

# **APPENDIX D.**

## **Entry and Advancement in the Construction and Engineering Industries**

Appendix D reviews entry and advancement of workers in the Oklahoma construction and engineering industries. Business formation is examined in Appendix E and business success is discussed in Appendix F. BBC researches access to capital in Appendix G. Appendix H discusses data sources used in Appendices D through F. Together, these appendices present a statistical overview of marketplace conditions in the Oklahoma construction and engineering industries.

### **Introduction**

Federal courts have found that Congress “spent decades compiling evidence of race discrimination in government highway contracting, of barriers to the formation of minority-owned construction businesses, and of barriers to entry.”<sup>1</sup> Congress found that discrimination had impeded the formation of qualified minority business enterprises. BBC examined whether some of the barriers to entry found on a national level also appear to occur in Oklahoma.

**Representation of minorities among workers and business owners in Oklahoma.** A starting point is to compare the percentage of Oklahoma businesses owned by race/ethnic minorities and women to the composition of the Oklahoma labor force. Statistics for 2008 show the following:

- African Americans comprised 8 percent of Oklahoma workers, 3 percent of business owners overall, and 3 percent of the owners of Oklahoma construction and engineering firms (see Figure D-1 on the following page);
- Hispanic Americans were 7 percent of workers, 5 percent of business owners and 8 percent of construction and engineering firm owners;
- Native Americans were 10 percent of the Oklahoma workforce, 8 percent of business owners and 12 percent of construction and engineering company owners; and
- Other minority groups (primarily Asian-Pacific Americans and Subcontinent Asian Americans) were 2 percent of the labor force and comprised 3 percent of business owners overall but 0 percent of construction and engineering business owners.

**Representation of women among workers and business owners in Oklahoma.** In 2008, women comprised 46 percent of the Oklahoma labor force, 30 percent of all business owners and 7 percent of people who owned construction and engineering firms. Appendices D and E further explore why representation of minorities and women in the ranks of Oklahoma construction and engineering business owners differs from the composition of the Oklahoma workforce.

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<sup>1</sup> *Sherbrooke Turf, Inc.*, 345 F.3d at 970, (citing *Adarand Constructors, Inc.*, 228 F.3d at 1167 – 76); *Western States Paving Co. v. Washington State DOT*, 407 F.3d 983 (9th Cir. 2005) at 992.

**Figure D-1.**  
**Demographic distribution of workforce, business owners, and construction and engineering business owners in Oklahoma and the U.S., 2000**

Oklahoma						
	Workforce (all industries)		Business owners (all industries)		Business owners in constr. & eng.	
	2000 (n=80,971)	2008 (n=17,519)	2000 (n=9,539)	2008 (n=1,944)	2000 (n=1,738)	2008 (n=400)
<b>Race/ethnicity</b>						
African American	6.9 %	7.6 %	2.9 % **	3.1 % **	1.7 % **	3.2 % **
Hispanic American	4.5	7.1	2.1 **	4.9 **	2.5 **	8.0
Native American	9.7	9.8	8.5	8.0 **	10.9	11.7
Other minority group	1.8	2.3	1.3	2.7	0.8	0.0
<b>Total minority</b>	<b>22.9 %</b>	<b>26.9 %</b>	<b>14.8 %</b>	<b>18.7 %</b>	<b>15.9 %</b>	<b>22.9 %</b>
Non-Hispanic white	<u>77.1</u>	<u>73.1</u>	<u>85.2</u> **	<u>81.3</u> **	<u>84.1</u> **	<u>77.1</u>
<b>Total</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>
<b>Gender</b>						
Female	45.5 %	46.0 %	31.8 % **	30.2 % **	8.3 % **	7.3 % **
Male	<u>54.5</u>	<u>54.0</u>	<u>68.2</u> **	<u>69.8</u> **	<u>91.7</u> **	<u>92.7</u> **
<b>Total</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>
United States						
	Workforce (all industries)		Business owners (all industries)		Business owners in constr. & eng.	
	2000 (n=6,835,013)	2008 (n=1,523,293)	2000 (n=676,804)	2008 (n=157,715)	2000 (n=119,227)	2008 (n=29,729)
<b>Race/ethnicity</b>						
African American	10.9 %	11.8 %	4.9 % **	5.7 % **	4.0 % **	4.5 % **
Hispanic American	10.7	14.3	7.3 **	12.0 **	7.7 **	14.6
Native American	1.1	1.0	1.0	0.8 **	1.2	1.0
Other minority group	4.6	5.3	4.6	5.5 **	2.0 **	2.3 **
<b>Total minority</b>	<b>27.3 %</b>	<b>32.4 %</b>	<b>17.7 %</b>	<b>23.9 %</b>	<b>14.9 %</b>	<b>22.4 %</b>
Non-Hispanic white	<u>72.7</u>	<u>67.6</u>	<u>82.3</u> **	<u>76.1</u> **	<u>85.1</u> **	<u>77.6</u> **
<b>Total</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>
<b>Gender</b>						
Female	46.5 %	46.7 %	33.6 % **	34.3 % **	7.9 % **	7.4 % **
Male	<u>53.5</u>	<u>53.3</u>	<u>66.4</u> **	<u>65.7</u> **	<u>92.1</u> **	<u>92.6</u> **
<b>Total</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>

