

REFERENCE SPECIFICATIONS FOR ENERGY AND RESOURCE EFFICIENCY

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Preface

The Public Interest Energy Research (PIER) Program supports public interest energy research and development that will help improve the quality of life in California by bringing environmentally safe, affordable, and reliable energy services and products to the marketplace.

The PIER Program, managed by the California Energy Commission (Commission), annually awards up to \$62 million to conduct the most promising public interest energy research by partnering with Research, Development, and Demonstration (RD&D) organizations, including individuals, businesses, utilities, and public or private research institutions.

PIER funding efforts are focused on the following six RD&D program areas:

- Buildings End-Use Energy Efficiency
- Industrial/Agricultural/Water End-Use Energy Efficiency
- Renewable Energy
- Environmentally-Preferred Advanced Generation
- Energy-Related Environmental Research
- Strategic Energy Research.

What follows is the final report for Building Specification Guidelines for Energy Efficiency, Contract Number 500-98-027, conducted by Eley Associates. This report is entitled *Reference Specifications for Energy and Resource Efficiency*. This project contributes to the Buildings End-Use Energy Efficiency program.

For more information on the PIER Program, please visit the Commission's Web site at: <http://www.energy.ca.gov/research/index.html> or contact the Commission's Publications Unit at 916-654-5200.

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Abstract

The science of energy efficient building design is fairly mature, yet most buildings designed today fail to reach optimum energy efficiency. While ample information is available about energy efficient components and systems, that information does not make it into the plans and specifications – the construction documents that guide contractors in the field.

Architects, engineers, and lighting designers generally wish to include energy efficient elements in their designs, but they don't have the information readily available. The goal of this research project was to provide a resource that is directly useful to building designers by developing a set of reference specifications for users to select from and insert into their construction documents. The intent was that this reference would eliminate a significant barrier to energy efficient design.

Specifications were developed to cover energy efficiency, indoor air quality, and resource efficiency topics. Development of the reference specifications relied primarily on the design experience of the authors. Team members brought experience in architectural, mechanical and electrical systems. Some specification sections were developed from scratch and others were further developments to specifications used in past projects.

These specifications are “recommended” by the State of California, but are not required. Section 01350 of these specifications, Special Environmental Requirements, contains building material emission levels to maintain indoor air quality – and is being recommended by the Los Angeles Unified School District for their contractors and referenced by the Collaborative for High Performance Schools (CHPS) in its air quality criteria.

Executive Summary

BACKGROUND

The science of energy efficient building design is fairly mature, yet most buildings designed today fail to reach optimum energy efficiency. While ample information is available about energy efficient components and systems, that information does not make it into the plans and specifications – the construction documents that guide contractors in the field. The technology of *specifying* efficient buildings is not yet mature. Architects, engineers, and lighting designers generally wish to include energy efficient elements in their designs, but they don't have the information readily available. Typically, specifications from previous jobs are recycled and evolve slowly over time. Therefore, standard specifications usually fail to include up-to-date requirements for energy efficient materials, systems, and commissioning.

PURPOSE AND METHODS

The overall goal of this research project was to provide a resource that is directly useful to building designers by developing a set of reference specifications for users to select from and insert into their construction documents. The specifications are intended to increase the use of energy efficient technologies and equipment which are cost effective to install but for which information, and particularly construction specifications, are currently lacking. The intent was that this reference would eliminate a significant barrier to energy efficient design. At the urging of interested stakeholders, an emphasis on recycled and environmentally preferred materials and indoor air quality was added after the project began.

These goals were met by developing specifications to cover energy efficiency, indoor air quality, and resource efficiency topics. Development of the reference specifications relied primarily on the design experience of the authors. Team members brought experience in architectural, mechanical and electrical systems. Some specification sections were developed from scratch and others were further developments to specifications used in past projects.

Interviews with 18 architects and engineers were conducted prior to development to discover how the specifications could be useful to them. A Delphi technique was used to refine the survey as it proceeded. The survey suggested ways the specifications could be made more useful and usable. For example, a recurring theme among architects was the need for a visually stimulating web site, and for supplemental information to provide guidance on design decisions. It was stated that the specifications would need to be updated regularly to remain relevant, and that ideally access would be free. Although the survey produced many outstanding recommendations, many of them were clearly beyond the scope of the project to deliver, but they do provide guidance for future efforts.

