GENESIS Solution Suite®

EDISON

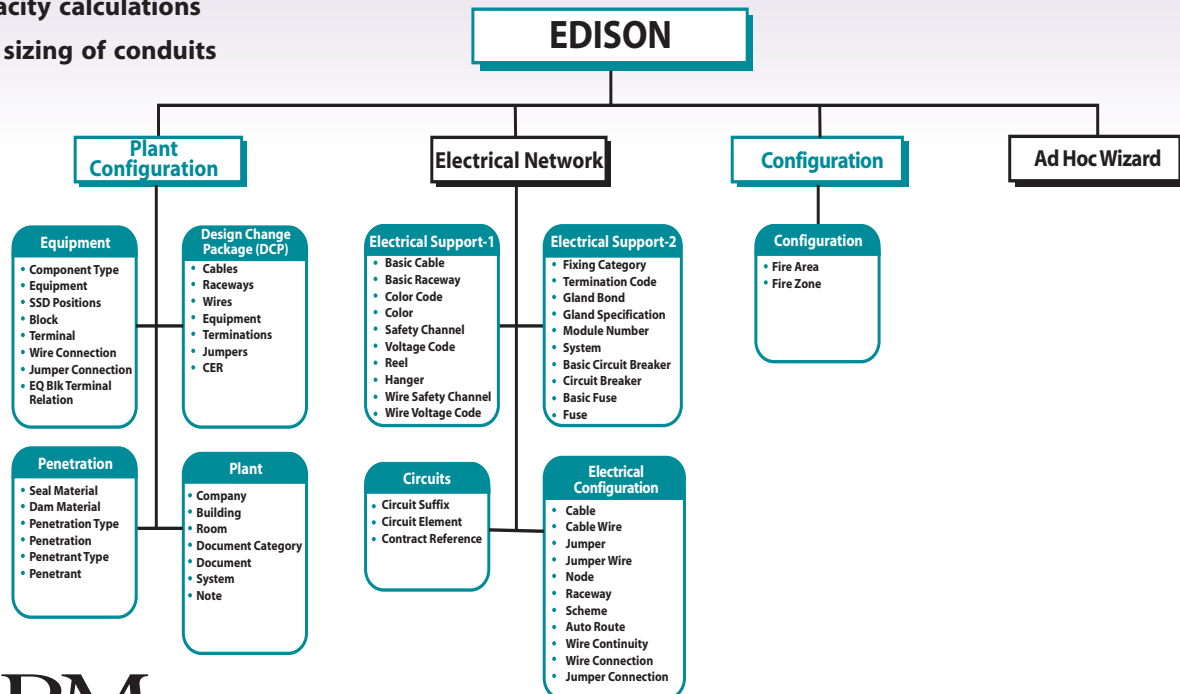# EDISON – Q Cable And Raceway System

Optimized for new plant construction design and long-term maintenance.

The Genesis® Electrical Design Intelligent System Operations Network (EDISON) is a proven, state-of-the-art cable, raceway and wire management configuration control system, designed specifically for new construction and ongoing electrical design modifications for nuclear power plants. EDISON is a verified 10 CFR 50 Appendix B compliant module of Genesis®.

EDISON addresses the complete life cycle of nuclear plant design, construction and long-term operation needs, by streamlining business processes and providing the capability to share information with all project participants throughout the integrated design process.

