

IEEE Recommended Practice for Unique Identification in Hydroelectric Facilities

IEEE Power & Energy Society

Sponsored by the
Energy Development and Power Generation Committee

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Abstract: A unique identification system for hydroelectric facilities that segregates and incorporates plant, unit, system, and component identifiers as a minimum is provided.

Keywords: coding, component, device, identification, IEEE 807, reporting, tagging

The Institute of Electrical and Electronics Engineers, Inc.
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Introduction

This introduction is not part of IEEE Std 807-2011, IEEE Recommended Practice for Unique Identification in Hydroelectric Facilities.

In April 1979, the Unique Identification in Power Plants Working Group of the Station Design Subcommittee was formed and charged with the task of producing a series of recommended practices for unique identification in power plants. The scope of the project was later extended to include power plant “related facilities.”

The resultant series of recommended practices, entitled the Energy Industry Identification System (EIIS), provided a single source for unique identification of systems, structures, and components for all types of power generation and related facilities with provision for the inclusion of currently established plant system identifier codes. Using this series of recommended practices, which included principles, a table of component-function identifier codes, implementation instructions, and system descriptions for the various types of power plants and related facilities, a user would be able to correlate a system, structure, or component with another organization for purposes of reporting, comparison, or general communication. Numerous safety and convenience benefits have been derived from this concept. IEEE Std 803.1™-1992 [B6] provided a table of component function identifiers for general use in developing unique identification codes for nuclear and fossil-fueled power-plant projects.^a

The original purpose of this working group was to generate an industry-wide language of communication that could be employed by users at the interface of their organizations and that would not require users to change a viable identification concept that they were already using internally. In the event that the users do not have a viable identification concept of their own, they are encouraged to employ the concept described herein for their internal applications because of its successful application by electrical utilities, architectural engineers, and consulting firms.

In September 1984, a working group was formed to develop EIIS for hydroelectric plants. The project was subsequently withdrawn when it was recognized that hydroelectric facilities, including pumped-storage facilities, are comprised of many specialized systems and equipment types not in common with steam generating plants. Because of the unique structures and components found in hydro plants, consensus was reached within the Energy Development and Power Generation Committee that development of a recommended practice for unique identification in hydroelectric facilities should be delegated to the Hydroelectric Power Subcommittee.

In October 2002, the Unique Identification in Hydroelectric Facilities Working Group of the Hydroelectric Power Subcommittee was formed and charged with the task of developing a recommended practice for unique identification with emphasis on hydroelectric facilities.

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Randall C. Groves, *Chair*

Jay A. Anders
David B. Apps
Terry Bauman
Bruce A. Benson
Steven R. Brockschink
Matthew T. Davis
Russ J. Fostiak
George K. Girgis
R. Dale Harris

John Kelly
David L. Kornegay
Lucas A. Kunz
Charles A. Lennon, Jr.
Lawrence D. Long
Cliff F. Malm
Cory Maurer
Edward P. Miska
Alex Morrison

Hans Naeff
Zhang Runshi
Douglas B. Seely
Chris Shultz
Philip A. Spotts
William W. Terry
Wayne Timm
Eric Vaughn
John B. Yale

The following members of the individual balloting committee voted on this recommended practice. Balloters may have voted for approval, disapproval, or abstention.

William J. Ackerman
Steven R. Brockschink
Matthew T. Davis
Gary Donner
Gary Engmann
Russ J. Fostiak
Randall C. Groves
James Gurney
Werner Hoelzl
Piotr Karocki

David L. Kornegay
Jim Kulchisky
Chung-Yiu Lam
Charles A. Lennon, Jr.
Lawrence D. Long
Greg Luri
O. Malik
Don McLaren
Michael S. Newman
Lorraine Padden
Christopher Petrola

Charles Rogers
Bartien Sayogo
Douglas B. Seely
Gil Shultz
James Smith
Gary Stodter
Wayne Timm
James Timperley
John Vergis
John B. Yale

When the IEEE-SA Standards Board approved this recommended practice on 10 September 2011, it had the following membership:

Richard H. Hulett, *Chair*
John Kulick, *Vice Chair*
Robert M. Grow, *Past Chair*
Judith Gorman, *Secretary*

Masayuki Ariyoshi
William Bartley
Ted Burse
Clint Chaplin
Wael Diab
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Alexander Gelman
Paul Houzé

Jim Hughes
Joseph L. Koepfinger*
David J. Law
Thomas Lee
Hung Ling
Oleg Logvinov
Ted Olsen

Gary Robinson
Jon Walter Rosdahl
Sam Sciacca
Mike Seavey
Curtis Siller
Phil Winston
Howard L. Wolfman
Don Wright

*Member Emeritus

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Don Messina
IEEE Standards Program Manager, Document Development

Laurie Policastro
IEEE Standards Program Manager, Technical Program Development

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1. Overview

1.1 Scope

This recommended practice provides a unique identification system for hydro facilities that segregates and incorporates plant, unit, system, and component identifiers as a minimum.

