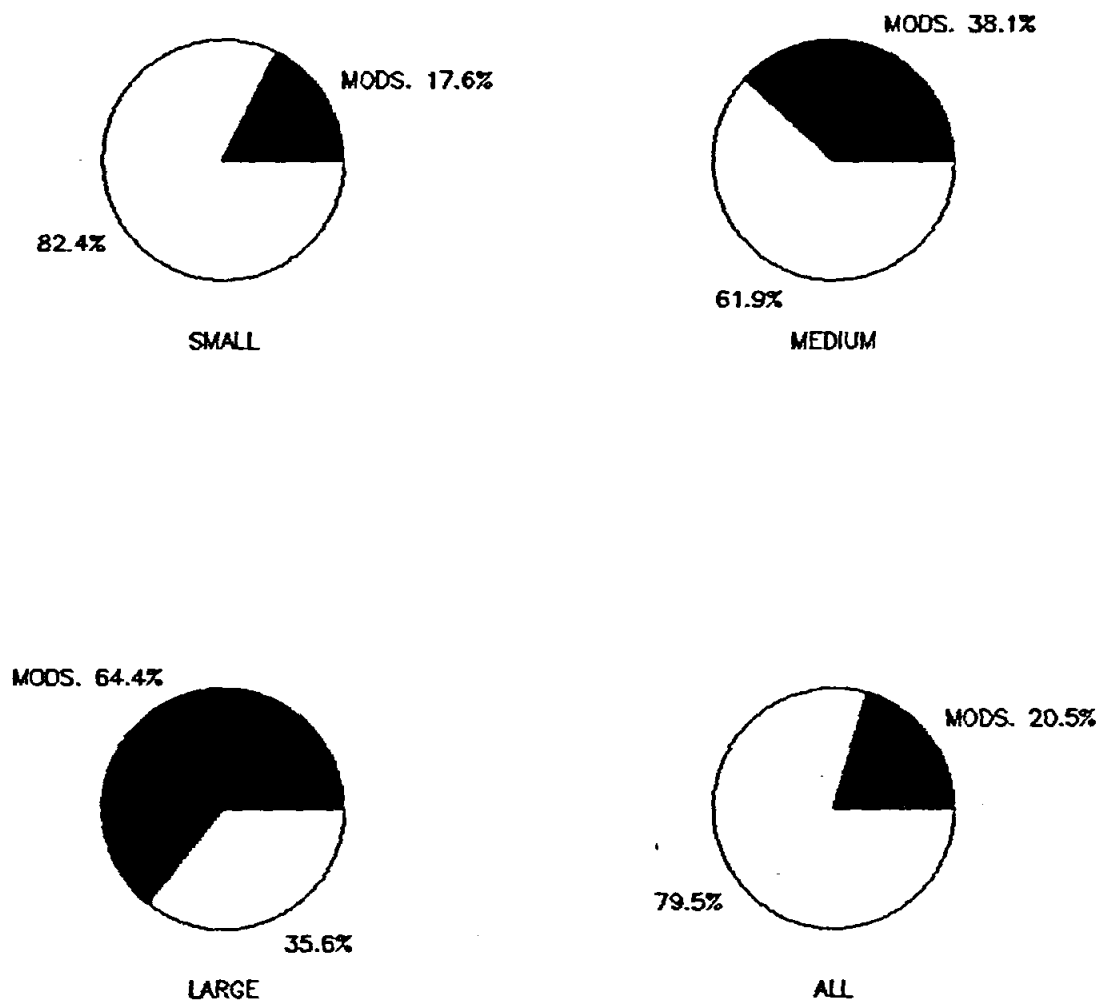


FIGURE IV - 60
WORKERS IN PLANTS WHICH MODIFIED
EQUIPMENT OR PROCESSES
(NOES 1981-1983)



**FIGURE IV - 61
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
BY PLANT SIZE
(NOES 1981-1983)**



NOES QUESTIONNAIRE ITEM NO 42
Equipment or Process Modifications Made to Reduce Worker Exposures

Intent

The intent of this question was to determine if major equipment or process modifications (as specified for question 41) were made for the primary purpose of reducing or eliminating worker exposure to chemical, physical or biological agents.

This item was displayed on the questionnaire as:

42. Were any of these modifications made for the primary purpose of reducing employee exposures?

- 1 Yes
- 2 No

Notes

Any modifications in equipment, plant layout, or process which was made primarily for economic reasons or for any reason not directly associated with protecting the health of the workers resulted in a negative response to this question.

Analysis

One analysis of the responses to this question is presented.

Response 42.1 - Modification made to reduce worker exposure

The estimates of the plants which made major equipment or process modifications during the past five years for the purpose of reducing occupational exposures, and workers in those plants (by number and proportion of the total) are displayed in Figures IV-62, IV-63, IV-64, IV-65, IV-66, and IV-67, and Tables IV-49 and IV-50.

Figure IV-62	Workers in plants which modified equipment or processes to reduce potential exposure (by major industrial group)
Figure IV-63	Workers in plants which modified equipment or processes to reduce potential exposure (by 2-digit SIC)
Figure IV-64	Plants which modified equipment or processes to reduce the exposure of workers (by major industrial group)
Figure IV-65	Plants which modified equipment or processes to reduce the exposure of workers (by 2-digit SIC)
Figure IV-66	Workers in plants which modified equipment or processes to reduce occupational exposure
Figure IV-67	Plants which modified equipment or processes to reduce occupational exposure.

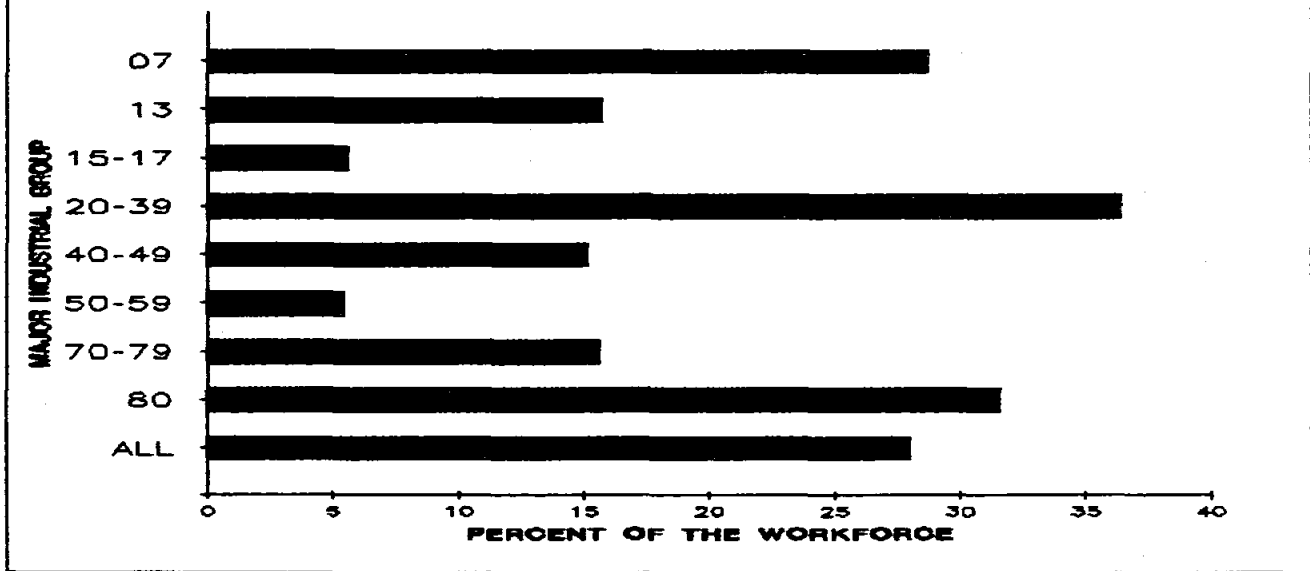
Table IV-49

Number and percent of plants and employees in plants which have modified equipment or processes to reduce worker exposure (by major industrial group)

Table IV-50

Number and percent of plants and employees in plants which have modified equipment or processes to reduce worker exposure (by 2-digit SIC)

FIGURE IV - 62
WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT
OR PROCESSES TO REDUCE POTENTIAL EXPOSURE
(NOES 1981-1983)



NATIONAL OCCUPATIONAL EXPOSURE SURVEY (1981-1983) TABLE NO. IV-49

NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH
 HAVE MODIFIED EQUIPMENT OR PROCESSES TO REDUCE WORKER EXPOSURE

MAJOR GROUP	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
07	720* (389) 12.9%	...	...	720* (389) 12.8%	31853* (18638) 30.7%	...	...	31853* (18638) 28.8%
13	1232* (648) 14.3%	90* (55) 8.8%	...	1322* (674) 13.7%	28485* (15917) 13.6%	36962* (22908) 21.2%	...	65446* (34180) 15.8%
15-17	2337* (742) 2.5%	464* (217) 11.2%	5* (5) 2.1%	2806* (704) 2.8%	64689* (19420) 3.1%	91685* (43742) 12.4%	20157* (21701) 8.5%	176531* (52740) 5.7%
20-39	15000 (1752) 9.8%	7801 (503) 24.6%	2948 (191) 47.0%	25748 (1807) 13.5%	556390 (64836) 12.1%	1737495 (123319) 27.2%	4740112 (323973) 57.3%	7033997 (340477) 36.5%
40-49	918* (499) 1.7%	703* (290) 12.0%	141* (48) 30.2%	1762* (639) 3.0%	35260* (16494) 2.5%	179190* (69992) 15.5%	265525* (100829) 46.3%	479975* (120499) 15.2%
50-59	3348* (1144) 5.7%	117* (87) 4.4%	...	3464* (1126) 5.7%	61882* (24519) 5.5%	21839* (14719) 5.3%	...	83721* (26067) 5.5%
70-79	4986 (1233) 6.8%	257* (112) 10.9%	165* (110) 46.5%	5407 (1245) 7.1%	103062* (33890) 7.4%	58195* (23266) 12.5%	184220* (98797) 54.3%	345477* (101714) 15.7%
80	722* (430) 25.4%	281* (127) 13.0%	608 (107) 29.5%	1611* (429) 22.8%	24404* (15293) 24.0%	80637* (34515) 15.1%	1056348 (120918) 34.9%	1161389 (110404) 31.7%
ALL	29262 (2730) 6.5%	9712 (651) 19.4%	3866 (249) 41.0%	42841 (2788) 8.4%	906026 (86239) 8.2%	2206003 (156505) 22.4%	6266362 (374136) 50.3%	9378390 (397437) 28.1%

*Standard error >25% of the estimate. The estimate may be unreliable.
 ...No facilities observed.

