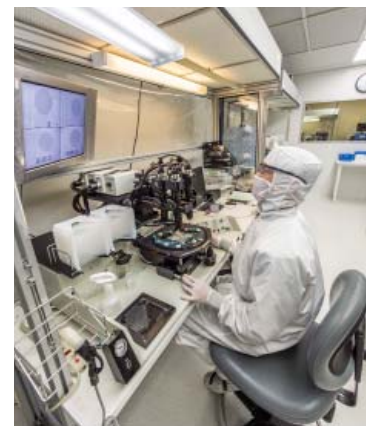
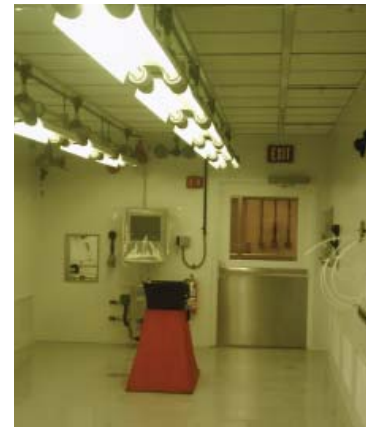


# Cleanroom & Related Experience



JM Coull is experienced in the renovation and construction of cleanrooms for a wide range of industries, including semiconductor manufacturing, medical device manufacturing, bio pharma, high-tech, and research and development. While every project has its own set of requirements and challenges, our depth of experience in these specialized spaces enables JMC to bring unique solutions to the table. Below is a partial list of our cleanroom work.

| Client                      | Project   | Scope  |
|-----------------------------|---|--|
| Dow Chemical                | New Advanced Technology Center<br><i>Marlborough, MA</i>                      | <ul style="list-style-type: none"> <li>64,000 sf total</li> <li>5,000 sf ISO 4 ballroom cleanroom on waffle slab</li> <li>Mechanical equipment mezzanine</li> <li>Process basement</li> <li>Stringent noise, vibration, temperature, and humidity control requirements</li> <li>Modular cleanroom design for future expansion</li> </ul>   |
| Dow Chemical                | 193 Resist Auto Fill Line<br><i>Marlborough, MA</i>                           | <ul style="list-style-type: none"> <li>1,800 sf total</li> <li>ISO 4 cleanroom</li> <li>Mezzanine</li> <li>Trenching for new underground piping</li> </ul>   |
| Dow Chemical                | Deep Ultraviolet Photolithography Semiconductor Fab<br><i>Marlborough, MA</i> | <ul style="list-style-type: none"> <li>12,000 sf total</li> <li>ISO 3 cleanroom</li> <li>Strict limitations on vibration, molecular outgassing, sound levels, and room pressurization</li> <li>Temperature 68° ± 1/2° F &amp; humidity 45% ± 1% RH</li> </ul>  |
| Pall Life Sciences          | New England Center of Excellence<br><i>Westborough, MA</i>                    | <ul style="list-style-type: none"> <li>113,000 sf total</li> <li>10 ISO 7 cleanrooms</li> <li>12 wet &amp; dry labs</li> <li>2 cold rooms</li> <li>MassEcon Bronze Award</li> </ul>  |
| Vaupell                     | Clean Injection Molding Facility<br><i>Agawam, MA</i>                         | <ul style="list-style-type: none"> <li>91,800 sf total</li> <li>ISO 8 manufacturing cleanroom</li> <li>MEP systems upgrades</li> </ul>   |
| Medtronic Vascular Division | Manufacturing Facility & Office Fit-Up<br><i>Danvers, MA</i>                  | <ul style="list-style-type: none"> <li>80,000 sf total</li> <li>30,000 sf ISO 8 manufacturing cleanroom suite</li> <li>Wet &amp; dry labs</li> <li>Chemical storage area</li> </ul>  |
| Skyworks Solutions, Inc.    | GaAs Pilot Fab Renovation & New Construction<br><i>Woburn, MA</i>             | <ul style="list-style-type: none"> <li>16,000 sf total</li> <li>ISO 4, 5, and 7 cleanrooms</li> <li>New construction &amp; relocation of existing cleanroom production spaces</li> <li>New 1500-ton chilled water system</li> <li>High-capacity steam boiler heating system</li> <li>High-purity process systems</li> <li>New DI water building</li> <li>New site electrical substation</li> <li>Suspended catwalk system</li> <li>Structural MEP systems mezzanine</li> </ul> |



