



Nebraska

PROFIT OPPORTUNITIES
FOR MANUFACTURERS OF
FABRICATED METAL PRODUCTS



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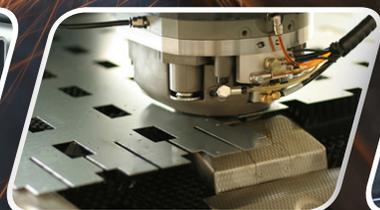


Table of Contents

EXECUTIVE SUMMARY	1
PART A THE FABRICATED METAL PRODUCT MANUFACTURING SUBSECTOR	4
I. Industry Structure	5
II. Industry Production Characteristics	9
III. Industry Location Characteristics	11
IV. Capital Expenditures and Industry Outlook	12
PART B NEBRASKA ADVANTAGES FOR FABRICATED METAL PRODUCT MANUFACTURERS	15
I. Nebraska Location Resources	15
Access to Markets - Transportation.....	16
Low Cost Utilities	16
High Quality Work Force	18
Higher Education Resources	18
Research.....	18
Engineering.....	18
Performance-Based Tax Incentives	21
New Economic Development Initiatives.....	24
Other Development Assistance Programs	25
Quality of Life.....	25
CONCLUSIONS	27
APPENDIX A LABOR AND ENERGY COST ANALYSIS	A-1
Alternative Plant Locations.....	A-1
The Model Plant.....	A-2
Energy Used in the Model Plant.....	A-2
Labor-Related Costs.....	A-3
Energy Costs.....	A-5
Labor and Energy Cost Summary	A-7

List of Tables

Table 1	The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Characteristics and Trends, Selected Years, 2002–2013	4
Table 2	The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Value of Industry Shipments by Major Industry Group, 2007, 2012, and 2013	5
Table 3	The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Number of Companies and Establishments, Employment, Value of Shipments, Value Added, and Capital Expenditures by Major Sector and Industry Subgroups, 2013	8
Table 4	Production Characteristics for the Fabricated Metal Product Manufacturing Subsector (NAICS 332), 2007, 2012, and 2013	9
Table 5	Establishment Characteristics for the Fabricated Metal Product Manufacturing Subsector (NAICS 332), Machine Shops and Threaded Product Manufacturing Industry Subgroup (NAICS 3327), and the Balance of Subsector, 2012.....	10
Table 6	Fabricated Metal Product Manufacturing Subsector (NAICS 332), Production Workers, Average Wages, Capital Expenditures, and Value of Shipments, Selected States and the U.S., 2013	11
Table 7	Capital Expenditures in the Fabricated Metal Product Manufacturing Subsector (NAICS 332), by Industry Subgroup, 2007, 2012, and 2013	12
Table 8	Employment and Output, Fabricated Metal Product Manufacturing Subsector (NAICS 332),by Industry Subgroup, and for All Manufacturing, 2002, 2012, and Projected 2022.....	13
Table 9	Cost of Living in Nebraska, Compared to the National Average, October 1, 2015	26
Table A-1	Alternative Locations for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)	A-1
Table A-2	Characteristics of a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332).....	A-2
Table A-3	Energy Use in Fabricated Metal Product Manufacturing Subsector (NAICS 332) Manufacturing Establishments.....	A-3
Table A-4	Total Annual Labor-Related Costs for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332).....	A-4
Table A-5	Annual Energy Costs for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)	A-6
Table A-6	Summary of Labor and Energy Costs for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332).....	A-7

List of Figures

Figure 1	Labor and Energy Costs per Production Worker for Fabricated Metal Product Manufacturers (NAICS 332).....	2
Figure 2	Value of Shipments by Industry Group, Fabricated Metal Product Manufacturers (NAICS 332), 2013	6
Figure 3	Truck Access to Regional and National Markets	15
Figure 4	Electric Costs for Industrial Service, Winter 2014–Summer 2014.....	17
Figure 5A	Location of Nebraska Area Colleges and Universities	23
Figure 5B	Community Colleges in Nebraska	23
Figure 6	Manufacturing Employment, Nebraska, Surrounding States, and the U.S., 1990–2014	26
Figure A-1	Estimated Total Labor Costs for a Fabricated Metal Product Model Plant, Alternative Plant Locations.....	A-5
Figure A-2	Estimated Total Energy Costs for a Fabricated Metal Product Model Plant, Alternative Plant Locations.....	A-6

EXECUTIVE SUMMARY

The “Fabricated Metal Product Manufacturing” subsector (NAICS 332) is the second largest manufacturing subsector, when measured by employment, in the United States. As fabricated metal product manufacturers continue to deal with slow growth in the U.S. and global economies, they face a variety of challenges, including rapidly increasing foreign and domestic competition, and opportunities that include expanding national and global markets.

This study has been developed specifically for use by fabricated metal product manufacturers to show how a Nebraska plant location can help them better respond to market conditions and significantly improve their competitive positions. Discussed are the many locational advantages the state offers, including performance-based tax incentives that enhance the state’s high-ranking business climate.

As the U.S. economy experienced two major recessions between 2000 and 2009, manufacturing employment in Nebraska outperformed the Plains Region and the nation. This suggests that companies with Nebraska manufacturing plants benefit from location and other competitive advantages associated with doing business in Nebraska.

Nebraska’s attractive business climate, a productive and well-educated labor force, competitive labor and energy costs, and central location are among the wide range of advantages the state offers manufacturers.

For an industry characterized by many small- and medium-sized production facilities, Nebraska provides substantial advantages in reducing costs, expanding capacity, and otherwise becoming more competitive.

Included in this study are example companies that have recently expanded their operation in Nebraska. These companies have found Nebraska to be a place to grow their companies and their profits.

Also included in this study is an analysis of geographically variable labor and energy costs. The analysis makes cost comparisons among states on the basis of a model manufacturing plant. The model plant assumes employment of 50 production workers and the manufacture of a product representative of the “Fabricated Metal Product Manufacturing” subsector (NAICS 332).

Sixteen states are examined in the analysis. These states include the top eight states in terms of value of shipments by the Fabricated Metal Product Manufacturing subsector and other states near Nebraska with which it typically competes for industrial location projects.

In the model plant analysis, estimated labor-related costs include the direct wages paid to production workers and costs associated with workers’ compensation insurance, unemployment insurance, social security, and fringe benefits. Compared to the 15 alternative states, Nebraska is found to offer an annual savings of \$170,891 in labor-related costs, which is 5.7 percent less than the average labor costs for the other states.

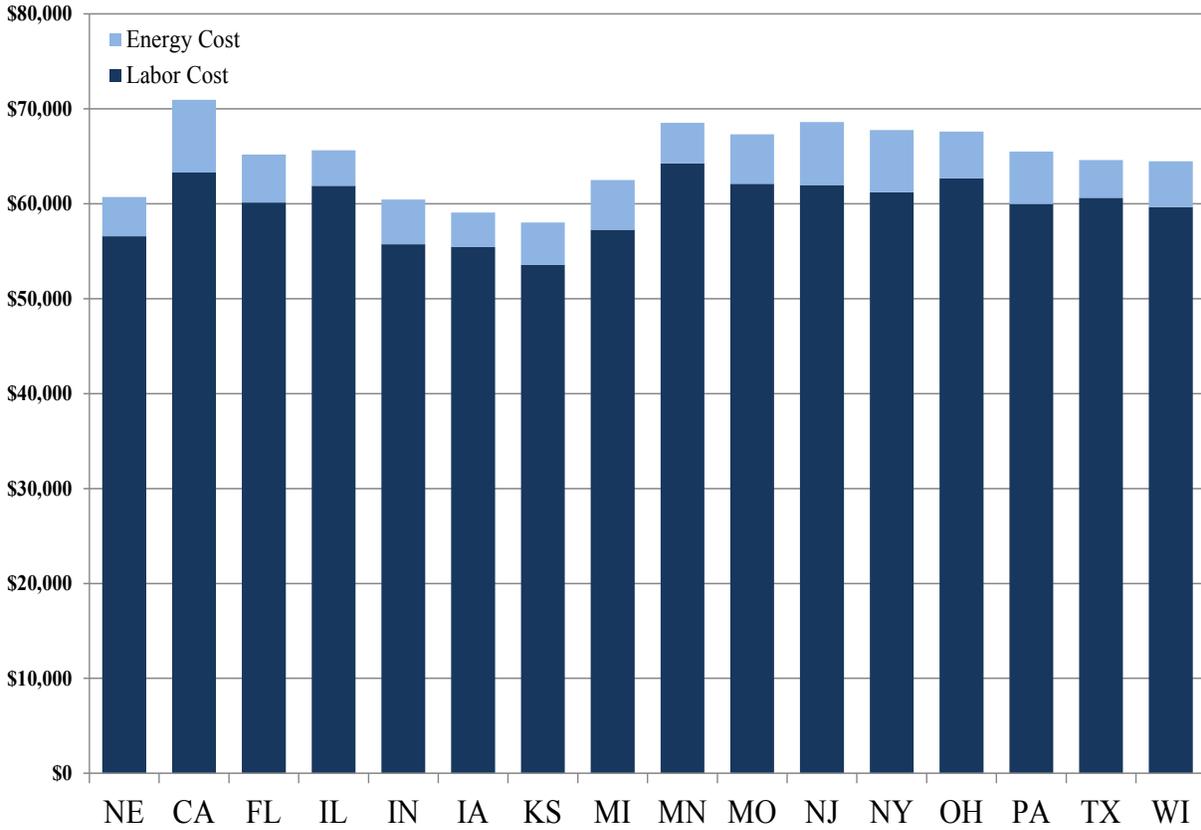
This study also concludes that a Nebraska plant location offers a significant energy cost advantage when compared to the average cost of the other 15 states. Industrial electric rates in the alternative states average 16.1 percent higher, and the average industrial gas rate is 27.1 percent more. Combining these advantages, Nebraska’s energy cost for the model plant is 18.6 percent less than the average for the other 15 alternative locations.

Together, Nebraska’s annual labor and energy costs for the model plant are \$218,279, or 6.7 percent less than the average costs for the 15 alternative states. Conversely, the average labor and energy costs in the other 15 states are 7.2 percent more than the Nebraska labor and energy costs.

Figure 1 provides a summary of the labor and energy costs for the model plant for each of the

16 alternative states. These costs are shown on a per-production-worker basis.

Figure 1
Labor and Energy Costs per Production Worker for
Fabricated Metal Product Manufacturers (NAICS 332)



Calculated labor (wages, workers' compensation insurance, unemployment insurance, social security, and fringe benefits) and energy (electricity and natural gas) costs for a fabricated metal product manufacturer (NAICS 332).

Source: Table A-6.

YES, NEBRASKA IS READY TO COMPETE

The opening of the impressive \$17-million Omaha Steel Castings plant in Wahoo sends an important message: Nebraska Can Compete.

At a time when our country is focusing on raising workforce skill levels and taking advantage of new opportunities in manufacturing, Omaha Steel Castings shows the importance of embracing nimble, efficient business practices that meet the requirements of an intensely competitive global economy.

High performance in the manufacturing sector doesn't just happen. More than ever, it requires skilled, hardworking employees, a forward-looking business culture, and top-flight equipment.

Nebraska can buttress such economic performance with supports that include sensible tax and regulatory policies, strong worker training programs, properly prepared industrial tracts, and competitive electrical prices.

Omaha Steel Castings soon will shift all of its 175 employees to the new Wahoo plant, with a goal of doubling production and increasing employment to at least 250. This will be a terrific economic boost to Wahoo and Saunders County, with an overall estimated economic effect of some \$32 million annually.

Nebraska's largest steel-producing facility, the Nucor Steel Complex in Norfolk, has exemplified that innovative spirit. Last month, the Nebraska Chamber of Commerce and Industry saluted Nucor's business acumen by designating it Nebraska's large-scale manufacturer of the year for business innovation.

Primary metals manufacturing is the 10th-largest manufacturing sector in Nebraska, according to the U.S. Bureau of Economic Analysis.

The U.S. steel industry has faced strong competitive pressures for decades, and some communities across the country have been hit hard. It's a tribute to the vision and skill of Nebraska's steel sector that it continues to stand tall.

Indeed, it exemplifies the forward-thinking mind-set that's crucial for competing in the 21st century.

Excerpts from October 14, 2013, Omaha World Herald editorial.



PART A

THE FABRICATED METAL PRODUCT MANUFACTURING SUBSECTOR

The “Fabricated Metal Product Manufacturing” subsector (NAICS 332) is the second largest manufacturing subsector¹, when measured by employment, in the United States. The 2013 Annual Survey of Manufactures indicates the fabricated metal product sector accounted for 12.5 percent of total employment by U.S. manufacturers. In 2013, fabricated metal product manufacturing establishments produced 7.7 percent of total U.S. manufacturing value added and 5.9 percent of value of shipments.

As the data shown in Table 1 indicate, the value of shipments for the “Fabricated Metal Product Manufacturing” subsector in the U.S. totaled \$345,089.3 million in 2013. Value added in the industry totaled \$183,908.9 million, with

total employees numbering 1,379,900 and production workers numbering 1,017,000. Capital expenditures for the subsector totaled \$11,348.7 million in 2013.

Data for the 2002–2013 review period provided in Table 1 show declines in total “Fabricated Metal Product Manufacturing” subsector employment and the number of production workers from 2002–2005, increases in employment from 2005–2007, declines from 2007–2010, with dramatic employment declines from 2008–2009, increases from 2010–2012, and a small decline in 2013. The declines in employment from 2002–2005 and from 2007–2010 are typical of the employment reductions in manufacturing following the recessions of 2001 and 2007–2009.

