



**PDHonline Course G152 (2 PDH)**

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# **Equipment Specifications: Requirements, Developments, and Use**

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## **Equipment Specifications: Requirements, Developments, and Use**

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### **Course Content**

#### **Introduction:**

Almost every engineered project involves the purchase of various types of equipment. If it is a chemical plant there are chemical tanks and reactors, cooling towers and heat exchangers, Boilers and auxiliaries, and of course instrumentation and controls for all of these major pieces of equipment. Many times a person responsible for procuring a piece of equipment simply looks up the manufacturer and model number of the item in a catalog and sends an RFQ (request for quotation) to the manufacturer for the item in question. This method of procuring a piece of equipment can lead to many errors. The written specification can eliminate most if not all errors.

**SPECIFICATIONS:** 1. A list of requirements that must be met when making a material, part, component or assembly; installing it in a system; or testing its attributes or functions. 2. A set of standard requirements applicable to any product or process within the jurisdiction of a given standards-making organization: an industry consensus standard... [Comprehensive Dictionary of Instrumentation and Control]. The specifications covered in this course are better described as "Technical Specifications" rather than "Functional Specifications" as covered by UNC "Writing Equipment Specifications.

**Types of specifications:** There are really only two types of specs, the short form or the long form. The short form, sometimes referred to as "Spec Sheets" are commonly used to describe instruments and equipment that can be fully described on one standard form sheet.

**Short form:** (for a complete usable set go to <https://ctjohnson.com/ZipFiles/INSTRSPC.ZIP> for downloading a Lotus v2 zip file.) The bold type is part of the form. Although they are in an old spreadsheet Microsoft Excel® will easily import the forms, however, they may require some changes in type size.

<b>SPECIFICATION</b>			
Client: _____	<b>PRESSURE GAUGE</b>		Sheet: <u>1</u> of <u>1</u>
Plant: _____	REV NO.	BY	DATE
Location: _____			
Client No.: _____			

DESCRIPTION			OPTIONS			
<b>PRESSURE GAUGE</b>	1	<b>Type</b>	Direct Reading Pressure	15	<b>Chemical Seal</b>	no
	2	<b>Mounting</b>	In-line	16	<b>Wetted Parts</b>	
	3	<b>Dial</b>	4.5" White w/Black Fig.	17	<b>Process Conn</b>	
	4	<b>Case</b>	Phenol Turret	18	<b>Fill Fluid</b>	
	5	<b>Ring</b>	Snap-In standard	19	<b>Instrument Conn</b>	
	6	<b>Accuracy</b>	Grade 2A; 0.5% of span	20	<b>Capillary Tubing</b>	
	7	<b>Blow-out Prot</b>	Disc	21	<b>Flushing Conn</b>	
	8	<b>Lens</b>	Lexan	22	<b>Diaphragm sealing</b>	
	9	<b>Element Material</b>	Bronze	23		
	10	<b>Conn Material</b>	Brass			
	11	<b>Conn Size/location</b>	1/2" MNPT Bottom			
	12					
	13					
	14					

You must have the knowledge to fill in the blanks in order to use the forms

TAG No	Qty	DESCRIPTION	RANGE	CONN	SERVICE
PI-GAGE	1	Pressure Gauge	0-60 PSIG	1/2" NPT	

	28	<b>Manufacturer</b>	
	29	<b>Model</b>	
	30		
	31		

**NOTES:**

PI-GAGE

The Specification Sheet should always be used if the long form is not employed and even if the client requires that a specific manufacturer be purchased. A manufacturer may be specified and even a basic model number, but it is never a good engineering practice to specify equipment by just the model number because manufacturers are constantly updating products. Always develop a complete specification, and then suggest a basic model number. ALWAYS STATE that the described specification prevails over the model number. It is also wise to make a statement that the provider must acknowledge any and all exceptions to the specifications in writing.

The Specification Sheet may incorporate more than one sheet, but is usually a form that is filled in or checked off similar to the above example. It is always a good sanity check to make sure you haven't missed an important item or function. Normally another person checks specification sheets before sending them out for bid or purchase.

Since many projects require hundreds of specifications it is the normal practice to number the specification similar to the equipment or instrument tag number.

Review the above specification sheet and notice that it contains not only a complete description of the item, but client, procurement and revision information. Short-form specifications are obtainable from most engineering societies (usually there is a cost) and they are not always up to date. I developed my own set of instrument specs because at the time the ISA's were based on pneumatic instruments AND my employer did not allow us to purchase them. Presently the ISA has updated forms that can be obtained through their web site [www.isa.org](http://www.isa.org)

**LONG FORM:** There are several methods to develop a long-form specification. There are formats that can be used as a guide in the development, but they are usually free form developed. The following is an example of one:

## SECTION 11 13 16

### AQS 900 SERIES SEAL SYSTEM

.....  
This guide specification section has been prepared by 4Front Engineered Solutions - Kelley and is intended to assist the specifier in preparing a specification for a dock shelters.