PROJECT OBJECTIVES AND OUTCOMES

There were seven technical and performance objectives defined at the beginning of the project, each is listed here with a brief discussion of outcomes:

- Simplify the specifications of some technologies. 80 specification sections were developed for a wide range of materials and systems. Most of the sections are followed by notes that describe the justification for the specification requirements, discuss costs and benefits, and provide references.
- Address project commissioning and monitoring. Commissioning and monitoring are covered in General Conditions (Section 01810) as well as in the Mechanical (Section 15970), Electrical (Section 16500), and Controls (Section 17959) sections. Sample commissioning forms are included to accompany the specifications, including pre-functional and functional tests for mechanical and control systems.
- Provide specifications for advanced cost-effective technologies. Some of the advanced technologies covered in the reference specifications include: efficient chillers (Section 15620), high efficiency lamps and ballasts, energy management and control systems (Division 17), emissions testing for materials, finishes, and furnishings (Section 01350), and recycled content materials.
- Address integrated controls and open protocols for HVAC. ASHRAE's BACnet protocol is referenced in Division 17 with regards to trending (recording of HVAC system performance data) capabilities. The specifications for control system sequence of operation (Section 17058) address the issue of integrated system operation for efficiency.
- Disseminate new specifications to industry via the Internet. As published, the specifications have been disseminated to the public and industry via several web sites to allow professionals to download the specifications. These web sites are listed in the References section of this report. Files are available for download in both MS Word and Adobe PDF format.
- A specific technical objective was for 25% of downloaded specifications to be used in construction documents. While this may have occurred, information has not been collected to confirm the accomplishment of this goal. However, downloads of the specifications have been tracked, and it would be possible to follow up with a survey of those who accessed the 'downloads' web page to determine the impact of the specification on construction documents.
- A second specific economic objective was to reduce annual building system energy costs by at least 5% for buildings built using specifications. Again, no specific analysis of this goal has been performed, but a 5% energy use reduction would seem a conservative savings estimate for buildings that follow the specifications.

CONCLUSIONS AND RECOMMENDATIONS

- There is a strong interest among architects for information related to green building practices. The information they desire includes specifications, but also includes guidelines and lists of products. Also, the reference specifications are relatively complex. Therefore, while the reference specifications are a necessary and useful resource, alone they do not fully meet the need for information. Reference specifications combined with material lists and links to manufacturers on a graphically rich website with plenty of explanatory material would be a very useful resource, but also one that would be challenging to develop and maintain.
- Much of the interest from architects is related to LEED. Therefore, direct connection to LEED requirements would greatly increase the size of the potential market. Rating systems such as LEED and CHPS are strong drivers of the demand for green specifications. In some areas, the specifications exceed the requirements of LEED. There could be a place in the market for a parallel system, but it would have a much smaller audience without a major promotion effort. As an alternative, an effort could be made to influence LEED to accept the higher standard.
- The reference specifications have not yet attracted as much attention from mechanical engineers, but the recently updated Divisions 15 and 17 should generate more interest. Engineers seek out reference specifications when they are required to include something like commissioning in their specifications that they have not specified in the past. Therefore, LEED commissioning requirements and monitoring and verification requirements provide a driver for the engineering market. Because the specifications do not currently directly reference LEED commissioning requirements, this would be a logical upgrade.
- These specifications are “recommended” by the State of California, but are not required. Section 01350 of these specifications, Special Environmental Requirements, contains building material emission levels to maintain indoor air quality in schools – and is being recommended by the Los Angeles Unified School District for their contractors and referenced by CHPS in its air quality criteria. There is also an effort underway to make the testing process into an ASTM standard. Further efforts to educate the construction and public interest communities about the reference specifications will help to increase their use and integration with building practices.
- For the specifications to remain a dynamic and useful document they require regular and ongoing maintenance and updating. Efforts are underway as the development project ends to identify an owner or process by which the specifications can be continuously updated and most broadly disseminated to the building design community.

BENEFITS TO CALIFORNIA

Benefits already received, and benefits that would occur if the specifications were commercialized, include reduced energy use in state building construction. Benefits could also include reduced time for specification development and possibly altered manufacturer construction or reporting practices, resulting in additional healthy products in the marketplace.

