

# TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENTS HANDBOOK

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### **Testing and Commissioning of Electrical Equipment: A Comprehensive Guide**

Proper testing and commissioning of electrical equipment are crucial for ensuring their safety, reliability, and performance. This handbook provides a comprehensive guide to these essential processes.

#### **1. What is the Purpose of Electrical Equipment Testing?**

Electrical equipment testing verifies that the equipment meets the manufacturer's specifications, applicable codes and standards, and is safe and functional for its intended use. It helps detect manufacturing defects, insulation failures, and other potential problems.

#### **2. What is Commissioning?**

Commissioning involves a series of tests and inspections performed after electrical equipment installation to ensure proper operation. It includes verifying wiring connections, load balancing, and performance parameters. Commissioning verifies that the equipment meets design specifications and is ready for service.

#### **3. What Types of Tests are Performed?**

Electrical equipment testing includes a wide range of tests, such as:

- Insulation resistance testing

- Megger testing
- Hi-pot testing
- Loop impedance testing
- Protective device testing
- Functional testing

#### **4. What Standards Cover Electrical Equipment Testing and Commissioning?**

Numerous standards govern electrical equipment testing and commissioning, including:

- IEEE Std 1584.1 (Standard for AC High-Voltage Circuit Breakers Rated on a Symmetrical Current Basis)
- NFPA 70E (Standard for Electrical Safety in the Workplace)
- IEC 61850 (Communication Networks and Systems for Power Utility Automation)

#### **5. What are the Benefits of Proper Testing and Commissioning?**

Thorough testing and commissioning of electrical equipment offers numerous benefits, including:

- Improved safety for personnel and equipment
- Reduced downtime and maintenance costs
- Enhanced system reliability and performance
- Compliance with codes and standards
- Reduced insurance premiums

### **Thermodynamics Questions and Answers for Mechanical Engineering**

#### **1. What is the first law of thermodynamics?**

The first law of thermodynamics states that energy cannot be created or destroyed, only transferred or transformed. In other words, the total energy of an isolated system remains constant.

## **2. What is the second law of thermodynamics?**

The second law of thermodynamics states that the entropy of an isolated system never decreases. Entropy is a measure of disorder or randomness. This law implies that systems tend to become more disordered over time.

## **3. What is a thermodynamic system?**

A thermodynamic system is any region of space that is isolated for the purpose of analysis. The system interacts with its surroundings through the exchange of energy and matter.

## **4. What is a thermodynamic process?**

A thermodynamic process is a change in the state of a system. Processes can be classified as isothermal (constant temperature), adiabatic (no heat transfer), isobaric (constant pressure), or isochoric (constant volume).

## **5. What is the Carnot cycle?**

The Carnot cycle is a theoretical thermodynamic cycle that describes the most efficient way to convert heat into work. The cycle consists of two isothermal and two adiabatic processes.

## **The Struggles of John Brown Russwurm: A Pan-Africanist Pioneer**

### **1. Who was John Brown Russwurm?**

John Brown Russwurm (1799-1851) was a pioneering journalist, abolitionist, and Pan-Africanist. Born free in Jamaica, he immigrated to the United States in 1827 and became the first African American editor of a newspaper, "Freedom's Journal."

### **2. What were the struggles faced by Russwurm?**

Russwurm's life was marked by challenges due to his race and the prevailing prejudices of his time. He faced discrimination, threats, and even physical violence for his work advocating for the rights of African Americans and promoting Pan-Africanism.

### **3. What is the significance of James Winston's book on Russwurm?**

James Winston's "The Struggles of John Brown Russwurm" is a comprehensive biography and annotated edition of Russwurm's writings. The book provides an in-depth exploration of his life, activism, and intellectual contributions.

### **4. Why is Russwurm considered a pioneer of Pan-Africanism?**

Russwurm was a vocal advocate for Pan-African unity and solidarity. He believed in the importance of collaboration among African people around the world to fight for their rights and self-determination. His newspaper, "Freedom's Journal," became a platform for discussing Pan-African issues and fostering connections between African Americans and their counterparts in Africa and the Caribbean.

### **5. What is the legacy of John Brown Russwurm?**

Russwurm's legacy as a pioneer of Pan-Africanism and a fearless advocate for equality continues to inspire generations of activists and scholars. His writings and activism played a crucial role in shaping the discourse on race and freedom in the United States and the broader African diaspora.