Table 1

**The Fabricated Metal Product Manufacturing Subsector (NAICS 332),
Characteristics and Trends, Selected Years, 2002–2013**

Year	Total Employees ----- Thousands	Production Workers	Value Added	Value of Shipments ----- (Millions \$)	Capital Expenditures	Avg. Hourly Earnings, Prod. Wrkrs. (%)
2002	1,574.8	1,169.2	138,972.0	247,059.5	7,964.3	15.76
2003	1,487.6	1,110.9	137,451.7	245,339.2	6,661.2	15.81
2004	1,468.5	1,082.0	144,994.8	261,100.5	7,209.4	16.26
2005	1,463.4	1,081.4	155,800.8	272,154.8	7,706.2	16.80
2006	1,491.8	1,110.9	169,321.7	298,368.9	8,340.3	17.33
2007	1,612.0	1,182.7	185,333.4	345,166.7	10,580.0	17.74
2008	1,570.3	1,152.2	189,113.7	358,257.0	11,324.3	18.45
2009	1,284.0	926.1	146,435.3	280,939.0	7,297.7	18.79
2010	1,236.2	902.3	156,888.3	293,889.0	7,866.1	19.72
2011	1,285.7	947.2	172,967.5	326,797.0	10,418.1	20.27
2012	1,385.9	1,023.1	180,393.5	339,774.5	12,360.8	20.41
2013	1,379.9	1,017.0	183,908.9	345,089.3	11,348.7	20.67

Data for the subsector and industries as defined by the 2012 definition for NAICS 332,
Fabricated Metal Product Manufacturing.

Sources: U.S. Bureau of the Census, *Census of Manufactures, Geographic Series 2002 and 2007;*
Industry Series: Detailed Statistics by Industry for the United States: 2012; and *Annual*
Survey of Manufactures, 2006, 2009, 2011, and 2013.

¹The North American Industrial Classification System (NAICS)—used by the statistical agencies of the United States, Canada, and Mexico—employs a hierarchical classification structure consisting of: “National Industries,” “NAICS Industries,” “Sectors,” “Subsectors,” and “Industry Groups.” For example, the “U.S. Industry” Industrial Valve Manufacturing (NAICS 332911) is part of “NAICS Industry” Metal Valve Manufacturing (NAICS 33291), “NAICS Industry Group” Other Fabricated Metal Product Manufacturing (NAICS 3329), “NAICS Subsector” Fabricated Metal Product Manufacturing (NAICS 332), and “NAICS Sector” Manufacturing (NAICS 31-33).

Between 2002 and 2007, the value of “Fabricated Metal Product Manufacturing” subsector shipments grew by 39.7 percent while the number of production workers increased by only 1.2 percent. From 2007–2013, subsector shipments declined by less than 0.1 percent and the number of production workers decreased by 14.0 percent. For the entire 11-year period from 2002–2013, the value of subsector shipments increased by 39.7 percent and the number of production workers declined by 13.0 percent.

Worker productivity increased significantly from 2002 to 2013, with output per production worker increasing 60.6 percent. During the 2002–2013 period, the value of shipments of fabricated metal product manufacturers adjusted for price changes² decreased 1.3 percent and the average hourly wage of production workers adjusted for price changes³ increased 1.3 percent. During the Recession of 2007–2009, the levels of employment and output in the Fabricated Metal Product Manufacturing subsector declined dramatically. From 2008–2010, the number of production workers declined by 21.7 percent, output declined by 18.0 percent, and output per worker increased by 4.8 percent.

I. Industry Structure

The 2012 North American Industrial Classification System (NAICS) divides the “Fabricated Metal Product Manufacturing” subsector (NAICS 332) into nine 4-digit NAICS industry groups shown in Table 2. As a subsequent table will show, these nine 4-digit industry groups are further subdivided into fourteen 5-digit NAICS industries.

The data presented in Table 2 provide a basic description of the “Fabricated Metal Product Manufacturing” subsector with further disaggregation into the major 4-digit NAICS industry groups. The table also provides insights into the relative sizes and growth in industry shipments of the industry groups.

For the “Fabricated Metal Product Manufacturing” subsector as a whole, industry shipments declined by 1.6 percent between 2007 and 2012 before increasing by 1.6 percent from 2012 and 2013. “Machine Shops and Threaded Product Manufacturing” (NAICS 3327) experienced the largest increase among the industry groups

Table 2
The Fabricated Metal Product Manufacturing Subsector (NAICS 332),
Value of Industry Shipments by Major Industry Group, 2007, 2012, and 2013

NAICS	Industry Subgroup	Value of Shipments			% Change		% of Total 2013
		2007	2012	2013	2007–2012	2012–2013	
		----- (Million \$) -----			(%)	(%)	(%)
332	Fabricated Metal Product Manufacturing	345,167	339,775	345,089.3	-1.6	1.6	100.0
3321	Forging and Stamping	33,511	34,488	34,559.7	2.9	0.2	10.0
3322	Cutlery and Handtool Manufacturing	11,010	9,894	10,052.1	-10.1	1.6	2.9
3323	Architectural and Structural Metals Manufacturing	91,084	75,700	77,473.6	-16.9	2.3	22.5
3324	Boiler, Tank, and Shipping Container Manufacturing	31,704	35,101	35,335.6	10.7	0.7	10.2
3325	Hardware Manufacturing	9,587	7,142	7,713.4	-25.5	8.0	2.2
3326	Spring and Wire Product Manufacturing	9,603	9,019	8,826.6	-6.1	-2.1	2.6
3327	Machine Shops and Threaded Product Manufacturing	60,975	66,965	68,599.1	9.8	2.4	19.9
3328	Coating, Engraving, Heat Treating, and Allied Activities	26,620	26,825	27,132.9	0.8	1.1	7.9
3329	Other Fabricated Metal Product Manufacturing	71,074	74,640	75,396.2	5.0	1.0	21.8

Sources: U.S. Bureau of the Census, *Census of Manufactures, Summary Series 2007 and 2012 and Industry Series: Detailed Statistics by Industry for the United States: 2012* and *Annual Survey of Manufactures, 2013*.

²Values adjusted using U.S. Bureau of Labor Statistics, *Producer Price Index for Fabricated Metal Products*.

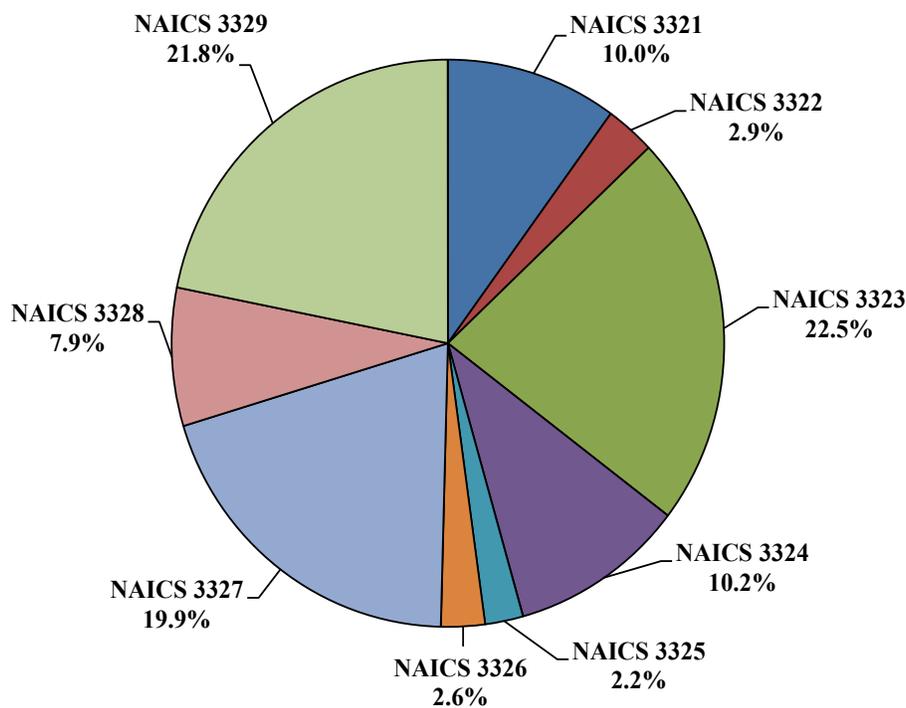
³Values adjusted using U.S. Bureau of Labor Statistics, *Consumer Price Index for All Urban Workers*.

(12.5 percent) during this six-year period. “Boiler, Tank and Shipping Container Manufacturing” (NAICS 3324); the second fastest growing industry group during the 2007–2013 period, grew 11.5 percent. Other “Fabricated Metal Product Manufacturing” subgroups experiencing positive growth in value of shipments between 2007 and 2013 were “Other Fabricated Metal Product Manufacturing”

(NAICS 3329 - 6.1 percent); “Forging and Stamping” (NAICS 3321 - 3.1 percent); and “Coating, Engraving, Heat Treating, and Allied Activities” (NAICS 3328 - 1.9 percent).

The data in Table 2 (previous page) and Figure 2 show the relative importance of fabricated metal product manufacturing subgroups, in terms of value of shipments for

Figure 2
Value of Shipments by Industry Group,
Fabricated Metal Product Manufacturers (NAICS 332), 2013



Total 2013 Shipments - \$345,089.3 Million

- | | |
|---|---|
| NAICS 3321 Forging and Stamping | NAICS 3326 Spring and Wire Product Manufacturing |
| NAICS 3322 Cutlery and Handtool Manufacturing | NAICS 3327 Machine Shops and Threaded Product Manufacturing |
| NAICS 3323 Architectural and Structural Metals Manufacturing | NAICS 3328 Coating, Engraving, Heat Treating, and Allied Activities |
| NAICS 3324 Boiler, Tank, and Shipping Container Manufacturing | NAICS 3329 Other Fabricated Metal Product Manufacturing |
| NAICS 3325 Hardware Manufacturing | |

Source: Table 2.

each industry group for 2013. “Architectural and Structural Metals Manufacturing” (NAICS 3323) is the largest industry group, accounting for 22.5 percent of total industry shipments. “Other Fabricated Metal Product Manufacturing” (NAICS 3329 – 21.8 percent), is the second largest industry group when measured by value of shipments, followed by “Machine Shops and Threaded Product Manufacturing” (NAICS 3327 – 19.9 percent); “Boiler, Tank, and Shipping Container Manufacturing” (NAICS 3324 – 10.2 percent); “Forging and Stamping” (NAICS 3321 – 10.0 percent); “Coating, Engraving, Heat Treating, and Allied Activities” (NAICS 3328 – 7.9 percent); “Cutlery and Handtool Manufacturing” (NAICS 3322 – 2.9 percent); “Spring and Wire Product Manufacturing” (NAICS 3326 – 2.6 percent); and “Hardware Manufacturing” (NAICS 3325 – 2.2 percent).

The data in Table 3 (next page) provide further detail for the “industry groups.” Data showing the number of companies and establishments for 2012 and the number of employees, production workers, value added, value of

shipments, and capital expenditures for 2013 are shown for the “Fabricated Metal Product Manufacturing” subsector (NAICS 332) as a whole and for NAICS 4-digit industry groups and 5-digit NAICS industries that make up the subsector. As noted previously, “Architectural and Structural Metals Manufacturing” (NAICS 3323) is the largest industry group, in terms of industry shipments.

The data in Table 3 show that “Machine Shops and Threaded Product Manufacturing” (NAICS 3327) is the largest industry group in terms of number of companies, number of establishments, total employees, production workers, value added, and capital investment. Also shown in Table 3, “Machine Shops” (NAICS 33271) is the largest 5-digit NAICS industry in terms of number of companies, number of establishments, total employees, production workers, value added, and capital expenditures, while “All Other Fabricated Metal Product Manufacturing” (NAICS 33299) is the largest NAICS industry in terms of value of shipments.

