Biosafety levels are designated by degree of protection provided to laboratory personnel, the environment, and the community. Below are the levels of containment for laboratories working with SARS-CoV-2 or handling specimens obtained from COVID-19 patients.

BSL2 Containment
- Analysis of inactivated specimens (e.g., blood, serum, plasma, tissues, feces, urine, sputum, mucosal swabs collected from any species infected with SARS-CoV-2)
- Molecular analysis of extracted nucleic acid preparations
- Pathologic/microscopic examination of fixed specimens (e.g., formalin-fixed or other inactivated tissues)
- Staining and microscopic analysis of fixed smears
- Routine examination of bacterial cultures
- Flow cytometry analysis of fixed samples
- Specimens from suspected or confirmed COVID-19 cases should be transported as UN3373, “Biological Substance,” Category B

BSL2 Enhanced Containment
- Processing specimens for research use and storage (including aliquoting or diluting specimens)
- Preparation of chemical- or heat-fixed specimens for microscopic analysis
- RNA/DNA extraction from COVID-19+ specimens
- Inoculating bacterial culture media

Enhanced BSL2 containment includes the following modifications of the standard BSL2 requirements:
1) Use Class II Biological Safety Cabinet (BSC) for all procedures (decontaminate after each experiment)
2) Wear a closed front gown and double pair of gloves
3) Use sealed centrifuge rotors or safety buckets with caps for spinning or transferring specimens between centrifuge and BSC
4) Use of sharps should be eliminated if is experimentally avoidable
5) Transport specimens between laboratory spaces in sealed, biohazard labeled secondary containers

BSL3/ABSL3 Containment
- SARS-CoV-2 virus isolation in cell culture
- Initial characterization and/or expansion of the viral agents in cultures derived from COVID-19+ specimens
- Using the virus to infect cultured cells
- Storage of the viral stocks
- Using infectious SARS-CoV-2 virus in functional assays
- Flow cytometry cell sorting with intact virus
- Viral cultures or isolates should be transported as UN2814, “Infectious substance, affecting humans”, Category A
- Use of SARS-CoV-2 with animals (currently there is no ABSL3 facility available at Temple University)

BSL2 and 3 standard practices are stipulated in CDC’s Biosafety in Microbiological and Biomedical Laboratories (BMBL) 5th Edition.

Related References:
- CDC Guidance for Laboratory
- WHO Laboratory Guidance
- ABSA International SARS-CoV-2/COVID-19 Toolbox

Quick Take
- All research with SARS-CoV-2 (COVID-19) requires review and approval by the Institutional Biosafety Committee (IBC).
- Contact the Biosafety Manager and BSO for concerns related to safe work with SARS-CoV-2 virus.