The work reported in this publication was supported by the National Skill Standards Board, administered by the U.S. Department of Labor, under a grant to the National Coalition for Advanced Manufacturing: No. E-9-4-7-0017.

MSSC Skill Standards

A Blueprint *for* Workforce Excellence

A Quick Orientation

Published by the Manufacturing Skill Standards Council (MSSC)

MSSC C/O National Coalition for Advanced Manufacturing
1201 New York Avenue, NW, Suite 725
Washington, DC 20005-3917
(202) 216-2740 (Phone)
(201) 289-7618 (Fax)

MSSC C/O Working for America Institute, AFL-CIO
888 16th Street, NW
Washington, DC 20006
202-466-8010 (Phone)
202-466-6147 (fax)

Dear Colleagues,

Welcome to *A Quick Orientation*. In just a few minutes, you will be reviewing the first official release of the manufacturing skill standards developed by the Manufacturing Skill Standards Council (MSSC). These skill standards, developed under the auspices of the National Skill Standards Board, are the result of an unprecedented partnership within the U.S. manufacturing sector and represent the start of a long-term commitment to revitalize manufacturing jobs, skills, and training.

Before you begin your exploration, I wanted to take a moment to explain why we started this project and why we think it is so important. In 1997, leaders in the manufacturing sector met to address a growing challenge: How could we ensure that workers have the skills needed for success in today's manufacturing environment?

We knew we needed to find an answer. If U.S.-based manufacturers are to gain a competitive edge in the global economy and continue to provide good, family-supporting jobs to millions of Americans, a skilled workforce is vital.

But what was it going to take to get there? In the past, most manufacturers operated internal labor markets to recruit and prepare workers. Workers gained their skills on the job or through training provided by their employer or union. We quickly recognized that more was needed.

Today, a higher level of skills is needed to keep pace with rapid technological change, new demands for quality, and growing customer needs. New approaches are needed, both to improve internal training and to ensure our educational system prepares individuals for today's workplace. At the same time, as the workforce has become more mobile, individuals need a way to transport their skills from one job to another. But because most manufacturing skill certifications are specific to a single industry or job function, this can be very difficult.

If we are to raise the skill level of today's workforce and attract a new generation to our industry, we need to create a new "skills pipeline" that will supply manufacturers with skilled workers, while also providing workers with portable certifications and access to good jobs. We believe an industry-wide skill standards system will provide the new approach that is needed.

The MSSC, a unique partnership among business, labor, education, professional and community groups, has stepped up to provide the leadership necessary to build this system. We have already made substantial progress. In the three years since its inception, the MSSC has completed two of the three major steps in building the system: We have created a broad-based coalition and developed skill standards. Our next major goal is to develop an assessment and certification program based on the skill standards.

We invite you to join us in building this new system – helping to ensure the long-term productivity and competitiveness of U.S.-based manufacturing.

Sincerely,

John Rauschenberger, MSSC Chair
Ford Motor Company

Manufacturing Skill Standards Council Steering Committee Members *July 2000 – June 2001*

*Dr. John Rauchenberger, Chair, MSSC
Manager, Workforce Research
Ford Motor Company
World Headquarters

Dr. Kenneth Breeden
Commissioner
Georgia Department of Technical and Adult Education

*Mr. Richard Brown
Chairman, Emeritus
The Brown Corporation of America And MSSC Representative, Precision Metalforming Association

Dr. Peter Bulkeley
President
Society of Manufacturing Engineers
SME Executive Office

*Mr. Don F. Carlson
President
Association for Manufacturing Technology

Mr. Steve Detter
Director of Manufacturing Councils
Boeing Company

Ms. Allyn Dillman
Labor Relations Specialist
Professional Airways Systems

Mr. Jeffrey E. Edstrom
Senior Policy Director
Council of Great Lakes Governors

Ms. Phyllis Eisen
Vice President of Manufacturing Institute
Center for Workforce Success
National Association of Manufacturers

Mr. Mike Flynn
Director
Occupational and Health and Safety
International Association of Machinists & Aerospace Workers

Ms. Kimberley Green
Executive Director
National Association of State Directors of Vocational-Technical Education

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Director, Technology Manufacturing Group
Intel Corporation

Mr. Joseph High
Vice President, Human Resources, Components & Package Application Group
Rockwell Automation Control Systems
Rockwell International

Ms. Trudy Humphrey
Director of Education
IUE-CWA International Union

Mr. Robert T. Jones
President and CEO
National Alliance of Business

*Mr. Robert Knight
President
National Association of Workforce Boards

Mr. Michael LaFave
Director of Production
Sheet Metal Workers' International Union

*Mr. Bret Lovejoy
Executive Director
Association for Career and Technical Education

Mr Wayne Mausbach
Manager, Manufacturing Systems
Schlumberger Company

Mr. Brad Markell
International Representative
United Auto Workers, International Union

Dr. Ronald McCage
Executive Director
Vocational Technical Education Consortium of States

Mr. Eric Mittelstadt
Chairman Emeritus
FANUC Robotics North America, Inc.

*Ms. Jackie Mullins
International Representative
United Steelworkers of America

Mr. Leo Reddy, Ex-Officio
President
National Coalition for Advanced Manufacturing
Co-Leader MSSC Staff

Mr. Keith Romig
Director, Communications
PACE – Paper, Allied-Industrial, Chemical & Energy Workers International Union

Ms. Ellen Scully, Ex-Officio
Skill Strategies Coordinator
Working For America Institute, AFL-CIO
Co-Leader, MSSC Staff

*Mr. Robert Stander
Director, Manufacturing Department
International Brotherhood of Electrical Workers

Ms. Janet Zobel
Senior Policy Advisor
National Urban League

* Business Planning Group Members (BPG)

I Want to Find Out…

How to use this publication 5

Who is behind this project 5

What skill standards are all about 7

Where assessment and certification fit into the picture 8

How skill standards were developed 9

How the skill standards are organized 10

Exactly what makes up a skill standard 12

What is meant by "core knowledge and skills" and "specialty skill standards" 21

How to use the MSSC skill standards now and in the future 22

What's next for the project 23

Acknowledgements 24

I Want to Find Out…
How to use this publication

A *Quick Orientation* provides important background information about the skill standards and is meant to be read before reviewing the skill standards for each concentration, the Core Knowledge and Skills, and the *Skill Scales Companion Guide*. You may wish to remove this booklet from the binder and use it as a reference when reviewing the skill standards.

