

Job Grading Standard for Composite/Plastic Fabricating, 4352

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INTRODUCTION

This standard provides the job definition, titling instructions, and grading criteria for nonsupervisory jobs in the Composite/Plastic Fabricating, 4352, for Federal Wage System (FWS) and other trades, craft, and labor pay plans.

This standard is divided into three parts. Part I contains occupational information applicable to Federal work covered by this standard without regard to pay plan or job grading system. Part II provides the grading criteria for jobs classified in accordance with FWS Key Ranking Jobs used to create the grade framework for FWS jobs. Part III will include explanatory material about the development of this standard and will be added after this draft is finalized.

The term “Federal Wage System” or “FWS” denotes the major job grading system and pay structure for trades, craft, and labor work in the Federal Government. Some agencies have replaced the FWS pay plan indicators with agency-unique pay plan indicators. References to Federal Wage System and Wage Grade (WG) have been omitted from much of this job grading standard.

Coverage

This job grading standard covers nonsupervisory jobs involved in the repair, fabrication, modification, removal, and installation of composite and/or plastic items, parts, assemblies, and structures.

Cancellation of Existing Occupational Standard

Issuance of this job grading standard supersedes the current standard, as described in the following table:

Previous Standard	Action Taken
Plastic Fabricating, 4352	Supersedes the standard for Plastic Fabricating, 4352 , last revised September 1978.

PART I – OCCUPATIONAL INFORMATION

Part I is intended for use by all agencies in evaluating trades, craft, and labor work in the Composite/Plastic Fabricating, 4352. It provides the job definition, titling instructions, and detailed information for this occupation.

General Job Determination Guidelines

For a variety of reasons, selection of the correct occupation for a job is essential to the human resources management process. For example, qualification requirements used in recruiting and organizational structure are often designed with consideration of the occupation.

Determining the correct occupation for a job is usually apparent by reviewing the assigned duties and responsibilities and then comparing them to the job definition and general occupational information provided by the standard. Generally, the job determination is based on the primary work of the job, the highest level of work performed, and the paramount skill and knowledge required to do the work. Normally, it is fairly easy to make this decision. However, in other instances, determining the correct occupation may not be as obvious.

When a job requires the performance of work in two or more occupations (mixed jobs), select the occupation most important for recruitment, selection, placement, promotion, or reduction in force purposes. This is typically the occupation having the highest skill and knowledge requirements.

Use the following guidelines to determine the appropriate occupation when the work matches more than one job. It is sometimes difficult to determine which particular occupation predominates. In such situations, apply the guidelines below in the order listed to determine the correct job.

- **Paramount skill and knowledge required.** Although there may be several different kinds of work in the job, most will have a paramount skill and knowledge requirement. The paramount skill and knowledge is the most important type of knowledge or experience required to do the work.
- **Reason for existence.** The primary purpose of the job or management's intent in its establishment is a positive indicator for determining the appropriate occupation.
- **Organizational mission and/or function.** Jobs generally align with the mission and function of the organization to which they are assigned.
- **Recruitment source.** Supervisors and managers can help by identifying the occupation that provides the best qualified applicants to do the work. This is closely related to the paramount skill and knowledge required.

Although the work of some jobs may require applying related skill and knowledge in repair, fabrication, modification, removal, and installation of composite and/or plastic items, parts, assemblies, and structures, classification to the Composite/Plastic Fabricating, 4352, may not be appropriate. The [Additional Occupational Considerations](#) section of this standard provides examples where the work may involve applying related skill and knowledge, but not to the

extent it warrants classification to this occupation.

Additional information may be found in the Office of Personnel Management (OPM) publication [Introduction to the Federal Wage System Job Grading System](#).

