AWS Welding/Fabrication Comprehensive Quality Plan & Manual

Selected pages (not a complete plan or manual)

Sample includes:

- ✓ Project-specific Quality Plan Pages
- ✓ Quality Manual Pages
- ✓ Submittal Forms Examples
- ✓ AWS Forms Examples

Contact:
First Time Quality
410-451-8006

www.firsttimequalityplans.com

[CompanyName]

Fabrication and Erection

Quality Assurance/Quality Control Plan

[ProjectName]
[ProjectNumber]

Management acceptance

This Construction Quality Assurance/Quality Control Plan has been reviewed and accepted.

Endorsed By: (Name / Title)	[QualityManagerName], Quality Manager		
Signature:	*[QualityManagerName]*	Date:	[Date]
Version	1.0	Notes	Initial Issue

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PROJECT-SPECIFIC WELDING QUALITY PLAN

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Background Information

This project-specific plan assures project compliance with the requirements American Welding Society AWS D1.1/D1.1M Structural Welding Code – Steel.

Customer

[CustomerName]

Project Name

[ProjectName]

Project Number

[ProjectNumber]

Project Location

[Insert Location of Project Work Here]

Overall Project Description

[Insert Overall Project Description Here]

[CompanyName] Scope of Work

[Insert Scope of Work for This Contract Here]

PROJECT QC ORGANIZATION CHART

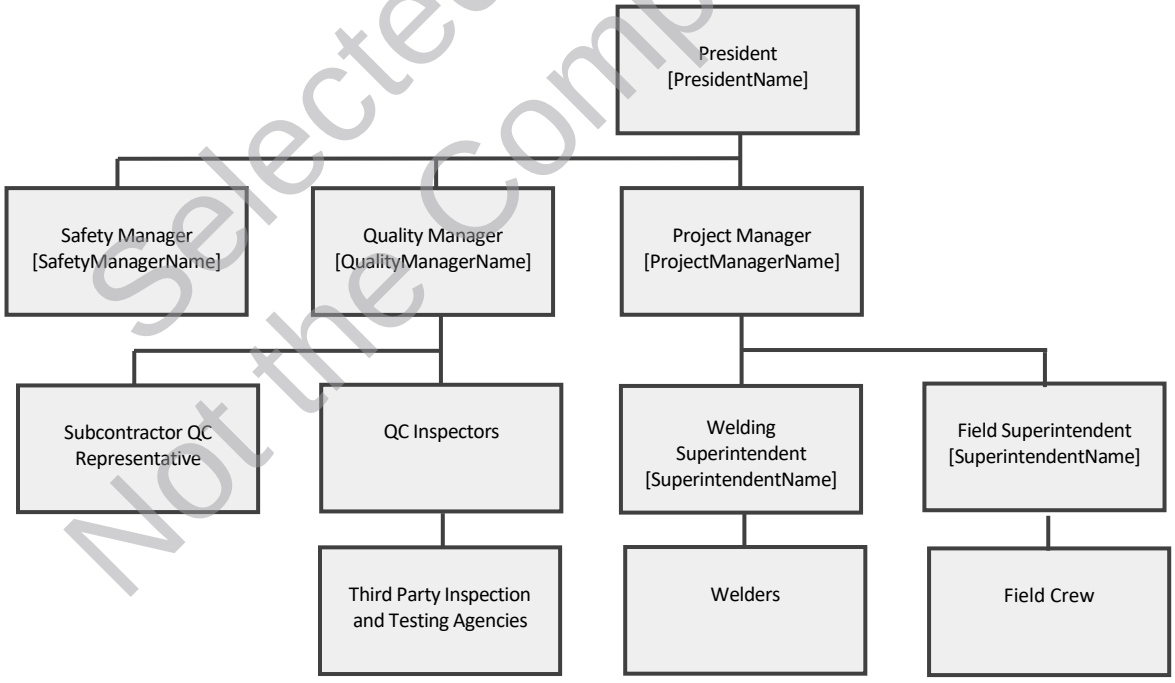
The Project QC Organization Chart shows the QC organizational structure. The chart includes job positions along with the name of each person appointed to that position. Figure A-1 shows the QC Organization Chart for this project.

The President defines the organization chart for the project. The organizational chart includes job titles, names of assigned personnel, and organizational and administrative interfaces with the customer. The organization chart defines lines of authority as indicated by solid connection; dotted lines indicate lines of communication. The lines of authority preserve independence of quality control personnel from the pressures of production.

When a person with authority is unavailable only a person with higher authority may assume the responsibility of the unavailable person.

The President assesses the qualification requirements for each position on the project organization chart, qualifications of each person, and then appoints only qualified persons to the project organization.

Figure A-1



D. Personnel Qualifications and Technical Certifications

[CompanyName] ensures that only knowledgeable, capable employees carry out the planning, execution, and control of the project.

We train our employees on quality standards and procedures based on project requirements as well as their job positions. Then we validate their capabilities before they are assigned to carry out their quality job responsibilities on the project. Ongoing monitoring of performance continually validates qualifications of each employee.

The Quality Manager qualifies employee capabilities to ensure that they are capable of completely carrying out their assigned quality responsibilities including the following capabilities:

- Knowledge of Company quality standards
- Knowledge of job responsibilities and authority
- Demonstrated skills and knowledge
- Demonstrated ability
- Demonstrated results
- Required training
- Required experience

The Quality Manager also evaluates independent contractor personnel on the same standards that apply to employees.

Personnel Certification and Qualification Requirements

Personnel certifications are required for the following:

Certification or License Title	Reference Standard No.	Reference Standard Title
Welders of structural steel	AWS D1.1/D1.1M	Structural Welding Code – Steel
Inspectors of structural steel welds	AWS D1.1/D1.1M	Structural Welding Code – Steel

Certified Welder Qualification Requirements

Only certified welders may perform welding activities. A welder must be certified to the AWS welding code, and any welding procedures.

For each project, the Quality Manager will determine welder certification requirements for codes and welding procedures

Certified welders must meet the requirements of AWS Q97-93 American Welding Society Standard for AWS Certified Welders. Only a Certified Welding Inspector can conduct welding tests for the purposes of welder certification.

The Quality Manager approves the qualification of all welders before they begin welding on a specific project.

Qualification of Welders for Specific Welding Codes

When indicated on the welding procedure, the Quality Manager approves qualification of welders to the specific welding procedure.