Edit entire section to suit project requirements. Modify or add items as necessary. Delete items which are not applicable. Words and sentences within brackets [\_\_\_\_\_] reflect a choice to be made regarding inclusion or exclusion of a particular item or statement. This section may include performance, proprietary and descriptive type specifications. Edit to avoid conflicting requirements.

This guide specification is written around the Construction Specifications Institute (CSI), Section Format, and standard references to section names and numbers are based on the CSI Master Format 2004.

For specification assistance on specific product applications or information about other 4Front Engineered Solutions - Kelley products, please contact our offices above or any of our local product representatives throughout the country.

4Front Engineered Solutions - Kelley reserves the right to modify these guide specifications at any time. Updates to this guide specification will be posted to the manufacturer's web site and/or in printed matter as they occur. 4Front Engineered Solutions - Kelley makes no expressed or implied warranties regarding content, errors, or omissions in the information presented.

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**PART 1 GENERAL**

**1.1 SUMMARY**

A. WORK INCLUDED

- 1. Factory assembled unit with necessary mounting hardware.
- 2. Installation and Owner's Manual

B. RELATED WORK

- 1. Section 11 13 19.13 – Dock levelers.
- 2. Section 11 13 19.33 - Trailer Restraints.
- 3. Section 11 13 13 - Dock Bumpers.

C. REFERENCES

- 1. Government Test Method Standard No.191A for fabric.

D. DESCRIPTION (APPLICATION)

- 1. Door Size - Unit shall accommodate an opening size of \_\_\_\_\_" wide x \_\_\_\_\_" high.
- 2. Dock Height - Loading dock height shall be \_\_\_\_\_".
- 3. Bumper - Total dock bumper protection including any building wall offset or building wall overhang shall be \_\_\_\_\_".
- 4. Drive Approach - Driveway shall have a \_\_\_\_\_ approach.
- 5. Service Range - Unit shall be designed to service vehicles ranging in height from \_\_\_\_'- \_\_\_\_" to \_\_\_\_' -

**1.2 SUBMITTALS**

- A. General: Submit in accordance with Section 01 33 00.
- B. Product Data: Submit for dock seals.
- C. Manufacturers Installation Instructions.
- D. Submit dimensional drawing.
- E. Submit specification sheet.

.....

Include quality assurance requirements below which are consistent with the size and scope of the project and extent of work of this section. Only request qualification statements you intend to review, and which are necessary to establish qualifications of the product, manufacturer, or installer.

.....

**QUALITY ASSURANCE**

- F. Single Source Responsibility: Provide each component of individual dock shelters of particular type by same manufacturer.
- G. Manufacturer Qualifications: Company specializing in manufacturing Products specified in this Section with minimum five years experience.
- H. Installer Qualifications: Approved in writing by manufacturer with experience on at least five projects of similar nature in past five years.
- I. Manufacturer to hold current ISO 9002 certification.

**PART 2 PRODUCTS**

**2.1 ACCEPTABLE MANUFACTURERS AND MODEL**

- A. Model AQS 900 as manufactured by 4Front Engineered Solutions - Kelley, Muskego, WI.

**2.2 EQUIPMENT**

- A. COMPONENTS: Each unit shall consist of (1) roll-formed galvanized steel head frame, foam wiper pad, weighted side covers, and head frame support brackets.
- B. Wiper Pad: Side curtains will include flexible fiberglass stays, spaced 14” on center. All stays will be inserted into sleeves and then inserted into stay pockets. Side curtains will also include bottom wear panels. The inside of both side curtains will include a closed cell neoprene sealing edge. Head curtains will include (4) wear pleats at each end and (5) flexible fiberglass stays inserted into sleeves and stay pockets. The unit shall also include yellow guide stripes.
- C. PROJECTION: Overall unit projection shall be 14” beyond the face of the dock bumpers.
- D. FABRIC: The unit base fabric shall be \_\_\_\_\_.  
The second layer of fabric for the (4) four wear pleats and (2) two bottom wear panels shall be \_\_\_\_\_.
- E. WARRANTY: Unit shall include the manufacturer’s standard (5) five-year frame warranty and a (1) year warranty against defects in materials and workmanship on the remaining components.
- F. OPTIONS: To include the following options \_\_\_\_\_  
\_\_\_\_\_.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- 1. Install in accordance with manufacturer’s instructions.
- 2. Caulk between the building wall and unit.