EDISON Features

- **Automated configuration control**
- **Automated shortest cable routing, while maintaining specified cable and raceway separation**
- **Automated safety train separation for cables and raceways**
- **Automated voltage level separation for cables and raceways**
- **Automated raceway fill and weight monitoring**
- **Wire and Jumper terminations**
- **Voltage Drop Calculations**
- **Ampacity calculations**
- **Auto sizing of conduits**

EDISON

Plant Configuration

Electrical Network

Configuration

Ad Hoc Wizard

Equipment
- Component Type
- Equipment
- SSD Positions
- Block
- Terminal
- Wire Connection
- Jumper Connection
- EQ Blk Terminal Relation

Design Change Package (DCP)
- Cables
- Raceways
- Wires
- Equipment
- Terminations
- Jumpers
- CER

Electrical Support-1
- Basic Cable
- Basic Raceway
- Color Code
- Color
- Safety Channel
- Voltage Code
- Reel
- Hanger
- Wire Safety Channel
- Wire Voltage Code

Electrical Support-2
- Fixing Category
- Termination Code
- Gland Bond
- Gland Specification
- Module Number
- System
- Basic Circuit Breaker
- Circuit Breaker
- Basic Fuse
- Fuse

Configuration
- Fire Area
- Fire Zone

Penetration
- Seal Material
- Dam Material
- Penetration Type
- Penetration
- Penetrant Type
- Penetrant

Plant
- Company
- Building
- Room
- Document Category
- Document
- System
- Note

Circuits
- Circuit Suffix
- Circuit Element
- Contract Reference

Electrical Configuration
- Cable
- Cable Wire
- Jumper
- Jumper Wire
- Node
- Raceway
- Scheme
- Auto Route
- Wire Continuity
- Wire Connection
- Jumper Connection

EDISON Menu

EPM
Engineering Planning and Management, Inc.

System Features

Configuration Management

EDISON has an integrated Design Change Process (DCP) to support engineered electrical designs from inception through installation and closeout. The DCP provides automated status updates based on electronic signatures for the preparer, reviewer, and approver. Electronic history files are automatically created and viewable from within the system. Change impact analyses are provided, along with the capability to automatically notify the project team of the status of the pending design, via email.

EDISON provides a convenient mechanism to track and schedule design, construction/startup, turnover and operations activities around the electrical installation of the plant.

Cable Routing

EDISON supports cable routing for nodalized and non-nodalized plants. When auto routing a cable in any of the three methods available, the system automatically applies separation checks, verifies physical connection of segments in a cable route and performs the fill and weight calculations.
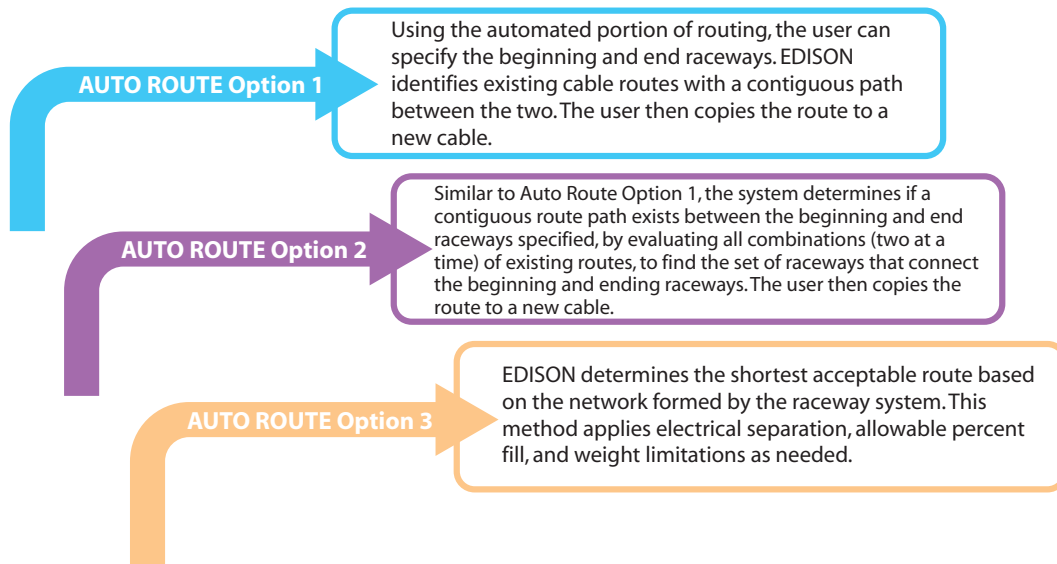
Cable Routing Methods