Qualification of Welders for Specific Welding Procedures

When indicated on the welding procedure, the Quality Manager approves qualification of welders to the specific welding procedure.

Certified Welding Inspector Requirements

Certified welding inspectors must be certified by the American Welding Society to AWS QC1-2007 American Welding Society Standard for AWS Certification of Welding Inspectors to the applicable code that applies to the inspections they perform.

The Quality Manager approves the qualification of all certified welding inspectors.

NDE Welding Inspector Requirements

Radiographic Interpreters shall be certified in accordance with AWS B5.15, Specification for the Qualification of Radiographic Interpreters.

Non-Radiographic NDE welding inspectors must be certified by the American Welding Society to AWS QC1-2007 American Welding Society Standard for AWS Certification of Welding Inspectors to the applicable code that applies to the inspections they perform.

The Quality Manager approves the qualification of all NDE welding inspectors.

[CompanyName]
Personnel Qualification Form

Name:	Job Position:

Project ID	Project Name	Approval	Approved By
[ProjectNumber]	[ProjectName]	☐Yes ☐No	

Review Topics	Project-Related Job Credentials	
	Certification required:	Certifications and expiration dates:
	Training required:	Training completed and expiration date:
	Licenses required:	License and expiration dates:
	Type and length of experience required:	Certifications and expiration dates:
	Qualifications	
	☐Knowledge of Company quality standards ☐Knowledge of Company job responsibilities and authority ☐Demonstrated skills and knowledge ☐Demonstrated ability ☐Demonstrated results	
	Qualification Notes:	

Provisional Approval: Action plan for improvement

Follow-up results and date

WELDER AND WELDING OPERATOR QUALIFICATION RECORD

Welder or welding operator's name _____ Identification no. _____
Welding process _____ Manual _____ Semiautomatic _____ Mechanized _____
Position _____
(Flat, horizontal, overhead or vertical—if vertical, state whether upward or downward)
In conformance with WPS no. _____
Material specification _____

FILLER METAL

Specification no. _____ Classification _____ F no. _____
Describe filler metal (if not covered by AWS specification) _____
Is backing used? _____
Filler metal diameter and trade name _____ Flux for SAW or gas for GMAW or FCAW-G _____

VISUAL INSPECTION (8.26.1)

Appearance _____ Undercut _____ Piping porosity _____

Guided Bend Test Results

Type	Result	Type	Result

Test conducted by _____ Laboratory test no. _____
per _____ Test date _____

Fillet Test Results

Appearance _____ Fillet size _____
Fracture test root penetration _____ Macroetch _____
(Describe the location, nature, and size or any crack or tearing of the specimen.)
Test conducted by _____ Laboratory test no. _____
per _____ Test date _____

RADIOGRAPHIC TEST RESULTS

Film Identification	Results	Remarks	Film Identification	Results	Remarks

Test witnessed by _____ Test no. _____
per _____

We, the undersigned, certify that the statements in this record are correct and that the welds were prepared and tested in conformance with the requirements of AASHTO/AWS D1.5M/D1.5, (_____) *Bridge Welding Code*.
(year)

Manufacturer or Contractor _____
Authorized By _____
Date _____

Form N-5

Form N-5—Welder and Welding Operator Qualification Record

[CompanyName]
Personnel Certifications and Licenses

Project ID	Project Name	Preparer	Date
[ProjectNumber]	[ProjectName]		

Person	Certification, License, or Credential	Expiration Date

G. Weld Project Quality Specifications

Fulfilling customer contract expectations is a primary objective of the [CompanyName] Quality System. To ensure that customer expectations will be fulfilled, [CompanyName] clearly defines the requirements for each contract before it is approved.

The Project Manager ensures that the information in customer contracts clearly defines customer expectations and that the necessary details are provided to set requirements for fabrication.

[CompanyName] personnel and subcontractors and suppliers are accountable for compliance to standards-based written specifications.

To achieve expectations reliably and consistently, specifications are clearly spelled out, not only for results but also for processes. Specifications apply to materials, work steps, qualified personnel and subcontractors and suppliers, safe work rules, and environmental work conditions.

Standards ensure that results are specified rather than left to discretionary practices.

All [CompanyName] fabrication activities comply with generally accepted good workmanship practices and industry standards.

Project - Specific Welding Procedure Standards

The Quality Manager approves welding procedures before they can be used to fabricate metal.

Welding procedures shall be qualified and approved, in accordance with the applicable AWS Welding Code(s) or Specification(s) (i.e., D1.1., D1.5) or AWS B2.1, Specification for Welding Procedure and Performance Qualification.

The welding procedure must identify the filler material.

When the governing AWS Welding Code(s) mandates that welding procedures be qualified by test, the Welding Fabricator shall have PQRs that support the applicable WPSs. When prequalified WPSs or Standard Welding Procedure Specifications (SWPSs) published by the AWS are permitted, PQRs are not required.

The Quality Manager or Certified Welding Inspector (CWI) reviews and approves the welding procedure before being used in production welding operations.

The WPSs and PQRs are controlled by the Quality Manager according by the document and record control procedures specified in the relevant section of this Quality Manual.

The applicable WPSs shall be available to welders or welding operators during testing and production welding.

WELDING PROCEDURE SPECIFICATION (WPS)
PREQUALIFIED ☐ QUALIFIED BY TESTING ☐
or PROCEDURE QUALIFICATION RECORDS (PQR) Yes ☐
AASHTO/AWS D1.5 Qualification Type 7.12.1 ☐ – 7.12.2 ☐ – 7.12.4 ☐

Contractor/
Organization _____
Welding Process(es) _____
Type: Manual ☐ Semiautomatic ☐
Mechanized ☐ Automatic ☐
Tandem ☐ Parallel ☐

JOINT DESIGN USED
Single ☐ Double Weld ☐
Backing: Yes ☐ No ☐ Material _____
Root Opening _____ Root Face Dimension _____
Groove Angle _____ Radius (J–U) _____
Backgouging: Yes ☐ No ☐ Method _____
Root Treatment _____

BASE METALS
Material Spec. _____
Type or Grade _____
Thickness: Groove _____ Fillet _____
Diameter (Pipe) _____

FILLER METALS
AWS Specification _____
AWS Classification _____
Manufacturer Trade Name _____

