

# ESSENTIAL FUNCTIONS JOB ANALYSIS

**JOB TITLE:** SHEET METAL APPRENTICE  
**EMPLOYER:** Sheet Metal Workers' Local 104  
& Bay Area Industry Training Fund  
**TELEPHONE:** (510) 483-9035

**D.O.T. :** 804.281-014 & 804.281-010  
**NUMBER OF POSITIONS:** 450  
**ANALYST:** Mark Barnett  
**DATE OF ANALYSIS:** May 7, 1998

## **PURPOSE OF JOB ANALYSIS:**

This analysis was performed to document the essential functions performed by a Sheet Metal Apprentice working through the Sheet Metal Workers' Local 104 and Bay Area Industry Training Fund.

**PURPOSE OF POSITON:** This is a trade union training program providing training and employment to Sheet Metal Worker Apprentices. The purpose of the training program is to provide training and the full range of work experiences required of Apprentices seeking Journeyman status. Apprentices may become Journeymen after 5 years. To ensure full employability through the union, Apprentices learn and perform work in the Trade Jurisdiction, which is defined by the Constitution of the Sheet Metal Workers' International Association. An Apprentice, working under the supervision of a Journeyman, performs semi- skilled and skilled tasks related to the fabrication, transport, and installation of sheet metal products in commercial, industrial, and residential applications. Products fabricated, handled and/or installed include but are not limited to forms, flashing, gutters, HVAC duct work, HVAC equipment, lighting fixtures, boats, ships, doors, appliances, furniture, kitchen equipment, industrial applications, and all others identified in Article One, Section 5(a) through 5(ff) of the SMWIA Constitution and Ritual.

**WORK HOURS:** The Apprentice works 8 hours per day (7 in San Francisco area), generally from 7:00 a.m. to 3:30 p.m., five days per week. The employee is provided a 30 minute lunch break and two, 10 minute rest periods. Average total working time less lunch and rest periods is 7 hours and 40 minutes.

## MINIMUM QUALIFICATIONS

**KNOWLEDGE/SKILLS/ABILITIES:** The knowledge and skills required to adequately perform the functions of an Apprentice Sheet Metal Worker include: **Knowledge** of Math and English sufficient to pass the entry level math test and to learn from English language instruction. **Skill in/Ability** to pass the program entrance math test with a minimum score of 80%; learn covered material and pass course examinations; perform the wide range of physical tasks encountered in the full range of Apprentice Sheet Metal Worker assignments; communicate in English at levels required for classroom participation and workplace safety; read and interpret blueprints and drawings; learn the use of and to use and maintain various tools and equipment required to perform work functions; be punctual for classes and work assignments; to perform work at a rate adequate to maintain a satisfactory pace in the classroom and as required at various work sites to meet employers' contractual obligations.

**WORK EXPERIENCE:** There are no experience requirements for an Apprentice. Credits toward an applicant's ranking is given for related work experience or training.

**LICENSE(S)/CERTIFICATION(S):** Valid California Class C Driver's License.

**GENERAL EDUCATION OR EQUIVALENT:** High School Diploma, GED, or High School Proficiency test in English translation is required at the time of application.

**ESSENTIAL FUNCTIONS:**

**Frequencies:** OCCASIONAL (Up to 1/3 of the time); FREQUENT (1/3 to 2/3 of the time); & CONTINUOUS (2/3 or more of the time). **Strength:** Refer to U.S. Dept. of Labor Strength Levels/Categories.

**ESSENTIAL FUNCTIONS FREQUENCY AND STRENGTH**

1. Attends, participates in, and prepares for classroom and hands-on instruction. Areas of study include math, algebra, trigonometry, metals/materials, tools/machines/equipment, estimating, design, Computer Aided Design, drawing, layout, all applicable laws/regulations/codes (including area seismic and energy codes), and other disciplines related to the estimating, manufacture, fabrication, assembling, handling, erection, hanging, application, adjusting, alteration, repairing, dismantling, reconditioning, testing and maintenance of all sheet metal work as defined by the Constitution and Ritual of the Sheet Metal Workers' International Association.

Frequency: Occasional to Continuous

Strength: Sedentary to Heavy

2. Accepts, learns and performs Apprentice work assignments with various employers in the order jobs are received and per the Apprentice's ranking. Assignments include any or all tasks or subtasks in Fabrication, Handling/Transport, and Installation/Erection in Residential, Commercial, and Industrial shops and job sites.

Frequency: Continuous

Strength: Medium to Heavy

3. Fabricates sheet metal products: obtains stock (commonly 10' X 4') of required gauge (commonly 24 ga. to 10 ga.); lays out and marks pieces for cutting, bending and/or shaping; cuts to size/shape; bends components; and assembles products.