1.2 Purpose

This recommended practice can be used as a unique identification system to delineate failure reporting, maintenance management, and design. The unique identification system is structured to allow expansion of the identifiers in a standard format to the level of detail that may be required.

1.3 General

Identification systems are used throughout hydroelectric plant design, construction, and maintenance. Unique identification is useful for maintenance and operating procedures, safety and clearance tagging, maintenance planning, and inventory control. Many systems are in use, including standard and individual owner developed systems.

Unique identification systems typically use an alphanumeric code to designate a specific equipment or system. The characters or numbers in the alphanumeric code are given specific meaning relating to the eventual unique description of a specific equipment or system.

Systems using unique identifiers do exist for reporting the failure and outages of hydroelectric equipment such as the North American Electric Reliability Corporation's (NERC) Generating Availability Data System (GADS). This structure tends to be limited to high-level reporting and is not used in low-level reports such as inventory or maintenance. NERC does maintain a large database for recording generation failures, the type of failure, the equipment that failed, and the length of the outage. The database is generally used for comparison purposes and benchmarking performance. Hydroelectric generation is recognized as a unique type of generation in the database.

It has become common practice for owners of generating facilities to utilize inventory, labor, and maintenance scheduling programs that employ unique identifiers. These identifiers can be used to track a variety of items that have meaning to the owner such as labor hours expended on a particular task, the tools and inventory used, and specific equipment or system involved. Some suppliers of maintenance programs require proprietary identifiers be used within their program, and others allow facility owners to develop their own identification schemes.

Often owners of facilities require that equipment and systems be uniquely identified on the drawings of record. The Instrument Society of America (ISA), now known as The International Society of Automation, developed one such system, originally known as S5.1, which was adopted by the American National Standards Institute (ANSI) and has been used for identification of process control instruments and devices. Another system for identification of electrical control, monitoring, and protective devices is presented in IEEE Std C37.2TM.¹

A system, common in Europe, for generating unique identifiers is the KKS system. KKS is the widely used abbreviation for Kraftwerk-Kennzeichensystem that translates to "identification system for power plants" and will be discussed later in this recommended practice (see 6.2). North America does not have a common practice though the Energy Industry Identification System (EIIS), as described in IEEE Std 803TM-1983 [B5], IEEE Std 803.1TM-1992 [B6], and IEEE Std 804TM-1983 [B7], with user-customized variations frequently used. An example will be developed later in this recommended practice.²

A goal of a commonly used unique identifier system is to be able to benchmark one plant, equipment, or system against similar equipment. Attempts have been made to achieve this goal though none have been universally accepted.

In addition to alphanumeric naming, power plant systems employ other means of identification coding. For example, visual codes provide color, shape, or positional clues to the operator. Acoustic and tactile codes are provided to focus attention to particular control events. These additional coding principles are discussed in detail within IEC 60073 [B1]. Coding methods not involving some combination of alphabetic and numeric identification codes are not covered within this recommended practice.

¹ Information on references can be found in Clause 2.

² The numbers in brackets correspond to those of the bibliography in Annex A.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

ANSI/ISA-5.1, Instrumentation Symbols and Identification (formerly ANSI/ISA-S5.1).³

IEEE Std C37.2, IEEE Standard for Electrical Power System Device Function Numbers, Acronyms, and Contact Designations.^{4, 5}

3. Definitions

For the purposes of this document, the following terms and definitions apply. *The IEEE Standards Dictionary: Glossary of Terms & Definitions* or IEC TR 61364 [B3] should be referenced for terms not defined in this clause.⁶

component: A part or assembly of parts that is viewed as an entity for the purposes of design, operation, and reporting.

component function identifier: An alphanumeric code that identifies the function that will be performed by a component. Reference codes have been established for the basic functions performed by the principal components currently in use in hydroelectric power plants and related facilities.

function: Normal or characteristic action of a component or the system of which it is a part.

