Radiographic testing (RT) — Levels 1, 2 and 3

The radiographic testing training shall be in accordance with Tables 1 and 2. (ISO/TS 25107:2019(E))

Table 1 — General content

Content	Level 1 (% of total duration)	Level 2 (% of total duration)	Level 3 (% of total duration)
5.1 Introduction to terminology and history of radiographic testing (RT)	3	1	1
5.2 Physical principles of the method and associated knowledge	15	10	15
5.3 Product knowledge and capabilities of the method and it's derived techniques	15	15	20
5.4 Equipment	25	20	25
5.5 Information prior to testing	5	8	5
5.6 Testing	30	25	2,5
5.7 Evaluation and reporting	5	10	7,5
5.8 Assessment	0	5	10
5.9 Quality aspects	2	5	8
5.10 Developments	0	1	6

NOTE: Annex A of ISO/TS 25107:2019(E) provides guidance on the training process for advanced radiographic techniques.

Table 2 — Radiographic testing (RT) — Levels 1, 2 and 3

Content			RT-F (Film)			RT-D (Digital)			RT-S (Radioscopy)		
			Level 1	Level 2	Level 3	Level 1	Level 2	Level 3	Level 1	Level 2	Level 3
5.1 Introduction to terminology and history of radiographic testing (RT)	History		X	X	X	X	X	X	X	X	X
	Purpose of NDT	What is testing?	X	X	X	X	X	X	X	X	X
		What is the purpose of NDT?	X	X	X	X	X	X	X	X	X
		A	X	X	X	X	X	X	X	X	X
		F	X	X	X	X	X	X	X	X	X
		V	X	X	X	X	X	X	X	X	X
		M	X	X	X	X	X	X	X	X	X
	Purpose of radiographic testing (RT)	D	X	X	X	X	X	X	X	X	X
		A	X	X	X	X	X	X	X	X	X
	Terminology	E	X	X	X	X	X	X	X	X	X
		F	X	X	X	X	X	X	X	X	X
		D	X	X	X	X	X	X	X	X	X
		D	X	X	X	X	X	X	X	X	X
		V	X	X	X		X	X		X	X
		I	X	X	X	X	X	X	X	X	X
		Dose rate constant	X	X	X		X	X		X	X
		Activity	X	X	X	X	X	X			X

	Relevant standards	See Annex B		X	X		X	X		X	X
5.2 Physical principles of the method and associated knowledge Concepts necessary for understanding the physical principles of radiographic testing (physics, mathematics) may be the object of a preliminary course	General	Structure of the atom	X	X	X	X	X	X	X	X	X
		Electromagnetic spectrum	X	X	X	X	X	X	X	X	X
		Sources of radiation and its properties:									
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X	X	X	X	X	X	X
		–			X			X			X
		X m	X	X	X	X	X	X	X	X	X
		E ters:									
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X	X	X	X	X	X	X
		R		X	X		X	X		X	X
		F	X	X	X	X	X	X	X	X	X
		D	X	X	X	X	X	X	X	X	X
		D	X	X	X	X	X	X	X	X	X
		D	X	X	X		X	X		X	X
	Attenuation of radiation	C tion:									
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X		X	X		X	X
		H w	X	X	X	X	X	X	X	X	X
		H	X	X	X	X	X	X	X	X	X
		S p f	X	X	X	X	X	X	X	X	X
		F	X	X	X	X	X	X	X	X	X
		X	X	X	X	X		X		X	X
		A e			X			X			X
	Radiation contrast, noise	C	X	X	X	X	X	X	X	X	X
		S		X	X		X	X		X	X
		S	X	X	X	X	X	X	X	X	X
		S				X	X	X	X	X	X
		C					X	X		X	X
		U	X	X	X	X	X	X	X	X	X
		E				X	X	X	X	X	X
		P				X	X	X	X	X	X
		N				X	X	X		X	X
	Optimization of image quality	C									
		–					X	X		X	X
		– SNR					X	X		X	X
		– Local unsharpness vs SNR					X	X		X	X
		Scatter protection	X	X	X	X	X	X	X	X	X
		Maximum/optimum X-ray voltage		X	X		X	X		X	X
	Geometrical projection conditions	Geometrical and inherent unsharpness	X	X	X	X	X	X	X	X	X
		Geometrical magnification		X	X		X	X	X	X	X
		Effect of magnification		X	X	X	X	X	X	X	X
		Optimum magnification			X		X	X		X	X

