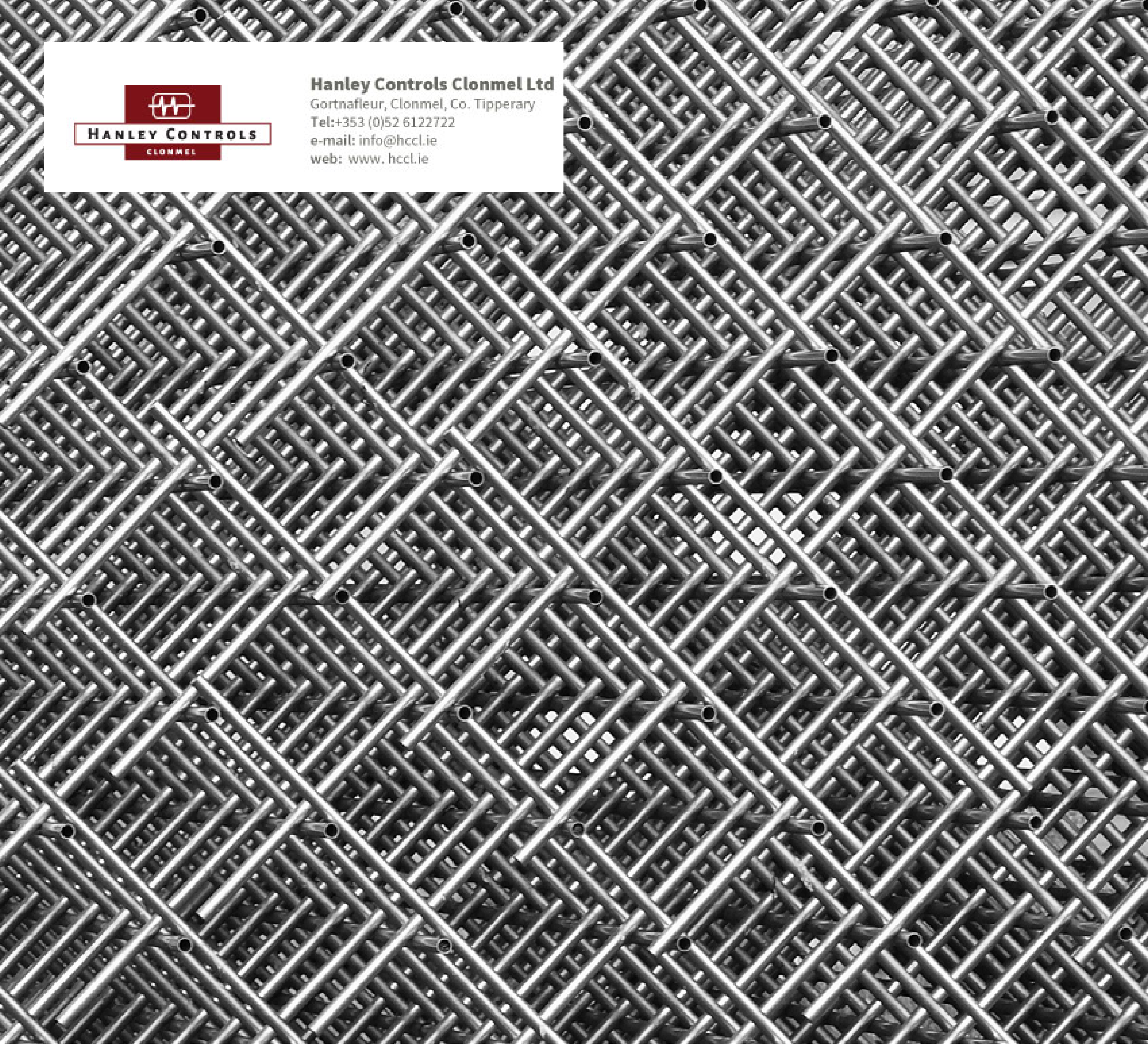
Hanley Controls Clonmel Ltd
Gortnafleur, Clonmel, Co. Tipperary
Tel:+353 (0)52 6122722
e-mail: info@hccl.ie
web: www. hccl.ie



The Importance of Material Certification

White Paper

ENGINEERING YOUR SUCCESS.

Material Certificates

Why material certificates are important and what level of information should they contain to help with traceability.

Clara Moyano

Clara is an innovation engineer - material science at Parker Instrumentation Products Division Europe

Material certificate, also known as mill test report (MTR) or mill test certificate (MTC), is a quality assurance document used in the metals industry that certifies material's technical parameters such as chemistry, mechanical or other physical properties, manufacturing routes, heat treatment details, testing results or compliance to a set of international or local standards.

Material certification is the ID of a particular material heat and production batch. It indicates its provenance, its quality and can offer an insight into material performance under real life service conditions.

