



ONTARIO COLLEGE OF TRADES

ORDRE DES MÉTIERS DE L'ONTARIO

Apprenticeship
Training Standard

Sheet Metal Worker

Trade Code: 308A

Development Date: April 1994

CONTENTS

PAGE

Preface.....1
Important Directions for Trainers1
Important Directions to the Apprentice/Trainee2
Notice/Declaration for Collection of Personal Information3
Apprentice/Trainee Record4
Employer Information.....5
Apprentice/Trainee Completion form.....7
Training Unit Completion Form8

TRAINING UNITS

NUMBER

TITLE

PAGE

U0338.0 Protect Self and Others12
U0339.0 Use and Maintain Hand/Power Tools and Equipment.....15
U0340.0 Read, Interpret and Produce Drawings17
U0341.0 Lay- Out and Drafting.....20
U0342.0 Set Up and Operate shop equipment.....23
U0343.0 Weld and Cut30

TRAINING UNITS .../cont'd

NUMBER	TITLE	. PAGE
U0344.0	Fabricate for Shop and Field.....	35
U0345.0	Erect, Remove and Operate Work Platform.....	39
U0346.0	Rig and Hoist	41
U0347.0	Install Heating, Ventilating and Air Conditioning Systems.....	44
U0348.0	Fabricate and Install Industrial Environmental Systems and Specialized Installations	51
U0349.0	Test and Adjust	56
U0350.0	Install Roofing and Architectural Metals.....	61

PREFACE

This training document was developed by the Apprenticeship and Client Services Branch of Ontario Training and Adjustment Board (OTAB) in consultation with representatives from the industry. These Training Standards are intended to be used by apprentice/ trainee, instructors and companies as a "blueprint" for training or as a prerequisite for government accreditation/certification.

The care and maintenance of this book is the joint responsibility of the apprentice/trainee and the employer. The Training Standards were developed specifically for documenting the apprentice's/trainee's acquisition of skills.

The book becomes the only record of an apprentice's/trainee's training.

IMPORTANT DIRECTIONS TO TRAINERS

The Training Standards identify skills required for this occupation and its related training program.

These Training Standards have been written in concise statements which describe how well an apprentice/trainee must perform each skill in order to become competent.

In using these Training Standards, trainers will be able to ensure that the apprentice/trainee is developing skills detailed for the occupation.

Trainers and apprentices/trainees are required to sign off and date the skills following each successful acquisition.

Employers participating in this training program will be designated as the Signing Authority and are required to attest to successful achievement by signing on the appropriate line included at the end of each unit.

IMPORTANT DIRECTIONS TO THE APPRENTICE/TRAINEE

Apprentice

1. All hours working for each employer(s) should be recorded in the Employer Information section.
2. The "Summary of Hours" should be completed, signed and dated by both the apprentice and employer when either all terms of the contract have been completed or the apprentice leaves the employ of the employer.
3. It is the responsibility of the apprentice to inform the local Apprenticeship Client Services office regarding the following changes:
 - change of employer address;
 - change of apprentice name or address;
 - transfer to a new employer.
4. At the fulfillment of all terms of a Contract of Apprenticeship, the Apprentice/Trainee Completion Form must be completed and signed by the current employer. Present these completed and authorized Training Standards and the Apprentice/Trainee Completion Form to your local Apprenticeship Client Services office.

Trainee

1. Training Reports must be signed for modular trainees by OTAB designated Signing Authority and forwarded to a local Apprenticeship Client Services office.
2. At the completion of training, the Apprentice/Trainee Completion Form must be completed and signed off by the employer/Signing Authority and submitted to the local Apprenticeship Client Services office.

NOTICE OF COLLECTION OF PERSONAL INFORMATION

1. At any time during your apprenticeship training, you may be required to show this training standard to the Ministry of Training, Colleges and Universities (the Ministry). You will be required to disclose the signed Apprenticeship Completion form to the Ministry in order to complete your program. The Ministry will use your personal information to administer and finance Ontario's apprenticeship training system, including confirming your completion and issuing your certificate of apprenticeship.
2. The Ministry will disclose information about your program completion and your certificate of apprenticeship to the Ontario College of Trades, as it is necessary for the College to carry out its responsibilities.
3. Your personal information is collected, used and disclosed by the Ministry under the authority of the Ontario College of Trades and Apprenticeship Act, 2009.
4. Questions about the collection, use and disclosure of your personal information by the Ministry may be addressed to the:

Manager, Employment Ontario Contact Centre
Ministry of Training, Colleges and Universities
33 Bloor St. E, 2nd floor, Toronto, Ontario M7A 2S3
Toll-free: 1-800-387-5656; Toronto: 416-326-5656
TTY: 1-866-533-6339 or 416-325-4084.

Please Note: Apprenticeship Training and Curriculum Standards were developed by the Ministry of Training, Colleges and Universities (MTCU). As of April 8th, 2013, the Ontario College of Trades (College) has become responsible for the development and maintenance of these standards. The College is carrying over existing standards without any changes.

However, because the Apprenticeship Training and Curriculum Standards documents were developed under either the Trades Qualification and Apprenticeship Act (TQAA) or the Apprenticeship and Certification Act, 1998 (ACA), the definitions contained in these documents may no longer be accurate and may not be reflective of the Ontario College of Trades and Apprenticeship Act, 2009 (OCTAA) as the new trades legislation in the province. The College will update these definitions in the future.

Meanwhile, please refer to the College's website (<http://www.collegeoftrades.ca>) for the most accurate and up-to-date information about the College. For information on OCTAA and its regulations, please visit: <http://www.collegeoftrades.ca/about/legislation-and-regulations>

APPRENTICE/TRAINEE RECORD:

Apprentice/Trainee Name: _____

Contract Number: _____
(If applicable)

EMPLOYER INFORMATION

Company: _____

Address: _____

Telephone: _____

Summary of Hours:

Dates of Employment: _____
From To

Total hours of training and instruction between dates of employment _____Hours

Employer's
Signature

Date

Apprentice/Trainee
Signature

Date

EMPLOYER INFORMATION

Company: _____

Address: _____

Telephone: _____

Summary of Hours:

Dates of Employment: _____
From To

Total hours of training and instruction between dates of employment _____Hours

_____ Employer's Signature	_____ Date	_____ Apprentice/Trainee Signature	_____ Date
----------------------------------	---------------	--	---------------

EMPLOYER INFORMATION

Company: _____

Address: _____

Telephone: _____

Summary of Hours:

Dates of Employment: _____
From To

Total hours of training and instruction between dates of employment _____Hours

_____ Employer's Signature	_____ Date	_____ Apprentice/Trainee Signature	_____ Date
----------------------------------	---------------	--	---------------

