

Operational and Engineering Asset Identification Handbook based on KKS Standard

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Abstract: The main purpose of this handbook is to define the methods used by NTPC for operational identification, classification and the naming convention of assets in mechanical, civil, electrical and control & instrumentation engineering, based on the KKS standard.

Contents

<i>Glossary</i>	4
1 Introduction	5
1.1 Business case for NTPC’s selection of KKS.....	5
2 KKS Standard.....	6
2.1 Purpose and Area of Application.....	6
2.2 Requirements	6
2.3 Structure and Application.....	7
2.3.1 Process-Related Identification	8
2.3.2 Point of Installation Identification	9
2.3.3 Location Identification	9
2.4 Structure and Contents of the Breakdown levels	10
2.4.1 General.....	10
2.4.2 Total plant (level 0)	10
2.4.3 Function (level 1)	11
2.4.4 Equipment (level 2).....	11
2.4.5 Component (level 3)	12
3 NTPC’s Asset Coding Concept for Asset Identification Codes (AICs)	13
3.1 Asset Identification Code (AIC) levels.....	13
3.1.1 Facility Codes (level -1)	15
3.1.2 Equipment Group (level 0).....	16
3.1.3 NTPC Keys for Asset Coding.....	17
3.1.4 Equipment Unit Codes (level 2)	26
3.1.5 Component Codes (level 3).....	30
3.1.6 Hydro Asset Coding.....	40
3.1.7 Thermal Asset Coding	41
3.1.8 Transmission & Distribution Asset Coding.....	42
3.1.9 Mobile Equipment / Vehicle Asset Coding	47
3.2 Asset Description Generation Concept	48
3.2.1 Asset description generation examples.....	50
4 Governance and Change Management	52

4.1	Transferring assets between locations.....	52
4.2	Code and Naming Convention Governance	55
4.3	Mapping table of AICs to GP fixed asset IDs.....	55
Appendices		56
Appendix A	CMMS field characteristics	56
Appendix B	Background on CMMS and ERP system.....	57
Appendix C	Community Codes	59
Appendix D	Codes from Record Drawing Numbering System	60

Glossary

Definitions of the terms and acronyms used in this handbook are in the table below:

Acronym / Term	Description
AIC	Asset Identification Code
BDL	Break Down Level
CMMS	Computerized Maintenance Management System
DIN	German: D eutsches I nstitut für N ormung English: German Institute for Standardization
ERP	Enterprise Resource Planning system; Microsoft Dynamics Great Plains (GP) at NTPC
FERC	Federal Energy Regulatory Commission
GP	Great Plains, see ERP
GPS	Global Positioning System
I&C	Instrumentation & Control
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
KKS	German: K raftwerk- K ennzeichensystem English: Identification Systems for Power Plants
RTU	Remote Telemetry Unit
SCADA	Supervisory Control and Data Acquisition
VGB	VGB PowerTech Service GmbH in Essen, Germany is the issuer of the KKS standard

1 Introduction

This handbook's main purpose is to define the methods used by the Northwest Territories Power Corporation (NTPC) for operational identification in mechanical, civil, electrical, control & instrumentation engineering, and asset management.

For this purpose, NTPC chose the identification system **KKS**; in German *Kraftwerk Kennzeichen System*, or the "Identification System for Power Plants" to create unique Asset Identifier Codes (AICs) for its integrated utility business in the Northwest Territories.

The AIC system provides classification of assets according to task, type, and location. Asset identifiers linked to the facility and function rather than the specific piece of equipment fulfilling the function.

The KKS key is based on the International Electrotechnical Commission (IEC) and International Organization for Standardization (ISO) standards together with the *Deutsche Industrie Norm* (DIN) 40719 part 2 (IEC 750).

In this handbook, KKS refers to the KKS Guidelines VGB-B 105 E, 7th edition 01/2010 (index E) with ISBN 978-3-86875-329-5.

1.1 Business case for NTPC's selection of KKS

Prior to the development and implementation of NTPC's Computerized Maintenance Management System (CMMS), NTPC did not have a unique asset identification system and naming convention for asset maintenance purposes. NTPC analyzed available options to classify its assets. A unique asset naming convention is needed for any and all CMMS systems for the following reasons:

- Unique AICs facilitate the search of particular assets in an electronic system, while reducing the risk of error;
- To facilitate searching for statistics on an asset, assets need to be uniquely identified in a CMMS to avoid the selection of data from other assets;
- The use of a coding standard ensures standardization of codes of assets and over time a greater ease of searching.

Based on an analysis, the KKS unit asset identification system for power systems and stations identified as a close fit to NTPC's asset identification needs.

The operational AICs and asset descriptions that result out of the use of this handbook are used to create operational assets in the Computerized Maintenance Management System: GuideTi.

KKS Standard

This section provides an overview of the KKS standard. The next section describes how NTPC adopts the KKS standard and how adjusted design concepts are used to support linear assets for electrical transmission and distribution and other asset types not specifically defined in KKS.

**This section serves as a reference for the KKS standard.
NTPC specific instructions for asset coding are described in section 3.**

1.2 Purpose and Area of Application

The power plant identification system is applied to clearly identify plants, systems, parts and components with respect to their purpose, type and location. The content is in accordance with "KKS Identification Systems for Power Stations" issued by VGB Power Tech Service GmbH Essen, Germany.

1.3 Requirements

KKS was designed to meet the following requirements:

- Uniform identification for all types of power stations and any connected processes;
- Sufficient capacity and detail for identification of all systems, components and structures;
- Sufficient capacity for extension to accommodate new technologies;
- Consistent identification for planning, licensing, construction, operation, maintenance and waste management;
- Interdisciplinary applicability to mechanical engineering, civil engineering, electrical and instrument & control engineering combined with ability to identify according to process functions, points of installation and location;
- Consideration of national and international standards;
- Non-language-based coding to ensure international usability;
- Application in computer data processing.

1.4 Structure and Application

The KKS consists of three types of identification:

- 1) The **process-related code** identifies installations and equipment according to their assigned task in the power plant process;
- 2) The **point of installation code** identifies the points of installation within an installation unit (e.g. cubicles, consoles, panels);
- 3) The **location code** identifies the rooms and floors, or other installation sites for installations and equipment in building structures.

A uniform identification structure, with a maximum of three levels (0, 1, 2 and 3), created for all three identification types; the units referred to becoming smaller from left to right. Note that “system code” is also referred to as “function”.

Definitions for prefixes and breakdown symbols for writing these codes are in DIN 40719, part 2. Figure 1 shows the role of the codes on different Breakdown Levels (BDL's).

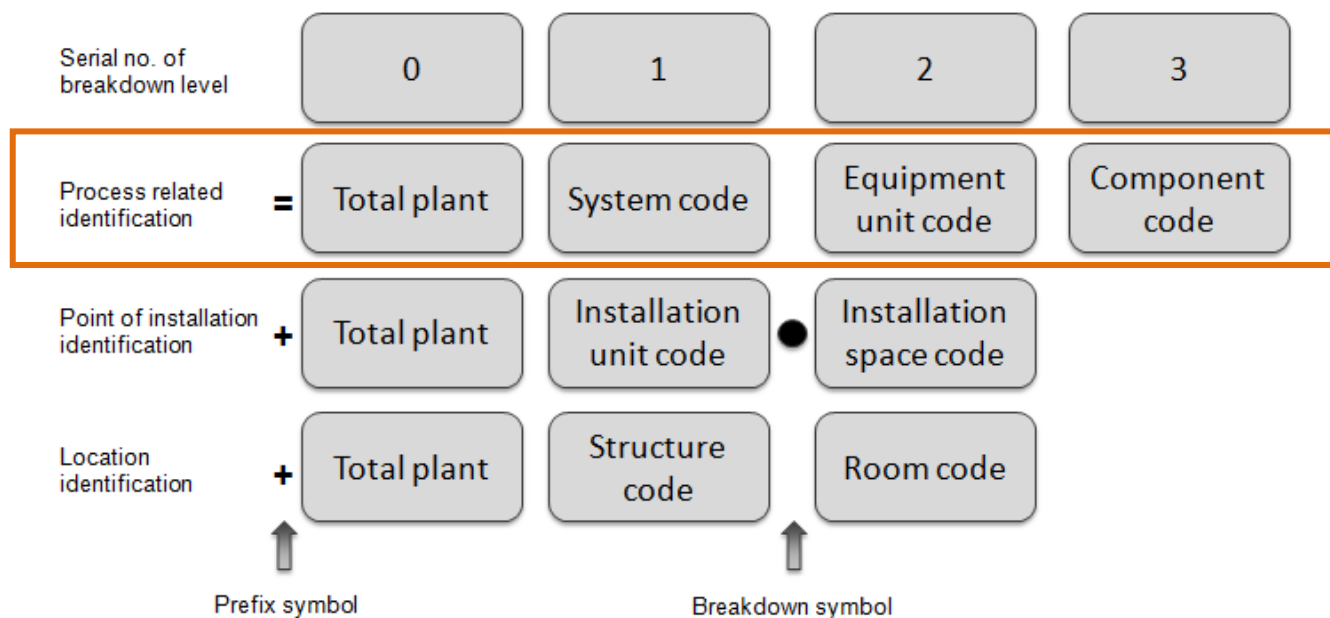


Figure 1 KKS breakdown levels and separators

NTPC uses the process-related identification as the preferred identification type. The asset identification concept in this handbook focuses on that process-related identification type.

1.4.1 Process-Related Identification

In this type of identification, the entire system is subdivided according to the function or process. The process-related identification is for many applications the most important identification. For example, identification of electrical and control equipment, signals, and the identification in circuit diagrams related to particular functions.

In the electrical and instrumentation & control (I&C) engineering sectors, the equipment for auxiliary services, power supply, open loop-control, instrumentation, protection, etc., is treated as a process engineering function. The same applies to structures in civil engineering work. The process-related identification corresponds to the identification block "Plant" in DIN 40719, part 2. This block has the prefix sign "=". According to the standard, the prefix sign can be omitted provided that the identification remains unambiguous.

Serial number of breakdown level	0	1	2	3
Name of breakdown level	Total Plant	Function	Equipment Unit	Component
Example	Unit 1	Feed water system	Pump unit	Pump

Table 1 KKS breakdown levels

Table 1 KKS breakdown levels for the Process-Related Identification method KKS applies the term "plant" differently than NTPC's common usage. Within KKS, and this AIC handbook, "plant" refers to the first breakdown level within a facility. For example, a generator-set and auxiliary equipment, distribution feeder, or transmission tower group would all be considered "plants". The commonly used term "power plant" is not reflective of this level of equipment grouping.

1.4.2 Point of Installation Identification

KKS also provides options for location-based identification. This method of identification is principally used to identify electrical and instrumentation & control equipment but can also be extended to mechanical equipment. Locations, for example, coordinates, racks and positions in cubicles, are identified in the breakdown level “equipment unit”.

Identification letters used for the point of installation identification in the breakdown level “function” may be the same as those for the process-related identification. This improves recognition of the identification in the overall system. In order to prevent possible confusion between process-related identification and point of installation identification the prefix sign “+” must be added to the point of installation code (according to DIN 40719, part 2). The breakdown symbol “full stop” between breakdown Level 1 and 2 must also be used. This prefix sign may be omitted only when there is absolutely no ambiguity e.g. in layout documents.

Since NTPC’s focus is on the process-related identification, the point of installation identification type will not be further addressed in this handbook.

1.4.3 Location Identification

In order to clearly identify the position of plants, sub-systems and equipment in the power station, the code of building structure and floor is entered at the breakdown level “function” and the rooms on the various floors of the building structure at the breakdown level “equipment unit”. The breakdown level “component” is not used in location identification. Fire protection sections are identified according to the room identification.

Since NTPC’s focus is on the process-related identification, the location identification type will not be further addressed in this handbook.

1.5 Structure and Contents of the Breakdown levels

1.5.1 General

The KKS is divided into different breakdown levels and codes from left to right in diminishing order of the units of a complete power plant:

Serial number of breakdown level	0			1					2				3		
Name of breakdown level	Total Plant			Function					Equipment Unit				Component		
Designation of data character	G			F ₀	F ₁	F ₂	F ₃	F _n	A ₁	A ₂	A _n	A ₃	B ₁	B ₂	B _n
Type of data character	A/N	A/N	A/N	(N)	A	A	A	NN	A	A	NNN	(A)	A	A	NN

Table 2 KKS Standard breakdown levels

A = Alphabetical symbols (letters, special symbols)

N = Numerical symbols (digits)

() = These data characters may be omitted if there is no ambiguity in created codes

The following terms are used in KKS:

- G: Overall plant prefix number;
- F₀: Function level prefix number;
- F₁F₂F₃F_n: Function code;
- A₁A₂A_nA₃: Equipment unit code;
- B₁B₂B_n: Component code.

