Wire Harness Design: CATIA V5 Electrical Routing and Formboard Drawings

7 – 11 November 2027
Jeddah - Corniche four-star



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Introduction:

Wire harness design problems usually surface on the assembly line or in service: bundles that will not fit the chassis or airframe, wires sized without temperature derating, connectors with no sealing or strain relief, and formboard drawings that disagree with the 3D model. This Core Concept course trains design engineers to build harnesses in CATIA V5, from system schematics and wire selection through 3D routing, protection, flattening and formboard drawings to manufacturing, testing and change control. Each participant produces a Harness Design and Formboard Drawing Pack for a case assembly.

Course Objectives:

- Define harness architecture, wire lists and environmental zones from system schematics and equipment interface requirements
- Select wire gauge, insulation class, connectors, terminals and protection components for current, temperature and mechanical exposure
- Route harness bundles in CATIA V5 electrical workbenches with correct supports, branch points, bend radius and clearance
- Resolve clashes between harness and mechanical structure and flatten the 3D harness into a dimensioned formboard
- Prepare harness drawings, pinout tables and bills of materials that suit hand assembly, fixture build and electrical testing
- Control harness changes through engineering change requests, revision tracking and design review checklists

Target Audience:

- Electrical design engineers who define harness architecture and wire lists for vehicles, aircraft and equipment
- Mechanical and packaging engineers who integrate cable bundles into structures, enclosures and moving assemblies
- CAD designers who route harnesses and produce formboard and manufacturing drawings in 3D CAD
- Manufacturing and process engineers who turn harness drawings into fixtures, work instructions and test programmes
- Quality and configuration engineers who approve harness drawings and control design changes

Course Outline:

Day 1: Harness Architecture, System Schematics and Design Inputs

- Harness Topology: Main Trunk, Branches, Breakouts and Inline Splice Points
- System Schematic and Wire List Structure for Signal, Power and Ground Circuits
- Electrical Interface Control Document Between Harness and Equipment Suppliers
- Environmental Zone Mapping: Temperature, Vibration, Fluid and Abrasion Exposure
- Harness Design Input Checklist for a New Vehicle or Equipment Programme

Day 2: Wire, Connector, Terminal and Protection Selection

- Wire Gauge Selection with AWG and Metric Cross-Section, Bundle Derating and Voltage Drop
- Insulation Materials and Temperature Class: PVC, XLPE, PTFE and Silicone Compounds
- Connector Family, Sealing and Keying Selection for Mating Cycles and Ingress Protection
- Crimp Terminal Types: Open and Closed Barrel, Insulated and Non-Insulated, Pull Test Criteria
- Protection Components: Braided Sleeve, Corrugated Tube, Heat-Shrink, Grommets and P-Clips

Day 3: CATIA V5 3D Routing and Bundle Design

- CATIA V5 Electrical Harness Assembly Workbench: Product Structure and Electrical Part Definition
- Connector and Support Placement in the Digital Mock-Up with Connection Points
- Bundle Segment Routing Through Supports, Diameter Calculation and Branch Point Creation
- Electrical Wire Routing Workbench: Importing the Wire List and Auto-Routing Wires into Bundles
- Minimum Bend Radius, Slack Allowance and Clearance Rules Against Edges, Heat Sources and Moving Parts

Day 4: Electrical-Mechanical Integration, Flattening and Manufacturability

- Clash Detection and Clearance Analysis Against Structure, Pipes and Moving Mechanisms
- Electrical Harness Flattening Workbench: Flattening Parameters, Straightening and Rotating Branches
- Formboard Drawing Layout: Scale, Fixture Positions, Branch Lengths and Tolerance Notes
- Design for Manufacturing: Splice Placement, Taping Rules, Fixture Count and Hand Assembly Time
- Design for Testing: Continuity and Insulation Test Planning with IPC/WHMA-A-620 Acceptance Classes

Day 5: Case Assembly Lab: Harness Design and Formboard Drawing Pack

- Case Brief: Equipment Enclosure Harness with Power, Sensor and Data Branches
- Routed Harness Model and Bundle Diameter Report Build
- Formboard Drawing, Connector Pinout Tables and Harness Bill of Materials
- Engineering Change Request Walkthrough: Wire Addition, Rerouting and Drawing Revision Update
- Drawing Pack Design Review Against a Harness Quality Checklist

Skills You Will Gain:

- Harness Architecture Definition
- Wire and Terminal Sizing
- 3D Bundle Routing
- Clearance and Clash Analysis
- Formboard Drafting
- Harness BOM Preparation
- Manufacturability Review
- Harness Change Control

Why Attend This Course:

- Leave with a Harness Design and Formboard Drawing Pack for a case assembly, including the routed model, formboard and bill of materials
- Cut late fit problems by resolving bundle clashes and bend radius violations in the digital mock-up before prototype build
- Give harness makers formboard drawings whose branch lengths match the 3D model, reducing rework at the fixture
- Compare harness practice with engineers from automotive, aerospace, rail and industrial equipment programmes

Conclusion:

A harness performs reliably when its architecture, components, routing and drawings are decided together and checked against the mechanical design. The course moves from harness topology, schematics and environmental zones, through wire, connector, terminal and protection selection, to 3D routing and bundle design in CATIA V5, then to clash analysis, flattening, formboard drawings and design for manufacturing and testing. The final day applies each step to a case assembly and produces a Harness Design and Formboard Drawing Pack with a controlled engineering change.