CLASSIFICATIE VAN LASFOUTEN MET HUN OMSCHRIJVING*

Deze Atlas is samengesteld door Commissie V (Beproeving en onderzoek lasverbinding) van het I.I.W.
De doelstelling van deze commissie is als volgt:
In de eerste plaats de studie van methoden van lasonderzoek, in het bijzonder de z.g. niet-destructieve methoden:
Als zodanig richt het werk zich op:

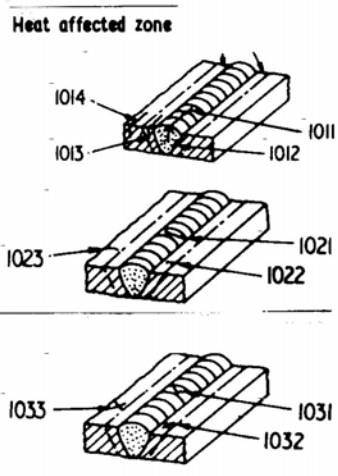
a. het verzamelen van gegevens over deze methoden.
b. de waardebepaling van de onderzoekmethoden.
c. studies ter verbetering van bestaande methoden.
d. het ontwikkelen van hulpmiddelen ten dienste van dit onderzoek.
e. het verwerken van deze gegevens in aanbevelingen voor de industrie. (Zie „Welding in the World").
f. de samenwerking met andere internationale commissies in verband met normalisatie van methoden en hulpmiddelen.

Het Nederlandse aandeel aan deze activiteiten wordt geleverd door N.I.L. Commissie V.
Een van de problemen die bij I.I.W. Commissie V is neergelegd is de beoordeling van de invloed van lasfouten op de constructies. In dit verband is het allereerst van belang, zo meende men in I.I.W. Commissie V-F, eenheid te brengen in de terminologie over lasfouten om daarna alle parameters van lasfouten op te stellen.
In een volgend stadium zou dan kunnen worden nagegaan hoe significant lasfouten in een constructie wel zijn. Uiteraard komt hier nog een aantal aspecten bij die vallen binnen de studies van de andere I.I.W.-commissies. De classificatie van defecten is in dit geheel echter een belangrijke eerste stap. Het is daarom ongetwijfeld nuttig dat ook in Nederland wordt kennis genomen van deze internationaal vastgestelde terminologie en definities.
Het onderstaande document is opgesteld met assistentie van I.I.W. Commissie VI „Terminologie".
Er is enigszins afgeweken van de terminologie, zoals deze is opgenomen in de I.I.W. „Multilingual Collection of Terms", uitgegeven in 1955.
Commissie V realiseert zich dat de lijst niet perfect is en is dan ook van plan deze lijst, wanneer er onvolkomenheden onder haar aandacht worden gebracht, van tijd tot tijd te herzien. De termen en hun verklaringen hebben betrekking op de volgende lasfouten die in 6 groepen zijn geklassificeerd, t.w.:

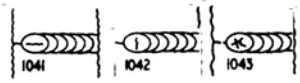
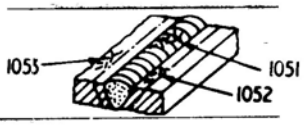
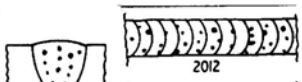
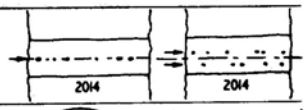
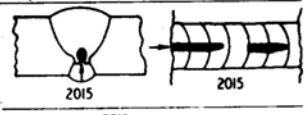
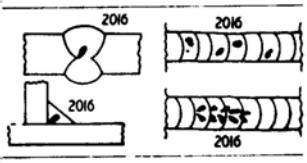
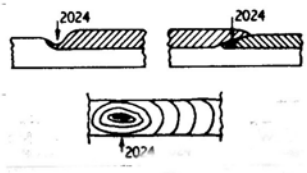
1. Scheuren
2. Holten
3. Insluitsels
4. Bindingsfouten en onvolkomen doorlassing
5. Ongunstige vorm
6. Resterende fouten, niet ondergebracht in de groepen 1-5.

