THIRD EDITION

THE CONSTRUCTION CHART BOOK

The U.S. Construction Industry and Its Workers

THE CENTER TO PROTECT WORKERS' RIGHTS

CPWR

SEPTEMBER 2002

1

The North American Industry Classification System

A new way to present industry statistics – the 2002 North American Industry Classification System (NAICS) – is replacing the U.S. Standard Industrial Classification (SIC) system.[1] NAICS was jointly developed by the United States, Canada, and Mexico to improve comparability of statistics about business activity across North America. NAICS also facilitates comparability with the International Standard Industrial Classification System, developed and maintained by the United Nations (ISIC, Revision 3).[2]

NAICS was produced in response to longtime criticism of the SIC, in which, for instance, some construction workers were classified in industries other than construction. NAICS reflects, among other changes, the emergence and growth of the service sector and new and advanced technologies.

Although the SIC and NAICS both have heirarchical structures, there are differences. NAICS uses a six-digit classification code that allows greater flexibility in the coding structure; the SIC is limited to four digits. NAICS uses the first two digits of the six-digit code to designate the highest-level groupings, with 20 such two-digit industry sectors, while the SIC has only 11 divisions. Unlike the SIC, NAICS has no sector for "nonclassifiable establishments." In addition, NAICS allows each country to recognize its own, possibly unique, industries by going into more detail, using a sixth digit. Thus, 6-digit U.S. codes may differ from counterparts in Canada or Mexico, while the 5-digit codes remain standardized. The following example shows the 2002 NAICS structure.

Code	Digits	Sector	Example
23---	First two	Major sector	Construction
236--	Third	Subsector	Construction of Building
2361-	Fourth	Industry group	Residential Building Construction
23611	Fifth	NAICS international industry	Residential Building Construction
236117	Sixth	National industry (U.S.)	New Housing Operative Builders
236118	Sixth	National industry (U.S.)	Residential Remodelers

NAICS is oriented toward production or supply, so units that use similar production processes are grouped together. For instance, Land Subdivision (SIC 6552, NAICS 2372), which was not part of construction under the SIC system, is included in Heavy and Civil Engineering Construction (NAICS 237).

Other key changes in construction in the 2002 NAICS include the new listing of a residential remodelers industry, the reshuffling of many heavy construction industries, and the rearranging (renumbering) of the specialty trades to place them in the order of the construction process. Some reclassifications are a result of the switch from SIC to NAICS. In addition to Land Subdivision, these SIC categories were added to construction: management services (SIC 8741) for subsectors 236 and 237; construction of field gathering lines on a contract or fee basis (SIC 1389), to NAICS 23712; household antenna installation (SIC 7622), to NAICS 23829; boiler cleaning, chipping, and scaling (SIC 7699), to NAICS 23822.

Rental of construction equipment with operator (SIC 7353), and site preparation and related construction activities on mining sites (SIC 1081, 1241, 1389, 1481) have been moved to construction (NAICS 23891). Remodeling contractors and residential remodeling construction management (part of SIC 1521, 1522, 1531, and 8741) are now NAICS 236118, Residential Remodelers.

Some SIC categories have been broken into different NAICS industries creating more industry-level detail. One example is SIC 1799, Special Trade Contractors, NEC, split into NAICS 23622, 23799, 23815, 23819, 23829, 23832, 23839, 23891 and 23899 (chart 1). ("NEC" is not elsewhere classified.)

The NAICS production-oriented system means that government data can more easily be used for measuring productivity, unit labor costs, and the capital intensity of production, and understanding employment-output relationships and other such statistics that require that inputs and outputs be grouped together.

NAICS is to be reviewed and updated every 5 years. When NAICS was first published in 1997, the categories for construction were not substantially different from those in the SIC system, partly because of limited resources and time to produce the new system. Given the additional time to revise NAICS for 2002, however, the 2002 NAICS differs in some important ways from the 1997 NAICS and the SIC. (A May 2002 analysis shows that employment in the 2002 NAICS Construction sector was drawn as follows from SIC categories: Construction, 97%; Financial, Insurance, and Real Estate, 1.3%; Services, 1.2%; and Mining, 0.3%.[3])

Thus, the transition to the new system poses some difficulties for researchers. For instance, data from the 1997 Economic Census,[4] based on the 1997 NAICS, are neither directly comparable to the previous Economic Census data using SIC nor to the 2002 Economic Census that will be coded by the 2002 NAICS.

Federal publications in the United States referring to January 1, 2002 and afterward, are expected to use the 2002 NAICS codes. Agencies may adopt the 2002 NAICS earlier at their discretion.[5] A *2002 NAICS United States Manual* is available. This chart book edition is based on SIC and 1997 NAICS coding.

1.Office of Management and Budget, Executive Office of the President, North American Industry Classification System–Revisions for 2002, Part III, *Federal Register* Tuesday, January 16, 2001, excerpt, 4 pages. **www.census.gov/epcd/naics02/naifr02d.htm**

2. U.S. Census Bureau, *Development of NAICS* **www.census.gov/epcd/www/naicsdev.htm**

3. Distribution of Employment from SIC Divisions to NAICS Supersectors, **www.bls.gov/ces/cesratio.htm <http://www.bls.gov>**

4. U.S. Census Bureau, *1997 Economic Census*. January 2000, **www.census.gov/epcd/www/econ97.html**

5. U.S. Census Bureau, Schedules of implementing NAICS by government agencies, no date, **www.census.gov/epcd/www/naics.html**

1. 2002 North American Industry Classification System

2002 NAICS	2002 NAICS U.S. Description	1987 SIC	1987 U.S. SIC Description
236 Construction of Buildings			
23611	Residential Building Construction	1521	General Contractors - Single-family Houses
		8741	Management Services
		1522	General Contractors - Residential Buildings Other Than Single-Family Houses
		1531	Operative Builders
23621	Industrial Building Construction	1531	Operative Builders
		1541	General Contractors Industrial Buildings and Warehouses
		1629	Heavy Construction, NEC
		8741	Management Services
23622	Commercial and Institutional Building Construction	1522	General Contractors - Residential Buildings Other Than Single-Family Houses
		1531	Operative Builders
		1541	General Contractors - Industrial Buildings and Warehouses
		1542	General Contractors - Nonresidential Buildings, Other than Industrial Buildings and Warehouses
		1799	Special Trade Contractors, NEC
		8741	Management Services
237 Heavy and Civil Engineering Construction			
23711	Water and Sewer Line and Related Structures Construction	1623	Water, Sewer, Pipeline, and Communications and Power Line Construction
		1629	Heavy Construction, NEC
		1781	Water Well Drilling
		8741	Management Services
23712	Oil and Gas Pipeline Related Structures Construction	1389	Oil and Gas Field Services, NEC
		1623	Water, Sewer, Pipeline, and Communications and Power Line Construction
		1629	Heavy Construction, NEC
		8741	Management Services
23713	Power and Communication Line and Related Construction	1623	Water, Sewer, Pipeline, and Communications and Power Line Construction
		1629	Heavy Construction, NEC
		8741	Management Services
23721	Land Subdivision	6552	Land Subdividers and Developers Construction
23731	Highway, Street, and Bridge Construction	1611	Highway and Street Construction
		1622	Bridge, Tunnel, and Elevated Highway Construction
		1721	Painting and Paper Hanging
		8741	Management Services
23799	Other Highway and Civil Engineering Construction	1622	Bridge, Tunnel, and Elevated Highway Construction
		1629	Heavy Construction, NEC
		1799	Special Trade Contractors, NEC
		8741	Management Services

Source: Chart 1 - Office of Management and Budget, Executive Office of the President, North American Industry Classification System–Revisions for 2002, Federal Register January 16, 2001, excerpt, 4 pp.; Table 3. 2002 NAICS-US Matched to 1987 Standard Industrial Classification **www.census.gov/epcd/naics02/**

238 Specialty Trade Contractors			
23811	Poured Concrete Foundatio	1771	Concrete Work
23812	Structural Steel & Precast Concrete contractors	1791	Structural Steel Erection
23813	Framing Contractors	1751	Carpentry Work
23814	Masonry contractors	1771	Concrete Work
		1741	Masonry, Stone Setting, and Other Stone Work
23815	Glass and Glazing Contractors	1793	Glass and Glazing Work
		1799	Special Trade Contractors, NEC
23816	Roofing Contractors	1761	Roofing, Siding, and Sheet Metal Work
23817	Siding Contractors	1761	Roofing, Siding, and Sheet Metal Work
23819	Other foundation, structure & Building Exterior Contractors	1791	Structural Steel Erection
		1799	Special Trade Contractors, NEC
23821	Electrical Contractors	1711	Plumbing, Heating, and Air-Conditioning
		1731	Electrical Work
23822	Plumbing, Heating, and Air-Conditioning Contractors	1711	Plumbing, Heating, and Air-Conditioning
		1791	Structural Steel Erection
		1796	Installation or Erection of Building Equipment, NEC
23829	Other Building Equipment Contractors	7699	Repair Shops and Related Services, NEC
		1796	Installation or Erection of Building Equipment, NEC
		1799	Special Trade Contractors, NEC
		7622	Radio and Television Repair Shops
23831	Drywall and Insulation Contractors	1742	Plastering, Drywall, Acoustical, and Insulation Work
		1743	Terrazzo, Tile, Marble, and Mosaic Work (fresco work)
23832	Paint and Wall Covering Contractors	1721	Painting and Paper Hanging
		1799	Special Trade Contractors, NEC
23833	Floor Contractors	1752	Floor Laying and Other Floor Work, NEC
23834	Tile and Terrazzo Contractors	1743	Terrazzo, Tile, Marble, and Mosaic Work (except fresco work)
23835	Finish Carpentry Contractors	1751	Carpentry Work
23839	Other Building Finishing Contractors	1761	Roofing, Siding, and Sheet Metal Work
		1799	Special Trade Contractors, NEC
23891	Site Preparation Contractors	1081	Metal Mining Service
		1241	Coal Mining Services
		1389	Oil and Gas Field Services, NEC
		1481	Nonmetallic Minerals Services, Except Fuel
		1629	Heavy Construction, NEC
		1711	Plumbing, Heating, and Air-Conditioning
		1794	Excavation Work
		1795	Wrecking and Demolition Work
		1799	Special Trade Contractors, NEC
23899	All Other Specialty Trade Contractors	7353	Construction Equipment Rental and Leasing
		1771	Concrete Work
		1799	Special Trade Contractors, NEC
		7353	Construction Equipment Rental and Leasing

2

Construction Establishments and Numbers of Employees

The Economic Census, the major source of information on the structure and performance of the U.S. economy, is conducted every five years by the Census Bureau. The *1997 Economic Census* reported 2.55 million construction establishments, an increase of 32% from 1.92 million in 1992.[1] Payroll establishments in construction totaled 656,448 in 1997, 15% higher than 572,851 in 1992. (3% of the 15% figure consists of payroll establishments that were not counted in construction in the SIC system used in 1992.) The 1.89 million establishments without payroll in construction – sole proprietorships and some corporations and partnerships – reflected a growth of 40% from 1.35 million. (Establishments without payroll are also known as nonemployer establishments.)

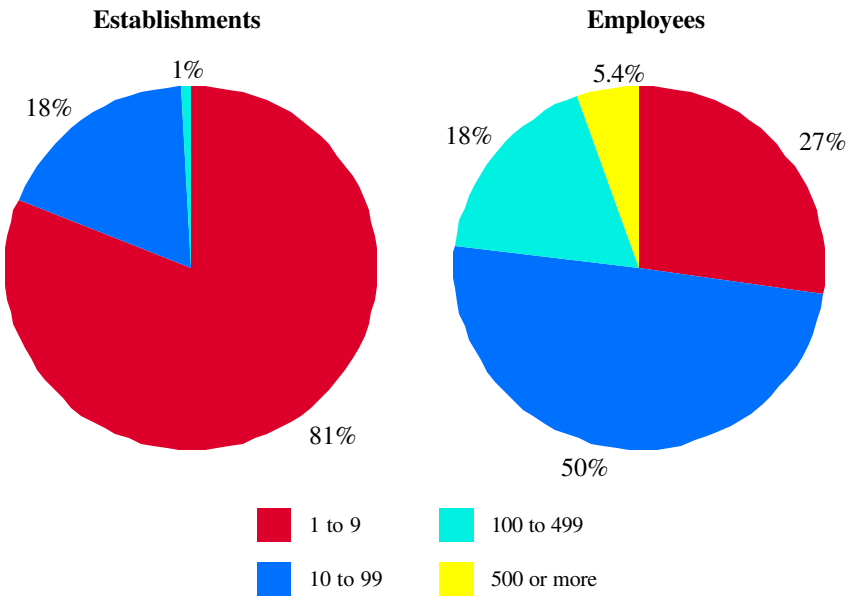
An establishment is a single physical location at which business is conducted and/or services are provided. So, a company or corporation may consist of more than one establishment (*see* Glossary). Because an establishment is relatively permanent, a construction project or site is not usually an establishment.

The construction industry consists almost entirely of small establishments (chart 2a). Some 81% of construction establishments with payroll have fewer than 10 employees. The largest payroll establishments in the industry, having 500 or more employees, are well under 1% of the total, although they employ 5.4% of the industry's payroll employees (chart 2b). The Census Bureau counts any establishment in business during 1997 using federal tax rolls.

The 1997 Economic Census counted 5.7 million construction employees. (The census averages counts of employees taken during four sample weeks yearly, which include these dates: March 12, May 12, August 12, and November 12. Employment levels ranged from 5.9 million in August to 5.3 million in March.)

Establishments without payroll make up 74% of construction establishments. More than 90% of construction establishments without payroll are sole proprietorships (chart 2c). In fact, some 70% or more of construction establishments are sale proprietorships in seven states. The states, Kentucky, New Hampshire, Oklahoma, Mississippi, Texas, Arkansas, and Tennessee, are listed here in increasing order, with Tennessee at 80%. (*see* chart book page, Self-Employment in Construction and Other Industries).

2a. Construction establishments and employees, by establishment size, 1997 (Payroll establishments)

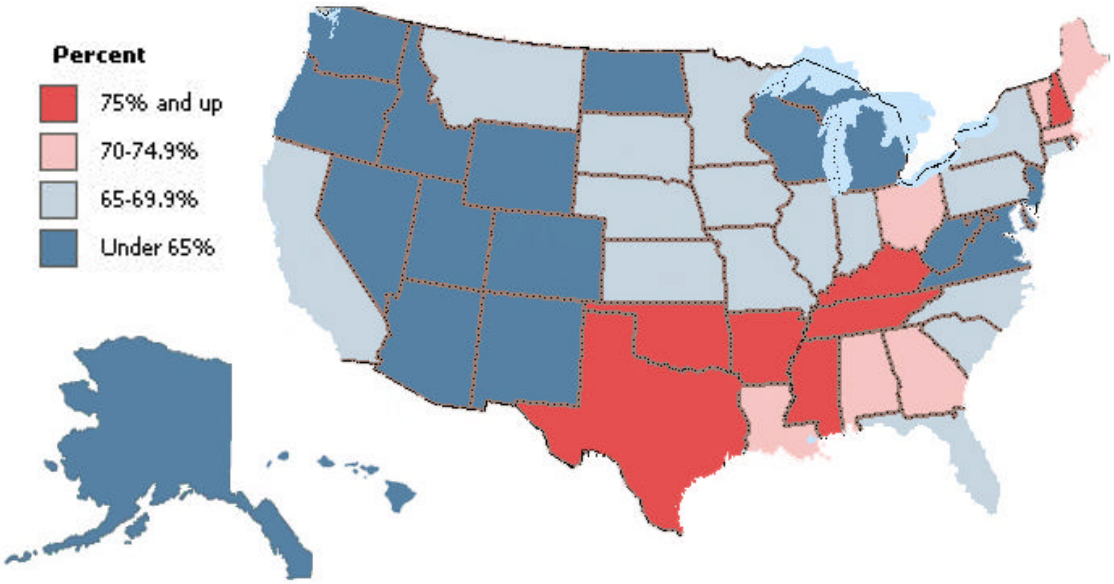


1. *The 1997 Economic Census - Construction* was published previously as the *1992 Census of Construction Industries* and counts only establishments in the private sector. For nonemployer data, *see* **www.census.gov/prod/ec97/97x-cs4.pdf**, which is published annually.

2b. Number and percentage of construction establishments and employees, by establishment size, 1997 (Payroll establishments)

Establishment size (number of employees)	Number of establishments	% of all establishments	Total number of employees	% of all employees
1 to 9	532,645	81.14%	1,552,155	27.40%
10 to 19	67,093	10.22%	890,450	15.72%
20 to 99	50,764	7.73%	1,920,339	33.90%
100 to 499	5,631	0.86%	994,244	17.55%
500 or more	317	0.05%	307,664	5.43%
Total	656,448	100.00%	5,664,853	100.00%

2c. Construction establishments as sole proprietorships, by state, 1997



Note: All charts - Data cover private sector only.
Chart 2a - Percentages may not add up to 100 because of rounding.
Charts 2a and 2b - In 1997, payroll establishments totaled 656,434, with 5.7 million employees.
Chart 2c - Nonemployer establishments totaled 1.89 million in 1997. Although this chart resembles chart 3d in *The Construction Chart Book, Second Edition*, the two charts are not comparable. Census data for 1992 covered numbers employed in partnerships and proprietorships by state, but estimates of numbers employed in such arrangements by state were not provided in the 1997 census. The Bureau of Labor Statistics Current Population Survey, using different definitions, shows 2.1 million self-employed (incorporated and unincorporated) (1997 Current Population Survey Earnings Files. Washington, D.C., Office of Current Employment Analysis. Calculations by Xiuwen Dong, The Center To Protect Workers' Rights.)

Source: Charts 2a-2b - U.S. Census Bureau, *Industry Summary*, 1997 Economic Census - Construction, Subject Series, January 2000 (EC97C23S-IS).
Chart 2c - U.S. Census Bureau, *Nonemployer Statistics 1997*, 1997 Economic Census, Core Business Statistics Series, January 2001 (EC97X-CS4), http://www.census.gov/prod/ec97/97x-cs4.pdf

3

The Dollar Value Produced and How It Is Spent in the Construction Industry

Construction in 2000 produced 4.7% of the total Gross Domestic Product (GDP), the highest level in at least a decade, and an increase from 4.1% in 1997.[1]

Also in 1997, construction establishments produced a total dollar value of $945.7 billion, an increase of 63% from $581.6 billion in 1992, the year of the previous Economic Census - Construction.[2] Most of the output was produced by payroll establishments (charts 3a and 3b). Total dollar value includes construction work plus business receipts from non-construction activities, such as, rental of equipment without an operator, legal services, insurance, and finance.

The figure, total dollar value, reflects some duplication, because the construction work of one company may be subcontracted to another construction company and reported by both. To avoid this double counting, the Economic Census calculates net value of construction and value added (see below).

Unlike earlier censuses, which used the Standard Industrial Classification (SIC) system, the 1997 census used the North American Industry Classification System, NAICS (see chart book page 1).[3] With the adoption of NAICS, some classifications in construction have shifted, limiting comparisons between data for 1992 and 1997. And, although data for establishments without payroll used to be counted as part of construction, as of 1997 the data are kept separate (and are known as nonemployer statistics).[4]

The Economic Census - Construction is based on establishments and publishes two major series: an industry series, which provides detailed national statistics on the NAICS 5-digit industry subsectors, such as "Highway and street" and "Bridge and tunnel," and a geographic series, which provides state and regional data. Data in the two series include employment (construction workers and others); payroll; value of construction work; cost of materials, supplies and fuels; cost of work subcontracted out; capital expenditures; assets; and type of construction.

The Census Bureau obtains information on employers (payroll establishments) through a survey of all medium-size and large establishments and a statistical sample of the smaller ones. Construction management firms are included. For establishments without payroll (nonemployers), the census gets statistics from administrative records of other federal agencies.

Economic Census data show the value of construction work as the sum of three categories: receipts from construction work, value of speculative construction work, and construction done for own use. The dollar value of construction work done by payroll establishments in 1997 equaled $845.5 billion. Unlike total dollar value, this figure excludes $13 billion in business receipts for equipment rental, legal service, insurance, finance, and other activities that the Census Bureau does not classify as construction.

There are two other ways of looking at output. Net value is defined as the (gross) dollar value of business done by an establishment minus costs for construction work subcontracted to others. For payroll establishments in 1997, the net value of construction work in 1997 was $612.2 billion, a 56% increase from $391.2 billion in 1992 (*see* note 1). Value added by payroll establishments was $383.8 billion in the year, which is equal to value of business done, less costs for construction work subcontracted out and costs for materials, components, supplies, and fuels

Establishments without payroll produced a total dollar value of $87.1 billion in 1997, increasing their share of output from 1992, when it was 7.3%, to 9.2% in 1997. No figure is provided for net value for establishments without payroll. We do know that their relative economic impact varies by state. In five states — New Hampshire, Arkansas, Maine, Oklahoma, and Connecticut – establishments without payroll generated 15% or more of construction receipts in 1997. The five states are listed here in decreasing order of share of establishments without payroll, with New Hampshire at 18.6%.

In another change from 1992 to 1997, the relative weight of some expenses has shifted (charts 3c and 3d). Subcontracting has become the largest expense category for payroll employers at $233.3 billion. Materials, components, and supplies make up the second-largest category at $231.1 billion, while labor – payroll and benefits – cost $215.6 billion. Payroll was $174.2 billion and fringe benefits were $41.4 billion. (The Census Bureau does not detail the components of the subcontracting or "other" category.)

Some Census Bureau numbers for construction may differ from data produced in other reports by the Census Bureau or other government agencies because of varying scope, coverage, timing, classification, and methodology. For instance, the census publication series, The Value of Construction Put in Place covers only new construction put in place without regard to who is performing the construction activity (*see* page 5, The Value of All Construction).

Data from the 1997 Economic Census - Construction are at **http://www.census.gov/epcd/www/econ97.html** or call customer service at 301-457-4100.

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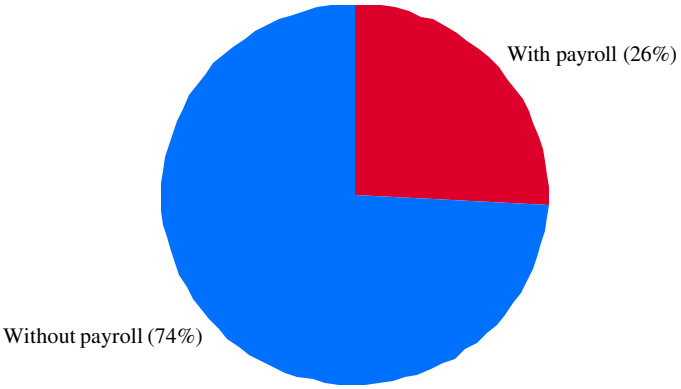
1. Bureau of Economic Analysis, Industry Accounts Data: Gross Domestic Product by Industry in Current Dollars as a Percentage of Gross Domestic Product, **http://www.bea.doc.gov/bea/dn2/gposhr.htm** . For nonemployer data, *see* **www.census.gov/prod/ec97/97x-cs4.pdf**, which is published annually.

2. All figures on this page are presented in current dollars and not adjusted for inflation; thus, 1997 data are expressed in 1997 dollars, and 1992 data in 1992 dollars. Between 1992 and 1997, consumer prices increased 14% and producer prices 7%.

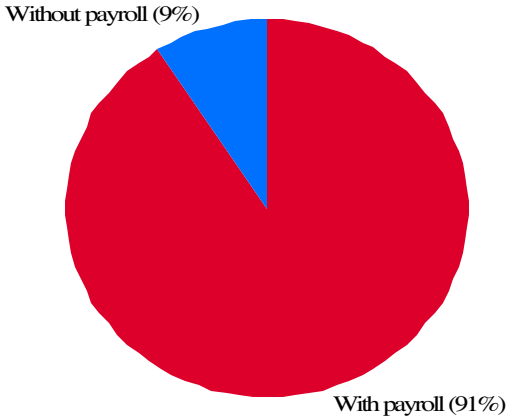
3. For a comparison of the NAICS with the SIC system, see the report, Bridge Between NAICS and SIC, at **http://www.census.gov/epcd/ec97brdg/**

4. Nonemployer Statistics, 1997 Economic Census Core Business Statistics Series, U.S. Census Bureau, January 2001 (EC97X-CS4). **http://www.census.gov/epcd/nonemployer/1997**

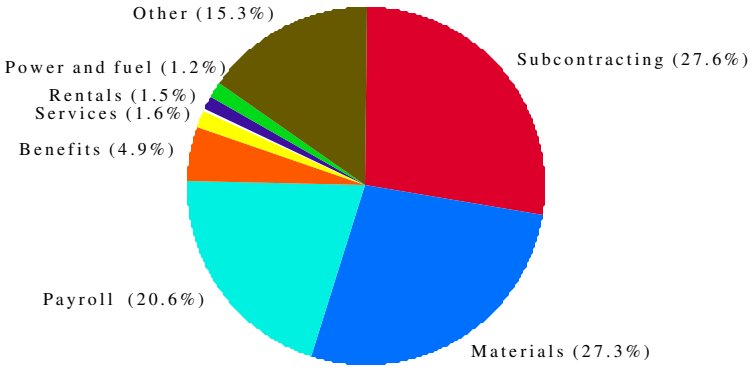
3a. Percentage of construction establishments, with and without payroll, 1997



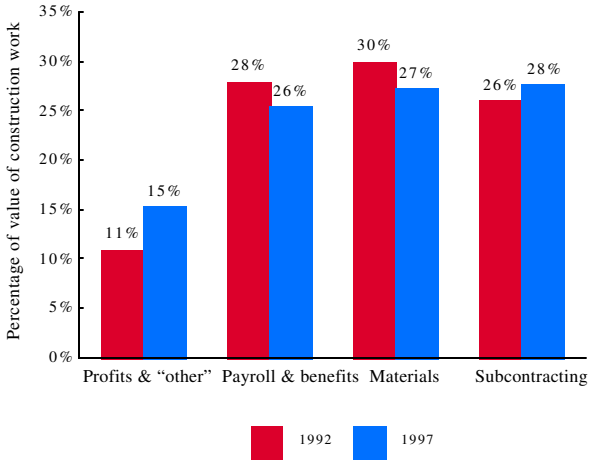
3b. Share of dollar value produced in construction by establishments, with and without payroll, 1997



3c. Where construction income goes, 1997
(Payroll establishments)



3d. Where construction income goes, 1992 v. 1997
(Payroll establishments)



Note: Charts 3a and 3b - Include all construction establishments, based on tax rolls; 2.55 million construction establishments (payroll and nonemployer) and a total dollar value of $945.7 billion.

Chart 3c. The calculation is based on a value of construction work totaling $845.5 billion; excluded are "nonconstruction" receipts totaling $13 billion, such as equipment rental and insurance. Power and fuel include electricity, gas, diesel fuel, and lubricating oils and greases. Rental costs include machinery, equipment, and buildings. Services consist of communications services and repairs to buildings, machinery, and equipment. "Other" includes profit and other expense. "Other" includes profit and other expenses.

Source: Charts 3a and 3b - *Industry Summary, 1997 Economic Census, Construction Subject Series*, U.S. Bureau of the Census, January 2000 (EC97C23S-IS); *Nonemployer Statistics, 1997 Economic Census Core Business Statistics Series*, U.S. Census Bureau, January 2001 (EC97X-CS4).

Chart 3c and 3d - Based on data from *Industry Summary, 1997 Economic Census, Construction Subject Series*, U.S. Bureau of the Census, January 2000 (EC97C23S-IS).

4

Employees, Establishments, and Dollar Value Produced in Construction

The ranking of construction industries varies in this chart book, depending on whether the number of employees or establishments or dollar value produced is considered (charts 4a, 4b, and 4c).

Census Bureau data show that payroll establishments were 26% of construction establishments in 1997, but produced 91% of the dollar value of business done in the construction industry (*see* chart book page 3). Generally, the types of payroll establishments that employ more workers create more dollar value.

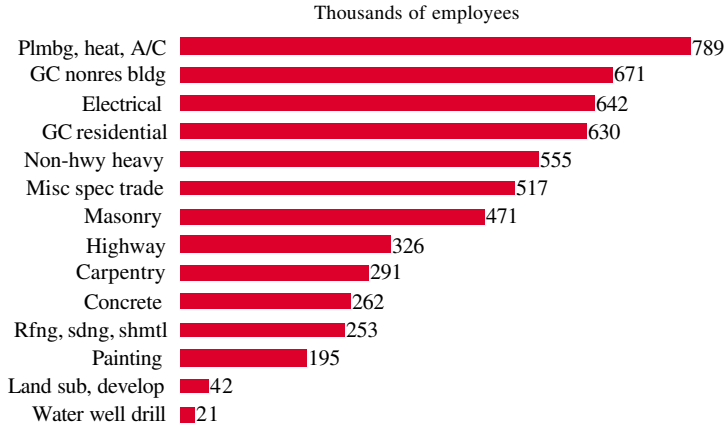
Twenty-eight percent of the dollar value of payroll establishments was subcontracted in 1997. As some types of establishments subcontract a large share of their work, they produce a disproportionately high output compared with the number of their employees. For instance, nonresidential building construction, NAICS 2333, which had 12% of payroll employees, produced $206.7 billion or 24% of the value of work of payroll establishments in 1997. Yet, 57% of the work produced by NAICS 2333 was subcontracted in 1997.

The percentage of establishments without payroll varies among construction "industries" (chart 4d). In some industries, more than 80% of the establishments are without payroll; for instance, land subdivision (NAICS 2331), other special trade contractors (NAICS 2359), painting (NAICS 2352), and carpentry (NAICS 2355) (*see* chart book page 21.) For carpentry, which had the largest share of establishments without payroll of the construction industries – 88% – the dollar value of business done by establishments without payroll in 1997 totaled $12.8 billion, about 32% of the total value for carpentry.

Because of the adoption of NAICS, numbers from the 1997 Economic Census are not directly comparable with data presented previously. About 3% of the payroll establishments now classified as construction were not included in construction under the SIC system (*see* chart book page 1). The following table shows NAICS codes used for charts 4a through 4d.

1997 NAICS codes	Construction industries
2331	Land subdivision and land development
2332	Residential building construction
2333	Nonresidential building construction
2341	Highway, street, bridge, and tunnel construction
2349	Other heavy construction
2351	Plumbing, heating, and air-conditioning contractors
2352	Painting and wall covering contractors
2353	Electrical contractors
2354	Masonry, drywall, insulation, and tile contractors
2355	Carpentry and floor contractors
2356	Roofing, siding, and sheet metal contractors
2357	Concrete contractors
2358	Water well drilling contractors
2359	**Other special trade contractors**

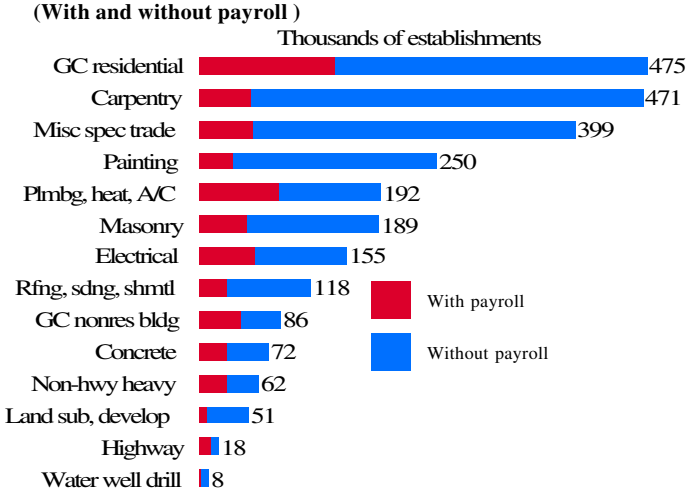
4a. Number of employees in selected construction industries, 1997
(Payroll establishments)



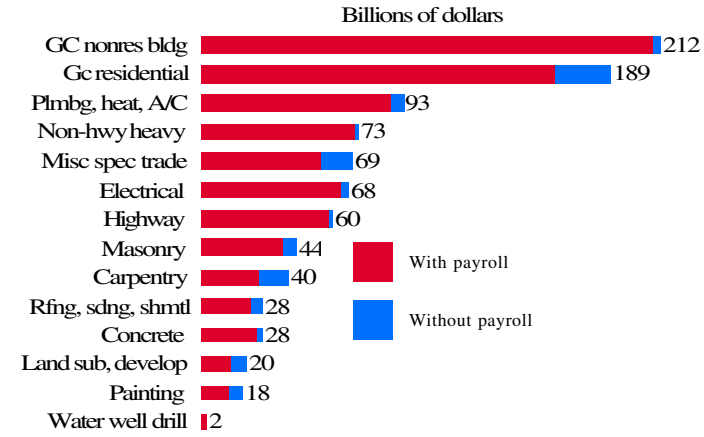
Note: All charts - Charts include all construction industries listed under NAICS at the four-digit level. Data based on tax rolls. Because some classifications have changed with the adoption of NAICS, numbers provided here are not comparable to charts in *The Construction Chart Book, Second Edition,* which used the SIC system.

Chart 4a - Total of 5.7 million payroll employees in construction in 1997.

4b. Number of establishments in selected construction industries, 1997
(With and without payroll)



4c. Dollar value produced, by selected construction industry, 1997
(With and without payroll)



4d. Percentage of establishments without payroll, by construction industry, 1997

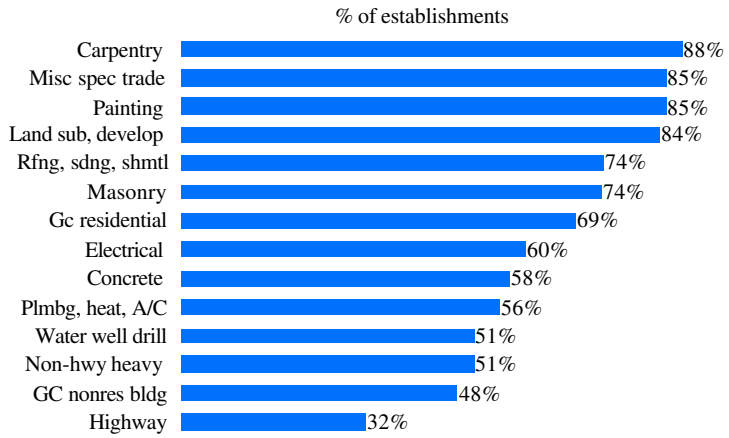


Chart 4b - Total of 2.55 million establishments.
Chart 4c - Total dollar value produced was $945.7 billion.

Source: All charts - Census Bureau, U.S. Department of Commerce (Nonemployer Statistics, 1997 Economic Census, Core Business Statistics Series, January 2001, EC97X-CS4; Industry Summary, 1997 Economic Census, Construction Subject Series, January 2000, EC97C23S-IS. See www.census.gov/epcd/nonemployer/1997/us/).

5

The Value of Construction

The Census Bureau publishes the *Value of Construction Put in Place* series. Preliminary data are published monthly and quarterly, in advance of complete annual reports. For 1997, the *Value of Construction Put in Place* series set the annual value of construction at $653.4 billion, in contrast with another Census Bureau series, the *Economic Census - Construction,* which reported a $612.2 billion net value for payroll establishments (*see* chart book pages 3 and 4).

The differences between figures produced by the two series result from differing survey and estimate methods. The *Economic Census - Construction* is limited to receipts for construction work done by establishments in the construction industry.

By contrast, the *Value of Construction Put in Place* series includes work done by projects in any industry, and is based on ownership, which may be public or private. The series broadly covers new construction, improvements, and major replacements, such as the complete replacement of a roof or heating system. If a construction project extends before or after the time covered, the project's value is adjusted, based on input from the owner.

The value-put-in-place series includes costs of (1) materials installed or erected, (2) labor, (3) construction rental equipment, (4) the contractor's profit, (5) architectural and engineering work, (6) miscellaneous overhead and office costs chargeable to the project on the owner's books, and (7) interest and taxes paid during construction (except state- and locally owned projects).

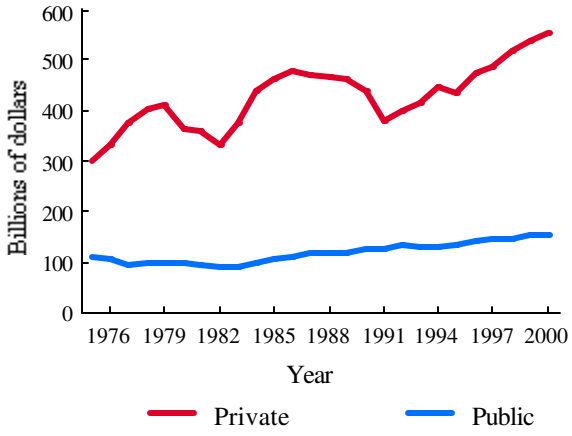
Not included are the costs of production machinery, such as heavy industrial machinery, printing presses, stamping machines, bottling machines, and display cases and shelving in stores. Also excluded is the drilling of gas and oil wells, including the construction of offshore drilling platforms and the digging and shoring of mines. Although additions and renovations are counted, maintenance and repairs to existing structures or service facilities are not. While modular homes are included, mobile homes are not.

In the value-put-in-place series, privately owned construction is larger than publicly owned construction in terms of dollar value, but is subject to market fluctuations. Private construction has ranged from $298.6 billion to $555.1 billion since 1975 (1996 dollars; chart 5a). Although the value of residential buildings has fluctuated, they remain the largest share of private construction (*see* chart book pages 6 and 7). Buildings are the largest portion of public construction (chart 5b; see chart book page 6).

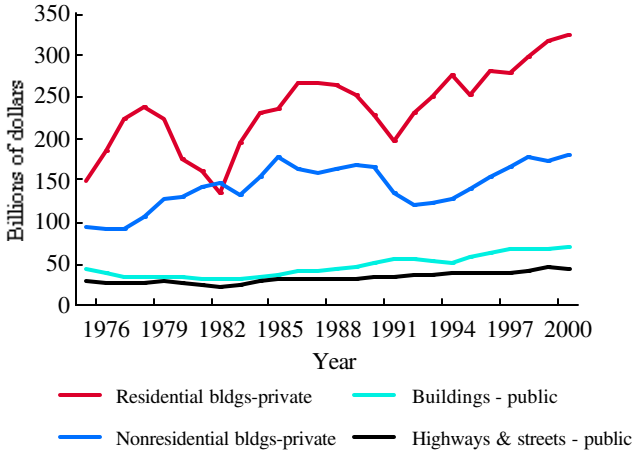
When the growth of privately owned nonresidential construction is compared by region, the South has shown the most growth (chart 5c).

5

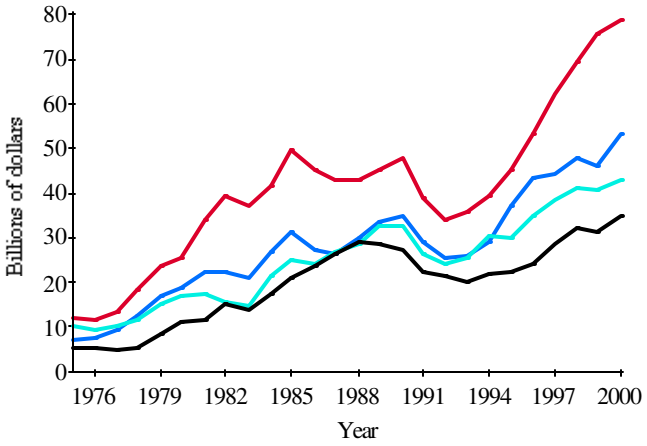
5a. Value of construction, public and private sector, 1975-2000
(1996 dollars)



5b. Value of construction, leading public and leading private, 1975-2000
(1996 dollars)



5c. Value of private nonresidential construction, by region, 1975-2000
(Current dollars)



Increase 1990 to 2000

South	64%
West	51%
Midwest	31%
Northeast	29%

South
West
Midwest
Northeast

Note: Charts 5a and 5b - Public and private construction totaled $815 billion in 2000 dollars, but $707 billion in 1996 dollars in 2000, according to *Value of Construction Put in Place*. For comparisons, dollar amounts have been adjusted to account for inflation; *see* "constant dollars" in glossary.

Chart 5c - All figures are in current dollars. Private nonresidential construction totaled $194 billion in 1999 (or $173 billion in 1996 dollars). Only current dollar amounts are available for the regional data. The states and the District of Columbia are divided into regions as follows: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont – Northeast; Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia – South; Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin, – Midwest; Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming – West.

Source: Charts 5a and 5b - Bureau of the Census, *Value of Construction Put in Place (Current Construction Reports)*, C30/01-5 and earlier issues. Washington D.C.: U.S. Government Printing Office.

Chart 5c - Bureau of the Census, C30 Supplement, *Value of Construction Put in Place Supplement*, Table S1, Private Nonresidential Buildings Projects, by Geographic Division and Type of Construction, various years. **http://www.census.gov/pub/const/C30/tableS2.pdf**

6

The Value of Private- and Public-Sector Construction

The *Value of Construction Put in Place* series classifies projects as privately owned or government owned during construction. Private construction is categorized as residential, nonresidential, farm nonresidential, public utilities, and all other privately owned nonbuilding projects. Public construction consists of housing and redevelopment, educational, hospital, other buildings, highways and streets, conservation and development, sewer systems, water supply and miscellaneous nonbuildings.

As measured by the series, the value of private construction was much higher than that of public construction — $555 billion for private construction and $152 billion for public construction in 2000, a ratio of 3.7 to 1.[1] The value of construction measured by this series totaled $707 billion in 2000.

The largest share of private construction, residential buildings, which includes single-unit and multiple-unit structures, totaled $323.7 billion in 2000 (chart 6a). The category includes major improvements also, such as a new roof. Repairs to an existing roof, however, are not counted by the value-put-in-place series as an improvement (*see* chart book page 7).

Nonresidential buildings, the second-largest category in privately owned construction, includes offices, factories, hotels, gymnasiums, private schools, and hospitals. Office construction soared during a boom in the mid-1980s, then slumped, and has been increasing steadily in the late 1990s, reaching $47.6 billion in 2000 (chart 6b).

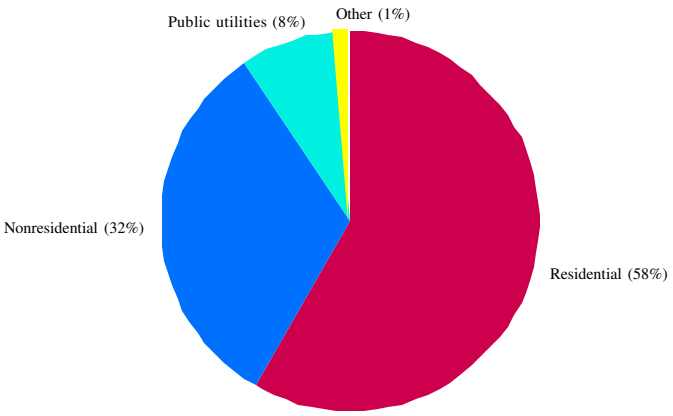
For each public utility category, construction expenditures are classified in terms of the industry rather than the function of the building or structure. Construction expenditures made by the following privately owned public utility companies or cooperatives are included in this category, such as railroad, telephone, television cable, gas, electric light and power, and petroleum pipelines.

"Other" construction includes privately owned streets and bridges, parking area, sewer and water facilities, parks and playgrounds, golf courses, and airfields.

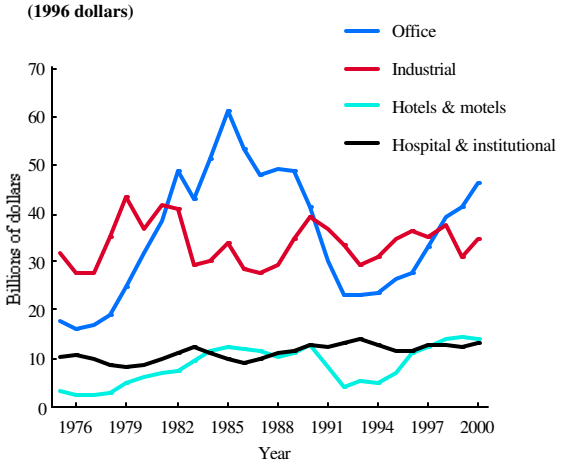
Looking at public construction by type, the relative rankings remained the same in recent years, although the size of some types of construction changed (chart 6c). Public buildings totaled $70.4 billion in 2000, an increase of 11% in the last five years (chart 6d). Industrial buildings declined by 28.7% in the years 1996 through 2000 to $991 million, while educational building construction grew, with a 30.3% increase in the same years to $37.2 billion. Highways and streets increased from $39.4 billion to $45.2 billion in the four years, a 14.8% increase (chart 6c), while military facilities dropped from $2.6 billion in 1996 to $2.0 billion in 2000, a 22.3% decrease.

1. Figures on this page are in 1996 dollars. To facilitate comparisons, dollar amounts have been adjusted to account for inflation; *see* "constant dollars" in glossary.

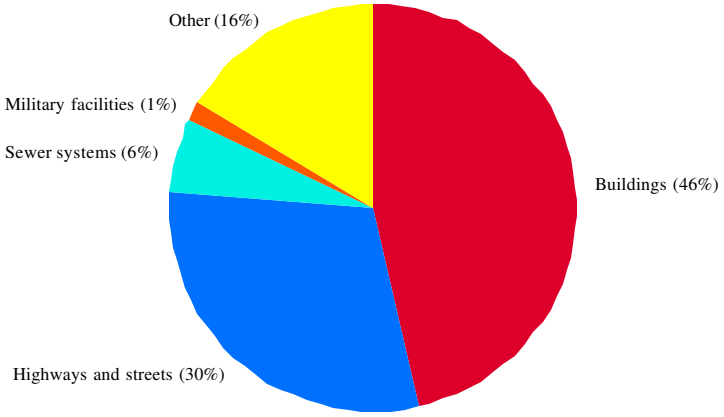
6a. Share of dollar value of private-sector construction, by type, 2000



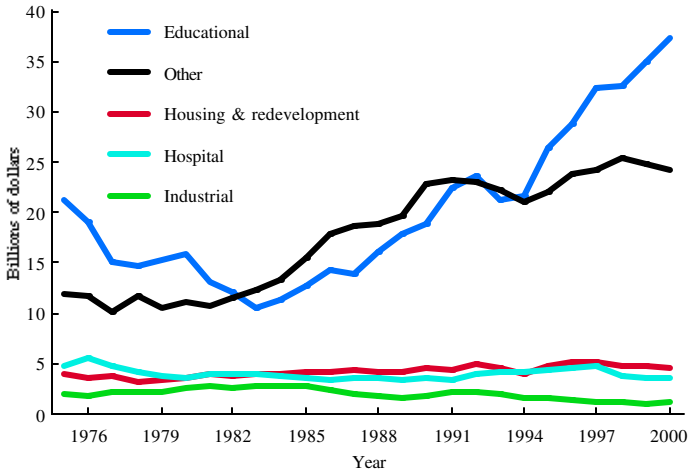
6b. Value of private nonresidential construction, by type, 1975-2000 (1996 dollars)



6c. Share of dollar value of public-sector construction, by type, 2000



6d. Value of public-sector building construction, by type, 1975-2000 (1996 dollars)



Note: Chart 6a and 6c - Percentages do not add up to 100 because of rounding.

Chart 6a - Private-sector construction was $555 billion in 2000 (1996 dollars)."Other" includes conservation and development, water supply facilities, and miscellaneous public construction.

Chart 6c - Public-sector construction totaled $152 billion in 2000 (1996 dollars). "Industrial" includes construction for the U.S. Department of Energy – research and development facilities and manufacturing, assembling, and processing buildings, and their related facilities, such as arsenals, ordnance works, and shipyards. "Other" includes general administrative buildings, prisons, police and fire stations, courthouses, civic centers, passenger terminals, space facilities, and postal facilities.

Chart 6d - "Other" includes transit systems, airfields, and recreational, power generating, and open parking facilities.

Source: Charts 6a and 6c- Bureau of the Census, *Value of Construction Put in Place* (Current Construction Reports), C30/01-5. Washington, D.C.: U.S. Government Printing Office, May 2001.

Charts 6b and 6d - Bureau of the Census, *Value of Construction Put in Place* (Current Construction Reports), C30/01-5 and earlier issues. Washington, D.C.: U.S. Government Printing Office, various years.

7

The Value and Units of Residential Construction

In addition to *Value of Construction Put in Place* (series C-30, *see* chart book pages 5 and 6), the Census Bureau publishes other construction reports on housing, counting the units of housing starts, permits, and completions, as well as spending for repairs and improvements.

Housing Starts (C-20), *Housing Completions* (C-22), and *Building Permits* (C-40) have been consolidated and published as *New Residential Construction*, as of May 2001. This combined data source provides the number of (1) new housing units authorized by building permits; (2) housing units authorized to be built, but not yet started; (3) housing units started (excavations dug); (4) housing units under construction; and (5) housing units completed. (*See* Glossary.) The methodology used for the new series is also changed, which may limit comparisons to data for earlier years.

Data from *Value of Construction Put in Place* indicate that, after the economic expansion of the mid-to-late 1990s, the value of residential construction set new records (chart 7a). The residential sector accounted for 46% of all construction in 2000, compared with 41% in 1990. In 2000, the value of private-sector residential construction was $323.7 billion, an increase of $94.8 billion from 1990; the value of public housing amounted to $4.5 billion in 2000 (1996 dollars).

The residential figures do not include the value of land on which housing is sited. Nor do the data cover mobile homes, although the numbers do include production of modular housing. Manufactured-housing placements are addressed in a separate report. (Unlike modular housing, manufactured housing is built and assembled off site, then delivered.)

When the value of new private residential-building construction is broken down and traced over time (*see* chart 7b), it becomes clear that the value of new single-unit housing constructed each year has grown substantially, from $135.3 billion in 1990 to $204.8 billion in 2000 (1996 dollars).

Along with the expansion of the value of residential construction in the 1990s, the numbers of units of new multi- and single-family construction increased, as did units of single-family housing production, making the 1990s the longest housing expansion in the last half century (chart 7c). New privately owned housing starts totaled 1.57 million units in 2000, compared with 1.19 million in 1990 and 1.29 million in 1980.