EMPLOYER INFORMATION

Company: _____

Address: _____

Telephone: _____

Summary of Hours:

Dates of Employment: _____
From To

Total hours of training and instruction between dates of employment _____Hours

_____ Employer's Signature	_____ Date	_____ Apprentice/Trainee Signature	_____ Date
----------------------------------	---------------	--	---------------

EMPLOYER INFORMATION

Company: _____

Address: _____

Telephone: _____

Summary of Hours:

Dates of Employment: _____
From To

Total hours of training and instruction between dates of employment _____Hours

_____ Employer's Signature	_____ Date	_____ Apprentice/Trainee Signature	_____ Date
----------------------------------	---------------	--	---------------

APPRENTICE/TRAINEE COMPLETION FORM

Apprentice/Trainee Name _____
Print

Signature

Social Insurance Number _____

Training Units when completed should be signed off by Trainer/Signing Authority on the following page and presented with this completion form to your local Apprenticeship Client Services Field Office. Any supporting documentation should also be attached.

In-School completed: Yes () No () Not Applicable ()
(proof to be provided)

Hours completed as per Contract: Yes () No () Not Applicable ()

Employer Name: _____

Address: _____

Signing Authority _____
Signature

OTAB USE ONLY:

Recommended for Exam: Yes () No ()

Signature

Consultant/Office Code

You will be required to disclose this signed form to the Ministry of Training, Colleges and Universities in order to complete your program. The Ministry will use your personal information to administer and finance Ontario's apprenticeship training system. For further information please see the notice/declaration for collection of personal information that is referenced in the table of contents of this training standard.

TRAINING UNIT COMPLETION FORM

TRAINING UNITS	TITLE	SIGNING AUTHORITY
U0338.0	Protect Self and Others	_____
U0339.0	Use and Maintain Hand/Power Tools and Equipment	_____
U0340.0	Read, Interpret and Produce Drawings	_____
U0341.0	Lay-Out and Drafting	_____
U0342.0	Set Up and Operate Shop Equipment	_____
U0343.0	Weld and Cut	_____
U0344.0	Fabricate for Shop and Field	_____
U0345.0	Erect, Remove and Operate Work Platforms	_____
U0346.0	Rig and Hoist	_____
U0347.0	Install Heating, Ventilating and Air Conditioning Systems	_____
U0348.0	Fabricate and Install Industrial Environmental Systems and Specialized Installations	_____
U0349.0	Test, Adjust and Balance U0350.0 Install Roofing and Architectural Metals	_____
U0350.0	Install Roofing and Architectural Metals	_____

U0338.0 PROTECT SELF AND OTHERS

GENERAL PERFORMANCE OBJECTIVE

Wear safety clothing and equipment, identify hazards in the work area, perform work in accordance with safety legislation, check condition of ladders and scaffolding, communicate with co-workers, inspect and maintain tools and apply basic first aid.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0338.01 Wear, adjust, and maintain safety clothing and equipment to ensure correct fit and optimum protection of self and others in compliance with the Occupational Health and Safety Act (OHSA) and owner/client safety standards.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0338.02 Identify hazards in the work area by inspecting the site to identify hazards to self and others including: fire hazards, exposure to toxic chemicals, electrical and explosive hazards, absence of protective barriers, the potential for falls, following good housekeeping practices and taking corrective action where required.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0338.0 PROTECT SELF AND OTHERS.../cont'd

U0338.03 Perform work in accordance with safety legislation including Workplace Hazardous Materials Information System (WHMIS), OHS Regulations pertaining to the industrial and construction sectors, the Workers' Compensation Act and Regulations to ensure the protection of self and others.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0338.04 Check condition of ladders, scaffolding and related equipment prior to use including toe boards, hand rails, outriggers and wheels, approved ladders, approved planking, cleats and pins and/or platforms, braced, motorized lifts and take corrective action where required by securing all attachments and reporting or replacing unsafe, worn or defective components.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0338.05 Communicate with co-workers and others to warn of hazards, ensure safe working practices, promote team work and to prevent accidents and injury to self and others.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0338.0 PROTECT SELF AND OTHERS.../cont'd

U338.06 Inspect and maintain tools and equipment prior to use, following manufacturers' recommended procedures. Check for damage or wear and repair or replace damaged components to ensure effective operation and the safety of self and others.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0338.07 Apply basic first aid to self and co-workers to treat cuts, burns, abrasions, sprains, chemical inhalation, contaminants in the eyes and seek immediate assistance when required.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

Employer's Name	Employer's Signature
_____	_____

U0339.0 USE AND MAINTAIN HAND/POWER TOOLS AND EQUIPMENT

GENERAL PERFORMANCE OBJECTIVE

Select, maintain and use hand tools, power tools, devices to measure, mark, align and level and operate explosive actuated tools.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0339.01 Select, maintain and use hand tools, demonstrating required hand/eye co-ordination and dexterity to perform sheet metal work effectively in accordance with required tolerances.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0339.02 Select, use and maintain power hand tools including electrical, pneumatic and gasoline powered types, following manufacturers' recommendations regarding equipment capacities and limitations to perform sheet metal work effectively in accordance with required tolerances.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0339.0 USE AND MAINTAIN HAND/POWER TOOLS AND EQUIPMENT..../cont'd

U0339.03 Select, maintain and use tools and devices to measure, mark, align and level, ensuring the fit and accuracy of sheet metal layouts, fabrication work and installations as required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0339.04 Select, maintain and operate explosive actuated tools in accordance with manufacturers' maintenance procedures and operational instructions and the requirements of OHSA to ensure safe and effective operation.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

Employer's Name	Employer's Signature
_____	_____

U0340.0 READ, INTERPRET AND PRODUCE DRAWINGS

GENERAL PERFORMANCE OBJECTIVE

Read and interpret drawings and specifications, free hand sketches and details, produce an interference drawing, read and interpret manufacturer's equipment manuals, take off required materials and design system layout.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0340.01 Read and interpret drawings and specifications including shop drawings, symbols, bills of materials, details, addendums and schematic drawings to determine the work to be performed.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0340.02 Produce free-hand sketches to illustrate to others the work to be performed, the fittings or components to be fabricated or installed, listing all symbols and required information, dimensions and materials.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0340.0 READ, INTERPRET AND PRODUCE DRAWINGS.../cont'd