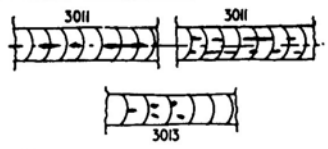
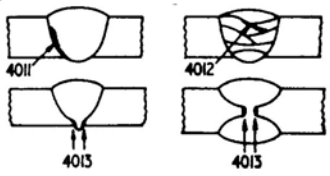
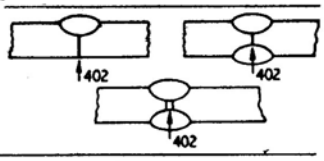
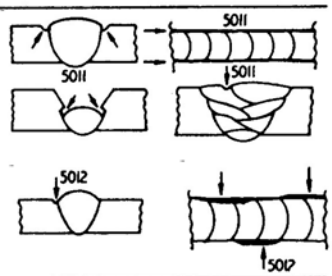
De kolommen in dit overzicht hebben de volgende betekenis:
Kolom 1 geeft 3 cijfers voor elke fout en een vierde cijfer voor de hierop betrekking hebbende sub-termen.
Kolom 2 geeft de letteraanduiding voor fouten, die momenteel gebruikt wordt in de I.I.W.-collectie van referentie radiografieën.
Kolom 3 geeft de aanduiding of benaming van elke fout in het Engels.
Kolom 4 geeft de verklaring in het Engels.
De afbeeldingen zijn voorzien van de benodigde aanvullende verklaringen.

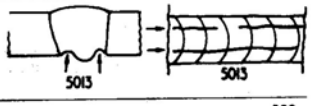
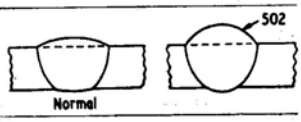
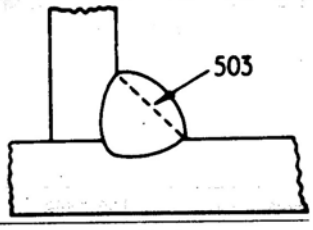
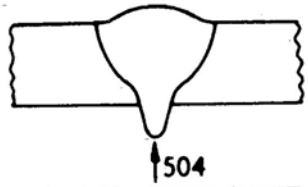
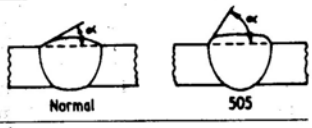
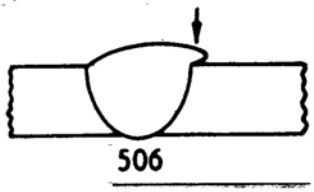
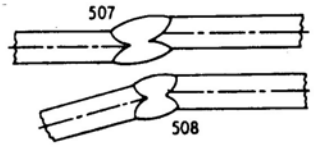
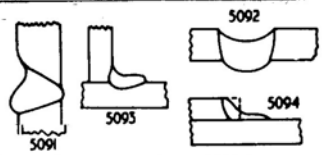
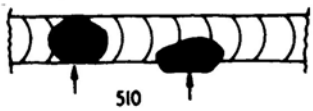
References No.	IIS/IIW Reference radiographs	Designation	Explanations
1	2	3	4
100	E	*Group No. 1 Cracks*	A discontinuity produced by a local rupture which may arise from the effect of cooling or stresses.
1001		Microfissure (micro-crack)	When a crack has microscopic dimensions it is known as a microfissure or microcrack.
101	Ea	Longitudinal crack	A crack substantially parallel to the axis of the weld. It may be situated:
1011			in the weld metal,
1012			at the weld junction,
1013			in the heat affected zone,
1014			in the parent metal.
	Eb	Transverse crack	A crack substiantially transverse to the axis of the weld. It may be situated:
1021			in the heat affected zone,
1022			in the weld metal,
1023			in the parent metal.
	E	Radiating cracks	Cracks radiating from a common point. They may be found:
1031			in the weld metal
1032			in the heat affected zone,
1033			in the parent metal.
			Note: Small cracks of this type are known as star cracks.

