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# IMPROVING BUILDING CONSTRUCTION SPECIFICATIONS IN STATE AND LOCAL GOVERNMENT

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Public Technology, Inc.
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Robert Muzi, Director of General Services, Township of Lower Merion, Pennsylvania

William Wilkerson, Deputy City Engineer, Akron, Ohio

Technical advisors and reviewers

James L. Binkley, GSA-PCDR-Criteria and Research, Washington, D.C.

Ray Gilbert, Special Projects Manager, Technology Utilization Division, NASA, Washington, D.C.

Thomas Hollenbach, Administrator Technical Programs, Construction Specifications Institute, Washington, D.C.

Gene Lokey, Chief, Systems Development Division, NASA, Washington, D.C.

Milton F. Lunch, General Counsel, National Society of Professional Engineers, Washington, D.C.

Harold F. McKnight, McKnight Engineers, Inc., NSPE representative to PSAE, Washington, D.C.

Campbell L. Reed, Associated General Contractors, Washington, D.C.

Lee Rogers, Head, Criteria Management Branch, Naval Facilities Engineering Command, Alexandria, Virginia

John Schruben, President, Production Systems for Architects and Engineers, Inc., Washington, D.C.

Edward T. Sullivan, Chief, Technology Utilization Division, NASA, Washington, D.C.

James Weir, Chief, Technical and Support Facilities Branch, NASA, Washington, D.C.

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Edward J. Lisee of PTI was the principal author of this publication. Other PTI staff who helped prepare the report are: Joseph M. Carlson, Vice President; Thomas V. Tiedeman, Building Technology, Program Manager; Roger Lubin, Director, NASA/PTI Technology Application Program, Robert N. Sockwell, Marjory Baumert, and Oni Lee.

## EXECUTIVE SUMMARY

Construction specifications are an important factor in controlling the cost, the quality of materials and the workmanship in construction projects. Specifications that are incomplete, erroneous, or out of date often lead to poor construction, costly design changes, and even disputes and litigation. Poor specifications can result in added costs ranging up to hundreds of thousands of dollars on a single project. Thus, improvement of the construction specifications for projects can provide major benefits for public sector jurisdictions in cost control, quality control, and project performance.

Specifications are written by architects or engineers to define the quality, performance, and installation requirements for construction projects. They are generally included in a project manual and function as a legal document specifying the builder's obligations. Specifications may also be used by the facility owner to monitor the builder's performance.

State and local governments are infrequent builders and consequently do not maintain staff experienced with the preparation or evaluation of specifications. The Construction Specifications Advisory Group, which was organized by PTI to address specification problems and organizational constraints, made several recommendations for improving specifications:

- Evaluate the current system used to develop specifications.
- Adopt a guide or master specification system.

- Automate preparation if volume is sufficient.
- Require that specifications developed by a private contractor follow the MASTERFORMAT system.
- Evaluate all specifications carefully before accepting them

Master specification systems that centralize data on all types of building materials, products, and processes have been developed to facilitate the preparation of individual specifications. Most are organized according to the MASTERFORMAT system. Guide specifications that require the insertion or deletion of standardized information have also been developed. Although both of these systems resulted from the specific needs of users and providers of services, state and local governments can benefit from such a centralized, up-to-date source of information. For jurisdictions preparing their own specifications, staff time and cost are reduced. For those subcontracting the preparation, master specifications provide a means of evaluating the specifications submitted.

Master specifications also allow reductions in preparation time and cost through automation. This may range from assembling extracted specification data by cutting and pasting or by computer retrieval and word processing. Because automated systems are revised frequently, savings may be made in several areas:

- Use of up-to-date materials, components, and systems.
- Specifications based on value engineering studies.
- Reduced proofreading time.
- Lower bids from elimination of contingency charges for unforeseen problems.
- Reduced cost for preparation of specifications by a private contractor as well as by staff.

- Lower insurance premiums due to decreased errors and ommissions.
- Less likelihood of disputes and litigation.

In a survey of users of the MASTERSPEC System developed by Production Systems for Architects and Engineers (PSAE), 75 percent used the system to develop specifications or to review those submitted by a private contractor. The other 25 percent used the system only as a reference tool. Most users employed manual preparation methods for specifications. The most frequently identified cost saving was the reduction of research time because of the availability of data.

After the development of the first master specification system, SPECSINTACT, by the National Aeronautics and Space Administration, several others were developed: Comspec, the Corps of Engineers Guide Specifications, the GSA Guide Specifications, MASTERSPEC, and the NAVFAC Guide Specifications, as well as SPECSINTACT. All have some application for state and local governments. They are presented in Chapter IV.

PTI's Construction Specifications Advisory Group has prepared an evaluation outline which can be used to determine the appropriate types of specifications for specific applications. The outline can also be used to evaluate the adequacy of existing specifications and to identify needed improvements. The evaluation outline is presented in Chapter V.

This guide contains useful material for those local officials who are involved in construction management. In many jurisdictions, this can include Public Works, Engineering, Utilities and other departments that manage the construction and operation of facilities.

# I. THE PROBLEM

## Introduction

Every building construction project has a set of documents that spell out physical and legal requirements. These documents consist of the drawings or plans and a project manual, which generally includes bid requirements, contract forms, conditions of the contract, and specifications. MASTERFORMAT, developed by the Construction Specifications Institute (CSI), provides a model for organizing such a manual. In 1977 Public Technology, Inc. (PTI), conducted a nationwide survey of state and local governments and found that many have difficulty in developing the building specifications for the last section of the manual. Therefore, this report focuses on how government jurisdictions can improve the development, evaluation and use of specifications for new buildings.

## Why Specifications?

Specifications are statements written by architects or engineers to clarify the content of building construction drawings by providing minimum standards for building materials, equipment, systems, and components. The drawings show the scope of the work and indicate its extent, size, and configuration. The specifications give information on quality, performance, and installation.

As part of the construction contract, specifications are legal documents. They are intended to give contractors a precise understanding

of the required work. Owners generally do not have extensive knowledge of specifications. However, they should be concerned with how the specifications affect the budget, building quality, programming and aesthetics. Public owners also should be concerned with health and safety considerations. The legal importance of specifications can not be overemphasized. Legal judgments depend to a great degree on the clarity and ease of interpreting the specifications. Sound specifications can, therefore, help to avoid costly legal conflicts.

Specifications are also important because they give the owner or the owner's representative a basis on which to measure the contractor's compliance with the contract and with levels of performance.

## Potential Specification Problems

A PTI survey identified two primary types of problems that government jurisdictions have with building specifications: those related to the means and methods a public owner has for handling building projects and those related to the development and use of the specifications themselves.

Problems frequently arise in the development and use of specifications because of inadequate staff experience. The survey indicated that jurisdictions with fewer construction projects tended to lack experienced in-house project staff and to have more problems developing specifications than those with larger programs. Although public construction is a large segment of the building construction market, most jurisdictions build infrequently and cannot justify long-term program staffing. As a result building construction is often

handled on an ad hoc basis through the administrator's office or the public works department.

Each time a building project is undertaken, a similar set of problems is encountered. Some of the unique problems of public builders are:

- Lack of a methodology to evaluate and improve specifications.
- Lack of standard paragraphs from which to formulate specifications or to communicate desires to the designers.
- Use of public works specifications which may not be appropriate for building construction.
- Lack of coordination between government offices on project management and specifications review.
- Lack of experienced staff to review project specifications.
- Use of out-of-date specifications.
- Cost of keeping a specifications system up-to-date.
- Contingency costs in estimates and bids to cover ambiguous specifications.
- Increased costs from unnecessarily high performance standards.
- Lack of coordination of specifications and drawings.
- Disputes, litigation, and change orders from errors, omissions, and ambiguity.