The user manually assigns a cable route and EDISON assists by providing a raceway links process, automating the creation of links connecting raceways to raceways and raceways to equipment. These links represent physical connections of raceways-to-raceways, and raceways-to-equipment.
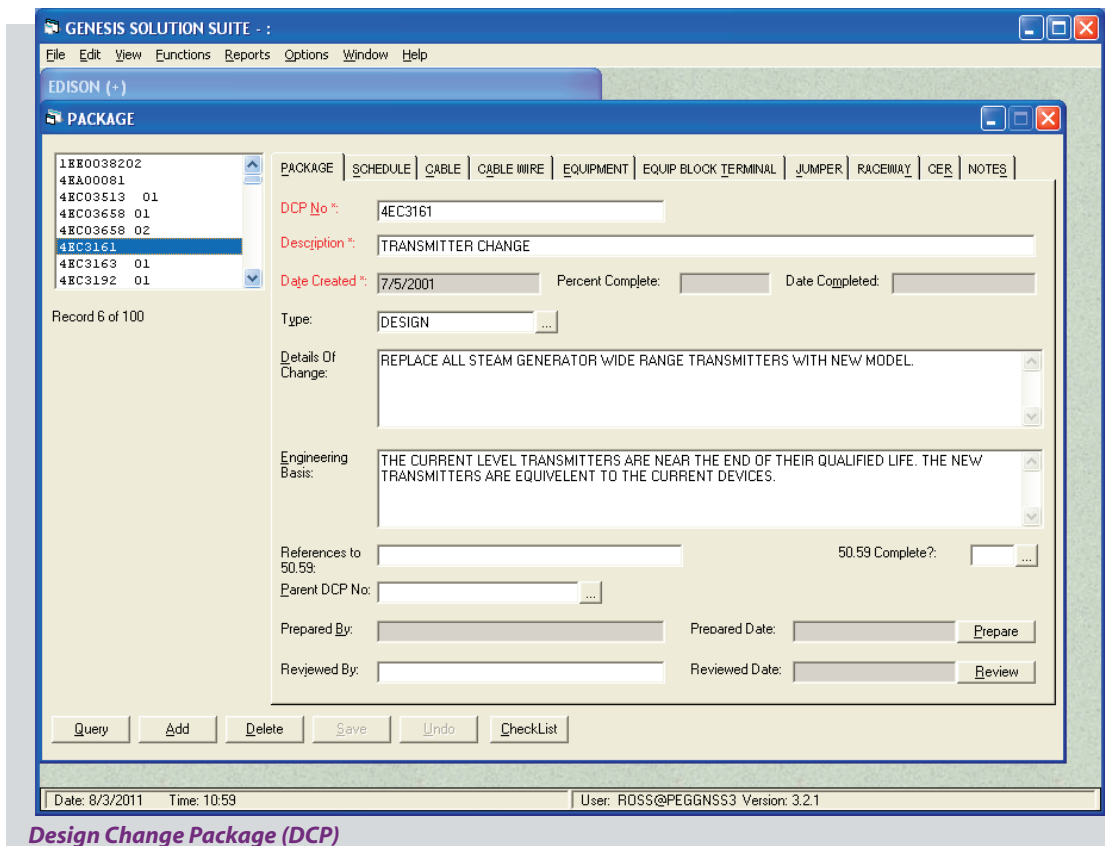
Design Change Package (DCP)

Cable Routing Methods

AUTO ROUTE Option 1

Using the automated portion of routing, the user can specify the beginning and end raceways. EDISON identifies existing cable routes with a contiguous path between the two. The user then copies the route to a new cable.

AUTO ROUTE Option 2

Similar to Auto Route Option 1, the system determines if a contiguous route path exists between the beginning and end raceways specified, by evaluating all combinations (two at a time) of existing routes, to find the set of raceways that connect the beginning and ending raceways. The user then copies the route to a new cable.