U0340.03 Produce details and drawings using drafting instruments to illustrate to others the work to be performed, the fittings or components to be fabricated or installed, listing all symbols, required information, dimensions and materials and showing correct proportions.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0340.04 Produce an interference drawing by comparing original mechanical, electrical, structural and architectural drawings to identify areas where original design places duct-work, conduit, piping or building systems at conflicting elevations or locations and using drafting instruments, illustrate on that drawing a relocation of the various systems that will resolve the conflict.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0340.05 Read and interpret codes and regulations, manufacturers' equipment manuals and specifications to determine installation clearances and dimensions, required maintenance and pre-operational checks prior to equipment installation and start-up.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0340.0 READ, INTERPRET AND PRODUCE DRAWINGS.../cont'd

U0340.06 Take-off required materials, components, hardware and equipment from drawings and specifications by correctly identifying system components on a drawing, listing all items and required information on bills of material and by calculating and including labour and material costs.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0340.07 Design system lay-out by determining: building size and orientation, window and door areas, U-factors for the building materials used, the number of air changes required by building occupancy, heating and cooling loads. Calculate duct sizes and required locations, fresh air requirements. Determine unit and fan sizes and produce a drawing showing the lay-out of the system and components.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

Employer's Name	Employer's Signature
_____	_____

U0341.0 LAY-OUT AND DRAITING

GENERAL PERFORMANCE OBJECTIVE

Develop patterns for rectangular, round, elliptical and irregular shapes employing parallel line, radial line and triangulation methods, develop templates and jigs and operate CAD/CAM equipment to produce drawings, production and shipping lists.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0341.01 Develop stretch out patterns for various profile forms using trammels, dividers, scribes, rules, squares, straight edges, calculating material thickness and bend allowances, marking symbols, brake points, notches, seams, areas to be rolled or formed, areas to be cut out and transferring measurements and cutting out the patterns accurately to the tolerances required by drawings and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0341.0 LAY-OUT AND DRAFTING .. /cont'd

U034 1.02 Develop patterns for rectangular, round, elliptical and irregular shapes, employing the parallel line method and using trammels, dividers, scribes, rules, squares, straight edges, calculating material thickness and bend allowances, marking symbols, brake points, notches, seams, areas to be rolled or formed, areas to be cut out, transferring measurements and cutting out the patterns accurately to the tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U034 1.03 Develop patterns for conical and pyramid shapes, employing the radial line method and using trammels, dividers, scribes, rules, squares, straight edges, calculating material thickness and bend allowances, marking symbols, brake points, notches, seams, areas to be rolled or formed, areas to be cut out, transferring measurements and cutting out the patterns accurately to the tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U034 1.04 Develop patterns for irregular tapered forms, transitions and double angle forms employing the triangulation method and using trammels, dividers, scribes, rules, squares, straight edges, calculating material thickness and bend allowances, marking symbols, brake points, notches, seams, areas to be rolled or formed, areas to be cut out, transferring measurements and cutting out the patterns accurately to the tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0341.0 LAY-OUT AND DRAFTING .../cont'd

U0341.05 Lay-out and use fitting patterns and templates, jigs for round, square and rectangular companion flanges, gauge lines and hole cutting guides to accurately and efficiently produce standard size fittings and fitting components to uniform dimensions and required tolerances.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U034 1.06 Operate CAD/CAM equipment to produce computer files of shop drawings, working drawings and interference drawings by entering required program from the main menu, correctly selecting sub-menu variables and attributes to input design data including symbols, dimensions, information, fitting and labelling data, store and save files on hard drive and a disk and print finished drawings by sending required computer commands to a fast plotter.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

Employer's Name	Employer's Signature
_____	_____

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT

GENERAL PERFORMANCE OBJECTIVE

Set up and operate hand brakes, foot shears, power brakes, power shears, roll forming equipment, rotary bench machines, punching and notching equipment, slitting equipment, drill presses, rotary cutting equipment, spiral, flex and duct/coil equipment, power rolling equipment, abrasive and friction cutting equipment and operate computer controlled shape cutter.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0342.01 Set up and operate standard hand brakes, box/pan brakes, bar folders, cleat formers and attachments, adjusting front and back gauges to perform profile bending, forming and shaping operations within equipment limitations and capacities to produce fittings and products of ferrous and non-ferrous metals to the tolerances required by drawings and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT.../cont'd

U0342.02 Set up and operate standard foot shears, performing all required equipment adjustments including front and back gauge settings to ensure that the blades and gauges produce clean and accurate cuts within equipment limitations and capacities, to a given line or dimension.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.03 Set up and operate power brakes, selecting and attaching required forming, punching and notching dies, adjusting stroke for various angles, material thickness and lengths, adjusting manual and power operated microprocessor controlled back gauges to perform profile bending forming and shaping operations within equipment limitations and capacities to produce fittings and products of ferrous and non-ferrous metals to tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.04 Set up and operate power shears, performing all required equipment adjustments including the settings for manual and power operated microprocessor controlled back gauges to ensure that the blades and gauges produce clean and accurate cuts within equipment limitations and capacities, to a given line or dimension.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT.../cont'd

U0342.05 Set up and operate roll forming equipment, checking stock width and length, making adjustments for material thickness and profile allowance for various shapes including locks, cleats, panels, pipe and eavestrough.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.06 Set up, adjust and operate manual and power rotary bench machines, selecting and attaching required rolls, making adjustments for material thickness and type, to produce beading, crimping, swaging, flanging, burring, easy edges, elbow edges, furnace collars, wired edges and turning edges of even dimensions free from roller cuts.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.07 Set up and operate manual and power punching and notching equipment, including an ironworker, beverly shear and rotex punches, selecting and positioning required dies and blades to produce holes and notches to the tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT.../cont'd

U0342.08 Set up, adjust and operate slitting equipment by setting guides and positioning slitting rolls to allow for material thickness, produce clean and accurate cuts within equipment limitations and capacities.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.09 Set up and operate a drill press, selecting and attaching required bit size, chuck speed, adjusting depth gauge and drill pressure and securing material with drill vice to produce clean and accurate holes to the tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.10 Set up and operate rotary cutting equipment, adjusting circle arm for radius of cut and offset allowance for various thickness of materials to produce clean and accurate circular, irregular or straight cuts to the tolerances required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.11 Set up, adjust and operate spiral and flex forming equipment, adjusting for material thickness, seam tension and appearance, selecting required mould diameter to produce spiral and flex pipe free from leaks or distortions in shape.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT.../cont'd