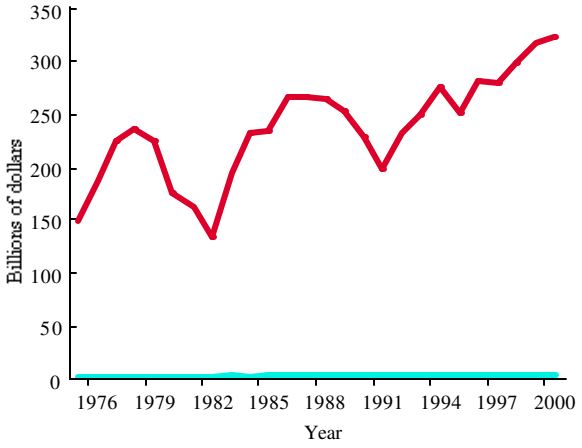
Another Census Bureau series, *Expenditure for Residential Improvements and Repair* (C-50), provides estimates of spending by property owners for maintenance, repairs, additions, alterations, and major replacements to residential properties (including, for instance, a guest house or landscaping) during the current quarter and for specified preceding quarters, with some comparative data for earlier years for the United States and regions.

According to the series, in 2000, about $150.9 billion was spent on owner-occupied and rental units, combined, for maintenance, repairs, additions, and alterations (or $102.1 billion and $48.8 billion, respectively, for owner-occupied and rental units, in 2000 dollars, chart 7d). Maintenance, repair, addition, and alteration estimates are based on data collected from about 5,000 homeowner interviews for the BLS Consumer Expenditure Survey and 3,000 rental-unit owners, who are contacted by mail or telephone by the Census Bureau each quarter.

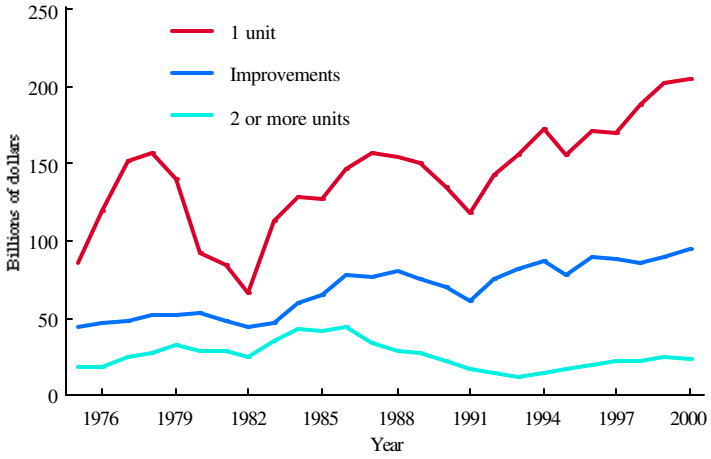
The housing market reflects, in part, changes in the underlying economy. Soaring stock prices, favorable financing terms, solid job growth, and strong consumer confidence all contributed to the housing expansion in the late 1990s. The baby boomers, the oldest of their children, and immigrants (especially the Hispanic population, which has increased dramatically in recent years) are expected to have a large effect on housing demand.[1]

1. *The State of the Nation's Housing, 2001*. Harvard University Joint Center for Housing Studies, 2001.

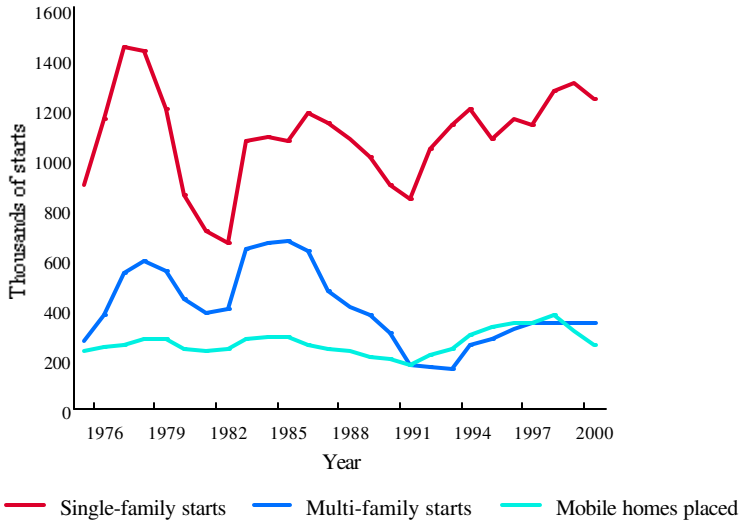
7a. Value of residential construction, private and public sector, 1975-2000 (1996 dollars)



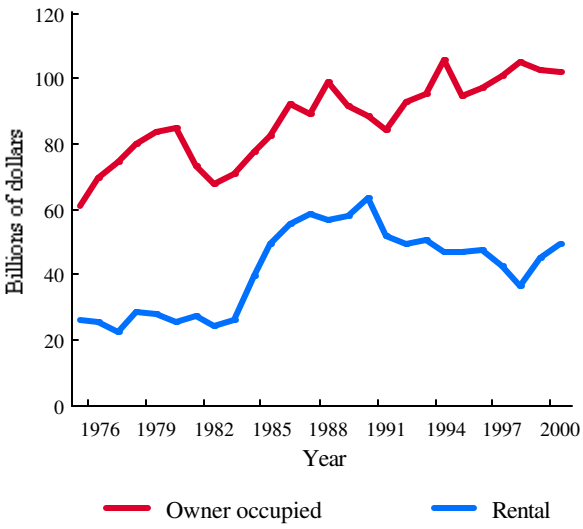
7b. Value of private residential construction, by type, 1975-2000 (1996 dollars)



7c. Number of housing starts, 1975-2000



7d. Spending on residential upkeep and improvement, 1975-2000 (2000 dollars)



Note: Chart 7a - In 2000, residential construction totaled $328.2 billion.
Chart 7b - Private-sector residential construction totaled $323.7 billion in 2000.
Chart 7c - Total of 1.57 million housing units started in 2000; data cover private sector only.
Chart 7d - In 2000, spending on residential maintenance, repairs, additions, and alterations totaled about $150.9 billion.

Source: Charts 7a and 7b - *Value of Construction Put in Place*. Series C-30, Bureau of the Census, 2001 (and earlier issues)
Chart 7c - Housing Starts, Series C-20, U.S. Bureau of the Census, cited as source by: *The State of the Nation's Housing, 2001*. Harvard University Joint Center for Housing Studies 2001.
Chart 7d - Expenditure for Residential Improvements and Repairs. Series C-50, U.S. Bureau of the Census, **http://www.census.gov/prod/www/abs/c50.html** ; *The State of the Nation's Housing, 2001*. Harvard University Joint Center for Housing Studies, 2001.

8

Types of Construction Companies and Reported Income Levels

In 1998, for the first time, all types of businesses used the new North American Industry Classification System (NAICS) codes on tax returns to describe their primary business activity (see chart book page 1). Also beginning in 1998, the Internal Revenue Service switched from using Standard Industrial Classification (SIC) codes to list industries in its *Statistics of Income Bulletin*. Thus, statistics of income data for 1998 are not easily comparable to data for 1997 and earlier. (Year-to-year comparability of statistics of income is affected also by consolidations and mergers and changes in tax laws.)

In construction, the changes in the classification system resulted in an increase of 9.7% in the number of returns and 18.4% in total assets for all corporate tax returns – for corporations and S corporations – counted as part of the industry in 1998 (chart 8a). (Some categories were moved to construction from other industries as part of the transition to NAICS.)

The *Statistics of Income Bulletin* is published quarterly by the Internal Revenue Service (IRS), based on about 200 million federal income tax returns filed each year by individuals and businesses; this is in contrast to the Economic Census, which is based on establishments. For the *Statistics of Income Bulletin*, business returns are filed even if a company does not produce income in a given year. A company with diversified activities or multiple establishments is included in only one industry based on its primary business activity, although many business operations may be unrelated to the industry in which the company is classified. The result can be some pluses and minuses for defining the construction industry.

The IRS *Statistics of Income Bulletin* distinguishes between corporations and S corporations. Corporations file corporate income tax, while their shareholders also file personal income tax on any dividends earned from the shares. S corporations are closely held businesses with no more than 75 shareholders (a husband and wife – and their estates – are counted as one). Like the corporations, S corporations shield their shareholders from liability. However, although S corporations file federal income tax returns, they are not taxed directly. Instead, they pass net income to their shareholders, who pay income taxes.

Partnerships – like S corporations – file annual information returns identifying allocations and distributions. Then each partner files his or her allocated profits along with personal income tax returns. Sole proprietorships pay taxes on their profits as personal income.

Using SIC codes to facilitate an historical comparison shows that the number of sole proprietorships and S corporations increased steadily, while other corporations and partnerships remained relatively stable in recent years (chart 8b).

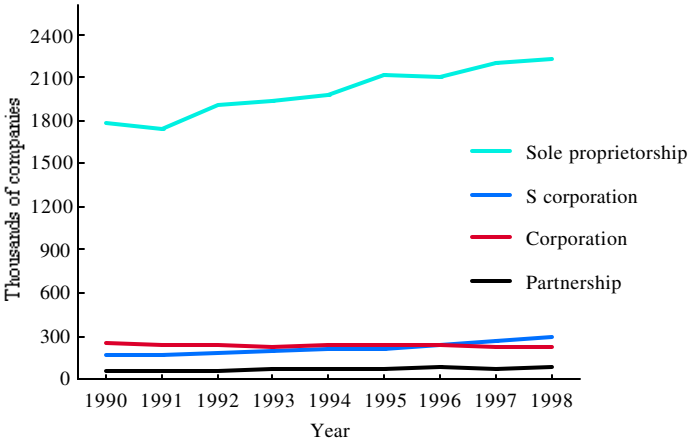
Business receipts totaled $1,109 billion in 1998, nearly double the level of $652.5 billion in 1990 (chart 8c). From 1990 to 1998, sole proprietorships increased by 45% in business volume as well, from $99.2 billion to $143.9 billion. As a portion of total business receipts, sole proprietorships decreased slightly, however, from15% in 1990 to 13% in 1998. By the same measure, S corporations have grown substantially as a share of the total, from $165.1 billion, 25% of the total in 1990, to $391.9 billion, 35% of total receipts in 1998.

In the decade 1990 to 1999, reported pre-tax corporate profits increased from $10.9 billion to $36.2 billion, more than tripling at the same time as a boom in the construction industry (chart 8d; *see* chart book page 20).

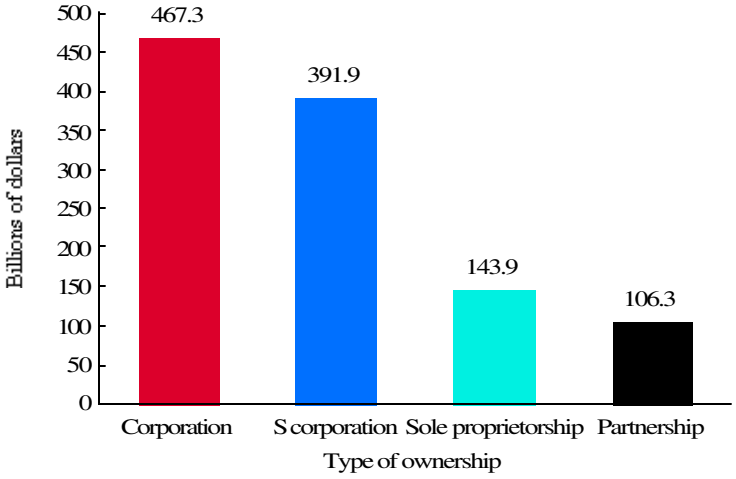
8a. Number of IRS returns from construction businesses, SIC v. NAICS coding, 1998

Type	SIC	NAICS	% change
Sole	2,228,593	2,243,044	0.6%
Partnership	81,981	125,823	53.5%
Corporations and S corporations	503,139	551,935	9.7%
Total	2,813,713	2,920,802	3.8%

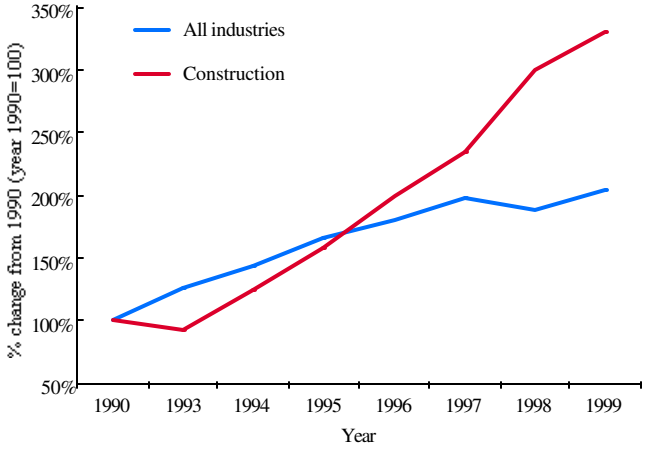
8b. Number of construction companies, by type of ownership, 1990-98



8c. Business receipts reported in construction, 1998



8d. Index of corporate profits before taxes, construction and all industries, 1990-99



Note: All charts - "Corporations" refers to corporations other than S corporations.
Chart 8a - No SIC data are available for S corporations. The number used in the chart for "Corporations and S corporations" under SIC is an estimate, based on the known percentage change for corporations.
Chart 8b - Total of 2,813,713 construction companies of all types in 1998. SIC codes are used for this chart.
Chart 8c - Business receipts in 1998 totaled $1,109 billion. NAICS codes are used for this chart.

Source: Chart 8a - Internal Revenue Service, *Statistics of Income Bulletin*, Summer 2001, 66-81, fig. F.
Chart 8b - Internal Revenue Service, Spring 1994 (table 1, p. 46), Fall 1994 (table 1, p. 41, p. 85), Spring 1995 (table 1, p. 83), Fall 1995 (table 1, p. 41); Spring 1996 (table 1, p. 36), Summer 1996 (table 14, p.142), Fall 1996 (table 1, p. 42, p. 86); Spring 1997 (table 1, p. 46), Summer 1997 (table 1, p. 16), and Fall 1997 (table 14, p. 214), Spring 1998, Spring 1999, Summer 1999, Fall 1999, Winter 1999-2000, Spring 2000 (Table 1). Each volume has more than one table 1; the page number is the first page on which the cited table appears. Most of the tables were downloaded from the IRS web site: **http://www.irs.ustreas.gov/prod/tax_stats/soi/**
Chart 8c - Internal Revenue Service, *SOI Bulletin*, Summer and Fall 2000, Winter 2000-2001, and Spring and Summer 2001 issues.
Chart 8d - U.S. Census Bureau, *Statistical Abstract of the United States*: 2001, Table 759.

9

The Diversity of Ownership of Construction and All Companies

Ownership of construction companies by women and African-Americans lagged behind these groups' ownership of companies in all industries in 1997, but the proportion of Hispanic ownership in construction exceeded Hispanic ownership of businesses overall. These trends mirror the employment picture in the industry; the proportion of workers who are women or members of racial minorities in construction is lower than in all industries and the share of Hispanic workers in construction is higher. (There likely is some overlap in data showing women and African-Americans, Hispanics, and other minorities.)

In 1997, a total of 2,33,424 construction companies produced $944 billion in revenues. Among all industries, revenues for 20.8 million nonfarm businesses totaled $18.6 trillion.

Overall, women owned 5.4 million companies in 1997, 26% of the total. In addition to the companies in which women held a majority ownership, women shared ownership equally with men in an additional 3.6 million businesses – 17% of nonfarm businesses. *The statistics are* from the *Survey of Minority-Owned Business Enterprises* and the *Survey of Women-Owned Business Enterprises*, reports produced by the economic census program. The publications provide valuable economic data on business owners' race, ethnicity, and gender; the number of companies, sales, and receipts; paid employees; and annual payroll.

In construction in 1997, women owned 157,173 companies, accounting for 7% of the 2.3 million businesses, employing 518,142 employees, and generating $67.6 billion in business revenues (chart 9a). Women also owned a 50% share of 345,161 other construction companies in the same year.

Overall, businesses owned by minorities – including African-Americans, Hispanics, and Asians and Pacific Islanders, American Indians, and Alaska Natives – totaled 3 million in 1997, accounting for 14.6% of the nation's total. Minority-owned construction companies totaled 264,227 in 1997, accounting for 11.5% of all construction companies.

Blacks owned 56,508 construction companies, with $7.7 billion in business revenues. This compares with 823,499 companies in all industries having $71.2 billion revenues overall, which were owned by this group (chart 9b).

Hispanics owned 152,573 construction companies with $21.9 billion in business revenues, compared with 1.2 million companies producing $186.3 billion in business revenues in all industries (chart 9c).

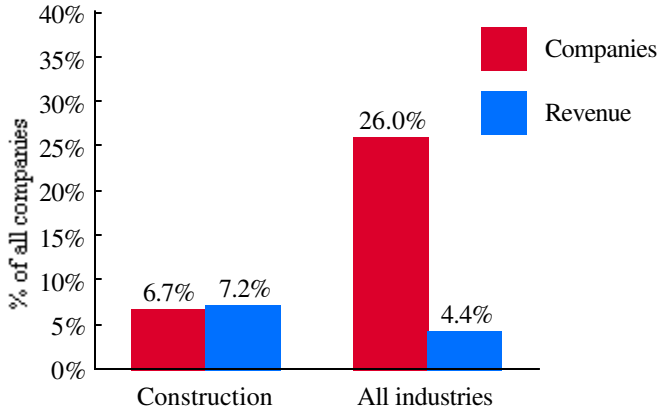
Unlike in previous years, the Economic Census provided data for businesses owned by Asians and Pacific Islanders and for businesses owned by American Indians and Alaska Natives in two separate publications for 1997. Members of these other minority groups owned 55,146 construction companies with $12.9 billion in business revenues, and 1.1 million companies with $341.3 billion in business revenues overall (chart 9d).

Because of several changes in survey methodology in 1997, the numbers are not directly comparable to those from previous survey years. The most significant changes were in the treatment of C corporations, which were not included in previous surveys and are included in the category corporations here for 1997.[1]

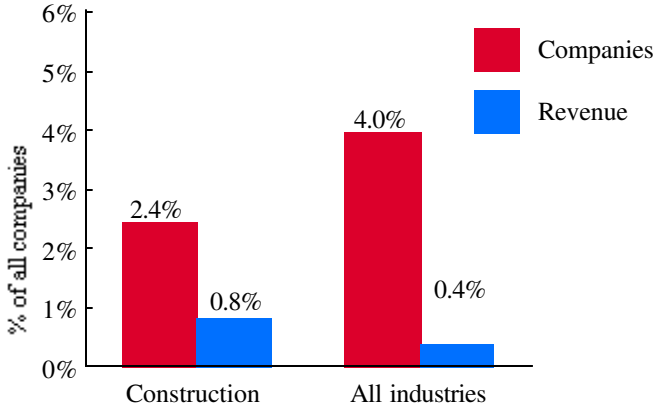
Also, the definition of ownership changed. In the past, ownership was based on the race/ethnicity/gender of the largest number of owners, without regard to the percentage of interest owned in a firm. In the 1997 surveys, the definition of a business as minority- or woman-owned was based on the race/ethnicity/gender of the person owning a majority interest in the business. In previous surveys, if the number of women or minority members was 50% or more of a company's owners, the company would be counted as a woman- or minority-owned company. In the 1997 survey, only a company having 51% or more of its interest owned by women or members of minority groups was counted as a woman- or minority-owned company. Businesses equally owned by male and female or minority and nonminority owners, or having no single majority interest were excluded from the women business counts (or the minority-owned business counts), and tabulated and reported in a separate publication, *Equally Owned Business Statistics*.

1. C corporations, under state laws, are all incorporated businesses, except S corporations.

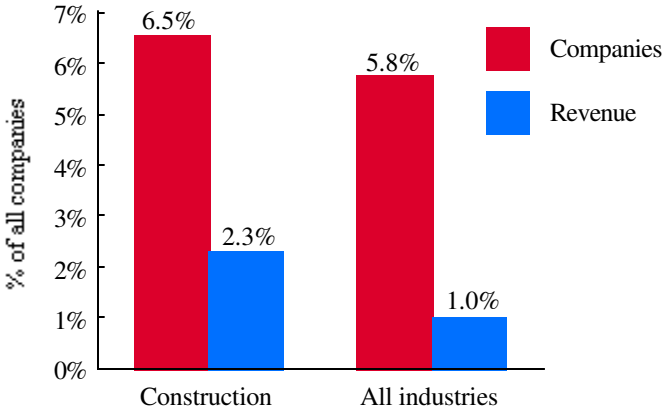
9a. Women-owned companies as a percentage of the total in construction and in all industries, 1997



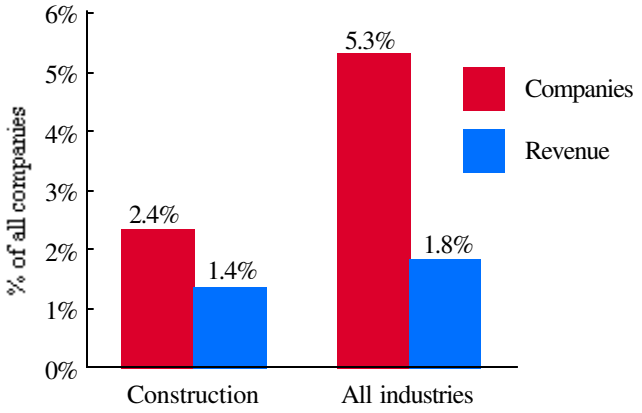
9b. Black-owned companies as a percentage of the total in construction and in all industries, 1997



9c. Hispanic-owned companies as a percentage of the total in construction and in all industries, 1997



9d. Other-minority-owned companies as a percentage of the total in construction and in all industries, 1997



Note: All charts - Data cover private sector only

Chart 9a - Women owned 157,173 of a total of 2.3 million construction companies and 5.5 million of the 20.8 million companies in all industries in 1997, compared with a total of 2.3 million and 20.8 million, respectively.

Chart 9b - Black-owned companies totaled 56,508 in construction and 823,499 overall in 1997.

Chart 9c - Hispanic-owned companies totaled 152,573 in construction and 1.2 million overall.

Chart 9d - "Other minorities" include Alaskan Native, American Indian, Asian, and Pacific Islander.

Source: Chart 9a - Women-Owned Businesses, 1997 Economic Census ,Survey of Women-Owned Business Enterprises, Company Statistics Series. Issued March, 2001, EC97CS-2. U.S. Department of Commerce, Economics and Statistics Administration, U.S. Census Bureau **(http://www.census.gov/prod/ec97/e97cs-2.pdf)**

Chart 9b- Black-Owned Businesses, 1997 Economic Census Survey of Black-Owned Business Enterprises, Company Statistics Series. Issued March, 2001, EC97CS-3. U.S. Department of Commerce Economics and Statistics Administration, U.S. Census Bureau **(http://www.census.gov/prod/ec97/e97cs-3.pdf)**

Chart 9c- Hispanic-Owned Business, 1997 Economic Census Survey of Black-Owned Business Enterprises, Company Statistics Series. Issued February, 2001, EC97CS-4. U.S. Department of Commerce Economics and Statistics, Administration U.S. Census Bureau **(http://www.census.gov/prod/ec97/e97cs-4.pdf)**

Chart 9d- Asian and Pacific Islanders, 1997 Economic Census, Survey of Minority-Owned Business Enterprises, Company Statistics Series, Issued May, 2001, EC97CS-5. U.S. Department of Commerce, Economics and Statistics Administration U.S. Census Bureau **(http://www.census.gov/prod/ec97/e97cs-5.pdf)**; American Indians and Alaska Natives, 1997 Economic Census, Survey of Minority-Owned Business Enterprises, Company Statistics Series, Issued May, 2001, EC97CS-6. U.S. Department of Commerce Economics and Statistics Administration U.S. Census Bureau **(http://www.census.gov/prod/ec97/e97cs-6.pdf)**

10

Business Failure Rates and Competitiveness in Construction

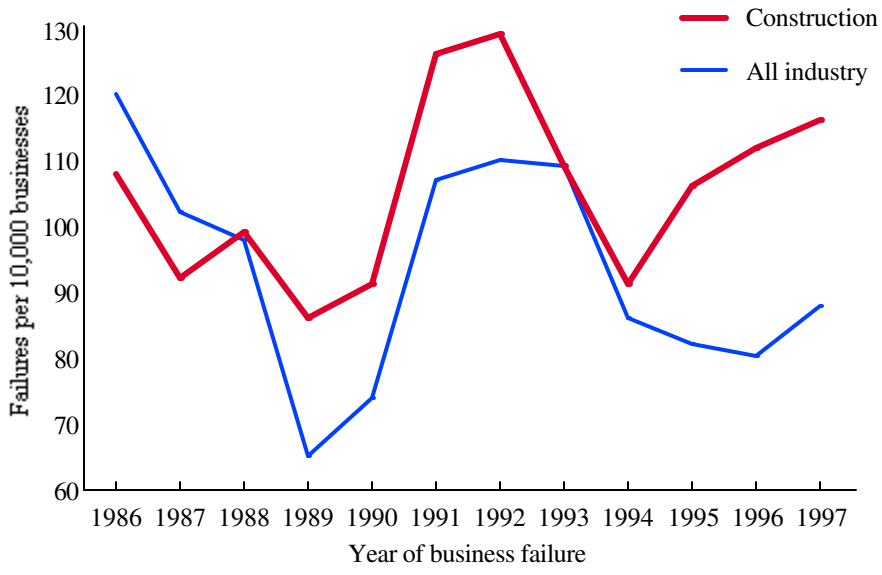
Dun & Bradstreet's Business Failure Record has reported business failure counts monthly and annually and provided the most comprehensive data available on business failures. (After 1997, the data series was discontinued.)

Dun & Bradstreet maintains its own database on more than 10 million businesses, including information on business failures. The database contains information about individual businesses of all sizes, compiled from sources like chambers of commerce, banks, and insurance companies. After collecting names of companies, Dun & Bradstreet contacts a company by mail or in person to verify and update company information. The number of concerns listed in the database fluctuates, because of the economy's volatility.

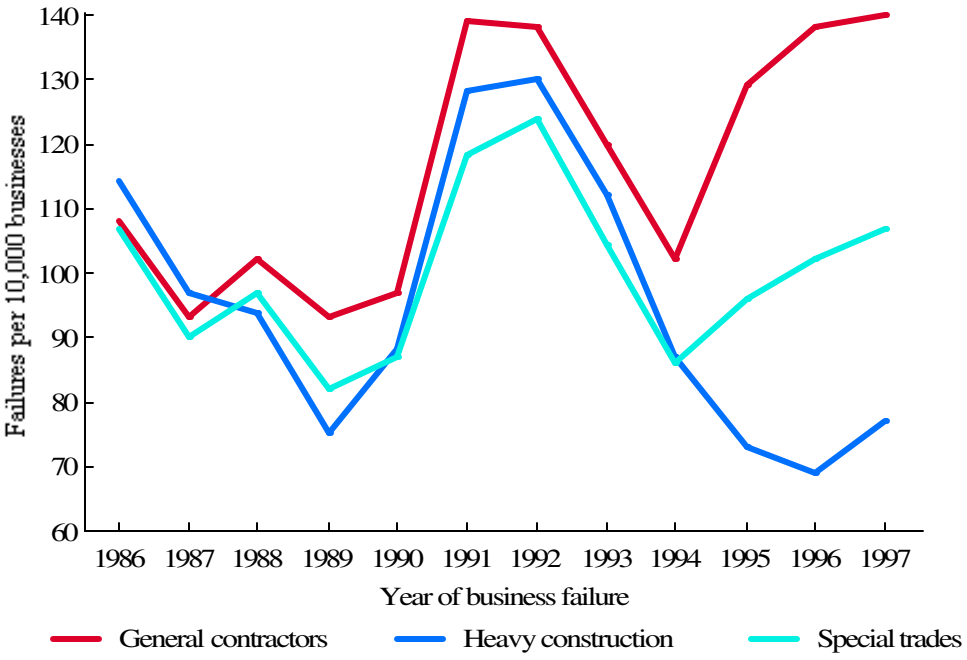
Dun & Bradstreet defines a business failure as a closure or interruption of business with a loss to creditors. This definition includes businesses that cease operations following assignment or bankruptcy; cease operations with losses to creditors after such actions as foreclosure or attachment; voluntarily withdraw, leaving unpaid debts; are involved in court actions, such as receivership, reorganization, or arrangement; or voluntarily compromise with creditors. A business closing that leaves no liabilities — as a result, for instance, of lack of profit, death, or retirement — is not classified as a failure.

The Dun & Bradstreet data show that construction businesses failed after 1988 at a higher rate than do all businesses (chart 10a). The number of business failures in construction was 10,867 in 1997, and the overall failure rate increased from 112 to 118 per 10,000 companies compared to the preceding year. All three construction sectors reported increased business failures (chart 10b). The greatest increase in the number of failures was in heavy construction, where there were 289 failures in 1996 and 346 in 1997, a 19.7% increase. General contractors, however, have been failing at higher rates than the other two construction sectors since 1988, on average. And, overall, older businesses were a larger proportion of business failures in 1997 than they were a decade earlier (chart 10c). Compared with general contracting and special trades, heavy construction had a larger increase in failure rates in 1996-97; this decline in the sector is reflected also in data on construction employment and the number of establishments (see chart book pages 4 and 20).

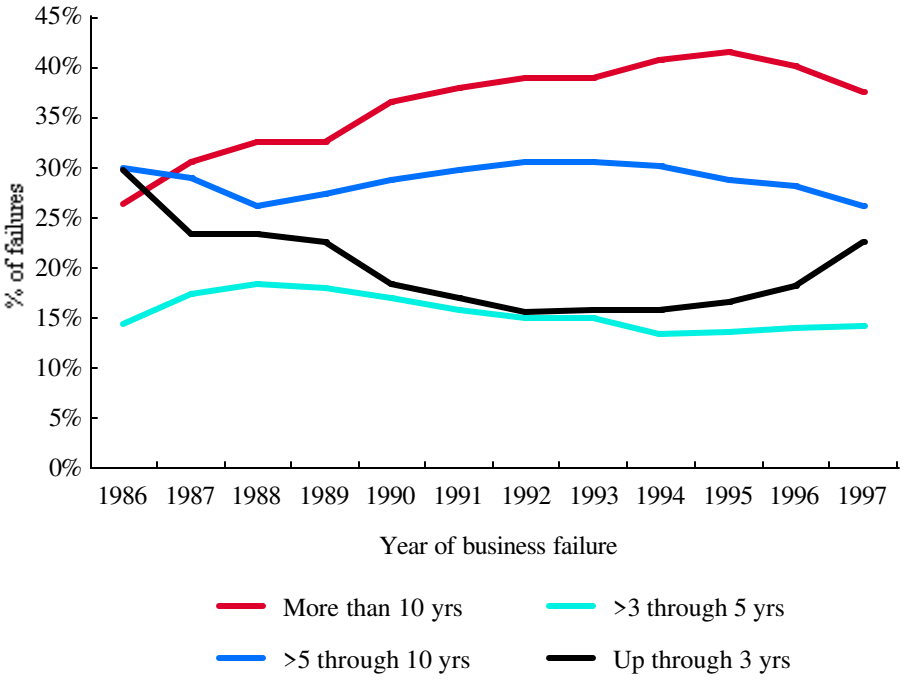
10a. Business failure rates, construction and all industries, 1986-97



10b. Construction business failure rates, by sector, 1986-97



10c. Percentage of construction failures, by age of business, 1986-97



Note: All charts - A total of 11,057 failures in 1997, among some 10 million businesses. Data are provided using SIC codes, rather than NAICS.

Chart 10c - Categories are "up to and including 3 years," "more than 3 through (including) 5 years," "more than 5 through 10 years," and "more than 10 years."

Source: All charts - Dun & Bradstreet Corporation, *Business Failure Record*, 1986-97, annually.

11

How the Bureau of Labor Statistics Defines the Civilian Labor Force

Statistics on the civilian labor force are obtained by two methods: household interviews or questionnaires and reports of establishment payroll records. Each method provides data that the other normally does not. Labor force characteristics, which are presented on this chart book page, are readily obtainable only from the household survey, while detailed industrial classification information can be readily derived only from establishment records.

Household (labor force) data are obtained from the Current Population Survey, a monthly sample survey of the population, conducted by the Census Bureau for the Bureau of Labor Statistics. This survey involves interviewing members of about 60,000 households that have been randomly selected to represent the U.S. civilian non-institutional population. The Current Population Survey is a rich source of demographic information on the labor force. The survey collects national totals of the number of people in the civilian labor force by sex, race, Hispanic origin, and age; the number employed, hours of work; industry and occupational groups; and the number unemployed, with reasons for and duration of unemployment. Comprehensive historical and current data are available from the BLS Internet site **http://www.bls.gov/cps/home.htm**. Current data are published in the BLS monthly publication, *Employment and Earnings.* Detailed data on the labor force are produced also by the Census Bureau's census of the U.S. population every 10 years.

According to Current Population Survey definitions, the civilian labor force comprises all non-institutional civilians 16 years and over classified as employed or unemployed, based on the following criteria: Employed persons comprise all who (1) during the reference week, did any work for pay or profit or worked 15 hours or more as unpaid workers in a family enterprise and (2) had jobs but who were not working because of illness, bad weather, vacation, or labor-management dispute, or because they were taking time off for personal reasons, whether or not they were paid for the time off or were seeking other jobs. The employed are classified by industry, occupation, and type of employment (*see* chart 11b). Wage-and-salary workers receive wages, salaries, commissions, tips, or pay in kind from a private employer or from a government unit. The *unemployed* did not work during the reference week, but were available for work and had looked for employment at some point in the previous four weeks. People on layoff or waiting to report to work are considered unemployed. (The civilian labor force excludes people in penal and mental facilities, homes for the aged, prisons, and on active duty in the Armed Forces.)

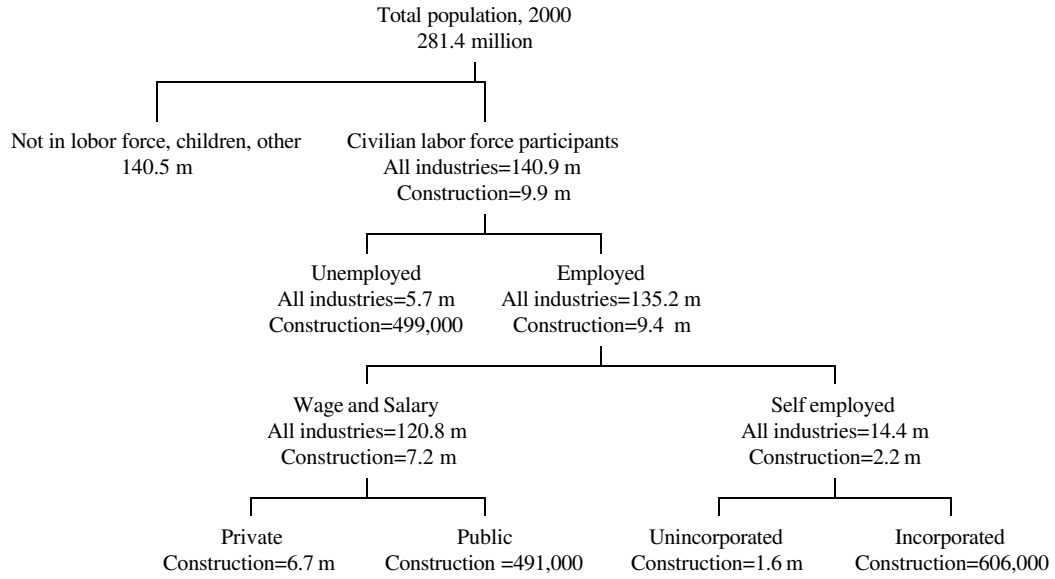
Data based on establishment records are compiled by BLS and cooperating state agencies as part of an ongoing Current Employment Statistics program. The statistical program is designed to provide detailed industry information for the nation, states, and metropolitan areas on nonfarm wage and salary employment. Survey data, gathered monthly from a sample of employers through mail questionnaires or interviewing, are supplemented by data from other government agencies and adjusted at intervals with data from government social insurance program reports. In March 2000, the reporting establishments covered 31% of all manufacturing employment, 20% of the total in private nonmanufacturing industries, and 72% of all government employees.[1] The estimates exclude the self-employed, private household workers, unpaid family workers, agricultural workers, and the Armed Forces. Unlike in the Current Population Survey, a person with two jobs is counted twice. Establishment survey data are published also in *Employment and Earnings.* Historical data are available on the site **http://www.bls.gov/ces/home.htm**.

In 2000, the civilian labor force made up about 50% of the U.S. population (chart 11a). The average unemployment rate that year for the civilian labor force was 4%, a historical low since the 1970s (see chart book page 20). The construction workforce was counted as 7% of the national workforce in 2000, while self-employed workers made up 23.4% in construction, a level that was slightly lower than in recent years. The proportion of total employment in the public sector has shrunk gradually in the last two decades, while private-sector construction employment has increased. (Self-employed workers may work in the private or public sector.)

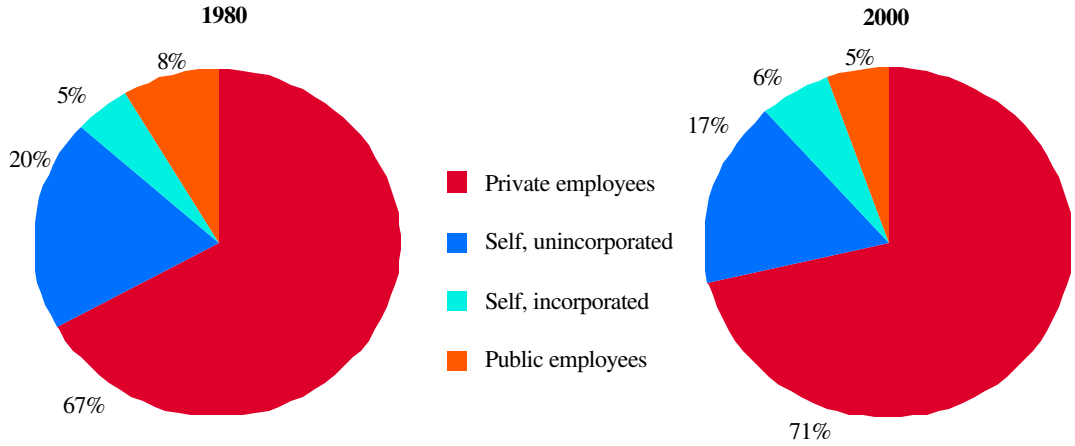
Unless otherwise noted, this chart book includes unincorporated and incorporated workers when estimating the number of self-employed. Figures for the self-employed provided in other publications may include only the unincorporated self-employed and thus may be smaller than the estimate in chart 11a.

1. U.S. Census Bureau, *Statistical Abstract of the United States: 2001*.

11a. Breakdown of the labor force, showing the number of wage-and-salary and self-employed workers in construction, 2000



11b. Type of construction employment, 1980 and 2000



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1. U.S. Census Bureau, Census 2000 Redistricting Data. Release date: April 2, 2001.

http://www.census.gov/Press-Release/www/2001/tables/dp_us_2000.PDF

2. Bureau of Labor Statistics, Household Data Annual Average. http://www.bls.gov/pdf/cpsaat1.pdf

3. Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center To Protect Workers' Rights.

Note: All charts - Charts cover all construction occupations, including managers and clerical staff.

Source: Chart 11a- U.S. Census Bureau, Census 2000 Redistricting Data. Release date: April 2, 2001, www.census.gov/ ; Bureau of Labor Statistics, Household Data Annual Average, www.bls.gov; and Bureau of Labor Statistics, 2000 Current Population Survey Earnings Files, Washington DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 11b- Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

12

The Distribution of Occupations in Construction

Skilled craftworkers or laborers, helpers, and apprentices who assist craftworkers, make up 76 to 77% of the construction workforce, while the rest consists of managerial, professional, and administrative support workers. The 1997 *Economic Census - Construction* shows that the percentage of all construction workers – nonsupervisory and nonclerical — compared with all construction employees has been declining for more than three decades (chart 12a).

In the economic census, the Census Bureau defines *construction workers* as full- and part-time employees on the payrolls of construction establishments, who are directly engaged in construction operations. These include painters, carpenters, plumbers, electricians, journeymen, mechanics, apprentices, laborers, truck drivers, helpers, equipment operators, on-site recordkeepers, security guards, and supervisors up through working foreman. *Other employees* are in executive, purchasing, accounting, personnel, technical activities, routine office functions, and above the working-foreman level. The Census Bureau asks employers to classify workers according to these definitions.

The Current Population Survey takes a different approach, asking workers to classify themselves (*see* chart book page 11). The Current Population Survey puts the workforce into 14 major occupational groups: Executive, Administrative, and Managerial; Professional, Specialty; Technicians and Related Support; Sales; Administrative Support; Private Household; Protective Service; Service, except Protective; Precision Production, Craft and Repair; Machine Operators, Assemblers, and Inspectors; Transportation and Material Moving; Handlers, Equipment Cleaners, Helpers and Laborers; Farming, Forestry and Fishing; and Armed Forces. Detailed occupational categories are provided also.

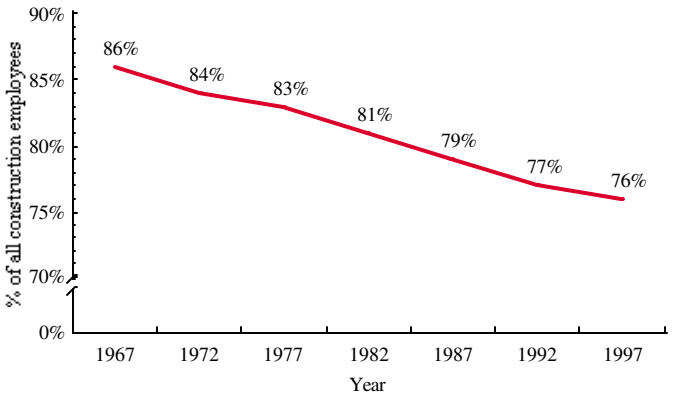
Because the Current Population Survey provides demographic and employment information on an individual level, most of the data used in this section are from that source. Some of the hundreds of occupational titles that underlie the occupational groups have been rearranged (*see* chart 12c). Because occupations may be grouped in several ways, the numbers presented in this chart book may differ from other published counts. Where indicated, these charts explicitly include supervisors and apprentices.

At the same time, some other pages in this chart book — for instance, page 13 — distinguish between "production" and "managerial and support staff," using Current Population Survey data codes above and below 500, respectively. However, unlike data from the economic census, these chart book pages (12-19) do not include onsite recordkeepers and security guards as construction workers. And, compared with the economic census, the listing used for charts 12b through 19c may include supervisors above working foreman.

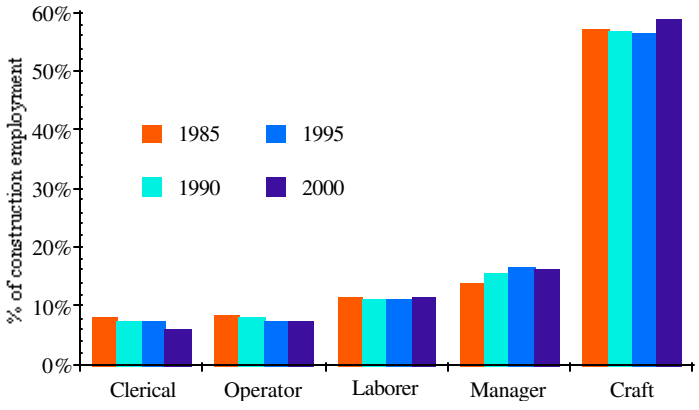
Because of differing occupational classifications, data on chart 12c differ from those used for chart 12a. Nevertheless, data from both sources show that the occupational structure in construction has been changing. The proportion of managerial and professional occupations has been increasing, while the proportion of clerical and administration support occupations declining. The proportion of machine operators and transportation and material-moving occupations shrank, but the proportion of craft occupations – such as, carpenters – remained relatively stable during the time period (chart 12b).

Starting in January 2003, the 2000 Standard Occupational Classification (SOC) System will replace the occupational system described on this page (*see* chart book page 24). The new system will be implemented by all government agencies that collect and publish occupational data, including the Census Bureau, the Bureau of Labor Statistics (Occupational Employment Statistics, Office of Employment Projections, Current Population Survey, Employment Cost Index, OSH-Census of Fatal Occupational Injuries, OSH-Survey of Occupational Injuries and Illnesses), the Employment and Training Administration, and other government agencies. In 2002, the BLS Office of Occupational Statistics and Employment Projections started to adopt the new system.

12a. " Construction workers" as a percentage of all construction employees,1967-97 (With payroll)



12b Selected occupations as a percentage of all construction employment, selected years, 1985-2000 (All types of employment)



12c. Occupational classification and distribution in construction, 2000
(16 years and older)

Label	Code	Description	Number (thousands)	Percent
Manager	0 to 197	General manager, supervisor & professional	1,499	16.0
Carpenter	567, 569	Carpenter & apprentice	1,287	13.8
Laborer/helper	865, 866, 869, 877, 883	Laborer, helper, mechanic/repair, freight/stock handler, material handler/bagger	1,078	11.5
Foreman	558	Supervisors who can't be classified by occupation	750	8.0
Electrical	555, 575-577	Electrician & electrical worker, including supervisor & apprentice	643	6.9
Painter	556, 579, 583, 584	Plainter, paperhanger & plasterer, including supervisor and apprentice	620	6.6
Adm. support	208 to 457	Support staff	591	6.3
Plumber	557, 585, 587	Plumber & pipe fitter, and steamfitter apprentice	431	4.6
Op. engineer	594, 843-859	Operating engineer, including supervisor	378	4.0
Heat A/C mech	534	Heat & air conditioning mechanic	231	2.5
Bricklayer, mason	553, 563-564	Bricklayer, stone mason; including supervisor & appretice	230	2.5
Drywall	573	Drywall installer & taper	209	2.2
Roofer	595	Roofer	196	2.1
Truck driver	803-804, 814	Truck driver/motor transport occupation, including motor vehicle supervisor	182	2.0
Const. nec.	599	Construction trades except supervisor	172	1.8
Repair	503-533, 538-539, 547-49	Repair & mechanic	169	1.8
Concrete	588	Concrete & terrazzo finisher	90	1.0
Carpet layer	566	Carpet layer	87	0.9
Welder	783, 784	Welder & cutter, solderer & brazer	84	0.9
Tile	565	Tile setter	82	0.9
Ironworker	597	Structural metal worker	69	0.7
Sheet metal	596, 653	Sheet metal worker & sheet metal duct installer	58	0.6
Insulation	593	Insulation worker	40	0.4
Glazier	589	Glazier	26	0.3
Elev constructor	543	Elevator installation construction	17*	0.2
Boilermaker	643	Boilermaker	8*	0.1
Other		Includes extraction, driller, millwright, rail/water trans., machine, plant/sys op.	110	1.2
TOTAL			9,351	100.0

Note: Chart 12a - Yearly figures are based on quarterly averages. Construction workers are defined as nonsupervisory and nonclerical.
Chart 12c - Operating engineers maintain and run heavy equipment, such as bulldozers and tower cranes. A brazer joins metals using lower heat than welders use. "Not classified" refers to some construction occupations (Census Bureau code 599), but not supervisors. "Other" occupations include supervisory, executive, purchasing, accounting, driller, millwright, and machine operator. Millwrights install, repair, replace, and dismantle the machinery and heavy equipment used in almost every industry.
Chart 12b - The Current Population Survey started to use 1980 Occupational Classification codes since 1983.

Source: Chart 12a - U.S. Census Bureau, *Economic Census - Construction*, 1997 and previous years.
Chart 12b -Bureau of Labor Statistics, U.S. Department of Labor. Current Population Survey Earnings Files, 2000 and previous years, Washington DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.
Chart 12c -Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

13

Union Membership and Density in Construction and Other Industries

Nearly 1.4 million construction workers were union members in 2000, accounting for 19.4% of the 7.2 million wage-and-salary workers in construction. Of the union members, 1.2 million worked for the private-sector companies, and the remainder – 170,000 – were government employees. Also, 69,000 construction workers who were not union members were represented at their place of work by unions.

The statistics are from the Current Population Survey, which includes two questions about union membership (unionization) and coverage. First, the survey asks, "On this (main) job, are you a member of a labor union or of an employee association similar to a union?" Respondents who answer "no" are asked, "On this job, are you covered by a union or employee-association contract?" The survey asks these questions of wage-and-salary employees only.

Union membership rates are calculated using the number of respondents who answer "yes" to the union membership question, divided by the total number of respondents. "Union density" is union membership plus union coverage of workers not belonging to a union among employed wage-and-salary workers who respond to those questions.

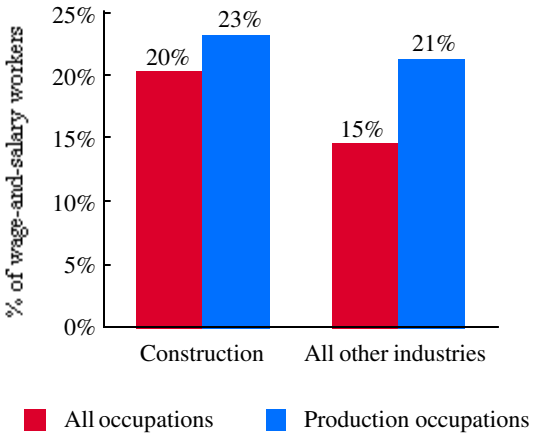
The union density rate of wage-and-salary workers (public and private sector) in construction is higher than in all industries. Also, the union density rate among construction production (blue-collar) workers is much higher than density among wage-salary construction workers with all occupations (chart 13a).[1]

Public-sector construction has roughly double the union density of private-sector construction — nearly 4 in 10 compared with less than 2 in 10, respectively (chart 13b).