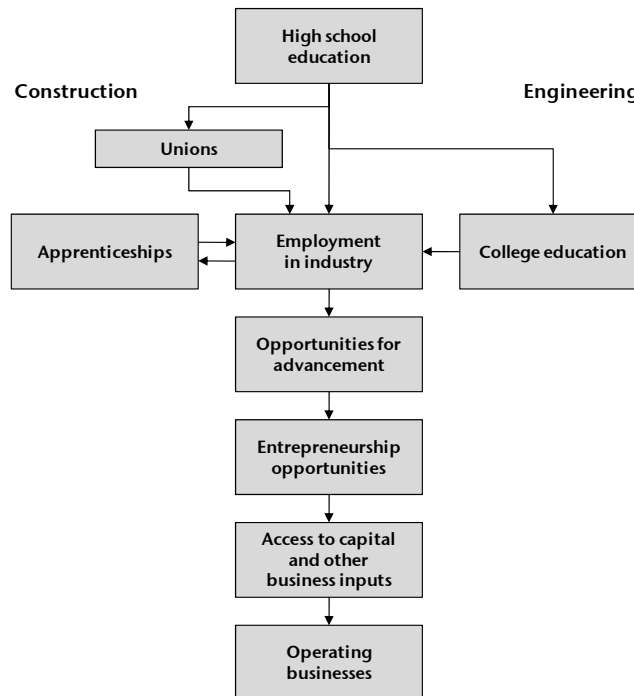
Note: \*\* Denotes that the difference in proportions between all workers and business owners (or business owners in the construction and engineering industries) for the given race/ethnicity/gender group and Census/ACS year is statistically significant at the 95% confidence level.

Source: BBC Research & Consulting from 2000 U.S. Census 5% and 2008 American Community Survey 1% Public Use Micro-sample data. The raw data extracts were obtained through the IPUMS program of the MN Population Center: <http://usa.ipums.org/usa/>.

One potential source of barriers is the process of entry and advancement in the construction and engineering industries. Business owners are often individuals who came from the ranks of people working in that industry. This Appendix uses 1980 and 2000 Census data and 2008 American Community Survey (ACS) data to analyze education, employment and workplace advancement — all factors that may ultimately influence business formation. Where possible, BBC used these data to separately examine any barriers to entry for construction and engineering, as entrance requirements and opportunities for advancement differ for these two industries. Figure D-2 outlines the different paths to business formation for these industries.

**Figure D-2.**  
**Model for studying entry into the industry**

Source:  
BBC Research & Consulting.



### Construction Industry

BBC first examined how education, training, employment and advancement may influence business ownership outcomes for different race/ethnicity and gender groups in the construction industry in Oklahoma and the nation.

**Education.** Formal education beyond high school is not a prerequisite for most construction industry jobs. For this reason, the construction industry often attracts individuals who do not have a high level of educational attainment.

Many construction industry employees in Oklahoma have, at most, a high school education. Based on the 2000 Census of Population, 41 percent of workers in construction were high school graduates with no post-secondary education, and 25 percent had not finished high school. According to 2008 ACS data, 38 percent of Oklahoma construction workers were just high school graduates and 24 percent had no high school diploma. Among people working in construction in Oklahoma, 6 percent in 2000 and 8 percent in 2008 had at least a four-year college degree.

In the Oklahoma labor force, Native Americans and Hispanic Americans represent a relatively large pool of workers with no post-secondary education. In 2000, 66 percent of Hispanic Americans and 49 percent of Native American workers age 25 and older had no formal education beyond high

school, compared to 41 percent of non-Hispanic whites and 43 percent of African Americans. Although the percentage of workers with no college education declined for some race/ethnicity groups between 2000 and 2008, percentages for Native Americans and Hispanic Americans were still substantially higher than those for non-Hispanic whites in 2008.

Based on minimal requirements for formal education for entry-level jobs and the limited education beyond high school for many Native Americans and Hispanic Americans in Oklahoma, one would expect relatively high representation of these minority groups in the Oklahoma construction industry.

Training in the construction industry is largely on-the-job or through trade schools and apprenticeship programs. Entry-level jobs for workers out of high school are often as laborers, helpers or apprentices. Higher-skilled positions in the construction industry may require additional training through a technical or trade school, or through an apprenticeship or other employer-provided training program. Apprenticeship programs can be developed by employers, trade associations, trade unions and other groups. Workers can enter apprenticeship programs from high school or a trade school. Apprenticeships have traditionally been three- to five-year programs that combine on-the-job training with classroom instruction.<sup>2</sup> Opportunities for these programs across race/ethnicity are discussed later in this appendix.

Among workers 25 and older in Oklahoma, 36 percent of Asian-Pacific Americans and 55 percent of Subcontinent Asian Americans had at least a four-year college degree in 2000, a higher rate than non-Hispanic whites. Given the relatively high educational levels of Asian-Pacific Americans and Subcontinent Asian Americans in Oklahoma, representation of these groups in construction might be low relative to other groups.

In Oklahoma, women workers age 25 and older were more likely than men to have education beyond high school. Based on 2000 data, 59 percent of female workers age 25 and older had at least some college education, compared to 56 percent of males in Oklahoma. This gap widened in 2008.

**Employment.** With educational opportunities and attainment for minorities and women as context, the study team examined employment in Oklahoma's construction industry.

Of the people working in construction in Oklahoma in 2008:

- 15 percent were Hispanic Americans (compared with 7% in the Oklahoma workforce);
- 10 percent were Native Americans (compared with 10% of the workforce);
- Roughly 4 percent were African Americans (compared with 8% of the workforce); and
- Less than 1 percent were from other minority groups (mostly Asian-Pacific Americans and Subcontinent Asian Americans, and substantially less than found in the workforce).

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<sup>2</sup> Bureau of Labor Statistics, U.S. Department of Labor. 2006-07. "Construction." *Career Guide to Industries*. <http://www.bls.gov/oco/cg/cgs003.htm> (accessed February 15, 2007).

In Oklahoma, Hispanic Americans made up a greater share of workers in construction than in the labor force as a whole, representing 15 percent of construction workers but only 7 percent of all workers in 2008. In contrast, African Americans working in Oklahoma were less likely to work in construction than other industries.