Occupational Information

COMPOSITE/PLASTIC FABRICATING, 4352		<u>Qualification Standard</u>
Job Definition	<p>This occupation covers nonsupervisory jobs involved in the repair, fabrication, modification, removal, and installation of composite and/or plastic items, parts, assemblies, and structures. Composite and plastic fabricating work requires knowledge of the physical properties and working characteristics of plastic, composite, and compound ingredients, with a working knowledge of metals, metal properties, and metal characteristics.</p> <p>Composite/plastic fabricating work requires skill and knowledge in:</p> <ul style="list-style-type: none"> • interpreting blueprints, sketches, and manufacturers’ instructions with specifications ply orientation, termination, and stacking sequence of laminates; • using a variety of low-pressure shaping, forming, and casting processes; • using casting and low-pressure processing techniques; • assembling, mating, and/or fitting skin assemblies, substructures, and/or honeycomb cores; • making master molds, patterns, and form blocks, and performing cutting and finishing operations; • using vacuum and medium pressure assembly bonding and high pressure laminating techniques (autoclave) to repair, remanufacture, and fabricate materials; and • bonding metal to composite materials or composite materials to metal. 	
Titling	<p>Title 5, United States Code, requires OPM to establish authorized official job titles within occupations. These include a basic title (e.g., Plastic Fabricator) and may be appended with one or more prefixes and/or suffixes. Agencies must use the official job titles for human resources management, budget, and fiscal purposes.</p> <p>The official titles for jobs in this occupation are:</p> <p>Journey and Intermediate Levels (Under the FWS, journey level jobs are at grade 9 or above, and intermediate level jobs are at grade 7 or 8)</p> <p><i>Composite Fabricator</i> for jobs primarily involving composite materials.</p> <p><i>Plastic Fabricator</i> for jobs primarily involving plastics.</p> <p><i>Composite and Plastic Fabricator</i> for jobs involving a mix of these functions, where neither is predominant.</p> <p>Worker Level (Under the FWS, jobs with these titles are at grade 9 or below)</p> <p><i>Composite Worker</i> for jobs primarily involving composite materials.</p> <p><i>Plastic Worker</i> for jobs primarily involving plastics.</p> <p><i>Composite and Plastic Worker</i> for jobs involving a mix of these functions, where neither is predominant.</p>	

(continued)

COMPOSITE/PLASTIC FABRICATING, 4352 (continued)	
Titling (continued)	<p>Helper Level (Under the FWS, jobs with these titles are at grade 5)</p> <p><i>Composite Fabricator Helper</i> for jobs helping journey level composite fabricators.</p> <p><i>Plastic Fabricator Helper</i> for jobs helping journey level plastic fabricators.</p> <p><i>Composite and Plastic Fabricator Helper</i> for helper jobs involving a mix of these functions, where neither is predominant.</p> <p>Supervisors and Leaders</p> <ul style="list-style-type: none"> • Add the suffix “Supervisor” to the basic title when the agency classifies the job as supervisory. If the job is covered by the Federal Wage System refer to the Federal Wage System Job Grading Standard for Supervisors for additional titling and grading information. • Add the suffix “Leader” to the basic title when the agency classifies the job as leader. If the job is covered by the Federal Wage System refer to the Federal Wage System Job Grading Standard for Leader WL/NL for additional titling and grading information.

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COMPOSITE/PLASTIC FABRICATING, 4352 (continued)**General Occupational Information**

Work with composite and/or plastic materials requires skill and knowledge in repairing, fabricating, modifying, removing, and installing composite and/or plastic items, parts, assemblies, and structures. The work also requires skill and knowledge in restoring damaged item surfaces to their original level of strength and durability. For the purposes of this standard composite fabricating will refer to repair or fabricating work using composite and/or advanced composite materials.

Composites are sometimes referred to as fiber-reinforced plastics and include materials such as fiberglass-polyester and fiberglass-epoxy. These materials are low in stiffness, resulting in reduced compression load-carrying capability and overall structural stiffness requirements. Due to their structural limitations, these materials have limited use for secondary structural components such as radomes and panels.

Advanced composite structures are generally made of a fibrous material embedded in a resin matrix. This structure of laminated plies is oriented in various directions to give it strength and stiffness. The fibers are made of boron, carbon, or aramid, or other types of fibers. The most common matrix (or bonding) material is epoxy. Other types of bonding materials are polyamide, polyester, or phenol. New materials are continuously becoming available.