U0342.12 Set up and operate duct/coil line equipment to produce various duct sizes, seams, notches, re-enforcement beads and braking, including required pin spotting, application of adhesives and insulation as required by drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.13 Set up and operate manual and power rolling equipment, adjusting rolls for material thickness and radius and performing lead edge preparation to roll metal sheets to required shape and dimensions.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.14 Set up and operate ring rolling equipment, selecting and fitting the required dies/rollers and adjusting roller tension to roll and form flat bar, angle iron and channel to specified radius and contour.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.15 Set up and operate abrasive and friction cutting equipment, selecting and fitting the required cutting blade/accessory and coolant, adjusting blade tension, wheel tension and cutting speed to produce safe, accurate cuts on metals and other materials.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT.../cont'd

U0342.16 Operate CAD/CAM equipment to produce and record production and shipping lists by selecting required program from main menu, correctly selecting sub-menu variables and attributes to input design data including symbols, dimensions, information, fitting and duct numbers, labelling data, orientation, connector type, fitting components, type and gauge of materials, seams, locks and stiffeners and save file on hard drive and .on a disk for use during shop fabrication.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.17 Load fabrication disk on the hard drive of the shop area computer, print labels showing sheet sizes, fitting, components and duct information and transmit file information to computer controlled plasma or laser shape cutter.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0342.0 SET UP AND OPERATE SHOP EQUIPMENT.../cont'd

U0342.18 Set up and operate computer controlled plasma or laser shape cutter, wearing all required personal protective equipment and following manufacturers' specified operating instructions. Perform cutting operations by clearing the previous data from the equipment monitor, selecting in-coming data, loading the required metal on the cutting table, moving the torch to the start position, activating the equipment and labelling, removing and arranging finished pieces in correct sequence for shop forming and fabrication.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

U0343.0 WELD AND CUT

GENERAL PERFORMANCE OBJECTIVE

Set up and operate oxy-fuel cutting and welding equipment, plasma arc cutting equipment, shielded metal arc welding, M.I.G. welding, gas tungsten, carbon arc, plastic and resistance welding equipment, apply thermo-setting materials and perform soldering operations.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0343.01 Set up, operate and maintain manual and automatic oxy-fuel cutting equipment, wearing all required safety clothing and equipment, selecting, fitting and adjusting regulators, cleaning and preparing tips, to produce clean and even cuts on all ferrous metals, free from excessive slag and heat distortion.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0343.02 Set up, operate and maintain plasma arc cutting equipment and components, wearing all required safety clothing and equipment, setting required gas or air pressure, current control, ensuring required speed of travel and distance from workpiece to produce precise cuts on ferrous and non-ferrous metals.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0343.0 WELD AND CUT /cont'd

U0343.03 Set up, operate and maintain manual and automatic oxy-fuel welding equipment, wearing all required safety clothing and equipment, selecting, fitting and adjusting regulators, cleaning and preparing tips, demonstrating dexterity with filler rod and torch manipulation to produce clean, firm welds in the flat and horizontal position of sufficient quality to pass visual inspection.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.04 Set up and operate shielded metal arc welding equipment, wearing all required safety clothing and equipment, selecting required polarity, current settings and electrodes to produce all position welds of sufficient quality to meet the codes and standards established by Canadian Welding Bureau.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.05 Set up and operate metal inert gas (M.I.G.) welding equipment, wearing all required safety clothing and equipment, selecting required polarity, current settings and filler wire, adjusting filler wire speed to produce all position welds of sufficient quality to meet the codes and standards established by Canadian Welding Bureau.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.0 WELD AND CUT.../cont'd

U0343.06 Set up and operate gas tungsten arc welding equipment including components and controls, wearing all required safety clothing and equipment, selecting required polarity and demonstrating dexterity with filler rod and torch manipulation to produce all position welds on ferrous and non-ferrous metals of sufficient quality to meet the codes and standards established by Canadian Welding Bureau.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.07 Set up and operate carbon arc welding equipment, wearing all required safety clothing and equipment, selecting required polarity and current setting, demonstrating dexterity with filler rod and carbon electrode manipulation to produce all position brazing joints on light gauge ferrous metals of sufficient quality to pass visual inspection.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.08 Set up and operate plastic welding equipment by adjusting nozzle temperature, performing required edge preparation, selecting correct filler rod diameter and maintaining required rate of travel to bond plastic fittings or parts in accordance with manufacturers' recommended procedures.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.0 WELD AND CUT.../cont'd

U0343.09 Set up and operate resistance welding equipment, selecting and fitting required tip size, filing to shape, adjusting tip pressure, current setting, weld time and activating cooling water to produce firm spot welds on ferrous and non-ferrous metals with a minimum of tip marking.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.10 Apply thermo-setting materials for bonding operations, wearing all required safety clothing and equipment, completing required material safety data sheets and using fibreglass reinforced polyester (F.R.P.), solvents, catalysts, resins, gauze and application tools to seal, bond and attach FRP pipe, fittings, flanges and components in accordance with manufacturers' recommended procedures.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.11 Perform soldering operations, demonstrating correct methods of forging, shaping and tinning soldering irons, using heating pots, sal ammoniac, required fluxes, soft solders, tools and files, to seam, join and seal ferrous and non-ferrous metals.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0343.0 WELD AND CUT .. /cont'd

U0343.12 Perform hard soldering operations using oxy-fuel equipment and components using required fluxes and hard solders including silver, solder and brazing rods to seam, join and seal ferrous and non-ferrous metals in accordance with drawings, codes and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

U0344.0 FABRICATE FOR SHOP AND FIELD

GENERAL PERFORMANCE OBJECTIVE

Select ferrous and non-ferrous materials, calculate allowances, perform hammering, forming and shaping operations and pin spotting, Apply sealants, join sheet metal with locks and seams, install hardware, cut and fit duct liners, perform final assembly and inspection of fabricated sheet metal.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0344.01 Identify and select ferrous and non-ferrous materials and all other materials used in lieu of metals by reviewing shop take-off sheets and using a metal gauge.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0344.02 Calculate allowances for bends, seams, rolling stretch-outs, small and big ends and material thickness, by applying trade formula and by recording and producing list sizes to ensure accurate cutting lists.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0344.0 FABRICATE FOR SHOP AND FIELD..../cont'd

U0344.03 Perform hammering, metal stretching, forming, shaping and joining operations using bench bars, mandrels, stakes, hammers, mallets and groove seamers to produce work pieces of required shape and dimensions, free from tool marks or metal stress.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.04 Perform manual and automatic pin spotting and insulation operations using specified materials, required tools, adhesives and clips as specified by the Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) standards, job drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.05 Apply sealants, install gaskets, duct sealers and gauze, wearing required protective equipment, using required tools and brushes to secure and effectively seal joints and fittings in accordance with drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.06 Join sheet metal using locks, seams, rivets, companion flanges, cleats, fasteners and welds, using required tools and equipment and following the spacing specified by SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.0 FABRICATE FOR SHOP AND FIELD.../cont'd