**What is the ASME standard for rigging?** ASME B30. This standard covers the design, marking, manufacturing, testing, inspection, installation, maintenance, and use of various rigging hardware components.

**What is ASME B30-26 standard?** B30. 26 applies to the construction, installation, operation, inspection, and maintenance of detachable rigging hardware used for load handling activities in conjunction with equipment described in other volumes of the B30 Standard.

**What is the ASME B30 21 standard?** B30. 21 applies to the construction, installation, operation, inspection, and maintenance of ratchet and pawl and friction brake type lever chain, rope and web strap hoists used for lifting, pulling, and tensioning applications.

**What is the ASME B30 16 standard?** B30. 16 is a manufacturing standard for powered hoists from the American Society of Mechanical Engineers (ASME).

**What is the ASME 16.25 standard?** This Standard covers the preparation of butt welding ends of piping components to be joined into a piping system by welding. It includes requirements for welding bevels, for external and internal shaping of heavy-wall components, and for preparation of internal ends (including dimensions and tolerances).

**What is the difference between ASME B16 5 and B16 36?** 36 is a standard that covers flanges which are similar to those components covered in standard ASME B16. 5. The only difference between these two standards is that the ASME B16. 36 Orifice Flange has orifice pressure differential connections.

**What is the ASME B 31.2 code used for?** This Code covers the design, fabrication, installation, and testing of piping systems for fuel gases such as natural gas, manufactured gas, liquefied petroleum gas (LPG)-air mixtures above the upper combustible limit, liquefied petroleum gas (LPG) in the gaseous phase, or mixtures of these gases.

**How much wear is allowed on rigging hardware items?**

**What does the ASME B30 5 apply to?** It addresses crawler cranes, locomotive cranes, wheel-mounted cranes, and any variations thereof that retain the same fundamental characteristics and are powered by internal combustion engines or electric motors.

**What is the ASME code B30-20?** Volume B30. 20 includes provisions that apply to the marking, construction, installation, inspection, testing, maintenance, and operation of below-the-hook lifting devices, other than components addressed by other ASME B30 volumes or other standards, used for attaching loads to a hoist.

**What is ASME B30-23?** 23 may apply to hoisting and accessory equipment covered within certain volumes of the ASME B30 Standard, which is used to lift, lower, hold, or transport personnel in a platform, by wire rope or chain, from hoist equipment, or by a platform that is mounted on a boom of the hoist equipment.

**Do carabiners meet ASME B30 standards to be utilized in rigging?** When rigging for material handling, carabiners are not to be used, because of the ASME B30. 26 standard. ASME B30 does not test carabiners for lifting. ASME B30 does

not rate for shock loading – as that is not allowed for material lifting hardware – PPE is a different matter.

**What is ASME B30 10?** The ASME B30. 10 standards cover the inspection of hooks for all hoists, cranes and rigging devices. B30. 10 requires that hooks be visually inspected during the normal course of use by the operator as well as periodically by a designated or qualified individual.

**What is ASME B30 9?** The American Society of Mechanical Engineers or ASME has set standards for industrial lifting and rigging equipment of all shapes and sizes. The ASME B30. 9 standard specifically deals with load-handling lifting slings. It covers everything about lifting slings, including: Attachment.

**What is ASME B30-26?** This Standard applies to the construction, installation, operation, inspection, maintenance, and safe use of lift- ing equipment used in construction and industrial set- tings.

**What is ASME B 16.5 used for?** B16. 5 is limited to flanges and flanged fittings made from cast or forged materials, and blind flanges and certain reducing flanges made from cast, forged, or plate materials. Also included in this Standard are requirements and recommendations regarding flange bolting, flange gaskets, and flange joints.

**What is the difference between ASME B16 20 and B16 21?** ASME B16. 20 covers metal ring-joint gaskets, spiral-wound gaskets, and metal- jacketed gaskets for use with raised-face and flat-face flanges. ASME B16. 21 covers nonmetallic flat gaskets.

**What is ASME B16 34 used for?** The content of American Society of Mechanical Engineers (ASME) Standard B16. 34 is essential to those who deal with flanged, threaded, and welded-end valves. The standard covers pressure-temperature ratings, materials, marking, and other characteristics of cast, forged, and fabricated valves.

**Is asme B16 5 the same as ANSI?** Yes, the standard is often referred to as ANSI B16. 5. The American National Standards Institute (ANSI) accredits the American Society of Mechanical Engineers (ASME).