Several industry standards establish harmonised material certificate formats, ISO/EN 10204 being the most widely used and 3.1 type certificate the most common one.

Not all commercially available materials have a material certificate. Likewise, not all certificates offer the same level of information and the traceability can greatly differ. A vague level of detail in a material certificate can often be associated with lack of control and poor quality procedures.

Good vs bad example of material certificate

In example 1 (Fig 1.) we can see a standardised 3.1 certificate with very limited information, containing just the mandatory parameters that the standard prescribes.

We can find its chemical and mechanical properties, but those parameters are not enough to offer full traceability or determine the quality and final properties of the alloy.

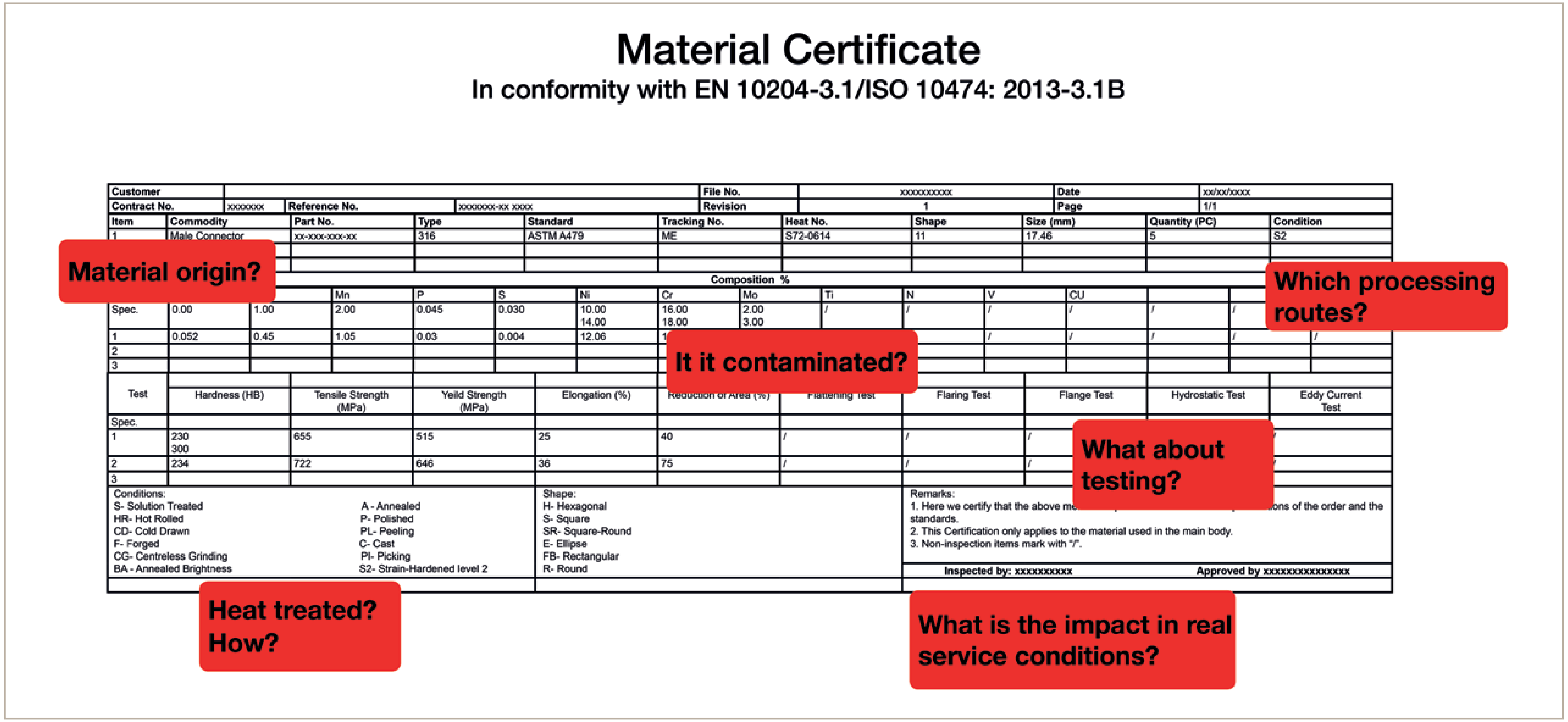
We find no information about other essential parameters such as:

- melting procedures
- manufacturing route that the material has undertaken
- material origin
- heat treatment details carried out
- testing procedures

More importantly, there is no guarantee that the material is not contaminated by mercury or other dangerous substances, but contamination is a very common problem in an industry where a huge percentage of steel is recycled and re-melted.

On the contrary, greater level of detail is usually associated with high quality materials and tightly controlled processes, as it permits to establish the whole manufacturing cycle on any production batch, from melting to finished component.

