

# STANDARDIZED INJURY CATEGORIZATION SCHEMES FOR EARTHQUAKE RELATED INJURIES

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Support for this project was provided by the National Science  
Foundation Grant CMS 9900062

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## STANDARDIZED INJURY CATEGORIZATION SCHEMES

### CATEGORY: Demographics

**A. Age:** Age is generally analyzed in 5 or 10-year age groups except in the very young and very old age groups. If the age is unknown, it is often useful to denote separate codes for whether the information is missing (not recorded, but there is a place to record it in the documentation) or not mentioned (not recorded, and there is no place to record it in the documentation). Standard 5-year age group categories include:

Newborn – 1 year  
 1-4 years  
 5-9 years  
 10-14 years  
 15-19 years  
 20-24 years  
 25-29 years  
 30-34 years  
 35-39 years  
 40-44 years  
 45-49 years  
 50-54 years  
 55-59 years  
 60-64 years  
 65-69 years  
 ≥ 70 years

**B. Gender** – Gender is generally categorized as male or female. If the gender of the injured person is unknown, it is sometimes useful to denote separate codes for whether the information is missing or not mentioned (see above paragraph for differentiation).

**C. Race/Ethnicity** – Race/ethnicity may be useful in situations where cultural variations may affect risk for injury. Facilities have various means for assessing race/ethnicity. For example, some may ask patients how they categorize themselves, while others may simply categorize based on the ethnic background of the surname. Whatever method is used should be written in order to properly interpret this demographic variable. Some epidemiologists prefer to ask these questions separately. The most common manner of grouping race in the United States includes the following categories:

*White*

*Black*

*Asian*

*Other*

These racial categories may be used in combination with a check box to denote whether the patient is Hispanic or Non-Hispanic.

Other epidemiologists may group race and ethnicity into a combined category. The most common combined categorization of racial/ethnicity groups in the United States are:

- Non-Hispanic Caucasian
- Hispanic
- African American
- Native American / Aleutian
- Asian / Pacific Islander

**D. Level of Education** – The highest level of education attained by both parents and offspring are surrogates for socioeconomic status and may be an indication of access to medical care. Since educational protocols vary between countries, it is often difficult to generalize categories from the United States to other countries. However, it can be done keeping in mind that each ‘grade’ in grammar and secondary school represents one year of tutelage, an associate undergraduate degree represents 2 years of tutelage, a baccalaureate degree represents 4-5 years of tutelage, a master’s degree represents 1-3 years of specialized tutelage, professional degrees (lawyer, physician, doctorate) represent 3-6 years of highly specialized tutelage. Therefore, it may be necessary to modify these categories depending on the traditional education routines in other countries:

1. Post-doctorate work
2. Professional degree (M.D., J.D., Ph.D.)
3. Master’s degree
4. Undergraduate degree (Baccalaureate degree)
5. Associate undergraduate degree (less than Baccalaureate degree)
6. Secondary school graduate (12<sup>th</sup> grade graduate)
7. Some secondary school (9<sup>th</sup> –12<sup>th</sup> grade)
8. Grammar school graduate (8<sup>th</sup> grade graduate)
9. Some grammar school education (less than 8<sup>th</sup> grade)

**E. Occupation** – Occupation is another surrogate for socioeconomic status, and may also give clues to environmental hazards and individual activity level which impacts overall health. Occupational groupings by income are not the same as they might be for occupational epidemiology, and economic classification systems seem to have more detail, and may be more easily grouped for epidemiologic analysis. Therefore, the Occupational Employment Statistics classification scheme will be used. Since occupations vary greatly between industrialized and non-industrialized countries, these categories may need to be modified depending on different economies. In the United States, Occupational Employment Statistics (OES) are generated to provide National Occupational Employment and Wage Estimates on an annual basis. These estimates are categorized by an OES code for occupation.

Seven super-headings are used to capture sub-specialties, which capture specific occupations. These occupations are listed in the Appendix with associated OES codes shown in parenthesis after the occupation title.

**F. Income** – Income can be measured by individual or family. For socioeconomic modeling on a population basis, it is more informative to obtain the household or family income as well as the number of individuals and ages of those individuals that are supported by that income. The value of a dollar will change over time, as will the dollar’s relationship to other currency. Therefore, it is also imperative to record the year of reported family income and the currency. In the United States, the lower categories of income are considered poverty levels, and the estimated threshold for poverty level income for 1 person in 1999 was \$8,500, whereas for 2 persons, the poverty level threshold was \$10,869 (U.S. Census Bureau, <http://www.census.gov/hhes/poverty/threshld/99prelim.html>). Therefore, the following categories are suggested for classifying income:

HOUSEHOLD INCOME:

< \$10,000  
 \$10,000 – \$14,999  
 \$15,000 - \$19,999  
 \$20,000 – \$29,999  
 \$30,000 - \$39,999  
 \$40,000 - \$49,999  
 \$50,000 - \$59,999  
 \$60,000 - \$69,999  
 \$70,000 - \$99,999  
 \$100,000 – \$149,999  
 \$150,000 - \$199,999  
 \$200,000 - \$299,999  
 at least \$300,000

NUMBER OF PERSONS IN HOUSEHOLD:

< 18 Years  
 18 – 64 Years  
 65 Years & Older

**G. Disabilities and Pre-existing Conditions** – To be considered disabled under the Americans with Disabilities Act (ADA), a person must have a physical or mental impairment that substantially limits a “major life activity,” has a record of such an impairment or is regarded as having such an impairment. Listed below are several categories of disabilities that may not be exhaustive, as well as categories for pre-existing conditions that might modify individual resiliency. Note that some impairments and disorders may affect multiple human organ systems, and conversely, that one organ system may be affected by multiple disorders or impairments.

1. Visual Impairments or Disorders
2. Physical Impairments or Musculoskeletal System Disorders

3. Hearing Impairments or Disorders
4. Learning or Cognitive Impairments or Disorders
5. Speech Impairments or Disorders
6. Psychological Impairments or Disorders
7. Personality Disorders
8. Cardiovascular and Circulatory System Disorders
9. Blood and Serum Disorders
10. Renal System Disorders
11. Metabolic or Endocrine Disorders
12. Respiratory System Disorders
13. Gastrointestinal Disorders
14. Nervous System Disorders
15. Disorders of the Head and Neck
16. Disorders of the Liver, Biliary Tract, and Pancreas
17. Genetic Disorders
18. Urogenital Disorders
19. Skin Disorders
20. Nutritional Deficiencies
21. Neoplasia
22. Fluid and Hemodynamic Derangements
23. Infectious Disease

Category: **Cause of Injury**

**A. Relation to EQ (EQ-relatedness)**

1. Unrelated – The force of energy that created the circumstantial environment resulting in injury was not a result of the force of the earthquake mainshock, any energy forces set into motion by the earthquake, or rescue or recovery activities after the earthquake; the injury may have occurred regardless of the earthquake event.
2. Indirect – The force of energy that created the circumstantial environment resulting in injury was **not** initiated during or immediately after the earthquake mainshock, but the energy release was set into motion by some consequence of the earthquake causing an unsafe environment resulting in injury (i.e., pedestrian struck by vehicle that lost control during the mainshock); the injury was due to rescue or recovery activities after the earthquake; the injury would not have occurred had there not been an earthquake.
3. Direct – The force of energy that created the circumstantial environment resulting in injury was a direct consequence of the earthquake and occurred at the time of the mainshock or immediately thereafter (i.e., hit by falling object at time of mainshock); the injury would not have occurred had there not been an earthquake.

## B. Structural Relatedness

1. Structural – Injury is caused by falling or damaged building structural elements i.e., beams, structural walls, roof, partial or total building collapse, etc. A structural element is a part of the building that is load-bearing or carries load in addition to its own weight, as opposed to partitions, plaster, etc., which only carry their own weight.
2. Non-Structural – injury is caused by falling or damaged non-structural building components (permanently attached non-load bearing components), i.e., ceilings, permanent light fixtures, windows, partitions (non-load bearing walls) etc.
3. Contents – injury is caused by moving or damaged building contents, i.e., items within the structure that are not permanently installed or attached, such as appliances, bookshelves, furniture, airborne objects, etc.
4. Infrastructure – injury is caused by damage to non-building infrastructure, i.e., highway bridge or overpass damage, electric power lines, natural gas explosion or fire, etc.
5. None – injury is not related to building or infrastructure damage.

**C. Secondary Hazards** – Earthquakes can result in secondary hazards which can cause injury in addition to or in place of the earthquake. Some of the typical secondary hazards which are possible causes of injury are listed.

1. Landslide – Ground shaking is often associated with large movements of top soil and rocks. The majority of deaths associated with the 1970 earthquake in Peru was as a result of landslides. Like with most factors, landslides can be a direct cause of injury or an indirect cause. An example of an indirect relationship between landslides and injury could be a motor vehicle accident that results from a road suddenly blocked by a landslide. A direct relationship would be injury from contact with dirt or rocks moving during a landslide.
  1. Direct contact with landslide
  2. Injury as an indirect result of landslide
  3. Not related
2. Tsunami – An earthquake generated coastal wave. These can occur local to the epicenter or at great distances. For example, the Alaska earthquake resulted in a tsunami which killed a number of people in Northern California. The risk for injury includes risk associated with trying to evacuate/escape from the path of a tsunami and injury as a direct result of contact with the water.