FIGURE IV - 63
WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT
OR PROCESSES TO REDUCE POTENTIAL EXPOSURE
 (NOES 1981-1983)

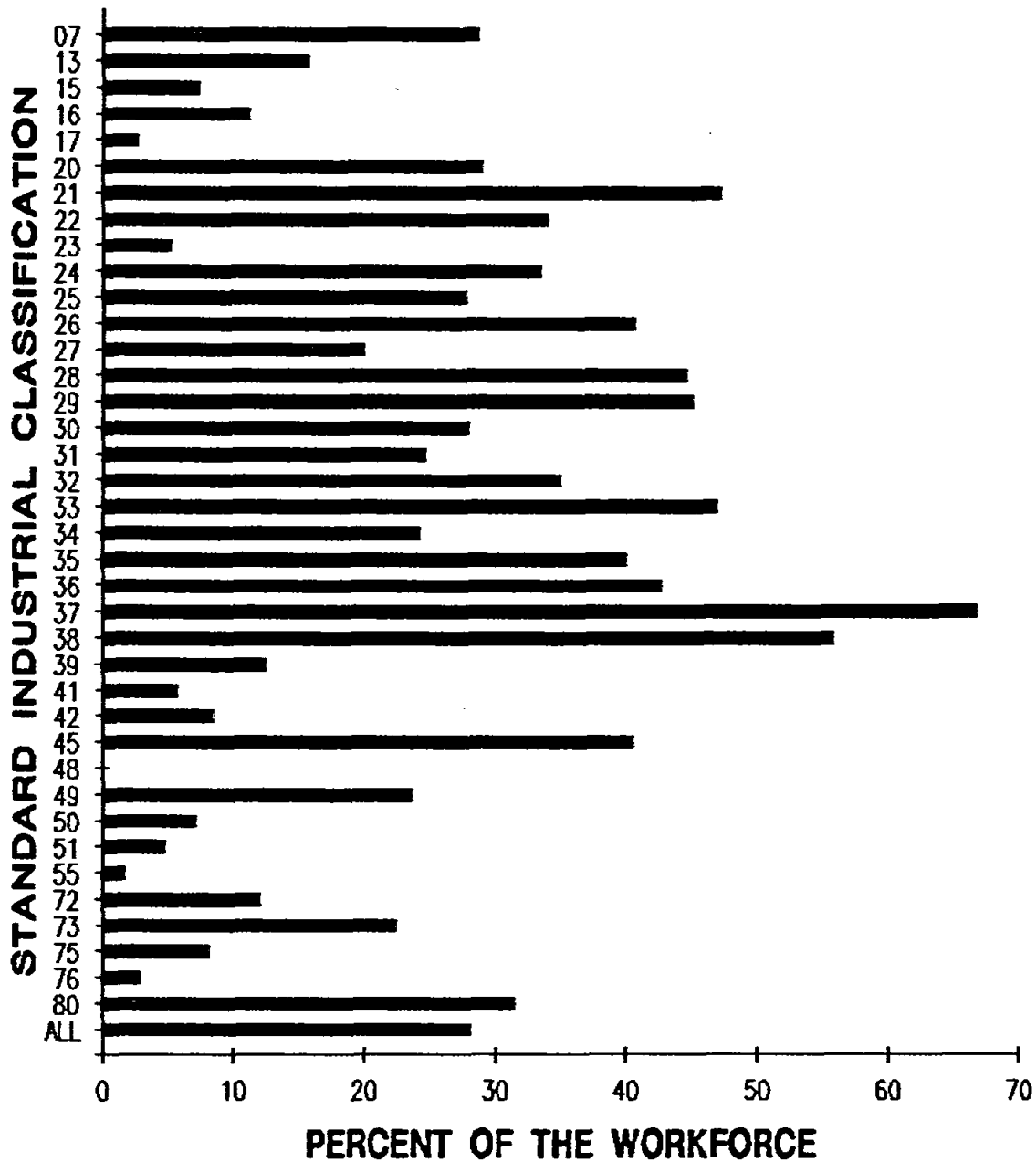
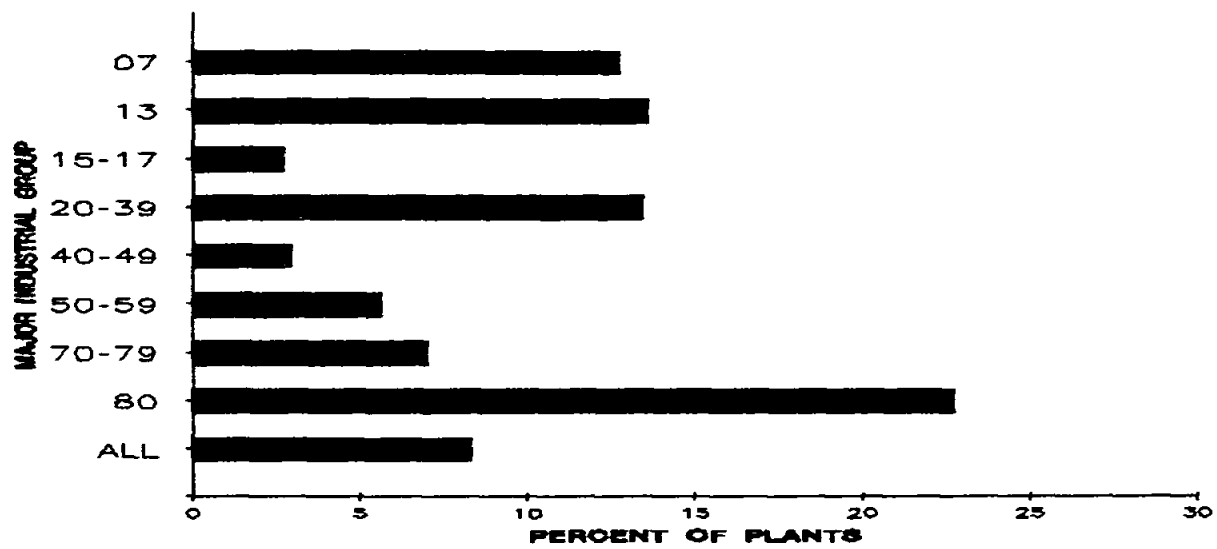


FIGURE IV - 64
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
TO REDUCE THE EXPOSURE OF WORKERS
(NOES 1981-1983)



NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH HAVE MODIFIED EQUIPMENT OR PROCESSES TO REDUCE WORKER EXPOSURE

SIC CODE	PLANTS			TOTAL	EMPLOYEES			TOTAL
	SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)		SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)	
07	720* (389) 12.9%	...	...	720* (389) 12.8%	31853* (18638) 30.7%	...	...	31853* (18638) 28.8%
13	1232* (648) 14.3%	90* (55) 8.8%	...	1322* (674) 13.7%	28485* (15917) 13.6%	36962* (22908) 21.2%	...	65446* (34180) 15.8%
15	673* (257) 2.7%	56* (57) 5.0%	5* (5) 3.7%	733* (262) 2.8%	24092* (9445) 4.3%	21769* (22236) 11.0%	20157* (21701) 15.0%	66018* (32112) 7.4%
16	657* (332) 5.8%	303* (158) 27.1%	...	960* (362) 7.7%	14752* (7043) 5.2%	52175* (28075) 25.1%	...	66926* (30774) 11.3%
17	1007* (588) 1.7%	105* (95) 5.5%	...	1113* (530) 1.9%	25845* (13427) 2.1%	17742* (15978) 5.4%	...	43587* (13962) 2.8%
20	907* (306) 7.9%	674* (178) 21.0%	242* (69) 43.2%	1823 (327) 12.0%	37358* (18690) 9.6%	167488 (36878) 24.9%	247676* (77960) 50.4%	452523 (83246) 29.1%
21	26* (42) 86.5%	...	29* (49) 37.0%	55* (62) 50.6%	1608* (2605) 86.2%	...	52420* (43762) 46.7%	54028* (43288) 47.4%
22	178* (163) 6.1%	348* (108) 21.9%	160* (64) 53.4%	685* (192) 14.2%	6811* (6217) 6.4%	82280* (28962) 23.7%	154794* (78929) 59.3%	243886* (83154) 34.1%
23	112* (97) .9%	42* (42) 1.3%	47* (41) 19.4%	200* (114) 1.3%	5643* (4885) 1.3%	13492* (14038) 2.2%	47062* (40984) 22.6%	66197* (40913) 5.3%
24	1307* (595) 12.2%	368* (160) 32.1%	104* (74) 100.0%	1779* (652) 14.9%	43068* (21930) 14.2%	59510* (24701) 32.4%	92355* (52501) 100.0%	194932* (71011) 33.6%
25	493* (218) 11.8%	291* (139) 27.4%	32* (25) 26.7%	816* (213) 15.3%	17699* (9962) 12.7%	78070* (37125) 30.4%	48937* (30396) 39.8%	144706* (39878) 27.9%
26	677* (212) 16.5%	334* (149) 21.3%	130* (80) 60.9%	1142* (298) 19.4%	37290* (13448) 27.1%	83311* (42494) 29.6%	134517* (71280) 65.0%	255118* (92655) 40.8%
27	663* (429) 3.7%	280* (142) 14.9%	135* (72) 42.9%	1078* (446) 5.3%	30163* (18114) 6.3%	60215* (32268) 16.7%	147529* (52602) 42.7%	237907* (62984) 20.1%
28	645* (230) 10.4%	470 (107) 40.6%	244* (65) 64.2%	1359 (252) 17.6%	29494* (10713) 16.3%	100834* (25306) 38.7%	279622* (73619) 58.7%	409950 (79761) 44.7%
29	190* (132) 18.8%	35* (27) 11.8%	56* (41) 55.0%	280* (140) 19.9%	6930* (4851) 16.9%	11069* (8773) 17.5%	82191* (72187) 69.9%	100191* (71607) 45.2%
30	1014* (393) 15.1%	261* (114) 17.0%	91* (38) 40.5%	1366* (400) 16.1%	41582* (16715) 18.5%	56377* (32698) 19.1%	113473* (45217) 48.6%	211431 (50127) 28.1%
31	223* (195) 24.0%	86* (63) 15.1%	22* (20) 87.3%	331* (212) 21.7%	5587* (4876) 22.5%	26350* (19103) 19.5%	11650* (10428) 74.4%	43587* (23928) 24.8%
32	1507* (604) 17.1%	473* (142) 46.7%	86* (56) 46.9%	2066* (611) 20.7%	54306* (17303) 22.9%	91494* (29508) 43.8%	56098* (36137) 43.5%	201898 (47685) 35.1%
3	904* (277) 21.9%	524* (165) 35.7%	80* (23) 23.7%	1508* (383) 25.4%	43413* (12760) 31.4%	131727* (38411) 42.3%	329207 (74114) 53.0%	504346 (94590) 47.1%

