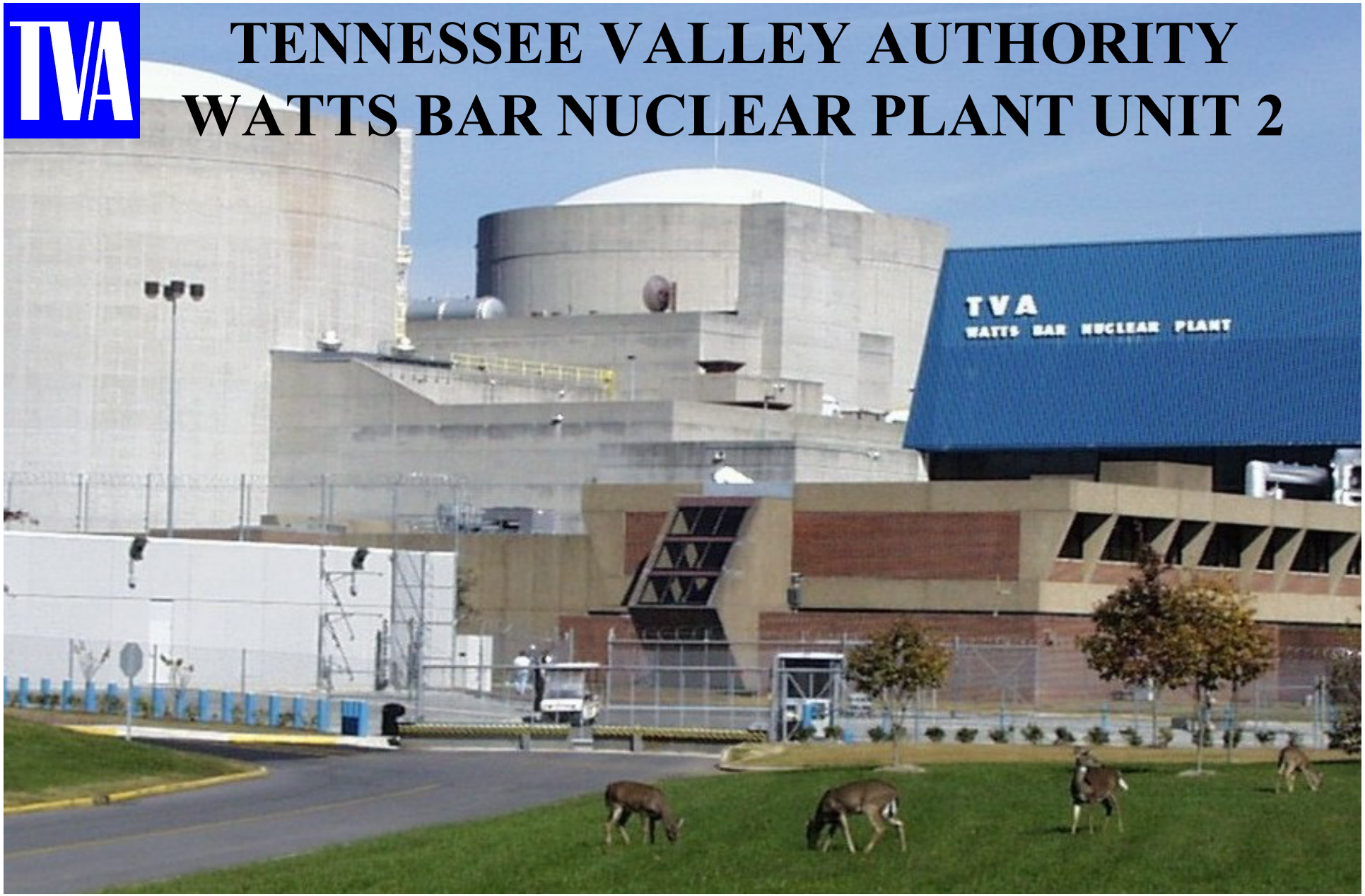
TENNESSEE VALLEY AUTHORITY
WATTS BAR NUCLEAR PLANT UNIT 2



Refurbishment Program

August 6, 2009

Agenda

- Introductions
- WBN Unit 2 Material Condition
- WBN Unit 2 Refurbishment Program
- WBN Unit 2 Refurbishment Program Implementation
- WBN Unit 2 Testing Programs
- Conclusion

WBN Unit 2 Material Condition

Evaluation of Material Condition

- Performed Plant Walkdowns
  - Identify Missing/Removed Components
  - Baseline to Determine Current Configuration of Installed Equipment
    - Electrical
    - Mechanical
    - Civil
- Reviewed Quality Assurance Records to Support ASME Section III Program
- Results Addressed by Engineering Modifications and Refurbishment Program

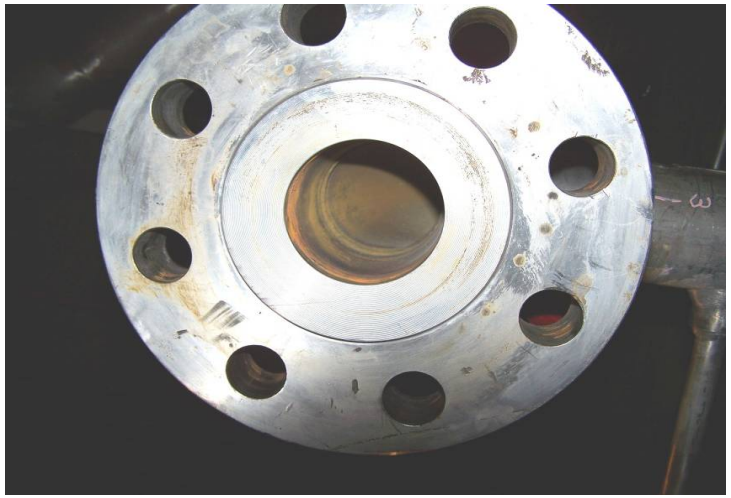
WBN Unit 2 Material Condition

Containment Spray Piping – 676’ Pipe Chase

As-found condition of internal piping shown below.

