



## Electronics

### Client

STMicroelectronics

### Location

Catania, Italy



*Exterior Façade During Construction*

## STMicroelectronics Facility Development

### Project Highlights

- Fabrication Facility
- Microelectronics Department
- Instrumentation and Controls
- Central Utility Plant
- Cleanroom Classes 1, 10, 100 and 1000
- Flexibility for Future Manufacturing

### Project Description



CH2M HILL IDC's architects and engineers met the challenge to develop a facility capable of high levels of flexibility and adaptability while nurturing its human occupants. The environment needed to be capable of recruiting highly trained personnel and retaining STMicroelectronics' reputation as one of the world's leading microelectronics and nanotechnology researchers.

CH2M HILL IDC provided multiple services for STMicroelectronics, including cleanroom architecture, mechanical, electrical, instrumentation and controls, chemical and process, life safety, telecommunications, and construction and program management. The building's material palette of masonry, metal panel and glazing blended into the campus context while simultaneously refining the existing architectural vocabulary. The form and composition of the building's massing, reflected through the cladding systems employed, are expressive of the building's specific functions and this facility's role on campus.

The cleanroom employed a ballroom design for optimal flexibility and included a clean subfab for air return, process utility distribution piping and support tools for the cleanroom above. A utility level was provided below the clean subfab for routing of process utility piping and exhaust mains. In addition to the main facility cleanroom, the project included: Specialized research suites for equipment such as SEM, SIMS, AFM, FID, TEM, and SAM characterization tools. Central utility building (CUB) for location of the chilled water, boiler water, ultrapure water, and water reclaim systems. The CUB shell and distribution systems are able to support the future adjacent R&D facility. Bulk chemical and specialty gas areas are also expandable for support of the future R&D facility. Wet, dry, and Q&R laboratories

### Energy and Utility Efficiency

Major criteria for the facility were increased energy efficiency and reduction of natural gas usage due to environmental NOx limitations for the campus. CH2M HILL IDC performed an extensive study of facility heat and cooling loads to aid in optimizing the HVAC systems design. By using detailed facility models, CH2M HILL IDC was able to show that addition of a heat recovery chilled water system would reduce boiler NOx emissions by



85%, gaining an expected capital cost pay-back of under two years. Additional utility efficiency measures incorporated into the project design included: Water reduction, recycling, and reclaim measures Use of variable frequency drives (VFDs) on large motors for increased efficiency Dryers on the clean dry air system that have greatly reduced purge requirement, allowing compressor sizes to be reduced. Integration of natural lighting

### **Cleanroom and Site Airflow Modeling**

The ballroom cleanroom design for this large facility required critical airflow controls. Using computational fluid dynamic (CFD) models, CH2M HILL IDC was able to “prove” airflow distribution with particle, temperature and pressurization data. The CFD model was essential in development of the specialized air handling systems, HEPA filter and ceiling systems, and flooring systems. Cleanroom performance levels achieved through CH2M HILL IDC’s design included stringent temperature and humidity specification (client confidential levels). CFD models were also developed for the site airflow characterization study. This study was necessary for modeling the facility exhaust and air intake locations to evaluate potential contaminant migration that could cause odor or molecular contamination issues inside of the facility. With this model, CH2M HILL IDC was able to determine appropriate exhaust and intake locations, with necessary stack heights and exit velocities.

### **Technical Issues**

- EMI control including mapping of tool locations
- Stringent vibration criteria (client confidential levels)
- Industry-leading specifications for ultrapure water quality
- Full process exhaust abatement controls
- AMC considerations
- Specialized lighting considerations for illumination level flexibility and color
- Comprehensive facility security system
- Life safety systems including hazardous materials monitoring, early warning smoke detection, leak containment, and access control