SIC CODE	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
34	2562* (783) 13.8%	938 (184) 30.0%	67* (36) 19.3%	3566 (768) 16.2%	70131 (16114) 12.6%	195197 (39525) 32.7%	100655* (51162) 28.7%	365983 (67064) 24.4%
35	2040* (644) 9.0%	1031 (178) 30.3%	353 (55) 45.1%	3425 (678) 12.8%	62212* (17208) 10.3%	233528 (43030) 35.3%	661442 (104149) 59.4%	957182 (109201) 40.2%
36	693* (270) 9.7%	601 (138) 22.4%	420* (123) 53.3%	1713 (369) 16.2%	28282* (10962) 12.3%	124612 (25790) 22.5%	688770 (166991) 58.2%	841664 (166067) 42.8%
37	126* (156) 3.2%	635* (167) 53.4%	333 (79) 80.0%	1094 (263) 19.6%	8469* (9604) 6.7%	135811* (35007) 56.8%	1112840 (189195) 73.5%	1257120 (183146) 66.9%
38	266* (243) 9.9%	196* (85) 20.4%	307* (98) 73.9%	770* (271) 18.9%	12137* (7207) 11.6%	40052* (20341) 20.6%	372873* (105182) 81.0%	425063* (109022) 56.0%
39	468* (306) 7.1%	215* (561) 26.9%	10* (16) 3.0%	693* (571) 9.0%	14206* (7982) 8.6%	46079* (131615) 30.8%	6000* (9493) 2.9%	66285* (132072) 12.6%
41	...	97* (83) 19.0%	...	97* (83) 2.0%	...	11518* (9829) 14.1%	...	11518* (9829) 5.8%
42	564* (462) 2.8%	137* (88) 9.2%	35* (27) 42.2%	735* (471) 3.4%	13167* (8543) 2.7%	29060* (17136) 11.2%	28451* (21784) 38.0%	70679* (18370) 8.6%
45	...	75* (75) 12.8%	66* (32) 44.7%	141* (90) 3.5%	...	7769* (7769) 7.1%	175728* (85097) 66.5%	183497* (85462) 40.7%
48	...	...	...	...	...	...	...	...
49	316* (226) 3.8%	368* (181) 19.8%	41* (25) 23.6%	724* (309) 7.1%	20158* (14534) 7.5%	119063* (54734) 28.0%	61346* (34258) 41.9%	200568* (77353) 23.8%
50	2543* (943) 8.4%	117* (87) 6.5%	...	2659* (917) 8.3%	43706* (18507) 6.9%	21839* (14719) 7.7%	...	65545* (20210) 7.2%
51	409* (305) 4.5%	...	...	409* (305) 4.4%	10358* (7025) 5.6%	...	...	10358* (7025) 4.9%
55	396* (368) 2.1%	...	...	396* (368) 2.0%	7818* (8064) 2.5%	...	...	7818* (8064) 1.9%
72	2175 (425) 10.5%	123* (90) 18.2%	...	2298 (436) 10.8%	39084* (13986) 10.3%	18452* (14645) 22.4%	...	57536* (20170) 12.2%
73	484* (323) 2.9%	134* (70) 9.0%	165* (110) 48.3%	782* (338) 4.2%	23627* (20183) 5.6%	39743* (18791) 11.4%	184220* (98797) 56.0%	247591* (101144) 22.5%
75	2027* (919) 7.7%	...	...	2027* (919) 7.7%	34356* (15750) 8.3%	...	...	34356* (15750) 8.2%
76	299* (415) 3.1%	...	...	299* (415) 3.0%	5994* (7820) 3.4%	...	...	5994* (7820) 3.0%
80	722* (430) 25.4%	281* (127) 13.0%	608 (107) 29.5%	1611* (429) 22.8%	24404* (15293) 24.0%	80637* (34515) 15.1%	1056348 (120918) 34.9%	1161389 (110404) 31.7%
ALL	29224 (2719) 6.5%	9686 (647) 19.5%	3866 (237) 41.0%	42776 (2806) 8.5%	904091 (93762) 8.2%	2194224 (148181) 22.5%	6266362 (320618) 50.3%	9364677 (341237) 28.2%

*Standard error >25% of the estimate. The estimate may be unreliable.
 ...No facilities observed.

FIGURE IV - 65
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
TO REDUCE THE EXPOSURE OF WORKERS
 (NOES 1981-1983)

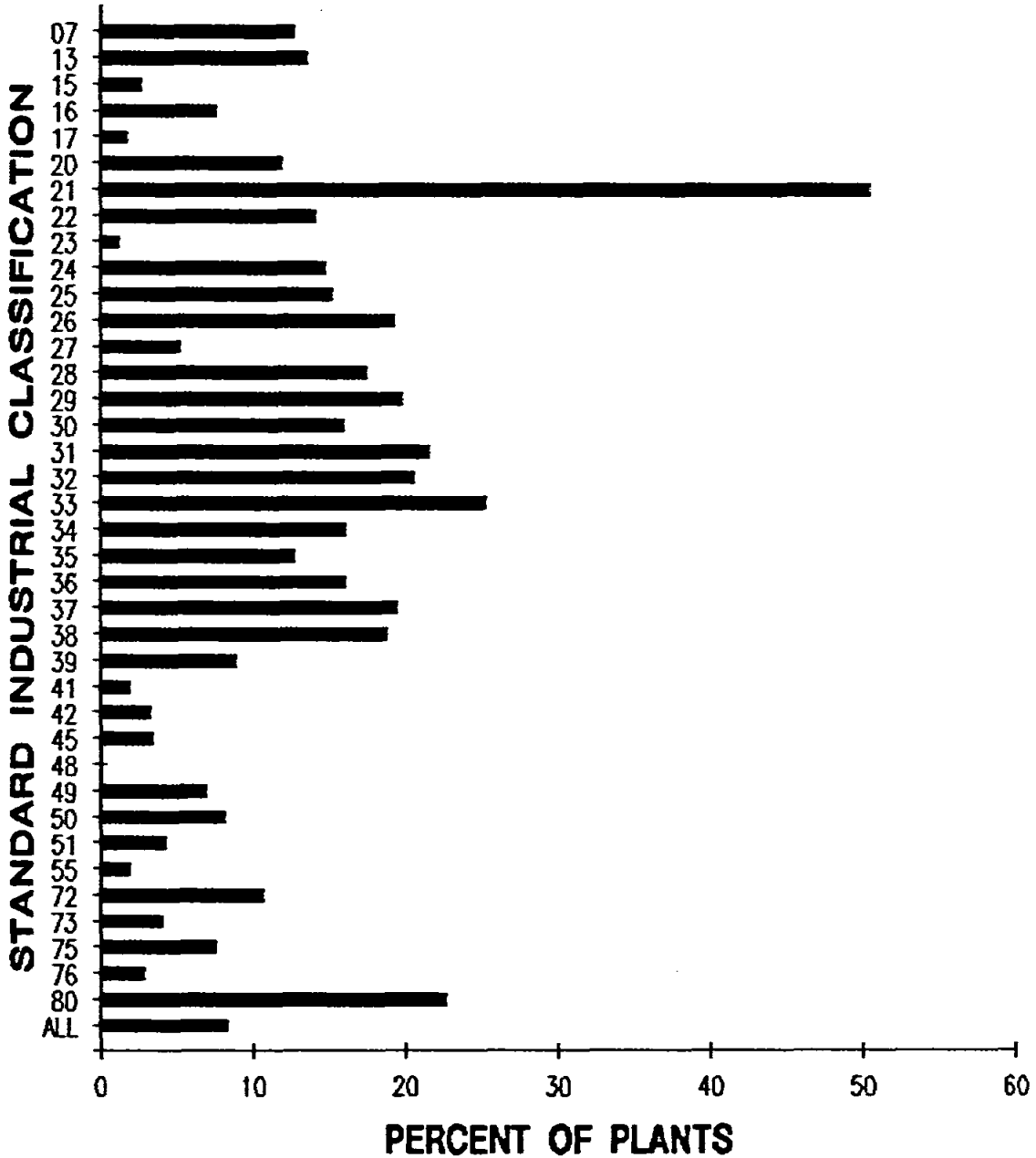


FIGURE IV - 66
WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT
OR PROCESSES TO REDUCE OCCUPATIONAL EXPOSURE
(NOES 1981-1983)

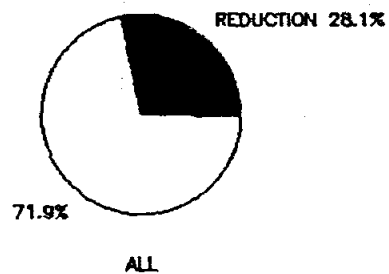
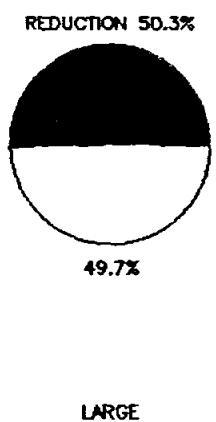
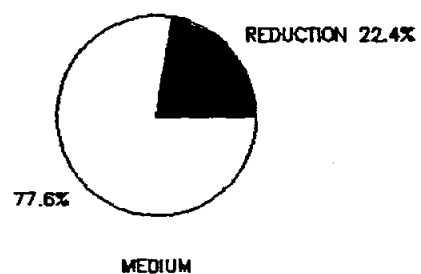
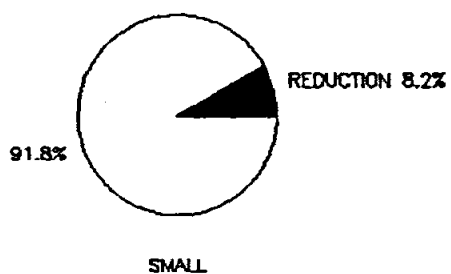
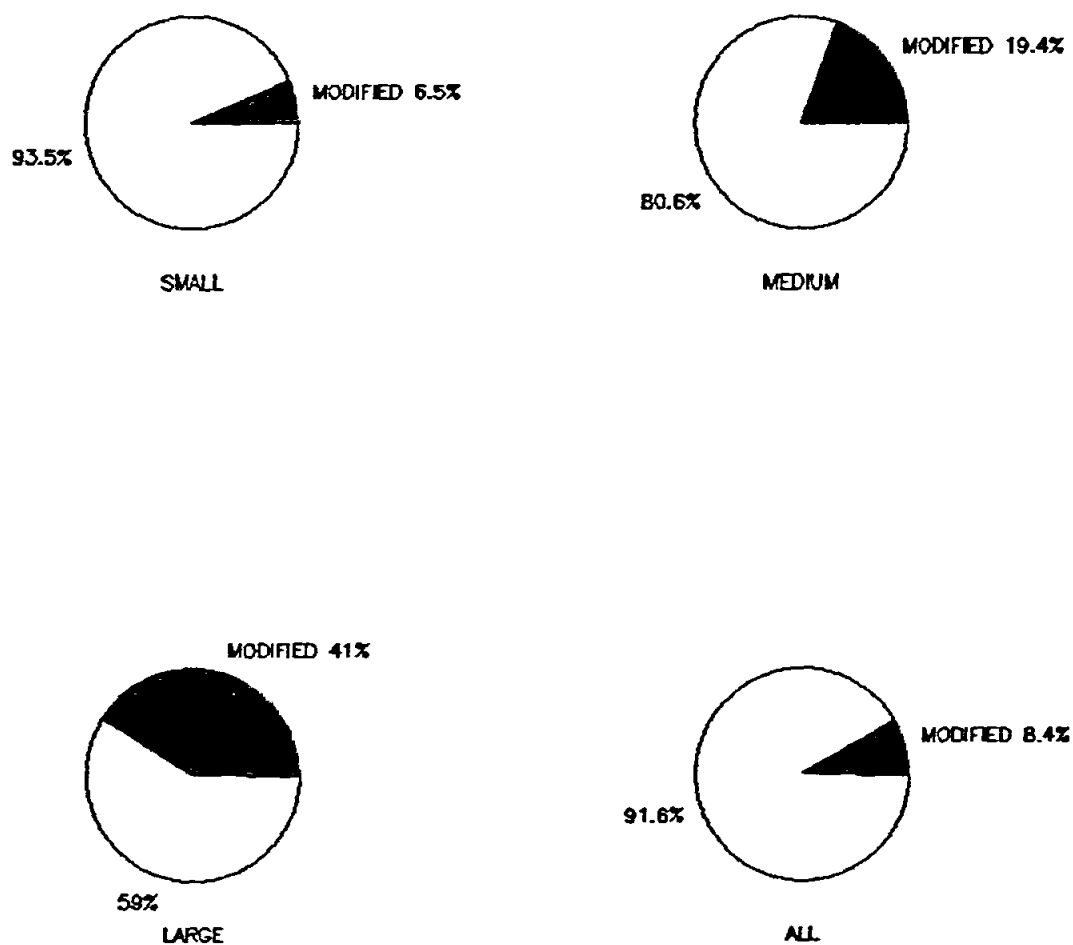


