BROWN & ROOT, INC. CPSES JOB 35-1195	NUMBER	REVISION	ISSUE DATE	PAGE
	CP-QAP-12.1	8	AUG 0 3 1983	1 of 23

TITLE:

INSPECTION CRITERIA AND DOCUMENTATION REQUIREMENTS PRIOR TO SYSTEM N-5 CERTIFICATION

ORIGINATOR: [signature] 31 Aug 83 DATE

REVIEWED BY: [signature] 8-3-83 DATE

APPROVED BY: [signature] 8/3/83 DATE
Site QA Manager

1.0 REFERENCES

1-A QI-QAP-2.1-5, "Training and Certification of Mechanical Inspection Personnel"

1-B QI-QAP-11.1-28, "Fabrication, Installation Inspection of ASME Component Supports, Class 1, 2, and 3"

1-C CP-QAP-16.1, "Control of Nonconforming Items"

1-D CP-QAP-12.3, "Testing Phase Quality Assurance Functions Prior to ASME Code Certification and Stamping"

1-E CP-QAP-12.2, "Inspection Procedure and Acceptance Criteria for ASME Pressure Testing"

1-F QI-QAP-11.1-26, "ASME Pipe Fabrication and Installation Inspections"

1-G QI-QAP-11.1-39, "Mechanical Equipment Installation Inspection"

1-H CP-QAP-11.1, "Inspection Criteria and Documentation Requirements Prior to System N-5 Certification"

2.0 GENERAL

2.1 PURPOSE

The purpose of this procedure is to establish requirements for a system/subsystem walkdown and verification by the Quality Control (QC) Group prior to:

a. Release for flushing and preoperational testing

b. Pressure testing

c. Release for penetration sealing

d. Verification that piping hangers comply with vendor certified drawings (large bore) or design reviewed drawings (small bore).

e. Release for preparation on N-5 Data Report

2.2 SCOPE

The scope of this procedure applies to all ASME Section III piping and components being inspected for release.

2.3 RESPONSIBILITY

The QC Group Supervisor shall be responsible for the overall implementation of this procedure.

All inspection personnel performing inspections required by this procedure shall be trained, qualified and certified in accordance with Reference 1-A.

The Quality Engineering (QE) Completions/Start-up Group Supervisor shall be responsible for supplying Quality Control with all the documentation required to perform piping system status walkdowns and component support design verifications.

Design drawing's (i.e, BRP's, BRHL's, GHH's, VCD's, DRD, etc.) used to perform system/subsystem walkdown per Paragraph 2.1 shall be the current revisions of the drawings'. QCI shall document the drawing and revision number on the applicable QC checklist.

3.0 PROCEDURE

3.1 PREOPERATIONAL/TESTING WALKDOWN

The walkdown status of the piping system/subsystem shall be performed using the "QC Preoperational/Flushing Checklist" (Attachment 1), and BRP drawings.

The following information shall be recorded on the System Verification Form (Attachment 7) during preoperational/ testing walkdown:

a. Manufacturers' identification/serial number of all ASME stamped items (i.e. piping subassemblies, valves, pumps and vessels), within the boundries of the BRP.

b. Material identification (i.e., Heat numbers, heat code, material specification) for material supplied by B&R, if available.

General hanger locations and hanger number for permanent hangers and attachments to piping shall be recorded on the BRP.

3.2 PRE-PRESSURE TEST WALKDOWN

The pre-pressure test walkdown status of the piping system/ subsystem shall be performed using the "QC Pre-pressure Test Checklist" (Attachment 2), current BRP drawing, previous BRP drawings and any CMC's that have not been incorporated into the latest drawings.

Valves, pumps, vessels, piping subassemblies and/or Brown & Root supplied material that has been installed by a CMC or a revision to the BRP used during that last walkdown shall have their identification/serial number or material identification recorded on the System Verification Form (Attachment 7).

All additional component supports shall be recorded on the BRP (reference paragraph 3.1).

3.3 RELEASE FOR PENETRATION SEALING

The Area Management Penetrations Seals Supervisor shall notify QC Systems Superintendent of piping penetrations they want released for sealing.

The QC Systems Lead shall verify the penetration meets the following acceptance requirements:

a. All welds inside penetrations are completed , pressure tested and acceptable.

b. No base material defects.

c. Free of foreign material.

d. Hangers and permanent attachments required are installed.

e. Pipe clearance and gradient.

The QC Group will notify Area Management of penetrations acceptable for sealing. Prior to releasing a penetration for sealing, the Penetration Seal Release Form (Attachment 4)

shall be completed and submitted to the ANI for his concurrence. Completed Penetration Seal Release Forms shall be forwarded to Area Management.