The construction industry has tried for years to motivate engineers and designers to use the **Construction Specifications Institute** <https://www.csinet.org/>. I found it difficult to develop instrumentation specifications using the CSI format because of the

inflexible format and paragraph number scheme that was very difficult to use in a standard word processor.

**EXAMPLE:** The following example is just to give you an idea and is not the complete specifications that incorporated 17 pages. The index is an example of what the actual specification contained. All complex pieces of equipment are normally covered by a long-form specification. I have highlighted sections that all specifications should contain.

### **SPECIFICATION INDEX**

- I. **HARDWARE SHALL MEET OR EXCEED THE FOLLOWING SPECIFICATIONS:**
- II. **HARDWARE SHALL CONSIST OF THE FOLLOWING AT A MINIMUM:**
- III. COMMUNICATIONS LINK:
- IV. OPERATOR DISPLAY SOFTWARE:
- V. OPERATOR ENTRY SOFTWARE:
- VI. MULTIVARIABLE CONTROL (Standard control requirements)
- VII. SOFTWARE ALGORITHMS:
  - A. CONTROL ALGORITHMS SHALL INCLUDE AT A MINIMUM:
  - B. COMPUTING ALGORITHMS SHALL INCLUDE AT A MINIMUM:
  - C. SIGNAL SELECT ALGORITHMS SHALL INCLUDE AT A MINIMUM:
  - D. LOGIC ALGORITHMS SHALL INCLUDE AT A MINIMUM:
- VIII. **SPECIAL CONTROL SOFTWARE REQUIREMENTS:**
  - A. Shall support high-level programming languages as follows:
- IX. DIAGNOSTICS SOFTWARE:
- X. **VENDOR CONFIGURATION SERVICES:**
  - A. Graphics Configuration
  - B. Continuous Control Configuration
  - C. Workstation access configuration
  - D. Default Display Configuration
  - E. Historian Software Configuration
  - F. Report Generation configuration
- XI. **ACCEPTANCE TESTING & CHECKOUT AT VENDORS FACILITY:**
- XII. DATABASE TESTING AND CHECKOUT AT VENDORS FACILITY:
- XIII. **SCHEDULING:**
- XIV. **REFERENCES:**
- XV. **DOCUMENTATION REQUIREMENTS:**
- XVI. **SHIPPING REQUIREMENTS:**

- XVII. TECHNICAL CONTACTS:
- XVIII. FUNCTIONAL DESCRIPTION - GENERAL
- XIX. FUNCTIONAL DESCRIPTION - PROCESS
- XX. FUNCTIONAL DESCRIPTION - SOLIDS HANDLING

**I. HARDWARE SHALL MEET OR EXCEED THE FOLLOWING SPECIFICATIONS:**

- A. Must be Microsoft Windows XP compatible.\*
- B. Completely Modular in design.
  - 1. Include all cabling required for the interconnection of modules.
    - a. All critical cables shall be redundant.
    - b. All wiring shall be identified at both ends.
    - c. All terminals shall be numbered.
- C. Modules to be mounted in any location of an enclosure.\*
- D. Field I/O points to be wired with 2/C #14 shielded cable.
- E. Use low-powered components.
  - 1. No direct convective cooling shall be required.\*
- F. Field Modules shall withstand temperatures of -25 to 70 deg C.
- G. All Modules shall withstand temperatures of 0 to 60 deg C.
- H. All electrical power by Customer shall be 120VAC.
  - 1. Vendor equipment must have redundant power supplies
  - 2. Vendor equipment "ride through" \* All Equipment must continue to function properly during and after an electrical power dip of 50% for 20HZ.

**II. HARDWARE SHALL CONSIST OF THE FOLLOWING AT A MINIMUM:**

- A. (2) 21" high-resolution color monitor-based Workstations:
  - 1. Monitors shall be the newest generation and be capable of 2048X1536 pixels.
    - a. Pixel sizes shall be as small as 1/250,000 of the screen.
  - 2. Each shall be mounted in a freestanding console
    - a. Workstations shall be desk height & support keyboard.
    - b. Workstations shall not house any processor modules.
- B. (2) Operator input keyboards.
- C. (2) Trackball operator cursor controllers.
- D. (1) Plotter Board and cursor control pen.
- E. (1) Communication Workstation:



1. Shall install between monitor-based Workstations.
  - a. Shall be desk height.
2. Shall include:
  - a. (1) DVD drive
  - b. (3) 250 MB Hard Disk drives running RISC.
3. Shall provide:
  - a. (2) Digital outputs for hard copy recording

### **Summary**

Specifications should be used for all procurements and installations, and incorporate drawings when necessary to describe equipment or service. The short form is best used if the item is an industry standard. Model numbers should **not** be used except in support of a specification. Specifications facilitate installation and later maintenance. The responsible engineer should at minimum check all specifications.