I Want to Find Out…
Who is behind this project

The Manufacturing Skill Standards Council (MSSC) was established to develop a national system of skill standards assessment, and certification for the manufacturing and related installation and repair industry sector. The MSSC membership is made up of close to 200 leading organizations with a direct impact on the future of manufacturing, including:

- Companies
- Trade associations
- Industrial unions
- Professional societies
- Large education and training organizations
- Civil rights and community groups
- Public interest and state government representatives

Individuals and smaller organizations affected by the skill standards, such as smaller manufacturers and community colleges, are also part of the MSSC, serving as associate members.

Such a large and diverse membership, representing nearly all elements of manufacturing, has helped the MSSC ensure that its skill standards reflect the needs of manufacturing employers and workers.

The MSSC is co-managed by the industry-led National Coalition for Advanced Manufacturing and the AFL-CIO Working for America Institute.

For more information, please contact us:

On the Web at www.msscusa.org
By phone at (202) 216-2740 or (202) 466-8010
By fax at (202) 289-7618 or (202) 466-4617
By mail at MSSC
C/O National Coalition for Advanced Manufacturing
1201 New York Ave, NW, Suite 725
Washington, DC 20005-3917

Or

MSSC
C/O Working for America Institute, AFL-CIO
888 16th Street, NW
Washington, DC 20006

The National Skill Standards Board

The MSSC's efforts to develop skill standards are part of a larger effort coordinated by the National Skill Standards Board (NSSB). The NSSB, made up of representatives from business, labor, employee, education, and community and civil rights organizations, was established in 1994 by Congress to help create a voluntary national system of skill standards, assessment, and certification. The NSSB has provided funding to the MSSC for the creation of the voluntary partnership and the development of the standards.

The NSSB has established a Common Framework for Skill Standards, which was used to guide the development of the MSSC skill standards. In addition, at key stages of the standards development process, the MSSC submitted its work to the NSSB for review and approval.

The MSSC skill standards were approved by the full board of the NSSB. This approval means that the MSSC skill standards described in this report were judged to have met the NSSB criteria for the development of skill standards.

For more information, please contact the NSSB:

On the Web at www.nssb.org
By email at information@nssb.org
By phone at (202) 254-8628
By fax at (202) 254-8646
By mail at NSSB
1441 L Street N.W., Suite 9000
Washington, DC 20005-3512

I Want to Find Out…
What skill standards are all about

Precision tolerances. Quality controls. Industry-wide product specifications. These are the common measures by which most manufacturers are judged. Without them, manufacturers would have a tough time improving their performance or communicating to customers.

Yet, where are the precision tolerances for today's workforce – the engine of modern manufacturing? What are the industry-wide specifications for training, certifying, and hiring skilled manufacturing workers? With the MSSC skill standards system, we can finally answer these questions.

MSSC skill standards define the knowledge, skills, and performance needed by today's frontline manufacturing workers. They give individuals a standard to work toward and provide a wealth of information that can be used to improve training, education, and hiring practices.

The need for skill standards has never been more pressing. In the 21st century, a skilled and knowledgeable workforce will be the manufacturing industry's principle competitive advantage. High volume has been replaced by "high performance" and "high value added." In this new environment, employers are looking for skilled workers who can work *smarter*, not just *harder*. Today, manufacturers need:

- Employees with problem-solving and customer service skills
- Employees who are creative and analytical
- Employees who can effectively use new technology
- Employees who can lead and adapt to change

Yet, survey after survey shows that manufacturers are finding it difficult to meet these needs. In the search to find a solution, whether through better training programs or a greater emphasis on education, the one thing that has been missing is a clear set of standards. If we do not know what we are working toward, how can we expect to get there?

By defining the knowledge, skills, and performance required for success in today's best practice manufacturing workplaces, the MSSC skill standards provide both a yardstick against which to measure our efforts and a clear set of goals to work toward.

A Focus on the Frontlines and High Performance

The MSSC started its standards development efforts by developing skill standards for the frontlines. By *frontlines,* we mean frontline workers, from entry-level through first-line supervisors working in production and production support and operations.

The reason the MSSC focused first on the frontlines is that this is where some of the most dramatic changes in work have been taking place. And it is an area that is often neglected, in terms of education, training, and certification programs.

Another of the MSSC's key goals was to ensure the standards reflected the needs of high performance and best practice workplaces. To do this, the MSSC developed a definition of these terms that was used to recruit companies to participate in the research. In this way, the MSSC was able to create standards that reflect the needs of today's high performance and best practice organizations.

I Want to Find Out…

Where assessment and certification fit into the picture

This project is about much more than just developing individual skill standards – it is about building a *skill standards system*. Although MSSC skill standards have value as a stand-alone tool, the standards are the foundation of a much larger system of assessment and certification being developed by the MSSC.

This system would assess individuals against the MSSC standards and provide them with feedback to help them improve their performance. Those individuals who achieve a certain level of performance in the assessments would receive a national certification recognized by manufacturing employers.