1.5.2 Total plant (level 0)

It may be necessary to identify units, non-unit specific plants or extension stages within a power station, such that a clear and unambiguous distinction exists between them. This is provided by breakdown level 0: Overall plant. This identification **must be** agreed upon by all parties concerned, regarding the contents and type of data character (A or N). Especially the identification of existing units must be taken into account. The breakdown level “Overall plant” can be omitted when the designation remains unambiguous.

1.5.3 Function (level 1)

Functions in KKS are identified as follows:

Serial number of breakdown level	1				
Name of breakdown level	Function				
Designation of data character	F ₀	F ₁	F ₂	F ₃	F _n
Type of data character	(N)	A	A	A	NN

Table 3 KKS Standard, level 1: Function

The following terms are used within the function code:

- F₀: Function level prefix number;
- F₁: Main group;
- F₁F₂: System group;
- F₁F₂F₃: System;
- F_n: Sub-system.

Keys for system (F₁F₂F₃) consist of 3 characters.

1.5.4 Equipment (level 2)

Equipment units in KKS are identified as follows:

Serial number of breakdown level	2			
Name of breakdown level	Equipment Unit			
Designation of data character	A ₁	A ₂	A _n	A ₃
Type of data character	A	A	NNN	(A)

Table 4 KKS Standard, level 2: Equipment

The following terms are used within the equipment code:

- A₁: Main groups of equipment units;
- A₁A₂: Sub-groups of equipment units;
- A_n: Numbering equipment units;
- A₃: Additional code.

Keys for sub-groups of equipment units (A₁A₂) consist of 2 characters.

1.5.5 Component (level 3)

Components in KKS are identified as follows:

3		
Component		
B ₁	B ₂	B _n
A	A	NN

Table 5 KKS Standard, level 3: Components

The following terms are used within the component code:

- B₁: Main groups of components;
- B₁B₂: Sub-groups of components;
- B_n: Numbering components.

Keys for sub-groups of components (B₁B₂) consist of 2 characters.

2 NTPC's Asset Coding Concept for Asset Identification Codes (AICs)

This section describes NTPC adoption of the KKS standard as the “Asset Identification Code level structure” and how Asset Identifications Codes (AICs) are constructed.

2.1 Asset Identification Code (AIC) levels

Table 6 summarizes the AIC level structure with the adopted¹ four Asset Identification Code levels (0, 1, 2 and 3) and NTPC's introduced facility level (-1) for identification and the types of data characters.

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Designation of data character	C				G			F ₁	F ₂	F ₃	F _n	A ₁	A ₂	A _n	B ₁	B ₂	B _n
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NNN	A	A	NN

Table 6 Asset Identification Code level structure with data character types

A = Alphabetical symbols (letters, special symbols)

N = Numerical symbols (digits)

The F₀ and A₃ data characters are not used by NTPC. The KKS standard describes that these characters can be omitted if there is no ambiguity in created codes

The structure is the same across all divisions, with adoption of the code slightly differing across the divisions.

NTPC's instruction is to identify assets to a level (e.g. 1, 2, or 3) that is practical and cost efficient for managing the asset concerned. That rule relies on the desired level of granularity of asset identification and asset level at which maintenance is planned and executed.

¹ Within NTPC, the “Asset Identification Code levels” is the unique asset coding structure and concept based on the KKS standard. Because the naming of “breakdown levels” can create confusion compared to failing assets or issues with assets, NTPC refers to an asset code structure and numbered levels rather than KKS' breakdown levels.

For example:

- Towers in transmission lines are grouped as 10 towers as 1 asset for NTPC's desired management approach of managing that number of towers at a time;
- In Hydro, trash racks at the function level (level 1) are the lowest level of assets that need to be identified for that purpose while other assets are identified up to the component level (level 3).

Counting of assets is established through use of F_n , A_n and B_n . For details on counting, refer to section **Error! Reference source not found.**

An exception to the standard AIC data characters for the Component level (level 3) for T&D stations is used to accommodate the use of American National Standards Institute (ANSI) standard device numbers. This is NTPC's common practice, and device identifiers based on ANSI numbering are found throughout existing engineering drawings, safety diagrams, and system displays. Integrating these existing numbers into the AIC coding will provide a smoother transition for operational staff. Therefore, B_n is set 3 data characters in the following format: A/N A/N A/N instead of NN.

If there is only function, equipment or component within a Facility, it must be numbered as 01 or 001 in accordance with the number of counting characters available in order to maintain the asset code length for consistency and accuracy in searching and matching assets within the CMMS software and between the CMMS software and Great Plains (GP).

The following sections provide example AIC creations for each division in NTPC, including asset descriptions. The way asset descriptions are generated is described on page 48.

The black filled boxes in the examples indicate that those fields are not used in the example asset code and description, reflecting the differences in desired granularity as described above.

2.1.1 Facility Codes (level -1)

-1			
Facility			
A	N	N	N

Table 7 AIC Level -1 types of data characters

For identification of plants, distribution systems, substations, and transmission lines, the alphabetic character(s) (A) indicates the asset group:

- P = Plant (Generating Station)
- B = Building
- D = Distribution System
- S = Substation
- L = Transmission Lines
- F = Fuel Oil Pipelines
- R = Retainers (Tanks, Berms, Dams)
- E = Emergency Module (“small power plants”)
- T = Transportation Infrastructure

The three numeric characters (NNN) correlate to NTPC’s drawing numbering system. Refer to 1Appendix D for the possible values for P, D, S and L which have been taken from a separate and existing document, titled: “NTPC Record Drawing Numbering System”, by Head Office of Engineering, revised April 2009.

For example:

- P165 = Norman Wells Diesel Plant
- S160 = Frank Channel Substation

For emergency modules (“E”), the numbering will continue to follow the GP inventory numbering method with the exception that the “M” in the previously used “EM” format has been omitted for standardization with the other facility coding as per the AIC. For example, E001, E002 are the current values rather than EM01 and EM02 respectively.

Mobile Equipment

For mobile equipment, the four numeric characters follow a separate numbering range which is described in more detail in section 2.1.9.

2.1.2 Equipment Group (level 0)

0		
Equipment Group		
G		
N	N	N

Table 8 AIC Level 0 types of data characters

Level 0 identification differentiates between generating units within a single plant, feeders on a distribution system, and tower “groups” on transmission lines.

Equipment which serves more than one generating unit, distribution feeder, or tower group is coded as “000” at this level and is referred to as “common”.

If there is a need to distinguish generating units or tower groups in the Transmission division, then this level is used to code with increments of 1, for example “001”, “002”, “003”, etc. Examples of this coding are available in Sections 2.1.3 through 2.1.8 of this handbook.

Transmission & Distribution distinction within Substations

To facilitate the desired distinction between “transmission” and “distribution” elements of substation assets (Facility codes starting with “S”), the Level 0 identifier is used to separate the equipment as follows:

- **0XX = Plant type**
used to refer to equipment in plants (e.g. 000, 001, 002, etcetera);
- **1XX = Transmission**
used to refer to Transmission equipment (e.g. 101, 102, etcetera);
- **2XX = Distribution**
used to refer to Distribution equipment (e.g. 201, 202, etcetera).

2.1.3 NTPC Keys for Asset Coding

Function Codes (level 1)

1			
Function			
F ₁	F ₂	F ₃	F _n
A	A	A	NN

Table 9 AIC Level 1 types of data characters

Level 1 identification uses a three-letter equipment function code and a two digit number. The prefix F₀ is not used by NTPC.

KKS function codes for electrical equipment may vary based on voltage. For equipment that uses multiple voltages (transformers, etc.) the code identifying the high-side voltage is to be used when entering assets into the CMMS.

The keys for use in coding assets are shown below by level.

The keys for use in coding NTPC assets are shown below by level.		
Function 1		
Possible values	Value Meaning	Notes
Distribution		
AEA	Grid & Distribution Systems, 110 - 150 kV	Towers & Fixtures
AEB	Grid & Distribution Systems, 110 - 150 kV	Overhead Conductors & Devices
AEL	Grid & Distribution Systems, 110 - 150 kV	Line
AET	Grid and Distribution Systems, Transformer Equipment	110-150 kV High Side Voltage
AHA	Grid & Distribution Systems, 30-35 kV	Poles & Fixtures
AHB	Grid and Distribution system 30-35 kV	Overhead Conductors & Devices
AHL	Grid & Distribution Systems, 34 kV	Disconnecting Switch
AHT	Grid and Distribution Systems, Transformer Equipment	30-35 kV High Side Voltage
AKA	Grid & Distribution Systems, 10-15 kV	Poles & Fixtures
AKB	Grid and Distribution system 10-15 kV	Overhead Conductors & Devices
AKD	Grid and Distribution system 10-15 kV	Underground Line
AKL	Grid and Distribution system, 10-15 kV	Disconnecting Switch
AKT	Grid and Distribution Systems, Transformer Equipment	10-15 kV High Side Voltage
ALA	Grid & Distribution Systems, 5 kV	Towers & Fixtures

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
ALB	Grid & Distribution Systems, 5 kV	Overhead Conductors & Devices
ALC	Grid and Distribution Systems, 5 kV	5 kV Distribution Cabinets
ALD	Grid and Distribution, Underground Conductor and Devices, 5-6 kV	Underground Line
ALL	Grid and Distribution Systems, 5 kV	Line/ Disconnecting Switch
ALT	Grid and Distribution Systems, Transformer Equipment,	5 kV High Side Voltage
ANA	Power Distribution & Auxiliary Power Supply, Foundation Cabinets	600 v Distribution Cabinet
ANC	Power Distribution & Auxiliary Power Supply, Circuit Breakers	600 v breakers
ANE	Grid & Distribution Systems, < 1 kV	Services
ANF	Grid & Distribution Systems, < 1 kV	Assets on Customer Premises
ANH	Grid & Distribution Systems, < 1 kV	Streetlights
ARA	Power Distribution, Protection <1 kV	Relays
ARB	Power Distribution, Protection >1 kV	Relays
ASQ	Grid & Distribution Systems, Decentralized panels & cabinets, Metering	Customer Meters
ATA	Grid & Distribution Systems, Transformer Equipment, Transmission Stabilization	Load banks, Capacitors & Inductors
ATH	Transformer 30-35 high side	
	Transmission	
BAB	Power Transmission & Auxiliary Power Supply, Foundation Cabinets	Cabinets
BAC	Power transmission, Generator Circuit Breaker	Generator Breakers
BAU	Power transmission, Earthing and lightning protection system	
BAY	Control and Protection Equipment	Protection Relay
BBA	Power Transmission, Medium Voltage Distribution Boards	600V MCC
BBB	Power Transmission, Medium Voltage Distribution Boards	480V MCC
BBT	Medium voltage auxiliary power transformers	Step Up/Down 4160v/ PTs & CTs

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
BFA	Power Transmission, Low Voltage Distribution Boards	600V or less lighting panel
BFC	Power Transmission, Low Voltage Distribution Boards	Combined AC/DC Panel 240V or less
BFT	Low voltage auxiliary power transformers	Step Up/Down 600 v/ PTs & CTs
BLC	Low voltage, Power Transmission, Distribution Boards, Sub-Distribution Boards	Transmission Cabinets
BTB	Power Transmission, 125V Batteries	Output Voltage 120v or 125v
BTC	Power Transmission, 110V Batteries	Output Voltage 110v
BTE	Power Transmission, 48V Batteries	Output Voltage 48v
BTG	Power Transmission, 24V Batteries	Output Voltage 24v
BTM	Battery Chargers, 125V	Output Voltage 125v
BTN	Battery Chargers, 120V	Output Voltage 120v
BTQ	Battery Chargers, 48V	Output Voltage 48v
BTS	Battery Chargers, 24V	Output Voltage 24v
BRU	Static Inverter, Uninterruptible Power Supply	Static inverter/converter
BTW	Power Transmission	UPS/Inverters
BUA	Power Transmission, Direct Current Normal Distribution Board	Greater than 220v
BUB	Power Transmission, Direct Current Normal Distribution Board	120 or 125v
BUE	Power Transmission, Direct Current, Distribution Board	48v
BUG	Power Transmission, Direct Current, Distribution Board	24v
BVA	Emergency Power Transmission, Direct Current, Distribution Board	125v
CAA	Cabinets for protective interlocks	Automatic Transfer Switch
CBA	Instrumentation & Control, Cabinets, Generating Unit Controls	Regulators, etc./Governor controls, etc.
CHA	Instrumentation and control equipment, Generator Switchgear, Meters	KWH,
CJA	Unit Control panels, Instrumentation & Control Equipment	Local Control Panel