1. Direct contact with water
  2. Injury resulting from evacuation/escaping tsunami
  3. Not related
3. EQ-related Fire – Conflagration following earthquakes results from broken lines or spills of combustible materials, including natural gas lines. Fire following earthquake can be a significant problem in urban areas, especially those where a large proportion of the building stock is wood-frame. A major contribution to the potential for fire following earthquakes is the effect of ground displacement on underground water pipes. Breaks in those pipes can result in a loss of water and water pressure, restricting the ability of fire departments to fight fires. While there has been little study of the impacts of post-earthquake conflagration, approximately 12% of fatalities in the Kobe earthquake were burns.
- 1 Injury caused by EQ-related fire
  - 2 Not related to fire

(Reference: Scawthorne, C. (1987) Fire Following Earthquake: Estimates of the Conflagration Risk to Insured Property in Greater Los Angeles and San Francisco)

4. Hazardous Materials – Hazardous materials spills can contribute to injury in a variety of fashions including increasing the risk for EQ-related fire, decreasing an individual's ability to react and take protective action, and direct exposure to the spill or material. Three levels of hazardous materials relatedness should be taken into consideration
1. Injury a direct result of contact with a hazardous material
  2. Injury as a result of the inability to take protective action because of contact with a hazardous material
  3. Injury not related to hazardous material release.
5. None

**D. Injury Mechanism** – The injury mechanism refers to the type of energy transferred to the host. The mechanisms are mutually exclusive, but often more than one mechanism may contribute to an injury. For example, if someone in a motor vehicle crash is burned, both kinetic and thermal energy are transferred. Usually, the initiating mechanism is the one classified, but the use of two fields to describe mechanism is common. Mechanism categories listed below follow the broad ICD-9 E-codes, with certain injuries pertinent to disasters included. We recommend that whenever possible four-digit ICD-9 or ICD-10 E-codes be applied to data.

Note that the ICD coding system has codes for cataclysmic storms and floods (E908) and for cataclysmic earth surface movements and eruptions (E909). While these codes are very useful to identify disaster-related injuries within a population of injuries, they do not describe the mechanism of injury within the disaster. We recommend that for disaster coding, two codes be applied. The first should identify the injury as one that was caused by the earthquake so that researchers examining existing data (such as Emergency Department and Hospital Admission records) can identify those injuries which were related to the earthquake. The second code should describe the specific mechanism of injury that was caused by the earthquake.

1. Railway accidents (E800- 807)
2. Motor vehicle accidents (traffic or non-traffic) (E810 – 825)
  - a. Occupant (.0, .1,.2,.3,.4,)
  - b. pedal cyclist (.6)
  - c. pedestrian (.7)
  - d. other (.8,.9)
3. Other transport accidents (E826-848)
4. Poisoning
  - a. by drugs, medicinal substances, and biologicals (E850 – 858)
  - b. by other solid and liquid substances, gases and vapors (E860-869)
5. Falls
  - a. from one level to another
    1. on or from stairs or steps (E880)
    2. on or from ladders or scaffolding (E881)
    3. from or out of building (E882)
    4. into hole or other opening in surface (E883)
    5. into water (E883)
    6. from furniture, such as a chair or bed (E884.2)
    7. other (E884)
  - b. fall on same level
    1. from slipping, tripping, or stumbling (E885)
    2. from accidental collision, pushing or shoving, by person or object (E886)
    3. other (E888)
6. Fire and Flames
  - a. in private dwelling (E890)
  - b. in other and unspecified building or structure (E891)
  - c. not in building or structure (E892)
  - d. ignition of clothing (E893)
  - e. other (E899)
7. Natural and environmental factors
  - a. excessive heat (E900)
  - b. excessive cold (E901)
  - c. hunger, thirst, exposure, and neglect (E904)
  - d. injury caused by animals or insects (E905-906)
  - e. other

8. Submersion (E910)
9. Suffocation
  - a. Mechanical (E913)
  - b. Obstructive (E911-912)
10. Struck by falling object – unintentional (E916)
11. Struck by persons – unintentional (E917)
12. Caught in or between objects – unintentional (E918)
13. Injury caused by machinery (E919)
14. Injury caused by cutting and piercing objects – unintentional (E920)
15. Injury caused by firearm, corrosive or explosive material - unintentional (E921- 924)
16. Injury caused by electric current (E925)
17. Suicide or self-inflicted injury (E950 – 959)
18. Homicide or injury purposely inflicted by other persons (E960-969)

Reference: International Classification of diseases, 9<sup>th</sup> Revision, Clinical Modification. Commission on Professional and Hospital Activities, Ann Arbor, MI, 48105.

Category: **Severity**

**A. Severity** – Severity of injury is defined as the level of threat to an individual’s life caused by the pattern of injuries sustained. Note that two units of analysis can be applied: the independent injuries and overall severity of all injuries to the individual. We recommend a coding structure that codes each individual type of injury, and then combines this information for a single overall severity. The only injury coding system that meets these guidelines is the Abbreviated Injury Scale. The unit of analysis is the individual and not the individual injuries. Note that this scale was designed specifically to predict threat to life from motor vehicle injuries. Research to determine the exact cut-off points on the Injury Severity Scale as they related to disaster-related injuries is needed.

Since a complete list of injuries is only available during medical or coroner examination, many situations in which injuries are evaluated may not yield such a list. For these conditions, we recommend the following broad categories, which apply to the overall level of injury to the individual.

1. **Lethal**: The injuries are non-survivable even with immediate medical attention. Severe crushing injury and decapitation are examples. (AIS: At least one level 6, non-survivable injury (ISS = 76))
2. **Severe**: The injuries pose a serious threat to the individuals’ life and require immediate medical attention. (AIS: At least one level 5, severe injury, or at least three regions with level 3 or 4 injuries (ISS 25 - 75))
3. **Moderate**: Injuries are survivable, but may require medical attention. Without medical attention the injuries could become severe. (AIS: No more than two injuries with severity above 3 or 4 (ISS = 13 – 24))

4. Mild: Injuries pose no serious threat to life if complications are prevented (such as infection of wounds). (AIS: No injuries above level 2 (0 – 12))

Reference: Abbreviated Injury Severity Scale. Association for the Advancement of Automotive Medicine. Des Plaines, IL. 1990.

Category: Treatment

**A. Level** – The level of treatment required for injuries is necessary to plan for resources in the event of a disaster. Generally treatment refers to the level of training and specialization that is needed to treat the most serious of injuries that a person has. However the supplies available to the different type of providers is also taken into consideration, (i.e., while individual practitioners are capable of suturing wounds, it is unlikely that most physician’s offices would have sufficient suture kits on hand to handle this level of care in an emergency situation). This category is intimately tied to severity and like it the unit of analysis is the individual, not the injury.

There may actually be two treatment variables. One would be the level of treatment needed based on the severity of the injury. The other variable would be the level of treatment actually provided. In an ideal situation the two would be identical, however, reality is often not the ideal situation. Patients may receive a higher level of treatment than needed or vice versa.

1. First Aid – Treatment that can be provided by most trained lay individuals and first responders. This would include cleaning and bandaging minor wounds, icing strains and bruises, etc.
2. Urgent – This level of treatment is that which can be provided by most skilled para-professionals (paramedics and EMT-II) and midlevel practitioners (physician’s assistants, nurse practitioners) without supervision. This would include the provision of basic life support (generally CPR), administration of standing order drugs (i.e., starting of IV fluids), suturing of simple lacerations, setting and casting simple fractures not needing reduction or surgery. This level of care can often be provided in a field setting or in local clinics or doctor’s offices.
3. Emergency – This level of treatment is that which needs access to advanced life support, surgery, anesthesia or other services which are generally only available in a hospital with a basic emergency department.
4. Trauma – This is the highest level of treatment and presupposes that specialized care is required. This level of treatment which is available in trauma hospitals and specialized care hospitals (i.e., burn hospitals, orthopedic hospitals or children’s hospitals) which have quick access to sub-specialists required for treating cases complicated by age, type of injury or multiple traumas.

5. Disposal Only –This is for fatal cases which need storage and transport to the coroner’s office.

**B. Immediacy** – Immediacy refers to the speed with which advanced care is needed by the victim. It is based on the triage system used by emergency medical personnel (*START Simple triage and rapid treatment (or transport)*) in multiple casualty incidents. It is somewhat situational in nature in that the highest priorities may differ dependent upon the available resources, although it is systematic. There are four levels green or minor; yellow or delayed care; red or immediate care; and black or deceased. (Baxter Larmin, MICP: BICEPP News, Spring 1990: LAC-DS Paramedic Training Institute lecture outline, Eddi Cohen, RN MICN, CCRN: Wills, Goold, & Watson: MedEMT: A Learning System for Pre-hospital Care, 2000.)

1. Green – this category is for all of those injuries that could wait for a time without treatment and recover fully. Generally these individuals are ambulatory and can access the needed care on their own. The injuries included here include minor to moderate lacerations, minor to moderate fractures, small foreign bodies.
2. Yellow – Secondary priority: This category requires care however, life is not threatened by the injury. These will need transport to a hospital but transport can be delayed for a short period of time without fear of threat to life. These injuries include burns without airway complications, major or multiple bone or joint fractures, back problems (with or without spinal cord complications), moderate hemorrhage (controllable).
3. Red – First priority: This category represents those injuries that are a serious threat to life and require immediate transport to the hospital for care. Generally it is expected that these will progress to life-threatening within an hour. These injuries include those with airway, breathing and shock problems, major burns, uncontrolled or severe bleeding, or decreased mental status.
4. Black – dead: This category represents those who are dead or generally will die regardless of the care that is provided. Depending on the circumstances these include those who have no vital signs, massive blood loss, major head or chest injuries, total body burns with inhalation injury, decapitation.

Category: **Diagnoses**

A textual description of the injury is always optimal, but this type of description is difficult to categorize and analyze. If it is possible to obtain coded injury data (by injury severity), that form of data will be most useful for analytic purposes. If data is not coded by injury severity, it is necessary to use the textual description in order to classify severity. Several classification schemes exist for categorizing diagnoses and injury severity, and these are listed below.