WBN Unit 2 Material Condition

Centrifugal Charging Pump
2B-B

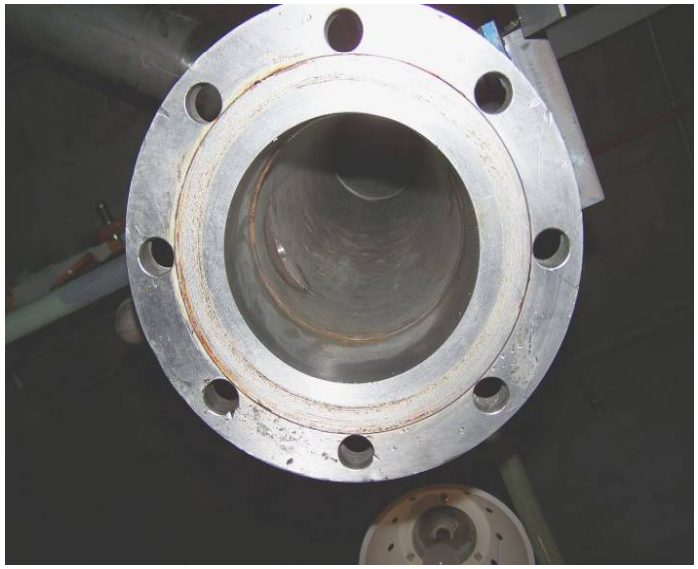


Pump recently removed for refurbishment. Internal suction piping shown above and discharge at left.

WBN Unit 2 Material Condition

Centrifugal Charging
Pump 2A-A

Pump is currently being removed for refurbishment. Internal pump casing shown at left and suction piping at right.



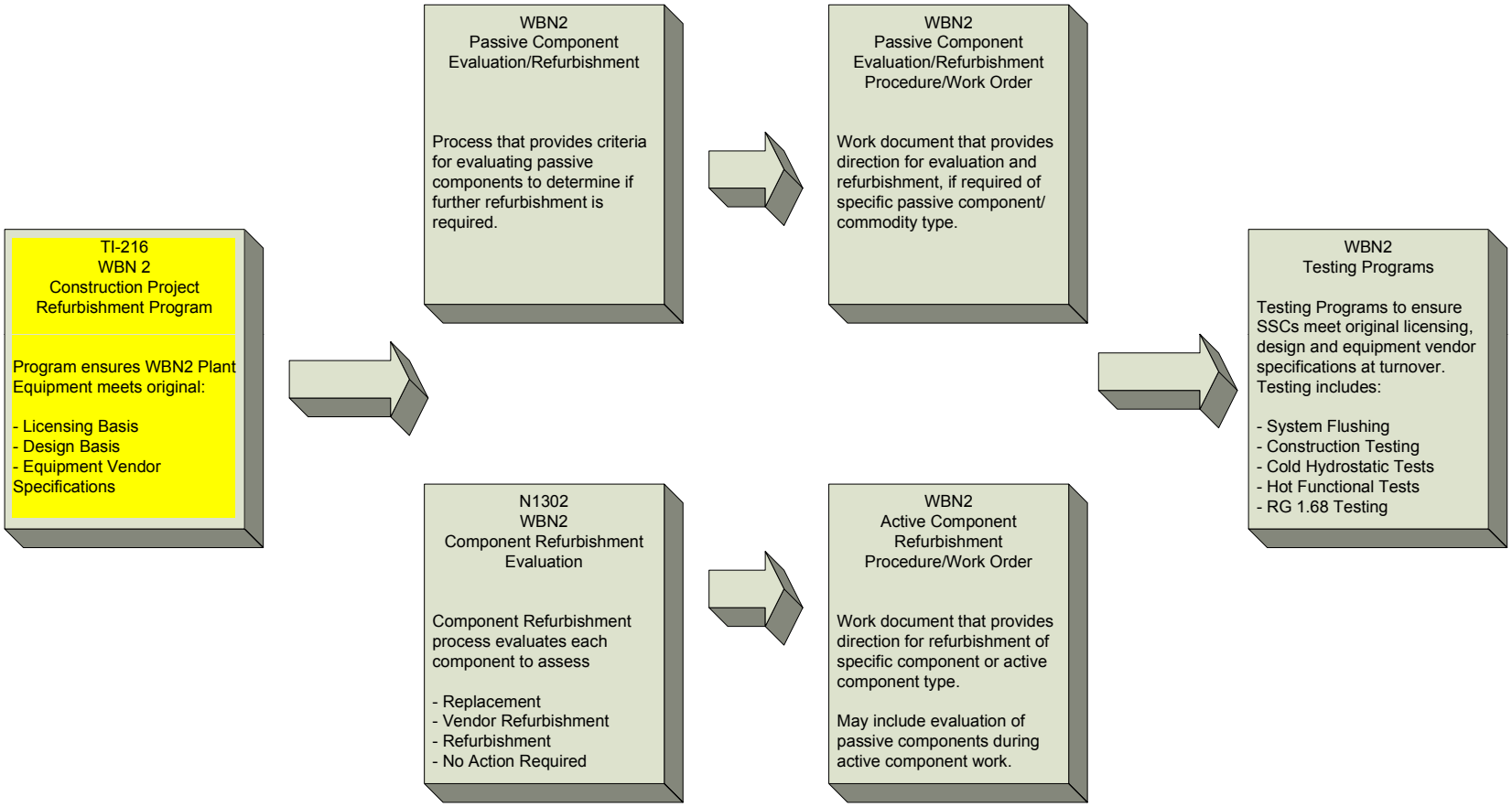
WBN Unit 2 Material Condition

Ventilation Damper

Damper sent off-site to vendor facility for inspection, evaluation and recommended refurbishment and testing requirements.

WBN Unit 2 Refurbishment Program

Overview



WBN Unit 2 Refurbishment Program

Refurbishment Program

Equipment Scope

- Safety Related / Non-Quality Related
- Active / Passive

Refurbishment Program Process Steps

- Identification
- Classification
- Inspection/Evaluation
- Refurbishment/Replacement
- Component/System Testing