Damage to composite items can occur externally and/or internally, though damage to plastic items or components is generally external. External damage includes scratches, dents, edge crushing, punctures, gouges, and cracks. Internal damage is related to delaminations, crushed core, steam pressure, or corrosion.

Tools and equipment used in composite and/or plastic work include high-speed routers, diamond and carbide tipped hole saws, portable saws and sanders, and skin peeling tools. Workers and fabricators operate core-forming equipment including autoclaves and curing ovens. They adjust computer programs and run equipment as needed. They use hand tools and miscellaneous equipment including fairing bars, pressure bars, mandrels, and vacuum blanket support. Woodworking equipment is used to cut, machine, and finish plastics; make molds, patterns, and forms from wood, plastic, plaster, rubber, and clay; and apply low-pressure shaping and forming techniques. Repair and finishing operations may involve trimming excess material, and machining, drilling, reaming, bonding, bolting, and final assembly of parts and components.

Materials used in composite and/or plastic work include adhesives such as foam and non-foaming tapes, liquid, core splice adhesives, paste, or aerodynamic smoothers. Bonding agents are also used in a variety of procedures such as fastening head grooves, external sealing grooves, or gaps at skin panel splices.

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Impact of Technological Advancements

Technological advancements in the field of composite/plastic materials and the methods required to modify or fabricate them have an impact upon the work and have been taken into consideration in the development of this standard. Advances in composite and plastic materials provide valuable alternatives to more traditional materials, for example, metals. Newer composite materials can withstand high pressure and temperature and highly corrosive environments while providing increased strength where conventional materials have been found insufficient. Composite materials exhibit good resistance to temperature extremes and wear and have high strength-to-weight ratios resulting in lighter weight materials. Composites are also more adaptable to specific applications.

Employees use computer-controlled core-cutting and curing machines to perform their work. They routinely use personal computers or computer terminals to reference technical manuals, order supplies and tools, and track components in process. Employees also adjust computer programs to run equipment as needed and use computers to perform basic work processes. However, the knowledge of composite/plastic properties and processes in performing the work remains the paramount subject matter knowledge required. Automation does not change the primary purpose of the work or the paramount skill required to do the work.

Additional Occupational Considerations

Some jobs may include work requiring skill and knowledge typically associated with the Composite/Plastic Fabricating, 4352. In some cases, a closer look at the work may reveal classification to this job may not always be appropriate. The [General Job Determination Guidelines](#) section of this standard offers guidance on selecting the most appropriate job.

The following table provides examples of work similar to that performed by composite and plastic fabricators, but not to the extent the paramount skill and knowledge required would warrant classification to Composite/Plastic Fabricating, 4352.

If Work Involves...	See This Job Definition:
Fabricating, repairing, modifying, and installing sheet metal parts, items, and assemblies	3806, Sheet Metal Mechanic
Setting up and operating molding equipment for the manufacture of plastic parts and items	4351, Plastic Molding Equipment Operating
Planning, laying out, and constructing patterns and core boxes for foundry operations or the manufacture of wood or wood substitute form blocks	4616, Patternmaking 4654, Form Block Making
Planning and fabricating research and prototype models made from a variety of materials and processes for use in scientific, engineering, developmental, experimental, and test work	4714, Model Making
Fabricating visual displays, exhibits, and training devices using a variety of materials such as wood, metal, plastic, and plaster	4715, Exhibits Making/Modeling

Crosswalk to the Standard Occupational Classification

The Office of Management and Budget requires all Federal agencies use the Standard Occupational Classification (SOC) system for statistical data reporting purposes when collecting occupational data. The Bureau of Labor Statistics uses SOC codes for the National Compensation Survey and other statistical reporting. The Office of Personnel Management (OPM) and other Federal agencies maintain a “crosswalk” between OPM authorized occupational series and the SOC codes to serve this need. This requirement and these SOC codes have no effect on the administration of any Federal human resources management system. The information in this table is for informational purposes only and has no direct impact on classifying jobs covered by this job grading standard. The SOC codes shown here generally apply only to nonsupervisory jobs in these occupations. As changes occur to the SOC codes, OPM will update this table. More information about the SOC is available at <http://stats.bls.gov/soc>.