1.0 Introduction

The science of energy efficient building design is fairly mature, yet most buildings designed today fail to reach optimum energy efficiency. While ample information is available about energy efficient components and systems, that information does not make it into the plans and the specifications – the construction documents that guide contractors in the field. The technology of *specifying* efficient buildings is not yet mature.

Architects, engineers, and lighting designers generally wish to include energy efficient elements in their designs, but they don't have the information readily available. Typically, specifications from previous jobs are recycled and evolve slowly over time. Therefore, standard specifications usually fail to include up-to-date requirements for energy efficient materials, systems, and commissioning.

The goal of this research project was to provide a resource that is directly useful to building designers by developing a set of reference specifications for users to select from and insert into their construction documents. The intent was that this reference would eliminate a significant barrier to energy efficient design.

Specifications were developed to cover the following topics:

Energy Efficiency

- Insulation
- Roof
- Windows & skylights
- HVAC
- Lighting
- Commissioning

Indoor Air Quality

- Material emissions

Resource Efficiency

- Material recycled content
- Recyclability
- Sustainably harvested wood
- Site waste management

1.1. Project Objectives

- *Simplify the specification of some technologies.*

The primary intent of the project is to make it easier to specify high performance buildings. This objective is satisfied by providing information that can be cut and pasted into designers' specification.

- *Address project commissioning and monitoring within each of the technologies.*

It is now well established that commissioning is essential for a building to achieve optimal operating efficiency. Commissioning consists of oversight and testing to make sure that systems operate according to the design intent. Monitoring also plays a role in successful commissioning by providing information that can be used to diagnose operating problems. This objective is achieved by including a separate section addressing commissioning and by including specific commissioning and monitoring requirements in appropriate sections.

- *Provide specifications for advanced, cost-effective technologies.*

The idea behind this objective is that specifications for newer, advanced technologies will not be as readily available and are especially appropriate for the reference specifications. And it is clear that the focus must be on cost-effective measures in order to provide useful guidance.

- *Address integrated controls and open protocols for HVAC systems.*

The intent behind this objective is that the reference specifications make it easier for designers, especially mechanical engineers, to specify systems that provide optimal efficiency, or operate as an "integrated" system. Achieving this goal requires that engineers clearly specify the control system "sequences of operation" that the contractor must implement. These sequences can be included in the specifications. In addition, the designer must ensure that the various components of the system can communicate with each other. "Open protocols", such as ASHRAE's BACNET protocol, are one way to improve the odds of compatible communications.

- *Disseminate the new specifications to the industry through the Internet.*

The Internet was seen as the most effective means of distribution.

- *Have at least 25% of those who download the specifications through the Internet or request a hard copy to actually use one or more of the specifications in their construction documents*

The intent is to make the reference specifications as useful as possible to a significant fraction of the designers who are aware of the document.

- *Reduce annual building system (e.g., lighting, HVAC) energy costs of the building whose design used the specifications by at least 5%*

One of the ultimate goals of the reference specifications is to achieve more energy efficient buildings. The opinion of the authors is that much more than 5% savings is possible in most new construction projects. But the reality is that specifications are just one part of the process necessary to achieve an energy efficiency outcome.

1.2. Specification Industry Overview

Specifications, sometimes referred to as the “project manual,” accompany the building plans, and together they comprise the construction documents. These documents are typically assembled by the architect with contributions from subconsultants such as the mechanical and electrical engineers. Some architecture firms, especially the larger ones, have in-house specification writers. Others use independent consultants to assist with developing the specifications. Most specifications have a consistent organization that follows the MasterFormat system of numbering. MasterFormat is published by the Construction Specifications Institute (CSI). Many firms and organizations maintain master guide specifications that they use as the basis for new projects.

There are three organizations in the United States that develop and distribute master guide specifications to other specification writers and building designers. These are comprehensive documents that help designers avoid the time required to research unfamiliar products and to keep update to date on all the latest codes and technologies.

- MasterSpec, by ARCOM (Architectural Computer Services, Inc.)
- SpecLink, by Building Systems Design, Inc.
- SPECTEXT, by Construction Sciences Research Foundation, Inc.

For these three sources, the distribution and pricing method varies, but they are usually available through subscription or for purchase as individual sections.