Frequency: Occasional to Continuous

Strength: Medium to Heavy

4. Handles/transport sheet metal products: transports fabricated components among shop departments or from shop to job site; prepares (secures, boxes, crates, etc.) products for transport as needed; loads and unloads products on and off truck trailer or other conveyance; stages components for installation or erection.

Frequency: Occasional to Continuous

Strength: Light to Heavy

5. Installs and/or erects products at job sites. Job sites include but not limited to construction, repair, renovation, etc. at industrial facilities (refineries, manufacturers, etc.), medical facilities (hospitals, clinics, medical offices, etc.) high tech (laboratories, research, clean rooms, process, etc.) commercial facilities (airports, office buildings, retail, etc.), institutional (public and private schools and universities as well as cafeterias, kitchens, and assembly halls), hospitality (hotels and restaurants), and residential (houses or apartments). Products include but are not limited to air-conditioning units, heaters, exhaust and blow pipe systems, fireplaces, duct work, roof flashing, gutters, sinks, production lines, custom equipment, etc. Job sites include buildings and facilities at varying stages of completion or renovation.

Frequency: Continuous

Strength: Heavy

6. Safely and efficiently operates and maintains varied powered and manual fabrication equipment including but not limited to press brakes, plasma / laser cutters, benders, whisperlock, welders, shears, drills, and punches.

Frequency: Occasional to Continuous

Strength: Medium to Heavy

7. Safely and efficiently uses and maintains varied hand and power tools used in the fabrication, transport, and installation of sheet metal products.

Frequency: Occasional to Continuous

Strength: Medium to Heavy

8. Attends and participates successfully in weekly training sessions/meetings on lifting, equipment operation, safe driving, safety meetings and other work-related topics.

Frequency: Occasional

Strength: Light

9. Safely and efficiently uses Computers, Computer auxiliaries jobsite lasers and location tools, and related equipment.

Frequency: Occasional

Strength: Light to Medium

10. Safely and efficiently uses truck and other equipment/vehicles.

Frequency: Occasional

Strength: Light to Medium

11. Assists and trains less experienced co-workers/classmates.

Frequency: Occasional

Strength: Light

**MARGINAL, SHARED, & MODIFIABLE FUNCTIONS:** No marginal, shared or modifiable functions were identified. Functions are performed under the direction of a Journeyman Sheet Metal Worker and may be performed with and without the assistance of other workers. The worker can be required to perform any one or all of the above noted primary functions for all or part of a work shift.

**SOME TYPES OF MACHINES, TOOLS, EQUIPMENT USED ON THE JOB:** Essential functions require use of tool box, tool pouch/belt, hand tools (bulldog snips, aviation snips, lineman pliers, wide-tong pliers, locking pliers, scratch-awl, prick punch, wrenches fixed and adjustable, screwdrivers, tinner's or claw hammer, dividers, drift pin, level, combination square, tape measure, plumb bob, hand crimpers, adjustable marking gauge), power tools (drill motors, battery powered drill motor, powder-actuated anchor setter, impact drills, lock forming machines), man lifts, scaffolding, ladders, dollies, carts, A-frames/hoists, electronic tools and test equipment (HVAC systems), welding equipment, computer controlled production machines, pen/pencil, power saws, oxygen or acetylene torches, and a variety of fittings, bolts, anchors, fasteners, couplings, clamps, and related items.

**VEHICLES/MOVING EQUIPMENT DRIVEN ON THE JOB:** Essential Functions may require the operation of a Pick-Up, Forklift, Scissor/Boom lift or Utility Truck.

### **CURRENT PHYSICAL FACTORS**

**Occasional- Up to 1/3 of the time; Frequent – 1/3 to 2/3 of the time; Continuous - Over 2/3 of the time**

**Note: The following physical demands are required in all work assignments - commercial, industrial, institutional, and residential; fabrication, handling, and installation - and/or in training. The frequencies and durations vary in some instances.**

### **ENDURANCE**

#### **Standing**

**Frequency:** Occasional to Frequent, from 2 to 4 hours per day.

**Duration:** Average of 60 to 90 seconds; maximum of approximately 10 minutes.

**Surfaces:** Anti-fatigue mats, concrete, asphalt, wood, metal, tile, turf, roofs, ladder rungs, scaffolding; including sloped, slippery and uneven surfaces.

**Work Performed:** Fabrication: layout and marking of stock; feeding, tending, offbearing production machinery such as coil lines, burn-in tables, shears, press brakes, programming machine controls; bench work including punching, cutting, bending, shaping pieces, and insulating components; welding; and others.