AUTO ROUTE Option 3

EDISON determines the shortest acceptable route based on the network formed by the raceway system. This method applies electrical separation, allowable percent fill, and weight limitations as needed.

Electrical Separation

EDISON safeguards electrical separation by evaluating user definable acceptance criteria: the matrix for cables and their respective routes, voltage levels and safety channels. Similarly, electrical separation between a cable and its wires for voltage levels and safety channel/trains is assured. The system also ensures electrical separation of a cable's function (e.g., control) and its raceway's function (e.g., power, control, instrumentation, etc.).

Electrical Calculations

EDISON performs the following calculations for cables and raceways:

Cables

• Ampacity (ANSI/NEMA WC51 ICEA P-54-440) for cables routed in cable trays. Calculated results are compared to maximum current for acceptability. The user can manually enter a calculated value to use instead of the automatically calculated value.

• Voltage drop-the system uses the following algorithm to calculate the voltage drop:

Phase 1 (applies to DC and single-phase circuits)

$$VD = R \times L/1000 \times I \times 2$$

Where:

VD = voltage drop (volts)

R = resistance/foot (ohms/1000 ft)

L = length (ft)

I = operating amperage (amps)

Phase 3

$$VD \text{ (line to ground)} = V_s - V_r$$

Vs = voltage at sending end

Vr = voltage at receiving end

$$V_r = \sqrt{V_s^2 - (xI\cos\sigma - R_{AC} I \sin\sigma)^2} - R_{AC} I \cos\sigma + Ix \sin\sigma$$

Where:

RAC = AC resistance

x = impedance (inductance), (ohms/1000 ft)

I = operating amperage (amps)

- EDISON is able to calculate the Maximum pull tension for new plant design and construction.

- Reel management-to better manage cable reel resources for new plant design and construction, EDISON provides a reel management function to ensure cable reel compatibility and update the associated Reel lengths (Remaining Length and Total Cut Length).

- Installation instructions (Released to Field status) when a design is complete, EDISON can print pull cards (for cables), term cards (for cable wires) and installation tickets (for raceways) from associated records to aid with installation.

Raceways

- *Percent fill — design and actual-for random lay and maintained spacing*

- *Weight — design and actual*

- *Combustible Btu/foot*

For these calculated values, EDISON performs a comparison for acceptance to their allowable values, for example, allowable percent fill.

Auto Sizing

EDISON can automatically create, size, and link cable conduits using information gathered from a cable. Conduits are automatically created and sized during the process of manually routing, or preparing to auto route a cable.

Circuit Connections

EDISON establishes an electrical loop by assigning cable wires and jumpers to equipment termination points.

	EQUIPMENT		CABLES WIRES			JUMPERS WIRES		
SEQ ID	BLOCK	TERMINAL	CABLE	WIRE ID	STATUS	JUMPER ID	WIRE ID	STATUS
1	1TB	01	NP1C0424B	1	FIELD COMPLETE	NP1JC042401	1	FIELD COMPLETE
2	1TB	02	NP1C0424B	2	FIELD COMPLETE	NP1JC042402	2	FIELD COMPLETE
3	1TB	03	NP1C0424B	22	FIELD COMPLETE			
4	1TB	04				NP1JC042402	2	FIELD COMPLETE
5	1TB	05	NP1C0424B	21	FIELD COMPLETE			
6	1TB	06				NP1JC042401	1	FIELD COMPLETE
7	1TB	U	NP1C0424B	U	FIELD COMPLETE			
8	1TB	X2	NP1C0424B	X1	FIELD COMPLETE			
1	3A	T1	NL0S0106A	A	FIELD COMPLETE			
1	3B	T2	NL0S0106A	B	FIELD COMPLETE			
1	3C	T3	NL0S0106A	C	FIELD COMPLETE			
1	4A	T1	NL0R0173A	A	FIELD COMPLETE			
1	4B	T2	NL0R0173A	B	FIELD COMPLETE			
1	4C	T3	NL0R0173A	C	FIELD COMPLETE			
1	4TB	01	NP0R0173B	41	FIELD COMPLETE			
2	4TB	03	NP0R0173B	3R	FIELD COMPLETE			
3	4TB	04	NP0R0173B	3G	FIELD COMPLETE			
4	4TB	07	NP0R0183C	1	FIELD COMPLETE			
5	4TB	08	NP0R0183C	11	FIELD COMPLETE			
6	4TB	09	NL0Y0633B	X	FIELD COMPLETE			
7	4TB	10	NP0R0189A	1	FIELD COMPLETE			
8	4TB	12	NP0R0189A	U	FIELD COMPLETE			
9	4TB	13	NL0Y0633B	U	FIELD COMPLETE			

