



# TORO Analysis of Commercial and Industrial Designers to Mechanical Drafters

## INPUT SECTION:

Transfer	Title	O*NET	Filters		
From Title:	Commercial and Industrial Designers	27-1021.00	Abilities:	Importance Level: 50	Weight: 1
To Title:	Mechanical Drafters	17-3013.00	Skills:	Importance Level: 69	Weight: 1
Labor Market Area:	Maine Statewide		Knowledge:	Importance Level: 69	Weight: 1

## OUTPUT SECTION:

Grand TORQ:

88

Ability TORQ		Skills TORQ		Knowledge TORQ	
Level	89	Level	87	Level	88

Gaps To Narrow if Possible				Upgrade These Skills				Knowledge to Add			
Ability	Level	Gap	Impt	Skill	Level	Gap	Impt	Knowledge	Level	Gap	Impt
Mathematical Reasoning	64	23	75	Active Listening	66	9	77	Design	89	12	95
Visualization	69	18	84	Equipment Selection	72	9	71	Engineering and Technology	80	9	84
Near Vision	69	16	84	Technology Design	67	7	74				
Written Expression	66	16	78	Mathematics	70	6	79				
Problem Sensitivity	62	12	78	Instructing	62	3	75				
Arm-Hand Steadiness	46	16	56	Complex Problem Solving	65	3	71				
Number Facility	55	13	59								
Oral Expression	66	9	84								
Oral Comprehension	66	9	81								
Deductive Reasoning	64	9	75								
Inductive Reasoning	59	9	75								
Category Flexibility	59	11	59								
Flexibility of Closure	50	11	59								
Perceptual Speed	46	11	53								
Written Comprehension	64	7	75								
Speed of Closure	44	9	53								



Speech Recognition	50	6	68
Far Vision	50	6	53
Selective Attention	42	5	59
Fluency of Ideas	59	4	65
Originality	59	4	62
Finger Dexterity	42	1	56

LEVEL and IMPT (IMPORTANCE) refer to the Target Mechanical Drafters. GAP refers to level difference between Commercial and Industrial Designers and Mechanical Drafters.

## ASK ANALYSIS

### Ability Level Comparison - Abilities with importance scores over 50

Description	Commercial and Industrial Designers	Mechanical Drafters	Importance
Oral Expression	57	66	84
Visualization	51	69	84
Near Vision	53	69	84
Oral Comprehension	57	66	81
Written Expression	50	66	78
Problem Sensitivity	50	62	78
Written Comprehension	57	64	75
Deductive Reasoning	55	64	75
Inductive Reasoning	50	59	75
Information Ordering	57	57	75
Mathematical Reasoning	41	64	75
Speech Clarity	46	44	72
Speech Recognition	44	50	68
Fluency of Ideas	55	59	65
Originality	55	59	62
Category Flexibility	48	59	59
Number Facility	42	55	59
Flexibility of Closure	39	50	59
Selective Attention	37	42	59
Arm-Hand Steadiness	30	46	56
Finger Dexterity	41	42	56



Speed of Closure	35	44	53
Perceptual Speed	35	46	53
Far Vision	44	50	53

Skill Level Comparison - Abilities with importance scores over 69

Description	Commercial and Industrial Designers	Mechanical Drafters	Importance
Reading Comprehension	69	69	82
Mathematics	64	70	79
Active Listening	57	66	77
Instructing	59	62	75
Critical Thinking	65	60	74
Technology Design	60	67	74
Complex Problem Solving	62	65	71
Equipment Selection	63	72	71

Knowledge Level Comparison - Knowledge with importance scores over 69

Description	Commercial and Industrial Designers	Mechanical Drafters	Importance
Design	77	89	95
Engineering and Technology	71	80	84
Mathematics	72	70	75

Experience & Education Comparison

Related Work Experience Comparison			Required Education Level Comparison		
Description	Commercial and Industrial Designers	Mechanical Drafters	Description	Commercial and Industrial Designers	Mechanical Drafters
10+ years	0%	0%	Doctoral	0%	0%
8-10 years	0%	2%	Professional Degree	0%	0%
6-8 years	30%	0%	Post-Masters Cert	0%	0%
4-6 years	21%	7%	Master's Degree	7%	0%
2-4 years	9%	26%	Post-Bachelor Cert	6%	0%
1-2 years	12%	0%	Bachelors	55%	0%
6-12 months	9%	30%	AA or Equiv	18%	81%
3-6 months	6%	25%	Some College	0%	5%
1-3 months	9%	0%	Post-Secondary Certificate	9%	13%
0-1 month	0%	0%	High School Diploma or GED	2%	0%
None	0%	5%			



