STATE OF SOUTH DAKOTA

"Evaluating and Updating South Dakota's Building Energy Codes"

Final Report for

Office of Energy Efficiency and Renewable Energy
2003 State Energy Program Special Projects
Building Codes and Standards: DE-PS36-03G093001-03

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Summary

In summary of the SEP grant titled "Evaluating and Updating South Dakota's Building Energy Codes," a detailed study of current state practices, implications, and code options was completed. The results were utilized to make a recommendation to the State of South Dakota to adopt ASHRAE/IESNA Standard 90.1-1999 as the state's Commercial Building Energy Code. By adopting this code, South Dakota would satisfy the minimum federal requirement and would also take a major step forward in integrating its first energy code into commercial building design. In addition, the benefits of adopting a state commercial building energy code were promoted by means of workshops, presentations, written and web-based literature.

Background

A commercial building energy code in South Dakota will set minimum building and building system requirements that are cost effective in saving energy. The energy savings translates into an energy cost savings for building owners.

South Dakota currently has no statewide commercial building energy code. However, South Dakota has applied for an Extention of Deadlines to gain time to study the options and then take steps towards adoption.

►Commercial Energy Code Options

Three main types of commercial building energy codes were considered for adoption. The ASHRAE/IESNA 90.1 series (referred to as the ASHRAE 90.1 series), the IECC (International Energy Conservation Code) series, and specifically written state codes (usually based on an ASHRAE/IESNA 90.1 series code). Table 1 shows a relative comparision of the codes.

Table 1: Energy Code Comparison

ASHRAE 90.1 Series	Comparable IECC Series
ASHRAE/IESNA 90.1-2001	2003 IECC
ASHRAE/IESNA 90.1-1999	2000/2001 IECC with 90.1-1999 ammendment

The 2003 IECC and the ASHRAE/IESNA Standard 90.1-2001 codes are similar and also have the most restrictive allowances and exceed the minimum Federal requirements, while the 2000/2001 IECC and the ASHRAE/IESNA 90.1-1999 are similar and meet the minimum Federal requirements.

Commercial building energy codes start with the ASHRAE/IESNA 90.1 series. There are three main codes to this series that apply to most states. First there is the ASHRAE Standard 90.1-1989. This code was the previous Federal standard. This code was succeeded by 90.1-1999, then by 90.1-2001. In addition, ASHRAE/IESNA Standard 90.1-2004 is the next generation of this code developed to further address technology upgrades and energy efficiency. The

ASHRAE/IESNA 90.1-1999 is the specified Federal minimum code. This means a state needs to either equal or exceed the energy efficiency as defined by this code. The easiest way to equal the minimum standard is to adopt ASHRAE/IESNA 90.1-1999.

The IECC series is a commercially written code which covers both residential and commercial buildings. The residential portion of the code (2000 IECC) is the Federal minimum code for residential buildings and is commonly adopted by states for their residential building energy code. This code is also often used by states who wish to adopt one energy code to cover all building types. The IECC commercial building code is similar to its respective ASHRAE/IESNA 90.1 counterpart. However, they achieve their equivalence to the ASHRAE/IESNA 90.1 series, in part, by refering to ASHRAE/IESNA 90.1. For example, in Chapter 7 of the 2003 IECC Section 701.1 Scope, it states, "Commercial buildings shall meet the requirements of ASHRAE/IESNA 90.1. Exception: Commercial buildings that comply with Chapter 8."

Specifically written state codes are usually written based on the ASHRAE/IESNA 90.1 series, although they may also utilize the IECC series.

►Summary of Project by Tasks

The following details the project accomplishments by task.

Current Practice Evaluation

This task included the examination and evaluation of current practices. The first part of this study determined what other states adopted to meet the Federal requirement. In particular, surrounding states, states with large, progressive state energy departments and states with similar climates were examined.

It was found that the majority of the states adopted either a version of ASHRAE 90.1, IECC, or wrote their own code, usually strongly based on a version of the ASHRAE 90.1 code.

Most states, especially states with small energy departments usually adopted a pre-written code, either a version of ASHRAE 90.1 or the International Energy Conservation Code (IECC). States that wrote their own code, usually largely based on the ASHRAE 90.1 code, normally had large, progressive energy departments. Since South Dakota has a small energy department, adopting a pre-written code was the most attractive option. In addition, adopting a widely accepted, pre-written code would aid in reducing code resistance due to questions concerning the motives of any particular code developers.

According to the Department of Energy funded Building Codes Assistance Project, South Dakota was one of only a few states that have no commercial building energy code. However, it was found that South Dakota did recommend that ASHRAE 90.1-1989 be applied to state owned facilities.

New Building Compliance Study

For this task, a study was completed to evaluate the current construction practices for commercial buildings in South Dakota. A sample of four buildings distributed throughout South Dakota was selected to evaluate the current building practices in the state (see Appendix B "Energy Code Recommendation to the State of South Dakota" for more information on the study). These buildings were selected with both geographical and utilization diversity in mind. Also, buildings constructed within the last five years were sought to help in determining current building practices. The building characteristics of each facility were examined utilizing COMCheck-EZ™. COMCheck-EZ™ is a software tool that provides a convenient and quick method in determining building compliance with energy codes. These codes include the IECC line, specific state codes as well as the ASHRAE 90.1 series.

The results of the compliance study provided valuable insight into the relationship of current building practices with ASHRAE/IESNA Standard 90.1-1999.

1) It appeared from the samples that current building practices were often well above ASHRAE/IESNA Standard 90.1-1999 levels.

2) When not in compliance, building practices were not far off from required levels. It is expected that in the worst case, only minor changes to building design will have to be made to meet ASHRAE/IESNA Standard 90.1-1999 levels.

3) Utilization of COMCheck-EZ™ provided a promising method of determining building compliance during the design and construction phase.

Economic Impacts

The results of the current practice analysis, the new building compliance study, and the expected impacts resulting from the adoption of ASHRAE/IESNA Standard 90.1-1999 were delivered to the Pacific Northwest National Laboratory who processed a thorough economic analysis. PNNL modeled the adoption as a 90.1-2001 adoption due to certain code intricacies, but found that the impacts from larger commercial facilities would be minimized due to the required guidance of professional engineering and architectural firms, whereas smaller buildings which are not required to employ professional engineering and architectural firms would yield larger impacts, particularly in the area of lighting (the complete study is shown in Appendix C). Based on the results, it appears that by adopting ASHRAE/IESNA Standard 90.1-1999 there will be a small, net positive economic and energy impact.

Commercial Building Energy Code Recommendation to the State of South Dakota

After thorough analysis of the current commercial building status within the state, procedures followed by neighboring states, and commercial energy code options, a recommendation was delivered to the State of South Dakota in January of 2005. The executive summary is shown below.

