Quality Manual Guideline

AMERICAN INSTITUTE OF STEEL CONSTRUCTION, INC.

Introduction

Each revision to the American Institute of Steel Construction's Certification Program during the past 25 years is the direct result of input from fabricators, specifiers and, most importantly, owners and developers. The most recent change in the program is the adoption of the Certification Standard for Steel Building Structures (Standard). This Standard describes the total quality management system certification for fabricators of steel building structures.

Under this new Standard, fabricators are required to develop and implement a quality management system and to describe it in a quality manual and in required procedures. To assist you in developing your firm's quality system documentation, AISC offers this Quality Manual Guideline.

The quality management system described by the Standard includes elements of a quality assurance system and elements of a quality control system-it is much more inclusive of how quality is addressed in your facility throughout the entire business of fabrication.

If your facility has no existing or sparse documentation, this guideline is provided as assistance to begin your thought process. If you have a mature existing documented system, this Guideline will help you to make a fresh review, to update your system, and to make further improvements that can improve your business processes.

The structural steel fabrication industry is diverse-as are its methods and procedures. As a result, this document offers suggestions but recognizes that each fabricator will have a unique approach. If your firm has a quality manual that covers the required elements, you do not have to change your manual. Nor does the AISC Certification Program require a separate quality manual. Because the AISC Certification Program is specific to the structural steel industry, it includes elements not found in other programs. Therefore, if your existing manual or system was prepared in accordance with ISO 9001, ASME, or a private company specific requirement, you should compare your manual with the requirements of the Standard to ensure that all required elements are covered.

Remember, this Guideline is generic and you may need to increase or reduce the detail of individual procedures to match how you do business. Always address how the requirements of the Standard can best be satisfied at your facility--comparison with other facilities is not always helpful. Your number of employees, the competency and training level of your employees and the complexity and variety of the projects that your facility undertakes are just a few factors that contribute to how detailed or simple your quality documentation becomes to address the requirements of the Standard.

It may not be necessary to change what has been successful for you in the past. However, it is required that you formalize these systems by writing them down and assuring that the responsible personnel understand your requirements and have implemented them effectively.

You may be interested to know that many first-time fabricators that are now certified and that have gone through the formalizing of their own procedures, have reported to AISC that they have seen marked improvement in their ability to meet their customers needs, to increase their business volume, and to better their profit outlook.

In addition to this Guideline, example procedures are provided for some of the elements of the Standard; however, these procedures should not be construed as acceptable as written for certification for an AISC certification audit. The chosen examples do not cover all the procedures required by the Standard for Steel Building Structures, and each procedure may not address all the requirements of each element of the Standard for Steel Building Structures.

To get started, refer to the definition of a documented procedure in the Standard. The minimum procedure requirements from this definition are summarized below:

1. Purpose (of the procedure);
2. Outline steps within the procedure functions
3. Assigned responsibilities;
4. Identify generated records;
5. Review responsibility (of the procedure)

The following page contains a complete list of required procedures and documentation.

Quality Manual Documentation	
Element	**Title**
8.3	Cover Page
5.6.2.2	Approval by the Highest Ranking Manager Responsible for the Facility
5.6.2 Para. 2	Description of the Quality Management System
5.6.2 Para. 1	Quality Policy
5.6.2 Para. 1; 5.4.1	Organization Description
3	Applicable Reference Documents, Codes and Contract Requirements.
5.6.2 Para. 2	Description of Interaction and Communication Between Processes
5.6.2.1 Para. 2	Additional procedures/documents/drawings beyond the minimum req.

Procedures (separate or in the Quality Manual)		
	Element	**Title**
1	6 Para. 1	Contract and Project Specification Review
2	7.1.1 Para. 1	Preparation of Shop and Erection Drawings
3	7.1.3 Para. 1	Provisions for Checking Shop and Erection Drawings
4	7.2.4 Para. 1	Receipt of Shop Drawings from Customer
5	7.2.4 Para. 1	Revisions to Shop Drawings from Customer
6	7.2.4 Para. 1	Control of Shop Drawings from Customer
7	8 Para. 1	Control of Documents and Data
8	8.2 Para. 1	Receipt and Document of Customer Requirements.
9	9 Para. 1	Control of Quality Records
10	10 Para. 1	Purchasing
11	10.2 Para. 3	Evaluation of Sub Contractors
12	11 Para. 1	Material Identification
13	12.1	Weld Procedures (WPS) and Weld Operator Qualification
14	12.2	Bolting Installation
15	12.3	Material Prep for Coatings
16	12.4	Coating Application
17	12.5	Preventative Maintenance of Equipment
18	13 Para. 1	Inspection and Testing
19	14 Para. 1	Control of Inspection, Measuring and Test Equipment
20	15 Para. 1	Control of Nonconformities (non conforming product)
21	16 Para. 1	Corrective Action
22	5.6.2.1 Para 2	Additional procedures beyond the minimum required (Optional)
23	12 Para. 1	Special procedures for fabrication processes (Optional)

From the Standard:

Management Responsibility Sections 5, 5.1 and 5.2

Management of the Fabricator shall be responsible for defining and adopting a commitment to quality; directing and leading the Fabricator to achieve that commitment; determining and providing the personnel and resources necessary; overseeing the procedures and practices necessary; and implementing the systems to comply with and to assure that the goals of the commitment have been met.

5.1 Commitment (Policy)

Executive Management shall adopt and document a policy (or policies) defining the quality management system goals of the Fabricator's organization. The document(s) shall state objectives for quality and management's commitment to quality. The policy will, at a minimum, commit to meeting contract requirements.

The policy shall be disseminated to personnel affecting quality. The management shall ensure that the policy is understood, implemented and maintained at appropriate levels of the Fabricator's organization.

Element 5, 5.1. 5.2 Management Responsibility

Key Concept(s):

Define Goals

Document a written Quality Policy which commits to meeting contract requirements and includes the quality management system goals and objectives for quality that you have for your company. The policy is to be distributed to personnel within the company "who affect quality."

Separately, ensure that the policy is understood, implemented and maintained at "appropriate levels" within the company.

Plan to reach goals and provide for measurement and evaluation

Your Executive Management needs to demonstrate that there is a plan to
(1) realize the goals of your company concerning quality,
(2) evaluate the current level of achievement of those goals
(3) make provisions for continuous improvement (opportunities for improvement) to the QMS
(4) address and resolve customer complaints.
(5) Determine a specific method of review of these items appropriate for your business.

Sample Procedure Included with this Guide

Sample Quality Policy

Required Documentation

Quality Policy

Interpretation

The success of your Quality Management System (QMS) depends on the commitment of your management team to implementing the program. Because of the importance of this program, it is critical that your executive management team is involved not just in developing the QMS, but also is involved in regularly reviewing the program.

An important part of the program is the ability to demonstrate management's active involvement in the QMS. **Examples** of how to demonstrate management involvement include:

- Having members of the management team establish reporting systems on key performance factors relating to the QMS;
- Establishing regular management reviews of the QMS;
- Having management involvement in regularly scheduled quality topic meetings to foster understanding by all individuals in the company.
- Developing any quality-related procedures in addition to those required directly by this program that are essential to your business.

The key measurement for management involvement is the company's commitment to resolve quality issues and to make staff aware of their responsibilities related to quality issues. Additionally, a key measurement is management's regular review of the quality management system.

5.2 Direction and Leadership

Executive management shall direct the development of systems necessary to achieve the goals of the Fabricator's policies. The systems shall comply with the requirements of this standard. Executive management will demonstrate that there is a plan to realize the goals and evaluate the current level of the achievement of those goals-the effectiveness of the program. Management shall provide direction and leadership consistent with the policies and monitor the effective implementation of those systems. Management shall provide adequate resources and channels for communication to address and resolve customer complaints. Management shall be responsible for qualification of personnel.

Executive management shall review the organization's quality management system at planned intervals to ensure its continuing suitability, adequacy and effectiveness. This review shall include assessing opportunities for improvement and the need for changes to the quality management system, including the quality policy and quality objectives.

Records from management reviews shall be maintained. Management

As part of your plan to demonstrate compliance, you may include a management responsibility section in your Quality Manual. In this section, identify your executive management team (the titles of the individuals who manage the key functions for you). Next, establish who has responsibility for the key business/quality functions, (reference the bulleted items in 5.4.1) Also, establish the frequency of management team meetings and the necessary agenda items (check this against the list in 5.2 of the Standard). Weekly project review meetings do not typically address the complete functions of the quality management system and do not fulfill this requirement. Finally, describe how records will be kept (for example, the QA Manager may be assigned to file and keep a simple log of issues and actions so a record is maintained and it can easily be determined whether the issues were resolved in an appropriate time period that you determine).

Policy Statement

A basic tool for demonstrating management's commitment to quality is by documenting, defining and issuing a Policy Statement. Executive Management is responsible for establishing the Policy Statement, including the company's quality goals and objectives. At the minimum, the policy needs to state that your company has a commitment both to quality and to compliance with your customer's contract documents. Make sure your policy also addresses how your management team demonstrates its commitment.

The policy Statement must be disseminated to your employees whose work affects quality. Further, you must be able to demonstrate that your employees understand the policy, that it is implemented, and that it is maintained at appropriate levels with in your organization.

However, not everyone in the organization needs to have or be aware of all policy statements. Certainly your accounting or reception personnel, if they do not have quality responsibilities, do not need to be involved in this issue.

Since knowledge of the QMS is required for employees who effect the quality of your product, training is usually required throughout the company to instill that knowledge.

In addition to training, you may choose to have all managers receive and sign a copy of the Policy Statement. Likewise, it should be included in your new employee orientation program. One method of dissemination could be the posting of the policy in prominent locations throughout your office and plant.

Another way to help inform appropriate personnel about your quality goals is to incorporate discussions of quality at meetings normally unrelated to your company's QMS. These types of discussions are particularly helpful in evaluating your company's progress toward meeting your identified QMS goals. If quality issues are discussed as part of a meeting, simple records might be maintained about who attended and what was discussed.

Direction and Leadership

The Standard for Steel Building Structures clearly places the responsibility for direction and leadership of the QMS squarely on the shoulders of company management. The Executive Management is ultimately responsible with ensuring the development, implementation and maintenance of the systems necessary to assure compliance with the contract documents, the requirements of the AISC program and your own QMS. At the same time, it is important to have systems in place to measure the effectiveness of the implementation program.

One method (required by the program) to assess the proper functioning of the QMS is to conduct a management review on a defined regularly scheduled basis. When setting your agenda (assure that items from element 5.2 are included), consider including: complaints from customers: shop and field reports of errors: other internal reports of deficiencies: and the results

review requirements will be defined by the Fabricator. This will include a specific method to obtain, report and appropriately analyze the following:

- results of internal and AISC audits,
- customer feedback, (examples may include: surveys, letters of recognition, personal interviews, requests for corrective action and complaints)
- process performance and product conformity, (e.g. back charges; internal error trends with fitting, welding, bolting and coating application processes; detailing errors; shipping delays; or equipment failures.),
- output from previous management reviews.

The output from the management review shall include the record and implementation of any decisions and actions related to:

- improvement of the effectiveness of the quality management system and its processes,
- improvement of product quality,
- resource needs.

from surveys taken of customers and others contacted concerning your company's performance. You need to maintain logs of these items on a regular basis. For example, each time a report or back charge resulting from an error is received, it should be investigated and the information reported. A determination should be made to see if it was a detailing, fabrication or erection error. The error can be further examined to identified the cause of the problem and, if it is a reoccurring problem, a method should be developed to correct the deficiency. This type of assessment will help to determine if the problem is in one particular operation or if personnel need additional training or direction. If a particular piece of equipment is the problem, a review of its calibration, maintenance reports and applicable use might resolve the difficulty.

Management can also set up periodical reviews of quality reports generated from each department during which your staff should be encouraged to discuss improvements to resolve quality issues. Keeping a record of these meetings will help document management involvement in the quality process and ensure proper correction and follow up that improves business.

Internal audits (which are discussed more fully later in this guide) are an excellent way for management to discover any quality issues that may exist within your organization. The results of these audits are a required item on the agenda of your management review. Note that these internal audits must take place at least once per year.

In your discussions of Direction and Leadership you must state your plan of how your company will achieve overall compliance of the goals included in your commitment policy and how you are evaluating the current level at which you are achieving those goals. How you will monitor this plan on an on going basis must be stated. The monitoring can be in the form of internal audits (see section 19). Depending on circumstances the audits may be performed on the entire company or individual departments. How often and by whom these audits will be performed needs to be stated. Notice in task 19 that a total company audit needs to take place at least once per year.
If customer complaints are received state to whom they channeled for disposition. Develop a method on how this person resolves the issue of the complaint and define who will sign off that the complaint has been satisfactorily handled.
When the standard asks for "records" the auditor can ask to see what you have to satisfy this requirement (see section 9).

For each management review prepare a report containing the subjects discussed (the definition of the review), attendees, directions decided upon, and assignments made to address specific issues. Maintain a folder of these reports at a central location (possibly by the management representative). The definition of the review must contain a method to obtain, report and appropriately analyze the bulleted items in section 5.2 of the standard. For instance, you might state:
1) That you have a standard method to measure the effectiveness for each department during the internal audit and that the results of these audits are reviewed by management in order to make continuous improvements in the quality of the company's performance.
2) That you send a survey card or make a telephone survey to each customer once a year or after completion of a major (define) project asking for comments about your firms performance.
3) That survey comments are categorized and evaluated by management on a defined schedule (state the schedule).
4) That you maintain a file of commendations.
5) When backcharges, QA/QC reports of errors, or any other report of poor performance are received, that they are broken down by cause, they are analyzed, and the results presented to management. Management is to assure that assignment of responsibility to personnel, equipment, training have been adequately reviewed with appropriate changes instituted for improvement of the company.

Tip(s)

You should define for purposes of the QMS what your company means by "executive management". It could be one person (the CEO), or several persons (the CEO plus major department managers). Notice that "executive management" may be different from the "management representative" or the "executive management team".

Management review meetings demonstrate commitment to your quality management system—and that the plant's chief executive has reviewed the system. The management representative is directly responsible to assure:
(1) there is a written procedure for every operation required by the Quality Program;
(2) the procedure has been implemented; and
(3) the procedure is effective.