- African Americans in Oklahoma were one-half as likely to work in construction as the average worker in 2008. Because average educational attainment of African Americans is consistent with requirements for construction jobs, other factors may be behind the relatively low number of African American workers in this industry. A number of studies throughout the United States have argued that race discrimination by construction unions has held down employment of African Americans in construction trades.<sup>3</sup> (The potential for unions to present a barrier to construction jobs is discussed beginning on page 7 of this Appendix.)
- Representation of other minority groups in construction was also lower than in the whole labor force. Asian-Pacific Americans made up less than 1 percent of the construction workforce but 2 percent of all workers in Oklahoma in 2008. There were no observations corresponding to Subcontinent Asian American construction workers in Oklahoma in either the 2000 or 2008 data.<sup>4</sup> The fact that Asian-Pacific Americans and Subcontinent Asian Americans are more likely to go to college than other groups may partly explain this difference.

There are also large differences between the percentage of construction workers who are women and the percentage of women in the labor force. Although the Oklahoma workforce was almost divided equally between male and female workers in 2008, fewer than one in ten construction workers were women. Representation of women in the construction workforce declined between 2000 and 2008.

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<sup>3</sup> See, for example, Waldinger, Roger and Thomas Bailey. 1991. "The Continuing Significance of Race: Racial Conflict and Racial Discrimination in Construction." *Politics & Society*, 19(3).

<sup>4</sup> Note that Census definitions of race and ethnicity have changed over time, which affects comparability of statistics from one census year to the next. Appendix H discusses how BBC coded data concerning race and ethnicity for each Census and for the 2008 ACS.

Overall, these differences in Oklahoma employment patterns are similar to those seen in the construction industry for the nation. Figure D-3 uses data from 1980, 2000 and 2008 to compare the demographic composition of workers in the construction industry with the whole labor force in Oklahoma and the United States.

**Figure D-3.**  
**Demographic distribution of workers in construction and all industries in Oklahoma and the U.S., 1980, 2000 and 2008**

	Oklahoma					
	Construction			All industries		
	1980 (n=5,079)	2000 (n=6,077)	2008 (n=1,287)	1980 (n=68,627)	2000 (n=80,971)	2008 (n=17,519)
<b>Race/ethnicity</b>						
African American	3.8 % **	3.4 % **	3.5 % **	6.1 %	6.9 %	7.6 %
Hispanic American	1.6	8.5 **	15.0 **	1.7	4.5	7.1
Native American	6.4 **	12.7 **	10.3 **	4.5	9.7	9.9
Other minority group	<u>0.2</u> **	<u>0.6</u> **	<u>0.4</u> **	<u>0.7</u>	<u>1.8</u>	<u>2.3</u>
<b>Total minority</b>	11.9 %	25.2 %	29.2 %	12.9 %	22.9 %	26.9 %
Non-Hispanic white	<u>88.1</u> **	<u>74.8</u> **	<u>70.8</u>	<u>87.1</u>	<u>77.1</u>	<u>73.1</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
<b>Gender</b>						
Female	7.7 % **	9.3 % **	7.9 % **	40.9 %	45.5 %	46.0 %
Male	<u>92.3</u> **	<u>90.7</u> **	<u>92.1</u> **	<u>59.1</u>	<u>54.5</u>	<u>54.0</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
	United States					
	Construction			All industries		
	1980 (n=330,464)	2000 (n=480,280)	2008 (n=107,037)	1980 (n=5,287,471)	2000 (n=6,832,970)	2008 (n=1,523,293)
<b>Race/ethnicity</b>						
African American	7.4 % **	6.2 % **	6.0 % **	10.1 %	10.9 %	11.8 %
Hispanic American	5.9 **	15.0 **	23.6 **	5.7	10.7	14.3
Native American	0.8 **	1.5 **	1.2 **	0.5	1.1	1.0
Other minority group	<u>0.9</u> **	<u>1.9</u> **	<u>2.1</u> **	<u>1.7</u>	<u>4.6</u>	<u>5.3</u>
<b>Total minority</b>	14.9 %	24.5 %	32.8 %	18.1 %	27.3 %	32.4 %
Non-Hispanic white	<u>85.1</u> **	<u>75.5</u> **	<u>67.2</u> **	<u>81.9</u>	<u>72.7</u>	<u>67.6</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
<b>Gender</b>						
Female	7.9 % **	9.9 % **	9.1 % **	42.2 %	46.5 %	46.7 %
Male	<u>92.1</u> **	<u>90.1</u> **	<u>90.9</u> **	<u>57.8</u>	<u>53.5</u>	<u>53.3</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Note: \*\* Denotes that the difference in proportions between the construction and all industry groups for the given Census/ACS year is statistically significant at the 95% confidence level.

Source: BBC Research & Consulting from 1980 and 2000 U.S. Census 5% sample and 2008 ACS Public Use Micro-sample data. The raw data extracts were obtained through the IPUMS program of the MN Population Center: <http://usa.ipums.org/usa/>.

**Importance of unions in entering the construction industry.** Labor scholars characterize construction as a historically volatile industry sensitive to business cycles, making the presence of labor unions important for stability and job security within the industry.<sup>5</sup> The temporary nature of construction work results in uncertain job prospects, and the high turnover of laborers present a disincentive for construction firms to invest in training. Some scholars have claimed that constant turnover has lent itself to informal recruitment practices and nepotism, compelling laborers to tap social networks for training and work. They credit the importance of social networks with the high degree of ethnic segmentation in the construction industry.<sup>6</sup> Unable to integrate themselves into traditionally white social networks, African Americans faced long-standing historical barriers to entering the industry.<sup>7</sup>

Construction unions aim to provide a reliable source of labor for employers and preserve job opportunities for workers by formalizing the recruitment process, coordinating training and apprenticeships, enforcing standards of work, and mitigating wage competition. The unionized sector of construction would seemingly be the best road for African American and other under-represented groups into the industry. However, researchers have identified that discrimination by trade unions has historically prevented minorities from obtaining employment in skilled trades.<sup>8</sup> Past papers claim union discrimination took place in a variety of forms. For example:

- Unions have used admissions criteria that adversely affect minorities. Federal courts ruled in the 1970s that standardized testing requirements unfairly disadvantaged minority applicants who had less exposure to testing, and that requirements that new union members have relatives in the union perpetuated the effects of past discrimination.<sup>9</sup>
- Of those minority individuals who are admitted to unions, a disproportionately low number are admitted into apprenticeship programs coordinated by unions. Apprenticeship programs are important means of producing skilled construction laborers, and the reported exclusion of African Americans from these programs has severely limited their access to skilled occupations in the construction industry.<sup>10</sup>
- Although formal training and apprenticeship programs exist within unions, most training of union members takes place informally through social networking. Nepotism characterizes the unionized sector of construction as it does the non-unionized sector, and this favors a white-dominated status quo.<sup>11</sup>

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<sup>5</sup> Applebaum, Herbert. 1999. *Construction Workers, U.S.A.* Westport: Greenwood Press.