We recommend that the State of South Dakota adopt ASHRAE/IESNA Standard 90.1-1999 as the state's Commercial Building Energy Code. Currently, South Dakota has no statewide, commercial building energy code, but has received an extention of deadlines to meet federal requirements.

ASHRAE/IESNA Series 90.1 is the most technically robust, most documented and most widely accepted commercial building energy code. By adopting ASHRAE/IESNA Standard 90.1-1999, South Dakota will satisfy the minimum federal requirements set forth by the Energy Policy Act of 1992 without being excessively stringent compared to current practices. A commercial building energy code will set minimum building and building system requirements that will translate into an energy cost savings for building owners or renters. The reduction in energy costs may free up long term funds and help spur economic growth for these commercial building facilities. Most builders and designers in South Dakota are already integrating many of the items specified in ASHRAE 90.1-1999. This will facilitate our transition to a commercial building energy code.

Timeframe: *It is recommended that the new code go into effect 9-12 months after it is adopted so that designers, builders, and jurisdictions have time to prepare and transition to the new requirements of the code.*

Enforcement: *The majority of states adopt some form of a mandatory code. However, one method of adoption utilized by some states can minimize the enforcement implications of the code. This method is to adopt the code as a voluntary code contingent on adoption by local jurisdictions. A more common adoption is to adopt the code as a mandatory requirement for state-owned or state-sponsored construction, and a voluntary code for all other buildings. An example is Arizona which utilizes ASHRAE/IESNA 90.1-1999 as a voluntary statewide commercial building energy code, except for state-owned or funded buildings in which case the energy code is mandatory.*

Compliance: *If the code is voluntary, then compliance would be at the discretion of local jurisdictions. If the code is mandatory, many states utilize COMcheck-EZ software to demonstrate energy code compliance. This easy to use software is provided at no cost by the DOE and can document a building's compliance.*

For more detailed information on the results, refer to the Energy Code Recommendation to the State of South Dakota, Appendix B.

Energy Code Promotion and Education

The results of this project were promoted throughout the State. Promotion was conducted via brochures and training seminars. The following items were accomplished.

Developed and presented several educational workshops promoting the benefits of commercial energy codes in South Dakota. These events were attended by approximately 400 engineers, architects, contractors, utility representatives, state and local officials, building owners and

building operators. One focus of the workshops was to continuously develop the covered topics to include examples linking commercial building energy codes to energy cost savings in order to display the benefits of an energy code to building owners and operators. The following training presentations were developed.

"SD Commercial Building Energy Code"
Brookings Rotary Club, Brookings, SD.

"Energy Standards for Commercial Buildings"
http://www.state.sd.us/puc/2004/Events04/Building%20Science%20Presentation.pdf
Commercial Building Science Seminars, Sioux Falls, Aberdeen, and Rapid City, SD.

"Evaluating and Updating South Dakota's Commercial Building Energy Code"
Mechanical Engineering Department, South Dakota State University, Brookings, SD.

"Energy Cost Savings for Commercial Facilities"
Sioux Valley Energy Commercial Energy Seminar, Brandon, SD.

A brochure was developed and distributed it as an education tool via workshops, presentations, utilities and copies were provided for the State to disseminate (refer to Appendix D for more details).

A very informative website was developed for the dissemination of South Dakota energy code information. The website can be accessed at: http://www.engineering.sdstate.edu/~sdcodes/

►Additional Accomplishments

Additional accomplishments were met as follows:

- Representatives attended, networked with other States, and obtained energy code information at the 2004 National Workshop on State Building Energy Codes, July 20-22, 2004, Philadelphia, PA.

- South Dakota Office of the State Engineer upgraded its recommended commercial building energy code for state-owned facilities from ASHRAE/IESNA Standard 90.1-1989 to ASHRAE/IESNA Standard 90.1-1999.

- The program increased the awareness for Commercial Building Energy Codes in South Dakota and brought the topic to light and into discussion.

- The results of this grant started the path towards adoption of a Commercial Building Energy Code for South Dakota.

►Suggested Future Work

South Dakota should build on the groundwork that this program started and continue to educate and promote the integration of a state commercial building energy code.

Additionally, South Dakota should consider updating the state facility energy code to ASHRAE/IESNA Standard 90.1-2004. Then use this adoption to springboard consideration of statewide adoption of 90.1-2004.

References

U.S. DOE EERE Building Energy Codes Program. http://www.energycodes.gov. November 2004.

Building Codes Assistance Project. "The Building Codes Assistance Project Bimonthly Newsletter." http://www.bcap-energy.org. December 2004.

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. ASHRAE/IESNA Standard 90.1-1999. 1999.

International Code Council. IECC 2003. 2003.

American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. ASHRAE/IESNA Standard 90.1-1989. 1989.

New Buildings Institute. The IECC 2000 and ASHRAE/IESNA Standard 90.1-1999. http://www.newbuildings.org. April 20, 2000.

Appendices

Appendix A: “Commercial Building Energy Code Recommendation Summary”

Appendix B: “Energy Code Recommendation to the State of South Dakota”

Appendix C: “Analysis of Potential Benefits and Costs of Adopting a Commercial Building Energy Standard in South Dakota”

Appendix D: “South Dakota’s Commercial Building Energy Codes” Brochure

Appendix A

Appendix B

Appendix C

Appendix D

Commercial Building Energy Code Recommendation Summary

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Executive Summary

We recommend that the State of South Dakota adopt ASHRAE/IESNA Standard 90.1-1999 as the state's Commercial Building Energy Code. Currently, South Dakota has no statewide, commercial building energy code, but has received an extention of deadlines to meet federal requirements.[1]

ASHRAE/IESNA Series 90.1 is the most technically robust, most documented and most widely accepted commercial building energy code. By adopting ASHRAE/IESNA Standard 90.1-1999, South Dakota will satisfy the minimum federal requirements set forth by the Energy Policy Act of 1992 without being excessively stringent compared to current practices. A commercial building energy code will set minimum building and building system requirements that will translate into an energy cost savings for building owners or renters. The reduction in energy costs may free up long term funds and help spur economic growth for these commercial building facilities. Most builders and designers in South Dakota are already integrating many of the items specified in ASHRAE 90.1-1999. This will facilitate our transition to a commercial building energy code.

Timeframe: It is recommended that the new code go into effect 9-12 months after it is adopted so that designers, builders, and jurisdictions have time to prepare and transition to the new requirements of the code.

Enforcement: The majority of states adopt some form of a mandatory code. However, one method of adoption utilized by some states can minimize the enforcement implications of the code. This method is to adopt the code as a voluntary code contingent on adoption by local jurisdictions. A more common adoption is to adopt the code as a mandatory requirement for state-owned or state-sponsored construction, and a voluntary code for all other buildings. An example is Arizona which utilizes ASHRAE/IESNA 90.1-1999 as a voluntary statewide commercial building energy code, except for state-owned or funded buildings in which case the energy code is mandatory.