Required Outcome

- Plant meets original licensing, design and equipment vendor specifications

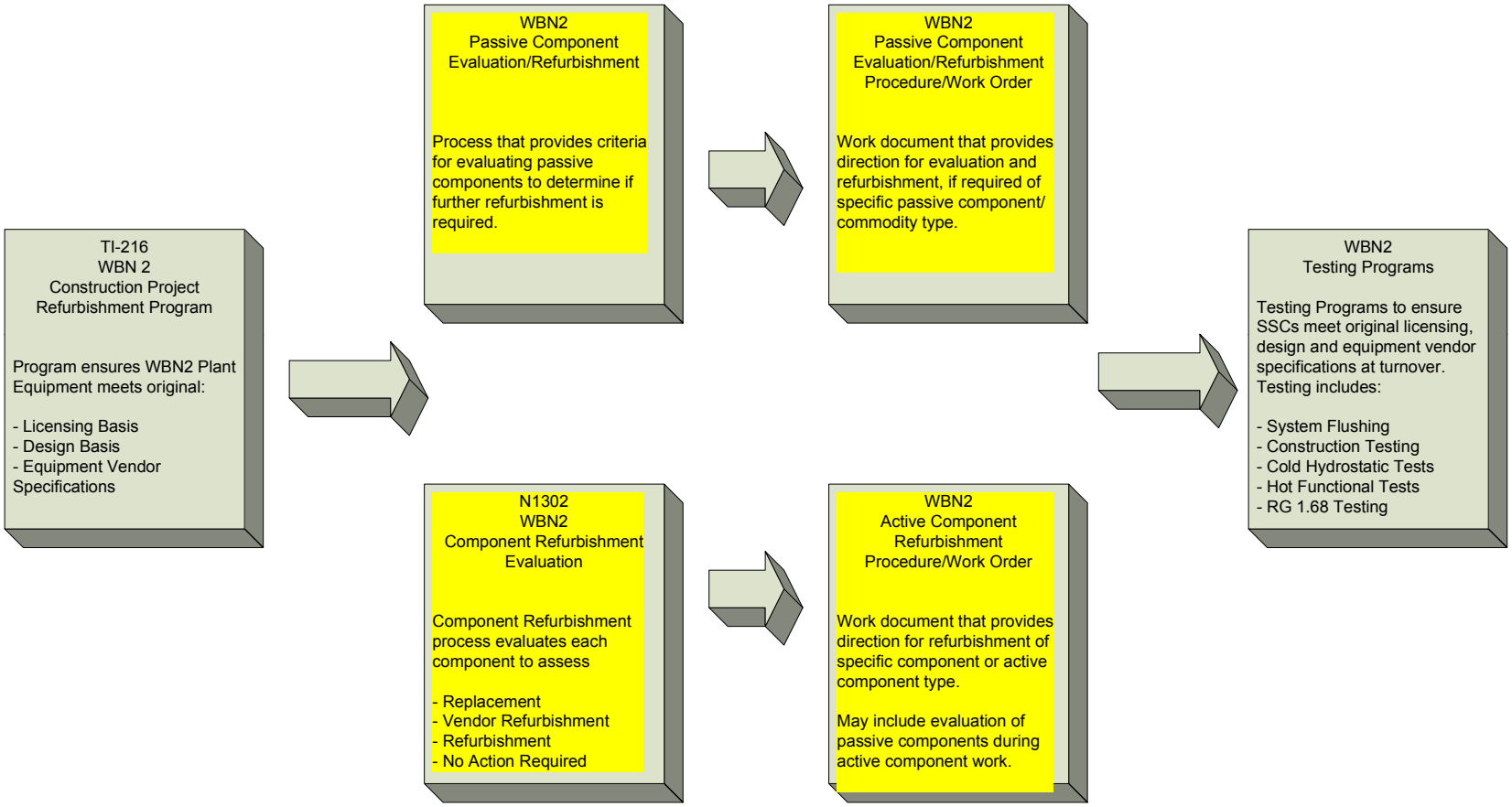
WBN Unit 2 Material Condition

Refurbishment/Replacement Commodity Estimates

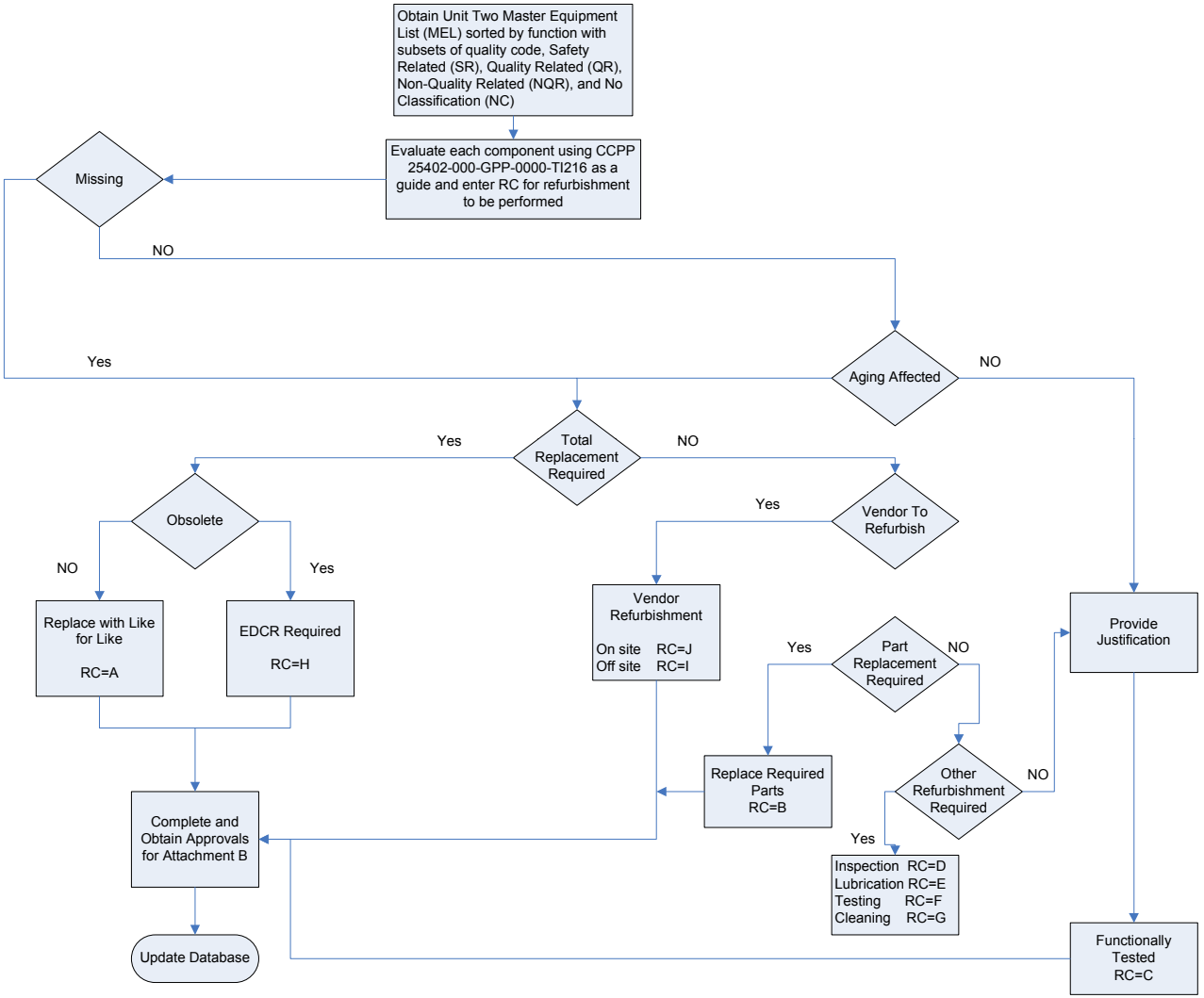
COMMODITY	TOTAL PROJECT (estimate)
Pumps	80
Motors	90
Breakers	600
Manual Valves	4000
Air Operated Valves	500
Motor Operated Valves	200
Safety/Relief Valves	300