## II. DEFINING SOLUTIONS

### Recommendations

With financial support from the National Aeronautics and Space Administration, Technology Utilization Division, PTI gathered a group of government officials and industry experts to examine the problems that state and local governments have with specifications. As a result, several steps were recommended to improve the handling of building specifications:

- Evaluate the current system of developing project specifications.
- Require the use of the CSI 16-division format for all specification preparation.
- Adopt a guide or master specification system.
- Use an automated preparation system if specification volume is sufficient.
- Evaluate specifications submitted before accepting them.

To help implement these recommendations, a brief review of how to prepare specifications follows.

### Selecting the Type of Specifications

There are two basic types of specifications--closed and open. Manufacturer's specifications, federal specifications, and performance specifications (see Table 1) can be characterized as being closed or open.

Closed specifications are prescriptive specifications in which one or a limited number of specific materials, products, or processes are mentioned. A specification that provides such a detailed description

## TABLE 1*

## Types of Specifications

| TYPE | PRINCIPLE FEATURES | ADVANTAGE | DISADVANTAGE |
|---|---|---|---|
| Closed | Limits materials to one or a select few | Allows architect to hold quality and avoid low quality substitutions. | Limits competition. |
| Manufacturer's | Information for writer, usually closed type | Source for information. | Usually requires rewrite to eliminate closed, non competitive aspects. |
| Open | Allows any product that meets requirements | Allows competition. | May include low quality items that barely meet requirements. |
| Federal | Usually open type | Requirements printed. Used as master copy material. | Many unnecessary items may be included. |
| Performance | Specifies results not specific products or methods | Allows contractor to select material and/or method. | Limits architect's control to accept or reject. |

* Adapted from Jack R. Lewis, Construction Specifications (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1975), pp. 52-53.

that only one item can possibly qualify is also closed. For example, "Colorless, polished, transparent wired glass complying with Federal Standard DD-G-451, Type III, Class 1, Kind A, Form 1, Diamond Mesh approximately 7/8" x 1/8" size diamonds as manufactured by ABC Glass Company."

Open specifications are written to permit any number of materials, products, or processes to be used to satisfy a particular building need if it is acceptable for the work. For example, "Asphalt floor tile 9" x 9" x 1/8", marbleized grade C color as selected by owner, complying with Federal Standard SS-T-306."

Manufacturer's specifications are written by the manufacturer as guides for specification writers and potential buyers. They are generally closed because they are frequently written so that no other manufacturer's product can comply.

Federal specifications are usually open specifications written to include minimum requirements for product compliance and to assure maximum competition among products. Any manufacturer's product that meets the requirements may be selected.

Performance specifications state the requirements a product must meet but leaves how the desired result is achieved up to the contractor. They can be closed or open. For example, a floor finish durability specification might state, "The exposed surface of this floor, except if carpet, shall have a 4H rating."

Although laws often limit the types of specifications a jurisdiction may use to assure competition, the pros and cons of each option should be weighed carefully for each job with the assistance of competent

specification experts. The choice can significantly influence the cost, quality, and time duration of construction.

## Preparing Specifications

The preparation of specifications for a building project is generally a straightforward, although detailed and difficult process. It is basically the same whether it is carried out by a public construction staff or by an architectural or engineering contractor. The specification writer's task can be divided into six steps:

1. Preliminary research.
2. Preparation of preliminary specifications.
3. Comprehensive research.
4. Preparation of final specifications.
5. Review of copy for errors.
6. Reproduction of final specifications.

Although the actual cost of preparing specifications may be less than one-half percent of the total project cost, the quality of the specifications can have a major impact on the final cost of construction. To avoid poorly formulated specifications, state and local officials must be concerned with the preparation process beginning with the selection of the type of specifications.

When the design process starts, the specification writer begins preliminary research to identify design decisions, available quality levels of materials and structures, and potential measures of performance. The alternative quality levels are an important contribution to the preliminary specifications. The preliminary specifications which are drafted from

this data, should be completed at about the same time as the preliminary design. They should be arranged according to the Construction Specifications Institute (CSI) MASTERFORMAT outline. This has 16 divisions that follow the construction process and a seventeenth, division 0, that covers bidding and contract requirements. These divisions are:

| Division | Topic |
|---|---|
| 0 | Bidding & Contract Requirements |
| 1 | General Requirements |
| 2 | Site Work |
| 3 | Concrete |
| 4 | Masonry |
| 5 | Metals |
| 6 | Wood and Plastics |
| 7 | Thermal and Moisture Protection |
| 8 | Doors and Windows |
| 9 | Finishes |
| 10 | Specialties |
| 11 | Equipment |
| 12 | Furnishings |
| 13 | Special Construction |
| 14 | Conveying Systems |
| 15 | Mechanical |
| 16 | Electrical |

Each division is divided into sections that are complete in themselves and that ideally specify only one unit of work. This allows for flexible bidding and subcontracting by trade and makes changes easier. The information in each section is presented in three parts: general, products, and execution. The assembled materials constitute a complete project manual. (See Appendix A for division and section titles.)

While working drawings are being prepared, the specification writer should be conducting comprehensive research and drafting the final specifications. Resources that may be used include specifications from similar projects, product catalogs, federal specifications, and master specifications.

While the final specifications are being drafted, the method of reproducing them should be determined. The number of copies needed will determine the method to some degree, and the method of copying can affect the preparation of the originals. The final copy must be carefully reviewed for errors and any necessary corrections made. Problems in the review and reproduction of final specifications can be minimized when an automatic preparation system is used.

## III. MASTER SPECIFICATION SYSTEMS

### What Are They?

Ideally, a master specification system includes complete data on every type of building material, product, and process that might be required in the construction of any building or structure. It is designed so that some sections may be used verbatim and others, with only minor editing changes. Thus, selected sections form a complete set of specifications for a project. However, no master specification system currently available achieves this ideal, and additional requirements usually must be inserted, especially for unique design features. Variations in climate, building codes, preference, and availability may require adjustments in the master. Nevertheless, it is more effective to amend a master specification than to develop project specifications from scratch. Most master specifications are organized according to the Construction Specifications Institute (CSI) MASTERFORMAT discussed previously.

Another form of the master specification uses the "insert approach." This requires an experienced specification writer to fill in blanks in the master with appropriate information. This is not a true master specification and is often referred to as a Guide Specification.

### Who Develops and Uses Master Specifications?

Master specifications are developed by users, such as architects, engineers, and government agencies, and by providers of services, such

as consultants, trade associations, and federal agencies. Most master specifications developed by architectural and engineering firms are tailored to the type of work the firm performs most frequently. Often, each type of project such as hospitals, residences, and offices, has its own master. Government master specifications are developed to satisfy the particular needs of the government agency using them, including those tailored to public works projects, government office buildings, and the special requirements of the military. Federal agencies generally have full guide or master specification systems. Consultants have developed and marketed their own master specification systems, and two professional societies, the American Institute of Architects and the Construction Specifications Institute, have promoted comprehensive master specification systems to aid their members.

## How Can Master Specifications Help?

Although an ideal master specification system has not been developed, some of the better ones are useful for state and local governments. A survey of current local government users by PTI confirmed this. Master specifications provide a centralized source for most of the information needed to develop particular project specifications. This saves preparation time, reduces preparation costs, and improves comprehensiveness and accuracy. Surveys corroborate that the use of master specifications can significantly reduce the time and cost of preparing specifications. Master specifications also help government officials in their review of specifications prepared by private sector professionals. Automated techniques can improve the process further. However, the use of master

specifications does not eliminate the need to have a trained professional assemble the final document.

## Automation

Automation of specification preparation is the application of machines to the preparation process. The machines used may vary from scissors for cut-and-paste to computer-controlled text editors and printers that retrieve and reproduce the information from master specifications. Minimal typing errors, increased production speed, and a high quality appearance are the primary advantages of an automated system.

The Construction Specifications Institute distinguishes six levels of automated specification preparation. The upper two levels which tie into cost estimating and design have not yet been developed. The four types of equipment used in the four functional levels are the typewriter, automatic typewriter, small computer and large computer. The six levels are reprinted below.

Level 1: The manual "cut and paste" method used by approximately half of the design firms in the United States at the present time.