Compliance: If the code is voluntary, then compliance would be at the discretion of local jurisdictions. If the code is mandatory, many states utilize COMcheck-EZ software to demonstrate energy code compliance. This easy to use software is provided at no cost by the DOE and can document a building's compliance.

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[1] U.S. DOE EERE Building Energy Codes Program. http://www.energycodes.gov. November 2004.

Energy Code Recommendation to the State of South Dakota

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Executive Summary

We recommend that the State of South Dakota adopt ASHRAE/IESNA Standard 90.1-1999 as the state's Commercial Building Energy Code.

By adopting this code, South Dakota will satisfy the minimum federal requirement without being excessively stringent compared to current practices. South Dakota will also take a step forward in integrating energy cost saving practices into commercial building design. In addition, this code is the most technically sound, the most documented and the most widely accepted commercial building energy code.

Background

A commercial building energy code will set minimum building and building system requirements that are cost effective in saving energy. The energy savings translates into an energy cost savings for building owners. In addition, designing better commercial buildings and building systems can yield smaller, less expensive HVAC equipment.

The areas which are addressed in an energy code usually consist of the building envelope, the lighting systems, and the mechanical systems. The building envelope requirements include items such as minimum wall, roof and window insulation values. The lighting requirements include such items as wattage requirements and controls for unoccupied hours. The mechanical system requirements include equipment efficiency requirements, controls for unoccupied hours, and duct insulation requirements.

►*Minimum Federal Energy Code Requirements / Federal Determination*[1]

The Energy Policy Act of 1992 set in motion the timeframe for all states to adopt building energy codes and the minimum requirements of the applicable code. Concerning the commercial portion of the requirement, Section 304 of the Energy Policy and Conservation Act (EPCA, Public Law 94-163), as amended by the Energy Policy Act of 1992 (EPACT, Public Law 102-486), establishes a role for the Department of Energy (DOE) to determine whether revisions to the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE) and the Illuminating Engineering Society of North America (IESNA) ASHRAE/IESNA Standard 90.1-1989 would improve energy efficiency in commercial buildings.

On July 15, 2002, DOE published its determination in the Federal Register that ASHRAE/IESNA Standard 90.1-1999 "Energy Standards for Buildings Except Low-Rise Residential Buildings," would improve commercial building energy efficiency by comparing it to Standard 90.1-1989, fulfilling DOE's mandate under the Energy Conservation Policy Act, as amended. "DOE has determined that Standard 90.1-1999, formulated by the American Society of Heating, Refrigerating and Air-Conditioning Engineers, will improve commercial building energy efficiency and make building code compliance easier for architects, builders, and code officials. By reducing energy use, Standard 90.1-1999 will also reduce power plant emissions and benefit the environment (Determination News Release, Building Energy Code Program,

www.energycodes.gov)." As required by the Act, all states have two years to adopt Standard 90.1-1999 or upgrade their existing commercial building codes to meet or exceed its requirements. The standard applies to all new commercial buildings, and all major remodeling or renovation of existing commercial buildings.

Certifications or Requests for Extension of Deadlines from each State, with regard to ASHRAE/IESNA Standard 90.1-1999, are due at DOE on or before July 15, 2004. Currently, South Dakota has applied for an Extention of Deadlines to gain time to study the options and then move towards adopting the most applicable code.

►*Commercial Energy Code Summary*

There are three main types of commercial building energy codes. The ASHRAE/IESNA 90.1 series (referred to as the ASHRAE 90.1 series), the IECC (International Energy Conservation Code) series, and specifically written state codes (usually based on an ASHRAE/IESNA 90.1 series code). Table 1 shows a relative comparision of the codes.

Table 1: Energy Code Comparison

ASHRAE 90.1 Series	Comparable IECC Series
ASHRAE/IESNA 90.1-2001	2003 IECC
ASHRAE/IESNA 90.1-1999	2000/2001 IECC with 90.1-1999 ammendment

The 2003 IECC and the ASHRAE/IESNA Standard 90.1-2001 codes are similar and also have the most restrictive allowances and exceed the minimum Federal requirements, while the 2000/2001 IECC and the ASHRAE/IESNA 90.1-1999 are similar and meet the minimum Federal requirements.

Commercial building energy codes start with the ASHRAE/IESNA 90.1 series. There are three main codes to this series that apply to most states. First there is the ASHRAE Standard 90.1-1989. This code was the previous Federal standard. This code was succeeded by 90.1-1999, then by 90.1-2001. In addition, ASHRAE/IESNA Standard 90.1-2004 is currently being developed to further address technology upgrades and energy efficiency. The ASHRAE/IESNA 90.1-1999 is the specified Federal minimum code. This means a state needs to either equal or exceed the energy efficiency as defined by this code. The easiest way to equal the minimum standard is to adopt ASHRAE/IESNA 90.1-1999.

The IECC series is a commercially written code which covers both residential and commercial buildings. The residential portion of the code (2000 IECC) is the Federal minimum code for residential buildings and is commonly adopted by states for their residential building energy code. This code is also often used by states who wish to adopt one energy code to cover all building types. The IECC commercial building code is similar to its respective ASHRAE/IESNA 90.1 counterpart. However, they achieve their equivalence to the ASHRAE/IESNA 90.1 series, in part, by refering to ASHRAE/IESNA 90.1. For example, in Chapter 7 of the 2003 IECC Section 701.1 Scope, it states, "Commercial buildings shall meet the

requirements of ASHRAE/IESNA 90.1. Exception: Commercial buildings that comply with Chapter 8."

Specifically written state codes are usually written based on the ASHRAE/IESNA 90.1 series, although they may also utilize the IECC series.

► *Other States Codes*[2]

The first part of this study determined what other states adopted to meet the Federal requirement. In particular, surrounding states, states with large, progressive state energy departments and states with similar climates were examined.

It was found that the majority of the states adopted either a version of ASHRAE 90.1, IECC, or wrote their own code, usually strongly based on a version of the ASHRAE 90.1 code.

Most states, especially states with small energy departments usually adopted a pre-written code, either a version of ASHRAE 90.1 or the International Energy Conservation Code (IECC). States that wrote their own code, usually largely based on the ASHRAE 90.1 code, normally had large, progressive energy departments.

According to the Department of Energy funded Building Codes Assistance Project, only 3 states have no commercial building energy code: Alaska, South Dakota, and Wyoming. The states surrounding South Dakota currently have the following commercial building energy codes **(**Table 2).

Table 2: Current Commercial Energy Code for Surrounding States

State	Commercial Building Energy Code
Iowa	ASHRAE 90.1-1989
Minnesota	State Code (based on ASHRAE 90.1)
Montana	2003 IECC
Nebraska	ASHRAE 90.1-2001
North Dakota	ASHRAE 90.1-1989
Wyoming	None

For more detailed information for surrounding states, refer to Appendix A.