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
CKP	Instrumentation & Control Equipment, Process Computer	PLC
CKN	Instrumentation & Control Equipment, Process Computer	Panel Mates
CMB	Instrumentation & Control Equipment	Vibration Monitoring System
CXA	Instrumentation and control equipment, Local Control Stations	Motor Control
CYA	Instrumentation & Control Equipment, Communication & Information System	Telephone System
CYE	Instrumentation & Control Equipment, Communication & Information System	Fire Alarm
CYF	Instrumentation & Control Equipment, Communication & Information System	Clock System
CYH	Instrumentation & Control Equipment, Communication & Information System	SCADA, Man Down
CYK	Instrumentation and Control equipment, Telemetry System	Carrier Telephone
CYQ	Instrumentation & Control Equipment, Communication & Information System	Gas Detection
CYS	Instrumentation & Control Equipment, Communication & Information System	Radio Phone System
CYV	Instrumentation & Control Equipment, Communication & Information System	Plant and Production Management Systems
CYW	Instrumentation & Control Equipment, Communication & Information System	Satellite Systems
EGA	Supply of Liquid Fuels, Tank Farm	Piping/Valves
EGB	Supply of Liquid Fuels, Tank Farm	Tanks
EGC	Supply of Liquid Fuels, Pump System	Fuel pumps
EGF	Supply of Liquid Fuels, Temporary Storage	Berms
EGU	Supply of Liquid Fuels, Tank Farm	Tank Farm Meters
EGY	Supply of Liquid Fuels, Control and Protection Equipment	Level monitoring
GKC	Water Supply and Disposal, Process Drainage System,	Drinking Water
GMA	Water Supply and Disposal, Process Drainage System,	Pumps

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
GMX	Fluid Supply System, Control and Protection Equipment	Level monitoring
GQA	Water Supply and Disposal, Domestic Wastewater collection and drainage systems	Septic Systems
LNA	Head & Tailrace System, Water Impounding Work	
LNB	Water impounding works for hydroelectric plants, Dam or Weir System	Trash Racks/Spillway Gate Hoist
LNC	Water impounding works for hydroelectric plants, Dam or Weir System	Dams and Weirs
LND	Spillways, Water Impounding Work	Spillways
LPA	Rake and cleaning system, Intake Systems	
LPB	Intake systems, Isolating Equipment	Intake gates /Stop logs/Hoists
LPC	Piping and penstock system	Penstock
LQA	Underwater Piping & Culvert System, Tailrace System	
LQC	Tail race systems,	Tailrace Stop logs
LQG	Extraction Systems for External Purpose	
MEA	Main Machine Sets, Hydraulic Turbine Plant, Turbine	
MEA10	Spiral Case	
MEA20	Wicket gate	
MEA30	Runner, Main shaft	
MEA40	Turbine head cover, stay ring, draft tube, main shaft seal	
MEA50	Spiral case drain	
MEB	Isolating Valve, Control Head Water Flow	Butterfly Valve,
MED	Main Machine Sets, Hydraulic Turbine Plant, Bearings	Bearings
MEV	Lubricant Supply System, Hydraulic Turbine Plant	Greasers/Oil
MEX	Governor, Hydraulic Turbine, Non-Electric Controls & Protection Equipment	
MEX10	Governor sump tank, pumps and pressure tank	
MEX20	Governor actuator, main control system	
MEX30	Governor, pilot control system	
MEX40	Governor servomotors	

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
MEX50	Governor air pressure device	
MEX60	Governor accumulator tanks	
MEY	Governor, Hydraulic Turbine, Electric Controls & Protection Equipment	
MJA	Main Machine Sets, Diesel Engine Plant, Engine	Diesel Engines
MJG	Main Machine Sets, Diesel Engine Plant, Liquid Cooling and Heating System	Radiators, heat exchangers
MJH	Main Machine Sets, Diesel Engine Plant, Air to Air Cooling System	Air to Air Coolers, Air Intercooling System
MJN	Main Machine Sets, Diesel Engine Plant, Fuel Systems	Filters/meters/Day Tanks/Piping
MJR	Main Machine Sets, Diesel Engine Plant, Exhaust Gas System	Silencers
MJV	Main Machine Sets, Diesel Engine Plant, Lubricant Supply System	Pre lube pumps
MKA	Main Machine Sets, Generator	Generators
MKA10	Main Machine Sets, Generator- Main shaft	
MKA20	Main Machine Sets, Generator – Rotor	
MKA30	Main Machine Sets, Generator - Stator	
MKA40	Main Machine Sets, Generator - Support structure and foundation	
MKA50	Main Machine Sets, Generator - Coolers	
MKC	Main Machine Sets, Generator Exciter	
MKD	Main Machine Sets, Generator Bearings	
MKV	Main Machine Sets, Generator, Lubricant Supply System	Oil Coolers, Pumps
MRA	Main Machine Sets, Gas Engine Plant, Engine	Gas Engines
MRG	Main Machine Sets, Gas Engine Plant, Liquid Cooling System	
MRN	Main Machine Sets, Gas Engine Plant, Fuel Systems	
MRR	Main Machine Sets, Gas Engine Plant, Exhaust Gas System	
MRV	Main Machine Sets, Gas Engine Plant, Lubricant Supply System	

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
PCM	Cooling Water for generator	Generator Bearings
PHB	Mechanical Cleaning System, Cooling Water Treatment	Oily water separators
SAA	Ancillary Systems, Heating Ventilation and Air Conditioning System	Hydronic Heating / cooling system
SAB	Ancillary Systems, Heating Ventilation and Air Conditioning System, Forced Air heating	Gas Fired/ Electric Heat/Oil Fired
SAH	Ancillary Systems, Heating Ventilation and Air Conditioning System	Building Ventilation, Fans
SBA	Ancillary Systems, Space Heating Systems	Residual Heating
SCA	Ancillary Systems, Stationary compressed Air Supplies, Compressed Air Generation System	Compressors/Air Systems
SGE	Ancillary Systems, Stationary Fire Protection	Sprinkler System
SGJ	Ancillary Systems, Stationary Fire Protection Systems, CO2 / Nitrogen Systems	
SMA	Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances	Overhead cranes
SMB	Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances	Gantry Crane
SMD	Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances	Monorail Systems
UAA	Civil Structures, Switchyard Structure	Switchyard structures
UAB	Civil Structures, Switchgear	Switchgear
UAC	Civil Structures, Structures for Grid and Distribution	Grid System Control Building
UAG	Civil Structures, Structures for Grid and Distribution Systems, Structure for Transformers	
UAX	Civil Structures, Structures for Grid and Distribution Systems, Special Structure (plant specific)	
UCC	Civil Structures, Structure for Communication Towers	Radio Tower
UEJ	Civil Structures, Structure for storage of liquid fuels	Fuel/Oil Tanks,
UEL	Civil Structures, Structures for Conventional Fuel Supply, Forwarding of	Fuel/Exhaust modules
ULN	Civil structures, Structures for Hydraulic Turbine Spillway Systems	Spillways Structure

The keys for use in coding NTPC assets are shown below by level.

Function 1

Possible values	Value Meaning	Notes
ULP	Civil structures, Structures for Hydraulic Turbine Intake Systems	Head Gates Structures
ULQ	Civil structures, Structures for Hydraulic Turbine, Tail Race Systems	Tail Race
UME	Civil structures, Structures for Main Machine Sets, Hydraulic Turbine Building	Hydro plant Building
UMJ	Civil structures, Structures for Main Machine Sets, Diesel engine building	Diesel plant building
USU	Civil Structures, General Service Structures	Storage Building/warehouse
UST	Civil Structures, General Service Structures	Workshop
UYC	Civil Structures, General Service Structures	Administration building
UYQ	Civil Structures, Garages	Garages
UYX	General Service Structures, Special Structure	Septic System Building
UZA	Outdoor Area, Plots of Land and Land Rights, Civil Structures	Airstrip/Helicopter/Roads /walkway/ Access Road
UZJ	Outdoor Area, Plots of Land and Land Rights, Civil Structures	Fencing/Gates
UZR	Structures for Transport	Boat Docks
UZT	Outdoor Area, Plots of Land and Land Rights, Civil Structures	Right of Way
UZW	Residential Buildings, Residential Area	Office, Trailers, Staff housing
UZY	Outdoor Area, Plots of Land and Land Rights, Civil Structures	Bridge Structures
UZX	Civil Structures, Special Structure	Pipe rack/Power pole rack, etc.
WSA	Renewable Energy Plants, Solar Systems	Solar Array
XJA	Station Service, Diesel Engine	Emergency Units
XJG	Liquid Cooling and Heating System	
XJN	Fuel Systems	
XJR	Exhaust Gas System	
XKA	Station Service, Generator	
XKY	Control & Protection Equipment	Transfer switch

The keys for use in coding NTPC assets are shown below by level.		
Function 1		
Possible values	Value Meaning	Notes
ZAA	Workshop & Office Equipment	Furniture
ZTA	Workshop & Office Equipment	Tools

Table 10 Function Keys

2.1.4 Equipment Unit Codes (level 2)

2		
Equipment Unit		
A ₁	A ₂	A _n
A	A	NNN

Table 11 AIC Level 2 types of data characters

Level 2 identification follows a two-letter, three digit pattern to identify sub-assemblies of Level 1 equipment. Only some assets will have Level 2 identification. An optional alphabetic suffix A₃ is permitted by KKS, but is not used by NTPC.

Function Level 2		
Equipment Unit		
Possible values	Value Meaning	Notes
AA	Mechanical Equipment, Valves, Dampers etc.	Louvers
AB	Mechanical Equipment, Isolating Elements / Air Locks	Seals/Gates
AC	Mechanical Equipment, Heat Exchangers / heat transfer surfaces	
AE	Mechanical equipment, Turning driving lifting and slewing gear	Hoists
AH	Mechanical Equipment, Heating Cooling and Air Conditioning Units	
AJ	Mechanical Equipment, Size Reduction Equipment	
AN	Mechanical Equipment, Compressor Units / Fans	Intake/Discharge
AP	Mechanical Equipment, Pump Units	
AS	Mechanical Equipment, Adjusting & Tensioning Equipment for non-electrical variables	
AT	Mechanical Equipment, Cleaning, drying, separating & filtering	Filters
AU	Breaking, gearboxes & coupling equipment	
AX	Mechanical Equipment, test and monitoring equipment	
BB	Mechanical Equipment, Storage Equipment (Tanks)	Tanks
BF	Foundation	
BN	Mechanical Equipment, Jet Pumps / Ejectors / Injectors	
BQ	Mechanical Equipment, Hangers / Supports / Racks / Piping Penetrations	

Function Level 2		
Equipment Unit		
Possible values	Value Meaning	Notes
BR	Piping, Ductwork & Chutes	
BS	Mechanical Equipment, Exhaust Gas System, Main Machine Sets	Silencers
BU	Insulation, sheathing	
	Coding of current- and voltage circuits Electrical measurements are coded as shown in table below. The main parts are named CE_ _ _ and are numbered by hundreds on A _N .	See also the counting specifics further down in this document for use with “GS”
CE	Meter	
CE100	Current	
CE101	Current phase L1 or R	
CE102	Current phase L2 or S	
CE103	Current phase L3 or T	
CE200	Voltage	
CE201	Voltage phase L1 or R	
CE202	Voltage phase L2 or S	
CE210	CVT	
CE203	Voltage phase L3 or T	
CE300	Measurement with different variables, (i.e. power, energy, inductance and resistance, cosφ)	
CE400	Multi	
CE500	Frequency	
CE600	Special measurements (i.e. earth fault measurements).	
CE700	Not in use	
CE800	Not in use	
CE900	Common/mixed measurements.	
CF	Flow, Rate	Fuel Meters
CH	Direct measuring circuits Fire Alarm	Pull Station
CR	Direct measuring circuits, Fire Alarm	Flame Detector
CT	Direct measuring circuits, Fire Alarm,	Heat Detector

Function Level 2		
Equipment Unit		
Possible values	Value Meaning	Notes
CL	Direct measuring circuits, Combined & Other Variables	Level monitoring
CP	Direct measuring circuits, Combined & Other Variables	Pressure Switch
CU	Direct measuring circuits, Combined & Other Variables	Smoke Detectors
DE	Closed Loop Control Circuits, Electrical Variables (Current, Voltage, etc.)	
DS	Closed Loop Control Circuits, (Mechanical) Velocity, speed, frequency	VFD
EG	Bell and Strobe Light,	
	Relay protection Distribution	
EY	Analog & Binary Signal Conditioning, Protection	Multi-Functional Relay
EY100	Over current	
EY200	Differential current	
EY300	Under voltage / over voltage	
EY400	Under frequency / over frequency	
	Relay protection Transmission	
EX	Analog & Binary Signal Conditioning, Protection	Multi-Functional Relay
EX100	Over current	
EX200	Differential current	
EX220	Differential current Id>, Lines	
EX300	Under voltage / over voltage	
EX400	Under frequency / over frequency	
EX560	Reverse power	
EX830	Loss of excitation	
EX900	Relay protection undefined	Neutral Differential Relay
EX980	Ground fault relay	
FG	Indirect measuring Circuits, Distance / Length / Position / Direction of Rotation	
GB	Overhead conductor and Insulators	

Function Level 2		
Equipment Unit		
Possible values	Value Meaning	Notes
GE	Conductor/Cable	
GH	Electrical Instrumentation and control equipment	Cubicles
GL	Overhead reactor	
GN	Electrical Instrumentation and control equipment, Network Equipment (SCADA)	
GR	Electrical Instrumentation and control equipment, D.C. Generating Equipment -	Batteries, Solar Panel
GS	Electrical Instrumentation and control equipment, Switchgear equipment if not identified under process equipment	(Generator Breaker, Generator Protection Relay)
GS100	Circuit breakers	
GS200	Disconnecting switches	
GS300	Earthing Switch	
GS400	Reclosers	
GT	Transformer equipment	
GU	Electrical Instrumentation and control equipment, D.C. Generating Equipment, Converter Equipment	Battery chargers
GV	Structure related earthing and lightning protection equipment, surge arrestors	
GZ	Support, Rack, hangers	
HD	Subassemblies of Main and Heavy Machinery	Bearings

Table 12 Equipment Unit Keys

2.1.5 Component Codes (level 3)

3		
Component		
B ₁	B ₂	B _n
A	A	NN

Table 13 AIC Level 3 types of data characters

Level 3 for components of equipment is not required for all assets but is used as-needed depending on the type of asset.