<sup>6</sup> Waldinger, Roger and Thomas Bailey. 1991. "The Continuing Significance of Race: Racial Conflict and Racial Discrimination in Construction." *Politics & Society*, 19(3).

<sup>7</sup> Feagin, Joe R. and Nikitah Imani. 1994. "Racial Barriers to African American Entrepreneurship: An Exploratory Study." *Social Problems*. 41(4): 562-584.

<sup>8</sup> U.S. Department of Justice. 1996. Proposed Reforms to Affirmative Action in Federal Procurement. 61 FR 26042.

<sup>9</sup> Ibid. See *United States v. Iron Workers Local 86* (1971), *Sims v. Sheet Metal Workers International Association* (1973), and *United States v. International Association of Bridge, Structural and Ornamental Iron Workers* (1971).

<sup>10</sup> Applebaum, Herbert. 1999. *Construction Workers, U.S.A.* Westport: Greenwood Press.

<sup>11</sup> Ibid. 299. A high percentage of skilled workers reported having a father or relative in the same trade. However, the author suggests this may not be indicative of current trends.

- Traditionally white unions have been successful in resisting policies designed to increase African American participation in training programs. The political strength of unions in resisting affirmative action in construction has hindered the advancement of African Americans in the industry.<sup>12</sup>
- Discriminatory practices in employee referral procedures, including apportioning work based on seniority, have precluded minority union members from having the same access to construction work as their white counterparts.<sup>13</sup>
- According to testimony from African American union members, even when unions implement meritocratic mechanisms of apportioning employment to laborers, white workers are often allowed to circumvent procedures and receive preference for construction jobs.<sup>14</sup>

However, these historical observations may not be indicative of current dynamics in construction unions. For example, the 2007 Current Population Survey (CPS) provides data indicating union membership for African Americans and non-Hispanic whites to be similar.<sup>15</sup> The CPS asked participants “Are you a member of a labor union or of an employee association similar to a union?” CPS data show union membership for African Americans in construction to be 11 percent and non-Hispanic whites to be 12 percent (not a statistically significant difference). On the other hand, based on these national data, only 7 percent of Hispanic Americans are union members.

A recent study on the presence of African Americans and Hispanic Americans in apprenticeship programs may help explain the high rates of Hispanics in the construction industry despite low union memberships. Two types of apprenticeship programs are available, joint programs (run by a combination of a union and one or more employers) and non-joint programs (run solely by one or more employers). Using 1989-1995 data from the U.S. Department of Labor, the study found that the probability of an African American being an apprentice in a joint program was 8 percent higher than in a non-joint program.

On the other hand, Hispanic Americans’ odds of being in a non-joint program were 7 percent higher than in a joint program.<sup>16</sup> These data suggest that Hispanic Americans may be more likely than African Americans to enter the construction industry without the support of a union. Thus, one reason that Hispanic Americans represent a large portion of the construction workers may be that their participation is less hindered by possible union discrimination.

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<sup>12</sup> Waldinger and Bailey. 1991. “The Continuing Significance of Race: Racial Conflict and Racial Discrimination in Construction.”

<sup>13</sup> U.S. Department of Justice. 1996. Proposed Reforms to Affirmative Action in Federal Procurement. 61 FR 26042. See *United Steelworkers of America v. Weber* (1979) and *Taylor v. United States Department of Labor* (1982).

<sup>14</sup> Feagin and Imani. 1994. “Racial Barriers to African American Entrepreneurship: An Exploratory Study.” *Social Problems*. 41(4): 562-584.

<sup>15</sup> 2006 Current Population Survey (CPS), U.S. Census Bureau and Bureau of Labor Statistics.

<sup>16</sup> Bilginsoy, Cihan. 2005. “How Unions Affect Minority Representation in Building Trades Apprenticeship Programs.” *Journal of Labor Research*, 57(1).



Further, union membership in Oklahoma is much lower than the rest of the country. Across all Oklahoma industries, 5.7 percent of employed people in 2009 were union members, less than one-half of the rate for the country as a whole.<sup>17</sup>

**Advancement in construction.** To research opportunities for advancement in the Oklahoma construction industry, the study team examined representation of minorities and women in different construction occupations, as defined by the U.S. Bureau of Labor Statistics.<sup>18</sup>

**Racial and ethnic composition of construction laborers and first-line supervisors.** Figure D-4 compares the race/ethnicity of all construction workers with that of construction laborers and first-line supervisors in 2000 and 2008.

**Figure D-4.**  
**Demographic distribution of workers in selected construction occupations in Oklahoma, 2000 and 2008**

	2000			2008		
	All construction (n=6,077)	Construction laborers (n=686)	First-line supervisors (n=497)	All construction (n=1,287)	Construction laborers (n=148)	First-line supervisors (n=127)
<b>Race/ethnicity</b>						
African American	3.4 %	6.1 %	1.4 %	3.5 %	4.5 %	3.7 %
Hispanic American	8.5	19.3	6.9	15.0	34.8	8.5 **
Native American	12.7	15.5	12.8	10.3	13.7	15.4
Other minority group	<u>0.6</u>	<u>1.0</u>	<u>0.3</u>	<u>0.4</u>	<u>0.9</u>	<u>0.7</u>
<b>Total minority</b>	25.2 %	41.9 %	21.4 %	29.2 %	53.9 %	28.3 %
Non-Hispanic white	<u>74.8</u>	<u>58.1</u>	<u>78.6</u>	<u>70.8</u>	<u>46.1</u>	<u>71.7</u> **
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
<b>Gender</b>						
Female	9.3 %	3.8	2.1 %	7.9 %	1.4 %	3.9 %
Male	<u>90.7</u>	<u>96.2</u>	<u>97.9</u>	<u>92.1</u>	<u>98.6</u>	<u>96.1</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %

Note: \*\* Denotes that the difference in proportions between construction laborers and first-line supervisors for the given Census/ACS year is statistically significant at the 95% confidence level.