Level 2: The printing of specification information on a perforated paper tape, or magnetic cards or tape which can be put into a robot typewriter, as needed, for automatic typing of the information. This provides a limited storage-and-retrieval system. Text can be manipulated to a limited degree by plugging "stops" into the tape and later typing in the blanks manually.

Level 3: A hookup of the automatic typewriter with a small computer. This allows the user to store a great deal of information, retrieve it quickly, and gives him a wide range of flexibility in manipulating blocks of text and even specific terms. Changes can be ordered in the "master" by entering the computer with a password.

Level 4: Level 4 differs from 3 more in refinement than in concept. It allows more flexible and complex manipulations of information. Level 4 represents the highest state-of-the-art for the handling of information.

Level 5: The introduction of more than a specification into the computer. For example, comparative cost data could be introduced into the system. Project costs might be monitored on a daily or weekly basis. Other inputs would allow other complex and nearly instant calculations. Level 5 operation could also allow the designer to tell a client which of several sites he should build on, given a computer analysis of the fiscal interrelationships of land prices, local taxes, labor, code restrictions, and the availability of materials.

Level 6: A new dimension in design. Level 6, now undergoing experimentation, would allow a designer to draw on a cathode ray screen with a computerized light pen. The act of drawing would, in effect, ask a question or series of questions. It would produce, instantly, the answer to a technical question affecting a detail. Or, it might produce a set of alternate plans for a given building type.*

State and local governments should choose a level of automation commensurate with the volume of work. Jurisdictions that do not prepare their own specifications may use availability of automated techniques as a criterion with which to evaluate private contractors.

## Benefits of Automation

A study for the Naval Facilities Engineering Command (NAVFAC), indicated that automated master specification systems can save in the cost of preparation and improve the quality of construction specifications. The study estimated that NAVFAC "would save from $180,000 to $297,000 per year of a current $771,000 expenditure by using a computerized specification production system in place of the current mixture of manual and

*Construction Sciences Research Foundation, Inc., Today-Comspec Tomorrow-A New World of Building. (Washington, D.C., 1970).

automatic typewriter techniques." This represents a savings of 23 to 39 percent.

Savings from improvements in the technical quality of project specifications may also result because automated systems are revised frequently with the most recent technological developments. Savings have been demonstrated in several areas:

- Use of up-to-date construction materials, components, and systems.
- Revision of master specifications based on value engineering studies.
- Reduced proofreading time.
- Lower bids from contractors who do not have to add extra charges to cover potential problems from unclear specifications.
- Lower cost for specification preparation by a private contractor.
- Lower insurance premiums for errors and omissions.
- Less likelihood of litigation and disputes.

User Experience with MASTERSPEC

In June 1978 PTI conducted telephone interviews of public users of the master specification system, MASTERSPEC, developed by Production Systems for Architects and Engineers' (PSAE). The objectives of the survey were to find out how a master specification system is used by government agencies and what benefits resulted. The agencies surveyed varied widely in the types of building construction they handled. Users included the Federal Aviation Administration, a bureau of indian affairs, a department of mental health, and a school district.

*Dalton-Dalton-Little, Inc., Final Report, "Summary of Practice and Systems of Automated Construction Specifications (Kensington, MD), 1971.

About 75 percent of those surveyed used MASTERSPEC to develop project specifications or to review those developed by a contractor. The others used MASTERSPEC primarily as a reference tool. The consensus of users was that MASTERSPEC generally could be adapted to most types of building construction. Concern was raised about the extension of these specifications to renovation projects. However, the users who dealt primarily with demolition and rehabilitation felt that MASTERSPEC could be modified for use with existing buildings. Some felt that new sections concerning renovation work should be added. Most users were quite enthusiastic about the value of MASTERSPEC as a reference document.

Substantial amounts of time were spent by users to train the staff in the use of MASTERSPEC. However, outside training may alleviate this problem. Several universities and colleges subscribe to the system, and use it as a teaching aid. They also conduct classes and training sessions on how to use MASTERSPEC manuals.

Among the user organizations interviewed, in-house specifications staffs ranged from one person to eighty. The educational background of staff members also varied widely, from individuals with college degrees to those without high school diplomas. The median staff had 3 to 4 professionals, typically architects, engineers, and/or specification writers.

The majority of the users employed a manual process to compile specifications and were satisfied with the results. Benefits sited included decreased preparation time over formulating an entire specification, reduced specification errors, and better project control. The most frequently identified cost saving was the reduction in research time due

to the availability of reference information. Also, several users reduced the amount of office paperwork.

Most of the users who contracted with outside design firms to prepare specification, require the use of MASTERSPEC or a similar master specification system. The use of CSI's MASTERFORMAT was also considered desirable.

## IV. CURRENT MASTER SPECIFICATION SYSTEMS

### SPECSINTACT: A First

The space program requires NASA to build, maintain, and modify a large number of ground-based support facilities from high-rise gantry towers and sophisticated test facilities to warehouse and office space. Obtaining economical construction that meets performance requirements is a major concern that NASA frequently has to face. In the late 1960s NASA developed a new specifications system that made improvement in several areas:

- Increased use of professional expertise in the development of specifications.
- Fewer errors and omissions.
- Uniformity in format and technical requirements.
- Incorporation of new technology.
- Comprehensive review.
- Reduced costs for developing individual project specifications.

The computer-based system of specification writing, developed by NASA's Langley Research Center, contains a comprehensive central catalog of master specification sections applicable to many types of construction which is accessible to all NASA centers. Using the SPECSINTACT system, designers for any project may retrieve relevant sections of text from computer storage and modify them to fit the needs of the project at hand. Thus, engineers can concentrate on modifying the basic master specifications, rather than developing all specifications from scratch. The "management

by exception" character of SPECSINTACT also allows NASA project monitors to focus their review solely on modifications made to the basic master specifications. Because master specifications are developed by a single center, only one professional team is needed to monitor use of the system, and to incorporate new and cost-effective building technologies.

Recently the NASA field centers placed SPECSINTACT on word processing equipment. Each field center has a self-contained mini-computer equipped with input unit, disk storage, and printer output.

The SPECSINTACT system is organized according to MASTERFORMAT's 16 divisions. A seventeenth division on, welding/brazing/soldering, was added to meet special needs, but there are plans to eliminate it by integrating the information into the other divisions.

Many of the specifications required by NASA are not entirely appropriate for builders with less stringent or differing needs. However, the basic technology of an automated master specifications system, is applicable to many needs. Several related systems are coming into widespread use in the construction industry. Some of the more important systems are discussed below and presented in Table 2. Sample specifications for the systems discussed below are presented in Appendix B. Mailing addresses are given in Chapter IV, Information Sources.

Comspec

Comspec is a computer-based system for storing, retrieving, manipulating, and printing out any part or all of a stored master specification. The system has a library of public master specifications available to all subscribers, and it can be used to manipulate and store

any master specification for individual needs. Comspec was developed by the Construction Sciences Research Foundation for the Construction Specifications Institute (CSI). It is available exclusively through the nationwide shared-computer facilities of Bowne Time Sharing. The master specifications currently in Comspec's library are: DOD Military Family Housing, Army Corps of Engineers Guide Specifications, NAVFAC Guide Specifications, Federal Aviation Administration Specifications, General Services Administration Guide Specifications, Veterans Administration Specifications, and division 1 master specifications for the CSI MASTER-FORMAT.

Corps of Engineers Guide Specifications

The U.S. Army Corps of Engineers Guide Specifications have evolved over a number of years and now cover divisions 2 through 16 of the CSI MASTERFORMAT. Division 1 is omitted as inappropriate for Army construction needs. The Corps specifications are available to any interested party. They are primarily intended to assist contractors in preparing project specifications. The guide specifications have application to civilian building needs when the structures are of a similar type. Project specifications are developed by a process of deleting, filling in blanks, and adding special sections to the guide specification sections.