**A. Abbreviated Injury Severity (AIS) scores** (for individual injuries – based on AIS Dictionary, 1995)

**B. Injury Severity Scores (ISS)** (for multiple injuries – based on AIS Dictionary, 1995)

**C. International Classification of Diseases, Ninth Revision (ICD-9 Codes 800-995.99, excluding late effects and surgical complications)**

1. Fractures (800-829)
2. Dislocations (830-839)
3. Sprains & Strains (840-848)
4. Intracranial Injury (850-854)
5. Internal Injury of Chest, Abdomen, and Pelvis (860-869)
6. Open Wound (870-897)
7. Injury to Blood Vessels (900-904)
8. Superficial Injury (910-919)
9. Contusion with Intact Skin Surface (920-924)
10. Effects of Foreign Body Entering through Orifice (930-939)
11. Burns (940-949)
12. Injury to Nerves and Spinal Cord (950-957)
13. Traumatic Complications and Unspecified Injuries (958-959)
14. Poisoning (960-979)
15. Toxic Effects of Chiefly Nonmedical Substances (980-989)
16. Other and Unspecified Effects of External Causes (990-995)

**D. International Classification of Diseases, Tenth Revision** (when this becomes standard around the world).

**E. Diagnostic Related Groupings (DRGs)** (reflecting only procedures performed, not diagnoses)

Note: Although some facilities use ICD-V-codes (V15.5, V15.6, V61.21, V71.3-V71.6) to observe patients after traumatic events, these should **NOT** be used to indicate incident or newly-diagnosed injuries. If a diagnosis is made after being observed following a trauma, that diagnosis should be applied rather than the V-code.

Category: **Location of Individual When Injury Occurred** (note: not mutually exclusive, e.g., can be in vehicle and on infrastructure)

**A. Location**

1. In Building or Structure – injury occurs inside a building.

- a. Floor - floor or story on which injury occurred (e.g., basement, 1<sup>st</sup> floor, 2<sup>nd</sup> floor, 3<sup>rd</sup> floor, roof, etc.)
  - b. Interior Location – room or location in which injury occurred
    1. Elevator
    2. Stairwell
    3. Attic
    4. Basement
    5. Kitchen
    6. Bedroom (including hotel/motel and dormitory bedrooms)
    7. Bathroom
    8. Office
    9. Living Room
    10. Family Room/Game Room
    11. Dining Room
    12. Den/Library
    13. Utility Room/Laundry Room
    14. Closet
    15. Garage - single family residential (i.e., one-, two- or three-car garage)
    16. Garage – multi-family residential
    17. Garage – Large commercial parking structure
    18. Store interior (e.g., retail, grocery store, clothing store, etc.)
    19. Warehouse interior
    20. Theatre interior
    21. Restaurant/Bar interior
    22. Waiting Area (restaurant/bar)
    23. Medical Office/Hospital Treatment room (i.e., no bed)
    24. Hospital Room (i.e., with bed)
    25. Waiting Area (doctor/dentist office)
    26. Other commercial interior
    27. Manufacturing/Industrial facility interior
    28. Laboratory
    29. Church interior
    30. School Classroom
    31. School Auditorium
    32. Other (Specify \_\_\_\_\_)
2. In Vehicle – includes injuries occurring to occupants of cars, trucks, motorcycles, airplanes, trains, etc.
    - a. Car
    - b. Pickup truck
    - c. Sport utility vehicle (SUV)
    - d. Passenger van/Minivan
    - e. Bus
    - f. Large truck (e.g., commercial truck or 18-wheeler)
    - g. Motorcycle/scooter/moped
    - h. Bicycle
    - i. Airplane – large commercial

- j. Airplane – small, light
  - k. Heavy Rail
  - l. Light Rail (e.g. commuter rail)
  - m. Boat/Ferry
  - n. Other (Specify \_\_\_\_\_)
3. On Infrastructure – injury occurs on road/highway, highway bridge or overpass, within utility facilities such as a refinery or water treatment plant but outside buildings, etc.
- a. On highway/freeway
  - b. On surface street
  - c. On bridge/overpass
  - d. In a tunnel
  - e. On a Dam
  - f. At a Port/Harbor/Ferry terminal, but outside buildings
  - g. Within oil refinery facility, but outside buildings
  - h. Within water or wastewater treatment plant, but outside buildings
  - i. Within an electric power plant, but outside buildings
  - j. Within an electric substation, but outside buildings
  - k. Within a tank farm (oil/petroleum), but outside buildings
  - l. Other (Specify \_\_\_\_\_)
4. Out of Doors – injury occurs outside, away from vehicles, buildings and infrastructure.

## **B. Geographic Location**

- 1. Street Address
  - a. First building number
  - b. Last building number (if provided in a range)
  - c. Street Direction
  - d. Street Name
  - e. Street Suffix
  - f. Apartment, Unit or Building Number
- 2. Zipcode (Zip + 4, 9 digit code) or other postal code
- 3. City
- 4. County
- 5. State
- 6. Country
- 7. Assessor's Parcel Number
- 8. Census tract
- 9. Census Block Group
- 10. Latitude
- 11. Longitude
- 12. Lat/Long Datum (e.g., NAD27)
- 13. Other Coordinates – X Value
- 14. Other Coordinates – Y Value

15. Other Coordinates – Projection and Datum (e.g., UTM Zone 9, California State Plane Zone 7, etc.)

Category: **Activity** (First things done when EQ hits, primarily from survey data)

**A. Starting Position**

1. Lying down
2. Sitting
3. Standing
4. Walking/Running

**B. Activity**

1. No movement
  - a. attempted to move and couldn't
  - b. froze
  - c. did not attempt to move
2. Moved
  - a. How?
    1. walked
    2. ran
    3. crawled
  - b. Where?
    1. Under something (take cover)  
Specify)\_\_\_\_\_
    2. Outside
    3. Toward something (specify)\_\_\_\_\_
    4. Toward someone (specify)\_\_\_\_\_
    5. Away from something (specify)\_\_\_\_\_
  - b. How Far to destination?
  - c. How far until injured?

Category: **Earthquake Source Characteristics**

- A. Earthquake Name (e.g., Northridge Earthquake)
- B. Earthquake Event Number or ID (e.g., CUSPID of event)
- C. Earthquake Magnitude (decimal X.X) < **May have more than one** >
- D. Earthquake Magnitude Scale (e.g., M, M<sub>w</sub>, M<sub>I</sub>, M<sub>s</sub>) < **May have more than one** >
- E. Date of Earthquake (MM/DD/YYYY)
- F. Time of Earthquake (HH:MM:SS), including time zone reference (e.g., PST, GMT)
- G. Day of the Week of Earthquake (e.g., Saturday)
- H. Earthquake Location:
  - 1) Epicenter Latitude
  - 2) Epicenter Longitude

- 3) Focal Depth
- 4) Descriptive location (e.g., 8 mi SSW of Century City)
- I. Rupture length (km)
- J. Rupture Area (km<sup>2</sup>)
- K. Presence of surface rupture? (Y/N)
- L. Deepest point of rupture/bottom of rupture plane (km)
- M. Shallowest point of rupture/top of rupture plane (km, 0 if surface rupture)
- N. Fault Source:
  - 1) Fault Name
  - 2) Fault Type/Geometry (e.g., left-lateral strike-slip, blind thrust, reverse thrust, etc.)
  - 3) Fault strike direction (direction of surface trace from north, e.g., west-northwest)
  - 4) Fault dip in degrees (angle between direction of steepest slope and horizontal)
  - 5) Fault dip direction (e.g., south-southwest)

Category: **Local Site Hazard Characteristics**

Hazard characteristics at the site where the injury occurred.

- A. Earthquake Ground Motion: mapped data typically available from the U.S. Geological Survey (USGS) or other similar organization. In some cases, the information is available in near real-time on the internet (see: [www.TRINET.ORG](http://www.TRINET.ORG) for information on real-time ShakeMaps in Southern California).
  1. Earthquake Intensity (Modified Mercalli Intensity, MMI)
  2. Peak Ground Acceleration (pga, measured in units of g)
  3. Peak ground velocity (pgv, measured in cm/sec)
  4. Spectral acceleration at 0.3 second period (measured in units of g)
  5. Spectral acceleration at 1.0 second period (measured in units of g)
  6. Spectral acceleration at 3.0 second period (measured in units of g)
- B. Local Site Conditions:
  1. Surgical geology – local soil conditions tend to amplify or de-amplify earthquake ground motion. This information is typically available from the State Geologist (e.g., California Division of Mines and Geology) or the USGS. May be categorized by a number of classification schemes (e.g., Eveded, 1988; Orchard, 1994; Park and Erick, 1998). CDMG is in the process of finalizing a statewide geology map for California which utilizes the NEHRP standard six-class (A, B, C, D, E, F) categorization scheme (NEHRP, 1997):
    - a. Hard rock
    - b. Rock
    - c. Very dense soil and soft rock
    - d. Stiff soils
    - e. Soft soils
    - f. Soils requiring site-specific evaluations, including:

1. Soils vulnerable to potential failure or collapse under seismic loading: e.g. liquefiable soils, quick and highly sensitive clays, collapsible weakly cemented soils.
2. Peat's and/or highly organic clays (10 ft (3 m) or thicker layer)
3. Very high plasticity clays: (25 ft (8 m) or thicker layer with plasticity index > 75)
4. Very thick soft/medium stiff clays:

It should be noted that combination classes (e.g., CD or BC) are also allowed.

2. Liquefaction: Liquefaction, the loss of strength of a saturated sandy soil during earthquake shaking, has been observed in almost every recent major earthquake. In the Los Angeles area, liquefaction was observed near the locations of both the 1933 Long Beach and the 1971 San Fernando earthquakes. As a result of the 1989 Loma Pieta earthquake, liquefaction-induced damages were reported in the Marina District, the South of Market area, parts of the East Bay, and in the Santa Cruz area. Although damage from liquefaction was limited in the 1994 Northridge earthquake, extensive liquefaction was documented in the 1995 Kobe earthquake.

- a. Several factors contribute to a soils liquefaction susceptibility; age and type of sediment, looseness of sediment, and depth to groundwater. These factors may be combined to develop maps of **liquefaction susceptibility zones**.

1. High to Very high Liquefaction susceptibility - Quaternary alluvium, mostly of late Holocene age, where groundwater table is generally less than 5 to 10 meters below the surface. These deposits are non-indurate, loose, poorly consolidated, sandy, non-marine sediments such as modern stream channel deposits, lake deposits, alluvial fan deposits, dune sand and basin fill and modern floodplain alluvium
2. Moderate - Generally the same as deposits in zones of High to Very High Susceptibility but slightly denser, more consolidated deposits, some with slightly greater age (early Holocene and late Pleistocene). Some of these deposits are somewhat elevated above the modern floodplains. The water table may be somewhat deeper, but still is generally above 5 to 10 meters depth with only localized areas below 5 to 10 meters.
3. Low to Very Low - Rock and alluvial deposits of Quaternary age similar to those deposits in zones of High to Very High Susceptibility but generally denser, more cohesive,

commonly slightly indurated. Water table is generally greater than 5 to 10 meters deep. The rock and alluvial deposits may contain narrow modern stream channels which are too small to show when mapped on a regional basis, but are nevertheless susceptible to liquefaction when saturated.