► *ASHRAE/IESNA Standard 90.1-1999*[3,4]

ASHRAE/IESNA Standard 90.1-1999 is a comprehensive energy code covering such areas as: building envelope, HVAC, service water heating, power, lighting and other equipment. It provides the minimum requirements for the energy-efficient design of buildings except low-rise residential as prescribed by the Department of Energy.

Development of the series 90.1 energy codes began in 1974 by ASHRAE and has undergone several revisions before the Standard 90.1-1999 version and several since. The 1999 version

succeded ASHRAE/IES 90.1-1989 and was jointly written by technical professionals, builders, owners and operators. This version was subjected to over 60,000 public review comments and revised multiple times to accommodate feedback. In addition, the energy efficiency items addressed were analyzed for economic feasibility by yielding simple payback periods of less than ten years, although most were seven years or less. ASHRAE as an organization maintains a high level of respect which is carried over to its series 90.1 energy codes. To date, 27 states employ the series 90.1 energy code as the state minimum while 13 states reference this series. Further, the New Buildings Institute "supports that States move to ASHRAE/IESNA Standard 90.1-1999 performance levels."[6]

►*New Building Compliance Study*

A sample of four buildings throughout South Dakota was selected to evaluate the current building practices in the state (see Appendix B for information on new building variety in South Dakota). These buildings were selected with both geographical and utilization diversity in mind. Also, buildings constructed within the last five years were sought to help in determining current building practices. The building characteristics of each facility were examined utilizing COMCheck-EZ™. COMCheck-EZ™ is a software tool that provides a convenient and quick method in determining building compliance with energy codes. These codes include the IECC line, specific state codes as well as the ASHRAE 90.1 series. 38 states reference COMCheck-EZ™ as a suitable method of checking compliance.[2] Further enhancing this software is it can downloaded for free from the Department of Energy website (www.energycodes.gov).

When determining building compliance with the ASHRAE/IESNA Standard 90.1-1999 energy code, COMCheck-EZ™ examines all sections of the code including: envelope, lighting and mechanical equipment. Within the envelope and lighting section, tradeoffs between components are accounted for thus saving significant time.

The results of the ASHRAE/IESNA Standard 90.1-1999 compliance tests utilizing COMCheck-EZ™ are shown in Table 3.

Table 3: Compliance Results

			ENVELOPE			LIGHTING	
Building Type	**Gross Area**	**Year Built**	**Roof Insulation**	**Wall Insulation**	**Compliance Percentage**	**Fixture Types**	**Compliance Percentage**
School	56,000 ft^2	2002	R-22.2 / R-7.4 ci R-30.8 ci	R-10.5 ci R-16 ci R-29.6 / R-8 ci	**+27%**	T-8 Fluorescent Compact Fluorescent Metal Halide	**+30%**
Retail	2,720 ft^2	1999	R-19 ci	R-19 R-31	**+10%**	T-8 Fluorescent	**+20%**
Office	20,265 ft^2	2004	R-15.4 ci	R-18.8 R-8	**-1%**	T-8 Fluorescent Compact Fluorescent Incandescent	**+0.2%**
Manufacturing	15,200 ft^2	2001	R-22 ci	R-15	**+13%**	T-8 Fluorescent Metal Halide	**+63%**

Table 3 details basic building information including: use, area, construction year as well as envelope and lighting characteristics all of which were used in determining compliance. Of major interest is the compliance percentage for the envelope and lighting sections. These numbers provide calculated proof of a building's compliance with ASHRAE/IESNA Standard 90.1-1999.

The results of the compliance study provide valuable insight into the relationship of current building practices with ASHRAE/IESNA Standard 90.1-1999.

1) It appears from the sample that current building practices are often well above ASHRAE/IESNA Standard 90.1-1999 levels. This indicates that current building practices would not be significantly altered.

2) When not in compliance, building practices are not far off from required levels. It is expected that in the worst case, only minor changes to building design will have to be made to meet ASHRAE/IESNA Standard 90.1-1999 levels.

3) Utilization of COMCheck-EZ™ provides a promising method of determining building compliance during the design and construction phase.

►*Economic impacts*

The expected impacts resulting from the adoption of ASHRAE/IESNA Standard 90.1-1999 will be detailed in a thorough economic analysis being prepared by the Pacific Northwest National Laboratory. It is expected that this analysis will be completed in March 2005.

Based on our preliminary results of current building practices in South Dakota, it would appear that by adopting 90.1-1999 there will be little economic impact.

►*Recommendations*

This study recommends adopting ASHRAE/IESNA Standard 90.1-1999 as the South Dakota commercial building energy code for the following reasons:

1) It is the specified code mandated by the Department of Energy 2002 determination.
2) It is the minimum acceptable standard which will facilitate the transition in adopting an energy code.
3) To date, a majority of states either employ or reference series 90.1 standards.
4) ASHRAE and IESNA are well respected organizations with much experience in developing technical standards. ASHRAE also performs and establishes many of the testing procedures and methods which energy standards are based upon.
5) A myriad of easily accessible support material is available, many times at no charge.
6) The standard is well organized in a logical manner.

By adopting this code, South Dakota will satisfy the minimum federal requirement without being excessively stringent compared to current practices. South Dakota will also take a step forward in integrating energy cost saving practices into commercial building design. This code also is the most technically sound, the most documented and the most widely accepted commercial building energy code. ASHRAE/IESNA Standard 90.1-1999 also has a large amount of easily attainable training material available to assist users with the new code.

References

[1] U.S. DOE EERE Building Energy Codes Program. http://www.energycodes.gov. November 2004.

[2] Building Codes Assistance Project. "The Building Codes Assistance Project Bimonthly Newsletter." http://www.bcap-energy.org. December 2004.

[3] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. ASHRAE/IESNA Standard 90.1-1999. 1999.

[4] International Code Council. IECC 2003. 2003.

[5] American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. ASHRAE/IESNA Standard 90.1-1989. 1989.

[6] New Buildings Institute. The IECC 2000 and ASHRAE/IESNA Standard 90.1-1999. http://www.newbuildings.org. April 20, 2000.

Appendix A: State Commercial Building Energy Codes

The following information summarizes state commercial building energy codes.[2]

Alabama

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1989 for state-owned funded buildings only. Use state-developed software (ABC-4) to show compliance.
Code Change Cycle: No set schedule. Most recent update adopted December 2002

Alaska

Commercial Energy Code: None statewide.
Code Change Cycle: No set schedule. Most recent update effective January 1, 1992

Arizona

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999 mandatory for state-owned and state funded buildings only; can use COMCheck-EZ™ to show compliance
Code Change Cycle: No set schedule.

Arkansas

Commercial Energy Code: 2003 IECC (including ASHRAE/IESNA Standard 90.1-2001), mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update effective October 1, 2004.