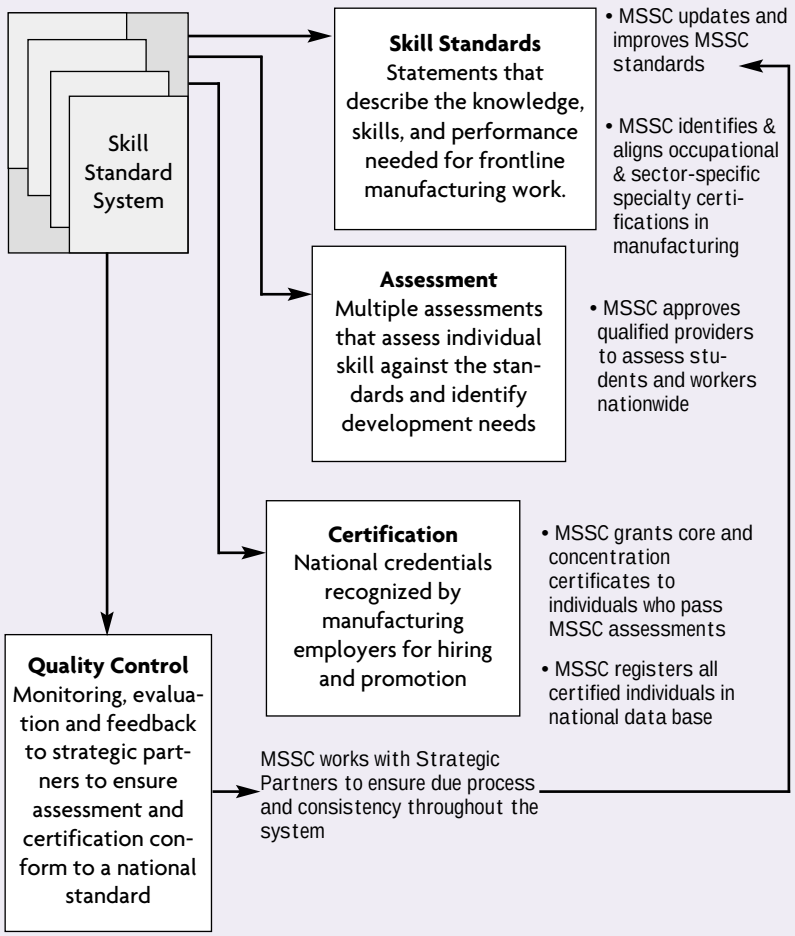
The benefits of such a system to both employers and workers are many. With standards-based assessment and certification:

- Employers would be able to make faster, better hiring decisions.
- Workers would be able to demonstrate to employers that they meet industry standards for excellence, helping them to get jobs and promotions. And because these credentials would be industry wide, they would be highly portable, helping individuals get jobs in many different segments of the manufacturing industry.
- Individuals would be able to measure their skills against the standards and gain valuable information they could use to make better training and education decisions and to improve their performance.

Now that the standards have been established, the MSSC is gearing up to provide assessment and certification based on the standards. We expect several assessments will be available within the next 12 months.

But to ensure the effectiveness of this system, we need to do everything we can to help individuals develop the skills and earn the certifications needed to have rewarding careers in manufacturing. This means making the integration of MSSC standards into industry training and education programs a top priority.

MSSC Skill Standards System



I Want to Find Out…

How the skill standards were developed

One of the real strengths of the MSSC skill standards is how they were developed. To ensure that MSSC skill standards reflect the real-world requirements of today's workplace, the MSSC went directly to frontline workers and first-line supervisors.

From June 1999 to April 2001, the MSSC worked with more than 4,000 frontline workers and first-line supervisors from some 700 companies to develop and validate the skill standards.

The effort began with a series of intensive research sessions, held in manufacturing hubs across the United States, in which hundreds of workers and supervisors were asked to describe the knowledge, skills, and performance needed for success in manufacturing today. The standards that emerged from these panels were reviewed by hundreds of subject matter experts, ranging from manufacturing managers to educators and trainers.

Next, the MSSC conducted a national validation survey of frontline workers and first-line supervisors to verify that the standards identified by the panels reflected a complete and accurate picture of work in their companies.

We believe the number of individuals who participated in the research, their diverse backgrounds, the focus on recruiting research participants from best-practice firms, and the rigorous review and refinement of the skill standards throughout the research process has enabled the MSSC to create world-class skill standards on which the industry can rely.

Ensuring the Quality of the Skill Standards

To develop the highest quality skill standards, the MSSC skill standards were:

- **Based on extensive input from thousands of workers:** More than 4,000 frontline workers and first-line supervisors helped develop and validate the skill standards.
- **Subjected to continuous expert review.** At key steps, the standards were reviewed and refined by subject matter experts, including manufacturing managers, educators, trainers, work analysis experts, and others with the experience and training necessary to ensure the quality of the skill standards.
- **Approved by the National Skill Standards Board (NSSB).** The NSSB, made up of leaders from business, unions, civil rights organizations, and other groups, provided important input and guidance throughout the standards development process. Recently, the NSSB approved the MSSC skill standards, showing its support for the MSSC research.

To ensure the skill standards remain current, the MSSC plans to update the standards regularly.

I Want to Find Out…

How the skill standards are organized

Now it's time to start learning about the skill standards themselves. Let's start by looking at how the MSSC skill standards are organized.

Industry-Wide Skill Standards

The MSSC skill standards were developed for the manufacturing industry sector, which encompasses the following 14 subindustries:

1. Food and Beverage
2. Textile, Textile Products, Apparel, and Leather
3. Furniture
4. Wood and Paper
5. Printing
6. Petroleum and Coal Products
7. Chemicals
8. Plastics and Rubber Production
9. Nonmetallic Minerals
10. Primary and Fabricated Metals
11. Machinery
12. Computers and Electronic Products
13. Electrical Equipment and Appliances
14. Transportation Equipment

What this means is that instead of developing different sets of skill standards for each of these 14 subindustries, the MSSC developed one set of skill standards that apply across all these subindustries. To develop industry-wide skill standards, the MSSC research focused on identifying the knowledge, skills, and performance *common across all the manufacturing subindustries*.

For example, we found that all manufacturing production workers need to know how to identify customer needs, set up equipment for the production process, and inspect the product to make sure it meets specifications - regardless of whether they work in a food and beverage plant, an auto plant, or a computer manufacturing plant. Because these elements of work were *common and critical* across the 14 subindustries, they, along with the knowledge and skills needed to achieve these goals, were included in the skill standards.