There are other specification sources that are not as comprehensive as the three listed above but provide information about specific products or systems. One example, also described below, is called GreenSpec, which focuses on green building products. Other sources, listed below, provide specification language from product manufacturers.

With each of these specification products, there is a possibility for incorporating all or part of the reference specification developed in this project. Each follows the same basic numbering system. The reference specifications are not comprehensive; they contain only subsections that affect efficiency and air quality. Therefore they would not replace most of the existing language in these currently available guide specifications. Rather, language from the reference specification could be plugged in to the master guide specifications. However, a bit of work would be required in each case to make sure that the language is consistent with the master guide specification language.

1.2.1. MasterSpec

ARCOM was selected by the AIA in 1995 by AIA to support Masterspec. Development of MasterSpec is overseen by a review committee that meets quarterly. In August 2003, two new Division 1 sections covering LEED requirements were released. In addition, there are roughly 80 individual sections with references to LEED requirements.

Pricing:

- \$110.00 for a single section
- \$80.00/section for 2-4 sections
- \$60.00/section for 5+ sections
- Contact ARCOM for subscription costs

1.2.2. BSD Speclink

This product is both a master guide specification and a software system that assists designers to assemble the specification document. Green building contents include a Section 01115 Green Building Requirements and Section 01735 Indoor Air Quality.

Pricing:

- \$1595 first year, \$995 renewal (for architectural)
- \$995/\$695 for Mech/Elec

1.2.3. SPECTEXT

Development of this master guide specification started in 1978. Green building content added in July 2003 includes Section 01351, Sustainable Project Requirements, and Section 01810, Commissioning. Pricing is available from www.csr.org.

1.2.4. GreenSpec

GreenSpec is a product developed by BuildingGreen, Inc. that includes both product listings as well as guideline specifications. Unlike the three products described above, GreenSpec is not a comprehensive master guide specification. It focuses on the specification of green building products. In that sense, it is similar to the reference specifications.

1.2.5. Manufacturer Specification Sources

Several organizations list information from manufacturers or links to manufacturer sites for product information. The websites managed by these organizations are a resource for specification writers. In many cases the specifications provided by manufacturers are slanted towards their products; they may be “proprietary” specifications. Therefore, designers and specification writers usually need to use some judgment when use language from these sources.

- 4Specs (www.4specs.com)
- ARCAT (www.arcata.com)
- Sweets (sweets.construction.com)

1.3. Report Organization

This report is organized as follows:

Section 1.0	Introduction
Section 2.0	Project Approach
Section 3.0	Project Outcomes
Section 4.0	Conclusions and Recommendations

There is one Attachment, **Reference Specifications for Energy and Resource Efficiency.**

2.0 Project Approach

Development of the reference specifications relied primarily on the design experience of the authors. Team members brought experience in architectural, mechanical and electrical systems. Some specification sections were developed from scratch and others were further developments to specifications used in past projects.

2.1. Methodology for Development

- Team kickoff meeting 4/9/99
The team including architects, mechanical engineers, electrical engineers, and specification writers met to discuss the appropriate content and structure of the specifications.
- Market research by Catherine Cooper Fall 1999
In-depth interviews were conducted with 18 architects, mechanical engineers, electrical engineers, design build contractors, lighting designers, and specification writers.¹ The interviews provided feedback on the concept and appropriate content of the reference specifications as well as a mockup of an on-line format for the materials.
- Additional team meeting 10/15/99
The authors met to hear results of the market research and to refine the specification outline.
- Developed specification content
A template for the format of the specifications was developed and content authors filled in the outline on a combination of modifications to existing specifications and development of new specification language
- Informal survey of ACEEE conference attendees Fall 2000
 - o Presented as a poster and corresponding paper in the conference proceedings
 - o Feedback collected via personal communications with conference attendees
- Public review Spring 2001
 - o California Integrated Waste Management Board and California Department of Health Services primary reviewers
 - o Feedback collected as markups in word document or on printed copy
- Division 15, Mechanical, completion postponed to follow the completion of another PIER project, development of the Advanced VAV Design Guidelines (an element of

¹ Catherine Cooper Market Research, *A Qualitative Research Report on Reference Specifications for Energy and Resource Efficiency*. September 1999.

project number P500-03-082), in order to be able to incorporate research results into the specifications. Completed fall 2003.