FIGURE IV - 67
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
TO REDUCE OCCUPATIONAL EXPOSURE
(NOES 1981-1983)



NOES QUESTIONNAIRE ITEM NO. 43

Equipment or Process Modifications Made as a Result of Government Inspection

Intent

The intent of this question was to determine if the equipment or process modifications made by the facility in the past five years were the direct result of government inspection activity.

This item was displayed on the questionnaire as:

43. Were any of these modifications made as a result of inspections of this facility by federal, state or local authorities?

- 1 Yes
- 2 No

Notes

An affirmative answer to this question was recorded only when modifications were made as a consequence of a regulatory visit.

Modifications resulting from non-regulatory consultations by private consultants, corporate staff, insurance carrier specialists, or government employees were excluded.

Analysis

One analysis of the responses to question 43 is presented.

Response 43.1 - Modifications made as a result of government inspection

The estimates of the plants which modified equipment or processes as a result of a government inspection, and workers in those plants (by number and proportion of the total) are displayed in Figures IV-68, IV-69, IV-70, IV-71, IV-72, and IV-73, and Tables IV-51 and IV-52.

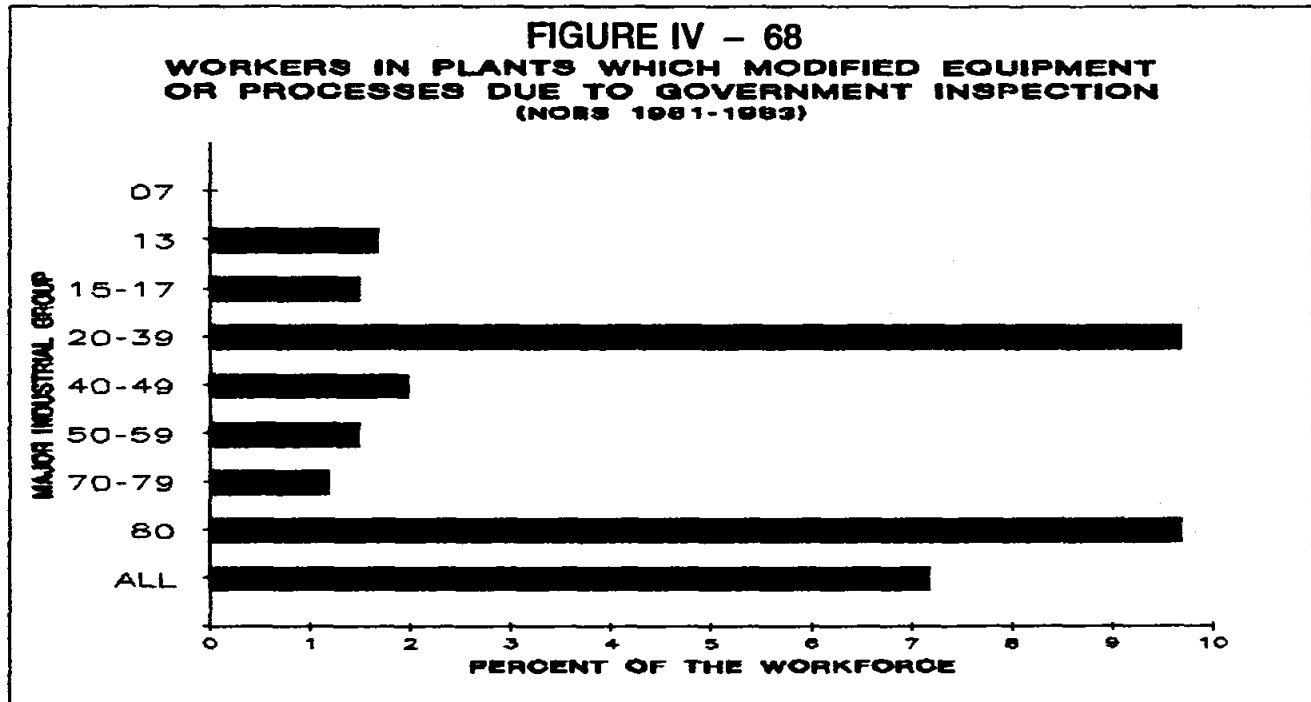
- Figure IV-68 Workers in plants which modified equipment or processes due to government inspection (by major industrial group)
- Figure IV-69 Workers in plants which modified equipment or processes due to government inspection (by 2-digit SIC)
- Figure IV-70 Plants which modified equipment or processes as a result of government inspection (by major industrial group)
- Figure IV-71 Plants which modified equipment or processes as a result of government inspection (by 2-digit SIC)
- Figure IV-72 Workers in plants which modified equipment or processes after government inspection
- Figure IV-73 Plants which modified equipment or processes after government inspection

Table IV-51

Number and percent of plants and employees in plants which modified equipment or processes due to government inspection (by major industrial group)

Table IV-52

Number and percent of plants and employees in plants which modified equipment or processes due to government inspection (by 2-digit SIC)



NATIONAL OCCUPATIONAL EXPOSURE SURVEY (1981-1983) TABLE NO. IV-51

NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH
 MODIFIED EQUIPMENT OR PROCESSES DUE TO GOVERNMENT INSPECTION

MAJOR GROUP	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
07	...	...	...	...	...	...	...	...
13	116* (156) 1.4%	...	...	116* (156) 1.2%	6973* (9359) 3.3%	...	...	6973* (9359) 1.7%
15-17	562* (266) .6%	160* (143) 3.9%	...	722* (272) .7%	21519* (9869) 1.0%	25225* (22742) 3.4%	...	46744* (22999) 1.5%
20-39	6259 (946) 4.1%	2388 (401) 7.5%	834 (137) 13.3%	9481 (1061) 5.0%	227541 (31640) 4.9%	525206 (78900) 8.2%	1119361 (111516) 13.5%	1872107 (152456) 9.7%
40-49	213* (157) .4%	15* (15) .3%	21* (16) 4.5%	249* (159) .4%	17186* (12239) 1.2%	4581* (4581) .4%	41485* (31333) 7.2%	63252* (35655) 2.0%
50-59	1072* (612) 1.8%	...	...	1072* (612) 1.8%	23012* (13653) 2.0%	...	...	23012* (13653) 1.5%
70-79	602* (419) .8%	57* (59) 2.4%	...	660* (420) .9%	16360* (12165) 1.2%	10404* (10710) 2.2%	...	26764* (15278) 1.2%
80	228* (234) 8.0%	146* (97) 6.8%	195* (72) 9.4%	569* (256) 8.0%	10924* (11242) 10.7%	38646* (25278) 7.2%	306924* (107843) 10.2%	356494* (103158) 9.7%
ALL	9052 (1272) 2.0%	2767 (441) 5.5%	1050 (156) 11.1%	12870 (1366) 2.5%	323514 (42387) 2.9%	604061 (86701) 6.1%	1467770 (158265) 11.8%	2395345 (190242) 7.2%

*Standard error >25% of the estimate. The estimate may be unreliable.
 ...No facilities observed.