California

Commercial Energy Code: State developed code. Title 24-Part 6 meets or exceeds ASHRAE/IESNA 90.1-1999; mandatory statewide.
Code Change Cycle: Three-year code change cycle. CA adopted revisions effective June 1, 2001. The Commission began the 2005 building code revision cycle in July 2001 and expects to complete the cycle by 2003.

The 2005 California Energy Efficiency Standards for Residential and Non-residential Buildings, will take effect October 1, 2005, and will supersede the 2001 standards. Projects that apply for a building permit on or after this date must comply with the new standards.

Colorado

Commercial Energy Code: Voluntary state provisions based on ASHRAE/IESNA Standard 90.1-1989; can use COMCheck-EZ™ to show compliance. (Denver: mandatory 2003 IECC)
Code Change Cycle: No set schedule.

Connecticut

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-2001, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Not more than every four years. Most recent update adopted: July 1, 2004.

The 2003 IRC and 2003 IECC were adopted in Connecticut for permits applied for on or after 9/1/04. The same two documents will be re-adopted in later 2005 when the state adopts the 2005 State Building Code. Public hearings for the 2005 are scheduled in 4 to 6 months.

Delaware

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update effective July 1, 2004.

District of Columbia

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Review in progress

Florida

Commercial Energy Code: State developed code, Chapter 13 of the Florida Building Code, meets or exceeds ASHRAE 90.1-2001, and is mandatory statewide; use Energy Gauge FLACOM to show compliance.
Code Change Cycle: Triennial code revision process. Most recent update July 1, 2004.
The effective date of the 2004 Florida Building Code has been delayed to July 1, 2005. The new code was originally slated to take effect July 1, 2004 and then initially delayed until January 1, 2005. Although the delay is due to review of non-energy issues, it postpones implementation of the entire code.

Georgia

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-2001, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: New editions of codes are reviewed as soon as practicable after publication. Supplements and amendments are updated annually.

Hawaii

Commercial Energy Code: ASHRAE/IESNA 90.1-1989 with modifications; adopted by all counties except Maui. Honolulu County MEC revised in 11 areas, including adoption of

ASHRAE/IESNA Standard 90.1-1999 efficiency levels of HVAC equipment.
Code Change Cycle: No set schedule. Most recent update October 24, 1994

Idaho

Commercial Energy Code: 2000 IECC is mandatory statewide; can use COMCheck-EZ™ to show compliance. 2003 versions of the Building, Residential, mechanical, fuel gas and energy conservation codes as the minimum requirements for all Idaho schools, state owned building and local jurisdictions that choose to adopt and enforce codes.
Code Change Cycle: Three-year code review cycle, concurrent with the publication of new editions of the Uniform Codes.

The state of Idaho will be adopting the 2003 IECC as of January 1st, 2005.

Illinois

Commercial Energy Code: IECC 2000, including reference to ASHRAE/IESNA Standard 90.1-1999, to be mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule.

Indiana

Commercial Energy Code: State-developed code that does not meet ASHRAE/IESNA Standard 90.1-1989; mandatory statewide.
Code Change Cycle: State codes are revised as necessary. Most recent update adopted May 21, 2003.

The Indiana Fire Prevention and Building Safety Commission is beginning the process of review and adoption of the 2003 IECC for Class 1 Structures ("commercial" buildings). A code review committee has been established to determine which, if any, elements of the IECC should be modified. The review is projected to be completed over the winter, with the new code ready for publication in March 2005.

Iowa

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1989, mandatory statewide; jurisdictions can adopt a more stringent code, can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update adopted April 2002.

Kansas

Commercial Energy Code: IECC 2003/ASHRAE/IESNA Standard 90.1-2001, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update July 1, 2003

Kentucky

Commercial Energy Code: 2002 KY Building Code and 2000 IECC for exterior envelope requirements only, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year code review/update cycle. Last updated on August 15, 2001.

Louisiana

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use modified version of COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Last update effective on January 1, 1999.

Maine

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-2001, mandatory statewide; can use COMcheck-EZ to show compliance.
Code Change Cycle: For commercial code, Maine abides by the most recently released ASHRAE Standard.

Maryland

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-2001, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Codes are usually reviewed every three years with the publication of the new editions of the model code.

Massachusetts

Commercial Energy Code: MA State Building Code, based on ASHRAE/IESNA Standard 90.1-1999, 2000 IECC, and additional state-developed amendments, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: The State Board of Building Regulations and Standards (BBRS) is required to revise the building code at least every five years. Public hearings are held each May and November to consider proposed modifications to the code.

Michigan

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year code review schedule.

Minnesota

Commercial Energy Code: MN State Energy Code, exceeds ASHRAE/IESNA Standard 90.1-1989, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent residential code update was effective on April 15, 2000. Most recent commercial code update was effective on July 20, 1999.

The Commercial Energy Code Advisory committee is working towards completing recommendations for the new Commercial Energy Code, by the end of 2004.

Mississippi

Commercial Energy Code: ASHRAE Standard 90-1975, mandatory for state owned buildings, public buildings, and high-rise buildings.
Code Change Cycle: No set schedule. Most recent update was effective on July 1, 1980.

Missouri

Commercial Energy Code: None statewide. State owned buildings must comply with ASHRAE/IESNA Standard 90.1-1989.
Code Change Cycle: No set schedule. Most recent update was adopted on January 26, 1996.

Montana

Commercial Energy Code: ASHRAE Standard 90.1-2001, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year code review/change cycle. Most recent update was adopted on September 3rd, 2004.

The State of Montana adopted the 2003 IECC effective September 3, 2004. The process was completed through administrative rule and is applicable to both commercial and residential buildings.

Nebraska

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-2001, is to be mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update is to be effective July 1st, 2005.

In the final days of the 2004 session, the Nebraska Legislature adopted the 2003 International Energy Conservation Code as the new Nebraska Energy Code. The 2003 IECC replaces the 1983 Model Energy Code which was the building code used for the past 20 years. The effective date for the changeover is July 1, 2005 and is for both commercial and residential buildings.

Nevada

Commercial Energy Code: 1986 MEC with state amendments; state-owned facilities must comply with the most current version of ASHRAE Standard 90.1.
Code Change Cycle: No set schedule. Most recent code update was adopted on July 8, 1988.

New Hampshire

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update was effective on September 14, 2002.

New Jersey

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide as of January 2002; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year code cycle concurrent with the publication of new editions of the model codes. Most recent code update adopted July 16, 2001.

New Mexico

Commercial Energy Code: 2003 IECC, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Generally reviewed at least every three years with the publication of the new editions of the model codes. Most recent code update effective July 1st, 2004.

The 2003 International Energy Code was implemented on July 1, 2004 with New Mexico amendments.

New York

Commercial Energy Code: State-developed code based on the 2000 IECC w/2001 supplements, including ASHRAE/IESNA Standard 90.1-1999, mandatory statewide, can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. Most recent update was completed on March 6, 2002.