Refurbishment Program Implementation

Overview



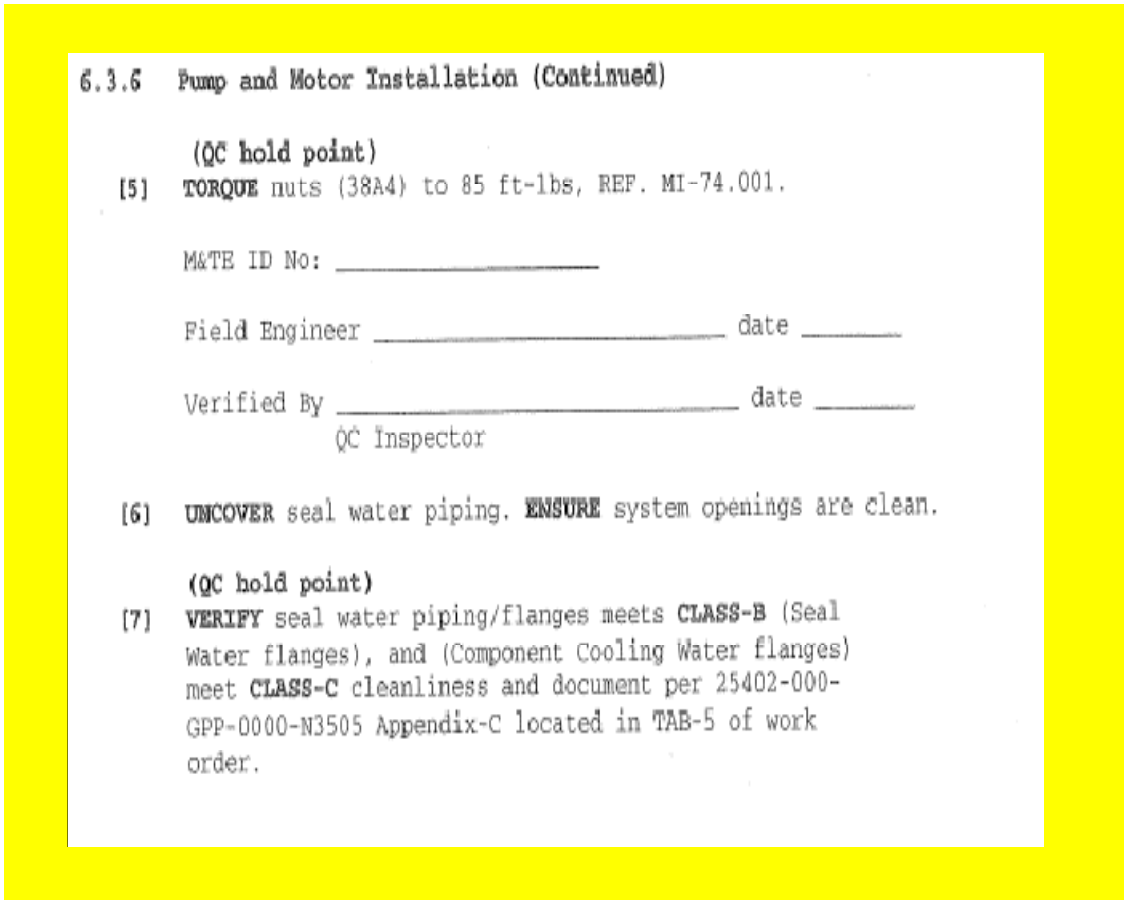
Refurbishment Program Implementation



Refurbishment Program Implementation

- Implementing Work Instructions/Procedures
  - Provide Guidance on Refurbishment to be Performed
  - Provide Guidance for Refurbishment/Evaluation Requirements to be Met
    - Vendor Manuals
    - Design Specifications
    - Piping Standards
    - Operating Experience

Refurbishment Program Implementation



6.3.6 Pump and Motor Installation (Continued)

(QC hold point)

[5] **TORQUE** nuts (38A4) to 85 ft-lbs, REF. MI-74.001.

M&TE ID No: _____

Field Engineer _____ date _____

Verified By _____ date _____
QC Inspector

[6] **UNCOVER** seal water piping. **ENSURE** system openings are clean.

(QC hold point)

[7] **VERIFY** seal water piping/flanges meets **CLASS-B** (Seal Water flanges), and (Component Cooling Water flanges) meet **CLASS-C** cleanliness and document per 25402-000-GPP-0000-N3505 Appendix-C located in TAB-5 of work order.

Sample Work Order

Refurbishment Program Implementation

PIPING SYSTEM CLEANLINESS	NO. 25402-000-GPP-0000-N3505 REV. 1 PAGE 22 OF 36

APPENDIX C
Page 3 of 8
Data Sheet 2

VISUAL/INTERNAL INSPECTION

☐ CLEANNESS CLASS B:

Swipe Test

1. **VERIFY** chloride and fluoride contamination of internal surfaces is ≤ 0.08 mg/dm2.
   Swipe Test Number(s)_____
   _____

   Performed By:_____ Date:_____

NOTE	Swipe tests shall be performed in accordance with CM Chapter 6.01.

2. **ATTACH** a copy of the completed CM Chapter 6.01 swipe results to this data sheet.

   Performed By:_____ Date:_____

Visual Inspection

1. **VERIFY** the internal surface appears to be metal clean.

   Performed By:_____ Date:_____

2. **VERIFY** scattered rust does not exceed two square inches in any square foot.

NOTE	A layer of black iron oxide resulting from system operation or welding and temper films are acceptable on carbon steel and stainless steel surfaces.

   Performed By:_____ Date:_____

3. **VERIFY** no evidence of pitting. If pitting from corrosion is observed, **THEN CONTACT** Nuclear Engineering for an evaluation.
   NE contacted? ☐ YES ☐ NO

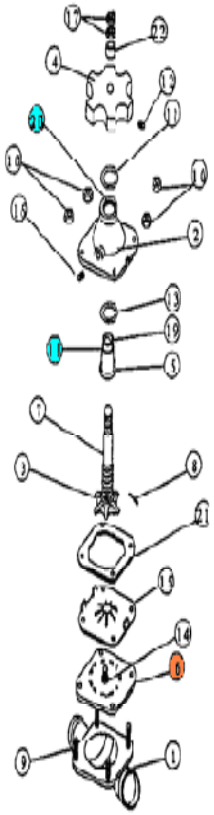
   Performed By:_____ Date:_____

Wipe Cloth

NOTE	Oily or otherwise dirty components may require thorough cleaning in accordance with Section 6.0 prior to verifying final cleanness. Wipe cloth examinations are not required on systems which have been in service unless the surfaces in question required cleaning during the present activities.