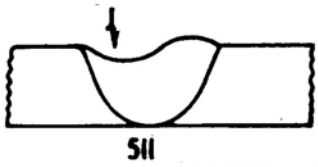
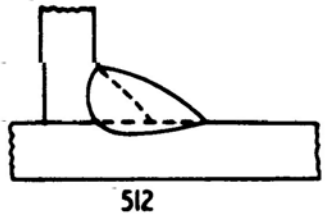
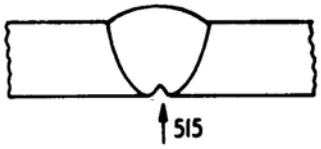
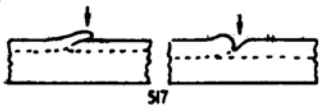


* Doc. IIS/IIW-340-69 (ex doc. V-360-67) opgesteld door I.I.W. Commissie V „Testing Measurement and control of welds." („Welding in the World", 1969, 7, 4).

References No.	IIS/IIW Reference radiographs	Designation	Explanations	
1	2	3	4	
104 1041 1042 1043	Ec	Crater crack	A crack in the end crater of a weld which may be: longitudinal, transverse, star cracking.	
105 1051 1052 1053	E	Group of disconnected cracks	A group of disconnected cracks which may be situated: in the weld metal, in the heat affected zone, in the parent metal.	
106 1061 1062 1063			A group of connected cracks originating from a common crack and distinguishable from disconnected cracks (105) and from radiating cracks (103). They may be situated: in the weld metal, in the heat affected zone, in the parent metal.	
		Group No. 2 Cavities		
201	A	Gas cavity	A cavity formed by entrapped gas.	
2011	Aa	Gas pore		
2012		Uniformly distributed porosity	A number of gas pores distributed in a substantially uniform manner throughout the weld metal; not to be confused with linear porosity (2014).	
2013		Localised (clustered) porosity	Group of gas cavities.	
2014		Linear porosity	A line of gas pores situated parallel to the axis of the weld.	
2015	Ab	Elongated cavity	A large non spherical cavity with its major dimension parallel to the axis of the weld.	
2016	Ab	Worm-hole	A tubular cavity in weld metal caused by release of gas. The shape and position of worm-holes is determined by the mode of solidification and the sources of the gas and they may be distributed in a herringbone formation.	
2017		Surface pore	A small gas pore which breaks the surface of a weld.	
202	K	Shrinkage cavity	A cavity due to shrinkage during solidification.	
2021		Interdendritic shrinkage	An elongated shrinkage cavity formed between dendrites during cooling which may contain entrapped gas. Such a defect is generally to be found perpendicular to the weld face.	
2022		Microshrinkage	Shrinkage only visible under the microscope.	
2023		Interdendritic microshrinkage	Interdendritic shrinkage only visible under the microscope.	
2024	K	Crater pipe	The depression due to shrinkage at the end of a weld run and not eliminated before or during the deposition of subsequent weld passes.	

