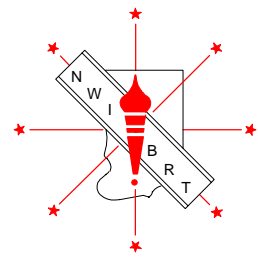


NWIBRT PUMP STANDARD

FOR REPAIRS TO CENTRIFUGAL PUMPS

10/27/98 Rev: 1



The purpose of this standard is to have uniform guidelines for repairing centrifugal pumps among the members of the Northwest Indiana Business Roundtable. This standard is to be the minimum requirements for rebuilding and repairing of such pumps. It is to be used for single and multiple stage centrifugal units. Revision 1 changes are notes in **bold type**.

I. Disassembly

1. Disassemble case, including studs, bearings housings, brackets and piping.
2. Sandblast and clean complete housing. The bearing housings are to be protected from sandblasting and should be water washed and cleaned by wire wheel.
3. Clean and chase all studs and/or bolts.
4. The attached strip reports (attachment A) is to be completed in it's entirety and forwarded to the customer for review and approval prior to repair.

II. Casing

1. If main bores, grooves, and/or seal ring faces are out of tolerance, then bore 1/8" oversize (1/16" per side) to accept appropriate weld overlay, when specified.
2. Weld fingers at joint split for 100% clean up with similar rod or wire, if applicable.
3. Stress relieve alloy steel casings only, if necessary.
4. If the joint splits are out of tolerance, remill joint split to approximately 63 micro-finish, as a minimum. A 125 RMS. for split line surfaces where a gasket is used.
5. Taper joint of either half case approximately 0.006", if required by design for high press pumps >2200 psi.
6. If required remill feet and flange faces to rms. 125 RMS. finish with feet within 0.005" parallel to split line, and faces perpendicular to split line (0.005" tolerance).
7. Rebore standard casing halves together, utilize working gasket thickness to separate halves. Use bolting procedures according to good machine shop practices.
8. Dress burrs, clean volutes and side walls. Dress any accumulated weld material flush to base metal.

9. Match upper and lower half volute configurations. Use template transfer method for high pressure systems (>2200 psi).
10. Retap all bolt holes. Holes cannot be oversized. Spot face bolt holes to a minimum of 80% contact. All bolts are to be coated with a no-seize compound as specified by the customer.

III. Rotor

1. Inspect impeller inlet and exit vanes for abrasive wear and cavitation damage. If any damage is found, all vanes should be ground back uniformly to ensure hydraulic balance.
2. All welding will be performed according to the AWS D14.6-81R code. Specification for Welding of Rotating Elements of Equipment.
3. No welding on the shaft unless approved by the customer.
4. All fits will be within specification of the drawing or pre-approved by the customer.
5. Check rotating element for binding after each pair of bolts are torqued.
6. **Balance rotor to API-541 standard (4W/N) with all rotating components installed, on multi stage pumps use (W/N). The (4W/N) formula refers to the weight on each plane.**

IV. Reassembly

1. Align and dowel bearing brackets when so equipped.
2. Fasten gasket material with a film of suitable bonding adhesive to both sides. Allow suitable drying time.
3. Cut gasket with knife or scissors, neatly trim at all machined edges, bores, grooves and faces.
4. All bolts are to be grade 5 or better.
5. No lock washers are to be used. Use hardened flat washers if applicable.
6. Use grade 2H nuts where required.

7. Torque bolts to prescribed value and sequence.
8. **Maximum shaft runout is max.0.002” at all fits.**
9. Bearings are not to be lubed unless specified by the customer. A tag specifying “Bearing is not lubed” is to be installed on the pump.
10. Bearings and gear type couplings that require heating for installation must be heated in an oil bath, with an induction heater or in a temperature-controlled oven. The temperature of the assembled part must never exceed 250 degrees Fahrenheit.
11. A hydrostatic or leak test is to be performed at 1 1/2 times the operating pressure for a minimum of 30 minutes.
12. A final inspection sheet (Attachment B) will be completed in it’s entirety prior to shipping.

V. Storage

1. Rotor must be sealed and properly supported in a protective wood box, capable of ten (10) year storage. The box should have clear identification of the pump and purchase order number on the outside.
2. Pump assemblies are to have the inlet and outlet covered with a suitable material for long term storage. Exposed machined surfaces are to have a rust preventive protection. The pump should be mounted on a pallet or skid.
3. The shipping report (attachment C) is to be completed in it’s entirety.

The pump repair house will be responsible for maintaining the records for each pump for a minimum of 5 years. This is to include the strip report and final inspection sheet.

NWIBRT CENTRIFUGAL PUMP STRIP REPORT AND RECOMMENDED REPAIRS

- INFORMATION SECTION -

VENDOR SUPPLIED:

ORIGINATED BY:		DIVISION:	
PURCHASE ORDER NUMBER:		DEPARTMENT:	
VENDOR:			
PREPARED BY:		DISASSEMBLY & INSPECTION COSTS	\$
MANUFACTURER:		TOTAL PRICE OF PARTS	\$
MODEL NUMBER:		TOTAL PRICE OF LABOR	\$
SERIAL NUMBER:		TOTAL REPAIR PRICE	\$
DESCRIPTION OF UNIT:		ESTIMATED COST NEW	\$
SIZE (IF APPLICABLE)		ESTIMATED DELIVERY DATE	

- APPROVAL SECTION -

DEPARTMENTAL APPROVAL:

APPROVED BY:		SIGNATURE:		DATE	
				:	
COMMENTS:					