> *"A vague level of detail in a material certificate can often be associated with lack of control and poor quality procedures."*
>
> — Clara Moyano



Material Certificate

In conformity with EN 10204-3.1/ISO 10474: 2013-3.1B

Customer			File No.	xxxxxxxxxx	Date	xx/xx/xxxx	
Contract No.	xxxxxxx	Reference No.	xxxxxxx-xx xxxx	Revision	1	Page	1/1

Item	Commodity	Part No.	Type	Standard	Tracking No.	Heat No.	Shape	Size (mm)	Quantity (PC)	Condition
1	Male Connector	xx-xxx-xxx-xx	316	ASTM A479	ME	S72-0614	11	17.46	5	S2

Composition %

			Mn	P	S	Ni	Cr	Mo	Ti	N	V	CU			
Spec.	0.00	1.00	2.00	0.045	0.030	10.00 14.00	16.00 18.00	2.00 3.00	/	/	/	/	/	/	
1	0.052	0.45	1.05	0.03	0.004	12.06	1				/	/	/	/	/
2															
3															

Test	Hardness (HB)	Tensile Strength (MPa)	Yeild Strength (MPa)	Elongation (%)	Reduction of Area (%)	Flattening Test	Flaring Test	Flange Test	Hydrostatic Test	Eddy Current Test
Spec.										
1	230 300	655	515	25	40	/	/	/		
2	234	722	646	36	75	/	/	/		
3										

Conditions:
S- Solution Treated
HR- Hot Rolled
CD- Cold Drawn
F- Forged
CG- Centreless Grinding
BA - Annealed Brightness
A - Annealed
P- Polished
PL- Peeling
C- Cast
PI- Picking
S2- Strain-Hardened level 2

Shape:
H- Hexagonal
S- Square
SR- Square-Round
E- Ellipse
FB- Rectangular
R- Round

Remarks:
1. Here we certify that the above me ons of the order and the standards.
2. This Certification only applies to the material used in the main body.
3. Non-inspection items mark with "/".

Inspected by: xxxxxxxxxx Approved by xxxxxxxxxxxxxx

Fig 1. Example of a 3.1 certificate with limited information on material traceability.

[redacted]

Customer

[redacted]

TEST CERTIFICATE IN ACCORDANCE WITH BS EN 10204 3.1/ISO 10474 3.1

Certificate No.	T60042	Product	Stainless steel bar		
Order No.	Consignment	Cast No.	148089	Specification	1.4404
Our Reference	Z111325/P42468	Quantity	42 Kgs	Size	.562" A/F Hex
Advice Note No.	DP609	Finish	Cold drawn		
Heat Treatment	Fully solution treated and water quenched prior to cold sizing				

Chemical Analysis

C	0,018	Si	0,462	Mn	1,332	S	0,0298	P	0,0243
Ni	10,082	Cr	16,682	Mo	2,038	Ti		Nb	
Co		Cu	0,484	N	0,038	W		Ca	
Sn		Ta		V		Al		Fe	

Mechanical Properties

Tensile Strength	737 Mpa	0.2% Proof Stress	533 Mpa
Reduction of Area	71,0%	Elongation	35,0%
Hardness	21.4 HRC	Impact Tests	

Special Conditions / Processing Details

In accordance with BS EN 10088-3 1.4404
In accordance with M019/1
Conforming to NACE MR0175/MR0103
Free from mercury and radioactive contamination
ICC test to ASTM A262 'E' - Satisfactory
Also conforming to ASTM A276/A479 Gr 316/316L
Country of origin : France

HCT No : 90M
Part No : 7710568203

Manufacturers Test Cert No.

Concessions Agreed

"Certified that the whole of the supplied detailed hereon, unless otherwise stated",are covered by the Sources Certificate of Conformity/Test Certificate referenced hereon,and has been subject to the Quality System requirements in accordance with the conditions of our BS EN ISO 9001 2015 registration.

"Certified that the supplies/services detailed hereon have been inspected and tested in accordance with the conditions/requirements of the contract or purchase order and,unless otherwise noted below,conform in all respects to the specification(s)/drawing(s) relevant thereto".

14/11/2019

Certification Department

Fig 2. Example of a detailed quality test certificate.

Fig. 2 is a good example of a certificate offering material traceability. It gives us insights into:

- how material was melted,
- processed,
- heat treated,
- at what temperature,
- how long for,
- which methods were followed for testing,
- which industry codes were met,
- whether material is contaminated or not...

In short, it's an extensive compilation of data that tells us everything we need to know about a material production batch, which allows us to have a fully controlled quality system.

With decades of experience in material science and thousands of successful applications in very demanding industries, Parker is here to help.

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