

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید پکیج پمپ های آب آتشنشانی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0023_00)</p>	 																								
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	<table><tr><th colspan="8">NDE PROCEDURE</th></tr><tr><td>پروژه</td><td>بسته کاری</td><td>صادر کننده</td><td>تسهیلات</td><td>رشته</td><td>نوع مدرک</td><td>سریال</td><td>نسخه</td></tr><tr><td>BK</td><td>GCS</td><td>KP</td><td>120</td><td>QC</td><td>PR</td><td>0003</td><td>V00</td></tr></table>	NDE PROCEDURE								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	KP	120	QC	PR	0003	V00	شماره صفحه : 1 از 11
NDE PROCEDURE																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
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طرح نگهداشت و افزایش تولید ۲۷ مخزن

NDE PROCEDURE

نگهداشت و افزایش تولید میدان نفتی بینک

V00	NOV. 2024	IFA	Kalaye Pump	M.Fakharian	M.Sadeghian	
Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval

Status:

- IFA: Issued for Approval
- IFI: Issued for Information
- AFC: Approved for Construction

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید پکیج پمپ های آب آتشنشانی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0023_00)</p>																									
شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	<table><tr><th colspan="8">NDE PROCEDURE</th></tr><tr><th>نسخه</th><th>سریال</th><th>نوع مدرک</th><th>رشته</th><th>تسهیلات</th><th>صادر کننده</th><th>بسته کاری</th><th>پروژه</th></tr><tr><td>V00</td><td>0003</td><td>PR</td><td>QC</td><td>120</td><td>KP</td><td>GCS</td><td>BK</td></tr></table>	NDE PROCEDURE								نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه	V00	0003	PR	QC	120	KP	GCS	BK	شماره صفحه : 2 از 11
NDE PROCEDURE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
V00	0003	PR	QC	120	KP	GCS	BK																			

REVISION RECORD SHEET

PAGE	V00	V01	V02	V03	V04
1	X				
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PAGE	V00	V01	V02	V03	V04
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67					
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NDE PROCEDURE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
V00	0003	PR	QC	120	KP	GCS	BK																			

1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also, PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

2.0 GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Supply Of Fire Water Pumps
EPD/EPC CONTRACTOR (GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR/PURCHASER:	Joint Venture of: Hirgan Energy – Design & Inspection (D&I) Companies
VENDOR:	Kalaye Pump Company
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
TPI:	Third Party Inspector.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

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NDE PROCEDURE																																
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه																									
V00	0003	PR	QC	120	KP	GCS	BK																									

3.0 SCOPE

- 3.1. This procedure establishes the minimum requirements and techniques for liquid penetrant testing of nonporous metal, the ferrous materials, steel casting, and their welds related.
- 3.2. This procedure applies to in-process, final, and in-service liquid penetrant inspections to detect discontinuities that are open to the part surface.
- 3.3. This procedure will address the use of Color Contrast Penetrants using Water Washable and Solvent removable.
- 3.4. This procedure shall be used for Centrifugal Pumps for Petroleum, Petrochemical, and Natural Gas Industries which are fabricated as per ANSI/API Standard 610 and ISO 13709: 2003.

4.0 APPLICABLE CODES, STANDARDS, AND SPECIFICATIONS

- 4.1. ANSI/API Standard 610 11th Edition, September 2010, Centrifugal Pumps for Petroleum, Petrochemical and Natural Gas Industries.
- 4.2. ISO 13709: 2003, Centrifugal pumps for petroleum, petrochemical, and natural gas industries.
- 4.3. ASME BPVC, Sec. V, Article 6.
- 4.4. ASME BPVC Sec.VIII,Div.1 Appendix 7 & 8
- 4.5. SNT-TC-1A-2006
- 4.6. Company specification for fabrication of Pump.

5.0 PERSONNEL QUALIFICATION

- 5.1. All personnel performing liquid penetrant testing shall be qualified by SNT-TC-1A or shall have a valid certificate issued by ASNT NDT Level - III Examiner.
- 5.2. If liquid penetrant testing is to be performed by the NDT subcontractor, all personnel belonging to the subcontractor shall be qualified by a subcontractor in accordance with the subcontractor's qualification procedure based on SNT-TC-1A.
- 5.3. Responsibility
 - 5.3.1. QC Manager shall be responsible for the implementation and control of this procedure.
 - 5.3.2. ASNT NDT Level III Examiner shall be responsible for the qualification of NDT Operator.
 - 5.3.3. NDT Level II operator shall be responsible for the interpretation of the liquid penetrant testing concerning this procedure and for preparing the test reports.