**Handling/Transport:** Staging and marking pieces for transport and placing/positioning pieces on trucks; and others.

**Installation/Erection:** hanging gutters or installing flashing (ladder, scaffold, roof); installing hangers and supports for duct work; hanging and securing duct work (ladders, man lifts, etc.); hooking-up heating or air conditioning units; and others.

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8 and 10.**

### **Walking**

**Frequency:** Frequent, from 4 to 6 hours per day.

**Distances:** Averages of 10 to 20 feet; maximum of 200 feet at a time.

**Surfaces:** Concrete, asphalt, wood, tile, turf metal, scaffolding, roofs, studs, joists; including sloped, slippery, and uneven surfaces.

### **Work Performed:**

Fabrication: layout and marking of stock; moving stock/pieces from one work area to another; positioning pieces in press brake/bending machines; bench work including punching, cutting, bending, shaping pieces, and insulating components (moving around a fixed piece); moving pieces using hoists; and others. Handling/Transport: staging pieces for transport, placing/positioning pieces on trucks, unloading and staging pieces at job sites and others. Installation/Erection: moving pieces to installation sites; hanging gutters or installing flashing (scaffold, roof); installing hangers and supports for duct work, hanging and securing duct work (ladders, man lifts; etc.); hooking-up heating or air conditioning units; and others.

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8 and 10.**

### **Sitting**

**Frequency:** Occasional from 30 to 60 minutes per day. (Class time may require Continuous sitting.)

**Duration:** Average of 5 minutes; maximum of 30 minutes. (Up to 90 minutes during classes.)

**Seat Structure:** Stacking chair, individual vehicle seat, stool, floor, ground, roof, joist, and others.

**Work performed:** Driving vehicle to work sites, operating Forklift or similar vehicle, bench work, installation of components at floor level or in ceilings, etc.

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8 and 9.**

### **COORDINATION**

**Eye-Hand:** Continuous to safely perform work with hands and tools and to drive.

**Eye-Hand-Foot:** Occasional to operate equipment and safely drive.

**Driving:** Occasional, up to 1 hour per day.

The above activities are currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.**

### **STRENGTH**

#### **Lifting/Carrying**

**Frequency:** Frequent to Continuous, from 3 up to 6 hours per day.

**Duration:** Average 3 - 5 seconds; maximum of approximately 10 minutes.

**Distances:** Averages of 10 to 20 feet; maximums of approximately 200 feet per occurrence.

#### **Work Performed:**

Fabrication: moving/feeding stock to work table/machine; using hand tools; using powered hand tools; moving stock/pieces from one work area to another; positioning pieces in press brake/bending machines; positioning pieces for assembly; and others. Handling/Transport: staging pieces for transport, placing/positioning pieces on trucks, unloading and staging pieces at job sites, and others. Installation/Erection: moving pieces to installation sites; hanging gutters or installing flashing; positioning and attaching hangers and supports for duct work; positioning and attaching duct work to hangers and supports; positioning and securing heating or air conditioning units; and others. Note: Tool belts or pouches weighing approximately 15 to 25 pounds may be worn at the waist all or part of a work shift.

With the: Bilaterally, major hand, minor hand, and shoulders.

Weights: The maximum weight lifted and carried is approximately 100 pounds. Although the majority of

lifting/carrying activities are performed at mid-thigh to chest level, up to 100 pounds may be handled at shoulder level and above (standard ceiling heights of 100") while installing heating units, commercial duct

work, and similar activities. In fabrication the most commonly used gauges of sheet metal stock fall between 24 gauge (46.25 pounds) and 10 gauge (231.25 pounds) in galvanized sheets, 4' by 10'. 18 gauge, at approximately mid-way between 10 and 24 gauge, weighs 86.25 pounds per 4' by 10' sheet. Industrial fabrication can require work with thicker gauges of heavier materials and greater use of overhead cranes and hoists. Workers singly and with assistance lift and/or maneuver stock from carts to work benches or machines. Additional weights handled by the Apprentice include completed sections of commercial duct work (60, 70 and 75 pounds before insulation), Plan Bags (pre-fabbed heat runs for residential construction - 30 to 40 pounds, large volume). Plenum (40 pounds), furnace (-200 pounds), 5' section of lead flashing (10 pounds), gutter sections (20, 25 and 30 pounds), power tools 7 to 9 pounds), and hand tools (1 to 4 pounds).