- Final project meeting held December 5, 2003 to discuss outcome of project and plans for the future.

2.2. Modifications/Improvements Made Based on Feedback

- Edits were made to the specifications based on reviews and feedback. No major changes were requested or made.
- As mentioned above, improvements were made to Division 15 following other PIER research.
- In addition, updates to Section 01350, Special Environmental Requirements, were made with shared funding from the Collaborative for High Performance Schools (CHPS).

3.0 Project Outcomes

3.1. Outcome Related to Objectives

In this section, project outcomes are presented in the context of the original goals.

3.1.1. Goal: Simplify The Specifications Of Some Technologies

- A total of 80 specification sections were developed for a wide range of materials and systems. These sections simplified specification of these technologies by providing text that designers could cut and paste into their own specifications. (See Table 1.)
- Most of the sections are followed by notes that describe the justification for the specification requirements, discuss costs and benefits, and provide references.

Table 1. Number of Sections Developed, Organized by CSI Divisions

Division Title	Number of Sections Developed
Div 1-General	3
Div 2-Site	2
Div 3-Concrete	3
Div 4-Masonry	2
Div 5-Metals	3
Div 6-Wood & Plastics	7
Div 7-Thermal & Moisture Protection	13
Div 8-Doors & Windows	10
Div 9-Finishes	8
Div 10-Specialties	1
Div 12-Furnishings	5
Div 15-Mechanical	17
Div 16-Electrical	1
Div 17-Controls	5
TOTAL	80

Some users would like to see more design guidance included as a supplement to the specifications. Including more reference information and recommendations would make use of the specifications easier for them. In this regard, the specifications could go farther in simplifying specification of these technologies. However, we felt that existing reference material does a reasonable job of providing design guidance. In future development, it might be useful to include more references or clearer links to existing guidelines.

3.1.2. Goal: Address Project Commissioning And Monitoring

- Commissioning and monitoring are covered in General Conditions (Section 01810) as well as in the Mechanical (Section 15970), Electrical (Section 16500), and Controls (Section 17959) sections.
- Sample commissioning forms are included to accompany the specifications, including prefunctional and functional tests for mechanical and control systems.

3.1.3. Goal: Provide Specifications For Advanced Cost-Effective Technologies

- Some of the advanced technologies covered in the reference specifications include:
 - o Efficient chillers (Section 15620)
 - o High efficiency lamps and ballasts
 - o Energy management and control systems (Division 17)
 - o Emissions testing for materials, finishes, and furnishings (Section 01350)
 - o Recycled content materials

3.1.4. Goal: Address Integrated Controls And Open Protocols For HVAC

- ASHRAE's BACnet protocol is referenced in Division 17 with regards to trending (recording of HVAC system performance data) capabilities.
- The specifications for control system sequence of operation (Section 17058) address the issue of integrated system operation for efficiency.
- Otherwise, the specifications focus on system capabilities without an emphasis on open communication protocols.

3.1.5. Goal: Disseminate New Specifications To Industry Via The Internet

- As published, the specifications have been disseminated to the public and industry via several web sites to allow professionals to download the specifications. These web sites are listed in the References section of this report.
- Files are available for download in both MS Word and Adobe PDF format.

3.1.6. Goal: 25% Of Downloaded Specifications Being Used In Construction Documents

- Information has not been collected to confirm this goal. Downloads of the specifications have been tracked, and it would be possible to conduct an email survey of those who accessed the downloads webpage to determine the impact of the specification on construction documents. (See Table 2.)

Table 2. Website Download Statistics

Year	Download Site Visitors (excluding repeat visits)	
2001	175	Starting 2/20/01
2002	269	
2003	166	Through 10/24/03

3.1.7. Goal: Reduce Annual Building System Energy Costs By At Least 5% For Buildings Built Using Specifications

- No specific analysis has been performed, but the authors are confident that 5% is a conservative savings estimate for buildings that follow the specifications.

3.2. Outcome of Feedback/Review Efforts

The market research study conducted at the beginning of the project emphasized the following findings:

- Crucial to update the specifications regularly
- Additional info beyond specifications desired
 - o Advantages/disadvantages of design alternatives
 - o Costs
 - o Examples, product links
- Website must look good to attract architects

One specification writer commented that the specifications include great information and research. A concern was that the language included a lot of “philosophy,” meaning information that a contractor cannot assign to a direct cost or action. That reviewer also would like to see a “product selection matrix.”