Quality Record

• Output from quality meetings

• Records of management's review of the quality system (required)

• Data that demonstrate attainment of quality management system goals

• Documentation of communication to employees about company goals, performance and quality policies.

Section 5.3 Management Responsibility

Key Concept(s):

A single member of management at your company must be designated as your Management Representative and that individual has the responsibility for your company's quality system.

Required Documentation

The identification of the Management Representative in your QMS definition.

Interpretation

The individual designated as Management Representative should understand all of the company's quality procedures and have the authority to implement those programs necessary to achieve the quality requirements of the company. Therefore, it is essential that the Management Representative be a member of the management team, though they don't need to be a QA (quality assurance) or QC (quality control) person. Although the Management Representative may not be the individual who actually prepares all the reports to management, the responsibility and understanding of the data are here to assure that it is accomplished. While you may be tempted to choose an inspector for this position, that is only an appropriate choice if the individual has management responsibility within your company. The Management Representative also will be the main contact between your company and AISC pertaining to fabricator certification.

The position of management representative should appear in your organization chart and the appointment of this position should be done in writing.
The management representative has primary responsibility for the QMS and must be assured that it has been established, written down, implemented, personnel are properly trained, and that it is being maintained. By being maintained the standard means that, as problems are uncovered that solutions are found, implemented, and retesting takes place to assure that the solutions are working. The management representative also must make sure that the customer requirements are properly addressed during the project review as outlined in the standard (section 5.5 and 6).
By "liaising with external parties" the standard refers to contacts you might have with organizations such as QMC or ISO.

Tip(s)

The Management Representative must know the quality management system, the reporting methods and be involved with the analysis of quality issues. Be sure to show the Management Representative position on your organizational chart or in the definition of your quality management system.

Quality Record Examples

None mandated by the Standard for Steel Building Structures

From the Standard:

5.4 Resources

The Fabricator will have the resources needed to achieve conformity to contract specifications. Resources will include, but are not limited to, the resources described in the sub-articles of 5.4.

Personnel

The responsibility, authority and the interrelation of personnel who manage, perform and verify work affecting quality shall be defined and documented using organization charts and job descriptions or other suitable means. Personnel performing assigned functions must have qualifications that indicate the ability to successfully perform the function. Unless otherwise noted, personnel can be assigned to more than one task, provided they are qualified and able to accomplish the duties of each position. Specifically, the individual(s) responsible for Quality Assurance and Quality Control management shall not report to production management for items related to quality.

Qualified personnel will be assigned to manage the functions detailed in sections 5 through 20 of this standard and shall include as a minimum:

- Management

Section 5.4 Resources

Key Concept(s)

Your organizational chart must clearly show lines of responsibility, authority and the interrelationships of personnel from all areas of your company.

Job descriptions for positions of key personnel effecting the quality of the product must be written and must include the qualifications and specific duties necessary to perform the work. The descriptions do not need to be part of the quality manual.

You must clearly demonstrate that your facility, building and equipment is sufficient for the type of fabrication you are performing.

Interpretation

Since Executive Management usually controls the budget, the rest of the organization will look to the Executive Management to institute changes and/or additions to the company's resources in order to ensure that work can be properly performed.

Management also defines the lines of responsibilities and reporting within the company and an organizational chart or other tool should clearly illustrate these lines of responsibility. In general, people can be assigned to more than one task, provided they are qualified and are able to accomplish the duties of the various positions assigned. For example, the QC Manager may also be the Purchasing Manager.

Compliance to the Standard for Steel Building Structures does not require the creation of positions with specific titles and/or responsibilities. At a minimum, however, the organizational chart must show who has responsibility for detailing, purchasing, fabrication, quality assurance and quality control.

The separation between managers responsible for production and managers responsible for QA/QC is important in your quality program. Therefore it is critical to establish the autonomy of the quality assurance and quality control management. This can be demonstrated by having direct reporting lines between those positions and top management, thus assuring independence from production management to make critical decisions on quality issues that may adversely impact schedules. Your complete quality function must be independent from production. That does not mean that an individual in a smaller organization cannot perform both duties. For example, a craftsperson may perform visual inspection on another's work, but they must report to an independent QC function when performing those duties, not to shop supervision responsible for production.

It is also important to understand the difference between Quality Assurance and Quality Control and take advantage of what each has to offer your business. The QA function's responsibility is to set the requirements, acceptance criteria and the frequency of examination, usually through the development of a sampling plan. The QC function is to perform the actual inspection of production work in accordance with the criteria established by QA. The QA function also includes evaluation of the work performed by QC.

Since, on occasion, the QA department may be critical of the QC department's work, manage-

Representative

- Detailing Management
- Purchasing Management
- Fabrication Process Management
- Quality Assurance Management
- Quality Control Management

Buildings, Workspace and Associated Utilities,

A fabrication facility shall consist of areas and buildings that provide space for the routine functions considered to be part of steel fabrication, including administration. The areas and buildings shall be conducive to achieving consistent quality work.

The fabrication facility shall include suitable areas for administration, quality assurance, quality control, detailing; adequate space for fitting, bolting and welding; provide ambient conditions conducive to acceptable work in all areas of the facility; suitable areas for receipt and storage of raw materials, consumables and hardware, storage and shipping of fabricated materials and coatings if coating application is performed by the Fabricator.

Process Equipment (both hardware and software)

The Fabricator shall

ment must carefully assess that both functions are working correctly and are not compromised.

It is also management's responsibility to clearly define the responsibilities for both the QC and QA function and to provide a job description. The job description has two elements: (1) the duties and responsibilities of the position; and (2) the qualifications needed to fill the position. Qualifications include education, training and work experience that indicates they have the ability to successfully perform the assigned responsibilities. The resumes or biographical information sheet for your management team and other personnel functioning in the quality system must be provided. Likewise, management records should include (though not as part of the Quality Manual) a list of the personnel that currently fill each position on the organizational chart along with their qualifications.

If you need to fill a position with a person who has some, but not all, of the qualifications for the position, you need to indicate what process is being followed to upgrade the person's skills. This often takes the form of education or training along with a timetable for obtaining the necessary qualifications. This information could be reported in the individual's personnel folder.

Facility

For application to the AISC Certified Fabricator Program, you will need to provide a drawing of your facility. This drawing should show the general outline of the production, administration and storage areas as well as the location of key equipment.

The drawing contributes to demonstrating that your company's facilities and equipment are sufficient to produce the work for which you routinely contract.

Equipment

All fabricators perform certain basic functions (such as hole making, bolting, welding and cutting) and the equipment necessary to perform this basic work should be available and in good working order at all times. This equipment also must be appropriate for the work being performed and the quality required. For example, if you were to cut the bearing end of a column, you would obviously need the equipment to provide the proper finish requirements specified in the AISC Code of Standard Practice. In a similar vein, you would not weld with a welding machine that regularly produced welding discontinuities.

Of course, it is not unusual to quote and receive contracts for projects that require equipment capabilities greater than is usual for your firm. In preparation for such an occurrence, you need to demonstrate that you have the ability to adjust your facility to provide the required capacities. This includes the selection of methods and equipment to assure the quality of the fabricated members produced in this custom fashion. Further, if the required equipment is to be leased or rented, the equipment must be under the fabricator's control and subject to the maintenance requirements of the fabricator. If heroic methods must occasionally be employed--for example turning a member much larger than regularly handled in your facility--you must demonstrate that the methods can be executed without damaging the product. Evaluate your plans to accommodate special work

Prepare an equipment list outlining all owned, leased and rented fabricating, coating, lifting and transportation equipment. The list does not need to be part of the Quality Manual but must be available to assist you in demonstrating maintenance of your equipment later in the program. For application to the AISC Certified Fabricator Program, you must provide an equipment list.

have under their control the equipment necessary to perform the functions common to fabrication consistent with the specifications and standards common to the work. Equipment must be maintained to produce the required quality.

Tip(s)

For instance smaller firms, it is typical for the CEO to manage the QA, QC and Production functions. Therefore, Quality and production can report to the same individual when it is the CEO. Use your internal audit program to determine if you can make decisions for production and quality separately, and favor quality when there is a choice. Additionally, while there may be separate positions for QA and QC, if the company cannot afford two people to fill these slots they can both be filled by the same individual. This is acceptable provided that the individual filling both slots understands and can articulate to the auditor the differences in functions and responsibilities of both and demonstrate independence when the QA function evaluates the work of QC and when QC evaluates work in accordance with established acceptance criteria.

Because people sometimes change positions or leave the company, it is recommended that the organizational chart provides only the position title or work function rather than the name of the individual who fills a particular position. However, your files should include information on the education, training and experience of each member of your management team. Additionally, make sure you have defined and documented the qualifications of each position in your company and that the people filling each position have the necessary qualifications.

From the Standard:

Internal Communication Section 5.5

Executive management shall ensure that appropriate communication processes are established within the Fabricator's organization and that communication takes place regarding the effectiveness of the quality management system.

Section 5.5 Internal Communication

Key Concept(s)

Communicate internally in a manner that will, for your company, be most effective in assuring that proper quality will occur.

Interpretation

There are variations in the ways that companies communicate within their own organization. For instance, some companies have methods of communications that are very formalized. The communications in these companies may take the form of reports or memos and/or meetings that are required at specific times. Other companies may not have formalized their communications within and/or between departments and instead have reports or memos and meetings on an "as needed" basis or none at all. However, regardless of your corporate culture, when it comes to your quality management system, it is often helpful to document instructions and meetings. For example, consider how you communicate to the shipping department that a special requirement is to be followed on a particular project? If you have more than one shift, are all shifts given the same information on a consistent basis and at constant times, such as at the start of each shift. It may be that many of the requirements of the Steel Building Structures Standard are being met by your organization but are handled in casual conversations, in person or over the telephone, instead of by memo or report. While these "casual" procedures may work many times, the risk and potential for problems when they are not effective, can have devastating results. Your role in the quality management of the company is to assure that the correct procedures are used and to articulate the procedure and the reasoning behind the procedure during an audit.

Review your present methods of internal communication to see if some adjustments should be made to minimize potential misunderstandings and to assure the proper parties are notified of quality issues.

Tip(s)

From time to time personally check how well your internal communications are working. Speak with some of your detailing and production personnel on a specific job related item and test their knowledge of special project requirements. You may choose to confirm this in a memo and make it a part of your self-audit.

Quality Record Examples

- Memos that confirm interpretations of the QMS
- Posting of special requirements at specific locations in the office and shop.
- Minutes or records of regularly scheduled production meetings, kick-off meetings and job close-out meetings are examples of communication.

From the Standard:

Documentation Requirements Section 5.6

5.6.1 General Requirements

The extent of the quality management system documentation can differ from one organization to another due to the size of organization and type of activities, the complexity of processes and their interactions and the competence of personnel. Quality management system documentation shall include:

- documented statements of a quality policy and quality objectives (as described in 5.1),
- documented procedures and their associated quality records required by this Standard,
- documents needed by the organization to ensure the effective planning, operation and control of its processes and
- a Quality Manual.

5.6.2 Quality Manual

The Fabricator shall establish and maintain a Quality Manual outlining the quality management system implemented in the Fabricator's organization. The documented Quality Manual shall

Section 5.6 Documentation Requirements

Key Concept(s)

The Quality Standard requires various types of documentation that are dependent on the work you perform and the skills of your employees.

The Quality Manual is YOUR Company's system for quality and must reflect the procedures you use and the records you employ to achieve a quality product. It is what communicates how you want your company to run.

Within your Quality Manual you must discuss the level of authority that approves the original Quality Manual and therefore all of its revisions.

Interpretation

This item of the Steel Building Structures Standard concerns the compilation of certain portions of your Quality Program and will encompass some of the documents already discussed (e.g., Policy Statements) as well as documents to be discussed later in this guide.

Your company's quality management system program will be contained in a document called your Quality Manual and it will contain documentation requirements you develop as part of this program. Remember that if the type of work your company performs changes, your Quality Manual should reference the additional procedures you have developed.

Some of the documents in the Quality Manual describe your company's procedures—they tell how to do something (prepare shop drawings, maintain quality records, prepare welding procedures, etc.). A well-written procedure, with the appropriate records demonstrating execution, provides that assurance. The items that must be documented for your QMS are identified in the Standard and cover certain administrative as well as certain specific production operations performed in the fabrication and shipping of the product. Your Quality Manual also should include other procedures based upon your operation and that cover any special processes that you may use. Organize and design your documentation so that it reflects the way you organize your business so that it is a useful tool.

To help prepare your Quality Manual, and to better familiarize yourself with the Standard, it is recommended that you read through the Standard and mark each reference to a required procedure or record. The phrase "documented procedure" means that these items, as a minimum, must be defined in your Quality Manual and a description of how your firm handles these matters must be included. The first step, of course, is to determine if your company already has documented procedures for any of these items. You should also consider whether any of your existing procedures can be slightly modified to bring you into compliance. Once you've identified all of the procedures and the way in which your firm approaches them, there are a wide variety of approaches to incorporating these items into your Quality Manual. For example, you could create a separate document/procedure for each item. Or you could choose to define and document each item in a section of your Quality Manual—or in combination with other items in another procedure. Some sample procedures accompany this guide and you may choose to adapt these samples to fit your own operation.

Note that some documents, such as qualification records, job descriptions, equipment lists,

consist of the policies and organizational description .

The Quality Manual will describe the quality management system, including the documented procedures established and a description of the interaction and communication between the processes of the quality management system used by the Fabricator to produce products of the required quality.

5.6.2.1 Organization

Procedures may be issued separately or be an integral part of the Quality Manual. The Fabricator's management determines the level of detail in the Quality Manual, and referenced procedures. At a minimum, these documents must be detailed enough to adequately describe the Fabricator's quality management system that assures the production of quality product. Additionally, these documents must demonstrate compliance with this Standard.

Further required reference documents include: job descriptions and qualifications of key personnel, a facility plan and an equipment list. Management will define what additional required written procedures/drawings or other documents are required beyond the minimum requirements set by this Standard to

etc., that are part of the quality management system are not necessarily placed in the Quality Manual but can be contained elsewhere within your company quality documentation.

