NEBRASKA

PROFIT OPPORTUNITIES FOR MANUFACTURERS OF

FABRICATED METAL PRODUCTS

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Nebraska Wins Governor's Cup for Second Consecutive Year.

Businesses are moving to Nebraska!
People are locating to Nebraska!

What worked for Nebraska in 2016 worked just as well in 2017, as the state successfully defended its claim to the Governor's Cup it won last year. The recognition is based on the number of projects per capita, and Nebraska gained 110.

Ask Gov. Ricketts why he thinks Nebraska won Site Selection's facilities race again in 2017, and he'll point first to the workforce.

"The main reason people want to invest in Nebraska is the people," Gov. Ricketts told Site Selection. "We consistently have one of the highest workforce participation rates. From personal experience, when you hire a Nebraskan, you know he or she is well-educated and has a great work ethic. They are customer-focused and loyal — they really want to work."

Parts of this article and photo courtesy Site Selection.

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EXECUTIVE SUMMARY

The "Fabricated Metal Product Manufacturing" subsector (NAICS 332) is the third 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 (NAICS 332) 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 $193,934 in labor-related costs, which is 6.1 percent less than the average labor costs for the other states.

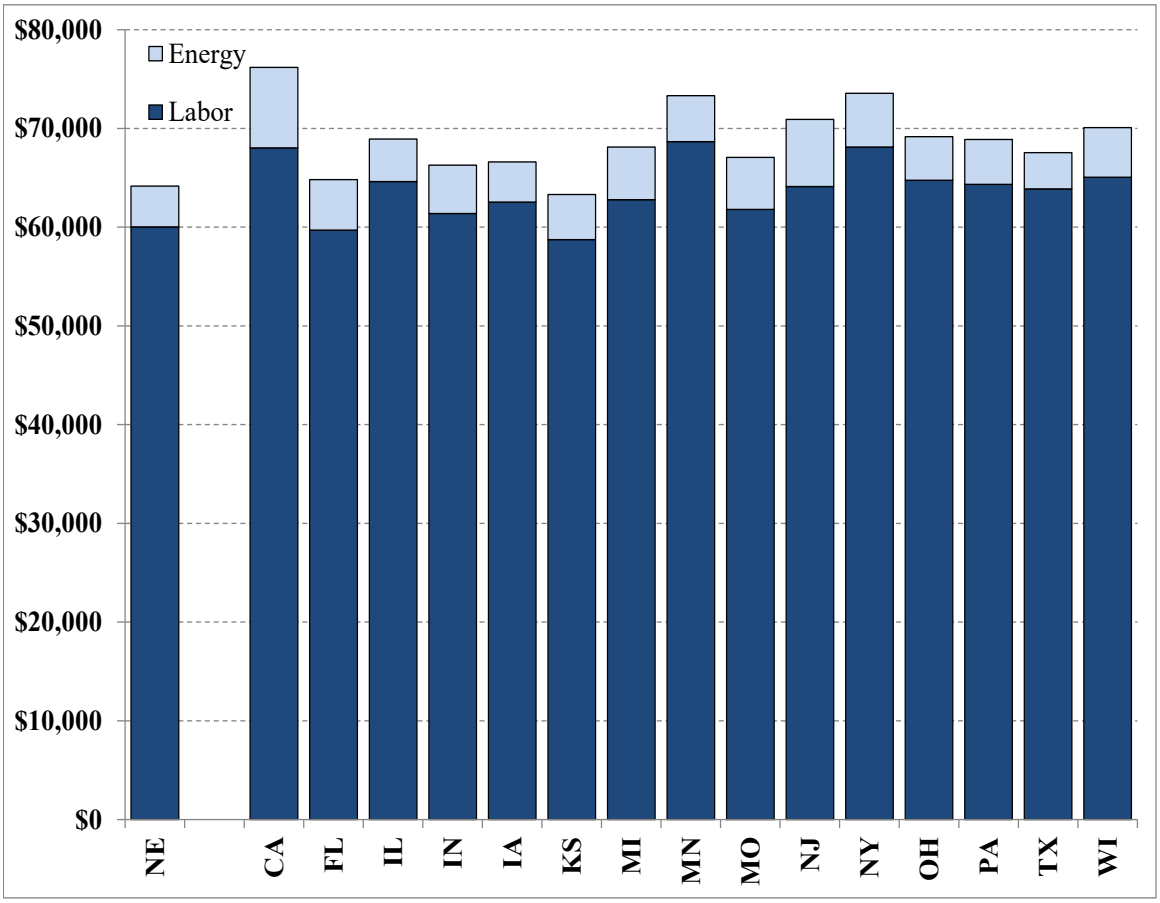
This study also concludes that a Nebraska plant location offers a significant energy cost advantage when compared to the average cost of the other 15 states. Industrial electric rates in the alternative states average 20.7 percent higher, and the average industrial gas rate is 31.4 percent more. Combining these advantages, Nebraska's energy cost for the model plant is 22.8 percent less than the average for the other 15 alternative locations.

Together, Nebraska's annual labor and energy costs for the model plant are $241,195, or 7.0 percent less than the average costs for the 15 alternative states. Conversely, the average labor and energy costs in the other 15 states are 7.5 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 Manufacturing Subsector (NAICS 332)



Source: Table A-6.

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 Manufacturing" subsector (NAICS 332).

PART A

THE FABRICATED METAL PRODUCT MANUFACTURING SUBSECTOR

The "Fabricated Metal Product Manufacturing" subsector (NAICS 332) is the second largest manufacturing subsector[1], when measured by employment, in the United States. The *2016 Annual Survey of Manufactures* indicates the fabricated metal product sector accounted for 11.9 percent of total employment by U.S. manufacturers. In 2016, fabricated metal product manufacturing establishments produced 7.6 percent of total U.S. manufacturing value added and 6.3 percent of value of shipments.

As the data shown in Table 1 indicate, the value of shipments for the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) in the U.S. totaled $335,755.5 million in 2016. Value added in the industry totaled $182,987.7 million, with total employees numbering 1,372,600 and production workers numbering 959,800. Capital expenditures for the subsector totaled $10,847.3 million in 2016.

Data for the 2002–2016 review period provided in Table 1 show declines in total "Fabricated Metal Product Manufacturing" subsector (NAICS 332) 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 from 2012–2016. 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, 2002–2016

Year	Total Employees	Production Workers	Value Added	Value of Shipments	Capital Expenditures	Avg. Hourly Earnings, Prod. Wrkrs.
	- - - - Thousand - - - -		- - - - (Million $) - - - -			($)
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	1,382.8	1,018.3	185,658.9	347,105.0	11,369.3	20.66
2014	1,375.0	1,013.8	190,967.2	357,477.6	10,930.2	21.27
2015	1,372.3	1,004.1	186,310.4	349,060.9	10,185.4	21.52
2016	1,327.6	959.8	182,987.7	335,755.5	10,847.3	22.18

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, 2013, 2014, 2015, and 2016.*

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

[1]The North American Industrial Classification System (NAICS)—used by the statistical agencies of the United States, Canada, and Mexico—employs a hierarchial 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 (NAICS 332) shipments grew by 39.7 percent while the number of production workers increased by only 1.2 percent. From 2007–2016, subsector value of shipments decreased by less than 2.7 percent and the number of production workers decreased by 18.8 percent. For the entire 14-year period from 2002–2016, the value of subsector shipments increased by 35.9 percent and the number of production workers declined by 17.9 percent.