**Federal Occupational Series and Job Titles
and Their Related Standard Occupational Classification System Codes**

Federal Occupational Series	Standard Occupational Classification Code Based on Occupational Series		Job Title	Standard Occupational Classification Code Based on Job Title	
Composite/Plastic Fabricating, 4352	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	Composite Fabricator	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
			Plastic Fabricator	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
			Composite and Plastic Fabricator	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic

PART II – GRADING INFORMATION

Part II provides grading information for use in determining the appropriate grade of nonsupervisory jobs in the Composite/Plastic Fabricating, 4352. These grading criteria are applicable to Federal Wage System jobs. You will find more complete instructions for evaluating jobs in the following OPM publications: [Introduction to the Federal Wage System Job Grading System](#) and the [Operating Manual for the Federal Wage System](#).

General Job Grading Guidelines

Jobs are graded by use of a method involving consideration of the total job including:

- its purpose and relationship to other jobs;
- analysis of the work done and its requirements; and
- determination of the correct grade by comparison with the grade definitions in an appropriate job grading standard.

For trades, craft, and labor work, four factors are considered in grading jobs:

- **Skill and Knowledge** – Covers the nature and level of skill, knowledge, and mental application required in performing assigned work. Jobs vary in such ways as the kind, amount, and depth of skill and knowledge needed, as well as in the manner, frequency, and extent to which they are used.
- **Responsibility** – Covers the nature and degree of responsibility involved in performing work. Jobs vary in responsibility in such ways as the complexity and scope of work assigned, the difficulty and frequency of judgments and decisions made, the kind of supervisory controls, and the nature of work instructions and technical guides used.
- **Physical Effort** – Covers the physical effort exerted in performing assigned work. Jobs vary in such ways as the nature, degree, frequency, and duration of muscular effort or physical strain experienced in work performance.
- **Working Conditions** – Covers the hazards, physical hardships, and working conditions to which workers are exposed in performing assigned work.

Determining Grade Levels

This standard describes work at grades 7, 9, 10, and 11. It does not describe all possible levels at which jobs might be established. You may grade jobs differing substantially from the level of skill, knowledge, and other work requirements described in this standard above or below these grade levels by applying sound job grading principles.

Helper and Intermediate Jobs

Use the Office of Personnel Management's [Federal Wage System Job Grading Standard for Trades Helper Jobs](#) and [Federal Wage System Job Grading Standard for Intermediate Jobs](#) to grade helper and intermediate jobs in Composite/Plastic Fabricating, 4352.

Grade Level Descriptions

COMPOSITE AND PLASTIC WORKER, GRADE 7

General: Grade 7 composite and plastic workers repair, restore, and remove composite or plastic parts and structures with surface damage such as chips, scratches, minor cuts, pits, abrasion, dents, surface ply rips, delamination, disbond, and bubbles. At this level, the presence of the imperfections will not affect the serviceability of the final product. Grade 7 workers repair and restore the aerodynamic smoothness of the part to prevent further damage. They bond composites, plastics, and metals. They set up and operate various standard industrial machines, tools, and equipment, such as sanders, routers, drills, heat blankets, heat lamps, pre-constructed jigs, molds, and form blocks.

Workers follow specific instructions and use established methods, processes, blueprints, and technical directives to accomplish routine assignments. Workers repair regularly shaped laminated engine case coverings, domes, sinks, and deck housings. Composite workers prepare composite materials for bonding or repairing by shaping, cutting, drilling, installing a filler material, and applying a heat blanket and vacuum bag materials onto composite or other surfaces. Plastic workers pour liquid plastic compounds into molds, and shape, cut, drill, and install plastic aircraft canopies and windshields.