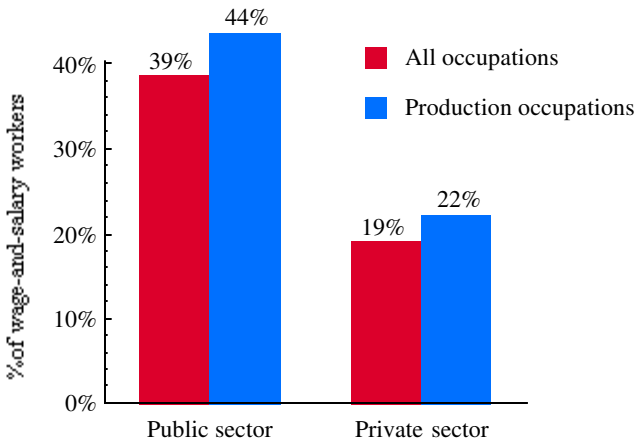
Union membership in construction varies as well among construction occupations (chart 13c) and geographic areas. In 2000, 9 states had a union membership rate of more than 30% — with Ohio, Indiana, Minnesota, New Jersey, New York, Missouri, Hawaii, Wisconsin, and Illinois listed in increasing order (chart 13d).

Unlike this chart book, most publications refer to union density among private-sector wage-and-salary workers only. And, because the Current Population Survey interviews people who have permanent addresses and telephones, it may miss some transient workers, a large proportion of whom work non-union. As a result, union density figures provided here may be slightly higher than presented elsewhere.

13a. Union density in construction and other industries, production and all occupations, 2000 (Wage-and-salary workers)



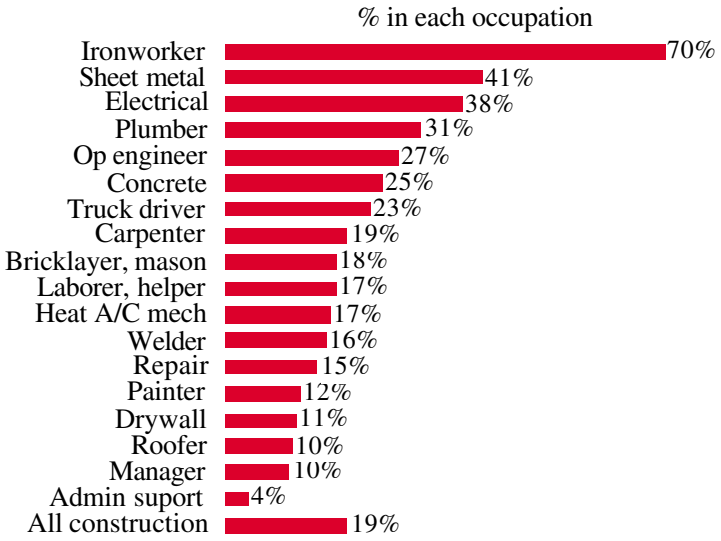
13b. Union density in public- and private-sector construction, production and all occupations, 2000 (Wage-and-salary workers)



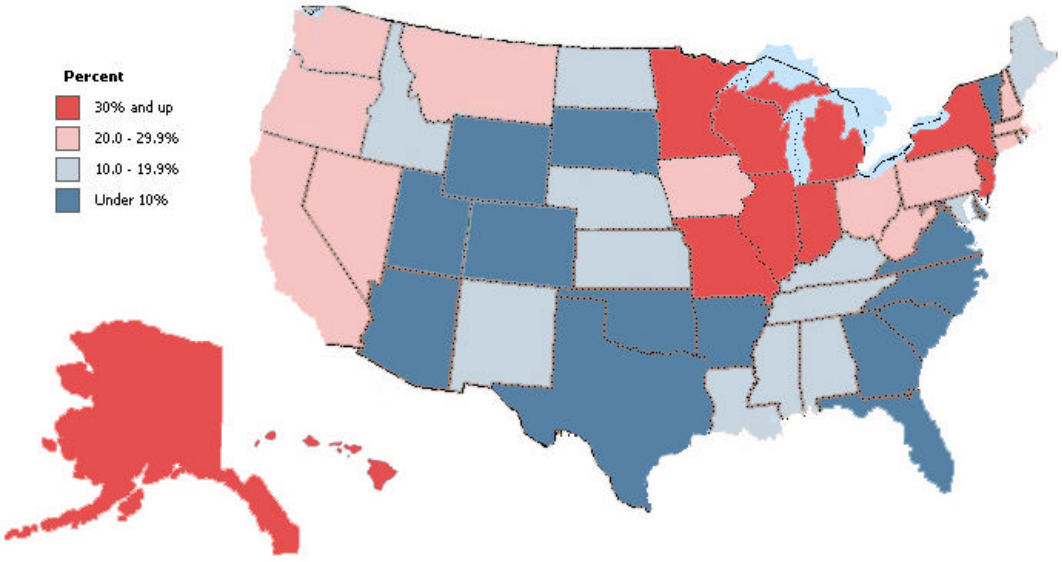
1. Production workers are all workers, except managerial and administrative-support staff — and include the self-employed.

Note: Charts 13a and 13b - Production occupations, as distinguished from managerial and support staff, are coded 500 and above in the Current Population Survey (*see* chart book page 12). Union density is union membership plus union coverage of workers not belonging to a union.

13c. Union membership, by selected construction occupation, 2000 (Wage-and-salary workers)



13d. Union density in construction, by state, 1998-2000



Note: Chart 13c - These figures do not reflect total membership in any given union, which may include more than one occupation.

Source: All charts - Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

14

Worker Age in Construction and Other Industries

The labor force has been growing older. The average age of the national labor force jumped from 37.3 to 39.4 years old between 1980 and 2000, and the median age grew from 35 to 39 years old during the same period. (The median is the midpoint; half the workers are older and half are younger.)

Construction workers are typically younger than the national labor force. But, construction workers are aging also. In 2000, the average age of construction workers was 38.7 years old, more than 2 years older than two decades earlier (chart 14a). The median age was 34 years in 1980, while it was 37 years in 2000.

Among wage-and-salary workers, public administration is the "oldest" industry, with an average age of 42.6 years. Construction workers are younger than the average, but older than those in agriculture and retail industries (chart 14b).

Another way to look at age is the age structure of the labor force. From 1980 to 2000, the proportion of those in their thirties and their forties in construction increased gradually. The proportion of those aged 40 to 49 years increased from 17 to 28%, a 65% increase. At the same time, the proportion of younger construction workers – teen-agers or in their twenties – decreased (chart 14c). The proportion of those in the 20-to-29-year age group decreased from 32 to 21%, a 34% decrease.

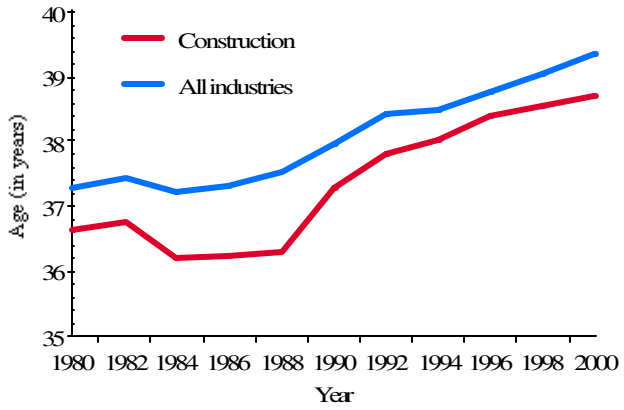
A major influence on the age composition of the labor force was the rapid increase in the baby boom generation, those born between 1946 and 1964.[1] In 2000, about 4.6 million baby boomers (who were between 36 and 54 years old) worked in construction, accounting for nearly half (49%) of the construction labor force.[2]

For the labor force overall, assuming a retirement age of 65, baby boomers will not begin to retire until 2010. Therefore, the workforce will continue to age in the next decade. (By contrast, the so-called baby-bust generation, born 1965-76, had a much lower birthrate than the baby boom.) The number of workers 35 to 44 years old can thus be expected to decline in 2000 to 2010 (chart 14d).[1]

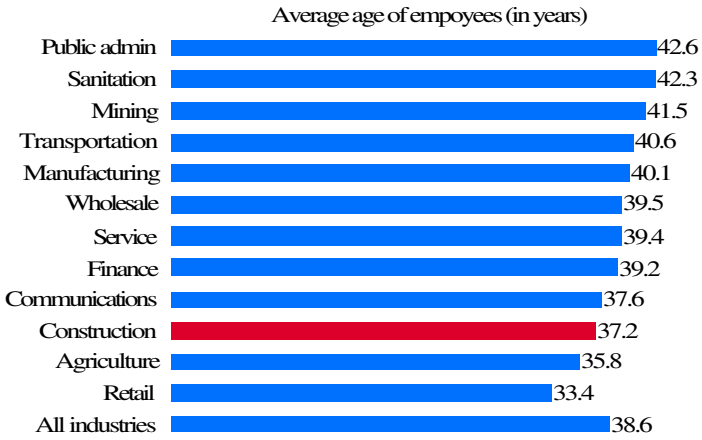
1. Howard N Fullerton, Jr., and Mitra Toossi, Labor force projections to 2010: steady growth and changing composition, *Monthly Labor Review*, 124(11): 21-38, November 2001.

2. 2000 Current Population Survey, calculations by Xiuwen Dong, the Center to Protect Workers' Rights.

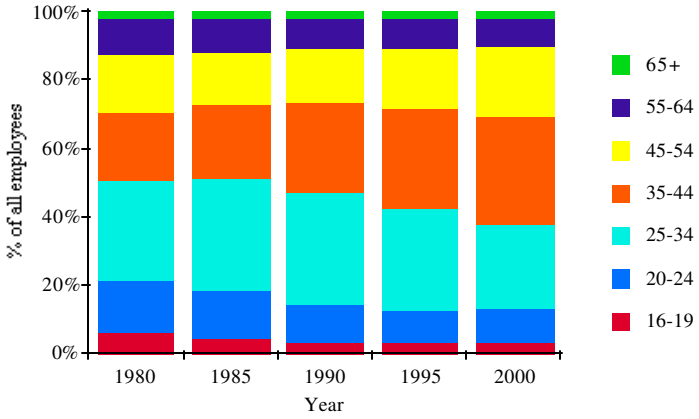
14a. Average age of workers, construction and all industries 1980-2000 (All types of employment)



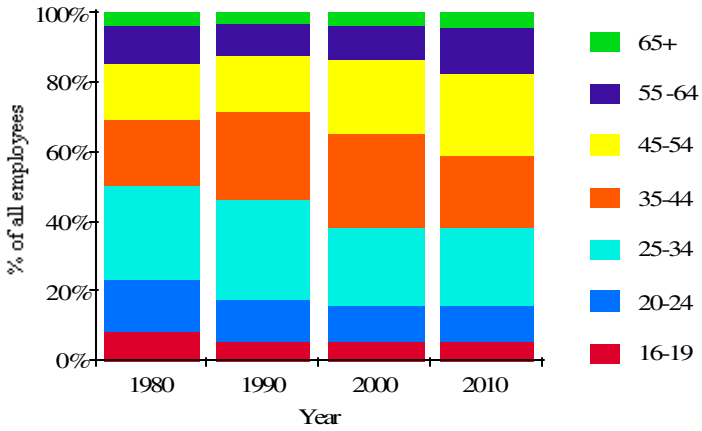
14b. Average age of employees, by industry, 2000 (Wage-and-salary workers)



14c. Age distribution in construction, selected years, 1980-2000 (All types of employment)



14d. Age distribution in all industries, selected years, 1980-2010 (All types of employment)



Note: Chart 14b excludes self-employed workers.

Source: Charts 14a and 14c- Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, and earlier years, Washington DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 14b - Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 14d - Howard N Fullerton, Jr. and Mitra Toossi. Labor force projections to 2010: steady growth and changing composition, *Monthly Labor Review*, November, 21-38. Bureau of Labor Statistics, U.S. Department of Labor, 2001.

15

Age of Construction Workers, by Union Status, Hispanic Status, Type of Employment, and Occupation

Age varies among worker groups in construction. Union members in construction, on average, are older than non-union workers, and production (blue-collar) workers are younger than those in managerial and professional occupations.[1] The average age of all construction workers in production occupations is 37.5 years (median 37).[2] For union members in construction production occupations, the average age is 39; for non-union workers, it is 35. The median age gap is similar – 39 years old for union members compared with 34 for non-union workers in construction production occupations.

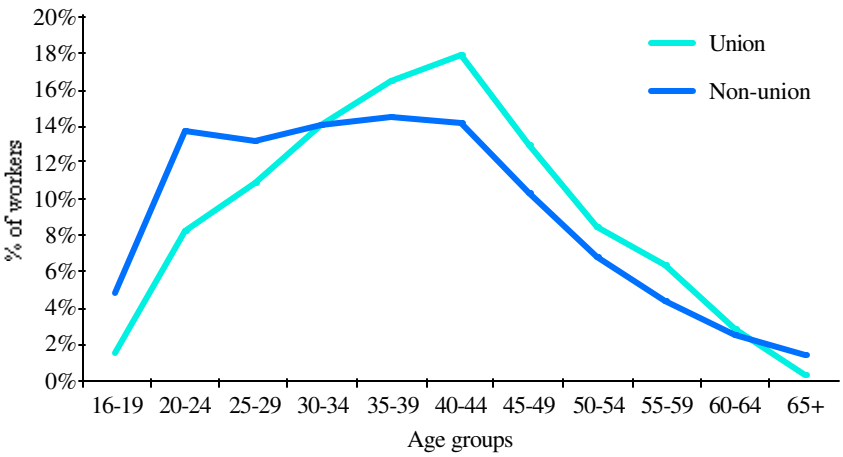
The differences show in the age structure for construction production workers. Only 21% of union members who perform construction production work are younger than 30 years old, but 32% of the non-union workers are. Nearly half (47%) of the employed union members in production occupations are between 35 and 49 years old, while only 39% of the non-union members are (chart 15a).

Hispanic workers, on average, are 5 years younger than non-Hispanic workers in construction. The median age is 33 for Hispanic workers, while it is 39 for non-Hispanic workers. More than one-third (37%) of the Hispanic workers are under 30 years old, compared to 23% of non-Hispanic workers. One-fifth of Hispanic workers is less than 25 years old, compared with one-tenth of non-Hispanic workers (chart 15b; *see* chart book page 16).

Age differences are reflected, as well, in type of employment in construction. While 41% of wage-and-salary construction workers are 40 years old or older, 64% of self-employed workers are in that age group (chart 15c). The average age of self-employed workers is nearly 44, much older than for construction employment as a whole. Among wage-and-salary workers, government employees are older than workers in private companies, with average ages of 44 and 37 years, respectively.

When all construction occupations are considered, construction managers are somewhat older than other occupations (chart 15d). When managers and administrative staff are included, the average age is 39 for all employees, 39 for union employees, and 37 for non-union employees. Along with the aging of the labor force, changes are expected in certain occupations in construction in next decade (*see* chart book page 32).

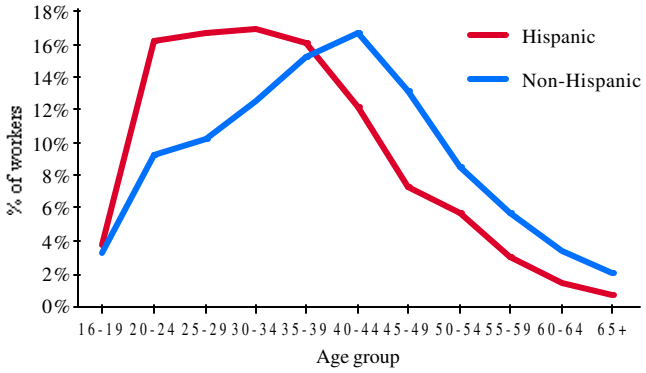
15a. Age distribution in construction, by union status, 2000
(Production workers)



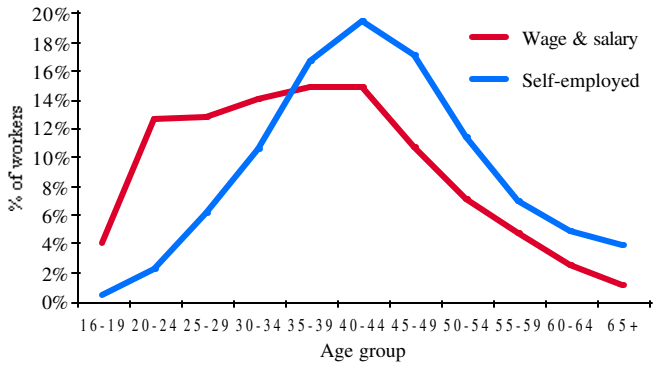
1. Production workers are all workers, except managerial and administrative-support staff — and include the self-employed.
2. The median is the midpoint; half of the workers are older and half are younger.

Note: All charts - All charts include self-employed workers.
Chart 15a - Production workers are all workers, except managerial and administrative-support staff.

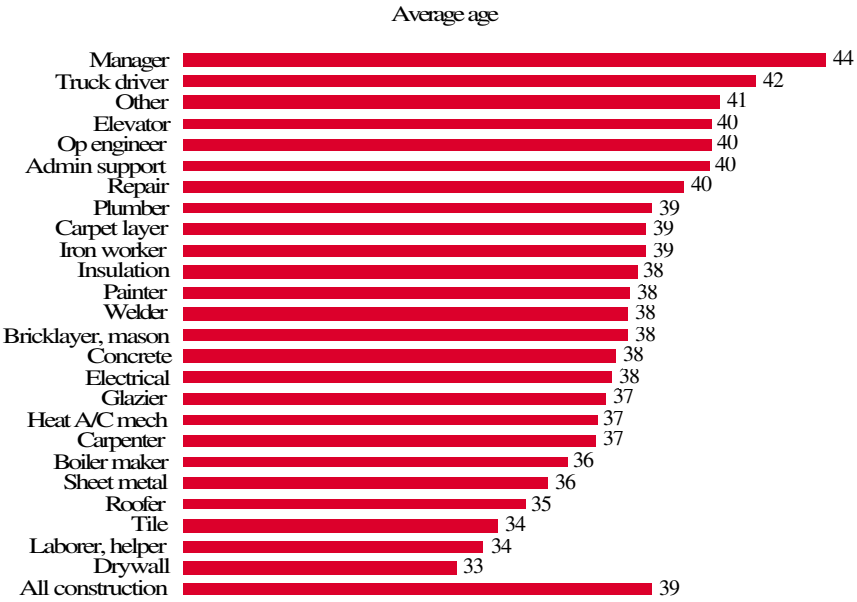
15b. Age distribution in construction, Hispanic and non-Hispanic workers, 2000
(All types of employment)



15c. Age distribution in construction, wage-and-salary and self- employed workers, 2000
(All types of employment)



15d. Average age, by construction occupation, 2000
(All types of employment)



Source: All charts - Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

16

Hispanic Workers in Construction and Other Industries

Almost three-quarters of Hispanic construction workers in the United States are Mexican nationals or Mexican-Americans. Other Hispanic workers report their origins as Puerto Rican, Cuban, Central or South American, or other (Spanish or not classifiable). Hispanics may be of any race.

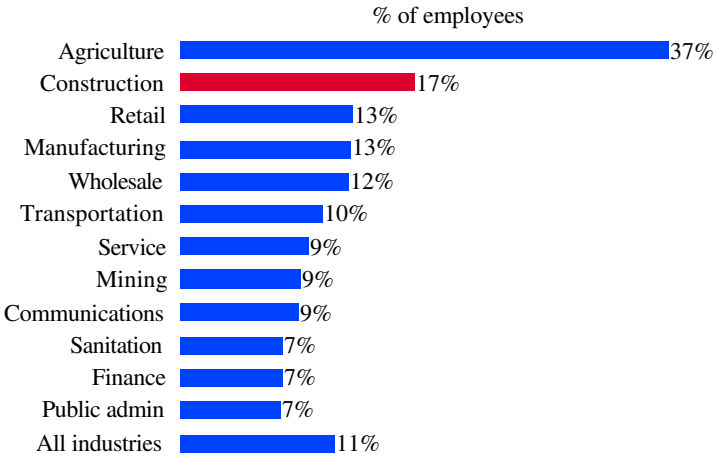
In 2000, about 14.7 million Hispanics were employed in the United States, making up 10.9% of the U.S. workforce. The increase in the Hispanic portion of the labor force has been rapid, particularly in construction, which has a larger share of Hispanic workers than any industry, except agriculture (chart 16a). From 1980 to 2000, the proportion of workers employed in the United States who identified themselves as Hispanic grew by 120%, while, in construction, it increased by 150% (chart 16b). The number of Hispanics employed in construction quadrupled from 1980 to 2000 (chart 16c). In construction, 17% of wage-and-salary workers are Hispanic.

Hispanic workers are more likely to reside in the South and West, and less likely to live in the northeastern United States.[1] In construction, 47% of Hispanic workers reside in the South, 39% in the West, 6% in the Midwest, and 8% in the Northeast.[2] Although the percentage of Hispanic construction workers is below 1% in some states, such as Alaska and West Virginia, the figure is as high as 48% in New Mexico and 45% in Texas, 34% in California and Arizona, 28% in Nevada, and 21% in Florida (chart 16d).

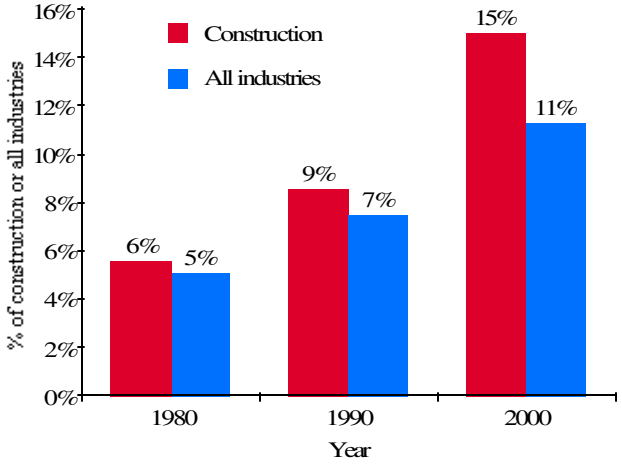
Most of the 1.4 million Hispanic construction workers – 70% – were born outside the United States and more than half – 809,000, or 57% – were not U.S. citizens in the year 2000. Among those who were not U.S. citizens, 26% (214,000) entered the country after 1996. About 32% (452,840) of the Hispanic construction workforce speaks only Spanish at home.

Data provided here are from the Current Population Survey, which identifies people as Hispanic only if they say they are. The survey is believed to undercount the population of Hispanic origin by about 10%.[3] New immigrants tend to be mobile and thus difficult to locate to interview.

16a. Hispanic employees as a percentage of each industry, 2000 (Wage-and-salary workers)

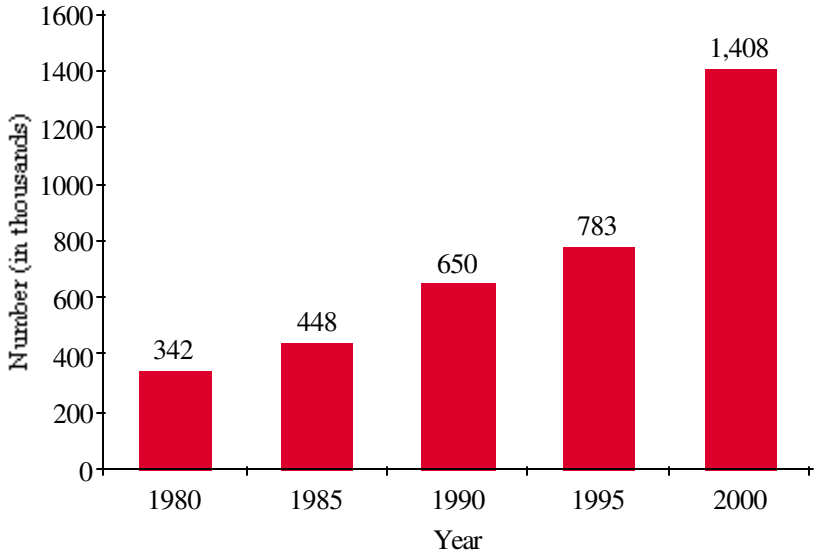


16b. Hispanic employees as a percentage of construction and all industries, 1980, 1990, and 2000 (All types of employment)

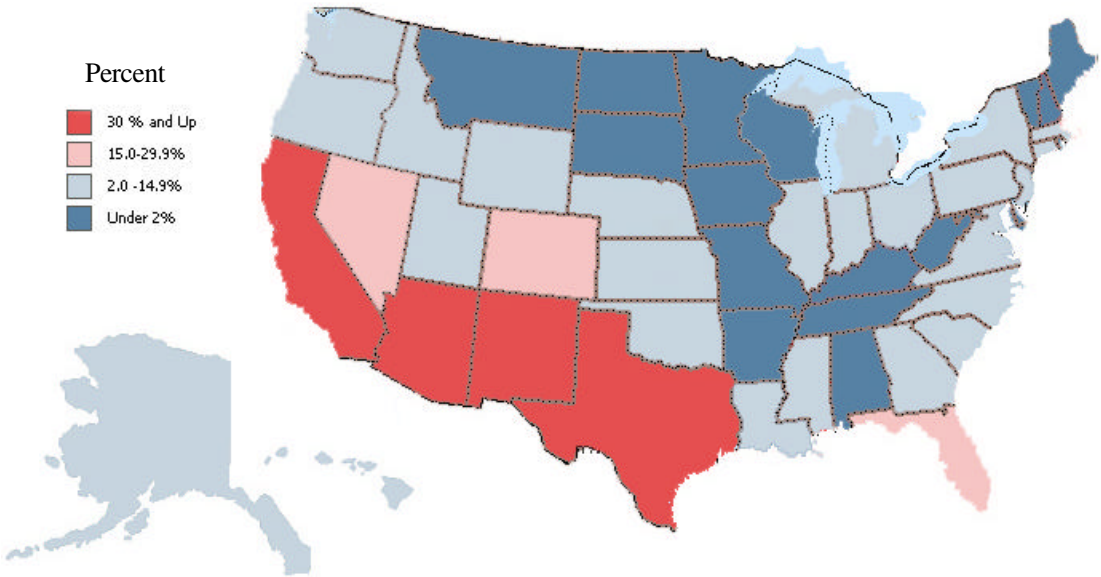


1. Melissa Therrien and Roberto R. Ramirez, *The Hispanic Population in the United States: Population Characteristics*. US. Census Bureau, March 2001.
2. The note to chart 5c lists the states in each region.
3. Ruth B. McKay, Cultural Factors Affecting Within Household Coverage and Proxy Reporting in Hispanic Households: A Pilot Study, *Proceedings of the Section on Survey Research Methods, American Statistical Association*, 614-18, 1992.

16c. Number of Hispanic employees in construction, selected years, 1980-2000
(All types of employment)



16d. Percentage of construction workers who are Hispanic, by state, 1998-2000 average



Note: Chart 16a - Wage-and-salary workers are compared here, because construction has a relatively high percentage of self-employed workers, but Hispanic workers tend not to be self-employed.

Chart 16d - The map is based on averaging of data for 1998, 1999, and 2000. The statistical sample for each state is larger than 400, except Rhode Island (300), Hawaii (286), and the District of Columbia (174).

Source: All charts - Bureau of Labor Statistics, 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

17

Hispanic Workers in Construction Occupations

The distribution of Hispanic workers in construction differs from that for non-Hispanic workers. For instance, Hispanic workers are less likely to be managers and more likely to work in production. In 2000, 1.3 million Hispanics made up 18% of the workforce in construction production occupations, even though Hispanics have a 15% share of all types of construction employment.

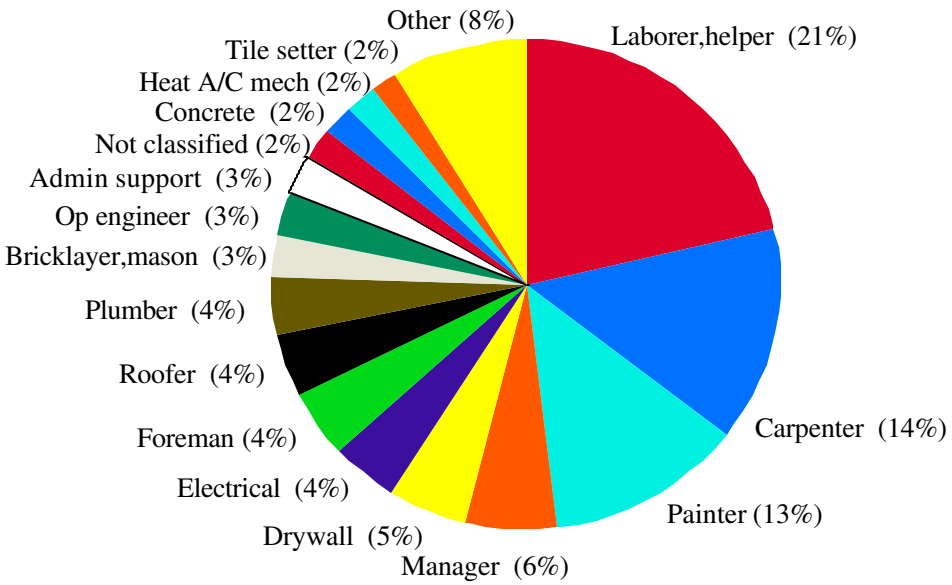
Of the 1.4 million construction workers of Hispanic origin, 21% are laborers, although 10% of all construction workers are laborers (chart 17a; see chart 12b). When Hispanic construction workers are considered as a percentage of each occupation, 33% of drywall workers are Hispanic (chart 17b).

Hispanic construction workers are less likely to be union members than are non-Hispanic construction workers (chart 17c).

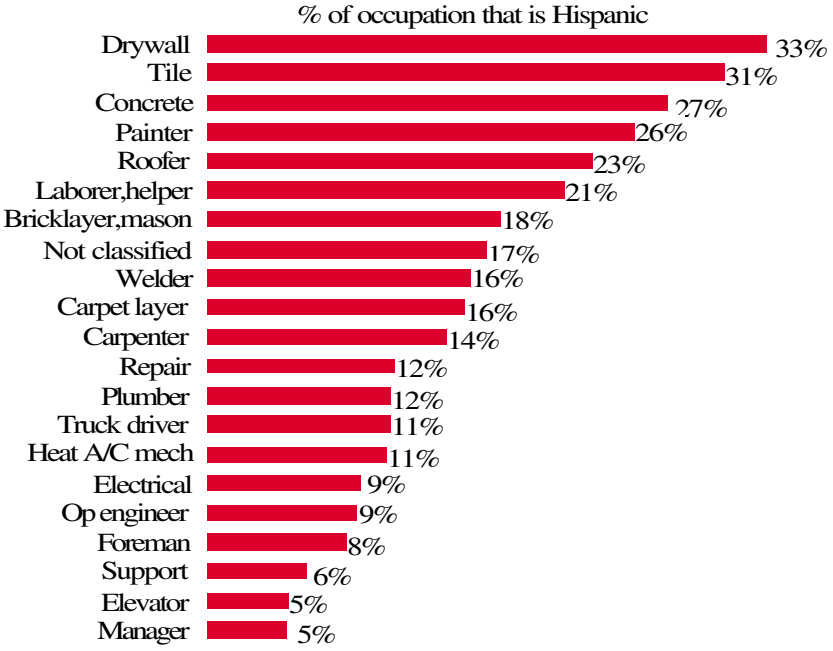
As with construction workers overall, most Hispanic construction workers are male. But even among females, the breakdown for Hispanics is atypical. Less than 4% of Hispanic construction workers are female – overall, including administrative support (clerical) – compared with 10% of non-Hispanic female construction workers.

People of Hispanic origin may be white, black, American Indian, Aleut, Eskimo, Asian or Pacific Islander; thus, the numbers overlap with data showing construction employees who are members of racial minorities.

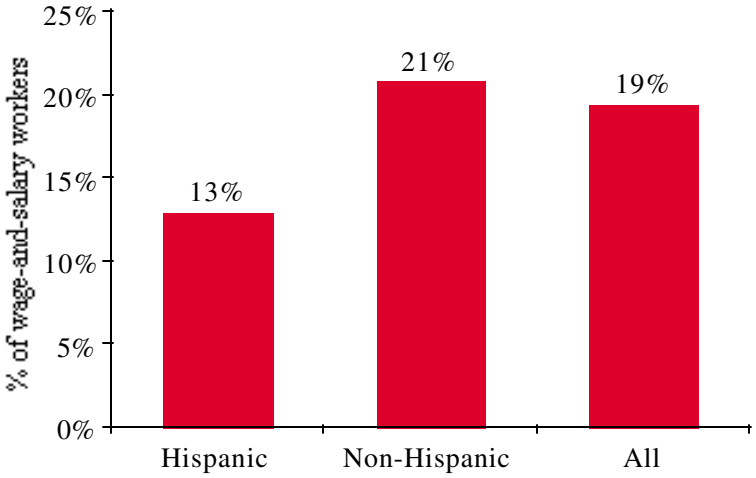
17a. Distribution of Hispanic construction workers among occupations, 1998-2000 average (All types of employment)



17b. Hispanic workers as a percentage of selected construction occupations, 1998-2000 average
(All types of employment)



17c. Union membership among Hispanic and non-Hispanic construction workers, 2000
(Wage-and-salary workers)



Note: All charts - Total of 1.4 million Hispanic construction workers (all types of employment) in 2000.

Chart 17a - "Other" includes Repair, Elevator, Millwright, Carpet layer, Glazier, Insulation, Sheet metal, Ironworker, Boilermaker, Welder, Truck driver, Extractive occupations, Driller, Machine operator, and those who worked in construction but are not in typical construction occupations (such as, meat cutter) or are not shown on the occupational listing. Data are averaged over 3 years to get statistically valid numbers. "Not classified" refers to some construction occupations (Census Bureau code 599), but not supervisors; *see* chart 12b.

Chart 17b - "Not classified" refers to some construction occupations (Census Bureau code 599), but not supervisors; *see* chart 12b.

Source: Charts 17a and 17b - Bureau of Labor Statistics, 1998, 1999, and 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 17c - Bureau of Labor Statistics, 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

18

Members of Racial Minorities in Construction and Other Industries

When all racial groups, except "white" are combined into "racial minority," the data show that 872,000 were employed in construction in 2000, as self-employed and wage-and-salary workers.[1] The percentage of workers who are members of racial minorities is lower in construction than for all industries (chart 18a). In addition, in construction, only about 17% of workers who are members of racial minorities were self-employed in 1998-2000, on average, compared with 25% of all construction workers.

If members of racial minorities are considered as a proportion of each construction occupation, racial minorities are 20% of concrete finishers, for instance (chart 18b).

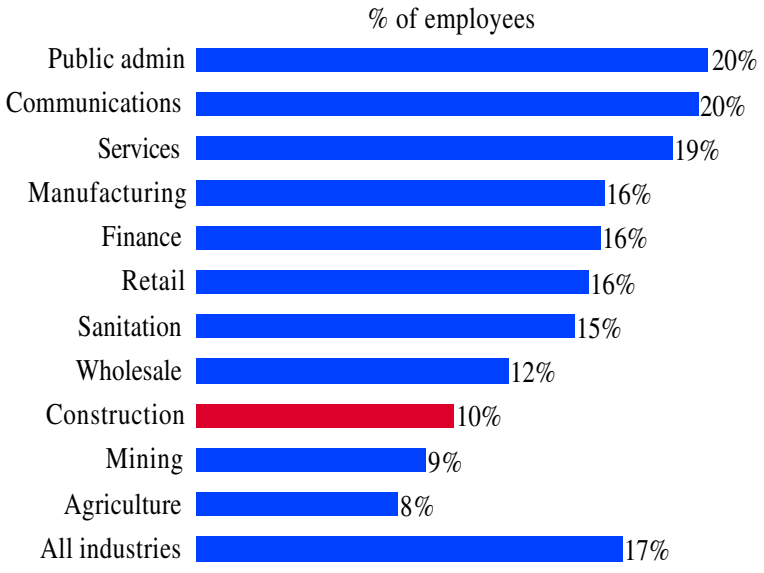
Among construction workers who are members of racial minorities, 16% were laborers or helpers. That proportion is higher than the average of 11.5% of all racial groups who were laborers (chart 18c).

Only 8% of members of racial minorities in construction were women, a figure slightly lower than the average for all women in the industry (10%).

The Current Population Survey, the source for numbers on this page, classifies race as white, black, Asian or Pacific Islander, and American Indian and Alaskan Native (*see* chart book page 11). Only data for whites and blacks are published, because the sample size for the other races is not large enough to produce statistically reliable estimates. The survey is scheduled to introduce revised race categories beginning in 2003.

"Race," which characterizes the population based on physical characteristics, is separate from ethnicity, which considers cultural, linguistic, or national-origin traits.[2] So, for instance, people of Hispanic origin may or may not be included in racial minorities (*see* chart book page 16).

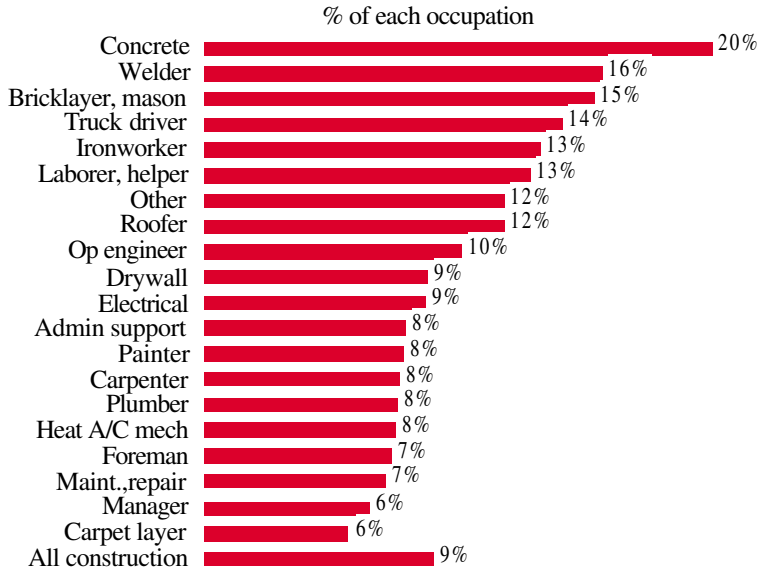
18a. Members of racial minorities as a percentage of employees, by industry, 2000 (Wage-and-salary workers)



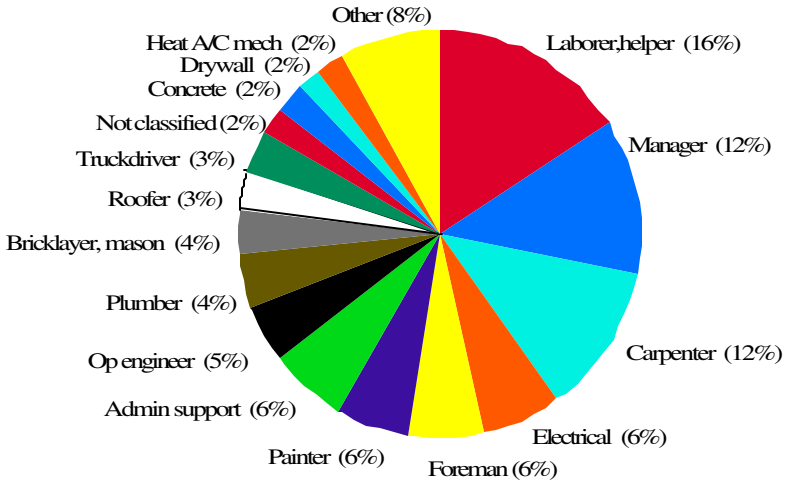
1. All numbers in the text are from Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

2. Bureau of Labor Statistics, U.S. Department of Labor, *Report on the American Workforce,* 2001, 18-20. http://www.bls.gov/opub/rtaw/pdf/rtaw2001.pdf Available from Office of Publications and Special Studies, U.S. Department of Labor, Bureau of Labor Statistics, Washington, D.C., 20212, or by calling 202-691-5200.

18b. Members of racial minorities as a percentage of each construction occupation, 1998-2000 average (All types of employment)



18c. Distribution among construction occupations of workers who are members of racial minorities, 1998-2000 average (All types of employment)



Note: All charts - Averages include all occupations from managerial through clerical/support.

Charts 18a, 18b, and 18c - "Racial minorities" are those who choose to identify themselves as black, American Indian, Aleut, Eskimo, Asian or Pacific Islander, or other than white. (The national 2000 census allows each individual to list more than once race, but the Current Population Survey, the source for data used here, does not.)

Charts 18b and 18c - Percentages given are 3-year averages; the sample size is larger than 30 for each category, except iron-worker (24) and carpet layer (21) on chart 18b.

Chart 18c - "Not classified" refers to some construction occupations (Census Bureau code 599), but not their supervisors; *see* chart 12b."Other" includes repair, sheetmetal, elevator, tile layer, insulation, glazier, boilermaker, extractive workers, driller, millwright, and those who worked in construction but are not in typical construction occupations (such as, meat cutter) or are not shown on the occupational listing. Percentages do not add up to 100 because of rounding.

Source: Charts 18a, 18b and/or 18c - U.S. Department of Labor, Bureau of Labor Statistics, 1998, 1999, and 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

19

Female Workers in Construction and Other Industries

Women's rate of participation in the labor force has been increasing and is expected to continue to increase.[1] And the numbers of women employed in construction have grown by 76% from 1980 to 2000, a change that largely reflects a boom in the industry (chart 19a).[2]

As a percentage of the construction workforce, women's gains have been much smaller. Female employees were 9% of the construction workforce in 2000, up from 8% in 1980 (chart 19b).

Female workers' share of production – or blue-collar – work has remained low, compared with other industries (chart 19c). The proportion of female production workers in construction is one-seventh the level for all industries.

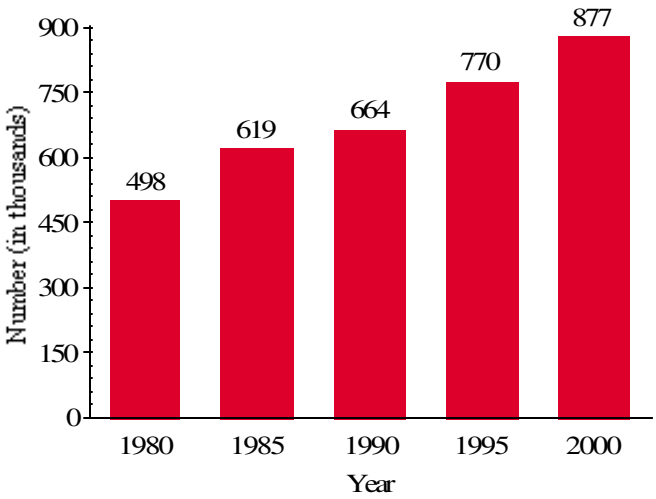
In construction, most – 71% – of the female workers are employed in private companies, while 6% are government employees; this pattern is similar to that for men, 5% are government employees.

About the same proportion of women and men are self-employed – 22% compared with about 24%, respectively. But, relatively more women are incorporated self-employed; about 9% of women compared with 6% of men. At the same time, 13% of the women in construction worked as unincorporated self-employed, compared with 17% of men who are unincorporated self-employed (*see* chart book page 21). And, about 1% of women worked without payment, usually for family businesses.

Although the largest portion of female workers in construction – 47% – are still administrative-support staff, the proportion is much smaller than it was 20 years ago (chart 19d). Of the women employed in construction in 2000, 33% were in managerial or professional occupations, compared with only 13% in these occupations in 1980. The changes reflect partly a decline in the numbers of administrative support staff because of office automation plus an increased demand for management skills.

In 2000, 37,000 women were construction laborers and helpers. In addition, 141,000 women were employed in production crafts and occupations that operate equipment, including painters, carpenters, electricians, operating engineers, plumbers, repair workers, carpet layers and welders. (The occupations are listed here in order of decreasing percentages of women; 3.7% of women construction workers are painters and 0.3% of women are welders.[3])

19a. The number of female employees in construction, selected years, 1980-2000 (All types of employment)

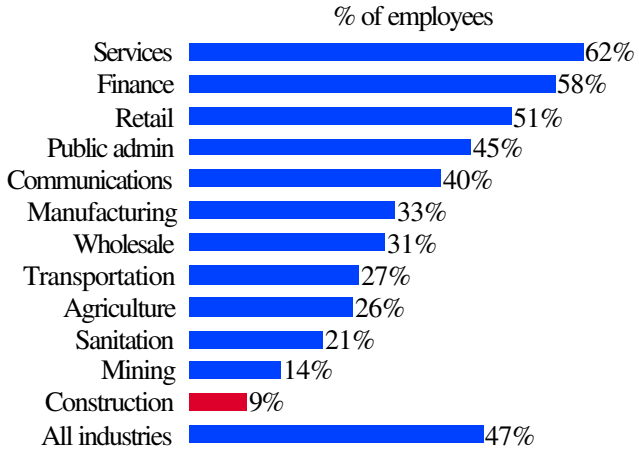


1. Howard N Fullerton, Jr. and Mitra Toossi. 2001. Labor Force Projections to 2010: Steady Growth and Changing Composition, *Monthly Labor Review*, 124(11): 21-38, November 2001.

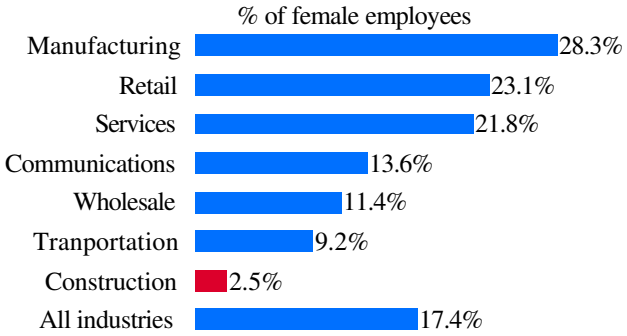
2. All numbers in the text are from Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

3. The sample size is too small to be statistically valid when broken down into specific occupations.

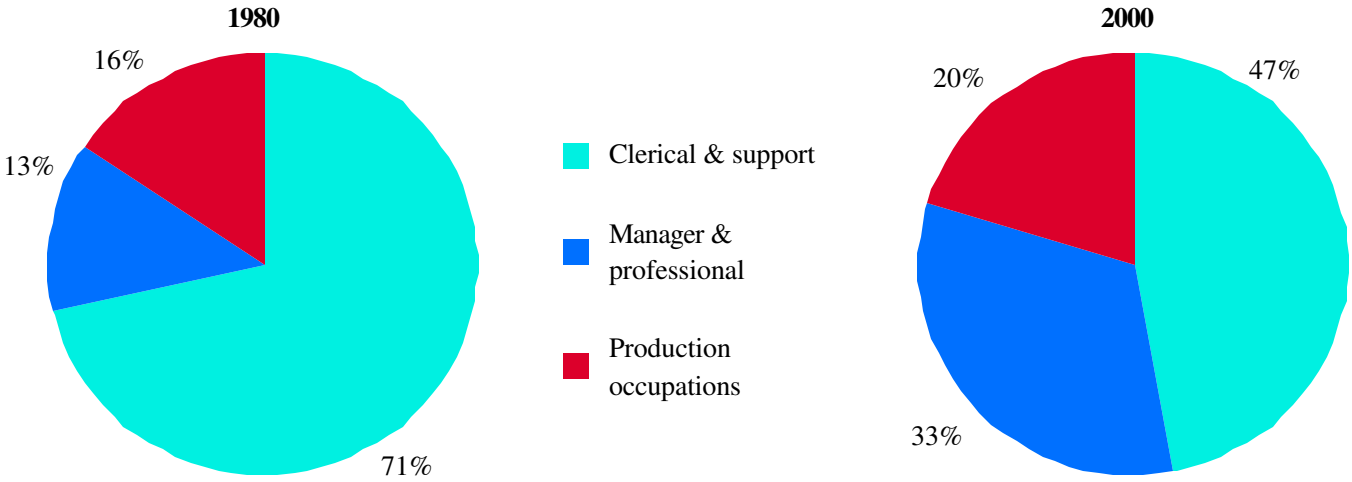
19b. Female employees as a percentage of each industry, 2000 (All types of employment)



19c. Female employees as a percentage of selected industries, production occupations, 2000



19d. Distribution of female construction workers among occupations, 1980 and 2000 (All types of employment)



Note: All charts - *See* list of occupations on chart book page 12; the figures are 12-month averages.
Chart 19c - Industries not shown in the chart include Agriculture, Mining, Sanitation, Finance, and Public Administration because the statistical samples were too small.

Source: All charts - Bureau of Labor Statistics, U.S. Department of Labor, Current Population Survey Earnings Files, 2000 and earlier years, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

20

Employment and Unemployment in Construction and Other Industries

Total employment in construction increased by 52% in 1980-2000, from 6.2 million to 9.4 million.[1] The increase reflected the nation's economic expansion, as well as the hot housing market of the 1990s (*see* chart book page 7). Construction's share of the labor force in the two decades varied as the economy changed, from a low of 5.8% in 1982 during a recession to a high of 7.0% in 2000 during an extended period of growth (chart 20a).

In 2000, payroll employment in construction was 6.34 million, 1.5 times the level of 1980. The rate of expansion was slightly higher than the average 1.4 times for all industries (chart 20b). (The payroll employment data are from the Bureau of Labor Statistics' Current Employment Statistics, which provides employment estimates that are consistent with data from the BLS Current Population Survey.)

Employment increases varied within construction. From 1992 to 2001, employment of special trade contractors grew most rapidly, by 60%, from 2.7 million to 4.4 million. Employment in the general building contractors subsector increased by 40%, from 1.08 million to 1.55 million in the same period. Heavy construction employment grew by 30% from 0.7 million to 0.9 million (chart 20c).

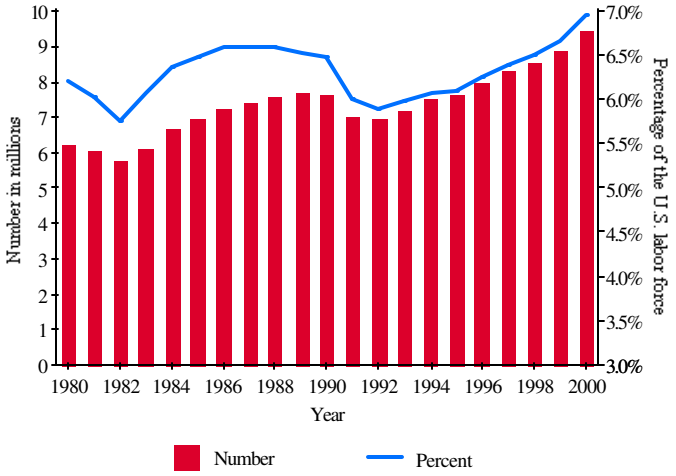
With the economic boom, the yearly unemployment rate in the construction industry reached a historic low, falling from 16.6% in 1992 to 6.5% in 2000 (chart 20d). By late 2000, however, the nationwide economic expansion slowed, leading to a reversal of the decline in the construction unemployment rate. Total nonfarm payroll employment for all industries decreased from an average of 131.8 million in 2000 to 131.3 million in 2001.[2] Although construction payrolls bucked the trend, growing by 0.5 million in 2001, the unemployment rate for construction grew (to 8.9% at the end of 2001),[3] along with the total unemployment rate (to 5.8%).