Omaha Steel Castings Expands in Wahoo

*From start to finish the plant can turn out finished steel castings in four weeks. That's one-half to one-third the time of most competitors, and saving time means savings to their customers. Omaha Steel, a leading producer of steel and stainless steel castings, built a new \$17-million, 150,000-square-foot, steel foundry in Wahoo, Nebraska. **“Everything we’ve done with the plant is lean process,”** said Phil Teggart, owner of Omaha Steel Castings Co. **“We can now compete worldwide.”***

*The company’s goal is to double production and increase employment to at least 250 as the economy recovers and orders increase from heavy equipment maker customers. **“The new plant is much more automated than the old one,”** he said, **“with less handling of the heavy casting molds and faster processes.”** More than 95 percent of the sand and other materials used in the process is reused.*



Table 3

**The Fabricated Metal Product Manufacturing Subsector (NAICS 332),
Number of Companies and Establishments, Employment, Value of Shipments,
Value Added, and Capital Expenditures by Major Sector and Industry Subgroups, 2013**

NAICS Code	Industry Description	Number of Companies*	Number of Establishments*	All Employees	Production Workers	Value		Value of Shipments ----- (Thousand \$) -----	Capital Expenditures -----
						Added	Added		
332	Fabricated Metal Product Manufacturing	52,483	55,400	1,379,859	1,016,981	183,908,899	345,089,256	11,348,744	
3321	Forging and Stamping	2,332	2,531	111,494	83,864	15,512,015	34,559,660	1,506,168	
33211	Forging and Stamping	2,332	2,531	111,494	83,864	15,512,015	34,559,660	1,506,168	
3322	Cutlery and Handtool Manufacturing	1,104	1,188	34,241	23,865	6,122,994	10,052,117	364,278	
33221	Cutlery and Handtool Manufacturing	1,104	1,188	34,241	23,865	6,122,994	10,052,117	364,278	
3323	Architectural and Structural Metals Manufacturing	11,485	12,318	322,236	232,222	38,150,701	77,473,642	1,686,992	
33231	Plate Work and Fabricated Structural Product Manufacturing	4,536	4,931	147,592	106,023	18,513,858	40,900,027	894,808	
33232	Ornamental and Architectural Metal Products Manufacturing	6,949	7,387	174,644	126,199	19,636,843	36,573,615	792,183	
3324	Boiler, Tank, and Shipping Container Manufacturing	1,241	1,523	87,980	65,531	14,319,941	35,335,632	840,320	
33241	Power Boiler and Heat Exchanger Manufacturing	267	317	24,144	16,402	3,843,344	7,255,766	130,199	
33242	Metal Tank (Heavy Gauge) Manufacturing	623	700	34,987	25,913	4,402,665	9,550,069	286,907	
33243	Metal Can, Box, and Other Container Manufacturing	351	506	28,849	23,217	6,073,932	18,529,797	423,214	
3325	Hardware Manufacturing	553	607	26,471	17,707	4,039,980	7,713,400	169,187	
33251	Hardware Manufacturing	553	607	26,471	17,707	4,039,980	7,713,400	169,187	
3326	Spring and Wire Product Manufacturing	1,161	1,300	37,428	27,852	4,255,557	8,826,580	217,933	
33261	Spring and Wire Product Manufacturing	1,161	1,300	37,428	27,852	4,255,557	8,826,580	217,933	
3327	Machine Shops and Threaded Product Manufacturing	23,339	23,750	384,119	290,829	42,951,708	68,599,121	3,460,730	
33271	Machine Shops	19,031	19,240	243,833	182,340	25,948,473	40,011,595	1,898,817	
33272	Turned Product and Screw, Nut, and Bolt Manufacturing	4,308	4,510	140,286	108,490	17,003,235	28,587,527	1,561,913	
3328	Coating, Engraving, Heat Treating, and Allied Activities	5,290	5,762	122,480	95,417	16,453,255	27,132,897	876,153	
33281	Coating, Engraving, Heat Treating, and Allied Activities	5,290	5,762	122,480	95,417	16,453,255	27,132,897	876,153	
3329	Other Fabricated Metal Product Manufacturing	5,978	6,421	253,410	179,693	42,102,749	75,396,207	2,226,983	
33291	Metal Valve Manufacturing	1,039	1,258	96,392	65,210	17,635,261	32,442,521	737,039	
33299	All Other Fabricated Metal Product Manufacturing	4,939	5,163	157,018	114,483	24,467,488	42,953,686	1,489,945	

*Values are for 2014

Sources: U.S. Bureau of the Census, *Census of Manufactures, Industry Series: Detailed Statistics by Industry for the United States: 2012 and Annual Survey of*

II. Industry Production Characteristics

The manufacture of fabricated metal products encompasses a very large and diverse industry. In 2012, 55,400 establishments were primarily engaged in fabricated metal product manufacturing, a decrease of 9.0 percent from 2007 (see Table 4). It is interesting to note that the number of small establishments, as measured by employment, and the number of larger establishments decreased during this period.

The data presented in Table 4 compares selected characteristics of the “Fabricated Metal Product Manufacturing” subsector as a whole for 2007, 2012, and 2013. During the 2007–2013 period, total employment in the subsector declined by 14.4 percent. Almost all (14.0 percent) of the reduction occurred between

2007 and 2012. During the same 2007–2013 period, the number of production workers in the subsector decreased by 14.0 percent with production workers’ hours declining 13.2 percent. For the 2012–2013 period, total employment in the “Fabricated Metal Product Manufacturing” subsector decreased by 6,000 or 0.4 percent and the number of production workers declined from 1,023,100 to 1,017,000, a reduction of 6,100 or 0.6 percent.

As shown in Table 4, between 2007 and 2012, the “Fabricated Metal Product Manufacturing” subsector experienced a slight decrease in labor (0.3 percent) and material (0.6 percent) costs and a substantial decrease in the cost of purchased fuels (42.1 percent) while the value of shipments decreased by 1.6 percent. During the same 2007 to 2012 period, the increase in electric energy

Table 4
Production Characteristics for the Fabricated Metal Product Manufacturing
Subsector (NAICS 332), 2007, 2012, and 2013

	2007	2012	2013	Percent Change		
				2007-2012	2012-2013	2007-2013
Establishments						
Number	60,895	55,400	NA	-9.0	NA	NA
With 20+ Employees	17,986	15,997	NA	-11.1	NA	NA
All Employees						
Number [thousands]	1,612.0	1,385.9	1,379.9	-14.0	-0.4	-14.4
Payroll [million \$]	67,709.1	67,497.7	69,157.3	-0.3	2.5	2.1
Production Workers						
Number [thousands]	1,182.7	1,023.1	1,017.0	-13.5	-0.6	-14.0
Hours [millions]	2,404.8	2,067.0	2,087.3	-14.0	1.0	-13.2
Wages [million \$]	42,663.5	42,189.8	43,141.7	-1.1	2.3	1.1
Average Hourly Wage [\$]	17.74	20.41	20.7	15.1	1.3	16.5
Value Added by Manufacture [million \$]	185,333.4	180,393.5	183,908.9	-2.7	1.9	-0.8
Cost of Materials [million \$]	161,447.7	160,558.0	138,310.8	-0.6	-13.9	-14.3
Value of Shipments [million \$]	345,166.7	339,774.5	345,089.3	-1.6	1.6	0.0
Cost of Purchased Fuels and Electric Energy						
Electric Energy [million \$]	3,107.2	3,250.1	3,376.8	4.6	3.9	8.7
Purchased Fuels [million \$]	1,964.0	1,136.9	1,242.5	-42.1	9.3	-36.7
Quantity of Purchased Electric Energy [million kWh]	47,621.1	41,291.8	42,666.2	-13.3	3.3	-10.4

NA: Not available.

Sources: U.S. Bureau of the Census, *Summary Series 2007 and 2012; and Annual Survey of Manufactures, 2013.*

costs (4.6 percent) exceeded the decrease in value of shipments.

Table 5 provides data for selected additional production characteristics for fabricated metal product manufacturing for 2012. The industry data presented in Table 5 are for “Fabricated Metal Product Manufacturing” (NAICS 332) as a whole; the “Machine Shops and Threaded Product Manufacturing” industry group (NAICS 3327) and the balance of the industry, excluding the “Machine Shops and Threaded Product Manufacturing” industry group.

As the data in Table 5 indicate, there were 52,483 companies and 55,400 establishments in the “Fabricated Metal Product Manufacturing” subsector in 2012. Establishments in the “Machine Shops and Threaded Product Manufacturing” industry group totaled 23,750 in 2012, or 42.9 percent of total sector establishments. Data on the distribution of manufacturing establishments by number of employees demonstrate that the industry consists of a large number of small establishments. In 2012, the average establishment in the “Fabricated Metal

Product Manufacturing” subsector employed 18.5 production workers; 39,403 or 71.1 percent of the establishments had less than 20 employees; and only 5.2 percent had more than 100 employees.

Data in Table 5 show that, on average, establishments in the “Machine Shops and Threaded Product Manufacturing” industry group are much smaller than those in the balance of the “Fabricated Metal Product Manufacturing” subsector. In 2012, 78.7 percent of “Machine Shops and Threaded Product Manufacturing” establishments had fewer than 20 employees, only 2.6 percent had more than 100 employees, and the average number of production workers per establishment was 12.3, 66.5 percent, of the subsector average. For the “Machine Shops and Threaded Product Manufacturing” industry group, 2012 average value added per establishment, \$1.8 million, was 54.5 percent of the subsector average and 2012 value of shipments per establishment, \$2.8 million, was 46.0 percent of the subsector average.

Table 5
Establishment Characteristics for the Fabricated Metal Product Manufacturing
Subsector (NAICS 332), Machine Shops and Threaded Product
Manufacturing Industry Subgroup (NAICS 3327), and the Balance of Subsector, 2012

	NAICS 332 Fabricated Metal Product Manufacturing	NAICS 3327 Machine Shops and Threaded Product Manufacturing	Other Fabricated Metal Products
Number of Companies	52,483	23,339	29,144
Number of Establishments	55,400	23,750	31,650
Est. - with 20+ Employees	15,997	5,062	10,935
Est. - with 20+ Emp (% of Total)	28.9	21.3	34.5
Est. - with 100+ Employees	2,867	609	2,258
Est. - with 100+ Emp (% of Total)	5.2	2.6	7.1
Establishments per Company	1.06	1.02	1.09
Production Workers	1,023,115	292,583	730,532
Average Prod. Workers per Establishment	18.5	12.3	23.1
Value Added (Million \$)	180,393.5	42,139.5	138,254.0
Per Establishment (Thousand \$)	3,256.2	1,774.3	4,368.2
Per Production Worker (\$)	176,317.9	144,025.8	189,251.1
Value of Shipments (Million \$)	339,774.5	66,964.9	272,809.6
Per Establishment (Thousand \$)	6,133.1	2,819.6	8,619.6
Per Production Worker (\$)	332,098.1	228,874.9	373,439.6

Sources: U.S. Bureau of the Census, *Census of Manufactures, Industry Series: Detailed Statistics by Industry for the United States: 2012*.

III. Industry Location Characteristics

Showing the geographic distribution of the “Fabricated Metal Product Manufacturing” subsector (NAICS 332), Table 6 presents data on employment, wages, capital expenditures, and value of shipments for 16 selected states. As indicated in the table, the 16 states accounted for \$221.8 billion or 64.3 percent, of the \$345.1 billion of value of shipments by Fabricated Metal Product Manufacturers in 2013.

Included in these states are the top ten states in terms of value of shipments by the “Fabricated Metal Product Manufacturing” subsector and other states near Nebraska with which it typically competes for industrial location projects. The 16 states are included in this study as alternative sites for plant locations and are evaluated in

Part B of this report using the geographically variable labor and energy costs.

In terms of employment, the “Fabricated Metal Product Manufacturing” subsector is largest in California followed by Texas and New York. In terms of value of shipments, Texas ranked first followed by New York and California. As the data presented in Table 6 indicate, the 16 states included in this study accounted for 64.7 percent of the production workers and 64.3 percent of the total value of shipments by the “Fabricated Metal Product Manufacturing” subsector in 2013.

Texas, with 94,300 production workers, led the nation in fabricated metal product manufacturing in 2013. Texas’ value of shipments of \$32,592 million accounted for 9.4 percent of the U.S. total.

Table 6
Fabricated Metal Product Manufacturing Subsector (NAICS 332),
Production Workers, Average Wages, Capital Expenditures, and Value of
Shipments, Selected States and the U.S., 2013

State	Employees (1,000)	Production Workers (1,000)	Average Hourly Earnings (\$)	Capital Expenditures (Million \$)	Value of Shipments (Million \$)	% of U.S. Value of Shipments (%)
Nebraska	7.7	5.6	19.45	52.1	2,325.9	0.7
California	127.3	93.3	21.44	932.3	27,801.0	8.1
Florida	13.2	9.6	20.63	142.0	3,811.7	1.1
Illinois	87.9	65.5	21.10	961.4	22,647.8	6.6
Indiana	54.4	41.6	19.21	481.1	15,518.3	4.5
Iowa	20.0	14.6	18.98	97.5	4,770.1	1.4
Kansas	15.8	11.4	18.40	142.1	3,342.2	1.0
Michigan	76.3	57.3	19.61	847.8	17,451.9	5.1
Minnesota	38.3	27.3	21.97	284.2	10,175.9	2.9
Missouri	27.4	20.2	21.28	196.4	6,608.8	1.9
New Jersey	22.3	15.7	21.02	2,684.2	4,691.6	1.4
New York	99.5	74.1	20.84	885.3	28,841.8	8.4
Ohio	25.8	18.8	21.52	171.4	7,853.2	2.3
Pennsylvania	82.0	59.9	20.46	771.1	18,589.8	5.4
Texas	123.7	94.3	20.85	1,105.5	32,591.9	9.4
Wisconsin	65.2	48.7	20.37	554.3	14,789.7	4.3
Total Selected States	886.8	657.9	20.65	10,308.7	221,811.6	N/A
Percent of U.S.	64.3	64.7	N/A	90.8	64.3	64.3
Total U.S.	1,379.9	1,017.0	20.67	11,348.7	345,089.3	37,951.0

N/A: Not available.

Source: U.S. Bureau of the Census, *Annual Survey of Manufactures, Geographic Area Statistics: 2013*.

IV. Capital Expenditures and Industry Outlook

Capital investment in the “Fabricated Metal Product Manufacturing” subsector (NAICS 332) was \$11,348.7 million in 2013, which was \$768.7 million or 7.3 percent higher than in 2007 and \$1,012.1 million or 8.2 percent lower than in 2012. As data in Table 7 demonstrate, the rates of change in capital expenditures varied significantly both among the industry groups and over the 2007–2012 and 2012–2013 time periods. The “Forging and Stamping” (NAICS 3321) recorded the greatest percent increase in capital expenditures (39.3 percent) between 2007 and 2013, followed by “Machine Shops and Threaded Product Manufacturing” (NAICS 3327 – 17.6 percent); “Other Fabricated Metal Product Manufacturing” (NAICS 3329 – 11.0 percent), “Boiler, Tank, and Shipping Container Manufacturing” (NAICS 3324 – 6.6 percent). “Hardware Manufacturing” (NAICS 3325) experienced the greatest percent decrease in capital investment (23.7 percent) during the same 2007–2013 time frame followed by “Architectural and Structural Metals Manufacturing” (NAICS 3323, 17.8 percent); “Spring and Wire Product Manufacturing”

(NAICS 3326, 5.4 percent); “Cutlery and Handtool Manufacturing” (NAICS 3322, 3.1 percent) and “Coating, Engraving, Heat Treating, and Allied Activities” (NAICS 3328, 0.5 percent).