Function Level 3		
Component		
Possible values	Value Meaning	Notes
-A	Assemblies	
-C	Capacitors	
-K	Relays, contactors	
-S	Switches	
-F	Electrical Components, Protective Devices	
-M	Electrical components, Motors	
-P	Electrical components, Measuring & Testing	
QP	Instrumentation and control components (non-electrical), Measuring Instruments / testing equipment	
-W	Electrical Components, Transmission paths / Waveguides / Aerials	
-Y	Electrical Components, Electrical Positioners (e.g. solenoids not motors)	
-Z	Filters, Limiters (LMUs, WT)	

Table 14 Component Keys

“Decade” and “Century” counting

Where KKS does not provide separation of assets into desired sections through the use of alphabetic codes or breakdown levels, the counting data characters may be assigned in ranges to allow further categorization. This use of the counting characters is referred to as “decade” or “century” numbering, depending upon the number of digits used to create the groups.

NTPC has applied a “century” numbering strategy to provide separation of transmission and distribution assets within substations, and to group mobile equipment into categories for easier searching. Decade numbering systems

described below have also been adopted to help provide consistency in naming and locating assets.

Measuring circuits

Coding of current- and voltage circuits

Electrical measurements are coded as shown in table below. The main parts are named CE_ _ _ and are numbered by hundreds on A_N.

A ₁	A ₂	A _N	A _N	A _N	Equipment
C	E	1	0	0	Current
C	E	1	0	1	Current phase L1 or R
C	E	1	0	2	Current phase L2 or S
C	E	1	0	3	Current phase L3 or T
C	E	2	0	0	Voltage
C	E	2	0	1	Voltage phase L1 or R
C	E	2	0	2	Voltage phase L2 or S
C	E	2	0	3	Voltage phase L3 or T
C	E	3	-	-	Measurement with different variables, (i.e. power, energy, inductance and resistance, cosφ)
C	E	4	-	-	Not in use
C	E	5	-	-	Frequency
C	E	6	-	-	Special measurements (i.e. earth fault measurements).
C	E	7	-	-	Not in use
C	E	8	-	-	Not in use
C	E	9	-	-	Common/mixed measurements.

Table 15 Coding of Current- and Voltage measurements, AIC level 2

Direct Current systems

For direct current systems use B on F₁ and the coding shall be done according to the following table.

DC Distribution					Accumulators					Chargers					Voltage
F ₁	F ₂	F ₃	F _N	F _N	F ₁	F ₂	F ₃	F _N	F _N	F ₁	F ₂	F ₃	F _N	F _N	[Volt]
B	U	A	-	-	B	T	A	-	-	B	T	L	-	-	>= 220 V DC
B	U	B	-	-	B	T	B	-	-	B	T	M	-	-	125 V DC
B	U	C	-	-	B	T	C	-	-	B	T	N	-	-	110 V DC
B	U	D	-	-	B	T	D	-	-	B	T	P	-	-	60 V DC
B	U	E	-	-	B	T	E	-	-	B	T	Q	-	-	48 V DC
B	U	F	-	-	B	T	F	-	-	B	T	R	-	-	36 V DC
B	U	G	-	-	B	T	G	-	-	B	T	S	-	-	24 V DC
B	U	H	-	-	B	T	H	-	-	B	T	T	-	-	12 V DC
B	U	J	-	-	B	T	J	-	-	B	T	U	-	-	6 V DC
B	U	K	-	-	B	T	K	-	-	B	T	V	-	-	<6 V DC

Table 16 Coding of DC systems, distribution, accumulators' racks and chargers on AIC level 1.

Relay Protection

For relay protection in distribution, transmission and production the coding shall be done according to the following tables.

Distribution

Transmission

Relay protection Transmission, KKS coding		
AIC level 2	Explanation	
EW 000	Combined relays, such as I>, Z<, Z>, V>, V<,f>, f<, GENERAL	
EW 010		
EW 020		
EW 030		
EW 040		
EW 050		
EW 060		
EW 070		
EW 080		
EW 090		

Table 17 Coding for relay protection in distribution on AIC Level 2

Relay protection Transmission, KKS coding		
AIC level 2	Explanation	
EW	100	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. GENERAL
EW	110	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Power transformer
EW	120	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Lines
EW	130	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Capacitors
EW	140	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Own consumption
EW	150	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Bus TIE
EW	160	
EW	170	
EW	180	Motor protection
EW	190	
EW	200	Differential current Id>, GENERAL
EW	210	Differential current Id>, Power transformer
EW	220	Differential current Id>, Lines
EW	230	Differential current Id>, Capacitors
EW	240	Differential current Id>, Own consumption
EW	250	
EW	260	
EW	270	Bus bar protection
EW	280	
EW	290	
EW	300	Under voltage / over voltage V<, V>, ALMENNT
EW	310	Under voltage / over voltage V<, V>, Power transformers
EW	320	Under voltage / over voltage V<, V>, Lines
EW	330	Under voltage / over voltage V<, V>, Capacitors
EW	340	Under voltage / over voltage V<, V>, Own consumption
EW	350	
EW	360	
EW	370	
EW	380	
EW	390	
EW	400	Under frequency / over frequency f<, f>, GENERAL
EW	410	Under frequency / over frequency f<, f>, Power transformers
EW	420	Under frequency / over frequency f<, f>, Lines

Relay protection Transmission, KKS coding		
AIC level 2		Explanation
EW	430	Under frequency / over frequency f<, f>, Capacitors
EW	440	Under frequency / over frequency f<, f>, Own consumption
EW	450	
EW	460	
EW	470	
EW	480	
EW	490	
EW	500	Distance protection Z<, >, GENERAL
EW	510	Distance protection Z<, >, Power transformers
EW	520	Distance protection Z<, >, Lines
EW	530	
EW	540	
EW	550	
EW	560	
EW	570	Phase selection relays
EW	580	Impedance relays for transformers
EW	590	
EW	600	Breaker Failure, GENERAL
EW	610	Breaker Failure, Power transformers
EW	620	Breaker Failure, Lines
EW	630	Breaker Failure, Capacitors
EW	640	Breaker Failure, Bus TIE
EW	650	
EW	660	
EW	670	
EW	680	
EW	690	
EW	700	
EW	710	
EW	720	
EW	730	
EW	740	
EW	750	
EW	760	
EW	770	
EW	780	
EW	790	
EW	800	

Relay protection Transmission, KKS coding		
AIC level 2		Explanation
EW	810	
EW	820	
EW	830	
EW	840	
EW	850	
EW	860	
EW	870	
EW	880	
EW	890	
EW	900	Relay protection undefined
EW	910	Auxiliary relays
EW	920	Reclosing equipment
EW	930	Synchro-Check
EW	940	Synchronizing equipment
EW	950	Fault location/Registration
EW	960	Voltage regulation
EW	970	Communication equipment, isolated
EW	980	
EW	990	

Table 18 Coding for relay protection in transmission on AIC Level 2

Production

Relay protection Transmission, KKS coding		
AIC level 2		Explanation
EX	000	Combined relays, such as I>, Z<, Z>, V>, V<,f>, f<, GENERAL
EX	010	
EX	020	
EX	030	
EX	040	
EX	050	
EX	060	
EX	070	
EX	080	
EX	090	
EX	100	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. GENERAL
EX	110	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Power transformers

Relay protection Transmission, KKS coding		
AIC level 2	Explanation	
EX 120	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Lines	
EX 130	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Capacitors	
EX 140	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Own consumption	
EX 150	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Bus TIE	
EX 160	Over current, I>, I>>, Io>, Io>>, I> -->, Io> -->, I> inv., Io> inv. Generators	
EX 170	Over current, I>, Shaft current	
EX 180	Motor protection	
EX 190		
EX 200	Differential current Id>, GENERAL	
EX 210	Differential current Id>, Power transformer	
EX 220	Differential current Id>, Lines	
EX 230	Differential current Id>, Capacitors	
EX 240	Differential current Id>, Own consumption	
EX 250	Differential current Id>, Generators	
EX 260	Differential current Id>, Generators / Transformers (BLOCK)	
EX 270	Bus bar protection	
EX 280		
EX 290		
EX 300	Under voltage / over voltage V<, V>, GENERAL	
EX 310	Under voltage / over voltage V<, V>, Power transformers	
EX 320	Under voltage / over voltage V<, V>, Lines	
EX 330	Under voltage / over voltage V<, V>, Capacitors	
EX 340	Under voltage / over voltage V<, V>, Own consumption	
EX 350	Under voltage / over voltage V<, V>, Generators	
EX 360		
EX 370		
EX 380		
EX 390		
EX 400	Under frequency / over frequency f<, f>, GENERAL	
EX 410	Under frequency / over frequency f<, f>, Power transformers	
EX 420	Under frequency / over frequency f<, f>, Lines	
EX 430	Under frequency / over frequency f<, f>, Capacitors	
EX 440	Under frequency / over frequency f<, f>, Own consumption	
EX 450	Under frequency / over frequency f<, f>, Generators	

Relay protection Transmission, KKS coding		
AIC level 2		Explanation
EX	460	
EX	470	
EX	480	
EX	490	
EX	500	Distance protection Z<, >, GENERAL
EX	510	Distance protection Z<, >, Power transformers
EX	520	Distance protection Z<, >, Lines
EX	530	
EX	540	
EX	550	Distance protection Z<, >, Generators
EX	560	Reverse power P<--
EX	570	Phase selection relays
EX	580	Impedance relays for transformers
EX	590	
EX	600	Breaker Failure, GENERAL
EX	610	Breaker Failure, Power transformers
EX	620	Breaker Failure, Lines
EX	630	Breaker Failure, Capacitors
EX	640	Breaker Failure, Bus TIE
EX	650	Breaker Failure, Generators
EX	660	
EX	670	
EX	680	
EX	690	
EX	700	Rotor earth Re<, Stator earth Se, GENERAL
EX	710	Rotor earth Re<
EX	720	Stator earth Se, 100% inj.
EX	730	Stator earth Se, 100% 3. Harm.
EX	740	Stator earth Se, 95% Un
EX	750	Stator earth Se, 80% Un
EX	760	
EX	770	
EX	780	
EX	790	
EX	800	Neg.-Seq Insc>, Therm. Overload θ >, Loss of Ex. Φ <, Over excitation U/f>, Under excitation U/f< GENERAL
EX	810	Neg.-Seq Insc>
EX	820	Therm. Overload θ >

Relay protection Transmission, KKS coding		
AIC level 2		Explanation
EX	830	Loss of Ex. $\Phi <$
EX	840	Over excitation $U/f >$
EX	850	Under excitation $U/f <$
EX	860	
EX	870	
EX	880	
EX	890	
EX	900	Relay protection undefined
EX	910	Auxiliary relays
EX	920	Reclosing equipment
EX	930	Synchro-Check
EX	940	Synchronizing equipment
EX	950	Fault location/Registration
EX	960	Voltage regulation
EX	970	Communication equipment, isolated
EX	980	Ground fault relay
EX	990	

Table 19 Coding for relay protection in production on AIC Level 2

Coding of Electrical Instrumentation and control equipment (GS)

A ₁	A ₂	A _n	A _n	A _n	Equipment
G	S	1	0	0	Circuit breakers
G	S	2	0	0	Disconnecting switches
G	S	3	0	0	Earthing Switch
G	S	4	0	0	Recloser

Table 20 Coding of GS equipment at AIC level 2

Coding of buildings

F_N	F_N	Equipment
1	0	Foundation
2	0	Building superstructure
3	0	Exterior Building Envelope
3	1	Cladding
3	2	Windows/Doors
3	3	Roof
4	0	Interior Finishes
4	1	Bathroom
4	2	Lighting
4	3	Bedrooms