Unemployment persists for construction workers – at a rate higher than for all industries – partly because construction projects and jobs generally are of limited duration.

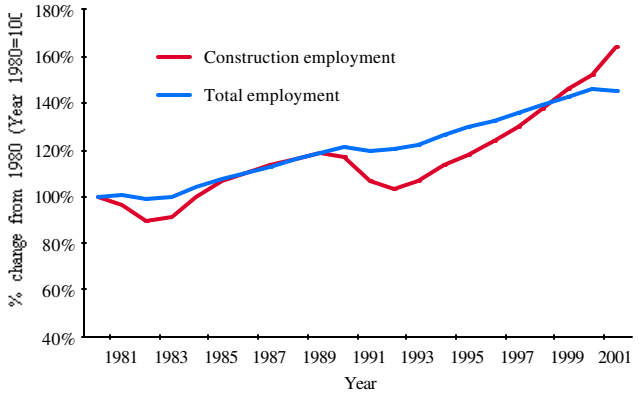
Estimates of unemployment are derived from the Current Population Survey. People counted as unemployed are those who had no employment during a given week (the reference week), were available for work (except for being temporarily ill), and had tried to find employment some time (or were waiting to be recalled from temporary layoff) during the 4-week period ending with the reference week.

1. Current Population Survey; *see* chart book page 11.
2. Figures for 2001 are preliminary.
3. The yearly unemployment rate for construction in 2001 was 7.4% (preliminary figures).

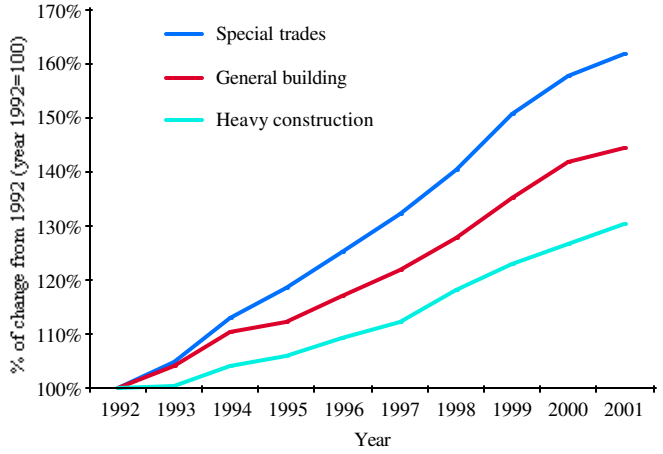
20a. Construction employment total and as a percentage of the labor force, 1980-2000 (All types of employment)



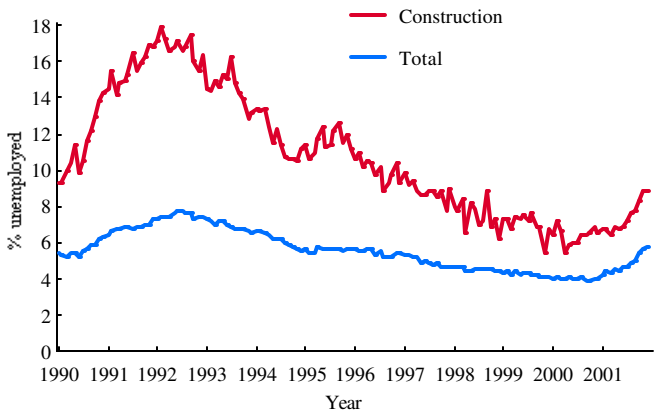
20b. Index of the rate of growth of employment, construction and all nonfarm payrolls, 1980-2001



20c. Index of the rate of growth of employment, construction subsectors, 1992-2001



20d. Monthly unemployment rate, construction and total, 1990-2001 (Seasonally adjusted; wage-and-salary workers)



Note: Chart 20a - Data cover all employees in construction.

Chart 20b - Data cover only private-sector nonfarm, civilian wage-and-salary workers; no self-employed are counted. Data are seasonally adjusted by the Bureau of Labor Statistics using a moving-average method based on previous years of data. Figures are yearly averages.

Chart 20c - Data cover payroll employment in construction. The self-employed are not included.

Chart 20d - Data are gathered monthly and cover unemployment only among private-sector, nonfarm civilian wage-and-salary workers, not any self-employed. The tick for each year on the X axis indicates January.

Source: Chart 20a - Bureau of Labor Statistics, U.S. Department of Labor. Current Population Survey Earnings Files, 2000 and earlier years, Washington DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 20b - Bureau of Labor Statistics, U.S. Department of Labor. Employment and Earnings, January 2002 and earlier issues. **http://data.bls.gov**

Chart 20c - Bureau of Labor Statistics, U.S. Department of Labor. **http://data.bls.gov**

Chart 20d - Bureau of Labor Statistics, U.S. Department of Labor. Employment and Earnings, January 2002 and earlier issues. **http://data.bls.gov**

21

Self-Employment in Construction and Other Industries

Data on self-employment are regularly collected as part of the monthly Current Population Survey by the Bureau of Labor Statistics (*see* chart book page 11). The survey classifies according to industry and occupation, but also by class of worker, or type of employment. Distinctions are made among wage-and-salary employment, self-employment, and unpaid work for a family business.

Those who respond that they are self-employed are asked, "Is this business incorporated?" Those who respond "yes" to incorporated are considered as wage-and-salary workers in many BLS publications. The rationale for the survey's classifying the incorporated self-employed as wage-and-salary workers is that, legally, they are the employees of the businesses and thus receive wages or salaries.[1] However, this chart book counts both incorporated and unincorporated as self-employed.

The BLS also lists the self-employed as "independent contractors" and as one type of "alternative work arrangement" with on-call workers, or employees of a temporary service company or contract (leasing) employment company (*see* chart book page 22). In some cases, employers are believed to misclassify employees as independent contractors to avoid paying Social Security, workers' compensation, and other taxes.

In recent decades, the proportion of the construction workforce who are unincorporated self-employed has remained higher than in all non-agricultural industries combined (chart 21a). And while the proportion for all non-agricultural industries has remained fairly constant, the proportion of unincorporated self-employed workers in construction varied. Although the number of the unincorporated self-employed has been growing, unincorporated self-employment has declined as a proportion of total construction employment as employment has increased (*see* chart book page 20).

The 2000 Current Population Survey reported 2.2 million self-employed in construction, of whom 1.58 million (72%) were unincorporated.[2] The distribution of self-employment varies among construction occupations. Carpet layer is the occupation with the largest proportion of self-employed workers in construction, and 90% of the self-employed carpet layers were unincorporated (chart 21b).

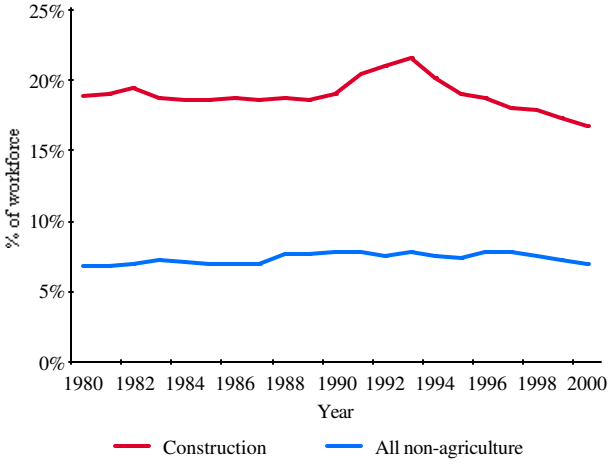
Another way to look at self-employment is to see how many establishments without payroll are reported by the U.S. Census Bureau in the Economic Census (chart 21c). To determine the number of such establishments, the Census Bureau does not obtain data directly from non-employer establishments, but instead obtains numbers from the administrative records of the Internal Revenue Service and the Social Security Administration. Such establishments numbered 1.89 million and accounted for 74% of construction establishments in 1997 (*see* chart book page 3). (The number of establishments is not the number of owners, however.)

The pattern of income varies between the unincorporated and the incorporated self-employed (chart 21d). While 38% of the incorporated self-employed workforce earned $75,000 or more in 2000, only 14% of the unincorporated self-employed earned this amount. On average, family income for the incorporated self-employed in construction was $50,000 to $60,000, but $30,000 to $35,000 for the unincorporated. Some view self-employment as a chance to advance professionally by becoming their own boss, earning more money, or gaining status.[3] Yet, overall, construction families whose income earners were unincorporated earned less than wage-and-salary workers and the construction industry average.[2] This holds true, even when accounting for differences in pay levels – that some higher-paid construction occupations, such as ironworker, tend not to be self-employed.

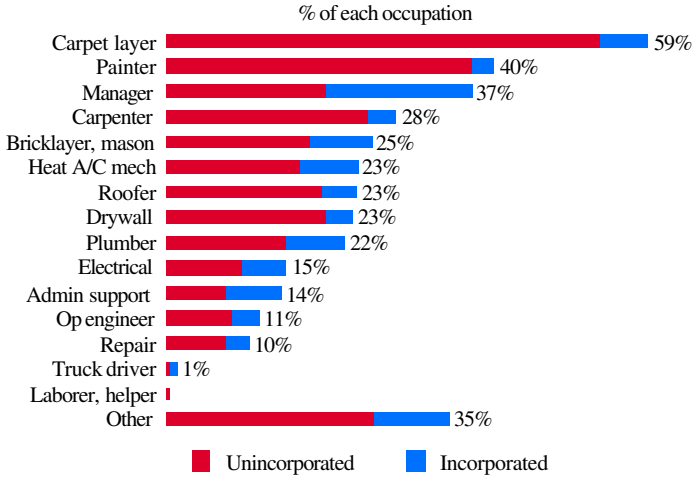
1. John E. Bregger, Measuring Self-employment in the United States, *Monthly Labor Review*, pp. 3-9, January /February 1996.
2. Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.
3. George T. Silvestri, Considering Self-Employment: What to Think about Before Starting a Business, *Occupational Outlook Quarterly*, 15-23, Summer 1999.

21

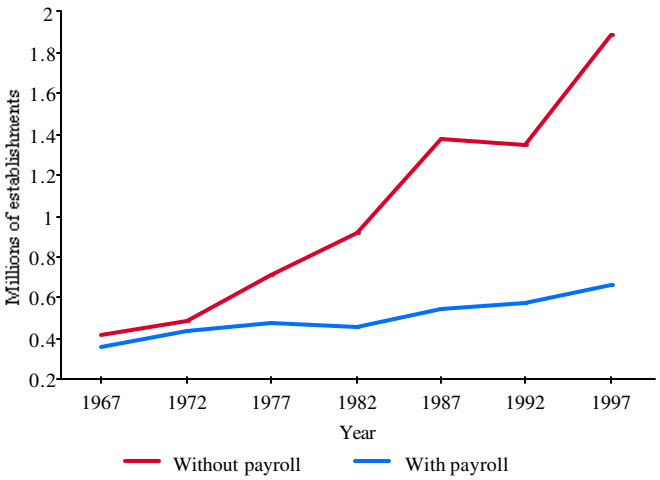
21a. Self-employment as a percentage of the workforce, construction and all non-agricultural industries, 1980-2000.



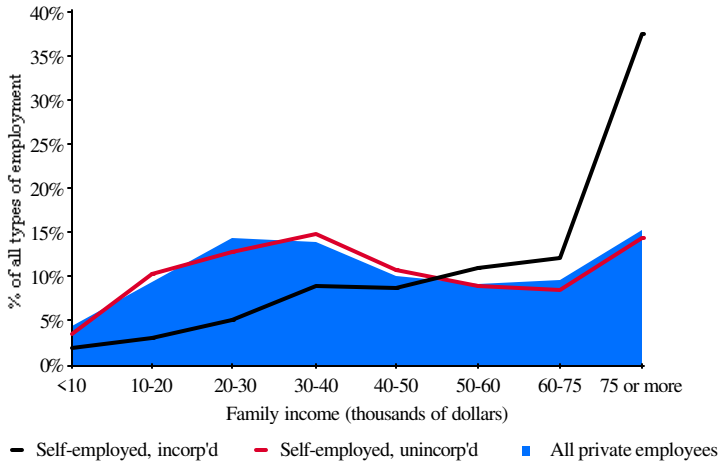
21b. Percentage of self-employed, by selected construction occupation, 2000



21c. Number of construction establishments, with and without payroll, 1967-97



21d. Family income distribution in construction, by employment type, 2000



Note: Chart 21a - The BLS publication used for this chart includes only unincorporated self-employed; incorporated self-employed are considered wage-and-salary workers. Agricultural or farm industries are the production or growing of food or livestock; processing is considered manufacturing.

Chart 21b - Because of sizes of the statistical samples, estimates vary ± 5%, except carpet layer, for which the estimate may vary from the actual by ± 7%. See listing, page 12, for occupational groupings.

Source: Chart 21a - Bureau of Labor Statistics, Employment and Earnings, 2002 and previous years.

Charts 21b and 21d -Bureau of Labor Statistics, U.S. Department of Labor. 2000 Current Population Survey Earnings Files, Washington DC. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 21c - U.S. Census Bureau, Economic Census, Industry Summary, Subject Series: Construction, 1997 and various years.

22

Job Tenure and Contingent and Alternative Employment in Construction and Other Industries

Almost any work arrangement that differs from the commonly perceived norm of a permanent, full wage-and-salary job might be considered contingent work. The phrase, contingent work, was first proposed by Audrey Freedman in 1985 to refer to:

> cognitional and transitory employment arrangements as initiated by a need for labor – usually because a company has an increased demand for a particular service or a product or technology, at a particular place, at a specific time.[1]

Since 1985, however, the term has been used to refer to a wide variety of employment arrangements, including part-time work, self-employment, temporary-help agency employment, contracting out, employee leasing, and employment in the business-services industry.[2]

Data on contingency have been collected in biennial supplements to the BLS Current Population Survey since February 1995. This survey defines contingent workers as "persons who do not expect their jobs to last or who report that their jobs are temporary." BLS uses 3 measures to estimate the number of contingent workers.

About 529,200 construction workers had contingent jobs at the time of the survey in February 2001,[3] making up 10% of the total contingent workforce and 6% of construction employment. The 2001 contingent rates were below those recorded in February 1995 for construction and for all industries. This drop coincided with declining unemployment and increasing wage-and-salary employment in construction (chart 22a). Although the proportion of contingent workers in construction might be expected to be higher than 6% – many construction projects and jobs take less than two years – an explanation may be that construction workers who move from job to job, when surveyed by BLS, may believe they will continue to have work, even if for a different employer.

In addition to reporting on contingent work, the same BLS survey collects data on alternative employment arrangements, which include independent contractors, on-call workers, workers paid by temporary help agencies, and workers whose services are provided through contract firms to only one customer at that customer's worksite.[4] About 1.92 million construction workers fell into one of the 4 types of alternative arrangements in the February 2001 Current Population Survey, nearly 88% of whom were independent contractors. The probability of working in an alternative arrangement ranked highest in construction compared with any industry. (chart 22b). (A worker may be in a contingent and an alternative work arrangement.)

Characteristics of contingent construction workers differ from those of the construction workforce overall. The rate of contingent work is higher among younger workers; the average age of contingent construction workers was 36 compared with 39 years for the total construction workforce. Hispanic workers are more likely to hold a contingent job; nearly one of three contingent construction workers (30%) is Hispanic, a rate double that (15%) for all construction employment.[5]

Contingent construction workers are much less likely to have employer-provided health insurance; 20% of those workers had health insurance from their employer, compared with 49% of their noncontingent counterparts. Also, only 19% of contingent construction workers are eligible for and participate in employer-sponsored pension plans compared with 35% of noncontingent construction workers (chart 22c).

Although there are may be reasons to prefer being a contingent worker, many contingent construction workers might prefer a permanent job if given a choice. Among day laborers, 41% said that day laborer was the only job they could find, and 8% said they hoped the current job could lead to permanent employment.[6]

Construction has a higher rate of contingent and alternative employment arrangements, but lower job tenure than other industries combined. In 2000, median years of tenure with one's current employer for employed wage-and-salary workers was 2.8 for construction compared with 3.5 for all industries.[7]

Job tenure in construction is associated with unionization. In 2000, the median job tenure reported by union members was 4 years, one year longer than for non-union construction workers (chart 22d). Average job tenure was higher for both groups, because the data likely were skewed by a few individuals who had worked a long time for one employer. Union members reported longer stays with one employer, but such workers are also older compared with non-union employees. Information on job tenure is derived from supplement questions in the February 2000 Current Population Survey.

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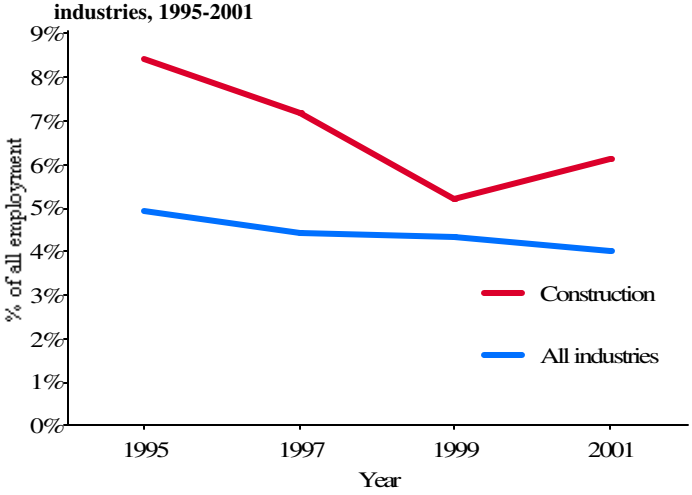
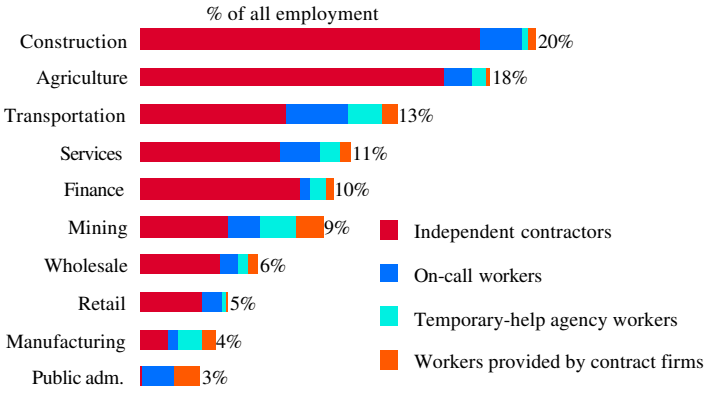
1. Testimony of Audrey Freeman before the Employment and Housing Subcommittee of the Committee on Government Operations, U.S. House of Representatives, May 19, 1988.
2. Steven Hipple, Contingent Work in the Late-1990s, *Monthly Labor Review*, 3-23, March 2001.
3. BLS uses 3 measures to estimate contingent workers. This chart book uses Estimate 3, the broadest measure:

   Contingent workers (Estimate 3) - Workers who do not expect their jobs to last. Wage and salary workers are included even if they already had held the job for more than 1 year and expect to hold the job for at least an additional year. The self-employed and independent contractors are included if they expect their employment to last for an additional year or less and they had been self-employed or indepen dent contractors for 1 year or less.
4. "Independent contractor" is defined differently from self-employed. *See* Glossary.
5. Bureau of Labor Statistics, U.S. Department of Labor. February 2001 CPS Contingent Worker Supplement, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.
6. Bureau of Labor Statistics, U.S. Department of Labor. February 2001 CPS Contingent Worker Supplement, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.
7. Bureau of Labor Statistics, Department of Labor. Employee Tenure in 2000, (BLS newsletter, 2001) Internet address: **http://stats.bls.gov/newsrels.htm** Technical information: (202) 691-6378. USDL 00-245

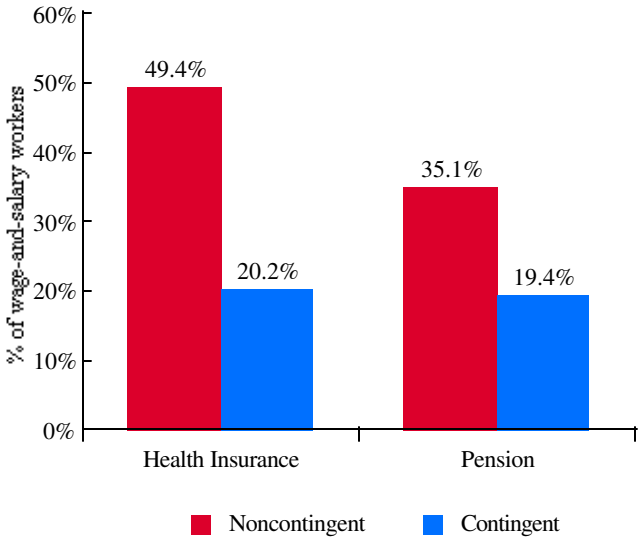
22a. Percentage of contingent employment in construction and all industries, 1995-2001



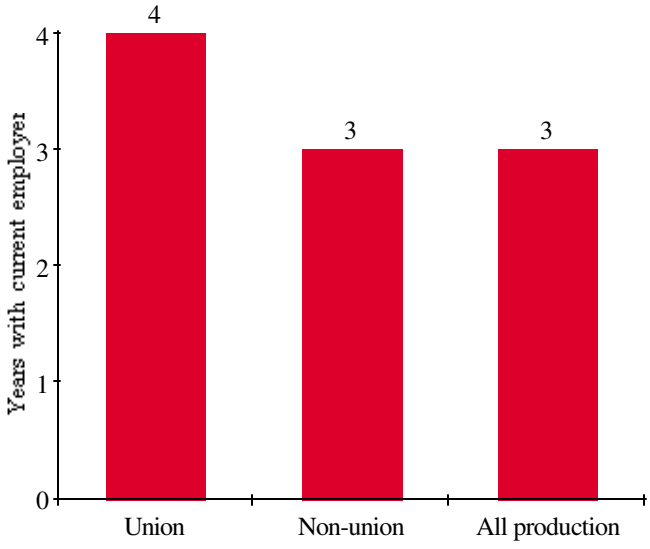
22b. Employment under alternative arrangements, by industry, 2000



22c. Health insurance and pension coverage among contingent and noncontingent wage-and-salary workers in construction, 1999



22d. Median job tenure for blue-collar construction workers, 2000



Note: Chart 22a - Based on survey in February of each year.
Chart 22d - The median is the midpoint; half the workers have a longer job tenure and half have a shorter one.

Source: Chart 22a - 1995 -1999 data from Steven Hipple, Contingent Work in the Late-1990s, *Monthly Labor Review*, 3-23, March 2001; 2001 data from February 2001 CPS Contingent Worker Supplement, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 22b – Bureau of Labor Statistics, February 2001 CPS Contingent Worker Supplement, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 22c - Steven Hipple, Contingent Work in the Late-1990s, *Monthly Labor Review*, 3-23, March 2001.

Chart 22d - Bureau of Labor Statistics, February 2000 CPS Job Tenure supplement, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

23

Wages and Labor Costs In Construction and Other Industries

Wage-and-salary employment increased markedly in construction – and faster than in industries overall – from 1992 to 2001 (*see* chart book page 20). But "real" wages, adjusted for inflation, increased only slightly, starting in 1997. As of 2000, wage and salary levels were still lower than in 1973 (chart 23a).[1]

If construction workers earned wages as high as they earned, on average, in 1973, adjusted for inflation, they could have bought $18.90 worth of goods and services for an hour's pay in 2000. Instead, on average, an hour's pay got a construction worker only about $15.81 worth of living expenses, a decline of about 16% (chart 23a; *see* chart book page 50). Since 1991, the average construction wage has fallen below the average for manufacturing; in 2000, the average wage for manufacturing was $16.74.[2]

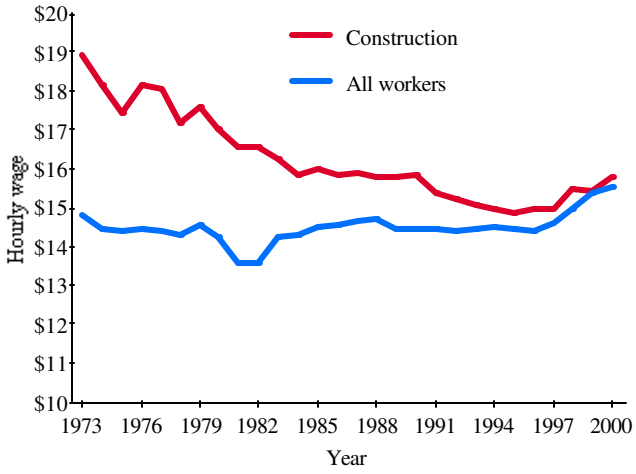
Another way to look at wages is to use an index of total costs to employers of employee benefits and wages and salaries (chart 23b). The Employment Cost Index, a component of the National Compensation Survey conducted by the Bureau of Labor Statistics, provides quarterly and annual percentage changes in labor cost, which includes wages, salaries, and employer costs for employee benefits. This index is one of the principal economic indicators used by the Federal Reserve Bank, the nation's central bank. The index allows people to examine trends in wages and salaries and benefit costs, as well as changes in total compensation. The survey covers private industry establishments plus state and local government workers, but the self-employed are excluded.

The survey defines civilian workers as all private industry and state and local government workers. Federal government, military, and agricultural workers are excluded. Wages and salaries are defined as total earnings before payroll deductions, excluding premium pay for overtime and for work on weekends and holidays, shift differentials, and nonproduction bonuses such as lump-sum payments provided instead of wage increases. Benefits are defined as paid leave, supplemental pay, insurance benefits, retirement and savings benefits, legally required benefits, and other benefits such as severance pay and supplemental unemployment insurance. When construction and all civilian workers are compared, using Employment Cost Index data, the finding, again, is that the construction worker has not gained as much (or as steadily) as have workers in all industries combined. Labor costs have declined in manufacturing and mining also.

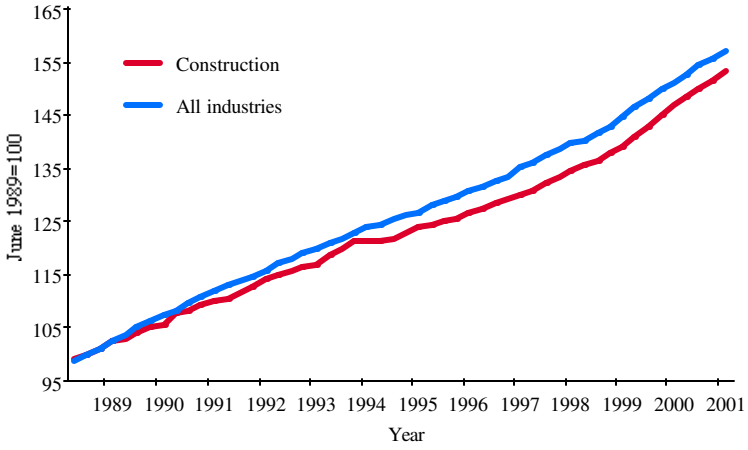
The average total compensation per hour in construction ranked fourth among industries (chart 23c). In all industries, paid time off was the most prevalent benefit available to most workers in private establishments, averaging 6.6% of the total, but such time off accounted only for 3.5% of compensation for construction wage-and-salary workers. Construction has the highest level of mandated benefits – workers' compensation, unemployment insurance – as a percentage of total compensation, reflecting the costs of unsafe working conditions. Benefits coverage varies by union and non-union status, establishment size, occupations, and other factors (*see* chart book pages 28 and 29).

1. Real hourly earnings were produced by means of current Consumer Price Index - All Urban Consumers (CPI-U; with 1982-84=100). The Consumer Price Index and its components are used to adjust other economic data for price changes and to translate these data into inflation-free dollars.
2. Barry T. Hirsch and David A. MacPherson, *Union Membership and Earnings Data Book: Compilations form the Current Population Survey, 2001 Edition*, table 2c. Washington, DC.: The Bureau of National Affairs, Inc. 2001.

23a. Average hourly wage, adjusted for inflation, construction and all workers, 1973-2000
(Wage-and-salary workers)



23b. Index of labor costs for construction and all industries, 1989-2001
(Wages, salaries, and benefits; seasonally adjusted)



23c. Breakdown of average labor costs, by industry, 2001

Industry	Total compens-ation	Wages and salaries	Benefit costs							
			Paid leave	Supplmtl pay	Insurance	Retirement & saving	Legally required		Total	
							$	% of all wkr. comp.	$	% of all wkr. comp.
Transportation	$27.70	$18.94	$1.98	$1.17	$2.08	$1.28	$2.21	7.9%	$8.76	31.6%
Manufacturing	$24.30	$16.66	$1.85	$1.09	$1.93	$0.75	$1.95	8.0%	$7.64	31.4%
Finance	$27.29	$19.35	$2.04	$1.22	$1.70	$1.07	$1.84	6.7%	$7.93	29.1%
Construction	**$24.08**	**$17.04**	**$0.85**	**$1.00**	**$1.51**	**$1.05**	**$2.62**	**10.9%**	**$7.04**	**29.1%**
Wholesale	$22.83	$16.51	$1.53	$0.70	$1.55	$0.65	$1.88	8.2%	$6.33	27.7%
Services	$21.11	$15.92	$1.49	$0.36	$1.12	$0.53	$1.68	7.9%	$5.19	24.6%
Retail	$11.49	$9.13	$0.46	$0.17	$0.46	$0.16	$1.11	9.7%	$2.36	20.5%
All private industry	$20.81	$15.18	$1.37	$0.61	$1.28	$0.62	$1.73	8.3%	$5.63	27.1%

Note: Chart 23a - Wages are in 2000 dollars. Estimates of real wages are weighted using the Consumer Price Index for all consumers (CPI-U) and differ from estimates published in the previous Construction Chart Book, because a different year is used as the standard.

Chart 23b and 23c - Data cover payroll (wage-and-salary) civilian (including non-institutionalized) workers in private industry and state and local government.

Source: Chart 23a - Barry T. Hirsch and David A. MacPherson, *Union Membership and Earnings Data Book: Compilations from the Current Population Survey, 2001 Edition*, table 2c. Washington, D.C.: The Bureau of National Affairs, Inc., 2001

Chart 23b -Bureau of Labor Statistics, Office of Compensation Levels and Trends, Department of Labor, Employment Cost Index Historical Listing (June 1989=100) See BLS web **ftp://146.142.4.23/pub/suppl/eci.echistry.txt**

Chart 23c - Bureau of Labor Statistics, Department of Labor, Employer Costs for Employee Compensation - March 2001, Table 1. USDL: 01-194, June 29, 2001. **www.bls.gov/ncs/ect/**

24

The Reclassification of Construction Occupations

A new Standard Occupational Classification (SOC) will be used by all federal statistical agencies to classify occupations for collecting, calculating, and disseminating data. The new SOC system was developed by the Office of Management and Budget in response to a growing need for a universal occupational classification system. It is designed to cover all occupations in which work is performed for pay or profit and to reflect the current occupational structure in the United States.[1] The SOC is gradually replacing the existing occupational classification systems used by government agencies, with the switch completed by 2004 (*see* chart book page 12). [2]

The SOC classifies workers at four levels: major group, minor group, broad occupation, and detaliled occupation. All occupations are clustered into one of 23 major groups. Within these major groups are 96 minor groups, 449 broad occupations, and 821 detailed occupations. Occupations with similar skills or work activities are grouped at each of the four levels to facilitate comparisons.

The SOC uses a six-digit code. The first two digits of the SOC code show the major group, the third digit represents the minor group, the fourth and fifth digits indicate the broad occupation, and the detailed occupation is shown by the sixth digit. Major group codes end with 0000, minor groups end with 000, and broad occupations end with 0. All residuals – "Other," "Miscellaneous," or "All Other" – at the detailed or broad occupation or minor-group level, contain a 9 at the level of the residual. Detailed residual occupations end in 9. Here is an example of the structure of the 2000 SOC:

47-0000 — Construction and Extraction
- 47-2000 — Construction Trades Workers
  - 47-2040 — Carpet, Floor, and Tile Installers and Finishers
    - 47-2041 — Carpet Installers
    - 47-2042 — Floor Layers, Except Carpet, Wood, and Hard Tiles
    - 47-2043 — Floor Sanders and Finishers
    - 47-2044 — Tile and Marble Setters
  - 47-4090 — Miscellaneous Construction and Related Workers
    - 47-4091 — Segmental Pavers
    - 47-4099 — Construction and Related Workers, All Other

Construction workers are listed primarily in 47-0000, but may also be in other occupation groups, such as Architecture and Engineering Occupations (17-0000); Building and Grounds Cleaning and Maintenance Operations (37-0000); Office and Administrative Support Occupations (43-0000); Installation, Maintenance, and Repair Occupations, (49-0000); Transportation and Material Moving Occupations (53-0000), and Production Occupations (51-0000). Under 47-0000, occupations are divided into five minor groups (chart 24). Under the minor groups, occupations are coded according to job requirements. For example, construction helpers and laborers, which were coded under Handlers, Equipment Cleaners, Helpers, and Laborers in the old system, are coded mainly in 47-3000, Helpers, Construction Trades. Different types of laborers and helpers are coded separately, such as, 47-2061, Construction Laborers; 47-3012, Helpers – Carpenters; 47-3011, Helpers – Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters; 47-3013, Helpers – Electricians; and 47-3016, Helpers – Roofers.

1. *Revising the Standard Occupational Classification System*, U.S. Department of Labor, Bureau of Labor Statistics, June 1999, Report 929. **www.bls.gov/soc/socrpt929.pdf** ; The SOC manual can be ordered from the U.S. Department of Commerce National Technical Information Service; call 703-605-6000 or 1-800-553-NTIS (6847), or visit **www.bls.gov/soc/**

2. This is the schedule for implementation by the Bureau of Labor Statistics: Occupational Employment Statistics (1999), Office of Employment Projections (2001),Current Population Survey (2003), Employer Costs for Employee Compensation (2004), Locality Wage Levels (2004), National and Census Division Publications (2004), Integrated Benefit Provision Products (2004), Employment Cost Index (2004), Census of Fatal Occupational Injuries (2003), and Survey of Occupational Injuries and Illnesses (2003).

24. Broad occupations in construction and extraction, 2000 SOC

Code	Occupation	Code	Occupation
47-1000	Supervisors, Construction and Extraction Workers	47-3000	Helpers, Construction Trades
47-1010	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-3010	Helpers, Construction Trades
47-2000	Construction Trades Workers	47-4000	Other Construction and Related Workers
47-2010	Boilermakers	47-4010	Construction and Building Inspectors
47-2020	Brickmasons, Blockmasons, and Stonemasons	47-4020	Elevator Installers and Repairers
47-2030	Carpenters	47-4030	Fence Erectors
47-2040	Carpet, Floor, and Tile Installers and Finishers	47-4040	Hazardous Materials Removal Workers
47-2050	Cement Masons, Concrete Finishers, and Terrazzo Workers	47-4050	Highway Maintenance Workers
47-2060	Construction Laborers	47-4060	Rail-Track Laying and Maintenance Equipment Operators
47-2070	Construction Equipment Operators	47-4070	Septic Tank Servicers and Sewer Pipe Cleaners
47-2080	Drywall Installers, Ceiling Tile Installers, and Tapers	47-4090	Miscellaneous Construction and Related Workers
47-2110	Electricians	47-5000	Extraction Workers
47-2120	Glaziers	47-5010	Derrick, Rotary Drill, and Service Unit Operators, Oil, Gas, and Mining
47-2130	Insulation Workers	47-5020	Earth Drillers, Except Oil and Gas
47-2140	Painters and Paperhangers	47-5030	Explosives Workers, Ordnance Handling Experts, and Blasters
47-2150	Pipelayers, Plumbers, Pipefitters, and Steamfitters	47-5040	Mining Machine Operators
47-2160	Plasterers and Stucco Masons	47-5050	Rock Splitters, Quary
47-2170	Reinforcing Iron and Rebar Workers	47-5060	Roof Bolters, Mining
47-2180	Roofers	47-5070	Roustabouts, Oil and Gas
47-2210	Sheet Metal Workers	47-5080	Helpers--Extraction Workers
47-2220	Structural Iron and Steel Workers	47-5090	Miscellaneous Extraction Workers

Source: Chart 24 - *Standard Occupational Classification (SOC) System Manual, 2000 Edition*, U.S. Department of Commerce, Technology Administration, National Technical Information Service, 2000.

25

Wage Estimates in Construction by Industry and Standard Occupational Classification

The Occupational Employment Statistics program, run by the U.S. Bureau of Labor Statistics and state employment security agencies, surveys about 400,000 establishments in all industries each year, taking 3 years to contact 1.2 million establishments, which employ more than 70% of the wage-and-salary workers in the United States.

Since 1996, the statistical program has been estimating numbers employed and wages earned for hundreds of occupations. Since 1999, when the program began using the new Standard Occupational Classification system (SOC), more than 800 occupations have been covered. The estimates are available for the nation as a whole, for individual states, and for metropolitan and non-metropolitan statistical areas; national occupational estimates for industries are available also.[1] The survey covers all part-time and full-time workers. It does not cover the self-employed, owners and partners in unincorporated firms, household workers, or people who do not receive salaries for their work in a family business.

The program surveys collect data for payroll periods that include the 12th day of October, November, or December, depending on the industry surveyed. If wage data are collected in 1999 for the 2000 report, for instance, the data are adjusted to 2000 prices by using information on wage changes in the most applicable national Employment Cost Index series (chart 25a; *see* chart book page 23).

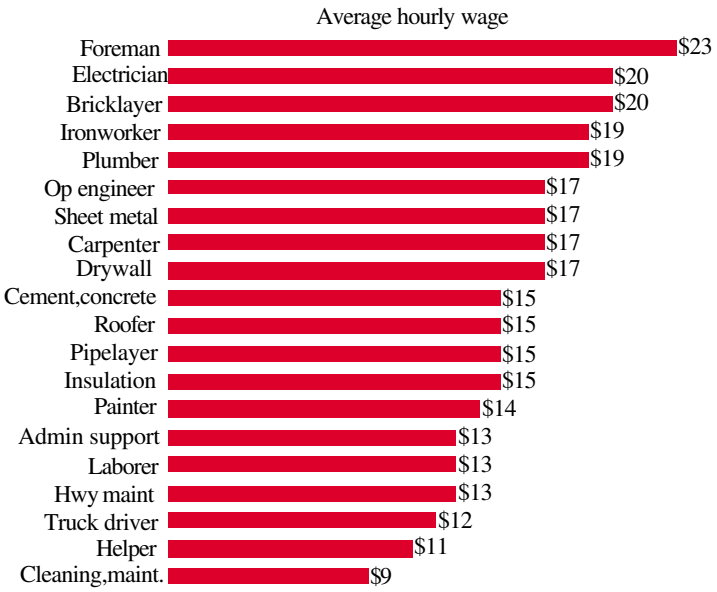
The data confirm that wage rates vary among industries and occupations (charts 25b and 25c). Even for the same occupation, wage rates can differ by industry.

The program coded industries using the 1987 Standard Industrial Classification system for its 2000 data, but is expected to start using the 2002 North American Industry Classification System in its fourth-quarter 2002 survey. (Before 1996, the program collected employment data for only a list of industries that varied in each year of the three-year survey cycle, and produced only numbers employed by each industry.)

Although another BLS survey, the National Compensation Survey, provides wage information, it does not provide the general wage profiles for a large number of occupations and locations that are used in this chart book. Instead, the National Compensation Survey is designed to integrate data from separate BLS compensation surveys and provides earnings data by worker characteristics (age, race, sex), establishment characteristics (such as, size), and geographic area; it can provide information to help set worker pay levels.

Because of the Occupational Employment Statistics program's transition to the new SOC system, the 2000 estimates are not directly comparable with previous years' estimates. The wage rates estimated by the program may differ from numbers on other pages in this chart book, as well, because of the unique survey methodology and estimate methods used by each data collection system.

25a. Average hourly wage, by selected construction occupation, 2000 (Wage-and-salary workers)



1. For state data, *see* www.bls.gov/oes/2000/oessrcst.htm and for data on metropolitan areas, *see* www.bls.gov/oes/2000/oessrcma.htm

25b. Hourly and annual wage, by construction industry, 2000 (Average and median)

		Hourly Wage		Annual Wage	
		Average	Median	Average	Median
152	GC residential bldg	$16.88	$14.44	$35,120	$30,030
153	Operative bldg	$19.69	$16.14	$40,950	$33,570
154	GC nonres bldg	$19.20	$16.98	$39,940	$35,310
161	Highway	$17.72	$15.96	$36,860	$33,200
162	Heavy non-hwy	$17.73	$15.42	$36,870	$32,070
171	Plumbing, heating, A/C	$18.18	$15.97	$37,820	$33,210
172	Painting	$15.07	$13.16	$31,350	$27,370
173	Electrical	$19.13	$16.91	$39,790	$35,180
174	Masonry	$17.52	$15.87	$36,440	$33,010
175	Carpentry	$16.74	$14.64	$34,820	$30,440
176	Roofing, siding, sheet metal	$16.18	$13.77	$33,650	$28,640
177	Concrete	$15.88	$13.83	$33,040	$28,760
178	Water well drilling	$14.35	$12.24	$29,860	$25,460
179	Miscellaneous	$17.32	$15.22	$36,030	$31,660

25c. Hourly wage, by selected construction industry and occupation, 2000 (Average and median; wage-and-salary workers)

		General Building		Heavy Construction		Special Trades	
		Average	Median	Average	Median	Average	Median
00-0000	Industry total	$17.95	$15.57	$17.73	$15.58	$17.54	$15.41
11-0000	Manager	$32.57	$28.97	$34.03	$30.42	$33.39	$29.23
43-0000	Office and adm support	$12.82	$12.16	$13.50	$12.50	$12.62	$11.72
47-0000	Construction and extraction	$16.35	$15.00	$16.49	$15.15	$17.00	$15.37
47-1011	Foreman/mgr.	$23.11	$22.03	$22.12	$21.09	$23.39	$21.44
47-2031	Carpenter	$17.01	$15.97	$18.72	$16.82	$17.60	$16.14
47-2061	Construction laborer	$12.75	$11.15	$13.69	$11.60	$13.05	$11.35
47-2073	Op engr & other const. occup.	$19.37	$18.08	$18.66	$17.35	$18.36	$16.91
47-2111	Electrician	$17.95	$16.70	$18.46	$17.93	$20.44	$19.19
47-2141	Painter	$13.78	$13.04	$14.78	$13.69	$14.31	$13.08
47-2152	Plumber, pipefitter	$20.76	$18.97	$18.41	$17.26	$19.43	$18.09
47-2211	Sheet metal worker	$17.10	$15.80	N/A	N/A	$17.61	$15.84
47-3012	Helper-carpenter	$10.26	$9.94	$11.60	$10.56	$10.62	$9.91
49-0000	Installation, maint., and repair	$14.97	$13.93	$16.09	$15.17	$16.17	$15.14
53-0000	Transport. and materials moving	$13.81	$12.55	$14.96	$13.38	$14.35	$13.14

Note: Charts 25b and 25c -The median is the midpoint; half of the reported wages are larger and half are smaller.
Chart 25c - N/A = not available.

Source: All charts - Bureau of Labor Statistics, *Occupational Employment and Wages, 2000*. Department of Labor. USDL: 01-415, November 2001, www.bls.gov/oes/

26

Hourly Wages, by Union Status and Region, Gender, and Ethnic and Racial Status

Wage rates among production – blue-collar – workers vary, depending on region, gender, ethnic background, and race. And union members in construction, on average, have a substantial advantage over nonmembers.

Unlike the Occupational Employment Statistics program, which collects data from employers, the Current Population Survey asks wage earners about their hourly pay, excluding overtime pay, tips, and commissions (*see* chart book pages 25 and 11). But, other factors that may explain wage differences include occupation, education, age, and experience. For instance, production workers who are union members are, on average, slightly older and more educated than non-union workers. The higher union wage may also reflect higher productivity and training levels that cannot be measured using this survey.

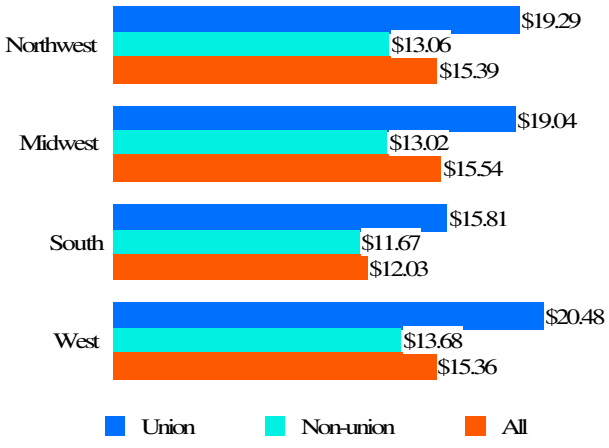
When wages are compared among regions, the union–non-union difference is smallest in the South, which is less unionized than other parts of the United States (chart 26a). The average hourly wage in the South is about $3 – or 20% – less than in other regions.

For women workers in construction production occupations, as for men, union pay is roughly 1.5 times higher than non-union pay (chart 26b). The average-wage difference between women and men in the union sector is 9% compared with 17% in the non-union sector.

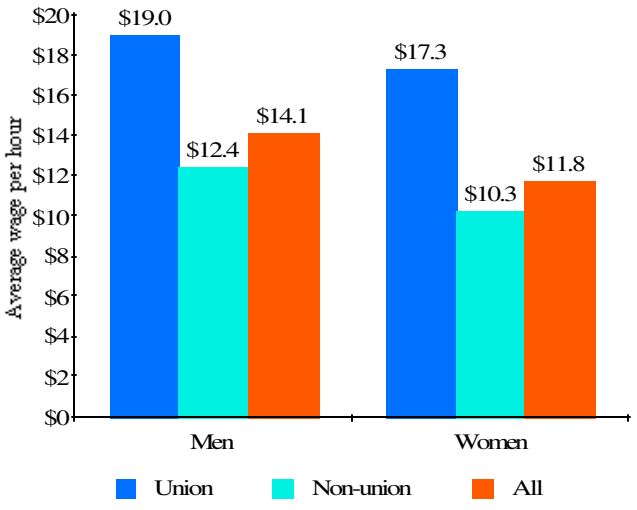
Hispanic workers in construction who are union members earn a higher hourly wage, on average, than nonmembers. The average wage difference between Hispanic and non-Hispanic workers in the union sector is 13% compared with 19% in the non-union sector (chart 26c).

Similarly, members of racial minorities earn a higher wage, on average, as union members than when not unionized in construction (chart 26d).

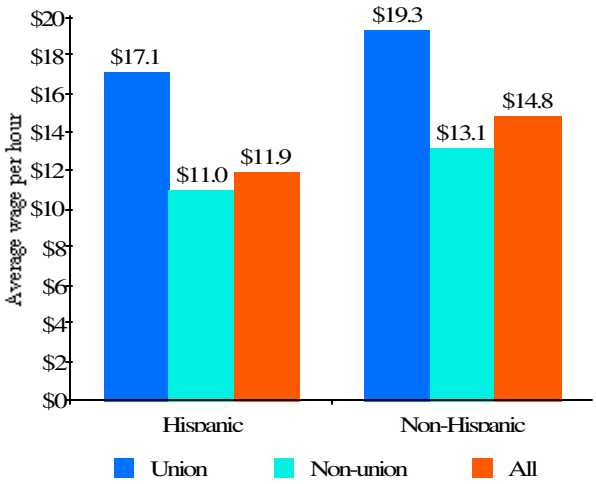
26a. Average hourly wage in construction, by region and union status, 2000 (Production workers)



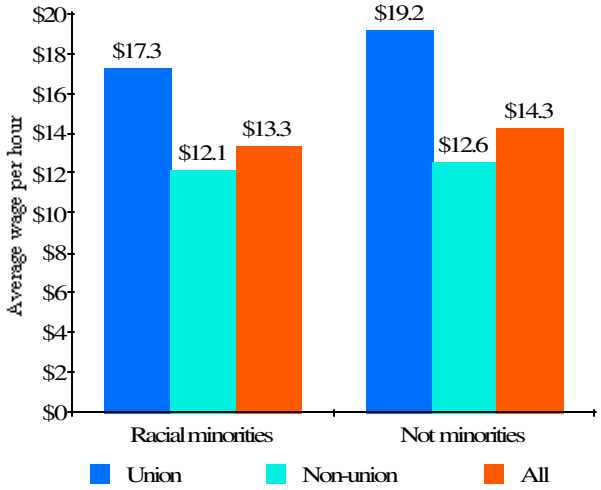
26b. Average hourly wage in construction, by gender and union status, 1998-2000 average (Production workers)



26c. Average hourly wage in construction among Hispanic and non-Hispanic workers, by union status, 2000 (Production workers)



26d. Average hourly wage among construction workers who are and are not members of racial minorities, by union status, 2000 (Production workers)



Note: All charts - Production workers are blue-collar workers – all workers except managerial, professional (architects, accountants, and so on), and administrative support staff. (The self-employed are excluded from these charts, which cover only wage earners.) The wage is what a worker reports as his/her hourly rate of pay, excluding overtime pay, tips, or commissions. Data include all hourly wage earners whose wages were greater than zero, among survey respondents who said it was easier to report their pay on an hourly basis. The estimates are based on the self-reported in the Current Population Survey. Thus, they are not comparable to estimates on chart book page 25. The calculations do not take into account occupational and other differences.

Chart 26a - BLS divides the states and the District of Columbia into these regions:

Northeast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont

Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin

South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia

West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nebraska, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

The minimum sample size is 150, standard errors of wages are within ±3%, ranges between upper and lower levels (95% CI) were within $2.00, p-value <0.001.