|                                 |   |   |
|---------------------------------|---|---|
| <p>Skyworks Solutions, Inc.</p> | <p>Wafer Fabrication Facility Expansion<br/><i>Woburn, MA</i></p>                   | <ul style="list-style-type: none"> <li>▪ 14,000 sf total</li> <li>▪ Chase photolithography cleanroom &amp; new bay</li> <li>▪ Scribe &amp; test cleanroom</li> <li>▪ Structural steel frame over cleanroom area</li> <li>▪ Molecular Beam Epitaxy (BEM) area</li> <li>▪ Make-up air systems &amp; recirculating air handlers</li> <li>▪ Cooling towers</li> <li>▪ Fab temperatures maintained at 68° ± 2% F</li> <li>▪ Low airborne molecular contamination, vibration, noise, and UV light protection in photolithography cleanroom</li> </ul>                         |
| <p>PerkinElmer</p>              | <p>Personalized Health Innovation Center of Excellence<br/><i>Hopkinton, MA</i></p> | <ul style="list-style-type: none"> <li>▪ 16,000 sf lab renovations</li> <li>▪ ISO 5 &amp; 6 cleanrooms</li> <li>▪ 7,000 sf clean &amp; non-clean production space</li> <li>▪ 3 new labs with offices</li> <li>▪ New MEP &amp; process systems</li> <li>▪ Upgraded electrical system, roof membrane replacement, and new power generator</li> <li>▪ Performed on active, occupied corporate campus</li> <li>▪ ABC MA Chapter Merit Award, ABC MA Chapter Spirit Award</li> </ul>   |
| <p>E Ink</p>                    | <p>Innovation Center<br/><i>Billerica, MA</i></p>                                   | <ul style="list-style-type: none"> <li>▪ 140,000 sf total</li> <li>▪ ISO cleanroom &amp; gowning areas</li> <li>▪ Bench-top &amp; walk-in organic chemistry fume hoods</li> <li>▪ 70,000 sf research lab &amp; pilot production space</li> <li>▪ Explosion-proof interior chemical storage bunkers with containment</li> <li>▪ Scanning electron microscope room</li> <li>▪ Two new power sources, new gas service, and backup power</li> <li>▪ ABC MA Chapter Eagle Award, Spirit Award, and Safety Award; ENR Regional Merit Award &amp; Best Safety Award</li> </ul> |
| <p>Osram Sylvania</p>           | <p>Solid State Laboratory<br/><i>Danvers, MA</i></p>                                | <ul style="list-style-type: none"> <li>▪ 3,000 sf total</li> <li>▪ Clean spaces for product development &amp; testing</li> <li>▪ Gowning areas</li> <li>▪ Isolated clean area with separate gowning entrance to prevent cross contamination</li> <li>▪ Strict humidity, temperature, noise, and light controls</li> </ul>   |



|                         |   |  |
|-------------------------|---|--|
| Nypro Inc.              | Cleanroom & Support Spaces<br><i>Clinton, MA</i>                        | <ul style="list-style-type: none"> <li>8,800 sf total</li> <li>ISO 8 cleanroom</li> <li>Removal wall panel system</li> <li>MEP systems configured to support future ISO 7 capability</li> <li>Catwalk system</li> <li>Performed on operational molding floor with 24/7 production schedule</li> </ul>  |
| Kokusai Semiconductor   | Clean Manufacturing Facility<br><i>Billerica, MA</i>                    | <ul style="list-style-type: none"> <li>30,000 sf total</li> <li>ISO 4, 5, and 7 clean space</li> <li>Stringent noise, dust, and vibration control measures</li> <li>Performed in occupied, operational building</li> </ul>   |
| ASML                    | Extreme Ultraviolet Cleanroom Test Addition<br><i>Wilton, CT</i>        | <ul style="list-style-type: none"> <li>4,300 sf EUV cleanroom addition</li> <li>Cleanroom design to be Class 10,000 space, but met more stringent Class 100 requirements</li> <li>Performed on occupied, active corporate campus</li> </ul>  |
| Northeastern University | Kostas Nanotechnology Laboratory & Cleanroom<br><i>Boston, MA</i>       | <ul style="list-style-type: none"> <li>5,000 sf total</li> <li>ISO 4, 6, &amp; 7 cleanroom labs</li> <li>Lab space with hoods, device testing area, and imaging lab (micro &amp; nano-fabrication)</li> <li>Collaborative project area</li> </ul>  |
| Bruker Daltonics        | Corporate Headquarters & Manufacturing Facility<br><i>Billerica, MA</i> | <ul style="list-style-type: none"> <li>92,000 sf total</li> <li>1,500 sf ISO 8 production cleanroom</li> <li>Laboratory support spaces</li> <li>8,000 sf atrium &amp; product demonstration area</li> <li>Two-story parts delivery system</li> <li>ABC MA Chapter Merit Award</li> </ul>   |
| Applied Biosystems      | New Biotechnology Lab & Corporate Headquarters<br><i>Bedford, MA</i>    | <ul style="list-style-type: none"> <li>30,000 sf total</li> <li>Molecular biology labs</li> <li>Wet chemistry labs</li> <li>cGMP cleanroom lab suite</li> <li>Quality control lab</li> <li>Darkroom</li> <li>Explosion-proof hazardous waste storage</li> </ul>  |
| 3M Corporation          | MOCVD Cleanroom & Build Gas Farm<br><i>West Haven, CT</i>               | <ul style="list-style-type: none"> <li>5,500 sf total</li> <li>ISO 7 high-bay cleanroom production area</li> <li>Test &amp; process labs</li> <li>High-purity, specialty gasses &amp; liquids</li> <li>New exhaust &amp; high-efficiency mechanical systems</li> <li>Wastewater treatment facility</li> <li>Life safety monitoring &amp; control system</li> </ul> |