Table 21 Coding of buildings

2.1.6 Hydro Asset Coding

Two examples for asset code creation for Hydro

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NNN	A	A	NN
Hydro example 1																	
Value	P	1	0	9	0	0	0	G	M	A	01	A	T	001			
Value Meaning	Twin Gorges (Taltson) Hydro Plant (Taltson River)				Common			Water Supply and Disposal, Process Drainage System, Oil Water Separator 01				Mechanical Equipment, Cleaning, drying, separating & filtering 001					
AIC	P109000GMA01AT001																
Asset Description	Twin Gorges (Taltson) Hydro Plant (Taltson River), Common, Water Supply and Disposal, Process Drainage System, Oil Water Separator 01, Mechanical Equipment, Cleaning, drying, separating & filtering 001																
Division	Hydro																

Table 22 Hydro asset coding example 1

Hydro example 2															
Value	P	1	0	9	0	0	1	M	E	A	50	B	N	001	
Value Meaning	Twin Gorges (Taltson) Hydro Plant (Taltson River)				G1			Main Machine Sets, Hydraulic Turbine Plant, Turbine 50				Mechanical Equipment, Jet Pumps / Ejectors / Injectors 001			
AIC	P109001MEA50BN001														
Asset Description	Twin Gorges (Taltson) Hydro Plant (Taltson River), G1, Main Machine Sets, Hydraulic Turbine Plant, Turbine 50, Mechanical Equipment, Jet Pumps / Ejectors / Injectors 001														
Division	Hydro														

Table 23 Hydro asset coding example 2

2.1.7 Thermal Asset Coding

Two examples for asset code creation for Thermal assets:

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NN	A	A	NN
Thermal example 1																	
Value	P	1	2	1	0	0	0	S	M	A	01	A	E	001			
Value Meaning	Fort Simpson Diesel Plant				Common			Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01				Mechanical equipment, Turning driving lifting and slewing gear 001					
AIC	P121000SMA01AE001																
Asset Description	Fort Simpson Diesel Plant, Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear 001																
Division	Thermal																

Table 24 Thermal asset coding example 1

Thermal example 2												
Value	P	1	2	1	0	0	3	M	K	A	01	
Value Meaning	Fort Simpson Diesel Plant				G3			Main Machine Sets, Generator 01				
AIC	P121003MKA01											
Asset Description	Fort Simpson Diesel Plant, G3, Main Machine Sets, Generator 01											
Division	Thermal											

Table 25 Thermal asset coding example 2

2.1.8 Transmission & Distribution Asset Coding

This section describes the asset coding concept for:

1. Distribution;
2. T&D Stations;
3. Transmission (linear assets).

2.1.8.1 Distribution Asset Coding

Two examples for asset code creation for Distribution assets:

*** represents 3 data characters in the following format: A/N A/N A/N to be used to define the tag number of T&D components

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NNN	A	A	***
Distribution example 1																	
Value	D	1	1	0	0	0	1	A	L	A	01						
Value Meaning	Distribution System Fort Simpson				Feeder 001			Grid & Distribution Systems, 5 kV, Towers & Fixtures									
AIC	D110001ALA00																
Asset Description	Distribution System Fort Simpson, Feeder 001, Grid & Distribution Systems, 5 kV, Towers & Fixtures																
Division	Transmission & Distribution																

Table 26 Distribution asset coding example 1

Distribution example 2													
Value	D	1	0	6	0	0	1	A	N	H	0		
Value Meaning	Distribution System Fort Smith				Feeder 001			Grid & Distribution Systems, < 1 kV, Streetlights					
AIC	D106001ANH00												
Asset Description	Distribution System Fort Smith, Feeder 001, Grid & Distribution Systems, < 1 kV, Streetlights												
Division	Transmission & Distribution												

Table 27 Distribution asset coding example 2

2.1.8.2 T&D Station Asset Coding

An exception to the standard AIC data characters for the Component level (level 3) for T&D stations is used to accommodate 3 character drawing numbers. For example, to identify “Switch F3B” as “-SF3B” as per the 2nd example shown below.

Two examples for asset code creation for an asset within a T&D station:

*** represents 3 data characters in the following format: A/N A/N A/N to be used to define the tag number of T&D components

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NNN	A	A	***
T&D Station example 1																	
Value	S	1	4	8	1	0	0	A	E	L	01	G	S	100	-	F	036
Value Meaning	Fort Smith Substation				Transmission			Grid & Distribution Systems, 110 - 150 kV, Line 01				Circuit breakers			Protective equipment 036		
AIC	S148100AEL01GS100-F036																
Asset Description	Fort Smith Substation, Transmission, Grid & Distribution Systems, 110 - 150 kV, Line 01, Circuit breakers, Protective equipment 036																
Division	Transmission & Distribution																

Table 28 T&D Station coding example 1

T&D Station example 2																	
Value	S	1	4	8	2	0	0	A	L	L	01	G	S	200	-	S	F3B
Value Meaning	Fort Smith Substation				Distribution			Grid and Distribution Systems, 5 kV, Line				Disconnecting switches			Switch F3B		
AIC	S148200ALL01GS200-SF3B																
Asset Description	Fort Smith Substation, Distribution, Grid and Distribution Systems, 5 kV, Line , Disconnecting switches, Switch F3B																
Division	Transmission & Distribution																

Table 29 T&D Station coding example 2

Note that both transmission stations and distribution assets are coded according to the same concept.

2.1.8.3 Transmission Asset Coding

As a consequence of the KKS standard being intended for naming power stations at discrete locations, the KKS structure is found to be less applicable for Transmission assets.

NTPC is using the KKS dictionary of keys as much as possible for coding its transmission assets. The NTPC AIC Structure for Transmission differs from the KKS standard and from what NTPC uses for Thermal, Hydro and Distribution assets. The rationale is to use the same dictionary of KKS keys for similar components and to use specific keys for naming NTPC's linear assets and linear sections (levels -1 and 0).

Two examples for asset code creation for a Transmission asset:

*** represents 3 data characters in the following format: A/N A/N A/N to be used to define the tag number of T&D components

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NNN	A	A	***
Transmission example 1																	
Value	L	1	5	0	0	0	1	U	Z	T	01						
Value Meaning	Twin Gorges (S161) to Pine Point (S157) Xmsn. Line -115 kV				Tower Group 1 (Towers 1-10)			Civil Structures, Outdoor Area, Plots of Land and Land Rights									
AIC	L150001UZT01																
Asset Description	Twin Gorges (S161) to Pine Point (S157) Xmsn. Line -115 kV, Tower Group 1 (Towers 1-10), Civil Structures, Outdoor Area, Plots of Land and Land Rights																
Division	Transmission & Distribution																

Table 30 Transmission coding example 1

Transmission example 2												
Value	L	1	5	0	0	0	2	A	E	A	01	
Value Meaning	Twin Gorges (S161) to Pine Point (S157) Xmsn. Line -115 kV				Tower Group 2 (Towers 11-20)			Grid & Distribution Systems, 110 - 150 kV, Towers & Fixtures				
AIC	L150002AEA01											
Asset Description	Twin Gorges (S161) to Pine Point (S157) Xmsn. Line -115 kV, Tower Group 2 (Towers 11-20), Grid & Distribution Systems, 110 - 150 kV, Towers & Fixtures											
Division	Transmission & Distribution											

Table 31 Transmission coding example 2

The keys for use in coding Transmission assets are shown below by level.

0		
Equipment Group		
Value Meaning (Transmission)	Possible values	Notes
Towers 1 to 10	001	Towers 1, 2, 3, 4, 5, 6, 7, 8, 9 and 10
Towers 11 to 20	002	Towers 11, 12, 13, 14, 15, 16, 17, 18, 19 and 20
(...)	(...)	
Towers 91 to 100	010	Towers 91, 92, 93, 94, 95, 96, 97, 98, 99 and 100
Towers 101 to 110	011	Towers 101, 102, 103, 104, 105, 106, 107, 108, 109 and 110
(...)	(...)	
Towers 981 to 990	099	Towers 981, 982, 983, 984, 985, 986, 987, 988, 989 and 990

Table 32 Equipment Group Keys for Transmission

2.1.9 Mobile Equipment / Vehicle Asset Coding

For vehicles and other assets that require registration, a custom coding concept is adopted. KKS offers **limited support** for such asset types; hence the following coding structure.

The 4 character numbering system follows a sequential numbering concept with increments of 1 for all mobile equipment assets that are identified for use in the CMMS.

Type of Mobile Equipment	AIC number range at level -1
Passenger	2000
Equipment	3000
Tow-Behind	4000
Off-Road	5000

Table 33 Mobile Equipment Asset Coding Ranges

The coding for mobile equipment is unique and only uses the break down levels -1 as described above for categorization and level 0 for sequential numbering. There is no further breakdown used at this time, however it can be used in the future.

Examples of asset code creation for mobile equipment / vehicle assets:

Asset Identification Code (AIC)	2000
Level 1 value (sequential numbering)	2001
Asset description	Mobile Equipment, Passenger (Service Truck)
Location description	131 - Fort Simpson

Table 34 Mobile Equipment Asset Coding example 1

Asset Identification Code (AIC)	5000
Level 0 value (sequential numbering)	5002
Asset description	Mobile Equipment, Off-Road (Snowmobile)
Location description	121 – Snare (Yellowknife)

Table 35 Mobile Equipment Asset Coding example 2

Counting with F_n , A_n and B_n

To allow for counting over 10 with more than 1 digit, given NTPC's number of functional assets, the F_n , A_n and B_n counters are used. The KKS standard's counter F_0 is considered less suitable for NTPC as it only allows for 1 digit counting, i.e. from 1 to 9 and is therefore not used.

See below table for the highlighted data characters for counting purposes:

Asset Identification Code (AIC) Level	-1				0			1				2			3		
Name of AIC level	Facility				Equipment Group			Function				Equipment Unit			Component		
Designation of data character	C				G			F_1	F_2	F_3	F_n	A_1	A_2	A_n	B_1	B_2	B_n
Type of data character	A	N	N	N	N	N	N	A	A	A	NN	A	A	NNN	A	A	NN

Table 36 Data characters for counting highlighted in the AIC coding structure

2.2 Asset Description Generation Concept

There is one single description field for an asset in the CMMS. The asset description field has a maximum length of 2,000 characters.

The minimum asset description field must be derived from the AIC as the starting point. Further details are stored in the technical data sheet and attribute fields for the asset.

Asset Identification Code (AIC)	{code}
Asset description , derived from AIC	{translation from AIC}

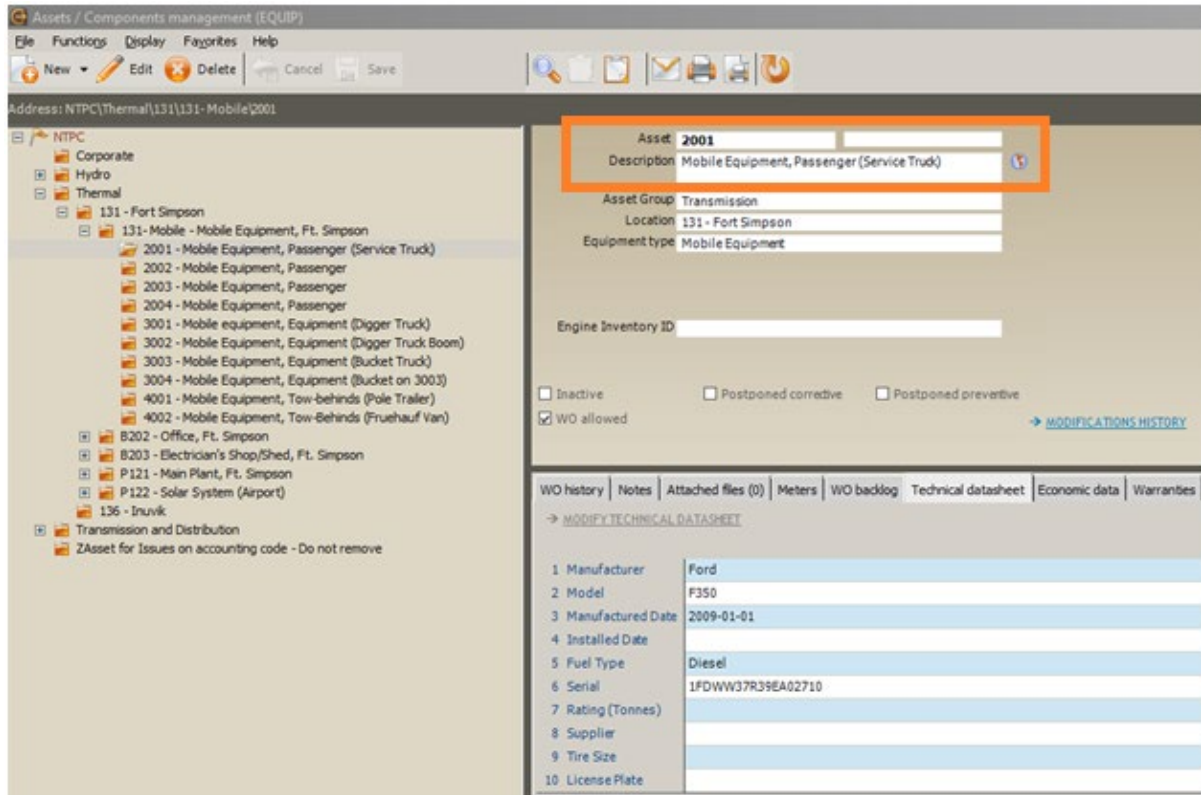
Table 37 Asset Description generation logic

For entry into the CMMS, the AIC and asset description need to be entered.