SHIELDING
Flux _____ Mfg. Trade Name _____
Electrode-Flux (Class) _____
Gas Composition _____
Flow Rate _____ Gas Cup Size _____

Identification _____
Revision _____ Date _____ By _____
Authorized by _____ Date _____
Supporting PQR No.(s) _____

POSITION
Position of Groove _____ Fillet _____
Vertical Progression: Up ☐ Down ☐

ELECTRICAL CHARACTERISTICS
Transfer Mode (GMAW): Globular ☐ Spray ☐
Current: AC ☐ DCEP ☐ DCEN ☐ Pulsed ☐
Electrical Stick Out _____
Other _____

TECHNIQUE
Stringer or Weave Bead _____
Multi-pass or Single Pass (per side) _____
Number of Electrodes _____
Electrode Spacing: Longitudinal _____
Lateral _____ Angle _____
Interpass Cleaning _____

PREHEAT
Preheat Temp., Min. _____
Interpass Temp., Min. _____
Interpass Temp., Max. _____

POSTWELD HEAT TREATMENT
Temp. _____ Hold Time _____
Heating/Cooling Rate _____

HEAT INPUT
Calculated Heat Input Value: kJ/in ☐ kJ/mm ☐
Max. Heat Input _____ Min. Heat Input _____

WELDING PROCEDURE

Pass or Weld Layer(s)	Process	Filler Metals	Current		Volts	Travel Speed	Joint Details
		Diam.	Type & Polarity	Amps or Wire Feed Speed			

Form N-2

Form N-2—Sample Welding Procedure Specification

PROCEDURE QUALIFICATION RECORD

PQR NUMBER_____ *(Include PQR Number on All Supporting Documents)*

Welder's Name _____ ID_____ Welding Test Date _____
Process _____ Position_____ Joint Detail: ☐ Fig. 7.1 ☐ Fig. 7.2 ☐ Fig. 7.3 ☐ Fig. 7.8
Electrode(s) Mfg. Designation_____
AWS Electrode Classification _____ Electrical Stick Out_____
Flux Mfg. Designation _____ AWS Flux Classification _____
Postweld Heat Treatment: Temp._____ Hold Time_____ Heating/Cooling Rate _____

		Diam.	Current	WFS*	Voltage	Current and Polarity
Electrode	(1)					
	(2)					
	(3)					

Calculated Heat Input (see 7.12) _____
Shielding Gas _____ Dew Point _____ Flow Rate _____ Gas Cup Size _____
Travel Speed: Min. _____ Max._____
Base Metal Specification and Thickness_____ Heat Number _____
Backing Metal Specification and Thickness _____ Heat Number _____

(Attach Copy of Certified Mill Test Report for Base and Backing Materials)

Preheat Temp._____ Interpass Temp. Min._____ Max._____

SPECIMEN	TEST RESULTS
All Weld Metal Tension (AWMT) ☐ ksi ☐ MPa	Tensile Strength_____ Yield Strength _____ Elongation in 50 mm [2 in] (%) _____ Reduction in Area % _____
Visual Inspection: ☐ Acceptable ☐ Unacceptable	**Macro Test: ☐ Acceptable ☐ Unacceptable
Side Bends	1. _____ 2. _____ 3. _____ 4. _____
Reduced Section Tension ☐ ksi ☐ MPa	Tension Strength 1. _____ 2. _____ Location of Break 1. _____ 2. _____
Charpy V-Notch Impact Toughness of Weld Metal SMAW, SAW, FCAW, GMAW—5 Req'd. ESW and EGW—8 Req'd.	(_____, _____, _____, _____, _____) (_____, _____, _____) [a]Avg. ☐ ft·lbs, ☐ J _____ @ _____ ☐ °F ☐ [°C] [a]*Discard the highest and lowest values and average the 3 remaining.*
**Chemical Composition of Deposited Weld Metal When Required by Contract Documents*	C_____ Mn_____ Si_____ P_____ S_____ Ni_____ Cr_____ Mo_____ V_____ Cu_____
Radiographic Test: ☐ Acceptable ☐ Unacceptable	Remarks: _____
Fillet Weld Soundness Macroetch	Maximum Size Single Pass: _____ 1._____ 2._____ 3._____ Minimum Size Multiple Pass: _____ 1._____ 2._____ 3._____

We, the undersigned, certify that the above described WPQR/FWS has been qualified in accordance with Clause 5 of the AASHTO/AWS D1.5M/D1.5, (_____) *Bridge Welding Code.*
(year)

State/3rd Party Witness _____ Mfr./Contractor _____
Date _____ Authorized By_____
Agency Results Reviewed_____
Date _____ Date _____

*Optional **Optional for CJP
Form N-3

Form N-3—Procedure Qualification Record (PQR) for Qualification, Pretest, and Verification Results

PROCEDURE QUALIFICATION RECORD WORKSHEET
PQR NUMBER_____

Welder's Name_____ ID_____ Welding Test Date _____
Process_____ Position_____ Joint Detail: ☐ Fig. 7.1 ☐ Fig. 7.2
☐ Fig. 7.3 ☐ Fig. 7.8
Electrode(s) Mfg. Designation_____
AWS Electrode Classification _____ Electrical Stick Out _____
Flux Mfg. Designation _____ AWS Flux Classification _____
Postweld Heat Treatment: Temp._____Hold Time_____ Heating/Cooling Rate _____

		Diam.	Current	WFS*	Voltage	Current and Polarity
Electrode	(1)					
	(2)					
	(3)					

Shielding Gas _____ Dew Point _____ Flow Rate _____ Gas Cup Size _____
Travel Speed: Min._____Max._____
Base Metal Specification and Thickness_____ Heat Number _____
Backing Metal Specification and Thickness _____ Heat Number _____
Preheat Temp._____ Interpass Temp. Min. _____ Max._____

Pass Number	Layer	Process	FILLER METAL	CURRENT						TEMPERATURE	
			Diam.	Type & Polarity	Wire Feed Speed	Amp	Volts	Travel Speed	Stick Out	Preheat	Interpass

*Optional

Page_____of _____

For multiple electrodes, list each electrode on separate line. For parallel electrodes, show "2 @_____" under number and diameter. Measure preheat and interpass at mid length of plate approximately 25 mm [1 in] from the weld center line.