Worker productivity increased significantly from 2002 to 2016, with output per production worker increasing 65.6 percent. During the 2002–2016 period, the value of shipments of fabricated metal product manufacturers adjusted for price changes[2] decreased 5.2 percent and the average hourly wage of production workers adjusted for price changes[3] increased 5.4 percent. During the Recession of 2007–2009, the levels of employment and output in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) 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 and declined by 1.2 percent between 2012 and 2016. "Machine Shops and Threaded Product Manufacturing" (NAICS 3327) experience the largest increase among the industry groups (3.0 percent) during the nine-year period, 2007 to 2016. "Other Fabricated

Table 2

The Fabricated Metal Product Manufacturing Subsector (NAICS 332), Value of Industry Shipments by Major Industry Group, 2007, 2012, and 2016

NAICS	Industry Subgroup	Value of Shipments			% Change		% of Total
		2007	2012	2016	2007–2012	2012–2016	2016
		- - - (Million $) - - -			- - - - ($) - - - -		
332	**Fabricated Metal Product Manufacturing**	**345,166.7**	**339,774.5**	**335,755.5**	**-1.6**	**-1.2**	**100.0**
3321	Forging and Stamping	33,510.5	34,488.4	31,351.0	2.9	-9.1	9.3
3322	Cutlery and Handtool Manufacturing	11,009.5	9,893.5	9,887.9	-10.1	-0.1	2.9
3323	Architectural and Structural Metals Manufacturing	91,084.0	75,700.0	84,860.3	-16.9	12.1	25.3
3324	Boiler, Tank, and Shipping Container Manufacturing	31,703.8	35,100.8	31,114.0	10.7	-11.4	9.3
3325	Hardware Manufacturing	9,587.4	7,142.3	8,454.9	-25.5	18.4	2.5
3326	Spring and Wire Product Manufacturing	9,603.1	9,019.2	8,998.4	-6.1	-0.2	2.7
3327	Machine Shops and Threaded Product Manufacturing	60,974.5	66,964.9	62,781.3	9.8	-6.2	18.7
3328	Coating, Engraving, Heat Treating, and Allied Activities	26,619.8	26,825.3	25,682.0	0.8	-4.3	7.6
3329	Other Fabricated Metal Product Manufacturing	71,074.1	74,640.1	72,625.6	5.0	-2.7	21.6

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, 2016.*

[2]Values adjusted using U.S. Bureau of Labor Statistics, *Producer Price Index for Fabricated Metal Products*.
[3]Values adjusted using U.S. Bureau of Labor Statistics, *Consumer Price Index for All Urban Workers*.

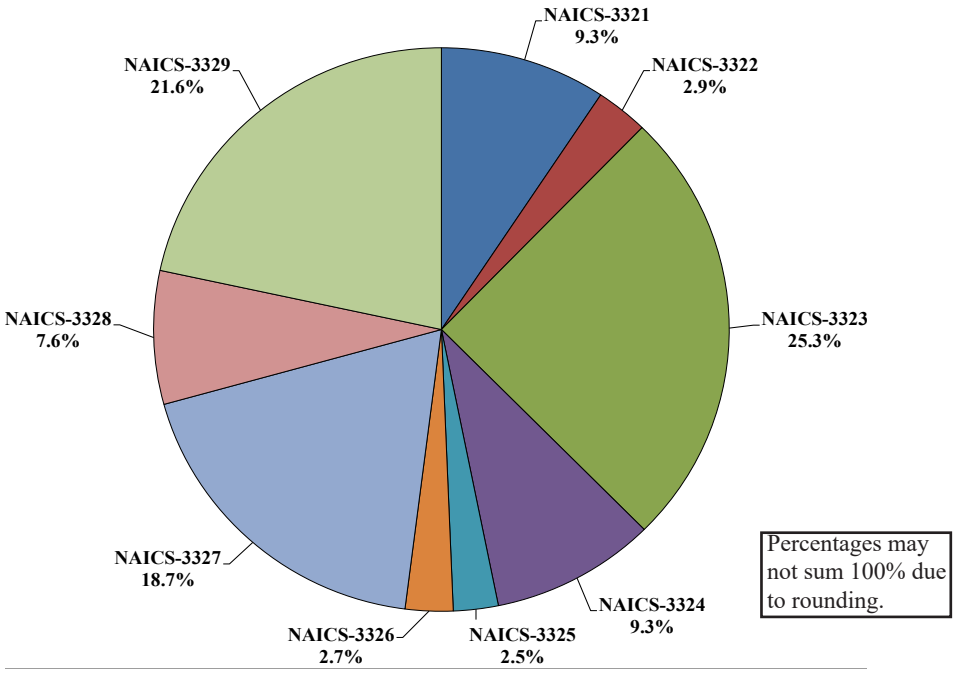
Metal Product Manufacturing" (NAICS 3329); the second fastest growing industry group during the 2007–2016 period, grew 2.2 percent.

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 each industry group. "Architectural and Structural Metals Manufacturing" (NAICS 3323) is the largest industry group, accounting for 25.3 percent of total industry shipments. "Other Fabricated Metal Product Manufacturing" (NAICS 3329, 21.6 percent), is the second largest industry group when measured by value of shipments, followed by "Machine Shops and Threaded Product Manufacturing" (NAICS 3327, 18.7 percent); "Forging and Stamping" (NAICS 3321, 9.3 percent); "Boiler, Tank, and Shipping Container Manufacturing" (NAICS 3324, 9.3 percent); "Coating, Engraving, Heat Treating, and Allied Activities" (NAICS 3328, 7.6 percent); "Cutlery and Handtool Manufacturing" (NAICS 3322, 2.9 percent); "Spring and Wire Product Manufacturing" (NAICS 3326, 2.7 percent); and "Hardware Manufacturing" (NAICS 3325, 2.5 percent).

The data in Table 3 (Page 7) provide further detail for the "industry groups." Data showing the number of companies and establishments for 2012 and the number of employees, production

Figure 2

Value of Shipments by Industry Group,
Fabricated Metal Product Manufacturing Subsector (NAICS 332), 2016



Total 2016 Shipments - $335,755.5 Million

NAICS 3321 Forging and Stamping

NAICS 3322 Cutlery and Handtool Manufacturing

NAICS 3323 Architectural and Structural Metals Manufacturing

NAICS 3324 Boiler, Tank, and Shipping Container Manufacturing

NAICS 3325 Hardware Manufacturing

NAICS 3326 Spring and Wire Product Manufacturing

NAICS 3327 Machine Shops and Threaded Product Manufacturing

NAICS 3328 Coating, Engraving, Heat Treating, and Allied Activities

NAICS 3329 Other Fabricated Metal Product Manufacturing

Source: Table 2.

workers, value added, value of shipments, and capital expenditures for 2016 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, all employees, production workers, 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, all employees, production workers, value added, and capital expenditures, while "Plate Work and Fabricated Structural Product Manufacturing" (NAICS 33231) is the largest NAICS industry in terms of shipments.

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, Page 8). It is interesting to note that the number of small establishments,

Weiland, Inc. Breaks Ground on New Manufacturing Facility in Norfolk

In 1984, on a farm in Madison County, Nebraska, Leon Weiland built one of the first fiberglass doors for the meat-packing industry. The company grew on that farm for more than 30 years, increasing sales and providing high quality products and customer service.

While still often referred to as "Weiland Doors," today's Weiland, Inc. remains a family-owned and operated company which manufactures specialized, industrial doors and windows. Their engineering efforts are concentrated on applications for inspected meat, poultry, seafood, and dairy facilities throughout North America.

In 2017, the need to consolidate operations and streamline manufacturing capabilities led the partners to a new site outside of Norfolk, Nebraska, along U.S. Highway 81. Lieutenant Governor Mike Foley, State Senator Jim Scheer, and other dignitaries assisted in the groundbreaking ceremony.

"The story of our business is nothing short of extraordinary," said Rob Haake, partner at Weiland Doors. "We've been blessed to have such a solid company foundation, such loyal customers, and such talented employees. We genuinely build the toughest doors in the world, and we have a lot of fun doing so."

The expansion and consolidation resulted in a more efficient work flow, added safety, more work stations, as well as a modern breakroom and workforce amenities to assist with recruitment and retention of workers. The new, expanded facility and location also gives the company more visibility, accessibility to workforce, and room for future growth. Because Weiland, Inc. is definitely growing.

The nationally known brand name and company boasts an impressive list of food industry customers such as Blue Apron, ConAgra Foods, Tyson, Starbucks, In-N-Out Burger, Panera Bread, General Mills, Kraft Heinz, Cargill, and Campbell Soup, among many others. In 2016 Weiland, Inc. shipped manufactured product to construction sites in 36 states and Canada.

Weiland, Inc.'s world class talent greatly contributed to the company's growth. With the new facility tripling the size of their previous building, the company had the capability to hire some of the best men and women in Northeast Nebraska. So far in 2018, Weiland, Inc. has added six full-time and two part-time positions and is expecting to add 4–5 more positions by the end of the year. These positions will help the company meet the ever growing customer, sales, and production demands.