No HSD or GED

0%

0%

Commercial and Industrial Designers	Mechanical Drafters
<b>Most Common Educational/Training Requirement:</b>	
Bachelor's degree	Postsecondary vocational award
<b>Job Zone Comparison</b>	
<p><b>4 - Job Zone Four: Considerable Preparation Needed</b> A minimum of two to four years of work-related skill, knowledge, or experience is needed for these occupations. For example, an accountant must complete four years of college and work for several years in accounting to be considered qualified.</p> <p>Most of these occupations require a four - year bachelor's degree, but some do not.</p> <p>Employees in these occupations usually need several years of work-related experience, on-the-job training, and/or vocational training.</p>	<p><b>3 - Job Zone Three: Medium Preparation Needed</b> Previous work-related skill, knowledge, or experience is required for these occupations. For example, an electrician must have completed three or four years of apprenticeship or several years of vocational training, and often must have passed a licensing exam, in order to perform the job.</p> <p>Most occupations in this zone require training in vocational schools, related on-the-job experience, or an associate's degree. Some may require a bachelor's degree.</p> <p>Employees in these occupations usually need one or two years of training involving both on-the-job experience and informal training with experienced workers.</p>

## Tasks

Commercial and Industrial Designers	Mechanical Drafters
Core Tasks	Core Tasks
<p>Generalized Work Activities:</p> <ul style="list-style-type: none"> <li>• Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.</li> <li>• Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.</li> <li>• Thinking Creatively - Developing, designing, or creating new applications, ideas, relationships, systems, or products, including artistic contributions.</li> <li>• Updating and Using Relevant Knowledge - Keeping up-to-date technically and applying new knowledge to your job.</li> <li>• Communicating with Supervisors, Peers, or Subordinates - Providing information to supervisors, co-workers, and subordinates by telephone, in written form, e-mail, or in person.</li> <li>• Identifying Objects, Actions, and Events - Identifying information by categorizing, estimating, recognizing differences or similarities, and detecting changes in circumstances or events.</li> </ul>	<p>Generalized Work Activities:</p> <ul style="list-style-type: none"> <li>• Drafting, Laying Out, and Specifying Technical Devices, Parts, and Equipment - Providing documentation, detailed instructions, drawings, or specifications to tell others about how devices, parts, equipment, or structures are to be fabricated, constructed, assembled, modified, maintained, or used.</li> <li>• Interacting With Computers - Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.</li> <li>• Getting Information - Observing, receiving, and otherwise obtaining information from all relevant sources.</li> <li>• Making Decisions and Solving Problems - Analyzing information and evaluating results to choose the best solution and solve problems.</li> <li>• Processing Information - Compiling, coding, categorizing, calculating, tabulating, auditing, or verifying information or data.</li> </ul>
Specific Tasks	Specific Tasks
<p>Occupation Specific Tasks:</p> <ul style="list-style-type: none"> <li>• Advise corporations on issues involving corporate image projects or problems.</li> <li>• Confer with engineering, marketing, production, or sales departments, or with customers, to establish and evaluate design concepts for manufactured products.</li> </ul>	<p>Occupation Specific Tasks:</p> <ul style="list-style-type: none"> <li>• Check dimensions of materials to be used and assign numbers to the materials.</li> <li>• Compute mathematical formulas to develop and design detailed specifications for components or machinery using computer-assisted equipment.</li> <li>• Confer with customer representatives to review schematics and answer questions pertaining to installation of systems.</li> </ul>



- Coordinate the look and function of product lines.
- Design graphic material for use as ornamentation, illustration, or advertising on manufactured materials and packaging or containers.
- Develop industrial standards and regulatory guidelines.
- Develop manufacturing procedures and monitor the manufacture of their designs in a factory to improve operations and product quality.
- Direct and coordinate the fabrication of models or samples and the drafting of working drawings and specification sheets from sketches.
- Evaluate feasibility of design ideas, based on factors such as appearance, safety, function, serviceability, budget, production costs/methods, and market characteristics.
- Fabricate models or samples in paper, wood, glass, fabric, plastic, metal, or other materials, using hand or power tools.
- Investigate product characteristics such as the product's safety and handling qualities, its market appeal, how efficiently it can be produced, and ways of distributing, using and maintaining it.
- Modify and refine designs, using working models, to conform with customer specifications, production limitations, or changes in design trends.
- Participate in new product planning or market research, including studying the potential need for new products.
- Prepare sketches of ideas, detailed drawings, illustrations, artwork, or blueprints, using drafting instruments, paints and brushes, or computer-aided design equipment.
- Present designs and reports to customers or design committees for approval, and discuss need for modification.
- Read publications, attend showings, and study competing products and design styles and motifs to obtain perspective and generate design concepts.
- Research production specifications, costs, production materials and manufacturing methods, and provide cost estimates and itemized production requirements.
- Supervise assistants' work throughout the design process.