Economic growth of the “Fabricated Metal Product Manufacturing” subsector is dependent on many factors, including the overall performance of the U.S. economy, economic and business conditions internationally, and the competitive position of U.S. fabricated metal product manufacturers relative to their foreign competitors. Over the longer term, the “Fabricated Metal Product Manufacturing” subsector is expected to record slow, positive growth in output, accompanied by moderate declines in employment.

As indicated by the data presented in Table 8 (next page), employment in the “Fabricated Metal Product Manufacturing” subsector is projected to increase by 5.8 percent between 2012 and 2022. During the same period, real output is projected to increase 28.8 percent, which is about the same as the projected 27.2 percent increase for the entire manufacturing sector. The “Architectural and Structural Metals Manufacturing” industry group

Table 7

Capital Expenditures in the Fabricated Metal Product Manufacturing Subsector (NAICS 332), by Industry Subgroup, 2007, 2012, and 2013

NAICS	Industry Group	Capital Expenditures (\$1,000)			% Change		2013 Cap. Exp. as Percent of Total
		2007	2012	2013	2007-2012	2012-2013	
332	Fabricated Metal Product Manufacturing	10,580,048	12,360,833	11,348,744	16.8	-8.2	100.0
3321	Forging and Stamping	1,081,224	1,366,009	1,506,168	26.3	10.3	13.3
3322	Cutlery and Handtool Manufacturing	376,092	402,072	364,278	6.9	-9.4	3.2
3323	Architectural and Structural Metals Manufacturing	2,052,244	1,977,106	1,686,992	-3.7	-14.7	14.9
3324	Boiler, Tank, and Shipping Container Manufacturing	788,318	802,370	840,320	1.8	4.7	7.4
3325	Hardware Manufacturing	221,716	145,333	169,187	-34.5	16.4	1.5
3326	Spring and Wire Product Manufacturing	230,479	361,609	217,933	56.9	-39.7	1.9
3327	Machine Shops and Threaded Product Manufacturing	2,942,008	4,074,682	3,460,730	38.5	-15.1	30.5
3328	Coating, Engraving, Heat Treating, and Allied Activities	880,895	937,357	876,153	6.4	-6.5	7.7
3329	Other Fabricated Metal Product Manufacturing	2,007,072	2,294,295	2,226,983	14.3	-2.9	19.6

Sources: U.S. Bureau of the Census, *Summary Series 2007 and 2012*; and *Annual Survey of Manufactures, 2013*.

Table 8**Employment and Output, Fabricated Metal Product Manufacturing Subsector (NAICS 332),
by Industry Subgroup, and for All Manufacturing, 2002, 2012, and Projected 2022**

NAICS Industry Sector / Subgroup		Part A -- Employment				
		Thousands of Jobs			Avg. Ann. Rate of Change	
		2002	2012	2022	2002-12	2012-22
31-33	Manufacturing	15,258.7	11,918.9	11,369.4	-2.4	-0.5
332	Fabricated Metal Product Manufacturing	1,548.4	1,411.4	1,493.3	-0.9	0.6
3321	Forging and Stamping	113.2	99.0	94.9	-1.3	-0.4
3322	Cutlery and Handtool Manufacturing	64.4	39.6	35.4	-4.7	-1.1
3323	Architectural and Structural Metals Manufacturing	399.1	341.4	410.4	-1.5	1.9
3324	Boiler, Tank, and Shipping Container Manufacturing	95.8	96.5	98.9	0.1	0.2
3325	Hardware Manufacturing	42.1	25.0	19.4	-5.1	-2.5
3326	Spring and Wire Product Manufacturing	70.0	41.6	31.3	-5.1	-2.8
3327	Machine Shop, Turned Product, and Screw, Nut, and Bolt Manufacturing	318.4	362.3	372.8	1.3	0.3
3328	Coating, Engraving, Heat Treating, and Allied Activities	149.1	136.1	141.7	-0.9	0.4
3329	Other Fabricated Metal Product Manufacturing	296.3	269.9	288.4	-0.9	0.7

NAICS Industry Sector / Subgroup		Part B -- Value of Output				
		Billions of Chained-Weighted 2005 Dollars ^(a)			Avg. Ann. Rate of Change	
		2002	2012	2022	2002-12	2012-22
31-33	Manufacturing	4,320.8	4,407.6	5,604.8	0.2	2.4
332	Fabricated Metal Product Manufacturing	267.6	258.4	332.8	-0.4	2.6
3321	Forging and Stamping	23.5	24.5	29.1	0.4	1.7
3322	Cutlery and Handtool Manufacturing	11.0	16.0	16.8	3.8	0.5
3323	Architectural and Structural Metals Manufacturing	65.5	65.2	88.4	0.0	3.1
3324	Boiler, tank, and shipping container manufacturing	25.8	20.2	22.1	-2.4	0.9
3325	Hardware Manufacturing	10.9	19.5	25.6	6.0	2.7
3326	Spring and Wire Product Manufacturing	9.8	13.1	18.9	2.9	3.7
3327	Machine Shops; Turned Product; and Screw, Nut, and Bolt Manufacturing	46.4	35.6	48.5	-2.6	3.2
3328	Coating, Engraving, Heat Treating, and Allied Activities	20.2	19.4	25.5	-0.4	2.8
3329	Other Fabricated Metal Product Manufacturing	54.4	45.3	57.9	-1.8	2.5

^(a) Output shown in billions of chain-weighted constant (2005) dollars.

Source: Employment Projections Program, U.S. Department of Labor, U.S. Bureau of Labor Statistics

(NAICS 3323) is projected to experience the greatest growth in employment, 20.2 percent, and the third greatest output growth, 35.6 percent, between 2012 and 2022. The “Spring and Wire Product Manufacturing” industry group (NAICS 3320) is projected to experience the greatest increase in real output (44.3 percent) and the largest decline in employment, (a decrease of 24.8 percent) from 2012 to 2022.

On balance, the factors affecting firms producing fabricated metal products will depend to a great

extent on the ability of companies to compete within their industry and in the markets for their products. While many external factors will influence the overall performance of the industry, the outlook for individual companies that can control costs and respond to emerging and changing market opportunities will be significantly enhanced. Part B of this study discusses how establishments producing fabricated metal products can better respond to market conditions and significantly improve their competitive positions with a Nebraska location.



Nebraska Innovation Campus and the “Maker Space”

Located on the former Nebraska State Fairgrounds in Lincoln, the University of Nebraska has established Nebraska Innovation Campus (NIC), a research campus to facilitate new, in-depth partnerships between the university and private sector businesses. Current partners include CCS, ConAgra Foods, Echo Canyon, Intellifarm, the Robert Daugherty Water for Food Institute, Tetrad, the UNL Food Processing Center, and others.

An exciting addition to the NIC is Nebraska Innovation Studio, the UNL maker space, which is a creative and collaborative area where makers and builders from the university and community join and team up to conceptualize, prototype and iterate a variety of projects. The idea of the maker space is to build a culture of innovation through making. Equipment in the facility includes a waveform generator, a 3D desktop printer, miter saw, vinyl cutter, laser cutter, and an Ultimaker 2. The idea began with Dr. Shane Farritor, UNL Mechanical & Materials Engineering professor, based on these types of spaces at campuses across the nation. Nebraska Innovation Studio is evolving over three phases of renovation before it's fully functional, and will eventually be a 16,000-square-foot facility, with additional construction planned for 2016. <http://innovationstudio.unl.edu>

PART B

NEBRASKA ADVANTAGES FOR FABRICATED METAL PRODUCT MANUFACTURERS

Nebraska offers a wide range of locational advantages to fabricated metal product manufacturers. In the continuing portion of this study, Nebraska resources and location attributes important to fabricated metal product manufacturers are discussed. An evaluation of geographically variable labor and energy costs for selected states using a model establishment manufacturing fabricated metal products is included in Appendix A.

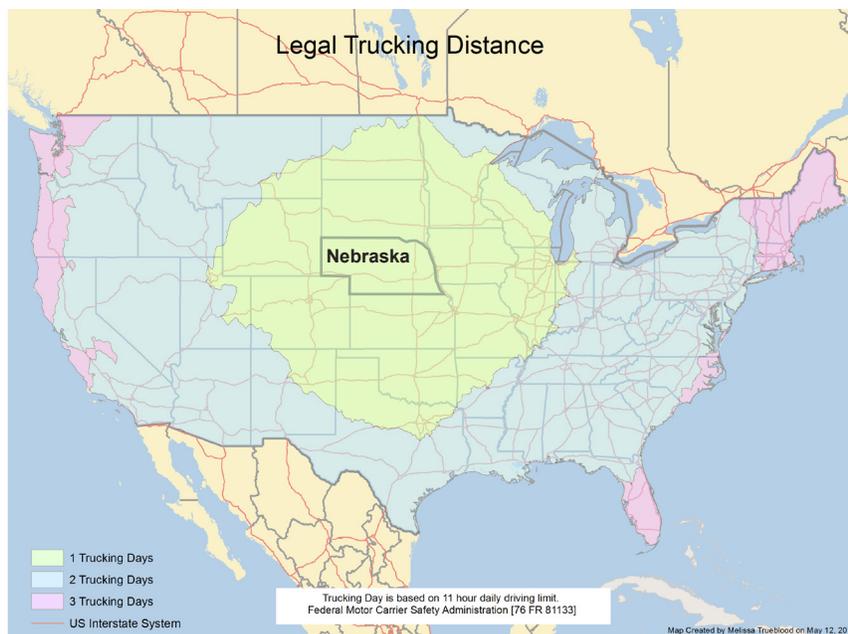
I. Nebraska Location Resources

Nebraska lies near both the population and geographic centers of the United States (Figure 3). The nation's population center moved across the Mississippi River for the first time in 1980 and continues to shift westward. The current population center is near Plano,

Missouri, and the geographic center is in Butte County, South Dakota (the geographic center of the 48 contiguous states is Smith County, Kansas). Within one day, goods shipped by truck from Nebraska reach more than 25 percent of the U.S. population; add a second day and the percentage skyrockets to more than 90 percent.

In addition to being a prominent location for national markets, Nebraska is well situated to serve international markets, which are important to many fabricated metal product manufacturers. For example, the Union Pacific's main railroad line in central Nebraska is the busiest freight corridor in the world; many of the trains carry grain to West Coast ports for shipment around the world. Also, the state currently has operating Foreign Trade Zones in Omaha (Zone No. 19,

Figure 3
Truck Access to Regional and National Markets



Source: Nebraska Department of Economic Development. Legal Trucking Distances from Kearney, Nebraska [maps]. 2014 1:26,000,000; generated by Melissa Trueblood; using ESRI Business Analyst Desktop 10.2.1 Software and Data.

Grantee: Greater Omaha Chamber of Commerce) and in Lincoln (Zone No. 59, Grantee: Lincoln Chamber of Commerce). Foreign trade zones reduce or eliminate duties and excise taxes by allowing domestic activity involving foreign items to take place as if it were outside of U.S. Customs territory.

Access to Markets - Transportation

Nebraska's central location is especially advantageous for transportation services. The state's communities are connected by a good highway system that includes 8,539 miles of interstate, freeway, and arterial roads. That system includes a 455-mile stretch of Interstate 80, the most traveled east-west transcontinental route of the interstate highway system. North-south interstate highways that add to Nebraska's market include Interstate 29, which passes along the state's eastern border in Iowa, and Interstate 25, which passes in close proximity to the state's western border.

More than 13,500 licensed motor carriers with worldwide connections are based in Nebraska and serve businesses throughout North America. Largely because of Nebraska's good interstate connections, one of the largest trucking companies in the country, Werner Enterprises, is headquartered in Omaha.

The nation's two largest rail companies—BNSF Railway Company and Union Pacific Railroad—provide rail service to many Nebraska communities. Ten freight railroads operate more than 3,200 miles of track throughout the state. No major city in the United States is more than five days by rail from Nebraska. Amtrak provides passenger service in Nebraska with stops in five communities.

The Union Pacific (UP) maintains headquarters in Omaha and is one of the largest railroads in North America with 32,000 miles of track in the western two-thirds of the country. UP operates more than 1,000 miles of track in Nebraska. The Harriman Dispatching Center in Omaha is the most technologically advanced dispatching facility in the country. Union Pacific's Bailey Yard in North Platte is the largest rail freight car classification yard in the world. The yard covers 2,850 acres, switches 10,000 rail cars daily, and

has more than 300 miles of track. Union Pacific's main line in central Nebraska is the busiest rail freight corridor in the world, with more than 115 trains operating over the line every 24 hours.

BNSF Railway Company (BNSF) operates more than 1,500 route miles of track in Nebraska, is one of the state's primary railroads transporting two million carloads of freight in Nebraska each year, and employs more than 4,000 people in the state. BNSF has rail yards in Alliance, Lincoln, McCook, and Omaha; intermodal and automotive facilities in Omaha; and mechanical shops in Alliance and Lincoln.