References No.	IIS/IIW Reference radiographs	Designation	Explanations	
1	2	3	4	
300			Solid foreign substances entrapped in the weld metal.	
301	Ba		Slag entrapped in the weld metal. According to the circumstances of their formation such inclusions may be:	
3011			linear,	
3012			isolated,	
3013			others.	
	G	Flux inclusion	Flux entrapped in the weld metal. According to circumstances such inclusions may be:	See 3011-3013
3021			linear,	
3022			isolated,	
3023			others.	
303	J	Oxide inclusion	Metallic oxide trapped in the weld metal during solidification.	
3031		Puckering	In certain cases especially in aluminium alloys gross oxide film enfoldment can occur due to a combination of unsatisfactory protection from atmospheric contamination and turbulence in the weld pool.	
304	H	Metallic inclusion	A particle of foreign metal trapped in the weld metal. It may be of:	
3041			tungsten,	
3042			copper,	
3043			other metal.	
		Groep No. 4		
401		*Lack of Fusion and Penetration*	Lack of union between weld metal and parent metal or weld metal and weld metal. It will be one of the following:	
4011		Lack of fusion	lack of side wall fusion	
4012		(incomplete fusion)	lack of inter-run fusion (1)	
4013			lack of fusion at the root of the weld. *Note* (1): In certain countries one uses the terms 'collage noir' and 'collage blanc' depending on the presence or absence of oxide inclusions together with the lack of fusion.	
402	D	Lack of penetration (incomplete penetration)	Lack of fusion between parent metal and parent metal due to failure of weld metal to extend into the root of the joint	
		Group No. 5		
500		*Imperfect Shape* Imperfect Shape	Imperfect shape of the external surfaces of the weld or defective joint geometry.	
5011	F	Undercut	A groove at the toe(s) of a weld run due to welding. Undercut may be continuous (term 5011) or intermittent (term 5012) but in English such a distinction is not normally made	
5012	F	Undercut		

References No.	IIS/IIW Reference radiographs	Designation	Explanations	
1	2	3	4	
5013		Shrinkage groove	A shallow groove in the root caused by contraction in the weld metal along each side of the penetration bead. (See also 515).	
502		Excessive reinforcement	An excess of weld metal at the face(s) of the butt weld.	
503		Excessive convexity	An excess of weld metal at the face of a fillet weld.	
504		Excessive penetration	Excess weld metal protruding through the root of a weld made from one side or through weld metal previously deposited from either side of a multi-run joint.	
5041		Goutte	Local excessive penetration (no equivalent term in English).	
505		Bad reinforcement angle	Too large an angle (α) between the plane of the parent metal surface and a plane tangential to the weld bead surface at the toe.	
506		Overlap	Excess of weld metal at the toe of a weld covering the parent metal surface but not fused to it.	
507		Linear misalignment	Misalignment between two welded pieces such that whilst their surface planes are parallel their projected surfaces are not at the required level.	
508		Angular misalignment	Misalignment between two welded pieces such that their surface planes are not parallel (or at the intended angle).	
509			*Note:* Weld metal collapse due to gravity. There are no terms in English.	
5091				
5092				
5093				
5094				
510		Burn through	A collapse of the weld pool resulting in a hole in the weld or at the side of the weld.	

References No.	IIS/IIW Reference radiographs	Designation	Explanations	
511		Incompletely filled groove	A longitudinal continuous or intermittent channel in the surface of a weld due to insufficient deposition of weld metal.	
512		Assymetrical fillet weld	Explanations not necessary.	
513		Irregular width	Explanations not necessary.	
514		Irregular surface		
515		Root cancavity	A shallow groove due to shrinkage of a butt weld at the root. (See also 5013).	
516		Rochage	Term not used in English.	
517		Poor restart	A local surface irregularity at a weld restart	
600		*Group No. 6 Miscellaneous Defects* Miscellaneous defects	All defects which cannot be included in groups 1-5.	
601		Stray flash or arc strike	Local damage to the surface of the parent metal adjacent to weld resulting from accidental arcing or striking the arc outside the weld groove.	
602		Spatter	Globules of weld metal or filler expelled during welding and adhering to the surface of parent metal or solidified weld metal.	
6021		Tungsten spatter	Particles of tungsten transferred from the electrode to the surface of parent metal or solidified weld metal.	
603		Torn surface	Surface damage due to the removal by fracture of temporary welded attachments.	
604		Grinding mark	Local damage due to incorrect grinding.	
605		Chipping mark	Local damage due to incorrect use of a chisel.	
606		Underflushing	Reduction in thickness of metal due to excessive grinding.	