Why were skill standards organized this way? Developing skill standards that will prepare people for work across the manufacturing sector will help individuals get as many different jobs across the industry as possible. For example, a laid-off worker certified in the MSSC skill standards will have many of the skills needed to work in an automobile manufacturing plant, a chemical manufacturing plant, and many of the other manufacturing workplaces covered by the 14 subindustries.

In addition to giving individuals portable skills and certifications, the development of standards that apply across the manufacturing sector gives employers a large pool of broadly trained workers from which to choose.

We recognize that many important skills are not common across manufacturing and are unique to a particular company or subindustry. Those skill requirements are being handled by something called specialty skill standards, which are explained later in this publication.

A Focus on Concentrations – Not Individual Job Titles

The MSSC skill standards are organized around six concentrations – major areas of frontline manufacturing work, typically covering families of related jobs and occupations. (These concentrations are described on the next page).

Concentration	Description of Work Covered by Concentration Skill Standards	Sample Job Classifications Covered by Concentration Skill Standards
Production	Set up, operate, monitor, control, and improve manufacturing processes and schedules to meet customer and business requirements.	Operator, production associate, and assembler
Manufacturing Production Process Development	Develop, implement, and improve the manufacturing process through early production and process changes. Assess product and process design for manufacturability	Manufacturing technician, process improvement technician, and jig and fixture designer
Quality Assurance	Ensure the manufacturing system meets quality system requirements as defined by business and its customers.	Lab technician, SPC coordinator, and inspector.
Health, Safety, and Environmental Assurance	Ensure that the manufacturing system meets health, safety, and environmental requirements	Health and safety representative, safety coordinator, and safety team leader.
Maintenance, Installation, and Repair	Ensure that the maintenance of the manufacturing system fulfills customer and business requirements. Install and repair equipment on the manufacturing floor	Industrial maintenance mechanic, industrial maintenance electrician, and millwright.
Logistics and inventory control	Plan and control the movement and storage of materials and products in the manufacturing system	Material handler, material mover, and material associate

What this means is that instead of developing skill standards for every frontline job within manufacturing, the standards have been developed to cover clusters of related jobs covered by the concentrations.

In this way, the standards will prepare individuals for more than one narrow job. This enhances an individual's ability to get different jobs by providing him or her with a broader range of skills and ensures that individuals have the flexibility needed to handle different kinds of work. It also helps the project avoid the pitfall of building standards around job titles and occupational definitions, which vary widely from company to company. Concentrations focus on the functions of work and, in this way, are much more stable than job titles. Organizations will combine the functions covered by the different concentrations into their own job titles.

So, the key things to keep in mind about the organization of the skill standards is that they apply across the manufacturing industry sector and are organized around clusters of jobs called concentrations.

I Want to Find Out…

Exactly what makes up a skill standard

Skill standards include lots of different types of information. That's because we wanted to create standards that are comprehensive enough to be useful in developing curricula, making important career decisions, and creating assessments. All this information is divided into two categories:

- Information *About the Work*
- Information *About the Worker*

About the Work

This describes what needs to be done at work and how well. It includes:

- *Critical Work Functions*: Major responsibilities of work within a concentration.
- *Key Activities*: Major tasks involved in carrying out a critical work function.
- *Performance Indicators*: Indicators of how to determine when someone is performing each key activity competently.

In the example to the right, taken from the Production concentration, the critical work function is "Maintain a safe and productive work area." Four key activities are associated with it:

- "Perform environmental and safety inspections,"
- "Perform emergency drills and participate in emergency response teams,"
- "Identify unsafe conditions and take corrective action," and
- "Provide safety orientation to other employees."

Each key activity has approximately half a dozen performance indicators.

What can we learn from this example?

We can see that one of the major responsibilities of production work in manufacturing is to "Maintain a safe and productive work area." We know this because this responsibility has been identified as a *critical work function*.

We know that one of the key tasks someone needs to do to fulfill this responsibility is to "Perform environmental and safety inspections." We know this because this task has been identified as a *key activity*.

From looking at the performance indicators for the skill standards, we can also find out what it looks like when someone is performing this task well.

For example, in the case of the key activity we just mentioned ("Perform environmental and safety inspections"), we know that when…

- "Potential hazards in the work are identified, reported, and monitored;"
- "Corrective action is taken to correct potential hazards;"
- "Health, safety, and environmental documentation and policies are thoroughly and regularly reviewed;"
- "Inspections meet all relevant health, safety, and environmental laws and regulations;"
- "Inspections are done according to company schedule and procedures;"
- "Inspections are documented;" and
- "Inspection records are stored correctly"

…this key activity has been performed competently. That's because all of these elements have been identified as *performance indicators*.

Concentration Area: **Production**

P3

Critical Work Function: Maintain a safe and productive work area.

Critical work functions *describe the major responsibilities involved in carrying out a concentration*

Concentrations *are the major areas of front-line work covering families of related jobs. Separate standards were identified for each concentration.*

Key Activities **Key activities** *are the duties and tasks involved in carrying out a critical work function*	Performance Indicators **Performance indicators** *correlate to the key activities. The performance indicators provide information on how to determine when someone is performing each key activity competently*
Perform environmental and safety inspections	Potential hazards in the work are identified, reported and monitored. Corrective action is taken to correct potential hazards. Health, safety and environmental documentation and policies are thoroughly and regularly reviewed. Inspections meet all relevant health, safety, and environmental laws and regulations. Inspections are done according to company schedule and procedures. Inspections are documented. Inspection records are stored correctly.
Perform emergency drills and participate in emergency response teams	Training and certification on relevant emergency and first aid procedures is complete and up to date. Emergency response complies with company and regulatory policies and procedures. Emergency drills and incidents are documented promptly according to company and regulatory procedures.
Identify unsafe conditions and take corrective action	Conditions that present a threat to health, safety and the environment are identified, reported, and documented promptly. Corrective actions are identified. Appropriate parties are consulted about corrective actions. Corrective actions are taken promptly according to company procedures. Ongoing safety concerns are tracked and reported until corrective action is taken.
Provide safety orientation to other employees	Orientation covers all topics and procedures needed to facilitate employee safety. Orientation makes clear the need and processes for employees to raise safety concerns, ask questions, and receive additional training. Orientation is documented according to company requirements. Orientation meets all relevant laws, policies, and regulations. Safety training is delivered regularly.