If you already have documented parts of a quality program, such as a Quality Control Manual, a Quality Assurance Manual, material control procedure or other procedures, they may be utilized with little change for your QMS documentation.

The top executive at the location of the facility must approve the Quality Manual. If there is a more senior management person at another location, their endorsement, while not required, is recommended to add another voice to the importance that quality has for the organization.

When the Quality Manual is revised the same level of executive endorsement received by the earlier Manual is to be applied to the revision. All the staff positions that received the original version will also get the revisions.

Tip(s)

As part of your review of your current system, list and locate the records you are already generating. Compare this list with the requirements of the Standard. Combine this list with any discoveries from your internal audit process.

“Say what you do, do what you say”. If it is different, one must change. Also assure that your documentation represents how you do business as well as the requirements of your contracts. Never implement a procedure from another source (including the examples in this Guideline!) without modification if it does not reflect your company’s methods and your employees are not trained to execute it.

Quality Record Examples

- Master lists of current documentation revisions

meet the needs of the Fabricator's organization and its customers.

5.6.2.2 Approval

Executive Management shall approve the Quality Manual, specifically, the approval of the highest-ranking individual in the organization responsible for the facility is required at a minimum.

From the Standard:

Contract and Project Specification Review and Communication Section 6

The Fabricator shall document and implement a procedure for contract and project specification review. The review will identify, determine, plan and record the specific project requirements as well as the distribution to the responsible individuals in the Fabricator's organization. This review will consider any issue that affects the Fabricator's capability to perform the work.

The procedure must provide for review of the original contract documents, revised contract documents and changes received through clarification (e.g. requests for information or other sources) to assure that the Fabricator fully understands the contract requirements.

Evidence of contract review can take the form of technical summaries, signoffs, change orders, schedules and allocation of adequate resources. Such evidence shall indicate consideration of pertinent elements of this Standard managed by the functions listed in 5.4.1 of this Standard and other critical project require-

Section 6 Contract and Specification Review

Key Concept(s)

Review specific project requirements.

Record the review.

Assure distribution to the people who are responsible.

Interpretation

Since the Standard requires a review of contract documents when a new contract is received, it is required that you have a procedure to conduct that review. The procedure must outline who is involved with the review (by title, not the employee's name), the time period during which the review is to take place (that is, some specific time before or after the receipt of the contract, and the subjects to be reviewed. Ultimately, you decide at what point contract review begins at your company.

Normally the review will involve the plans, specifications, addenda, and any supplementary information issued, as well as any other terms and conditions that may have been agreed to including scheduling information (though the AISC Certification Program does not review the actual performance of delivery commitments or provide a judgment of facility capacities, it does ensure that the proper procedures are in place). This contract review should contain a comparison of the documents received from your customer with those stipulated in your agreement with your customer and with your proposal, including dates and revisions. While different companies will utilize different functions to undertake this portion of the review, the important process is to assure that the fabricator has all of the documents (including reference codes and standards) required by the contract.

This contract review should also discuss any technical, special, or unusual issues that are anticipated to affect the fabricators work. These are issues that, if missed, could have an adverse affect on the project, such as: special NDT requirements; special base material requirements; special grinding or other preparation work; special welding or bolting issues; special coating requirements; and any variations from your usual shop or detailing standards. The record of your review should record the details of these special considerations.

The contract review should also include information about potential subcontracted work on the project. If you intend to outsource portions of the fabrication process, include a review of your potential subcontractors' quality and ability to perform. Additionally, discuss your suppliers' ability to perform against the specific requirements of this contract.

Your procedure should also have provisions for requesting or clarifying missing or questionable information provided in the plans and specifications. The method that you would put into your procedure could vary from project-to-project and customer-to-customer, but your procedure should explain your process and provide some examples of the different approaches you prefer. The procedure should also outline a process for reviewing revisions and new material that arrives after the initial review.

It is critical that the findings of the review be communicated to those individuals in the organi-

ments that, if missed, will have a major impact on project quality. The identified specific project requirements shall be distributed to responsible personnel in the Fabricator's organization.

zation who need to be aware of this information, which means that records should at least go to the managers of the functions involved in the review—and often to others within your organization. Your procedure should state the title of the persons to receive copies.

To help achieve a consistent review, some fabricators use a checklist to summarize specific items such as: material requirements; domestic requirements; inspection requirements; NDE requirements; and coatings.

Sometimes the person in charge of contract review will delegate that work. Reviews by other departments or functions can take place separately, but there must be a way for pertinent information to be shared when it affects the execution of the contract in other parts of the company.

One useful tool is the kick-off meeting. Held shortly after the contract has been received, the kick-off meeting is an opportunity for representatives from each department to raise issues that may impact the project so that issues and potential conflicts may be readily resolved. To demonstrate compliance with the Standard, a record should be kept of the issues and recommendations resulting from the review meeting.

If the project is a simple one or is identical or extremely similar to other projects you have completed and all of the provisions contained in the plans and specifications fall within your company's standards, then your procedure for contract review may be as simple as to document that the appropriate individuals reviewed the contract documents and decided the project contained no exceptions to your company standards. In those cases, you should then inform the appropriate persons in the organization and place a copy in the project file folder.

Regardless of the similarity of projects, you must hold a project review. The review may be abbreviated due to work similar from year-to-year, with only an occasional job falling outside the norm of your usual work,

Note, however that if you decide either of these two methods are workable for your company, you must be prepared to demonstrate to the auditor that you follow them, that they are appropriate for your company, and that they work.

Tip(s)

Keep a master file of quality meetings and contract reviews for quick reference.

Quality Records

- Minutes of project kick-off meetings.
- Requests for information transmitted back to the customer.
- Cover sheets of reviews or contracts showing sign offs from the appropriate function representatives.
- Records documenting the scope of the review, such as technical summary sheets or check lists.
- Notes of special contract requirements on shop drawings.

From the Standard:

7.1 Detailing Procedures

7.1.1 Preparation of Shop Drawings and Erection Drawings

The shop and erection drawings produced must incorporate all customer requirements, specifications, codes and relevant Standards to adequately procure materials, fabricate and erect the structural steel frame. To ensure and verify this, a documented procedure for preparation of shop and erection drawings shall be developed which describe:

- How project requirements are reviewed and incorporated.
- How the Fabricator coordinates, clarifies, resolves, and tracks information with the customer (e.g., construction change documents, Requests for Information [RFI]) and how the associated resolutions are tracked and controlled).

7.1.2 Detailing Standards

The Fabricator will prepare and utilize detailing Standards describing technical preferences and requirements customarily used in the shop. These Standards will show spe-

Element 7.1.1, 7.1.2 Detailing Procedures

Key Concept(s)

Your shop drawings must clearly represent your customer's requirements, including applicable codes and specifications, and that the drawings adequately communicate those requirements.

Detailing standards must be developed and put into practice to assure uniformity in your shop and erection drawings.

Required Documentation

Describe the preparation of shop and erection drawings
Detailing Standard(s)

Interpretation

While procedures will vary from company to company, there are some basic items that need to be addressed in your written detailing procedures.

First, prior to the start of detailing, your methodology for reviewing the contract documents must be established and described in your written procedure. The review is performed by your firm’s equivalent to a chief draftsman, squad leader, or detailing manager. This review includes a comparison of the company standard detailing procedures with those that may be required by the contract documents and includes issues pertaining to materials, fabrication requirements, loading, shipping, erection, non-destructive examination and any special processes. You may find that a written summary of that review made available to the individual responsible for contract review and all those doing drafting on the project, both within the company and, as appropriate, to subcontracted detailers, is an excellent way to assure that the review is effective and that all requirements are incorporated. Choose to stipulate a specific time period for the review after the detailing function receives the plans and specifications.

If warranted by the review, written documentation should be sent to the customer advising of any variations between the company's standards and the specific customer requirements.

The procedure must also contain a method to assure that changes, additions and deletions that arise during the project don't "fall between the cracks". This will require that controls be implemented to assure that these items are incorporated into the shop and erection drawings. Likewise, the procedure should include the process by which you track missing or incorrect information uncovered during your detailing that have resulted in a RFI (request for information). Again, it is critical that these items are not forgotten or misplaced.

One way these issues may be controlled is by means of logs or a similar system that also incorporates a method to follow up if responses to questions are not forthcoming within a stipulated period of time. You may create a list of outstanding issues and review them at a particular time. It may be that these items are brought up at your regular detailing meetings or regularly scheduled production meetings until such time as answers are received. Any system will work that assures that unclear, missing or incorrect issues with contract specification are resolved to protect you later at contract delivery time.

cial information required on advance bills such as allowances for cuts, camber or supplementary requirements. The Standards will include how mill order lists are prepared which, at a minimum, include: sizes, appropriate ASTM specification references, special ordering information and any allowances or tolerances.

The Standards will illustrate the Fabricator's preferred methods of drawing layout, including but not limited to views, title block information, the method of designating shipping sequences, the piece marking system, dimensional preferences, commonly used shop abbreviations, the method of showing bolt type and installation requirements, information required on weld symbols including any special NDT requirements, the preferred way to designate coating requirements

The Standards will describe the Fabricator's preferred method for the selection of geometry, connections and material (including sizes and specifications)-the preferred method for detailing holes, fasteners, washers, cuts and copes, assignment of appropriate welding symbols, shop welds, piece marks, bolt placement lists, field welds-and the preferred method for showing surface preparation (including specification of sur-

Detailing Standard(s)

In order that all of your employees, as well as those of your subcontracted detailers, are completely familiar with your detailing system, a written set of detailing standards must be prepared. Some fabricators prepare a major document of substantial length. Others may use the AISC publication *Detailing for Steel Construction* as a base and use their company standard as a supplement to that document. Others have something in between. The key is for your standard to contain instructions covering topics such as how you prepare advance bills of materials and mill orders; how you show shipping sequences; your preferred marking system; how you want dimensions shown; the style of detailing for various building components; as well as any other items that would have an effect on the detailing process.

In the detailing standards you should reference, where appropriate, the sections within industry documents that govern the item being discussed. Many of these documents are listed in the Quality Standard, Element 3. For instance, when discussing welding you will instruct your detailers to incorporate the specific applicable requirements of the AWS D1.1. This section of your detailing standard will interpret how you will incorporate and meet a D1.1 requirements. Other issues may be clarified by referencing the AISC *Code of Standard Practice*. Compliance to these two codes is required by the AISC Certification Program and most building structures contracts. Reference the specific requirements that relate to your work often in your detailing standard. This practice will assure compliance and be easier than developing your own in-house criteria completely without direct reference.

Providing clear and definitive information to the erector is a critical component to the detailing process and should be addressed in your detailing standard.

Tip(s)

There are three procedures required under element 7, one for preparation of shop and erection drawings, one for checking of these drawings and one for those furnished by your customer. These can be issued as separate procedures, or combined into one procedure.

Quality Record Examples

- RFI's and other communications with customers regarding shop drawings
- Advanced bill of materials
- Design calculations

face finish), coating materials and dry film thickness, shipping sequences and any necessary special instructions to fabricate and erect the structural steel frame.

Finally, the Standards will include necessary information required by the erector to install the members including bolt lists and any other information required by the Fabricator.

7.1.3 Checking of Shop and Erection Drawings

The Fabricator will document a procedure to provide for checking of all shop and erection drawings to ensure compliance with contract documents.

The procedure will describe the method by which the Fabricator performs its final check of shop drawings before release for fabrication. Such methods may include signatures, stamps, logs, files or lists.

For computer-generated shop drawings, the procedure will include a determination of which variables, graphics, calculating formulas and other output must be checked to verify the accuracy of the software.

In the case of subcontracted detailing, the Fabricator will define and document the extent of the review of received details by detailing management.

7.1.4 Customer Approval of Shop Drawings

The procedure will describe the method to document approval of shop drawings released for fabrication or drawings released for field construction. Such methods may include signa-

Element 7.1.3, 7.1.4 Checking of Shop and Erection Drawings, Customer Approval of Shop Drawings

Key Concept(s)

Assure your drawings are being checked prior to release for fabrication and erection.

Know the status of each shop drawing at all times during the approval process.

Assure the drawings released for fabrication are the latest revisions.

Determine the review you will perform on subcontracted detailing

Required Documentation

How drawings are checked

Describe the method of documenting customer approval of shop drawings and what you will check on drawings that come from your subcontract detailers

Interpretation

You must have a procedure to check drawings before they are sent to the shop for fabrication. This procedure must also outline a method to clearly show the checking of the drawings has taken place. This is normally accomplished by a checker signing a drawing or a log, stamping a drawing, or using some other method that demonstrably indicates the drawings have been checked. The log would typically contain the drawing number, the revision number, the date it was checked, the identification of the checker, and when it was released to the shop for fabrication. If the drawings are prepared manually, describe what items on the drawings you require to be checked, especially if under special circumstances you require less than the entire drawing to be checked. If you are using a computer to generate your drawings the procedure will define which variables, graphics, calculating formulas, and output must be checked to satisfy your checking requirements. Check to see if there is a ready made testing regimen available from your software provider that can assist you in meeting this requirement. Again, a log or other method must be maintained to show that the checking of the variables was performed.

In addition, the shop must have some way of knowing that a drawing they will be using in production has been checked. The checker, by initialing the "checked by" block on the shop drawing, would normally perform this function.

It is not unusual in the structural steel fabricating industry to have continuous changes, even after a drawing has been checked and the checker has signed off. Your procedure should address this situation. Using a revision number or letter located at the area of the change can accomplish this. You could also cloud the area of the change or use any other method that adequately outlines the alteration. There is normally a place on the drawing near the title block where all revisions are listed. By pointing out in this fashion that a change has taken place the approver and checker need only check the stipulated change and not the entire drawing.

tures, stamps, logs, files or lists.

This method must have provisions for the customer and/or Engineer of Record to approve shop drawings-whether produced in house or by a subcontractor. Waiver of approval from the Engineer of Record or the customer must be in writing.

When checkers are informed of changes it should be standard practice for them to look at all the documents that initiated the change and not only at the drawing changes made by the detailer.

You should also state when in the detailing process checking takes place. Ideally this would occur after the details are completed and before the drawings are sent for approval.