4. Non-Susceptible -All non-Quaternary rock units.

- a. Occurrence of Liquefaction in earthquake under study (Y/N).
- b. Occurrence of Liquefaction in previous earthquake (Y/N)
- c. Specify the previous earthquake in which liquefaction occurred.

3. Landslide:

- a. Landslide susceptibility depends on the site geology, slope angle and groundwater conditions, as shown in the following table describing ten classes of landslide susceptibility, taken from the HAZUS99 Technical Manual (NIBS/FEMA, 1999).
- b. Occurrence of landslide in earthquake under study (Y/N).
- c. Occurrence of landslide in previous earthquake (Y/N)
- d. Specify the previous earthquake in which landslide occurred.

**Landslide Susceptibility of Geologic Groups**

Geologic Group		Slope Angle, degrees					
		0-10	10-15	15-20	20-30	30-40	>40
<b>(a) DRY (groundwater below level of sliding)</b>							
<b>A</b>	<b>Strongly Cemented Rocks (crystalline rocks and well-cemented sandstone, <math>c' = 300</math> psf, <math>f' = 35^\circ</math>)</b>	None	None	I	II	IV	VI
<b>B</b>	<b>Weakly Cemented Rocks and Soils (sandy soils and poorly cemented sandstone, <math>c' = 0</math>, <math>f' = 35^\circ</math>)</b>	None	III	IV	V	VI	VII
<b>C</b>	<b>Argillaceous Rocks (shales, clayey soil, existing landslides, poorly compacted fills, <math>c' = 0</math> <math>f' = 20^\circ</math>)</b>	V	VI	VII	IX	IX	IX
<b>(b) WET (groundwater level at ground surface)</b>							
<b>A</b>	<b>Strongly Cemented Rocks (crystalline rocks and well-cemented sandstone, <math>c' = 300</math> psf, <math>f' = 35^\circ</math>)</b>	None	III	VI	VII	VIII	VIII
<b>B</b>	<b>Weakly Cemented Rocks and Soils (sandy soils and poorly cemented sandstone, <math>c' = 0</math>, <math>f' = 35^\circ</math>)</b>	V	VIII	IX	IX	IX	X
<b>C</b>	<b>Argillaceous Rocks (shales, clayey soil, existing landslides, poorly compacted fills, <math>c' = 0</math> <math>f' = 20^\circ</math>)</b>	VII	IX	X	X	X	X

Category: **Building Description**

**A. Structural System** – load-resisting structural system (ref: HAZUS, modified from FEMA 178, 1992)

1. Steel frame (Fire Class A):
  - a. Steel Moment Frame
  - b. Steel Braced Frame
  - c. Steel Light Frame
  - d. Steel Frame with Cast-in-Place Concrete Shear Walls
  - e. Steel Frame with Unreinforced Masonry Infill Walls
2. Concrete frame (Fire Class B):
  - a. Concrete Moment Frame
  - b. Concrete Shear Walls
  - c. Concrete Frame with Unreinforced Masonry Infill Walls
3. Precast Concrete and Masonry (Fire Class C):
  - a. Precast Concrete Tilt-Up Walls
  - b. Precast Concrete Frames with Concrete Shear Walls
  - c. Reinforced Masonry Bearing Walls with Wood or Metal Deck Diaphragms
  - d. Reinforced Masonry Bearing Walls with Precast Concrete Diaphragms
  - e. Unreinforced Masonry Bearing Walls
4. Wood frame (Fire Class D):
  - a. Wood, Light Frame ( $\leq 5,000$  sq. ft.)
    - I. slab on grade construction
    - II. cripple walls (unbraced) on a perimeter wall foundation
    - III. cripple walls (braced) on a perimeter wall foundation
    - IV. with basement
  - b. Wood, Commercial and Industrial ( $> 5,000$  sq. ft.)
    - I. With tuck-under parking
    - II. Without tuck-under parking
5. Other:
  - a. Manufactured Housing

**B. Building Height**

1. Number of stories – actual number of stories of structure
2. Height Category (ref: ATC-13, HAZUS, etc.) –
  - a. Low-rise – one to three stories in height
  - b. mid-rise – four to seven stories in height
  - c. high-rise – eight or more stories in height
  - d.

**C. Building Size** – expressed in square feet or thousand square feet.

**D. Building Year Built** – four digit year structure was built.

**E. Building Seismic Design Quality** – seismic design criteria for structure, related to structural system and structure age (ref: HAZUS)

1. Inferior – designed and built prior to modern building codes (e.g., CA URM built prior to 1933, pre-1971 tilt-ups, etc.)
2. Standard – designed to modern seismic design standards (e.g., in conformance with 1976 UBC, 1985 NEHRP Provisions, or later editions of these model Codes)
3. Superior – designed to above average seismic standards, e.g. modern CA hospitals.

#### **F. Debris Generation Potential**

1. Light – Building damage has the potential to create light debris which can be broken into smaller pieces by handheld tools without heavy equipment– includes buildings constructed of wood frame, tilt-ups and URM (ref: ATC 21-2)
2. Heavy – Building damage has the potential to create heavy debris requiring mechanical equipment to break up and move – includes buildings constructed of CIP concrete, precast concrete, and RM (potentially subject to pancake failures), and steel structures (potentially subject to cladding failures). (ref: ATC 21-2)

#### **G. Occupancy Type** – building use category (ref: HAZUS)

1. Residential
  - a. Single Family Dwelling
  - b. Mobile Home
  - c. Multi Family Dwelling (apartment/condo)
  - d. Temporary Lodging (hotel/motel)
  - e. Institutional Dormitory (dorms/jails)
  - f. Nursing Home
2. Commercial:
  - a. Retail Trade (stores)
  - b. Wholesale Trade (warehouses)
  - c. Personal and Repair Services
  - d. Professional/Technical Services (offices)
  - e. Banks
  - f. Hospital
  - g. Medical Office/Clinic
  - h. Entertainment & Recreation (restaurants/bars)
  - i. Theaters
  - j. Parking
3. Industrial:
  - a. Heavy
  - b. Light
  - c. Food/Drugs/Chemicals
  - d. Metals/Minerals Processing

- e. High Technology
- f. Construction
- 4. Agriculture
  - a. Agriculture
- 5. Religion/Non/Profit
  - a. Church/Non-Profit
- 6. Government
  - a. General Services (offices)
  - b. Emergency Response (police/fire)
- 7. Education
  - a. Grade Schools
  - b. Colleges/Universities

**H. Estimated Occupancy Load** – estimated number of building occupants

1. Daytime occupants – number of building occupants at 2 pm
2. Nighttime occupants – number of building occupants at 2 am
3. Occupants during commute – number of occupants at 5 pm

Category: **Building Damage**

**A. Building Safety Inspection Status** – status of post-earthquake building safety evaluation

1. Not Inspected
2. Inspected
  - a. Date of most recent inspection
  - b. Total number of inspections

**B. Building Safety Tag** – Result of most recent post-earthquake building safety evaluation, usually conducted by building inspectors or structural engineers in the immediate post-earthquake period using standard forms (ref: ATC-20).

1. **Green tag** - indicates that the building has been inspected, and that no apparent hazards have been found.
2. **Yellow tag** - indicates that the structure's safety is questionable. The tag reads "Limited Entry - Off Limits to Unauthorized Personnel", with the following warning: "Warning: This structure has been damaged and its safety is questionable. Enter only at own risk. Aftershocks or other events may result in death or injury."
3. **Red tag** - indicates that the structure is unsafe, and must be repaired or removed. The tag itself reads "Unsafe - Do Not Enter or Occupy". In addition, ATC-20 provides the following warning: "Warning: This structure has been seriously damaged and is unsafe. Do not enter. Entry may result in death or injury".

**C. Dollar Damage** – damage to structure in terms of actual or estimated repair costs. Data sources include field inspector's estimates, building permit data.

**D. Damage percent** – damage to structure expressed as percent of full replacement value (note: full replacement cost is the cost to build a new structure of same size

and use, based on localized industry standard cost models. Does not consider depreciated or market value of structure). Data sources include field inspector's estimate (ATC-20 form) or actual repair cost (permit data) relative to replacement cost.

**E. Damage State** – Building damage defined in ranges of percent damage (see C above). In practice, most building with significant damage, usually > 50%, are considered a total loss. (ref: ATC-13)

1. None: 0% damage (central damage factor = 0)
2. Slight: 0 - 1% damage (CDF = 0.5)
3. Light: 1 – 10% damage (CDF = 5)
4. Moderate: 10 – 30% damage (CDF = 20)
5. Heavy: 30 – 60% damage (CDF = 45)
6. Major: 60 – 100% damage (CDF = 80)
7. Destroyed: 100% damage (CDF = 100)

**F. Building Collapse**

1. None – although the building may experience damage, no part of the building structure collapses.
2. Partial – portions of the structure collapse, but complete collapse does not occur, e.g., collapse of first floor in Northridge Meadows apartments in 1994 Northridge earthquake.
3. Total – total collapse of structure, e.g., pancake collapse of precast concrete structures.