GSA Guide Specifications

The Public Buildings Service (PBS) of the General Services Administration (GSA) produces its own master specifications for federal office building construction. Divisions 1 through 16 of the CSI MASTERFRONT

are included in the master which is regularly updated on a two-year cycle. Each section of a specification generally follows the three part CSI section format, although the headings for each part are not used. GSA specifications are written to guide contractors in preparing project specifications. The GSA system is developed according to the guidelines and procedures of the Federal Construction Council Guide Specification Program. Project specifications are developed by deleting, filling in blanks, and adding any special sections needed.

MASTERSPEC

One of the first SPECSINTACT spin-off systems to be developed was the MASTERSPEC system developed by Production Systems for Architects and Engineers (PSAE). PSAE was organized by the American Institute of Architects. Like SPECSINTACT, the MASTERSPEC system is based on a comprehensive catalog of master specifications maintained by a full-time professional staff. The system follows MASTERFORMAT organization and can be used in computerized word processor, or manual modes. Personnel from the support contractor for SPECSINTACT were instrumental in developing MASTERSPEC and are still active with the system.

MASTERSPEC covers all building types, including housing and heavy industrial buildings. Subscribers are provided with a user's manual and a comprehensive table of contents (TOC). Together with the user notes that are contained within the sections of a specification, MASTERSPEC is easily used by the specification writer.

In the past eight years MASTERSPEC has grown from 300 subscribes to about 1,100. Users include architects, engineers, universities,

colleges, and government jurisdictions. Insurance companies providing liability coverage for architects and engineers provide reduced premiums for professionals subscribing to MASTERSPEC.

NAVFAC Guide Specifications

Following NASA's lead, the Naval Facilities Engineering Command (NAVFAC), decided to consider automating the production of specifications in 1971. The system is now in operation and is available in a fully automated mode. The NAVFAC specification system covers most types of construction from general public works to hospitals. It covers all 16 divisions of the CSI MASTERFORMAT, although there are some deviations in section numbers and use of section subheadings, which is typical for all the master specification systems reviewed. There is a guide and index for using the system, and the specifications are available upon request.

TABLE 2

Master Specifications Matrix*

| Systems | User Notes | Open or Closed | Updating Cycles | Form | Training Requirements** | Available Automation | Building Types Covered |
|---|---|---|---|---|---|---|---|
| CORPS OF ENGINEERS SPECIFICATIONS | Yes | Open, federal | 3 year | Looseleaf | Minimal | No | All |
| GSA GUIDE SPECIFICATIONS | Yes | Open, federal | 2 year | Looseleaf | Minimal | Soon | Office |
| MASTERSPEC | Yes | Open | 2-1/2 year | Looseleaf | 1 day work shops offered | Yes | All |
| NAVFAC SPECIFICATIONS | Yes | Open, federal | 3 year | Looseleaf | Minimal | Yes | All |
| SPECSINTACT | Yes | Open, federal | as needed | •Looseleaf •Word processing-Tape, Disk, Diskette | 2-1/2 hour session offered | Yes | All |

*All systems listed use the CSI 16 division format, however, most have their own section organization and numbering.
**This assumes you are dealing with a professional specification writer.

## V. EVALUATING MASTER SPECIFICATION SYSTEMS: A HOW-TO GUIDE

### Master Specifications for State and Local Governments

Although several master and guide specification systems are used in private and federal construction, PTI's 1977 survey found no system developed specifically for use by state and local governments. However, some jurisdictions have used the available systems for building construction, as well as roads and streets, sewers, and lighting.

The consensus of PTI's Construction Specifications Advisory Group was that state and local governments can benefit from the use of master specifications. There are several approaches government jurisdictions may take to utilize master specifications, including developing an in-house system, subscribing to specification systems or services (e.g. Masterspec, Comspec), or using consultants who have their own system.

### How to Evaluate Master Specification Systems

Deciding which alternatives to use or evaluating an existing system, can be difficult and complex. An evaluation of a master specification requires the comparison of many detailed issues with expected measures of performance. The methodology for accomplishing this and a set of user performance requirements developed by PTI's Construction Specification Advisory Group, is outlined below. The evaluation methodology is based on that used by NASA to determine the cost-effectiveness of the

SPECSINTACT system and ways in which the system could be made more acceptable and worthwhile for its users. The NASA study is entitled "NASA SPECSINTACT System Analysis."

The issues involved in evaluating a master specification system range from the initial cost of the system to the comprehensiveness, quality and useability of the catalog. To examine these issues a "Master Specification Evaluation Outline" has been devised. It has six evaluation categories, which are subdivided into appropriate issues. The six evaluation categories cover:

1. Content of the catalog.
2. Updating.
3. Form of the catalog.
4. User interaction.
5. Review of final project specifications.
6. Overall system performance.

Each issue in these categories has a performance requirement. In order to evaluate a master specification simply use the evaluation outline to examine it, issue by issue, for conformance to the listed requirements. Each requirement is valued as desirable, highly desirable, or mandatory. Those specifications that do not measure up to the mandatory requirements are considered more deficient than those that do not meet the desirable requirements.

The evaluation outline can be used to evaluate existing master specifications for improvements or to compare alternative systems to determine which is most suitable. The Master Specification Evaluation Outline and related performance requirements are presented below. The

performance requirements were developed by PTI's Construction Specifications Advisory Committee and can be adjusted to reflect the expectations of individual jurisdictions. Because some of the requirements are more refined than others, focusing them more clearly may be necessary.

Master Specifications Evaluation Outline

1. Content of the master specifications catalog:

   1.1 Orientation toward state and local government

      1.1.1. (Highly desirable) The master specification system should be developed and worded specifically for state and local government building construction to reflect the types of buildings commonly constructed by state and local governments and the legal constraints facing these jurisdictions. (A construction specification system developed primarily for private industry or for federal construction may be useful, but one developed primarily for state and local governments would be more desirable.)

      1.1.2. (Mandatory) A user's manual specifically directed toward state and local government construction should be provided.

   1.2 Basic format of presentation

      1.2.1. (Mandatory) The specifications catalog should be based on the Construction Specifications Institute (CSI) MASTERFORMAT, divisions 1-16.

   1.3 Comprehensiveness by division

      1.3.1. (Highly desirable) Each of the 17 divisions of the CSI MASTERFORMAT should be covered.

   1.4 Comprehensiveness by section

      1.4.1. (Mandatory) Each technical section which is used should be comprehensive and complete in coverage.

   1.5 Broadscope or narrow scope

      1.5.1. (Mandatory) Use of the system should be flexible for narrow scope, broad-scope, and short language specifications. The subsection should allow for alternative levels of performance and/or quality. Use must also be flexible to allow for incorporation of standard specifications developed by the user jurisdiction or for regional variations.

1.6. Wordiness of text

1.6.1. (Mandatory) Clear concise text is essential.

1.7. Reliability

1.7.1. (Mandatory) Typographical errors and incorrect information must be kept to a minimum. (Recurrence of such problems will quickly destroy the usefulness of a master specification.)

1.8. User notes

1.8.1. (Mandatory) Lists of symbols for drawing coordination, abbreviations, and reference standards used should be included and easily accessed.

1.8.2. (Mandatory) User notes should accompany specifications text to aid the state and local government user and to aid design professionals under contract to the jurisdictions.

1.9. Master versus guide specifications

1.9.1. (Highly desirable) The specifications catalog should be developed as a master specification rather than as a guide specification with blank spaces to be filled in. (A master specification would be more useful than a guide specification as a project specification review aid by local jurisdictions with fairly low levels of design and construction activity.)

1.10. Closed versus open specifications

1.10.1. (Mandatory) Master specifications must be open in nature, not specifying products by brand or containing unnecessary requirements which would effectively restrict product competition.

1.10.2. (Highly desirable) Building materials, systems, and components deemed to satisfy the various specifications should be included in the master specification catalog or in a companion document. The recommendation on acceptability will be that of the system developer, not the user jurisdictions. Further, this product acceptance shall not be binding on the user of the system.