Skill and Knowledge: Grade 7 composite and plastic workers must have and apply knowledge of:

- the physical properties and working characteristics of commonly used composite materials, plastic resins, and sheet stock, such as polyesters, acrylics, and vinyl;
- the effect of chemical reactions between resins and other compound ingredients, such as catalysts, fillers, retardant compounds, and pigments;
- the proper sequence and proportions for weighing, mixing, and blending ingredients by hand or machine;
- the use, preservation, and storage needs of resins, adhesives, composites, compound agents, solvents, cleaning and parting agents, and other chemicals used to perform assignments;
- bagging and curing procedures; and
- repair techniques such as scarf and step joint methods, spray-up, drape, vacuum snap-back, vacuum and pressure bag molding, dipping and encapsulation, foaming, casting, potting, trimming, sanding, and routing.

Composite and plastic workers must have skill to:

- examine parts and items to locate defects;
- estimate the amount of adhesive filler needed for a repair by approximating the depth, length, and width of the damaged area in inches and then estimating the amount of filler in grams;
- pour or inject liquid compounds into voids and available molds;
- remove excess resin or composite material;
- repair regularly shaped composite materials or laminated and transparent plastic items which have been burned, chipped, scratched, cut, pitted, dented, ripped, contaminated by moisture, or otherwise damaged;
- outline the parameter for repair and transfer reference marks from the skin to the patch; and
- bond plastic to plastic, plastic to metal, composite material to composite material, or composite material to metal.

Grade 7 Level Description

(continued)

COMPOSITE AND PLASTIC WORKER, GRADE 7 (continued)

Plastic workers have skill in:

- preparing defective surfaces by sanding, scraping, and applying prepared solvents and cleaning agents;
- smoothing or removing scratches, dents, depressions, and uneven surfaces;
- cleaning and preparing mold surfaces with release agents;
- coating items with protective compounds by dipping or brushing;
- removing defective layers of reinforcement;
- calculating surface and volume dimensions to determine the correct amount of compound and reinforcement materials based upon specific manufacturer or shop instructions;
- marking, cutting, and trimming materials such as pre-impregnated plastics, sheet stock, fiberglass cloth, or foam;
- cutting honeycomb to dimensions given in simple drawings or work orders, using templates and forms as guides; and
- using preconstructed molds and form blocks to manufacture a variety of plastic parts or items.

Composite and plastic workers must have the ability to use and operate tools and equipment including:

- measuring instruments such as balance and gram scales to weigh resins and other compound ingredients;
- hand sanders, orbital sanders, and cleaning equipment;
- router motors, cutters, drills, and fasteners to remove or join materials;
- moisture indicators and optical micrometers to detect and measure depths of damaged areas;
- rulers, squares, forms, and templates to measure materials and trim lines;
- scissors, shears, knives, and power saws to cut and trim materials;
- injection guns and pressure regulators to repair delaminations and disbonds on composite surfaces; and
- rivet guns, drills, files, squeegees, and rollers to accomplish fabrication and final installation.

Responsibility: Grade 7 composite/plastic workers receive detailed oral or written instructions from the supervisor. They receive sketches or easily understood blueprints explaining what to do and listing materials to use. They notify the supervisor or higher-graded worker(s) when they encounter problems after using standard methods and techniques. The supervisor spot-checks the work in progress and reviews the work upon completion to ensure it meets standards.

Physical Effort: Work assignments at this level require moderate effort. Workers frequently stand, stoop, bend, kneel, reach, and work in uncomfortable positions. They frequently lift and carry materials and equipment weighing less than 50 pounds (under 23 kilograms).

Working Conditions: While work is normally performed inside well-heated and well-lighted areas, workers at this level may also work in unheated buildings or outside in all types of weather conditions. Work conditions frequently include exposure to loud noise, dust, fumes, and toxic and/or potentially flammable and explosive chemicals that can cause skin, eye, and lung irritations. In addition, there is the possibility of cuts, bruises, burns, and falls while working on platforms or climbing ladders.