**What is ASME B16-35?** Flange Applications: Water works, shipbuilding industry, petrol chemical & gas industry, power industry, valve industry, and general pipes connecting projects etc.

**What is the ASME B16 47 equivalent to?** 47 standard includes two flange series, ASME B16. 47 series A standard is equivalent to MSS SP-44 (the 1996 Edition of MSS SP-44 complies with B16. 47 tolerance), ASME B16. 47 series B standard is equivalent to API 605 (API 605 has been cancelled).

**What is ASME B 31.3 standard?** ASME B31. 3 contains requirements for piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals.

**What is the difference between ASME B16 47 A and B Series A?** 47 Series A vs Series B? Physical attributes for Series A flanges are typically thicker in flange thickness, heavier in weight, and have large diameter bolt holes in comparison to Series B in the same size and pressure rating.

**What is ASME b36?** 19 covers standard specifications for seamless and welded pipe grades that are designed to work in high as well as low pressure and temperature applications. The ASME B 36.19 can also be used for non-ferrous grade pipes such as titanium, zirconium, copper, and aluminum.

**What is ASME ANSI B16 5 standard for?** ASME B16. 5 is the standard specification for pipe flanges and flanged fittings sized from NPS 1/2 (DN 15) to NPS 24 (DN 600). It is the most widely used flange standard in piping industry. This standard is developed by the sectional Committee B16 of American Standards Association (ASA).

**What is the ANSI ASME 13.1 standard?** ANSI/ASME A13. 1 is the broadest and most common recommendation for pipe marking in the United States. The standard has been revised over time, with the biggest change in 2007 when the old ANSI pipe labeling standard was combined with recommendations from the American Society of Mechanical Engineers (ASME).

**What is the ASME Code for lifting?** ASME B30. 23-2022: Personnel Lifting Systems is the safety standard for the construction, installation, operation, TESTING AND COMMISSIONING OF ELECTRICAL EQUIPMENTS HANDBOOK

inspection, testing, maintenance, and use of cableways, cranes, derricks, hoists, hooks, jacks, and slings used to lift, lower, hold, or transport personnel.

**What is the ASME B30 safety standard?** As stated, the ASME safety standards are designed to protect those operating and working around cranes and other heavy lifting machines. ASME B30 standard is the section entitled "Safety Standard for Cableways, Cranes, Derricks, Hoists, Hooks, Jacks, and Slings."

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**What is the difference between ASME B16 9 and ANSI B16 9?** ANSI B 16.9 9, It is a standard for all the weld fittings that are wrought butt welded and are produced in factories that range from NPS ½ to NPS 48". ASME B16. 9 is integrated by MSS SP43 which comprises the stainless steel and nickel alloy fittings.

**What is the difference between ASME and ANSI?** ANSI establishes and accredits performance and quality standards for products and services in a wide variety of sectors, while ASME is primarily focused on boilers and pressure vessels.

**What is the ANSI standard s1 13 2005?** This standard specifies requirements and describes procedures for the measurement of sound pressure levels in air at a single point in space. These requirements and procedures apply primarily to measurements performed indoors but may be utilized in outdoor measurements under specified conditions.

**What is ANSI ASME SEC B31 9?** ASME B31. 9 prescribes requirements for the design, materials, fabrication, installation, inspection, examination, and testing of piping systems for building services. It includes piping systems in the building or within the property limits.



**What is the ASME standard for slings?** Specifically, ASME B30. 9-2021: Slings addresses slings fabricated from alloy steel chain, wire rope, metal mesh, synthetic fiber rope, synthetic webbing, and polyester and high performance fiber yarns in a cover (or covers).

**What series of ASME standards pertains to the safety of cranes and rigging?**

The ASME B30 Safety Standard is a suite of 30 volumes governing safe lifting practices. These American National Standards are written by the American Society of Mechanical Engineers. They cover cranes of all descriptions, as well as rigging and other below-the-hook equipment.

**What is the ASME 17.1 standard?** The ASME 17.1 elevator and escalator safety code covers the design, construction, operation, inspection, testing, maintenance, alteration, and repair of hoisting and lowering mechanisms, equipped with a car or platform, when that hoisting mechanism is located in or adjacent to a structure. This includes: Elevators.

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**What is ANSI ASME B30 5?** B30. 5 offers comprehensive solutions applying to the construction, inspection, testing, maintenance and operation of mobile and locomotive cranes. It is to be used in conjunction with equipment described in other volumes of the ASME B30 series of safety standards.

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