3.4 COMPONENT SUPPORT DESIGN VERIFICATION

The QC Leads shall be responsible for performing an inspection of all ASME component supports to verify they are in compliance with the vendor certified (Large Bore) or design reviewed (Small Bore) drawings.

Inspections of component supports shall be performed using the "QC Component Support Checklist" (Attachment 5).

Any welds on component supports that are not required by the vendor certified or design reviewed drawing shall be inspected in accordance with the requirements of Reference 1-B. Actual weld sizes shall be documented on the vendor certified or design review drawing.

3.4.1 Unsatisfactory items shall be documented in accordance with Reference 1-C/1-H.

The physical measurement of structural welds shall be conducted in accordance with the following guidelines:

a. On supports where welds have been mapped on Attachment 13 of Reference 1-B, remeasurement of the welds is not required unless the weld visually indicates contour modification, or the weld size is changed by a starred (*) revision to the VCD/DRD;

b. On supports where welds have not been mapped on Attachment 13 of Reference 1-B, remeasurement of accessible welds shall be performed due to weld contour modification.

3.4.2 Pipe to support clearances are established by Engineering to provide adequate support for the piping, while permitting expected growth or movement due to the operating environment. Clearances indicated on a VCD/DRD are construction installation clearances and do not require remeasurement after clearances are verified on process control documents, unless;

a. The support configuration is modified by design change,

b. The support is being reinstalled following removal to accomplish a design change or other constuction, or

c. Directed by Engineering.

d. Visual examination indicates the sum of the clearances have not changed after verification at time of installation.

3.4.3 Initial load or travel settings are established by Engineering to provide adequate support for the piping, while permitting expected growth or movement due to the operating environment. Load or travel settings indicated on a VCD/DRD are construction installation clearances and do not require remeasurement after settings are verified on process control documents or QA checklists, unless:

a. The support configuration is modified by design change, or directed by Engineering.

3.5 N-5 WALKDOWN

The final status walkdown to verify completion of the system/sub-system shall be performed using the "QC N-5 Checklist" (Attachment 3) and current BRP's, BRHL's, Vendor Certified or Design Reviewed Drawings.

3.6 SYSTEM/SUBSYSTEM DOCUMENTATION

All items defined on the "QC Checklist" as unsatisfactory shall be documented on the "QC Deficiency List" (Attachment 6) and entered on the Master Data System Description (Attachment 8). QE Completions/Start-up Group/QE Task Force shall verify that all items on the QC Deficiencies List are inputted and shall monitor until system turnover/start-up.

Base material defects and arc strikes shall be identified and resolved per Reference 1-C, in addition to being recorded on the "QC Deficiency List".

When the prerelease walkdown is completed, the QC leads shall return walkdown documentation supplied by Quality Engineering and a copy of the "QC Deficiency List" to the QE Completions/Start-up Group for coordinating resolution of deficient items (Reference 1-D).

The QE Completions/Start-up Group/QE Task Force shall notify the responsible QC Systems leads when the "QC Deficiency

List" items have been corrected by returning their copy of the deficiency list and supporting documentation to the QC leads. The corrected items will be reinspected to verify acceptability and a copy of the deficiency list returned to the QE Completions/Start-up Group.

A system or portion of a system shall not be considered completed until Quality Assurance has verified through the above mentioned QC walkdown and QE Systems documentation review that all permanent piping, valves, pumps and hangers are complete and intact and have been installed in accordance with current design documentation (i.e., BRP drawings, BRHL's, BRH's, GHH's, CMC's, etc.). Also the pressure test shall have been completed and accepted by the ANI and the Owner in accordance with Reference 1-E.

4.0 REPORTING DEFICIENCIES/NONCONFORMANCES

Deficiencies/Non-Conformances shall be reported and documented in accordance with References 1-C/1-H.

ATTACHMENT 1 Page 1 of 2

QC PREOPERATIONAL/FLUSHING CHECKLIST

Prerelease No._____

BRP & Rev._____

QC Checklist Unsat Items_____

ATTACHMENT 1 (Continued)

QC PREOPERATIONAL/FLUSHING CHECKLIST Page 2 of 2

PARA.	OP.NO.	INSPECTION CRITERIA	QCI/DATE	SAT/UNSAT
3.1	1.	The temperature and pressure indicated on the Code Data Plate for valves and equipment is in compliance with the piping design requirements indicated on SEP Drawings.		
	2.	Valve location and orientation is in accordance with the design documents.		
	3.	ASME Code Name Plates are attached to "N" stamped pumps and vessels.		
	4.	Items show no visible sign of damage.		
	5.	For liquid service, stops are removed from support spring cans.		
	6.	For steam, gas or air service, the stops are installed in support spring cans.		
	7.	COMMENTS:		

