INSPECTION PROCEDURE FOR SHELL AND TUBE HEAT EXCHANGERS

shell and tube he
taining parts of the excha

afety Data Sheets (MSDS) are electro
to in the MSDS program by equipment nu
y searching by manufacturer, product name,
dure user is responsible for referring to the appr

porate Safety Procedures shall be referred to for all
ey are accessible electronically plant wide by going to
ervices tab on the Intranet. Personnel are responsible fo
ppropriate safety procedures.

National Board Inspection Code ANSI-NB-23, Latest Editio

API-510 Pressure Vessel Inspection Code: Maintenance Ins
Repair, and Alteration; Latest Edition

American Society of Mechanical Engineers (ASME), Section

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Applicable Local, Stale and Federal Regulations

Applicable Engineering Standards and Practices API

P571 Conditions Causing Deterioration and Failure

RP572 Inspection of Pressure Vessels

P750 Management of Process Hazards

e Maintenance Inspection Procedures

ng for the vessel being inspecte

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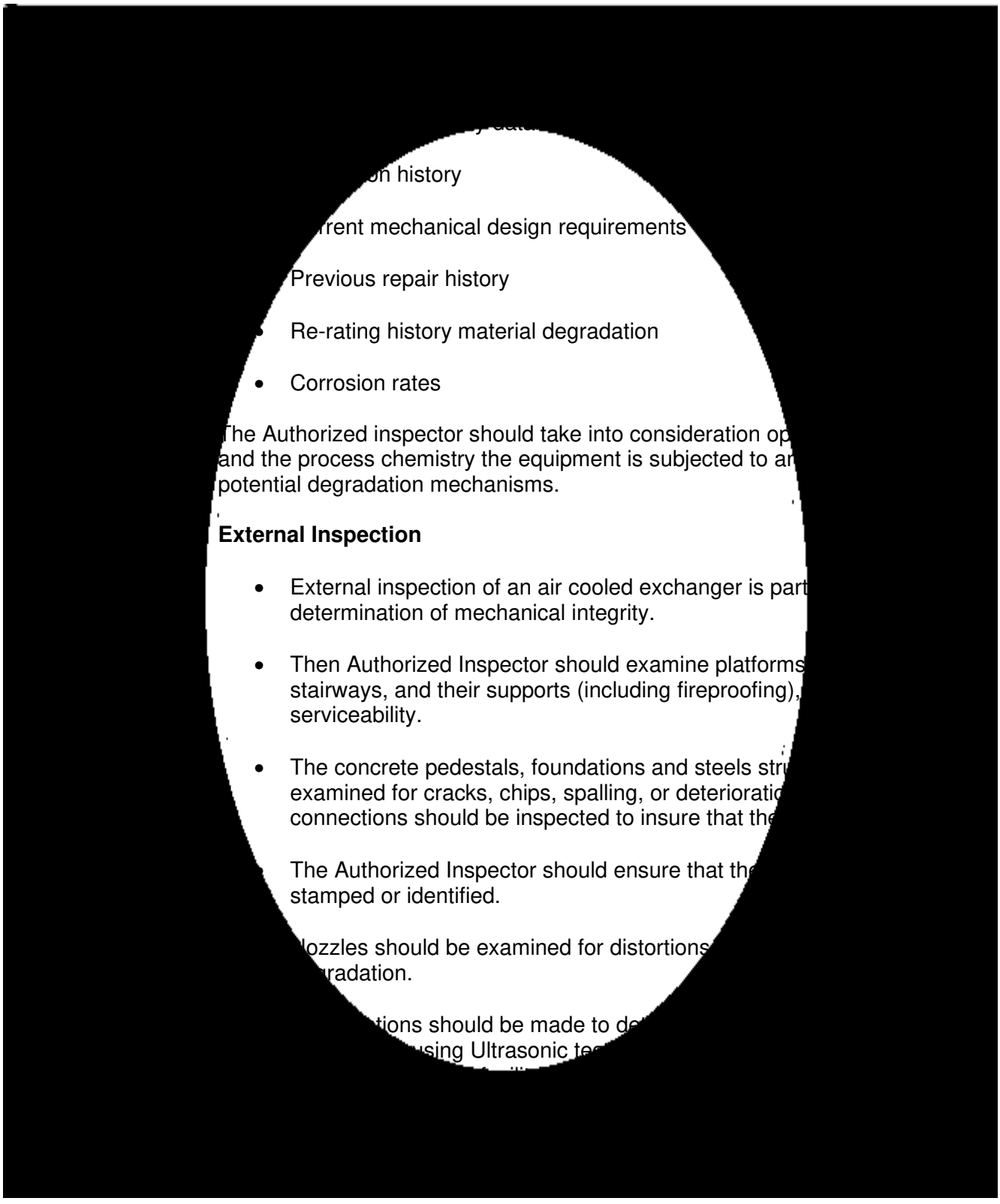

on history

rrent mechanical design requirements

Previous repair history

- Re-rating history material degradation
- Corrosion rates

The Authorized inspector should take into consideration op
and the process chemistry the equipment is subjected to ar
potential degradation mechanisms.