1.11. Format

1.11.1. (Mandatory) For computerized print-out of project specifications the exact format (type size, margins, spacing, page size) must be compatible with rules existing in various jurisdictions.

2. Updating of Master Specifications

2.1. Frequency of update

2.1.1. (Highly desirable) Users of the master specification system should be provided with updated text revisions at least annually. More frequent revisions are desirable.

2.2. Scope of annual review and update

2.2.1. (Highly desirable) All divisions and sections should be reviewed for update at least once annually.

2.2.2. (Highly desirable) Automated and looseleaf systems may be updated simultaneously.

2.3. User participation in updating

2.3.1. (Mandatory) User feedback should be actively solicited to assist in keeping the catalog up to date. Comments and suggestions for modification made by users should be available to the public.

2.3.2. (Mandatory) A review committee of system users should interact regularly to review proposed changes to the master specification system and to provide general direction.

2.4. Composition of review committee

2.4.1. (Highly desirable) The master specification review committee should include state and local government users of the system.

2.5. Extent of professional support

2.5.1. (Mandatory) The master specification catalog should be maintained and kept current with new technology and standards by a professional staff.

2.6. Highlighting recent changes to the catalog

2.6.1. (Mandatory) Some form of coding or graphics should be used to identify sections of the text which have been recently revised.

3. Form of master specification catalog

3.1. Bound volume, looseleaf, microfiche

3.1.1. (Mandatory) The master specifications catalog should be in looseleaf format.

3.2. On-line versus off-line computer storage

3.2.1. (Highly desirable) Electronic data processing for catalog access and specification production should be available to suit the needs of major construction agencies if they determine it to be economically feasible.

4. User Interaction

4.1. Training required for professional personnel

4.1.1. (Highly desirable) No special training for professional staff should be required.

4.2. Training necessary for clerical personnel

4.2.1. (Highly desirable) Training required for clerical and professional users of the system should be available but should be minimized.

4.3. Availability of technical assistance

4.3.1. (Highly desirable) Assistance to answer technical specification questions and system use problems should be available to users from the group maintaining the master specification system.

4.4. Relative time required for making initial pull of relevant sections

4.4.1. (Mandatory) Assembling sections from the master specification must be significantly more efficient than doing it conventionally.

4.4.2. (Desirable) When comparing master specifications systems you should favor the system from which relevant sections can be pulled the fastest.

4.5. Relative time required for revising sections for a specific project

4.5.1. (Highly desirable) Revisions of the scope and content of sections should be able to be accomplished simply by the deletion of material.

4.5.2. (Mandatory) All references to proprietary products must be readily deleted in the final development of project specifications unless no reasonably equivalent product exists.

4.5.3. (Desirable) When comparing master specification systems you should favor the system that requires the least amount of time to revise sections.

4.6. User notes

4.6.1. (Mandatory) User notes must be readily deleted for preparation of final project or bid specifications.

5. Owner agency review of final project specifications

5.1. Deviations from master specifications

5.1.1. (Highly desirable) Aids should be provided to enable a local official reviewing project specifications to quickly identify sections of the text which have been modified when drawn from the master specification.

5.2. Detail required in proofreading

5.2.1. (Mandatory) Proofreading must be no more detailed than that required for conventionally prepared specifications. (In fact, proofreading should be simplified by consistent format and high-lighting of revisions.)

5.3. Legal review

5.3.1. (Highly desirable) The use of a master specification should minimize the need for legal review.

6. Overall system performance

6.1. Cost of acquiring system

6.1.1. (Mandatory) The cost of acquiring a master specification system must be justified by your volume of work.

6.2. Cost of using a master specification system

6.2.1. (Mandatory) The anticipated cost for preparing a project specification from the master specification must be less than the costs for conventional preparation techniques.

The remainder of the issues under this category can only be evaluated accurately by field testing the master specification. If that is not feasible you may attempt to evaluate these issues on the basis of the experience of others who have used the system and your estimates of how effective the system will be in the issue areas listed. You should, of course, favor the master specification system that performs best overall on these and all preceding issues. The list of issues for this category are concluded below:

6.3. What contractor contingency reserves can be expected from uncertainty over specifications

6.4. Cost of change orders resulting from bad specifications

6.5. Cost reduction for specification preparation and review

6.6. Reduction in time for preparation and review of specifications

6.7. Impact of specification quality on final project construction cost

6.8. Impact of specification quality on overall project quality including durability, life cycle cost, and maintainability

## VI. INFORMATION RESOURCES

### Organizations and People

Comspec Automated Specification System:

Comspec Services
Suite 818
1025 Connecticut Avenue, N.W.
Washington, D.C. 20036
(202) 785-8800

Construction Specifications Institute (CSI):

Administrator Technical Programs
Construction Specifications Institute
Suite 300
1150 17th Street, N.W.
Washington, D.C. 20036
(202) 833-2160

Corps of Engineers Guide Specifications:

Department of the Army
Office of the Chief of Engineers
Washington, D.C. 20314
Attention: DAEN-MCE-S
(202) 693-7371

GSA Guide Specifications:

Mr. James A. Parker
Chief of Criteria and Research Branch
Office of Construction Management
General Services Administration
Public Buildings Service
18th and F Streets, N.W.
Washington, D.C. 20405
(202) 566-0714

MASTERSPEC Master Specifications System:

Mr. Leonard Bain, AIA
Production Systems for Architects and Engineers, Inc.
1735 New York Avenue, N.W.
Washington, D.C. 20006
(202) 785-7246

Naval Facilities Engineering Command (NAVFAC)
Specification System:

Commander
NAVFAC
Code 0432
200 Stovall Street
Alexandria, Virginia 22332
Attention: Mr. Lee Rogers
(703) 325-0450

SPECSINTACT Automated Specification System
(Mini Computer Word Processing):

Mr. James F. Weir, Jr.
NASA Headquarters
Code BXE-9
Washington, D.C. 20546
(202) 755-3285

# APPENDIX A

## MASTERFORMAT Divisions

## Section Titles

**DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS**

| | |
|---|---|
| 00010 | PRE-BID INFORMATION |
| 00100 | INSTRUCTIONS TO BIDDERS |
| 00200 | INFORMATION AVAILABLE TO BIDDERS |
| 00300 | BID/TENDER FORMS |
| 00400 | SUPPLEMENTS TO BID/TENDER FORMS |
| 00500 | AGREEMENT FORMS |
| 00600 | BONDS AND CERTIFICATES |
| 00700 | GENERAL CONDITIONS OF THE CONTRACT |
| 00800 | SUPPLEMENTARY CONDITIONS |
| 00950 | DRAWINGS INDEX |
| 00900 | ADDENDA AND MODIFICATIONS |

**DIVISION 1 - GENERAL REQUIRMENTS**

| | |
|---|---|
| 01010 | SUMMARY OF WORK |
| 01020 | ALLOWANCES |
| 01030 | SPECIAL PROJECT PROCEDURES |
| 01040 | COORDINATION |
| 01050 | FIELD ENGINEERING |
| 01060 | REGULATORY REQUIRMENTS |
| 01070 | ABBREVIATIONS AND SYMBOLS |
| 01080 | IDENTIFICATION SYSTEMS |
| 01100 | ALTERNATES/ALTERNATIVES |
| 01150 | MEASUREMENT AND PAYMENT |
| 01200 | PROJECT MEETINGS |
| 01300 | SUBMITTALS |
| 01400 | QUALITY CONTROL |
| 01500 | CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS |
| 01600 | MATERIAL AND EQUIPMENT |
| 01650 | STARTING OF SYSTEMS |
| 01660 | TESTING, ADJUSTING, AND BALANCING OF SYSTEMS |
| 01700 | CONTRACT CLOSEOUT |