Source: BBC Research & Consulting from 2000 Census and 2008 American Community Survey data. The raw data extract was obtained through the IPUMS program of the MN Population Center: <http://usa.ipums.org/usa/>.

Based on 2000 Census and 2008 ACS data, differences exist in the representation of minorities and women within different construction occupations. Overall, 42 percent of construction laborers were minorities in 2000, while minorities represented only 21 percent of first-line supervisors and 25 percent of all construction workers. ACS data show that minorities also represented a larger share of construction laborers compared with first-line supervisors and the whole construction labor force in 2008.

<sup>17</sup> Bureau of Labor Statistics, U.S. Department of Labor. 2010. "Union Members 2009." <http://www.bls.gov/news.release/pdf/union2.pdf> (accessed April 1, 2010).

<sup>18</sup> Bureau of Labor Statistics, U.S. Department of Labor. 2001. "Standard Occupational Classification Major Groups." [http://www.bls.gov/soc/soc\\_majo.htm](http://www.bls.gov/soc/soc_majo.htm) (accessed February 15, 2007).

Hispanic Americans and Native Americans were the largest minority groups in the industry and in the two occupations examined:

- In 2008, Hispanic Americans were 35 percent of construction laborers but only about 9 percent of first-line supervisors (a statistically significant difference).
- Native Americans comprised 14 percent of construction laborers in 2008, similar to their representation among all construction workers (also true for 2000).
- African Americans represented the third-largest minority group among the two occupations examined. In 2000, African Americans represented 6 percent of construction laborers and about 1 percent of first-line supervisors. In 2008, this gap was smaller, with African Americans representing 5 percent of construction laborers and nearly 4 percent of first-line supervisors.

**Women in construction trades.** Figure D-4 also compares the representation of women in the construction labor force with their representation among construction laborers and first-line supervisors. Overall, less than 10 percent of workers in the Oklahoma construction industry were women in 2000 and 2008. Representation of women in the Oklahoma construction workforce declined from 2000 to 2008.

Representation of women among construction laborers and first-line supervisors was lower than in the construction labor force as a whole. In 2000, women comprised 9 percent of all construction workers but only 4 percent of construction laborers and 2 percent of first-line supervisors.

**Relative share of minorities and women in construction who are managers.** Figure D-4 shows the representation of minorities and women among first-line supervisor positions in the Oklahoma construction industry. The study team also reviewed employment of minorities and women as managers, a higher position than first-line supervisor.

Construction managers, on average, have somewhat more education than first-line supervisors. In Oklahoma in 2000, 15 percent of construction managers had at least a bachelor's degree, compared with 6 percent of first-line supervisors. Figure D-5 shows the proportion of workers in the construction industry who reported a "manager" occupation by race/ethnicity and gender groups in 1980, 2000 and 2008.

In 2000, roughly 6 percent of non-Hispanic whites working in the Oklahoma construction industry were managers. The percentage of construction workers who were managers for other race/ethnic groups was lower:

- Roughly 3 percent of Hispanic Americans were managers (a statistically significant difference).
- About 4 percent of African Americans and Native Americans in the construction industry labor force were managers.
- Representation of other minority groups among construction managers in Oklahoma in 2000 was very low.

In 2008, the percentage of Hispanic Americans and Native Americans who were construction managers remained below that of non-Hispanic whites in Oklahoma.

- Less than 1 percent of Hispanic American construction workers were managers in 2008, compared to 10 percent of non-Hispanic whites (a statistically significant difference).
- Roughly 2 percent of Native American construction workers were managers — the difference with the rate for non-Hispanic whites was statistically significant.

Based on 2008 data, there was little difference between the percentage of African Americans and non-Hispanic whites working in the Oklahoma construction industry who were managers.

Female construction workers were also less likely to be managers than male construction workers in 2000 and 2008. In 2008, about 4 percent of women in the Oklahoma construction industry were managers compared to 8 percent of men.

**Figure D-5.**  
**Percentage of construction workers who work as a manager, Oklahoma and the U.S., 1980, 2000 and 2008**

Note:

\*\* Denotes that the difference in proportions between the minority and non-Hispanic white groups (or female and male gender groups) for the given Census/ACS year is statistically significant at the 95% confidence level.

Source:

BBC Research & Consulting from 1980 and 2000 U.S. Census 5% sample and 2008 ACS Public Use Micro-sample data. The raw data extracts were obtained through the IPUMS program of the MN Population Center: <http://usa.ipums.org/usa/>.

Oklahoma	1980 (n=5,079)	2000 (n=6,077)	2008 (n=1,287)
<b>Race/ethnicity</b>			
African American	2.6 %	4.1 %	11.6 %
Hispanic American	0.0	2.5 **	0.6 **
Native American	2.1 **	3.5	2.2 **
Other minority group	0.0	0.0	0.0
Non-Hispanic white	4.4	6.3	9.9
<b>Gender</b>			
Female	4.4 %	3.4 %	4.3 %
Male	4.1	5.8	8.0
<b>All individuals</b>	4.1 %	5.5 %	7.7 %
United States	1980 (n=330,464)	2000 (n=480,280)	2008 (n=107,037)
<b>Race/ethnicity</b>			
African American	1.5 % **	3.1 % **	4.1 % **
Hispanic American	2.0 **	2.5 **	3.1 **
Native American	2.6 **	4.6 **	6.3 **
Other minority group	4.2 **	7.6	9.3
Non-Hispanic white	4.9	7.5	9.4
<b>Gender</b>			
Female	5.7 % **	4.1 % **	5.8 % **
Male	4.4	6.7	7.8
<b>All individuals</b>	4.5 %	6.5 %	7.6 %

## Engineering Industry

BBC next examined how education, training and employment may influence business ownership outcomes for different race/ethnicity and gender groups in the engineering industry in Oklahoma and the nation.