ATTACHMENT 2

QC PRE-PRESSURE TEST CHECKLIST

Page 1 of 3

Pressure Test _____ System _____

BRP & Rev. _____ CMC _____ QC Checklist Unsat Item _____

ATTACHMENT 2 (Continued) Page 2 of 3

QC PRE-PRESSURE TEST CHECKLIST

PARA.	OP.NO.	INSPECTION CRITERIA	QCI/DATE	SAT/UNSAT
3.2	1.	All items within the test boundary are complete and readily accessible.		
	2.	Gradient: 3/16" per foot maximum (this applies to horizontal lines deviating from level only. Deviations from plumbness of vertical lines and horizontal departure from design will be controlled by the two-inch tolerance on location.)		
	3.	The size of all pipe socket welds shall be checked to the requirements of Reference 1-F.		
	4.	All items in the pressure test boundary are free from arc strikes and base metal defects: when identified, they shall be handled in accordance with Reference 1-C.		
		NOTE: Piping shall be installed within the following tolerances of items 6 thru 9.		
	5.	Slope - Minimum slope shall be as designated on the drawings.		
	6.	Clearance - A minimum of two inches (2") of clearance shall be maintained, including pipe insulation with respect to other piping when one or both lines have an operating temperature of 200° or greater. All other lines may be installed with a minimum of one-inch (1") clearance, with respect to other piping.		
	7.	For clearance of pipe (with an operating temperature of 200° F or greater) from hangers, walls, ceiling, hand rails, etc., other than pipe to pipe, a minimum of one inch shall be maintained, including pipe insulation. All other lines may be installed with a clearance only for insulation; however, on a case by case basis, it might be necessary to notch insulation to establish clearances which will require engineering approval.		
	8.	When installed in blockouts, sleeves shall be installed so that, for lines with operating temperatures at or above 200° F, their centerlines are within 1/4 inch of piping centerlines. For lines with operating temperatures of less than 200°, the sleeve inside diameter must be no less than 1/2 inch from pipe outside diameter.		
	9.	All bolts installed in flanged connections.		

ATTACHMENT 2 (Continued)
QC PRE-PRESSURE TEST CHECKLIST

Page 3 of 3

PARA.	OP.NO.	INSPECTION CRITERIA	QCI/DATE	SAT/UNSAT
	10.	Bolting material shall be verified by heat number or color code. Document heat number/color code on Attachment 7.	_____	_____
		NOTE: Any valves and equipment installed with CMC's or revisions to the ERP used during the last walkdown must have items 12 thru 16 complied with.		
	11.	The temperature and pressure indicated on the Code Data Plate for valves and equipment is in compliance with the piping design requirements indicated on ERP drawings.	_____	_____
	12.	Valve location and orientation is in accordance with the design documents.	_____	_____
	13.	For in-line concentrated loads or equipment items, a support (permanent or temporary) should be located as close as possible.	_____	_____
	14.	For liquid service, cams are removed from support spring cans.	_____	_____
	15.	For steam, gas or air service, the cams are installed in support spring cans.	_____	_____
	16.	Identify all hangers and permanent attachments on ERP.	_____	_____
	17.	Equipment anchoring is in compliance with Ref. 1-G (QI-QAP-11.1-39, Paragraphs 3.4.3 and 3.4.3.1)	_____	_____

ATTACHMENT 3

QC M-S CHECKLIST

System _____

BRP & Rev	Checklist Unsat Items	BRHL & Rev	Checklist Unsat Items

BRH/GRH & Rev	Checklist Unsat Items	Vendor Drawing	Checklist Unsat Items

ATTACHMENT 3 (Continued) Page 2 of 2

Q.C. M-5 CHECKLIST

PARA.	CP.NO.	INSPECTION CRITERIA	QCI/DATE	SAT/UNSAT
3.3	1.	Piping system/subsystem and component supports show no visible sign of damage.		
	2.	All permanent component supports are installed per final design drawings.		
	3.	Piping configuration complies with ERP's.		
	4.	All Equipment indicated on ERP is installed.		
	5.	Equipment anchoring complies with Ref. 1-G (QI-QAP-11.1-39, Paragraphs 3.4.3 & 3.4.3.1)		
	6.	Jam nut(s) on snubbers and struts are tight and will not turn by hand, using nominal applied force.		
	7.	Nuts, bolts, cotter pins, lock wire and any removable mechanical items are installed where required (snubbers, struts, spring cans, expansion anchor, U-bolts, etc.)		