State/3rd Party Witness _____ Mfr./Contractor _____

Date _____

Form N-4

Form N-4—Procedure Qualification Record (PQR) Worksheet

I. Weld Equipment

The selection and use of equipment are controlled to assure the use of only correct and acceptable equipment on the project.

The Quality Manager determines specifications of required equipment that affect quality and the specifications of quality-controlled equipment.

When equipment is received, the Superintendent verifies that equipment is as specified.

Quality Controlled equipment is listed on the Quality Controlled Equipment form included as an exhibit in this subsection.

Calibration of Inspection, Measuring, and Test Equipment

The Quality Manager determines inspection, measuring, and test equipment that will be controlled, calibrated, and maintained.

Records of calibrations will be maintained including calibration certificates documenting of traceability to national standards.

A list of controlled and calibrated test equipment is listed on the Test Equipment Calibration Plan and Log included as an exhibit in this subsection.

The Quality Manager evaluates the project requirements and determines if there are measuring devices that require controls to assure quality results.

For each type of device, the Quality Manager identifies:

- Restrictions for selection
- Limitations on use.
- Calibration requirements including the frequency of calibration. All calibrations must be traceable to national measurement standards.

When a measurement device is found not to conform to operating tolerances, the Quality Manager validates the accuracy of previous measurements.

[CompanyName] Quality Controlled Equipment Form				
Project ID	**Project Name**	**Preparer**	**Date**	
[ProjectNumber]	[ProjectName]			

Equipment	**Intended Use (If description is necessary)**			

[CompanyName]
Test Equipment Calibration Plan and Log

Project ID	Project Name	Preparer	Date	
[ProjectNumber]	[ProjectName]			

Type of measuring device	Calibration Type and Frequency	Measuring Device ID	Calibrated By/ Calibration Date	Calibration certificate #	Next Calibration Due Date
					Project Start

J. INSPECTIONS AND TESTS

INSPECTION OF WELDING WORK

DIMENSIONAL INSPECTIONS – SIZE, LENGTH, AND LOCATION OF WELDS

A qualified welding inspector inspects all weld dimensions to ensure that the size, length, and location of all welds conform to the requirements of the applicable AWS Welding Code(s) or Specification(s) (i.e., D1.1., D1.5) as specified in the Manual Conformance section of this Manual, and to the detail drawings; and that no unspecified welds have been added without the approval of the contract Engineer.

WELD INSPECTIONS

During the welding process, at suitable intervals, weld inspections are performed by a qualified welding inspector. Such inspections will be conducted, on a sampling basis, prior to assembly, during assembly, and during welding. The welding inspector will observe joint preparation, assembly practice, and the welding techniques, and performance of each welder, welding operator, and tack welder to endure that the applicable requirements of the AWS Welding Code(s) or Specification(s) (i.e., D1.1., D1.5) as specified in the Manual Conformance section of this Manual are met.

FINAL INSPECTIONS

After completion of the work, a certified welding inspector performs a final visual inspection of every weld to ensure that the requirements of the applicable sections of code are met. Other acceptance criteria, different from those described in the applicable AWS Welding Code(s) or Specification(s) (i.e., D1.1., D1.5) as specified in the Manual Conformance section of this Manual, may be used when approved by the Engineer on the contract.

Size and contour of welds will be measured with suitable gages. Visual inspection for cracks in welds and base metal and other discontinuities will be observed with the aid of a strong light, magnifiers, or such other devices as may be found helpful.

WELD INSPECTION AND TEST STATUS

The inspector identifies final acceptance or rejection of the work either by marking on the work or with other recording methods.

Final product acceptance inspection shall be indicated by permanent stamping or marking adjacent to the weld or must be unambiguously identified in the inspection report.

WELD INSPECTION RECORDS

The inspector shall make a record of the inspection which shall include the following information:

- Unique part identifier (serial number, shop order, or batch number)
- Drawing number and revision
- Procedure and applicable acceptance criteria
- Inspector identity and date of inspection
- Record of defect findings
- Nominal
- Actual

[CompanyName]
Visual Weld Inspection Report

Report ID #	Unique Part ID (Serial #, Shop order, or batch number)	Project ID	Project Name	Drawing # & Rev.	Date of Inspection

Procedure and Acceptance Criteria / Ref#	Inspection Result Pass/Fail	Nominal	Actual	Tolerance	Comments

Final acceptance of completed work (sign and date)

Inspector Sign and Date	Supervisor Sign and Date

K. Weld Inspection and Test Plan

The Quality Inspection and Test Plan form lists inspections and tests (other than work task inspections) that will be performed on this project.

Results of inspections and tests will be recorded on the Inspection and Test Form.

Form exhibits are included as an exhibit in this subsection.

Welding Inspection and Testing Standards

Inspection and testing standards that may apply to this project include those listed below. Specifications that determine the rules for controlling the welding process and weld acceptance include, but are not limited to the following:

Description	Reference Standard No.	Reference Standard Title
Identification markings to conform to ASTM standards specified in the approved construction documents	AISC 360 Section A3.3 and applicable ASTM material Standards	Material verification of high-strength bolts, nuts and washers
Identification markings to conform to AWS specification in the approved construction documents	AISC 360, Section A3.5 and applicable AWS A5 documents	Material verification of weld filler materials
Inspection of high-strength bolting	AISC 360, Section M2.5	Inspection of high-strength bolting
For structural steel, identification markings to conform to AISC 360	AISC 360, Section M5.5 and applicable ASTM material standards	Material verification of structural steel and cold-formed steel deck
Ultrasonic weld inspecting techniques	ASNT SNT-TC-1A Q&A Bk C	Ultrasonic Testing Method
Ultrasonic Inspection	ASTM E 164	Standard Practice for Contact Ultrasonic Testing of Weldments
Liquid Penetrant Inspection	ASTM E 165	Standard Practice for Liquid Penetrant Examination for General Industry
Magnetic Particle Inspection	ASTM E 709	Standard Guide for Magnetic Particle Testing
Radiographic Inspection	ASTM E 94.D	Standard Guide for Radiographic Examination
Non-destructive weld testing and visual examination	AWS B1.11	Guide for the Visual Examination of Welds
Specification for Welding Procedure and Performance Qualification	AWS B2.1/B2.1M	Specification for Welding Procedure and Performance Qualification
Test frequency for ferrous materials	AWS D1.1/D1.1M	Structural Welding Code – Steel
Visual inspection of welds	AWS D1.1/D1.1M	Structural Welding Code – Steel
Structural Welding Code - Sheet Steel	AWS D1.3	Structural Welding Code - Sheet Steel
Inspection of Reinforcing Steel welding	AWS D1.4 ACI 318, Section 3.5.2	Required verification and inspection of concrete construction