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NDE PROCEDURE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
V00	0003	PR	QC	120	KP	GCS	BK																			

6.0 EXAMINATION PROCEDURE

6.1. General

6.1.1. As per clause 7.2.2 of API 610 the Method and Procedure of Examination shall be by ASME BPVC Sec V Article 6.

6.1.2. Penetrant materials shall be Colour contrasted using Water Washable and Solvent removable.

6.1.3. All materials used during the test (cleaners, penetrant, and developers) shall be certified not to exceed 1% by weight in sulphur, for Nickel base alloys, and the total Halogens content not to exceed 1% by weight for Austenitic or Duplex Stainless Steel and Titanium content, following the requirements of Article 6, Mandatory Appendix II. Records of certification shall include the penetrant materials manufacturer's batch numbers and test results. These records shall be maintained as required by the referencing Code section.

6.1.4. Penetrant materials from different manufacturers, or a different type or family group, shall not be intermixed.

6.1.5. With colour contrast penetrants, a minimum light intensity of 100 fc (1000 Lux), as measured with a calibrated light meter, is required on the surface to be examined. The light source, the technique used, and light level verification are required to be demonstrated one time, documented, and maintained on file.

6.1.6. When the casting specification requires heat treatment, these examinations shall be conducted after that heat treatment.

6.1.7. Visual inspection will be made of the tested area for surface defects.

6.1.8. All indications shall be evaluated following Para. 8.0 & 9.0.

6.2. SURFACE CONDITIONING

6.2.1. In general satisfactory results may be obtained when the surface of the part is in the as-welded, as-rolled, as-cast, or as-forged condition.

6.2.2. Surface preparation by grinding or machining may be necessary where surface irregularities could mask indications due to discontinuities.

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شماره پیمان:	NDE PROCEDURE							شماره صفحه : 6 از 11
۰۵۳ - ۰۷۳ - ۹۱۸۴	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GCS	KP	120	QC	PR	0003	V00

6.2.3. Before the liquid penetrant examination, the surface to be examined and all adjacent areas within at least 1 in. (25mm) shall be cleared dry and free of all dirt, grease, lint, scale, welding flux, and spatter oil, or other extraneous matter that could interfere with the examination.

6.2.4. Cleaning may be accomplished using tergents, organic solvents, solutions, paint removers, vapor degreasing, sand or grit blasting, or by ultrasonic cleaning methods.

6.2.5. Final penetrant inspection shall be performed before application of any surface finish or coating such as anodize, paint, or plating.

6.2.6. Final liquid penetrant inspection shall be performed after completion of all manufacturing operations that can generate surface discontinuities or expose existing subsurface discontinuities.

6.3. PENETRANT APPLICATION

6.3.1. The penetrant shall be applied by brushing, dipping, or spraying.

6.3.2. The minimum penetration time shall be under Table 1.0, but shall not exceed 30 minutes or that recommended by the penetrant manufacturer, and in no case shall the penetrant be allowed to dry during the dwell period.

Material	Form	Type of Discontinuity	Dwell Times (minutes) NOTES (1, 2)	
			Penetrant	Developer
Steel Or Cast Iron	Castings and Welds	Cold Shuts, Porosity, Lack of Fusion, cracks (all forms)	5	10

Table 1: Minimum Dwell Times

Notes:

1. for temperature ranges from 50°F to 125°F (10°C to 52°C).
2. for temperature range from 40°F to 50°F (5°C to 10°C) minimum dwell times shall be 2 times the value listed.

6.4. EXCESS PENETRANT REMOVAL

6.4.1. After the specified penetration (dwell) time has elapsed, any penetrant remaining on the surface shall be removed, taking care to minimize removal of penetrant from discontinuities.

6.4.2. Remove excess solvent removable penetrant, with clean, dry, lint free cloth or absorbent paper. If all the penetrants cannot be removed with the dry cloth or paper, the cloth or paper may be slightly dampened with solvent and surfaces lightly wiped to remove the remaining traces. Flushing the surface with solvent following the application of penetrant and before developing is prohibited.

6.4.3. Excess water washable penetrant shall be removed with a water spray. The water pressure shall not exceed 40psi (280kPa), and the water temperature shall not exceed 110°F (43°C). Rinse time should not exceed 120 seconds unless otherwise specified by part of the material specification.