#### Detailed Tasks

##### Detailed Work Activities:

- analyze market conditions
- analyze project proposal to determine feasibility, cost, or time
- analyze technical data, designs, or preliminary specifications
- communicate visually or verbally

performing to installation of systems.

- Coordinate with and consult other workers to design, lay out, or detail components and systems and to resolve design or other problems.
- Design scale or full-size blueprints of specialty items such as furniture and automobile body or chassis components.
- Develop detailed design drawings and specifications for mechanical equipment, dies, tools, and controls, using computer-assisted drafting (CAD) equipment.
- Draw freehand sketches of designs, trace finished drawings onto designated paper for the reproduction of blueprints, and reproduce working drawings on copy machines.
- Lay out and draw schematic, orthographic, or angle views to depict functional relationships of components, assemblies, systems, and machines.
- Lay out, draw, and reproduce illustrations for reference manuals and technical publications to describe operation and maintenance of mechanical systems.
- Modify and revise designs to correct operating deficiencies or to reduce production problems.
- Position instructions and comments onto drawings.
- Review and analyze specifications, sketches, drawings, ideas, and related data to assess factors affecting component designs and the procedures and instructions to be followed.
- Shade or color drawings to clarify and emphasize details and dimensions or eliminate background using ink, crayon, airbrush, and overlays.
- Supervise and train other drafters, technologists, and technicians.

#### Detailed Tasks

##### Detailed Work Activities:

- analyze technical data, designs, or preliminary specifications
- analyze test data
- collect scientific or technical data
- communicate technical information
- conduct training for personnel
- confer with engineering, technical or manufacturing personnel
- consult with customers concerning needs
- create mathematical or statistical diagrams or charts
- direct and coordinate activities of workers or staff
- draw prototypes, plans, or maps to scale
- evaluate engineering data
- examine engineering documents for completeness or accuracy



- confer with client or staff regarding theme
- confer with other departmental heads to coordinate activities
- consult with customers concerning needs
- coordinate activities of assistants
- create art from ideas
- distinguish details in graphic arts material
- draw designs, letters, or lines
- draw prototypes, plans, or maps to scale
- estimate production costs
- evaluate product design
- evaluate product quality for sales activities
- fabricate craft or art objects
- follow manufacturing methods or techniques
- identify color or balance
- identify problems or improvements
- maintain consistent production quality
- make presentations
- organize commercial artistic or design projects
- prepare artwork for camera or press
- read blueprints
- recommend improvements to work methods or procedures
- recommend solutions of administrative problems
- schedule work to meet deadlines
- sketch or draw subjects or items
- understand artistic crafts production methods
- use characteristics of graphic design materials
- use computer aided drafting or design software for design, drafting, modeling, or other engineering tasks
- use computer graphics design software
- use computers to enter, access or retrieve data
- use creativity in graphics
- use creativity in industrial artistry
- use creativity to art or design work
- use drafting or mechanical drawing techniques
- use graphic arts techniques
- use hand or power tools
- use marketing techniques
- use product knowledge to market goods

- follow manufacturing methods or techniques
- inspect manufactured products or materials
- prepare technical reports or related documentation
- read blueprints
- read schematics
- read technical drawings
- understand engineering data or reports
- understand technical operating, service or repair manuals
- use computer aided drafting or design software for design, drafting, modeling, or other engineering tasks
- use drafting or mechanical drawing techniques
- use government regulations
- use knowledge of metric system
- use precision measuring tools or equipment
- use spreadsheet software
- work as a team member

Technology - Examples

Computer aided design CAD software

- Autodesk AutoCAD software
- Autodesk Inventor
- Autodesk Mechanical
- Bentley Microstation
- Bentley Navigator
- Dassault Systemes CATIA software
- Piping and instrumentation design PID software
- PTC Pro/Cable
- PTC Pro/ENGINEER software
- PTC Pro/ENGINEER Wildfire
- PTC Pro/Mechanica
- PTC Pro/Pipe
- PTC Pro/Sheetmetal
- Reverse engineering software
- SofTech CADRA
- SolidWorks CAD software