To minimize or eliminate the effects of adverse conditions, composite and plastic workers follow numerous safety practices. They wear or use various protective devices such as aprons, gloves, and protective creams to help guard against skin irritations caused by resins, catalysts, solvents, and other chemical compounds. They wear earplugs to lessen noise caused by power equipment. Fans and respirators are used to protect against dust, vapors, and fumes in the air. Workers follow numerous safety practices while operating tools and equipment and while storing and mixing potentially explosive chemicals.

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COMPOSITE AND PLASTIC WORKER, GRADE 9

General: Grade 9 composite and plastic workers repair, fabricate, modify, and install composite and/or plastic items, parts, assemblies, and structures with contours that must be reestablished or must meet rigid mechanical or electrical tests. Composite and plastic workers use standard trade practices, processes, and techniques in accomplishing assignments. Composite work involves fabricating parts or patches for use in repair, modification, or part replacement. These parts include aircraft ribs, spars, or bulkheads. Plastic work involves fabricating partial backup molds to make major repairs of laminated structures, such as microwave radomes, fairings, wing tips, and initial layout and hand lay-up of multi-contoured plastic and fiberglass parts. Plastic work also involves manufacturing simple molds from plastic and plaster or rubber tooling compounds for successive casting, molding, and foaming operations when the part or a pattern is available.

Skill and Knowledge: Grade 9 composite and plastic workers have a greater knowledge than grade 7 workers of the working characteristics and properties of composite and resin materials such as carbon/epoxy, boron/epoxy, aramid/epoxy, plastic materials, and tooling compounds such as silicones, polyurethanes, plastisol vinyl, and flexible epoxies. They have greater skill in varying the proportions of composite materials, plastic and synthetic rubber resins, and other compound ingredients used to obtain required working properties. They consider factors such as the size of the item, the effect of temperature and humidity conditions on setup time, acceptable pot life requirements, and the penetrability by different viscosities of compounds through various weaves and thickness of reinforcement materials. They know the compatibility of commonly used resins, release agents, and surface parting compounds. They know how to avoid problems such as voids and pitting caused by improper mixing, pouring, or curing techniques.

Composite and plastic workers at this level apply a broader knowledge of, and skill in using, low-pressure shaping, bonding, forming, and casting techniques compared to grade 7 workers. Grade 9 composite and plastic workers:

- plan and accomplish repair and manufacture of laminated items with complicated and varied shapes or damaged contours;
- manufacture parts, patches, or molds from a variety of materials such as composites, resins, plastics, plaster, and synthetic rubber tooling compounds;
- lay out and accomplish initial hand lay-up of laminated items on molds with sharp, irregular angles and combinations of curved and flat areas;
- identify and fix problems such as warpage of manufactured parts, voids, pin holes, pin bubbles, poor lamination results, adhesion of part to molds, crazing, and incomplete cures;
- make necessary corrections and adjustments to cure times, temperatures, pressures, mixing, and pouring techniques;
- interpret and apply directions relating to the mixture, ratios, uses, cure times, temperatures, and pressures of composite materials, resins, solvents, and mold release agents; and
- determine dimensions and sizes in drawings and blueprints to make templates used in marking, cutting, and trimming final products.

Grade 9 workers have more skill than the grade 7 workers in the use of equipment, because their work products must meet more rigid requirements.

Grade 9 composite workers manufacture composite patches to repair or replace irregular or curved surfaces. They check the orientation and stacking order of each ply. They saturate dry fabric such as fiberglass or aramid fiber with a matrix material, usually an epoxy or other organic resin, and then stack one ply at a time. These composite workers also have skill in patch forming. They warm the patch or part and then move it into place using hands, weights, or vacuum pressure.