A green building consultant also commented that the specifications contents are impressive. This reviewer also felt that specific references to the US Green Building Council’s LEED program would greatly increase demand.

Other reviewers commented that the emissions testing requirements of Section 01350 are complex and difficult to use.

Most specification writers and designers who were contacted for feedback were very interested and wished to be kept updated on progress.

3.3. Outcome of Market Connection Efforts

3.3.1. Use of the Reference Specifications

- The Los Angeles Unified School District has adopted a policy recommending that new schools follow the requirements of Section 01350, Special Environmental Requirements.
- The Collaborative for High Performance Schools (CHPS) references Section 01350 in its air quality criteria.
- One of the authors of 01350 is working towards creation of an ASTM standard based on the emissions testing protocol described in that section.

3.3.2. Presentations

- A paper and poster were presented at the ACEEE 2000 Summer Study in Asilomar.
- The specifications were described in a presentation to specification writers at the CSI West Region Conference, October 19, 2001.

3.3.3. Media

- The specifications were covered in Environmental Building News, in the July/August 2002 issue. The article was titled "Getting from Design to Construction: Writing Specifications for Green Projects."

3.3.4. Internet Links

- California Integrated Waste Management Board Green Project Specifications
<http://www.ciwmb.ca.gov/GreenBuilding/Specs/>
- New Buildings Institute High-performance Building Specifications
<http://www.newbuildings.org/architecture.htm>
- Link to these Reference Specifications for Energy and Resource Efficiency
http://www.globalgreen.org/programs/building_resources.html
- State of California Pier Program
http://www.energy.ca.gov/pier/buildings/market_outreach.html
- CHPS Publications and Resources <http://www.chps.net/manual/>
- California State Architect Indoor Environment Quality
<http://www.sustainableschools.dgs.ca.gov/SustainableSchools/sustainabledesign/ieq/iaq/constructionphases.html>

3.3.5. Specification Developers

Contacts have been made with the developers of GreenSpec (Building Green, Inc.) and MasterSpec (ARCOM, Inc) to inform them of the reference specifications. However, their level of interest is not yet clear.

4.0 Conclusions and Recommendations

4.1. Conclusions

- The reference specifications have been successfully developed and posted on the Internet, as contracted.
- The authors have received significant positive feedback regarding the contents.
- There has already been a significant impact from the indoor air quality testing requirements of Section 01350, Special Environmental Requirements. Those requirements are referenced in the criteria of the Collaborative for High Performance Schools and by the Los Angeles Unified School District. There is also an effort underway to make the testing process into an ASTM standard.
- There is a strong interest among architects for information related to green building practices. The information they desire includes specifications, but also includes guidelines and lists of products. Therefore, the reference specifications alone do not meet the need for information (which was understood from the beginning).
- Much of the interest from architects is related to LEED. Therefore, direct connection to LEED requirements would greatly increase the size of the potential market. Rating systems such as LEED and CHPS are strong drivers of the demand for green specifications.
- The reference specifications have not yet attracted as much attention from mechanical engineers, but the recently updated Divisions 15 and 17 should generate more interest. Engineers seek out reference specifications when they are required to include something like commissioning in their specifications that they have not specified in the past. Therefore, LEED commissioning requirements and monitoring and verification requirements provide a driver for the engineering market. The specifications do not currently directly reference LEED commissioning requirements.
- The reference specifications are relatively complex, and education for designers would be important if they are to be widely used.
- In some areas, the specifications exceed the requirements of LEED. There could be a place in the market for a parallel system, but it would have a much smaller audience without a major promotion effort.

4.2. Commercialization Potential

Feedback indicates that the reference specifications may not have great potential for direct commercialization in their current form and with their current “unsupported” status. The contents would have greater commercialization potential if they included direct links to LEED requirements. In addition, support is critical because a designer wants to feel confident that the specifications will be well maintained before investing time and money into incorporating them in their construction documents. They will usually want to be able reuse the specifications for subsequent projects and be confident that they can check for updates if best practices change.

