Sno.	IS 9537:PART 1:1980	IEC 61386:1:2008	RECOMMENTIONS FOR IS 9537:PART 1:1980
1	**Cl 2.1 Conduit** : A part of closed wiring system of circular or noncircular cross section for conductors and/or cables in electrical installations allowing to draw them in and/or to replace them	**Cl 3.2 Conduit** : part of conduit system of circular cross-section for insulated conductors and/or cables in electrical or communication installations, allowing them to be drawn in and/or replaced	The definition may specify that conduits are meant for insulated conductors and not bare conductors and may be used for electrical or communication installations. Hence the clause 2.1 para 1 may be change to : Conduit - A part of closed wiring system of circular or noncircular cross section for insulated conductors and/or cables in electrical or communication installations allowing to draw them in and/or to replace them.
	Cl 2.7 Pliable Conduit – A conduit which can be bent by hand with a reasonable force, but without other assistance.	**3.12** **pliable conduit** conduit which can be bent by hand with reasonable force, and which is not intended for frequent flexing	The definition for pliable conduits may be changed to following to elaborate the features of conduit to distinguish it with flexible conduit as mentioned in IEC standard Pliable Conduit – A conduit which can be bent by hand with a reasonable force, but without other assistance and is not intended for frequent flexing.
	2.14 Self-Recovering Conduit - A pliable conduit which deforms when a transverse force is applied for a short time and which after removal of this force returns close to its original shape within a further short time	**3.14** **self-recovering conduit** pliable conduit which deforms when a transverse force is applied for a short time and which, after removal of this force, returns close to its original shape after a defined period	The definition of self recovering conduit may be change to following to align with IEC standard. **2.14 self-recovering conduit** pliable conduit which deforms when a transverse force is applied for a short time and which, after removal of this force, returns close to its original shape ~~within a further short time~~ after a defined period
	2.16 External Influences - The presence of water or oil or building materials, low and high temperatures, corrosive or polluting substances and solar radiation.	**3.17** **external influence** factors which may affect the conduit system NOTE Examples of such factors are a presence of water, oil or building materials, low and high temperatures, and	The definition given in the standard seems to be incomplete. The same may be change to following: **2.16 external influence** Factors like presence of water or oil or building materials, low and high temperatures, corrosive or polluting substances and solar radiation which

		corrosive or polluting substances.	may affect the conduit system.
1	6.4 Marking according to 6.1 to 6.3 shall be checked by inspection and by rubbing lightly the marking by band for 15 seconds with a piece of cloth soaked with water and again for 15 seconds with a piece of cloth soaked with petroleum spirit.	**7.6** The marking shall be durable and clearly legible. Compliance is checked by inspection, using normal or corrected vision, without additional magnification and by rubbing the marking by hand for 15 s with a piece of cotton cloth soaked with water and again for 15 s with a piece of cotton cloth soaked with petroleum spirit nhexane 95 %1. When using the liquid specified for the test, precautions as stated in the relative material safety datasheet provided by the chemical supplier shall be taken to safeguard the laboratory technicians. Laser marking directly on the product and marking made by moulding, pressing or engraving are not subjected to this test. The marking surface to be tested shall be dried before rubbing the marking with n-hexane 95 % solvent. Rubbing shall commence immediately after soaking the piece of cotton, applying a compression force of (5 ± 1) N at a rate of about one cycle per second (a cycle comprising a forward and backward	Clause 6.4 of IS 9537:Part 1 may be aligned with Cl 7.6 of IEC 61386:1:2008

		movement along the length of the marking). For markings longer than 20 mm, rubbing can be limited to a part of the marking, over a path of at least 20 mm length. The compression force is applied by means of a test piston which is wrapped with cotton comprising of cotton wool covered by a piece of cotton medical gauze. The test piston shall have the dimensions given in Figure 9 and shall be made of an elastic material which is inert against the test liquids and has a Shore-A hardness of 47 ± 5 (for example synthetic rubber). When it is not possible to carry out the test on the specimens due to the shape/size of the product, a suitable piece having the same characteristics as the product can be submitted to the test. After the test, the marking shall be legible.	
2	8. Construction: The inside and the outside surfaces of conduits shall be reasonably smooth and free from burrs, flash and similar defects; in addition, the edges over which the conductors or cables are likely to be drawn shall not	9. Construction Within the conduit system, there shall be no sharp edges, burrs or surface projections which are likely to damage insulated conductors or cables, or inflict injury on the installer or user.	Clause 8 para one may be modified as below to mention that insulated conductors are to be drawn: The inside and the outside surfaces of conduits shall be reasonably smooth and free from burrs, flash and similar defects; in addition, the edges over which the insulated conductors or cables are likely to be drawn shall not damage the cables or insulated conductors.

