SPECIFICATION FOR RE-FILLING OF SF6 GAS CYLINDERS

1. **GENERAL**:
   This specification governs the technical and statutory requirements for re-filling of empty SF6 gas cylinders provided by BHEL.

2. **APPLICATION**:
   For SF6 circuit breakers and gas insulated power equipments.

3. **COMPLIANCE WITH NATIONAL/INTERNATIONAL STANDARDS :**
   a) **IEC: 60376 and IS -13072**:SF6 (Sulphur Hexafluoride) gas shall conform to these standards.
   b) **IEC 61634**: To establish appropriate health and safety practices and to determine the applicability of regulatory limitations prior to use. Also, disposal of these items should be carried out according to local regulations with regard to the impact on the environment. Every precaution shall be taken to prevent the release into the environment of sulphur hexafluoride as per this standard.

4. **TECHNICAL SPECIFICATIONS** :
   a) **Cylinder Capacity**: The empty cylinders provided by BHEL will have water capacity 40 liters and weight of SF6 gas in each cylinder should be approximately 50kg.

5. **TESTING ON SF6 GAS**
   I) Purity Test

Content	Specification	Analytical methods (for indication only, not exhaustive)	Precision
Air	2 g/kg [note 1] max	Infrared absorption method	35 mg/kg
		Gas-chromatographic method	3 – 10 mg/kg
		Density method	10 mg/kg
CF4	2.400 mg/kg [note 2] max	Gas-chromatographic method	9 mg/kg

Content	Specification	Analytical methods (for indication only, not exhaustive)	Precision
H2O	25 mg/kg [note 3]	Gravimetric method	0,5 mg/kg[note 5]
		Electrolytic method	2 – 15 mg/kg
		Dew point method	1 ℃
Mineral Oil	10 mg/kg	Photometric method	< 2 mg/kg
		Gravimetric method	0,5 mg/kg [note 5]
Total acidity expressed in HF	1 mg/kg [note 4]	Titration	0.2 mg/kg

NOTE 1 2 g/kg is equivalent to 1 % vol under ambient conditions (100 kPa and 20 ℃).
NOTE 22.400 mg/kg is equivalent to 4µl/l under ambient conditions (100 kPa and 20 ℃).
NOTE 3 25 mg/kg (25 mg/kg) is equivalent to 200 µl/l and to a dew point of –36 ℃, measured at ambient conditions (100 kPa and 20 ℃).
NOTE 4 1 mg/kg is equivalent to 7.3 µl/l under ambient conditions (100 kPa and 20 ℃).
NOTE 5 Depending on the sample size.

Due to the maximum impurity levels that can be present in SF6, the SF6 amount in a container (measured in the liquid phase), shall be higher than 99.7 % in weight.

II) SF6 gas shall also be tested for dew point and hydrolysable fluorides contents other than those mentioned at Sl No. I of Clause-5 as per IEC: 376, 376A & 376B and test certificates shall be furnished to BHEL indicating all test results as per IEC standards for each lot of SF6 gas.

6. TRANSPORATION

Transport of SF6 shall be carried out in accordance with national and international regulations. However, it is recommended to legibly mark the containers at the valve end and preferably on the cylindrical part of the body.

Cylinders can be shipped on the deck in conformance with shipping regulations.

7. DOCUMENTS TO BE SUPPLIED BEFORE SHIPMENT:

a. Documents necessary for obtaining the approval of the chief controller of Explosives for License to import the SF6 gas in cylinders shall be supplied at the appropriate time. If the chief controller of Explosives asks for additional information or suggests any change in the cylinders or valves, the same shall be compiled by the supplier.

b. The supplier shall not ship the cylinders filled with SF_6 gas until we obtain the license from the chief controller of explosives and the same is communicated by us in writing.

c. A material safety data sheet (MSDS) shall be provided by the supplier.

In case the gas is imported by the local representative and he has complied with above regulations, the supplier shall submit a copy of above document for ready reference of BHEL prior to supply.

8. MATERIALS & DOCUMENTS TO BE PROVIDED BY BHEL

a. After PO placement, empty SF6 Gas cylinders shall be provided by BHEL, Bhopal on returnable basis. Returnable gate pass shall be issued by the planning department for number of cylinders required for re-filling.

b. Test reports of cylinders shall be provided by BHEL.

9. GUARANTEE

1. The supplier shall guarantee against purity of SF6 Gas.
2. Supplier shall guarantee that the SF6 supplied is non-toxic, taking into account the local regulations and state-of-the-art knowledge.

10. ACCEPTANCE CRITERIA:

a. Conformance to relevant IEC Standards/IS Standards as per Clause 3.

b. Routine Tests certificate as per Clause 5 for each lot of SF6 gas.