	Values to populate in CMMS
Asset Identification Code (AIC)	P121000SMA01AE001
Asset description	Fort Simpson Diesel Plant, Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear 001
Location description	131 - Fort Simpson

Table 38 Example of fields that are entered into the CMMS

Figure 2 on the next page shows the AIC field (box right of “Asset”) and the Asset description field in the CMMS.



The screenshot displays the CMMS interface for asset management. On the left, a tree view shows the hierarchy: NTPC > Corporate > Hydro > Thermal > 131 - Fort Simpson > 131-Mobile - Mobile Equipment, Ft. Simpson > 2001 - Mobile Equipment, Passenger (Service Truck). The main panel on the right shows the details for Asset 2001. A red box highlights the 'Asset' field (containing '2001') and the 'Description' field (containing 'Mobile Equipment, Passenger (Service Truck)'). Below these fields, other information is visible: Asset Group: Transmission, Location: 131 - Fort Simpson, Equipment type: Mobile Equipment, and Engine Inventory ID: [empty]. At the bottom, there is a table with technical data.

WO history	Notes	Attached files (0)	Meters	WO backlog	Technical datasheet	Economic data	Warranties
→ MODIFY TECHNICAL DATASHEET							
1 Manufacturer	Ford						
2 Model	F350						
3 Manufactured Date	2009-01-01						
4 Installed Date							
5 Fuel Type	Diesel						
6 Serial	1FDWW37R39EA02710						
7 Rating (Tonnes)							
8 Supplier							
9 Tire Size							
10 License Plate							

Figure 2 Screenshot of CMMS showing the Asset Code field (for the AIC) and Asset Description fields in the highlighted box

2.2.1 Asset description generation examples

Example **Hydro**:

Asset Identification Code (AIC)	P109000GMA01AT001
Asset description , derived from AIC	Twin Gorges (Taltson) Hydro Plant (Taltson River), Common, Water Supply and Disposal, Process Drainage System, Oil Water Separator 01, Mechanical Equipment, Cleaning, drying, separating & filtering 001
Location description	129 (Taltson)
Division	Hydro

Table 39 Hydro Asset Description generation example

Example **Thermal**:

Asset Identification Code (AIC)	P121000SMA01AE001
Asset description , derived from AIC	Fort Simpson Diesel Plant, Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear 001
Location description	131 (Fort Simpson)
Division	Thermal

Table 40 Thermal Asset Description generation example

Example **Distribution**:

Asset Identification Code (AIC)	D110001ALA00
Asset description , derived from AIC	Distribution System Fort Simpson, Feeder 001, Grid & Distribution Systems, 5 kV, Towers & Fixtures
Location description	131 (Fort Simpson)
Division	Distribution

Table 41 Distribution Asset Description generation example

Example T&D Station:

Asset Identification Code (AIC)	S148001UAG01
Asset description, derived from AIC	Fort Smith Substation, Foundation T1, Civil Structures, Structures for Grid and Distribution Systems, Structure for Transformers 01
Location description	128 (Fort Smith)
Division	T&D Station

Table 42 T&D Station Asset Description generation example

Example Transmission:

Asset Identification Code (AIC)	L150001UZT01
Asset description, derived from AIC	Twin Gorges (S161) to Pine Point (S157) Xmsn. Line -115 kV, Tower Group 1 (Towers 1-10), Civil Structures, Outdoor Area, Plots of Land and Land Rights
Location description	T01
Division	Transmission

Table 43 Transmission Asset Description generation example

3 Governance and Change Management

This section describes how ongoing operational maintenance of asset locations in case of transfers between locations and maintenance of the KKS keys and naming conventions are to be applied.

3.1 Transferring assets between locations

When discrete assets are transferred from one Community to another, both the 3-digit Community code in the “Asset Location” field **and** the 4 character alphanumeric Facility code in the AIC must be updated in the CMMS.

The CMMS uses a system generated unique sequential number as the database key (e.g. 0000000000000000000010) which is the true source of tracking an asset. Therefore, the CMMS supports updates to the AIC for the purpose of transfers between Communities or for other reasons, e.g. updates to keys used in the AIC.

The following fields need to be updated when transferring an asset:

- Asset Identification Code;
- Asset description;
- Location description field.

An example of an asset transfer is provided in the following 2 tables. The asset code structure remains the same, except for the Community code and the Facility code.

	Community	Community name
Transfer from	131	Fort Simpson
Transfer to	128	Fort Smith

Table 44 Asset transfer example #1: from one community to another community

	AIC	Asset description	Location
Old values	<u>P121</u> 000SMA01AE001	<u>Fort Simpson Diesel Plant</u> , Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear 001	<u>131</u>
New values	<u>P108</u> 000SMA01AE001	<u>Fort Smith Diesel Plant</u> , Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear 001	<u>128</u>

Table 45 Asset transfer example #1: old and new AICs, asset description and location field values

In case a similar asset already exists in the new Facility / Community, then the numbering in the new AIC must be sequential and follow after the existing numbered assets.

	AIC	Asset description	Location
Old values of asset for transfer	<u>P121000SMA01AE</u> 001	<u>Fort Simpson Diesel Plant</u> , Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear 001	<u>131</u>
<i>Existing asset</i>	<u>P108000SMA01AE</u> 001	<u>Fort Smith Diesel Plant</u> , Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear <u>001</u>	<u>128</u>
<i>Existing asset</i>	<u>P108000SMA01AE</u> 002	<u>Fort Smith Diesel Plant</u> , Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear <u>002</u>	<u>128</u>
New values of transferred asset	<u>P108000SMA01AE</u> 003	<u>Fort Smith Diesel Plant</u> , Common, Ancillary Systems, Cranes Stationary Hoists and Conveying Appliances, Building Crane 01, Mechanical equipment, Turning driving lifting and slewing gear <u>003</u>	<u>128</u>

Table 46 Asset transfer example #2: old and new AICs, asset description and location field values in case similar assets already exist in the Facility where an asset is transferred to.

Transferring assets between locations does not impact the GP fixed asset ID associated with the AIC. Hence, the GP fixed asset ID in the CMMS for an asset that is being transferred, does **not** need to be updated as part of the transfer.

3.2 Code and Naming Convention Governance

The NTPC Asset Managers are responsible for the unique asset naming convention and the maintenance of the valid values that can be used in the coding of new assets.

Any requests for new KKS keys to be used in function, equipment unit and component coding need to be reviewed by the asset managers prior to use.

The KKS Standard's dictionary of keys is the starting point to select keys from. If no suitable key can be found, a new specific key can be suggested aligned with the KKS extension rules and is to be discussed with the respective asset manager to use in AICs.

3.3 Mapping table of AICs to GP fixed asset IDs

As described in 1Appendix B, there can be multiple AICs in the CMMS that are linked to one and the same GP fixed asset ID in the ERP system.

As the creation of assets in the CMMS takes place based on this handbook, it is recommended to create a mapping table that lists which AICs link to which GP fixed asset IDs.

That mapping table enables validating and maintaining the relationships between AIC and GP fixed asset IDs to support correct reporting of, for example, FERC codes by AIC.

Appendices

Appendix A CMMS field characteristics

Data fields in the CMMS are defined in a list by CoGep including field name, details, examples and size (maximum number of characters per field). Below is an excerpt of the complete list, focused on the key asset fields related to the asset code and asset description.

With respect to the asset code field, the maximum size for the asset code is 60 characters. Symbols, dash or period can be used as characters in the asset code field.

Field	Details	Size
Asset		
Asset (Code)	Asset Code <i>(AIC = Asset Identification Code)</i>	60
Asset (Description)	Description of the asset in language #1 <i>(English)</i>	2,000
Asset (Description)	Description of the asset in language #2 <i>(not used)</i>	2,000
Asset (Description)	Description of the asset in language #3 <i>(not used)</i>	2,000
Asset (Alternate asset code)	<i>Planned for storing the “GP fixed asset ID”</i>	60
Asset header		
Asset Group	<i>Used for storing Division, 5 options, mandatory:</i> <i>1 Hydro</i> <i>2 Thermal</i> <i>3 Transmission & Distribution</i> <i>4 Finance</i> <i>5 Information Technology</i>	200
Location (Description)	<i>Used for storing the 3-digit Location code as defined by the NTPC Chart of Accounts</i>	200

Table 47 Selection of key field characteristics in the CMMS

Appendix B Background on CMMS and ERP system

NTPC's Enterprise Resource Planning (ERP) system, Microsoft Dynamics Great Plains (GP), holds the master list of fixed assets. GP also holds the Federal Energy Regulatory Commission's (FERC) code and sub FERC code for the fixed assets. The primary purposes of the ERP system are financial reporting on fixed assets and FERC-light regulatory compliance reporting related to fixed assets. Sub FERC code fields in the ERP system are available for future planning processes. The key identifier in the ERP system is the GP fixed asset ID.

The CMMS holds the fixed assets for maintenance planning and work order management purposes. The key identifier in the CMMS is the AIC. This handbook describes how the AIC for the CMMS is defined.

Key asset identifiers in the context of NTPC's CMMS and ERP system are:

- 1 The GP fixed asset ID: consists of 5 digits;
- 2 FERC code: consist of 3 digits (e.g. code 344 relates to generators);
- 3 Asset Identification Code: (the AIC).

The AIC and GP fixed asset ID are linked by storing the GP fixed asset ID from the ERP system in a designated CMMS field.

Multiple AICs can be related to a single GP fixed asset ID in the ERP system. The FERC code for assets can be referenced through the fixed asset ID link.. For the scope of this asset identification handbook, it is important to note that FERC codes will **not** be stored in the CMMS to avoid data duplication and to avoid additional data maintenance efforts.

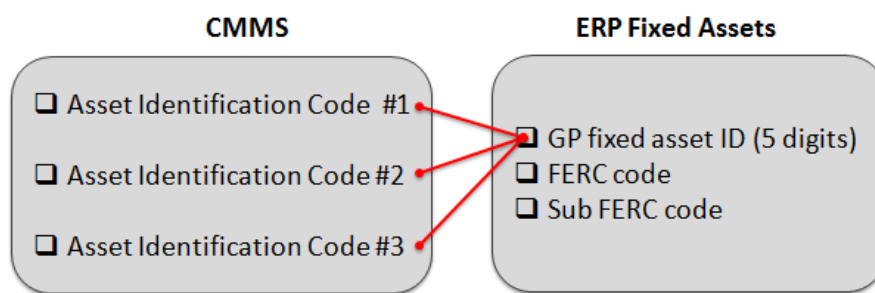


Figure 3 Relationship between assets in the CMMS and ERP system

Integration between the CMMS and the ERP system represents a future phase of the CMMS implementation, and is not defined in the current edition of this handbook.

Location in CMMS

NTPC uses 3-digit discrete codes to identify operating locations, for example “131” stands for Fort Simpson. These codes are defined in the *NTPC Chart of Accounts*.

The 3-digit location code is not considered part of the AIC. For reporting and sorting purposes within the CMMS system, the “Location description” field under the Asset Header in the CMMS holds the location code as part of a dropdown list (i.e. not free text).

- The inclusion of the 4 character alphanumeric Facility code in the AIC supports searching, sorting and filtering identical assets that exist at multiple Facilities;
- The inclusion of the 3-digit plant code in the location field supports reporting by location.

A more granular asset location determination method such as Global Positioning System (GPS) for linear assets may be assessed for potential adoption by NTPC in the future. GPS location information is not in scope of this handbook in relation to the initial asset creation and set up process in the CMMS. A suitable attribute field for GPS coordinates of assets will need to be assessed when planning future use of GPS coordinates of linear assets.

GPS coordinates should not be stored in the “Location description” field in the CMMS as per GuideTi’s design and the present use of location codes as dropdown list values in the “Location description” field. The technical data sheet section in the CMMS offers fields that can be customized for additional types of data as required.

Appendix C Community Codes

Community codes

The following 3-digit location codes are used by NTPC to refer to discrete locations in the identified Guide Ti asset parameter.