I Want to Find Out… Exactly what makes up a skill standard

About the Worker

This aspect of the skill standards describes the knowledge and skills an individual needs to perform the work described by each critical work function, along with its key activities and performance indicators.

There are three types of knowledge and skills described in the skill standards:

- *Academic Knowledge and Skills* – Academic skills, such as mathematics, writing, etc.
- *Employability Knowledge and Skills* – Broadly applicable skills, such as working in teams, analyzing and solving problems, etc.
- *Occupational and Technical Knowledge and Skills* – Occupational and technical skills that tend to be specific to an industry or concentration, such as skill using inspection tools, knowledge of manufacturing processes, etc.

So, for example, on a previous page, you reviewed the critical work function of "Maintain a safe and productive work area." The "About the Worker" aspect of the skill standards would tell us the specific academic, employability and occupational and technical knowledge and skills needed to maintain a safe and productive work area (see example to the right). The following information provides a more in-depth explanation of the "About the Worker" aspect of the skill standards.

Academic and Employability Knowledge and Skills

The MSSC skill standards incorporate 17 categories of academic and employability knowledge and skills.[1] They are:

Academic Knowledge and Skills Categories

- *Mathematics*
- *Science*
- *Reading*
- *Writing*

Employability Knowledge and Skills Categories

- *Listening*
- *Speaking*
- *Using information and communications technology*
- *Gathering and analyzing information*
- *Analyzing and solving problems*
- *Making decisions and judgments*
- *Organizing and planning*
- *Using social skills*
- *Adaptability*
- *Working in teams*

[1] An expert panel convened by the NSSB identified these academic and employability knowledge and skills based on more than a year of research.

P3 Critical Work Function: **Maintain a safe and productive work area.**

Knowledge and Skills

Describes what a worker needs to know or be able to do to perform the critical work function

ACADEMIC AND EMPLOYABILITY SKILLS

Skill	Overall Complexity Rating for Workers	Overall Complexity Rating for Supervisors	Complexity Dimension	Complexity Subdimension	Complexity Subdimension Rating for Workers
Math	**NA**	**L**	Complexity of mathematics content	Number sense and computation	**NA**
				Geometry, measurement, and spatial sense	**NA**
				Complexity of data analysis, statistics, and probability	**NA**
				Functions and algebraic thinking	**NA**
				Complexity of representation and communication	**NA**
			Complexity of problem solving	Mathematical methods	**NA**
				Mathematical reasoning	**NA**
				Mathematical tools	**NA**
Science	**L**	**L**	Complexity of scientific inquiry	Design	**L**
				Use of evidence	**L**
			Complexity of understanding the nature of science	Unifying concepts and processes	**L**
			Complexity of core scientific content	Physical science	**M**
				Life science	**NA**
				Earth and space science	**NA**
			Complexity of applied science	Science and technology	**L**
				Science in personal and social perspective	**NA**
Reading	**M**	**M**	Complexity of text		**M**
			Complexity of reading skills		**M**
			Complexity of reading purpose		**M**
Writing	**L**	**M**	Complexity of text	Complexity of text	**M**
			Complexity of writing product	Type of product	**M**
				Organization	**M**
				Elaboration	**M**
			Complexity of writing process	Writing development	**L**
				To inform	**M**
				To persuade	**M**
Listening	**M**	**M**	Complexity of communication	Content complexity	**M**
				Demands on attention	**M**
				Communication indirectness	**L**
			Barriers to communication	Limitations on interaction	**M**
				Distractions	**M**
Speaking	**M**	**M**	Complexity of communication	Content complexity	**M**
				Tact and sensitivity required	**M**
				Communication indirectness	**L**
			Context demands	Diversity of audience	**M**
				Constraints on preparation	**M**
				Distractions	**M**
				Listener resistance	**M**
Using Information and Communications Technology	**L**	**L**	Complexity of technology application	Complexity of equipment or technology	**L**
				Complexity of applications	**L**
				Training time constraints	**M**
			Frequency of technology change	New learning required	**M**
Gathering and Analyzing Information	**M**	**M**	Difficulty of information gathering	Amount of information	**M**
				Number and variety of sources	**M**
				Resourcefulness needed	**M**
			Complexity of analysis	Complexity of information and analysis	**M**
				Need to evaluate source information	**M**
				Lack of analysis guidelines	**M**

About the Worker

- *Leading others*
- *Building consensus*
- *Self and career development*

For each of these academic and employability knowledge and skills, the MSSC skill standards provide:

Complexity Ratings: The complexity level rating tells us, for a given critical work function, the level of complexity required in a particular academic and employability knowledge and skill. For example, if writing is required to perform a given critical work function, the complexity rating would tell us whether individuals need to possess complex writing skills enabling them to write technical manuals, reports, or proposals, or whether they need lower-level writing skills to write labels and telephone messages.

To develop complexity level ratings, the MSSC used the NSSB Academic and Employability Skill Scales, which enable experts to rate the level of complexity required in a given knowledge and skill. The scales include various dimensions and subdimensions, which look at different aspects of a skill. On the next page is an example of part of the skill scale for writing, showing one subdimension for "complexity of text."

The standards provide us with two different types of complexity ratings, both based on scales like this.

Overall Complexity Rating: As the name implies, the overall complexity rating gives a rough estimate of the overall level of complexity required for a given knowledge and skill. This rating was developed by looking across the complexity subdimensions in a given skill scale and determining the overall level of complexity required to perform a particular critical work function, along with its key activities and performance indicators. This overall rating is expressed as:

L= low complexity
M= moderate complexity
H= high complexity

In some cases, the overall complexity rating was **NA (Non-Applicable)**. This means that this skill was deemed not to be needed to perform this given critical work function, so no complexity rating was assigned.