FIGURE IV - 69
WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT
OR PROCESSES DUE TO GOVERNMENT INSPECTION
(NOES 1981-1983)

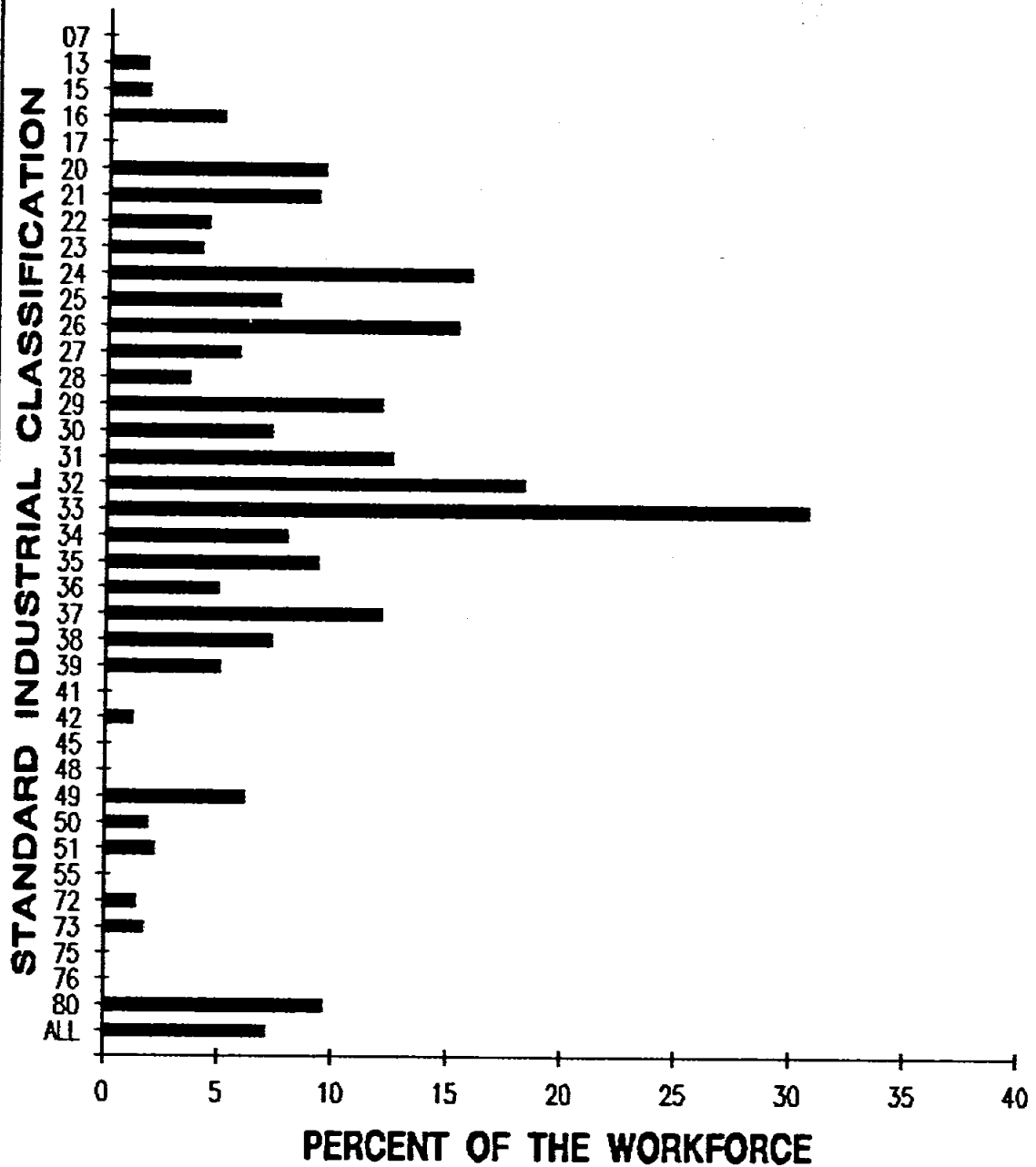
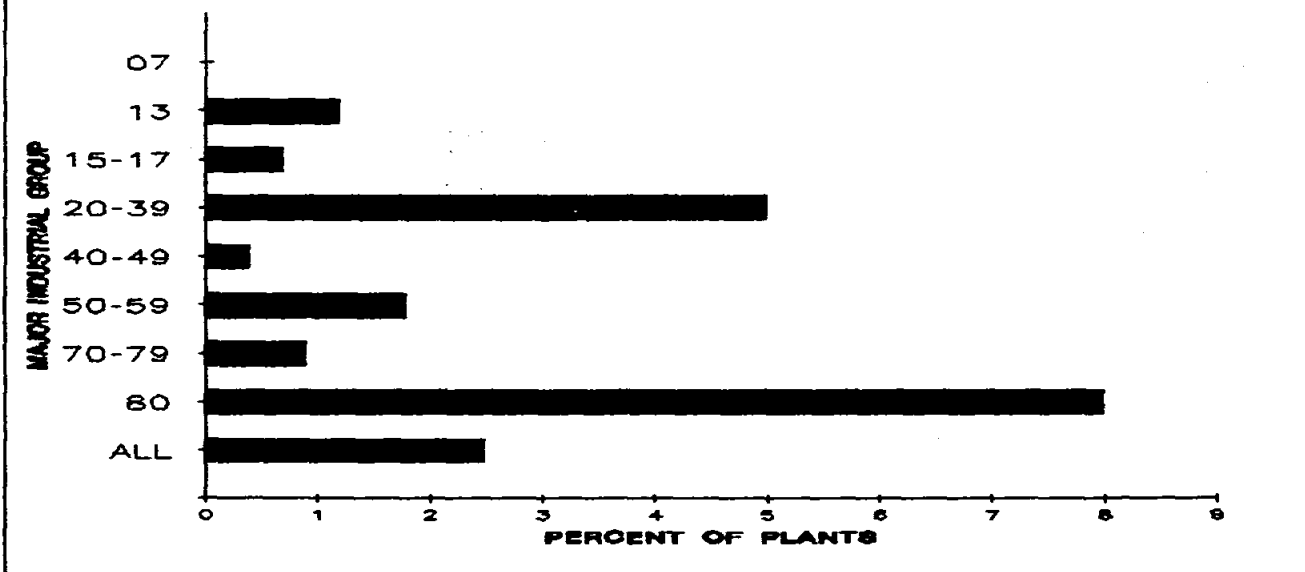


FIGURE IV - 70
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
AS A RESULT OF GOVERNMENT INSPECTION
(NOES 1981-1982)



NUMBER AND PERCENT OF PLANTS AND EMPLOYEES IN PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES DUE TO GOVERNMENT INSPECTION

SIC CODE	PLANTS			TOTAL	EMPLOYEES			TOTAL
	SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)		SMALL (8-99)	MEDIUM (100-499)	LARGE (>500)	
07	...	...	...	...	...	...	...	...
13	116* (156) 1.4%	...	...	116* (156) 1.2%	6973* (9359) 3.3%	...	...	6973* (9359) 1.7%
15	446* (257) 1.8%	...	...	446* (257) 1.7%	15922* (8972) 2.8%	...	...	15922* (8972) 1.8%
16	108* (99) 1.0%	160* (143) 14.3%	...	268* (155) 2.1%	5040* (4289) 1.8%	25225* (22742) 12.1%	...	30265* (21860) 5.1%
17	8* (10) .0%	...	...	8* (10) .0%	557* (729) .0%	...	...	557* (729) .0%
20	471* (272) 4.1%	381* (141) 11.8%	54* (42) 9.6%	905* (320) 6.0%	15269* (8443) 3.9%	100323* (39229) 14.9%	33563* (26033) 6.8%	149155* (54645) 9.6%
21	...	...	19* (45) 23.5%	19* (45) 17.0%	...	...	10657* (26041) 9.5%	10657* (26041) 9.3%
22	...	97* (63) 6.1%	12* (11) 3.9%	108* (64) 2.2%	...	21892* (12906) 6.3%	10490* (9909) 4.0%	32383* (16981) 4.5%
23	67* (82) .5%	...	47* (41) 19.4%	114* (87) .7%	5630* (6860) 1.3%	...	47062* (40984) 22.6%	52692* (40809) 4.2%
24	794* (452) 7.4%	143* (95) 12.4%	19* (8) 18.1%	955* (459) 8.0%	30614* (18221) 10.1%	26431* (16287) 14.4%	35767* (18789) 38.7%	92813* (30903) 16.0%
25	203* (131) 4.9%	69* (69) 6.5%	17* (16) 14.7%	289* (150) 5.4%	10212* (6955) 7.3%	14009* (14474) 5.5%	15306* (14277) 12.4%	39527* (20490) 7.6%
26	254* (131) 6.2%	74* (63) 4.7%	100* (46) 46.7%	428* (161) 7.3%	11856* (7054) 8.6%	10687* (9058) 3.8%	73893* (41479) 35.7%	96436* (42474) 15.4%
27	279* (227) 1.5%	28* (29) 1.5%	41* (41) 12.8%	348* (226) 1.7%	11058* (7851) 2.3%	3853* (3959) 1.1%	54795* (46537) 15.8%	69706* (45597) 5.9%
28	220* (135) 3.6%	103* (85) 8.9%	11* (22) 2.8%	334* (162) 4.3%	5221* (3303) 2.9%	20585* (19186) 7.9%	8161* (17132) 1.7%	33967* (25159) 3.7%
29	...	...	32* (31) 31.7%	32* (31) 2.3%	...	...	26926* (26106) 22.9%	26926* (26106) 12.1%
30	410* (281) 6.1%	...	55* (36) 24.6%	465* (297) 5.5%	11877* (8186) 5.3%	...	43346* (27144) 18.6%	55223* (31883) 7.3%
31	...	32* (38) 5.7%	22* (20) 87.3%	54* (44) 3.6%	...	10482* (12234) 7.7%	11650* (10428) 74.4%	22131* (16757) 12.6%
32	273* (247) 3.1%	272* (121) 26.8%	37* (28) 20.0%	582* (271) 5.8%	13595* (11891) 5.7%	63330* (32504) 30.3%	28732* (21763) 22.3%	105657* (38213) 18.4%
33	583* (268) 14.1%	342* (150) 23.3%	54* (26) 16.1%	980* (307) 16.5%	27310* (9365) 19.7%	90658* (37653) 29.1%	212433* (73715) 34.2%	330402* (83994) 30.8%

SIC CODE	PLANTS				EMPLOYEES			
	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL	SMALL (8-99)	MEDIUM (100-499)	LARGE (≥500)	TOTAL
34	1004* (618) 5.4%	284* (109) 9.1%	44* (29) 12.7%	1332* (594) 6.1%	22108* (9783) 4.0%	69044* (28680) 11.6%	28616* (18331) 8.2%	119768* (41824) 8.0%
35	1194* (550) 5.3%	81* (49) 2.4%	120* (47) 15.3%	1395* (556) 5.2%	30709* (11093) 5.1%	12362* (6365) 1.9%	181127 (34185) 16.3%	224198 (33236) 9.4%
36	99* (72) 1.4%	187* (98) 7.0%	14* (11) 1.8%	299* (119) 2.8%	8365* (6106) 3.6%	35530* (17191) 6.4%	54659* (51311) 4.6%	98554* (55842) 5.0%
37	312* (289) 7.8%	180* (92) 15.1%	105* (56) 25.3%	597* (321) 10.7%	21170* (19213) 16.7%	27905* (15365) 11.7%	180193* (58053) 11.9%	229267* (69483) 12.2%
38	...	...	22* (28) 5.3%	22* (28) .5%	...	...	55983* (51347) 12.2%	55983* (51347) 7.4%
39	98* (105) 1.5%	116* (285) 14.6%	10* (16) 3.0%	224* (294) 2.9%	2548* (2720) 1.5%	18116* (41740) 12.1%	6000* (9493) 2.9%	26664* (45439) 5.1%
41	...	...	...	...	...	...	...	...
42	67* (68) .3%	15* (15) 1.0%	...	83* (69) .4%	6405* (6442) 1.3%	4581* (4581) 1.8%	...	10985* (7684) 1.3%
45	...	...	...	...	...	...	...	...
48	...	...	...	...	...	...	...	...
49	146* (146) 1.8%	...	21* (16) 12.1%	167* (146) 1.6%	10781* (10796) 4.0%	...	41485* (31333) 28.3%	52266* (32737) 6.2%
50	983* (588) 3.2%	...	...	983* (588) 3.1%	18090* (11884) 2.9%	...	...	18090* (11884) 2.0%
51	90* (110) 1.0%	...	...	90* (110) 1.0%	4923* (6034) 2.7%	...	...	4923* (6034) 2.3%
55	...	...	...	...	...	...	...	...
72	433* (379) 2.1%	...	...	433* (379) 2.0%	7257* (6780) 1.9%	...	...	7257* (6780) 1.5%
73	169* (191) 1.0%	57* (59) 3.8%	...	226* (194) 1.2%	9103* (10303) 2.2%	10404* (10710) 3.0%	...	19507* (14132) 1.8%
75	...	...	...	...	...	...	...	...
76	...	...	...	...	...	...	...	...
80	228* (234) 8.0%	146* (97) 6.8%	195* (72) 9.4%	569* (256) 8.0%	10924* (11242) 10.7%	38646* (25278) 7.2%	306924* (107843) 10.2%	356494* (103158) 9.7%
ALL	9052 (1192) 2.0%	2767 (355) 5.6%	1050 (166) 11.1%	12870 (1264) 2.5%	323514 (43004) 2.9%	604061 (65774) 6.2%	1467770 (164101) 11.8%	2395345 (183715) 7.2%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.