Sample Visual Internal Inspection Data Sheet

Refurbishment Program Implementation



ITEM	DESCRIPTION
1	VALVE BODY
2	BONNET
3	COMPRESSOR
• 4	HANDWHEEL
5	BUSHING
6	DIAPHGRAM
7	SPINDLE
8	SPIROL PIN
9	BONNET STUD
10	BONNET NUT
• 11	SHIM/WASHER
12	SETSCREW
13	THRUST BEARING
14	DIAPHRAGM STUD
• 15	FINGER PLATE
16	"V" TYPE VENT PLUG
• 17	JAM NUTS (OR LOCKNUT)
• 18	"O" RING-SEAL COLLAR
19	SEAL COLLAR
• 20	O' RING BONNET
• 21	GASKET
22	SPACER

• MAY NOT BE PRESENT DEPENDING ON VALVE SIZE OR TYPE.

Refurbishment Program Implementation

12” Swing Check Valve

The refurbishment activity has identified surface indications (right) which could affect the pressure boundary in the bonnet gasket area which will likely require a Code repair.

Refurbishment Program Implementation

Data Sheet 1
(Page 1 of 1)

Check Valve Data Shee:

As-Found Inspection: ❑ As-Left Inspection: ❑

CHECK VALVE GENERAL INFORMATION:
(Enter N/A if information was obtained previously or is not available).

UNID _____ Type (Swing, Lift, piston, etc.) _____
WO No _____ Size _____
Manufacturer _____
Model/Serial No _____

Location: (ENTER in the Remarks Section below the valve proximity to upstream flow disturbance physical orientation, physical location in plant, and any other pertinent information.)

OPERABILITY CHECK:

Valve operates freely	❑ YES	❑ NO	❑ N/A
Valve internals are clear of sludge buildup corrosion, or debris which could restrict full opening/closing	❑ YES	❑ NO	❑ N/A

WEAR CHECK:				LOOSE PARTS CHECK:			
Disc Piston OK	❑ YES	❑ NO	❑ N/A	Tack Welds OK	❑ YES	❑ NO	❑ N/A
Anti-rotation device OK	❑ YES	❑ NO	❑ N/A	Set Screws OK	❑ YES	❑ NO	❑ N/A
Hinge Pin OK	❑ YES	❑ NO	❑ N/A	Cotter Pin OK	❑ YES	❑ NO	❑ N/A
Bushings OK	❑ YES	❑ NO	❑ N/A	Retaining Clip OK	❑ YES	❑ NO	❑ N/A
Disc Arm OK	❑ YES	❑ NO	❑ N/A	Retaining Screws/Bolts OK	❑ YES	❑ NO	❑ N/A
Disc Post OK	❑ YES	❑ NO	❑ N/A	Other_____	❑ YES	❑ NO	❑ N/A
Disc Nut OK	❑ YES	❑ NO	❑ N/A	REMARKS/RECOMMEDED ACTIONS:			
Backstop Body OK	❑ YES	❑ NO	❑ N/A				
Seat Ring OK	❑ YES	❑ NO	❑ N/A				
Spring OK	❑ YES	❑ NO	❑ N/A				
Other_____	❑ YES	❑ NO	❑ N/A				

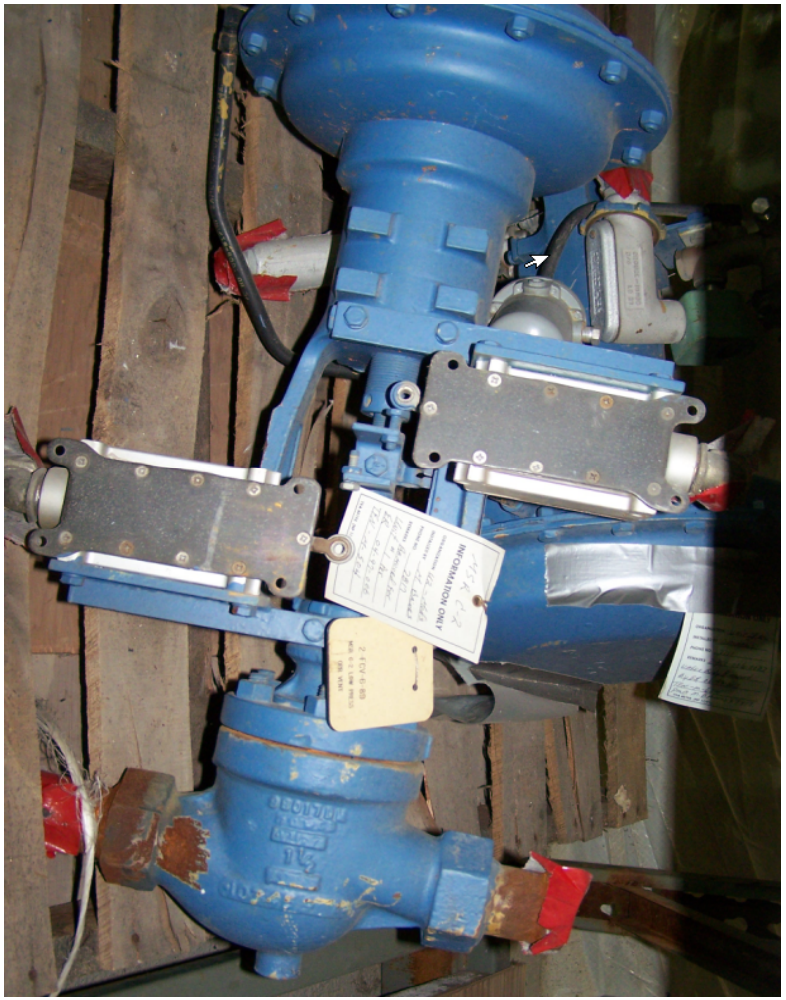
INSPECTION PERFORMED BY: _____ _____
Field Engineer/Supervisor or Vendor Rep. Date

A copy of this datasheet forwarded to TVA check valve coordinator.