OTHER APPROVAL:

APPROVED BY:		SIGNATURE:		DATE	
				:	
COMMENTS:					

REASON FOR FAILURE:

<input type="checkbox"/> Shaft worn	<input type="checkbox"/> Impellar worn	<input type="checkbox"/> Casing worn	<input type="checkbox"/> Bearing worn	<input type="checkbox"/> Sleeve worn
<input type="checkbox"/> Shaft broken	<input type="checkbox"/> Impellar clogged	<input type="checkbox"/> Casing damaged	<input type="checkbox"/> Bearing failed	<input type="checkbox"/> Mechanical seal failed
<input type="checkbox"/> Shaft Bent	<input type="checkbox"/> Impellar damaged	<input type="checkbox"/> Casing clogged	<input type="checkbox"/> Bearing lubrication	<input type="checkbox"/> Mechanical seal worn
<input type="checkbox"/> Other _____				
Cause of failure:				

NWIBRT CENTRIFUGAL PUMP STRIP REPORT AND RECOMMENDED REPAIRS

PURCHASE ORDER NUMBER: _____

VENDOR JOB NUMBER: _____

			CONDITION						VEN DOR		O W N R				
DRAWING	M K	P C S	D	N	R P	S I S	PRINT SIZE	ACTUAL SIZE	F U R N I S H	R E P A I R	F U R N I S H	EST HRS	EST COST	RECOMMENDED REPAIR AND COMMENTS	

ATTACHMENT B

NWIBRT CENTRIFUGAL PUMP STANDARD
FINAL INSPECTION SHEET

DATED: October 1, 1996

Customer and P.O#	Date
Pump Description	Size
Vendor and No.	Rotation: ___ CW; ___ CCW
Manufacturer	Model No.
Final Inspector	Serial No.

Part No.	Part description	Description of fit	Dimension as repaired
	Pump lower housing	Foot flatness and parallel	In board end ____/____ Out board end ____/____
	Shaft	run out	In board end _____ Out board end _____
	Coupling	run out	
	Bearing journal	run out	Inboard ____/outboard ____ Inboard ____/outboard ____
	Bearing housing	ID	Inboard ____/outboard ____ Inboard ____/outboard ____
	Shaft sleeves	ID and OD	_____/_____
	Shaft sleeves	ID and OD	_____/_____
	Impeller(s)	ID and OD	_____/_____
	Case to case-wear ring clearance	each stage if applicable.	List stages on back.
	Sleeve bearing contact pattern	>(85%)	Yes ____/ No ____
	Assembled shaft end play	If applicable	
	Impellar wear ring to case wear ring clearance		List stages on back.
	Impeller(s)	run out	
	Balance final results with all rotating components	In mils p-p and oz.in. at balance RPM	Inboard end (mils)_____/oz.in. ____ Outboard end (mils) _____/oz.in _____ RPM _____
	Pump hsg. bolts torque value	Based on OEM recommendation	_____ ft. lbs.

ATTACHMENT C

**NWIBRT CENTRIFUGAL PUMP SHIPPING
REPORT
DATED 10/1/96**

VENDOR: _____

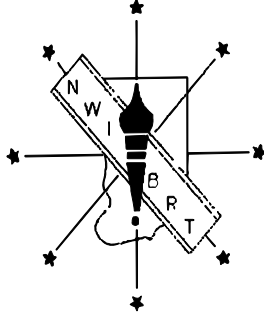
P.O. NUMBER: _____

INSPECTOR: _____

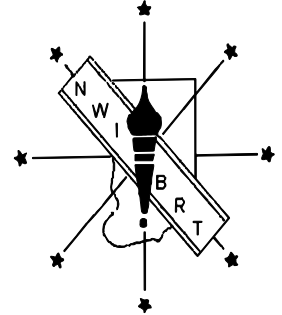
CHECK POINTS	YES	NO	N/A
1. PAINT/PROTECTIVE COATING QUALITY			
1.1 Color and finish per customer's specification or standards			
2. IDENTIFICATION			
2.1 Repair tag(s) has been attached.			
2.2 Has the ID number been secured to the pump.			
2.3 Has bearing lubrication tag been attached.			
2.4 Has mechanical seal lubrication tag been attached.			
3. SHIPPING/PACKING			
3.1 Has the coupling shroud been secured.			
3.2 Has cap/plugs been installed in the outlets.			
3.3 Have covers been installed on inlets and outlets.			
3.4 Is the unit properly boxed and/or secured to a serviceable pallet.			
4. DOCUMENTATION			
4.1 Have all quality system documents been approved and forwarded to the Quality Control Manager.			
5. APPROVED FOR SHIPMENT			

Shipping Inspector

Date



NWIBRT PUMP STANDARD



SIGNATURE SHEET

October 1, 1996

Wil H. Kassie
Amoco Oil Co. Wil Kassie

Charles A. Totten
Bethlehem Steel Charles Totten

Dave Carlson
Cerestar Dave Carlson

Rich Marwitz
Inland Steel Co. Rich Marwitz

John Slovski
Keil Chemical John Slovski

Marie Getsug
Lever Bros. Marie Getsug

Karl Koenig
LTV Steel Co. Karl Koenig

Neal Mortensen
National Steel Co. Neal Mortensen

Joe Roorda
NIPSCO Joe Roorda

Rich Mikus
Republic Engineered Steel Co. Rich Mikus

Matt Butler
Rhone Poulenc Co. Matt Butler

Tom McNeil
U. S. Steel Co. Gary Works, Tom McNeil