Community	Location	Community	Location
120	Jackfish - Yellowknife	139	Fort McPherson
121	Snare - Yellowknife	140	Aklavik
122	Bluefish - Yellowknife	141	Deline
123	Wha Ti	142	Fort Good Hope
124	Gameti (Rae Lakes)	143	Paulatuk
125	Behchoko (Rae/Edzo)	144	Sachs Harbour
126	Dettah	145	Tsiigehtchic
127	Lutsel K'e	146	Colville Lake
128	Fort Smith	147	Ulukhaktok
129	Taltson	148	Tulita
130	Fort Resolution	350	Hay River
131	Fort Simpson		
132	Fort Liard		
133	Wrigley		
134	Nahanni Butte		
135	Jean Marie River		
136	Inuvik		
137	Norman Wells		
138	Tuktoyaktuk		

Table 48 NTPC 3-digit Community codes (ordered by 3-digit code)

Appendix D Codes from Record Drawing Numbering System

Power Plants (P in level -1)

The following power plants are sorted alphabetically. A numerical list follows after the alphabetical list. Only currently operating plants are shown in this list. For a complete list of assigned plant numbers, refer to the *NTPC Record Drawing Numbering System* documentation.

Location	Plant No.
Aklavik 2007 Diesel Plant	P156
Aklavik Solar Plant	P157
Bluefish Hydro Plant No. 1 (G1)	P107
Bluefish Hydro Plant No. 2 (G2)	P106
Colville Lake Diesel Plant Old Plant	P243
Colville Lake Diesel Plant	P245
Deline Diesel Plant	P174
Deline Diesel Plant 1986	P175
Fort Liard 1975 Diesel Plant	P223
Fort Liard Solar Plant	P224
Fort McPherson 2004 Diesel Plant	P151
Fort Resolution Standby Diesel Plant	P111
Fort Resolution Diesel Plant (Buffalo Junction – Not owned by NTPC)	P114
Fort Simpson Diesel Plant	P121
Fort Simpson Solar Plant	P122
Fort Simpson LNG Plant	P123
Fort Smith Diesel Plant	P108
Frank's Channel Diesel Plant	P237
Inuvik 1970 Natural Gas Plant (K-Plant)	P136
Inuvik 1984 Diesel Plant (EMD)	P137
Inuvik Wind Farm	P138
Jackfish Diesel Plant No.1 (kV 16)	P101
Jackfish Diesel Plant No.3 (1992) (CAT)	P231
Jackfish Lake Diesel Plant No. 2 (1974) (EMD)	P232
Jackfish Lake Diesel Plant No.4 (1995) (Ruston)	P105
Jackfish Lake Modular Plant	P233
Jean Marie River Diesel Plant	P226
K'asho Got'ine (Fort Good Hope) Diesel Plant	P172
Lutsel K'e Diesel Plant	P113
Lutsel K'e New Diesel Plant	P115
Nahanni Butte 1973 Diesel Plant	P229
Norman Wells Diesel Plant	P165
Paulatuk 1999 Diesel Plant	P230
Gameti 1975 Diesel Plant	P227
Sachs Harbour 1975 Diesel Plant	P217

Location	Plant No.
Sachs Harbour New Diesel Plant	P220
Snare Cascades Hydro Plant	P242
Snare Falls Hydro Plant	P102
Snare Forks Hydro Plant	P104
Snare Rapids Hydro Plant	P103
Tsiigethchic 1973 Diesel Plant	P240
Tuktoyaktuk 1992 Diesel Plant	P142
Tulita Diesel Plant	P176
Taltson Hydro Plant (Twin Gorges)	P109
Uluhaktok 1975 Diesel Plant	P241
Wha Ti Diesel Plant	P112
Wrigley Diesel Plant	P222

Table 49 Power Plants from Record Drawing Numbering System, Revised April 2009 (alphabetical)

Power plants (numerical):

Plant No.	Location
P101	Jackfish Diesel Plant No.1 (kV 16)
P102	Snare Falls Hydro Plant
P103	Snare Rapids Hydro Plant
P104	Snare Forks Hydro Plant
P105	Jackfish Lake Diesel Plant No.4 (1995) (Ruston)
P106	Bluefish Hydro Plant No. 2 (G2)
P107	Bluefish Hydro Plant No. 1 (G1)
P108	Fort Smith Diesel Plant
P109	Taltson Hydro Plant (Twin Gorges)
P111	Fort Resolution Standby Diesel Plant
P112	Wha Ti Diesel Plant
P113	Lutsel K'e Diesel Plant
P114	Buffalo Junction Diesel Plant (Not owned by NTPC)
P115	Lutsel K'e New Diesel Plant
P121	Fort Simpson Diesel Plant
P122	Fort Simpson Solar Plant
P123	Fort Simpson LNG Plant
P136	Inuvik 1970 Natural Gas Plant (K-Plant)
P137	Inuvik 1984 Diesel Plant (EMD)
P138	Inuvik Wind Farm
P142	Tuktoyaktuk 1992 Diesel Plant
P151	Fort McPherson 2004 Diesel Plant
P156	Aklavik 2007 Diesel Plant
P157	Aklavik Solar Plant
P165	Norman Wells Diesel Plant
P172	K'asho Got'ine (Fort Good Hope) Diesel Plant
P174	Deline Diesel Plant
P175	Deline Diesel Plant 1986

Plant No.	Location
P176	Tulita Diesel Plant
P217	Sachs Harbour 1975 Diesel Plant
P220	Sachs Harbour New Diesel Plant
P222	Wrigley Diesel Plant
P223	Fort Liard 1975 Diesel Plant
P224	Fort Liard Solar Plant
P226	Jean Marie River Diesel Plant
P227	Gameti 1975 Diesel Plant
P229	Nahanni Butte 1973 Diesel Plant
P230	Paulatuk 1999 Diesel Plant
P231	Jackfish Diesel Plant No.3 (1992) (CAT)
P232	Jackfish Lake Diesel Plant No. 2 (1974) (EMD)
P233	Jackfish Modular Plant
P237	Frank's Channel Diesel Plant
P240	Tsiigethchic 1973 Diesel Plant
P241	Uluhaktok 1975 Diesel Plant
P242	Snare Cascades Hydro Plant
P243	Colville Lake Diesel Plant OLD Plant
P245	Colville Lake Diesel Plant

Table 50 Power Plants from Record Drawing Numbering System, Revised April 2009 (numerical)

Distribution Systems (D in level -1)

The following distribution systems are sorted alphabetically. Only systems currently operated and maintained by NTPC are included in this document. For a full list of assigned distribution system codes, refer to NTPC's *Record Drawing Numbering System* documentation. A numerical list follows the alphabetical list.

Location	Distribution System No.
Aklavik	D125
Bluefish	D108
Colville Lake	D243
Dettah	D103
Duncan Lake	D255
Edzo (Behchoko)	D102
Enterprise	D130
Deline	D147
Fort Liard	D197
Fort McPherson	D119
Fort Providence	D109
Fort Resolution	D123
Fort Simpson	D110
Fort Smith	D106
Frank Channel	D126
Gameti	D122
Inuvik	D115
Jackfish Lake	D107
Jean Marie River	D203
Fort Good Hope	D143
Lutselk'e	D124
Nahanni Butte	D205
Norman Wells	D137
Rae (Behchoko)	D101
Snare Cascades	D242
Snare Falls	D104
Snare Forks	D114
Snare Lakes	D112
Snare Rapids	D105
Snare River	D113
Strutt Lake	D116
Taltson	D128
Tsiigehtchic	D157
Tuktoyaktuk	D145
Tulita	D149
Ulukhaktok	D173
WhaTi	D201
Whittiker Falls	D120
Wrigley	D195

Location	Distribution System No.
Yellowknife	D100

Table 51 Distribution Systems from Record Drawing Numbering System, Revised April 2009 (alphabetical)

Distribution systems (numerical):

Distribution System No.	Location
D100	Yellowknife
D101	Rae (Behchoko)
D102	Edzo (Behchoko)
D103	Dettah
D104	Snare Falls
D105	Snare Rapids
D106	Fort Smith
D107	Jackfish Lake
D108	Bluefish
D109	Fort Providence
D110	Fort Simpson
D112	Snare Lakes
D113	Snare River
D114	Snare Forks
D115	Inuvik
D116	Strutt Lake
D119	Fort McPherson
D120	Whittiker Falls
D122	Gameti
D123	Fort Resolution
D124	Lutselk'e
D125	Aklavik
D126	Frank Channel
D128	Taltson
D130	Enterprise
D137	Norman Wells
D143	Fort Good Hope
D145	Tuktoyaktuk
D147	Deline
D149	Tulita
D157	Tsiigehtchic
D173	Ulukhaktok
D195	Wrigley
D197	Fort Liard
D201	WhaTi
D203	Jean Marie River
D205	Nahanni Butte
D242	Snare Cascades
D243	Colville Lake

Distribution System No.	Location
D255	Duncan Lake

Table 52 Distribution Systems from Record Drawing Numbering System, Revised April 2009 (numerical)

Substations (S in level -1)

The following substations are sorted alphabetically by location. A numerical list follows the alphabetical list. Only systems currently operated and maintained by NTPC are included in this document. For a full list of assigned substation codes, refer to NTPC's *Record Drawing Numbering System* documentation.

	Location	Voltage Class
S357	Dettah Village Substation	34.5kV – 7.5kV
S456	D.O.T. Monitoring Site Substation in Alberta	12 kV -600 V
S356	Fort Resolution Single Phase Ground Return Substation	34.5 -2.4 kV
S452	Fort Simpson Airport Substation	4.16 -12 kV
S455	Fort Smith Feeder 4 Substation (D.O.T. Line)	4.16 kV
S148	Fort Smith Substation	115 -4.16 kV
S160	Frank's Channel Substation	115 -12 kV
S300	Inuvik Powerhouse Substation	5 – 25 kV
S301	Inuvik Airport Substation	25 – 5kV
S352	Jackfish Lake Substation	4.16 -34.5 kV
S172	Jackfish Lake Substation	34.5 kV Ring Bus
S460	Norman Wells NTPC Substation	4.16 -12 kV
S461	Norman Wells Esso Substation	12 -4.16 kV
S343	P.W.G. & E. Substation No. 400	34.5 -4.16 kV
S451	Rae Town site Substation	12 -4.16 kV
S345	Rat Lake Substation No. 500	4.16 -34.5 kV
S344	Rat Lake Substation No. 600	4.16 -34.5 kV
S151	Sass River C.N.T. Tap-off & Substation (On Fort Smith/Pine Point Line)	66.4 kV -120/240V
S174	Smiley Lake Substation	115 KV
S162	Snare Cascades Substation	6.9 – 115 kV
S444	Snare Falls C.N.T. Substation (Isolating)	6.9 -6.9 kV
S159	Snare Falls Substation	6.9 -115 kV
S173	Snare Falls Substation	115 kV Ring Bus
S169	Snare Forks Substation	12 -115 kV
S158	Snare Rapids Substation	6.9 -115 kV
S170	Snare Rapids Tie Point Substation	115 kV
S170	Snare Rapids Tie Point Substation	115kV
S458	Tuktoyaktuk Substation	4160/120/208 V
S161	Twin Gorges (Taltson) Substation	6.9 -115 kV
S156	Yellowknife Terminal Station	115 -34.5 kV

Table 53 Substations from Record Drawing Numbering System, Revised April 2009 (alphabetical)

Substations (numerical):

Substation No.	Location	Voltage Class
S148	Fort Smith Substation	115 -4.16 kV
S151	Sass River C.N.T. Tap-off & Substation (On Fort Smith/Pine Point Line)	66.4 kV -120/240V
S156	Yellowknife Terminal Station	115 -34.5 kV
S157	Pine Point Substation	115 kV – 12.5 kV
S158	Snare Rapids Substation	6.9 -115 kV
S159	Snare Falls Substation	6.9 -115 kV
S160	Frank Channel Substation	115 -12 kV
S161	Twin Gorges (Taltson) Substation	6.9 -115 kV
S162	Snare Cascades	6.9 – 115 kV
S163	Snare Falls Substation	
S169	Snare Forks Substation	12 -115 kV
S170	Snare Rapids Tie Point Substation	115 kV
S170	Snare Rapids Tie Point Substation	115kV
S172	Jackfish Lake Substation	34.5 kV Ring Bus
S173	Snare Falls Substation	115 kV Ring Bus
S174	Smiley Lake Substation	115 KV
S252	Inuvik Substation (Out of Service)	4.16 -69 kV
S253	Tuktoyaktuk Substation (Out of Service)	6.9 -4.16 kV
S301	Inuvik Airport Substation	25 – 5kV
S344	Rat Lake Substation No. 600	4.16 -34.5 kV
S345	Rat Lake Substation No. 500	4.16 -34.5 kV
S352	Jackfish Lake Substation	4.16 -34.5 kV
S353	Pine Point Cominco Sub #3 (Ruston Plant)	7.2 -34.5 kV
S356	Fort Resolution Single Phase Ground Return Substation	34.5 -2.4 kV
S357	Dettah Village Substation	34.5kV – 7.5kV
S444	Snare Falls C.N.T. Substation (Isolating)	6.9 -6.9 kV
S452	Fort Simpson Airport Substation	4.16 -12 kV
S455	Fort Smith Feeder 4 Substation (D.O.T. Line)	4.16 kV
S456	D.O.T. Monitoring Site Substation in Alberta	12 kV -600 V
S460	Norman Wells NTPC Substation	4.16 -12 kV
S461	Norman Wells Esso Substation	12 -4.16 kV

Table 54 Substations from Record Drawing Numbering System, Revised April 2009 (numerical)

Transmission lines (L in level -1)

The following transmission lines are sorted numerically by voltage class.