Partners who helped with the expansion project, include Nebraska Department of Economic Development, Nebraska Business Development Center, Northeast Nebraska Economic Development District, Nebraska Economic Development Corporation/Small Business Association, utility providers and Madison County among others.

The facility is served electrically by Elkhorn Rural Public Power District.

Table 3

The Fabricated Metal Product Manufacturing Subsector (NAICS 332),
Number of Companies and Establishments, Employment, 2012
Value Added, Capital Expenditures, and Value of Shipments by Major Sector and Industry Subgroups, 2016

NAICS Code	Industry Description	Number of Companies	Number of Establishments	All Employees	Production Workers	Value Added	Value of Shipments	Capital Expenditures
						- - - - - (Thousand $) - - - - -		
332	**Fabricated Metal Product Manufacturing**	**52,483**	**55,400**	**1,327,632**	**959,837**	**182,987,657**	**335,755,502**	**10,847,269**
3321	Forging and Stamping	2,332	2,531	106,798	79,649	14,668,496	31,351,003	1,358,630
33211	Forging and Stamping	2,332	2,531	106,798	79,649	14,668,496	31,351,003	1,358,630
3322	Cutlery and Handtool Manufacturing	1,104	1,188	33,660	24,013	6,370,672	9,887,945	334,578
33221	Cutlery and Handtool Manufacturing	1,104	1,188	33,660	24,013	6,370,672	9,887,945	334,578
3323	Architectural and Structural Metals Manufacturing	11,485	12,318	326,363	230,302	42,836,612	84,860,324	1,803,765
33231	Plate Work and Fabricated Structural Product Manufacturing	4,536	4,931	145,292	102,384	20,459,875	43,074,342	836,308
33232	Ornamental and Architectural Metal Products Manufacturing	6,949	7,387	181,071	127,917	22,376,736	41,785,982	967,457
3324	Boiler, Tank, and Shipping Container Manufacturing	1,241	1,523	79,501	58,254	13,210,692	31,114,030	856,703
33241	Power Boiler and Heat Exchanger Manufacturing	267	317	22,418	14,482	3,817,959	6,634,176	141,039
33242	Metal Tank (Heavy Gauge) Manufacturing	623	700	30,282	21,956	3,897,070	7,603,690	174,214
33243	Metal Can, Box, and Other Container Manufacturing	351	506	26,801	21,816	5,495,664	16,876,164	541,451
3325	Hardware Manufacturing	553	607	27,635	18,244	4,591,944	8,454,937	179,183
33251	Hardware Manufacturing	553	607	27,635	18,244	4,591,944	8,454,937	179,183
3326	Spring and Wire Product Manufacturing	1,161	1,300	36,031	26,799	4,797,201	8,998,362	299,183
33261	Spring and Wire Product Manufacturing	1,161	1,300	36,031	26,799	4,797,201	8,998,362	299,183
3327	Machine Shops and Threaded Product Manufacturing	23,339	23,750	348,433	256,814	39,520,893	62,781,307	3,375,417
33271	Machine Shops	19,031	19,240	220,623	160,902	23,283,238	35,851,333	1,830,818
33272	Turned Product and Screw, Nut, and Bolt Manufacturing	4,308	4,510	127,810	95,912	16,237,655	26,929,974	1,544,599
3328	Coating, Engraving, Heat Treating, and Allied Activities	5,290	5,762	120,054	92,857	15,712,222	25,682,025	893,361
33281	Coating, Engraving, Heat Treating, and Allied Activities	5,290	5,762	120,054	92,857	15,712,222	25,682,025	893,361
3329	Other Fabricated Metal Product Manufacturing	5,978	6,421	249,157	172,905	41,278,926	72,625,569	1,746,448
33291	Metal Valve Manufacturing	1,039	1,258	87,816	57,563	16,652,367	29,990,146	596,326
33299	All Other Fabricated Metal Product Manufacturing	4,939	5,163	161,342	115,343	24,626,559	42,635,423	1,150,122

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 Manufactures, 2016.*

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 (NAICS 332) as a whole for 2007, 2012, and 2016. During the 2007–2016 period, total employment in the subsector declined by 17.6 percent. Almost all (14.0 percent) of the reduction occurred between 2007 and 2012. During the same 2007–2016 period, the number of production workers in the subsector decreased by 18.8 percent with production workers' hours declining 17.3 percent. For the 2012–2016 period, total employment in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) decreased by 58,300 or 4.2 percent and the number of production workers declined from 1,023,100 to 959,800, a reduction of 63,300 or 6.2 percent.

As shown in Table 4, between 2007 and 2012, the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) 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 percent increase in electric energy costs (4.6 percent) exceeded the decrease in value of shipments.

Table 5 (next page) 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"

Table 4

Production Characteristics for the Fabricated Metal Product Manufacturing Subsector (NAICS 332), 2007, 2012, and 2016

				Percent Change		
	2007	2012	2016	2007-2012	2012-2016	2007-2016
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	1,327.6	-14.0	-4.2	-17.6
Payroll [million $]	67,709.1	67,497.7	71,416.6	-0.3	5.8	5.5
Production Workers						
Number [thousands]	1,182.7	1,023.1	959.8	-13.5	-6.2	-18.8
Hours [millions]	2,404.8	2,067.0	1,989.9	-14.0	-3.7	-17.3
Wages [million $]	42,663.5	42,189.8	44,127.2	-1.1	4.6	3.4
Average Hourly Wage [$]	17.74	20.41	22.18	15.1	8.7	25.0
Value Added by Manufacture [million $]	185,333.4	180,393.5	182,987.7	-2.7	1.4	-1.3
Cost of Materials [million $]	161,447.7	160,558.0	152,445.7	-0.6	-5.1	-5.6
Value of Shipments [million $]	345,166.7	339,774.5	335,755.5	-1.6	-1.2	-2.7
Cost of Purchased Fuels and Electric Energy						
Electric Energy [million $]	3,107.2	3,250.1	3,453.6	4.6	6.3	11.1
Purchased Fuels [million $]	1,964.0	1,136.9	1,142.1	-42.1	0.5	-41.8
Quantity of Purchased Electric Energy [million kWh]	47,621.1	41,291.8	41,995.6	-13.3	1.7	-11.8

Sources: U.S. Bureau of the Census, Summary Series 2007 and 2012; and *Annual Survey of Manufactures, 2016* .
NA: Not available.

subsector (NAICS 332) as a whole; the "Machine Shops and Threaded Product Manufacturing" (NAICS 3327) industry subgroup and the balance of the industry, excluding the "Machine Shops and Threaded Product Manufacturing" (NAICS 3327) industry subgroup .

As the data in Table 5 indicate, there were 52,483 companies and 5,400 establishments in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) in 2012. Establishments in the "Machine Shops and Threaded Product Manufacturing" (NAICS 332) industry subgroup 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 (NAICS 332) 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" (NAICS 3327) subgroup industry group are much smaller than those in the balance of the "Fabricated Metal Product Manufacturing" (NAICS 332) 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" (NAICS 3327) industry subgroup, 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 Other Fabricated Metals, 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 (Est.)	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 Est.	18.5	12.3	23.1
Value Added (Million $)	180,393.5	42,139.5	138,254.0
Per Establishment ($1,000)	3,256.2	1,774.3	4,368.2
Per Production Worker ($)	176,317.9	144,025.8	189,251.1
Value of Shipments (Million $)	339,774.5	66,964.9	272,809.6
Per Establishment ($1,000)	6,133.1	2,819.6	8,619.6
Per Production Worker ($)	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 $218.5 billion or 62.6 percent, of the $349.1 billion of value of shipments by fabricated metal product manufacturers in 2016.