How you determine who the checker(s) will be also should be addressed. Discuss in your procedure the qualifications you require for someone to become a checker. Remember the Standard states that a person is qualified by experience, training and education, (reference 7.2.2.2)

The AISC *Code of Standard Practice* requires that shop and erection drawings be submitted for review and approval to the Owner's Designated Representative. The approvals you obtain from the owner or the owner representative for the release of drawings for fabrication must be in writing. A procedure must be developed outlining how, once the approval is received by your detailing department, these approvals are recorded. Your detailing department may have a log where there is a column defining the various type of approvals for each drawing submitted. The log would also define the status of the drawing such as" released for fabrication", or" released for erection". In lieu of the log you may choose to have a drawing list for each project or some other method. Incorporate the method that works for you into your procedure.

Sometimes there may be an overriding issue where the owner/designer elect to waive the shop drawing approval. Everyone knows that lack of approval has definite risks associated with it and your approval procedure must stipulate, that in this situation, such a waiver must also be in writing from the Owner's Designated Representative.

Quality Record Examples

Document approval of shop drawings, including revisions and release dates.

Written waivers for approval from/by the customer

From the Standard:

7.2 Detailing Function Resources

7.2.1 References (required library)

The Fabricator shall maintain the current references as a library as listed in Element 3 as a minimum.

7.2.2 Personnel

The Fabricator shall employ staff personnel assigned to Detailing Management. Connection Consultation and other detailing functions may either be by employed staff personnel or subcontract services.

7.2.2.1 Detailing Management

Personnel performing Detailing Management are responsible for: overseeing the production of shop and erection drawings, liaising with designers, scheduling, developing company drafting Standards and detailing procedures, coordinating and incorporating construction requirements and training of detailers and checkers. Management personnel must be qualified by one or more of the following:

Experience in sizing connections; detailing

Element 7.2 Detailing Function Resources

Key Concept(s)

The contents of a library of information for the fabricated structural steel industry have been developed. This information must be readily available within your facility.

Someone within your company must have the responsibility for the detailing function.

You must assure that the personnel assigned to perform and supervise the detailing function are qualified.

Qualified outsourcing of detailing or connection design is permitted.

Even if your customer provides shop drawings from which you can fabricate, keeping track of changes to these drawings during the course of the project is critical, and you must have a procedure for handling this function.

Required Documentation

Describe how subcontractors are qualified

Interpretation

All firms must at least have **current versions** of the reference documents in Section 3 of the Standard:

- AISC Selected ASTM Standards for Structural Steel Fabrication
- Manual of Steel Construction, LRFD and ASD, which include the following specifications and codes:
    - Specification for Structural Steel Buildings
    - LRFD Specification for the Design of Steel Hollow Structural Sections
    - LRFD Specification for Single-Angle Members
    - Specification for Structural Joints Using ASTM A325 or A490 Bolts
    - AISC Code of Standard Practice for Steel Buildings and Bridges
- A Guide to Engineering and Quality Criteria for Steel Structures: Common Questions Answered (OPTIONAL Fabricator library item)
- ANSI/AWS D1.1 Structural Welding Code - Steel
- ANSI/AWS A2.4 Symbols
- ANSI/AWS A3.0 Terms and Definitions
- Steel Structures Painting Manual, Volume I, Good Painting Practice.
- Steel Structures Painting Manual, Volume II, Systems and Specifications
- Detailing for Steel Construction (OPTIONAL Fabricator library item)

No matter what the size of your firm someone must be assigned the specific task of being responsible for the detailing function. This is required whether details and connection designs are actually produced within the Fabricator's organization or all these functions are sublet. This person(s) would be considered part of your detailing management.

To comply with the requirement of the Standard, the person assigned the responsibility for detailing management must be your employee and must possess a certain minimum level of

and checking shop and erection drawings meeting the approval of designers for a variety of structures representative of projects the company provides. Experience must include training in courses with a written curricula in steel design and connection design. In lieu of this curricula, the Fabricator may describe and determine an appropriate way to demonstrate competence

- Graduate Engineer with experience related to structural steel fabrication.
- Licensed P. E. or S.E., with experience related to structural steel fabrication.

7.2.2.2 Detailing Functions

Personnel who detail and/or check shop and erection drawings must have experience in drawing projects typical of the projects fabricated. Detailers in training must work under the supervision of a trained detailer or checker. A qualified checker must check all shop drawings. Checkers must have training and experience in connection selection.

7.2.2.3 Connection Consultation

Personnel directing detailers performing connection detailing must be

experience and knowledge as outlined in the Standard. However, to say that the individual in charge of detailing has been doing this "type of work" for five,10 or even 20 years, while important, is not in itself a complete description of qualification. Some further description of the type of work performed and the type of projects handled should be included. Especially in the case of individuals lacking formal education, it is important to demonstrate their ability based on experience and other relevant factors (such as letters of recommendation from customers, copies of drawings prepared and/or checked or done under the supervision of the manager, and copies of reports, letters and other documents illustrating the individual's competence).

You also need the assurance that each person doing the detailing, as well as each checker, has the experience to perform the work. Just as was suggested for the detailing manager, you should consider maintaining a file for each detailer and checker with his/her experience containing similar applicable information as that listed for the detailing manager.

Many fabricators subcontract some portion or all of their detailing. Knowing the competence of your subcontractors is essential. For this program you will need to develop a procedure defining the basis by which you decide to which firms you will subcontract your detailing work. This procedure often involves creating an approved detailer list. Many fabricators maintain a file for each detailer that they currently work with as well as firms they may work with in the future. That file contains information provided by the detailer, such as the names of their personnel and their resumes, the names of recent projects which describes the nature of the work, the size of the project and references to contact, examples of training of the detailer's personnel, and any other information illustrating the competency of the detailer. For those firms that have done work for you in the past, you can augment their file by placing the names of projects the detailer has performed for your firm, his ability to perform in the past, and his demonstrated knowledge in various aspects of completed work. The file should also contain information on the qualifications of the detailing firm and their key staff. You may choose to acknowledge nationally recognized certification programs for individuals and firms.

Occasionally your customer will have contracted directly with a detailer for the shop drawing preparation. These drawings are now the owner's responsibility for correctness and timeliness. Even so, you still need to develop a system that deals with the receipt of these approved drawings from your customer. In addition, the same type of controls that you use when the drawing preparation is your responsibility need to be in place when the owner prepares the shop drawings. This would include a procedure to deal with changes that could come about after you receive the drawings from the owner. Just because the customer provides drawings doesn't relieve you of the responsibility to provide a system for revision control to those drawings. You must still be able to demonstrate your capability to manage and check a detailing process.

If your firm subcontracts out some or all of its detailing requirements you need to establish the extent of your internal review of the drawings received from your subcontractor. This review varies from fabricator to fabricator and is also often dependent on the complexity of the project, the skill of the detailer and other conditions unique to the fabricator. It is important for you to state in writing what form of review you perform. Each time a review is made the person responsible for the review should report the results of that review. In some cases the report of the review may be quite simple. At other times, more detailed.

qualified by one or more of the following:

- Experience in sizing connections, detailing and checking of shop and erection drawings for steel, approved by an engineer, for a variety of structures representative of the projects the company provides and training in courses with a written curricula in steel design and connection design.
- Graduate Engineer with experience related to structural steel fabrication.
- Licensed P. E. or S.E., with recent experience related to structural steel fabrication.

7.2.3 Subcontract Services

In lieu of employed staff personnel, subcontract services may be used for the following functions: detailing, connection consultation, checking of shop and erection drawings, training of detailers and checkers. However, the Fabricator retains the responsibility for compliance with the requirements of this element.

The Fabricator must define and document the qualification and selection process for choosing subcontract detailers.

Tip(s)

Be sure that the function of detailing manager is shown on your organization chart.

Many documents, including AISC documents, are available on line at no cost.

You may find it helpful to add the names and types of projects worked on to a file for your detailers and checkers on a regular basis.

Having the names and resumes of specialists available on an approved list of connection designers would demonstrate that you are prepared in the event a project requires this expertise. The resume should contain education, training, experience and projects for which the engineer did the connection design.

If you have a preference or requirement for a particular form of software, the detailing subcontractor's ability in that regard should also be stated in the approved detailer list.

Quality Record Examples

Approved list of detailing subcontractors

Record of the subcontractor qualification process (telcon records, audits, letters of recommendation, references, etc.)

Details (tonnage, description, connection types, etc.) of projects that personnel have worked on for qualification purposes

7.2.4 Customer Supplied Shop Drawings

When the Fabricator receives shop drawings from the customer, procedures will be documented for the receipt, revision and control of those drawings.

From the Standard:

8 Document and Data Control

The Fabricator shall document a procedure to control the Quality Manual, contract documents, shop and erection drawings, all documented procedures required by this Standard and all documented procedures, data and documents affecting quality.

8.1 Review and Approval

Documents affecting quality shall be reviewed and approved by authorized management. Revisions to the Quality Manual and other quality management system documents shall be reviewed for adequacy and approved by the same function and level that authorized the original document. Management shall establish the frequency and requirements for review and updating. A method will be established to identify the changes.

Element 8 Document and Data Control

Key Concept(s)

Develop a procedure for consistent control of the Quality Management System documents.

All Quality documents, as well as revisions to those documents, must be approved by management.

Develop a procedure so the user knows which are the up-to-date documents.

Receive and document customer requirements.

Required Documentation

Describe how Quality Management Systems documents are controlled.

Interpretation

It's important that you establish and maintain procedures that when followed will assure that the correct documents are provided to those who require them can perform their work properly. This will require a definition of how revisions to these documents are made as well as how obsolete documents are handled.

To help develop a Document and Data Control procedure, start by creating a list of your controlled documents and their current revision status. On the original and on controlled copies there must be a place to indicate the position and the name of the person who is approving the document.

There are many types of quality documents and they vary in degree of significance to your quality system. Some are:

1. Quality Manual—General Direction
2. Procedures—What you do
3. Work instructions—How you do it (WPS's)
4. Records—Documentation of the activity that confirm how you did it (a record is a filled in form)
5. Forms

When revisions take place, there must be a means or method to identify the revision. Typically, a change in type or bars in the left margin are used, but any effective and clear method you prefer is acceptable. Also, within the "list" of controlled documents, track all those individuals who are issued controlled copies of quality documents. Develop a method to distribute and confirm receipt of the original and all revisions of those documents. Consider sending a list once a year to each holder of a controlled Quality Manual with a list of all documents that are contained in the Manual and their latest revision dates.

You must also provide access to current documents to those that have a need to see them to perform their work. As an example, if a welder does not have a copy of the WPS at his welding machine and wants to look at it, it should be available within a short distance and without

the requirement of getting a door unlocked. Consider training your internal auditor to test your compliance by requesting selected personnel to retrieve and explain such a document.

It's important that the appropriate managers are assigned to review and approve your company's quality documentation. The same level of approval will be required for all subsequent revisions. For example, the same job position that initially approved your company's Detailing Standard must also sign off on any changes to the Detailing Standard prior to the implementation of the change.

In order to keep your procedures current and to reflect your company's current practices, you should set periodic review cycles. For example, an NDT procedure could be reviewed every year on the anniversary date of its implementation. Whether the review is on a set schedule or on an as needed basis, management must determine and document these frequencies.

A procedure is required that illustrates the process your firm uses to assure that the correct contract documents, including all revisions to those documents, are being used in the work throughout the fabrication process. This procedure should be implemented at the beginning of the project when the sales function obtains the sales order. At that point, the Sales Department should obtain from your customer the documents you will use to prepare shop and erection drawings. Your procedure should identify to whom the Sales Department gives these documents. Also, if there is a form used to describe any special terms or conditions agreed to between sales and the customer, your procedure should describe the form.

Likewise, if your procedure includes a meeting to discuss the project within the organization, your procedure should include when the meeting takes place, who attends and what is usually discussed. Also, a description of what the detailing function does when it receives these documents in so far as recording them and reviewing their content should be included (there is one such process described in this Guide under the heading of Detailing; in the event that the detailing portion of your contract is sublet to an outside firm, your procedure should describe the process by which the subcontractor is sent the documents they require to do their work).

If the change affects documents already released for fabrication and/or erection, your procedure should describe what process you utilize to assure that the previously released—and now obsolete information—has been retrieved and taken out of the hands of the fabricators and/or erectors.

Quality Record Examples

A master list of all quality documents and their revision level.

Tips

Realize that data effecting quality can be on paper or electronic versions of forms, records or other bits of retrieved information (such as inspection checks) which is maintained in a data base. Other examples might be EDI (electronic data input) transmittals to customer.

Additionally other data considerations is how to control your electronic detailing drawings and information.

From the Standard:

8.3 Revision Control

The Quality Manual shall have a cover page showing the current revision date and the name and location of the Fabricator. The revision will be clearly identifiable on all manuals and procedures and there will be a method for monitoring and identifying the latest revision. The Fabricator will establish a method to ensure that changes to the Quality Manual and/or referenced procedures are identified from the previous revision. Documents must remain legible and easily identifiable.

8.4 Access

Relevant and current procedures and policies pertinent to an area of operation or management shall be available and readily accessible to all personnel responsible for performing work effecting the quality of the product.

8.5 Obsolescence and Transmittal

Controlled documents that are obsolete will be marked, segregated, destroyed or otherwise prevented from inadvertent use in the fabrication or erection process.

Element 8.3, 8.4, 8.5 Revision Control, Access, Obsolescence and Transmittal

Key Concept(s)

Changes to your Quality Manual must be done in a prescribed manner.

Only current documents are to be used.

Identify the location and distribution of quality documents.

Required Documentation

quality manual cover page

describe how quality document revisions, access are controlled

describe how obsolete documents are controlled.

Interpretation

Once a revision is required to any part of the approved Quality Manual or procedures, it is essential that the same level of management that approved the original approve all revisions. To provide control of the documents and revisions to them, you should consider using a standard form at the beginning of each document. This form provides spaces for: the title of the document; the original date of approval, and the person and title of the original approver; the distribution list; date of receipt of the document by the recipients and their acknowledgement of the receipt of the documents (a place to initial); and revisions to the documents. Each revision would be identified in some fashion (by a letter or number and a brief description) and space should be provided for the same information (approver, dates, recipients, etc.) mentioned for the original document. Remember, whatever means you use, always use a method that best suits your company.