Category: **Costs**

**A. Direct** - medical care costs (medical/EMS/USAR)

1. Actual cost – reimbursement level (data hard to get)
2. Charges – what patient is charged, depends on insurance (hospital billing rate data, data available)
3. Estimates

**B. Indirect**

1. Societal loss/productivity value
2. Total life value

## APPENDIX

### Occupation Codes:

- b. Managerial and Administrative Occupations
  - i. Staff and Administrative Specialty Managerial Occupations
    - 1. Financial Managers (13002)
    - 2. Personnel, Training, and Labor Relations Managers (13005)
    - 3. Purchasing Managers (13008)
    - 4. Marketing, Advertising, and Public Relations Managers (13011)
    - 5. Administrative Services Managers (13014)
    - 6. Engineering, Mathematical, and Natural Sciences Managers (13017)
  - ii. Line and Middle Management Industry Specific Managerial Occupations
    - 1. Postmasters and Mail Superintendents (15002)
    - 2. Education Administrators (15005)
    - 3. Medicine and Health Services Managers (15008)
    - 4. Property and Real Estate Managers and Administrators (15011)
    - 5. Industrial Production Managers (15014)
    - 6. Construction Managers (15017)
    - 7. Mining, Quarrying, and Oil and Gas Well Drilling Managers (15021)
    - 8. Communications, Transportation, and Utilities Operations Managers (15023)
    - 9. Food Service and Lodging Managers (15026)
    - 10. Nursery and Greenhouse Managers (15031)
    - 11. Lawn Service Managers (15032)
  - iii. Other Managerial and Administrative Occupations
    - 1. Public Administration Chief Executives, Legislators, and General Administrators (19002)
    - 2. General Managers and Top Executives (19005)
    - 3. All Other Managers and Administrators (19999)
- c. Professional, Paraprofessional, and Technical Occupations
  - i. Management Support Occupations
    - 1. Insurance Underwriters (21102)
    - 2. Credit Analysts (21105)
    - 3. Loan Officers and Counselors (21108)
    - 4. Tax Preparers (21111)
    - 5. Accountants and Auditors (21114)
    - 6. Budget Analysts (21117)
    - 7. All Other Financial Specialists (21199)
    - 8. Wholesale and Retail Buyers, Except Farm Products (21302)
    - 9. Purchasing Agents and Buyers, Farm Products (21305)

10. Purchasing Agents, Except Wholesale, Retail, and Farm Products (21308)
11. Claims Takers, Unemployment Benefits (21502)
12. Special Agents, Insurance (21505)
13. Employment Interviewers, Private or Public Employment Service (21508)
14. Personnel, Training, and Labor Relations Specialists (21511)
15. Cost Estimators (21902)
16. Management Analysts (21905)
17. Construction and Building Inspectors (21908)
18. Compliance Officers and Enforcement Inspectors, Except Construction (21911)
19. Tax Examiners, Collectors, and Revenue Agents (21914)
20. Assessors (21917)
21. Claims Examiners, Property and Casualty Insurance (21921)
22. All Other Management Support Workers (21999)
- ii. Engineers and Related Occupations
  1. Aeronautical and Astronautical Engineers (22102)
  2. Metallurgists and Metallurgical, Ceramic, and Materials Engineers (22105)
  3. Mining Engineers, Including Mine Safety (22108)
  4. Petroleum Engineers (22111)
  5. Chemical Engineers (22114)
  6. Nuclear Engineers (22117)
  7. Civil Engineers, Including Traffic (22121)
  8. Agricultural Engineers (22123)
  9. Electrical and Electronic Engineers (22126)
  10. Computer Engineers (22127)
  11. Industrial Engineers, Except Safety (22128)
  12. Safety Engineers, Except Mining (22132)
  13. Mechanical Engineers (22135)
  14. Marine Engineers (22138)
  15. All Other Engineers (22199)
  16. Architects, Except Landscape and Marine (22302)
  17. Marine Architects (22305)
  18. Landscape Architects (22308)
  19. Surveyors and Mapping Scientists (22311)
  20. Civil Engineering Technicians and Technologists (22502)
  21. Electrical and Electronic Engineering Technicians and Technologists (22505)
  22. Industrial Engineering Technicians and Technologists (22508)
  23. Mechanical Engineering Technicians and Technologists (22511)
  24. Drafters (22514)

25. Estimators and Drafters, Utilities (22517)
26. Surveying and Mapping Technicians (22521)
27. All Other Engineering and Related Technicians and Technologists (22599)
- iii. Natural Scientists and Related Occupations
  1. Physicists and Astronomers (24102)
  2. Chemists, Except Biochemists (24105)
  3. Atmospheric and Space Scientists (24108)
  4. Geologists, Geophysicists, and Oceanographers (24111)
  5. All Other Physical Scientists (24199)
  6. Foresters and Conservation Scientists (24302)
  7. Agricultural and Food Scientists (24305)
  8. Biological Scientists (24308)
  9. Medical Scientists (24311)
  10. All Other Life Scientists (24399)
  11. Biological, Agricultural, and Food Technicians and Technologists, Except Health (24502)
  12. Chemical Technicians and Technologists, Except Health (24505)
  13. Nuclear Technicians and Technologists (24508)
  14. Petroleum Technicians and Technologists (24511)
  15. All Other Physical and Life Science Technicians and Technologists (24599)
- iv. Computer, Mathematical, Operations Research, and Related Occupations
  1. Systems Analysts, Electronic Data Processing (25102)
  2. Data Base Administrators (25103)
  3. Computer Support Specialists (25104)
  4. Computer Programmers (25105)
  5. Computer Programmer Aides (25108)
  6. Programmers, Numerical Tool and Process Control (25111)
  7. All Other Computer Scientists (25199)
  8. Operations and Systems Researchers and Analysts, Except Computer (25302)
  9. Mathematical Scientists (25310)
  10. Statisticians (25312)
  11. Actuaries (25313)
  12. Financial Analysts, Statistical (25315)
  13. All Other Mathematical Scientists (25319)
  14. Mathematical Technicians (25323)
- v. Social Scientists and Other Social, Recreational, and Religious Occupations
  1. Economists, Including Market Research Analysts (27102)
  2. Urban and Regional Planners (27105)
  3. Psychologists (27108)

4. All Other Social Scientists (27199)
5. Social Workers, Medical and Psychiatric (27302)
6. Social Workers, Except Medical and Psychiatric (27305)
7. Residential Counselors (27307)
8. Human Services Workers (27308)
9. Recreation Workers (27311)
10. Clergy (27502)
11. Directors, Religious Activities and Education (27505)
12. All Other Religious Workers (27599)
- vi. Law and Related Occupations
  1. Judges and Magistrates (28102)
  2. Adjudicators, Hearings Officers, and Judicial Reviewers (28105)
  3. Lawyers (28108)
  4. Law Clerks (28302)
  5. Paralegal Personnel (28305)
  6. Title Searchers (28308)
  7. Title Examiners and Abstractors (28311)
  8. All Other Legal Assistants and Technicians, Except Clerical (28399)
- vii. Teachers, Educators, Librarians, and Related Occupations
  1. Lecturers (31111)
  2. Postsecondary Instructors (including Graduate Assistants) (31114-31299)
  3. Teachers, Preschool, Kindergarten, Elementary School (31303 – 31305)
  4. Teachers, Secondary School (31308)
  5. Teachers, Special Education (31311)
  6. Teachers & Instructors, Vocational & Nonvocational Education & Training (31314, 31317)
  7. Coaches, Sports & Physical Training Instructors (31321)
  8. Farm and Home Management Advisors (31323)
  9. All Other Teachers (31399)
  10. Librarians (31502, 31505)
  11. Audio-Visual Specialists (31508)
  12. Curators, Archivists, Museum Technicians, and Conservators (31511)
  13. Vocational & Educational Counselors, Instructional Coordinators, Teachers Aides (31514, 31517, 31521)
- viii. Health Practitioners, Technologists, Technicians, and Related Health Occupations
  1. Physicians and Surgeons (32102)
  2. Dentists (32105)
  3. Optometrists (32108)
  4. Podiatrists (32111)
  5. Chiropractors (32113)
  6. Veterinarians and Veterinary Inspectors (32114)

7. All Other Health Diagnosing and Treating Practitioners (32199)
  8. Respiratory, Occupational, Physical, Recreational Therapists (32302, 32305, 32308, 32317)
  9. Speech-Language Pathologist and Audiologists (32314)
  10. Corrective and Manual Arts Therapists (32311)
  11. All Other Therapists (32399)
  12. Registered Nurses (32502)
  13. Licensed Practical Nurses, Emergency Medical Technicians, Physicians Assistants (32505, 32508, 32511)
  14. Opticians (32514)
  15. Pharmacists (32517)
  16. Pharmacy Technicians & Aides (32519)
  17. Dietitians & Nutritionists (32521)
  18. Dietetic Technicians (32523)
  19. Medical & Clinical Laboratory Technologists & Technicians (32902, 32905)
  20. Dental Hygienists (32908)
  21. Medical Records Technicians (32911)
  22. Radiation Therapists (32913)
  23. Nuclear Medicine, Radiologic, Electroneurodiagnostic, Cardiology Technologists (32914, 32919, 32923, 32925)
  24. Electrocardiograph, Surgical, Psychiatric, Veterinary Technologists and Technicians (32926, 32928, 32931, 32951)
  25. All Other Health Professionals, Paraprofessionals, and Technicians (32999)
- ix. Writers, Artists, Entertainers, Athletes, and Related Occupations
1. Writers & Editors (34002)
  2. Technical, Public Relations/Publicity, Writers (34005, 34008)
  3. Reporters and Correspondents, Broadcast News Analysts (34011, 34014)
  4. Announcers (34017, 34021)
  5. Photographers & Camera Operators (34023, 34026)
  6. Broadcast Technicians, Film Editors (34028, 34032)
  7. Artists and Related Workers (34035)
  8. Designers, Except Interior (34038)
  9. Interior designers (34041)
  10. Merchandise Displayers & Window Trimmers (34044)
  11. Music Directors, Singers, Composers, and Related Workers (34047)
  12. Musicians, Instrumental (34051)
  13. Dancers & Choreographers (34053)