Included in these states are 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 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" (NAICS 332) subsector is largest in California followed by Texas and Ohio. In terms of value of shipments, Ohio ranked first followed by California and Texas. As the data presented in Table 6 indicate, the 16 states included in this study accounted for 63.7 percent of the production workers and 62.6 percent of the total value of shipments by the "Fabricated Metal Product Manufacturing" (NAICS 332) subsector in 2016. Ohio, with 69,600 production workers, led the nation in fabricated metal product manufacturing in 2016. Ohio's value of shipments of $27,902 million accounted for 8.0 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., 2016

State	Employees	Production Workers	Average Hourly Earnings	Capital Expenditures	Value of Shipments	% of U.S. Value of Shipments
	- - - (Thousand) - - -		($)	- - - (Million $) - - -		(%)
Nebraska	**8.1**	**5.7**	**20.68**	**67.9**	**2,101**	**0.6**
California	120.2	87.1	23.11	880	27,292	7.8
Florida	28.5	20.6	20.57	166	6,615	1.9
Illinois	84.1	61.8	22.10	890	22,053	6.3
Indiana	56.7	42.9	21.20	457	16,098	4.6
Iowa	18.8	13.4	21.42	109	4,691	1.3
Kansas	15.6	11.1	20.24	134	3,531	1.0
Michigan	75.2	55.6	21.57	831	18,038	5.2
Minnesota	38.5	26.8	23.55	370	9,715	2.8
Missouri	28.7	21.1	21.23	341	6,565	1.9
New Jersey	21.6	14.9	21.80	199	4,643	1.3
New York	48.5	34.0	23.22	296	11,155	3.2
Ohio	96.2	69.6	22.28	785	27,902	8.0
Pennsylvania	73.4	53.0	21.99	547	17,464	5.0
Texas	106.2	75.2	22.00	788	26,194	7.5
Wisconsin	64.3	46.7	22.28	541	14,469	4.1
Total Sel. States	**884.6**	**639.5**	**22.12**	**7399.4**	**218,524**	**62.6**
Percent of U.S.	64.5	63.7	102.80	72.6	62.6	62.6
Total U.S.	**1,372.3**	**1,004.1**	**21.52**	**10,185**	**349,061**	**100.0**

Source: U.S. Bureau of the Census, *Annual Survey of Manufactures, Geographic Area Statistics: 2016.*

IV. Capital Expenditures and Industry Outlook

Capital investment in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) was $10,847.3 million in 2016, which was $267.2 million or 2.5 percent higher than in 2007 and $1,513.6 million or 12.2 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 2012–2016 time periods. "Spring and Wire Product Manufacturing" (NAICS 3326) recorded the greatest percent increase in capital expenditures (29.8 percent) between 2007 and 2016 followed by, "Forging and Stamping" NAICS 3321, 25.7 percent) "Machine Shops and Threaded Product Manufacturing" (NAICS 3327, 14.7 percent); "Boiler, Tank, and Shipping Container Manufacturing" (NAICS 3324, 8.7 percent); "Coating, Engraving, Heat Treating, and Allied Activities" (NAICS 3328, 1.4 percent); "Cutlery and Handtool Manufacturing" (NAICS 3322, -11.0 percent); "Architectural and Structural Metals Manufacturing" (NAICS 3323, -12.1 percent) "Other Fabricated Metal Product Manufacturing" (NAICS 3329, -13.0 percent); and "Hardware Manufacturing" (NAICS 3325, -19.2 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 and in employment.

As indicated by the data presented in Table 8 (next page), employment in the "Fabricated Metal Product Manufacturing" subsector (NAICS 332) is projected to increase by 0.3 percent between 2016 and 2026. During the same period, real output is projected to increase 19.1 percent, which is about the same as the projected 19.4 percent increase for the entire manufacturing sector. The "Machine Shops and Threaded Product Manufacturing" (NAICS 3327) is projected to experience the greatest growth in employment, 0.5 percent, and fourth highest output growth, 21.5 percent, between 2016 and 2026. The "Spring and Wire Product Manufacturing" industry group (NAICS 3326)

Table 7

Capital Expenditures in the Fabricated Metal Product Manufacturing Subsector (NAICS 332) by Industry Subgroup, 2007, 2012, and 2016

NAICS	Industry Group	Capital Expenditures			% Change		2016 Cap. Exp. as Percent of Total
		2007	2012	2016	2007-2012	2012-2016	
		- - - - (Thousand $) - - -					
332	**Fabricated Metal Product Manufacturing**	**10,580,048**	**12,360,833**	**10,847,269**	**16.8**	**-12.2**	**100.0**
3321	Forging and Stamping	1,081,224	1,366,009	1,358,630	26.3	-0.5	12.5
3322	Cutlery and Handtool Manufacturing	376,092	402,072	334,578	6.9	-16.8	3.1
3323	Architectural and Structural Metals Manufacturing	2,052,244	1,977,106	1,803,765	-3.7	-8.8	16.6
3324	Boiler, Tank, and Shipping Container Manufacturing	788,318	802,370	856,703	1.8	6.8	7.9
3325	Hardware Manufacturing	221,716	145,333	179,183	-34.5	23.3	1.7
3326	Spring and Wire Product Manufacturing	230,479	361,609	299,183	56.9	-17.3	2.8
3327	Machine Shops and Threaded Product Manufacturing	2,942,008	4,074,682	3,375,417	38.5	-17.2	31.1
3328	Coating, Engraving, Heat Treating, and Allied Activities	880,895	937,357	893,361	6.4	-4.7	8.2
3329	Other Fabricated Metal Product Manufacturing	2,007,072	2,294,295	1,746,448	14.3	-23.9	16.1

Sources: U.S. Bureau of the Census, Summary Series 2007 and 2012; and *Annual Survey of Manufactures, 2016.*

Table 8

Employment and Output, Fabricated Metal Product Manufacturing Subsector (NAICS 332) by Industry Subgroup, and for All Manufacturing, 2006, 2016, and Projected 2026

		Part A -- Employment				
		Thousands of Jobs			Avg. Ann. Rate of Change	
NAICS	Industry Sector / Subgroup	2006	2016	2026	2006-2016	2016-2026
31-33	**Manufacturing**	**14,155.8**	**12,348.1**	**11,611.7**	**-1.4**	**-0.6**
332	Fabricated Metal Product Manufacturing	**1,553.1**	**1,424.7**	**1,379.3**	**-0.9**	**-0.3**
3321	Forging and Stamping	113.1	98.3	92.9	-1.4	-0.6
3322	Cutlery and Handtool Manufacturing	54.1	38.4	35.2	-3.4	-0.9
3323	Architectural and Structural Metals Manufacturing	411.6	367.3	356.9	-1.1	-0.3
3324	Boiler,Tank, and Shipping Container Manufacturing	93.6	92.2	89.7	-0.2	-0.3
3325	Hardware Manufacturing	34.3	25.2	22.2	-3.0	-1.3
3326	Spring and Wire Product Manufacturing	58.0	43.0	36.5	-2.9	-1.6
3327	Machine Shops and Threaded Product Manufacturing	352.5	352.7	354.3	0.0	0.0
3328	Coating, Engraving, Heat Treating, and Allied Activities	148.7	136.3	128.7	-0.9	-0.6
3329	Other Fabricated Metal Product Manufacturing	287.2	271.3	262.8	-0.6	-0.3

		Part B -- Value of Output				
		Billions of Chain-Weighted 2009 Dollars[(a)]			Avg. Ann. Rate of Change	
NAICS	Industry Sector / Subgroup	2006	2016	2026	2006-2016	2016-2026
31-33	**Manufacturing**	**5,298.3**	**5,449.9**	**6,509.8**	**0.3**	**1.8**
332	**Fabricated Metal Product Manufacturing**	**366.0**	**321.2**	**382.6**	**-1.3**	**1.8**
3321	Forging and Stamping	32.7	37.9	45.1	1.5	1.8
3322	Cutlery and Handtool Manufacturing	13.1	9.4	10.7	-3.3	1.2
3323	Architectural and Structural Metals Manufacturing	87.1	81.0	90.7	-0.7	1.1
3324	Boiler, Tank, and Shipping Container Manufacturing	32.7	39.8	50.1	2.0	2.3
3325	Hardware Manufacturing	13.1	7.4	7.3	-5.5	-0.1
3326	Spring and Wire Product Manufacturing	12.4	7.8	9.9	-4.5	2.5
3327	Machine Shops and Threaded Product Manufacturing	63.5	71.0	86.3	1.1	2.0
3328	Coating, Engraving, Heat Treating, and Allied Activities	27.7	27.6	34.7	0.0	2.3
3329	Other Fabricated Metal Product Manufacturing	84.3	46.2	55.9	-5.8	1.9

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

[(a)] Output shown in billions of chain-weighted constant (2009) dollars.

is projected to experience the greatest increase in real output (26.9 percent) and the largest decline in employment, (a decrease of 15.1 percent) from 2016 to 2026.