Computer aided manufacturing CAM software

- Rapid prototyping software

Technology - Examples

Computer aided design CAD software

- Ashlar-Vellum Cobalt
- Autodesk AliasStudio



## Autodesk AutoCAD software

- Autodesk Maya software
- Dassault Systemes CATIA software
- PTC Pro/ENGINEER software
- Siemens PLM Software UGS NX
- SolidWorks CAD software

## Data base user interface and query software

- Microsoft Access

## Desk top publishing software

- Adobe Systems Adobe InDesign
- Microsoft Publisher
- QuarkXpress

## Document management software

- Adobe Systems Adobe Acrobat software

## Electronic mail software

- Email software

## Graphics or photo imaging software

- Adobe Systems Adobe FreeHand
- Adobe Systems Adobe Illustrator
- Adobe Systems Adobe Photoshop software
- Corel CorelDraw Graphics Suite
- Corel Painter
- McNeel Rhino software
- Xara Xtreme

## Internet browser software

- Web browser software

## Office suite software

- Microsoft Office

## Presentation software

- Microsoft PowerPoint

## Spreadsheet software

- Microsoft Excel

## Video creation and editing software

- Autodesk 3ds Max
- Chaos Group V-Ray
- MAXON CINEMA 4D
- Softimage XSI

## Data base user interface and query software

- Microsoft Access

## Document management software

- Document management software

## Graphics or photo imaging software

- Adobe Systems Adobe After Effects
- Adobe Systems Adobe LiveMotion
- Graphic presentation software
- McNeel Rhino software
- Motion graphics software
- Non uniform rational b-splines NURBS software

## Materials requirements planning logistics and supply chain software

- Bill of materials software

## Optical character reader OCR or scanning software

- Scanning software
- Three-dimensional scanning software

## Presentation software

- Microsoft PowerPoint

## Spreadsheet software

- Microsoft Excel

## Word processing software

- Microsoft Word

## Tools - Examples

- Calculators
- Compasses
- Three-dimensional motion controllers
- Flexible curves
- Desktop computers
- Computer aided design CAD multi-unit display graphics cards
- Notebook computers
- Cutting plotters
- Print servers
- Protractors
- Architects' scales



## Word processing software

- Microsoft Word

## Tools - Examples

- Desktop computers
- Compact digital cameras
- Universal serial bus USB flash drives
- Liquid crystal display LCD video projectors
- Laptop computers
- Personal computers

- Backlit digitizers
- T-squares
- Graphics tablets
- Estimating keypads
- Triangles

### Labor Market Comparison

Description	Commercial and Industrial Designers	Mechanical Drafters	Difference
Median Wage	\$ 49,170	\$ 46,630	\$( 2,540)
10th Percentile Wage	\$ 29,790	\$ 38,290	\$ 8,500
25th Percentile Wage	N/A	N/A	N/A
75th Percentile Wage	\$ 72,210	\$ 50,240	\$( 21,970)
90th Percentile Wage	\$ 81,030	\$ 52,420	\$( 28,610)
Mean Wage	\$ 53,870	\$ 46,320	\$( 7,550)
Total Employment - 2007	140	710	570
Employment Base - 2006	153	742	589
Projected Employment - 2016	160	754	594
Projected Job Growth - 2006-2016	4.6 %	1.6 %	-3.0 %
Projected Annual Openings - 2006-2016	5	22	17

### National Job Posting Trends

Trend for Commercial and Industrial Designers

Trend for  
Mechanical  
Drafters



Data from [Indeed](#)

### Recommended Programs

Mechanical Drafting and Mechanical Drafting CAD/CADD

Mechanical Drafting and Mechanical Drafting CAD/CADD. A program that prepares individuals to apply technical knowledge and skills to develop working drawings and electronic simulations in support of mechanical and industrial engineers, and related professionals. Includes instruction in manufacturing materials and processes, mechanical drafting, electrode-mechanical drafting, basic metallurgy, geometric dimensioning and tolerancing, blueprint reading and technical communication.