[CompanyName]

[CompanyAddress]
[CompanyPhone]

Quality Manual

Operating Policies of the [CompanyName] Quality System

Management acceptance

This Quality Manual has been reviewed and accepted

Endorsed By: (Name / Title)	[PresidentName], President		
Signature:	*[PresidentName]*	Date:	[Date]

[CompanyName]
Document Revision Log

Document	Responsible Person					
Quality Manual	Quality Manager					
Description	**Section of Change**	**Approved by**	**Approval Date**	**Document Distribution (Name / Organization)**	**Method of Control (hard copy or computer file)**	**Document Return Date**

QUALITY MANUAL

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WELDING QUALITY POLICY

[CompanyName] is committed to quality. Our objective is to safely deliver 100 percent complete fabrication and installation projects that meet all contract and customer expectations the first time, every time. Our commitment to quality means:

- Every [CompanyName] employee is responsible for fully implementing and complying with all provisions of the [CompanyName] quality system.
- Our quality standards meet or exceed all applicable regulations, codes, industry standards, and manufacturer specifications as well as with our customers' contract and individual requirements.
- We stand behind our work. We inspect every work task to assure conformance to the project requirements. Should problems be found, we correct them.
- We are always improving. All employees receive regular training to make systematic improvements to remove quality risks and enhance quality performance.

We conduct our work with dignity and respect for the customer, our subcontractor and supplier partners, and ourselves.

Approval Signature, Title and Date:

[PresidentName] President, [Date]

2. PERSONNEL QUALIFICATIONS

2.1. OVERVIEW

The Quality Manager qualifies employee capabilities to ensure that they are capable of completely carrying out their assigned quality responsibilities including the following capabilities:

- Knowledge of Company quality standards
- Knowledge of job responsibilities and authority
- Demonstrated skills and knowledge
- Demonstrated ability
- Demonstrated results
- Required training
- Required experience

The Quality Manager also evaluates independent contractor personnel on the same standards that apply to employees.

2.2. QUALIFICATION OF [COMPANYNAME] VISUAL, MT, OR PT PERSONNEL

QC Inspectors who perform VT, MT, or PT examinations on [CompanyName] welds are qualified and certified for each method in accordance with the following minimum requirements:

- Instruction by the Level III or Quality Manager in the fundamentals of the NDE method.
- On the job training to familiarize the candidate with the appearance and interpretation of indications of weld defects. The length of such training shall be sufficient to assure adequate assimilation of the knowledge required.
- Candidates already qualified in one method may, at the discretion of the Quality Manager, be exempt from this training for other methods.
- A visual acuity examination performed at least annually to determine the optical capability of the candidate to read Jaeger 1 letters at a distance of not less than 12", and to distinguish the contrast between colors.

Upon completion of the above, the candidate is given an oral or written examination and a performance examination by the Quality Manager to determine if he is qualified to perform the examination and interpret the results.

Certification records of each QC Inspector who performs NDE examination shall be signed and dated by the Quality Manager and placed in the examiner's file.

Certified NDE Personnel who have not performed a specific examination method for a period of one year or more are recertified only after successfully completing the examinations described above.

Substantial changes in procedures or equipment used require recertification of NDE personnel as determined by the Quality Manager.

The following criteria may be used as an alternative to the above requirements, as applicable for the method:

- Qualification to AWS QC1, Standard for Qualification and Certification of Welding Inspectors, with the addition of the requirements above.

- Recommended Practice ASNT SNT-TC-1A - Current Code accepted edition, qualification of Nondestructive Testing Personnel

2.3. Qualification of Welders and Welding Operators

For structural metals fabrication, only certified welders may perform welding activities. Welders must be certified and maintain a valid certification in accordance with the AWS Welder Certification Program and have completed the necessary tests in accordance with QC7, *Standard for AWS Certified Welders*.

The Quality Manager or a Certified Welding Inspector (CWI) will review and approve the welder and welding operator's qualification record for compliance with the necessary code(s) before they begin welding on a specific project.

A WPQ/WOPQ is also required for the welder who welded the test welds used to qualify a WPS or to re-qualify, based on the performance essential variables used. The original WPQ/WOPQ's are retained in the Quality Manager's files.

The Quality Manager approves the qualification of all welders before they begin welding on a specific project.

2.4. Qualification of Welders for Specific Welding Procedures

When indicated on the welding procedure, the Quality Manager approves qualification of welders to the specific welding procedure.

2.5. Maintenance of Welder and Welding Operator Qualifications

Each qualified welder is listed on the Welding Personnel Certifications and Licenses form in the Forms section of this Quality Manual. The Quality Manager determines from the Welding Personnel Certifications and Licenses form when a welder's qualification will expire.

2.5.1. Retesting Based on Quality of Work

In addition to welder certification, welding personnel may be required to be retested based on the following criteria:

- An interview of the welder
- Increased visual inspection for a limited time period
- Observation of the welding, or a simplified weld test developed to evaluate the issue of concern
- Requalification in compliance with Clause 6 or Clause 10 for tubulars of the D1.1/D1.1 M code

2.5.2. Retesting Based on Qualification Expiration

If evidence cannot be supplied that shows a welder, welding operator, or tack welder has used the welding process within the last six months, he or she is not considered qualified to weld using that process without new qualification testing.

2.6. Certified Welding Inspector Requirements

For structural metals fabrication, [CompanyName] uses only qualified weld inspectors. If an AWS Certified Welding Inspector is not used, the Quality Manager will ensure that the weld inspector is qualified and certified in accordance with [CompanyName]'s written practice based on current ASNT (American Society

for Nondestructive Testing) SNT-TC-1A (VT). The certification process will include the educational, training, experience and testing provisions described in SNT-TC-1A (VT).

The Quality Manager will ensure that inspectors are knowledgeable with the code(s) which applies to the fabrication work being performed.

The Quality Manager approves the qualification of all certified welding inspectors.