	damage the cables or conductors.		
3	**9.3** Compression Test **9.3.1** Samples of conduit, each 200 mm long, shall be subjected to a compression test using the apparatus shown in Fig. 1. Before the test, the outside diameters of the samples shall be measured. The samples shall then be conditioned at a temperature of 27 ± 20 deg C for at least 10 hours. **9.3.2** Immediately after the conclusion of conditioning period, the samples shall be positioned on a flat steel support and a steel intermediate block as shown in Fig. I, is placed on the middle of the sample. A slowly increasing force as shown in Table I for diflerent types of conduits shall then be applied to the intermediate piece within 30 seconds. 9.3.3 After the full force has been applied for I minute, the outside diameter of the sample shall be measured where flattening has taken place, without removing the force.	**10.2 Compression test** **10.2.1** Samples of conduit, each (200 ± 5) mm long, shall be subjected to a compression test at (23 ± 2) ºC, using the apparatus shown in Figure 1. **10.2.2** Before the test, the outside diameters of the samples shall be measured. **10.2.3** The samples shall be positioned on a flat steel support, and a steel intermediate piece, as shown in Figure 1, shall be placed in the middle of the sample. **10.2.4** A uniformly increasing compression force, reaching the values shown in Table 4 within (30 ± 3) s, shall be applied to the intermediate piece. **10.2.8** After the test, the samples shall show no cracks visible to normal or corrected vision without additional magnification.	Clause 9.3 may be changed to following to align the same with IEC standard **9.3** Compression Test **9.3.1** Samples of conduit, each 200±5 mm long, shall be subjected to a compression test using the apparatus shown in Fig. 1. Before the test, the outside diameters of the samples shall be measured. The samples shall then be conditioned at a temperature of 27 ± 20 deg C for at least 10 hours. **9.3.2** Immediately after the conclusion of conditioning period, the samples shall be positioned on a flat steel support and a steel intermediate block as shown in Fig.1, is placed on the middle of the sample. A uniformly increasing compression force, reaching the values shown in Table 1 within (30 ± 3) s, shall be applied to the intermediate piece. NOTE In order to achieve a uniformly increasing compression force, the force indicated in Table 4 is divided by time; this value is the required rate per second to fulfill the requirement. Example: For a test force of 750 N an increase of the test force of 25 N/s is required (750 divided by 30 equals 25). 9.3.3 After the full force has been applied for 60±2 s, the outside diameter of the sample shall be measured where flattening has taken place, without removing the force. The difference between the initial diameter and the diameter of the flattened

	The difference between the initial diameter and the diameter of the flattened sample shall not exceed a specific percentage of the outside diameter measured before the test. The values are given in the relevant conduit specifications. The force and the intermediate piece are then removed and, I minute after removal, the outside diameter of the samples, where they have flattened, is again measured. The difference between the initial diameter and the diameter of the flattened samples shall not exceed 10 percent of the outside diameter measured before the test.		sample shall not exceed a specific percentage of the outside diameter measured before the test. The values are given in the relevant conduit specifications. The force and the intermediate piece are then removed and, 60±2 s after removal, the outside diameter of the samples, where they have flattened, is again measured. The difference between the initial diameter and the diameter of the flattened samples shall not exceed 10 percent of the outside diameter measured before the test. **9.3.4** After the test, the samples shall show no cracks visible to normal or corrected vision without additional magnification.
	9.4 Impact Test **9.4.1** Twelve samples of conduits, each 200 mm long, shall be subjected to an impact test by means of the apparatus shown in Fig. 2. Before the test, the samples shall be conditioned at a temperature of 60 ± 2°C for 10 days (240 hours). **9.4.2** The test apparatus shall be		**9.4 Impact Test** **9.4.1** Twelve samples of conduits, each 200±5 mm long, shall be subjected to an impact test by means of the apparatus shown in Fig. 2. Before the test, the samples shall be conditioned at a temperature of 60 ± 2°C for 10 days (240 hours). **9.4.2** The test apparatus shall be placed on a pad of sponge rubber 40 mm thick, and this together with the samples, shall be placed in a freezer, the temperature within which is maintained at -5 ± 2°0. When the samples have attained the temperature of the air within the freezer or after 2 hours,