As discussed in the Detailing element of this Guide, drawings that are revised or otherwise obsolete are taken out of production, with all copies accounted for in order to assure that they are not used inadvertently. They can be destroyed, marked obsolete or otherwise made unusable You should consider using a similar method when other controlled documents, and in fact, any portions of the Quality Manual, are revised. When controlled documents are revised it is imperative that all holders of the original document be sent the revision.

Controlled documents, drawings and specifications sent outside the organization to vendors, suppliers, subcontractors, erectors, engineers and others must have a transmittal system. This transmittal system must document the distribution and any other pertinent information.

Tip(s)

Keep the master Quality Manual containing all the revisions and list of manual holders under the control of the Management Representative. This is true for transmittals sent to employees, subcontractors, customers, etc.

A method shall be established and maintained showing the latest revisions and location of the Quality Manual and other quality management system documents, and contract documents including design drawings and shop and erection drawings.

A transmittal system will be established to track the distribution of drawings, documents and specifications to customers, subcontractors and suppliers. These records will indicate the approval and release to shop or field status.

To make sure that key people are aware of changes, you may want to have them sign a transmittal, that they received the original Manual and all revisions to the Manual or procedures, as they are issued.

Applicable documentation which could be copies of the Manual, or procedures, that they describe.

Quality Record Examples

Records of transmittals of documents and their revisions.

From the Standard:

9 Control of Quality Records

The Fabricator shall establish and maintain a documented procedure for identification, collection, storage, maintenance, retention and disposition of quality records. All quality records shall be legible and shall be stored and retained in such a way that they are retrievable from facilities that provide a suitable environment to prevent damage, deterioration or loss. Retention times shall be established and recorded for records retained for any purpose. The retention periods will be at least long enough to permit evaluation of the records during the course of project construction. Where agreed contractually, and contractually by code reference, the Fabricator shall make quality records available for review and evaluation for the agreed time period. Records that document quality typically include: inspection records, NDT Reports, drawing logs, MTRs (material test reports), CofCs (certificates of compliance/conformance), design changes, RFIs (requests for information), mill and consumable purchase orders, records or summaries of nonconformance reports, corrective action reports,

Element 9 Control of Quality Records

Key Concept(s)

Establish a procedure outlining the handling and storage of quality records.

Establish a retention period for quality records.

Required Documentation

Describe how quality records are controlled.

Interpretation

You need to develop a procedure defining which quality records are generated, how long they should be saved, where and how they are to be saved, and who will collect them and direct them to the proper location.

To start, first again consult the Standard for the list of every record required. Add to this list any other records you use in the conduct of your business.

Your procedure should include information on who is responsible for collecting records (for example, your chief draftsman would be responsible for collecting detailing records while the QA or QC managers would be responsible for collecting QA and QC records).

The procedure should also define where and how they are retained. You should state if they are to be microfilmed, scanned into a computer and stored on a disc, or simply stored as paper files.

Retention times for quality documents and records can vary based not just on a fabricator's needs, but also on the requirements of the local, state and federal governments or of the project's owner. If the owner has a policy different than your normal retention policy, it should be clearly explained to all concerned parties and documented prior to the start of the project. It is helpful to consult with your attorney or accountant in establishing retention policies.

Tip(s)

Once you set the retention period requirements you may wish to consider setting a time each year to purge those documents that have become out dated.

During your internal audit, you should examine some sample records to verify that your retention policy is being followed.

Quality Record Examples

A list of quality records that are generated by your company’s quality documentation.

internal and external quality management system audits.

From the Standard:

10 Purchasing

The Fabricator shall document a procedure to ensure that subcontractors, purchased products, materials and services conform to project requirements. The responsibility for quality of the subcontracted product remains with the Certified Fabricator. Purchase orders, records of the qualification of subcontractors and suppliers and records of the periodic evaluation of suppliers shall be maintained.

Element 10 Purchasing

Key Concept(s)

The fabricator has responsibility for the quality of items from suppliers and service providers.

Required Documentation

Describe how you ensure the quality of purchased products and services.

Document how you assure the quality of subcontracted fabrication.

Interpretation

A documented procedure is required for the purchasing all materials and services. Any agreement, purchase order or contract, should include a clear description of the work or product to be furnished; the documents (plans and specifications and/or codes) that will govern the work; NDT or other inspection provisions; requirements for Certificates of Compliance, mill test reports or other compliance document; delivery instructions and dates; and any prerequisites (AISC certification, etc.) that may be required.

Obviously, certain agreements will have unique terms and conditions. Erection contracts will have insurance provisions and perhaps performance and payment bond provisions. Detailer's agreements may have specific software requirements or scheduling requirements. Wherever possible, your purchasing standard should outline any specific requirement that you require.

In addition, as part of your agreement with your customer you have accepted certain terms and conditions. There may be portions of that agreement, or the entire agreement, that you may wish to tie into the purchase order or contract with your supplier or subcontractor.

Tip(s)

Standard purchase order forms may be beneficial for products purchased on a regular basis, such as welding consumables, galvanizing, paint, bolts, NDE services.

Assure that purchase orders that were initially created verbally, are eventually converted to a documented format.

Quality Record Examples

Records of qualifications of subcontractors and suppliers.

Records of the evaluation of subcontractors and suppliers

Records of periodic reviews or audits of subcontractors and suppliers.

Purchase orders.

From the Standard:

10.2 Selection of Subcontractors

The Fabricator shall evaluate and select subcontractors on the basis of their ability to meet subcontract requirements, the Fabricator's quality management system, the requirements of this Standard, project requirements and any specific inspection requirements. The structural steel fabricator selected as a subcontractor shall have the required level of AISC Certification on projects requiring AISC Certification.

The Customer or Engineer of Record must approve (in writing) any subcontracted Fabricator that is not an AISC Certified Fabricator on projects requiring AISC Certification.

A written procedure shall be established that describes how the Fabricator evaluates all subcontractors. Subcontractors shall be evaluated in an interval agreed upon by the management. The Fabricator will evaluate the subcontractor via an audit or documented acceptable past experience. Management shall determine the basis of evaluation criteria and the personnel involved in the evaluation process. As a minimum, quality of the

Element 10.2 Selection of Subcontractors

Key Concepts

Develop a method for selecting subcontractors.

Develop criteria to verify that each subcontractor is an acceptable, qualified provider of a specific product or service.

Develop the method for evaluating companies against these criteria.

Required Documentation

Describe how subcontractors are qualified and evaluated.

Interpretation

It's critical to develop a procedure to assure that your firm uses only subcontractors that you have identified as being satisfactory. Often, companies create and maintain a list of pre-approved subcontractors that meet their quality requirements.

The Standard requires that you re-evaluate subcontractors at defined intervals. Choose the intervals that make the most sense for you based upon the complexity or size of the work subcontracted and make that a part of your procedure. Whether the intervals are yearly, at set times during a large project, or at the conclusion of a project, it is important that you have an established procedure and that it makes sense for your company and the type of work that you do.

Before pre-approving subcontractors, it's important that you first establish the criteria on which approval is based. These may include a wide range of factors depending on the type of subcontractor and the type of work your firm does. Examples include on-time performance, proper fitting of materials in the field, satisfactory coating application, and specific records that you require that they keep.

The method of evaluation of suppliers and subcontractors needs to be established and it can vary by any method you feel is appropriate. You could have one method for a firm doing smaller work as opposed to one doing large work. (Define large and small by tons, square footage, dollar volume, etc.) It could vary depending on any other objective method you feel is appropriate. State the method you use in your procedure. Your evaluation of the supplier can be accomplished by personal interview, telephone interview, visit to their facility, previous experience, etc. As with other components of this Standard you may find it helpful to establish a folder for each company. Place the results of the audit or examples of the experience into the folder.

If you do not already have a list of pre-approved contractors, the easiest place to start is by compiling a list of the companies you have done business with in the past. The list should include key information on the company, including an outline of the subcontractor's facilities and equipment, resumes of key personnel, and a list of recently completed projects. You

finished products and timely, proper delivery of products shall be part of the evaluation procedure.

should also have the project managers who have previously worked with the subcontractors provide information on the type of work performed and whether it was completed satisfactorily. Both positive and negative comments should be documented.

A similar evaluation can be performed on subcontractors with whom you have not previously worked. In this case, you should document the company's credentials as they relate to the work they will perform for you. Often this includes information on previous projects (with names and phone numbers for checking records), information on the qualification of their staff and copies of their welding, bolting, painting, and NDT procedures. You should also review their QC and/or QA program, interview key personnel, and visit their facility.

Remember, if you have entered into a contract that requires you to have a certain level of AISC Certification you need to either 1) be sure that your subcontractor has that level of Certification or 2) submit the subcontractor's name to the customer or engineer of record for written approval of their involvement in the project.

As a minimum you must define the criteria that determines acceptable performance. You may say that only AISC certified fabricators or that only firms with their own in-house CWI will be your subcontractor on a specific project.

For the Standard, the distinction between a supplier of a service and a subcontractor is important. If required by the contract documents, a subcontractor needs to be certified unless excused from that requirement as provided by this Standard. However, a supplier does not have that certification requirement. The definition used in this Standard is that a subcontractor is an entity that attaches something to a member being fabricated, such as by welding or bolting.

You may decide on a proactive method of pre-qualifying your subcontractors such as by auditing their facility and their management looking especially at quality issues and their inspection processes.

Because of the number of subcontractors or the critical nature of the work you wish to subcontract, you may need to establish a rating system against the criteria that you have established. The individual responsible for purchasing or managing the project can choose to systematically rate each subcontractor's performance during the course of the contract as well as at the end of the contract. The number of comments and their interval should be a function of the intricacy of the work being performed or if the work is especially critical to the success of the entire project.

Tips

To minimize errors relative to subcontracting to a firm without the proper AISC Certification, the certification level received by subcontractors and suppliers should be shown on your approved subcontractor list and updated as required. An up-to-date list of certified fabricators is available on the AISC web site (www.aisc.org).

You may chose to place the performance of major subcontractors, which occur over several projects, on one system, program, or sheet so that positive or negative trends can be easily identified to aid in making purchasing decisions.

The fact that you have done business with a particular firm for years, is not in itself a qualify-

ing characteristic. You must show how the firm meets your specific qualification criteria.

Quality Record Examples

List of approved subcontractors.

Records of the evaluation process, such as audits or documented acceptable experience.

Written waiver if AISC Certified fabricators are not used when specified.

From the Standard:

10.3 Verification of Purchased Product, Materials and Services

The Fabricator shall define the extent of control necessary to conform to the project requirements. This may be dependent upon the type of product, the impact of subcontracted product on the quality of the final product or the records available for the demonstrated capability and performance of previous projects. Test reports, certificates of compliance or other evidence of quality control shall be kept on file.

Element 10.3 Verification of Purchased Product, Materials and Services

Key Concept(s)

Define the verification you need from your suppliers and subcontractors and include it in your purchasing procedure.

Interpretation

The contract documents on some projects contain a list of requirements for verification of product quality, including certificates of compliance, mill test reports, rotational capacity of bolts, etc. Within your purchasing procedure you must state that this contractual requirement is to be passed down to your suppliers, vendors and subcontractors so that you may remain in compliance with your contract.

But, even if these verifications of quality are for some reason not required by your customer, you need to consider the documentation your firm expects from those providing you services or product to assure that you are being provided a product that is in compliance with your purchase order. The individuals you have performing the purchasing function need direction from management as to what your company requires in this regard, even in the absence of any contractual requirements between you and your customer. The types of verification are varied but could include such items as certain minimum NDT examinations for welding; minimum checking of coatings depending whether they are primers or finish coats; and allowable tolerances. This latter case is particularly important if you are purchasing components that will then connect to or be incorporated into a product being fabricated by you or another party. These requirements also would tie into the responsibilities of those performing your receipt inspections. Depending on the type of work your firm usually fabricates several standards could be developed. Of course a special procedure could also be developed for any unusual projects requiring special verifications.

Tip(s)

The contractor review agenda should include discussion of special purchasing requirements. These requirements need to be included on purchase orders.

Quality Record Examples

Test reports, certifications of compliance, and other evidence of quality control.

From the Standard:

10.4 Customer Verification of Fabricated Product

The customer or the customer's representative shall be allowed the right to verify the conformance of the final product to the project requirements at the Fabricator's premises.

10.5 Control of Customer-Supplied Material

If materials are supplied by the customer; the Fabricator shall verify, store and maintain materials in an appropriate fashion. Verification shall include confirmation that the material is what is required and meets the quality requirements. Any such product that is lost, damaged, or is otherwise unsuitable for use shall be recorded and reported to the customer.

Element 10.4, 10.5 Customer Verification of Fabricated Product, Control of Customer Supplied Material

Key Concept(s)

Your customer has the right to inspect their final product at your facility. However, whether or not they inspect, you are still responsible for making the product in accordance with the plans and specification.

Materials supplied by your customer must be verified and handled just as any other material.

Interpretation

Inspection by the owner or the owner's designated representative is fairly standard in the fabrication industry. Often the owner subcontracts the inspection to a testing agency or an engineering company. The level of inspection can vary and may or may not have an NDT component. However, whatever the level of testing and/or inspection by the owner, you still have the responsibility to provide the product you produce in compliance with the contract documents.

Sometimes the customer requires inspection a particular point in the fabrication cycle (at weld fit-up, just prior to coating, etc.). If this is the case, you should get that specific information from the customer before hand and set a definite time for those inspections. You may consider telling your customer or their inspector that you will "hold" further fabrication beyond the requested "hold point" and wait for the inspection for a certain time frame, say two hours.

Sometimes your customer may provide you with raw material or other components such as bearings, architectural pieces, or other fabricated items for incorporation into the project. When this occurs the customer material should be handled in the same manner that you would inspect any material coming from a source. Your customer should provide you with the same documentation that you expect from other suppliers including MTRs, certifications of compliance, etc. If this level of documentation can not be obtained from your customer, you should obtain a waiver of this requirement from your customer.

Tip(s)

Because customers do not furnish materials to a fabricator on a regular basis it is even more important that this information be outlined in your purchasing procedure.