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شماره پیمان: ۰۵۳ - ۰۷۳ - ۹۱۸۴	<table><tr><th colspan="8">NDE PROCEDURE</th></tr><tr><th>نسخه</th><th>سریال</th><th>نوع مدرک</th><th>رشته</th><th>تسهیلات</th><th>صادر کننده</th><th>بسته کاری</th><th>پروژه</th></tr><tr><td>V00</td><td>0003</td><td>PR</td><td>QC</td><td>120</td><td>KP</td><td>GCS</td><td>BK</td></tr></table>							NDE PROCEDURE								نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه	V00	0003	PR	QC	120	KP	GCS	BK	شماره صفحه : 7 از 11
NDE PROCEDURE																																
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V00	0003	PR	QC	120	KP	GCS	BK																									

6.5. DEVELOPING

6.5.1. A liquid non-aqueous developer shall be used and applied by spraying only. For solvent removable penetrants, the developer shall be applied as soon as possible after excess penetrant removal. Care shall be taken to ensure complete coverage of the part or examination area with an even, thin film of a developer.

6.5.2. For Water washable penetrants the developer will be applied to a dry surface. Developer solutions shall be frequently agitated. Care shall be taken to ensure complete coverage of the part or examination area with an even, thin film of a developer.

6.5.3. The minimum final interpretation developing time begins as soon as the wet developer coating is dry. The minimum developing time shall be specified in Table 1.0.

6.5.4. The observation of penetrant indication shall, as a rule, be made immediately after the formation.

6.6. EXAMINATION

6.6.1. For Colour Contrast penetrant examination shall begin immediately after application of the Non-aqueous developer and as the indications are forming. The final interpretation shall not be made before ten (10) minutes or later than a maximum of 60 minutes after the developer is dry. If the surface to be examined is large enough to preclude complete examination within the prescribed or established time, the examination shall be performed in increments.

6.7. POST EXAMINATION CLEANING

6.7.1. Post examination shall be performed as soon as possible upon completion of all inspection activities. Any cleaning shall be conducted using a process that does not adversely affect the part.

7.0 TECHNIQUES FOR STANDARD TEMPERATURES

7.1. The temperature of the penetrant and the surface of the part to be processed shall not be below 40°F (5°C) or above 125°F (52°C) throughout the examination period. Local heating or cooling is permitted provided the part temperature remains in the range of 40°F (5°C) to 125°F (52°C) during the examination.

8.0 PROCEDURE FOR NONSTANDARD TEMPERATURES

8.1. When a liquid penetrant examination cannot be conducted within the temperature range of 40°F to 125°F, the examination procedure requires qualification at the proposed higher or lower temperature range. This qualification shall require the use of a quench cracked aluminum block designated as a liquid penetrant comparator block.

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شماره پیمان:	NDE PROCEDURE							شماره صفحه : 8 از 11	
۰۵۳ - ۰۷۳ - ۹۱۸۴	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	KP	120	QC	PR	0003	V00	

8.2. Application of Liquid Penetrant Comparator Block

8.2.1. To qualify a liquid penetrant examination procedure at a temperature of less than 40°F, the proposed procedures shall be applied to block "B" after the block and all penetrant materials have been cooled and held at the proposed examination temperature until the comparison is completed. A standard procedure that has been previously demonstrated shall be applied to block "A" in the 40°F to 125°F range. The indications revealed on blocks "A" and "B" shall be compared and if the indications are essentially the same on both blocks the proposed procedure shall be qualified for use.

8.2.2. To qualify for an examination above 125°F, block "B" shall be held at this temperature throughout the examination. Block "A" shall be subjected to a previously demonstrated procedure in the 40°F to 125°F temperature range. The indications revealed on Blocks "A" and "B" shall be compared and if the indications are essentially the same on both blocks, the proposed procedure shall be qualified to use.

8.3.3. A procedure qualified at a temperature lower than 40°F shall be qualified from that temperature to 40°F. To qualify a procedure for temperatures above 125°F, the upper and lower temperature limits shall be established and the procedure qualified at these temperatures.

9.0 EXTENT OF TEST

9.1. All surfaces including machined gasket seating surfaces shall be examined fully unless the surfaces are examined by the Magnetic Particle method.

9.2. All casting having a maximum body thickness less than 4 ½ in. (114 mm) shall be examined as follows:

9.3. prescribed herein. When more than five castings are being produced, examination, as prescribed, shall be performed on the first five and on one additional casting for each five additional five castings produced. If any of these additional castings proves to be unacceptable, each of the remaining four castings of that group shall be examined fully.

9.4. All casting having a maximum body thickness of 4 ½ in. (114 mm) and greater and casting of a lesser thickness which is intended for severe service applications shall be examined as follows:

All surfaces including machined gasket seating surfaces shall be examined fully, unless the surfaces are examined by the Magnetic Particle method.

10.0 EVALUATION OF INDICATIONS

10.1. Since the penetrant indication include some non-relevant indications caused by reasons other than defects, great care must be taken for the discrimination between non-relevant and relevant indications.

10.2. Indications will be revealed by the color of penetrant material. All such indications are not necessarily imperfections.