FIGURE IV - 71
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
AS A RESULT OF GOVERNMENT INSPECTION
(NOES 1981-1983)

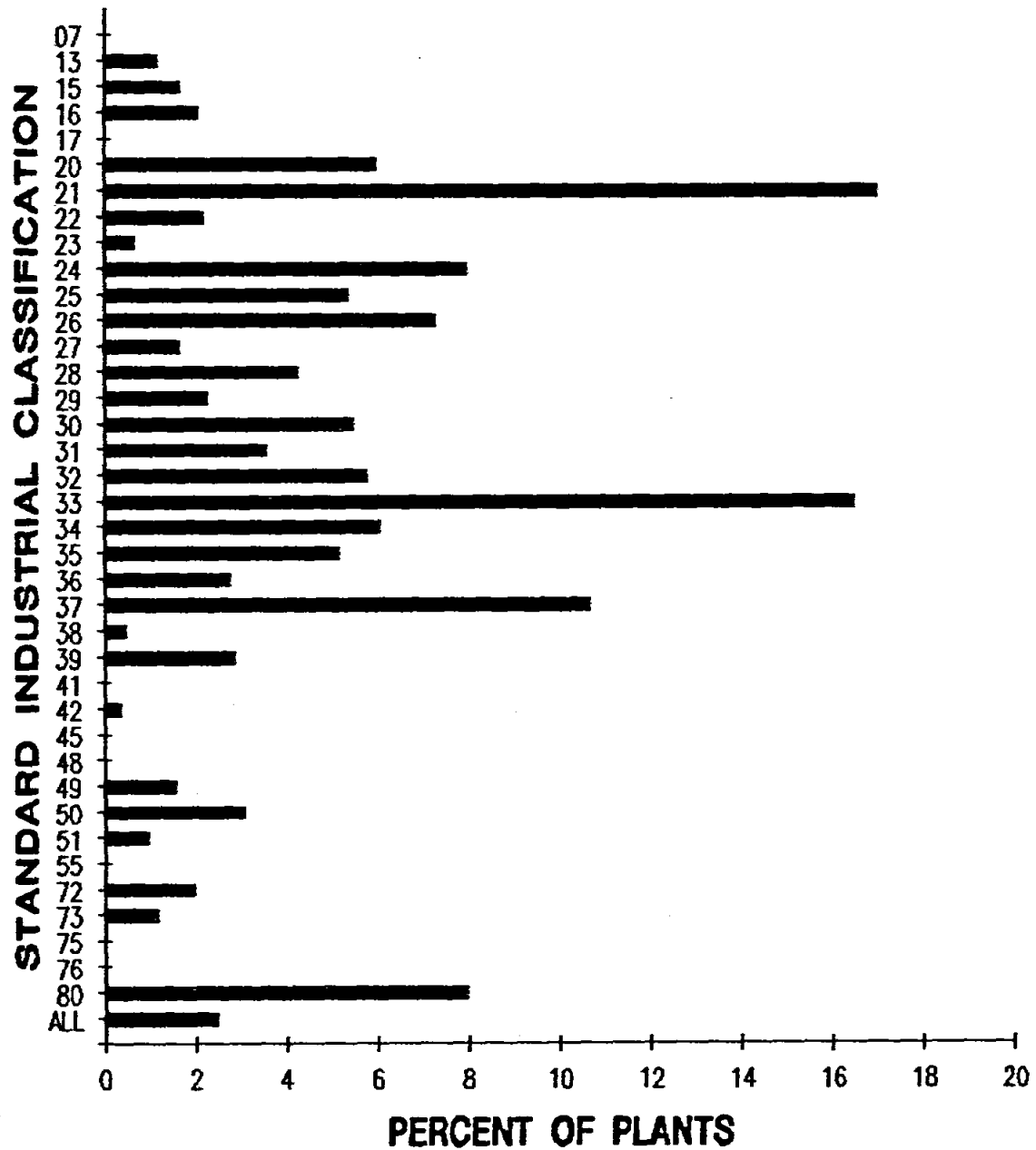


FIGURE IV - 72
WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT
OR PROCESSES AFTER GOVERNMENT INSPECTION
(NOES 1981-1983)

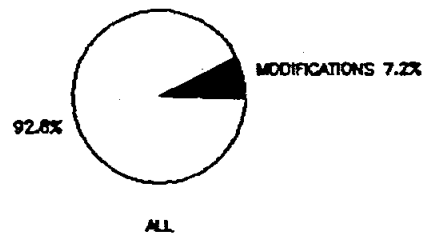
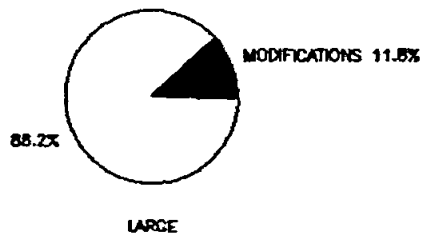
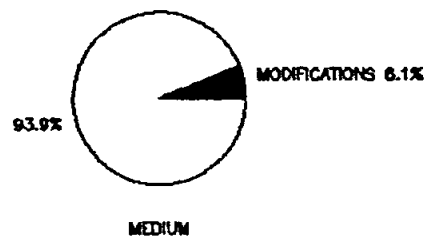
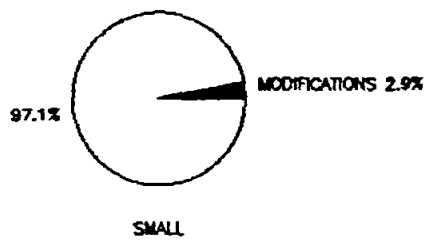
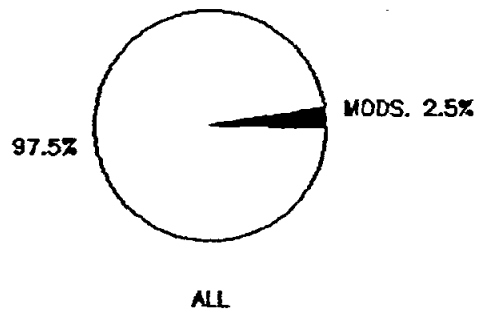
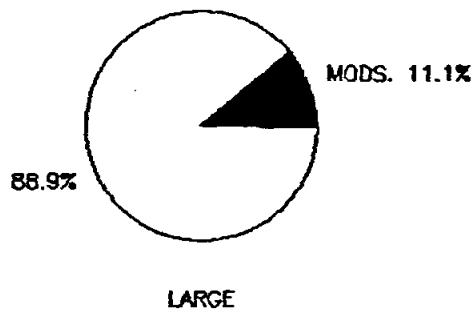
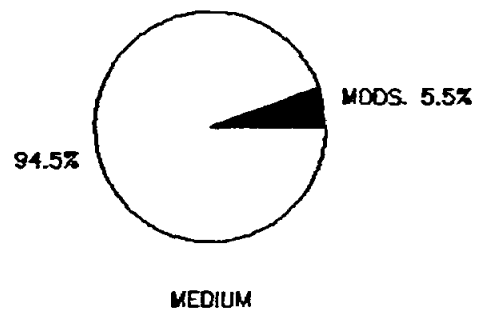
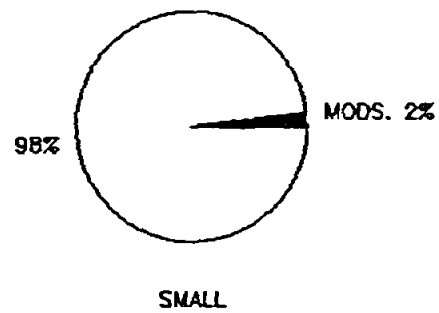


FIGURE IV - 73
PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES
AFTER A GOVERNMENT INSPECTION
(NOES 1981-1983)



NOES QUESTIONNAIRE ITEM NO. 44
Type of Equipment or Process Modification

Intent

The intent of this question was to categorize process or equipment modifications made in the past five years.

This item was displayed on the questionnaire as:

44. What was the nature of the modification?

- 1 A redesign of the process
- 2 Enclosing the process
- 3 Equipment substitution
- 4 A redesign of the equipment
- 5 Combination of the above
- 6 Not listed here

Notes

This question was asked only of those respondents who gave a positive response when asked if major modifications of equipment or processes had been made during the previous five years. The criteria for "major modification" detailed in the notes for question 41 therefore apply to the modifications specified in this question.

Any combination of modifications 1 through 4 was coded "5" or "combination of the above".

Analysis

Two analyses of the responses to question 44 are presented.

- (1) Response 44, sub-items 1 to 6 - Types of modifications made in the past five years

The estimated proportions of plants and workers in those plants which have made major modifications to equipment or processes are displayed in Figure IV-74.