From the Standard

11 Material Identification

The Fabricator will document a procedure for identification of material as stated in the AISC Code of Standard Practice and contract documents. Purchasing documents for materials furnished to ASTM specifications shall include the information required in the "Order Information" section of the ASTM Standard.

The filing and retention of mill test reports, manufacturers' test reports and certificates of conformance for base materials, bolts, welding consumables and coatings provide minimum material identification. The retention of these records will be defined.

Element 11 Material Identification

Key Concept

Establish a procedure for verifying the material used in the product you have fabricated meets the requirements of the plans and specifications of your customer and utilizes the information stated in the AISC Code of Standard Practice.

Interpretation

The process for identification of the steel incorporated into a structure usually starts with the advance-bill-of-materials and purchase order to your supplier and continues when the material is received from your source. The markings for shape sections coming from a mill are outlined in ASTM A6 and include the heat number, size of section, length, and marks identifying the manufacturing mill. The markings on each may include the specification and grade depending on the size of the member. The larger members have that information on the piece while with smaller members, which come bundled, every piece is not marked but the bundle is identified with the specification and grade. As the bundles are opened, assure that each piece continues to carry the mark of the original bundle.

For plate markings (also outlined in ASTM A6), each plate will have markings indicating its specification number and grade, heat number, and an identification of the producing mill. Because many fabricators require additional information to properly process raw materials into their system the purchase order to the supplier, mill or service center needs to outline what your particular facility requires (for example, your purchase order number, the line and page number from your purchase order, and the material specification and grade). Material ordered to one of the grades that has been given a color code should come with those colored markings as well.

Your system must include a method for checking and verifying that the pieces received match both the purchase order (documents), for example: shipping statement, bill of lading, manifest papers. You also should mark each piece to indicate it has been checked. When bundles of materials are broken apart, each piece in the bundle must be appropriately identified. The method that you choose can utilize identification numbers or marks affixed by the original supplier or service center, or your own system. Just make sure that the system can relate back to a purchase order number, a bill of lading or bill of material number that will relate to a mill test report.

When there are requirements contained in your purchase order to a supplier for markings, it is the supplier's obligation to identify the piece by proper markings. You must address in your procedure what you do if the piece does not come in properly marked or you inadvertently loose the mark. Further, if you order multiples (several members cut from one ordered piece), state the procedure for transferring identifying marks to all pieces in your facility.

Your procedure for identification must assure that these marks are carried through the fabrication process up through the fit-up which is defined as the operation when the main shipping piece and all of the attachments to the main shipping piece are assembled. The fittings (angle, plate) that will be attached to the main piece have their markings transferred from the larger section they are cut from. Because often a group of fittings are bundled together and are generally marked as a group and not individually, the mark on fittings may be lost after fit-up.

If it is a requirement of your project to carry the identification further (for example, to the point of shipping), you should have an established procedure that may include using the shop drawings or cutting list as the recording document.

Tip

Your written procedure must be understood by all personnel involved and be consistent with the work in progress.

As with all quality records, you must establish a retention time for mill test reports, manufacturer test reports and certificates of compliance.

Quality Record Examples

Mill test reports.

Manufacturer's test reports.

Certificates of compliance for base material, bolts, welding consumables, and coatings.

From the Standard

12 Fabrication Process Control

The Fabricator shall document procedures necessary to produce a consistent acceptable level of quality of the furnished product in accordance with the applicable codes or specifications. The Fabricator will include additional "special procedures" that cover fabrication processes done at the facility (e.g., cambering).

Regardless if these processes are habitually performed at the facility, effective implementation of the following documented procedures are required as a minimum:

12.1 Welding

Including WPSs and qualification of welders.

12.2 Bolt installation

Including required inspection and testing.

12.3 Material Preparation for Application of Coatings

12.4 Coating Application

12.5 Equipment Maintenance

A documented preventative maintenance program shall be implemented for equipment critical to product quality and

Element 12 Fabrication Process Control

Key Concepts

Establish the necessary details that assure that each fabrication process is executed consistently to produce a product of the required quality.

Even if your facility does not perform one of the required processes on a regular basis, you must have procedures and cognizant personnel that can execute each process and the required quality assurance and quality control.

Required Documentation

A general procedure for each process

Document special fabrication process (other than welding, bolting, material preparation for coating application, coating, maintenance)that are employed at your facility, for example: cambering or heat treatment.

Interpretation

You must establish procedures describing how your company performs the fabrication processes used in your shop to assure compliance with the contract documents. If you perform other special fabrication processes, such as cambering or the use of certain CNC equipment, these will be outlined in a procedure as well.

delivery requirements at a minimum.

Element 12.1 Welding

Key Concepts

Establish the methods by which you assure that welds and welders meet ANSI/AWS D1.1 (Structural Welding Code Steel) or project specification if more stringent.

Required Documentation

Welding Procedure Specifications.

A procedure that describes how your facility addresses welder and welding procedure qualification, the assignment of welding work and responsibilities and the quality records that are generated.

Interpretation

In this procedure(s) you will need to discuss the process by which you develop Welding Procedure Specifications (WPSs); Procedure Qualification Reports (PQRs); certify and qualify welders; assure that the welders are using the correct consumables; assure that welders follow the WPSs; develop a system for identifying the welder that welded a specific joint; and maintain proper records for all of these items. Writing an effective procedure here, will help to establish and demonstrate your ability to implement the requirements of welding codes.

A requirement of the Standard is that the welding operation will be governed by the ANSI/AWS D1.1 as a minimum regardless of a specific contract requirement. Of course, the owner can specify a more stringent requirement provided that it is spelled out in the contract documents. You need to have copies of all required reference standards and codes at your facility.

Your documented procedure on WPSs and PQRs will depend on the welding processes, welding positions and welding joints you use in your facility. Identify the sections in ANSI/AWS D1.1 that you use in developing the WPS and PQR both for fillet and groove welds. Discuss prequalified procedures and those that require qualification testing. Discuss who is responsible in your organization to perform the various tasks required in preparing these documents. This would include the preparation of the WPS, the making of the weld test plates, making test coupons, machining the welded test plates, testing the test plates and coupons, use of a testing laboratory, acceptance criteria and any other requirement of AWS D1.1. Describe who is authorized to sign the WPS and where they are kept in the shop to provide open access to the welders and others who are responsible to execute the WPS. **Assure that your company name is on the WPS and that a responsible company representative signs each WPS and PQR taking ownership of the information or results for that document. Additionally, your welders must know and understand the information in the WPSs that they use in their work.**

The procedure should describe the controls placed on the access to consumables by your welders and weld operators. Is there a central storage area? If so, who has access to it? Does the foreman provide the consumable to the welder or does the welder get his own? Is a low hydrogen procedure necessary for the processes you use? This type of procedure will assure

that the correct materials are used according to your WPS. Using a sign out sheet when consumables are taken is one method of record keeping.

Making sure the welders working on a project have up to date certification for the welding process and the type of weld they are working on is essential. You must determine who maintains those records and the method you employ to assure that only the correct certified welder is used.

Your WPSs and your welding inspection procedures must be presented in a fashion that your personnel can understand. Thus the detail and readability of this presentation is dependent to a great extent on the competence and experience of your workers in dealing with these documents. Have your internal auditor verify your company's implementation of your welding program, talking with your welders, inspectors and QC manager. In talking with them about their knowledge, ask what they do prior to welding, what is their understanding of the WPSs, where the WPS located, how do they get consumables, etc.

Tips

The QC inspector or the welding supervisor can periodically question the welders to insure they understand and are following the WPSs, and although not required by the Standard, consider verifying that they are identifying their welds.

Quality Record Examples

Welder qualification records/Welder Performance Qualification Records (WQR, WPQR).

Welder continuity or maintenance records.

Element 12.2 Bolt Installation

Key Concepts

Develop a procedure to assure that the correct bolt assemblies are used and that they are properly installed.

Interpretation

You need to describe the method used by your shop personnel to select the bolt assembly they will be installing, how the plies of the joint are brought together (snug tightened), and the method used in your shop for tightening the assembly. Whatever method(s) you use in your shop for tightening, describe it (them) using as a guide the Specification for Structural Joints Using ASTM A325 or A490 Bolts by the Research Council on Structural Connections (RCSC). A copy can be downloaded at www.boltcouncil.org. or at www.aisc.org. There may be one method for tightening high strength bolts and another for non-high strength bolts.

High Strength Bolts may be designated by the contract documents as "snug tightened joints" or "Pretensioned joints" (four potential methods listed below). Your procedure must include how this information is given to the shop and field personnel, either by notes on the drawings or by some other method.

All Pretensioned fasteners are required to be tested prior to installation using the "Pre-Installation Verification" procedure. This must be addressed in your procedure.
Even if you don't normally perform shop bolting, you still are required to have a bolting procedure in place referencing at least one of the aforementioned tightening methods.

Even if you don't normally perform shop bolting, you still are required to have a bolting procedure in place referencing at least one of the aforementioned tightening methods.

There are four acceptable methods listed by the RCSC for tightening (Pretensioning) high strength bolts. They are: Turn-of-nut; Calibrated Wrench; Twist-off-Type Tension Control Bolt; and Direct Tension Indicator. Your shop may use one or more of these methods. For each method you use you should describe the tightening process and when and how the bolts are inspected and tested and who in the organization does the testing. Include under what circumstances a bolt may be reused.

There are times when the project specification may require a defined inspection of the shop bolting. However, in the absence of such a requirement you must state what your company has as it's own minimum-testing procedure. State if you require total inspection or if just a sampling is your standard. If you use a sampling method, define the required sampling.
There are provisions in the RCSC specifications for the use of a tension calibrator (such as a Skidmore-Wilhem Torque-Tension Tester). Even if you do not install bolts on a regular basis, you must make provisions to demonstrate that you have reasonable access to one. The AISC Certification Program requires that Fabricators demonstrate this knowledge at the initial audit and every third year at their full audit time.

The storage requirements for fasteners as specified by RCSC also must be included in your procedure.

Evaluate your storage area to assure that bolts are protected from weather, deterioration and dust and dirt.

Quality Record Examples

Records of pre-installation verification.

Element 12.3 Material Preparation for Application of Coatings

Key Concepts

Develop a procedure to assure that the fabricated material has been properly prepared to receive the specified coating.

Interpretation

Your procedure should state that your internal documents (such as shop drawings) specify the cleaning requirement for production and that these requirements are no less than the minimum required by the coating manufacturer and the contract documents. The publication Steel Structures Painting Manual outlines the various types of cleaning that are available for structural steel from hand cleaning, the minimum cleaning, and the various forms of blast cleaning. Your procedure needs to reference what is applicable to your customer requirements. For example, you may require that only SSPC designations be used (such as SSPC-SP2 for hand tool cleaning or SSPC-SP6 for commercial blast cleaning). Address how the blasting material is stored to prevent contamination from moisture and the elements.

The procedure should include checking the surface condition of the steel prior to the application of the coating for cleanliness and for profile when required. In the procedure describe the use of visual aids (pictorials) available for each of the blasting specifications, which are used to assure that the correct amount of cleanliness and percentage of surface cleaned has been achieved during the blasting process. Also, describe the use of a profileometer or other means to determine the proper anchor pattern created by the blast. Since deterioration of the blast surface is time sensitive, define the amount of time that the tests can take place prior to the application of the coating.

The procedure must state that any deviations found in the surface preparation from the approved drawings or specifications will be corrected before the coating operation commences.

Quality Record Examples

Records of blast profiles.

Surface condition inspections.

Element 12.4 Coating Application

Key Concepts

Develop a procedure to assure that the specified coating is applied properly.

Interpretation

This procedure is developed so that the proper coating is applied in a manner in which the coating meets customer requirements. Examples of what is to be included are:

- Identification of the proper temperature and humidity;
- Application by trained and experienced personnel using proper equipment;
- and that the recommendations of the manufacturer and requirements of the contract documents are followed.

The procedure may start with a description of how you determine which coating products are purchased and the documentation that should accompany the shipment of the coating material from the manufacturer. It would discuss the inspection that should occur when the coatings are delivered (the cans or other containers should not be dented, the tops securely fastened and no other sign that damage has occurred). Leaking or damaged containers should not be used.

Include what information contained on the coating container that needs to be checked. The receiving foreman would normally verify the job number, the paint is the one appearing on the purchase order, and that the expiration date of the coating will not affect the work. If the label cannot be read the material should not be used.

The procedure should also include how the coating requirements for each project are transmitted to the paint department (for example, by notes on the drawings or by other transmittals). It might state how the materials that are used in the coating operation must be stored in a suitable environment and of what a suitable environment consists. Coatings and solvents in storage should never be exposed to temperatures below freezing and some must be kept to specified temperatures. There are certain maximum temperatures as well. The manufacture's information must be checked in this regard. Therefore paint must normally be kept in some temperature controlled environment and how you accomplish this must be addressed.

The surface of the steel prior to application of the coating must be checked for compliance with the cleaning requirements, and if blasting was used, that any blast residue has been removed. The surface preparation is a major contributor to paint problems and the auditor will pay close attention to this area.

There are often "no paint" areas that must be covered to prevent coating from getting to the steel surface. These areas are usually outlined on the shop drawings or other communication from the detailing function. Describe the method used to protect those areas and who performs the work. Some fabricators use masking tape, some a reusable device to mask the areas.

You must outline how you verify, and the equipment you use to check, the ambient conditions of air temperature, temperature of the steel surface, humidity and dew point prior to the application of the coating. These tests are normally taken at the beginning of the painting operation as well as during the operation, usually at four-hour intervals unless conditions appear to be

changing. Keep records of these tests.

How coating materials are mixed and thinned is an important item. Describe the equipment used and state that the manufacturer's recommendations will be followed in the use of solvents. If multiple part products are used the mixing must be in accordance with the manufacture's and SSPC recommendations.

The procedure should address the method of application of the coating and state that the recoating times to which you must strictly adhere.

Also include the curing time and when handling can take place after the coating operation. Utilizing the criteria of the SSPC, outline the nature and documentation of inspection and/or testing during the coating and after completion of the coating. The method of taking and recording wet and dry film measurements, the frequency of the tests and who takes them needs to be stated. For a multiple coating system these must be taken for each coat. There are various methods of determining dry film thickness and there is a tolerance from the stipulated mil thickness. The tests are normally performed in a set of 5 taken over every 100 square foot area and averaged with no one reading less than 80% of the specified thickness (see SSPC for additional information).