North Carolina

Commercial Energy Code: State-developed code modeled on the 2000 IECC with NC amendments, including ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: State Building Code Council reviews and approves changes to the state building code on a bi-annual basis. Most recent update was effective on December 31, 2001.

The state is working to write the 2006 edition of the Energy Code for North Carolina. It will be based on the 2003 IECC with North Carolina amendments. The first meeting of the Ad Hoc committee appointed to being work on the NC Energy Code was scheduled for November 9, 2004.

North Dakota

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1989, voluntary; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: New editions of the code are considered for adoption as they become available. Most recent update became effective in October 1995.

Ohio

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use COMCheck-EZ™ to show compliance.

Code Change Cycle: Most recent update effective January 1, 2002.

The 2003 IECC was adopted by the Board of Building Standards for Ohio, is mandatory statewide for residential and commercial buildings, and will become effective March 1st 2005.

Oklahoma

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1989 mandatory for jurisdictions that do not adopt their own code and for state-owned and -leased facilities; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year code review/change cycle concurrent with model code update cycle. The most recent update became effective on May 11, 2000.

Oregon

Commercial Energy Code: The Uniform Building Code, a state-developed code, exceeds ASHRAE Standard 90.1-1999, which is mandatory statewide.
Code Change Cycle: It begins every three years with the availability of new editions of or supplements to the Uniform Codes.

Pennsylvania

Commercial Energy Code: 2003 IECC, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Generally reviewed at least every three years with the publication of the new editions of the model codes. Most recent code update effective April 9, 2004.

Rhode Island

Commercial Energy Code: 2003 IECC amended to include ASHRAE/IESNA Standard 90.1-2001, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year code review/change cycle concurrent with publication of new editions of model codes. Most recent update adopted August July 1, 2004.

South Carolina

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-2001 is to be mandatory statewide January 1st, 2005. The State Engineer's Office and the SC Department of Education have adopted the ASHRAE/IESNA Standard 90.1 1999 as the energy code, for state buildings and schools and buildings under their jurisdiction. Can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Pending

South Dakota

Commercial Energy Code: None.
Code Change Cycle: N/A.

South Dakota will be receiving technical assistance from the Department of Energy (DOE) and Pacific Northwest National Labs (PNNL) to analyze what the economic costs and benefits would be for South Dakota to adopt the ASHRAE/IESNA Standard 90.1-1999 as the commercial building energy code. This is part of South Dakota's recent interest in upgrading the state energy standards.

Tennessee

Commercial Energy Code: ASHRAE Standard 90A-1980 and 90B-1975 statewide, voluntary.
Code Change Cycle: No set schedule. Most recent update effective July 2003.

Texas

Commercial Energy Code: 2000 IECC with 2001 Supplement (ASHRAE/IESNA Standard 90.1-1999); can use COMCheck-EZ™ to show compliance; ASHRAE/IESNA Standard 90.1-2001 (by rule) for state agencies and institutions of higher education.
Code Change Cycle: No set schedule. Most recent update effective May 1, 2001.

Utah

Commercial Energy Code: 2003 IECC mandatory statewide including ASHRAE/IESNA Standard 90.1- 2001; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Code changes are ongoing with new editions of codes adopted when they become available. Most recent update effective January 1, 2004.

Vermont

Commercial Energy Code: 2001 Vermont Guidelines for Energy Efficient Commercial Construction based on 2000 IECC with amendments to incorporate and exceed ASHRAE/IESNA Standard 90.1-1999, mandatory for state funded new construction, ACT 250 projects and within the City of Burlington. Voluntary statewide as minimum performance criteria for new construction program operated by Efficiency Vermont, the state's energy efficiency

utility. Can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Both the residential and commercial code will be updated every three-years; currently being updated.

Virginia

Commercial Energy Code: ASHRAE/IESNA Standard 90.1-1999, mandatory statewide; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: Three-year review cycle concurrent with the publications of new editions of the model codes. Most recent update effective October I, 2003.

Washington

Commercial Energy Code: State-developed code that meets or exceeds ASHRAE/IESNA Standard 90.1-1999. Amended: July 1, 2004
Code Change Cycle: Three-year code review/change cycle. Most recent update effective: July 1, 2004.

The Washington State Building Code Council is reviewing several proposals that would increase energy efficiency in non-residential buildings. These changes are to envelope, mechanical, and lighting standards. Public hearings on proposed changes to the Washington State Energy Code were held October 15th, 2004. The Council will make its final decision on proposed changes November 12th, 2004, with any changes effective July 1st, 2005.

West Virginia

Commercial Energy Code: 2000 IECC; can use COMCheck-EZ™ to show compliance.
Code Change Cycle: No set schedule. The new editions of the code are reviewed for possible adoption as soon as they become available. Most recent update effective June 1, 2003.

Wisconsin

Commercial Energy Code: 2000 IECC; can use COMCheck-EZ™ for building envelope, but not for lighting or HVAC to show commercial building compliance; COMcheck-PLUS may not be used.
Code Change Cycle: Codes are updated on an ongoing basis through various citizen advisory project committees and the Wisconsin Building Code Advisory Review Board. Most recent update effective: July 1, 2002.

Wyoming

Commercial Energy Code: 1989 MEC may be adopted and enforced by local jurisdictions
Code Change Cycle: Three-year review cycle concurrent with the publications of new editions of the model codes.

Appendix B: 2003 Nonresidential Building Statistics

To better ascertain the impact of ASHRAE/IESNA 90.1-1999, state building characteristics were needed. Information regarding the number of buildings constructed in South Dakota cities and the dollar value spent on those buildings were obtained to assist in the decision making process.

►*Buildings Constructed By City*

Information was collected from sources at the city level. Each individual city was called and asked to provide an in depth set of nonresidential building records for 2003. The information from all responding cities was then compiled in a summary table (Table 4) by types of buildings and their respective cities. To be included in the sample, a building's construction costs were required to exceed $30,000. The cities listed in the following table represent a sample population of 289,077 people, (over 3/8 of South Dakota's total population).

Table 4: Number of Buildings Constructed by Type in Sample Area

City	Population	Store/Customer Service	Warehouse/Storage	Office/Professional	Public Works	Educational	Health Care	Service Stations	Parking Garages	Religious	Industrial	Amusement-Recreational	**Total by City**
Sioux Falls	133,800	29	15	24	1	2	1	1	0	0	0	0	**73**
Rapid City	60,900	12	10	7	0	0	1	0	0	0	1	1	**32**
Aberdeen	24,100	6	8	1	0	1	0	2	1	0	0	0	**19**
Brookings	18,500	3	3	3	0	0	0	1	0	0	0	0	**10**
Mitchell	14,700	3	4	0	0	0	0	0	0	1	0	1	**9**
Pierre	13,900	8	4	6	4	2	1	0	2	1	0	0	**28**
Yankton	13,400	9	4	9	2	1	2	0	1	2	0	0	**30**
Brandon	6,500	8	3	0	1	0	0	1	0	0	0	0	**13**
Dell Rapids	2,980	0	0	0	1	0	0	0	0	0	1	0	**2**
Bonesteel	297	0	2	0	0	1	1	0	0	0	0	0	**4**
Total By Type	**289,077**	**78**	**53**	**50**	**9**	**7**	**6**	**5**	**4**	**4**	**2**	**2**	**220**

Figure 1 is a bar graph corresponding to Table 4. The graph displays the sample number of buildings constructed with respect to building types.

