Sample handling and user labs (SULF)

SULF has quite successfully started the installation of the on-site laboratories in buildings E04 and E03 next to the long instrument hall at the very beginning of 2020. The handover of buildings E03 and E04 hall E01 took place in December 2019. During that time, Q4 2019, SULF focussed mainly on providing all necessary documentation and information to be able to start installation in Q1/2020 and to prepare our move to site. The preparation and organization for the start of the laboratory fit-out was quite extensive as it involved ESS internal experts on installation, safety, and quality, the outfitter Sanber Ltd from the UK and non-SULF stakeholders such as Sample Environment, Detectors, Motion Control and Optics. We completed our installation binder, a suppository containing all installation documentation, and went through the installation readiness review process. During this review the binder content, e.g. construction drawings, risk assessments, training requirements, quality assurance, material specifications, and many similar topics were discussed. Our in-kind partner Marek Jura (STFC) accompanied and heavily supported us during this period so that the fit-out could start as planned on January 13, 2020 (Figure 1, left).

Figure 1: Our in-kind partner Marek Jura inspecting the arrived furniture in our intermediate storage area for our furniture and equipment in the experimental hall E01 (left). Harald Schneider during the office move of SULF and FLUCO to E04 (right).

The SULF group moved together with the FLUCO platform to their offices in E04 the first week of January (Figure 1, right), one week before the site operatives for the laboratory fit-out arrived at ESS. The site operatives of Sanber LTD and their subcontractors have been working 10 hours per day on weekdays and most weekends since January 13th. ESS rules require an ESS supervisor to be present any time a contractor is working in ESS-owned areas. We solved this problem by scheduling the daily coverage performed not only by us but also by our colleagues from Sample Environment, from the involved technical groups and even by a few volunteers. Progress of the lab fit-out has been according to schedule and in some areas even faster than planned. We have finished about 80-90% of the chemical laboratories in E04 and started on the technical areas in E03 and E04 as well as the SLIME laboratory in E03 (see Figure 2). Currently, the installation has come to a halt as our UK site operatives were called home due to the Covid-19 pandemic on March 14, 2020. Nevertheless, due to the great progress we have made already, we do not expect any delays of the installation completion dates, provided that construction does not rest for more than 3 months.



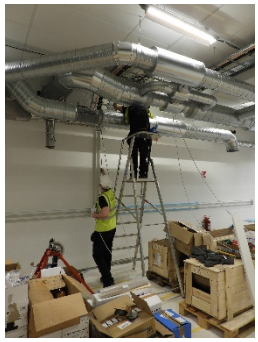


Figure 2: top row: chemical laboratory on ground floor of E04 (left) and first floor (middle); electrical fit-out of the detector lab in E04. Bottom row: Electrical installation in SLIME lab in E03 (left) and fume hood duct adjustments in chemical lab (right).

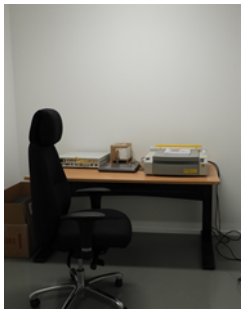
SULF's current main contribution to the chemical and technical laboratory fit-out is the coordination of the installation for all stakeholders in E03 and E04. This way we are providing a cost saving and consistent fit-out for all technical areas in the laboratory buildings. This work comprises of supervising the installation and supporting our outfitter Sanber. SULF has constant presence on site. So we are able to respond timely to questions and requests from Sanber's site-operatives. These inquiries can be for example on the design of the labs, especially when the as designed and the as-built features of E03/E04 differ, or to make on-the-spot decisions on pressing items. SULF is supervising and supporting Sanber in multiple areas, e.g. assuring technical design details are correct, acquiring permission for modifying the building structure as needed, hiring of equipment, procuring locally when needed, scheduling deliveries to E04, performing risk assessments and responding to incident reports, organizing ESS-required training for site operatives, and similar. We strongly believe that this kind of support has allowed Sanber to proceed faster than scheduled. Additionally it has given us the quality of fit-out we were aiming for.

SULF staff is busy in several areas even now during the Covid-19 pandemic. Katrin Michel, our laboratory technician, is starting to hand-over responsibility for safety and services of the shared laboratory in Medicon Village (MV) to DEMAX. She is also coordinating and organizing the move of SULF glassware, chemicals and equipment from MV to our new laboratory building, E04. This is work that is still proceeding even if the lab-fitout is stopped. Melissa Sharp, SULF scientist, is working 50% as the interface to Conventional Facilities (CF) and Facility Management (FM). She is following-up with CF/FM and SKANSKA/SEC on addressing construction issues in the handed-over buildings E03/E04. At the same time, she is involved in the final design for the D-buildings and implementing the lessons learned from the E-buildings in collaboration with CF/FM and SKANSKA/SEC. Her remaining time is spent in overseeing the laboratory fit-out and supporting fit-out related documentation. Alice Corani is the shared sample environment technician, who is working 50% for SULF and 50% for FLUCO. She commissions our two potentiostats for electrochemistry and leads the in-kind effort on electrochemistry cells for neutron scattering. She continues to test various electrochemical measurement methods in the lab and establishes reference measurements. The focus is currently on impedance spectroscopy to measure ion conductivity in solids. She has also taken over the responsibility to be the SULF contact to the ESS gas supplier to assure that SULF will be able to order speciality gases once our instruments move to E04. Monika Hartl is the SULF group leader and the