There are at least a few options for commercialization:

- Identify a single organization to maintain and distribute the reference specifications as an independent document. One advantage to this approach is that someone would have control over the content and quality of the product. Another advantage is that California state agencies could use references to a single source for construction projects. The significant disadvantage is that a fairly large investment would be necessary for promotion and future development. It is likely that at least a portion of that funding would have to come from public goods charges or a similar public source.
- The path more likely to be successful in reaching the market is to promote incorporation of the specifications by the organizations that are already in the business of selling master guide specifications. The advantage is that this path would require the least investment of public funds. One disadvantage is that quality control would be less certain. There is also no guarantee that the reference specifications will be picked up and promoted by any of these organizations. The success of this approach would depend somewhat on the amount of support provided to these organizations to adapt the specifications for their existing system and to perhaps help promote sales.

There are several organizations that could be approached to help distribute the specifications:

- BuildingGreen (GreenSpec)
- ARCOM (MasterSpec)
- Building Systems Design (SpecLink)
- Construction Sciences Research Foundation (SPECTEXT)

4.3. Recommendations

The recommendations listed here cover both the approach for distribution and promotion as well as a few additions and improvements to the content for future development.

4.3.1. Distribution

The recommended approach is the second of those listed above, to promote the reference specifications to other specifications developers in the hope that they will adopt some or all of the approaches in their products. To be successful, this approach will require some time spent in contacting these distributors and supporting them in the work necessary to understand and incorporate the reference specifications. The steps involved in this process include the following:

- Develop language for a license agreement that provides developers the right to use and modify the language but not apply copyright to the original product. The intent is to allow any interested developers to use the material.
- Contact each of the developers listed above to determine their level of interest and determine requirements they might have in order to use the reference specifications. It is likely that any of these organizations would have to invest some time to adapt the

specifications to their systems. We would try to determine the level of investment necessary and figure out what support they would need in adopting the material.

- Provide support for a limited period of time to assist the specification developers.

4.3.2. Promotion

While working to get specification developers to adopt the material from the reference specifications, it is also recommended that some level of promotion be carried out to develop broader awareness and interest. General interest in the reference specifications would help encourage developers to use the material. Promotion activities could include the following:

- Pursue links on websites that are used as references by specification writers, such as 4Specs, ARCAT, and Sweets.
- Have a representative attend the CSI Meeting, April 2004 in Chicago.
- Get an article published in the SCIP (Specification Consultants in Independent Practice) Newsletter (Mark Kalin, Editor).
- Place the specifications on the Energy Commission website.
- Develop and distribute a press release to other publications and newsletters.

4.3.3. Further Development

There are several recommendations for work to improve both the contents and the implementation of the reference specifications.

- Develop training materials to help specification writers and designers understand the specifications and incorporate them into their own construction documents.
- Add LEED references to the notes portion of appropriate specification sections to point out the relationship to specific LEED credits.
- Develop an additional Division 1 section for LEED compliance.
- Update Section 01350, Special Environmental Requirements.
- Adapt the testing requirements of Section 01350 for ASTM Standard development.
- Add specific references to sections related to Title 24 compliance, such as control system sequence of operations. Energy savings can be a driver as well, related to both Savings By Design incentives and LEED credits.

4.4. Benefits to California

- Benefits already received, and benefits that would occur if the specifications were commercialized, include reduced energy use in state building construction. Benefits could also include reduced time for specification development and possibly altered manufacturer construction or reporting practices, resulting in additional healthy products in the marketplace.

References

Reference Specifications for Energy and Resource Efficiency
<http://www.eley.com/specs/>

MasterSpec
<http://www.arcomnet.com/visitor/masterspec/ms.html>

BSD Speclink
<http://www.bssoftlink.com>

Spectext
<http://www.spectext.com/>

4Specs
<http://www.4specs.com/>

Specification Consultants in Independent Practice (SCIP)
<http://www.scip.com/>

GreenSpec
<http://www.buildinggreen.com/menus/index.cfm>

Whole Building Design Guide
<http://www.wbdg.org/>

Attachment

Summary Attachments

Attachment Name	Contents	Publication #
Reference Specifications for Energy and Resource Efficiency	Divisions 1 through 12, 15 through 17, Supplements to Specifications: HVAC Functional Test Forms HVAC Pre-Functional Test Forms	P500-04-015A1