Figure IV-74 Equipment or process modification by plants and workers in plants

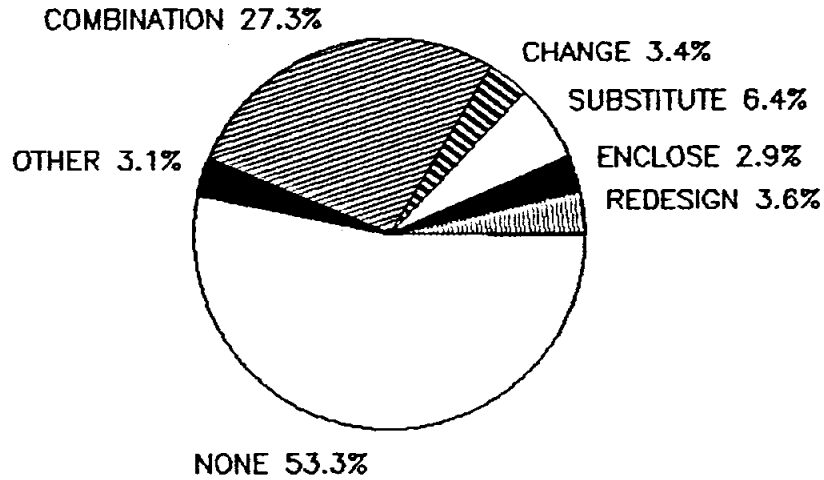
- (2) Response 44, sub-items 1 to 6 - Estimated plants and workers by category of equipment or process modification

The estimates of the plants which have made specific equipment or process modifications in the last five years, and workers in those plants (by number and proportion of the total) are displayed in Table IV-53, IV-54, IV-55, and IV-56.

Table IV-53 Number and percent of plants which modified equipment or processes in the past five years by type of modification (by major industrial group)

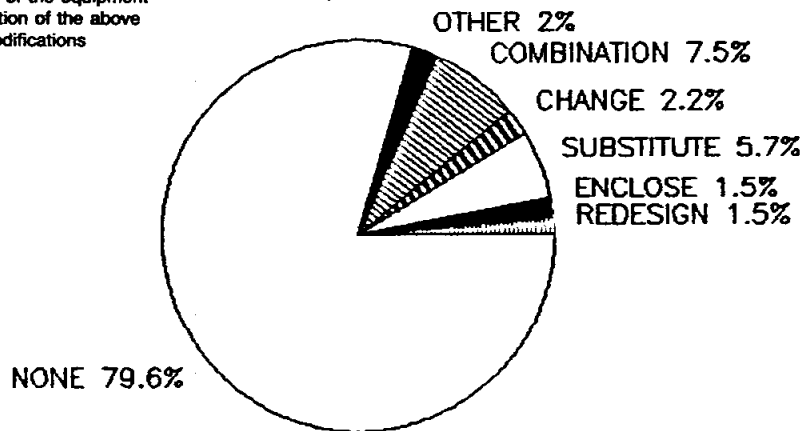
- Table IV-54** **Number and percent of plants which modified equipment or processes in the past five years by type of modification (by 2-digit SIC)**
- Table IV-55** **Number and percent of workers in plants which modified equipment or processes in the past five years by type of modification (by major industrial group)**
- Table IV-56** **Number and percent of workers in plants which modified equipment or processes in the past five years by type of modification (by 2-digit SIC)**

FIGURE IV - 74
EQUIPMENT OR PROCESS MODIFICATIONS
BY PLANTS AND WORKERS IN PLANTS
(NOES 1981-1983)



WORKERS

- LEGEND**
- REDESIGN • a redesign of the process
 - ENCLOSE • enclosing the process
 - SUBSTITUTE • equipment substitution
 - CHANGE • redesign of the equipment
 - COMBINATION • combination of the above
 - OTHER • other modifications



PLANTS

NATIONAL OCCUPATIONAL EXPOSURE SURVEY (1981-1983) TABLE NO. IV-53

NUMBER AND PERCENT OF PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES IN THE PAST FIVE YEARS BY TYPE OF MODIFICATION

MAJOR GROUP	REDESIGN PROCESS	ENCLOSING PROCESS	EQUIPMENT SUBSTITUTION	EQUIPMENT REDESIGN	COMBINATION OF REDESIGN/SUBSTITUTION	OTHER METHODS
07	162* (162) 2.9%	...	407* (289) 7.2%	151* (191) 2.7%	...	...
13	...	493* (553) 5.1%	48* (57) .5%	2* (2) .0%	1200* (524) 12.4%	...
15-17	409* (213) .4%	239* (171) .2%	2899* (845) 2.9%	977* (487) 1.0%	1239* (407) 1.3%	1565* (590) 1.6%
20-39	3965 (801) 2.1%	4712 (947) 2.5%	12208 (1168) 6.4%	5881 (861) 3.1%	24182 (1693) 12.6%	5432 (880) 2.8%
40-49	910* (655) 1.5%	108* (80) .2%	4505* (1365) 7.6%	858* (548) 1.4%	2438* (684) 4.1%	1710* (616) 2.9%
50-59	1022* (532) 1.7%	1264* (770) 2.1%	3558* (997) 5.8%	895* (686) 1.5%	1718* (656) 2.8%	1102* (665) 1.8%
70-79	1279* (486) 1.7%	587* (381) .8%	4484* (1421) 5.9%	1985* (857) 2.6%	5813* (1707) 7.7%	493* (420) .6%
80	82* (47) 1.2%	56* (33) .8%	1067* (376) 15.1%	285* (87) 4.0%	1737 (400) 24.6%	117* (74) 1.7%
ALL	7830 (1290) 1.5%	7458 (1407) 1.5%	29176 (2680) 5.7%	11033 (1590) 2.2%	38327 (2698) 7.5%	10419 (1458) 2.0%

*Standard error >25% of the estimate. The estimate may be unreliable.
 ...No facilities observed.

NUMBER AND PERCENT OF PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES IN THE PAST FIVE YEARS BY TYPE OF MODIFICATION

SIC CODE	REDESIGN PROCESS	ENCLOSING PROCESS	EQUIPMENT SUBSTITUTION	EQUIPMENT REDESIGN	COMBINATION OF REDESIGN/SUBSTITUTION	OTHER METHODS
07	162* (162) 2.9%	...	407* (289) 7.2%	151* (191) 2.7%	...	...
13	...	493* (553) 5.1%	48* (57) .5%	2* (2) .0%	1200* (524) 12.4%	...
15	...	162* (147) .6%	762* (446) 2.9%	175* (175) .7%	306* (198) 1.2%	884* (288) 3.4%
16	...	77* (86) .6%	553* (322) 4.4%	215* (187) 1.7%	358* (198) 2.9%	329* (406) 2.6%
17	409* (213) .7%	...	1585* (736) 2.6%	587* (408) 1.0%	575* (301) 1.0%	352* (219) .6%
20	392* (150) 2.6%	305* (247) 2.0%	1601* (415) 10.5%	787* (286) 5.2%	2749 (599) 18.1%	429* (259) 2.8%
21	43* (34) 39.5%	19* (45) 17.0%	...	...	37* (42) 33.6%	...
22	158* (134) 3.3%	...	439* (153) 9.1%	239* (166) 5.0%	672* (213) 14.0%	244* (86) 5.1%
23	150* (171) .9%	...	366* (215) 2.3%	66* (47) .4%	334* (134) 2.1%	406* (278) 2.6%
24	68* (63) .6%	268* (139) 2.2%	396* (177) 3.3%	274* (143) 2.3%	1821* (556) 15.2%	76* (68) .6%
25	199* (143) 3.7%	184* (133) 3.4%	207* (147) 3.9%	173* (133) 3.2%	313* (157) 5.9%	...
26	191* (94) 3.2%	257* (131) 4.4%	120* (101) 2.0%	348* (306) 5.9%	1540* (468) 26.1%	49* (46) .8%
27	347* (93) 1.7%	43* (46) .2%	1678* (499) 8.3%	619* (452) 3.1%	1928* (521) 9.5%	1157* (541) 5.7%
28	159* (108) 2.1%	74* (84) 1.0%	431* (212) 5.6%	630 (157) 8.2%	1419 (272) 18.4%	227* (125) 2.9%
29	176* (181) 12.5%	163* (123) 11.6%	...	93* (103) 6.6%	199* (98) 14.1%	170* (213) 12.1%
30	17* (20) .2%	77* (56) .9%	232* (140) 2.7%	291* (212) 3.4%	1403* (505) 16.6%	468* (281) 5.5%
31	50* (39) 3.3%	223* (195) 14.7%	...	22* (20) 1.4%	134* (81) 8.8%	...
32	694* (510) 6.9%	181* (140) 1.8%	292* (142) 2.9%	357* (180) 3.6%	1463* (513) 14.6%	273* (158) 2.7%
33	2* (2) .0%	180* (105) 3.0%	738* (247) 12.4%	235* (165) 4.0%	1495* (404) 25.2%	292* (147) 4.9%

SIC CODE	REDESIGN PROCESS	ENCLOSING PROCESS	EQUIPMENT SUBSTITUTION	EQUIPMENT REDESIGN	COMBINATION OF REDESIGN/SUBSTITUTION	OTHER METHODS
34	194* (86) .9%	578* (305) 2.6%	2117* (623) 9.6%	680* (377) 3.1%	2725 (629) 12.4%	893* (409) 4.1%
35	221* (129) .8%	1501* (689) 5.6%	1709* (465) 6.4%	408* (204) 1.5%	2783 (429) 10.4%	321* (184) 1.2%
36	628* (227) 5.9%	185* (169) 1.8%	288* (113) 2.7%	132* (72) 1.2%	1371 (279) 13.0%	134* (102) 1.3%
37	81* (51) 1.5%	95* (69) 1.7%	694* (327) 12.4%	212* (158) 3.8%	623 (144) 11.2%	196* (122) 3.5%
38	135* (67) 3.3%	348* (259) 8.6%	281* (156) 6.9%	90* (66) 2.2%	609* (222) 15.0%	79* (87) 1.9%
39	59* (133) .8%	30* (105) .4%	618* (376) 8.0%	223* (152) 2.9%	565* (590) 7.3%	19* (46) .2%
41	...	...	273* (251) 5.5%	...	...	97* (83) 2.0%
42	156* (153) .7%	105* (80) .5%	701* (361) 3.2%	210* (165) 1.0%	1255* (549) 5.8%	122* (115) .6%
45	38* (26) 1.0%	3* (4) .1%	97* (84) 2.4%	...	72* (47) 1.8%	122* (118) 3.1%
48	629* (631) 4.0%	...	3115* (1130) 19.9%	...	557* (373) 3.6%	680* (371) 4.3%
49	86* (68) .8%	...	281* (321) 2.7%	648* (505) 6.3%	476* (237) 4.6%	690* (433) 6.7%
50	164* (216) .5%	674* (617) 2.1%	1884* (684) 5.9%	190* (144) .6%	787* (358) 2.4%	1102* (665) 3.4%
51	711* (489) 7.6%	257* (216) 2.8%	1061* (607) 11.3%	90* (110) 1.0%	...	...
55	147* (125) .8%	332* (367) 1.7%	613* (463) 3.1%	616* (642) 3.2%	931* (580) 4.8%	...
72	13* (19) .1%	81* (74) .4%	2427* (1087) 11.4%	830* (557) 3.9%	2400* (997) 11.3%	113* (114) .5%
73	188* (190) 1.0%	29* (23) .2%	563* (308) 3.1%	649* (376) 3.5%	1113* (390) 6.0%	18* (20) .1%
75	864* (425) 3.3%	476* (383) 1.8%	1200* (606) 4.6%	507* (474) 1.9%	1690* (919) 6.4%	...
76	213* (148) 2.2%	...	294* (363) 3.0%	...	610* (774) 6.2%	362* (424) 3.7%
80	82* (47) 1.2%	56* (33) .8%	1067* (376) 15.1%	285* (87) 4.0%	1737 (400) 24.6%	117* (74) 1.7%
ALL	7830 (1143) 1.5%	7458 (1460) 1.5%	29138 (2129) 5.8%	11033 (1403) 2.2%	38275 (3108) 7.6%	10419 (1516) 2.1%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.