Chart 26b -- Wages are averaged for three years in 2000 dollars; wages in 1998 and 1999 are adjusted by using the Urban Consumer Price Index (CPI-W). The minimum sample size is 80, the standard errors of wages were within ±5%; ranges between upper and lower limits (95% CI) were within $3.00, p-value <0.001.

Chart 26c – The minimum sample size is 150, the standard errors of wages were within ±4%; ranges between upper and lower limits (95% CI) were within $2.50, p-value <0.001.

Chart 26d - The minimum sample size is 145, the standard errors of wages were within ±4%; ranges between upper and lower limits (95% CI) were within $2.50, p-value <0.001.

Source: All charts - U.S. Department of Labor, Bureau of Labor Statistics, 2000 Current Population Survey Earnings Files, Washington, D.C. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

27

Hours Worked and Overtime in Construction and Other Industries

How many hours do workers in the United States work per week? The answer can be found in surveys from the Bureau of Labor Statistics – the Current Employment Statistics program and the Current Population Survey – which approach the question differently. The first collects data from employers; the second from workers (*see* chart book page 11).

Current Employment Statistics data show a long-term downward trend in average weekly hours at work for all nonfarm production employees on payroll, but an upward trend for such workers in construction between 1980 and 2000 (chart 27a). In the two decades, average weekly hours for all industries dropped from 35.3 hours per week to 34.5 per week, while growing from 37.0 to 39.3 hours per week for construction .

The Current Employment Statistics survey, however, has limitations. It counts only employers' reports on employees' paid hours of work, not hours worked.[1] Also, if a worker holds more than one job, as many construction workers do, the CES counts each job's hours separately. So, if someone works two part-time jobs, one of 15 and one of 25 hours per week, the CES does not report that a worker worked 40 hours. Instead of keeping count of all the jobs each worker has, the survey counts the average hours per week for each job.

The other survey used by the BLS, the Current Population Survey, is based on workers' reports on their own hours worked and includes all jobs held during the survey reference period – the previous week, for instance. In addition, each March, workers are asked about their hours at work in the previous calendar year, including their typical work schedule and the number of weeks that they worked. This survey's limitation is that it depends on people's memories.

Based on the Current Population Survey, on average in 2000, construction workers worked 41.8 (median 40) hours per week and 48.7 weeks (median 52) per year, totaling 2,048 hours (median 2,080) per year. For all industries, the averages are 39.9 hours (median 40) per week, 48.6 weeks (median 52) per year, and 1,964 hours (median 2,080) per year.[2] The construction average hours worked per week and per year are 4 to 5% higher than for all industries.

Another measure of hours worked is the proportion of people working overtime. This chart book defines overtime as beginning after 40 hours per week. More than 29% of construction workers reported working overtime in 2000, while the proportion was 23% in1980, a 27% increase (chart 27b) For all industries, the proportion of workers working overtime increased from 25 to 27% from 1980 to 2000, an 8% increase. The estimates are based on the question, "How many hours did you actually work last week," in the monthly Current Population Survey, and the yearly calculation was averaged using data from the 12 monthly reports.

Among wage-and-salary workers, hours worked vary by occupation and union status (chart 27c). Some occupations are more likely to work overtime than others, in part because their trades may be in great demand. When type of employment is considered, self-employed workers have the longest workweek in construction (chart 27d).

Longer work hours may not mean higher productivity. A study by the National Electrical Contractors Association of electrical construction indicated that certain overtime schedules – such as those with 7 days per week or 12 hours per day – can result in lower productivity (per hour) than in the 40-hour work week.[3] Overtime for several weeks worsens productivity and increases costs per unit of production, according to the report.

The amount of time people spend on their jobs is an indicator of a society's quality of life, particularly because extensive overtime work can harm worker health.[4] Efforts to shorten and standardize the length of the workweek have long been at the forefront of labor market issues. The first such law since World War I in the United States, passed and signed in May 2000 by Gov. Angus King of Maine, limited overtime to 80 hours every two weeks.[5] Since 2001, at least 5 states have passed laws allowing some health care workers, but not doctors, to refuse to work overtime (Marc Linder, College of Law, University of Iowa, personal communication, March 2002).

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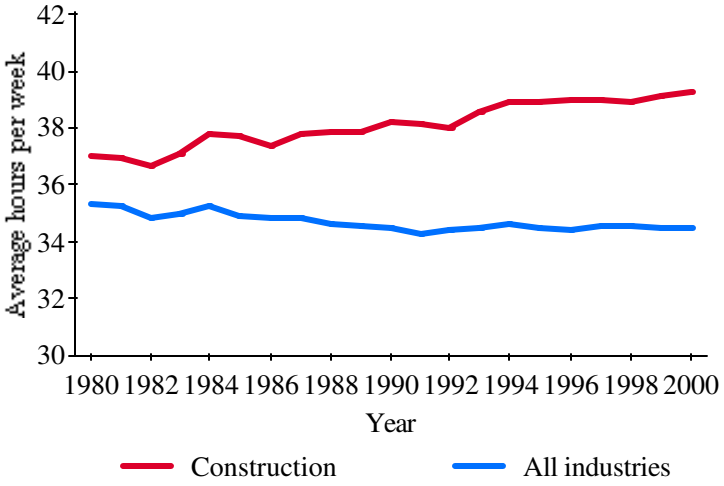
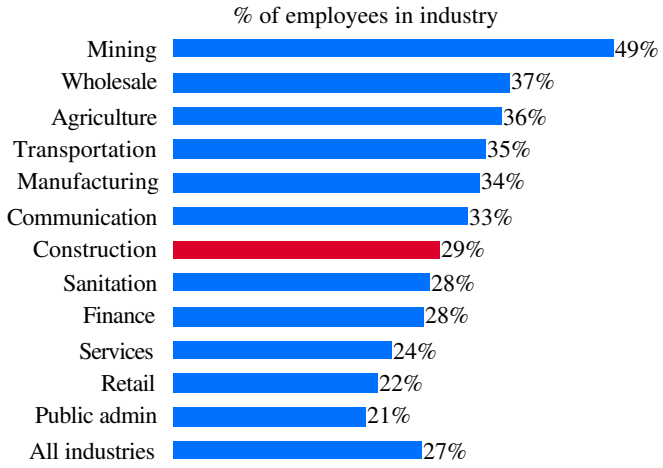
1. Philip L. Ronges, Randy E. Ilg, and Jennifer M. Gardner, Trends in Hours of Work Since the Mid-1970s. *Monthly Labor Review*, April 1997, 3-14.
2. Census Bureau, 2001 March Supplement to the Current Population Survey. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights. Sample size of construction was 4,109, and all industry 13,729. Technical note: The standard errors were within ±1%; ranges between upper and lower limits (95% CI) were: Construction: Hrs /wk (CI: 41.48, 42.05); Wks / yr (CI: 48.41, 48.92); Hrs / yr (CI: 2030.27, 2066.41); All industry: Hrs /wk (CI: 40.90, 41.21); Wks / yr (CI: 48.54, 48.84); Hrs / yr (CI: 2006.35, 2026.33).
3. National Electrical Contractors Association. *Overtime and Productivity in Electrical Construction, 2nd Edition*, Bethesda, Md., 1989.
4. M. Shield, Long working hours and health. *Health Reports*,11:22-48, 1999; J.M. Harrington, Shift work and health – a critical review of the literature on working hours. *Annals of the Academy of Medicine, Singapore*, 23:699-705, 1994; T. Uehata, Long working hours and occupational stress-related cardiovascular attacks among middle-aged workers in Japan. *Journal of Human Ergology* 20:147-53, 1992.
5. Marc Linder, *"Moments are the Elements of Profits"– Overtime and the Deregulation of Working Hours Under the Fair Labor Standards Act*, Fanpìhuà Press, Iowa City, Iowa, 2000, 49-51 and 194-98.

27a. Average hours worked per week, construction and all industries, 1980-2000 (Production workers)



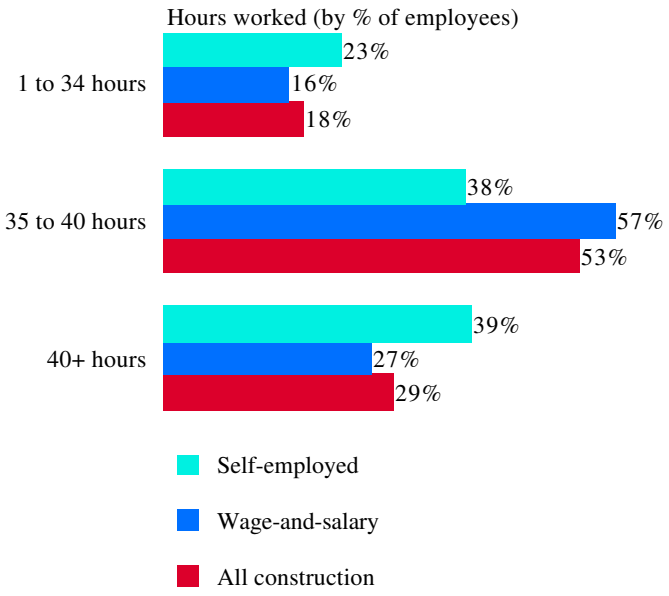
27b. Overtime by industry, 2000 (All types of employment)



27c. Average hours worked per week, by selected construction occupation and union status, 2000 (Wage-and-salary workers)

Occupation	Union	Non-union	Average
Manager	42.5	43.5	43.4
Op engineer	41.8	43.1	42.7
Welder	39.0	42.4	41.9
Repair	42.3	43.6	43.4
Truck driver	44.0	41.9	42.3
Heat A/C mech	40.1	40.8	40.7
Insulation	39.8	43.9	42.0
Plumber	40.9	41.0	40.9
Roofer	38.2	37.4	37.5
Electrical	42.8	41.8	42.2
Ironworker	45.2	41.2	44.0
Sheet metal	46.9	40.1	42.9
Concrete	39.7	37.9	38.4
Carpenter	40.3	38.7	39.0
Drywall	43.3	38.5	39.0
Bricklayer, mason	39.6	39.3	39.4
Laborer, helper	38.7	37.7	37.8
Painter	39.2	38.1	38.2
Admin. support	40.8	36.6	36.7
All construction	41.3	40.1	40.3

27d. Average hours worked per week in construction, by wage-and-salary and self-employed workers, 2000



Note: Chart 27a - Covers private-sector nonfarm payrolls; excludes the self-employed.

Chart 27c - The minimum sample size was >30 for all except Support (26), Concrete (23), Roofer (23), and Drywall (18), in the union sector. The standard errors for hours were within ±5% except Drywall (6%) and Roofers (7%).

Source: Chart 27a - Establishment Data, Historical Hours and Earnings, B-2. Average hours and earnings of production or nonsupervisory workers on private nonfarm payrolls by major industry, 1964 to date. Bureau of Labor Statistics, ftp://146.142.4.23/pub/suppl/empsit.ceseeb2.txt

Charts 27b, 27c, and 27d - Bureau of Labor Statistics, 2000 Current Population Survey Earnings Files, Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

28

Health Insurance Coverage in Construction and Other Industries

In 2000, about 61% of wage-and-salary employees were covered by health insurance obtained at the workplace from their employer or union.[1] That compares with 86% of the population who had health insurance coverage from any source.[2] The estimates are based on the March 2001 Current Population Survey, which is the most consistently cited source of data on the number and characteristics of people with and without health insurance.

The survey asks people whether they were covered by a private health insurance plan in the last calendar year. If they say "yes," they are asked, "Was this health insurance plan in your own name?" and "Was this health insurance plan offered through your current or former employer or union?" Respondents are asked also about health insurance coverage from public sources, such as Medicare, Medicaid, CHAMPUS (Civilian Health and Medical Program of the Uniformed Services), and CHAMPVA (for dependents or survivors of military veterans).

Overall, the proportion of construction workers covered by health insurance is relatively low, whether insurance is provided by the employer or any other source (chart 28a). Just under 54% of construction wage-and-salary workers had health insurance provided by their employer or union in 2000, a slight increase from 5 years earlier, when the figure was 52%. Another 16% of construction workers got health insurance from a family member's employer or by buying it themselves. About 3% of construction workers got health insurance from public sources. Of the workers who had health insurance coverage, 1.7% had both public and private insurance.

Several factors contribute to fewer construction workers' having insurance coverage. One is the prevalence of small companies in the industry. Companies having 25 or more employees are more likely to provide health insurance, on average, than are smaller companies (chart 28b), and about 44% of construction employees work in establishments having fewer than 25 employees.[3]

Another factor contributing to the relatively low level of health insurance coverage in construction is that Hispanics are less likely to have health insurance coverage than their non-Hispanic counterparts – 33% of Hispanics and 57% of non-Hispanic construction workers have health insurance through their employer or union – and 17.5% of construction wage-and-salary workers are Hispanic workers, compared with 11.3% in all industries.

The seasonality of construction work in many parts of the United States may contribute, as well, to the relatively low health-insurance coverage in construction. Industries having a higher proportion of seasonal employment, such as construction and agriculture, provide less access to insurance.[4] Alternative-work arrangements, including independent contracting and temporary, leased, or day labor, are less likely to have health insurance also (see chart 22c).

In two ways, however, data on health insurance coverage among production workers in construction appear to buck overall trends. Although members of racial minorities are less likely to have health insurance generally,[2] the pattern is different in construction. Among production workers, 55% of minorities, compared with 50% of nonminority workers have insurance through their employer or union. One reason might be that the average age (38) of construction production workers who are members of racial minorities is slightly higher than for workers overall (36) and length of service is a commonly used criterion for eligibility for health insurance coverage.

Second, for construction production workers, the lower rate of employer- or union-provided health insurance coverage for women compared with men – 42% of the women and 51% of the men have the insurance – runs counter to the patterns shown for wage-and-salary workers in construction or all industries. In construction, 56% of women who are wage-and-salary workers have health insurance coverage through their employment, while 53% of men do.

Among production workers in construction, union members are much more likely to have employer- or union-provided health insurance than are non-union workers, who are more likely to buy their own or be uninsured (chart 28c). A similar pattern prevails for production workers in all industries combined, where 84% of union members obtain health insurance through their employment, compared with 58% of nonunion workers. However, non-union workers in construction are even less likely to have health insurance coverage than non-union workers in other industries. Some characteristics of construction, such as smaller companies and seasonal employment (described above), may partly explain the difference.

Health insurance coverage varies also by construction occupation, in part because of different trends in average firm size, unionization rates, and independent contracting practices among occupations (chart 28d).

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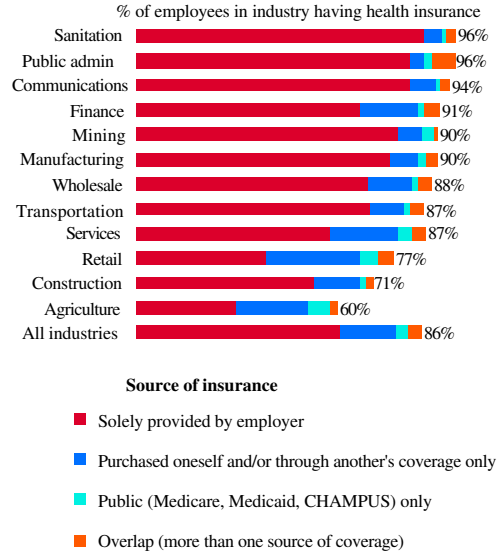
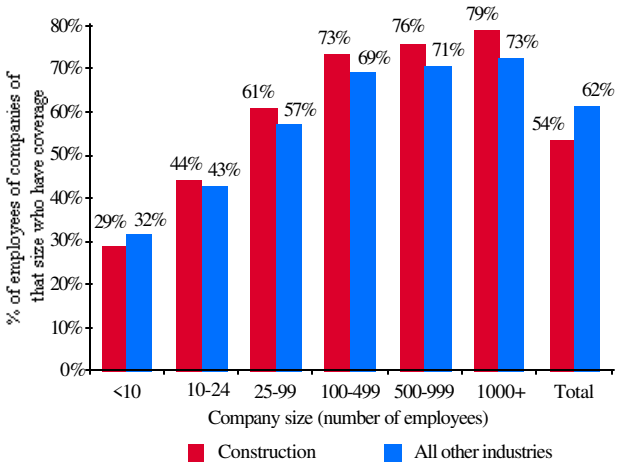
1. Where not footnoted, all numbers cited in the text: Census Bureau, Current Population Survey, March 2001 supplement. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights. As with all surveys, the estimates may differ from the actual values due to sampling and nonsampling errors. *See* Technical Paper 63, *The Current Population Survey: Design and Methodology*, Census Bureau, 2000.
2. Robert J. Mills, *Health Insurance Coverage: 2000*, Census Bureau, September 2001.
3. Data on chart book page 2, which differ slightly from numbers on this page, are from a different source, a survey of employers.
4. Stephen Long and M. Susan Marquis. *Gaps in Employment Based Health Insurance: Lack of Supply or Lack of Demand?* In: Department of Labor, Pension and Welfare Benefits Administration, *Health Benefits and the Workforce*. Washington, D.C: U.S. Government Printing Office, 1992.

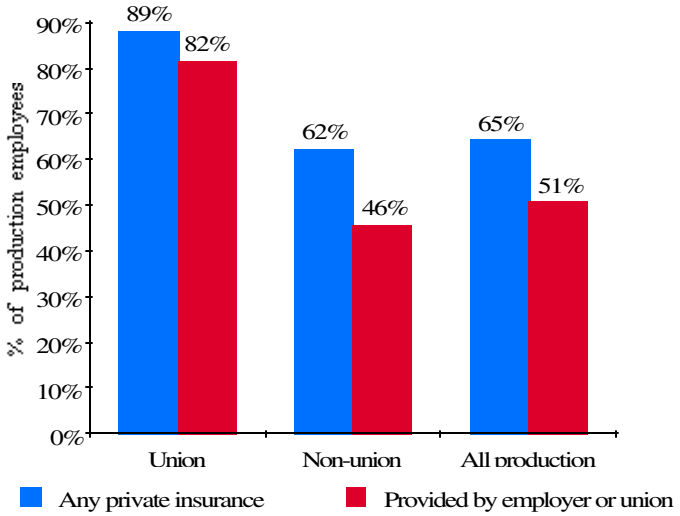
28a. Percentage of employees covered and source of health insurance, by industry, 2000 (Wage-and-salary workers)



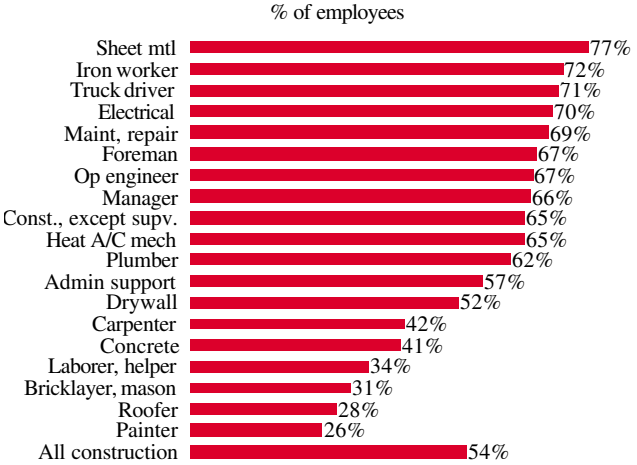
28b. Percentage of employees with health insurance provided by employer or union, by company size, 2000 (Wage-and-salary workers)



28c. Percentage of construction workers who have private health insurance, by union status, 2000 (Production workers)



28d. Percentage of construction workers with health insurance provided by employer or union, by selected occupation, 2000 (Wage-and-salary workers)



Note: All charts - Cover private-sector workers, but exclude the self-employed.

Chart 28c - Production workers are all workers, except managerial, professional and administrative-support staff – and include the self-employed.

Chart 28d - Sample sizes >30, except Iron worker (27). "Construction, exc. supervisor" includes some unclassifiable occupations (but not supervisors).

Source: All charts - U.S. Census Bureau, Current Population Survey, March 2001 supplement. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

29

Pensions in Construction and Other Industries

Construction workers are less likely than workers in most other industries to be eligible for – or participate in – an employer- or union- provided pension plan (chart 29a).[1] Employer-provided plans include traditionally defined benefit plans, including union pension plans to which the employer contributes; profit-sharing and stock plans; and defined contribution plans, such as 401(k) plans.

In 2000, 46% of wage-and-salary construction employees were eligible for an employer- or union-provided pension plan, while 39% of such workers participated in the plans (chart 29a). Although construction is still far behind most other industries, the rates of eligibility and participation in construction increased compared with 1995, when 42% were eligible and 35% participated.

The estimates are based on the 2001 March supplements to the Current Population Survey (*see* chart book page 11). The survey asks, "Other than social security, did the employer or union that (reference person) worked for in (calendar year preceding the survey) have a pension or other type of retirement plan for any of the employees?" If the response is "yes," the survey asks, "Was (reference person) included in this plan?"

Rates of eligibility for and participation in pension plans are even lower in construction when only production workers are counted. While 36% of production workers in construction said their employer or union offered a pension plan in 2000, only 31% of those workers participated in the plans.

The Current Population Survey does not ask reasons for nonparticipation in pension plans, but there are two possible explanations: an employee is not eligible (because a job project or position is not covered, or the employee hasn't been on the job long enough) or the employee chooses not to participate (often because a plan requires employee contributions).

Pension participation among union members working in construction production is much higher, at 76%, than pension participation among the non-union workers, at 28% (chart 29b). Construction occupations having relatively high unionization rates also have high rates of participation in pension plans (chart 29c; *see* chart 13c).

Another factor affecting the percentage of pension eligibility and participation is company size; only 12% of construction workers who worked for companies having fewer than 10 employees participated in pension plans in 2000, compared with 71% in companies with 500 or more employees. The relatively large proportion of small employers in construction is a factor in the low percentages of pension eligibility and participation in the industry.

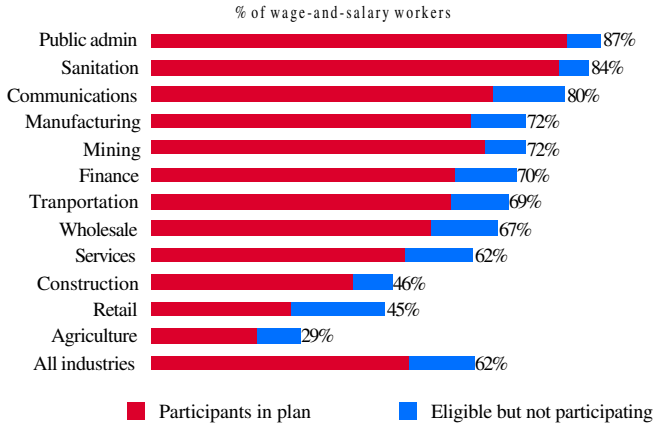
In addition to the Current Population Survey cited here, information on retirement benefits can be obtained from another BLS survey, the National Compensation Survey, covering employee benefit plans for all wage-and-salary workers in private-sector establishments and state and local governments. The percentage of workers having retirement benefits in construction ranked second-lowest (39%), exceeding only the retail industry (30%), among the (private-sector) industries covered by the survey.[2]

The National Compensation Survey evolved from four BLS programs: the Employment Cost Index, the Employer Costs For Employee Compensation, the Occupational Compensation Survey, and Employee Benefit Survey. Results were first published in 1996. Since then, measures of benefit costs, incidence, and provisions have been added.

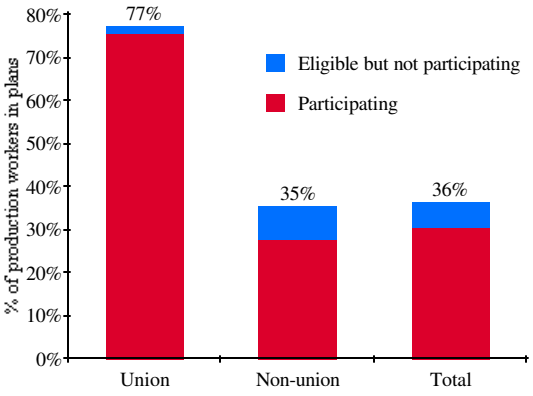
The Department of Labor's Form 5500, which pension plans having 100 or more participants must submit annually, provides pension information from another perspective. (Plans covering fewer than 100 participants file information every three years on Form 5500C and the other years on a form 5500R.) Data derived from Form 5500 show that 70% of pension participants in construction participated in multi-employer plans (*see* chart 29d and note).[3] Multi-employer pension plans are widespread in private industries that are characterized by small companies and workers who switch employers frequently. In addition to construction, other businesses that tend to have workers covered by multi-employer pension plans are trucking, garment manufacturing, and grocery stores.[4]

1. Numbers used in the text (except where noted otherwise) are from U.S. Census Bureau, March 2001 Current Population Survey, Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.
2. Employee Benefits in Private Industry, 1999. Bureau of Labor Statistics, USDL:01-473, Issued December 19, 2001.
3. Pension and Welfare Benefits Administration, United States Department of Labor. Private Pension Plan Bulletin, Abstract of 1998 Form 5500 Annual Reports. No. 11, Winter 2001-2002. Washington, D.C.
4. Harriet Weinstein, and William J. Wiatrowski, Multiemployer Pension Plans, *Compensation and Working Conditions,* Spring 1999, pp. 19-23. Bureau of Labor Statistics, Department of Labor, 1999.

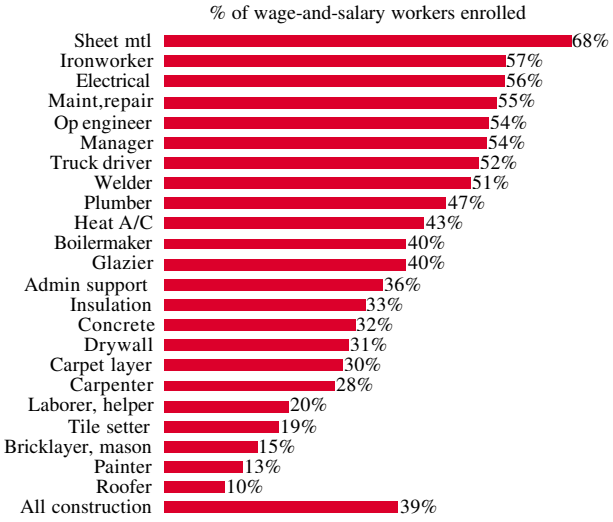
29a. Participation level in employer- or union-provided pension plans, by industry, 2000 (Wage-and-salary workers)



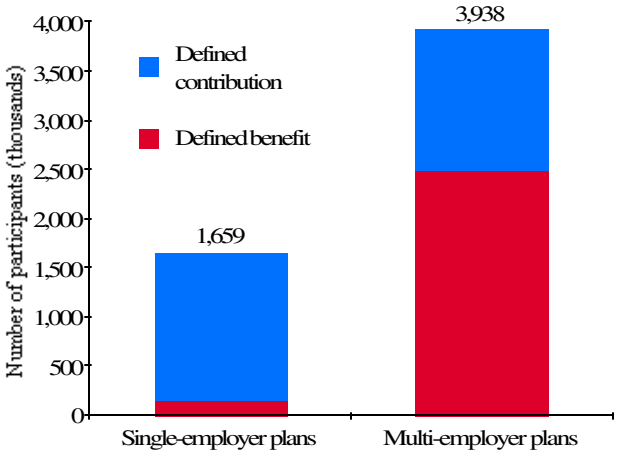
29b. Participation level in employer- or union-provided pension plans in construction, by union status, 2000 (Production workers)



29c. Participation level in employer- or union-provided pension plans, by selected construction occupation, 2000 (Wage-and-salary workers)



29d. Distribution of participants in single- and multi-employer pension plans in construction, 1998



Note: Charts 29a - 29c - Pension plan coverage includes eligibility for an employer or union and if the employee was included during the previous calendar year.

Chart 29b - Production workers are all workers, except managerial, professional (architects, accountants), and administrative-support staff – and include the self-employed.

Chart 29c - *See* list of occupations, page 12.

Chart 29d - Participants include active, retired, and separated vested participants not yet in pay status. The number of participants includes double counting of workers who are in more than one plan. Plans are divided into defined benefits and defined contribution.

Source: Charts 29a, 29b, and 29c - U.S. Census Bureau, Current Population Survey, March 2001 supplement. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 29d - Pension and Welfare Benefits Administration, United States Department of Labor. *Private Pension Plan Bulletin, Abstract of 1998 Form 5500 Annual Reports*. No. 11, Winter 2001-2002. Washington, D.C., table B3.

30

Educational Attainment and Computer Use in Construction and Other Industries

Educational attainment in construction is lower compared with all other industries combined; this is true also when construction is compared with the other goods-producing industries, manufacturing and mining (chart 30a). In 2000, about 35% of construction workers had some post-secondary education, while 56% of the total workforce did. These estimates are based on the Current Population Survey, in which respondents are asked about the highest level of education they have reached, coding each level of formal education attained.

Although the level of formal education in construction still lags behind that of most industries, it has been improving gradually (chart 30b). More than 25% of construction workers had some college education in 2000, including 5% who had vocational/occupational education, while less than 19% of construction workers had completed some college studies in 1980. The percentage of post-secondary education in construction increased by 25% between 1980 and 2000.

The lower level of formal education for construction is, at least partly, due to the high proportion of production workers, who tend to have a lower educational attainment in all industries.[1] Of construction production workers, in 2000, 25% had less than a high school diploma, 47% had a high school diploma, and 28% had some post-secondary education, and this distribution was similar to that among production workers in other industries.

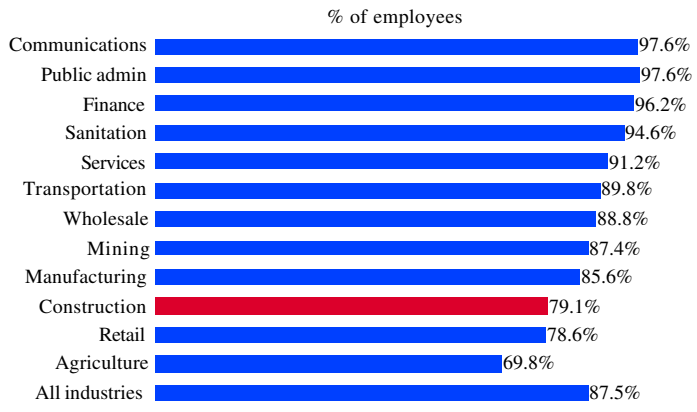
Within construction, union workers are more likely to have a high school diploma than are non-union workers (chart 30c). Among production occupations in 2000, a larger portion of union workers had a post-secondary education – including some college or an associate's degree – than did non-union workers.

Educational attainment differs among ethnic groups and gender. Hispanic construction workers are much less likely to have a high school diploma and post-secondary education than non-Hispanic workers (chart 30d). Women workers are more likely to have higher education attainment than men in construction. Occupational distribution partly contributes to the difference between the groups. There is no significant difference in education attainment between racial minorities and non-minorities in construction.

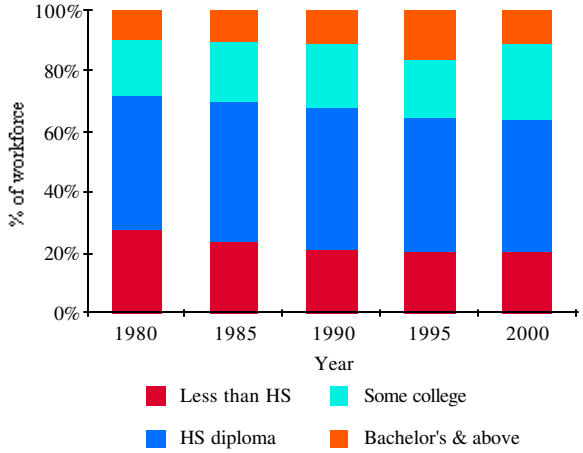
While the Current Population Survey measures formal levels of training, it is less effective at measuring informal training — although most construction knowledge is learned on the job — or as part of special courses, licensing, or certification requirements and apprenticeship (*see* chart book page 31). Training toward these levels may or may not include safety training. For instance, unions and employer associations require that their members take 10-hour or 30-hour safety-training courses mandated by OSHA, and this training may or may not be counted toward an occupational or vocational associate's degree.

In addition, along with the rapid adoption of computer and internet technology, more and more people have computer and internet access at home (chart 30e).[2] Union members are more likely than non-union workers to have a computer and access to the Internet. For instance, about 65% of union wage-and-salary workers in construction had a computer at home in 2000, compared with 49% of non-union workers.

30a. Percentage of employees having a high school diploma or higher education, by industry, 2000
(All types of employment)

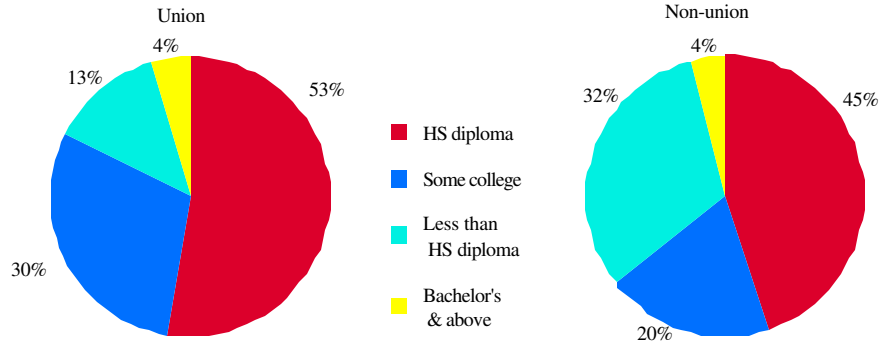


30b. Distribution of educational attainment in construction, 1980-2000

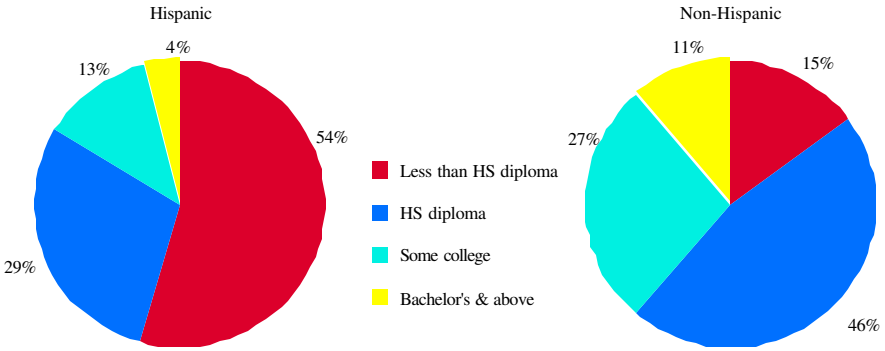


1. The numbers used in the text: U.S. Census Bureau & Bureau of Labor Statistics, 1980 and 2000 Current Population Survey Earning Files, Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.
2. Eric C. Newburger, Home Computer and Internet Use in the United States: August 2000, Special Studies, *Current Population Reports.* Census Bureau, Issued September 2001.

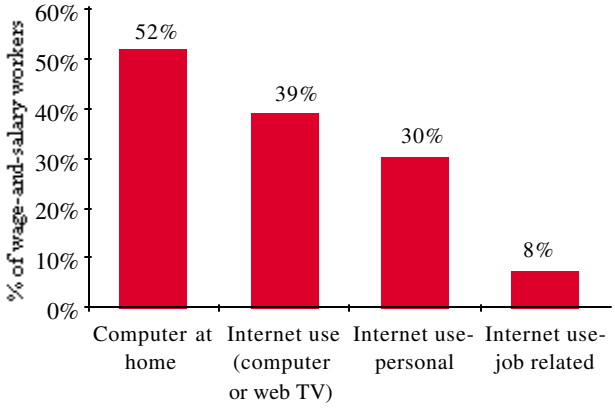
30c. Distribution of educational attainment in construction, by union status, 2000 (Production workers)



30d. Distribution of educational attainment in construction, Hispanic and non-Hispanic workers, 2000 (All occupations)



30e. Access to personal computers and the internet among construction workers, 2000 (Wage-and-salary workers)



Note: Chart 30c - Production workers are all workers, except managerial, professional, and administrative-support staff, and include the self-employed.

Chart 30d - Percentages do not add up to 100 because of rounding.

Chart 30e - Computer access includes all individuals living in a households in which the respondents answered "yes" to the question, " Is there a personal computer or laptop in this household?" (Members of the households are considered to have access to the computers.) Internet access includes those who have at least one member using the internet at home.

Source: Charts 30a, 30b, 30c and 30d - Bureau of Labor Statistics, 2000 Current Population Survey Earnings Files. Calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

Chart 30e - Census Bureau, U.S. Department of Commerce, Current Population Survey Internet and Computer Use Data. August supplement, 2000. Calculations by Xiuwen Dong, The Center To Protect Workers' Rights.

31

Apprenticeships in Construction and Other Industries

Apprenticeships are important in construction, because the work is craft-based, relying on skilled workers who have a great deal of autonomy. Many people enter the construction crafts through apprenticeship programs, which offer on-the-job training under the close supervision of a craftworker, along with formal classroom instruction. Construction apprenticeships generally take 3 to 4 years, depending on the occupation.

The Bureau of Apprenticeship Training at the U.S. Department of Labor sets quality standards, requiring that apprenticeships registered with the federal government include at lest 1 year or 2,000 hours of on-the-job training and recommending 144 hours of formal instruction.

Based on data from the Apprenticeship Information Management System, a database maintained by the Office of Apprenticeship Training/Bureau of Apprenticeship Training, 74% of 230,101 registered apprentices were in about 7,400 construction programs in 2001 (chart 31a). Of the construction workers receiving training, 21% (35,651) were members of racial minorities and 4% (6,064) were women. (The numbers for women and minorities may overlap.)[1] The database system covers only about 60% of the 386,383 apprentices registered with the Bureau of Apprenticeship Training, however.

When apprenticeship numbers are compared with occupational distributions in construction (see chart 12b), it is clear that certain trades have higher rates of apprenticeship than do others (chart 31b). One reason may be certification requirements – for instance, for electricians – which tend to result in higher rates of apprenticeship.

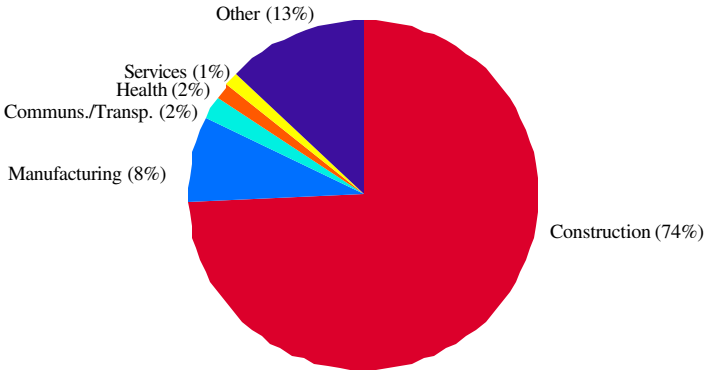
Joint union-management apprenticeship programs are major providers of skilled labor. For the 36 states for which data are available, typically more than 70% of apprentices are enrolled in the joint programs (*see* chart 31c).

In addition to a higher enrollment rate, the completion rate appears to be higher for the joint union-management programs than the non-union programs. One study found that, of 81,386 new apprentices registered from 1989 through 1991 – more than 70% of them in joint apprenticeship programs – 41% in the joint programs had completed them by 1995, while 25% in non-union apprenticeship programs had graduated.[2] (The apprentices were followed through November1995, the most recent month for which data were made available.)

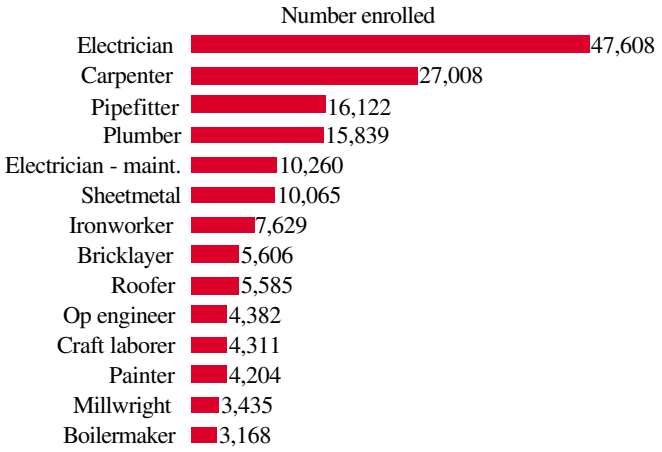
Workers benefit from apprenticeships by advancing their skills and obtaining a credential recognized throughout an industry. For employers, apprenticeship can help ensure that workers learn consistent skills, practices, and safety procedures. In October 2000, the U.S. Department of Labor began a Registered Apprenticeship Awareness Initiative, a program to increase awareness of and support for registered apprenticeship among employers and potential apprentices.[3]

1. Office of Apprenticeship Training, Employer and Labor Services/Bureau of Apprenticeship and Training, U.S. Department of Labor, *The National Apprenticeship System Programs and Apprentices, Fiscal Year 2001*, April 2002, **www.doleta.gov/atels_bat/statistics.asp**
2. Cihan Bilginsoy, Apprenticeship Training in the U.S. Construction Industry, unpublished (University of Utah), revised September 1998, based on data from the Bureau of Apprenticeship and Training, U.S. Department of Labor.
3. U.S. General Accounting Office, *Registered Apprenticeships, Labor Could Do More to Expand to Other Occupations*, Washington, D.C., GAO-01-940, September 2001, p 9.

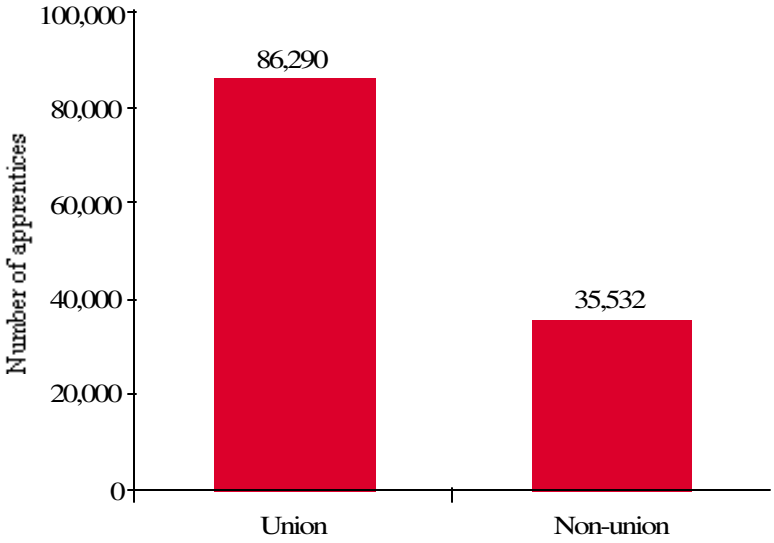
31a. Registered apprentices, by industry, 36 states, 2001



31b. Numbers of active apprentices in 14 construction occupations, 36 states, 2001



31c. Number of apprentices in construction, by union status, 36 states, 1999



Note: All charts - The data do not reflect the entire registered apprenticeship system or provide a nationally representative sample. The District of Columbia, Puerto Rico, the Virgin Islands and the following 14 states do not participate in the Apprenticeship Information Management System (AIMS) used for these charts: California, Connecticut, Delaware, Hawaii, Louisiana, Maryland, New Hampshire, New York, North Carolina, Oregon, Vermont, Virginia, Washington, and Wisconsin.

Charts 31a and 31b - Data are as of Oct. 22, 2001.

Chart 31b - Millwrights install, repair, replace, and dismantle the machinery and heavy equipment used in almost every industry. Although the occupations are construction occupations, the figures may include workers in industries other than construction.

Source: All charts - Office of Apprenticeship Training, Employer and Labor Services / Bureau of Apprenticeship and Training. U.S. Department of Labor, The National Apprenticeship System Programs and Apprentices, Fiscal Year 2001, April 2002, www.doleta.gov/atels_bat/statistics.asp.

32

Projected Employment, Job Creation, and Skills Shortages in Construction

Construction employment to 2010 is expected to rise, although not as quickly as in the 1990s. Between 1990 and 2000, wage-and-salary employment in construction grew from 5.1 million to 6.7 million, or by a 2.7% annual average, while such employment is projected to increase at an average of 1.2% between 2000 and 2010, adding 825,000 wage-and-salary jobs.[1]

Recently released BLS employment projections show, on average, that wage-and-salary employment nationwide is expected to grow by 15% between 2000 and 2010.[2] Services are expected to grow faster than any other industry, continuing a trend of 1990-2000. Although the growth rate in construction is slower than that for the overall economy, the construction industry – which may reach 7.5 million full- and part-time wage-and-salary employees – is the largest and fastest source of employment growth among goods-producing industries. Employment in mining is expected to contract 11%, losing 55,000 jobs in the decade (chart 32a). [3]

Employment growth in industries within construction will vary, depending on the demand for types of construction (chart 32b). Employment in nonresidential building construction is expected to grow slightly faster than in most of the rest of the industry, because replacement or remodeling of many industrial plants, delayed for years, will be needed. Technology enhancements are expected to dampen demand for new commercial construction as nontraditional work and retail environments such as teleconferencing, home offices, telecommuting, and electronic shopping proliferate. Construction of nursing, convalescent homes, and other extended-care institutions likely will increase also, because of the aging of the population, the growing use of high-technology medical treatment facilities, and the need for more drug treatment clinics.[4]

Although household growth may slow slightly in the coming decade, residential construction is expected to grow by 9% in 2000-2010. The demand for new, larger homes with more amenities, as well as second homes, will continue to rise, especially as baby boomers reach their peak earning years and can afford to spend more on housing. At the same time, as the number of immigrants increases and as the children of the baby boomers start to replace the smaller "baby bust" generation born in 1965-76, the demand for manufactured housing, starter homes, and rental apartments also is expected to increase.

The numbers of operative builders are expected to decline, however, as increasingly high prices of building materials hamper financing for home building funded by small builders (Jay Berman , BLS, personal communication, March 2002).

Heavy-construction employment is projected to increase about as fast as the industry average. Growth is expected in highway, bridge, and street construction, as well as in infrastructure repairs.

Employment in special trades contracting will grow at about the same pace as in the entire construction industry. Demand for special trades subcontractors in building and heavy construction is rising. At the same time, home improvement and repair construction is expected to continue to grow faster than new-home construction, which will result in a growing demand for miscellaneous special trade contractors.

Employment growth will differ among construction occupations (chart 32c).[5] About 620,940 (75%) of new wage-and-salary jobs are expected to be added to Construction and Extraction occupations (SOC 47-0000) in the decade. Employment of sheetmetal workers is projected to grow faster than any other occupation in this major group, adding 43,400 new jobs. Electrician, another fast-growing occupation, is projected to create 84,800 new jobs. The number of construction laborers is expected to increase by 106,480 by 2010.

Employment of construction managers is expected to grow as a result of advances in building materials and construction methods which would, presumably, require more oversight, as well as a proliferation of laws dealing with building construction, worker safety, and environmental issues. The numbers – and proportion – of office and administrative support staff are expected to decline slightly, because of increased office automation(chart 32c).[6]

Along with the general demand for workers, the construction industry has been encountering shortages of skilled labor,[7] the result of factors such as the aging labor force, changes in vocational education and technology, and economic ups and downs that have driven some skilled workers from the industry.[8]

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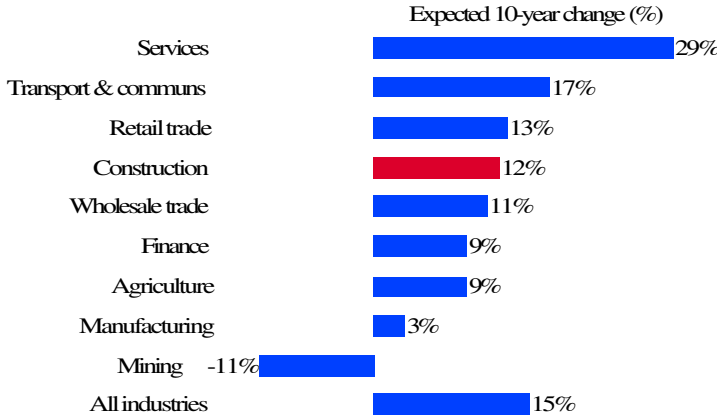
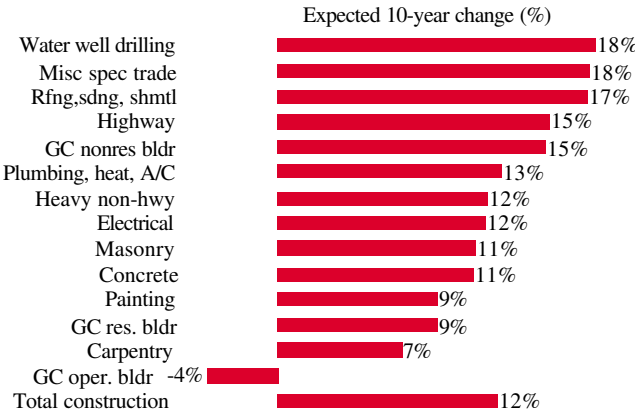
1. Jay M. Berman, Industry Output and Employment Projections to 2010, *Monthly Labor Review*, 39-56, November 2001.
2. These projections were completed before Sept. 11, 2001. The U.S. Bureau of Labor Statistics is expected to incorporate any long-term economic consequences of the 9/11 events in future projections. *2000-2010 Employment Projections*. BLS News Release, USDL 01-443, December 3, 2001. *See* **www.bls.gov/emp**.
3. Industries were coded using the 1987 Standard Industrial Classification (SIC) system.
4. U.S. Bureau of Labor Statistics, *The 2002-03 Career Guide to Industries*. **www.bls.gov/oco/cg/home.htm** (The print edition was expected to be available in early 2002.)
5. Occupations were coded using the 2000 Standard Occupational Classification (SOC) system (*see* chart book page 24). Employment data for wage and salary workers are from the BLS Current Employment Statistics (payroll) survey, which counts jobs, whereas self-employed, unpaid family workers, agricultural, and private household data are from the Current Population Survey (household survey), which counts workers. Estimates on self-employment are excluded, because no breakdown is provided on the construction industry.
6. U.S. Bureau of Labor Statistics, *Occupational Outlook Handbook, 2002-03 Edition*, **www.bls.gov/oco/home.htm** (The print version of the 2002-03 editions was to be available in early 2002.)
7. *Craft Labor Supply Outlook, 2000-2010*. Construction Labor Research Council, Washington DC, 1998; The Business Roundtable, *Confronting the Skilled Construction Work Force Shortage, a blueprint for the future*, October 1997.
8. Abdol R. Chini, Brisbane H. Brown, and Eric G. Drummond, *Causes of the Construction Skilled Labor Shortage and Proposed Solutions*, Gainesville: M.E. Rinker, Sr., School of Building Construction, University of Florida. **http://asceditor.unl.edu/archives/1999/chini99.htm**

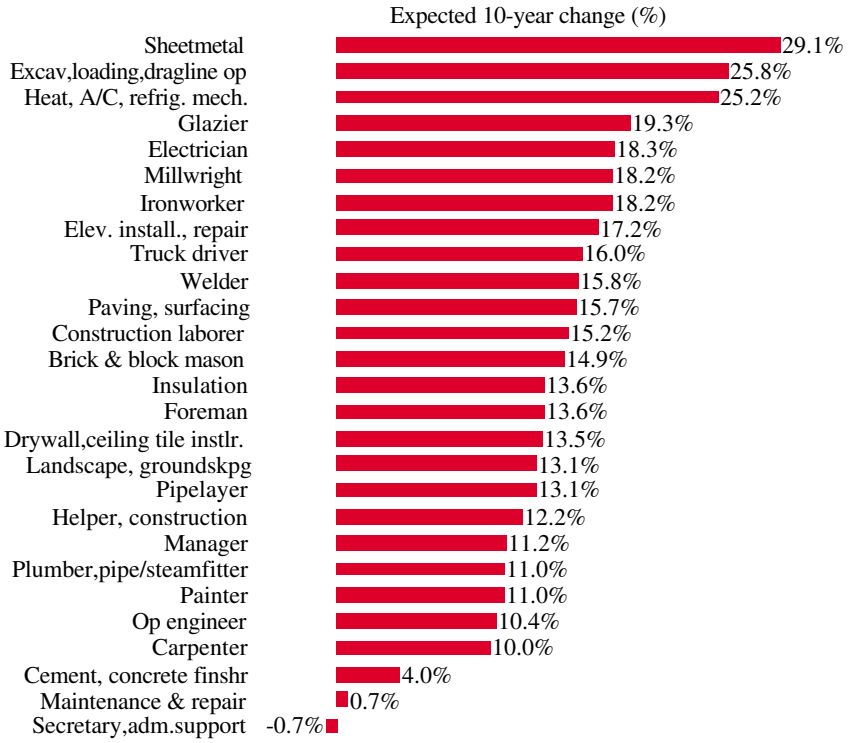
32a. Percentage of projected employment change, by industry, 2000-2010 (Wage-and-salary employment)



32b. Percentage of projected employment change, by selected construction industry, 2000-2010 (Wage-and-salary employment)



32c. Percentage of projected employment change, by selected construction occupation, 2000-2010 (Wage-and-salary employment)



Note: All charts - Employment projections include all occupations, but not the self-employed.
Chart 32c - Millwrights install, repair, replace, and dismantle the machinery and heavy equipment used in almost every industry.