_____ _____
Field Engineer/Supervisor Date

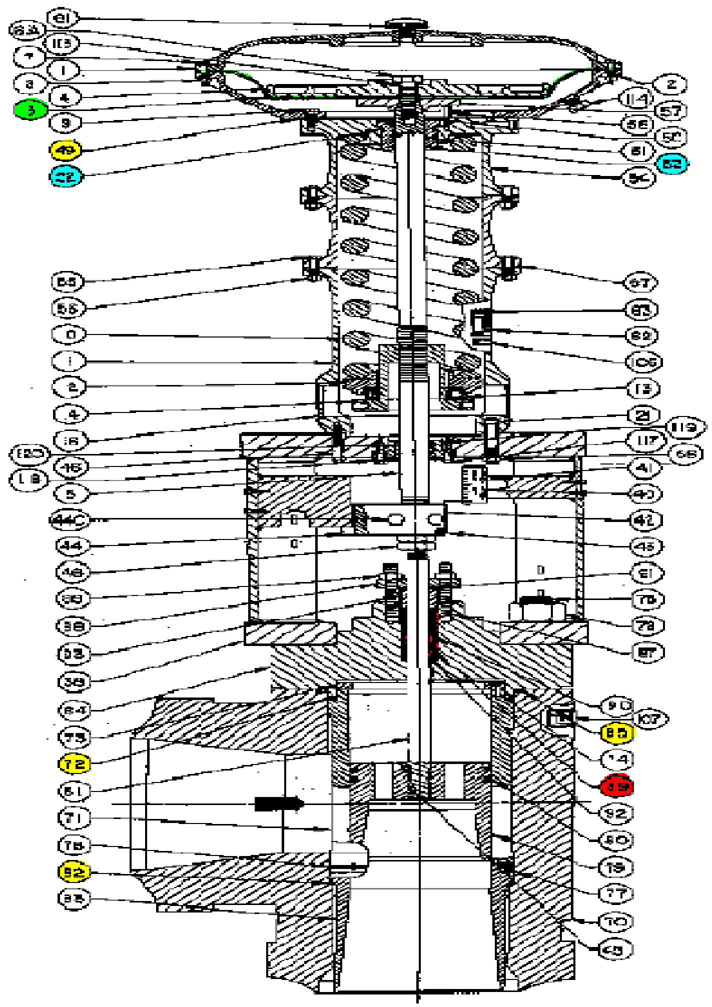
Example Check Valve Data Sheet

Refurbishment Program Implementation



This valve is a 1 1/2”, Hammel-Dahl, Globe valve with an A-40 Pneumatic Diaphragm type actuator. The items subject to refurbishment are the actuator diaphragm and valve packing

Refurbishment Program Implementation

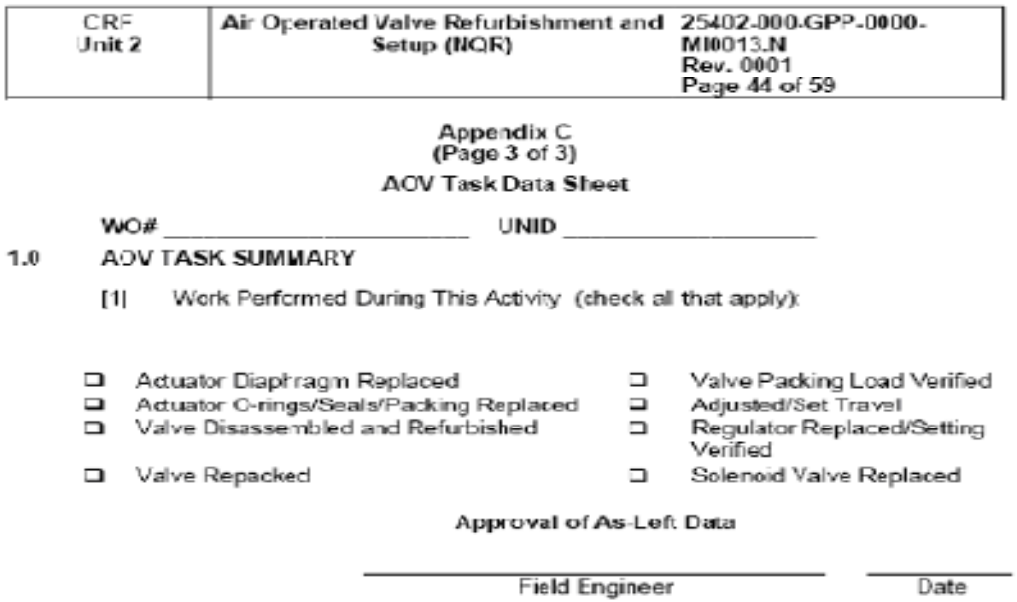


FIND No.	NO. REQD	PART NUMBER	DESCRIPTION
1	1	3L4481220 12	UPPER DIAPHRAGM CASING
2	1	32J6844X012	LOWER DIAPHRAGM CASING
3*	1	2R137032202	DIAPHRAGM
4	1	1L3241220 12	DIAPHRAGM PLATE
6	1	20A7843X012	ACTUATOR STEM
6.1A	1	1A1248X0012	CAP SCREW, 1-8 x 3
7	36	1A1166240 52	CAP SCREW, 7/16-20 x 2
8	36	1A1403241 22	HEX NUT, 7/16-20
9	12	1A340924052	CAP SCREW, 1/2-13 x 1-1/4
10	1	1U1314X0012	ACTUATOR SPRING
11	1	25A0702X012	SPRING CASE
12	1	1L4403220 12	SPRING SEAT
13	6	1H7331 26982	THRUST BEARING
14	1	1L024312012	SPRING ADJUSTING SCREW
15	1	1H7338X00A2	COVER BAND ASSEMBLY
21	9	1H7348320 92	CAP SCREW, 1/2-13 x 4
38	1	55L0785X012	YOKE
40	1	1H74813 9892	TRAVEL INDICATOR SCALE
41	2	1A3431 28982	MACHINE SCREW, 10-24 x 1/4
42	1	1HP3143 8882	TRAVEL INDICATOR
43	2	1H73152 8882	MACHINE SCREW, 6-40 x 1/4
44	1	21L8580X012	STEM CONNECTOR
44C	2	1A544724052	CAP SCREW, 1/2-13 x 2-1/4
46	1	1V734036072	GROOVE PIN
48	4	1A3132024052	CAP SCREW, 1/2-13 x 2-3/4
48	2	0VD73124122	HEX NUT, JAM, 1-1/4-12
49*	1	1HP3880 4022	GASKET, 8-3/4 x 12-13/16 x 1/32
50	1	1HP4403T022	SNAP RING
51	1	1HP44114012	SEAL BUSHING
52*	1	1043922 6982	O-RING, 2-7/8 x 3-1/4 x 3/16
53*	2	1064250 6932	O-RING, 1-5/8 x 2 x 3/16
54	1	3L1242 32012	SPRING CASE ADAPTOR
54	24	1A3B1624 092	CAP SCREW, 1/2-13 x 2
56	30	1A341224122	HEX NUT, 1/2-13
57	1	1K104924332	LOWER DIAPHRAGM PLATE
58	3	1HP44624082	TRAVEL STOP
61	1	1062150 00A2	VENT
62	1	1K324738982	NAMEPLATE
63	9	1A3B1228982	DRIVE SCREW, 10 x 2 x 3/16
67	1	2U5318X00A2	SPRING CASE EXTENSION
70	1	45V0843X012	VALVE BODY
71	1	33A417EX012	CAGE
72*	1	1U8534X0012	CAGE GASKET, 9-5/8 x 10-5/8 x .175
73*	1	1UP430X00A2	ASSEMBLY RING
74	18	1F144852982	CAP SCREW, 5/16-18 x 3/4
75	12	1559191X012	STUD, 1-3/4-8 x 10-1/2
76	12	1N8892D0052	HEX NUT, 1-3/4-8
77	12	1LP813X0012	CAGE PIN
78	1	1U8510X0012	RETAINING SPRING
79*	1	2V4183X0082	VALVE PLUG
80*	2	1UP617X0012	PISTON RING
81*	1	1V4162X0022	STEM
82*	1	1V2853X0012	SPIRAL WOUND GASKET, 10-1/16 x 10-5/16 x .175
83*	1	2UP346X0012	SEAT & LINER
84	1	33A450X0012	BONNET
85*	1	1V0E4X0012	SPIRAL WOUND GASKET, 11-15/16 x 11-13/16 x .175
86	1	1V1085625052	PACKING FLANGE
87	2	1V108893 1082	STUD, 3/4-10 x 4-1/4
88	2	1A886124112	HEX NUT, 3/4-10
89**	8	1DP61X00122	PACKING RING, 1-1/4 x 2 x 3/8
90	1	1V7031435072	LANTERN RING
91	1	1J573030332	UPPER WIPER
92	1	1J573535012	PACKING BOX RING
93	1	1HB6456072	PACKING FOLLOWER
95	1	[illegible]	BAILEY POSITIONER
97	1	[illegible]	MOUNTING BRACKET
98	1	TYPE 67FR	FILTER REGULATOR
99	2	[illegible]	NATIONAL ACME LIMIT SWITCH EA170-8-N06
103	1	[illegible]	MOUNTING PLATE
104	1	TYPE 64R	PRESSURE REGULATOR
112	1	[illegible]	MOUNTING BRACKET
106	1	TYPE 2625	VOLUME BOOSTER
124	1	[illegible]	ASCO SOLENOID VALVE
100	1	[illegible]	MOUNTING PLATE
133	1	[illegible]	NAMEPLATE
13P	1	[illegible]	NAMEPLATE, NUCLEAR
109	1	TYPE 546	TRANSDUCER BRACKET
110	1	TYPE 111	NEEDLE VALVE
111	1	[illegible]	ANGLE NEEDLE VALVE
116	1	[illegible]	SPACER
114	1	[illegible]	PIPE PLUG, 3/8-18 NPT
117	4	[illegible]	CAP SCREW
115	1	[illegible]	YOKE BUSHING RETAINER
117	1	[illegible]	YOKE BUSHING HOLDER
120	1	[illegible]	BUSHING