Grade 9 Level Description

(continued)

COMPOSITE AND PLASTIC WORKER, GRADE 9 (continued)

Grade 9 Level Description (continued)

Grade 9 plastic workers manufacture partial backup molds to reestablish proper contours for damaged items. They hand lay-up laminate female and/or male molds on an identical section of a serviceable part to obtain proper configurations. Grade 9 plastic workers make flexible and rigid casting and potting molds from plastic and rubber tooling compounds. They use master parts or patterns. They make flat-back one-piece, split one-piece or shelled flexible casting molds. They also make male, female, and two-part laminated molds. They prepare lay-up boxes, mark parting lines and alignment points, determine location, and cut vent holes.

Responsibility: Grade 9 workers receive work orders orally or in writing from the supervisor, along with appropriate drawings or blueprints. Grade 9 workers use judgment in planning their work and determining equipment, procedures, and sequence of operations. They determine the ratio of resin to compound ingredients, the cure cycle and equipment needed, and proper repair techniques. They determine the cause of rejects and make corrections. The products of their work must meet stringent requirements for size, appearance, proper contours, and required mechanical and electrical properties. Grade 9 workers have greater independence than grade 7 workers. The supervisor and/or quality controller checks work after completion for conformance to job specifications and use of standard trade practices.

Physical Effort: Physical efforts are similar to those described at [grade 7](#).

Working Conditions: Working conditions are similar to those described at [grade 7](#).

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COMPOSITE AND PLASTIC FABRICATOR, GRADE 10

Grade 10 Level Description

General: Grade 10 composite and plastic fabricators repair, modify, and fabricate composite or plastic items and assemblies with straight and curved surfaces and a number of interconnecting parts and components. The numerous curves, angles, and shapes cause difficulty in planning and laying out material. Fabricators make patterns or form blocks for the various interconnecting parts of the final items.

Skill and Knowledge: Grade 10 composite and plastic fabricators apply an in-depth knowledge of the working characteristics of a wide range of composite or plastics materials and woods, rubbers, clays, and plaster tooling compounds. They determine and select or substitute the materials to be used in the manufacture of master patterns, molds, and final items.

Fabricators determine the type of composite, plastic, or other compound to use based on temperature, cure, weight, compatibility, flexibility, and time considerations. They consider the density, weave, and number of plies of reinforcement needed to obtain the required strength, stiffness, drape, and bulk of molds and final parts.

Composite fabricators apply a thorough knowledge of, and skill in applying:

- the full range of manufacture and fabrication techniques to plan and lay out composite items and assemblies for items;
- rough sketches, blueprints, manufacturer specification, and verbal instructions from design engineers to repair or manufacture composites;
- molds, bondforms, and fixtures to repair or manufacture composite components;
- tooling designs, ply orientations, adhesives, and composite materials to repair composites; and
- the full-range of curing methods including the use of heat controllers, autoclaves, and ovens.

They provide feedback to design engineers on material characteristics, methods, and techniques of manufacture and repair directly effecting design specifications (e.g., strength, durability, cost, and aerodynamics).

Plastic fabricators apply a thorough knowledge of, and skill in applying:

- the full-range of low-pressure shaping, forming, and casting techniques;
- plans, blueprints, and sketches;
- segment and laminated methods of construction using wooden form blocks with curved and contoured surfaces for successive lay-up and/or thermoforming processing; and
- casting and laminating techniques for fabricating plastic and creating rubber molds, such as shelled multi-piece molds.

(continued)

COMPOSITE AND PLASTIC FABRICATOR, GRADE 10 (continued)

Grade 10 Level Description (continued)

Grade 10 composite and plastic fabricators have more skill than workers at the grade 9 level in:

- using shop mathematics including geometric and trigonometric formulas to calculate angles, radii, contours, and surface areas when laying out work;
- interpreting more complex blueprints and diagrams;
- using a wide range of manufacturers' instructions and specifications to select or substitute materials;
- marking and measuring master patterns and templates using scribes, dividers, protractors, squares, micrometers, thermographs, calipers, or radar measuring devices;
- setting up, programming, and operating complex computer controlled core-cutting and curing machines (e.g., heat blanket controllers); and
- using ultrasonic prepreg cutters; curing ovens; autoclaves; heat blanket controllers; a variety of woodworking equipment such as lathes, routers, and milling machines; and low-pressure shaping, forming, and molding tools and equipment.