**Education.** Education is an important factor for entry into the engineering workforce. A four-year college degree in engineering is an important qualification in that industry. Barriers to such education may affect employment and ultimately advancement and business ownership. Greater barriers for minorities and women could, in part, explain relative differences in business ownership by race/ethnicity and gender.<sup>19</sup>

Based on Census data for 2000, 51 percent of individuals working in the engineering industry in Oklahoma had at least a four-year college degree. When examining people who reported working as civil or environmental engineers, the percentage is even greater — 81 percent had at least a four-year college degree.

The level of education necessary to become an engineer appears to be a barrier for African Americans, Hispanic Americans and Native Americans. Among those in the labor force age 25 and older, the percentage of African Americans, Hispanic Americans and Native Americans with a bachelors degree or higher was substantially lower than that of non-Hispanic whites in both 2000 and 2008. Figure D-6 presents the percentage of workers 25 and older who had at least a four-year degree for the whole labor force in Oklahoma and the United States in 2000 and 2008.

In Oklahoma, most race/ethnicity groups showed an increase from 2000 to 2008 in the proportion of workers with degrees. However, the percentage of Hispanic American workers with at least a four-year degree declined slightly during this time. In 2008, Hispanic American, Native American and African American workers continued to have lower percentages of four-year college graduates than non-Hispanic whites. In contrast, a greater proportion of Asian-Pacific American and Subcontinent Asian American workers were college graduates than non-Hispanic white workers.

Between 2000 and 2008, the percentage of female workers with four-year college degrees surpassed that of males in Oklahoma and the United States.

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<sup>19</sup> Feagin, Joe R. and Nikitah Imani. 1994. "Racial Barriers to African American Entrepreneurship: An Exploratory Study." *Social Problems*. 42 (4): 562-584.

**Figure D-6.**  
**Percentage of labor force 25 and older with at least a four-year degree in Oklahoma and the United States, 2000 and 2008**

Oklahoma	2000	2008	United States	2000	2008
<b>Race/ethnicity</b>			<b>Race/ethnicity</b>		
African American	18.5 % **	22.2 % **	African American	19.1 % **	22.2 % **
Asian-Pacific American	36.0 **	40.2 **	Asian-Pacific American	45.0 **	48.7 **
Subcontinent Asian American	55.0 **	74.1 **	Subcontinent Asian American	68.4 **	73.3 **
Hispanic American	11.4 **	11.1 **	Hispanic American	13.4 **	14.9 **
Native American	17.1 **	21.8 **	Native American	17.1 **	20.1 **
Other minority group	32.5	17.6	Other minority group	30.0 **	34.5
Non-Hispanic white	26.8	29.0	Non-Hispanic white	32.5	35.8
<b>Gender</b>			<b>Gender</b>		
Female	24.6 %	28.3 % **	Female	29.3 % **	33.0 % **
Male	25.3	25.8	Male	30.2	31.5
<b>All individuals</b>	<b>25.0</b>	<b>27.0</b>	<b>All individuals</b>	<b>29.8</b>	<b>32.2</b>

Note: \*\* Denotes that the difference in proportions between the minority and non-Hispanic white groups (or female and male gender groups) for the given Census/ACS year is statistically significant at the 95% confidence level.

Source: BBC Research & Consulting from 2000 U.S. Census 5% sample and 2008 ACS Public Use Micro-sample data. The raw data extracts were obtained through the IPUMS program of the MN Population Center: <http://usa.ipums.org/usa/>.

**Additional indices of high school educational attainment.** Because college admission is an important step in entering the engineering industry, the study team examined additional information on the educational achievement of minority high school students in Oklahoma. Universities generally evaluate prospective students based on a number of factors, including high school achievement and standardized test scores. One such test, the American College Testing assessment (ACT), measures educational attainment in four subject areas: English, Mathematics, Reading, and Science Reasoning. The same organization that administers the ACT also measures “college readiness” among students who take the test for college admissions by using a benchmark score — the minimum score needed in each subject area to indicate a 50 percent chance of obtaining a “B” or higher or a 75 percent chance of obtaining a “C” or higher in a corresponding college-level course. Each year, ACT publishes its findings in an Oklahoma-specific report, which shows the percent of students from each race/ethnic group meeting the college readiness benchmark score.

Using these benchmark scores, BBC created an attainment index for minority students by measuring their scores against those of non-Hispanic white students. For example, about 6 percent of African American students in Oklahoma met the ACT benchmark score for Science Reasoning, compared to about 27 percent of non-Hispanic white students. BBC created an “index” for African American college readiness by dividing 6 percent by 27 percent, and then multiplying by 100, yielding an index value of 22. Hispanic American students in Oklahoma had a college readiness index of 44 when measured against non-Hispanic white students in this subject area.

As shown in Figure D-7, high school achievement indices range from 15 to 52 for African American students in Oklahoma. For Hispanic American and Native American students, high school achievement indices range from 40 to 64 and 55 to 79, respectively. Figure D-7 also shows ACT composite scores, which are calculated from raw scores received on the test, to make scores comparable across years. Using the same indexing method, it also presents average freshman graduation rates (for high school) and high school dropout rates for different racial and ethnic groups.