Commercial airline service is available in nine Nebraska cities, providing direct service to major hubs. Scheduled air freight service is provided to five additional communities with on-demand service available. A total of 81 public-use airports are located throughout the state.

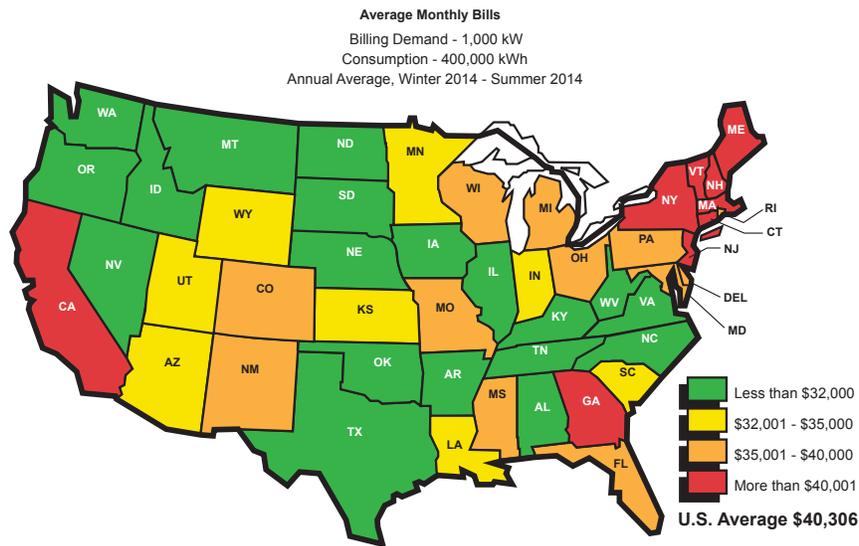
With the Missouri River forming Nebraska's eastern border, the state is a western terminus for barge traffic. Barges have access to both the Gulf of Mexico via the Mississippi River and to the Atlantic Ocean via the Great Lakes and the St. Lawrence Seaway.

Low Cost Utilities

In providing a full range of reliable utilities with many cost advantages, Nebraska offers additional benefits to fabricated metal product manufacturers. Nebraska's electric rates for typical industrial customers are 22.0 percent less than the U.S. average and are among the lowest of the 48 contiguous states (Figure 4, next page). This benefit is of particular importance to the "Fabricated Metal Product Manufacturing" subsector (NAICS 332), with its high level of electricity use relative to total energy consumption. A statewide grid system with regional interconnections assures reliability of service and adequacy of supply.

One of the reasons for Nebraska's low electric rates is its close proximity to the vast low-sulfur coal fields of eastern Wyoming. It is also the only state in the nation with electric service provided entirely by public power. Nebraska's two largest utilities, Nebraska Public

Figure 4
Electric Costs for Industrial Service, Winter 2014–Summer 2014



Source: Edison Electric Institute, "Typical Bills and Average Rates Report," January 1, 2014 and July 1, 2014. State averages are weighted using eight months of January 2014 data and four months of July 2014 data. Nebraska data represent the average for Omaha Public Power District, Lincoln Electric System, and Nebraska Public Power District using the same seasonal weighting.

Power District (NPPD) and Omaha Public Power District (OPPD), have under their control an efficient and dependable "mix" of generating systems to supply current and projected needs; the mix includes coal, nuclear, hydro, gas, oil, wind, and diesel sources.

Some major electric-generating facilities in Nebraska are:

- 1,300-megawatt NPPD coal-fired Gerald Gentleman Station near Sutherland, Unit No. 1 on-line in 1979 and Unit No. 2 on-line in 1982
- 1,330-megawatt OPPD coal-fired Nebraska City Station near Nebraska City, Unit No. 1 on-line in 1979 and Unit No. 2 online in 2009
- 800-megawatt NPPD Cooper Nuclear Station near Brownville, on-line in 1974
- 486-megawatt OPPD Fort Calhoun Nuclear Station, on-line in 1973

NPPD owns and operates a 59 MW wind generation facility near Ainsworth. NPPD has long-term agreements to purchase 122 MW of wind generated power from Nebraska facilities located near Bloomfield, 80 MW from a facility near Petersburg, 75 MW from a facility located in

Custer County, and 75 MW from a facility near Steele City.

Nebraska utilities also operate 12 hydroelectric plants and receive a power allotment from the Western Area Power Administration (WAPA) hydroelectric facilities on the Missouri River. The utilities operate with a reserve capacity that protects users against voltage reductions and brownouts. Furthermore, the utilities are members of the Mid-Continent Area Power Pool (MAPP), the Southwest Power Pool (SPP), and the Western System Power Pool (WSPP).

Natural gas in Nebraska is also attractive to industry for service, supply, and price. A gas-producing state, Nebraska is close and well-connected by pipeline to the major gas fields of the central and southern plains. The state's average cost of industrial gas is less than both the regional and national averages.

The pipelines of two major companies, Northern Natural Gas and Kinder Morgan, provide an ample supply of natural gas to most areas of Nebraska. Depending on usage requirements, natural gas is offered both on a "firm" and "interruptible" basis.

High Quality Work Force

Any industry derives benefits from a productive and well-educated labor force. Nebraska's labor force has a strong work ethic and technical proficiency. The state was settled by individuals with the foresight and diligence to transform it into a world center of agricultural production. Their descendants maintain a work ethic and mechanical aptitude that carry over into the state's manufacturing sector. Contributing to Nebraska's high labor productivity are very low absenteeism and labor turnover rates. Furthermore, Nebraska employers pay among the lowest unemployment insurance and workers' compensation costs in the nation.

Nebraska's work force quality is also highly rated by the state's employers and by various national comparisons. In 2013, 90.2 percent of the state's population 25 years of age and older were high school graduates, compared to 86.6 percent nationally. In addition, the 2013 Nebraska high school graduation rate was 88.5 percent. One reason for the high graduation rate is the state's comparatively low student-teacher ratio—13.73:1 in 2011–12 compared to 16.01:1 for the nation. Finally, Nebraska students consistently score above the U.S. average on both standardized achievement tests and college entrance exams. In 2014 Nebraska students averaged 21.7 on the ACT college entrance test, compared to 21.0 nationally. Moreover, Nebraska's average composite ACT score was achieved with 86 percent of graduates taking the exam, compared to 57 percent of graduates nationwide.

Higher Education Resources

As part of a growing and rapidly changing industry, fabricated metal product manufacturers can benefit greatly from flexible state-of-the-art educational resources. The University of Nebraska, state colleges, and the community college network are important elements in providing resources to assist manufacturers in maintaining an educated and trained work force.

The University of Nebraska, is comprised of four campuses: the University of

Nebraska-Lincoln, the University of Nebraska-Omaha, the University of Nebraska Medical Center, and the University of Nebraska at Kearney. It has the largest facilities among the state's 21 colleges and universities and offers advanced degrees in most professional fields. It is a major center for both basic and applied research and has a combined student enrollment of more than 48,000.

Founded in 1869, the University of Nebraska-Lincoln (UNL) is the state's land-grant university. Nebraska was the first university west of the Mississippi to establish a graduate college (in 1896). UNL boasts 22 Rhodes scholars and 2 Nobel laureates among its alumni.

Research

The University of Nebraska-Lincoln is among the top 35 public universities in the U.S. in spending on research and development. Research funding has more than doubled since 2002, and extensive new research facilities have been built on the Lincoln campus and at the Medical Center. UNL has embarked on an exciting partnership called Nebraska Innovation Campus, a 249-acre private-public research and technology center adjacent to City Campus. The Innovation Campus is being developed with the support of 2015 Vision, a group of Lincoln, Nebraska, business leaders dedicated to strengthening research, education, and economic development through entrepreneurship and investment. The Innovation Campus will leverage UNL's research capacity by attracting private sector companies to locate near the university where they can work closely with university researchers, generating jobs and economic activity.

Engineering

The UNL College of Engineering is situated on three campuses: Lincoln (City and East Campuses) and Omaha. Currently, the college has over 3,400 students enrolled and 300 permanent faculty and staff. A total of 12 undergraduate majors and numerous graduate programs are offered in the departments of Biological Systems Engineering (includes Agricultural Engineering), Chemical & Biomolecular Engineering, Civil Engineering, Computer Science & Engineering,

The Durham School of Architectural Engineering and Construction, Electrical & Computer Engineering, and Mechanical & Materials Engineering.

Research at the College of Engineering is progressive and collaborative, supporting innovative research through two core facilities, housing six areas of research, and more than 16 research centers and laboratories. The two core facilities are supported by the Nebraska Research Initiative funded by the Nebraska Legislature to significantly enhance the scientific and research capabilities at UNL in technological areas with commercial potential. The Advanced Electro Optics Engineering Core Facility houses state-of-the-art lasers for producing a range of novel materials, thin films, and coatings that can be deposited with atomic precision on nanometer- to millimeter-sized areas/volumes. The Advanced Manufacturing Engineering Core Facility has the unique capability of synthesizing biological products, nanocomposites, and nanomachined electrical components. The programs residing in the research centers/laboratories include a \$10-million program for transportation research, an organization developing the technologies for the next generation of bridges and pavement, a trauma mechanics research initiative advancing the experimental and theoretical understanding of the mechanics of traumatic brain injury resulting from improvised explosive devices, and a facility developing vaccines against biological warfare agents and products that can be used as therapeutic countermeasures to treat people who have been exposed to biological agents.

The **Engineering and Science Research Support Facility (ESRSF)** is a dedicated, highly diverse technical facility with expertise in mechanical design, manufacturing, machining, fabrication, and technical services. The ESRSF technical staff combines high technical aptitude and background in hands-on instrument design, advanced machining, welding, fabrication, and materials testing. ESRSF will provide manufacturers with consulting services, prototyping, new part production runs, and other machining and construction services. Consulting services include: Workflow Management, Product/Process Design, Employee Technical

Training, Machining Procedures, and Project Life Cycle Management.

- CNC & Conventional Machining, Welding, Fabrication, and Electroplating/Anodizing
- Flexible Machining
- Materials Testing Equipment

Equipment housed within the ESRS machine shop includes:

CNC Cincinnati-Milacron 1250 Sabre with Ab Acramatic 2100 Control

- has four-axis operation with a maximum of three-axis interpolation. This machine is used to machine a variety of drill system parts and components. Its large capacity allows for work pieces up to 50" x 30" x 26". This CNC machining center utilizes the latest computer technology for the machining of complex contours through parametric programming (equational programming), solid modeling programming through CAM software, and online quick programming of simple geometries. This feature enhances the technical staff's ability to accommodate a wide range of machining jobs.

BridgePort Series 1 CNC Milling Machines (2)

- provide additional resources for high volume machining and drastically cut delivery time to the customer. They are capable of machining smaller complex and simple 2-dimensional work pieces. Their conversational shop floor programming features allow tool makers to quickly program and machine the work piece.

CNC BridgePort Interact 412 Machining Center

- a three-axis, 12-tool station with a GE Fanuc Series O-Mate control that is available for multiple part production. Off-line part programming using a CAD workstation facilitates part design and production.

CNC Mazak Quick Turn ATC Lathe

- has a unique feature of live tooling on the turret. This feature allows the technical staff to perform turning and milling operations

in one setup. The result is a high precision machining process that can be performed without ever having to remove the work piece from the chuck, which eliminates costly secondary machining processes. The Mazak CNC lathe has been used to machine drill system components for the past eight years.

Engis Lapping Machine

- for precision machining, is used to machine and polish work pieces of extreme tolerances (.000001 inch). Common applications are thin film polishing and material removal, sharpening to razor edges, and finish machining of hardened materials. This lapping machine is located in the clean room facility of the engineering machine shop. During and after machining, the work piece is inspected with precision inspection equipment.

25" x 18" Nardini Gap Bed Lathe

- where much of the large cumbersome work pieces that require turning operations are performed. Drill system equipment such as barrels, large pulleys, housings, winch hubs, etc. are currently machined on the Nardini Lathe. Other heavy applications include the machining of train axles and wheels for material science research projects.

Conventional BridgePort Milling Machines (3)

- used for such applications as milling, drilling, boring, key-way cutting, etc.

Conventional 15" x 50" Clausing Lathes (2)

- used for turning, threading, and boring of cylindrical work pieces. All of the conventional machining equipment contains state-of-the-art digital readouts and tooling.

Kent Automatic Surface Grinder

- used for grinding flat and angular surfaces. This grinder has been used for sharpening ice coring cutters, core dogs, reamers, and surface grinding precision drill system parts. An Oliver tool cutter grinder is used for the complex geometry grinding on double angle cutters, core dogs, and reamers.

Tig, Mig, Gas, and Arc Welders

- all have a capacity ranging from very intricate applications to heavy-duty. The Tig and Mig welders can accommodate a wide range of steel and non-ferrous alloys. The shop has an acetylene/oxygen gas torch for brazing and flame cutting, along with a Plasma cutting unit.

Haas CNC Lathe

- allows technical staff to perform turning operations for high-precision machining.

Betenbender Heavy Duty Shear, Edwards 100-Ton Iron Worker, and Additional Hand Brakes and Foot Shears

- turn in-house fabrication and sheet metal work into routine services for the machine shop.

Materials Testing Bay

- the bay houses computer-controlled testing machines that can perform a variety of material and structural tests. The capacities of these testing machines are from 0 to 440,000 pounds. A torsion testing machine is available for testing barrels, well screens, drive shafts, gears, and more. Impact testing equipment is also accessible for impact tests on metals, plastics, and other materials.

A brief description of centers offering special expertise of interest to manufacturers of fabricated metal products follows.