		Difference between radiography and radioscopy		X	X		X	X		X	X
		Law of the squared distance	X	X	X	X	X	X	X	X	X
	Image quality indicators	Wire type	X	X	X	X	X	X	X	X	X
		Step hole type	X	X	X	X	X	X	X	X	X
		Plate hole type	X	X	X	X	X	X	X	X	X
		D	X	X	X	X	X	X	X	X	X
		M r		X	X		X	X		X	X
		C			X		X	X		X	X
		I			X			X			X
5.3 Product knowledge and capabilities of the method and its derived techniques	General defects	P		X	X		X	X		X	X
		–		X	X		X	X			X
		–		X	X		X	X		X	X
		–		X	X		X	X			X
		–		X	X		X	X			X
		–		X	X		X	X		X	X
		–		X	X		X	X		X	X
		T	X	X	X	X	X	X	X	X	X
		F			X			X			X
		V			X			X			X
		M		X	X		X	X		X	X
		C		X	X		X	X		X	X
		F		X	X		X	X		X	X
	Influence on detectability	T	X	X	X	X	X	X	X	X	X
		S	X	X	X	X	X	X	X	X	X
		C	X	X	X	X	X	X	X	X	X
		N		X	X		X	X		X	X
		F	X	X	X	X	X	X	X	X	X
		C								X	X
		I		X	X		X	X		X	X
		T C		X	X		X	X		X	X
		N rtion a		X	X		X	X		X	X
5.4 Equipment	Radiation sources — X-ray sources	S									
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X	X	X	X			
		– of	X	X	X	X	X	X	X	X	X
		–		X	X		X	X		X	X
		S		X	X		X	X		X	X
		C		X	X		X	X		X	X
		C	X	X	X	X	X	X	X	X	X
		Handling	X	X	X	X	X	X	X	X	X
		Parameters:									
		— kV	X	X	X	X	X	X	X	X	X
		— mA	X	X	X	X	X	X	X	X	X
		— Spot size	X	X	X	X	X	X	X	X	X
		Measurement of parameters		X	X		X	X		X	X
	Radiation	Container:									

	sources — Gamma sources	— Shielding	X	X	X	X	X	X			
		— Classes of containers			X			X			
		Transportation	X	X	X	X	X	X			
		Source holder and capsula:									
		— Handling and projection	X	X	X	X	X	X			
		— Special design		X	X		X	X			
		—	X	X	X	X	X	X			
		P									
		—	X	X	X	X	X	X			
		—	X	X	X	X	X	X			
		—	X	X	X	X	X	X			
		—	X	X	X	X	X	X			
		—	X	X	X	X	X	X			
		—	X	X	X	X	X	X			
	Film	C	X	X	X			X			
		— rigin	X	X	X			X			
		— ide, g	X	X	X			X			
		—	X	X	X			X			
		P									
		—	X	X	X			X			
		—	X	X	X			X			
		— , sp	X	X	X			X			
		— g	X	X	X						
		—	X	X	X						
		—	X	X	X						
		—		X	X						
		C	X	X	X						
		Q st st		X	X						
		F									
		—	X	X	X						
		—	X	X	X						
		—	X	X	X						
		—	X	X	X						
		— inac	X	X	X						
		W	X	X	X						
	Film development and dark room conditions	D	X	X	X						
		M ent	X	X	X						
		B									
		—	X	X	X						
		— rk ro	X	X	X						
		Developing process:									
		— Principles	X	X	X						
		— Processing equipment, adjustment	X	X	X						
		— Checking	X	X	X						
		— Storage of unexposed films	X	X	X						
		— Darkroom light test	X	X	X						