* RECOMMENDED SPARE PARTS: 3, 49, 52, 53, 72, 73, 79, 80, 81, 82, 83, 85, 89

PRESSURE RETAINING PARTS: 71, 75, 76, 79, 84

Refurbishment Program Implementation



CRF Unit 2	Air Operated Valve Refurbishment and Setup (NQR)	25402-000-GPP-0000-MI0013.N Rev. 0001 Page 44 of 59

Appendix C
(Page 3 of 3)

AOV Task Data Sheet

WO# _____ UNID _____

1.0 AOV TASK SUMMARY

[1] Work Performed During This Activity (check all that apply):

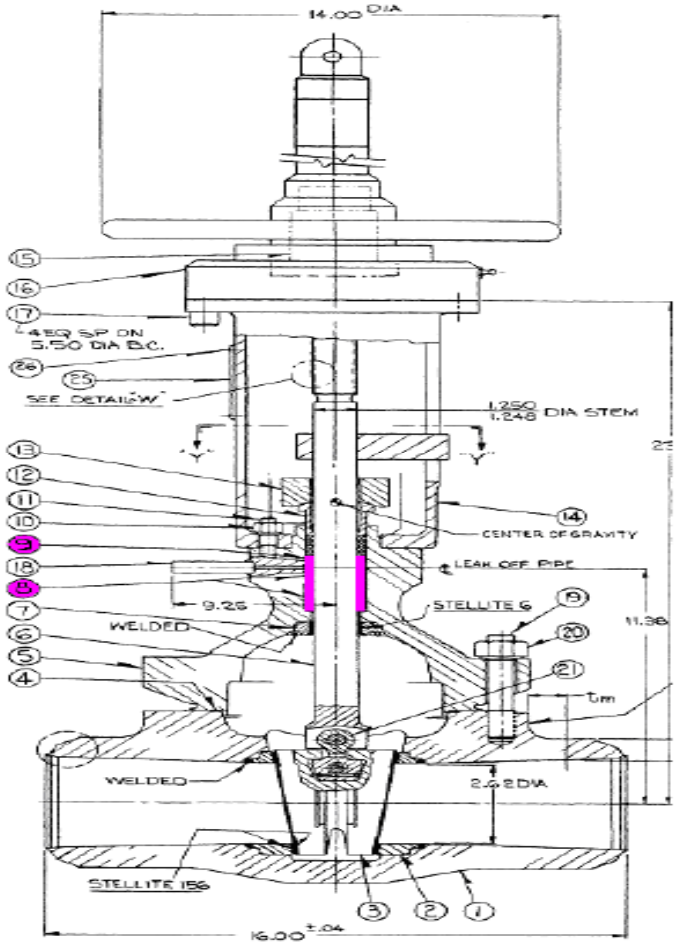
- ❑ Actuator Diaphragm Replaced
- ❑ Actuator O-rings/Seals/Packing Replaced
- ❑ Valve Disassembled and Refurbished
- ❑ Valve Repacked
- ❑ Valve Packing Load Verified
- ❑ Adjusted/Set Travel
- ❑ Regulator Replaced/Setting Verified
- ❑ Solenoid Valve Replaced

Approval of As-Left Data

_____ Field Engineer _____ Date

Example Air Operated Valve Refurbishment Sheet

Refurbishment Program Implementation



Refurbishment Program Implementation

TVA Valve Packing Data Sheet

Facility:	WATTS BAR UNIT 2 STARTUP	**Type:**	Valve	**Status:**	Future
Unit:	2	**Manufacturer:**	MASONEILAN	**Prepared By:**	
System:	006	**Model:**	35-35200		**Unverified**
Tag:	2-LCV-006-0015B	**Valve Size:**	6	**Work Order:**	08-951643-000
Location:	TURB			**Rev:**	0

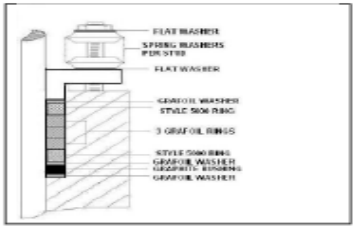
VALVE DATA

Actuator Type:	AOV
Stem Orientation:	