2.7. NDE Welding Inspector Requirements

For structural metals fabrication, the Quality Manager will ensure that Radiographic Interpreters are certified in accordance with AWS B5.15, *Specification for the Qualification of Radiographic Interpreters*. Alternatively, Radiographic Interpreters may be qualified and certified in accordance with [CompanyName]'s written practice based on ASNT SNT-TC-1A. The certification process will include the educational, training, experience, and testing provisions described in SNT-TC-1A. These requirements will also apply to personnel performing other NDE methods, (e.g., MT, PT, and UT).

3. PROJECT QUALITY ASSURANCE/QUALITY CONTROL PLAN

Before project work begins, the Project Manager prepares a fabrication and installation process plan that defines the sequence of each work task and related quality inspections. The fabrication and installation process plan ais documented through an integrated and coordinated set of documents that includes:

- A schedule consisting of a sequence of each work task and activities required to complete a project
- The customer contract (Section 5 Contract Specifications) including contract technical specifications and contract drawings
- Required quality inspections and tests (Section 14.2 Required Work Task Quality Inspections and Tests) and the project Quality Inspection and Test Plan when required
- The Contract Submittal Schedule (Section 5.4.1 Contract Submittal Schedule)

3.1. IDENTIFICATION OF QUALITY CONTROLLED WORK TASKS

The Quality Manager identifies each phase of fabrication and installation work task that requires separate quality controls. Each work task triggers a set of requirements for quality control inspections before, during and after work tasks.

3.2. PROJECT QUALITY INSPECTION AND TEST PLAN (ITP)

The Quality Manager prepares quality inspection and test plans for a project that identifies:

- Each required quality inspection and/or test
- Inspection and test specifications for each required quality inspection or test
- Hold points for customer quality inspection
- Specification requirements for each quality inspection and test

3.3. PROJECT QUALITY COMMUNICATIONS PLAN

After [CompanyName] is awarded a contract, the Project Manager plans the methods of communications among the customer, subcontractors and suppliers and [CompanyName].

3.4. PROJECT QUALITY TRAINING PLAN

The Quality Manager ensures that all employees receive training relevant to their quality responsibilities.

The Quality Manager ensures that all subcontractors and suppliers receive training on relevant elements of the [CompanyName] Quality System, , Project Quality Assurance/Quality Control Plan, and quality standards.

The Quality Manager identifies the training needs of all personnel performing activities that affect quality. Training topics may include:

- The [CompanyName] Quality System
- The [CompanyName] Quality Policy
- Quality standards cited in the Quality Manual, or project documents, or records
- Relevant quality standard operating procedures

3.5. Project Startup and Coordination Meeting

Prior to the commencement of work, the Quality Manager holds a meeting to discuss and coordinate how project work will be performed and controlled. Key personnel from [CompanyName], subcontractors and suppliers meet to review expectations for project quality results as well as quality assurance and quality control policies and procedures including:

- Key requirements of the project
- The fabrication and installation Process Plan
- Required quality inspections and tests
- Required Welding Procedure Specifications
- The project submittal schedule
- Quality policies and heightened awareness of critical quality requirements
- Project organization chart and job responsibilities
- Methods of communication and contact information
- Location of project documents and records

3.6. Project Records and Documentation Plan

The Quality Manager identifies the quality records that will be maintained during the planning and execution of the project. Considerations include:

- Contract requirements for maintaining records
- The size of the project
- Types of activities
- The complexity of processes and their interactions
- The competence of personnel
- The duration of the project
- The need to demonstrate completion of work
- The need to demonstrate due diligence for quality system related activities
- Balancing the cost and benefits of maintaining the record

3.7. Project Audit Plan

The Quality Manager identifies the frequency of project quality audit that will be conducted during the project and the job position that will conduct the audits. Considerations include:

- The size of the project
- The complexity of processes and their interactions
- The duration of the project

10. WELDING CONTROL

10.1. WELDING PROCEDURE SPECIFICATIONS (WPS)

Welding procedure specifications shall be qualified and approved in accordance with the applicable AWS Welding code(s) or Specification(s) (i.e., D1.1., D1.5) or AWS B2.1*, Specification for Welding Procedure and Performance Qualification*.

When the governing Welding code(s) mandates that welding procedures be qualified by test, the [CompanyName] shall have PQRs that support the applicable WPSs. When prequalified WPSs or Standard Welding Procedure Specifications (SWPSs) published by the AWS are permitted, PQRs are not required.

The Quality Manager or a Certified Welding Inspector (CWI) reviews and approves the welding procedure before being used in production welding operations.

Revisions to the WPSs and PQRs are controlled by the Quality Manager according by the document and record control procedures specified in the relevant section of this Quality Manual.

The applicable WPSs shall be available to welders or welding operators during testing and production welding.

The Quality Manager is responsible for selecting and assigning welding procedures. The Quality Manager or qualified designee shall ensure that welding procedures are listed on applicable shop fabrication drawings.

10.2. WELDER ID

Each qualified welder is issued a unique stamp (stencil) by the Quality Manager with which to identify each weld made. When conditions prevent the stamping of welds, the QC Inspector enters the stencil on the Supplemental Traveler for each joint welded, or the QC Inspector will record all stencils for each weld joint on an as-built drawing.

10.3. TACK WELDS

Tack welds, whether left in place or completely removed, are made by qualified welders using a qualified procedure.

If left in place, the ends of each tack weld are ground to ensure complete fusion into the final weld, and the welder's symbol is recorded on the Supplemental Traveler or as-built drawing.

After preparation, each tack weld is visually examined by the QC Inspector and if found defective, completely removed.

11. Material Controls

11.1. Material Specifications

The Quality Manager ensures that all types of materials and equipment that affect quality are identified and controlled.

The Quality Manager evaluates the expected use of materials and equipment and identifies types of materials and equipment that may affect project quality. For each item, the Quality Manager sets specifications for their intended use, including:

- Compliance to contract requirements
- Compliance to code and industry standards and listing requirements
- Structural integrity
- Performance
- Durability
- Appearance
- Product identification for traceability.

The Quality Manager identifies controlled material and equipment that apply to the project.

The Quality Manager ensures that purchase orders for listed materials and equipment include the relevant specifications as required.

Only approved materials are used in the fabrication and installation process.

11.2. Work Process Specifications

The Quality Manager ensures that work processes are controlled to ensure that the specified requirements are met. When appropriate, the Quality Manager will specify project quality standards for work processes that may include:

- References to documented procedures such as manufacturer's installation instructions
- Procedures for carrying out process steps
- Methods to monitor and control processes and characteristics
- Acceptability criteria for workmanship
- Tools, techniques and methods to be used to achieve the specified requirements.