10.3. An indication is the evidence of a mechanical imperfection. Only indications that have any dimension greater than 1/16 in. shall be considered relevant.

10.4. A linear indication is one having a length greater than three times the width.

10.5. A rounded indication is one of circular or elliptical shape with a length equal to or less than three times its width.

10.6. Any questionable or doubtful indications shall be re-examined to determine whether they are relevant or not.

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NDE PROCEDURE																																
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																									
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11.0 ACCEPTANCE CRITERIA

These acceptance criteria shall apply unless other more restrictive standards are specified for specific materials.

11.1. For Fabrications

As per clause 7.2.2 of API 610, the ASME BPVC Sec VIII Div 1 Appendix 8 shall be used for fabrications and it is as follows:

11.1.1. Relevant linear indications

11.1.2. Relevant rounded indications greater than 3/16 in. (5mm).

11.1.3. Four or more relevant rounded indications in a line separated by 1/16 in. (1.5 mm) or less, edge to edge.

11.2. FOR CASTINGS

11.2.1. As per clause 7.2.2 of API 610, the ASME BPVC Sec VIII Div 1 Appendix 7 shall be used for castings and it is as follows:

11.2.2. Surface indications determined by liquid penetrant testing are unacceptable if they exceed the following limits:

- All cracks and hot tears;
- any group of more than six linear indications other than those in (a) above in any rectangular area of 1½ in. x 6 in. (350 mm x 150 mm) or less or any circular area having a diameter of 3 ½ in. (88 mm) or less these areas being taken in the most unfavorable location relative to the indication being evaluated;
- other linear indications more ¼ in. (6 mm) long for thickness up to ¾ in. (19 mm) inclusive, more than one-third of the thickness in length for thicknesses from ¾ in. to 2 ¼ in. (19 mm to 57 mm), and more than ¾ in. (19mm to 57 mm), and more than ¾ in. (19 mm) long for thicknesses above 2 ¼ in. (57 mm)(aligned acceptable imperfections separated from one another by a distance equal to the length of the longer imperfection are acceptable);
- Indications of nonlinear imperfection which have any dimension exceeding 3/16 in. (5 mm).

12.0 RE-EXAMINATION

12.1. Treatment of indications believed a non-relevant any indication which is believed to be non-relevant shall be regarded as an imperfection unless it is shown by re-examination by the same method or by the use of other non-destructive methods and/or by surface conditioning that no unacceptable imperfection is perfect.

12.2. Examination of areas from where imperfections have been removed. After a defect is thought to have been removed and before weld repairs, the area shall be examined by suitable methods to ensure it has been removed or reduced to an acceptably sized imperfection.

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض</p> <p>خرید پکیج پمپ های آب آتشنشانی ایستگاه تقویت فشار گاز بینک (قرارداد BK-HD-GCS-CO-0023_00)</p>																									
<p>شماره پیمان:</p> <p>۰۵۳ - ۰۷۳ - ۹۱۸۴</p>	<table><tr><th colspan="8">NDE PROCEDURE</th></tr><tr><th>نسخه</th><th>سریال</th><th>نوع مدرک</th><th>رشته</th><th>تسهیلات</th><th>صادر کننده</th><th>بسته کاری</th><th>پروژه</th></tr><tr><td>V00</td><td>0003</td><td>PR</td><td>QC</td><td>120</td><td>KP</td><td>GCS</td><td>BK</td></tr></table>	NDE PROCEDURE								نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه	V00	0003	PR	QC	120	KP	GCS	BK	<p>شماره صفحه : 10 از 11</p>
NDE PROCEDURE																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادر کننده	بسته کاری	پروژه																			
V00	0003	PR	QC	120	KP	GCS	BK																			

12.3. Re-examination of Repair Areas

12.3.1. After repairs have been made, the repaired area shall be blended into the surrounding surface so as to avoid sharp notches, crevices, or corners and re-examined by the magnetic particle method and by all other methods of examination that were originally required for the affected area.

12.3.2. except the surfaces are examined by Magnetic Particle Method to ensure it has been removed or reduced to an acceptable size.

12.3.3. The finished surface of all repair welds shall be examined except the surfaces are examined Magnetic Particle Method.

12.3.4. Where the depth of repairs is less than 1 in. or 20% of the section thickness whichever is lesser, and when repaired section cannot be radiographed effectively the first layer of each ¼ in. 6 mm thickness of deposited weld metal shall be examined except the surfaces are examined by Magnetic Particle Method.

13.0 RECORDS

Examination condition and interpretation & evaluation shall be recorded on the report form of Liquid Penetrant Examination Attachnebt#1, attached to this procedure.