**DIVISION 2 - SITEWORK**

| | |
|---|---|
| 02010 | SUBSURFACE INVESTIGATION |
| 02050 | DEMOLITION |
| 02100 | SITE PREPARATION |
| 02150 | UNDERPINNING |
| 02200 | EARTHWORK |
| 02300 | TUNNELLING |
| 02350 | PILES, CAISSONS AND COFFERDAMS |
| 02400 | DRAINAGE |
| 02440 | SITE IMPROVEMENTS |
| 02480 | LANDSCAPING |
| 02500 | PAVING AND SURFACING |
| 02590 | PONDS AND RESERVOIRS |
| 02600 | PIPED UTILITY MATERIALS AND METHODS |
| 02700 | PIPED UTILITIES |
| 02800 | POWER AND COMMUNICATION UTILITIES |
| 02850 | RAILROAD WORK |
| 02880 | MARINE WORK |

**DIVISION 3 - CONCRETE**

| | |
|---|---|
| 03050 | CONCRETING PROCEDURES |
| 03100 | CONCRETE FORMWORK |
| 03150 | FORMS |
| 03180 | FORM TIES AND ACCESSORIES |
| 03200 | CONCRETE REINFORCEMENT |
| 03250 | CONCRETE ACCESSORIES |
| 03300 | CAST-IN-PLACE CONCRETE |
| 03350 | SPECIAL CONCRETE FINISHES |
| 03360 | SPECIALLY PLACED CONCRETE |
| 03370 | CONCRETE CURING |
| 03400 | PRECAST CONCRETE |
| 03500 | CEMENTITIOUS DECKS |
| 03600 | GROUT |
| 03700 | CONCRETE RESTORATION AND CLEANING |

**DIVISION 4 - MASONRY**

| | |
|---|---|
| 04050 | MASONRY PROCEDURES |
| 04100 | MORTAR |
| 04150 | MASONRY ACCESSORIES |
| 04200 | UNIT MASONRY |
| 04400 | STONE |
| 04500 | MASONRY RESTORATION AND CLEANING |
| 04550 | REFRACTORIES |
| 04600 | CORROSION RESISTANT MASONRY |

**DIVISION 5 - METALS**

| | |
|---|---|
| 05010 | METAL MATERIALS AND METHODS |
| 05050 | METAL FASTENING |
| 05100 | STRUCTURAL METAL FRAMING |
| 05200 | METAL JOISTS |
| 05300 | METAL DECKING |
| 05400 | COLD-FORMED METAL FRAMING |
| 05500 | METAL FABRICATIONS |
| 05700 | ORNAMENTAL METAL |
| 05800 | EXPANSION CONTROL |
| 05900 | METAL FINISHES |

**DIVISION 6 - WOOD AND PLASTICS**

| | |
|---|---|
| 06050 | FASTENERS AND SUPPORTS |
| 06100 | ROUGH CARPENTRY |
| 06130 | HEAVY TIMBER CONSTRUCTION |
| 06150 | WOOD METAL SYSTEMS |
| 06170 | PREFABRICATED STRUCTURAL WOOD |
| 06200 | FINISH CARPENTRY |
| 06300 | WOOD TREATMENT |
| 06400 | ARCHITECTURAL WOODWORK |
| 06500 | PREFABRICATED STRUCTURAL PLASTICS |
| 06600 | PLASTIC FABRICATIONS |

**DIVISION 7 - THERMAL AND MOISTURE PROTECTION**

| | |
|---|---|
| 07100 | WATERPROOFING |
| 07150 | DAMPPROOFING |
| 07200 | INSULATION |
| 07250 | FIREPROOFING |
| 07300 | SHINGLES AND ROOFING TILES |
| 07400 | PREFORMED ROOFING AND SIDING |
| 07500 | MEMBRANE ROOFING |
| 07570 | TRAFFIC TOPPING |
| 07600 | FLASHING AND SHEET METAL |
| 07800 | ROOF ACCESSORIES |
| 07900 | JOINT SEALANTS |

**DIVISION 8 - DOORS AND WINDOWS**

| | |
|---|---|
| 08100 | METAL DOORS AND FRAMES |
| 08200 | WOOD AND PLASTIC DOORS |
| 08250 | DOOR OPENING ASSEMBLIES |
| 08300 | SPECIAL DOORS |
| 08400 | ENTRANCES AND STOREFRONTS |
| 08500 | METAL WINDOWS |
| 08600 | WOOD AND PLASTIC WINDOWS |
| 08650 | SPECIAL WINDOWS |
| 08700 | HARDWARE |
| 08800 | GLAZING |
| 08900 | GLAZED CURTAIN WALLS |

**DIVISION 9 - FINISHES**

| | |
|---|---|
| 09100 | METAL SUPPORT SYSTEMS |
| 09200 | LATH AND PLASTER |
| 09230 | AGGREGATE COATINGS |
| 09250 | GYPSUM WALLBOARD |
| 09300 | TILE |
| 09400 | TERRAZZO |
| 09500 | ACOUSTICAL TREATMENT |
| 09550 | WOOD FLOORING |
| 09600 | STONE AND BRICK FLOORING |
| 09650 | RESILIENT FLOORING |
| 09680 | CARPETING |
| 09700 | SPECIAL FLOORING |
| 09760 | FLOOR TREATMENT |
| 09800 | SPECIAL COATINGS |
| 09900 | PAINTING |
| 09950 | WALL COVERING |

**DIVISION 10 - SPECIALITIES**

| | |
|---|---|
| 10100 | CHALKBOARDS AND TACKBOARDS |
| 10150 | COMPARTMENTS AND CUBICLES |
| 10200 | LOUVERS AND VENTS |
| 10240 | GRILLES AND SCREENS |
| 10250 | SERVICE WALL SYSTEMS |
| 10260 | WALL AND CORNER GUARDS |
| 10270 | ACCESS FLOORING |
| 10280 | SPECIALTY MODULES |
| 10290 | PEST CONTROL |
| 10300 | FIREPLACES AND STOVES |
| 10340 | PREFABRICATED STEEPLES, SPIRES, AND CUPOLAS |
| 10350 | FLAGPOLES |
| 10400 | IDENTIFYING DEVICES |
| 10450 | PEDESTRIAN CONTROL DEVICES |
| 10500 | LOCKERS |
| 10520 | FIRE EXTINGUISHERS, CABINETS, AND ACCESSORIES |
| 10530 | PROTECTIVE COVERS |
| 10550 | POSTAL SPECIALTIES |
| 10600 | PARTITIONS |
| 10650 | SCALES |
| 10670 | STORAGE SHELVING |
| 10700 | EXTERIOR SUN CONTROL DEVICES |
| 10750 | TELEPHONE ENCLOSURES |
| 10800 | TOILET AND BATH ACCESSORIES |
| 10900 | WARDROBE SPECIALTIES |

**DIVISION 11 - EQUIPMENT**

| | |
|---|---|
| 11010 | MAINTENANCE EQUIPMENT |
| 11020 | SECURITY AND VAULT EQUIPMENT |
| 11030 | CHECKROOM EQUIPMENT |
| 11040 | ECCLESIASTICAL EQUIPMENT |
| 11050 | LIBRARY EQUIPMENT |
| 11060 | THEATER AND STAGE EQUIPMENT |
| 11070 | MUSICAL EQUIPMENT |
| 11080 | REGISTRATION EQUIPMENT |
| 11100 | MERCANTILE EQUIPMENT |
| 11110 | COMMERCIAL LAUNDRY AND DRY CLEANING EQUIPMENT |
| 11120 | VENDING EQUIPMENT |
| 11130 | AUDIO-VISUAL EQUIPMENT |
| 11140 | SERVICE STATION EQUIPMENT |
| 11150 | PARKING EQUIPMENT |
| 11160 | LOADING DOCK EQUIPMENT |
| 11170 | WASTE HANDLING EQUIPMENT |
| 11190 | DETENTION EQUIPMENT |
| 11200 | WATER SUPPLY AND TREATMENT EQUIPMENT |
| 11300 | FLUID WASTE DISPOSAL AND TREATMENT EQUIPMENT |
| 11400 | FOOD SERVICE EQUIPMENT |
| 11450 | RESIDENTIAL EQUIPMENT |
| 11460 | UNIT KITCHENS |
| 11470 | DARKROOM EQUIPMENT |
| 11480 | ATHLETIC, RECREATIONAL, AND THERAPEUTIC EQUIPMENT |
| 11500 | INDUSTRIAL AND PROCESS EQUIPMENT |
| 11600 | LABORATORY EQUIPMENT |
| 11650 | PLANETARIUM AND OBSERVATORY EQUIPMENT |
| 11700 | MEDICAL EQUIPMENT |
| 11780 | MORTUARY EQUIPMENT |
| 11800 | TELECOMMUNICATION EQUIPMENT |
| 11850 | NAVIGATION EQUIPMENT |