In the example on page 15, writing received an overall complexity rating of "L" (for workers). This means that a low level of complexity in writing is required for workers to perform the critical work function of "Maintain a safe and productive work area."

The overall complexity ratings were developed for "Workers" and for "Supervisors." As mentioned earlier, the standards were developed for frontline manufacturing workers. This includes entry-level workers *through* first-line supervisors. The critical work functions, key activities and performance indicators apply to this entire group. However, separate overall complexity ratings were developed for "workers," whom the project defines as entry-level manufacturing workers *up* to first-line supervisors, and for "supervisors," whom the project defines as first-line supervisors.

Subdimension Complexity Rating: To provide users with more detailed information, the MSSC skill standards also provide

Skill Scale Example

WRITING

Express ideas and information in written form clearly, succinctly, accurately, and in an organized manner; use English language conventions of spelling, punctuation, grammar, and sentence and paragraph structure; tailor written communication to the intended purpose and audience.

COMPLEXITY DIMENSION	COMPLEXITY SUBDIMENSION	COMPLEXITY LEVEL SCALE				
		HIGH		MODERATE		LOW
COMPLEXITY OF TEXT	**COMPLEXITY OF TEXT** *How complex is the type of material to be written in performing this critical work function?*	• Highly complex or technical materials are written (e.g., technical manuals, reports, proposals, procedures, written commentaries, formal email, substantially visual material such as flowcharts); material contains high density of information and a substantial proportion of highly technical terms or unfamiliar vocabulary.		• Moderately complex or technical materials are written (e.g., letters, memos, email, multistep directions and instructions, reference materials, books on particular topics, visuals that support meaning such as charts, graphs, figures, diagrams, and maps).		• Simple, familiar, or non-technical materials are written (e.g., labels, telephone messages, routine forms, lists, simple notes, signs, informal email).

Please Note: This is just an excerpt of a much larger scale for writing, which can be found in the *Skill Scales Companion Guide*, enclosed with this publication.

individual ratings for each subdimension on the skill scales. This rating is expressed as:

L = low complexity
M = moderate complexity
H = high complexity

In some cases, the subdimension complexity rating was **NA (Non-Applicable)**. This means that this *particular dimension* of the skill was deemed not to be needed to perform this given critical work function, so no complexity rating was assigned.

In the example on page 15, the writing subdimension of "complexity of text" received a rating of "M," which means that a moderate level of complexity in the area of "complexity of text" is required for workers to perform the critical work function of "Maintain a safe and productive work area."

The subdimension complexity ratings were only identified for workers, which includes entry-level manufacturing workers up to first-line supervisors. No subdimension complexity ratings have been developed at this time for first-line supervisors.

Skill Scales Companion Guide

To review a full copy of the skill scales, see the *Skill Scales Companion Guide*, a separate publication that is part of this binder. As you review the skill standards, use the guide to understand each table and exactly what each complexity rating means.

How Can All This Information Be Used?

Education and training developers can use complexity level ratings to find out what level of skill they should be focusing on (e.g., basic mathematics vs. high-level mathematics).

Employers can use complexity ratings to help focus training. For example, a team leader may notice that her co-workers are having trouble performing the work described by a particular critical work function. She can then look at the complexity ratings for the knowledge and skills needed to perform that critical work function and zero in on the right training program, saving time and money.

The MSSC will use complexity ratings information as the basis for developing assessments and certifications based on the skill standards.

Occupational and Technical Knowledge and Skills

Occupational and technical knowledge and skills are those knowledge and skills that are unique to a given industry sector or concentration. In manufacturing, they include knowledge and skills in areas such as inspection tools and equipment, production tools and equipment, and manufacturing processes.

For each critical work function, the MSSC identified the occupational and technical knowledge and skills needed to perform the function, along with its key activities and performance indicators.

In the example to the right, we see that for the critical work function of "Maintain a safe and productive work area," the following major categories of occupational and technical knowledge and skills are needed:

- Safety procedures
- Personal safety
- Safety policies and regulations
- Corrective action
- Safety training

For each of these categories, the standards include specific examples illustrating what types of knowledge and skill are needed.

Like the information on the academic and employability knowledge and skills, the occupational and technical knowledge and skills can be used to help workers identify what they need to know and be able to do to perform the work described by the skill standards. This information can also be used by training developers, providing them with more detail about how to prepare individuals to perform the work described by each critical work function.

Please note that the MSSC did not develop complexity ratings for the occupational and technical knowledge and skills. This may be a part of future research.

About the Work and About the Worker: A Powerful Combination

One of the real strengths of the MSSC skill standards is that they provide information about what needs to be done on the job (i.e., critical work functions, key activities, and performance indicators) and the knowledge and skills needed to achieve this performance. It may be tempting to use just one aspect of the skill standards in your efforts to improve the workforce, but the real power of

P3 Critical Work Function: **Maintain a safe and productive work area.**

Knowledge and Skills

Describes what a worker needs to know or be able to do to perform the critical work function

OCCUPATIONAL AND TECHNICAL KNOWLEDGE AND SKILLS

These are the technical knowledge and skills needed to perform the critical work function.