NATIONAL OCCUPATIONAL EXPOSURE SURVEY (1981-1983) TABLE NO. IV-55

NUMBER AND PERCENT OF WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES IN THE PAST FIVE YEARS BY TYPE OF MODIFICATION

MAJOR GROUP	REDESIGN PROCESS	ENCLOSING PROCESS	EQUIPMENT SUBSTITUTION	EQUIPMENT REDESIGN	COMBINATION OF REDESIGN/SUBSTITUTION	OTHER METHODS
07	4547* (4528) 4.1%	...	17066* (12218) 15.4%	10241* (12985) 9.3%	...	...
13	...	7392* (8299) 1.8%	2511* (2946) .6%	248* (236) .1%	101891* (40724) 24.6%	...
15-17	29856* (15806) 1.0%	10782* (7617) .4%	72735* (23179) 2.4%	18789* (8611) .6%	126387* (49066) 4.1%	56473* (25528) 1.8%
20-39	897644 (105251) 4.7%	722482 (107691) 3.8%	1268598 (180484) 6.6%	704536 (90501) 3.7%	6716502 (315467) 34.9%	617072 (132609) 3.2%
40-49	123349* (65771) 3.9%	56577* (49596) 1.8%	188728* (56601) 6.0%	86186* (52519) 2.7%	281896* (77656) 8.9%	198616* (92215) 6.3%
50-59	20244* (9691) 1.3%	33551* (19152) 2.2%	109903* (46395) 7.2%	17511* (11487) 1.1%	50220* (15649) 3.3%	27720* (17743) 1.8%
70-79	45714* (23426) 2.1%	35480* (16764) 1.6%	166052* (47661) 7.6%	54534* (13783) 2.5%	342759* (101229) 15.6%	24499* (15229) 1.1%
80	92648* (43074) 2.5%	112634* (55779) 3.1%	321177* (103275) 8.8%	253391* (77354) 6.9%	1516311 (260570) 41.4%	104798* (56212) 2.9%
ALL	1214001 (134803) 3.6%	978897 (133952) 2.9%	2146771 (227075) 6.4%	1145436 (132276) 3.4%	9135966 (433595) 27.3%	1029178 (174490) 3.1%

*Standard error >25% of the estimate. The estimate may be unreliable.
 ...No facilities observed.

NUMBER AND PERCENT OF WORKERS IN PLANTS WHICH MODIFIED EQUIPMENT OR PROCESSES IN THE PAST FIVE YEARS BY TYPE OF MODIFICATION

SIC CODE	REDESIGN PROCESS	ENCLOSING PROCESS	EQUIPMENT SUBSTITUTION	EQUIPMENT REDESIGN	COMBINATION OF REDESIGN/SUBSTITUTION	OTHER METHODS
07	4547* (4528) 4.1%	...	17066* (12218) 15.4%	10241* (12985) 9.3%	...	...
13	...	7392* (8299) 1.8%	2511* (2946) .6%	248* (236) .1%	101891* (40724) 24.6%	...
15	...	6141* (5597) .7%	23564* (16284) 2.6%	2269* (2269) .3%	51918* (30942) 5.8%	17350* (6169) 1.9%
16	...	4641* (5158) .8%	22145* (13911) 3.7%	3014* (2623) .5%	45071* (29050) 7.6%	27144* (24915) 4.6%
17	29856* (15806) 1.9%	...	27026* (12979) 1.7%	13505* (7857) .9%	29398* (16996) 1.9%	11980* (8140) .8%
20	129013* (62781) 8.3%	37864* (22248) 2.4%	152065* (40052) 9.8%	66704* (25257) 4.3%	483012 (101088) 31.1%	43080* (19063) 2.8%
21	56325* (44772) 49.4%	10657* (26041) 9.3%	...	...	43371* (35614) 38.0%	...
22	20553* (19307) 2.9%	...	116235* (67473) 16.3%	29689* (17956) 4.2%	232878* (82759) 32.6%	36599* (24675) 5.1%
23	2699* (3075) .2%	...	46335* (16758) 3.7%	53553* (39460) 4.3%	33707* (11543) 2.7%	41653* (29866) 3.4%
24	11292* (10494) 1.9%	90723* (63952) 15.7%	44961* (21310) 7.8%	12219* (7063) 2.1%	99082* (28910) 17.1%	11747* (10539) 2.0%
25	74703* (44083) 14.4%	20594* (19755) 4.0%	76006* (61196) 14.7%	5603* (4135) 1.1%	54045* (29531) 10.4%	...
26	45202* (23952) 7.2%	74558* (43670) 11.9%	9046* (7288) 1.4%	51613* (45250) 8.2%	214457* (70881) 34.3%	14662* (13760) 2.3%
27	78304* (32001) 6.6%	17397* (23421) 1.5%	95118* (35553) 8.0%	33337* (30091) 2.8%	307538* (80105) 26.0%	76461* (34106) 6.5%
28	50027* (26487) 5.5%	16621* (15602) 1.8%	23727* (13368) 2.6%	129721* (50373) 14.1%	367095 (71200) 40.0%	21464* (8631) 2.3%
29	11069* (11377) 5.0%	41662* (28474) 18.8%	...	3264* (3617) 1.5%	98980* (69455) 44.6%	6796* (8540) 3.1%
30	3324* (3928) .4%	10254* (10643) 1.4%	8395* (4644) 1.1%	42349* (30197) 5.6%	301777* (75617) 40.1%	22784* (20015) 3.0%
31	2188* (1707) 1.2%	5587* (4876) 3.2%	...	11650* (10428) 6.6%	34433* (21440) 19.6%	...
32	20272* (10077) 3.5%	7841* (6273) 1.4%	24312* (15101) 4.2%	29229* (14883) 5.1%	161664* (49091) 28.1%	48455* (45559) 8.4%
33	306* (309) .0%	32045* (18740) 3.0%	38735* (13947) 3.6%	21783* (13884) 2.0%	544062 (81250) 50.8%	37125* (16614) 3.5%

SIC CODE	REDESIGN PROCESS	ENCLOSING PROCESS	EQUIPMENT SUBSTITUTION	EQUIPMENT REDESIGN	COMBINATION OF REDESIGN/SUBSTITUTION	OTHER METHODS
34	22136* (11413) 1.5%	82633* (34903) 5.5%	128941* (44874) 8.6%	25648* (10595) 1.7%	340995* (91808) 22.7%	58396* (25282) 3.9%
35	42433* (24914) 1.8%	90665* (25143) 3.8%	111742* (29628) 4.7%	27350* (12229) 1.7%	1041683 (127164) 43.8%	60974* (36338) 2.6%
36	209748 (49433) 10.7%	53128* (45290) 2.7%	125554* (63149) 6.4%	51764* (29135) 2.6%	807380 (89838) 41.1%	74151* (60800) 3.8%
37	80879* (23620) 4.3%	97879* (54444) 5.2%	169060* (92020) 9.0%	77097* (50630) 4.1%	1103260 (254669) 58.7%	40728* (20831) 2.2%
38	28205* (22049) 3.7%	28728* (18391) 3.8%	58097* (37310) 7.7%	12504* (9688) 1.6%	398246* (117885) 52.4%	14395* (37020) 1.9%
39	8966* (19780) 1.7%	3644* (12834) .7%	40269* (23446) 7.7%	19460* (17797) 3.7%	48837* (134009) 9.3%	7602* (17649) 1.4%
41	...	...	11472* (10554) 5.8%	...	...	11518* (9829) 5.8%
42	4376* (4273) .5%	16675* (12650) 2.0%	38915* (23448) 4.7%	17574* (10829) 2.1%	42843* (13397) 5.2%	6087* (5758) .7%
45	51932* (40473) 11.5%	39902* (51083) 8.8%	25043* (19859) 5.6%	...	74869* (61331) 16.6%	57819* (48863) 12.8%
48	54505* (47211) 8.1%	...	95852* (35865) 14.3%	...	41681* (23239) 6.2%	24717* (16405) 3.7%
49	12535* (9909) 1.5%	...	15512* (15669) 1.8%	68612* (45026) 8.2%	92547* (40078) 11.0%	98475* (49684) 11.7%
50	3440* (4533) .4%	16714* (15165) 1.8%	87076* (42201) 9.5%	5199* (4167) .6%	36262* (16404) 4.0%	27720* (17743) 3.0%
51	10169* (6927) 4.8%	9525* (8002) 4.5%	12363* (6820) 5.8%	4923* (6034) 2.3%	...	...
55	6635* (5622) 1.6%	7312* (8079) 1.8%	10464* (7229) 2.6%	7390* (7710) 1.8%	13958* (8710) 3.4%	...
72	10670* (15114) 2.3%	8627* (7858) 1.8%	78372* (29728) 16.6%	16333* (9668) 3.5%	36468* (13685) 7.7%	9182* (8180) 1.9%
73	11762* (10443) 1.1%	22095* (16084) 2.0%	61280* (30274) 5.6%	31616* (10622) 2.9%	265018* (99928) 24.1%	9894* (11061) .9%
75	7210* (3553) 1.7%	4758* (3833) 1.1%	22583* (11705) 5.4%	6585* (6164) 1.6%	31550* (16231) 7.5%	...
76	16072* (11435) 7.9%	...	3817* (4721) 1.9%	...	9722* (11653) 4.8%	5423* (6355) 2.7%
80	92648* (43074) 2.5%	112634* (55779) 3.1%	321177* (103275) 8.8%	253391* (77354) 6.9%	1516311 (260570) 41.4%	104798* (56212) 2.9%
ALL	1214001 (141221) 3.7%	978897 (131750) 2.9%	2144836 (220760) 6.4%	1145436 (126723) 3.4%	9115098 (396457) 27.4%	1029178 (153532) 3.1%

*Standard error >25% of the estimate. The estimate may be unreliable.
...No facilities observed.