U0344.07 Fabricate and install hardware and related system components including turning vanes, dampers, control rods, quadrants, access doors, bracing, coils, and filter sections using required tools, fasteners and equipment to tack, brace, secure and align metal work, ensuring the fit and finish required by SMACNA standards, job drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.08 Measure, cut and fit duct and spouting liners, using friction and abrasive cutting equipment, required tools, adhesives, welding and cutting equipment to ensure a firm fit and bond, smooth and clean interior finish with required laps and setbacks in accordance with drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.09 Perform final assembly of sheet metal work by cleaning, grinding, sanding, polishing, and painting operations to achieve the fit and the finish required by drawing and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0344.0 FABRICATE FOR SHOP AND FIELD .. /cont'd

U0344.10 Conduct final inspection of fabricated sheet metal work by checking measurements, alignment, fit and finish to ensure quality control required by drawings and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

U0345.0 ERECT, REMOVE AND OPERATE WORK PLATFORMS

GENERAL PERFORMANCE OBJECTIVE

Erect, secure, operate and remove site fabricated work platforms, pre-manufactured scaffold, single and multi-level swing stages and manual and motorized work platforms.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0345.01 Erect, secure, operate and remove site fabricated work platforms including angle iron, channel, pipe, beam and decking construction types using required tools and equipment and securing all components to provide safe and effective access to and from the work area in compliance with OHSA and the scaffold manufacturers' directions.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0345.02 Erect, secure, operate and remove all pre-manufactured scaffold including all related brackets and attachments, securing all components to provide safe and effective access to and from the work area in compliance with OHSA and the scaffold manufacturers' directions.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0345.0 ERECT, REMOVE AND OPERATE WORK PLATFORMS..../cont'd

U0345.03 Erect, secure, operate and remove single and multi-level swing stages, including manual and power operated types, boatswains chairs and suspended platforms, using hoisting and rigging equipment, tools and accessories, testing operation of all components to provide safe and effective access to and from work area in compliance with OHSa and the scaffold manufacturers' directions.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0345.04 Erect, secure, operate and remove manual and motorized work platforms using all safety equipment and attachments in compliance with OHSa and the manufacturers' directions.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

Employer's Name	Employer's Signature
_____	_____

U0346.0 RIG AND HOIST

GENERAL PERFORMANCE OBJECTIVE

Demonstrate the ability to tie off personnel, materials and equipment, perform standard hand signals, check condition of hoisting equipment, select and operate hoisting equipment to lift, move and place equipment and materials.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0346.01 Perform all rigging and hoisting operations in compliance with OHSA and in accordance with the Hoisting and Rigging Manual of the Construction Safety Association of Ontario (CSAO) to perform work effectively and to protect self and others.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0346.02 Demonstrate the ability to effectively tie off personnel, materials and equipment with fibre and wire rope using approved knots, hitches, splices and accessories in accordance with the Hoisting and Rigging Manual of the CSAO.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0346.0 RIG AND HOIST.../Cont'd

U0346.03 Demonstrate standard hand signals to convey directions and instructions to co-workers and equipment operators to ensure rigging and hoisting operations are performed safely and effectively in accordance with the Hoisting and Rigging Manual of CSAO.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0346.04 Check condition of hoisting equipment prior to use by checking operation of moving components, condition of fibre and wire ropes and attachments and by replacing damaged parts to ensure safe and effective operation in accordance with the Hoisting and Rigging Manual of CSAO.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0346.05 Select hoisting, lifting and moving equipment by performing calculations to determine the weight load, location of materials and equipment and place of installation to ensure that hoisting, lifting and moving operations are performed safely and effectively within equipment capacities and limitations.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0346.0 RIG AND HOIST.../cont'd

U0346.06 Operate hoisting equipment to lift, move and place equipment and materials using overhead cranes, genie (cable lifts), rope falls, fork lifts, rope and chain falls, tirlors, hydraulic and mechanical jacks, air cushions, and dollys to ensure that hoisting operations are performed safely and effectively in accordance with OHSA and the Hoisting and Rigging Manual of CSAO.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

U0347.0 INSTALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS

GENERAL PERFORMANCE OBJECTIVE

Select tools materials and equipment, position sleeves determine work sequence, establish reference points, locate and install equipment, assemble and erect duct-work, install sound attenuators, isolators, plastic FRP duct systems, louvres, stacks, grilles, diffusers, perform leak test operations, install alternative energy systems, access flooring and clean rooms.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0347.01 Select tools, materials and equipment required for work to be performed by reviewing drawings and specifications, surveying work location to establish lines, grades and elevations to effectively plan and prepare for the installation and erection required by drawings and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0347.02 Position sleeves, fire dampers, inserts, by following drawings to accommodate later installation of Heating, Ventilating and Air Conditioning and other air handling systems to avoid interference with other building systems and amenities in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0347.0 INSTALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS..../cont'd

U0347.03 Determine work sequence and required manpower by reviewing site accessibility, order of assembly, size and weight of components and method of assembly to facilitate effective installation and/or erection in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.04 Establish reference points and bench marks by locating the indicators, symbols and dimensions on drawings and transferring those measurements and marks to the required work location to facilitate fabrication, erection or installation.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.5 Plan and co-ordinate sequence of fabrication and installation by reviewing site accessibility, order of delivery, order of assembly, required labour, materials, equipment and safety requirements and by planning the work in co-operation with other trades.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.0 INSTALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS..../cont'd

U0347.06 Locate and install residential equipment including low, medium and high efficiency furnaces, filters, electronic air cleaners, combustion air, venting, heat recovery ventilators, ventilation, air conditioners and humidifiers and related components using tools, components and accessories to complete installations in accordance with applicable codes, manufacturers' manuals, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.07 Locate and install heating, ventilating and make-up air equipment including coils, boosters, filters and racks, dampers, volume boxes, V.A. V boxes, blowers, fans, humidifiers and filter gauges using tools components and accessories to complete installations in accordance with manufacturers' installation manuals, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.08 Assemble and erect duct work, fittings, plenums, hangers, supports, splitter dampers, silencers and related components, supplementary steel support structures, using tools, hardware and equipment to complete installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.0 INSTALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS..../cont'd

U0347.09 Install sound attenuators, insulation materials and lead shielding for sound and radio frequency abatement, using tools, hardware and equipment to complete installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.10 Install and adjust isolators, flexible connectors and inertia bases to eliminate vibration and sound transmission using tools, hardware and equipment to complete installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.11 Install plastic FRP and other non-metallic duct systems, following manufacturers' recommended procedures and using tools, adhesives and accessories to complete installations in accordance with manufacturers' directions, codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.12 Install louvres, bird and fly screens, intake and exhaust outlets, weather-proofing and related components using tools, hardware and equipment to complete installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.0 INSTALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS..../cont'd