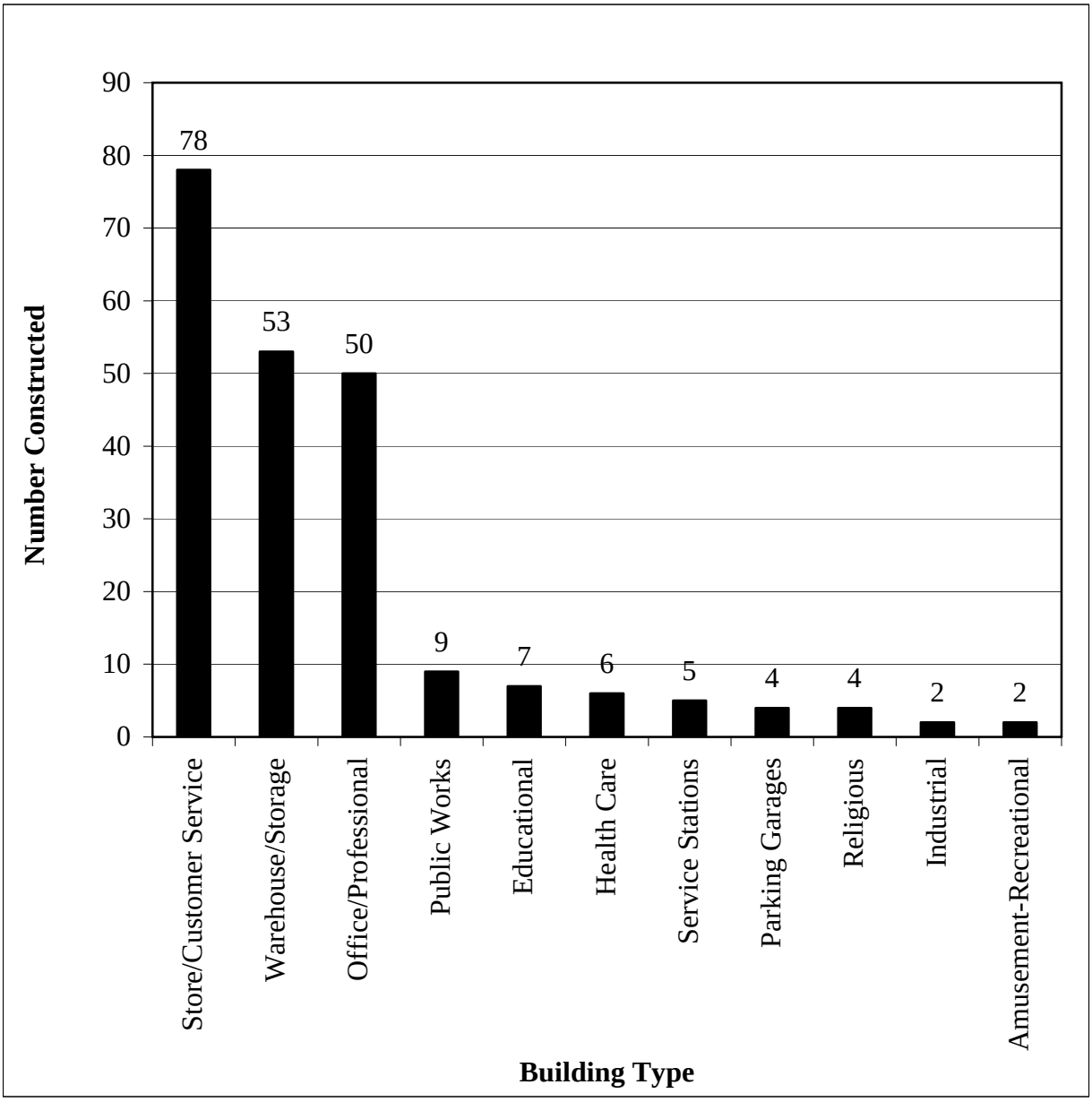

Figure 1: Number of Buildings Constructed by Type in the Sample Area

This figure represents only 3/8 of South Dakota's total population so the next step was to extrapolate from this chart to find numbers that would represent the entire state.

►*Buildings Constructed in South Dakota*

The information displayed in Table 5 represents the total number of buildings constructed in South Dakota by building type. The numbers were calculated by scaling the total number of

buildings found in Table 4 to a number that would represent the entire state. The calculation is shown below:

$$\frac{S_{population}}{SD_{population}} = \frac{S_{number}}{SD_{number}}$$

where,

$S_{population}$ = sample Population (289,077)

$SD_{population}$ = south Dakota Population (764,309)

S_{number} = sample number of buildings constructed

SD_{number} = total number of buildings constructed in South Dakota

Table 5: Projected Number of Buildings Constructed by Building Type in South Dakota

Building Type	Number Constructed
Store/Customer Service	206
Warehouse/Storage	140
Office/Professional	132
Public Works	23
Educational	18
Health Care	16
Service Stations	13
Parking Garages	10
Religious	10
Industrial	5
Amusement-Recreational	5
Total	**578**

Table 5 gives a general idea of the total number of buildings constructed in South Dakota but does have some limitations. The sample number of buildings constructed mainly represents South Dakota's largest cities. When this number is scaled, the result represents South Dakota's remaining population as if it consisted of all large cities. So the number will be a little skewed because South Dakota's remaining population consists of primarily small rural cities.

Figure 2 is a bar graph corresponding to Table 5. The chart displays the scaled number of buildings constructed in South Dakota with respect to building types.