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.

University of Nebraska Innovation Campus: Spaces & Culture that Inspire

The University of Nebraska's Nebraska Innovation Campus (NIC) is connecting the talents of experts, companies, and the university to create a unique culture of innovation. NIC is a research campus designed to facilitate new and in-depth partnerships between the University of Nebraska and private sector businesses. NIC is adjacent to the University of Nebraska-Lincoln and strategically provides access to research faculty, facilities, and students. NIC was honored in October 2017 with the Engineering Research Park Award from the Association of University Research Parks.

At full build-out, NIC will be a 2.2-million square-foot campus with uniquely designed buildings and amenities that inspire creative activity and engagement, transforming ideas into global innovation. It is envisioned that up to 5,000 people could work on NIC at full build-out with one-third employed by the university and two-thirds employed by private business and non-university employers. The development at NIC will be a dense urban environment with multi-story buildings.

Currently, the campus features 380,000-square-feet of office, conference center, lab, pilot plant, and greenhouse space. In August 2017, construction began on a new 80,000-square-foot, multi-tenant building, with a planned opening of summer 2018. It will feature a planned business incubator and common spaces to encourage collaboration. A new restaurant was also recently opened, along with the Biotech Connector wet lab research space.

Housed at NIC is Nebraska Innovation Studio (NIS). Sometimes referred to as a makerspace, fab lab, hobby shop, or hacker space, this is a space where creators of all sorts can share ideas, tools, and knowledge that contribute to the creation of a final product. The primary focus is on creativity, interdisciplinary collaboration, entrepreneurship, and education. The space features a collaborative workspace and areas for woodworking, fine arts, rapid prototyping, and electronics. University faculty, students, staff, and community members are welcome to join Nebraska Innovation Studio for a monthly fee. Members take part in workshops, receive training on the studio's start-of-the-art machines, and ultimately, make things.

While building NIC, many aspects were taken into consideration including employing the newest and most creative technologies to heat and cool the buildings. The Centralized Renewable Energy System (CRES) uses reclaimed, non-drinkable water from the nearby Theresa Street wastewater treatment plant to heat and cool up to 1.8-million square-feet of offices and labs on NIC. This award-winning, closed-loop system transfers thermal energy in underground piping to the entire campus. The investment in this source of alternative energy will ensure that NIC buildings operate 30 percent more efficiently than ones with standard equipment and will lower the risks associated with fluctuating commodity prices. This system is even more efficient than a geothermal system because of the consistent water temperatures provided by the wastewater treatment facility.

NIC is committed to becoming a zero waste campus. The zero waste concept looks to change the way the campus thinks about waste, and transcends the design, production, and consumption processes. By reengineering systems in ways that reduce inefficiency, emulate sustainable natural cycles, and empower the local community, NIC's zero waste efforts promote environmental sustainability, economic opportunity, and social equity. NIC's zero waste strategy incorporates robust recycling and composting programs, sustainable purchasing policies, and fosters collaboration with our partners.

NIC also features a full-service conference center located in a historic building that has been reconstructed to provide multi-functional meeting and collaboration space. The NIC Conference Center includes:

- 400-seat auditorium with state-of-the-art audio and visual capabilities; each seat has a table and outlet
- 400-seat banquet room with state-of-the-art audio and visual capabilities
- 8 breakout rooms, each with projector and whiteboard
- Multi-day conference opportunities
- Individual event options

For more information about NIC, please visit: *innovate.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.

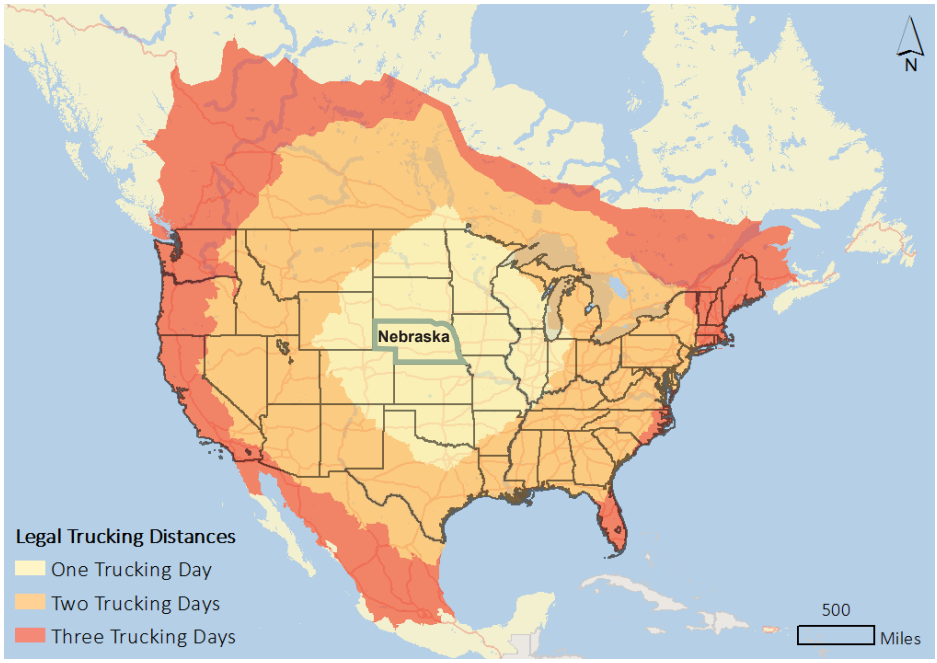
I. Nebraska Location Resources

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 Columbus, Nebraska [maps]. 2016: Melissa Trueblood; using ESRI Business Analyst Desktop.

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 six 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.

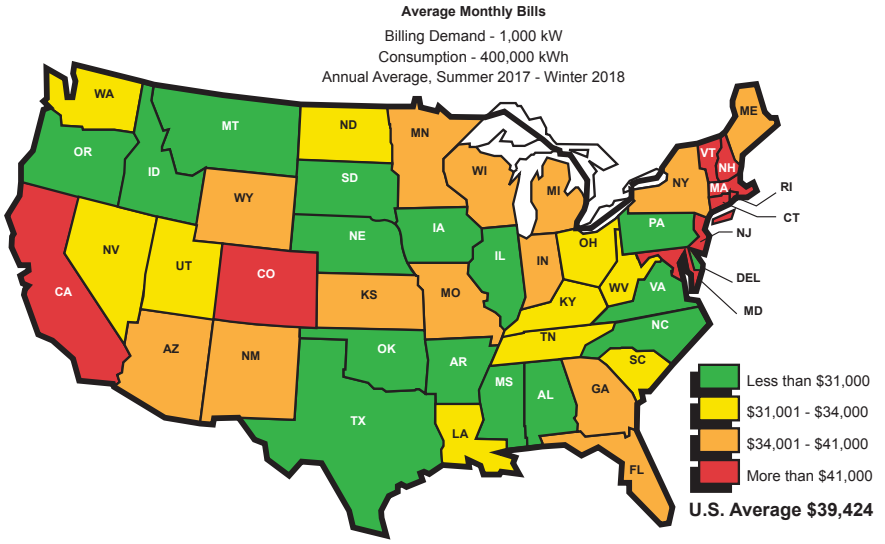
Low Cost Utilities

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 19.1 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 Cost for Industrial Service, Summer 2017–Winter 2018



Source: Edison Electric Institute, "Typical Bills and Average Rates Report," July 1, 2017 and January 1, 2018. State averages are weighted using eight months of January 2018 data and four months of July 2017 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 (MW) 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 on-line in 2009
- 800-megawatt NPPD Cooper Nuclear Station near Brownville, on-line in 1974

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 2016, 90.9 percent of the state's population 25 years of age and older were high school graduates, compared to 87.5 percent nationally. In addition, the 2014–15 Nebraska public high school graduation rate was 90.0 percent. One reason for the high graduation rate is the state's comparatively low student-teacher ratio—13.60:1 in 2014–15 compared to 16.07:1 for the nation. Finally, Nebraska students consistently score above the U.S. average on both standardized achievement tests and college entrance exams. In 2017 Nebraska students averaged 21.4 on the ACT college entrance test, compared to 21.0 nationally. Moreover, Nebraska's average composite ACT score was achieved with 84.0 percent of graduates taking the exam, compared to 60.0 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 52,500.