Source: Chart 32a - Jay M. Berman, Industry Output and Employment Projections to 2010, *Monthly Labor Review*, 39-56, November 2001.
Charts 32b and 32c - BLS web site ftp://ftp.bls.gov/pub/special.requests/ep/ind-occ.matrix/ind_pdf/i300000.pdf

33

Inconsistent Data on Safety and Health in Construction

While, in many cases, data on construction fail to adequately describe the industry, the problems – and the potential consequences – are particularly acute relative to safety and health. Most of the shortfalls appear to involve the reporting of injuries, which are easier to overlook than deaths. The underreporting may stem from a desire to maintain a perfect safety record and avoid potential increases in workers' compensation premiums. In some cases, the reporting problems appear to lie in the structuring of national surveys.

Data on nonfatal injuries by establishment size from the U.S. Bureau of Labor Statistics (BLS) show an increase in the rate of recordable injuries as the size of construction establishments declines – but not for establishments of fewer than 50 employees (chart 33a). Those findings, however, from BLS, provider of the most-reliable data on occupational injuries in the United States, do not match the pattern reported in Ontario, Canada, nor do they make sense. Ontario data, based on reports of hours worked for workers' compensation, have suggested for more than a decade that the rate of lost-time injuries increases as firm size decreases (*see* chart 33b). Smaller construction companies are believed to have higher injury rates than larger companies for a mix of reasons, including a reluctance to invest in safety training or equipment for workers who cannot be kept long-term on their payrolls. The two sets of data suggest that smaller construction companies in the United States are underreporting injuries.

Another gap is found when comparing injury and illness numbers produced by the state of Washington's Department of Labor and Industries and BLS. The state receives workers' compensation claims from workers and medical providers, which are confirmed with employers, while BLS depends on a statistical sample of employer reports. Washington state's numbers for 1998 exceed BLS's for that state by 16% or more, depending on whether the most-serious or all cases are counted. Yet Washington state's definition is more restrictive; the state does not count injury or illness cases as lost-workday cases (days away from work) unless an employee is absent 4 days or longer, this practice contrasts with that of BLS, which includes cases involving any days away from work (chart 33c). (The state system data presented in chart 33c exclude about one-third of the workforce who are employed by self-insured companies.) (*Also see* chart book page 38.)

A partial explanation for the gap in total cases may be that the state counts first aid cases, while BLS does not, and that Washington includes some ailments as diseases that BLS treats as injuries. The state system counts an estimated 7% of its cases as "occupational disease,"[1] slightly more than the BLS count of 2% of the reports of injuries and illnesses in construction. Washington state's definition of occupational disease includes chemical-related illnesses, some musculoskeletal disorders, and hearing loss; BLS too includes noise-induced hearing loss and carpal tunnel syndrome as illnesses, but appears to define some musculoskeletal disorders other than carpal tunnel syndrome as injuries.

One way or another, however, BLS appears to be missing a large share of work-related injury or illness cases.

The apparent unreliability of national injury data is evident again when looking at BLS numbers for Hispanic workers, who are an increasingly important part of the construction workforce (*see* chart book page 16). Hispanic construction workers since 1994 have had a death rate markedly higher than the rate for all construction workers. In 1999, the most recent year measured, the rate of work-related deaths from injuries in construction for Hispanics was 19.05 per 100,000 full-time workers, 39% higher than the rate of 13.7 for all construction workers.[2]

Unlike the death reports, however, the injury and illness data for Hispanic workers show no increased job hazards (chart 33d). In fact, the work-related injury and illness rate in construction for Hispanics in 1999 was 7% lower – at 2,852.5 per 100,000 full-time workers – than the rate of 3,072.9 for all construction. Of interest is whether Hispanic worker injuries are underreported, even more than the apparent underreporting of injuries for other workers. Is it that most Hispanic construction workers work for the smallest companies, which appear to underreport injuries more than do larger companies?

There are problems also with the way the data or the surveys are organized. For instance, BLS surveys fail to consistently capture skin diseases that have been documented and that are not believed to have disappeared. Cases of irritant and allergic contact dermatitis among construction workers are nonfatal, but are serious enough that many workers are forced to change occupations (*see* chart book page 47). In 1995, BLS data on skin disorders involving days away from work ranged from 8.61 cases per 10,000 full-time workers among concrete workers to 1.49 among masonry workers and 1.04 among highway workers.

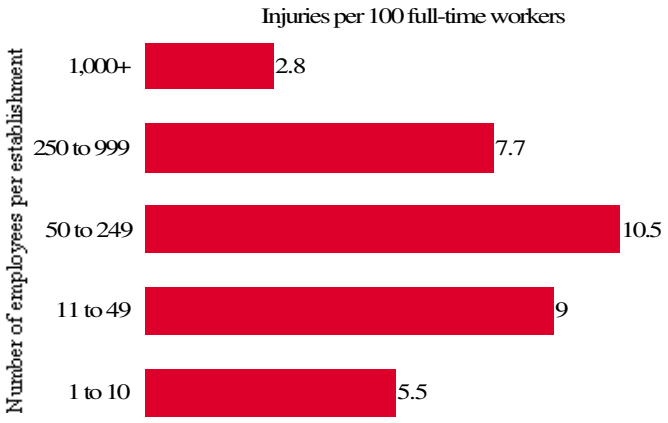
In the four years 1996-99, disorders of the skin and subcutaneous tissue among some construction trades were not reported. For instance, in 1996, BLS listed no such disorders for masonry; in 1997, none for plumbing, masonry, or concrete work; in 1998, none for plumbing or concrete; in 1999, none for plumbing, masonry, or concrete (Shane Stephens, BLS, personal communication, February 2002).

The data were not available to the public because the numbers failed to meet BLS reporting criteria. According to BLS, one possible reason for the failure is that not enough responses were received from surveyed contractors to make the data statistically reliable. As with many surveys, the survey may be too limited to accurately reflect trends in the industry, but expanding of data-gathering is costly.

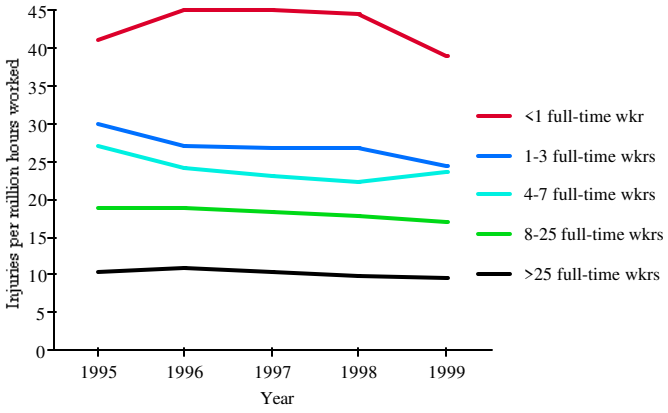
A similar problem has made it difficult to ascertain the number of deaths from trenching. Although trenching is, by definition, construction, trenching-related deaths are separated by the BLS Census of Fatal Occupational Injuries into several classifications and reports must be collected (*see* chart book page 37). Thus, for years, the only published numbers on trenching deaths were estimates ranging from 61 to 200 per year (*see The Construction Chart Book, Second Edition,* chart 33b).

1. Heather Grob, Department of Labor and Industries, personal communication, March and June 2002.
2. Calculations by Risana Chowdhury, the Center to Protect Workers' Rights, using BLS data. Because many construction workers work part time at construction, safety and health statistics are defined in terms of full-time equivalents to allow comparisons with other industries. Full-time work is defined as 2,000 hours worked per year. Hispanics, an ethnic group, may be white, black, or any other race.

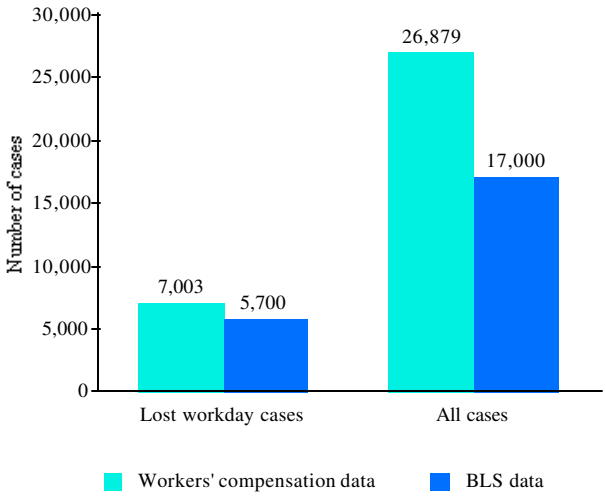
33a. Rate of nonfatal injuries, by establishment size, construction, 1999



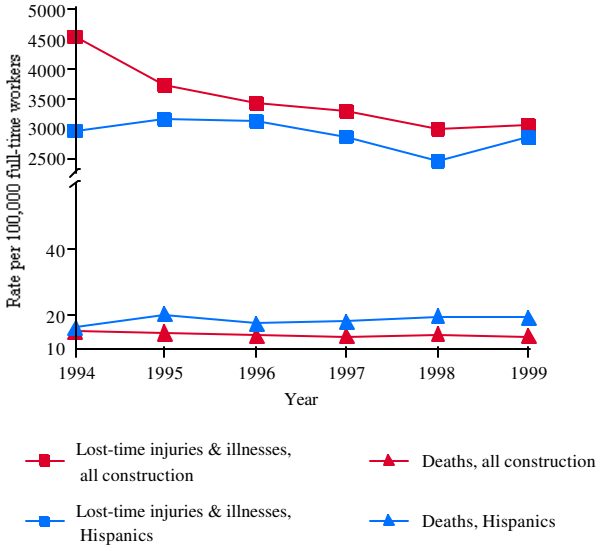
33b. Lost-time injury rates, by company size, construction, Ontario, Canada, 1995-99



33c. Number of nonfatal injuries and illnesses reported for construction in Washington state, workers' compensation system and BLS, 1998



33d. Rate of lost-time injuries and illnesses and work-related deaths from injuries in construction, Hispanics and all construction, 1994-99



Note: Chart 33a - Data cover all recordable injuries in the private sector and exclude the self-employed. Full-time equivalents are defined as 2,000 hours worked. Total of 493,000 injuries.

Chart 33b - Companies showing less than one full-time worker reported fewer than 2,000 payroll hours in a given year.

Chart 33c - For Washington state, lost workday cases have 4 or more days away from work; BLS counts cases with any days away from work. "Occupational disease" makes up an estimated 7% of all Washington state system claims, compared with about 7% of BLS injuries and illnesses, or 2% of BLS totals for construction injuries and illnesses. Definitions for the two systems may differ. The Washington state data exclude about one-third of the state's workforce, who work for self-insured companies.

Chart 33d - Workers identify themselves as of Hispanic origin and may be of any race. Total number of Hispanic deaths ranged from 116 in 1994 to 225 in 1999. Nonfatal injuries and illnesses involving days away from work among Hispanics totaled 17,739 in 1994 and 28,757 in 1999. Data on nonfatal injuries and illnesses cover private sector only and exclude the self-employed; illnesses are less than 2% of the total for construction. Full-time is defined as 2,000 hours worked per year.

Source: Chart 33a - Bureau of Labor Statistics, News Release(Annual Survey of Occupational Injuries and Illnesses), December 2000, table 3.

Chart 33b - Data provided from Construction Safety Association of Ontario. *See* Douglas J. McVittie, Harry Banikin, and Wayne Brocklebank, The Effects of Firm Size on Injury Frequency, in Construction. *Safety Science*, 27(1):19-23, 1997.

Chart 33c - Industrial Insurance Claims 1998, Washington State Department of Labor and Industries, Insurance Division, Olympia, www.lni.wa.gov or 360-902-4783; Bureau of Labor Statistics, Occupational Injuries and Illnesses in the United States, Profiles Data.

Chart 33d - Based on data from Census of Fatal Occupational Injuries, Occupational Injuries and Illnesses in the United States (Profiles Data), and Current Population Survey, all BLS; calculations by Risana Chowdhury, The Center to Protect Workers' Rights.

34

Rates of Work-Related Deaths In Construction and Other Industries

In five industrial countries, reported work-related death rates for the construction industry ranged from 5.2 per 100,000 full-time-equivalent workers in Sweden to 14.2 in the United States, in 1998 (chart 34a). (The rates were adjusted using a definition of full-time work of 2,000 hours per year.)

In spite of the adjustment for full-time hours, it is still difficult to interpret these comparisons because of differences in inclusions and exclusions in the data for the various countries. For instance, the figures for Germany exclude structural steel erection (ironworkers), electrical installers, and sheet metal workers. A death that occurs within 30 days of an injury is considered work-related. The Dutch figures include workers doing new construction, renovation, and demolition on a construction site, but not maintenance of an existing building. Data from Germany, Sweden, and the United States include the self-employed, but estimates from the Netherlands do not and it is unclear whether the self-employed are included in the statistics for Japan.

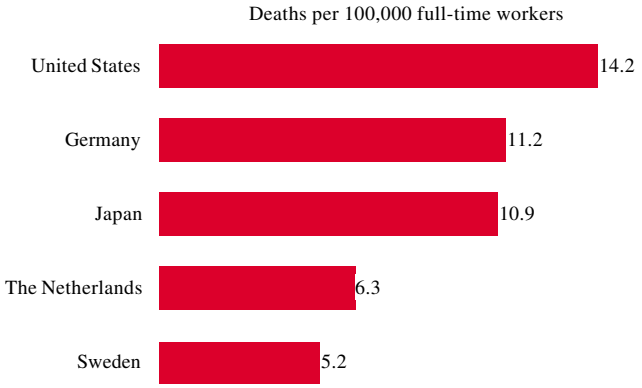
In the United States, when work-related death rates are compared, the construction industry has the fourth-highest rate (chart 34b). At the same time, construction had the largest number of work-related deaths of any industry in 1999 – 1,228 – because of the large number of people employed in the industry, 7% of the workforce.[1] And construction's 20.3% share of work-related deaths is disproportionately high.

Within construction, the death rate for ironworkers (structural metal workers in the BLS occupational code) was 6 times higher than the rate for all construction occupations (chart 34c). Although the rate for construction laborers was roughly half as high, more laborers than any other occupation were killed on the job in the three years 1997-99 — 989 compared with 131 ironworkers, who had the highest death rate — because there are so many more laborers. Because death rates vary from year to year for occupations and because the numbers in some occupations are small, the use of a three-year average can give more statistically reliable estimates.

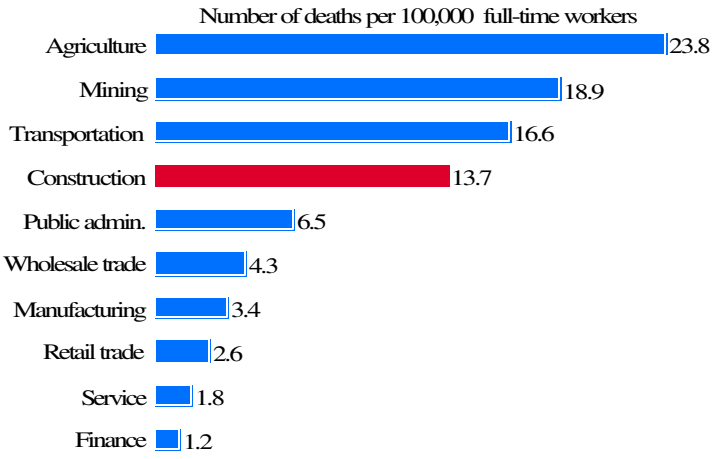
On charts 34b and 34c, the numbers of deaths were obtained from the Census of Fatal Occupational Injuries conducted by the Bureau of Labor Statistics. The Census of Fatal Occupational Injuries is the result of an agreement between the Bureau of Labor Statistics and the 50 states, which collect the information. BLS publishes the national results. The census is based on information from state governments, medical examiner reports, news reports, and other sources. The work-relatedness of all deaths must be verified by at least two sources. Deaths occurring while commuting to work are not counted, but deaths while traveling on a work assignment are. This census is the most complete information available in the United States on work-related deaths.

1. The count of 1,228 deaths is based on BLS revised data, December 2001.

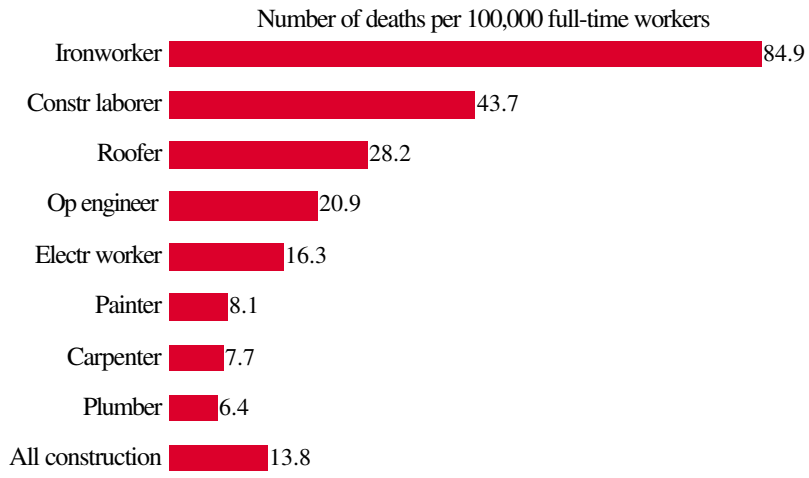
34a. Rate of deaths from injuries in construction, selected countries, 1998



34b. Rate of work-related deaths from injuries, by industry, 1999



34c. Rate of work-related deaths from injuries, selected construction occupations, 1997-99 average



Note: All charts - Because many construction workers work part time at construction, safety and health statistics are defined in terms of full-time equivalents to allow comparisons with other industries. Full-time work is defined as 2,000 hours worked per year.

Chart 34a - Germany figures exclude structural steel erection (ironworkers), electrical installers, and sheet metal workers, and include deaths that occur within 30 days of injuries. The Netherlands figures include workers doing new construction, renovation, and demolition on a construction site, but not maintenance of an existing building.

Chart 34b - In 1999, of 6.054 deaths from work-related injuries, 1,228 (20.3%) were in construction.

Chart 34c - A total of 3,571 deaths in 1997-99, which averages to 1,190 per year.

Source: Chart 34a - Risana Chowdhury, The Center to Protect Workers' Rights, based on Bureau of Labor Statistics and Current Population Survey data; Harald Wilhelm, Bau-Berufsgenossenschaften, Frankfurt, Germany; Masahiko Kunishima, University of Tokyo, Japan; J.C. van Duivenbooden, Arbouw, the Netherlands; Lotta Lundholm, Swedish Work Environment Authority (Arbetsmiljöverket), Solna, Sweden.

Chart 34b - Bureau of Labor Statistics News Release (Census of Fatal Occupational Injuries), August 2001 and http://data.bls.gov Series ID : CFU00M09080, CFU00M10080, CFU00M20080, CFU00M30080, CFU00M40080, CFU00M50080, CFU00M60080, CFU00M70080, CFU00M80080, and population estimates calculated by Risana Chowdhury, The Center to Protect Workers' Rights, based on the 1999 Current Population Survey.

Chart 34c - Based on data from the Bureau of Labor Statistics for the Census of Fatal Occupational Injuries and the Current Population Survey; calculations by Risana Chowdhury, The Center to Protect Workers' Rights. Ironworkers includes only structural metal workers (no welders); laborers include only construction laborers (no helpers); plumbers and carpenters include apprentices; electrical workers include electricians, their apprentices, and electrical power line installers.

35

Rate of Nonfatal Injuries in Construction and Other Industries

The reported rate of serious nonfatal injuries and illnesses in construction dropped 14% in the 5 years 1996 - 2000, according to the Bureau of Labor Statistics, or BLS (chart 35a). Still, compared with other goods-producing industries, construction continues to have the highest rate of such injuries and illnesses.

In 2000, construction workers experienced 194,400 injury and illness cases serious enough to require days away from work – lost workday cases – about 778 per workday. (Illnesses are less than 2% of the total in construction, so the numbers for construction essentially show injuries.)

The rate of cases with days away from work in construction dropped from 1999 to 2000 from 3.3 to 3.2 per 100 full-time-equivalent workers. This 3% decline, however, reflects an increase in the construction labor force rather than a decrease in the number of injury and illness cases. From 1999 to 2000, the total number of cases with days away from work decreased by 2% for all industry and the construction industry's share of such cases increased by 3% (to 11.7%). But the number of construction workers grew by 4.5%; the number of workers is the denominator when rates are calculated (*see* chart book page 20).

Lost-workday cases, by some definitions, may include cases involving only restricted work activity, without any days away from work. But this chart book counts only cases that involve days away from work (with or without restricted work activity, as well).

When BLS injury data – which cover the private sector – are compared with other reports on construction injuries, it becomes clear that much more can be done. The U.S. Army Corps of Engineers, which supervised 66 million to 68 million work hours yearly by contractors in the United States in 1996-2000, reported a rate of nonfatal injuries with days away from work of one-fourth or less of the BLS rate for construction (chart 35b).

Contracting companies of all sizes may work for the Army Corps of Engineers, which reports that it sets rigorous standards. A prospective contractor must submit a proposal on safety and health that, among other things, demonstrates top-management commitment to safety and health, names a responsible person for a project, coordinates and controls work on the job, organizes education and training, and provides for emergency response. The Corps monitors progress in the safety program throughout construction.

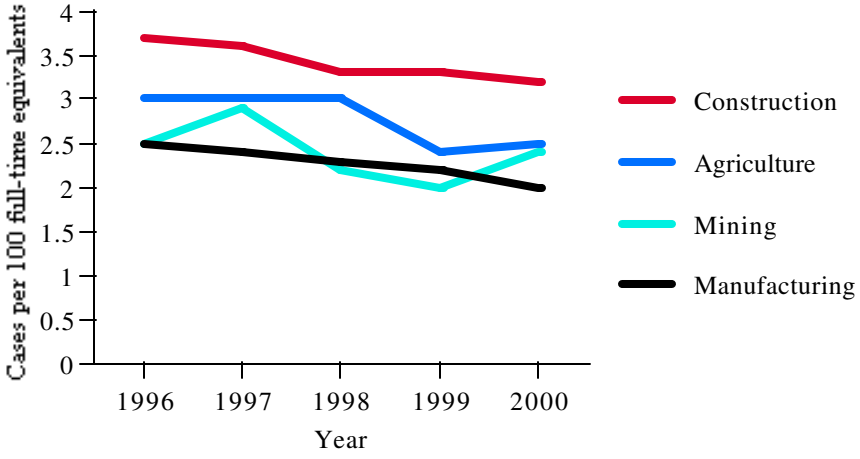
A trade group also reports rates well below the BLS rate. The Construction Industry Institute (CII) reported 0.3 nonfatal lost-workday injury cases per 100 full-time-equivalent workers in 2000 among 46 mid-to-large-size contractor members who reported data (Steve Thomas, personal communication, February 2002). That figure does not reflect all contractor members of the trade group; some who didn't report might have had higher injury rates. At the same time, the figure is more inclusive than the BLS category used here, "with days away from work." CII lost-workday cases may include cases with days of restricted work only.

BLS reported these rates per 100 full-time-equivalent workers. Other BLS injury data reported elsewhere in this chart book are per 10,000 full-time-equivalent workers.

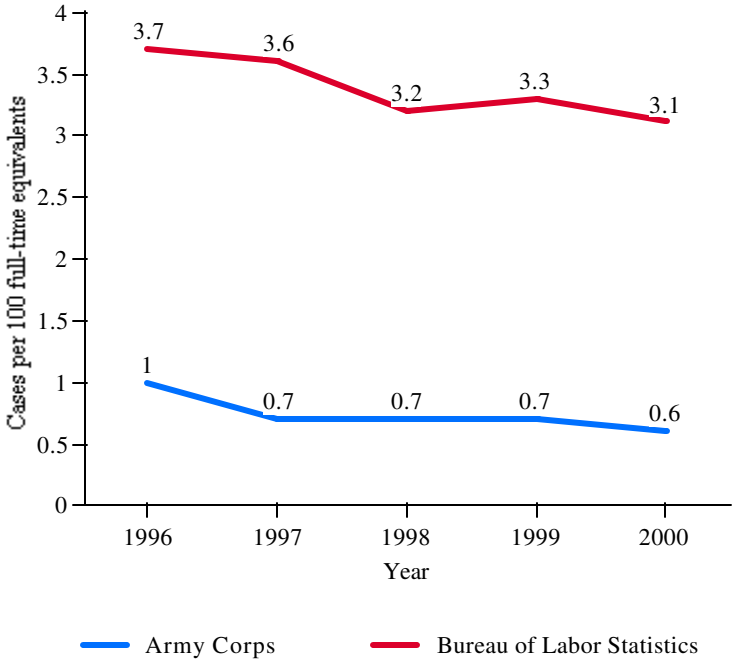
Many construction workers work less than full time (defined as 2,000 hours per year) because of project completions, bad weather, or other reasons. To compare injury rates for construction to the rates in other industries, the rates are calculated for full-time-equivalent workers.

The Bureau of Labor Statistics (BLS) has been collecting safety-and-health data from private-sector employers for 20 years; the numbers do not include any self-employed workers. BLS usually presents detailed data only for injuries and illnesses combined. Data from recent years show illnesses to be about 3% for mining and agriculture and 9% for manufacturing.

35a. Rate of nonfatal injuries and illnesses with days away from work, selected industries, 1996-2000



35b. Rate of nonfatal injury cases with days away from work, construction, BLS and Army Corps of Engineers, 1996-2000



Note: Charts 35a and 35b - Data cover private sector only and BLS data exclude the self-employed. Total of 194,400 lost-workday injury and illness cases in 2000.

Charts 35a - In 2000, illnesses are less than 2% of the total for construction, 3% for agriculture and mining, and 9% for manufacturing.

Chart 35b - Army Corps data are for the fiscal year, which begins October 1 the previous year, and cover all U.S. operations.

Source: Chart 35a - Bureau of Labor Statistics News Releases (Annual Survey of Occupational Injuries and Illnesses), Dec. 2000, table 7, and Dec. 2001, table 7.

Chart 35b - Page Duppstadt, Headquarters Safety Office, U.S. Army Corps of Engineers (personal communication, Feb 2002); Bureau of Labor Statistics News Releases Dec. 1997 table1, Dec.1998 table 1, Dec. 1999 table 1, Dec. 2000 table 1, and Dec. 2001 table 1.

36

Leading Causes and Types of Fatal and Nonfatal Injuries in Construction

In the construction industry, the ranking of causes of deaths from work-related injuries differs from that for causes of serious nonfatal injuries (charts 36a and 36b).

For instance, transportation incidents cause more than one-fourth of deaths from injuries in construction, but are less than 4% of nonfatal injuries. Overexertion, which does not cause deaths, is the second-leading cause of nonfatal injuries.

Fatal falls tend to differ in type from nonfatal falls (*see* also chart book page 38). Although falls were 31% of fatal injuries and 21% of nonfatal injuries in 1999, 98% of the fatal falls were to a lower level, compared with 56% of the nonfatal falls. Of the fatal falls, just over 1% were to the same level, compared with 34% of the nonfatal falls.

The leading cause of nonfatal injuries, contact with objects, most often is being struck by an object. The rate of injuries from contact with objects that resulted in cases with days away from work – 115.6 per 10,000 full-time construction workers in 1999 – was higher for construction than for any other industry.

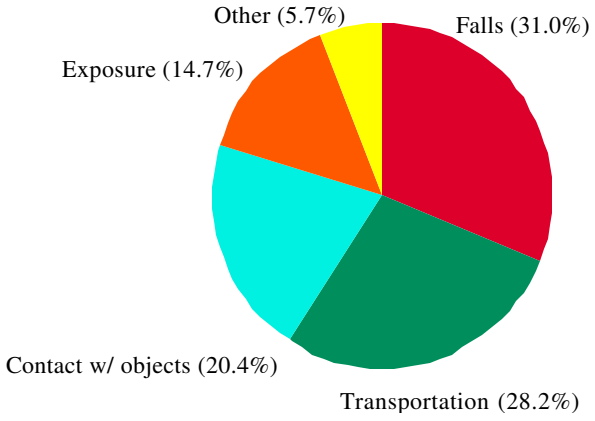
The most common *types* of injuries resulting in deaths are unlike the leading types of nonfatal injuries (charts 36c and 36d). Because most of the deaths result from traumatic blows (from falls from heights or being struck by vehicles), it is not surprising that multiple head injuries, traumatic injuries, and massive internal injuries make up nearly 60% of the fatal injuries.

On the other hand, musculoskeletal disorders – including most sprains and strains – are the most common type of nonfatal injury in construction. In 1999, sprains and strains resulted in lost workdays for 72,371 construction workers, according to the Bureau of Labor Statistics (BLS).

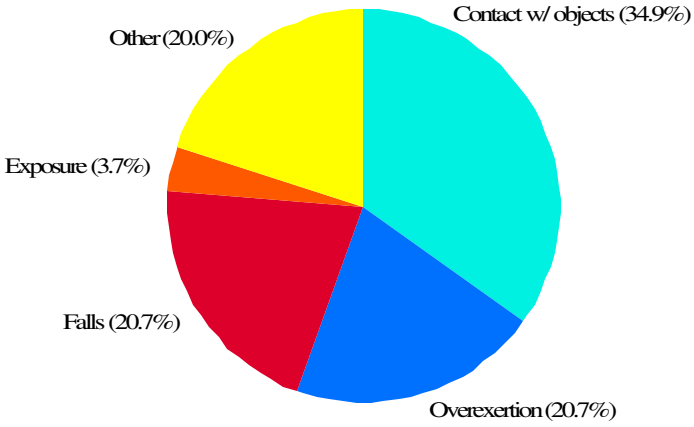
The data on deaths are derived from the 1999 Census of Fatal Occupational Injuries and the nonfatal-injury data are from the 1999 Annual Survey of Occupational Injury and Illnesses, both conducted by BLS.

When BLS presents detailed data on nonfatal injuries and illnesses, the data cover only the private sector and exclude the self-employed. In addition, the data are available only with injuries and illnesses combined. Illnesses are only about 1.7% of the total in construction, however, and do not substantially affect injury rates. Many of the most serious work-related illnesses in construction, such as asbestosis or cancers, take years to develop and thus would not be reported as cases resulting in absences from work. So, the charts presented here are essentially about injuries.

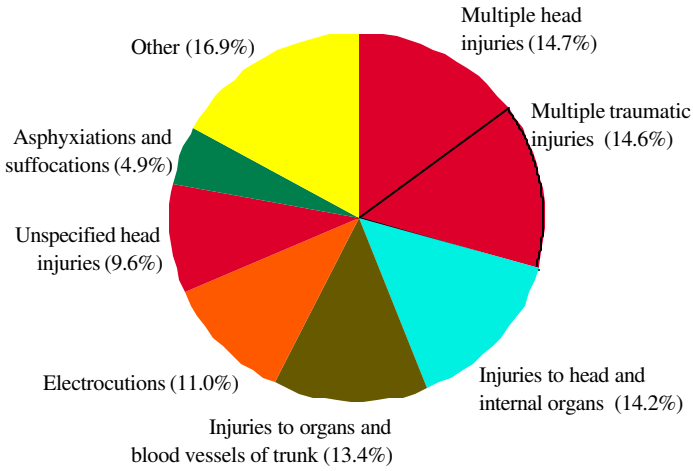
36a. Distribution of leading causes of deaths from injuries in construction, 1999



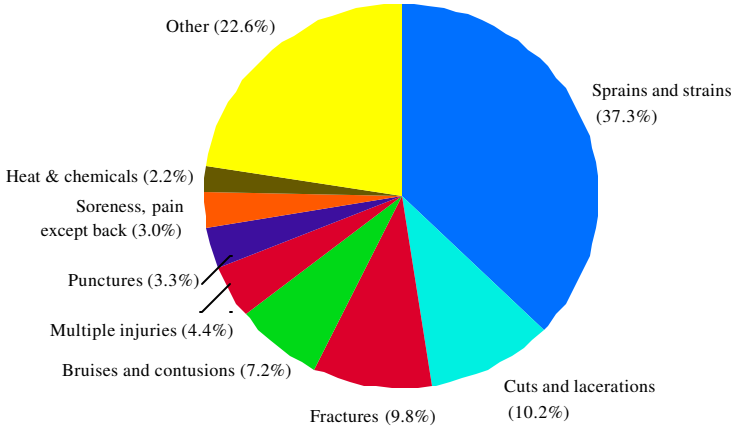
36b. Distribution of leading causes of cases with days away from work, construction, 1999



36c. Distribution of types of fatal injuries in construction, 1999



36d. Distribution of types of nonfatal injuries and illnesses in construction resulting in days away from work, 1999



Note: Charts 36a and 36b - "Contact with objects" includes struck by an object, struck against an object, caught in or compressed by equipment or objects, and caught in or crushed in collapsing materials. "Exposure" includes exposure to electric current, to temperature extremes, to air pressure changes, and to caustic, noxious, or allergenic substances. "Other" includes fires and explosions; violence, including self-inflicted injuries, assaults, and assaults by animals; and bodily reaction, such as when startled

Charts 36a and 36c - Total of 1,228 deaths from injuries.

Chart 36a - "Transportation incidents" refers to injuries involving vehicles – including the capsizing of a crane that is being moved – and not necessarily on the work site.

Chart 36b - Data cover private sector only and exclude self-employed. "Other" also includes transportation incidents. Cases include only those involving days away from work, not just restricted work activity. Illnesses are about 1.7% of the total.

Charts 36b and 36d - Total of 193,765 cases involving days away from work.

Chart 36c - "Other" includes drownings, poisonings and toxic effects including animal bites, and multiple traumatic injuries not elsewhere classified. Percentages may not add up to 100% because of rounding.

Chart 36d - Data cover private sector only and exclude self-employed. Numbers do not add up to 100% because of rounding. "Other" includes back pain and other pain, electrical burns, abrasions, heat stress, and carpal tunnel syndrome. Cases include only those involving days away from work, not cases with only restricted work activity. Illnesses are about 1.7% of the total.

Source: Charts 36a and 36c - Calculations by Risana Chowdhury, The Center to Protect Workers' Rights, from data provided by the Bureau of Labor Statistics for the Census of Fatal Occupational Injuries.

Charts 36b and 36d - Bureau of Labor Statistics 1999 News Release (Annual Survey of Occupational Injuries and Illnesses), March 2001, table5. Also BLS ftp web site **http://stats.bls.gov/iif/oshwc/osh/case/ostb0976.pdf table R64** and **http://stats.bls.gov/iif/oshwc/osh/case/ostb0961.pdf** , table R49.

37

Deaths Related to Falls, Collapses, and Trench Cave-ins

In 1999, falls were the leading cause of death in construction, causing 380 of 1,228 work-related deaths from injuries (31%). But the percentage was much higher for some construction occupations. Falls caused 30 of 40 deaths (75%) among ironworkers and 48 of 56 reported work-related deaths (86%) among roofers. The rate of work-related deaths from falls in 1999 among ironworkers was 16 times higher than the construction average and among roofers 6 times higher (chart 37a).

Most of the fatal falls were from roofs (chart 37b), with just under half of those falls being from a roof edge.

At least 52 of the 380 deaths reported as falls in 1999 (14%) resulted from collapses, when the surface a worker was standing on collapsed or tipped over (an aerial lift, for instance). In the 8 years 1992-99, at least 16% of reported fall deaths were collapses (chart 37c).

Trenching-related deaths are more difficult to count. BLS reports do not separate out trenching-related deaths. Such deaths might be listed in "excavation or trenching cave-in," "caught in or crushed in collapsing materials," "explosion," "contact with electric current," and "pedestrian struck by vehicle, mobile equipment on side of road."

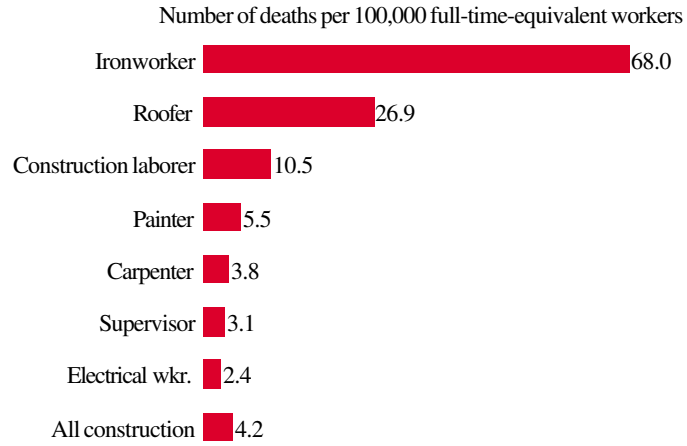
A search of computerized BLS fatal injury records for all industries, except mining and shipbuilding, for 1992-99 using keywords "trench," "ditch," "cave," "excav," and "sewer," followed by reading the reports, identified 429 trenching-related deaths, about 54 per year. Of these, trench wall cave-ins caused 317 deaths (74%), 40 per year (chart 37d). In addition, 44 deaths (11% of the total) involved excavating equipment, particularly backhoes. Almost half of the deaths involving excavator equipment occurred when workers in trenches were struck by backhoe buckets or crushed between a trench wall and excavation equipment. Other causes of death were electrocutions (overhead power lines and buried, underground power lines), being struck by falling objects, drowning due to trench flooding, natural gas explosions, oxygen deficiency, poisoning, and falls into trenches.

Eighty percent of the trenching deaths occurred in the construction industry (SIC codes 15-17). Half of the construction industry employees killed were construction laborers.

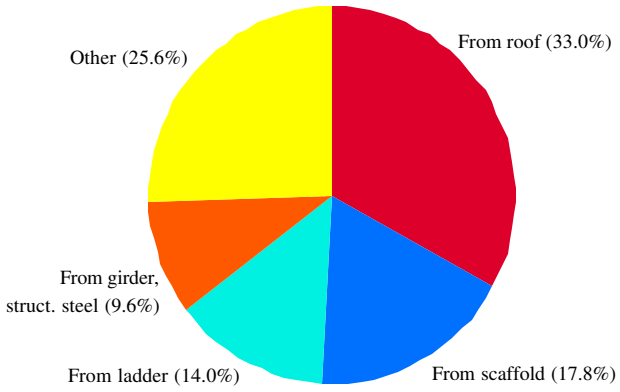
The number of trench cave-in deaths appears to have dropped since the 1980s, according to the National Institute for Occupational Safety and Health (NIOSH). Based on data from its National Traumatic Occupational Fatalities Surveillance System for the 10 years 1980-89, NIOSH identified 606 deaths resulting from trench cave-ins, 468 of them (77%) in construction.[1] This amounts to 61 trench cave-in deaths/year, compared to 40 per year in 1992-99 (identified through BLS records). The 1980s data were likely an undercount, because the NIOSH system counted only death certificates where the box, "injury at work," was checked. Death certificates underreport work-related deaths, capturing, on average, 81% of such deaths.[2]

1. Nancy Stout and Catherine Bell, Effectiveness of Source Documents for Identifying Fatal Occupational Injuries: A Synthesis of Studies. *American Journal of Public Health*, 81(6):725-28, June 1991.
2. Anthony J. Suruda, Dawn N. Castillo, James C. Helmkamp, and Ted A. Pettit, Epidemiology of Confined-Space-Related Fatalities. In: National Institute for Occupational Safety and Health, Department of Health and Human Services. *Worker Deaths in Confined Spaces: A Summary of Surveillance Findings and Investigative Case Reports.* Cincinnati. DHHS (NIOSH), 94-103. January 1994.

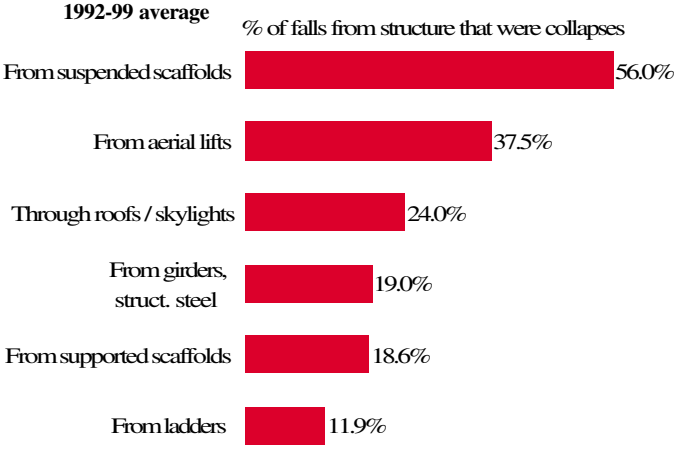
37a. Rate of deaths from falls, selected construction occupations, 1999



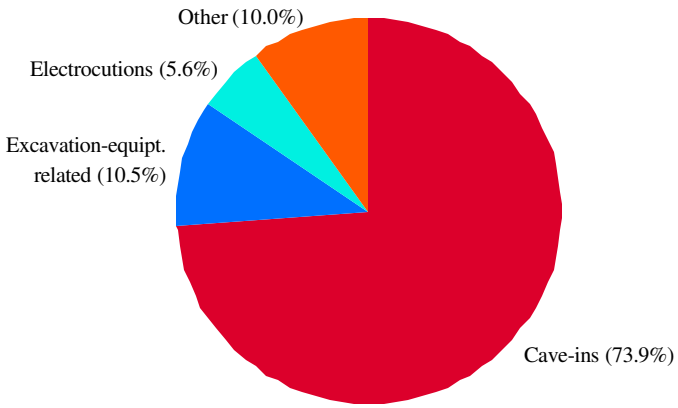
37b. Distribution of causes of deaths from falls in construction, 1992-99 average



37c. Percentage of collapses in selected fall categories in construction, 1992-99 average



37d. Breakdown of causes of trenching-related deaths, 1992-99 average



Note: Chart 37a - Falls caused 380 deaths in construction in 1999. 30 or more deaths in each category, except, painter (26 deaths), supervisor (24), and electrical worker (15). "Ironworkers" includes structural metal workers and excludes welders and cutters. Because many construction workers work part time at construction, safety and health statistics are defined in terms of full-time equivalents to allow comparisons with other industries. Full-time work is defined as 2,000 hours worked per year. (Occupational categories are as follows: Ironworkers include only structural metal workers. Roofers, construction laborers, and painters include only those trades, not helpers. Carpenters include carpenters and their apprentices. Supervisors include only construction supervisors [occupational codes 503, 553- 558]. Electrical workers include electricians and their apprentices, plus electrical power installers and repairers.)

Chart 37b - "Other falls" includes falls through existing floor openings, from nonmoving vehicles, from aerial lifts, and so forth. Total of 2,712 deaths.

Chart 37c - Total collapses in each category were: suspended scaffolds, 47; aerial lifts, 36, roofs/skylights, 215; girders/structural steel, 22; supported scaffolds, 57; and ladders, 45. (Girders/structural steel is based on 116 deaths in the structural steel erection industry and does not include communications towers collapses, for instance.)

Chart 37d - Total of 429 trenching deaths, about 54 for each of the 8 years. Aerial lifts include scissor lifts and boom-supported lifts. "Other" includes struck by falling object while in trench, drowning as a result of trench flooding, and so forth.

Source: All charts based on data from Bureau of Labor Statistics, Census of Fatal Occupational Injuries and Current Population Survey, 1992-99. Calculations by Michael McCann and Risana Chowdhury, The Center to Protect Workers' Rights.

38

Falls and Elevations as a Major Injury Hazard

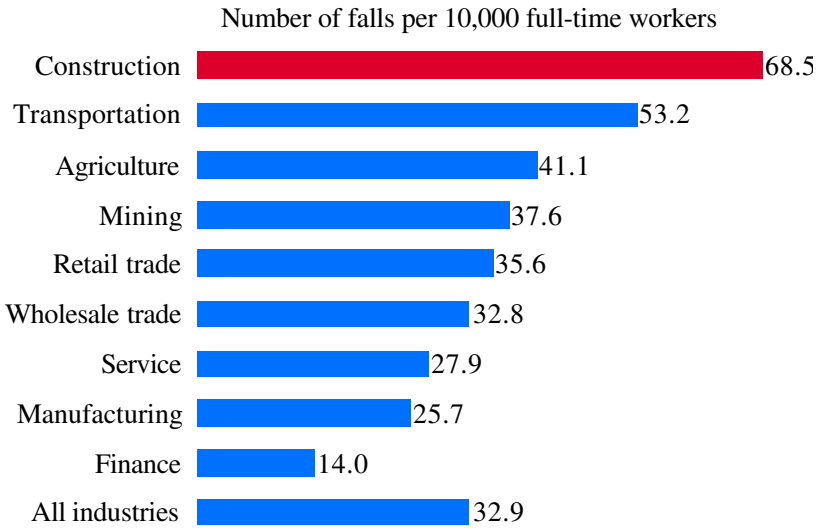
In 1999, falls caused 40,061 nonfatal injuries – 21% of the total – resulting in days away from work in the construction industry. The rate of these falls for construction was twice the rate for all industries combined (chart 38a). Still, the rate of nonfatal falls has declined by about 21% since 1995, when it was 86.2 per 10,000 full-time workers.[1]

The main types of nonfatal falls in construction were falls to the same level and falls from ladders, compared to falls from roofs and falls from scaffolds for fatal falls (chart 38b). Only 1% of fatal falls were on the same level.

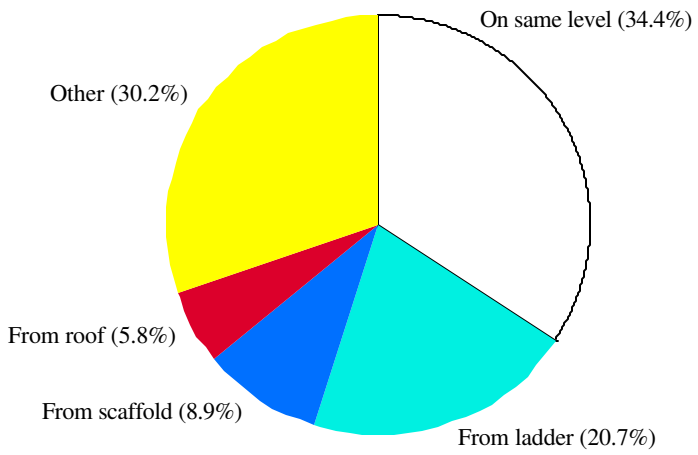
Nonfatal falls to a lower level made up 56% of all nonfatal falls in construction, compared with 51% in mining and 45% in agriculture, the other industries having the highest proportions of falls to a lower level. (Some nonfatal falls to a lower level are in the "other" category on chart 38b.) For all industries, nonfatal falls to a lower level average 32%.

1. Because many construction workers work part time at construction, safety and health statistics are defined in terms of full-time-equivalents to allow comparisons with other industries. Full-time work is defined as 2,000 hours worked per year.

38a. Rate of work-related nonfatal falls, by industry, 1999



38b. Distribution of causes of injuries from falls involving days away from work. construction, 1999



Note: Charts 38a and b - Total of 297,499 nonfatal falls in all industries in 1999. Data cover private industry only and exclude all self-employed.

Chart 38b - Based on 40,061 nonfatal falls. "Other causes" include jump to lower level; fall from floor, dock, or ground level; fall from nonmoving vehicle; and fall down stairs or steps.