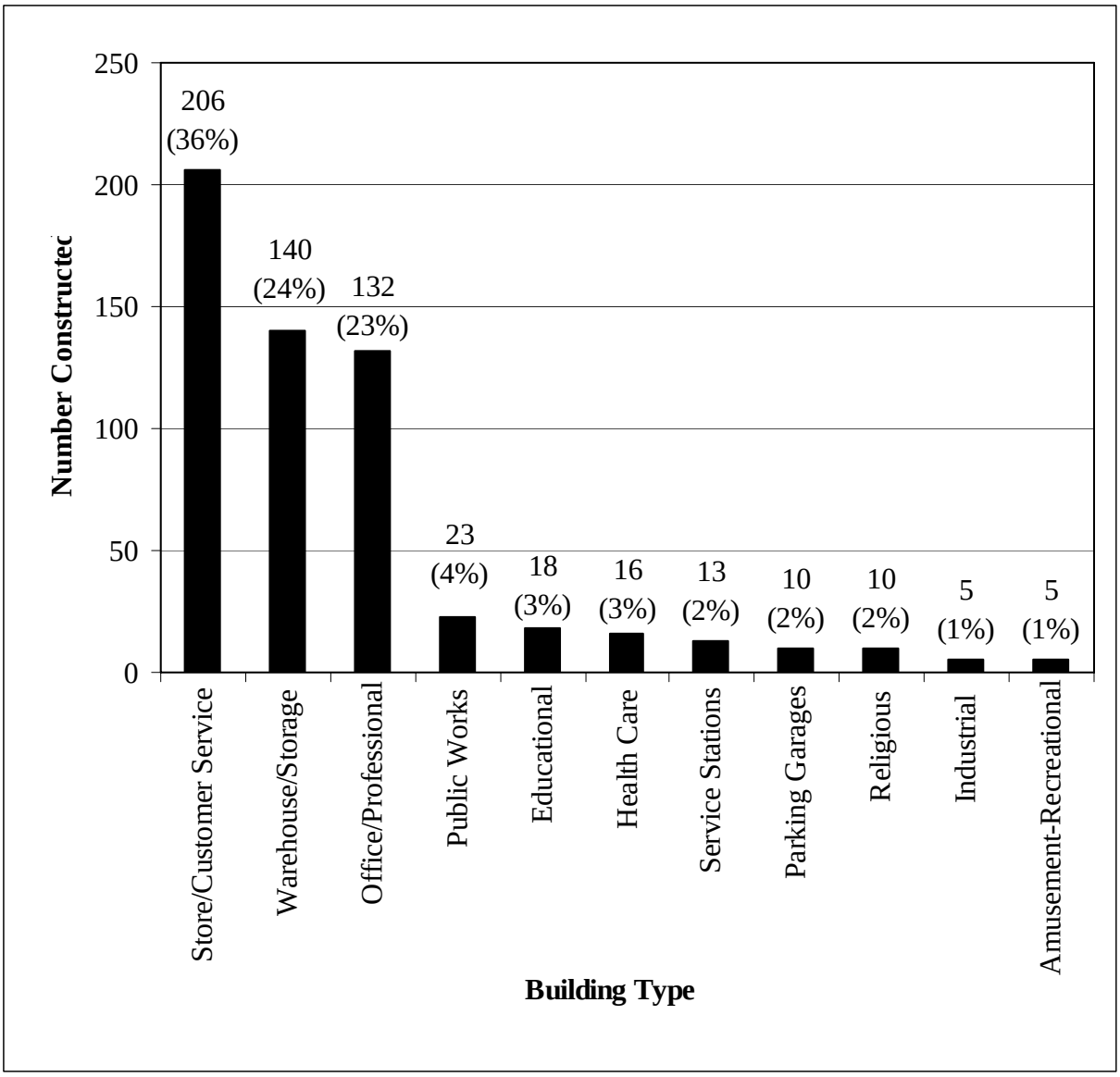

Figure 2: Projected Number of Buildings Constructed by Building Type in South Dakota

►***Funds Invested***

Table 6 was developed by grouping selected cities with their total dollars spent on each type of building in 2003. To be included in the sample, a building's total costs were required to exceed $30,000. The total dollars spent per city was calculated and can be found in the bottom row. By combining each city's dollars spent per building type, a comparison between building types was developed to show which building types absorb the most funds in the sample area. This comparison can be found in the far right column.

Table 6: 2003 Total Dollars Spent on Building Types by City

Building Type	Sioux Falls	Mitchell	Yankton	Rapid City	Pierre	Total Spent Per Building Type
Store/Customer Service	$18,879,000	N/A	$2,289,000	$6,388,000	$1,366,000	**$28,922,000**
Warehouse/Storage	$3,710,000	N/A	$431,000	$4,179,000	$1,418,000	**$9,738,000**
Office/Professional	$23,261,000	$0	$1,351,000	$9,228,000	$1,905,000	**$35,745,000**
Public Works	$1,740,000	$0	$485,000	$0	$1,692,000	**$3,917,000**
Educational	$12,751,700	$0	$924,000	$0	$776,000	**$14,451,700**
Health Care	$3,500,000	$0	$315,000	$1,500,000	$9,490,000	**$14,805,000**
Service Stations	$832,000	$0	$0	$0	$0	**$832,000**
Parking Garages	$0	$0	$269,000	$0	$225,000	**$494,000**
Religious	$0	$248,160	$497,000	$0	$1,375,000	**$2,120,160**
Industrial	$0	$0	$0	$1,000,000	$0	**$1,000,000**
Amusement-Recreational	$0	$50,400	$0	$114,000	$0	**$164,400**
Total Spent Per City	**$64,673,700**	**$298,560**	**$6,561,000**	**$22,409,000**	**$18,247,000**	**$112,189,260**

*N/A – not available

The information in Table 7 was calculated by taking the total number of dollars spent on a building type by city and dividing it by the number of buildings constructed in that city to get an average amount spent per permit. The calculation is shown below:

$$AV = DS / BC$$

where,

AV = Average dollars spent per building type by city
DS = Total dollars spent on a building type in a specified city
BC = Total number of typed buildings constructed in that city

Table 7: 2003 Average Dollars Spent Per Building Type by City

Building Type	Sioux Falls	Mitchell	Yankton	Rapid City	Pierre	Average Spent Per Building Type
Store/Customer Service	$651,000	N/A	$254,333	$532,333	$170,750	**$402,104**
Warehouse/Storage	$247,000	N/A	$107,750	$417,900	$354,500	**$281,788**
Office/Professional	$969,208	$0	$150,111	$1,318,000	$317,500	**$688,705**
Public Works	$1,740,000	$0	$242,500	$0	$423,000	**$801,833**
Educational	$6,375,000	$0	$924,000	$0	$388,000	**$2,562,333**
Health Care	$3,500,000	$0	$157,500	$1,500,000	$9,490,000	**$3,661,875**
Service Stations	$832,000	$0	$0	$0	$0	**$832,000**
Parking Garages	$0	$0	$269,000	$0	$112,500	**$190,750**
Religious	$0	$248,160	$248,500	$0	$1,375,000	**$623,887**
Industrial	$0	$0	$0	$1,000,000	$0	**$1,000,000**
Amusement-Recreational	$0	$50,400	$0	$114,000	$0	**$82,200**
Average Spent Per City Permit	**$2,044,887**	**$149,280**	**$294,212**	**$813,706**	**$1,578,906**	**---**

►*Conclusions*

Based on this data we selected the following buildings to evaluate ASHRAE/IESNA Standard 90.1-1999: educational, healthcare, store/customer service, office/professional and manufacturing.