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

Research expenditures at the University of Nebraska-Lincoln totaled more than $295 million in 2016. This total included nearly $95 million in federal research expenditures. The National Science Foundation accounted for 30 percent of the university's federal research expenditures, followed by 23 percent from the U.S. Department of Agriculture, 17 percent from the Department of Health and Human Services, and 8 percent from the Department of Defense. UNL's goal is to achieve $300 million in research expenditures by 2018.

Engineering

The University of Nebraska-Lincoln College of Engineering offers programs on three campuses: City and East Campuses in Lincoln and Scott Campus in Omaha. Currently, the college has over 4,200 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 and Biomolecular Engineering, Civil Engineering, Computer Science and Engineering, the Durham School of Architectural Engineering and Construction, Electrical and Computer Engineering, and Mechanical and 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, 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 and Conventional Machining, Welding, Fabrication, and Electroplating
- 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 for 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 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 university 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 22.

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 22), 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.opportunity.nebraska.gov/why-nebraska/incentives.**

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), and the production of electricity using renewable energy sources. 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 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.

The University of Nebraska's NEAT Lab Prints Plastics and Titanium with Three New 3-D Printers

With a recent investment of nearly $1.5 million for three unique hybrid 3-D printers, the College of Engineering at the University of Nebraska-Lincoln is positioning itself on the cutting edge of additive manufacturing technology, providing invaluable opportunities for faculty, students, and industry.

The Nebraska Engineering Additive Technology (NEAT) Labs was installed in the loading bay area in Scott Engineering Center on the university's City Campus. The printers – two from Japanese manufacturer Matsuura and one from Optomec in New Mexico – are each close to 500 cubic feet and are hybrid printers: they can add or subtract multiple materials.

The printers are adept at sculpting many different types of materials – such as plastics or titanium – into highly complex three-dimensional shapes by using less material than conventional technology.

"This is incredibly rare, unique equipment we're now able to access," said Michael Sealy, assistant professor of mechanical and materials engineering.

The labs allow for printing products using highly reactive materials such as magnesium, titanium, and aluminum and for a part to be machined as it's being built – a capability imperative for creating intricate geometries such as lattice structures and complex internal cooling channels for aerospace applications.

The printing possibilities could help transform many industries, especially paired with the quality control systems development research of Prahalada Rao, assistant professor of mechanical and materials engineering.

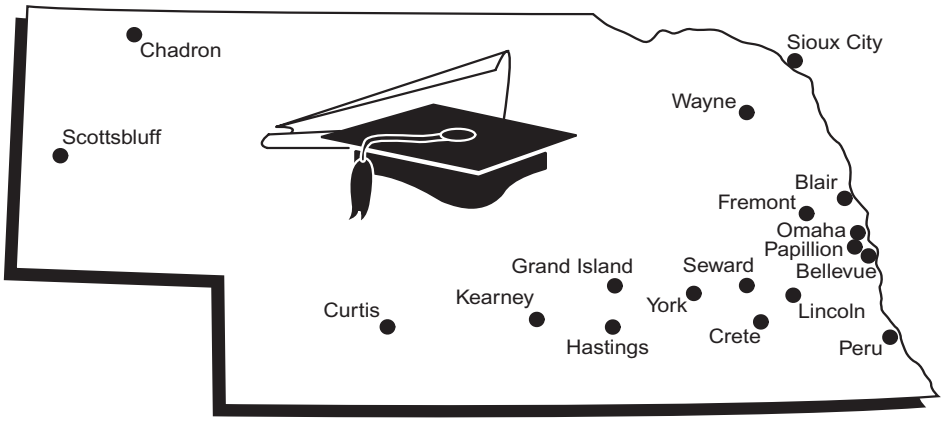
"Nebraska is working to become a hub for additive manufacturing in a variety of industries, including agricultural equipment, manufacturing, and biomedical applications," Rao said. "If this research is successful, it will have a huge impact on how quickly and reliably we can turn around new products and designs, spurring innovation in the state."

Companies and individuals interested in learning more about the printers' capabilities and the current research can find out more at **engineering.unl.edu/NEAT/**.

Article submitted by the Univerisity of Nebraska's Department of Engineering.

Figure 5A

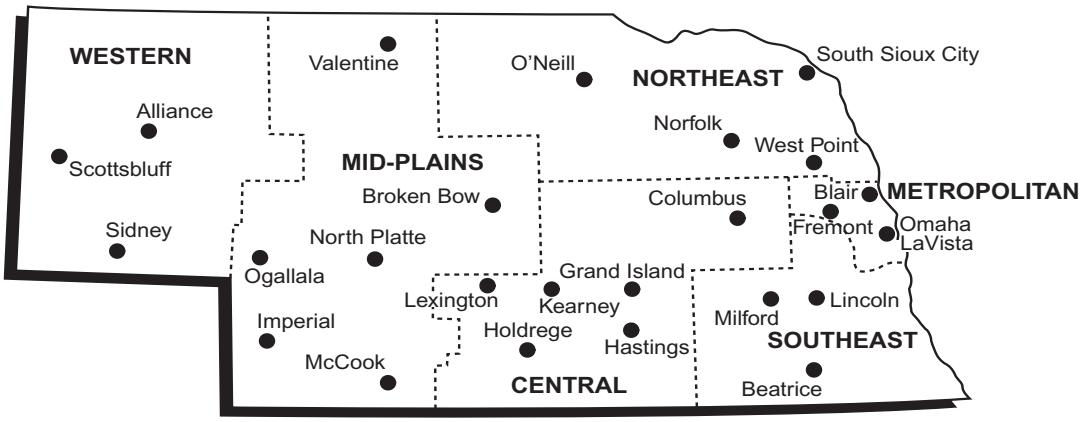
Location of Nebraska Area Colleges and Universities



Source: Nebraska Coordinating Commission for Postsecondary Education.

Figure 5B

Community Colleges in Nebraska



Source: Nebraska Community College System.

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 the 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 a 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 Intangibles 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 **opportunity.nebraska.gov**.

Talent and Innovation Initiative (TI2) - The four-part TI2 was developed to enhance momentum in Nebraska's fastest growing industries, maintain Nebraska's 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 who are in the eleventh or twelfth grade in a public or private high school, enrolled full time in a college, university, or other institution of higher education, or applies for an intership within six months following graduation from a college, university, or other institution of higher education.

Grant awards are capped at ten per business, five 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 and 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 $4,000,000 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 **opportunity.nebraska.gov**.

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.

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.

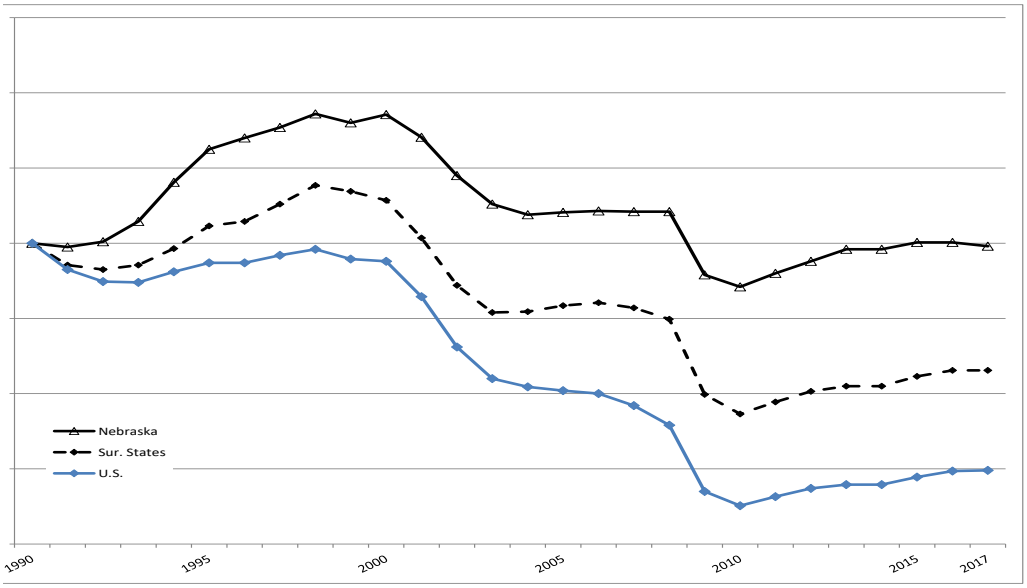
Quality of Life

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 (next page) indicates on average, the cost of living in Nebraska is 4.9 percent less than the U.S. average. Of particular interest is the cost of housing in Nebraska, which averages 14.3 percent less than for the U.S. as a whole for families owning a home.