**Figure D-7.**  
**Indices of high school achievement for African Americans, Asian Americans, Hispanic Americans and non-Hispanic whites in Oklahoma, 2005-2006 (white=100)**

Oklahoma	African American	Asian American	Hispanic American	Native American	Non-Hispanic white
<b>ACT college readiness benchmark index for:</b>					
English	52	95	64	79	100
Math	28	144	56	61	100
Reading	43	96	61	77	100
Science Reasoning	22	115	44	59	100
All four	15	125	40	55	100
<b>ACT composite score</b>	80	103	86	92	100
<b>Average freshman graduation rate</b>	88	127	93	99	100
<b>High school dropout rate</b>	152	58	200	123	100

Note: Data for college readiness are from the graduating class of 2006, and data for graduation rates and dropout rates are from 2005-2006. The Average Freshman graduation rate (AFGR) is an estimate of the percentage of the entering high school freshman class graduating in four years. For a more detailed explanation, visit the United States Department of Education website.

Source: BBC Research & Consulting from ACT. *ACT High School Profile Report*. Oklahoma, 2006 & U.S. Department of Education, Common Core of Data. *Public School Graduates and Dropouts from the Common Core of Data; School Year 2005-2006*.

Notable indices for African Americans included:

- Meeting the ACT college readiness benchmark score for Math at 28 percent of the rate for non-Hispanic white students in Oklahoma;
- Meeting the ACT college readiness benchmark score for all four subject areas at 15 percent of the rate for non-Hispanic white students in Oklahoma.
- Having a high school dropout rate that is 152 percent of that for non-Hispanic white students in Oklahoma.

African American students in Oklahoma generally performed better on humanities-oriented subject areas of the ACT. In terms of the college readiness benchmark score, the smallest disparity between African Americans and non-Hispanic whites was in English.

There were also disparities in college readiness and high school achievement for Hispanic American and Native American students in Oklahoma when measured against non-Hispanic white students. In the 2005-2006 school year, Hispanic Americans had a high school dropout rate higher than that of African Americans and double that of non-Hispanic whites.

Asian American students, on the other hand, had higher rates of college readiness in Math and Science Reasoning, higher graduation rates and lower high school dropout rates, compared to non-Hispanic whites. Asian American college readiness rates for English and Reading were slightly lower than those for non-Hispanic whites.

Disparities in educational attainment through high school are important for explaining the relatively low number of African Americans, Hispanic Americans, and Native Americans who have college degrees in Oklahoma. National studies consider the extent to which disparities in the quality of education causes these disparities in educational outcomes for minority high school students, but these studies are not reviewed here.

**Additional factors affecting college engineering programs in Oklahoma.** Historically, college engineering programs in the United States were slow to open doors to minorities such as African Americans.<sup>20</sup> A study by the National Action Council for Minorities in Engineering (NACME) argues that while opportunities have improved slightly for these students, lack of adequate high school preparation has limited the ability of certain minority groups to enter engineering programs in representative numbers. Only about 4 percent of under-represented minorities graduate high school with the knowledge and skills necessary to enter university engineering programs.<sup>21</sup> This is consistent with the low rates of college readiness in Math and Science Reasoning for African Americans, Hispanic Americans and Native Americans in Oklahoma shown in Figure D-7.

Although some studies explain the relative lack of minority students in college engineering programs as a problem of input — that is, African Americans, Hispanic Americans, and Native Americans do not acquire necessary knowledge and skills during the educational stages leading up to college — other studies suggest that a lack of diversity in university engineering faculties constrains minority enrollment in these programs. Engineering programs without minority faculty members struggle to enroll and maintain a diverse student body due to a lack of mentors and role models for minority students. These students may also perceive the lack of diversity as a reflection on the engineering industry as a whole. A 2007 study reported that engineering departments at top research universities have relatively fewer minority faculty members compared to other academic departments.<sup>22</sup> Data from the University of Oklahoma (OU) and Oklahoma State University (OSU) show the following with respect to engineering departments:

- From 2005 to 2008, minorities represented an average of about 13 percent of the engineering department faculty at Oklahoma State University; African Americans and Hispanic Americans combined to represent less than 1 percent of engineering faculty.
- For the same years, the engineering department at the University of Oklahoma consisted of about 27 percent minority faculty members, but there were no African Americans or Native Americans on the faculty.

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<sup>20</sup> Unknown Author. 2003. “Blacks Strive to Build a Bridgehead in Academic Engineering.” *The Journal of Blacks in Higher Education*. 41 (Autumn): 98-108, 98.

<sup>21</sup> Frehill, Lisa M. “Confronting the New American Dilemma.” *National Action Council for Minorities in Engineering*. 2008.

<sup>22</sup> Nelson, Donna J. “A National Analysis of Minorities in Science and Engineering Faculties at Research Universities.” [Chem..ou.edu/~djn/diversity/Faculty\\_Tables\\_FY07/FinalReport07.html](http://chem..ou.edu/~djn/diversity/Faculty_Tables_FY07/FinalReport07.html) (accessed December 22, 2009).

- Both schools' engineering departments had a larger proportion of Asian American faculty members compared to other minority groups.
- Lack of minority representation in engineering faculty does not appear to affect minority enrollment in undergraduate engineering programs compared to other programs at Oklahoma universities, but it may have an impact on retention and graduation rates among such students. Some studies suggest that while their enrollment has increased in university engineering departments, minorities continue to earn degrees at a rate lower than that of non-Hispanic white students.<sup>23</sup>

To better understand the broader patterns of enrollment by race and ethnicity, the study team examined engineering and total undergraduate minority enrollment at OU and OSU. Figure D-8 shows the average annual enrollment of engineering students and all undergraduate students between 2001 and 2008, by race/ethnicity.

Overall, representation of minorities among all engineering undergraduates at OU was similar to or greater than their representation in all programs during this period. The OSU engineering department had a somewhat smaller representation of African American and Native American students compared to the overall undergraduate population.

However, female representation among all engineering students at both OU and OSU was far lower than their representation for all undergraduate programs, as shown below.