installation package leader for the chemical and technical laboratories. She is the main contact to our in-kind partners STFC, UK, and the lab outfitter Sanber Ltd. as well as to our in-kind partner for the glove-boxes University of Tartu, Estonia. Since February 2020, she is the area coordinator for E03 and E04 and as such responsible for scheduling work in these areas and taking care of safety in collaboration with Occupational Health and Safety (OHS). Judging from the past three months, this additional scope has been beneficial to the lab installation. It allows for easier and more flexible scheduling of work. 20% of her time is spent overseeing accident analysis for NSS areas needed for the SSM application (Swedish Radiation Authorities).

The bullet points below summarize SULF progress in the various topics:

- SULF Chemical Safety: We are in the process to establish our chemical safety documentation for our new labs. We have started to establish a training flow for our chemistry lab training with the Training Office at ESS. This way we will have an official record including the training requirements for several types of access to our laboratories.
- SULF in-kind projects: The in-kind project with University of Tartu is coming to a close in the foreseeable future. The glove boxes will be shipped to ESS ahead of schedule within the next few weeks. The glove boxes will be setup in E04 by our Estonian partners once they are allowed to travel to us. They will be commissioned in E04 until they can move to their final home in the Radiological Materials Laboratory (RML) in D08. The laboratory in-kind project has now entered the stage of installation. Marek Jura from STFC is supporting our lab installation by sharing his experience from installations at ISIS and advising us on challenges and solutions for installation. The installation of the RML is planned to begin early 2021.
- CF/FM interaction: The hand-over of buildings E03 and E04 was successful. The office area in E04 has been declassified. SULF has asked office support and IT to provide furniture for the offices and the common areas. We have obtained a video conference setup for the meeting room as well as a functioning printer/copy machine. Consequently, the offices are now fully functional. SULF continuously engages with CF, FM and SKANSKA on issues and repairs needed in E03/E04 as well as on the design for the D-buildings.
- Synergies with other groups: SULF and FLUCO have jointly moved their equipment from Utgard and MV to E04. As soon as the Cutting and Polishing Laboratory in E04 is finished, FLUCO will move into the space until the laboratory in D04 becomes available. This will allow SULF to benefit from common tools and equipment that would otherwise be spread-out. It will also make the work on electrochemistry – from lab (SULF) to instrument (FLUCO) for our joint technician Alice easier. The remaining Sample Environment platforms will be located very close in E03 and thus all SAD will be present in the E-buildings.
- Increasing SULF capabilities: Thanks to Melissa's Human Frontiers Science Foundation (HFSB) Grant we are in the process of hiring a postdoc that will be stationed at ESS. This will boost SULF's life science and soft condensed matter expertise and equipment, e.g. through the purchase of a DLS instrument. SULF has been supporting the ESS project by analysis of concrete for the bunker and for the target as well as with water analysis for the beam dump cooling water circulation. We inherited the used X-ray Fluorescence instrument from ISIS, STFC that we setup E04 (see figure on the right). Once we obtain the permission to run it, it will greatly assist with the elemental analysis of the concrete species. We will continue to support the ortho- and parahydrogen measurements in collaboration with JPARC and SNS. We will, furthermore, be part of the research on the luminescence screen by the Beam Diagnostics Group. We just attended beamtime for investigating the radiation damage on the luminescence screen planned for the ESS target.



SULF also encounters challenges. One of the current challenges is the large amount of time spend on fitting out the chemical and technical-laboratories in E03/E04. While we choose to do so for benefits to SULF and the other stakeholders, we do realize that we are starting to struggle to complete other important areas of our work. Luckily, this is a time-limited effort.

With the current Covid-19 pandemic and our site operatives having returned to the UK, SULF is trying to continue to move forward with the installation even though we are mostly working from home. We are concentrating our efforts on preparing testing documentation for the lab services (water, gas, electric) and having them reviewed within ESS. With this complete, we can commence the testing for the first laboratory as soon as work resumes. We are also trying to do minor installation work on our electrical distribution panels and other necessary installations not directly related to the lab fit-out with companies from Sweden. We have started to move shelves, equipment and boxes with glassware and consumables from MV and Utgard to E04. This will safe us time later on and will help keep our overall moving schedule. We just put our first refrigerator for chemicals into service in E04 and we are in the process of buying more appliances for the labs to get them installed during this break in lab installation. We will continue to push forward as much as possible and as fast as possible.