Figure 6

Manufacturing Employment, Nebraska, Surrounding States, and the U.S., 1990–2017, 1990=100



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

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

Table 9

Cost of Living in Nebraska, Compared to the National Average, July 1, 2018

	All Items Index [a]	Consum-ables	Transpor-tation [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	95.1	95.4	102.2	103.0	92.0	85.7	75.6	84.9
Omaha, NE	95.3	96.3	94.0	99.4	116.2	85.9	86.4	84.9
Lincoln, NE	101.1	98.4	103.9	105.4	104.4	99.2	72.1	84.9
Nonmetro NE [d]	92.5	94.5	103.9	103.3	82.2	80.0	72.1	84.9

Source: Index values computed from cost-of-living data obtained from Economic Research Institute (ERI), Relocation Assessor Database as of July 1, 2018.

[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.

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
(877) 275-6773
Email: mmplett@nppd.com
sites.nppd.com

Nebraska Public Power District
Always there when you need us

NEBRASKA Advantage

Business Development Division
NEBRASKA DEPARTMENT OF ECONOMIC DEVELOPMENT
PO Box 94666
Lincoln, Nebraska 68509-9466
(402) 471-6513
(800) 426-6505
Email: jason.guernsey@nebraska.gov
www.opportunity.nebraska.gov

UNIVERSITY OF NEBRASKA-LINCOLN COLLEGE OF ENGINEERING
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COLLEGE OF ENGINEERING

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" subsector (NAICS 332) and other states near Nebraska with which it typically competes for industrial location projects. The sixteen states account for 62.6 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 Added by Manufacture [(a)]
Nebraska	**0.6**
California	7.8
Florida	1.9
Illinois	6.3
Indiana	4.6
Iowa	1.3
Kansas	1.0
Michigan	5.2
Minnesota	2.8
Missouri	1.9
New Jersey	1.3
New York	3.2
Ohio	8.0
Pennsylvania	5.0
Texas	7.5
Wisconsin	4.1
Total Selected States*	**62.6**

Source: U.S. Bureau of the Census, *Annual Survey of Manufactures,* 2016.

[(a)] Percent of the 2016 U.S. total value added by manufacture for establishments in NAICS 332.

* Values do not sum due to rounding.

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)]	9,532,250	190,645
Total Output [dollars] [(b)]	17,490,250	349,805
Energy Inputs [million BTUs] [(c)]	17,522	350

Source: Calculated from data presented in Table A-3 and from U.S. Bureau of the Census, *Annual Survey of Manufactures, 2016.*

[(a)] Estimated value added applies the 2016 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 2016 value of shipments per production worker to the model plant (see Table 4).

[(c)] Estimated by applying the 2016 ratio of energy inputs per production worker to the model plant (see Table A-3).

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 *2016 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 $9,532,250 and the total annual output (value of shipments) is estimated to be $17,490,250. Energy inputs are estimated at 17,522 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 (Page A-3) presents data estimating energy use for the industry in 2016. 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 17,522.3 million BTUs. Electric energy inputs are estimated to be 7,464.5 million BTUs (2,187,727 kWhs), or 42.6 percent of the total energy inputs, while natural gas inputs are estimated at 10,057.8 million BTUs.

Table A-3

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

Part A

Estimated 2016 Industry Energy Inputs

	Trillion BTUs	Percent
Purchased Fuels and Electric Energy	336.4	100.0
Purchased Electric Energy	143.3	42.6
Purchased Fuels	193.1	57.4

Source: Energy use estimated from data from the U.S. Bureau of the Census, *Annual Survey of Manufactures, 2016 and U.S. Energy Information Administration, 2014 Manufacturing Energy Consumption Survey.*

Part B

Energy Inputs for the Fabricated Metal Model Plant

	Million BTUs	Percent
Purchased Electricity	7,464.5 (2,187,727 kWhs)	42.6
Natural Gas	10,057.8	57.4
Total Energy Inputs	17,522.3	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, 2016 hourly wage rates for Nebraska production workers ($20.68) are 6.6 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 $287.27 or 66.9 percent greater than the Nebraska cost of $95.00. Insurance rates for workers' compensation average $1.94 per $100 of payroll for the 15 alternative states, 16.2 percent more than Nebraska's rate of $1.67.

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 $432,200 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 $193,934 or 6.1 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 Insurance	Unemployment Insurance	Social Security [a]	Fringe Benefits [b]	Total Labor Costs	Difference Other States (-) Nebraska	Relative Other States (/) Nebraska
	($)		($)	($)	($)	($)	($)	($)	($)	(%)
Nebraska	**20.68**	**50**	**2,150,700**	**35,917**	**4,732**	**164,529**	**645,210**	**3,001,088**	**0**	**100.0**
California	23.11	50	2,403,400	77,870	15,382	183,860	721,020	3,401,532	400,444	113.3
Florida	20.57	50	2,139,300	35,512	4,706	163,656	641,790	2,984,964	-16,124	99.5
Illinois	22.10	50	2,298,400	51,254	15,859	175,828	689,520	3,230,861	229,773	107.7
Indiana	21.20	50	2,204,800	23,150	10,804	168,667	661,440	3,068,861	67,773	102.3
Iowa	21.42	50	2,227,700	41,435	19,158	170,419	668,310	3,127,022	125,934	104.2
Kansas	20.24	50	2,105,000	29,681	9,473	161,033	631,500	2,936,687	-64,401	97.9
Michigan	21.57	50	2,243,300	35,220	15,703	171,612	672,990	3,138,825	137,737	104.6
Minnesota	23.55	50	2,449,200	46,780	15,185	187,364	734,760	3,433,289	432,201	114.4
Missouri	21.23	50	2,207,900	42,392	9,052	168,904	662,370	3,090,618	89,530	103.0
New Jersey	21.80	50	2,267,200	66,202	19,044	173,441	680,160	3,206,047	204,959	106.8
New York	23.22	50	2,414,900	68,342	13,040	184,740	724,470	3,405,492	404,404	113.5
Ohio	22.28	50	2,317,100	33,598	14,366	177,258	695,130	3,237,452	236,364	107.9
Pennsylvania	21.99	50	2,287,000	42,081	26,758	174,956	686,100	3,216,895	215,807	107.2
Texas	22.00	50	2,288,000	33,176	11,669	175,032	686,400	3,194,277	193,189	106.4
Wisconsin	22.28	50	2,317,100	47,732	15,293	177,258	695,130	3,252,513	251,425	108.4