Of total hours spent lifting/carrying - Estimated Average Percentages:

**Up to 10 pounds:** 50% (includes hand tools, drill motor, fasteners, hardware, small sections, etc.)

**11 to 25 pounds:** 15% (power tools, tool pouch w/ tools, sections. etc.)

**26 to 50 pounds:** 20% (Duct sections, tool boxes, ladders, power tools, box of fasteners, etc.)

**51 to 75 pounds:** 10% (Duct work, sheet metal sections, sheet metal stock resting on work surface, etc.)

**76 to 100 pounds:** 05% (Sheet metal stock, sheet metal stock resting on work surfaces, heating or air conditioning units, welding units, compressors, generators, etc.)

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.**

### **Pushing/Pulling**

**Frequency:** Occasional to Frequent from 2 to 3 hours per shift.

**Duration:** Average of 3 to 5 seconds; maximum: of 20 seconds.

**Levels:** Shoulder level and above -20%; Waist to chest level - 50%; Below waist level- 30%.

**With the:** Bilaterally, major hand, minor hand, and shoulders.

**Distances:** Averages of a few feet; maximums of 50 feet at a time.

**Surfaces:** Concrete, asphalt, tile, wood, metal, studs, joists, turf; sloped or pitched surfaces, over uneven pavement/dirt.

**Work Performed:** Moving/positioning stock on work benches or machines; positioning duct work or HVAC units in crawl spaces, attics, etc.; moving carts of stock; pulling stock from stacks; using wrenches/hand tools to tighten/loosen fasteners; moving/positioning heavy stock or products on hoists or overhead cranes (pulling); moving coil stock on can; using hand trucks, and similar activities.

Weights/forces: Of total hours pushing/pulling - Estimated:

**Up to 10 PSI:** 50 %    **11 to 25 PSI:** 15%    **26 to 50 PSI:** 15%

**51 to 75 PSI:** 15%    **76 to 100 PSI:** 05%

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.**

### **PHYSICAL AGILITY**

**Climbing:** Occasional, up to 30 minutes per shift. Climbs in and out of vehicles, ascends/descends steps and stairs, ladders, roofs, or on slopes for approximate durations of 5 to 60 seconds.

**Balancing:** Occasional to Frequent - Working on ladders, roofs, in crawl spaces, attics, etc.

**Bending/Stooping:** Occasional to Frequent, from 2, up to 3 hours per shift for average durations of 2 seconds; maximum durations of approximately 3 minutes. Performed in order to lift items, while performing fabrication tasks at a work bench, to work in crawl spaces or attics, to make HVAC connections at floor/ground level, and similar activities.

**Kneeling:** Occasional, up to 1 hour per shift to hook up and test HV AC equipment, while working in crawl spaces or ceilings, to assemble large products, and similar activities.

**Squatting/Crouching:** Occasional, up to 1 hour per shift for durations of 1 to 2 minutes while working in crawl spaces or ceilings to assemble large products, and similar activities.

**Crawling:** Occasional, up to 30 minutes per shift. See Kneeling, Squatting/Crouching.

**Lying Prone/Supine:** May be performed infrequently to access hard to reach sections of products in fabrication or while installing products in the field.

**Running:** In an Emergency.

**Twisting/Turning:** Occasional to Frequent, intermittent and prolonged twisting may be required while working in crawl spaces or ceilings, to assemble large products, and similar activities.

Also performed while driving/backing up.

Physical Agility in Climbing, Balancing, Kneeling, Squatting/Crouching, Bending and Twisting/Turning is currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.** Note: The above frequencies are estimates of average activities. Some job sites/situations require greater frequencies and longer durations.

## **DEXTERITY**

### **Reaching**

**Shoulder level and above:** Occasional to Frequent for durations of 30 to 60 seconds for totals from 1 hour up to 3 hours per day to install heating registers, install hangers for duct work, to install duct work, while climbing ladders, hanging gutters, and similar activities.

**Waist to chest level:** Frequent, from 3 to 6 hours per day, with slight to full extensions while laying out/markings sections, operating fabrication machines, lifting/maneuvering metal stock or products, driving. climbing ladders/steps, etc.

**Below waist level:** Occasional, from 1 to 2 hours per day while pushing carts, assembling pieces, working at ground level or while on roofs, and similar activities.

Note: Level of reaching required varies with height of worker and current assignment.

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.**

### **Handling/Fingering:**

#### **Gripping/Grasping**

**Frequency:** Frequent to Continuous, from 3 to 6 hours per day, with and without gloves.

**Type:** Simple grasping to handle lighter items such as plans, drawings, paperwork, hand tools, and to drive. Firm and Power grasping to use hand tools, power tools, push/pull cranes/hoists/calls, handle heavier components, and similar activities.