External Inspection

- External inspection of an air cooled exchanger is part
determination of mechanical integrity.
- Then Authorized Inspector should examine platforms
stairways, and their supports (including fireproofing),
serviceability.
- The concrete pedestals, foundations and steels stru
examined for cracks, chips, spalling, or deteriorati
connections should be inspected to insure that the
- The Authorized Inspector should ensure that the
stamped or identified.

lozzles should be examined for distortions
radation.

tions should be made to de
using Ultrasonic te

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rvals for Shell and Tube exch
ssels as defined in API 510 Vessel
spection at vessel half remaining life, up
ode also provides for extensions based on

nal Inspection intervals for Shell and Tube Excha
ordance with pressure vessels as defined in API 51
de. Generally, this interval is 5 years.

nternal Inspection

NOTE: The below scopes for Internal and external Inspecti
considered the limits of inspection. Inspector is respo
inspecting in accordance with and on the basis of ref
Documents.

Internal Inspections should be performed by or under the dir
Authorized Inspector as defined by Code. An External Inspe
performed in conjunction with each Internal Inspection.

- The Inspector should examine the internal walls of t
and nozzles for cracking, pitting, general corrosion
Indications should be quantified through use of pit
ultrasonics (straight or angle beam). Locations and
plotted on an equipment drawing

- Scale buildup or sludge deposits should be note
location on the shell or nozzle.

All gasket surfaces should be examined for

mine condition of pass partition pla
) and gasket surfaces for m

dle is

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[redacted]

of inlet nozzles.

the bundle is cleaned, a thorough
rformed on tubes, tube ends and tube s
general corrosion. A representative portion
measured using appropriate instruments. Da
OD tube measurements, and pit depths. Findi
equipment drawing.

ternal Lining Inspection

- Metallic and nonmetallic linings (e.g. strip and plate
internal coatings, refractory) shall be examined duri
inspections of pressure vessels.

- The inspection scope and methods recommended in
metallic and nonmetallic linings should be followed to
condition of the lining and the vessel surface beneath

- A visual inspection of the accessible internal lining sh
each internal inspection interval. The lining should be
damage such as separation, bulging, spalling, holes,
chipping, and erosion.

- If lining damage is detected, representative portion
should be removed to assess the condition/effecti
the metal beneath the lining. Alternatively, ultraso
external surface may be used to asses the dama

Thermography (IR) is an accepted on-stream
detect refractory damage. Reference Mainte
NSP-029. Infrared.

pection

should be included

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[redacted]s, spalling, [redacted]
[redacted]nspected to insure that

[redacted]t coating should be examined for bl[redacted]
[redacted]pose the vessel to corrosive elements i[redacted]
[redacted]should be examined for integrity of sealing a[redacted]
corrosion under insulation.

- Condition of Data Plates and ID Markings.

- Nozzles should be examined for distortions, crack[redacted]
degradation. Reinforcements should be examined [redacted]
leakage. Weep holes should be open.

- Any ancillary equipment such as level bridles, tempe[redacted]
gauge connections, should be inspected for external[redacted]
leakage, and condition of support

- The Inspector should examine the surfaces of the she[redacted]
covers, and heads for possible cracks, bulges, and o[redacted]
deterioration. Attention should be given to support sa[redacted]
external supports.

- Follow-up examinations should be made to determi[redacted]
channel wall thickness (using Ultrasonic testing) in[redacted]
is observed.

[redacted]epairs and Alterations

All repairs end alterations performed on shells,[redacted]
be done in accordance with Maintenance Proc[redacted]
Vessel Repair/Alteration Procedure, and in a[redacted]
[redacted]odes.

[redacted]rs to bundles (tube pluggings) o[redacted]
[redacted]ted by the Inspector in th[redacted]
[redacted]be mapped on e[redacted]

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[redacted]

...ition - Any change in the condition...
...ginal Manufacturer's Data Report (U-1A...
...Repair/Alterations Reports that affects the p...
of the pressure vessel.

- Non-conformance conditions will be reviewed by... Team (typically Area Inspector and Area Mainter... will make repair or alteration recommendations in... Maintenance Procedure; MNT-INSP-027, Inspecti... Process, to assure continued integrity and Code co...

- Non-conformance issues should be forwarded to Re... if proper resolution is not reached in a timely manner...

Reports

At a minimum, condition of the following should be indicated ... Report:

1. Recommendations and Repairs Completed during cu... Event.

2. Condition of the following:

    a. Bundle

        i. Tubes (ID and OD)

        ii. Tubesheet (face a, baffle and...

        iii. Floating Head (ID and OD... surfaces)

        iv. Spacers, baffles, i...

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hannel

i. Dollar Plate (Channel Cov

ii. Pass Partition and gaskets su

iii. Nozzle Necks and gasket surfac

NOTE: External Checklist should be used for Exte

Documentation

Inspection Reports should become a part of the Equ
Progressive Inspection Records.

Documentation and results on inspections should be
Equipment Files and/or in Plant Condition Monitoring
Base.

END OF PROCEDURE