U0347.13 Install stacks, breeching and chimneys including prefabricated pipe and custom fabricated types and related components, using tools, hardware and equipment to complete installations in accordance with drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.14 Locate and install grilles, diffusers, light troughers, linear diffusers, combo units, vectrol extractor dampers, using tools, manufacturers' hardware and attachments to complete installations and to regulate airflow in accordance with drawings and balancing specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.IS Perform leak test operations using air blowers, pressure gauges, sealants and related components to pressurize system to design pressure and locate and seal any leaks in the system.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.16 Install alternative energy systems including solar and heat reclaiming types, using required tools, manufacturers' specified hardware, attachments and components to conserve energy by supporting conventional heating ventilating and air conditioning systems in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.0 INSTALL HEATING, VENTILATING AND AIR CONDITIONING SYSTEMS.../cont'd

U0347.17 Install access flooring for computer zone environmental control using required tools, equipment, components and hardware, following manufacturers' recommended procedures to complete installations and ensure operational performance in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0347.18 Install clean rooms (Environmental Rooms) including all system components and filters, following manufacturers' recommended procedures and installation manuals, to complete installations and ensure operational performance of system in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

Employer's Name	Employer's Signature
_____	_____

U0348.0 FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED INSTALLATIONS

GENERAL PERFORMANCE OBJECTIVE

Fabricate and install dust collecting systems, material handling and conveyor systems, exhaust hoods, industrial ovens, sound abatement shielding, insulation lagging and cladding, chutes, miscellaneous support structures, catch pans, stainless steel equipment, metal shelving, laundry and garbage chutes, fresh air intake and exhaust systems, draft curtains, fire stops and drying systems.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0348.01 Fabricate and install dust collecting systems and reclaim systems including, fabric filter collectors, precipitators, air cleaning devices and explosion venting, related ducting, blast gates, blowers, cyclones, fire dampers, bag house, flexible piping and fittings, sound attenuators and hoppers using tools, hardware and equipment, sealants, soldering and welding equipment to ensure operational performance of system in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0348.0 FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED INSTALLATIONS..../cont'd

U0348.02 Fabricate and install material handling and conveyor systems including vacuum systems, chutes and flumes, air-veyor systems, gravity chutes, conveyor covers, rubber skirting, flame scanners, loop box coolers, trim chutes, sampling systems, using tools, hardware and equipment, piping, fittings, manufactured components, fans, blowers, volume control devices, sealants, soldering and welding equipment and gaskets to ensure operational performance of system in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.03 Fabricate and install fume exhaust hoods and ventilators including heat recovery and filtration systems, and carbon monoxide exhaust systems, fans and blowers, dampers and controls, using fasteners and sealers, tools, hardware and equipment to ensure operational performance of system in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.04 Fabricate and install industrial ovens, spray booths, casings, air-washers, cupolas, and spray eliminators, including all attachments, braces, flashings, expansion joints, associated duct-work, blowers, filters, hardware, sealants and insulation, using tools, rigging and welding equipment to ensure operational performance of system in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.0 FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED INSTALLATIONS..../cont'd

U0348.05 Fabricate and install sound abatement and radio frequency shielding of lead, copper and other shielding materials using hardware, required isolation, tools and equipment, following manufacturers' installation instructions and recommended sequence to complete installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.06 Fabricate and install lagging and cladding, including flashings, strapping and fasteners, clips, locks, seams, sealers, expansion joints, and related components using tools and equipment to enclose, protect, seal and weatherproof insulation material covering equipment, piping and other installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

D0348.07 Fabricate and install chutes, spouting, hoppers, dryers and elevator leg casings, using tools, equipment and hardware, welding and rigging equipment, aligning all components and performing necessary adjustments to ensure effective operation and fit in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.0 FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED INSTALLATIONS... /cont'd

U0348.08 Fabricate and install miscellaneous/supplementary steel support structures and imbedded parts using tools, hardware, welding, cutting and rigging equipment to secure, brace and support duct-work, stacks, equipment and installations in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.09 Fabricate and install catch pans, drip pans and guards, using tools, hardware and equipment to complete installations in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.10 Custom fabricate and install stainless steel equipment and components for hospital, kitchen laboratory and general industrial and commercial purposes, using tools, equipment and hardware, welding and cutting equipment to ensure the required fit and finish in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.11 Fabricate and install metal shelving, racking, toilet partitions and lockers, following manufacturers' recommended installation procedures, using tools, hardware and equipment to ensure correct alignment, fit and finish in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.0 FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED INSTALLATIONS..../cont'd

U0348.12 Fabricate and install laundry, garbage chutes and mail chutes including related access doors, fire dampers and components, using tools, hardware and equipment to complete installations in accordance with codes, drawings and specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.13 Fabricate and install fresh air intake and exhaust systems including motorized dampers, silencers, louvres, and flexible connectors for standby electrical generators using tools, hardware and equipment to complete installations and ensure correct operation of the generator in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.14 Fabricate and install draft curtains and fire stops including hangers, required supports, access openings and protective fire doors using tools, equipment, hardware, welding, rigging and cutting equipment, to ensure zone isolation, fire protection and containment in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0348.0 FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED INSTALLATIONS.../CONT'D

U0348.15 Fabricate and install specialized drying systems used in pulp and paper manufacturing operations including hoods, pocket ventilators, economizers, eliminators, blades, fans, volume dampers, doors, related duct-work, fittings, components and controls, using tools, equipment, hardware, welding, rigging and cutting equipment, ensuring correct alignment, fit and effective operation in accordance with codes, drawings and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

U0349.0 TEST, ADJUST AND BALANCE

GENERAL PERFORMANCE OBJECTIVE

Determine location of equipment, complete system data sheets, check position of dampers, activate system equipment, measure fan velocity and static pressure, locate pitot transverse stations, adjust dampers, check air quality, take final readings and compile a balancing report.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0349.01 Determine location of equipment, components and controls by reviewing systems drawings and by visual inspection of the installation to organize and plan the sequence of operations for the testing, adjusting and balancing work to be performed.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0349.02 Complete system data sheets including schematic drawings showing test locations and system components, listing specified and actual air quantities, hydronic and performance data to accurately record the status of the system.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0349.0 TEST, ADJUST AND BALANCE..../cont'd

