

Checklist for the periodic inspection of FRP piping (not dual laminate)

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1. Introduction

This document contains a checklist for the periodic inspection of FRP piping.

For dual laminate piping etc. see checklist doc. nr. 2017C05

Inspection is mainly done by visual inspection. As up till now other NDT techniques than visual inspection are not very applicable in daily practice. If you see an opportunity to use NDT methods, don't hesitate to get some experience with these methods!

Make notes and pictures of all inspection items and remarkable things. Describe all the determined phenomena, including the location, size and extent from each phenomenon.

Tools

Barcol hardness tester

Camera

Feeler gauges

Magnifier

Measuring tape

Torch

Personal protection

According to local plant and safety instructions, such as: helmet, safety glasses, ear protection, working clothes (antistatic, resistant to chemicals, reflecting bands etc.), safety shoes, gloves, gas warning equipment, etc.

2. Checklist inspection

1. Preparation

Before starting the inspection gather all information that could be of any importance for the coming inspection.

A. Piping description

A1 Drawings (P&ID's, lay-outs, isometrics) and calculations (stress, flow, water hammer)

A10 check availability and as-built

A11 piping material, laminate description, pipe class, pressure class

A12 design conditions

A13 year built, manufacturer and installer

A2 QA-documents

A20 check availability

A21 former inspection reports

A3 Process conditions

A30 chemical environment inside and outside

A31 temperature range and pressure range

A32 risk of water hammer (flow velocity, diameter, length etc.)

A33 risk of vacuum

A4 Location and inspectors data

A40 plant name, address, piping position, tag number

A41 inspectors name, phone and email

A5 Inspection requirements

A50 accessibility

A51 entry (large diameter piping)

A52 cleanliness (mainly inside)

A53 safety

A54 flange faces should be visible

2. Outside

B. Supports, secondary steel structure and sleepers

B1 Pipe shoes, for each shoe if necessary

B10 material

B11 condition (coating, corrosion etc.)

B12 all nuts and washers present ?

B13 suitable for the function, rest, guide, fixed point, incl. axial stops, gaps, sliding plates

B14 (guide, rest) position of the shoe to the secondary steel

B2 Spring supports (hangers and supports)

B20 type

B21 load check

B22 travel check

B3 Secondary steel

B30 material

B31 condition (coating, corrosion etc.)

B32 excessive deformation

B4 Sleepers and foundations

B40 material

B41 condition (coating, corrosion etc.)

B42 anchoring

B5 Grounding/earthing

B50 condition

B6 Tracing and insulation

B60 materials (thickness, sheeting)

B61 condition (water tightness)

B9 Other observations and abnormalities

C. Outside pipe surface

C1 Surface

C10 colored topcoat present ?

C11 weathering (bare glass), flakes, moss/algae/etc.

C12 leaks (sweating), soft spots, overall Barcol hardness

C9 Other observations and abnormalities

C90 excessive deformation (bending)

D. Laminated connections, butt welds

D1 butt welds

D10 leakage, sweating

D11 cracks (depth, position)

D12 delamination (area, position)

E. Flanged connections

E1 Flanges and stub ends, each flange

E10 alignment

E11 leakage

E12 cracks in the neck (depth, position)

E13 cracks flange blade

E14 delamination

E15 bolt, nuts, washers, gaskets, see **E3** and **E4**

E16 raised face or flat face

E17 prescribed bolt torques

E18 flange labels

E2 Loose flanges

E20 material, check with design

E21 condition (coating, corrosion etc.)

E22 cracks (in case of FRP loose flanges)

E3 Bolts, nuts, washers

E30 material, check with design

E31 condition (coating, corrosion etc.)

E32 bolt length outside the nut

E33 all bolts, nuts and washers present ?

E4 Gaskets

E40 gasket type, check with design

E41 material, check with design

E9 Other observations and abnormalities

F. Bonded connections (bell and spigot)

F1 bell and spigot

F10 type

F11 leakage

F12 cracks in adhesive

G. Couplings (bell and spigot)

G1 single O-ring and locking strip

G10 leakage

G11 displacement between bell and spigot

G12 alignment

G2 double O-ring and locking strip

G20 leakage

G21 displacement between bell and spigot

G22 alignment

H. Other fittings, Tees, bends, reducers, expansion joints

H1 Tees

H10 cracks in the neck (position, depth)

H11 delamination (area, position)

H12 deformation

H2 Bends, reducers

H20 cracks (position, depth)

H21 delamination (area, position)

H22 deformation

H3 Expansion joints

H30 material, rubber type

H31 installation length, axial movement, out of plane

H32 visual condition and Shore hardness of the rubber

H33 length and condition of tie rods and/or hinges

H34 length of bolts (to long bolts may damage the compensator)

H9 Other observations and abnormalities

3. Inside

I. Inside surface (CBL)

I1 Cleanliness

I10 scaling

I11 liquid (pH, etc.)

I12 humidity

I2 Pipe surface

I20 discoloration

I21 condition (cracks, delaminations, blisters, hardness etc.)

I22 chemical attack

I24 erosion

I23 Barcol hardness

I3 Connections, surface of butt welds and tees

I30 discoloration

I31 condition (cracks, delamination, blisters, hardness, gaps etc.)

I32 chemical attack

I33 Barcol hardness

I9 Other observations and abnormalities

J. Flanged connections

J1 Surface of flanges and stub ends

J10 discoloration

J11 condition (cracks, delamination, blisters, scratches etc.)

J12 chemical attack

J13 Barcol hardness

J9 Other observations and abnormalities

4. Immediate repairs

Description of repairs that need to be done before taking the piping back in operation.

5. Recommendations

5.1 Future repairs

Description and time schedule

5.2 Inspection periods

5.2.1 Next inspection period outside and points that need special attention

5.2.2 Next inspection period inside and points that need special attention