4. Structure description

4.1 General

Unique Identification of hydroelectric facility systems and components is a useful tool for communication and control during all phases of engineering, procurement, construction, operation, and maintenance throughout the life cycle of the facility. Several accounting-type systems exist that can be selected for generating the equipment and system identification codes for use on equipment and in documents. Users should select the method most appropriate for their particular application. The common features of most of the available systems are described in the following subclauses.

³ ANSI publications are available from the Customer Service Department, American National Standards Institute, 25 W. 43rd Street, 4th Floor, New York, NY 10036, USA (<http://www.ansi.org/>). ISA standards are available from the International Society of Automation at <http://www.isa.org/>.

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⁶ *The IEEE Standards Dictionary: Glossary of Terms & Definitions* is available at <http://shop.ieee.org/>.

4.2 Alphanumeric unique identifier

The unique identifier code contains a number of alphabetic characters and numeric digits depending on the system used. Codes with a larger number of characters and digits inherently can specify more information about the system and equipment than more concise codes.

4.3 Structure hierarchy

Systems of unique identifiers usually have a hierarchy. The code begins at a general level such as the plant name, or a representative code, and extends with narrowing focus to a part on a specific piece of equipment. How far down into the equipment or organization the structure is developed is a matter of preference by the user. It is not necessary to repeat the full identifier within a document containing the full identifier. Partial identifiers are permitted within an individual document as long as no ambiguity exists within the overall design package. A user is permitted to use the plant code in some applications and omit it in specific cases such as within the facility.

4.4 Code generation

The different systems of unique identifiers guide the user in selecting an alphabetic character or a number to represent a specific aspect of the component. The complete code, or unique identifier, is fully generated when all the aspects of the equipment have been identified from the highest level to the lowest level. If all users of the same system adhered to the code generation guides, the same type of equipment would have the same unique identifier. This would enable users of the same system to compare the performance of similar equipment or perhaps share inventory parts.

5. Common system characteristics

5.1 Attributes

5.1.1 General

The equipment identification systems that are prevalent in use all assign a unique identifier to each major equipment component that relates that piece of equipment to its location and to its function in the power plant. The identifier is composed of distinct fields, usually separated by dashes that relate the component to its function in the power plant. Fields that are typically used to construct the equipment identifier are as follows.

5.1.2 Location identifier

The total project is divided into discrete functional areas or structures to which a unique identifier is assigned to provide a geographic reference for the item of equipment. Typical locations in a hydroelectric project include the following:

- a) Hydroelectric plant
- b) Each generating unit

- c) Areas that are common to all of the generating units
- d) Switchyard
- e) Areas common to the power plant, unrelated to a specific generating unit
- f) Dam
- g) Reservoir(s)
- h) Recreational facilities
- i) Visitors centers and museums
- j) Project roadways
- k) Warehousing, maintenance, and repair shops

5.1.3 System identifier

Each system is assigned a unique function identifier, which identifies the function being performed by the system. Typical systems in a hydroelectric project include turbine-generator unit, auxiliary electrical power, compressed air, plant and unit controls, cooling water, lubrication, governor, excitation, fire protection, security, heating and ventilation, and plant drainage. Examples of system identifiers (IEEE Std 805TM-1984 [B8], IEEE Std 806TM-1986 [B9]) that have been used in hydroelectric facilities are given in Annex C.

5.1.4 Equipment identifier

The equipment identifier describes the function of the particular device or item of equipment. Typical components in a hydroelectric project include compressors, motors, pumps, limit switches and servomotors (IEEE Std 803.1-1992 [B6]). A more comprehensive listing is provided in Annex D.

5.1.5 Component identifier

A component identifier distinguishes between various devices mounted on a particular equipment assembly. For example, an air compressor is assigned an overall equipment identifier, and each component on the compressor such as the motor and valves is given a distinct component identifier.

5.1.6 Sequence identifier

Sequence numbers or letters are assigned to distinguish similar components that are part of the same system or mounted on the same item of equipment.

Sometimes a field is used to uniquely identify the plant from all other plants of the same organization. However, this field is generally not used on the drawings or equipment labels at the station itself. This identifier is more commonly used as part of an enterprise-wide asset management system to identify uniquely each item of equipment, components, and subcomponents within the entire organization.

5.1.7 Electrical separation identifier

In some facilities electrical separation is used to maximize protection and continuity of vital circuits during abnormal events such as fire or flooding. Where such requirements exist, the electrical separation identifier should be added to the unique identification code where it is carried through the design process, the drawings, cable numbers, and equipment labels throughout the plant.