**Figure D-8.**  
**Average annual enrollment of undergraduates at OU and OSU by race and ethnicity, 2001-2008**

	University of Oklahoma		Oklahoma State University	
	Engineering	All colleges	Engineering	All colleges
<b>Race/ethnicity</b>				
African American	7.0 %	5.8 %	3.1 %	4.1 %
Asian American	9.3	5.3	3.1	1.8
Hispanic American	5.6	3.9	2.4	2.3
Native American	<u>6.9</u>	<u>7.4</u>	<u>7.4</u>	<u>8.9</u>
<b>Total minority</b>	<b>28.9 %</b>	<b>22.5 %</b>	<b>16.0 %</b>	<b>17.2 %</b>
Non-Hispanic white	<u>71.1</u>	<u>77.5</u>	<u>84.0</u>	<u>82.9</u>
<b>Total</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>
<b>Gender</b>				
Female	19.2 %	51.1 %	16.8 %	48.2 %
Male	<u>80.8</u>	<u>48.9</u>	<u>83.2</u>	<u>51.8</u>
<b>Total</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>	<b>100.0 %</b>

Note: Enrollment totals are for U.S. residents. International and non-resident students are not included.

Source: BBC Research & Consulting from Oklahoma State University college ledgers and the University of Oklahoma Factbooks, 2001-2008.

<sup>23</sup> Murphy, Shehab. 2007. "Academic Struggles and Strategies: How Minorities Persist." Research Institute for STEM Education. (1).



**Employment.** With educational opportunities and attainment for minorities and women as context, the study team examined the race/ethnicity and gender composition of the engineering industry in Oklahoma and the U.S. in 1980 and 2000.

Figure D-9 compares the demographics of civil engineers to those of workers age 25 and older with a college degree for Oklahoma and the U.S. in 1980 and 2000. In Oklahoma:

- In 2000, there were relatively fewer African Americans and Hispanic Americans among civil engineers than among all college-educated workers age 25 or older. However, these differences were not statistically significant (possibly due to small sample sizes).
- Women were relatively under-represented among civil engineers in both 1980 and 2000. In 2000, women were 16 percent of civil engineers and 45 percent of workers age 25 and older with a college degree (a statistically significant difference). Although the relative number of female civil engineers increased between 1980 and 2000, representation of women among civil engineers was still substantially below their representation in the college-educated workforce.

Some of the employment patterns for civil engineers in Oklahoma are consistent with those seen for the nation between 1980 and 2000. However, small sample sizes for civil engineers in both 1980 and 2000 mean that caution should be used in examining these figures for Oklahoma.

There were insufficient observations corresponding to engineers in Oklahoma in the 2008 ACS for these data to be included in this analysis.

**Figure D-9.**  
**Demographic distribution of civil engineers and workers age 25 and older with a college degree in all industries in Oklahoma and the U.S., 1980 and 2000**

Oklahoma				
	Civil engineers		Workers 25+ with a degree	
	1980 (n=100)	2000 (n=80)	1980 (n=10,391)	2000 (n=14,919)
<b>Race/ethnicity</b>				
African American	1.0 %	3.0 %	3.8 %	4.8 %
Hispanic American	2.0	0.2	0.9	1.7
Native American	1.0	9.7	2.7	6.4
Other minority group	<u>5.0</u>	<u>3.2</u>	<u>1.3</u>	<u>2.6</u>
<b>Total minority</b>	9.0 %	16.1 %	8.6 %	15.6 %
Non-Hispanic white	<u>91.0</u>	<u>83.9</u>	<u>91.4</u>	<u>84.4</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %
<b>Gender</b>				
Female	1.0 %	15.7 % **	31.9 %	44.7
Male	<u>99.0</u>	<u>84.3</u> **	<u>68.1</u>	<u>55.3</u> %
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %
United States				
	Civil engineers		Workers 25+ with a degree	
	1980 (n=10,087)	2000 (n=12,192)	1980 (n=858,464)	2000 (n=1,631,919)
<b>Race/ethnicity</b>				
African American	2.5 % **	3.7 % **	5.3 %	6.8 %
Hispanic American	2.9 **	4.4	2.5	4.4
Native American	0.2	0.8 **	0.2	0.6
Other minority group	<u>6.3</u> **	<u>9.3</u> **	<u>3.4</u>	<u>7.3</u>
<b>Total minority</b>	11.8 %	18.2 %	11.4 %	19.1 %
Non-Hispanic white	<u>88.2</u>	<u>81.8</u> **	<u>88.6</u>	<u>80.9</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %
<b>Gender</b>				
Female	3.0 % **	10.3 % **	34.7 %	45.6 %
Male	<u>97.0</u> **	<u>89.7</u> **	<u>65.3</u>	<u>54.4</u>
<b>Total</b>	100.0 %	100.0 %	100.0 %	100.0 %

Note: \*\* Denotes that the difference in proportions between civil engineers and workers age 25 or older with a four-year degree in all industry groups for the given Census/ACS year is statistically significant at the 95% confidence level.

Source: BBC Research & Consulting from 1980 and 2000 U.S. Census 5% sample. The raw data extracts were obtained through the IPUMS program of the MN Population Center: <http://usa.ipums.org/usa/>.

## **Summary of Entry and Advancement in the Construction and Engineering Industries**

BBC's analysis suggests that barriers to entry into the construction and engineering industries in Oklahoma may help to explain relatively low numbers of businesses owned by certain minority groups and women.

- College education appears to be a barrier for entry of African Americans, Hispanic Americans and Native Americans into the engineering industry in Oklahoma. Disparities in educational attainment for each of these groups appear at the high school level, which may affect college opportunities.
- There is low representation of women among civil engineers, especially in light of the fact that more female than male workers in Oklahoma have four-year college degrees.
- Representation of African Americans in the construction industry is relatively low compared to all industries in Oklahoma, which is unexplained by amount of formal education.
- The representation of women in the construction industry as a whole is relatively low.
- There appear to be disparities in the advancement of Hispanic Americans to first-line supervisor positions.
- Relatively few Hispanic Americans and Native Americans working in construction are managers.

In sum, certain patterns of disparity seen nationally concerning entry and advancement in the construction and engineering industries are also present in Oklahoma.