Skill Category	Specific Knowledge and Skills	Specific Knowledge and Skills
Safety Procedures	A. Knowledge of how to locate and use Material Safety Data Sheets (MSDS). B. Knowledge of company first aid or first response procedures. C. Knowledge of material handling techniques to safely move materials. D. Knowledge of how to be proactive in responding to a safety concern and document occurrences. E. Knowledge of emergency exits. F. Knowledge of various emergency alarms and procedures.	G. Knowledge of clean-up procedures for spills. H. Knowledge of Lock Out/Tag Out requirements. I. Knowledge of how to inspect work area and report possible safety risks. J. Knowledge of machine functions to determine if all safeguards are operational. K. Knowledge of safety procedures in case of smoke or chemical inhalation. L. Knowledge of procedures for handling hazardous materials.
Personal Safety	A. Skill in identifying and reporting unsafe conditions. B. Knowledge of safety issues related to hazardous materials. C. Knowledge of housekeeping needed to maintain a safe work environment.	D. Skill in determining if all safety guards are in place prior to machine operation. E. Knowledge of clothing and personal protective equipment (PPE) that should be worn to ensure safety.
Safety Policies and Regulations	A. Knowledge of basic filing procedures to properly store inspection records. B. Knowledge of safety requirements and environmental regulations related to performing inspections. C. Knowledge of policies and procedures needed to perform audits and train employees about hazardous conditions.	D. Knowledge of company safety standards for handling potential hazards. E. Knowledge of how to safely store, identify, and use hazardous materials and pressurized vessels. F. Knowledge of OSHA and other health and safety requirements as applied to the workplace.
Corrective Action	A. Knowledge of what constitutes an unsafe condition to be able to take corrective actions. B. Knowledge of required corrective action procedures.	C. Knowledge of accident documentation procedures.
Safety Training	A. Skill in developing and/or delivering safety training per guidelines.	B. Knowledge of health and safety education requirements.

About the Worker

the MSSC skill standards is that they cover both elements.

For example, if you are an educator developing curricula, you may be tempted to focus only on the knowledge and skills, but teaching the knowledge and skills in the context of the real demands of the workplace (as expressed by the critical work functions, key activities, and performance indicators) can often achieve the best results. Or, if you are an employer wishing to communicate your business goals to your workforce, you can use the critical work functions, key activities, and performance indicators to explain the kind of performance you need on the job, while communicating the knowledge and skills required to help individuals achieve that level of performance.

I Want to Find Out…

What is meant by "core knowledge and skills" and "specialty skill standards"

You just finished reviewing what the MSSC calls the Concentration Skill Standards. In addition the MSSC skill standards system includes Core Knowledge and Skills and Specialty Skill Standards:

Core Knowledge and Skills– Once the MSSC developed skill standards for all six concentrations, it looked across those concentrations to identify the knowledge and skills that are common and important across the six concentrations. These common skills form the MSSC Core Knowledge and Skills. Core Knowledge and Skills identify the knowledge and skills that will give individuals a broad-based introduction to many kinds of work across the manufacturing industry sector, cutting across the concentrations. To obtain MSSC certification, individuals will need to demonstrate mastery of the core knowledge and skills plus standards for at least one concentration.

Specialty Skill Standards – We have spoken a lot about portability of skills and certifications and how important it is to develop standards that apply across the entire manufacturing industry sector in order to achieve that goal. That's precisely what core and concentration skill standards enable us to do.

Although core knowledge and skills and concentration skill standards will cover a large part of what an individual needs to know and be able to do to succeed at work, they will not cover everything. The skills, knowledge, and performance unique to a specific job or occupation, a manufacturing subindustry, a specific technology, or a specific apprenticeship program will be covered by specialty skill standards. The MSSC is working to align these specialty skill standards and certifications with the MSSC skill standards system.

I Want to Find Out…

How to use the skill standards now and in the future

The MSSC is working to build a national assessment and certification system for the manufacturing sector, but there are many things you can begin doing now to make use of the skill standards. Here are some ideas.

I am:	Value of stand-alone MSSC Standards	Value of MSSC Assessments and Certifications
An Employer	• Help establish high-skilled jobs and career paths • Benchmark manufacturing processes to best practices • Plan organizational re-design and develop job descriptions • Work with line mangers, unions and employees to conduct training needs analyses • Develop or improve training programs • Work with local schools to develop curriculum and programs to prepare students for good manufacturing jobs	• Recruit or hire staff • Help your employees assess their skills and develop an individual training plan • Compare job profiles and interviewees
An Employee	• Plan your career path • Upgrade your existing skills and learn high-performance skills • Learn about the skills employers need and describe your skills to an employer • Support and promote best practices in your workplace	• Assess skills against MSSC standards • Obtain portable credentials for new and existing skills • Demonstrate qualifications to employers
An Educator/ Trainer	• Work with local manufacturers and unions to develop curriculum that meets skill needs • Identify teacher/trainer qualifications • Advise students on career opportunities in manufacturing	• Assess proficiency • Recommend certification
A Union Representative	• Encourage employers to develop or improve training programs • Bargain training dollars and programs for your members • Develop or improve union training programs • Negotiate new career paths for members • Help leverage public training dollars for manufacturing training	• Get recognition for members' existing knowledge and skills • Assess members skills and provide assistance in education/career planning • Credential members and workers in MSSC skill standards • Work with employers and public agencies to place union-credentialed workers in good manufacturing jobs
A Workforce Development Professional	• Work with employers and unions to incorporate standards into local labor market information and economic development systems • Build capacity of training providers to help workers attain standards • Build the use of standards into criteria for funding public job training programs	•Assess and credential participants in MSSC skill standards •Use MSSC credentials in job placement

MSSC skill standards were developed using rigorous research methods, including industry-wide validation. To ensure the use of the standards and their related assessments and certifications comply with U.S. employment law and civil rights law, employers are legally required to conduct an internal validation of the standards before using them to make hiring and promotion decisions, just as they do today for any new standards or tests they use.

I Want to Find Out…
What's next for the project

Work is under way within the MSSC to develop assessment tools and certification programs based on the skill standards. These tools and programs are part of the total MSSC system, and our mission will not be realized until these are complete.[2]

As the MSSC and its partners work to build the national assessment and certification system, we encourage you to begin using the skill standards. As a stand-alone tool, the standards allow employers and unions to do a better job of communicating skill needs to workers, educators, and trainers. Employees can use the standards to seek out training for career advancement. Educators and trainers can start to plan curricula based on the standards and communicate to students about the skills that employers expect.

In the long term, we need the leadership of company executives, employees, union leaders, educators, and economic development directors in using the standards in their workplaces and training programs. Other businesses, vendors, and suppliers will follow the innovators who begin to use the skill standards.

