

**Table 4.1 Classification of abrasion and related tests**

Test type	ID for test and appendix	Short name	Abrading medium	Main abrasive action	Degree of severity	Secondary abrasive action	Abrasion Wear Code	Principle of test	Specimen location
U1	U.1.01	Fwa's cube tumbler	steel drum	impact	severe	rolling & sliding	<b>R2S2I4</b>	cubes tumbling in steel drum (i.e. LA machine)	changing
U1	U.1.02	Cantabrian paver tumbler	steel drum	impact	severe	rolling & sliding	<b>R2S2I4</b>	paver tumbling in steel drum (i.e. LA machine)	changing
U2	U.2.01	Abram's tumbling balls	steel balls	impact	severe	rolling & sliding	<b>R2S2I4</b>	steel balls tumbling in a rotating drum (I.e. Talbot Jones Rattler) lined with concrete blocks	below
U2	U.2.02	PCI TM 7.8	steel balls	impact	severe	rolling & sliding	<b>R1S1I3</b>	steel balls tumbling in a rotating box lined with concrete specimens	below
U2	U.2.03	AS/NZS 4456.9	steel balls	impact	mild	rolling & sliding	<b>R1S1I3</b>	steel balls tumbling in a rotating box over concrete pavers	below
U2	U.2.04	SABS 541	steel balls	impact	mild	rolling & sliding	<b>R1S1I3</b>	steel balls tumbling in a rotating box lined with concrete specimens	below
U2	U.2.05	Impact Box	steel balls	impact	mild	rolling & sliding	<b>R1S1I3</b>	steel balls tumbling in a rotating box lined with concrete flags	below
U2	U.2.06	Horiguchi's bouncing balls	steel balls <sup>1</sup>	impact	mild		<b>R1S1I3</b>	steel balls bouncing up and down in water	below
U2	U.2.07	ASTM C1138	steel balls <sup>1</sup>	impact	mild	sliding & rolling	<b>R1S1I3</b>	steel balls tumbling in a circular orbit in swirling water on the concrete specimen	below
U2	U.2.08	EN 154 (P.E.I. Test)	steel balls	rolling <sup>2</sup>	mild	sliding	<b>R1S1I0</b>	steel balls rolling and sliding on abrasive grit on tile specimens	below
U2	U.2.09	DIN 51951	steel balls	rolling	severe		<b>R3S1I2</b>	loaded orbiting steel balls also moving in a planetary circuit	below
U2	U.2.10	Davis' rolling balls	steel balls <sup>1</sup>	rolling	severe		<b>R3S1I2</b>	loaded orbiting steel balls submerged in water	below
U2	U.2.11	Davis modified rolling balls	steel balls <sup>1</sup>	rolling	severe		<b>R3S1I2</b>	loaded orbiting steel balls submerged in water	below
U2	U.2.12	ASTM C779 Proc C	steel balls	rolling	severe	sliding (Heathcote)	<b>R3S1I2</b>	loaded orbiting steel balls	below
U2	U.2.13	MA20	steel balls <sup>1</sup>	rolling	severe	sliding (Heathcote)	<b>R3S1I2</b>	loaded orbiting steel balls	below
U2	U.2.14	CCA:TM6	steel balls <sup>1</sup>	rolling	severe	sliding (Heathcote)	<b>R3S1I2</b>	loaded orbiting steel balls	below
U2	U.2.15	MA20SA	steel balls <sup>1</sup>	rolling	severe	sliding (Heathcote)	<b>R3S1I2</b>	loaded orbiting steel balls	below
U2	U.2.16	CMA20	steel balls <sup>1</sup>	rolling	severe	sliding (Heathcote)	<b>R3S1I2</b>	loaded orbiting steel balls	below
U3	U.3.01	Caterpillar tracks	steel tracks	rolling	severe	sliding (slewing)	<b>R3S3I3</b>	caterpillar tracks passing over concrete	below
U3	U.3.02	Chained tyres	chained tyres	rolling	severe	sliding (cutting)	<b>R3S3I3</b>	loaded large chain fitted tyres	below
U3	U.3.03	Norcem studded tyres	studded tyres	rolling	severe	sliding (cutting)	<b>R3S2I3</b>	loaded studded tyres orbiting	below
U3	U.3.04	Finnish studded tyres	studded tyres	rolling	severe	sliding (cutting)	<b>R3S2I3</b>	loaded studded tyres orbiting	below
U3	U.3.05	Japanese studded tyres	studded tyres	rolling	severe	sliding (cutting)	<b>R3S2I3</b>	loaded studded tyres on orbiting concrete specimens	below
U3	U.3.06	ASTM C779 Proc B	dressing wheels	rolling	severe	sliding (cutting)	<b>R3S3I3</b>	loaded dressing wheels orbiting on surface	below
U3	U.3.07	C&CA - dressing wheels	dressing wheels	rolling	severe	sliding (cutting)	<b>R3S3I3</b>	loaded dressing wheels orbiting on surface	below
U3	U.3.08	Smith's dressing wheels	dress wls + fine abras	rolling	severe	sliding (cutting)	<b>R3S3I3</b>	fine abrasive pressed into surface by orbiting loaded dressing wheels (rotating cutter)	below
U3	U.3.09	ASTM C944	dressing wheels	rolling	severe	sliding (cutting)	<b>R3S3I3</b>	loaded dressing wheels orbiting on surface (= rotating cutter)	below
U4	U.4.01	Finnish steel wheels	steel wheels	rolling	severe	sliding (wheel slip)	<b>R4S3I2</b>	loaded 110mm diameter wheels orbiting - tangentially displaced	below
U4	U.4.02	NT BUILD 044	steel wheels	rolling	severe	sliding (wheel slip)	<b>R4S2I2</b>	loaded 125mm diameter wheel can caster in 2 directions	below
U4	U.4.03	SP - Swedish steel wheels	steel wheels	rolling	mild	sliding (wheel slip)	<b>R3S3I2</b>	loaded 47mm diameter wheels orbiting - tangentially displaced	below