Wire Terminations

Electronic Plant Integration

EDISON utilizes a normalized relational data table set, capable of being integrated with external electrical design tools such as ETAP®, SmartPlant®, or other design data warehouses.

Genesis Ad Hoc Wizard

This integrated tool provides user a graphical query tool across the entire EDISON data table set.

User Security/Ownership

The Genesis® Profiler application enables the System Administrator to control read/write and view access to all EDISON tables down to the field level, based upon individual user and group privileges.

Additionally, EDISON enforces ownership of design records, allowing multiple organizations to maintain control over the records they create for the following entity types:

- Cable
- Cable wire
- Wire connection
- Jumper
- Raceway
- Equipment
- Equipment block terminal
- Circuit element reference

Profiler Screen
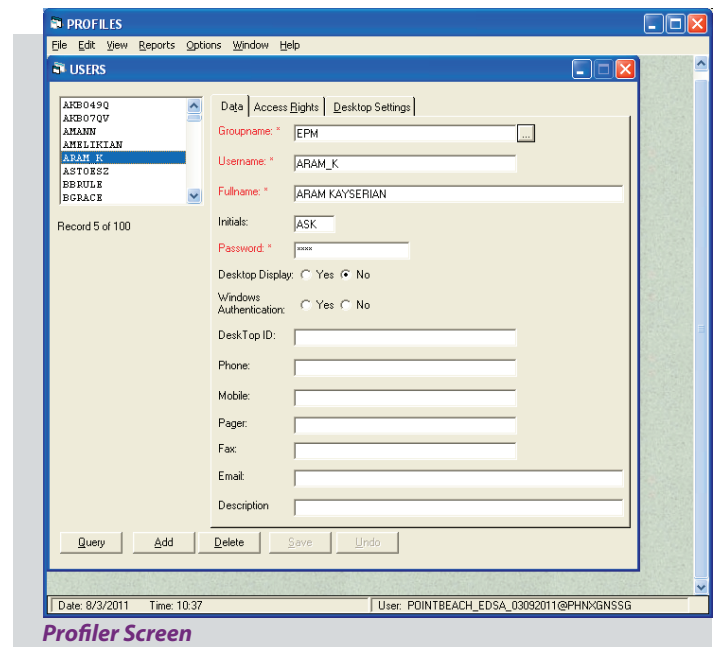
For more information, contact Vincent Renzi at vrr@epm-inc.com or 508-532-7167

EDISON Version 1.5.0

EDISON DEPLOYMENT:

Server:

Database Management System - Oracle ® Version 9.x (or greater) or MS/SQL Server 2005 (or greater)

Operating System - Microsoft® Windows server 2003, 2008 or Unix/Solaris

Disk Space - 5 GB

Memory - 1 GB (minimum)

Client:

Operating System - Microsoft® Windows 7, Vista, XP, 2000

Disk Space - 250 MB

Memory - 1 GB (minimum)

Oracle® Objects 2.3.x (or greater)

Microsoft® ADO 2.6

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