SPECIFICATIONS

Gland Stud Torque Pref:	46 FT-LBS
Gland Stud Torque Min:	23 FT-LBS
Calculated Friction Pref:	2651
Calculated Friction Min:	
Packing Stress Pref:	4000
Packing Stress Min:	2000

CONFIGURATION SFW5GGG5WBW



COMMENTS

CLASS/TYPE	SUPPLIER PART NUM	STOCK CODE	QTY
BOLTING/Stud	1000042473	WBGB004	1
PACKING/Bushing	B5701500021	CJJ735Q	1
PACKING/Set	5470720	CFP299B	1
PACKING/WASHER	6200720	CPH281C	4
WASHER/Flat	1000101100	CPH346A	4
WASHER/Spring	62H177	BPV576C	1

PACKING DATA VERIFIED

Packing Type:	5000/6300 (BRAIDED GRAPHITE/GRAFOIL) ☐
Number of Rings:	5
Packing Set Height:	1.875

STEM and BOX DATA

Stem Dia (+.005/-.010):	1.5 in ☐
Box Dia (±0.010):	2.250 in ☐
Box Depth (± 0.031):	2.5 in ☐
Gland Box Angled:	
Gland Insert:	in ☐
Gland Follower Lgth:	

STUD DATA

Gland Stud Diameter:	0.625 in ☐
Number of Studs:	2 ☐
Gland Stud Type:	STUD
Wrench Size:	in ☐
Total Stud Length:	

BUSHING DATA

Upper Bush HT:	in ☐
Lower Bushing HT:	in ☐

PORT DATA

Port Type:	☐
Port Active:	☐
Port Depth:	in ☐
Port Dia:	in ☐

LIVE LOADING

Live Loaded:	Yes ☐
Springs/Stud:	8 ☐
Spring Cfg:	SERIES ☐
Flat Washers Per Stud:	2 ☐

INSTALLATION DATA

REPACK ☐ RETORQUE ☐

Gland Follow Take Remain:	0
No of Strokes:	
As Left Gland Stud Torque:	

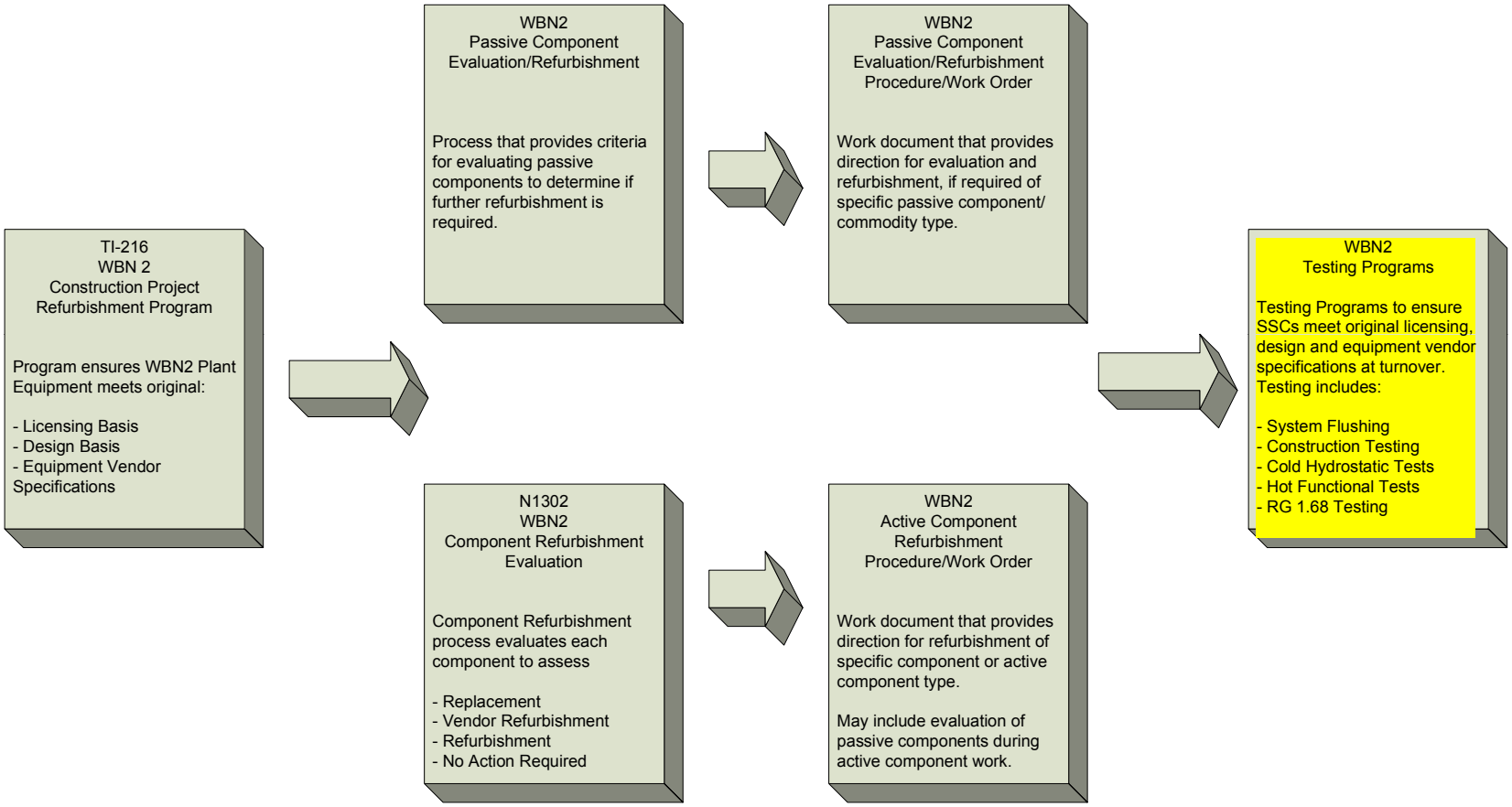
Date Printed: 5/26/2009

Return Completed Data Sheet to the Valve Packing Specialist

Example Valve Packing Data Sheet

Refurbishment Program Implementation

Overview



WBN Unit 2 Testing Programs

System Flushing

Testing

- Construction tests
- Cold Hydrostatic test
- Hot Functional
- RG 1.68 tests

Conclusion

In Summary TVA :

- Established the Existing Condition of WBN Unit 2
- Developed and Implemented Programs to
  - Install New Equipment Where Necessary
  - Refurbish Existing Equipment
  - Improve Material Condition and Equipment Performance Where Appropriate
- Will Perform Testing to Ensure Systems and Components will Meet Original Design, Licensing and Vendor Specifications