U0349.03 Check position of dampers including volume control dampers and fire dampers. Check that all filters are in place, following schematic and system drawings and remove shipping bolts and hold down straps to prepare system for start-up and initial performance checks.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.04 Activate system equipment under maximum load conditions. Check rotation of blowers and motors, motor and fan rpm and check motor amperage using tachometers and ammeters to ensure the system has been installed in accordance with codes, drawings and specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.05 Measure fan velocity and static pressure, calibrating and using instruments including manometers, pitot tubes, magnehelic gauges, anemometers, electronic instruments and velometers. Perform calculations to determine air velocities in HVAC systems and convert test readings to air volume and accurately record findings on system data sheets.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.0 TEST, ADJUST AND BALANCE..../cont'd

U0349.06 Measure fan velocity and static pressure, calibrating and using instruments, including manometers, pitot tubes, magnehelic gauges, anemometers, electronic instruments and velometers. Perform calculations to determine the velocities required for conveying various materials and convert test readings to air volume and accurately record findings on system data sheets.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.07 Locate pitot traverse stations on trunk ducts and take readings using pitot tubes, manometers, magnehelic gauges. Perform calculations to convert velocities into air volumes and accurately record findings on system data sheets and make fan and damper adjustments where air volumes do not match design specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.08 Adjust dampers, diffusers, grilles, and registers on branch ducts, taking readings with velometers, electronic instruments and magnehelic gauges, performing calculations to convert velocities into air volumes and accurately record findings on system data sheets and make adjustments to achieve the air distribution required by design specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.0 TEST, ADJUST AND BALANCE..../cont'd

U0349.09 Adjust dampers, blast gates, branch ducts on material handling systems, taking readings with velometers, pitot tubes, manometers, electronic instruments, and magnehelic gauges, performing calculations to convert velocities into air volumes and accurately record findings on system data sheets and make adjustments to achieve the air distribution and material handling capacities required by design specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.10 Check air quality and sound levels using sling psychrometers, psychometric charts, thermometers, filter gauges, sound meters, carbon monoxide sensing devices/equipment and air sampling devices. Visually check filter and humidification systems and accurately record findings on system data sheets and make adjustments to ensure that the systems' performance conforms to design specifications.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0349.0 TEST, ADJUST AND BALANCE..../cont'd

U0349.11 Take final readings of temperatures, air velocities, volumes, and air distribution, humidity, fan revolutions per minute, fan motor readings, operation of dampers and controls, filter and unit resistance, using test instruments and compile a detailed balancing report in accordance with drawings and specifications.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

U0350.0 INSTALL ROOFING AND ARCHITECTURAL METALS

GENERAL PERFORMANCE OBJECTIVE

Fabricate and install copings and flashings, cornice work, expansion joints, soakers, metal roofs, single or double walled siding and floor decking, gutters, down-spouts, scuppers, skylights, roof entries, minarets, turrets and ventilators.

TERMINAL PERFORMANCE OBJECTIVES

Supervisor's Name (print)

Apprentice's Name (print)

SKILLS

U0350.01 Fabricate and install coping and flashings of ferrous and non-ferrous metals, using tools, equipment, hardware, caulking and soldering equipment and starter strips to cover and waterproof roofing installations in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0350.02 Fabricate and install architectural cornice and decorative work, using tools, equipment, hardware, caulking and soldering equipment, clips, cleats, locks and seams to seal, protect, weatherproof and enhance the appearance of architectural structures in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed

Supervisor's Signature

Apprentice's Signature

U0350.0 INSTALL ROOFING AND ARCHITECTURAL METALS.../cont'd

U0350.03 Fabricate and install expansion joints of ferrous and non-ferrous metals, butyl rubber or other materials to seal, protect and weatherproof building materials and structures, using tools, equipment, sealants, hardware and soldering equipment, clips, cleats, locks and seams to maintain a waterproof seal during thermal expansion, contraction and settling of building structures in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0350.04 Fabricate and install soakers, flashings for step, cape, hip, valley, ridge, gravel stops and nosing, using tools, hardware, soldering equipment, sealants, drills, clips, cleats, locks and seams to protect and weatherproof building materials and structures in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0350.05 Fabricate and install ferrous and non-ferrous metal roofs, including corrugated, flat, lapped, batten seam, inverted and other types joined by seams, cleats, fasteners, and locks using tools, hardware, equipment, sealants, soldering equipment, clips and cleats, to seal, protect, weatherproof and enhance the appearance of architectural structures in accordance with codes, drawings, specifications and SMACNA standards.

U0350.0 INSTALL ROOFING AND ARCHITECTURAL METALS..../cont'd

U0350.06 Install single or double walled siding, roof and floor decking using tools, equipment, hardware, locks, seams, soldering equipment, sealants, clips, cleats, insulation, gaskets, hoisting, rigging and welding equipment, scaffolding and swing stages, Z bars and structural supports, vapour barriers and related components to enclose, seal and weatherproof structures in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0350.07 Fabricate and install gutters, down-spouts, scuppers and conductor heads using tools, hardware, soldering equipment, sealants, clips, spikes, locks and seams, snow and ice guards, to seal and weatherproof structures in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed	Supervisor's Signature	Apprentice's Signature
_____	_____	_____

U0350.08 Fabricate, install, repair, enclose and weatherproof skylights, roof entries, smoke and explosion hatches, louvred enclosures and roof penetrations including all components and flashings using tools, hardware, soldering equipment, sealants, clips, cleats, locks and seams to permit natural lighting and ventilation into buildings and to seal and weatherproof structures in accordance with codes, drawings, specifications, and SMACNA standards.

U0350.0 INSTALL ROOFING AND ARCHITECTURAL METALS.../cont'd

U0350.09 Fabricate and install towers, minarets, steeples, turrets, ventilators, monitors and other roofing enclosures using tools, equipment, hardware, caulking and soldering equipment, clips, cleats, locks and seams to seal, protect, weatherproof and enhance the appearance of architectural structures in accordance with codes, drawings, specifications and SMACNA standards.