11.3. Application of Multiple Sources of Specifications

Should multiple sources of specifications apply to a work task, the higher level of specification applies. When there are equal levels of specifications that conflict, the specifications are applied in this order:

- Submittals approved by the customer
- Contract technical specifications
- Contract drawings
- Government regulations that exceed requirements of items below
- [CompanyName] quality specifications, including subcontract specifications
- [CompanyName] Quality Manual
- Product installation instructions
- Industry standards
- Generally accepted practices

Should multiple sources of conflicting specifications apply to a project, the Quality Manager defines the standards that apply to the specific project on the Project Quality Plan.

11.4. Welding Material

11.4.1. Filler Materials

Filler materials of different filler metal types, sizes and heat numbers (if applicable) will be labeled and stored separately to prevent intermixing.

Filler materials will be stored in a controlled environment to prevent contamination and degradation. The storage environment will conform to any elevated temperature holding requirements of the filler metal manufacturer and the applicable code or filler metal specification.

11.4.1.1. Low Hydrogen

Low hydrogen coated electrodes are received and stored in hermetically sealed containers. When opened, the electrodes are placed in a heated oven maintained at the temperature recommended by their Manufacturer or applicable welding code.

Coated Low Hydrogen type electrodes are issued only in a quantity sufficient to complete the weld or for a period of four hours whichever is less.

Unused Low Hydrogen type coated electrodes which have been out of the hot box are scrapped or used for non-code work. Damaged or unidentified electrodes are scrapped or used for non-code work.

11.5. Material Receiving Inspection

The Superintendent or qualified receiving inspector inspects materials for conformance to the purchase order and project quality requirements. The receiving inspection includes a verification that the

- Correct material has been received
- The material is identified and meets the traceability requirements for the material
- Material certifications and/or test reports meet the specified requirements if required
- Materials are tested and approved for the specific application if required

11.5.1. Source Inspections

Source quality inspections are required when quality characteristics cannot or will not be verified during subsequent processing. The Quality Manager determines if a source inspection is necessary to validate supplier quality before materials are delivered to the project jobsite.

The Superintendent ensures that each work task that uses the source inspected materials proceed only the material has been accepted by the source inspection.

11.6. Material Inspection and Test Status

The status of each material quality control inspection or test is clearly marked by tape, tag, or other easily observable signal to ensure that only items that pass quality inspections are used.

For each quality-controlled material, the Quality Manager determines the appropriate method for identifying quality inspection and test status.

13. NONDESTRUCTIVE EXAMINATION

13.1. OVERVIEW

Nondestructive Examination (NDE) required for code compliance is specified on the drawings or in the contract specifications, and is performed by a qualified NDE subcontractor, whose written procedures, personnel qualifications and certifications and equipment calibration records have been reviewed and approved by the Quality Manager. Some NDE activities (PT, MT, and VT) may be performed in-house after approval of NDE procedures and personnel qualifications by the Quality Manager.

13.2. SUBCONTRACTED NDE PROCEDURES

All NDE performed by the NDE subcontractor is performed using written procedures that are approved by a Level III Examiner qualified in the method. The Quality Manager will review and approve all NDE Subcontractor personnel.

13.3. SUBCONTRACTOR NDE PERSONNEL

The Quality Manager will review and approve qualification records after he has assured himself that subcontracted NDE personnel used on code work have the training, experience, qualifications and are certified for the methods, including to SNT-TC-1A current Code accepted Edition requirements, in accordance with their employers Written Practice and the Code.

NDE personnel qualification records are available for review by the Welding Inspector, who may request re-qualification if he has reason to question an examiner's ability to perform the examination.

Copies of the following Subcontractor NDE personnel qualification and certification records for all examiners performing Code NDE are kept on file by the Quality Manager, and made available for review:

- Name, level of certification and examination method.
- Educational background and experience of examiner.
- Statement indicating satisfactory completion of training in accordance with the employer's written practice
- Results of annual visual acuity examination.
- Copies of current examinations, or documentation or successful completion of examinations in each method qualified.
- Composite grades, or documented grades for each of the above examinations.
- Dates of each certification and or recertification in each method qualified, and dates of assignment to NDE.
- Signature of the Employer's designated representative.

13.4. NDE RECORDS

All reports of NDE, including RT film, are reviewed and accepted by the Level II/III NDE subcontractor and the Quality Manager before submittal to the Welding Inspector for acceptance.

NDE reports, including RT film are filed by the Quality Manager for retention as described in Section 22 of this Manual.

14. Calibration of Measurement and Test Equipment

14.1. Overview

The Quality Manager evaluates the project requirements and determines if there are measuring devices that require controls to assure quality results.

For each type of device, the Quality Manager identifies:

- Restrictions for selection
- Limitations on use.
- Calibration requirements including the frequency of calibration. All calibrations must be traceable to national measurement standards.

When a measurement device is found not to conform to operating tolerances, the Quality Manager validates the accuracy of previous measurements.

14.2. Calibration Procedure

All measurement, examination and test equipment are identified by marking the item or its container with a unique serial number (I.D. number).

The Quality Manager is responsible for maintaining all equipment in calibration, unless out of service and clearly marked “NOT CALIBRATED-DO NOT USE”.

Calibration may be performed by an outside testing agency which provides certified records of calibration and has suitable standards whose accuracy is traceable to N.I.S.T. standards or similar.

The frequency of calibration is as determined from the manufacturer’s recommendations, or experience with the instrument.

Pressure gauges are calibrated against a dead weight tester or a calibrated master gauge yearly and whenever there is reason to question their accuracy.

Master gauges are recalibrated at a frequency of one year.

Calibration of radiographic densitometer and density of step-wedge comparison films is verified by the subcontractors’ RT Level II/III Examiner with a calibrated step wedge film which is traceable to national standards, at the start of each 8-hour shift, or at each change of operator.

Calibration of micrometers or calipers will be performed using a known thickness block every (3) years or whenever there is reason to question the accuracy.

14.3. Calibration Records

Each calibrated instrument will be logged on the Calibration Record, maintained by the Quality Manager in the calibration file. The Calibration Record shall include a description of the equipment, unique number on the gauge, date calibrated, date due, and identification of the person (testing agency when applicable) performing the calibration.