Nebraska Center for Materials and Nanoscience (NCMN) is a multidisciplinary organization with more than 90 faculty members from UNL and other University of Nebraska campuses. The concern is with atomic manipulation, properties affected by nanoscale dimensions, self-assembly, ordered nanoarrays, quantum dots and wires, nanoelectronics, quantum computing, nanomechanics, nanooptics, molecular design, nanoelectro-mechanical systems, nanobiological function, and life sciences.

There are eight central facilities to support the NCMN's mission: Electron Microscopy, Materials Preparation, Mechanical and Materials Characterization, Scanning Probe Microscopy, X-Ray Structural Characterization, Nanofabrication, and Cryogenics. These facilities

are available to all UNL faculty as well as companies in Nebraska and elsewhere.

Center for Nontraditional Manufacturing Research is dedicated solely to the examination of nontraditional manufacturing methods. Projects involve both basic and applied research on numerous nontraditional manufacturing processes such as EDM, ECM, and USM.

Along with research and development efforts at the University of Nebraska, Nebraska operates a state college system with campuses at Chadron, Peru, and Wayne. Undergraduate degrees are offered at these institutions in Industrial Technology and Industrial Management and teaching endorsements are offered in Industrial Technology Education and Trade and Industrial Education. A variety of private colleges and universities are also located in Nebraska including Creighton University in Omaha, Nebraska Wesleyan University in Lincoln, and others throughout the state (see Figure 5A) on page 23.

Another important facet of higher education in Nebraska is the statewide community college system that provides specialized training programs for new and expanding industries. As indicated in Figure 5B (page 23), the state has six community college areas, which provide services in 25 cities across the state. The colleges offer a full curricula of occupational courses, which provide a steady flow of skilled graduates to Nebraska industries. As examples, Hastings and Milford Community College Campuses offer vocational/technical training in more than 50 different one-year and two-year programs, including Associate of Applied Science degrees in “Machine Tool Technology,” “Manufacturing Engineering Technology,” “Nondestructive Testing Technology,” and “Welding Technology.” Training is accomplished through the extensive use of hands-on activities and is centered around practical application of technical knowledge gained in lecture and laboratory sessions.

Performance-Based Tax Incentives

In 2005 the Nebraska Legislature enacted the Nebraska Advantage Tax Incentive Program and amended the program in 2008 and 2010. The Nebraska Advantage package replaced and

improved on Nebraska’s existing tax incentive programs and created a business climate that makes Nebraska the preferred location for business start-ups and expansions. The Nebraska Advantage rewards businesses that invest in the state and hire Nebraskans. In this progressive, pro-business climate, corporate income and sales taxes are reduced or virtually eliminated. Further information about the Nebraska Advantage is summarized in this study and is available at www.NebraskaAdvantage.biz.

The legislative components of the Nebraska Advantage package include:

Nebraska Advantage Act (LB 312)

- Expanded incentives for six “tiers” of investment and/or job creation
- Small business advantage
- Research and development advantage
- Microenterprise tax credit advantage
- Rural development advantage
- State and local sales tax exemptions of manufacturing machinery, equipment, and related services

Qualified businesses for Tier One include scientific testing research and development, manufacturing, and targeted export services. Qualified businesses for Tiers Two, Three, Four, and Five include the above plus data processing, telecommunications, insurance, financial services, distribution, storage, transportation, and headquarters (administrative). All businesses other than retail qualify for Super Tier Six. Retail sales of tangible personal property to specified markets can also qualify under Tiers Two through Six.

Nebraska Agricultural Innovation Advantage (LB 90)

- Agriculture opportunities and value-added partnership act
- Building entrepreneurial communities act
- Ethanol production incentive cash fund enhancement

Other components in the Nebraska Advantage package are:

Nebraska Customized Job Training Advantage - Provides a flexible job training



Made in Nebraska, equipment goes to the end of the earth for scientific impact

*The University of Nebraska-Lincoln's Engineering Science and Research Support Facility—known as ESRSF or simply the “Engineering Shop” on the UNL City Campus—has built equipment for several years of missions by ANDRILL, the ANtartic geological DRILLing collaboration. ESRSF Manager, Jim McManis said, **“It’s great that we can build these items right here at the UNL College of Engineering, where resources developed in Nebraska can help advance this exploration.”***

Based at UNL, ANDRILL includes 200 scientists, educators, and students from five nations: Germany, Italy, New Zealand, the United Kingdom, and the United States. ANDRILL manages and supports expeditions of scientists and field personnel who conduct the experiments and analyze the data.

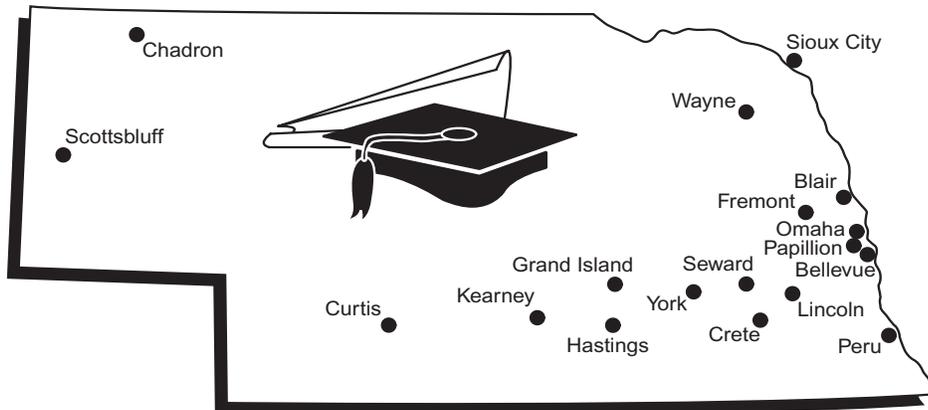
ESRSF has prepared a range of custom items for Antarctic projects, including scientific and drilling equipment to retrieve ice samples. In 2011, ESRSF designed and built a nozzle device that sprays near-boiling water to melt and abrade ice and deploy explosive charges for seismic tests. ANDRILL scientists use the samples to discover a history of paleoenvironmental changes that can guide understanding of the speed, size, and frequency of glacial and interglacial changes in Antarctica. In Autumn 2012, the team built a giant hose reel to help collect samples from deep beneath the ice (pictured).

*McManis said his ESRSF team enjoyed the design-build challenges associated with equipment’s use in extreme and remote environments such as Antarctica: **“It’s always fun to be part of new science and engineering, and this ANDRILL work has been really exciting science with a promising future.”***

*ANDRILL work was featured in the PBS NOVA program, *Secrets Beneath the Ice*, which can be viewed at <http://www.pbs.org/wgbh/nova/earth/secrets-beneath-ice.html>.*

Figure 5A

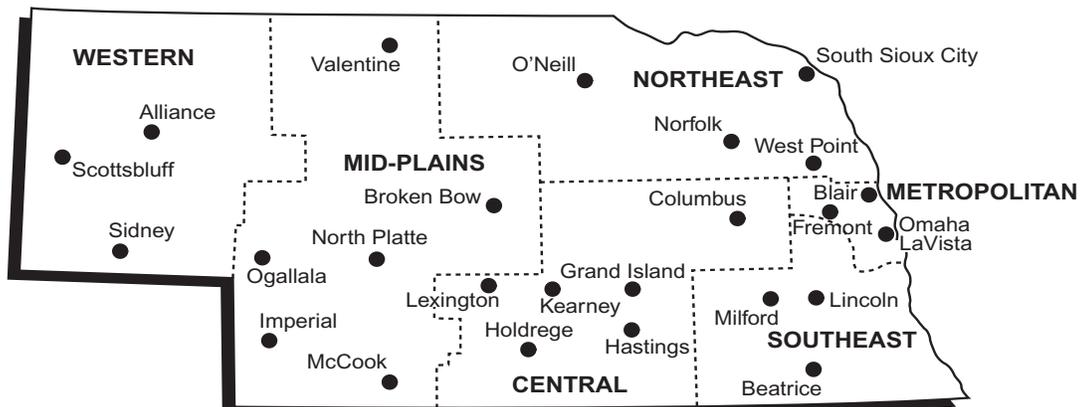
Location of Nebraska Area Colleges and Universities



Source: Nebraska Coordinating Commission for Postsecondary Education.

Figure 5B

Community Colleges in Nebraska



Source: Nebraska Community College System.

program with grants from \$500 to \$4,000 per job. Additional funds may be available for new jobs created in rural or high poverty areas. Companies can design their own training or a statewide training team can assist with training assessments, training plans, curriculum development, and instruction.

Nebraska Research and Development Advantage - Offers a refundable tax credit for research and development activities undertaken by a business entity. The credit is equal to 15 percent of federal credit allowed under Section 41 of the Internal Revenue Code of 1986. The credit is increased to 35 percent of the federal credit allowed under Section 41

if the business firm makes expenditures on the campus of a Nebraska college or university or a facility owned by a college or university in Nebraska. An important feature—businesses with little or no income may take advantage of the tax credit by receiving a sales tax refund or a refundable income tax credit.

Nebraska Microenterprise Tax Credit Advantage - Provides a 20 percent refundable investment tax credit to micro businesses on new investment in targeted communities. Applicants may qualify for a maximum \$10,000 throughout the life of the program. The credit is geared to companies with five or fewer employees, including

start-ups. Credits are approved through an application process with the Nebraska Department of Revenue and evaluated on expected local economic impacts. The credits are earned on new expenditures for wages, buildings, certain expenses, and non-vehicle depreciable personal property.

Additional Tax Savings:

- Sales Tax Exemption On:
 - Manufacturing equipment
 - Manufacturing or processing raw materials
 - Common carrier vehicles
 - Utilities used in manufacturing
- No Tangibles Tax
- No Inventory Tax
- Sales Tax Refund on Pollution Control Equipment
- 100% Tax Exemption on Certain Personal Property

In a tax policy incentive, Nebraska determines the taxable income attributable to Nebraska operations using a single factor, or “sales only,” formula. This method for determining corporate income tax allocation provides a significant advantage to multi-state unitary firms that sell products or services outside Nebraska. Nebraska also provides a capital gains exemption. State residents may elect, on a one-time basis, to subtract from their income tax liability the gain from the sale of capital stock of a corporation acquired during Nebraska-based employment with the corporation.

New Economic Development Initiatives

Nebraska has recently adopted several new legislative initiatives and programs designed to build Nebraska’s innovation economy and foster new high-quality job opportunities. Additional information on all these initiatives can be viewed at www.neded.org.

Talent & Innovation Initiative (TI2) - The four-part TI2 was developed to enhance momentum in Nebraska’s fastest growing industries, maintain Nebraska world class workforce, and leverage private sector innovation.

Nebraska Internship Program (InternNE), LB 476, is a partnership with Nebraska

businesses to create paid internship opportunities for full-time students. The program provides matching grants to create internship opportunities for full-time students studying at four-year institutions or students at a community college.

Grant awards are capped at 10 per business, 5 per location. Internships must pay at least minimum wage and have a duration of at least 160 hours. Applications are accepted continuously and reviewed for consideration bi-monthly. The program will reimburse a business 50 percent of their cost of wages paid, up to \$5,000 per internship.

Business Innovation Act, LB 387, is intended to help businesses develop new technologies and leverage innovation to enhance quality job opportunities in the state. It will provide competitive matching grants for research, development, and innovation and will also help expand small business and entrepreneurial outreach efforts. Eligible grant activities may include: prototype development, product commercialization, applied research in the state, and support for small business and microenterprise lending.

Site & Building Development Fund, LB 388, makes state resources available to increase industrial site and building availability and support site ready projects. State funding will be focused initially on land and infrastructure development and building rehabilitation, with 40 percent of funding available to non-metro areas. Communities will provide matching funds. This program also makes funding available to assist with demolition of dilapidated residential and industrial buildings and offers direct support to communities that lose a major employer.

Angel Investment Tax Credit, LB 389, encourages investment in high-tech startup enterprises in Nebraska by providing a 35–40 percent refundable state income tax credit to qualified Nebraska investors investing in qualified early-state companies. Capped at \$3,000,000 annually, the program requires minimum investment of \$25,000 for individuals and \$50,000 for investment funds. Eligible small businesses must have

fewer than 25 employees, with the majority based in the state.

Other Development Assistance Programs

Building on traditional advantages, Nebraska offers additional development assistance programs. Among those programs are the following:

Tax Increment Financing (TIF) - An additional incentive program of note is Nebraska's Tax Increment Financing. TIF is a method of financing the public improvements associated with a private development project in a blighted area by using the projected increase in property tax revenue that will result from the private development.

Community Development Block Grants (CDBG) - Eligible businesses may be able to qualify for CDBG through local governments so they may make improvements to the public infrastructure serving the project site. Performance based loans of up to \$1,000,000 may be awarded to qualifying companies creating new investments and jobs. Fifty-one percent of the new jobs must be held by or made available to low- or moderate-income persons. Other federal requirements apply. The program is administered by the Nebraska Department of Economic Development. More details are available at www.neded.org.

Industrial Revenue Bonds - All Nebraska counties and municipalities, as well as the Nebraska Development Finance Fund, are authorized to issue industrial revenue bonds to finance land, buildings, and equipment for industrial projects. No general election is required for an issue.

Other Financing Assistance - Supplementing traditional sources, financing assistance is also available through the Nebraska Investment Finance Authority, the Business Development Corporation of Nebraska, and the local development corporations. The Nebraska Department of Economic Development also administers development finance services, with staff helping assemble government financing with conventional

financing to put together the best comprehensive package.