- 14. Producers, Directors, Actors, and Other Entertainers (34056)
- 15. Athletes, Coaches, Umpires, and Related Workers (34058)
- x. Other Professional, Paraprofessional and Technical Occupations
  - 1. Airplane Dispatchers and Air Traffic Controllers (39002)
  - 2. Traffic Technicians (39005)
  - 3. Radio Operators (39008)
  - 4. Funeral Directors and Morticians (39011)
  - 5. Embalmers (39014)
  - 6. All Other Professional, Paraprofessional, and Technical Workers
- d. Sales and Related Occupations
  - i. First Line Supervisors and Manager/Supervisors - Sales Workers
    - 1. First-Line Supervisors and Managers (41002)
  - ii. Sales Occupations, Service
    - 1. Sales Agents & Placers, Ins. (43002)
    - 2. Brokers, Real Estate (43005)
    - 3. Sales Agents, Real Estate (43008)
    - 4. Appraisers, Real Estate (43011)
    - 5. Sales Agents, Securities, Commodities, and Financial Services (43014)
    - 6. Sales Agents, Selected Business Services (43017)
    - 7. Travel Agents (43021)
    - 8. Sales Agents, Advertising (43023)
    - 9. All Other Sales Representatives and Salespersons, Services (43099)
  - iii. Merchandise, Products & Other Sales and Sales Related Occupations
    - 1. Sales Engineers (49002)
    - 2. Sales Representatives, Scientific & Related Products Except Retail (49005)
    - 3. Sales Representatives, Retail, Except Retail & Scientific & Related Products (49008)
    - 4. Salespersons, Retail (49011)
    - 5. Salesperson, Parts (49014)
    - 6. Counter & Rental Clerks (49017)
    - 7. Stock Clerks, Sales Floor (49021)
    - 8. Cashiers (49023)
    - 9. Telemarketers, Door-to-door Sales Workers, News & Street Vendors, & Other Related Workers (49026)
    - 10. Demonstrators & Promoters (49034)
    - 11. Models (49036)
    - 12. All Other Sales & Related Workers (49999)
- e. Clerical and Administrative Support Occupations

- i. First Line Supervisors and Managers/Supervisors - Clerical Workers
  - 1. First-Line Supervisors and Managers/Supervisors- Clerical and Administrative Support Workers (51002)
- ii. Industry Specific Clerical and Administrative Support Occupations
  - 1. Tellers (53102)
  - 2. New Account Clerks (53105)
  - 3. Transit Clerks (53108)
  - 4. Loan Interviewers (53111)
  - 5. Credit Authorizers, Checkers, Loan & Credit Clerks (53114, 53117, 53121)
  - 6. Adjustment, Statement, Brokerage Clerks (53123, 53126, 53128)
  - 7. Insurance Adjusters, Examiners, & Investigators (53302)
  - 8. Insurance Appraisers, Auto Damage (53305)
  - 9. Insurance Examining Clerks (53308)
  - 10. Insurance Claims Clerks (53311)
  - 11. Insurance Policy Processing Clerks (53314)
  - 12. Welfare Eligibility Workers & Interviewers (53502)
  - 13. Investigators, Clerical (53505)
  - 14. Bill & Account Collectors (53508)
  - 15. Court, Municipal, License Clerks (53702, 53705, 53708)
  - 16. Travels Clerks, Reservation & Transportation Ticket Agents (53802, 53805)
  - 17. Hotel Desk Clerks (53808)
  - 18. Library Assistants & Bookmobile Drivers (53902)
  - 19. Teacher Aides & Educational Assistants, Clerical (53905)
  - 20. Advertising Clerks (53908)
  - 21. Proofreaders & Copy Markers (53911)
  - 22. Real Estate Clerks (53914)
- iii. Secretarial & General Office Occupations
  - 1. Legal, Medical Secretaries (55102, 55105)
  - 2. Secretaries Except Legal & Medical (55108)
  - 3. Stenographers &/or Court Reporters (55302)
  - 4. Receptions, Information Clerks (55305)
  - 5. Typists, Word Processors (55307)
  - 6. Personnel Clerks, Except Payroll & Timekeeping (55314)
  - 7. Correspondence & File Clerks (55317, 55321)
  - 8. Order Clerks, Materials, Merchandise, & Service (55323)
  - 9. Procurement Clerks (55326)
  - 10. Statistical Clerks (55328)

11. Interviewing Clerks, Except Personnel & Social Welfare (55332)
  12. Customer Service Representatives, Utilities (55335)
  13. Bookkeeping, Accounting, and Auditing Clerks (55338)
  14. Payroll & Timekeeping Clerks (55341)
  15. Billing, Cost, and Rate Clerks (55344)
  16. General Office Clerks (55347)
- iv. Electronic Data Processing and Other Office Machine Occupations
1. Billing, Posting, & Calculating Machine Operators (56002)
  2. Duplicating Machine Operators (56005)
  3. Mail Machine Operators, Preparation and Handling (56008)
  4. Computer Operators, Except Peripheral Equipment (56011)
  5. Peripheral EDP Equipment Operators (56014)
  6. Data Entry Keyers, Except Composing (56017)
  7. Data Keyers, Composing (56021)
  8. All Other Office Machine Operators (56099)
- v. Communications, Mail, and Message Distributing Occupations
1. Switchboard Operators (57102)
  2. Directory Assistance Operators (57105)
  3. Central Office Operators (57108)
  4. Telegraph & Teletype Operators (57111)
  5. All Other Communications Equipment Operators (57199)
  6. Mail Clerks, Except Mail Machine Operators & Postal Service (57302)
  7. Postal Mail Carriers (57305)
  8. Postal Service Clerks (57308)
  9. Messengers (57311)
- vi. Material Recording, Scheduling, Dispatching, and Distributing Occupations
1. Dispatchers, Police, Fire, & Ambulance (58002)
  2. Dispatchers, Except Police, Fire or Ambulance (58005)
  3. Production, Planning, and Expediting Clerks (58008)
  4. Transportation Agents (58011)
  5. Meter Readers, Utilities (58014)
  6. Weighers, Measurers, Checkers, and Samplers, Recordkeeping (58017)
  7. Marking Clerks (58021)\
  8. Stock Clerks - Stockroom, Warehouse or Storage Yard (58023)
  9. Order Fillers, Wholesale & Retail Sales (58026)
  10. Shipping, Receiving, and Traffic Clerks (58028)
  11. All Other Material Recording, Scheduling and Distributing Workers (58099)

12. All Other Clerical and Administrative Support Workers  
(59999)

f. Service Occupations

- i. First-line Supervisors & Managers/Supervisors - Service Occupations
  1. Fire Fighting & Prevention Supervisors (61002)
  2. Police & Detective Supervisors (61005)
  3. Housekeeping Supervisors (61008)
  4. All Other Supervisors & Managers/Supervisors - Service Workers (61099)
- ii. Protective Service Occupations
  1. Fire Inspectors (63002)
  2. Forest Fire Inspectors & Prevention Specialists (63005)
  3. Fire Fighters (63008)
  4. Police Detectives (63011)
  5. Police Patrol Officers (63014)
  6. Correctional Officers & Jailers (63017)
  7. Parking Enforcement Officers (63021)
  8. Bailiffs (63023)
  9. Criminal Investigators, Public Service (63028)
  10. Sheriffs & Deputy Sheriffs (63032)
  11. Detectives & Investigators, Except Public (63035)
  12. Railroad & Transit Police & Special Agents (63038)
  13. Fish & Game Wardens (63041)
  14. Crossing Guards (63044)
  15. Guards & Watch Guards (63047)
  16. All Other Protective Service Workers (63099)
- iii. Food & Beverage Preparation & Service Occupations
  1. Hosts, Hostesses, Restaurant, Lounge, Coffee Shop (65002)
  2. Bartenders (65005)
  3. Waiters & Waitresses (65008)
  4. Food Servers, Outside (65011)
  5. Dining Room & Cafeteria Attendants & Bartender Helpers (65014)
  6. Counter Attendants - Lunchroom, Coffee Shop, or Cafeteria (65017)
  7. Bakers, Bread & Pastry (65021)
  8. Butchers, Meat Cutters (65023)
  9. Cooks, Restaurant (65026)
  10. Cooks, Institution or Cafeteria (65028)
  11. Cooks, Fast Food or Short Order (65032, 65035)
  12. Food Preparation Workers (65038)
  13. Combined Food Preparation & Service Workers (65041)
  14. All Other Food Service Workers (65099)
- iv. Health Service & Related Occupations
  1. Dental Assistant (66002)
  2. Medical Assistant (66005)

3. Nursing Aides, Orderlies, and Attendants (66008)
4. Home Health Aides (66011)
5. Psychiatric Aides (66014)
6. Physical and Corrective Therapy Assistants and Aides (66017)
7. Occupational Therapy Assistants and Aides (66021)
8. Ambulance Drivers and Attendants, Except Emergency Medical Technicians (66023)
9. All Other Health Service Workers (66099)
- v. Cleaning & Building Service Occupations
  1. Maids & Housekeeping Cleaners (67002)
  2. Janitors & Cleaners, Except Maids & Housekeeping Cleaners (67005)
  3. Pest Controllers & Assistants (67008)
  4. Elevator Operators (67011)
  5. All Other Cleaning & Building Service Workers (67099)
- vi. Personal Service Occupations
  1. Barbers, Hairdressers, Hairstylists, & Cosmetologists (68002, 68005)
  2. Manicurists, Shampooers (68008, 68011)
  3. Amusement & Recreation Attendants (68014)
  4. Guides (68017)
  5. Ushers, Lobby Attendants, Ticket Takers (68021)
  6. Baggage Porters & Bellhops (68023)
  7. Flight Attendants (68026)
  8. Transportation Attendants, Except Flight Attendants & Baggage Porters (68028)
  9. Wardrobe, Locker, Dressing Room Attendants (68032)
  10. Personal & Home Care Aides (68035)
  11. Child Care Workers (68038)
  12. Funeral Attendants (68041)
- vii. Other Service Occupations
  1. All Other Service Workers (69999)
- g. Agricultural, Forestry, Fishing, and Related Occupations
  - i. First-Line Supervisors & Managers/Supervisors - Agricultural and Related Workers
    1. First-Line Supervisors & Managers/ Supervisors - Agricultural, Forestry, Fishing, and Related Workers (72002)
  - ii. Timber Cutting and Logging Occupations
    1. Fallers & Buckers (73002)
    2. Choke Setters (73005)
    3. Log-Handling Equipment Operators (73008)
    4. Logging Tractor Operators (73011)
    5. All Other Timber Cutting and Related Logging Workers (73099)
  - iii. Other Agricultural, Forestry, Fishing, and Related Occupations
    1. Forest and Conservation Workers (79002)