14.4. Verification and Validation of Welding Machines

At least annually, The Quality Manager ensures that welding machines are verified as specified by the manufacturer. At a minimum, the following will be checked:

- Condition of volt meters, amp meters and gas flow meters (if equipped)
- Condition of cables
- Condition of hoses (if equipped)
- Condition of wire feeders (if equipped)

14.5. Calibration Identification

The Quality Manager ensures that a calibration identification label or tag is securely fixed to each piece of measuring and test equipment that will be controlled, calibrated and maintained.

The calibration identification label or tag will include the item serial number, date of last calibration, identification (initials or employee ID) of the person who performed the calibration, and due date of the next calibration. If the equipment is too small to place a sticker on it, the container box will have the calibration sticker attached to it.

14.6. Discrepant Equipment

When instruments are found out of calibration or damaged, the QC Inspector tags the item “DO NOT USE UNTIL CALIBRATED”, removes it from the work area and arranges for calibration or replacement.

All Code items checked with such discrepant equipment are nonconforming until the Quality Manager has verified that they meet all Code requirements, or they are retested with accurate instruments.

Traceability is provided by recorded serial numbers of instruments used from examination and inspection records.

15. Storage, Shipping and Handling

15.1. Preservation, Storage and Protection of Materials and Completed Work

[CompanyName] will preserve and protect work in process, completed work, component parts, materials, and when applicable, delivery to the destination, to maintain compliance with project requirements and standards. This includes handling, storage, protection from natural elements, and reducing risks of damage.

Completed work is protected from dirt, oil, ferrous material, other foreign matter, and damage as specified by government regulations, contract technical specifications, industry standards, or product installation instructions.

Protections will be employed that prevent water from collecting and pooling.

Aluminum will be packaged and stored in a manner that prevents damage to the material properties of the metal.

The Quality Manager identifies supplemental protection requirements that apply to a specific project when they are necessary to assure quality results.

19. Record and Document Controls

19.1. Overview

[CompanyName] ensures that quality related documents and records are created, current versions are in use, complete, identifiable, and stored properly.

19.2. Quality System Documents

19.2.1. Quality Manual

The Quality Manager maintains the [CompanyName] Quality Manual that documents [CompanyName] quality policies. Each policy identifies the titles of personnel responsible.

The Quality Manager ensures that the Quality Manual and documents related to a work task are accessible to personnel performing the work.

The Quality Manager maintains, improves, and updates the manual as necessary. At least annually, the Quality Manager determines if updated versions of standards and product installation instructions are available. If so, the Quality Manager updates the Quality System documentation accordingly.

The President approves revisions to the Quality Manual, then signs and dates the cover.

19.3. Document Controls

The Quality Manager assigns a new version number to each version of quality system documents, including the Quality Manual.

The Quality Manager and President control all company-wide quality system documents including:

- Approval of all quality system documents and for adequacy prior to issue or reissue.
- Ensures that applicable documents are available and usable at points of use
- Prevents unintended use of obsolete documents

The Quality Manager controls project-specific quality system documents including:

- Approval of all project quality documents and for adequacy prior to issue or reissue.
- Ensures that applicable documents are available and usable at points of use
- Prevents unintended use of obsolete documents

19.3.1. Control of System Documents

The Quality Manager controls documents related to the [CompanyName] Quality System including:

- Quality Manual
- Quality System Procedures
- Project Management Procedures (including interface and coordination with customers and regulatory agencies with jurisdiction over jobsites)
- Government regulations
- Industry standards
- Procurement specifications

The Quality Manager ensures that records of the distribution of Quality System documents are kept. When new versions are distributed, obsolete versions are destroyed or controlled to prevent inadvertent use.

19.4. Record Control and Retention

The Quality Manager verifies records for conformance to the Quality System Requirements and approves all Quality System records.

Records demonstrating conformance with, and operation of the Quality System are retrievable for at least five years. The Quality Manager verifies records for conformance to the Quality System Requirements.

19.4.1. Quality System Records Control

The Quality Manager verifies the completeness, accuracy, and retention of project-specific Quality System records including:

- Annual reviews
- Quality improvement records

19.4.2. Project Records Control

The Quality Manager verifies the completeness, accuracy, and retention of project-specific Quality System records including:

- Inspection and test records
- Quality submittals to the customer
- Project quality system audits
- Management reviews
- Calibration certificates
- Daily log reports
- Incident reports
- Redline drawings
- Qualified personnel approvals
- Qualified subcontractor approvals
- Quality improvement records
- Project Quality records specified by customer contract, or contract technical specifications

19.4.3. Welding Quality Records, Forms, and Reports

The Quality Manager collects all records described in this QC Manual at the completion of the job, and reviews them for completeness, correctness and Code compliance before preparing the Manufacturers' Data Report.

The Quality Manager verifies the completeness, accuracy, and retention of project-specific welding records including:

- Welder Performance Qualification Records (WPQRS)
- Welding Procedure Specifications (WPSS)
- Procedure Qualification Records (PQRS)
- Material Test Reports (MTRS) (when required by the contract, governing AWS code or specification)

- Nondestructive Examination (NDE) reports (when required by the contract, governing AWS code, or specification)
- Nondestructive Examination Personnel Qualification Records
- Weld Identification Reports (Weld Mapping) when required
- Record of Final Inspection (I.E., Traveler, Inspection Record, Check Off List)
- Heat Treatment Records (When Required by The Contract, Governing AWS, or Specification)
- Receiving Material Inspection Reports
- Nonconformance Reports (NCRS) and dispositions
- Calibration Records of Test Equipment
- Internal Quality Audit Rep
- Manufacturing drawings
- Design calculations including and applicable proof tests d. Material Test Reports and/or material certifications
- Pressure parts documentation and certifications
- Continuity records
- RT film and RT and UT reports and any other Code required NDE records
- Repair procedure and records
- Process Control sheets (Traveler)
- Heat Treat records and test results/Post Weld heat treatment records
- Proof Testing
- Transfer Forms

The Quality Manager assigns record control responsibilities and document location that apply to a specific project.

Project Quality Records will be maintained for a minimum of five years or more as specified by project specifications, or by the Quality Manager for a specific project. Project Quality Records will be filed in the project office during the project. After the project is complete, project records will be stored in file storage area of the main office.

For More Information:

Visit our Online Store at:

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or

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