**DIVISION 12 - FURNISHINGS**

| | |
|---|---|
| 12100 | ARTWORK |
| 12300 | MANUFACTURED CABINETS AND CASEWORK |
| 12500 | WINDOW TREATMENT |
| 12550 | FABRICS |
| 12600 | FURNITURE AND ACCESSORIES |
| 12670 | RUGS AND MATS |
| 12700 | MULTIPLE SEATING |
| 12800 | INTERIOR PLANTS AND PLANTINGS |

**DIVISION 13 - SPECIAL CONSTRUCTION**

| | |
|---|---|
| 13010 | AIR SUPPORTED STRUCTURES |
| 13020 | INTEGRATED ASSEMBLIES |
| 13030 | AUDIOMETRIC ROOMS |
| 13040 | CLEAN ROOMS |
| 13050 | HYPERBARIC ROOMS |
| 13060 | INSULATED ROOMS |
| 13070 | INTEGRATED CEILINGS |
| 13080 | SOUND, VIBRATION, AND SEISMIC CONTROL |
| 13090 | RADIATION PROTECTION |
| 13100 | NUCLEAR REACTORS |
| 13110 | OBSERVATORIES |
| 13120 | PRE-ENGINEERED STRUCTURES |
| 13130 | SPECIAL PURPOSE ROOMS AND BUILDINGS |
| 13140 | VAULTS |
| 13150 | POOLS |
| 13160 | ICE RINKS |
| 13170 | KENNELS AND ANIMAL SHELTERS |
| 13200 | SEISMOGRAPHIC INSTRUMENTATION |
| 13210 | STRESS RECORDING INSTRUMENTATION |
| 13220 | SOLAR AND WIND INSTRUMENTATION |
| 13410 | LIQUID AND GAS STORAGE TANKS |
| 13510 | RESTORATION OF UNDERGROUND PIPELINES |
| 13520 | FILTER UNDERDRAINS AND MEDIA |
| 13530 | DIGESTION TANK COVERS AND APPURTENANCES |
| 13540 | OXYGENATION SYSTEMS |
| 13550 | THERMAL SLUDGE CONDITIONING SYSTEMS |
| 13560 | SITE CONSTRUCTED INCINERATORS |
| 13600 | UTILITY CONTROL SYSTEMS |
| 13700 | INDUSTRIAL AND PROCESS CONTROL SYSTEMS |
| 13800 | OIL AND GAS REFINING INSTALLATIONS AND CONTROL SYSTEMS |
| 13900 | TRANSPORTATION INSTRUMENTATION |
| 13940 | BUILDING AUTOMATION SYSTEMS |
| 13970 | FIRE SUPPRESSION AND SUPERVISORY SYSTEMS |
| 13980 | SOLAR ENERGY SYSTEMS |
| 13990 | WIND ENERGY SYSTEMS |

**DIVISION 14 - CONVEYING SYSTEMS**

| | |
|---|---|
| 14100 | DUMBWAITERS |
| 14200 | ELEVATORS |
| 14300 | HOISTS AND CRANES |
| 14400 | LIFTS |
| 14500 | MATERIAL HANDLING SYSTEMS |
| 14600 | TURNTABLES |
| 14700 | MOVING STAIRS AND WALKS |
| 14800 | POWERED SCAFFOLDING |
| 14900 | TRANSPORTATION SYSTEMS |

**DIVISION 15 - MECHANICAL**

| | |
|---|---|
| 15050 | BASIC MATERIALS AND METHODS |
| 15200 | NOISE, VIBRATION, AND SEISMIC CONTROL |
| 15250 | INSULATION |
| 15300 | SPECIAL PIPING SYSTEMS |
| 15400 | PLUMBING SYSTEMS |
| 15450 | PLUMBING FIXTURES AND TRIM |
| 15500 | FIRE PROTECTION |
| 15600 | POWER OR HEAT GENERATION |
| 15650 | REFRIGERATION |
| 15700 | LIQUID HEAT TRANSFER |
| 15800 | AIR DISTRIBUTION |
| 15900 | CONTROLS AND INSTRUMENTATION |

**DIVISION 16 - ELECTRICAL**

| | |
|---|---|
| 16050 | BASIC MATERIALS AND METHODS |
| 16200 | POWER GENERATION |
| 16300 | POWER TRANSMISSION |
| 16400 | SERVICE AND DISTRIBUTION |
| 16500 | LIGHTING |
| 16600 | SPECIAL SYSTEMS |
| 16700 | COMMUNICATIONS |
| 16850 | HEATING AND COOLING |
| 16900 | CONTROLS AND INSTRUMENTATION |

# APPENDIX B

## Master Specification System Samples

Corps of Engineers Guide Specifications
GSA Guide Specifications
MASTERSPEC
NAVFAC Guide Specifications
SPECSINTACT

3. DELIVERY AND STORAGE: Deliver all materials to the building site in original unopened containers. Store materials in a clean dry area with temperature maintained above 70° F. for two days prior to installation.

4. ENVIRONMENTAL REQUIREMENTS: Areas to receive resilient flooring shall be maintained at a temperature above 70° F. for two days before, during and after application. A minimum temperature of 55° F. shall be maintained thereafter.

5. SCHEDULING: Resilient flooring shall be scheduled after any other work which would damage the finished surface of the flooring.

6. PATTERN: Pattern shall be as indicated.

7. EXTRA STOCK: Spare tiles of each color and pattern shall be furnished at the rate of [___] [5] tiles for each 1,000 tiles installed. Tiles shall be from the same lot as installed.

8. MATERIALS:

8.1. Vinyl-Asbestos Tile: Vinyl-asbestos tile shall conform to Fed. Spec. SS-T-312, Type IV, and shall be 12-inches square and [3/32] [1/8 ]-inch thick. Tile shall be of the color and pattern indicated with the color and pattern uniformly distributed throughout the thickness of the tile. Flooring in any one continuous area shall be from the same lot and shall have the same shade and pattern.

8.2 Sheet Vinyl Flooring: Sheet vinyl flooring shall conform to Fed. Spec. L-F-475, Type II, Grade A, with inorganic backing. Sheet vinyl flooring shall be not less than 72-inches wide.

8.3 Wall Base: Wall base shall conform to Fed. Spec. SS-W-40, Type I or Type II, Style B. Base shall be 4-inches high, minimum 0.080-inch thick, _____ in color. Premolded corners in matching size, shape, and color shall be provided for all right-angle external and internal corners.

8.4 Edge Strips: Edge strips shall be of vinyl plastic, 1-inch wide and of thickness to match flooring.

8.5 Adhesive: Adhesive for [vinyl-asbestos tile] [sheet vinyl flooring] and wall base shall be of a type recommended by the flooring manufacturer.

8.6 Underlayment and Crack Filler: Underlayment and crack filler shall be of a type recommended by the flooring manufacturer.