2. Log Graders and Scalers (79008)
  3. Graders & Sorters, Agricultural Products (79011)
  4. Animal Breeders (79015)
  5. Animal Trainers (79016)
  6. Animal Caretakers, Except Farm (79017)
  7. Farm Equipment Operators (79021)
  8. Pruners (79033)
  9. Sprayers/Applicators (79036)
  10. Laborers, Landscaping and Groundskeeping (79041)
  11. Veterinary Assistants (79806)
  12. Farmworkers, Food & Fiber Crops (79856)
  13. Farmworkers, Farm & Ranch Animals (79858)
  14. All Other Agricultural, Forestry, Fishing, and Related Workers (79999)
- h. Production, Construction, Operating, Maintenance, and Material Handling Occupations
- i. First-Line Supervisors & Managers/Supervisors - Production, Construction, Maintenance, and Related Workers
    1. First Line Supervisors & Managers (Mechanics, Installers, & Repairers - 81002; Construction Trades & Extractive Workers - 81005; Production & Operating Workers - 81008; Transportation & Material-Moving Machine and Vehicle Operators - 81011; Helpers, Laborers, & Material Movers, Hand - 81017; All Other First-Line Supervisors & Managers/Supervisors- Production, Construction, Maintenance, and Related Workers - 81099)
  - ii. Inspectors & Related Occupations
    1. Precision Inspectors, Testers, and Graders (83002)
    2. Production Inspectors, Testers, Graders, Sorters, Samplers, and Weighers (83005)
    3. Transportation Inspectors (83008)
    4. All Other Inspectors, Testers, and Related Workers (83099)
  - iii. Mechanics, Installers, and Repairers
    1. Machinery Maintenance Mechanics (85110) (Textile - 85112; Sewing - 85113; Marine Equipment - 85116; Underground Mine Machinery Mechanics - 85117; Water or Power Generation Plant - 85118; All other Machines - 85119)
    2. Millwrights (85123)
    3. Refractory Materials Repairers, Except Brickmasons (85126)
    4. Machinery Maintenance Workers (85128)
    5. Maintenance Repairers, General Utility (85132)
    6. Automotive Mechanics (85302); Autobody & Related Repair (85305); Motorcycle Repair (85308); Bus & Truck Mechanics & Diesel Engine Specialists (85311)

7. Mobile Heavy Equipment Mechanics, Except Engines (85314)
8. Rail Car Repairers (85317)
9. Mechanics (Farm Equipment - 85321; Aircraft - 85323; Radio - 85514)
10. Aircraft Engine Specialists (85326)
11. Small Engine Specialists (85328)
12. Central Office & PBX Installers & Repairers (85502)
13. Frame Wires, Central Office (85505)
14. Telegraph & Teletype Installers & Maintainers (85508)
15. Signal or Track Switch Maintainers (85511)
16. All Other Communications Equipment Mechanics, Installers, and Repairers (85599)
17. Telephone & Cable Television Line Installers and Repairers (85702)
18. Data Processing Equipment Repairers (85705)
19. Electronic Home Entertainment Equipment Repairers (85708)
20. Electric Home Appliance and Power Tool Repairers (85711)
21. Electric Motor, Transformer, and Related Repairers (85714)
22. Electronics Repairers, Commercial & Industrial Equipment (85717)
23. Powerhouse, Substation, and Relay Electricians (85721)
24. Electrical Power-Line Installers and Repairers (85723)
25. Station Installers & Repairers, Telephone (85726)
26. Electrical Installers & Repairers, Transportation Equipment (85728)
27. All Other Electrical and Electronic Equipment Mechanics, Installers, and Repairers (85799)
28. Heating, Air Condition, and Refrigeration Mechanics and Installers (85902)
29. Precision Instrument Repairers (85905)
30. Electromedical and Biomedical Equipment Repairers (85908)
31. Electric Meter Installers and Repairers (85911)
32. Camera and Photographic Equipment Repairers (85914)
33. Watchmakers (85917)
34. Musical Instrument Repairers and Tuners (85921)
35. Locksmiths and Safe Repairers (85923)
36. Office Machine and Cash Register Servicers (85926)
37. Mechanical Control and Valve Installers and Repairers (85928)
38. Elevator Installers and Repairers (85932)
39. Riggers (85935)
40. Installers and Repairers, Manufactured Buildings, Mobile Homes, and Travel Trailers (85938)

41. Gas Appliance Repairers (85944)
  42. Coin and Vending Machine Servicers and Repairers (85947)
  43. Bicycle Repairers (85951)
  44. Tire Repairers and Changers (85953)
  45. Menders, Garments, Linens, and Related (85956)
  46. All Other Mechanics, Installers, and Repairers (85999)
- iv. Construction Trades and Extractive Occupations
1. Carpenters (87102)
  2. Ceiling Tile Installers & Acoustical Carpenters (87105)
  3. Drywall Installers (87108)
  4. Tapers (87111), Lathers (87114), Brattice Builders (87121)
  5. Electricians (87202)
  6. Brickmasons (87302); Stonemasons (87305)
  7. Hard Tile Setters (87308); Concrete & Terrazzo Finishers (87311)
  8. Reinforcing Metal Workers (87314)
  9. Plasterers and Stucco Masons (\*7317)
  10. Painters and Paperhangers, Construction and Maintenance (87402)
  11. Plumbers, Pipefitters, and Steamfitters (87502)
  12. Pipelaying Fitters (87505); Pipelayers (87508)
  13. Septic Tank Servicers and Sewer Pipe Cleaners (87511)
  14. Carpet Installers (87602)
  15. Floor Layers, Except Carpet, Wood and Hard Tiles (87605)
  16. Floor Sanding Machine Operators (87608)
  17. Air Hammer Operators (87702)
  18. Pile-Driver Operators (87705)
  19. Paving, Surfacing, and Tamping Equipment Operators (87708)
  20. Highway Maintenance Workers (87711)
  21. Rail-Track Laying and Maintenance Equipment Operators (87714)
  22. Insulation Workers (87802)
  23. Hazardous Materials Removal Workers (87803)
  24. Sheet Metal Duct Installers (87805)
  25. Roofers (87808)
  26. Glaziers (87811)
  27. Structural Metal Workers (87814)
  28. Fence Erectors (87817)
  29. All Other Construction Trades Workers (87899)
  30. Earth Drillers, Except Oil and Gas (87902)
  31. Blasters and Explosives Workers (87905)
  32. Rock Splitters, Quarry (87908)
  33. Rotary Drill Operators, Oil & Gas Extraction (87911)
  34. Derrick Operators, Oil and Gas Extraction (87914)

35. Service Unit Operators (87917)
  36. Roustabouts (87921)
  37. Roof Bolters (87923)
  38. Continuous Mining Machine Operators (87941)
  39. Mine Cutting and Channeling Machine Operators (87943)
  40. All Other Minine Machine Operators (87949)
  41. All Other Extractive Workers, Except Helpers (87989)
  42. All Other Construction and Extractive Workers, Except Helpers (87999)
- v. Precision Production Occupations
1. Tool & Die Makers (89102)
  2. Precision Instrument Makers (89105)
  3. Machinists (89108)
  4. Tool Grinders, Filers, Sharpeners and Other Precision Grinders (89111)
  5. Pattern and Model Makers, Metal (89114)
  6. Precision Lay-Out Workers, Metal (89117)
  7. Shipfitters (89121)
  8. Jewelers and Silversmiths (89123)
  9. Precision Hand Workers, Jewelry and Related Products (89126)
  10. Precision Etchers and Engravers, Hand or Machine (89128)
  11. Sheet Metal Workers (89132)
  12. Boilermakers (89135)
  13. All Other Precision Metal Workers (89199)
  14. Pattern and Model Makers, Wood (89302)
  15. Pattern Markers, Woods (89305)
  16. Wood Machinists (89308); Cabinetmakers and Bench Carpenters (89311); Furniture Finishers (89314)
  17. All Other Precision Woodworkers (89399)
  18. Fabric and Apparel Patternmakers and Lay-Out Workers (89502)
  19. Custom Tailors and Sewers (89505); Upholsterers (89508)
  20. Shoe and Leather Workers and Repairers (89511)
  21. Spotters, Dry-Cleaning (89514); Pressers, Delicate Fabrics (89517); Precision Dyers (89521)
  22. All Other Precision Textile, Apparel, and Furnishings Workers (89599)
  23. Hand Compositors and Typesetters (89702)
  24. Job Printers (89705)
  25. Past-Up Workers (89706)
  26. Electronic Pagination System Operators (89707)
  27. Photoengravers (89712); Camera Operators (89713); Scanner Operators (89715); Strippers (89717); Platemakers (89718)

28. All Other Lithography and Photengraving Workers
29. Bookbinders (89721)
30. All Other Precision Printing Workers (89799)
31. Slaughterers and Butchers (89802)
32. Bakers, Manufacturing (89805)
33. Food Batchmakers (89808)
34. All Other Precision Food and Tobacco Workers (89899)
35. Precision Foundry Mold and Coremakers (89902);  
Precision Molders, Shapers, Casters, and Carvers,  
except Jewelry and Foundry (89905)
36. Precision Patternmakers, Model Makers, Lay-Out  
Workers, and Cutters (89908)
37. Precision Detail Design Decorators & Painters (89911)
38. Precision Photographic Process Workers (89914)
39. Precision Optical Goods Workers (89917)
40. Precision Dental Laboratory Technicians (89921)
41. Medical Appliance Makers (89923)
42. Gem and Diamond Workers (89926)
43. All Other Precision Workers (89999)
- vi. Machine Setters, Set-Up Operators, Operators, and Tenders
  1. Metal and Plastic: for Sawing Machine Tools (91102);  
for Lathe and Turning Machines (91105); for Drilling  
and Boring Machines (91108); for Milling and Planing  
Machines (91111); for Grinding, Lapping, and Buffing  
Machines (91114); for Machine Tool Cutting Operators  
(91117); for Punching Machines (91302); for Press &  
Press-Brake Machines (91305); for Shear & Slitter  
Machines (91308); for Extruding & Drawing Machines  
(91311); for Rolling Machines (91314); for Forging  
Machines (91317); for Machine Forming Operators  
(91321); for Numerical Control Machines (91502); for  
Combination Machines (91505, 91508); Electrolytic  
Plating and Coating Machines (91917, 91921);  
Nonelectrolytic Plating & Coating Machines (91923,  
91926); Heating Equipment (91928); Heat Treating,  
Annealing, and Tempering Machines (91932); Heaters  
(91938).
  2. Welding Machines (91702, 91705); Soldering & Brazing  
Machines (91708, 91711)
  3. Metal Fabricators, Structural Metal Products (91714)
  4. Plastic Molding and Casting Machines (91905)
  5. Metal Molding, Coremaking, and Casting Machines  
(91908, 91911)
  6. Foundry Mold Assembly & Shake-Out Workers (91914)
  7. Furnace Operators & Tenders (91935)
  8. All Other Metal and Plastic Machines (92197, 92198)
  9. Sawing Machines (92302, 92308)
  10. Head Sawyers (92305)