If any work is found to be non-conforming the procedure needs to outline how these members are dealt with. As part of that issue the procedure should require that only a supervisor knowledgeable in coatings sign off on the previously rejected materials.

Quality Record Examples

Records of atmospheric conditions before and during coating application

Film thickness inspection reports

Element 12.5 Equipment Maintenance

Key Concepts

Develop a procedure to assure maintenance of your equipment to its proper operating level.

Interpretation

The process equipment used in your shop that directly affects quality needs to be maintained on a prescribed schedule (many firms have a maintenance program for all equipment). Examples of equipment that directly affect quality are welding machines, bolting equipment, hole making equipment, saws and automatic cutting equipment, measuring devices, cleaning and coating equipment. The procedure should cover the type of maintenance, period of maintenance, and the method of maintenance that you use as well as a means to document or provided evidences that maintenance was performed.

For instance, for your welding machines, you should state the interim between maintenance inspections and maintain records of the inspections and their results. Your procedure should include a sample form and the procedure for alerting the welding operator to when the welding machine was last checked and the results.

Typically there would be a log for each piece of equipment that is involved in your equipment maintenance program. The log would state the type of equipment, manufactures name, any company identification, the normal preventative maintenance functions needed for that piece of equipment, the dates of maintenance, what maintenance was accomplished, and the name of the person performing the maintenance. Your procedure should include a sample of the log.

The critical aspect, of course, is to insure that whatever maintenance method you outline in your system is the one you use.

Quality Record Examples

Records of the maintenance performed.

Element 13, 13.1 Inspection and Testing

From the Standard

13 Inspection and Testing

The Fabricator shall document a procedure for inspection and testing activities in order to verify that the product quality meets the project requirements. The Fabricator will establish in the procedure the level and frequency of inspection to assure expected contract quality. The Fabricator will adjust the level and frequency at any time when the required level of quality is not met. The inspection procedure shall include assignments of inspection and QC monitoring duties, showing the required inspection and testing and the required records to meet the project requirements. The inspection procedure shall include receipt, in-process and final inspection of all product furnished to a project. The procedure will include any sampling plan, if less than 100%, for each type of inspection. The fabricator shall enforce its nonconformance procedure when its product is determined to be nonconforming.

13.1 Assignment of QC Inspections and Monitoring

Key Concepts

Develop a procedure to describe how you verify that the product produced meets the requirements of the AISC Fabricator Certification Program, your own company requirements, applicable codes and standards, and the project plans and specifications.

Use qualified QC personnel. If production personnel perform QC duties they must be specifically trained. They may not perform final inspection.

Interpretation

In general your inspection procedures will cover incoming materials inspection, materials in-process inspection and a final inspection that is performed after all fabrication has been completed. These procedures can be contained in your quality manual or in a separate quality control or inspection procedure if you choose.

Your quality assurance function (QA) will plan the quality control (QC) activity by setting the frequency and types of inspections required. QA will then monitor the QC results and report them to management to assure that adjustments to inspection and testing frequency as well as types of inspection are made if necessary. These procedures may be developed on a project-to-project basis or you may develop a minimum requirement for all routine projects fabricated by your company. This procedure will define inspection (visual, dimensional, etc,) frequency, NDT (type, frequency), and the sampling plan. It also establishes the items to be inspected and includes the acceptable level of non-conforming items and the action(s) to be taken if that level is exceeded. If, as a result of these inspections and/or tests, you find that the fabrication is not producing an acceptable product, You must show a method to change the the procedure potentially to require more stringent and/or more frequent inspection and testing. The products produced, which are found to be nonconforming, are handled in accordance with an approved nonconformance procedure.

NOTE: Where your customer specifies the type and frequency of inspection and testing, and that requirement is in excess of your procedure, the customer's requirements govern.

The assignment of your inspectors would generally be based on the background and experience of the inspector as it pertains to the work to be inspected. You may choose to demonstrate the competence of your QC personnel by using a nationally recognized certification program. Additionally, you must document training related to their duties either provided directly by you, by a local institution, by a nationally recognized professional organization or other appropriate entity. Your procedure must address how you assign inspectors. This process must take into account the type and complexity of the work to be inspected and the qualifications of the inspector. In the event you are producing a type of work for which your inspectors have little or no experience you should consider stating in your procedure that if this situation arises, your intention is to hire an outside inspection lab that does have the required experience.

Sometimes, particularly in smaller shops, production personnel are used as inspectors. If you find that this makes the most sense for your business, this is an acceptable procedure providing some basic rules are followed. The individuals performing the inspections need to be trained in how to inspect the items they are asked to inspect and what is acceptable and not

QC inspectors shall be assigned on the basis of experience, training and education. Qualification Standards and Certifications granted by recognized industry organizations related to structural steel fabrication can be used to establish basis for assignment.

Production personnel shall be assigned to inspection duties under the following conditions:

- They shall be trained both in knowledge and practice in proper inspection methods and acceptance criteria specified for the material they are inspecting.
- They are aware of their responsibilities and are given time to perform their inspection responsibilities.
- They do not inspect their own work.
- Their inspections are monitored by qualified QC personnel.

acceptable quality for those items. It is recommended that you maintain records of this training. In addition, production personnel should never be responsible for checking their own work. Further, it is important that when your production employees are working as inspectors that they report to a designated member of your QC staff and not to their normal production supervisor. This is an important point. You compromise the inspection process when there is not a separation. This is an item that needs to be reviewed during your internal audit.

Tips

If at times you use production personnel as shop inspectors, it is important that your internal auditor can verify through interviews with the inspector/production person that there is within your company a commitment of quality over delivery or other considerations.

Quality Record Examples

Training records for production personnel assigned to inspection duties.

Indicate the required records for mandated inspection within project requirements.

From the Standard

13.2Inspection Procedure

The procedure shall include provisions for the following:

13.2.1 Material Receipt Inspection

Materials received shall be compared to the purchase order requirements. The receiver shall identify the material, grade and quantity and look for visible shipping damages. The receiver shall inspect shapes and plates for obvious deviations from the requirements of ASTM A6.

13.2.2 In-Process Inspection

The Fabricator shall conduct in-process inspection. In-process inspection plans and practices will provide a level of assurance that specified process requirements and inspection acceptance criteria that are not verifiable at final inspection or can hinder assembly are in compliance. Materials shall be inspected for specification and grade, workmanship and tolerances using appropriate codes, standards or a documented plan before fabrication begins. Compliance with documented bolting procedures, WPSs, preheat and welder qualifications shall be monitored. Production personnel

Element 13.2 Inspection Procedure

Key Concepts

Incoming material needs to be inspected to assure that it meets contract requirements.

Products are required to be inspected during fabrication as well as having a final inspection.

Records of these inspections are required.

Interpretation

Receipt inspection

An inspection procedure must assure that incoming materials meet the requirements of your purchase order and applicable specifications. This includes an assurance that these materials are marked to properly identify them in accordance with your purchase order. Your procedure should outline the documents that the receiving inspector needs to obtain in order to properly perform this function.

In addition to the markings on steel sections identifying material specification, size, and purchase order/job number, your receiving inspector will have to check the number of pieces received, the surface condition, and any obvious deviations from ASTM A-6. Sometimes there will develop a situation where the incoming material for some reason is not in compliance with your purchase order. You will need to address in your procedure how your organization deals with materials that are, for any reason, in non-compliance. Also include what the disposition of the material will be as well as the paper work trail for these items. Describe who gets the result of the inspections (inspection report), who is informed of problems with the material, who determines if the material will be reconditioned, used as-is, or replaced (reference element 15 Control of Nonconformances).

In-process inspection

Before fabrication begins, those who perform the QC function must be alerted to the extent of in-process inspection. One method to achieve this is to have the individuals in-charge of QA and QC for your firm review the contract documents and, in conjunction with the minimum standards of your company's QA/QC program and applicable code requirements, establish the QA/QC requirements for the fabrication. Among the codes to consider would be AWS, ASTM, SSPC, AISC, and ASNT. These requirements would spell out frequency, type and any other inspection criteria for welding, bolting, layout, fit-up, cleaning, coating, etc.

One particular item that is critical to the in-process inspection occurs when items are covered up or otherwise non-verifiable at final inspection. One example of this would be preheat and welding parameters or the coating on the inside of a box column. In cases of this sort the only inspection will be the in-process inspection.

Typically the incoming materials inspector can only perform a minimum check to see if materials conform to ASTM A-6. A more complete check can occur during the cutting operation or the in process inspection. The earlier this can be checked the less likely costly fabrication will be

shall be capable of inspecting the product or subassembly before sending it to the next process.

13.2.3 Final Inspection

The Fabricator shall conduct final inspection. QC inspectors shall perform the final inspection of structural steel products after the fitting, welding and coating operations, but prior to delivery. If nonconforming products are found, the nonconformance procedure shall be followed. Personnel specifically trained and responsible for final inspection will perform these inspections.

13.2.4 Inspection Records

The inspection procedure shall indicate what records and marks are used to document inspections. Inspections by production personnel shall be verifiable until the final inspection of the piece. Inspections by QC personnel shall be documented on records. It must be easy to determine which items and aspects of those items were inspected.

incorporated into the work.

You may choose to mandate that your production employees are required to inspect their own work and, to the best of their ability, determine if there are any defects. If any are found they must repair those defects before sending the material on to the next workstation. This does not replace the need to establish and document a final inspection function that is independent and where fabrication process craftspeople do not inspect their own work.

Final inspection

At the end of fabrication, or the end of a specific fabrication process, you need to have a final inspection performed. You may choose to perform final inspection of each fabrication process (welding, bolting, painting as examples) after the process is complete. Alternately, you may choose to perform final inspection of all fabrication process when the piece is complete. In any case, be careful to choose an appropriate time for final inspection where a previous process has not made the inspection impossible (for example paint over a weld.)

Assignments of inspectors are based upon a comparison of the inspectors experience and the inspections required. Remember that the inspectors performing final inspection require documented training.

In your inspection procedure you need to outline what method you use to document the inspections and what specifically was inspected. Some firms ask for a daily report in which each piece inspected is listed along with the items inspected and any nonconforming issues. The specific items and/or the percentage of a group of items that are to be inspected are outlined by QA and the inspection report(s) by your QC Department must verify that these items were inspected. To indicate that an item on a list was inspected it is necessary that a specific notation be made. Don't leave a blank space in the report but rather make a comment such as, "OK".

Reports that indicate problem areas need to be reviewed by QA or management to see if any trends can be observed. Develop a system to assure that management gets those reports.

Tips

Many firms have developed standard in-process inspection sheets that are used on all of the standard work they perform. This helps them develop standard records for all projects. Special forms would be developed for the project that has special requirements, not typical for your company.

Quality Record Examples

A procedure for inspection and testing is required.
Inspection reports for final inspections are required.
Material receipt and in-process inspections documented in accordance with your procedure.

From the Standard

14 Calibration of Inspection, Measuring and Test Equipment

The Fabricator shall document a procedure to control, calibrate and maintain inspection, measuring and test equipment used to demonstrate the conformance of product to the specified requirements, including volt/amp meters used to verify welding procedure parameters (may be welding machine volt and amp meters or auxiliary volt/amp meters). Inspection, measuring and test equipment shall be used in a manner, which ensures that it is consistent with the required measurement capability. Where the availability of technical data pertaining to the measurement equipment is a specified requirement, such data shall be made available for verification that the measuring equipment is performing properly. Calibration shall be per project requirement or per manufacturer's recommendation or specification requirement, the latter two of which being traceable to a national Standard.

The calibration procedure shall address:

- Identifying and listing all the inspection,

Element 14 Calibration of Inspection Measuring and Test Equipment.

Key Concepts

A procedure is required to verify the correct functioning of inspection, testing and measuring equipment.

Interpretation

Measuring devices of all sorts are used to inspect, test or otherwise determine that products produced are correct to the plans and specifications. The devices used to demonstrate the conformance of product to specified requirements shall be verified on a regular basis against a known standard traceable to a national standard to assure that they are providing accurate information. What those instruments are, the standards you use to check them and the frequency of the checking is the subject of this procedure.

Your procedure includes a list of the measuring and test equipment (inspection equipment) in your shop that is used for measuring, including dimensioning items (tapes and other devices). In this case your calibration device could be a master tape having a certificate of accuracy traceable to the National Institute of Standards and Technology and could be contolled by your QC Department. Another item would include volt/amp gages and meters on welding machines and rod ovens that in addition to their regular checks will be calibrated on a set schedule when they are cleaned and tested with a device that has been calibrated to a standard. NDT testing equipment and paint gauges would be calibrated based upon manufacture’s recommendations. A tension calibrator ('Skidmore”) will likely be sent out to a firm that re-calibrates that equipment on an annual basis and for which you receive a calibration certification. If a piece of equipment does not calibrate to a recognized standard, provide the basis of the calibration.

In some cases, it is up to you to determine the frequency of calibration based on what is reasonable, and in other cases it is set by specifications, such as the Skidmore-Wilhem Gage and the volt/amp meters.

To prepare the procedure list, include documentation on each item requiring calibration, including: the interval of inspection; who within your organization will be responsible to perform, or arrange for performing the inspection; the measurements to be made; the criteria for acceptance; where inspection or standard calibration items are stored; and where calibration records are stored.

The procedure must address what to do if a gage is found to be out of calibration or there is reason to question it’s accuracy.

When the results of the inspection show that a piece of this equipment is out of tolerance (the results do not compare favorably with the standard) the following action shall be taken:

1. The equipment is red tagged and removed from service until properly calibrated
2. A study is undertaken immediately to determine the extent of the material checked by the equipment that may have been improperly been found to be acceptable.
    2a. If the material is still in-house QC will undertake an appropriate level of checking, as defined by QA. Based upon the QC findings, and as appropriate to the situation, management will define what repairs will be undertaken.

measuring and test equipment-tools with devices for measuring properties of fabricated pieces or process variables shall be calibrated in accordance with the inspection measuring and test equipment procedure;

- determination of the measurements to be made, the accuracy required and the frequency of calibration;
- the use of certified equipment having a known valid relationship to internationally or nationally recognized Standard to calibrate listed equipment. Where such Standards do not exist, the basis used for calibration shall be documented;
- the acceptance criteria;
- the action to be taken when results are unsatisfactory;
- Calibration records maintenance;
- handling, preservation and storage of inspection, measuring and test equipment to maintain accuracy and fitness for use;
- identification of equipment that is not calibrated to prevent inadvertent use where calibrated equipment is required.