COMMENTS:

NOTE 1: WHEN PIPING HAS BEEN INSULATED, ANY DAMAGE TO PIPING SYSTEM WOULD HAVE BEEN IDENTIFIED DURING CLEANLINESS INSPECTION PRIOR TO INSULATION.

ATTACHMENT 4

RELEASE FOR HIGH DENSITY PENETRATION SEALS

PENETRATION SEAL RELEASE FORM

Report #_____

Date_____ Room #_____ BLDG. #_____

Bisco Dwg._____

Released for sealing by:

QC_____

ANI_____

Exceptions - Holds_____

_____

_____

_____

_____

ATTACHMENT 5

ATTACHMENT 5

_____ Page _____ of _____
Support Drawing Number/Revision

QUALITY CONTROL
COMPONENT SUPPORT CHECKLIST

CP-QAP-12.1 Rev. _____

PARA.	OP.NO.	INSPECTION CRITERIA	QCI/DATE	SAT/UNSAT
3.5	1.	Support Configuration complies with Vendor Certified or Design Reviewed Drawing (VCD/DRD)	_____	_____
N/A	2.	Structural member cut lengths comply with Reference dimensions ± 1"	_____	_____
N/A	3.	Baseplate tolerances (excluding thickness) comply with the VCD/DRD ± ½".	_____	_____
N/A	4.	Working point dimensions locating structural components comply with the VCD/DRD ± 1" (except for pipe location tolerances)	_____	_____
3.5.1	5.	a) All accessible welds reinspected and are in compliance with VCD/DRD.	_____	_____
		b) All skewed welds have been reinspected and are in compliance with the VCD/DRD.	_____	_____
3.5.3	6.	Snubber(s) Serial Number_____ a) Nuts, bolts, cotter pins, lock wire, etc. installed where required.	_____	_____
		b) Exposed threaded surfaces are free of excessive rust or foreign material.	_____	_____
		c) Spherical bearings are free of foreign material, and spacer(s) are installed as required.	_____	_____
N/A	7.	Strut(s) (if applicable) Serial number_____ a) Nuts, bolts, cotter pins, lock wire, etc. installed where required.	_____	_____
		b) Exposed threaded surfaces are free of excessive rust or foreign material.	_____	_____
		c) Spherical bearings are free of foreign material	_____	_____
		d) Jam nut(s) and barrel will not turn by hand, using nominal applied force.	_____	_____
3.5.1	8.	Spring Can(s) (if applicable) Serial number_____ a) Nuts, bolts, cotter pins, lock wire, etc. installed where required.	_____	_____
		b) Exposed threaded surfaces are free of excessive rust or foreign material.	_____	_____

ATTACHMENT 5 (Cont'd.)

ATTACHMENT 5

Page _____ of _____

_____
Support Drawing Number/Revision

QUALITY CONTROL
COMPONENT SUPPORT CHECKLIST

CP-QAP-12.1 Rev. _____

PARA.	OP. NO.	INSPECTION CRITERIA	QCI/DATE	SAT/UNSAT
N/A	9a.	Concrete Expansion anchors embedment/engagement complies with drawing or Attachment 5B.	_____	_____
	9b.	Concrete inserts have proper embedment/engagement (ID + 1/8").	_____	_____
ATTACH 5A	10.	Installation of U-bolts on large bore/small bore supports shall be inspected as follows:		
		1) U-bolts used in pinned connection application (i.e., struts and snubbers) are to be installed on the pipe as shown in Figure 1 for large bore supports.	_____	_____
		2) U-bolts on rigid frames, (large bore) shall be installed as shown in Figure 2.	_____	_____
		3) U-bolts on small bore supports shall be installed as shown in Figure 1 or as specified on the hanger drawing.	_____	_____
		4) Clearances as specified on VCD/DRD	_____	_____
3.5.2	11.	Clearances must be verified if:		
		a) The support configuration is modified by design change.	_____	_____
		b) The support is being reinstalled following removal to accomplish a design change or other construction;	_____	_____
		c) Directed by Engineering.	_____	_____
		d) Visual Examination indicates the sum of the clearances have not changed after verification at time of installation.	_____	_____
N/A	12.	Remarks: _____		
		_____		
		_____		
		_____		
		_____		