11. Woodworking Machines, Except Sawing (92311, 92314)
12. Printing Press Machines (92510)
13. Offset Lithographic Press Setters (92512)
14. Letterpress Setters (92515)
15. All Other Printing Press Setters & Set-Up Operators (92519)
16. Specialty Materials Printing Machine Setters and Set-Up Operators (92522)
17. Screen Printing Machine Setters and Set-Up Operators (92524)
18. Bindery Machine Setters and Set-Up Operators (92525)
19. All Other Printing Related Machine Setters and Set-Up Operators (92529)
20. Typesetting and Composing Machines (92541)
21. Printing Press Machines (92543)
22. Photoengraving & Lithographing Machines (92545)
23. Bindery Machines (92546)
24. All Other Printing, Binding, and Related Machine Operators and Tenders (92549)
25. Textile Machines (92702, 92705)
26. Extruding & Forming Machine Operators, Synthetic or Glass Fibers (92708)
27. Textile Draw-Out Machines (92711); Textile Bleaching & Dyeing Machines (92714)
28. Sewing Machines (92717, 92721)
29. Shoe Sewing Machine Operators & Tenders (92723)
30. Laundry & Dry-Cleaning Machines, Except Pressing (92726)
31. Pressing Machine Operators & Tenders (92728)
32. Electronic Semiconductor Processors (92902)
33. Motion Picture Projectionists (92905)
34. Photographic Processing Machine Operators (92908)
35. Tire Building Machine Operators (92911)
36. Paper Goods Machine Operators (92917)
37. Cooking & Tobacco Machine Operators (92917)
38. Roasting, Baking, Drying Machine Operators for Food or Tobacco (92921)
39. Furnace, Kiln, Oven, Drier, or Kettle Operators (92923)
40. Boiler Operators (92926)
41. Cooling and Freezing Equipment Operators (92928)
42. Dairy Processing Equipment Operators (92932)
43. Chemical Equipment Operators (92935, 92938)
44. Cutting and Slicing Machines (92941, 92944)
45. Painters, Transportation Equipment (2947)
46. Coating, Painting, and Spraying Machines (92951, 92953)
47. Cementing and Gluing Machines (92956)

- 48. Cleaning, Washing, Pickling Equipment Operators (92958)
- 49. Separating, Filtering, Clarifying, Precipitating, and Still Machine Operators (92962)
- 50. Crushing, Grinding, Mixing, and Blending Machine Operators (92965)
- 51. Extruding, Forming, Pressing, Compacting Machine Operators (92971)
- 52. Packaging & Filling Machines (92974)
- 53. All Other Machine Setters and Set-Up Operators (92997)
- 54. All Other Machine Operators and Tenders (92998)
- vii. Hand Working Occupations, Including Assemblers and Fabricators
  - 1. Aircraft Structure, Surfaces, Rigging, and Systems Assemblers, Precision (93102)
  - 2. Machine Builders and Other Precision Machine Assemblers (93105)
  - 3. Fitters, Structural Metal, Precision (93108)
  - 4. Electromechanical Equipment Assemblers, Precision (93111)
  - 5. Electrical and Electronic Equipment Assemblers, Precision (93114)
  - 6. Watch, Clock and Chronometer Assemblers, Adjusters, Calibrators, Precision (93117)
  - 7. All Other Precision Assemblers (93197)
  - 8. Machine Assemblers (93902)
  - 9. Electrical and Electronic Assemblers (93905)
  - 10. Coil Winders, Tapers, and Finishers (93908)
  - 11. Glaziers, Manufacturing (93911)
  - 12. Welders & Cutters (93914)
  - 13. Solderers and Brazers (93917)
  - 14. Pressers, Hand (93921)
  - 15. Sewers, Hand (93923)
  - 16. Cutters & Trimmers, Hand (93926)
  - 17. Portable Machine Cutters (93928)
  - 18. Carpet Cutters, Diagrammers, and Seamers (93932)
  - 19. Cannery Workers (93935)
  - 20. Meat, Poultry, and Fish Cutters and Trimmers, Hand (93938)
  - 21. Metal Pourers and Casters, Basic Shapes (93941)
  - 22. Molders and Casters, Hand (93944)
  - 23. Painting, Coating, and Decorating Workers, Hand (93947)
  - 24. Engraving & Printing Workers, Hand (93951)
  - 25. Grinding and Polishing Workers, Hand (93953)
  - 26. Assemblers and Fabricators, Except Machine, Electrical, Electronic, and Precision (93956)

- 27. All Other Hand Workers (93999)
- viii. Plant and System Occupations
  - 1. Water and Liquid Waste Treatment Plant System Operators (95002)
  - 2. Gas Plant Operators (5005)
  - 3. Chemical Plant & System Operators (95008)
  - 4. Petroleum Pump System Operators (95011)
  - 5. Petroleum Refinery & Control Panel Operators (95014)
  - 6. Gaugers (95017)
  - 7. Power-Generating Plant Operators, Except Auxiliary Equipment Operators (95021)
  - 8. Auxiliary Equipment Operators, Power (95023)
  - 9. Power Reactor Operators (95026)
  - 10. Power Distributors and Dispatchers (95028)
  - 11. Stationary Engineers (95032)
  - 12. All Other Plant and System Operators (95099)
- ix. Transportation and Material-Moving Machine & Vehicle Operators
  - 1. Truck Drivers (97102, 97105)
  - 2. Bus Drivers (97108, 97111)
  - 3. Taxi Drivers & Chauffeurs (97114)
  - 4. Driver/Sales Workers (97117)
  - 5. All Other Motor Vehicle Operators (97199)
  - 6. Railroad Conductors & Yardmasters (97302)
  - 7. Locomotive Engineers (97305)
  - 8. Rail Yard Engineers, Dinkey Operators, and Hostlers (97308)
  - 9. Locomotive Firers (97311)
  - 10. Subway and Streetcar Operators (97314)
  - 11. Railroad Brake, Signal, and Switch Operators (97317)
  - 12. All Other Rail Vehicle Operators (97399)
  - 13. Captains, Water Vessel (97502)
  - 14. Mates, Ship, Boat, and Barge (97505)
  - 15. Pilots, Ship (97508)
  - 16. Motorboat Operators (97511)
  - 17. Able Seamen (97514)
  - 18. Ordinary Seamen and Marine Oilers (97517)
  - 19. Ship Engineers (97521)
  - 20. Aircraft Pilots & Flight Engineers (97702)
  - 21. Bridge, Lock, and Lighthouse Tenders (97802)
  - 22. Service Station Attendants (97805)
  - 23. Parking Lot Attendants (97808)
  - 24. All Other Transportation and Related Workers (97899)
  - 25. Longshore Equipment Operators (97902)
  - 26. Tank Car & Truck Loaders (97905)
  - 27. Oil Pumpers, Except Wellhead (97908)
  - 28. Wellhead Pumpers (97911)
  - 29. Main-Line Station Engineers (97914)

- 30. Gas Pumping Station Operators (97917)
- 31. Gas Compressor Operators (7921)
- 32. Excavating and Loading Machine Operators (97923)
- 33. Dragline Operators (97926)
- 34. Dredge Operators (97928)
- 35. Loading Machine Operators, Underground Mining (97932)
- 36. Shuttle Car Operators (97935)
- 37. Grader, Bulldozer, and Scraper Operators (97938)
- 38. Hoist and Winch Operators (7941)
- 39. Crane and Tower Operators (97944)
- 40. Industrial Truck and Tractor Operators (97947)
- 41. Conveyor Operators and Tenders (97951)
- 42. Pump Operators (97953)
- 43. Operating Engineers (97956)
- 44. All Other Material-Moving Equipment Operators (97989)
- 45. All Other Transportation and Material Moving Equipment Operators (97999)
- x. Helpers, Laborers, and Material Movers, Hand
  - 1. Helpers, Mechanics, and Repairers (98102)
  - 2. Helpers, Brick and Stonemasons and Hard Tile Setters (98311)
  - 3. Helpers, Carpenters, and Related Workers (98312)
  - 4. Helpers, Electricians and Power-Line Transmission Installers (98313)
  - 5. Helpers, Painters, Paperhangers, Plasterers, and Stucco Masons (98314)
  - 6. Helpers, Plumbers, Pipefitters, and Steamfitters (98315)
  - 7. Helpers, Roofers (98316)
  - 8. Helpers, All Other Construction Trades Workers (98319)
  - 9. Helpers, Extractive Workers (98323)
  - 10. Machine Feeders and Offbearers (98502)
  - 11. Stevedores, Except Equipment Operators (98702)
  - 12. Refuse and Recyclable Material Collectors (98705)
  - 13. All Other Freight, Stock, and Material Movers, Hand (98799)
  - 14. Hand Packers and Packagers (98902)
  - 15. Vehicle Washers and Equipment Cleaners (98905)
  - 16. All Other Helpers, Laborers, and Material Movers, Hand (98999)