8.7 Polish: Polish shall conform to Fed. Spec. P-F-430 or P-@-155.

7. REQUIREMENTS FOR ALUMINUM WINDOWS:

7.1 Shapes shown are representations of design, function, and required profile. Dimensions shown are minimum.

7.2 The aluminum windows shall be of the side-hinged, double-glazed, insulating type with a narrow slat venetian blind located between the two panes of glass. The unit types and sizes shall be as shown on the drawings. Accessories shall include [mullions,] [closures,] [trim,] clips, anchors, fastenings, weatherstripping. (D)

8. MATERIALS:

8.1 Material shall conform to the requirements of Master Specification Part A (ARCHITECTURAL) of AAMA 302.9.

8.2 Glass and Glazing:

8.2.1 Glass shall be [of types and thickness indicated on the drawings.] [types, thickness and quality specified in Section, GLASS AND GLAZING.] (E)

8.2.2 Windows shall be factory glazed by the manufacturer.

8.2.3 Glazing beads shall be the removable fin type beads and the glazing system shall be "wedge" type process with a continuous neoprene wedge exerting pressure holding the glass against an outer tape sealing materials.

8.3 Weatherstrips: Double weatherstripping shall be provided. External and internal vinyl or neoprene weatherstripping shall be provided around the entire perimeter of the sash members where they contact the frame.

8.4 Thermal Barrier: The window frames shall be continuously separated by a .125 inch (3.175 mm) thick closed cell neoprene or the window frames shall be continuously separated by a .375 inch (9.525 mm) thermal barrier material consisting of a two-part, chemically curing, high strength polymer resin (Polyurethane).

8.4.1 The window dual vents shall be separated by an extruded polyvinyl chloride insulator which seals against the vinyl bulb and closed cell neoprene to provide a continuous compression seal. A continuous vinyl or neoprene seal shall be provided between the vent and the window frame.

9. FABRICATION:

9.1 Fabrication of window units shall conform to the requirements of Master Specification Part A (ARCHITECTURAL) of AAMA 302.9.

Continuously heat spaces to receive tile to a temperature of 70 degrees F., for at least 48 hours prior to installation whenever project conditions are such that heating is required. Maintain 70 degrees F. temperature continuously during and after installation as recommended by the tile manufacturer, but for not less than 48 hours. Maintain a temperature of not less than 55 degrees F in areas where work is completed.

PART 2 - PRODUCTS

©© ADD SPECIFIC MFRS. COLORS, PATTERNS, AND GRADES IF NOT SCHEDULED.

MATERIALS:

Colors and Patterns: Provide as shown or scheduled. Provide tile units with uniformly distributed color and pattern throughout the thickness of the tile, except as otherwise indicated. Variation in shades and off pattern matches between containers will not be acceptable.

Asphalt Tile (AspT): FS SS-T-312, Type I, 9" x 9" x 1/8" gage, unless otherwise indicated.

©© BELOW IS GENERAL COLOR RANGE ONLY.

Color and Pattern: As selected by Architect from color Group "C", unless otherwise indicated.

©© RUBBER TILE ALSO AVAILABLE IN 3/32" AND 3/16" GAGE THICKNESSES FROM SELECTED MFRS.

Rubber Tile (RbrT): FS SS-T-312, Type II, 12" x 12" x 1/8" gage, unless otherwise indicated.

©© DELETE BELOW IF NONE; COORD. DRAWINGS IF RETAINED. VERIFY AVAILABILITY; UL LISTS ONLY ONE MANUFACTURER (BURKE).

For conductive rubber tile (C-RbrT), provide units listed by Underwriters' Laboratories as acceptable. for "Electrically Conductive Flooring" and complying with NFPA No. 56A.

©© 1/8" GAGE IS "STANDARD" THICKNESS FOR SOLID VINYL TILE BELOW.

Vinyl Tile (VinT): FS SS-T-312, Type III, 12" x 12" x 1/8" gage.

* Meeting rails [and] [meeting stiles] shall be in line with the meeting 12.9
* rail [or stile] of the prime window. 12.11

5. MATERIALS: 12.13

5.1 Wrought Aluminum: Alloy of 3000 or 5000 series. 12.16

5.2 Extruded Aluminum: Alloy 6063 or 6463, temper T5 or T6. 12.19

5.3 Storm Windows: Conform to all requirements of ANSI/AAMA 1002.9, (E) 13.1
* Specification [HSW-C1] [VSW-C1], except as otherwise specified herein. 13.4
Extrusions shall have a wall thickness of not less than 0.045 inch. 13.5

5.3.1 Air Infiltration shall be not more than [2.0] [0.5] cfm per foot 13.10
of crack when tested in a laboratory in accordance with ASTM E283 at a (F)
pressure of 1.56 psf (25 mph wind).

5.3.2 Uniform Load Tests: Window shall be subjected separately to ext- 13.13
erior uniform load of 20 psf and an interior uniform load of 10 psf each (G)
for 10 seconds, in conformance with ASTM E330. 13.14

5.3.3 Inserts shall operate smoothly without binding. Horizontally 13.17
operating inserts shall be provided with wheels, rollers or nylon glides on
rigid vinyl and meeting the ANSI specification of the fifteen (15) pound 13.18
pull test, to assure smooth operation.

5.3.4 Window Glass: Float glass may be used in lieu of sheet glass spe- 13.21
cified in ANSI/AAMA publication.

5.4 Storm Doors: Conform to all requirements of ANSI/AAMA 1102.7, (E) 14.3
Specification CSD-C1, except as otherwise specified herein. Doors shall be 14.4
self-storing, equal lite, combination storm doors.

5.4.1 Hardware: Each storm door shall have a spring loaded latch bolt, 14.7
operated by a turn knob, thumb piece, or lever handle, and lockable from 14.8
the inside; a tubular, adjustable, pneumatic or hydraulic closer, ANSI
A156.4, Type C09363 or C09343; a chain door stop BHMA 1201, Type L82232; 14.9
and an adjustable sweep, mounted on a bottom expander or with a flat metal
retainer.

5.4.2 Door Frames: Expander type, regular Z-bar, or New England Z-bar 14.12
as required to suit actual conditions at the door openings.

5.4.3 Screening for Storm Doors: Aluminum, Fed. Spec. RR-W-365, Type 14.15
VII, mesh 18 by 14 heavy or 18 by 18 regular.

5.4.4 Glazing for Doors: Safety glazing material conforming to CPSC 14.18
Standard 16 CFR Part 1201.

---PART 2 - PRODUCTS---

---MATERIALS---

NOTE: SELECT FROM THE FOLLOWING PROCEDURES AND DELETE THE INAPPLICABLE PARAGRAPH.

RESILIENT FLOORING, BASE AND EDGING STRIPS SHALL BE PROVIDED IN THE COLORS AND PATTERNS SCHEDULED.

RESILIENT FLOORING, BASE AND EDGING STRIPS SHALL BE AS SELECTED BY THE CONTRACTING OFFICER FROM THE MANUFACTURER'S STANDARD COLOR RANGE.

---SHEET VINYL FLOORING

NOTE: INCLUDE THE ABOVE PARAGRAPH TITLE AND THE FOLLOWING PARAGRAPHS IF SHEET VINYL RESILIENT FLOORING IS REQUIRED.

SCHEDULES AND DRAWINGS SHOULD INDICATE FLOOR JOINT LOCATION, PATTERNS AND COLORS OF SHEET VINYL FLOORING REQUIRED FOR PROJECT.

SHEET VINYL IS NORMALLY MANUFACTURED IN ROLLS 72 INCHES WIDE BY 42 TO 100 FEET LONG.

SHEET VINYL FLOORING SHALL CONFORM TO FS L-F-474A (1) INT. AMD. 2 (11 OCT 65), TYPE II, GRADE A, AND THE FOLLOWING MODIFICATIONS:

MINIMUM OVERALL THICKNESS SHALL NOT BE LESS THAN 0.090 INCH. FLOORING SHALL BE SUITABLE FOR ABOVE GRADE, ON GRADE AND BELOW GRADE APPLICATION.

---VINYL ASBESTOS TILE

NOTE: INCLUDE THE ABOVE PARAGRAPH TITLE AND THE FOLLOWING PARAGRAPHS IF VINYL ASBESTOS TILE IS REQUIRED.

SCHEDULES AND DRAWINGS SHOULD INDICATE SIZE AND

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