Most of all, we encourage you to get involved with the work of the MSSC. Start by giving us your feedback on the skill standards, either by completing the feedback form in the binder and faxing it to (202) 289-7618 or by completing a feedback form online at www.msscusa.org .

[2] The skill standards in this publication should not be viewed as potential substitutes for existing certification and apprenticeship programs. Although some aspects of the MSSC skill standards may overlap with existing certification and apprenticeship programs, the MSSC's mission is to provide assessments and certifications for manufacturing work where none currently exists. To do this, the MSSC plans to work with existing certification and Registered Apprenticeship programs to ensure our assessments and certifications complement and support, rather than duplicate, existing programs.

Special Thanks and Acknowledgement

For the past three years, the MSSC has been fortunate to have the dedication of several leading organizations and individuals who are committed to making workforce excellence an attainable goal for all American manufacturers. Although the list is too large to print in this document, the MSSC would like to extend a very special thank you to the following individuals for their leadership, expertise and exceptional work over the past few years:

MSSC Committee Chairs 1998 - 2001

John Rauschenberger
Manager, Personnel Research & Development
Ford Motor Company
MSSC Chair 1998 – 2001

Mr. Dave Horn
Continuous Improvement Director
Association For Manufacturing Technology
Standards Committee Chair 2000 – Present

Ms. Karen Shewbart
Director, Mfg. & Eng. Learning Resources
The Dow Chemical Company
Standards Committee Chair 1999-2000

Dr. RoseAnn Stevenson
The Boeing Company
Standards Committee Chair 1998 – 1999

Ms. Penny Weidner
Commonwealth of Pennsylvania
Framework & Systems Building Chair 2000 – Present

Dr. Chris Olson
Director, NSSB/STW Manufacturing Linkages Project
Manufacturing Linkages Project/VTECS
Framework & Systems Building Chair 1998 –1999

Dr. Ken Mericle
Chairman
School for Workers, University of Wisconsin
Assessment & Certification Chair
1998 – Present

Ms. Pam Lund
President, Workforce Development Consulting
Momenta Inc.
Marketing Committee Chair, 1999 – Present

Ms. Gayla Zoz
Human Resources Manager
R.R. Donnelly & Sons, Inc.
Marketing Committee Chair, 1999 – 1999

Ms. Tina Koester
Human Resources Manager
R.R. Donnelly & Sons, Inc.
Marketing Committee Chair, 1998 – 1999

MSSC Staff

Mr. Leo Reddy (NACFAM), MSSC Industry Co-Leader
Ms. Ellen Scully (WAI), MSSC Labor Co-Leader
Mr. Bob Baugh (WAI)
Ms. Janice Brangman (NACFAM)
Ms. Emily Brennan (NACFAM)
Ms. Bridget Brown (NACFAM)
Mr. Bill Bywater (WAI)
Mr. Peter DiCicco (WAI)
Mr. Tom Gannon (WAI)
Ms. LeeSa Gerst (NACFAM)
Mr. Curt Ostrander (WAI)
Robert Ramos, Ph.D. (NACFAM)
Mr. Jeff Rickert (WAI)
Mr. C.J. Shroll (NACFAM)
Mr. Keenan Yoho (WAI)

NSSB Staff

Ms. Edie West, Executive Director, NSSB
Ms. Bridget Brown
Elizabeth Kolmstetter, Ph.D.
Ms. Cathy Silverstein
Mr. David Wilcox

NSSB Technical Team

Eileen Antonucci, Ph.D., Director - NSSB Technical Team
Ms. Terryll Bailey
Mr. Michael Campion, Ph.D.
Ms. Cheryl Fields-Tyler
Hal Gueutal, Ph.D.
James Hogan, Ph.D.
Ms. Eve Rose
Ms. Judy Seabridge,
Paul Squires, Ph.D.

Other Consultants

Ms. Carol Hardy, Standards Design and Layout
Ms. Patti Soltys, Consultant National Association of Manufacturers
Dr. Dan Luria, Industrial Technology Institute
Ms. Kristin Dziczek, Industrial Technology Institute

MSSC Facilitator Network

Ms. Corky Baggett, School Uniform Direct, Concord, CA
Ms. Ramona Bilgram, Center for Business, Industry & Labor, St. Louis, MO
Mr. Robert Bilsky, Industrial Management Council, Rochester, NY
Mr. Hugh Bleddyn, Valencia Community College, Orlando, FL
Ms. Shanna Chastain, Guilford Technical Community College, Jamestown, NC
Dr. Jim Clark, Southern Regional Education Board, Atlanta, GA
Mr. Craig Cooper, California Manufacturing Technology Center, Ontario, CA
Mr. Joe Cortez, Orange Coast College, Costa Mesa, CA
Ms. Phaedra Ellis-Lamkins, Working Partnership U.S.A, San Jose, CA
Ms. Sandra Everett, Lorain County Community College, Elyria, OH
Dr. Jerry J. Field, Illinois Institute of Technology, Chicago, IL
Mr. Terry Fisher, Bill J. Priest Institute for Economic Development, Dallas, TX
Mr. Steve Herzenberg, Keystone Research Center, Harrisburg, PA
Mr. Peter Kardas, Workers' Center, Olympia, WA
Ms. Pat Kelley, Enhanced Training Opportunities Program, Inc., Orlando, FL
Ms. Sally Klingel, Cornell University, Ithaca, NY
Mr. Robert Link, Rock Valley College, Rockford, IL
Ms. Lisa Medeiros, Manufacturers' Partnership of Rhode Island, Providence, RI
Ms. Corliss Olson, School for Workers, Madison, WI
Mr. Michael Pahides, Delaware Valley Industrial Resource Center, Philadelphia, PA
Dr. Jim Picquet, Bill J. Priest Institute for Economic Development, Dallas, TX
Ms. Maureen Sheahan, Labor Management Council for Economic Renewal, Southfield, MI
Ms. Stephanie Stalmah, Institute for Career Development, Merrillville, IN
Ms. Debbie Strange, Guilford Technical Community College, Jamestown, NC
Mr. Skip Tenczar, Springfield Technical Community College, MA