**Duration:** Average of 30 to 60 seconds at each occurrence; maximum of 15 minutes each occurrence.

**With the:** Major hand or minor hand and bilaterally.

**Work Performed:** Move/maneuver stock, use all tools, driving, handle/transport products and similar activities.

Currently performed in function numbers **1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.**

## **Finger Dexterity**

**Frequency:** Occasional to Frequent, 1 to 3 hours per day.

**Duration:** Average 3 to 5 seconds; maximum of 60 seconds each occurrence.

**With the:** Bilaterally, major and minor hand.

**Work Performed:** Handwriting, calculator, programmable controls, computer keyboard/mouse, manipulating fasteners, and similar activities.

Currently performed in function numbers **1,2,3,4,5,6,7,8,9 and 10.**

## **CERVICAL MOVEMENT**

**Hyperextension:** Occasional, intermittent while climbing up ladders, working overhead, viewing supplies/equipment on shelving, etc.

**Rotation:** Frequent in order to view clearances during installations or while handling/transporting, retrieving tools while performing installations, etc.

**Flexion:** Occasional to Frequent in order to view paperwork/drawings, to view objects on work bench, while working on roofs, viewing supplies/equipment, etc.

**Neutral:** Frequent to view work with hands in front of body, while driving, etc.

The above cervical movements are currently performed in function numbers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10.

## **SENSORY**

**Speech:** The employee is required to use basic English in normal conversational tones and at levels sufficient to be heard above vehicle/equipment motors. Apprentices work on busy construction sites with heavy traffic and perform heavy lifting and carrying tasks in conjunction with other workers.

**Hearing:** Normal or corrected to normal hearing is required.

**Vision:**  X  Near Acuity  X  Far Acuity  X  Depth Perception  
  Color  X  Field of Vision  X  Accommodation

**Smell:** Normal olfactory sense is not required.

Currently performed in function numbers **1,2,3,4,5,6,7,8,9 and 10.**

### ENVIRONMENTAL FACTORS

The employee works inside approximately 80% of the time and outside 20% of the time where he/she is exposed to:

Weather  Extreme Cold  Extreme Heat  Wet and/or Humid Conditions

Vibration  Electrical Shock  High/Exposed Places Radiation

Moving Parts  Explosives  Toxic/Caustic Chemicals

Noise Levels:  Very Quiet  Quiet  Moderate  Loud  Very Loud

Other Atmospheric Conditions, Hazards, Comments: Dusts, traffic, cuts, scrapes, Pinch points, and others.

**Note: On occasion, the apprentice may be outside for full shifts. \*Infrequently, work may also require the worker to perform tasks in walk-in refrigerators or in the vicinity of heating units, steam pipes, etc.**

### MENTAL FACTORS

#### General Educational Development

**Reasoning:** Apply principles of rational thinking to solve practical problems and deal with a variety of concrete variables in situations where limited standardization exists. Interpret a variety of instructions furnished in written, oral, diagrammatic or schedule form.

**Mathematics:** Complex Skills· Business math, algebra, geometry, shop math, calculus, or statistics.

**Reading:** Complex Skills - Comprehend manuals (such as policies and procedures, training materials, multistep instructions, code books), instructions in use of equipment, safety rules and procedures, and drawings.

**Writing:** Simple Skills - Prepare basic English sentences containing subject, verb and object; names and address, complete job application or notations in a log book.

#### **Perception**

Spatial- Ability to comprehend forms in space and understand relationships of plane and solid objects.

Clerical - Ability to perceive pertinent detail in verbal or tabular material. To observe differences in computation.

Form - Ability to perceive pertinent detail in objects or in pictorial or graphic material. To make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of line.

### **Data, People, Things:**

**Data:** Data are intangible and include numbers, words, symbols, ideas, concepts, and oral verbalization: Analyzing, Compiling, Computing, Copying, and Comparing.

**People:** Human beings, dealt with on an individual basis: Speaking/Signaling, Taking Instructions Helping.

**Things:** Inanimate objects as distinguished from human beings, substances or materials; machines, tools, equipment and products. A thing is tangible and has shape, form, and other physical characteristics: Precision Working, Operating-Controlling, Driving-Operating. Manipulating, Tending, Feeding-Offbearing, and Handling.

### **Personal Traits:**

Work Functions required by specific job-worker situations, also known as temperaments:

- I. Ability to comprehend and follow specific instructions.
- II. Ability to perform simple and repetitive tasks, or short-cycle work.
- III. Ability to maintain a work pace appropriate to a given work load.
- VI. Ability to perform complex: or varied tasks.
- VII. Ability to make generalizations, evaluations or decisions without immediate supervision.