Source: Chart 38a - Bureau of Labor Statistics 1999, table R75, **www.bls.gov/iif/oshcdnew.htm**
Chart 38b - Bureau of Labor Statistics 1999, table R64, **www.bls.gov/iif/oshcdnew.htm**

39

Deaths Caused by Vehicles and Heavy Equipment on Construction Sites

Vehicles and mobile heavy equipment caused 213 deaths on construction sites out of 1,228 construction deaths (17.3%) in 1999. Trucks were involved in 39% of the deaths, mobile heavy equipment in 37%, and forklifts in 7%. (If two vehicles were involved in a collision, the vehicle counted was the one the worker was in.) There were an additional 113 deaths of drivers and passengers on streets and highways – 81% of the deaths involving trucks – and 9 deaths of workers on highways who were struck by vehicles.

Traffic work zones for highway and street construction, except overhead highways, (SIC code 1611) – were the locations of 65 of the construction site deaths (31%) involving vehicles and mobile heavy equipment. These traffic work zones had more than twice the percentage of non-collision vehicle deaths compared to other construction sites (chart 39a). The non-collision vehicle deaths included overturning of vehicles and "caught in/between" incidents.

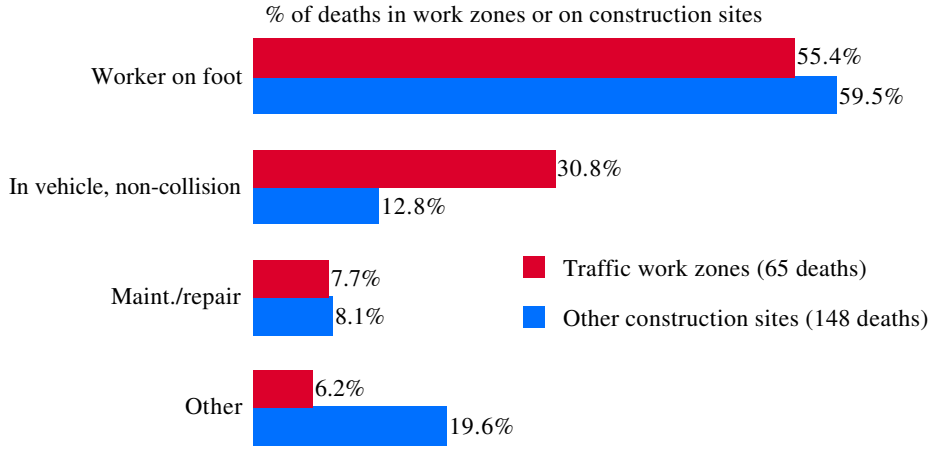
In the eight years, 1992-99, there were 564 traffic work zone deaths, 530 of them related to vehicles or heavy equipment (94%).[1] Construction laborers accounted for 237 of the work-zone deaths (chart 39b).

Of the 530 vehicle-related traffic work zone deaths, only 170 involved traffic vehicles moving through a work zone. Of these, 20% of those killed were flaggers and 15% were workers setting traffic cones or barriers. The remaining 360 work zone vehicle deaths were divided roughly between workers in construction vehicles and workers on foot struck by heavy equipment or trucks (chart 39c).

Of 177 workers on foot killed by work zone vehicles or heavy equipment, 88 (50%) deaths involved vehicles backing up; half of those vehicles were dump trucks. Of the 88 deaths, 20% were directing trucks or flagging traffic.

Good data on nonfatal injuries in traffic work zones is not available. The Bureau of Labor Statistics (BLS) Annual Survey of Occupational Injuries and Illnesses does not provide separate data on traffic work zone injuries. Although one-quarter of the work-zone deaths involved government workers, BLS injury data do not include municipal or state employees.

39a. Distribution of deaths caused by vehicles and mobile heavy equipment, in traffic zones and on other work sites, highway and street construction, 1999

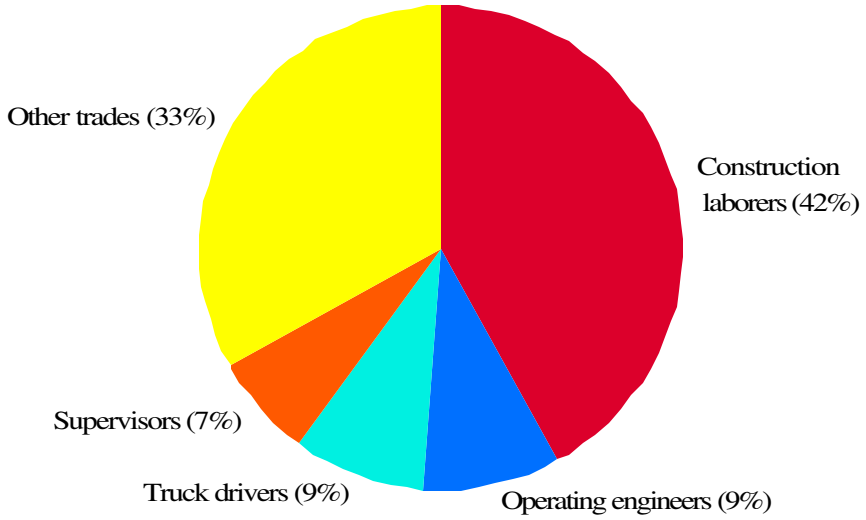


1. For 1992-98 data, see Stephanie G. Pratt, David F. Fosbroke, and Suzanne M. Marsh, *Building Safer Highway Work Zones: Measures to Prevent Worker Injuries from Vehicles and Equipment*. Cincinnati, OH. DHHS (NIOSH) Pub. No. 2001-128, 2001.

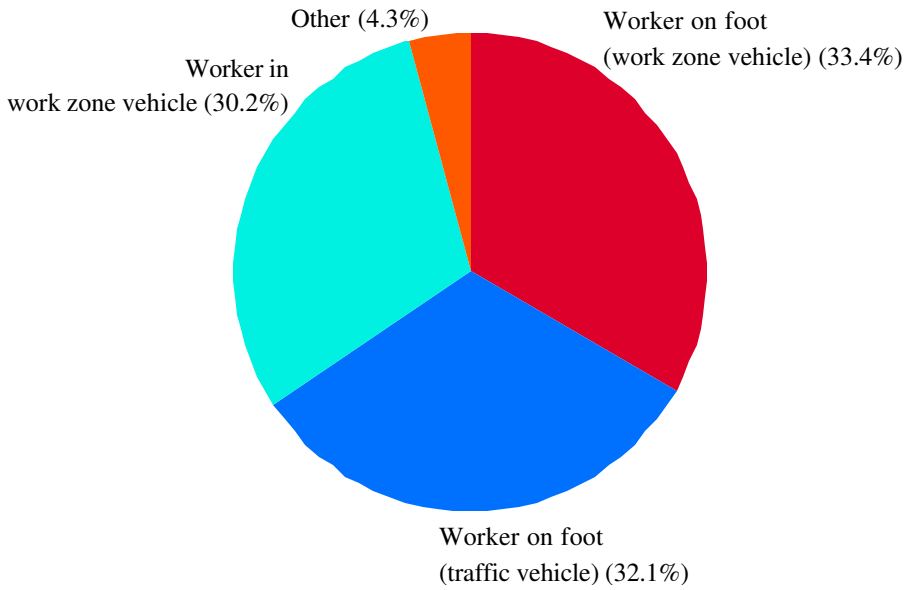
Note: Chart 39a –"Other" for traffic work zones refers to work zone vehicle collisions. For other construction sites, "other" includes 12 deaths involving workers struck by vehicle loads, 9 vehicle collisions,and 8 falls from vehicles, mostly aerial lifts.

Source: Chart 39a- Based on data provided by the Bureau of Labor Statistics for the Census of Fatal Occupational Injuries. Calculations by Michael McCann, The Center to Protect Workers' Rights.

39b. Distribution of traffic work zone deaths, by occupation, 1992-99 average



39c. Distribution of vehicle-related deaths of workers in traffic work zones, 1992-99 average



Note: Chart 39b – Other trades include operators of paving, surfacing, and tamping equipment; graders, dozers and scrapers; and excavating and loading machines.

Chart 39c – Total of 530 deaths in 8 years. Some of the deaths of "worker on foot (work zone vehicle)" occurred to workers doing maintenance or repairs. "Worker in work zone vehicle" includes 27 passengers. Work zone vehicles may include pickup trucks moving about a work site. "Other" deaths were unspecified.

Source: Charts 39b and 39c - Data for 1992-98 were provided by Stephanie Pratt, Division of Safety Research, NIOSH, Morgantown, W.Va. 1999 figures based on data provided by the Bureau of Labor Statistics for the Census of Fatal Occupational Injuries, with calculations by Michael McCann, The Center to Protect Workers' Rights.

40

Deaths and Injuries from Contact with Electricity

Data from the U.S. Bureau of Labor Statistics show that, in 1999, electrocution was the third-ranking cause of death in construction, after falls to a lower level and highway traffic injuries. Electrocutions caused 11% of the 1,228 construction worker deaths.

Like falls to a lower level, contact with electricity often kills. Contact with electricity made up only 0.6% of reported recordable nonfatal construction injuries in 1999.[1]

For 1997-99, the death rate from electrocutions for the construction industry was 1.7 per 100,000 full-time-equivalent workers. The highest rates from electrocution in construction were among electrical power installers and repairers and electricians (chart 40a). (Statistics on deaths over the three years 1997-99 were averaged to produce numbers large enough to be statistically reliable.)

For 1997-99, there was an average of 147 electrocutions per year. The construction occupations with the highest average number of deaths per year due to electrocution were electricians (40), construction laborers (26), supervisors (10), carpenters (7), and electrical power installers and repairers (7).

The causes of electrocutions in construction are different for electrical workers (electricians, electrical power installers and repairers, electrical apprentices, and helpers doing electrical work, and their supervisors) and non-electrical workers.[2] The main cause of electrocution of electrical workers from 1992-99 was contact with "live" (energized) equipment and wiring (chart 40b). The hazard results mostly because of a failure to de-energize and lock out or tag out electrical equipment and wiring. Working live on light fixtures, especially 277-volt (fluorescent lighting) circuits, caused a large percentage of electrocutions, as well.

For non-electrical workers, the main cause of electrocution was contact with overhead power lines (chart 40c). Failure to lock out or tag out machinery and appliances before working on them and lack of ground fault circuit interrupters caused many of the other electrocutions.

Contact with energized objects means touching objects that can carry current as a result of their own contact with live parts of equipment and wiring. Incidents included accidentally drilling into or cutting live wires and touching wires, metal ladders, pipes, and hand and power tools that had contacted live circuits.

Overall, contact with overhead power lines was the main cause of electrocution from 1992-99, causing 547 deaths (48%), or 68 per year. Among the trades, electrical workers had the greatest percentage of overhead power line electrocutions, closely followed by construction laborers (chart 40d). Although heavy equipment often contacts overhead power lines, heavy equipment operators suffered only 3% of the electrocutions from overhead power lines, because much heavy equipment, such as cranes, is insulated from the ground.

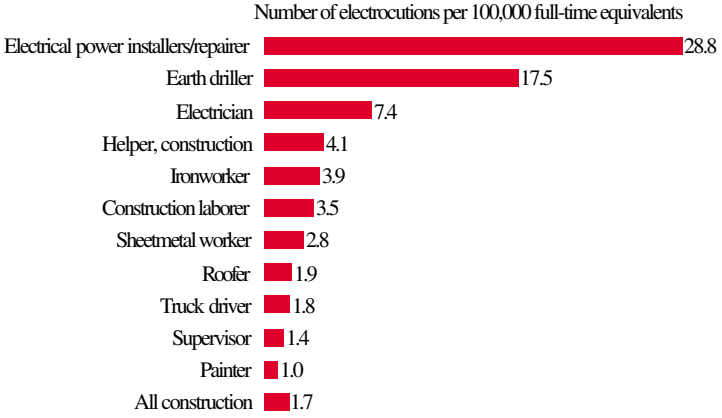
The types of electrical injury include electric shocks, electrical burns (from contact with electrical current), heat burns (from arc flashes and blasts), arc blast effects (hearing loss and physical injury), and falls (as a result of electric shocks). Electric shock causes most deaths tied to contact with electricity. In 1992-99, 1,139 deaths were confirmed as caused by electric shock, compared with the other cause of electricity-related death, arc flashes or blasts, known to have resulted in 24 deaths.

There are no good statistics on a similar breakdown of electrical injuries. One study of visits by construction workers to an urban hospital emergency room from 11/90 through 1998 identified 19 arc flash or blast injuries out of 61 construction electrical injuries (31%). The same study found that 15 of the 42 electric shock injuries also involved falls (including two jumps) from ladders as a result of the electric shock.[2]

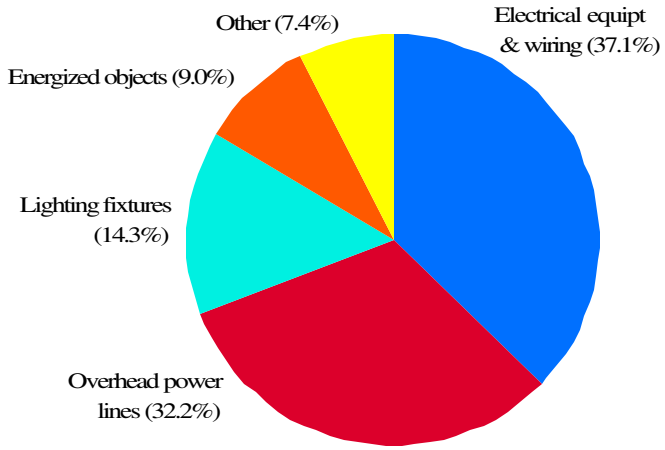
1.Bureau of Labor Statistics, **www.bls.gov/iif/oshcdnew.htm**, table R64.

2. Research by Michael McCann, Katherine Hunting, Risana Chowdhury, Judith Murawski, and Laura Welch on causes of electrical deaths and injuries among construction workers, 1990-99. Submitted for publication

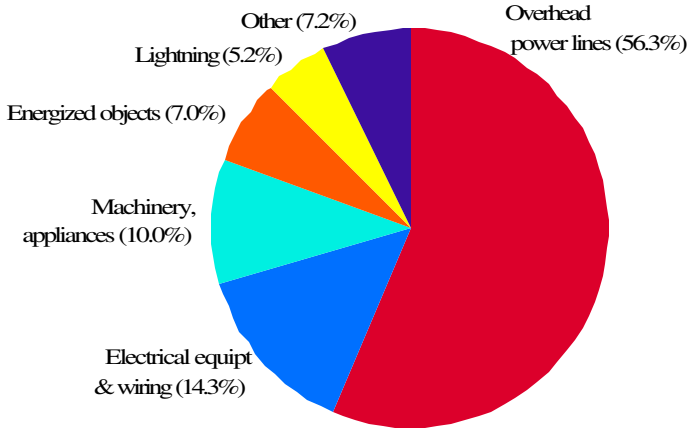
40a. Rate of deaths from electrocutions, selected construction occupations, 1997-99 average



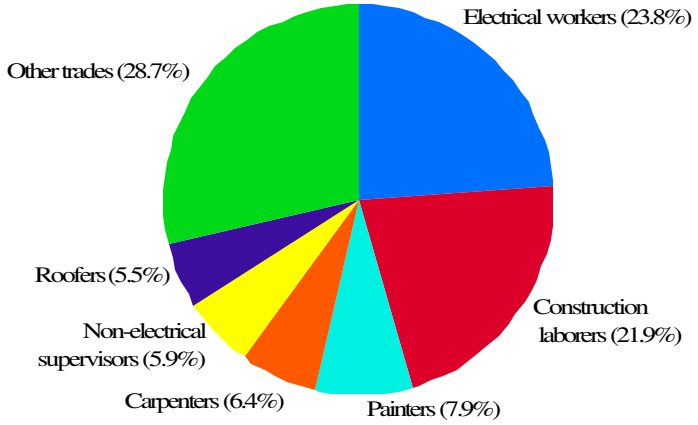
40b. Breakdown of causes of electrocutions among electrical workers in construction, 1992-99 average



40c. Breakdown of causes of electrocutions among non-electrical workers in construction, 1992-99 average



40d. Overhead power line electrocutions in construction, by occupation, 1992-99 average



Note: Chart 40a - Full-time is defined as 2,000 hours worked per year. Total of 440 electrocutions. Number of deaths in each category: electric power installer, 20; earth driller, 9; electrician, 120; helper, 12; ironworker, 6; laborer, 79; sheetmetal worker, 6; roofer, 11; truck driver, 10; supervisor, 30; painter, 13. (Occupational categories are as follows: Electrical power installers/repairers, earth drillers, helpers (helpers,construction only), construction laborers, roofers, truck drivers, and painters include only those trades. Ironworkers include only structural metal workers. Electricians include electricians and their apprentices. Sheet metal workers include sheet metal workers, their apprentices, and sheet metal duct installers. Supervisors include only construction supervisors [occupational codes 503, 553- 558].)

Chart 40b - "Other" includes contact with electric current of machinery, appliances and power tools, and contact with underground, buried power lines. Deaths counted only among electrical workers in the construction industry (SIC 15, 16, and 17). Total of 391 electrocutions.

Charts 40b and 40c - Electrical equipment includes electrical control panels, switching equipment, transformers, circuit breakers, and junction boxes.

Chart 40c - Machinery and appliances also includes power tools and portable lights. Other includes contact with underground, buried power lines and contact with electric current of light fixtures. Total of 748 electrocutions.

Chart 40d - Electrical workers includes electricians and their apprentices, helpers doing electrical work, electrical power installers and repairers, and supervisors of electricians and electrical power installers. Other trades include heavy equipment operators, truck drivers, earth drillers – about 3% each – and ironworkers, managers and administrators. Total of 547 deaths.

Source: All charts - Based on data from the Census of Fatal Occupational Injuries and the Current Population Survey, both BLS. Calculations by Michael McCann and Risana Chowdhury, The Center to Protect Workers' Rights.

41

Nonfatal Injuries to the Back and Other Body Parts

In the construction industry, injuries and illnesses causing days away from work affect the back more than any other body part (chart 41a). The same is true for all industries combined, where back injuries make up 25% of the total.

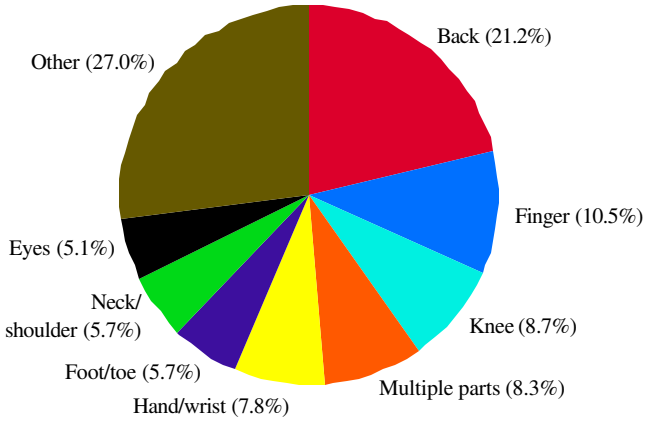
Although construction wage-and-salary workers make up less than 6% of the labor force, serious back injuries and illnesses in construction are 9.7% of back injuries and illnesses for all industries. In 1999, there were 40,998 reported back injuries and illnesses with days away from work in construction, compared with 424,251 for all industries.

The rate of back injuries resulting in days away from work for construction is exceeded only by the rate for transportation (chart 41b). In 1999, the rate of back injuries in construction was 1.5 times the rate for private-sector industries. The rate of reported back injuries fell by 29% from 1995 to 1999 for construction and for all industries (Bureau of Labor Statistics web site **www.bls.gov/iif/oshcdnew.htm**, table R6, 1999 and table R6, 1995).

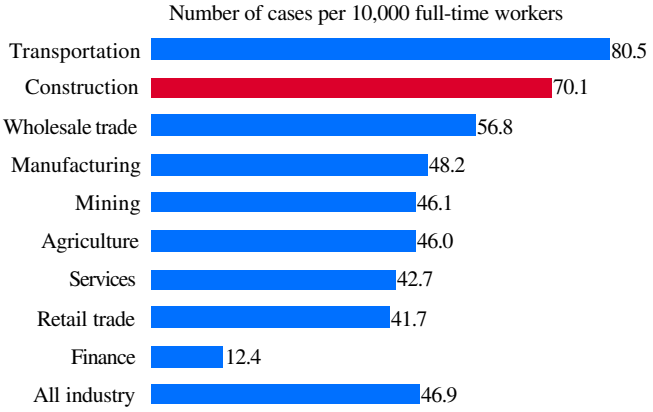
Within construction, the rate of back injuries causing days away from work is highest for the roofing industry, which exceeds the rate for all construction by 1.8 times (chart 41c).

The Bureau of Labor Statistics reports injuries and illnesses together, but in construction illnesses make up less than 2% of the reports and do not substantially affect construction injury rates that are calculated.

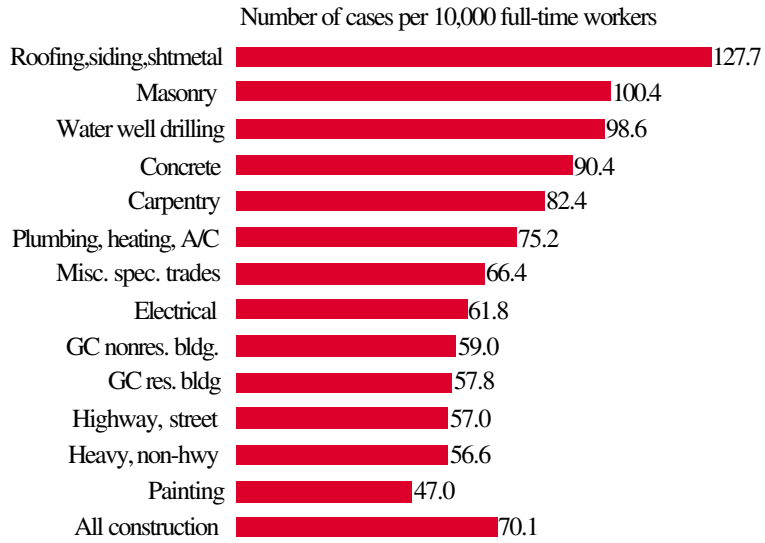
41a. Distribution of nonfatal injuries and illnesses with days away from work, by body part, construction, 1999



41b. Rate of back injuries and illnesses resulting in days away from work, by industry, 1999



41c. Rate of back injuries and illnesses with days away from work, by construction industry, 1999



Note: All charts - Data cover private sector only and exclude self-employed. BLS provides the data for injuries and illnesses combined, but illnesses make up less than 2% of the total in construction.

Chart 41a - "Other" body parts affected include head, abdomen, elbow, lower leg, and body systems. Nonfatal illnesses affecting body systems include heat exhaustion and skin diseases. In 1999, back injuries and illnesses with days away from work totaled 40,998 in construction and 424,251 for all industries.

Charts 41b and 41c - Because many construction workers work part time at construction, safety and health statistics are defined in terms of full-time equivalents to allow comparisons with other industries. Full-time work is defined as 2,000 hours worked per year.

Source: Chart 41a - Bureau of Labor statistics web site **www.bls.gov/iif/oshcdnew.htm**, table R2, 1999.

Charts 41b and 41c - Bureau of Labor statistics web site **www.bls.gov/iif/oshcdnew.htm**, table R6, 1999.

42

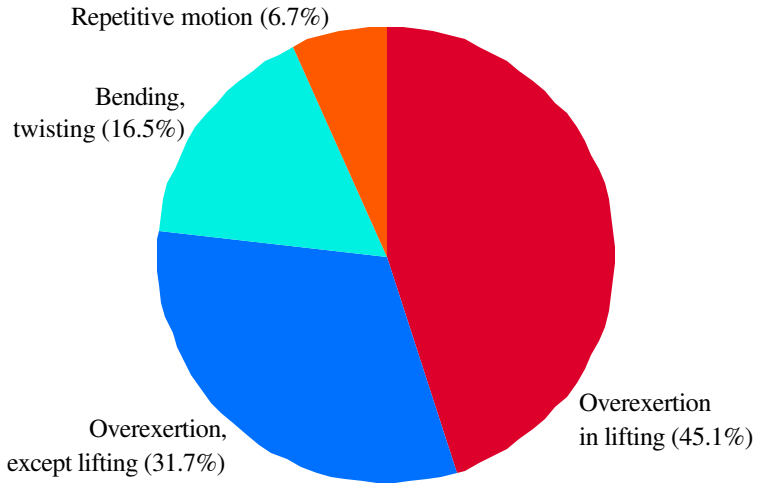
Musculoskeletal Disorders in Construction and Other Industries

Work-related musculoskeletal disorders (WMDs) made up 52,303 (27%) of the 193,765 nonfatal injuries and illnesses in construction in 1999. Overexertion in lifting caused 45% of the musculoskeletal disorders in construction and other overexertion, such as pushing, pulling, and carrying, caused 32% (chart 42a).[1]

The rate of overexertion injuries in construction is exceeded only by the rate in the transportation industry (chart 42b). For overexertion injuries related to lifting, the rate for construction is 1.4 times the rate for all industries. Repetitive motion injuries, which include carpal tunnel syndrome, are less of a problem in construction than in some other industries.

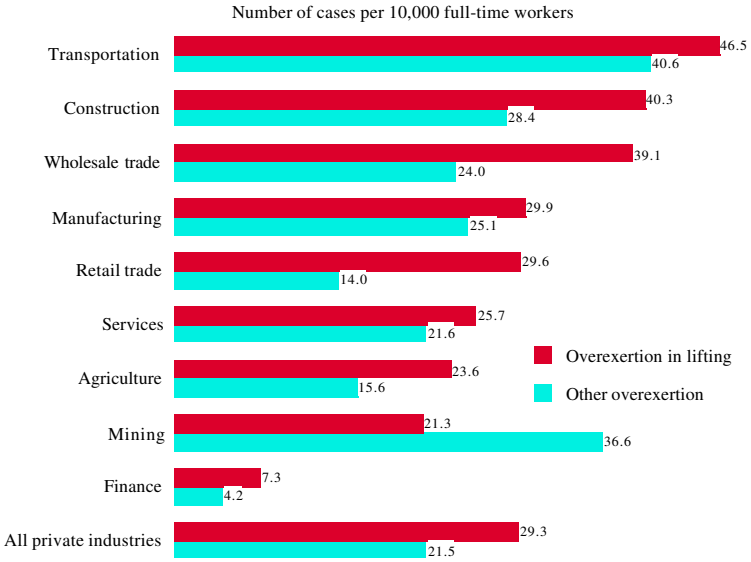
Within construction, roofing, siding and sheet metal, masonry, and carpentry have the highest rates of injuries tied to overexertion in lifting (chart 42c). For other overexertion injuries, roofing, siding, and sheetmetal had the highest rates.

42a. Distribution of risk factors for musculoskeletal disorders with days away from work in construction, 1999

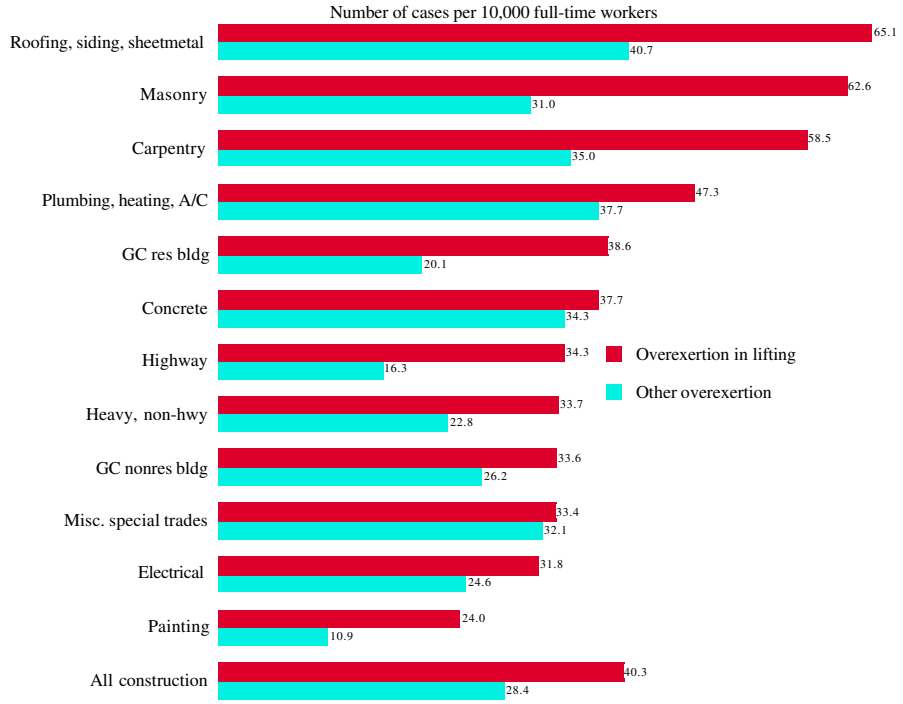


1.Strains and sprains are commonly used as a stand-in for work-related musculoskeletal disorders (WMDs). An analysis of BLS data for 1999, however, shows that only 61% of strains and sprains are actually WMDs, according to the Bureau of Labor Statistics definition. According to BLS, work-related musculoskeletal disorders include cases where the nature of injury or illness is sprains, strains, tears; back pain, hurt back; soreness, pain, hurt, except the back; carpal tunnel syndrome; hernia; or musculoskeletal system symptom and connective tissue diseases and disorders and when the event or exposure leading to the injury or illness is bodily reaction/bending climbing, crawling, reaching, twisting; overexertion; or repetition (*Lost-worktime Injuries and Illnesses: Characteristics and Resulting Time Away From Work*, 1999, News Release, March 28, 2001. *See* BLS web site **www.bls.gov/news.release/osh2.nr0.htm**)

42b. Rate of overexertion injuries resulting in days away from work, by industry, 1999



42c. Rate of overexertion injuries resulting in days away from work, by construction industry, 1999



Note: All charts - Data cover private sector only and exclude self-employed.

Charts 42a, 42b, and 42c - BLS provides the data for injuries and illnesses combined, but illnesses make up less than 2% of the total in construction. Because many construction workers work part time at construction, safety and health statistics are defined in terms of full-time equivalents to allow comparisons with other industries. Full-time work is defined as 2,000 hours worked per year.

Chart 42a - Total of 52,303 injuries.

Chart 42c - Total numbers for lifting overexertion is 23,578 and for other overexertion is 16,603; all categories > 1,000 on lifting, except highway and street (901), and painting (442); in other overexertion, all categories > 1,000, except carpentry (945), roofing, siding, and sheetmetal (875), highway and street (430), and painting (201).

Source: Chart 42a - Bureau of Labor Statistics web site, www.bls.gov/iif/oshcdnew.htm, table R64, 1999.

Charts 42band 42c - Bureau of Labor Statistics web site www.bls.gov/iif/oshcdnew.htm, table R8, 1999.

43

Noise-Induced Hearing Loss in Construction

Each year, thousands of construction workers suffer increased hearing loss from noise exposure on the job. Hearing loss impairs quality of life on and off the job, but it can also increase the risk of injuries – for instance, when a worker cannot hear approaching vehicles or warning signals.

Workers' compensation data from British Columbia, in Canada, show that the amount of hearing lost by construction workers is strongly associated with the length of time worked in construction (charts 43a and 43b). After 16 to 25 years on the job, on average, a construction laborer or equipment operator has the hearing of someone about 20 years older who has had no workplace exposure to noise. The British Columbia study found that carpenters, truck drivers, electricians, and welders also had considerable hearing losses.

Noise-induced hearing loss begins at higher frequencies (4,000 Hertz and above) and thus may first affect the ability to hear high-pitched sounds, such as women's and children's voices (especially on the telephone). With increasing exposure, the high-frequency hearing losses become more severe and losses occur in the normal-speech range (3,000 Hertz and below).

Studies in Sweden comparing construction workers and office workers from the construction companies show construction workers lose much more hearing than office workers in each age group, which means the losses likely result from work-related exposures to noise. (No data were available for comparison with other types of workers.)

The Swedish data, based on more than a million hearing tests over a 16-year period, show that, in 1974, by age 41, only about 20% of construction workers still had normal hearing in both ears when compared to office workers of the same age (chart 43c). By age 50, only about 7.5% had normal hearing in both ears.

By 1990, several years after the Swedish construction industry started a comprehensive hearing-conservation program, the proportion of 41-year old construction workers with normal hearing in both ears rose to 32%, an increase of 65%.

In the United States, OSHA requirements for comprehensive hearing conservation programs do not apply to construction. There has been little information available on hearing loss among construction workers in the United States.

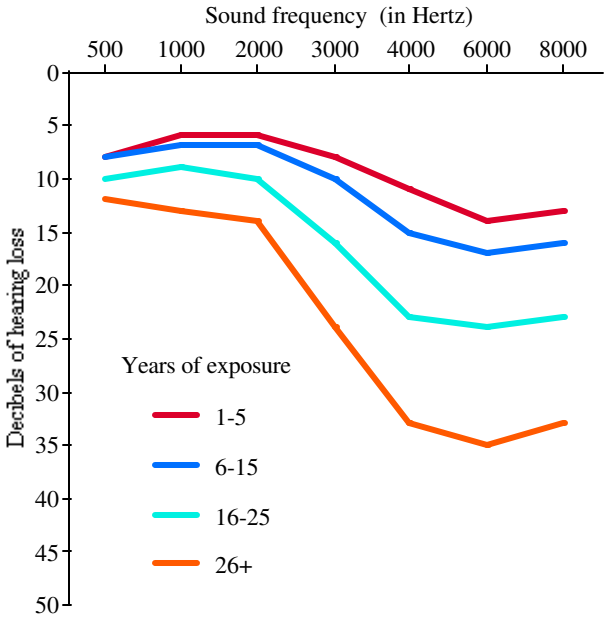
To determine whether current and former construction workers are at significant risk for occupational illnesses as a result of having worked at the Department of Energy's (DOE) nuclear weapons facilities, a research consortium led by the Center to Protect Workers' Rights and the University of Cincinnati Medical Center started three pilot surveillance programs in 1996 and 1997 at the Hanford Nuclear Reservation, in Washington state; Oak Ridge, in Tennessee; and the Savannah River Site, in South Carolina. The workers who were examined were about 58 years old and had worked in construction for 23 years, on average.

This study included an evaluation of hearing loss of 2,375 DOE construction workers. It found that 60.3% of workers examined have significant hearing loss as a result of work-related noise. The study used the 1998 NIOSH criteria of a significant threshold shift (hearing loss) of 15 decibels at 1,000, 2,000, 3,000, 4,000, 5,000, or 6,000 Hertz in either ear to determine abnormal hearing loss.[1] Although more than 60% of the workers experienced hearing loss, the amount of hearing loss varies by occupation. Plumbers, ironworkers, millwrights, carpenters, operating engineers, and electricians appear to have experienced the most hearing loss (chart 43d). The percentage of workers with hearing loss increases greatly by age, but even 9% of workers under age 35 have evidence of hearing loss, and by age 50, half of all workers experience hearing loss.

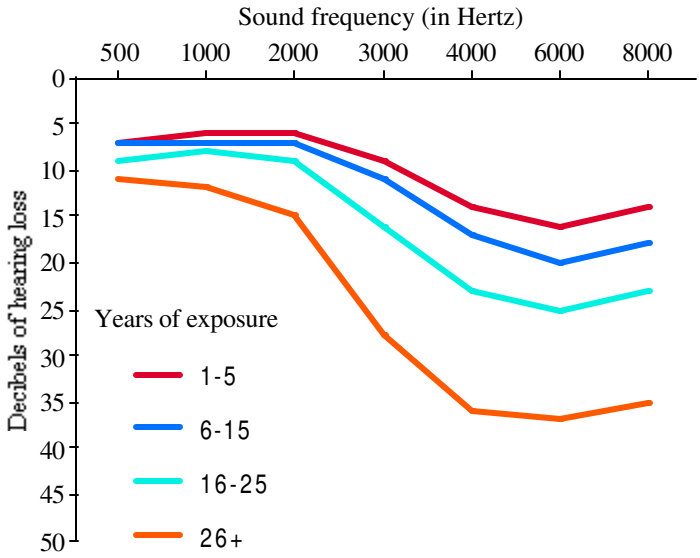
1. National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention. *Criteria for a Recommended Standard: Occupational Noise Exposure*. Cincinnati, OH. DHHS (NIOSH), Pub. 98-126, 1998.

43

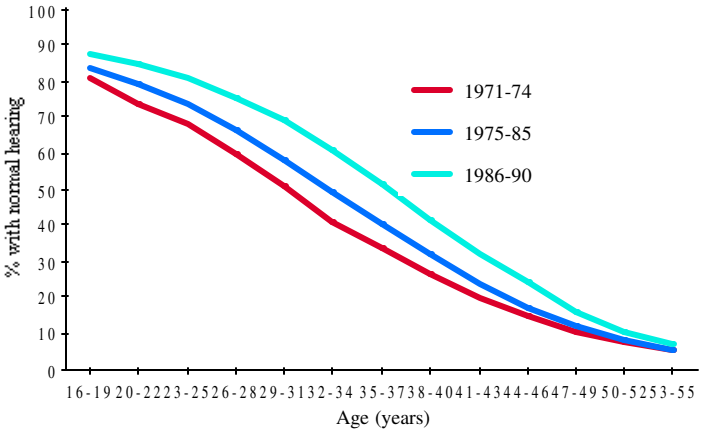
43a. Amount of hearing loss among construction laborers in British Columbia, by sound frequency, 2000 (By number of years worked in construction)



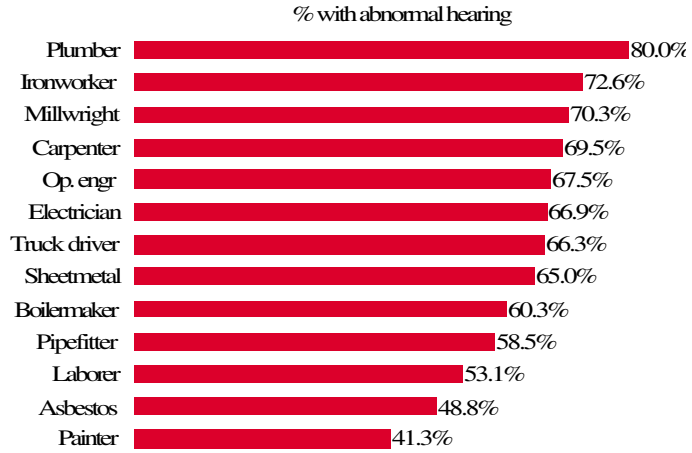
43b. Amount of hearing loss among construction equipment operators in British Columbia, by sound frequency, 2000 (By number of years worked in construction)



43c. Prevalence of normal hearing (both ears) in Swedish construction workers, 1974-90



43d. Noise-induced hearing loss, by trade, U.S. Department of Energy construction workers, 1997-2002



Note: Chart 43a – Based on 9,377 workers.
Chart 43b – Based on 5,931 workers.
Chart 43c – Based on 134,000 examinations in 1974, then about 55,000 exams per year through 1990,a total of about 1 million exams.
Chart 43d – Based on results from 25 or more examinations per trade (total of 2,375 DOE construction workers). Millwrights install, repair, replace, and dismantle the machinery and heavy equipment used in almost every industry.

Source: Charts 43a and 43b – Heather Gillis, British Columbia Workers' Compensation Board, personal communication, March 2002.
Chart 43c – Göran Engholm, Bygghälsan, personal communication, 1994. Bygghälsan was the Swedish Construction Industry Organization for Working Environment, Occupational Safety, and Health. Because of cutbacks beginning in 1992 throughout the Swedish economy, more-recent data are not available.
Chart 43d - Former worker medical screening programs for DOE building trades workers, Hanford, Savannah River, and Oak Ridge, c/o The Center to Protect Workers' Rights, 2002 (unpublished data).

44

Lung Hazards, Including Asbestos, Silica, Dusts, Fumes, and Smoking

Construction work has long been known to be hazardous to workers' lungs. Worksites tend to be dusty, as bags of cement are opened, wood products and masonry are cut, and heavy equipment moves across the earth. Fumes are produced, for instance, by painting, gluing, cleaning with solvents, welding, and the use of heavy equipment.

Three centuries ago, in 1713, Dr. Bernardino Ramazzini wrote about dust that "would gradually prove fatal to stone-cutters who took no precautions."[1] Silicosis, a disabling lung disease caused by exposure to crystalline silica (found in quartz rock), was identified in the late 1800s.[2] An increased risk of lung cancer among insulation (asbestos) workers in the United States was documented in 1964.[3]

Other lung problems faced by construction workers and documented more recently include an increased risk of tuberculosis and lung cancer from exposure to silica; asbestosis, which is disabling and potentially fatal; asthma and fluid in the lungs from gases and fumes produced during welding; and lung irritation and carbon monoxide poisoning from diesel exhausts, particularly during tunnel and highway construction.[4]

The numbers of deaths from silicosis and from exposures to asbestos are believed to be declining, but the National Institute for Occupational Safety and Health has said silicosis deaths are underreported. And while work around asbestos has been tightly regulated in the United States since 1976, new exposures continue during unprotected (and illegal) demolition and abatement work.[5]

Unfortunately, conclusive studies relating disease to workrelated exposures are difficult to obtain. One reason is that workplace exposures to hazards may not result in symptoms of disease for years or decades. As a result, cases of silicosis, tuberculosis, asbestosis, mesothelioma, or lung cancer are rarely documented as workrelated in the Bureau of Labor Statistics system. In 2000, BLS reported a total of 100 nonfatal "dust diseases of the lungs" and 500 "respiratory conditions due to toxic agents" among the nation's 8.9 million construction workers.[6] The BLS Census of Fatal Occupational Injuries, by definition, does not count illnesses.

Some statistical studies and large-scale medical screenings do suggest patterns of disease, however.[7] The National Center for Health Statistics, a branch of the U.S. Department of Health and Human Services, publishes information based on death certificates from about 20 cooperating states (the roster of participating states changes from year to year). Comparing the reported deaths in a given construction occupation, such as bricklayer, with the number that would have been expected for the general U.S. population produces proportionate mortality ratios, PMRs. A PMR is the ratio of the proportion of deaths attributed to a specific cause in an exposed group (construction trade) to the corresponding proportion in a U.S. refrence population, matched for age, race, and sex. PMRs are used to find excess deaths from disease and differences between an exposed group and the reference population.

An analysis of death certificates for 1991-93 suggests that members of some construction trades in those states have about a 25% higher risk of death from "pneumoconiosis and other respiratory diseases" compared to the general U.S. population (matched for age, race, and sex) (chart 44a). (Recent medical tests have shown that some construction workers at nuclear weapons plants have been exposed to beryllium, but it is unclear whether the kinds of beryllium exposures that construction workers have experienced lead to significantly higher risk for beryllium disease of the lungs.)

From 1996 to 2002, 2,602 pulmonary (lung) function tests and chest X-rays were given to current and former construction workers at Department of Energy nuclear weapons facilities. At an average age of 58 and with an average 23 years in construction work, the workers were older and have worked longer in construction than the general construction population.

An average of 45% of the pulmonary function tests were abnormal compared with tests of men of the same age and height without known lung disease (chart 44b). Chest X-ray abnormalities, compared to what is expected among workers with no known lung disease, ranged from 19 to 44%, depending on the trade (chart 44c).

Cigarette smoking often compounds the risks of respiratory disorders among the construction trades. The risk of lung cancer increases 10-fold among smokers compared with nonsmokers exposed to asbestos – and smoking is more common among construction workers than in many other occupations (chart 44d).[8] Among the 2,602 Department of Energy workers tested for lung problems in 1996-2002 – see above – only one-third reported never smoking. Current and former smokers reported smoking, on average, 30 and 25 years, respectively, about one pack a day.

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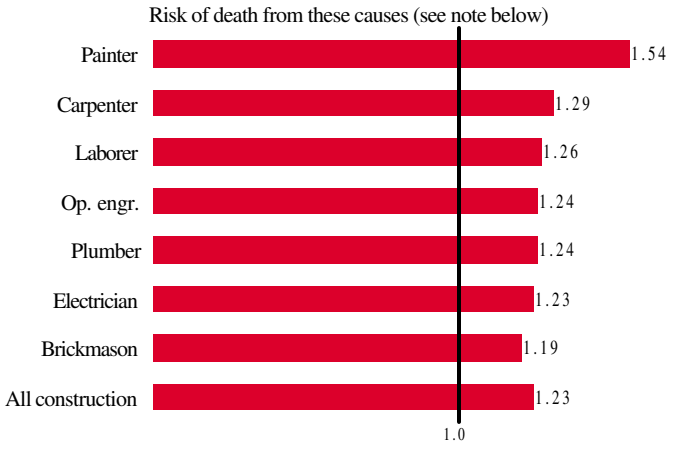
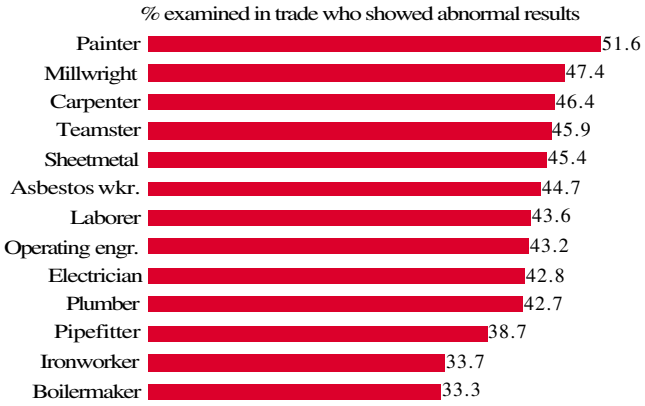
1. Bernardino Ramazzini, *Diseases of Workers (De Morbis Artificum Diatriba),* 1713. Translated by Wilmer Cave Wright, 167.
2. *See* Ian A. Greaves, Not-So-Simple Silicosis: A Case for Public Health Action, Commentary, *American Journal of Industrial Medicine,* 37:245-51, 2000.
3. Irving J. Selikoff, J. Churg, and E.C. Hammond, Asbestos exposure and neoplasia, *Journal of the American Medical Association,* 188:22-26, 1964.
4. *See* D.E. Snider Jr., The Relationship between Tuberculosis and Silicosis. *American Review of Respiratory Diseases,* 118:455-60, 1978; IARC, International Agency for Research on Cancer, World Health Organization. *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans: Silica, Some Silicates, Coal Dust and para-Aramid Fibrils,* Vol. 68, Lyon, France, 1997, 210.
5. *See The Construction Chart Book, Second Edition,* pp. 43 and 44.
6. John Franklin, OSHA Directorate of Construction, personal communication, September 2002. (8.9 million figure is based on Census of Fatal Occupational Injuries)
7. *See* Antti Karjalainen, Rami Martikainen, Panu Oksa, Kimmo Saarinen, and Jukka Uitti, Incidence of Asthma Among Finnish Construction Workers, *Journal of Occupational and Environmental Medicine*, 44(8): 752-57, August 2002.
8. I.J. Selikoff, E.C. Hammond, and J. Chung, Asbestos Exposure Smoking and Neoplasia. *Journal of the American Medical Association*, 204:706, 1968.

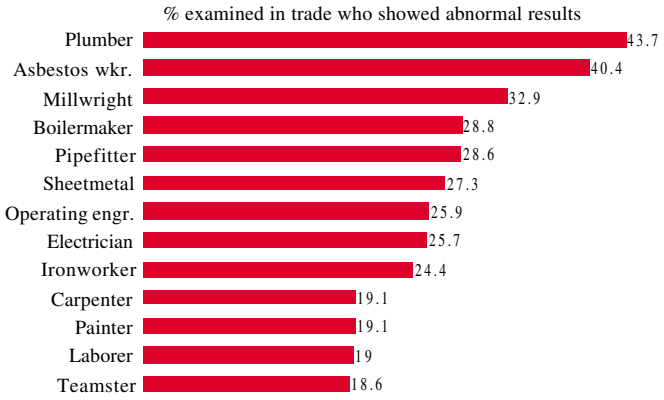
44a. Approximate risk of death from pneumoconiosis and some other respiratory diseases, selected construction trades in about 20 states, 1991-93



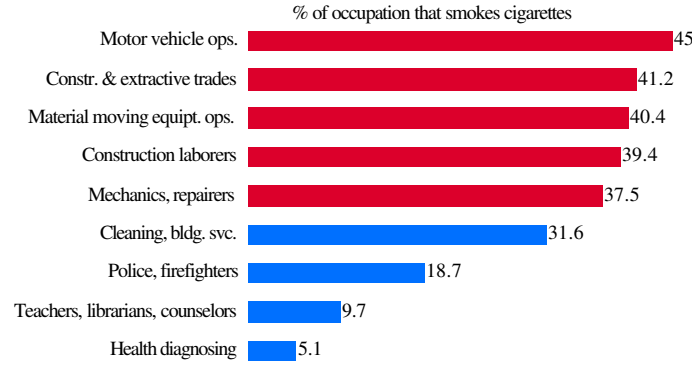
44b. Pulmonary function test results, selected construction trades, three Department of Energy nuclear weapons facilities, 1996-2002



44c. Chest X-ray results, selected construction trades, three Department of Energy nuclear weapons facilities, 1996-2002



44d. Percentage of smokers, selected occupations, 1998-2000 average



Note: Chart 44a - Risk is based on the proportionate mortality ratio (PMR). A PMR equal to 1.0 means that the proportion of deaths from a given cause among workers in a trade is equal to the proportion of deaths in a comparable age-race-gender reference U.S. population. A PMR of 1.25 means that the proportion of deaths from a given cause among workers in a specific trade is 25% higher than that observed in the reference population. "Pneumoconiosis and other diseases" includes, among other diseases, asbestosis, silicosis, pneumoconiosis from inorganic dusts (such as, beryllium), and respiratory conditions due to chemical fumes and vapors. Total of 5,771 observed deaths for construction workers from "pneumoconioses and other respiratory diseases," including 436 painters, 1,197 carpenters, 924 laborers, 288 operating engineers, 320 plumbers, 249 electricians, and 217 brickmasons. Trades shown are those for which the PMR was (statistically) significantly elevated. The number of states providing data changes from year to year.