Transmission lines, 115 to 138 kV class:

Transmission Line No.	Location & Voltage
L142	Twin Falls – Taltson S/S
L150	Twin Gorges (S161) to Pine Point (S157) -115 kV
L190	Snare Rapids (S158) to Yellowknife Terminal Station (S156) - 115 kV
L191	Snare Falls (S159) to Snare Rapids Tie Point (L190) -115 kV
L192	Smiley Lake (L190) to Frank Channel Sub (S160) -115 kV
L193	Snare Forks (S169) to Snare Falls (S159) Xmsn. Line -115 kV
L196	Snare Tie Sub (S173) to Snare Falls Substation (S159) – 115 kV
L199	Yellowknife to Snare (1989) - 161 kV

Table 55 Transmission line codes (115 to 138 kV) from Record Drawing Numbering System, Revised April 2009

Transmission lines, Max Voltage @ 69 kV:

Transmission Line No.	Location & Voltage
L200	Ingraham Trail (S201) to Bluefish Hydro (S200)– 46 kV

Table 56 Transmission line codes (Max Voltage @ 69 kV) from Record Drawing Numbering System, Revised April 2009

Transmission lines, 23 to 34.5 kV class:

Transmission Line No.	Location & Voltage
L350	Pine Point (S353) to Fort Resolution (S356) Single Phase Ground Return -34.5 kV
L352	Yellowknife Terminal Station (S156) to P.W.G. & E. Sub. No.100 (S352) and Jackfish Diesel Plant (S352) -34.5 kV
L354	C.M. & S. Xmsn. Line from C.M. & S. Bluefish Hydro Plant (S354) to C.M. & S. Mines (S355) to -34.5 kV
L355	Jackfish Lake Substation (S172) to Con Miramar Mine (Rob Shaft) – 34.5 kV
L359	Giant Bluefish Tie Line GT 89-1 to GT89-2 inclusive – 34.5 kV

Table 57 Transmission line codes (23 to 34.5 kV) from Record Drawing Numbering System, Revised April 2009

Transmission lines, 6.9 to 15 kV class:

Transmission Line No.	Location & Voltage
L450	Frank Channel (S160) to Rae Town Site (S451) -12 kV
L451	Frank Channel (S160) to Edzo Town Site (D102) & C.N.T. Repeater Xmsn. Line -7.2 kV
L452	C.M. & S. Xmsn. Line (L354) to Ptarmigan Indian Village (D103) Xmsn. Line-7.2 kV
L454	Fort Simpson Town Site (S452) to Airport -12 kV
L458	Ft. Smith Feeder 4 Sub. (S455) to D.O.T. Monitoring Site (S456) -12 kV
L460	Fort Smith to Salt River Single Phase Ground Return -7.2 kV
L461	Snare Falls Hydro Plant (S444) to C.N.T. Site -6.9 kV
L464	Snare Rapids Tie-Point to Spillway 5B -6.9 kV

Table 58 Transmission line codes (6.9 to 15 kV) from Record Drawing Numbering System, Revised April 2009

Buildings (B in level -1)

The following building codes are sorted alphabetically by Community and numerically by building number. The building number ranges by Community are listed in the next table.

Community	Building No.	Description
Aklavik	B001	Office/Garage
	B002	Sea Container
Bluefish	B026	Transient House
	B027	Garage
	B028	New Trailer
	B029	Old Trailer
	B030	Employees Residence
	B031	Head Gate Building
	B032	Duncan Lake Dam
	B033	Radio Building
	B034	Spillway Gate Building
Deline	B076	Staff Residence
Behchoko	B101	Storage Area
	B102	Office Trailer
	B103	Radio Building
Ft. Liard	B126	Office/Transient Trailer
	B127	Heated Sea-Can
Fort Resolution	B176	Office/Transient Trailer
	B177	Radio Building
	B178	Switchgear Building
Fort Simpson	B201	Garage Warehouse & Office
	B202	Office Complex
	B203	Electrician Shop/Shed
Fort Smith	B226	Equipment Building
	B227	Staff House - Retired
	B228	Control Center
	B229	Line Vehicle Garage & Storage
	B230	Building Lot
	B231	Lineman Office
	B232	Storage Building
Gameti	B233	Substation Control Building
	B276	New Office/Transient Trailer
	B277	Warehouse
Hay River	B301	Head Office
	B302	Warehouse
Ulukhaktok	B326	Staff Quarters
Inuvik	B351	Composite Building
Inuvik	B352	Warehouse

Community	Building No.	Description
	B353	Cold Storage Warehouse
	B354	Filter Building
	B355	NCPC 6 Bay Garage
	B356	Water Treatment Plant
	B357	Garage at Airport Road
	B358	Double Garage
	B359	Storage Area
	B360	Office Building
	B361	14 Unit Staff Quarters
	B362	Admin Building (Demolished)_
	B363	Apartment
	B364	Community Center
	B365	Skidded Lift Station
	B366	8 Spruce Hill
	B367	15 Raven Row House
	B368	17 Raven Row House
	B369	Admin Building
Jackfish	B376	Line Shop
	B377	New Office Addition
	B378	Extension of Building B1
	B379	Control Center
	B380	Warehouse
	B381	Communications Tower Ingraham Trail
	B382	Radio Building
Jean Marie River	B401	Office/Staff Quarters
	B402	Storage Container
Fort Good Hope	B426	Detached Residence
	B427	Transient Trailer
	B428	Generating Station
	B429	Cold Storage Container Sea-Can
	B430	Heated Storage Container
Lutselk'e	B451	Transient Trailer
	B452	Office Trailer/Line Shack
	B453	Warehouse
	B454	Storage Container Sea-Can
Nahanni Butte	B476	Four Man Transient
	B477	Storage Container Sea-Can
	B478	Fuel Module Building
Norman Wells	B501	Transient Trailer
	B502	Office Trailer
	B503	Atco House
	B504	Warehouse
	B505	Detached Residence
Paulatuk	B526	Garage/Workshop

Community	Building No.	Description
Pine Point	B527	3 Bedroom Staff Quarters
	B551	Warehouse
	B552	PCB Storage Area
Sachs Harbour	B601	Office/Transient Trailer
	B602	Sea Container
Snare Cascades		
Snare Falls	B651	Parking Garage
	B652	Spillway Gate Structure
	B653	Gate Hoist Building
	B654	Radio Building
	B655	Radio Building CN Hill
	B656	Main Tie Sub Building
Snare Forks	B676	Water Treatment Plant
	B677	Gate Hoist Building
	B678	Radio Building
	B679	Office Trailer
Snare Rapids	B701	Portable Sleeper Residence
	B702	Garage
	B703	Staff House
	B704	8 Man Wet Sleeper
	B705	3 Bay Garage
	B706	Gate Hoist Building
	B707	New Building - Knob Hill
	B708	Camp
	B709	5B Spillway Gate Structure
	B710	Radio Building,
	B711	Water Treatment Plant
	B712	Carpenter Shop
Taltson	B726	Staff House
	B727	Transient Quarter Residence
	B728	Garage
	B729	Storage Building
	B730	Head Gate Building
	B731	Radio Building,
Tsiigehtchic	B751	Trailer /Staff Quarters
	B752	Heated Sea-Can
Tuktoyaktuk	B776	Warehouse
Tulita	B801	Trailer/Staff Quarters
Wha Ti	B826	Transient Trailer
Wrigley	B851	Trailer/Staff Quarters

Table 59 Building codes by Community

Building code ranges:

Community	Building No.
Aklavik	B001-B025
Bluefish	B026-B050
Colville Lake	B051-B075
Deline	B076-B100
Edzo	B101-B125
Ft. Liard	B126-B150
Ft. McPherson	B151-B175
Ft. Resolution	B176-B200
Ft. Simpson	B201-B225
Ft. Smith	B226-B250
Frank's Channel	B251-B275
Gameti	B276-B300
Hay River	B301-B325
Ulukhaktok	B326-B350
Inuvik	B351-B375
Jackfish	B376-B400
Jean Marie River	B401-B425
K'asho Got'ine	B426-B450
Lutselk'e	B451-B475
Nahanni Butte	B476-B500
Norman Wells	B501-B525
Paulatuk	B526-B550
Pine Point	B551-B575
Rae	B576-B600
Sachs Harbour	B601-B625
Snare Cascades	B626-B650
Snare Falls	B651-B675
Snare Forks	B676-B700
Snare Rapids	B701-B725
Taltson	B726-B750
Tsiigehtchic	B751-B775
Tuktoyaktuk	B756-B800
Tulita	B801-B825
Wha Ti	B826-B850
Wrigley	B851-B875
Yellowknife	B876-B900

Table 60 Building code ranges by Community

Original Authors, reviewers and approvers

	Name	Position / Role
Authors:	Dean Hendrickson	Asset Manager, Thermal
	Dipankar Chakrabarti	Asset Manager, Transmission & Distribution
	Eileen Hendry	Manager, Performance & Benchmarking
	Morris Callahan	Diesel Maintenance Planner
	Stuart Robinson	Maintenance Planner & Special Projects
	Hugo van Hoogstraten	Advisor (KPMG)
Reviewers:	Kerry Hataley	Business System Analyst
	Belinda Whitford	Controller
	David Cheng	Advisor (KPMG)
Approvers:	CMMS Steering Committee	Judy Goucher, CFO Glenn Smith, Director IT Mike Ocko, Director Thermal division Jay Pickett, Director Hydro division Dave Duncan, Director T&D Michael Doyle, Director Human Resources

Change Tracking

Version	Date	By Whom	Pages Altered/Comments
1.5	September 15, 2020	Leah Plett	Updated Plants List
1.4	April 16, 2020	Leah Plett	Updated Substation list
1.3	March 6, 2020	Leah Plett	New building codes added, new function code (AKL)
1.2	November 29, 2019	Leah Plett	New building codes added
1.1	July 31, 2019	Leah Plett	New building codes added
1.0	Jun 13, 2019	Leah Plett	Updated Building List, new function code (ATA). Removed DRAFT from name.
0.16	Sep 11, 2018	Leah Plett	Addition of new function codes (UEL, UAB, BFC, CYV) Updated descriptions (GR, BVA)
0.15	Dec 30 2015	CJ Consulting	Added Keys for asset coding & building numbers

Version	Date	By Whom	Pages Altered/Comments
0.14	April 02, 2015	CJ Consulting	Review of manual, added asset numbers
0.13	June 27, 2014	Hugo van Hoogstraten	Updated section 3.2 on counting as T&D indicated no need to have an extra character for transmission assets.
0.12	June 27, 2014	Hugo van Hoogstraten	Updates based on review with Finance and authors, reviewers and approvers.
0.11	April 23, 2014	Hugo van Hoogstraten	Included minor revisions regarding title and T&D component data structure from Dipankar Chakrabarti.
0.10	April 14, 2014	Hugo van Hoogstraten	Included T&D asset coding examples from Dipankar Chakrabarti. Included decade counting principles from Eileen Hendry and highlighted new asset identifier codes used in those counting principles in yellow. Sent to project committee for review on April 15 by Dean Hendrickson with responses requested by April 22.
0.9	April 9, 2014	Hugo van Hoogstraten	Processed comments from Eileen Hendry and Dipankar Chakrabarti including building codes, AIC definitions, vehicle coding and reviewed appendices. Pending updating of T&D asset coding section (3.1.9).
0.8	April 1, 2014	Hugo van Hoogstraten	Processed comments from Eileen Hendry, Dean Hendrickson, Stuart Robinson, Morris Callahan and Dipankar Chakrabarti from review sessions on April 1. Highlighted yellow sections for further improvement.

Version	Date	By Whom	Pages Altered/Comments
0.7	March 31, 2014	Hugo van Hoogstraten	Updated asset coding examples based on sample of assets coded by the CMMS project team according to the updated coding concept. Inserted placeholder for mobile equipment and key definition to be completed. Took out previous custom keys (saved in separate notes and actions file).
0.6	March 24, 2014	Hugo van Hoogstraten	Processed comments from Eileen Hendry regarding customization of asset code levels. Indicated highlights in turquoise and yellow for discussion on March 25.
0.5	March 4, 2014	Hugo van Hoogstraten	Processed comments from reviewers regarding asset parameters, technical data sheets, substation coding and Thermal and Hydro keys.
0.4	February 27, 2014	Hugo van Hoogstraten	Processed comments from reviewers. Pending review of Hydro/Thermal keys, CMMS fields confirmation, Finance confirmation of financial asset ID.
0.3	February 26, 2014	Hugo van Hoogstraten	Processed part of comments from reviewers.
0.2	February 26, 2014	Hugo van Hoogstraten	Processed comments from David Cheng. Pending review of Hydro/Thermal keys and description generation.
0.1	February 25, 2014	Hugo van Hoogstraten	First draft.