		— Fog test	X	X	X						
		— Clearing time	X	X	X						
		— Tally sheet	X	X	X						
		Use of test film strips		X	X						
	Computer-radiography (CR), Imaging plates	Phosphor imaging plates:									
		— Introduction				X	X	X			
		—				X	X	X			
		I r				X	X	X			
		C					X	X			
		C					X	X			
		F				X	X	X			
		V s				X	X	X			
		F				X	X	X			
		S					X	X			
	DDA's	I):									
		-				X	X	X	X	X	X
		-				X	X	X	X	X	X
		I					X	X		X	X
		I					X	X		X	X
		C					X	X		X	X
		I					X	X		X	X
		C					X	X		X	X
		F					X	X		X	X
		H				X	X	X	X	X	X
		S						X			X
	LDA's	I									
		-				X	X	X	X	X	X
		-					X	X		X	X
		A					X	X		X	X
		C					X	X		X	X
		C					X	X		X	X
		F rams					X	X		X	X
		H					X	X		X	X
		S						X			X
	Intensifiers, fluoroscope	I						X	X	X	X
		I							X	X	X
		A							X	X	X
		C								X	X
		F rams								X	X
		H							X	X	X
		S									X
		C								X	X
	Film digitization	S									
		-		X	X						
		- Line scanners		X	X						
		- Laser scanners		X	X			X			
		Quality assurance (phantom)		X	X			X			
		Handling, archiving		X	X			X			
		System selection			X			X			
		Classification		X	X		X	X			
	Accessories	Equipment:									

		— Lead letters and tape	X	X	X	X	X	X	X	X	X
		— Holding magnets	X	X	X	X	X	X			
		— Lead shielding, collimation, masking	X	X	X	X	X	X	X	X	X
		— Rubber bands	X	X	X	X	X	X	X	X	
		— Radiation protection equipment	X	X	X	X	X	X	X	X	X
	Data acquisition, detector adjustment	A				X	X	X	X	X	X
		C									
		– sk				X	X	X	X	X	X
		– ages				X	X	X	X	X	X
		–				X	X	X	X	X	X
		I									
		– ime				X	X	X	X	X	X
		– e n				X	X	X	X	X	X
		– s					X	X		X	X
		– n					X	X		X	X
5.5 Information prior to testing	Information about the test object	I m									
		–	X	X	X	X	X	X	X	X	X
		–	X	X	X	X	X	X	X	X	X
		–		X	X		X	X		X	X
		–	X	X	X	X	X	X	X	X	X
	Test conditions and application of standard	A		X	X		X	X		X	X
		I		X	X		X	X		X	X
		P		X	X		X	X		X	X
		A		X	X		X	X		X	X
		S e li d o		X	X		X	X		X	X
		S o		X	X		X	X		X	X
		R l		X	X		X	X		X	X
		A		X	X		X	X		X	X
	Technique and sequence of performing test	S		X	X		X	X		X	X
		S		X	X		X	X		X	X
		P		X	X		X	X		X	X
	Instructions	P re			X			X			X
		P ion		X	X		X	X		X	X
		P a ction	X			X			X		
		P codes and procedures			X			X			X
5.6 Testing	Standard practice and evaluation standards	Selection of technique:									
		— Different exposure geometries		X	X		X	X		X	X
		— Interpretation of images		X	X		X	X		X	X
		— Evaluation of flaws		X	X		X	X		X	X
		— Use of catalogues		X	X		X	X		X	X
		— Measurement of flaw		X	X		X	X		X	X

		dimensions									
5.7 Evaluation and reporting	Basic of evaluation	Viewing conditions:									
		— Room condition	X	X	X	X	X	X	X	X	X
		— Viewing time	X	X	X	X	X	X	X	X	X
		— Lapsed time after dazzling	X	X	X						
		— Luminance		X	X		X	X		X	X
		— Density measurement	X	X	X						
		—		X	X						
		F									
		—	X	X	X						
		—		X	X						
		—		X	X						
	Physical factors	F		X	X		X	X		X	X
		A		X	X						
	Evaluation of radiographs	V ity	X	X	X	X	X	X	X	X	X
		R		X	X		X	X		X	X
	Test report	C s		X	X		X	X		X	X
		C		X	X		X	X		X	X
		A	X	X	X	X	X	X	X	X	X
		A of t	X	X	X	X	X	X		X	X
	Digital image processing	I (				X	X	X	X	X	X
		E									
		—				X	X	X	X	X	X
		—				X	X	X	X	X	X
		P									
		—				X	X	X	X	X	X
		—				X	X	X	X	X	X
		—				X	X	X	X	X	X
		—					X	X		X	X
		—					X	X		X	X
		M					X	X		X	X
		— f S					X	X		X	X
		—					X	X		X	X
		— e					X	X		X	X
		—					X	X		X	X
		M									
		—					X	X		X	X
		—					X	X		X	X
		— h					X	X		X	X
		—					X	X		X	X
		— Measurement of depth					X	X		X	X
		Correction of raw data:									
		— Introduction					X	X		X	X
		— Linearization, LUT						X			X
		— Bad pixel interpolation						X			X
	Automated	Principles					X	X		X	X