Nebraska Process Loan Fund - Focuses on making loans to qualifying small businesses. The minimum loan is \$50,000, with a maximum of \$2,000,000. Advantages with this loan are interest rates ranging from 0 percent to 4 percent, payment deferrals, and the ability to support loans that lack sufficient collateral to qualify the loan(s) from a private lender.

It is important to recognize the Nebraska Advantage package replaces and significantly enhances Nebraska's previous performance-based tax incentive programs. Those earlier incentives, the first of which was passed by the Nebraska Legislature in 1987, had a profound effect in stimulating business investment, expansion, and job creation. Nebraska's previous tax incentive programs contributed to substantial investment and job creation, including total investment of more than \$23.5 billion and 121,000 jobs.

The combination of many factors, including Nebraska's Attractive business climate, tax incentives, labor productivity, and effective job training programs as well as other positive attributes, has resulted in Nebraska's manufacturing sector significantly outperforming both that of the surrounding states and the U.S. as a whole. Manufacturing employment in Nebraska grew by 17.1 percent between 1990 and 2000. As the U.S. economy experienced two major recessions between 2000 and 2010, manufacturing employment in Nebraska declined but outperformed the Plains Region and the nation (Figure 6, next page). These data suggest that companies with Nebraska manufacturing plants benefit from location and other competitive advantages associated with doing business in Nebraska.

Quality of Life

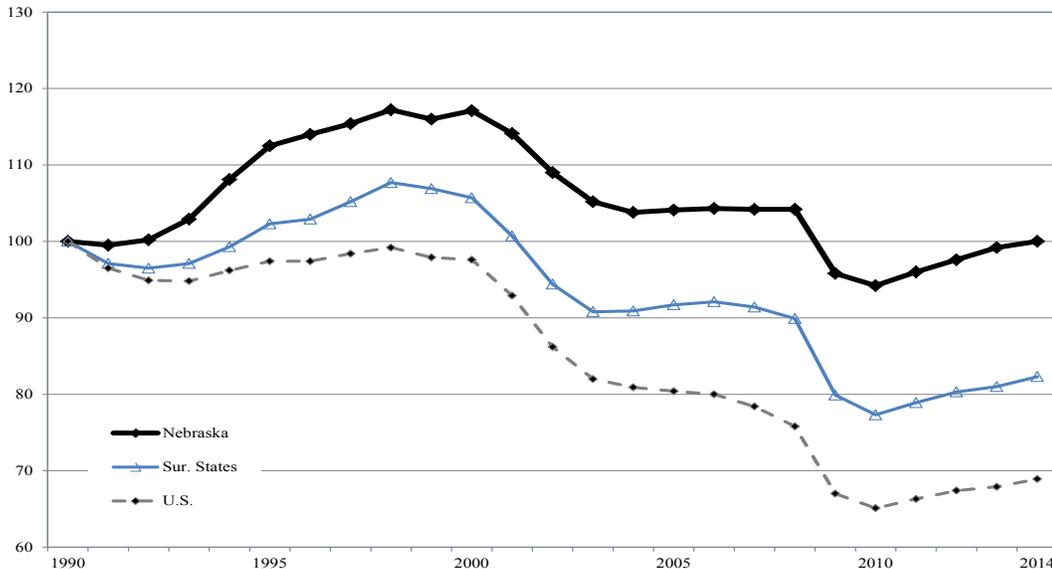
For a potential newcomer to Nebraska, the state's livability is obviously also a consideration. Nebraska ranks high in quality of life studies—and at or slightly above average in cost of living measures. The state's landscape is clean and spacious, both in urban and rural areas. Residents blend Midwestern values with Western enthusiasm for growth and change. This helps

create a high degree of citizen participation in both neighborhood and community-wide activities.

The cost of living in Nebraska is consistently at or slightly below the national average. Data

presented in Table 9 indicates on average, the cost of living in Nebraska is 1.2 percent less the U.S. average. Of particular interest is the cost of housing in Nebraska, which averages 7.1 percent less than for the U.S. as a whole for families renting a home.

Figure 6
Manufacturing Employment, Nebraska, Surrounding States, and the U.S., 1990–2014, 1990=100



Surrounding States include data for states contiguous to Nebraska, as a group, including Colorado, Iowa, Kansas, Missouri, South Dakota, and Wyoming.

Source: Bureau of Labor Statistics, www.bls.gov.

Table 9
Cost of Living in Nebraska, Compared to the National Average, October 1, 2015

	All Items Index ^(a)	Consumables	Transportation ^(b)	Health Services	Monthly Rent ^(c)	Home Value ^(c)	Utilities	Income/ Payroll Taxes
U.S. Average	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Nebraska	98.8	95.3	97.0	97.4	92.9	88.8	87.3	105.8
Omaha, NE	98.7	93.9	94.6	97.3	117.0	88.6	90.6	105.8
Lincoln, NE	103.1	98.6	97.5	99.0	105.5	99.7	86.7	105.8
Nonmetro NE ^(d)	96.0	94.8	97.5	97.0	82.4	80.7	86.7	105.8

^(a) Cost of living values computed for a family of three with an annual income of \$50,000.

^(b) Transportation costs assumes ownership of two cars valued at \$14,312 which, are driven a total of 20,000 miles annually.

^(c) Assumes a house of 1,613 square feet for both rental assumption and home value.

^(d) Nonmetro Nebraska data represent the average of 14 Nebraska cities outside of the Omaha and Lincoln metropolitan areas. These cities include Beatrice, Columbus, Dakota City, Fremont, Grand Island, Hastings, Kearney, McCook, Norfolk, North Platte, O'Neill, Scottsbluff, South Sioux City, and Valentine Nebraska.

Source: Index values computed from cost-of-living data obtained from Economic Research Institute (ERI), Relocation Assessor Database as of October 1, 2015.

CONCLUSIONS

This study concludes the fabricated metal product manufacturing industry is desirable for Nebraska and a Nebraska location is desirable for the industry. The locational advantages Nebraska offers appear well-suited to fabricated metal product manufacturers. They cover a wide spectrum, ranging from an attractive business climate to a high quality of life at a relatively low cost. But, as the study's model plant analysis demonstrates, in Appendix A on the following page, the competitive advantages Nebraska offers in such important cost areas as labor and energy are particularly noteworthy. The state's well-educated and productive labor force is a long-standing asset, as are its very favorable electric and natural gas rates.

Essentially, the analysis presented in this study was based on state-to-state comparisons

applicable to the fabricated metal product manufacturing industry generally. Individual manufacturers will therefore need to further consider the locational requirements of their particular kinds of fabricated metal product manufacturing as well as the merits of specific sites within states. Certainly in terms of general locational situation for fabricated metal product manufacturers, Nebraska has much to offer.

The three organizations cooperating in the preparation of this study can also assist fabricated metal product manufacturers in assessing advantages in Nebraska for a specific new location or expansion project. To obtain this assistance, write or call:

Economic Development Department
**NEBRASKA PUBLIC POWER
DISTRICT**
PO Box 499
Columbus, Nebraska 68602-0499
(402) 563-5534
(800) 282-6773
Email: rjnelse@nppd.com
<http://econdev.nppd.com>



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(800) 426-6505
Email: dan.curran@nebraska.gov
www.neded.org

**UNIVERSITY OF NEBRASKA-LINCOLN
COLLEGE OF ENGINEERING**
114 Othmer Hall
PO Box 880642
Lincoln, Nebraska 68588-6363
(402) 472-3181
Email: twei3@unl.edu
<http://engineering.unl.edu>

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APPENDIX A LABOR AND ENERGY COST ANALYSIS

Nebraska offers a wide range of locational advantages for fabricated metal product manufacturers. In this Appendix, labor and energy production cost factors that have geographic variability are analyzed. Such analysis permits the identification of the plant site providing the best advantage on these important input factors.

In the analysis of geographically variable labor and energy costs, the following procedures are used:

- 1) Selection of alternative plant locations for evaluation of the geographically variable labor and energy costs.
- 2) Definition of a model manufacturing plant for identifying labor and energy inputs and costs.
- 3) Evaluation of labor-related costs associated with each alternative plant location.
- 4) Evaluation of energy costs for each alternative plant location.

Alternative Plant Locations

Sixteen alternative plant locations were selected for comparison in this analysis. The plant locations include the top eight states in terms of value of shipments by the “Fabricated Metal Product Manufacturing” (NAICS 332) subsector and other states near Nebraska with which it typically competes for industrial location projects. The sixteen states account for 64.3 percent of the value of shipments from the fabricated metal products industry (see Table A-1).

Table A-1

Alternative Locations for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

State	Percent of Value of Shipments
Nebraska	0.7
California	8.1
Florida	1.1
Illinois	6.6
Indiana	4.5
Iowa	1.4
Kansas	1.0
Michigan	5.1
Minnesota	2.9
Missouri	1.9
New Jersey	1.4
New York	8.4
Ohio	2.3
Pennsylvania	5.4
Texas	9.4
Wisconsin	4.3
Total Selected States*	64.3

* Values do not sum due to rounding.

Source: U.S. Bureau of the Census, *Annual Survey of Manufactures*, 2013.

Table A-2

Characteristics of a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

	Total Model Plant	Per Production Worker
Production Workers	50	- - -
Value Added [dollars] ^(a)	9,041,750	180,835
Total Output [dollars] ^(b)	16,966,050	339,321
Energy Inputs [million BTUs] ^(c)	16,341	327

^(a) Estimated value added applies the 2013 value added per production worker for the Fabricated Metal Product Manufacturing Subsector (NAICS 332) to the model plant (see Table 4).

^(b) Estimated value of shipments derived by applying the 2013 value of shipments per production worker to the model plant (see Table 4).

^(c) Estimated by applying the 2013 ratio of energy inputs per production worker to the model plant (see Table A-3).

Source: Calculated from data presented in Table 4 and Table A-3 and from U.S. Bureau of the Census, *Annual Survey of Manufactures, 2013*.

The Model Plant

To facilitate the analysis of the comparative labor and energy costs for the alternative states, it is useful to define a model plant for which the geographically variable costs can be quantified. The model plant is assumed to manufacture a product representative of the fabricated metal product manufactures industry as a whole. To specify the relevant labor and energy costs, information was obtained from the *2013 Annual Survey of Manufactures*.

Table A-2 presents industry characteristics used in developing the model plant, which is assumed to employ 50 production workers. Estimated production worker hours total 104,000 annually or 2,080 hours per worker. Value added by manufacture is estimated to be \$9,041,750 and the total annual output (value of shipments) is estimated to be \$16,966,050. Energy inputs are estimated at 16,340.6 million BTUs, with all energy inputs supplied by electricity and natural gas.

Energy Used in the Model Plant

The assumption that the model plant is representative of the industry as a whole leads to the assumption that energy used in the plant also should be characteristic of industry use patterns. Part A of Table A-3 (next page) presents data estimating energy use for the industry in 2013. The estimated energy use for the model plant was derived using the ratio of energy inputs to industry value added. It was further assumed all energy inputs for the model plant are derived from electricity and natural gas.

Part B of Table A-3 (page A-3) indicates the model plant, employing 50 production workers, will have annual energy inputs of 16,340.6 million BTUs. Electric energy inputs are estimated to be 7,157.2 million BTUs (2,097,650 kWhs), or 43.8 percent of the total energy inputs, while natural gas inputs are estimated at 9,183.4 million BTUs.

Table A-3

Energy Use in Fabricated Metal Product Manufacturing Subsector (NAICS 332) Manufacturing Establishments

Part A

Estimated 2013 Industry Energy Inputs

	Trillion BTUs	Percent
Purchased Fuels and Electric Energy	332.4	100.0
Purchased Electric Energy	145.6	43.8
Purchased Fuels	186.8	56.2

Source: Energy use estimated from data from the U.S. Bureau of the Census, *Annual Survey of Manufactures, 2013 and U.S. Energy Information Administration, 2010 Manufacturing Energy Consumption Survey.*

Part B

Energy Inputs for the Food Manufacturing Model Plant

	Million BTUs	Percent
Purchased Electricity	7,157.2 (2,097,650 kWhs)	43.8
Natural Gas	9,183.4	56.2
Total Energy Inputs	16,340.6	100.0

Source: Calculated from data in Table A-2 and Part A of this table.

Labor-Related Costs

Labor costs in the fabricated metal product manufacturing industry are affected by several factors: wage rates, productivity of workers, fringe benefits, unemployment insurance, and workers' compensation costs. Estimated annual labor-related costs for a model, fabricated metal manufacturing plant operating at a Nebraska location and in each of the 15 alternative state locations are presented in Table A-4 (next page) and Figure A-1 (page A-5).

Table A-4 also includes data on wage rates for the states identified as alternative plant locations.

An analysis of state wage levels indicates Nebraska's production workers have hourly wage rates significantly below the average for the alternative plant sites. For example, 2013 hourly wage rates for Nebraska production workers (\$19.45) are 5.2 percent below the average wage rates for

the other 15 states included as alternative plant locations.

The Nebraska costs for unemployment insurance and workers' compensation are significantly less than the other states. In the case of unemployment insurance contributions, the average cost per employee for the 15 alternative states is estimated at \$374.00 or 58.9 percent greater than the Nebraska cost of \$154.00. Insurance rates for workers' compensation average \$2.04 per \$100 of payroll for the 15 alternative states, 14.7 percent more than Nebraska's rate of \$1.78.

If located in Nebraska, the model plant has a significant labor cost advantage over the alternative locations. The Nebraska labor cost advantage reaches as high as \$384,265 in annual savings when compared to Minnesota. When compared to the average labor costs for the 15 alternative locations, Nebraska's annual labor cost advantage is \$170,891 or 5.7 percent lower.