	placed on a pad of sponge rubber 40 mm thick, and this together with the samples, shall be placed in a freezer, the temperature within which is maintained at -5 ± 2°0. When the samples have attained the temperature ofthe air within the freezer or after 2 hours, whichever is longer period, each sample shall be in tum placed in position on the steel base as shown in Fig. 2 and the hammer is. allowed to fall whereby an impact energy J according to Table 2 is applied. The mass of the hammer and the fall height are also specified in Table 2.		whichever is longer period, each sample shall be in turn placed in position on the steel base as shown in Fig. 2 and the hammer is allowed to fall whereby an impact energy J according to Table 2 is applied. The time between the removal of the sample from the cold chamber and the completion of the impact test shall not be greater than 10 s. The mass of the hammer and the fall height are also specified in Table 2. Conduit test samples shall be tested at the centre of their length.
	12. ELECTRICAL CHARACTERISTICS 12.1 Insulating conduits shall have adequate electrical strength and insulation resistance. Compliance is checked by the test given in 12.1.1 and 12.1.2, which is made on three samples of appropriate length. The end of each sample is provided with a conductive coating at least of 10 mm length. 12.1.1 Electrical Strength - The samples are bent and immersed over a length of 1 m in water at a temperature of 27 ± 5°C, as shown in	**11.3 Dielectric strength and insulation resistance** **11.3.1** *Conduits* **11.3.1.1** *Samples of conduit are immersed over a length of 1 m ± 10 mm in accordance with Figure 4 or Figure 5 in a salt water solution at (23 ± 2) ° C, with a length of 100 mm kept above the level of the solution. Rigid conduit samples are to be supplied by the manufacturer complete with one end sealedwith an appropriate insulating material with high electrical insulation, for example silicone elastomer; see Figure 4.* – 20 – IEC 61386-1:2008+AMD1:2017 CSV · IEC 2017 *Pliable and flexible conduit samples are bent into a "U" shape and then immersed;*	Cl 12 of IS 9537:Part1 may be modified as follows to align with IEC 61386:part1 **12. ELECTRICAL CHARACTERISTICS** 12.1 Insulating conduits shall have adequate electrical strength and insulation resistance. Compliance is checked by the test given in 12.1.1 and 12.1.2, which is made on three samples of appropriate length. The end of each sample is provided with a conductive coating at least of 10 mm length. *The salt water solution is made by completely dissolving 1 g/l of sodium chloride. The salt water solution is poured into the open end of the conduit to match the external level. An electrode is placed inside the conduit and another placed into the tank* 12.1.1 Electrical Strength - The samples are bent and immersed over a length of 1 m in water at a temperature of 27 ± 5°C, as shown in Fig. 4, a length of about 100 mm

	Fig. 4, a length of about 100 mm at each end being kept above the water level. Water is then poured into the sample so that the levels inside and outside are approximately the same and one electrode is immersed in the water inside each sample and another electrode in the water outside. After 24 hours, a voltage of 2 000 V, ofsubstantially sine-wave form and having a frequency of 50 Hz, is applied for 15 minutes between the electrodes. No breakdown shall occur during the test.	*see Figure 5.* *The salt water solution is made by completely dissolving 1 g/l of sodium chloride.* *The salt water solution is poured into the open end of the conduit to match the external level.* *An electrode is placed inside the conduit and another placed into the tank.* **11.3.1.2** *After 24 h ± 15 min, an a.c. voltage is applied across the two electrodes, gradually being increased from 1 000 V to 2 000 V of substantially sine wave form and having a frequency of 50 Hz to 60 Hz between 45 Hz and 65 Hz is applied across the two electrodes.* *Having reached 2 000 V, the voltage is maintained for a period of 15 min* 0 + 5 *s. The voltage is then gradually increased from 1 000 V to 2 000 V a.c. Once the maximum voltage has been reached it shall be maintained for a period of 60* 5 0 + *s. The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage, the output current is of at least 200 mA. The overcurrent relay shall not trip when the output current is less than 100 mA. Care is taken that the r.m.s. value of the test voltage applied is measured within ± 3 %. The samples shall be considered to have adequate electrical insulating strength if a 100	at each end being kept above the water level. Water is then poured into the sample so that the levels inside and outside are approximately the same and one electrode is immersed in the water inside each sample and another electrode in the water outside. *After 24 h ± 15 min, an a.c. voltage of substantially sine wave form and having a frequency of 50 Hz is applied across the two electrodes. The voltage is then gradually increased from 1 000 V to 2000 V a.c. Once the maximum voltage has been reached it shall be maintained for a period of 60* +5/-0 s. No breakdown shall occur during the test. *The high-voltage transformer used for the test is so designed that, when the output terminals are short-circuited after the output voltage has been adjusted to the appropriate test voltage,the output current is of at least 200 mA. The overcurrent relay shall not trip when the output current is less than 100 mA. Care is taken that the r.m.s. value of the test voltage applied is measured within ± 3 %. The samples shall be considered to have adequate electrical insulating strength if a 100 mA trip device, incorporated into the circuit, does not trip during the test.* **12.1.2 Insulation Resistance** - *Immediately after the test in* **12.1.1**, *the same samples shall be subjected to an electrical insulation resistance test. A d.c. voltage of 500 V shall be applied across the two electrodes.* *After (60 ± 2) s from the application of the voltage, the insulation resistance between the electrodes shall be obtained. Conduits shall be considered to have adequate electrical insulation resistance if the measured resistance is greater than 100 MΩ* NOTE - The voltage it applied to the conductive coating in order to exclude any leakage current along the exposed surface.