U4	U.4.04	Ahlers' steel wheels	steel wheels	rolling	mild	sliding (wheel slip)	<b>R2S2I2</b>	loaded trolley wheels orbiting	below
U4	U.4.05	Fruchtbaum's steel wheels	steel wheels	rolling	mild	sliding (wheel slip)	<b>R2S2I2</b>	loaded 76mm diameter wheels orbiting	below
U4	U.4.06	C&CA - steel wheels	steel wheels	rolling	mild	sliding (wheel slip)	<b>R2S2I2</b>	loaded 75mm diameter wheels orbiting	below
U4	U.4.07	Wastlund's steel wheels	steel wheels	rolling	mild	sliding (wheel slip)	<b>R2S1I2</b>	loaded 305mm diameter wheels orbiting	below
U5	U.5.01	Dorry Hardness	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.02	DIN52108	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.03	NBN269	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.04	UNE7015	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.05	SI 6	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.06	BS 812 : Part113	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.07	NBN B15-233	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.08	NEN 2874	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.09	ONORM 3232	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	large revolving steel disc causes abrasive to slide/roll beneath loaded specimens	above
U5	U.5.10	FBPM	fine abrasive	rolling	mild	sliding	<b>R1S1I0</b>	revolving rubber disc causes abrasive to roll/slide beneath loaded specimens	above
U5	U.5.11	NF P98-303	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	rotating steel disc causes abrasive to slide/roll across face of loaded specimen	vertical
U5	U.5.12	PrEN 1338	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	rotating steel disc causes abrasive to slide/roll across face of loaded specimen	vertical
U5	U.5.13	Schuman's revolving discs	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	loaded rotating steel discs moving in planetary circuit cause abrasive to slide/roll over specimen	below
U5	U.5.14	Scripture's revolving discs	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	loaded rotating steel discs moving in planetary circuit cause abrasive to slide/roll over specimen	below
U5	U.5.15	ASTM C779 ProcA	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	loaded rotating steel discs moving in planetary circuit cause abrasive to slide/roll over specimen	below
U5	U.5.16	PCI TM 7.11 (Grit)	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	loaded rotating steel disc causes abrasive to slide/roll over specimen	below
U5	U.5.17	Reciprocating pan	fine abrasive	sliding	mild	rolling	<b>R2S2I0</b>	reciprocating table causes abrasive to slide/roll between specimen below and load above	below
U5	U.5.18	Drum Sander	fine abrasive	impact	severe	sliding	<b>R1S3I4</b>	sandpaper fastened to revolving steel drum bounces and slides on specimen	below
U5	U.5.19	NEN 7000	fine abrasive	impact	mild	sliding (cutting)	<b>R0S2I3</b>	sand is pneumatically propelled against the surface	below
U5	U.5.20	Ruemelin's shotblast	fine abrasive	impact	mild	sliding (cutting)	<b>R0S2I3</b>	steel shot is pneumatically propelled against the surface	below
U5	U.5.21	ASTM C418	fine abrasive	impact	mild	sliding (cutting)	<b>R0S2I3</b>	sand is pneumatically propelled against the surface	below
U5	U.5.22	Water Sandblast	fine abrasive <sup>1</sup>	impact	mild	sliding (cutting)	<b>R0S2I3</b>	water borne sand is propelled against the surface	below
U6	U.6.01	C&CA - steel pads	steel pads	sliding	mild	rolling	<b>R1S2I0</b>	loaded steel pads slide over specimen in an orbit	below
U6	U.6.02	PCI TM 7.11 (wirebrush)	wire bristles	sliding	mild	(cutting)	<b>R1S2I0</b>	the bristles of the rotating wirebrush slide over the specimen	below
U6	U.6.03	NEN 7000 (wirebrush)	wire bristles	sliding	mild	(cutting)	<b>R1S2I0</b>	the bristles of the moving wirebrushes slide against the concrete specimen	above
U6	U.6.04	Diamond tip scratcher	diamond scratcher	sliding	severe <sup>3</sup>	(cutting)	<b>R3S3I0</b>	loaded diamond tip slides over specimen	below
U6	U.6.05	Mohs scratch hardness	mineral scratchers	sliding	severe <sup>3</sup>	(cutting)	<b>R3S3I0</b>	loaded mineral crystal slides over specimen	below
U7	U.7.01	BRE screed tester	steel hammer	impact	severe <sup>4</sup>		<b>R0S0I4</b>	steel mass free falls onto concrete surface	below
U7	U.7.02	Rebound hammer	steel hammer	impact	severe <sup>5</sup>		<b>R0S0I3</b>	hammer/plunger strikes specimen surface	any
U8	U.8.01	ISAT	water	NDT		na	<b>R0S0I0</b>	water is absorbed into surface at a measured rate	below
U8	U.8.02	ISAT	water	NDT		na	<b>R0S0I0</b>	water is absorbed into surface at a measured rate	below
U8	U.8.03	UPV	sound	NDT		na	<b>R0S0I0</b>	sound waves pass through specimen at a measured rate	any