	image interpretation	Binarization						X		X	X
		Measurement of dimensions					X	X		X	X
5.8 Assessment	Classification of imperfections	Type		X	X		X	X		X	X
		Size		X	X		X	X		X	X
		I		X	X		X	X		X	X
		F		X	X		X	X		X	X
		I r		X	X		X	X		X	X
5.9 Quality aspects	Personnel qualification	I	X	X	X	X	X	X	X	X	X
		C c			X			X			X
	Documentation	F P			X			X			X
		C ures			X			X			X
		A ion, P			X			X			X
		I n		X	X		X	X		X	X
		V i	X			X			X		
		T		X	X		X	X		X	X
		F		X	X		X	X		X	X
	Knowledge of applicable NDT application and product standards	C		X	X		X	X		X	X
		U s		X	X		X	X		X	X
		N			X			X			X
		J		X	X		X	X		X	X
		F		X	X		X	X		X	X
5.10 Developments	Special techniques	S		X	X		X	X		X	X
		C									
		—			X		X	X		X	X
		—					X	X		X	X
		—						X			X
		—						X			X
		— Tilted beam techniques						X			X
		— Applications			X		X	X			X
		— Requirements, limitations			X			X			X
		RT-F vs RT-D		X	X		X	X		X	X

Annex A — (informative)

Alternative training hours for advanced radiographic techniques

Table A.1 — Trainings times for RT-training (in hours)				
Technique	Required certificate	Level 1 hours	Level 2 hours	Level 3[c] hours
RT-F Film	None	40	80 + RT-F1 training[a,c]	40 + RT-F1,2 training[a,b]
	RT-D 1	32	80	40
	RT-D 2,3	32	40	32
	RT-D 2,3	—	60[c,d]	32
RT-D Digital	None	40	80 + RT-D1 training[a,c]	40 + RT-D1,2 training[a,b]

	RT-F 1	32	80	40
	RT-F 2,3	32	40	32
	RT-F 2,3, RT-S 2,3	—	60[c,d]	32
RT-S Radioscopy	None	32	32 + RT-S1| training	32 + RT-S1,2 training[a,b]
	RT-F 2,3		32	32
	RT-D 2,3		32	32

Key
RT: radiographic testing method
RT-F: for film technique
RT-D: for digital technique (film replacement)
RT-S: for radioscopic technique
a[1] Level 1 training not required if additional technical qualification can be proven (e.g. university).
b[1] Additional basic training and examination by ISO 9712 required and practical examination in level 2.
c[1] Direct access, only if additional technical qualification can be proven (e.g. university).
d[1] Direct access, only if certified in level 2 or level 3.

NOTE ISO/TS 25108 provides requirements and recommendations for organizations providing training for non-destructive

Enough clean different product sectors, step w

If only one typ ample, the training with one or bo odelling.

The virtual tra

— Input
— Selec 1742);
— Radiat
— Expos
— Detec noise, efficiency;
— Atten
— Data f DE or RAW. It is impor
— Image

Additionally, t

— Differ
— Sever
— Mater
— Pre-fil
— Step w

Annex B — (informative)

Useful references

B.1 Radiographic testing

B.1.1 ISO standards

ISO 3999				ISO 10675-2
ISO 11699				15708-1
ISO 15708				16526-3
ISO 17635				19232-2
ISO 19232				15708-3
ISO 15708-4				

B.1.2 European standards

EN 12543-1				12543-5
EN 12679				13068-3
EN 16016-1				

B.1.3 ASTM standards

ASTM E94	ASTM E155	ASTM E186	ASTM E192	ASTM E242
ASTM E				446
ASTM E				1000
ASTM E				1165
ASTM E				1416
ASTM E				1672
ASTM E				1815
ASTM E				2033
ASTM E				2660
ASTM E				2736
ASTM E2737	ASTM E2738	ASTM E2767	ASTM E2903	

B.1.4 ASME standards

ASME BPVC Section V, Article 2 ASME BPVC Section V, Article 1