		mA *trip device, incorporated into the circuit, does not trip during the 15 min test.* **11.3.1.3** *Immediately after the test in 11.3.1.2, the same samples shall be subjected to an electrical insulation resistance test. A d.c. voltage of 500 V shall be applied across the two electrodes.* NOTE In accordance with 422.3.4 of IEC 60364-4-42:2010 and Annex F of IEC 60364-5-52:2009, flame propagating conduits are not suitable for use in buildings, unless embedded in non-combustible material, such as concrete. **11.3.1.4** *After (60 ± 2) s from the application of the voltage, the insulation resistance between the electrodes shall be obtained. Conduits shall be considered to have adequate electrical insulation resistance if the measured resistance is greater than 100 MΩ .*	
	13. EXTERNAL INFLUENCES 13.1 Conduits shall have adequate protection against external influences. The influences included here are ingress of water or oil or building materials, low or high temperatures, corrosive and polluting substances and solar radiation. NOTE - Tests for low and high temperatures are covered in 9.4, 9.5 and 10. 13.2 Ingress of Water -	**14 External influences** **14.1 Degree of protection provided by enclosure** **14.1.1 General** Conduit systems, when assembled in accordance with the manufacturer's instructions, shall have adequate resistance to external influences according to the classification declared by the manufacturer, with a minimum requirement of IP30. *Compliance is checked by the tests given in 14.1.1 and 14.1.2.* **14.1.2 Degree of protection – Ingress of foreign solid objects** **14.1.2.1** *An assembly is made of conduit and*	Cl 13 of IS 9537:part 1 may be change as follows: **13 External influences** Conduit systems, when assembled in accordance with the manufacturer's instructions, shall have adequate resistance to external influences according to the classification declared by the manufacturer, with a minimum requirement of IP30. Compliance is checked by the tests given in 13.1 and 13.2. **13.1 Degree of protection – Ingress of foreign solid objects** 13.1.1 An assembly is made of conduits using all conduit entries. Where

	under consideration. 13.3 Ingress of Solid Foreign Bodies - under consideration.	*conduit fittings using all conduit entries. Where necessary, any open ends of the assembly are plugged, or are not part of the test.* **14.1.2.2** *The assembly shall be tested in accordance with the appropriate test of IEC 60529.* *For numeral 5, category 2 applies.* **14.1.2.3** *The assembly, tested for numeral 5 or 6, shall be deemed to have passed the test if there is no ingress of dust visible to normal or corrected vision without magnification.* **14.1.3 Degree of protection – Ingress of water** **14.1.3.1** *An assembly is made of conduit and conduit fittings using all conduit entries. Where necessary, any open ends of the assembly are plugged, or are not part of the test.* **14.1.3.2** *The assembly shall be tested in accordance with the appropriate test of IEC 60529.* *For numerals 3 and 4, the oscillating tube shall be used.* **14.1.3.3** *The assembly, tested for numeral 1 and above, shall be deemed to have passed the test if there is not sufficient ingress of water to form a drop visible to normal or corrected vision without magnification.*	necessary, any open ends of the assembly are plugged, or are not part of the test. 13.1.2 The assembly shall be tested in accordance with the appropriate test of IEC 60529. For numeral 5, category 2 applies. 13.1.3 The assembly, tested for numeral 5 or 6, shall be deemed to have passed the test if there is no ingress of dust visible to normal or corrected vision without magnification. **13.2 Degree of protection – Ingress of water** 13.2.1 An assembly is made of conduit and conduit fittings using all conduit entries. Where necessary, any open ends of the assembly are plugged, or are not part of the test. 13.2.2 The assembly shall be tested in accordance with the appropriate test of IEC 60529. For numerals 3 and 4, the oscillating tube shall be used. 13.2.3 The assembly, tested for numeral 1 and above, shall be deemed to have passed the test if there is not sufficient ingress of water to form a drop visible to normal or corrected vision without magnification.