No schools available for the program

### Maine Statewide Promotion Opportunities for Commercial and Industrial Designers

O*NET Code	Title	Grand TORQ	Job Zone	Employment	Median Wage	Difference	Growth	Annual Job Openings
27-1021.00	Commercial and Industrial Designers	100	4	140	\$49,170.00	\$0.00	5%	5
17-2072.00	Electronics Engineers, Except Computer	87	4	210	\$76,420.00	\$27,250.00	-26%	4
17-2112.00	Industrial Engineers	87	4	580	\$68,350.00	\$19,180.00	11%	22
27-1022.00	Fashion Designers	87	3	60	\$71,370.00	\$22,200.00	19%	1
17-3026.00	Industrial Engineering Technicians	87	3	370	\$51,700.00	\$2,530.00	6%	9
17-2121.02	Marine Architects	86	4	60	\$75,520.00	\$26,350.00	-9%	1
17-2131.00	Materials Engineers	85	4	40	\$70,250.00	\$21,080.00	-7%	1
17-2111.03	Product Safety Engineers	85	5	90	\$49,940.00	\$770.00	3%	3



15-1051.00	Computer Systems Analysts	84	4	1,650	\$69,340.00	\$20,170.00	20%	78
11-9041.00	Engineering Managers	84	5	720	\$91,030.00	\$41,860.00	-2%	14
17-2071.00	Electrical Engineers	84	4	260	\$73,050.00	\$23,880.00	-10%	6
17-2141.00	Mechanical Engineers	84	4	620	\$67,210.00	\$18,040.00	-9%	14
17-2111.02	Fire-Prevention and Protection Engineers	83	4	90	\$49,940.00	\$770.00	3%	3
27-1011.00	Art Directors	83	4	90	\$66,570.00	\$17,400.00	10%	7
15-1032.00	Computer Software Engineers, Systems Software	82	4	290	\$73,410.00	\$24,240.00	11%	8

### Top Industries for Mechanical Drafters

Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Architectural and structural metals manufacturing	332300	6.37%	4,993	5,394	8.04%
Self-employed workers, primary job	000601	4.81%	3,771	4,064	7.77%
Metalworking machinery manufacturing	333500	4.69%	3,674	3,043	-17.18%
Other general purpose machinery manufacturing	333900	4.37%	3,423	3,126	-8.68%
Employment services	561300	3.41%	2,669	3,075	15.23%
Agriculture, construction, and mining machinery manufacturing	333100	2.98%	2,333	2,204	-5.55%
Aerospace product and parts manufacturing	336400	2.73%	2,139	2,372	10.88%
Industrial machinery manufacturing	333200	2.48%	1,945	1,612	-17.13%
Other fabricated metal product manufacturing	332900	2.03%	1,593	1,427	-10.37%
Motor vehicle parts manufacturing	336300	1.85%	1,446	1,164	-19.46%
Navigational, measuring, electromedical, and control instruments manufacturing	334500	1.78%	1,397	1,353	-3.15%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	333400	1.70%	1,328	1,236	-6.94%
Management of companies and enterprises	551100	1.39%	1,089	1,270	16.62%
Plumbing, heating, and air-conditioning contractors	238220	1.36%	1,064	1,215	14.23%
Commercial and service industry machinery manufacturing	333300	1.17%	918	814	-11.27%

### Top Industries for Commercial and Industrial Designers



Industry	NAICS	% in Industry	Employment	Projected Employment	% Change
Self-employed workers, primary job	000601	25.29%	12,136	12,929	6.54%
Specialized design services	541400	8.84%	4,243	5,678	33.81%
Management of companies and enterprises	551100	5.03%	2,414	2,783	15.28%
Self-employed workers, secondary job	000602	4.50%	2,158	2,148	-0.45%
Motor vehicle parts manufacturing	336300	2.70%	1,296	1,032	-20.39%
Employment services	561300	2.16%	1,038	1,314	26.56%
Plastics product manufacturing	326100	1.90%	910	965	6.00%
Miscellaneous durable goods merchant wholesalers	423900	1.40%	674	774	14.80%
Advertising and related services	541800	1.37%	657	741	12.83%
Navigational, measuring, electromedical, and control instruments manufacturing	334500	1.13%	541	518	-4.26%
Research and development in the physical, engineering, and life sciences	541710	1.11%	533	569	6.69%
Other general purpose machinery manufacturing	333900	0.94%	452	408	-9.73%
Medical equipment and supplies manufacturing	339100	0.91%	437	447	2.29%
Ventilation, heating, air-conditioning, and commercial refrigeration equipment manufacturing	333400	0.90%	430	396	-8.01%
Household appliance manufacturing	335200	0.86%	410	311	-24.33%