ATTACHMENT 5A

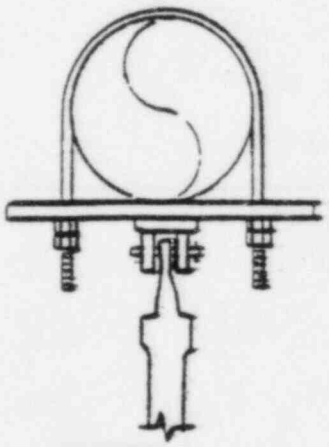

FIGURE 1

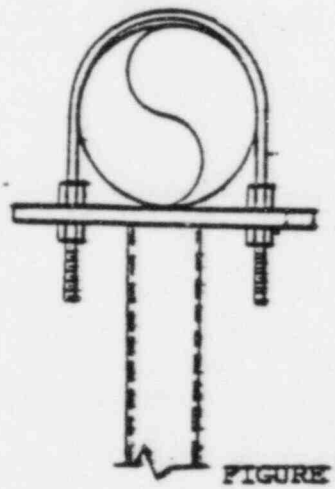

FIGURE 2

ATTACHMENT 5B

TABLE 5

BOLT DIAMETER	MINIMUM EMBEDMENT	
	Kwik-Bolts	Super Kwik-Bolts
1/4	1-1/8	—
3/8	1-5/8	—
1/2	2-1/4	3-1/4
5/8	2-3/4	—
3/4	3-1/4	
1	4-1/2	6-1/2
1-1/4	5-1/2	8-1/8

NOTE: "Embedment Length" is the length of the bolt extending below the surface of the structural concrete prior to setting (tightening). During tightening the nut, the change in bolt projection shall not exceed one nut height unless otherwise approved by the engineer.

ATTACHMENT 5C

LENGTH IDENTIFICATION SYSTEM

STAMP ON ANCHOR	LENGTH OF ANCHOR (INCHES)	
	FROM	UP TO BUT NOT INCLUDING
A	1-1/2	2
B	2	2-1/2
C	2-1/2	3
D	3	3-1/2
E	3-1/2	4
F	4	4-1/2
G	4-1/2	5
H	5	5-1/2
I	5-1/2	6
J	6	6-1/2
K	6-1/2	7
L	7	7-1/2
M	7-1/2	8
N	8	8-1/2
O	8-1/2	9
P	9	9-1/2
Q	9-1/2	10
R	10	11
S	11	12
T	12	13
U	13	14
V	14	15
W	15	16
X	16	17
Y	17	18
Z	18	19

ATTACHMENT 5D

ROD SIZE NUMBER X 1/8 = DIAMETER

ROD SIZE NO.	R ROD SIZE	TL STANDARD THREAD LENGTH	MAX. REC. LOAD/LBS. 650°F.	750°F.	WEIGHTS LBS. PER FOOT
03	3/8	1-1/2	610	540	0.376
04	1/2	2-1/2	1130	1010	0.668
05	5/8	2-1/2	1810	1610	1.04
06	3/4	3	2710	2420	1.50
07	7/8	3-1/2	3770	3360	2.04
08	1	4	4960	4420	2.67
09	1-1/8	4-1/2	6230	5560	3.38
10	1-1/4	5	8000	7140	4.17
12	1-1/2	6	11630	10370	6.01
14	1-3/4	7	15690	14000	8.18
16	2	8	20690	18460	10.68
18	2-1/4	9	27200	24260	13.52
20	2-1/2	10	33500	29880	16.69
22	2-3/4	11	41600	37070	20.19
24	3	12	50600	45090	24.03
26	3-1/4	12	60500	53900	28.21
28	3-1/2	12	71260	63500	32.71
30	3-3/4	12	82900	73860	37.55
32	4	12	95500	85100	42.73
34	4-1/4	12	108900	97140	48.23
36	4-1/2	12	123200	109900	54.08
38	4-3/4	12	138400	123450	60.25
40	5	12	154500	137800	66.76

ATTACHMENT 6

Q.C. DEFICIENCY LIST

CP-QAP-12.1 TEST NO._____ PAGE ____OF____

ORIGINATOR_____SUBSYSTEM_____ISO/PRETURNOVER_____

ITEM	DEFICIENCY (DESCRIPTION OR NCR NO.)	CLOSEOUT DATE/QCI

ATTACHMENT 7

SYSTEM VERIFICATION FORM

DRAWING _____ REV. _____

MATERIAL ID/PC #	AT WELD #	MATERIAL SPECIFICATION	HEAT CODE/ HEAT NUMBER	MANUFACTURER'S ID/SN

ATTACHMENT 8

MASTER DATA BASE INPUT FORM

ORIGINATOR________ Ext.______ CUSTODY CODE A G S (CIRCLE ONE)

T/O # ITEM #	DOCUMENT / DESCRIPTION	LOCATION BLDG/RM/EL	SWA #	SEC. S/S	SPECIAL	FR #	RESP.	PTAT	QC Closeout/Remarks