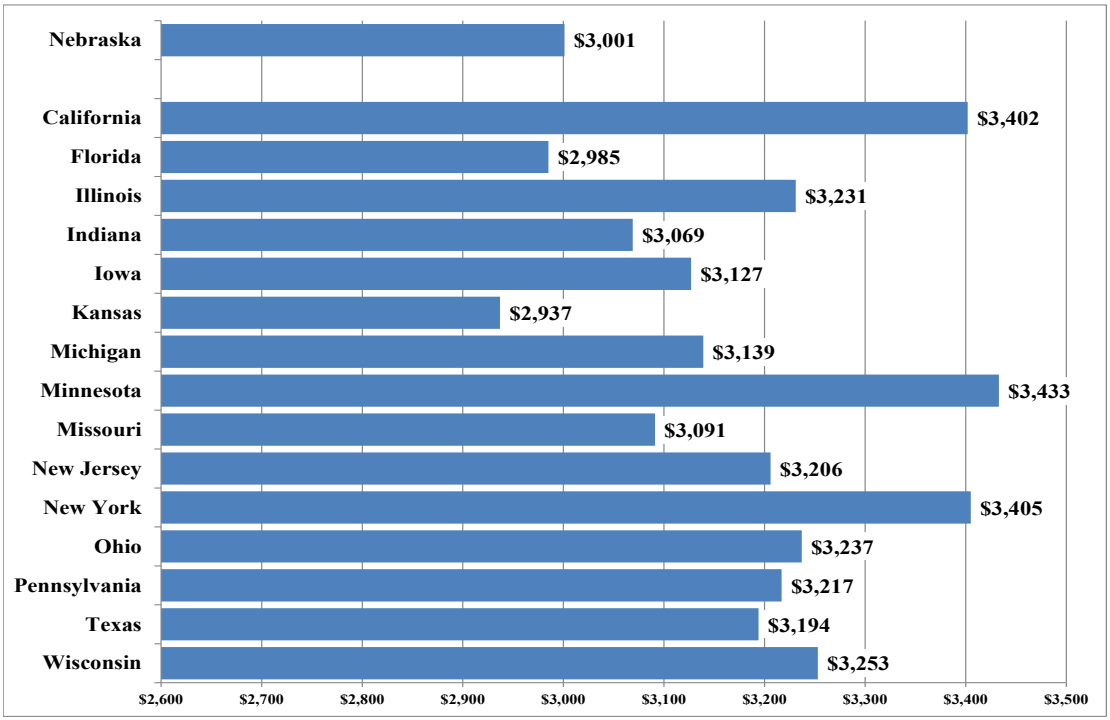
Sources: Oregon Department of Consumer & Business Services, *Oregon Workers' Compensation Premium Rate Rankings Calendar Year 2016, October 2016.*
U.S. Department of Labor, Bureau of Labor Statistics, August 2016.
U.S. Bureau of the Census, *Annual Survey of Manufactures, 2016.*
U.S. Department of Labor, Employment and Training Administration, *Unemployment Insurance Data, 2018.*

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

[b] Fringe benefit costs are assumed to be 30 percent of payroll.

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.

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 $0.0919 per kWh or 20.8 percent more than the Nebraska rate of $0.0761.

In the case of industrial rates for natural gas, the average for the 15 other states is 31.4 percent more than the Nebraska rate of $4.04 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 alterative 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 97.1 percent more than the Nebraska energy costs. When compared to the average total energy costs for the 15 alternative states, Nebraska energy costs are 17.2 percent lower, translating into an average annual savings of $34,508.

Table A-5

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

Plant Locations	Electricity Rate[a]	Electricity Cost	Natural Gas Rate[b]	Natural Gas Cost	Total Energy Cost	Difference Other States (-) Nebraska	Relative Other States (/) Nebraska
	($)	($)	($)	($)	($)	($)	(%)
Nebraska	**0.0761**	**166,486**	**4.04**	**40,634**	**207,120**	**0**	**100.0**
California	0.1551	339,316	6.79	68,292	407,608	200,488	196.8
Florida	0.0904	197,771	5.77	58,034	255,805	48,685	123.5
Illinois	0.0753	164,736	5.03	50,591	215,327	8,207	104.0
Indiana	0.0894	195,583	4.99	50,188	245,771	38,651	118.7
Iowa	0.0713	155,985	4.70	47,272	203,257	-3,863	98.1
Kansas	0.0876	191,645	3.69	37,113	228,758	21,638	110.4
Michigan	0.0959	209,803	5.75	57,832	267,635	60,515	129.2
Minnesota	0.0870	190,332	4.19	42,142	232,474	25,354	112.2
Missouri	0.0912	199,521	6.29	63,264	262,785	55,665	126.9
New Jersey	0.1249	273,247	6.59	66,281	339,528	132,408	163.9
New York	0.0975	213,303	5.92	59,542	272,845	65,725	131.7
Ohio	0.0790	172,830	4.81	48,378	221,208	14,088	106.8
Pennsylvania	0.0700	153,141	7.40	74,428	227,569	20,449	109.9
Texas	0.0718	157,079	2.65	26,653	183,732	-23,388	88.7
Wisconsin	0.0917	200,615	5.05	50,792	251,407	44,287	121.4

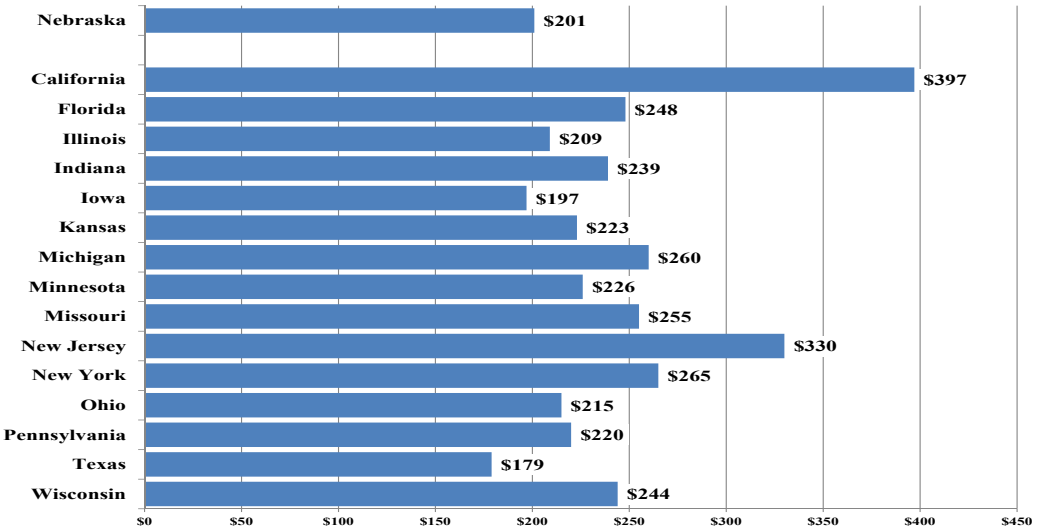
Sources:

[a] Electric rate is cost per kWh using the average per kWh cost for 1,000 kW monthly demand with 400,000 kWh of consumption. The model plant is assumed to use 3,556,990 kWh annually.

[b] U.S. Energy Information Administration, Natural Gas Data, Available at **http://www.eia.gov/dnav/ng/ng_pri_sum_a_epg0_prs_dmcf_m.htm**. Accessed October 2017. Natural Gas rate is per million BTUs. The model plant is assumed to use 27,525.0 million BTUs annually.

Figure A-2

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



(Energy Costs in Thousands of Dollars)

Source: See Table A-5.

*Calculated energy costs include electricity and natural gas costs.

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 $265,407 annually, or 7.9 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 8.6 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	**3,001,088**	**207,120**	**3,208,208**	**0**	**100.0**
California	3,401,532	407,608	3,809,140	600,932	118.7
Florida	2,984,964	255,805	3,240,769	32,561	101.0
Illinois	3,230,861	215,327	3,446,188	237,980	107.4
Indiana	3,068,861	245,771	3,314,632	106,424	103.3
Iowa	3,127,022	203,257	3,330,279	122,071	103.8
Kansas	2,936,687	228,758	3,165,445	-42,763	98.7
Michigan	3,138,825	267,635	3,406,460	198,252	106.2
Minnesota	3,433,289	232,474	3,665,763	457,555	114.3
Missouri	3,090,618	262,785	3,353,403	145,195	104.5
New Jersey	3,206,047	339,528	3,545,575	337,367	110.5
New York	3,405,492	272,845	3,678,337	470,129	114.7
Ohio	3,237,452	221,208	3,458,660	250,452	107.8
Pennsylvania	3,216,895	227,569	3,444,464	236,256	107.4
Texas	3,194,277	183,732	3,378,009	169,801	105.3
Wisconsin	3,252,513	251,407	3,503,920	295,712	109.2

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

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Best in U.S. - Economic Development Projects Per Capita (Site Selection, 2017 & 2018)

Best in U.S. - Power Grid Reliability (U.S. News & World Report, 2018)

2nd Best - State Fiscal Solvency (George Mason University, 2016)

2nd Best - Cost of Doing Business (CNBC, 2018)

3rd Best - Education System (CNBC, 2018)

4th Best - Best States for Business (Forbes, 2017)

4th Best - Regulatory Environment (Forbes, 2017)

4th Best - Lowest Unemployment Tax (SBE Council, 2018)

4th Best - Business Incentives (WalletHub.com, 2018)

4th Best - Labor Force Participation (U.S. News & World Report, 2018)

6th Best - Quality of Life (Forbes, 2017)

6th Best - Commute Time (U.S. News & World Report, 2018)

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