2b. If the material has shipped management will make an assessment of the risk associated with the issue and take appropriate action.

Quality Record Examples

Calibration records.
Calibration stickers on equipment showing status.
Basis for calibration if no standards exist.

Nonconforming product shall be clearly marked as soon as practical after it has been discovered. Disposition shall be selected by personnel authorized by the procedure. Records shall be kept of the pieces affected, the nature of the nonconformance, the disposition selection, authorization and inspection results.

From the Standard

15 Control of Nonconformances

The Fabricator shall document a procedure to ensure that product that does not conform to specified requirements is prevented from reaching the customer. This procedure shall provide for identification, documentation, evaluation, segregation and when practical, disposition of nonconforming product and for notification to the functions concerned.

The responsibility for review and authority for disposition of nonconforming product shall be defined. The disposition of nonconforming product may be:

- reworked,
- repaired,
- used as is (after more detailed analysis or acceptance by engineering or management),
- customer-approved nonconforming product or
- scrapped.

Repaired or reworked product shall be re-inspected in accordance with the drawings, specifications and/or project requirements. Where customer approval is required, it shall be documented.

Element 15 Control of Nonconformances

Key Concepts

A procedure is required describing how you handle nonconforming material.

Interpretation

When an item has been found to be out of specification, its disposition must be covered by a procedure. Describe the process of segregating a piece found to be in non-conformance to assure it is not sent to your customer in its present condition. A procedure that some firms use involves a red tag method in which a red cardboard tag is affixed to the piece identifying that the piece is out of specification and outlining the deficiency. Everyone in the organization would be familiar with what a red tag means. This tag cannot be removed unless the deficiency is corrected and only a QC inspector may remove the tag. This procedure might go on to say that at the time the tag is issued a report is also issued by the QC inspector. This report could go to the foreman of the area involved as well as the plant manager and to a file listing all nonconformances. This file of nonconformances would be used by management in evaluating root causes that will help direct the continuous improvement process.

The procedure must also identify who has responsibility to decide what to do when an item is found to be nonconforming. The Standard calls this responsibitliy for disposition of nonconforming product. Examples could be an inspector, the QC manager, the detailing manager, back to the customer representative or even a member of production. It is up to you to determine this responsibility related to thet types of nonconformances. You must also establish the qualifications of these individuals. As you review these assignments of responsibility, assure that each individual has the right qualifications and experince that matches the criticality of the nonconformances that they will review.

The choices available to bring it into compliance are to: fix the problem (repair); use the piece as-is if that approach is approved by some higher authority within your organization (chief engineer or top management); submit the problem with the corrective action to your customer or their representative; or dispose of the piece and make a new one. Some companies have developed standard repair procedures for typical problems they may encounter such as repair of standard weld defects, re-tightening bolts, re-cambering beams, repair of mis-located holes. After the piece has been brought into compliance, the procedure should describe how the member is released back into the production cycle. Usually the tag can only be removed by a senior QC inspector who signs and returns the tag to a specific file. Perhaps there is a log of these non-conforming members and a note is made in the log as to what was done. The responsible person should sign off after a re-inspection is performed.

Quality Record Examples

List of: nonconformances, pieces affected, the nature of the nonconformances, the disposition of the pieces, authorization, and inspection results.

Nonconforming product shall be clearly marked as soon as practical after it has been discovered. Disposition shall be selected by personnel authorized by the procedure. Records shall be kept of the pieces affected, the nature of the nonconformance, the disposition selection, authorization and inspection results.

From the Standard

16 Corrective Action

The Fabricator shall document a procedure for initiation of corrective action. Any corrective action taken to eliminate the causes of nonconformance shall be to the degree appropriate to the magnitude of problems and commensurate with the risks encountered.

The procedure will include periodic review of records or summaries of nonconformances, internal and external quality audit reports, determination and initiation of corrective actions and periodic monitoring to assure the corrective action is being performed and is effective.

Element 16 Corrective Action

Key Concepts

Fix areas within the company that have ongoing problems.

Interpretation

A procedure for the initiation of corrective action is required.

At the heart of your Quality Assurance system is a procedure outlining a regular review of nonconforming lists, the causes of back charges, internal and external audits and any customer complaints. This procedure should require that if a trend has been seen in either the frequency or types of nonconformances, then it is a management responsibility to take the action necessary to eliminate or otherwise assure that the problem(s) that caused these nonconformances has been resolved. The procedure should state who is responsible for the periodic review, the timing or frequency of the review, and the method used to resolve problems when they are discovered.

One way to determine the effectiveness of your corrective action system is to assess if your program:

- Defines the problem
- Finds the root cause
- Determines the magnitude (the entire system is wrong or one person needs added Training)
- Problem reviewed at appropriate level (when should management rep get Involved)
- Determine if actions taken resulted in desired results

Quality Record Examples

Records showing the results of periodic reviews.

Records showing improvements to the QMS as a result of the procedure.

From the Standard

17 Handling, Storage and Delivery of Product and Materials

Material shall be stored, loaded and shipped to avoid damage and deterioration. Material shall be marked with its identification and shall be listed on a manifest or shipping documents.

If a shipping agreement between the Fabricator, the customer or the subcontractors exists, material shall be shipped in compliance with the agreement including sequencing that complies with erection needs. Shipments by subcontractors shall be coordinated and monitored for compliance with shipping instructions.

Element 17 Handling, Storage and Delivery of Product and Materials

Key Concepts

Storage and shipment of materials and fabricated product must be controlled to avoid damage and to maintain identification.

Shipments must be made in an orderly fashion as agreed to between the customer and the erector.

Interpretation

The handling of materials throughout fabrication, storage and shipment must be performed in an appropriate manner to assure that damage is not inadvertently done to the material. Discuss in your handling procedure how extremely long or heavy pieces should be handled. Discuss how the handling of coated materials, both primer and finish coat (if you perform this work) should be accomplished.

It is not uncommon at some point in the fabrication process that you find anticipated delivery to the site has been delayed and you are now required to store the steel for a period of time. Procedures should be in place to accommodate this eventuality. This procedure is useful in mitigating any potential problems that may arise due to storage. For instance, beams stack best with the webs horizontal. However, this position also provides a place for rainwater to collect. So your standard storage procedure could state that where possible you pitch members in storage to allow rainwater to drain

Another issue of long-term storage comes about if the piece marks on the members are lost. The procedure for piece marking should be described to insure standardization and permanence of the marks.

Shop primer paints present their own set of issues for extended storage. They are considered to be a temporary and provisional coating by the AISC Code of Standard Practice. Your procedure should state that you communicate this fact to your customer so that they are made aware of this if you anticipate an extended delay in shipping. Further, if members require additional handling as a result of the delay this may cause more marring of a coating than would have been experienced had the project shipped as originally planned. Again, you should be sure the proper party is notified. Fasteners, welding consumables, and other ancillary items in your control will need to be protected from the elements as well.

Members are often stored by shipping sequence established with the erector early in the planning. If members from one shipping sequence get mixed with those of another sequence it might be costly. Describe how you deal with this issue in storing and shipping. In this regard, your procedure should discuss how member piece marks are shown on the shipping manifest for each shipping sequence.

The method that you establish so that you are assured that each piece is accounted for in the shipment to the site should be discussed. Your system might simply be having the shipper yellow out the members on the approved shop drawings or perhaps you establish a master ship-

ping list, by sequence, and that is the document the shipper uses as the control sheet.

Quality Record Examples

Shipping lists, including sequences if appropriate.

From the Standard

18 Training

Personnel responsible for functions that affect quality shall receive initial training and periodic training. Training shall provide the information necessary to inform personnel of sound fabrication practices and to perform their assigned tasks in a manner that shall result in a quality product. It is recommended that training be documented. However, training shall be documented for inspection personnel performing final inspection of the product. Training will be used to inform personnel of any changes to the requirements of their assigned tasks.

Element 18 Training

Key Concepts

Develop a program to keep your employees up to date and trained (at a minimum, document the training of inspection personnel).

Interpretation

You need to create a training plan for each position that effect quality and include the information in the job descriptions found in HR files.

All of your employees who effect quality need to have initial training as well as up-dates on training. The training may be in-house, given by your own supervisory people, or by outside trainers. Consider initial training the training that is necessary before the employee assumes the responsibilities of their position. The training of the inspectors who perform final inspections must be documented. The documentation of your other employees is optional, but it is recommended. Documented training sessions must be in writing and outline the name of the trainer, those in attendance receiving the training, subject(s) taught as part of the curriculum of the training, location of training, length and dates of the session, and any other pertinent information. That documentation is then placed both in the employee's personnel folder as well as a folder kept by your management representative concerning your company's overall training program.

Examples of those positions you should provide training for are welders, bolters, layout personnel, machine operators, purchasing, those involved in applying coatings and preparing surfaces for coatings, inspectors, final inspectors, NDT personnel, engineers, supervisory and management. Material handling personnel also should have training to assure proper material identification and the prevention of damage during handling. Thus crane and forklift operators should have training sessions.

Positions where training is not typically be required would be employees involved in accounting and human resources.

As discussed previously, certain positions have experience, education, and training requirements. If the individual assigned to a position doesn’t already possess the required knowledge, then training is necessary. Further, there are some code requirements for training—as in the AWS D1.1 where training is required in order that certain individuals can become inspectors (note that in AWS D1.1 they use the terms "must be familiar" and "instructed" and these terms mean the same as "training"). Also, familiarization training is often both beneficial and cost effective for welders who are responsible to implement WPSs.

These training sessions do not have to be conducted in a classroom. They can be done in the shop, in the yard, or in the drafting room as long as records are kept.

Proper training for one or more of your employees is often a good method for discharging a corrective action request (CAR).

For each of those positions requiring some form of training you should outline a basic training plan for the position. One way to do this is to simply to list all of your employees who have

some responsibility for the quality of your product.

Identify both the initial training and the periodic training that the position requires:

- The initial training would be appropriate for new hires and those who have received promotions or new assignments.
- Periodic training would involve those items for each position that you have identified as essential for you to produce a satisfactory product.

As stated before, those involved in the final inspection of the product must have documentation of their training but you may find that documenting the training of others is a good management tool. For purposes of this Quality Program, final inspection does not necessarily have to take place after all fabrication on the member is completed. What may occur, for example, is that final welding inspection will take place some time after all welding has been performed. Final inspection of the layout will be made some time after that operation is completed. And the same would be true for the bolting, cleaning, painting operations as well. As long as each operation is checked prior to shipping, the intent of the program is achieved. Remember, those who perform each of those specific final inspections will need to have the documented training.

The person or department that maintains your personnel files can maintain the training information as well.

Tips

Keep a roster of your employees with the types of training each has received to be sure no one falls through the cracks. This would be in addition to the notations made in the employee's personnel folder.

Check to see if some of this training may be mandated by the State where your plant is located. You may find that companies you do business with may offer training at little or no cost to you. Crane and forklift manufactures, welding consumables, and paint manufactures all may offer information on, or provide, training.

Quality Record Examples

Documented training for final inspectors.

From the Standard

19 Internal Audit

The Fabricator shall perform an internal audit of each element of the quality management system at least once a year to verify their compliance and effectiveness. The management representative or a qualified individual, independent of the function being audited, shall perform the audit.

Element 19 Internal Audit

Key Concepts

Check your quality management system yourself to see if it is effective and if changes would benefit the operation of the company.

Interpretation

Establish a regular schedule for reviewing the quality performance of your company, however, it must be at least once per year. By checking all of the reports and records suggested in the Standard, you or your management representative will be able to gauge where progress has been made and where more work is required. Many company's have found the changes generated by these internal audits to be very beneficial.

The audit should cover all of the areas outlined in your quality management system. However, special attention should be paid if the same individuals are performing QA and QC functions (see element 5.4.1) and production personnel are performing inspections (see element 13.1.) For example, you might look at whether there are more or less complaints associated with their work than with others in your organization. Also, examine if problems have arisen during final inspection.

Developing a standard method by which you look at each department could be an important tool to assure that there is a consistency from audit to audit as well as making sure all appropriate areas are reviewed each time. One approach could be to develop a list of items required by this Standard for each department. The audit would assess if the departments were successfully satisfying the requirements of the Standard.

Remember that the internal audit must be conducted "independent of the function being audited." For example, the head of the detailing department (or any member of that department) cannot do the internal audit of your drafting department. Rather, the manager of another department who has some knowledge and experience with drafting should perform the audit. Another option is to have a knowledgeable member of your QA or QC staff perform the audit-though they couldn't, of course, audit the QA/QC functions.

Tips

Make the dates of these internal audits standard so that everyone involved can be prepared (for example, the first Monday in June).

Every year strive for some improvement by adjusting your QMS. When an auditor comes for the next visit point out what was done and why it was done. This will be a positive indication that the internal audit was performed and served its intended purpose.

Don't rest on your laurels! Encourage your team to do better for their customers, their company and for them selves.

Quality Record Examples

A report of the results of the internal audit

Corrective action reports including closed issues.

APPENDIX A--REQUIRED QUALITY RECORDS

records of...

a. management reviews (5.2)

b. the implementation of decisions from management meetings (5.2)

c. contract and project specification review (6)

d. logs, files or master lists that show the incorporation of changes in shop drawings (8.2)

e. transmittals of approval and release of shop and erection drawings (8.5)

f. qualifications of subcontractors and suppliers(10)

g. evaluations of subcontractors and suppliers (10)

h. the damage to customer supplied material (10.5)

i. mill test reports, certificates of conformance, manufacturers test reports (11)

j. inspection and test results (13, 13.2.4)

k. nonconforming product (15)

l. corrective action identification and resolution

m. training records of individuals that perform final inspection of the product (18, 4.3.8)

n. the results of your internal audits (5.2, 19)