The Indian Standard IS 17293:2020 provides specifications for electric cables utilized in photovoltaic (PV) systems, particularly those with rated voltages exceeding 1500 V d.c. These cables are integral to PV systems, connecting solar panels and other components while enduring harsh outdoor environments characterized by ultraviolet radiation, moisture, and fluctuating temperatures.

The cable structure comprises a conductor, insulation and sheath. The conductor is typically constructed using Class 5 conductors for free-moving applications and Class 2 conductors for fixed installations. The insulation and sheath are made from cross-linked compounds designed to withstand elevated temperatures and resist environmental degradation. For instance, these cables can operate at a continuous conductor temperature of 90°C, with a maximum permissible temperature of 120°C for a duration of up to 20,000 hours.

Testing is an integral component of this standard, encompassing various aspects such as electrical, mechanical, thermal, and environmental durability. Key tests include:

1.**Thermal Endurance:** This test ensures that the insulation and sheath can withstand elevated temperatures over extended periods, which is crucial as PV cables are frequently exposed to direct sunlight.

2. **UV and Weather Resistance:** Since PV cables are installed outdoors, they undergo testing for ultraviolet stability and resistance to environmental conditions. A sample is subjected to ultraviolet light and moisture cycles, and the material's tensile strength and elongation at break are measured to ascertain its resilience.

3. **Electrical Tests:** These encompass voltage tests (ac or dc) on the completed cable and insulation resistance measurements at various temperatures, simulating real-world electrical loads. Long-term d.c. resistance testing assesses the insulation's durability over time, thereby preventing potential failures in PV systems due to cable degradation.

4. **Mechanical Strength:** Tests such as cold impact, cold bending, and dynamic penetration assess the cables' resistance to mechanical stress, ensuring their integrity even under extreme conditions such as low temperatures or physical impact.

5. **Chemical Resistance:** The sheath material undergoes acid and alkaline resistance tests, which are crucial in areas where environmental pollution may affect the cable's durability.

Impact of the Standard on UN SDGs:

Standards for electric cables in PV systems, such as IS 17293:2020, play a pivotal role in advancing several Sustainable Development Goals (SDGs), including SDG 7, SDG 9 and SDG 11. By ensuring the reliability, durability, and efficiency of solar power infrastructure, these cables contribute to a stable and expanding renewable energy framework. This framework facilitates a transition to clean energy, supports sustainable urban and industrial development, and aligns with global climate action efforts.