



Company Information

Company Name	Carrier Corporation	Date Submitted	10/8/2025
Project Title	Design of a Modular V-Coil Fan Wiring Harness and Quick Connect (CARRIER_HARNESS)	Planned Starting Semester	Spring/Fall 2026

Senior Design Project Description

Personnel

Typical teams will have 4-6 students, with engineering disciplines assigned based on the anticipated Scope of the Project.

Please provide your estimate of staffing in the table below. The Senior Design Committee will adjust as appropriate based on scope and discipline skills.

Discipline	Number	Discipline	Number
Mechanical	4-5	Electrical	2-3
Computer		Systems	

Company and Project Overview:

Carrier Corporation is a global provider of heating, ventilation and air conditioning (HVAC) and broader air management solutions serving residential, commercial, and industrial markets. The company emphasizes energy efficiency, reliability, and manufacturability, with continuous improvement initiatives across engineering and operations.

The Carrier Project proposal: The current state is that we have 15 or more-part numbers which are basically all the same harnesses just differing lengths and identified by which location in the unit they go. Carrier would like the student team to modularize the harnesses so that the main harness from each fan motor is the same length and configuration and then having different length harnesses to make home runs back to panel. By doing this Carrier can standardize the V section so it doesn't matter where on the unit you place the V section. A redesign will save cost by stocking and handling fewer types of harness assemblies which will simplify manufacturing and warranty logistics.



Project Requirements:

After project kickoff, the student team will be hosted at the Carrier facility so they can see the current design for the harness system that is being modularized. During that tour, the subassembly names and nomenclatures mentioned below, will be clarified.

Functional & Platform Requirements for the Redesigned Harness

- **Modular architecture** that supports AMS V-section fan wiring across platforms **30XV, 30RC, 38RC**; design shall accommodate platform specific variability through modular subassemblies rather than unique harnesses.
- **Voltage configurability**: interface control drawings and harness design must support multiple voltage configurations used by these platforms.
- **Connector strategy**: perform a **connector trade study** and choose robust quick connect options using a selection matrix and defined test plan.

Manufacturing, Assembly, and Service Requirements

- Provide **design-for-manufacturing (DFM)** and **design-for-assembly (DFA)** guidance to reduce assembly time, rework, and training burden.
- Deliver **installation and serviceability guidelines** (routing, labeling, strain relief, access for replacement).

Documentation & Verification Requirements

- **Interface Control Drawings** capturing pinouts, connector part numbers, lengths, branch points, and platform specific breakouts.
- **Bill of Materials (BOM)** with part specifications and alternates; maintain traceability to the trade study rationale.
- **Cost analysis** quantifying piece part cost, assembly time impacts, and SKU reduction effects; include a comparison vs. current harness variants.
- **Test plan & results** for the selected connectors and the prototype harness set (electrical continuity, insulation, pullout, vibration/thermal exposure as appropriate to AMS environment).

Prototyping Requirements

- Build a **prototype V-section harness set** representative of the modular architecture; validate form, fit, and basic function on sample hardware/fixtures supplied by Carrier

Expected Deliverables/Results:

- **Modular wiring harness design package** covering the 30XV/30RC/38RC use cases and voltage options (drawings, CAD (CREO) as applicable).
- **Prototype V-section harness set** suitable for bench or fixture validation.
- **Connector trade study**: options screened, selection matrix, environmental assumptions, and **test plan** with results for the chosen solution.
- **Manufacturing/assembly & service guidelines** (DFM/DFA + installation/service instructions, labeling scheme).
- **Comprehensive BOM** with cost analysis and implementation feasibility summary.



- ***SKU and variant reduction*** via a unified harness family, simplifying supply chain and inventory management.
- ***Lower assembly time and improved quality*** through standardized, serviceable harnesses and documented best practices.
- ***Reusable harness standards*** to accelerate future AMS and V-section designs across platforms.
- ***Talent pipeline benefits*** through collaboration with UNC-Charlotte's Senior Design

Disposition of Deliverables at the End of the Project:

Students are graded based on their display and presentation of their team's work product. It is mandatory that they exhibit at the Expo, so if the work product was tested at the supporter's location, it must be returned to campus for the Expo. After the expo, the team and supporter should arrange the handover of the work product to the industry supporter. This handover must be concluded within 7 days of the Expo.

List here any specific skills, requirements, specific courses, knowledge needed or suggested (If none please state none):

- Ability to travel to the Carrier Huntersville facility as needed for data collection, presentations, testing, etc. Mileage will be reimbursed according to ISL procedures.