These composite and plastic fabricators apply skill in:

- selecting the most economical methods of mold construction;
- planning section joining and parting the shell from the mold;
- machining wood, plastic sheet, and tube stock;
- avoiding problems such as extreme undercut or high mass to thin pour situations;
- finishing and smoothing the master patterns to required dimensions; and
- fitting and assembling fabricated parts by nailing, bonding, bolting, and inserting them in the proper position.

Responsibility: Grade 10 fabricators receive work from the supervisor through work orders, plans, specifications, and drawings. Fabricators work with greater independence than grade 9 workers in planning and laying out their work; devising patterns, forms, and molds; planning the sequence of operations; and selecting appropriate materials, tools, equipment, and techniques.

Completed work is subject to spot-check by the supervisor for use of acceptable standards of workmanship and conformance with specifications.

Physical Effort: Physical efforts are similar to those described at [grade 7](#).

Working Conditions: Working conditions are similar to those described at grade 7, except work at this level is typically performed in well-heated and well-lighted shops, and workers are not usually exposed to the possibility of falls.

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COMPOSITE AND PLASTIC FABRICATOR, GRADE 11

General: Grade 11 composite and plastic fabricators plan, lay out, modify, and fabricate unconventional, one-of-a-kind items for one-time projects, to support experimental, developmental, or testing activities. They may work in close coordination with scientists and engineers in determining the most feasible materials and means of manufacturing items that typically have numerous compound curves and intersecting compound angles. Assignments may involve manufacturing prototype models of radomes, missiles, wings, ship hulls, or full body casts. Assignments at this level are more difficult to plan and lay out than those at the grade 10 level due to the need to meet more complex and critical configurations and fits and the need to adapt trade practices, methods, and techniques to fit each new situation.

Skill and Knowledge: Grade 11 composite and plastic fabricators apply a thorough practical knowledge of the newest substances to recommend and/or select materials for prototype and one-time items. Items produced at this level usually have unusual physical or functional characteristics such as extremely lightweight products, minute detail reproduction, or very high heat resistance. Grade 11 fabricators may experiment with different combinations and amounts of resins and other compound materials with different cure cycles and temperatures. In comparison, grade 10 composite and plastic fabricators select resins and compound materials based upon the information provided by manufacturers' instructions and specifications. Grade 11 fabricators have an extensive knowledge of the properties and machining characteristics of a variety of composite or plastic materials.

In comparison with grade 10 fabricators, who use accepted manufacturing methods and techniques, fabricators at grade 11 must have skill and knowledge in:

- adapting shop practices, methods, and procedures for use in unorthodox processes to fit new projects;
- establishing manufacturing procedures for newly developed compound materials by experimenting with various manufacturing techniques, curing times, temperatures, and pressures;
- recommending changes to established methods to simplify the manufacturing process, improve the functional characteristics of the item, and establish realistic fabrication requirements;
- planning and laying out items with hard-to-define reference points; and
- manufacturing master patterns and molds with numerous compound curves and intersecting compound angles.

In addition to the skill requirements of fabricators at lower levels, grade 11 fabricators:

- apply mathematics to calculate loads, fits, sizes, and weights not provided in instructions and blueprints to overcome design flaws and lay out more complex items;
- fabricate items to extremely close tolerances;
- make special jigs and fixtures for holding, machining, and curing irregularly shaped parts; and
- set up and operate trade tools, equipment, and measuring instruments to fabricate complex components.

Responsibility: Grade 11 fabricators receive the specifications of the desired final product from the supervisor. Fabricators apply originality and ingenuity in devising changes to methods, materials, and processes to solve fabrication, assembly, design, and related problems. Workers receive minimal supervision. The supervisor reviews work to ensure the work meets assigned objectives.

Physical Effort: Physical efforts are similar to those described at [grade 7](#).

Working Conditions: Working conditions are similar to those described at [grade 10](#).

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