Date Completed

Supervisor's Signature

Apprentice's Signature

Employer's Name

Employer's Signature

**AREAS OF
COMPETENCY**



COMPETENCY ANALYSIS PROFILE

SHEET METAL WORKER



PROTECT SELF AND OTHERS 1.0	Wear, adjust and maintain safety clothing and equipment 1.1	Identify hazards in the work area 1.2	Perform work in accordance with safety legislations 1.3	Check condition of ladders, scaffolding and related equipment 1.4	Communicate with co-worker 1.5
	Inspect and maintain tools and equipment 1.6	Apply basic first aid to self and coworkers 1.7			
USE AND MAINTAIN HAND/POWER TOOLS AND EQUIPMENT 2.0	Select, maintain and use hand tools 2.1	Select, use and maintain power tools 2.2	Select maintain and use tools and devices to measure 2.3	Select, maintain and operate explosive actuated tools 2.4	
	Read and interpret drawings and specifications 3.1	Produce free-hand sketches 3.2	Produce details and drawings 3.3	Produce an interference drawing 3.4	Read and interpret codes and regulations 3.5
READ, INTERPRET AND PRODUCE DRAWINGS 3.0	Take-off required materials from drawings 3.6	Design system lay-out. 3.7			
	Develop stretch out patterns 4.1	Develop patterns employing the parallel line method 4.2	Develop patterns employing the radial line method 4.3	Develop patterns employing the triangulation 4.4	Lay-out and use fitting patterns and templates 4.5
LAY-OUT AND DRAFTING 4.0	Operate CAD/CAM equipment to produce shop drawings 4.6				
	Set up and operate standard hand brakes 5.1	Set up and operate standard foot shears 5.2	Set up and operate power brakes 5.3	Set up and operate power shears 5.4	Set up and operate roll forming equipment 5.5
SET-UP AND OPERATE SHOP EQUIPMENT 5.0	Set up, adjust and operate rotary bench machines 5.6	Set up and operate punching and notching equipment 5.7	Set up and operate sitting equipment 5.8	Set up and operate a drill press 5.9	Set up and operate rotary cutting equipment 5.10

**AREAS OF
COMPETENCY**



COMPETENCY ANALYSIS PROFILE

SHEET METAL WORKER



	Set up and operate spiral and flex forming equipment 5.11	Set up and operate duct/coil line equipment 5.12	Set up and operate rolling equipment 5.13	Setup and operate ring rolling equipment 5.14	Set up and operate abrasive cutting equipment 5.15
	Operate CAD/CAM equipment to produce production lists 5.16	Load disk on shop area computer 5.17	Set up and operate plasma or laser shape cutter. 5.18		
WELD AND CUT 6.0	Set up and operate oxy-fuel cutting equipment 6.1	Set up and operate plasma arc cutting equipment 6.2	Set up and operate oxy-fuel welding equipment 6.3	Set up and operate resistance welding equipment 6.4	Set up and operate metal inert gas welding equipment 6.5
	Set up and operate gas tungsten arc welding equipment 6.6	Set up and operate carbon arc welding equipment 6.7	Set up and operate plastic welding equipment 6.8	Set up and operate resistance welding equipment 6.9	Apply thermo-setting materials 6.10
	Perform soldering operations 6.11	Perform hard soldering operations 6.12			
FABRICATE FOR SHOP AND FIELD 7.0	Identify and select ferrous and non-ferrous ferrous material 7.1	Calculate allowances for bends and seams 7.2	Perform hammering, metal stretching and forming operations 7.3	Perform pin spotting operations 7.4	Apply sealants, install gaskets and duct sealers 7.5
	Join sheet metal using locks and seams 7.6	Fabricate and install hardware 7.7	Measure, cut and fit duct liners 7.8	Perform final assembly of sheet metal work 7.9	Conduct final inspection of sheet metal work 7.10
ERECT, REMOVE AND OPERATE WORK PLATFORMS 8.0	Erect and use site fabricated work platforms 8.1	Erect and use pre-manufactured scaffold 8.2	Erect and operate swing stages 8.3	Erect and operate motorized work platforms 8.4	
RIG AND HOST 9.0	Perform all rigging and hoisting operations in compliance with OHSA 9.1	Tie off personnel, materials and equipment 9.2	Demonstrate standard hand signals 9.3	Check condition of hoisting equipment 9.4	Select lifting and moving equipment 9.5

**AREAS OF
COMPETENCY**



COMPETENCY ANALYSIS PROFILE

SHEET METAL WORKER



	Operate equipment to lift, move and place equipment and materials 9.6				
INSTALL HEATING VENTILATING AND AIR CONDITIONING SYSTEMS 10.0	Select tools, materials and equipment 10.1	Position sleeves, fire dampers and Inserts 10.2	Determine work sequence 10.3	Establish reference points and bench marks 10.4	Plan and co-ordinate sequence of installation 10.5
	Locate and install residential equipment 10.6	Locate and install equipment 10.7	Assemble and erect duct work 10.8	Install sound attenuators 10.9	Plan and co-ordinate sequence of installation 10.10
	Install plastic duct systems 10.11	Install louvers, bird and fly screens 10.12	Install stacks, breeching and chimneys 10.13	Locate and install grilles and diffusers 10.14	Perform leak test operations 10.15
	Install alternative energy systems 10.16	Install access flooring 10.17	Install clean rooms 10.18		
FABRICATE AND INSTALL INDUSTRIAL ENVIRONMENTAL SYSTEMS AND SPECIALIZED 11.0	Fabricate and install dust collecting systems 11.1	Fabricate and install material handling systems 11.2	Fabricate and install exhaust hoods 11.3	Fabricate and install ovens and spray booths 11.4	Fabricate and install sound abatement material 11.5
	Fabricate and install lagging and cladding 11.6	Fabricate and install chutes, spouting and hoppers 11.7	Fabricate and install supplementary support structures. 11.8	Fabricate and install catch pans 11.9	Custom fabricate stainless steel equipment 11.10
	Fabricate and install metal shelving 11.11	Fabricate and install laundry chutes 11.12	Fabricate and install fresh air intake and exhaust systems 11.13	Fabricate and install draft curtains 11.14	Fabricate and install drying systems 11.15
TEST, ADJUST AND BALANCE 12.0	Determine location of equipment 12.1	Complete system data sheets 12.2	Check position of dampers 12.3	Activate system equipment 12.4	Measure fan velocity in HVAC systems 12.5

**AREAS OF
COMPETENCY**



COMPETENCY ANALYSIS PROFILE

SHEET METAL WORKER



**INSTALL,
ROOFING AND
ARCHITECTURAL
METALS
13.0**

Measure fan velocity for conveying various materials 12.6	Locate pilot traverse stations 12.7	Adjust dampers diffusers and grilles 12.8	Adjust dampers, blast gates and branch ducts 12.9	Check air quality and sound levels 12.10
Take final reading				
Fabricate and install coping and flashings 13.1	Fabricate and install cornice and decorative work 13.2	Fabricate and install expansion joints 13.3	Fabricate and install soakers and flashing 13.4	Fabricate and install metal roofs. 13.5
Install single or double walled siding 13.6	Fabricate and install gutters and down spouts 13.7	Fabricate and install skylights and roof entries 13.8	Fabricate and install Towers and minarets 13.9	