Table A-4
Total Annual Labor-Related Costs for a Model Plant
for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

Plant Location	Hourly Wage Rate	Number of Production Workers	Total Payroll	Workers' Compensation		Unemployment Insurance	Social Security ^(a)	Fringe Benefits ^(b)	Total Labor Costs	Cost Difference		Relative Other States (/)
				Insurance	Insurance					Nebraska	Nebraska	
Nebraska	\$19.45	50	\$2,022,800	\$36,006	\$7,687	\$154,744	\$606,840	\$2,828,077	\$0	100.0		
California	21.44	50	2,229,800	77,597	17,392	170,580	668,940	3,164,309	336,232	111.9		
Florida	20.63	50	2,145,500	39,048	13,946	164,131	643,650	3,006,275	178,198	106.3		
Illinois	21.10	50	2,194,400	51,568	22,163	167,872	658,320	3,094,323	266,246	109.4		
Indiana	19.21	50	1,997,800	21,177	14,784	152,832	599,340	2,785,933	-42,144	98.5		
Iowa	18.98	50	1,973,900	37,109	17,765	151,003	592,170	2,771,947	-56,130	98.0		
Kansas	18.40	50	1,913,600	29,661	14,161	146,390	574,080	2,677,892	-150,185	94.7		
Michigan	19.61	50	2,039,400	34,262	20,598	156,014	611,820	2,862,094	34,017	101.2		
Minnesota	21.97	50	2,284,900	45,470	21,707	174,795	685,470	3,212,342	384,265	113.6		
Missouri	21.28	50	2,213,100	43,819	14,828	169,302	663,930	3,104,979	276,902	109.8		
New Jersey	21.02	50	2,186,100	61,648	27,982	167,237	655,830	3,098,797	270,720	109.6		
New York	20.84	50	2,167,400	59,604	16,906	165,806	650,220	3,059,936	231,859	108.2		
Ohio	21.52	50	2,238,100	38,943	13,876	171,215	671,430	3,133,564	305,487	110.8		
Pennsylvania	20.46	50	2,127,800	42,556	27,236	162,777	638,340	2,998,709	170,632	106.0		
Texas	20.85	50	2,168,400	34,911	11,493	165,883	650,520	3,031,207	203,130	107.2		
Wisconsin	20.37	50	2,118,500	40,675	25,422	162,065	635,550	2,982,212	154,135	105.5		

^(a) Employer Social Security costs are 7.65 percent of payroll (wages).

^(b) Fringe benefit costs are assumed to be 30 percent of payroll.

Sources: Oregon Department of Consumer & Business Services, *Oregon Workers' Compensation Premium Rate Rankings Calendar Year 2014, October 2014*.

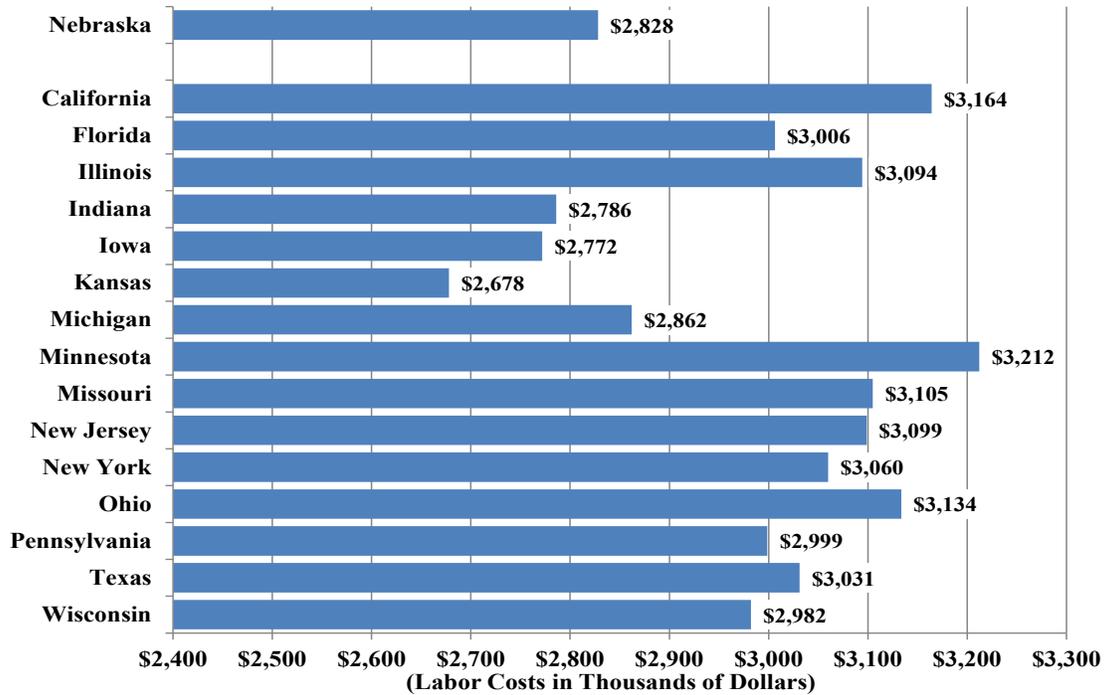
U.S. Department of Labor, Bureau of Labor Statistics, August 2015.

U.S. Bureau of the Census, *Annual Survey of Manufactures, 2013*.

U.S. Department of Labor, Employment and Training Administration, *Unemployment Insurance Data, 2015*.

Figure A-1

**Estimated Total Labor Costs* for a
Fabricated Metal Product Model Plant, Alternative Plant Locations**



* Calculated labor costs include wages, workers' compensation insurance, unemployment insurance, social security, and fringe benefits.

Source: See Table A-4.

Energy Costs

The availability and cost of energy are increasingly important factors in the industrial location process. Rates for industrial electricity and natural gas for the alternative plant locations are presented in Table A-5 (next page). For both energy sources, Nebraska's rates are generally less than the alternative states. The average electric rate for a 1,000 kW billing demand with monthly usage of 400,000 kWhs for the 15 alternative plant sites is \$0.0937 per kWh or 16.1 percent more than the Nebraska rate of \$0.0786.

In the case of industrial rates for natural gas, the average for the 15 other states is 27.1 percent more than the Nebraska rate of \$4.60 per million BTUs.

Table A-5 and Figure A-2 (next page) provide an analysis of the energy costs for the operation of the model plant. The total energy costs for the alternative locations include the cost for the assumed level of electrical energy and natural gas inputs for the operation of the plant.

Nebraska provides a significant energy cost savings compared to the average of the alternative plant locations. When considering the California location, energy costs for the model plant are 84.9 percent more than the Nebraska energy costs. When compared to the average total energy costs for the 15 alternative states, Nebraska energy costs are 18.6 percent lower, translating into an average annual savings of \$47,388.

Table A-5

Annual Energy Costs for a Model Plant for the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

Plant Locations	Electricity		Natural Gas		Total Energy Cost	Cost Difference Other States (-) Nebraska	Cost Relative Other States (/) Nebraska
	Rate ^(a)	Cost	Rate ^(b)	Cost			
Nebraska	\$0.0786	\$164,875	\$4.60	\$42,244	\$207,119	\$0	100.0
California	0.1545	324,087	6.40	58,774	382,861	175,742	184.9
Florida	0.0917	192,355	6.59	60,519	252,874	45,755	122.1
Illinois	0.0633	132,781	5.84	53,631	186,412	-20,707	90.0
Indiana	0.0843	176,832	6.37	58,498	235,330	28,211	113.6
Iowa	0.0631	132,362	5.29	48,580	180,942	-26,177	87.4
Kansas	0.0857	179,769	4.72	43,346	223,115	15,996	107.7
Michigan	0.0955	200,326	6.79	62,355	262,681	55,562	126.8
Minnesota	0.0805	168,861	4.81	44,172	213,033	5,914	102.9
Missouri	0.0894	187,530	7.97	73,192	260,722	53,603	125.9
New Jersey	0.1229	257,801	7.97	73,192	330,993	123,874	159.8
New York	0.1246	261,367	7.24	66,488	327,855	120,736	158.3
Ohio	0.0911	191,096	5.98	54,917	246,013	38,894	118.8
Pennsylvania	0.0924	193,823	8.97	82,375	276,198	69,079	133.4
Texas	0.0777	162,987	3.82	35,081	198,068	-9,051	95.6
Wisconsin	0.0890	186,691	5.86	53,815	240,506	33,387	116.1

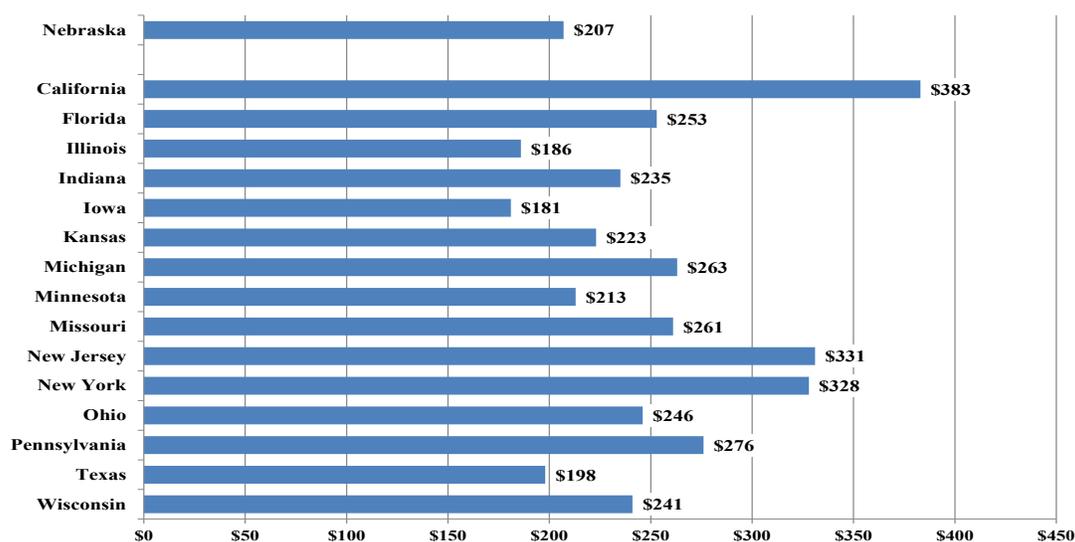
Sources:

^(a) Electric: Edison Electric Institute, *Typical Residential, Commercial, and Industrial Bills*, January 1, 2014 and July 1, 2014. State average weighted using eight months of January 2014 data and four months of July 2014 data. Nebraska data represent average for Nebraska Public Power District, Omaha Public Power District, and Lincoln Electric System using the same seasonal weighting.

^(b) Natural Gas: U.S. Energy Information Agency, *Natural Gas Industrial Price*, 2013, www.eia.gov/dnav/ng/ng_pri_sum_a_epg0_pin_dmcf_a.htm. Values converted from price per MCF to per mmBTUs by dividing prices by 1.027.

Figure A-2

Estimated Total Energy Costs* for a Fabricated Metal Product Model Plant, Alternative Plant Locations



(Energy Costs in Thousands of Dollars)

*Calculated energy costs include electricity and natural gas costs.

Source: See Table A-5.

Labor and Energy Cost Summary

Combining the labor and energy cost findings, the results of the model plant analysis are summarized in Table A-6. As the table shows, a Nebraska location has a cost advantage over all of the 15 alternative states. When considering the average labor and energy costs for the 15 alternative states, the cost advantage of the Nebraska location is \$218,279 annually, or 6.7 percent less than the average costs for the other 15 plant sites considered.

Conversely, the average labor and energy costs for the alternative states are 7.2 percent more than the costs associated with a Nebraska location. Inescapable from these results is the conclusion that, in terms of major labor and energy input costs, Nebraska fabricated metal product manufacturers have a clear competitive advantage over manufacturing establishments in the industry not so fortunately located.

Table A-6
Summary of Labor and Energy Costs for a Model Plant for
the Fabricated Metal Product Manufacturing Subsector (NAICS 332)

Plant Locations	Total Labor Cost	Total Energy Cost	Total Labor and Energy Cost	Cost Difference Other States (-) Nebraska	Cost Relative Other States (/) Nebraska
Nebraska	\$2,828,077	\$207,119	\$3,035,196	\$0	100.0
California	3,164,309	382,861	3,547,170	511,974	116.9
Florida	3,006,275	252,874	3,259,149	223,953	107.4
Illinois	3,094,323	186,412	3,280,735	245,539	108.1
Indiana	2,785,933	235,330	3,021,263	-13,933	99.5
Iowa	2,771,947	180,942	2,952,889	-82,307	97.3
Kansas	2,677,892	223,115	2,901,007	-134,189	95.6
Michigan	2,862,094	262,681	3,124,775	89,579	103.0
Minnesota	3,212,342	213,033	3,425,375	390,179	112.9
Missouri	3,104,979	260,722	3,365,701	330,505	110.9
New Jersey	3,098,797	330,993	3,429,790	394,594	113.0
New York	3,059,936	327,855	3,387,791	352,595	111.6
Ohio	3,133,564	246,013	3,379,577	344,381	111.3
Pennsylvania	2,998,709	276,198	3,274,907	239,711	107.9
Texas	3,031,207	198,068	3,229,275	194,079	106.4
Wisconsin	2,982,212	240,506	3,222,718	187,522	106.2

Source: Calculated from data presented in Tables A-4 and A-5.



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