Charts 44b and 44c - Total of 2,602 current and former DOE workers examined 1996-2002; average 58 years old and with, on average, 23 years in construction. Results are shown for trades in which 25 or more workers have been examined; the numbers examined and included in the charts are as follows: 89 painters, 76 millwrights, 220 carpenters, 83 teamsters/truck drivers, 132 sheetmetal workers, 47 asbestos workers, 406 laborers, 139 operating engineers, 474 electricians, 96 plumbers/steamfitters, 501 pipefitters, 160 ironworkers, and 66 boilermakers.

Chart 44b - Pulmonary function test used spirometry, with American Thoracic Society Standards. Chest X-rays were posterior-anterior classified by a B-reader following ILO Classification of Radiographs of Pneumoconiosis. Abnormal spirometry results were identified using the prediction equations and the 95 confidence interval defined by R. Crapo, A. Morris, and R. Gardner, Reference spirometric values using techniques and equipment that meet the ATS recommendations. *American Review of Respiratory Diseases*, 123:659-64, 1981.

Chart 44c - Any pleural abnormality was defined as the presence of any notation of positive findings according to sections 3A-D of the NIOSH ILO coding form and/or any parenchymal abnormality defined as ILO profusion score of 1/0 or greater.

Chart 44d - "Construction and extractive trades" include, among others, brickmasons, carpenters, drywall, electricians, glaziers, pile drivers, sheetmetal duct installers, tilesetters, and supervisors; "material moving equipment operators" include, among others, operating engineers; "mechanics and repairers" include, among others, elevator installers and equipment repairers and heavy-equipment mechanics.

Source: Chart 44a - Risana Chowdhury, The Center to Protect Workers' rights, based on Multiple-Cause-of-Death Data 1991-93, National Center for Health Statistics (based on death certificates from about 20 states).

Charts 44b and 44c - The Center to Protect Workers' Rights, (Hanford Building Trades Medical Screening Program, Augusta [Ga.] Building Trades Medical Screening Program for the Savannah River Site) and the University of Cincinnati Medical Center (Oak Ridge Building Trades Medical Screening Program).

Chart 44d - Xiuwen Dong, The Center to Protect Workers' Rights, based on data from the National Health Interview Survey, National Center for Health Statistics.

45

Lead and Other Heavy Metals in the Construction Industry

Construction workers can be exposed to lead and other heavy metals on the job, which can cause anemia, hypertension, infertility, miscarriages, and damage to the nervous system or kidneys, depending on the metal and the exposure level. Exposures come mainly from fumes and dusts, thus putting a wide range of workers at risk from nearby operations. But the dangers may be most acute for welders, painters, masons, and hazardous-waste or lead-abatement workers.

Some state governments have legal authority for surveillance of heavy-metal exposures. While 35 states maintain registries of blood-lead levels reported by laboratories, only 6 states are known to maintain registries for heavy-metal exposures.[1]

The health effects of exposures to heavy metals can be serious. Cadmium, for instance, is found in paint pigments and encountered during painting and welding; exposures can result in kidney and lung damage. Chromium is found in portland cement, concrete, and stainless steel and is released as a result of such work as welding, torch cutting, grinding, and sand blasting; exposures can cause nasal septum perforation, contact and allergic dermatitis – and, in the hexavalent form, lung cancer.[2]

Manganese, found in some types of steel and encountered in welding, can damage the central nervous system.[3] Mercury can be found in electrical apparatus and some paints. Acute exposure to high concentrations of mercury vapor can cause corrosive bronchitis, inflammation of the lungs, and nervous-system damage; long-term exposure to lower levels is tied to damage to the nervous system and kidneys.

For some metals, NIOSH has set recommended exposure levels, which are guidelines. OSHA has standards for beryllium, cadmium, chromium, lead, mercury, and other heavy metals. Since 1993, the lead standard has required a program of protections for construction workers on jobs where they might be exposed to lead (29 CFR 1926.62). Lead endangers abatement workers and can also poison workers repairing or demolishing – welding, burning, and sandblasting – old bridges and other structures coated with lead paint. Although lead has been banned from residential paints since 1978, it is used in industrial paints and can be found in layers of paint in older housing and bridges and other steel structures.

The lead standard specifies medical monitoring (including a baseline blood-lead test) and the removal of workers having blood-lead levels at or above 50 micrograms per deciliter (µg/dL) from work where they can be exposed to lead until blood-lead levels are at or below 40 µg/dL. Many experts believe even 40 micrograms is too high.[4]

All but two states that maintain lead registries require reports at 25 µg/dL or lower. (The 24 states in the CDC's Adult Blood Lead Epidemiology and Surveillance, or ABLES, program in 2000 reported 2001 adults – including an unspecified number of construction workers – had blood-lead levels of at least 40 µg/dL.)

The hazards of lead may reach workers' families, as well. One study concluded that 2 to 3% of U.S. children with blood-lead levels of 10 µg/dL or greater were exposed to lead taken home from the workplace.[5] Levels as low as 10 µg/dL in children aged 1 to 5 years have been associated with harm to cognitive development, growth, and behavior.[6]

In the California lead registry, painting (SIC 1721) and masonry (SIC 1741) had the highest number of construction workers showing blood-lead levels of 25 µg/dL or higher in 1995-2000 (chart 45a). Painters, who accounted for 42% of construction reports during the six years, were mainly industrial painters removing lead paint on bridges undergoing earthquake retrofit, although some of the painters were employed by residential or commercial painting contractors. An additional 16% of the construction workers in the registry did masonry work replacing lead-contaminated furnace material in lead smelters. (In 1997, according to the Census Bureau, painters were about 4% of 569,061 wage-and-salary construction employees in the state and masons were less than 2%, but this number excludes self-employed construction workers. No information is available on the extent of estimated exposures.)

Reports for individual years in California do not show a consistent trend by industry in construction, but appear to be influenced by the scheduling of large jobs (such as, bridge projects in 1995, 1999, and 2000 and smelter furnace masonry work in 1995, 1996, and 1998).

The numbers of construction workers and employers in the registry are small. For 1995-2000, only 233 painters from 47 companies were reported with blood-lead levels at or above 25 µg/dL. By comparison, U.S. Census data indicate 24,562 workers were employed by 4,394 painting establishments in California in 1997. A 1998 survey by the state identified 596 companies doing wrecking and demolition work; yet only seven such companies (1%) had employee blood-lead levels reported to the state that year. The low numbers might be explained by poor compliance with testing requirements among industries working with lead.[7]

In 1986-2001, New Jersey's registry listed 1,466 construction workers (from 269 workplaces) as having blood-lead levels at or above 25 µg/dL. Construction workers were 23% of the workers in the registry in 2001. The number of cases showing blood-lead levels at or greater than 40 µg/dL among construction workers peaked at 103 in 1993 and ranged from 51 to 13 cases between 1986 and 2001.

Several factors may have contributed to the decline in reported lead levels of construction workers in New Jersey: the inclusion of lead safety in contract language for bridge construction by the state Department of Transportation in 1992, implementation of the OSHA interim lead-in-construction standard in 1993, a licensing requirement for lead abatement workers, and certification of lead abatement contractors by the state Department of Community Affairs, starting in 1996.

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1. The six states that have reporting requirements for exposures to heavy metals other than lead and which code by occupation or industry, are Maine, Maryland, Massachusetts, New Jersey, New York and North Carolina (ABLES Listserv, May 2002). The 35 states with lead registries and the levels of micrograms per deciliter of lead at which reporting is required are Alabama (10 µg/dL), Arizona (10), California (25), Connecticut (all), Florida (10), Georgia (unk), Hawaii (unspec), Illinois (25), Iowa (all), Kansas (25), Kentucky (25), Maine (25), Maryland (25), Massachusetts (15), Michigan (all), Minnesota (all), Missouri (25), Montana (unk), Nebraska (all), New Hampshire (25), New Jersey (all), New Mexico (all), New York (all), North Carolina (40), Ohio (all), Oklahoma (10), Oregon (25), Pennsylvania (25), Rhode Island (all), South Carolina (40), Texas (25), Utah (15), Washington (all), Wisconsin (10), Wyoming (all).

2. William N. Rom, Environmental and Occupational Medicine, Second Edition, Boston: Little, Brown and Company, 1992, pg. 800; Barry S. Levy and David H. Wegman, eds., *Occupational Health Recognizing and Preventing Work-Related Disease, Fourth Edition.* Boston: Little Brown and Company, 2000, pp. 316 and 486.

3. G.J. Hathaway, N.H. Proctor, J.P. Hughes, *Chemical Hazards of the Workplace. Fourth Edition.* Van Nostrand Reinhold, 1996. A workers' compensation decision has linked manganese exposure to Parkinson's disease. *See* State of California, Division of Workers' Compensation, Case ANA 016 8718, May 1996, Jimmy Sartain vs. Washington Ornamental Ironworks/Beaver Insurance; Star "D" Ironworks/Great American Insurance.

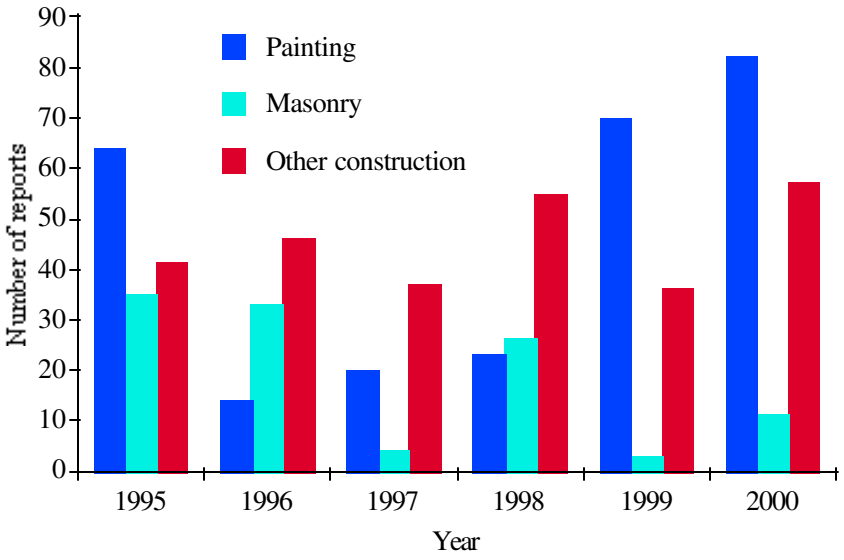
4. *See* Centers for Disease Control and Prevention, Blood Lead Levels in Young Children–United States and Selected States, 1996-1999, *Morbidity and Mortality Weekly Report*, 49(50); 1133-37, December 2000; E.K. Vig and H. Hu, Lead Toxicity in Older Adults. *Journal of the American Geriatrics Society*, 48(11):1501-1506, November 2000.

5. Robert J. Roscoe, Janie L. Gittleman, James A. Deddens, M.R. Peterson, and William E. Halperin, Blood Lead Levels among the Children of Lead-Exposed Workers: A Meta-Analyisis. *American Journal of Industrial Medicine*, 36: 475-81, 1999.

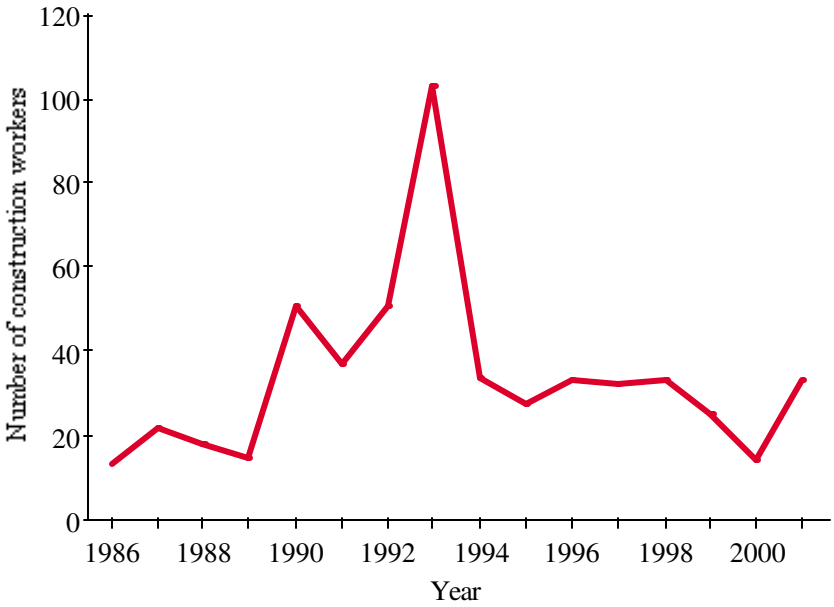
6. National Research Council. *Measuring lead exposure in infants, children, and other sensitive populations*. Washington, D.C.: National Academy Press, 1993

7. *See* L. Rudolph, D.S. Sharp, S, Samuels, C. Perkins, and J. Rosenberg. Environmental and biological monitoring for lead exposure in California workplaces. *American Journal of Public Health* 80(8): 921-25, 1990.

45a. Number of reports of worker blood-lead levels at or above 25 µg/dL in painting, masonry, and other construction industries, California, 1995-2000



45b. Number of construction workers reported in New Jersey as having blood-lead levels at or above 40 µg/dL, 1986-2001



Note: Chart 45a - The CDC's ABLES program defines elevated blood-lead levels as 25 micrograms per deciliter (µg/dL) or greater, the level at which California requires reporting. There were reports for a total of 559 construction workers in the 6-year period (some workers were reported more than once).

Chart 45b - Workers in SIC 15, 16, or 17. Total of 542 workers reported as having blood-lead level above 40 µg/dL; smallest number in a given year was 13 in 1986.

Source: Chart 45a - California Department of Health Services, Occupational Lead Poisoning Prevention Program.

Chart 45b - The New Jersey Department of Health and Senior Services, Adult Blood Lead Epidemiology and Surveillance Program.

46

Nonfatal Skin Diseases and Disorders in Construction

Work-related skin disorders can be severe enough to force a construction worker to miss work for several days or to change occupations.

The Bureau of Labor Statistics (BLS) category, "skin diseases or disorders," includes oil acne, chrome ulcers, chemical burns or inflammations, tinea (ringworm), and contact dermatitis, eczema, or rashes caused by primary irritants and sensitizers or poisonous plants (such as poison ivy). BLS does not list frostbite or sunburn as skin diseases or disorders.

The average incidence rate of skin diseases and disorders in 1995 for all industries was 1.2 per 10,000 full-time-equivalent workers. Among goods-producing industries, the rate for agriculture, forestry, and fishing was 4.4; for manufacturing, 1.9; for construction, 1.6; and for mining, 1.2 (Bureau of Labor Statistics ftp web site ostb0445, table R72).

In 1999, the incidence rates of nonfatal skin diseases and disorders varied widely among construction industries; the rate for all construction had declined by one-third from 1995, when it was 4.5 cases per 10,000 full-time workers (see chart 46a). In 1995, the most recent year for which data on days away from work were available for key construction industries, skin disorders caused concrete workers to lose much more work than did other construction workers (chart 46b). (*See* chart book page 33).

Concrete, which is widely used in masonry, floor laying, and other occupations, is a mix of portland cement (calcium, silica, iron, and alumina), sand, aggregate, and water. Fly ash, gypsum, and blast-furnace slag may be added to produce blended-cement products. Contact with wet concrete can cause both irritant and allergic contact dermatitis. Irritant dermatitis, which can be acute or chronic, is caused by the concrete's alkaline and abrasive properties. Irritant dermatitis can also be caused by solvents, soaps, asphalt, dust, fiberglass, abrasives and mechanical trauma or friction.

Allergic dermatitis may be caused by persistent contact with hexavalent chromium, which is in most portland cement; other causes of allergic dermatitis include cobalt, nickel, rubber gloves or boots, epoxy resins, asphalt and coal tars, some sawdusts, and poison ivy.[1]

Hexavalent chromium is water soluble and thus can penetrate the skin. Chromates are one of the main causes of allergic dermatitis among workers.[2] Some 5 to 15% of workers coming into contact with portland cement that contains hexavalent chromium suffer allergic contact dermatitis at a rate well over 25 times the rate for allergic dermatitis in the general population (Christian Avnstorp, University of Copenhagen, Denmark, personal communication, 1996). Allergic contact dermatitis that develops after cement exposure may persist in 20 to 40% of workers who have reacted to hexavalent chromium, even without further exposures to the substance (James Nethercott, University of Maryland, personal communication, 1997). Since 1981, Denmark, Finland, and Sweden have reduced hexavalent chromium levels in cement to below 2 parts per million and have reported a reduction in skin problems.

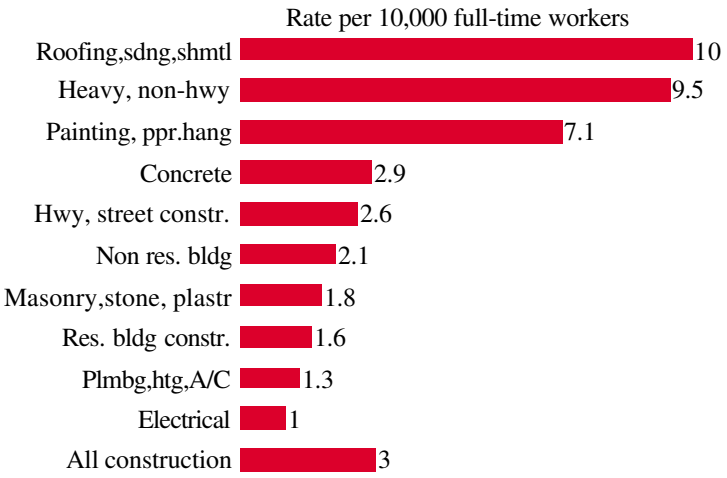
In Finland, from the years just before 1987 legislation reduced chromium levels until a decade later, the rate of reported (and medically confirmed) cases of allergic dermatitis declined 80% (chart 46c). At the same time, the number of reported cases of irritant dermatitis — caused by contact with other irritants in wet cement — remained constant.[3]

Although Demnark, Finland, and Sweden report success in reducing hexavalent chromium levels in cement, there is still discussion in some European countries about the benefits of the method used, adding ferrous sulfate to cement. In Belgium and Holland, statistics show that the numbers of new cases of chromium allergies have fallen without modifying the cement. The concentrations of chromium in cement differ from country to country, depending on the raw materials.

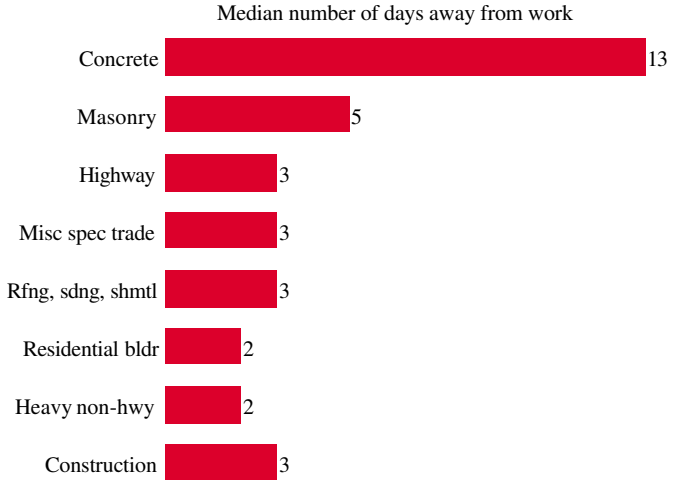
Approaches to the problem of hexavalent chromium in portland cement are being considered in the United States. But some in the U.S. cement industry say adding ferrous sulfate may not work, because of the large number of cement manufacturing plants (more than 120), wide variations in hexavalent chromium content in cement, and time delays between cement manufacturing and use. The time delays are of concern because ferrous sulfate may lose its effectiveness over time, depending on how cement is packaged and on water and temperature conditions.

1. Robert M. Adams, *Occupational Skin Disease*. New York: Grune & Stratton, Inc., 1983.
2. *See*, for instance, David Burrows, Adverse chromate reactions on the skin. In: Torkil Menne and Howard I. Maibach, eds., *Chromium: Metabolism and Toxicology*. Boca Raton: CRC Press, 1983, 137.
3. Pekka Roto, Hannele Sainio, Timo Reunala, and Pekka Laippala, Addition of ferrous sulfate to cement and risk of chromium dermatitis among construction workers, *Contact Dermatitis*, 1996, 34:43-50.

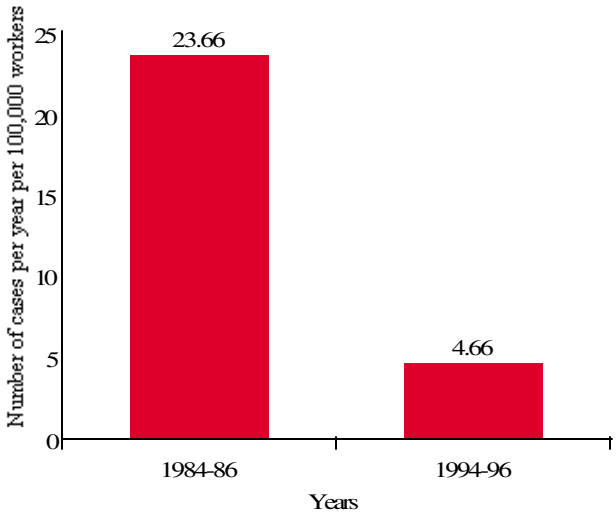
46a. Rate of nonfatal work-related skin diseases and disorders, by construction industry, 1999



46b. Median number of days away from work for nonfatal skin disorders, by construction industry, 1995



46c. Rate of work-related allergic dermatitis among construction workers in Finland, before and after reduction of chromium content in cement (3-year averages)



Note: Chart 46a - The rate for all industries is 4.9. These data, which cover private in the private sector and exclude the self-employed, are based on employer reports, not employee information (such as that provided in the Current Population Survey).

Chart 46b - Data cover private sector only and exclude all self-employed workers. The median is the mid-point; half of the cases have more days away from work and half have fewer days. Numbers include nonfatal occupational injuries and illnesses, with days away from work, involving disorders of the skin and subcutaneous tissue. Residential builders (general contractors) do not perform all residential construction. Special trades contractors (SIC 17; *see* page 1) produce 29% of the net value of residential construction work done — and are half the establishments that work primarily in residential construction, according to the 1992 Census of Construction Industries (Eric Belsky, Harvard University Joint Center for Housing Studies, personal communication, March 1998). Data were not available for nonresidential building construction (SIC 154), plumbing, heating, and air conditioning (SIC 171), electrical work (SIC 173), and carpentry and floor work (SIC 175).

Source: Chart 46a - Bureau of Labor Statistics, **www.bls.gov**, table S14.
Chart 46b - William Weber, Bureau of Labor Statistics, personal communication, January 1998.
Chart 46c - Pekka Roto, Institute of Occupational Health, Helsinki, Finland, personal communication, March 1998.

47

OSHA's Enforcement of Construction Safety and Health Regulations

Since its founding in 1970, the U.S. Occupational Safety and Health Administration (OSHA) has been responsible for enforcement of workplace safety and health standards in the United States. OSHA enforces labor law or delegates such enforcement powers to 21 states, Puerto Rico, and the Virgin Islands.[1] OSHA state plans may have more-stringent rules.

The OSHA construction standard, 29 CFR 1926, underlies enforcement.[2] In construction, since 1994 the agency has concentrated on fall protection, in an effort to reduce the leading cause of work-related deaths in the industry (charts 47a and 47b; *see* chart 36b). (Some scaffold-related violations involve fall hazards.)

Of 20,276 inspections that OSHA conducted in construction in 2001, 1,501 (7.4%) covered health, rather than safety, whereas, for all industries, health inspections are 20% of the total. (John Franklin, OSHA Directorate of Construction, personal communication, March 2002). (Because state-plan inspection systems differ from those of OSHA, state-plan numbers are not included here.)

Although the number of inspections (of employers) has increased over the years, the number of worksites visited is estimated to be much lower than the number of inspections, given that OSHA inspects 3 to 3½ employers on each construction site visited.[3]

And OSHA's resources continue to be limited. The most recent published number of worksites, from the Census Bureau, estimated there were 7 million establishments in all industries and 700,000 construction establishments in the United States in 1999, but the number of worksites – at least, in construction – would be larger.[4] That same year, OSHA had 2,324 inspectors, including state-plan inspectors, for all industries nationwide (John Franklin, OSHA, personal communication, April 2002). So, at best, the ratio is more than 3,000 sites (in all industries) for each inspector.

With its limited resources, OSHA appears to inspect some types of construction worksites more than others. David Weil examined OSHA inspection reports for the seven years 1987-93 for the nation's 2,060 largest construction contractors. Using data that included state-plan jurisdictions, he found that OSHA was likely to inspect union contractors' sites about 10% more often than sites of non-union contractors. The analysis showed also that OSHA "devotes a substantial percentage of its [enforcement] resources" to worksites of very large companies, even though compliance inspections of mid-size and smaller companies produced a higher proportion of citations. For instance, in 1993, 30% of the inspections of Weil's sample produced serious violations, compared with 46% of all other construction inspections.[5] OSHA's inspection-targeting procedures reportedly have not changed substantially since the years studied (H. Berrien Zettler, OSHA Directorate of Construction, personal communication, April 2002).

Between 1987 and 2001, penalties per citation increased ninefold (*see* chart 47c), which may be explained partly by increases in the fines that OSHA is able to levy for citations. Also, the OSHA focused-inspection program, begun in 1994, is intended to allow compliance officers to spend more time on worksites where greater hazards may exist. In 2001, 8.4% of OSHA construction inspections were classified as focused (John Franklin, OSHA, March 2002). A third factor is that penalties listed are "current," which means that penalties for the most recent years may be lowered, if fines are protested.

Along with enforcement, OSHA has been working to encourage voluntary protection by contractors – for instance, through focused-inspection initiatives – and to highlight successful safety and health programs. OSHA non-enforcement activities include OSHA Training Institute courses on safety and health, which provided 10- and 30-hour training for 169,560 construction workers in 2001, and training grants to reach construction workers who might be particularly hard to reach or at high risk of work-related injuries and illnesses.

The effectiveness of OSHA's efforts remains unknown. As OSHA reported to Congress in 1997, the agency has lacked data to show whether its programs improve safety and health at worksites.[6] A report prepared for OSHA in 2002 described efforts to develop a measure of effectiveness – by comparing a site's lost-workday injury and illness rates before an OSHA intervention with rates in the 2 years following.[7] The report, however, pointed up the difficulty measuring results in construction, given that few construction sites exist for as long as 3 years.

1.OSHA jurisdiction is complicated, but this is a sketch: OSHA regulations cover private-sector construction activity in 29 states. OSHA regulations cover private-sector construction in the remaining 21 states through the operation of state-plan OSHA programs. These 21 states regulate construction performed by state- or local-government employees, as well. Also, 3 of the 29 states – Connecticut, New Jersey and New York – have state-plan programs that apply only to state- and local-government employees. And, under an executive order, OSHA regulations apply to all federal agencies.

2.Office of the Federal Register, National Archives and Records Administration, *Code of Federal Regulations*, Labor 29, part 1926 (Revised as of July 1, 2001). Washington, D.C.: U.S. Government Printing Office, 2001

3. The estimate of employers visited per site excludes state-plan jurisdictions. Knut Ringen, *Scheduled Inspections in Construction: A Critical Review and Recommendations*, Report Prepared for The Directorate of Construction, Occupational Safety and Health Administration, U.S. Department of Labor, In response to Contract No. B9F91522. Seattle, March 1999, pg. 15.

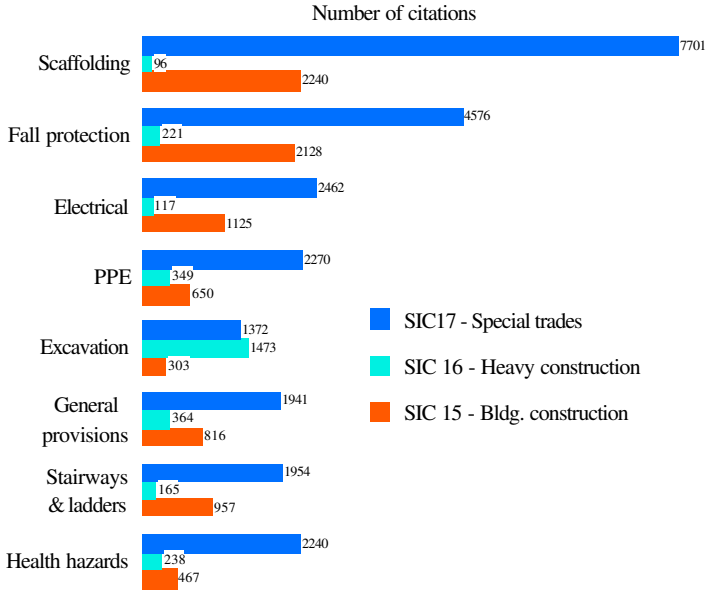
4. The estimate, used by OSHA and taken from the Census Bureau, County Business Patterns (www.census.gov/prod/2001pubs/cbp99/cbp99-1.pdf, table 1, page 9), is based on the number of establishments, which may differ from the number of worksites; the gap might be largest in construction, which is, by definition, based on temporary worksites. *See* Glossary. This chart book uses the Economic Census estimate of 656,448 establishments in 1997; *see* chart book page 2.

5. David Weil, Assessing OSHA Performance: New Evidence from the Construction Industry, *Journal of Policy Analysis and Management*, 20 (4): 651-74, Fall 2001, 657, 668, fig. 3.

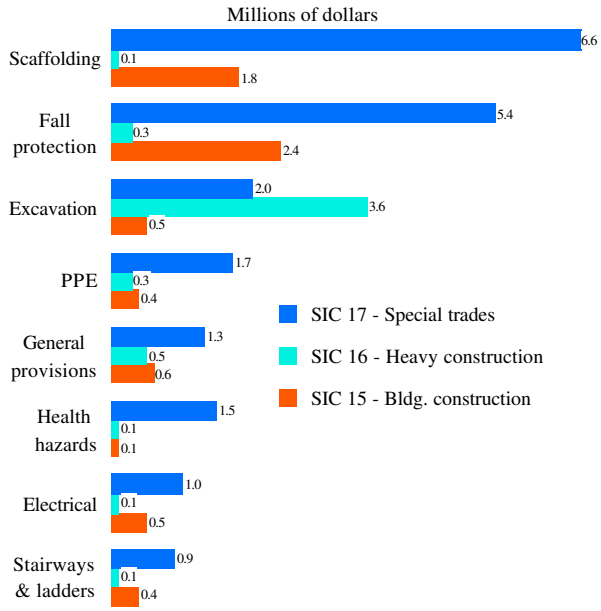
6. Occupational Safety and Health Adminstration, *Strategic Plan: Occupational Safety and Health Administration FY 1997-FY2002,* 1997.

7.The Lexington Group and Eastern Research Group, An Estimate of OSHA's Progress from FY 1995 to FY 2001 in Attaining Its Performance Goal of Reducing Injuries and Illnesses in 100,000 Workplaces, Prepared for The Office of Statistics, Occupational Safety and Health Administration, Washington, D.C., Contract No. J-9-F-7-0043, March 15,2002.

47a. OSHA citations in most-cited construction categories, by SIC grouping, 2001



47b. OSHA penalties in most-cited construction categories, by SIC grouping, 2001



47c. Number of OSHA inspections, total citations, total penalties, and average penalty per citation, construction, 1987-2001

Year	Inspections	Citations	Total penalties	Average penalty per citation
1987	35,562	53,985	$6,834,736	$126
1988	31,073	55,174	$9,791,204	$177
1989	28,858	69,642	$13,772,631	$198
1990	24,310	67,871	$15,618,493	$230
1991	22,425	55,491	$23,717,564	$427
1992	22,664	49,769	$26,006,198	$522
1993	20,364	44,212	$24,773,057	$560
1994	22,766	48,854	$33,999,882	$696
1995	13,131	22,714	$18,438,936	$812
1996	11,532	16,713	$17,715,305	$1,060
1997	18,353	31,063	$28,099,943	$905
1998	18,338	29,277	$24,904,322	$851
1999	18,734	29,971	$28,574,226	$953
2000	19,647	30,781	$30,770,596	$1,000
2001	20,276	32,754	$36,193,932	$1,105

Note: All charts - Data cover categories having the largest number of citations and highest penalties. Citations and penalties were assessed by OSHA only, not the 23 state-OSHA jurisdictions. Scaffolding refers to all citations within subpart L, Fall protection refers to all citations within subpart M, Electrical refers to all citations within subpart K, PPE refers to all citations within subpart E (including respirators), Excavation refers to all citations within subpart P, General provisions refers to all citations within subpart C (including safety programs, jobsite inspections, and training), Stairways & ladders refers to all citations within subpart X, and Health hazards refers to all citations within subpart D (including hazard communication and lead). Years are fiscal years. SIC is Standard Industrial Classification (*see* Glossary).

Charts 47b and 47c - Penalties are "current," rather than initial assessments. So, penalties reported for the most recent years may be lowered in some cases after employers contest the penalties.

Source: Chart 47a and 47b - OSHA web site (www.osha.gov on 2/21/02).

Chart 47c - OSHA Directorate of Construction and Engineering, Washington, D.C., personal communication, March 2002.

48

Workers' Compensation and Other Costs of Injuries and Illnesses in Construction (I)

The more than 194,000 annual injury and illness cases with days away from work in construction mean losses not only to workers, but also to their families, employers, and society. Some of the costs are in wage replacement and medical payments, direct – billable – costs that can be measured. But those workers' compensation payments reflect only a small part of injury- or illness-related expenses.

Many costs are not compensated, partly because they are difficult to tie to specific work exposures. Construction workers may move among several employers in a year or even dozens of employers in a career. Work-related musculoskeletal disorders, which can be extremely costly in expense and suffering, often develop through repetition over months or years. Similarly, work-related illnesses, such as cancers or nervous system diseases may not appear for many years after worker exposures to asbestos, solvents, or other toxics in the workplace.

The nonbillable costs are borne by families through bills for prescriptions, home care, and health supplies; reduced time to care for children; and reduced income or productivity as a result of having to stay home to care for an ill family member. Employers, too, bear some nonbillable costs through reduced worker productivity. Society pays in increased Social Security taxes, higher health care premiums, and reduced savings for retirement.

Published estimates of the total cost of nonfatal injuries in all industries in the United States range from $131.2 billion to $145 billion per year.[1]

For an employer, who pays workers' compensation insurance premiums, costs of injury can threaten survival in a highly competitive environment. A construction company operating at a 3% profit margin would have to increase sales by $333,000 to pay for a $10,000 injury, such as the amputation of a finger (chart 48a).

Some of the most useful information on direct costs comes from the insurance industry. Liberty Mutual, which underwrites workers' compensation insurance, compiles a list of the 10 causes of injuries and illness which cost the most in wage replacement and medical payments (chart 48b). The 10 leading causes listed were reportedly responsible for $34.5 billion or 86% of the total $40.1 billion paid by employers in 1999. Although no breakdown is available for construction, the items listed match those of greatest concern in construction and 32% of total estimated costs involved ergonomics (overexertion and repetitive motion) (*see* chart book page 36).

Based on a close examination of 573 injury reports from 103 mid-size and large construction companies in 34 states[2] and on more-recent research, Jimmie Hinze has found a ratio greater than 2 to 1 for indirect to direct costs of injuries resulting in lost worktime. He has found, as well, that a less-serious injury, resulting in medical costs but no missed workdays, can still result in indirect costs that more than match the medical bills. The ratios are believed to be underestimates of the true costs, because many costs are not quantified, such as decreased workforce morale and harm to a company's competitiveness (*see* chart 48c). It is generally believed that the true ratio of indirect to direct costs of injuries has declined substantially in the past two decades, as a result of dramatically increased medical costs (Jimmie Hinze, M.E. Rinker Sr. School of Building Construction, University of Florida, personal communication, April 2002).

Looking at direct and indirect costs, Lisa Roché, an epidemiologist, used methods developed by Ted Miller and others to estimate that work-related deaths in New Jersey in 1992 cost $1.07 million each, including lifetime lost wages and benefits, workplace costs (hiring and training replacement workers, disrupted productivity), lifetime lost household production (including nonmonetary activities), and medical and legal costs related to a death.[3] If "quality of life" – the value placed on avoiding pain, suffering, and lost enjoyment – is counted, the cost of each death would increase by $1.69 million.

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1. The lower figure, for the year 2000, is from the National Safety Council, *Injury Facts, 2001 Edition, Itasca*, Ill., 2001; the higher figure, described as a low estimate for direct and indirect costs, is from J. Paul Leigh and others, Occupational Injury and Illness in the United States, *Archives of Internal Medicine*, 1557-68, July 1997.

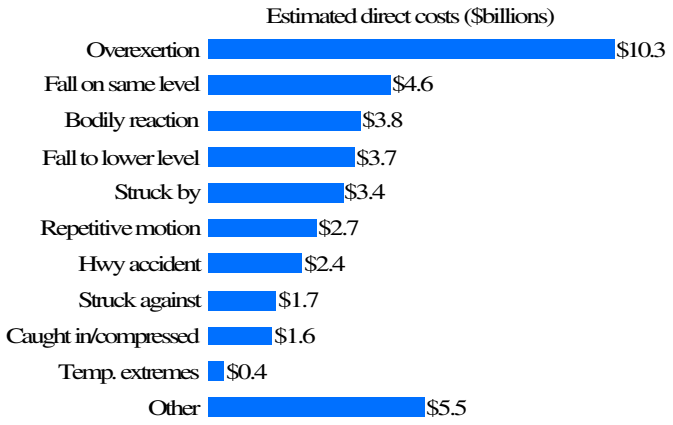
2. Jimmie Hinze, Indirect Costs of Construction Accidents. Construction Industry Institute, Austin, Texas, November 1991. *See* Jimmie Hinze, *Construction Safety*, Upper Saddle River, N.J.: Prentice-Hall, 1997.

3. Lisa M. Roché, Economic Costs of Occupational Injury Fatalities in New Jersey in 1992. In Bureau of Labor Statistics, Department of Labor. 1995. *Fatal Workplace Injuries in 1993: A Collection of Data and Analysis*. Washington, D.C.: U.S. Government Printing Office, Report 891, 28-31, June 1995. The work has reportedly not been updated.

48a. Sales needed to cover direct costs of injury, at various profit margins

Direct costs of injury	Profit margin				
	1 percent	2 percent	3 percent	4 percent	5 percent
$1,000	$100,000	$50,000	$33,000	$25,000	$20,000
$5,000	$500,000	$250,000	$167,000	$125,000	$100,000
$10,000	$1,000,000	$500,000	$333,000	$250,000	$200,000
$25,000	$2,500,000	$1,250,000	$833,000	$625,000	$500,000
$100,000	$10,000,000	$5,000,000	$3,333,000	$2,500,000	$2,000,000

48b. Estimated direct costs for workplace injuries and illnesses, all industries, 1999



48c. Some indirect costs to an employer of an injury on a construction site

- Loss of productivity
  - Job shutdown at the time of injury
  - The injured worker - at the time of injury
  - The injured worker's reduced capacity upon return to work
  - Co-workers at the time of the injury: watching and helping the injured
  - Co-workers who are short-handed following injury
  - Co-workers who must train a replacement worker
  - Supervisor/management time hiring or retraining a temporary or permanent replacement worker
  - Management time investigating and reporting on the incident 9to government, insurance, and news media representatives
- Fines
- Production delays
- Damaged equipment and the costs of repairing or replacing it
- Lawsuits
- Damage to the company image and reduced company competitiveness
- Higher workers' compensation premiums
- Reduced worker morale

Note: Chart 48b - Workers' compensation direct costs – wage replacement and medical payments – totaled $40.1 billion in 1999. Bodily reaction is a single incident of free body motion, such as when slipping without falling; "struck by" an object might be when a tool falls from above; temperature extremes include exposures to hot or cold environments and contact with hot or cold objects; an example of "struck against"an object would be a worker walking into a door frame.

Source: Chart 48a - Richard Jacobsen, Raytheon Engineers & Constructors, presentation to Second National Conference on Ergonomics, Safety, and Health in Construction, Washington, D.C., June 19, 1995.

Chart 48b - Liberty Mutual Group, based on company data and data from the U.S. Bureau of Labor Statistics and the National Academy of Social Insurance. **www.libertymutual.com**

Chart 48c - Jimmie Hinze, *Indirect Costs of Construction Accidents*. Construction Industry Institute, Austin, Texas, November 1991.

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Workers' Compensation and Other Costs of Injuries and Illnesses in Construction (II)

Spending, benefits, and other features of workers' compensation nationwide are difficult to document; specifics vary greatly among the states and other jurisdictions. Construction's distinction as the most expensive industry, in terms of safety and health, however, can be inferred in several ways.

Nationwide in 2000, the average level of injury compensation payments (of all types) for construction was nearly double the level for all industries – $ 7,542 compared with $3,943, respectively. That year, workers receiving injury compensation from any source, including workers' compensation, were 1.3% of all workers in construction compared with 0.8% in all industry.[1]

The industry's share of workers' compensation costs is disproportionately high also. In 2001, while construction workers were about 6% of the nonfarm, private-sector labor force, the industry used 18% of employer costs of workers' compensation (John F. Burton, Jr., Workers' Compensation Policy Review, personal communication, April 2002). (Employer costs consist of premiums, except for self-insured companies, which may make direct payments or set funds aside to cover potential losses or to meet self-insurance requirements. *See* chart 49a.)

In Colorado, a state-created workers' compensation insurer, Pinnacol Assurance, insures 52,000 businesses, about half of the state's workers' compensation market. The insurer's roster is a cross-section, which includes hard-to-insure companies, because Pinnacol is an "insurer of last resort." In 2001, costs of construction claims exceeded costs for all other industries in each of seven categories. That year, when construction employment was about 7% of the state total, construction made up 21% of claims filed with Pinnacol but ate up 34% of costs. Construction claims averaged $9,315 that year, compared with $4,787 for all other industries, or an average of $5,749 per claim for all industries. (George Wahl, Decision Support Analyst, Pinnacol Assurance, Denver, Colorado, personal communication, April 2002).

Similarly, in Washington state, construction appears to have more than its share of costs (chart 49b). Construction was about 6% of the state workforce in 2000. Nonetheless, claims for construction were 21% of those paid, eating up 27% of the cost to the state fund. (These data, however, exclude about one-third of the workforce, for which employers are self-insured; self-insured companies tend to be larger than average, and larger construction companies generally have better-than-average safety records. *See* chart 33a.)

Each year, the magazine *ENR* (*Engineering News-Record*) publishes construction premium levels that have been compiled from state rate manuals by Marsh USA Inc. Insurance Brokers (*see* chart 49c). The nationwide trend appears to be that construction compensation insurance rates increased substantially in 2000, declined slightly in 2001, and were expected to rise in 2002 – although specifics varied among jurisdictions.[2] The costs vary, as well, by occupation.

Chronic injuries appear to be a large factor in the high costs of workers' compensation in construction. The Washington State Department of Labor and Industries examined workers' compensation claims for 1989-96 that were paid by the state for gradual-onset work-related low-back and upper-extremity musculoskeletal disorders. All employers in Washington must participate except the self-insured and self-employed. Although the incidence rate for back and upper-extremity injuries declined slightly in the 8 years covered, gradual-onset back and upper-extremity musculoskeletal disorders remained 36% of the total. Wood-frame building, wallboard installation, and roofing – all of which require extensive manual materials handling – were among the industries having the highest claims rates for back and/or upper-extremity disorders.

In 1989, claims for gradual-onset low-back claims averaged $6,347; claims for upper-extremity disorders ranged from $7,093 to $8,250. The authors note that one factor that may inflate the estimates is that self-insured companies in Washington (which are not in the survey) tend to be larger and may have lower incidence rates than the others. Nonetheless, applying the available data nationally, the report estimate that yearly workers' compensation claim costs for all industries average $16.8 billion for gradual-onset low-back disorders and $6.7 billion for upper-extremity disorders.[3]

In 2001, in Colorado, the average costs of claims for chronic injuries, such as "lifting" ($9,931) and repetitive motion ($8,428) in construction were exceeded only by costs for slips and falls ($16,585) and automobile-related injuries ($26,010). Slip- and fall-related claims used up the largest share, 30%, of incurred costs for the industry, while lifting used up 25% (George Wahl, April 2002).

To attempt to control costs, some states allow collective bargaining agreements on workers' compensation. This approach is intended to make the system more responsive and efficient, although the approach has been criticized for limiting worker rights to appeal. The states include California, Florida, Hawaii, Kentucky, Maine, Maryland, Massachusetts, Minnesota, Pennsylvania, and New York. States that may permit such agreements include Connecticut, Delaware, Georgia, Indiana, Iowa, Missouri, Nebraska, Oklahoma, Rhode Island, South Carolina, South Dakota, Utah, and West Virginia (Robert McGarrah, AFL-CIO, personal communication, April 2002).

1. Figures do not include administrative costs. The median levels were $3,360 for construction and $1,800 for all industry. Data from Census Bureau, Current Population Survey, 2001 March Supplement; calculations by Xiuwen Dong, The Center to Protect Workers' Rights.

2. Stephen H. Daniels and Tim Grogan, Insurance: Workers' Comp Rates Cool Off but Bigger Hikes Could be Coming. *ENR, Engineering News-Record*, 247 (13):34-35, 2001.

3. Barbara Silverstein and John Kalat. 1998. *Work-related Disorders of the Back and Upper Extremity In Washington State, 1989-1996*. Olympia, Washington: Washington State Department of Labor and Industries, Technical Report Number 40-1-1997, pg. 18.

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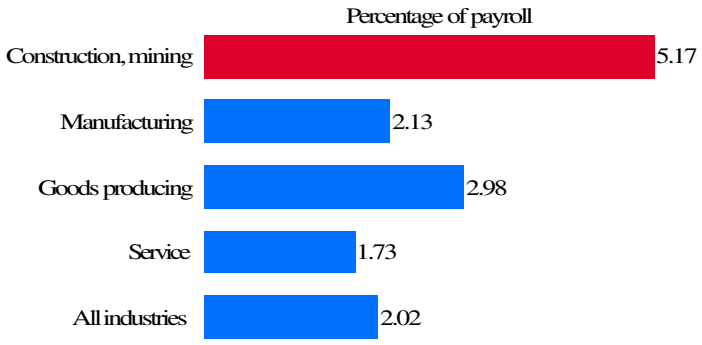
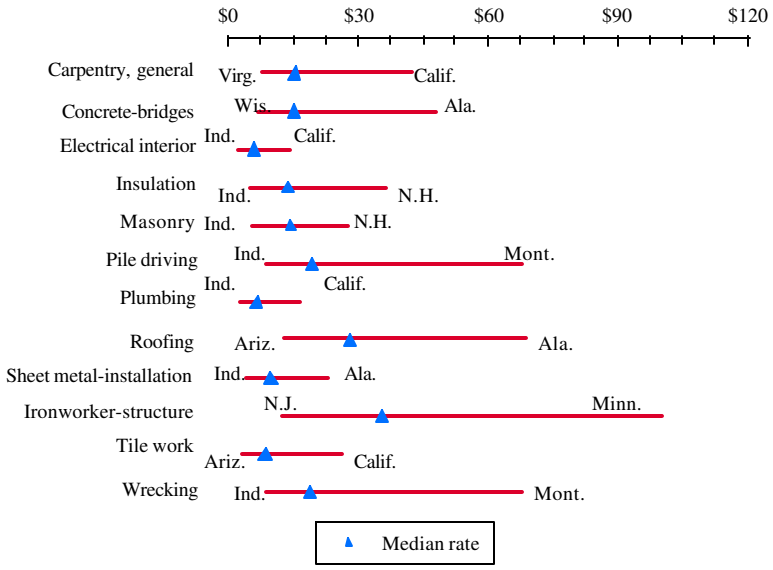
49a. Employer spending on workers' compensation, by industry, 2000 (As a percentage of payroll)



49b. Number and costs of compensable workers' compensation claims, by selected industry, Washington state, 2000

Industry	Payable claims		Costs	
	Number	% of total	$ million	% of total
Construction	**6,956**	**21%**	**$155.7**	**27%**
Manufacturing	4,298	13%	$83.9	15%
Retail	5,045	15%	$62.9	11%
Finance	779	2%	$13.2	2%
Service	7,475	22%	$108.7	19%
Public admin.	1,344	4%	$19.9	3%
Other	7,878	23%	$129.4	23%

49c. Range of workers' compensation base rates for selected construction occupations, 45 jurisdictions, 2000



Note: Chart 49a - Private sector only. Construction employment is 92.6% of the construction, mining category. Goods producing includes mining, construction, and manufacturing. Service includes transportation, communications, and public utilities; wholesale and retail trade; finance, insurance, and real estate; and service industries. Employer costs are workers' compensation premiums for firms that buy insurance or, for self-insured employers, administrative expenses plus payments to workers, their survivors, and health care providers.

Chart 49b - Data as of 3/1/02. Construction was about 6% of the state workforce in 2000. Compensable cases include only those in which an employee misses 4 days or more of work; the state system data exclude about one-third of the workforce who are employed by self-insured companies. (The self-insured companies tend to be larger, and larger construction companies tend to have lower injury rates than average.) "Other" includes agriculture, mining, transportation and utilities, wholesale, and nonclassifiable establishments. Costs are amounts paid, for closed cases, and estimated, for others.

Chart 49c - Rates, per $100 of payroll, were in effect Sept. 1, 2001. Ala. is Alabama. Listings do not include Maine, Nevada, North Dakota, Ohio, Washington, West Virginia, and Wyoming. (Minnesota is included, but rates are variable in that state.) The median is the mid-point: half the jurisdictions in the survey charge more and half charge less. For instance, for plumbing, the rate of $6.63, in Mississippi, is the median. (The listing does not include all categories for the 45 jurisdictions.)

Source: Chart 49a - John F. Burton Jr. and Florence Blum, Workers' Compensation Costs in 2000: Regional, Industrial, and Other Variations, Workers' Compensation Policy Review, May/June 2001, 3-11, based on U.S. Bureau of Labor Statistics data. Article by password at: **www.workerscompresources.com**

Chart 49b - Heather Grob, Department of Labor and Industries, Washington state.

Charts 49c - Data compiled by Marsh USA Insurance Brokers, published in *ENR (Engineering News-Record),* Sept. 24, 2001, 34-35.