Scientific Workplace Strategy

Expert Planning is Essential to Re-Occupy Safely and Economically

Flad

CONTENTS

INTRODUCTION

The recent and ongoing COVID-19 Pandemic is requiring new paradigms and a fundamental shift in how we think about research design and space use at all levels of interaction. With the goal of lessening density and creating safer environments, many perspectives will be needed to plan for safe and effective solutions. Interdisciplinary thinking will be required to create effective social distancing in our workplaces, while still maintaining strong and viable communities for research, education, and clinical care.

Flad has undertaken in-house research collecting information from our clients, health organizations, and professional affiliates and have utilized our inherent knowledge of scientific and clinical planning to develop some “common sense” solutions for providing a safer work environment. Our current work for the CDC, NBAF, the national federal labs, healthcare institutions, academic campuses, and large private research organizations has also provided a solid foundation for some of the recommendations included in this booklet.

Traditionally, Environmental Health & Safety officers (EHS) oversaw lab design and usage. As infectious disease work increased, Biosafety Officers were added to the operational team. Future planning teams will likely include Industrial Engineers and other process planning experts to assess special conditions, materials and people flow, and waste streams. A parallel can be drawn to clinical environments, where similar operational protocols apply to how material and people flow through clinical and non-clinical spaces.

Lab planning principles and protocols are well documented in the literature; however, with the advent of COVID-19, new space planning metrics, operational protocols, and workplace standards will need to be developed and applied very quickly.

We anticipate that federal initiatives and investment will stimulate new thinking in how to plan for future crisis intervention and that regulatory restrictions and code changes may influence future space planning across all areas of work and living in the foreseeable future.

RE-OCCUPYING SCIENTIFIC WORKPLACES ACROSS THE U.S.

During the last several weeks, Flad has assisted several clients as they plan for re-start and re-opening of labs and workplaces in corporate and academic settings. Essentially, the traditional dense and shared occupancy plan in labs requires new thinking and more space between occupants.

RE-START SCENARIOS

This booklet includes diagrammatic sketches illustrating various re-occupancy scenarios and a planning checklist considering how to modify your existing labs. They illustrate:

- *a start-up scenario for initial re-occupancy shows one person per bay (many sites are operating with minimal staff currently)*
- *a scenario based on the availability of additional testing, shows two people per bay, where it can be feasible to add a second person if there is proper spacing at their primary workstation*
- *a scenario where three people per bay are shown as the new normal. This scheme includes a separate corridor for the back of the lab.*
- *lastly, an institutional/corporate model for three persons per bay.*

As confidence grows and new operational and training regimens are practiced over time, it may be possible to add further staff and return to a more “normal” occupancy level.

These diagrams follow in the booklet and include some annotations and text to describe concepts and ideas. The checklist, found on pages 15-19, is useful as a resource for assessing different types of planning issues and current- and future-state scenarios.

ENHANCING SAFETY, CONSERVING RESOURCES AND OPERATIONAL CHANGES

When thinking about occupancy scenarios, it is also important to consider short- and long-term opportunities for changing how we think about our scientific workplace. Capital resources are limited to make changes, and some solutions can create appropriate separations and workflow changes with minimal physical modifications.

There are significant differences between corporate and institutional labs in space metrics and ability to maintain and manage funding streams. However, similar lab planning and safety protocols will apply as we re-start functional operations everywhere.

When areas are modified or renovated over time to accommodate new social norms, it will be important to test ideas and plans against operational precepts that can adapt so that space can remain operational in the future in a crisis or unpredictable event to reduce our safety and financial exposure.

AS WE LOOK TO THE LONGER-TERM OCCUPANCY OF BUILDINGS, AND OPERATING PROTOCOLS FOR USE OF OUR BUILDINGS, IT IS IMPORTANT TO EMBRACE THE CONCEPT OF RESILIENCY. RESILIENCY CAN BE DEFINED AS BEING ABLE TO ADAPT TO CHANGING NEEDS AND CIRCUMSTANCES.

REVISITING PROTOCOLS

Post COVID-19 work in the lab will require more attention to operational flows in the lab for people, materials, and waste.
It is also likely there will be additional testing required to monitor contaminations and test staff regularly for infectious diseases.

To do this, it will be important to revisit existing operational protocols and apply new ways of working when returning because these changes can reduce initial and long-term expenditures. For example:

- *You may operate lab buildings that are older and newer—what operational protocols will apply universally? What changes in flow or operation work in each building or for different types of science?*
- *How will you train staff to reoccupy their space and monitor that safety protocols are being followed? (For example, air flows can be designed for safety and use of closed doors provides natural barriers. How will you monitor that these protocols are being followed?)*
- *Do you have data that validates current occupancy and conditions for each space?*
- *How can you assess each lab or building similarly and develop unique or custom solutions at minimal expense?*
- *Will you operate shifts or teams of people who occupy the building at different times of the day?*
- *Will you pre-test all staff who come to the labs through a sensor device to monitor temperature?*
- *Will all labs be converted to card access and would sensor technology aid in monitoring density at different times of the day?*
- *Can bench space be pre-assigned for specific use and time frames?*
- *Will a combination of island and existing peninsula benches work as a short-term plan?*
- *Can some casework be eliminated to open additional pathways in the space?*
- *Will you consider one-directional flows and predetermined pathways for all users?*
- *Is there more than one means of egress from a lab space?*
- *Do all staff crossover in their daily movements? Can work patterns be altered to segregate activities and reduce interaction?*
- *For supporting collaborative activity, are there adjacent support areas that can be designated for small group interaction and six-foot social distancing?*
- *Are handwash sinks accessible?*
- *Do you have adequate PPE supplies? What will be required?*
- *Where will hygiene stations be placed for access and convenience?*
- *Which staff can work from home or off site in temporary space?*
- *Can studies be prioritized and scheduled given funding cycles, etc.?*

This booklet also contains diagrams that demonstrate ideas for social distancing in pubic areas, for team and conferencing density, for incorporating hygienic kiosks and for suggested behavioral changes that can support safety in the overall work environment.

PROTECTING OUR STAFF IN THE NEW NORM

The inherent nature of labs is typically more hazardous than office environments. The national guidelines typically require a slightly negative pressure, depending on adjacencies to other functions and the type of hazard. Training is usually required and PPE (Personnel Protection Equipment) is required based on hazards used in the space.

Most wet labs are either chemistry- or biology-based functions; however, there are other sciences that have a variety of usages such as dry labs/ computer science, materials science, and physical testing / mechanics labs. The protocols in these types of labs will need to be rethought as well for new operating procedures.

If the new standard becomes the norm, it will help allow for intelligent occupancy after an event. The modular lab planning grid may be able to address social distancing, if carefully planned. Forward-thinking operational principles, proper module width, and depth in the lab can address separations and allow for safe circulation around and among staff. The primary driver for all new thinking will be focused on the public safety, for now and into the future. New ideas and solutions will continue to evolve as we challenge ourselves to plan for resiliency and the new challenges yet to come.

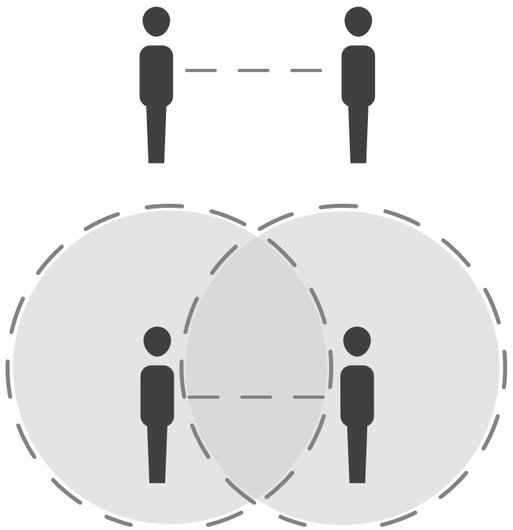
THE LAB INDUSTRY HAS BEEN ADVANCING LAB DENSIFICATION FOR MANY YEARS, TO CONSERVE RESOURCES, REDUCE CLUTTER IN THE WORKPLACE, AND PROVIDE MORE SHARED USE OF PRIMARY LAB SPACE. NOW, TO PROMOTE SAFE DISTANCING, PRIMARY METRICS AND FLOWS WILL NEED TO BE REVISITED CAREFULLY.

LAB CONFIGURATION

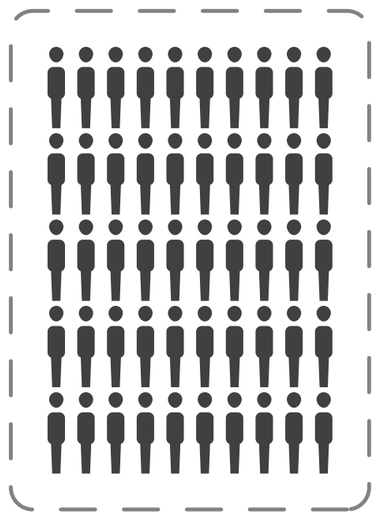
SOCIAL DISTANCING

ADJUSTMENTS TO PROMOTE HEALTH + SAFETY

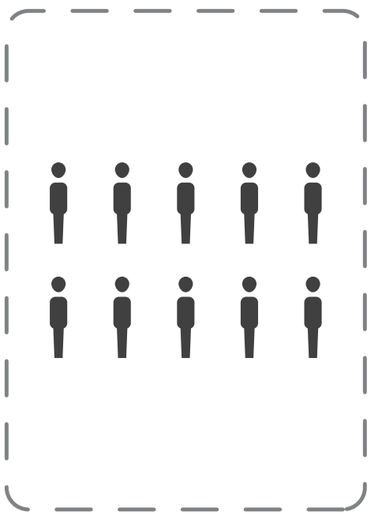
Social distance protocols involve maintaining personal space and minimizing large group activities. The diagrams to the right illustrate a reduction in density protocols for lab and office spaces while maintaining a six-foot distance between staff.



6 FEET APART



LARGE GATHERING



LIMITED GROUPS

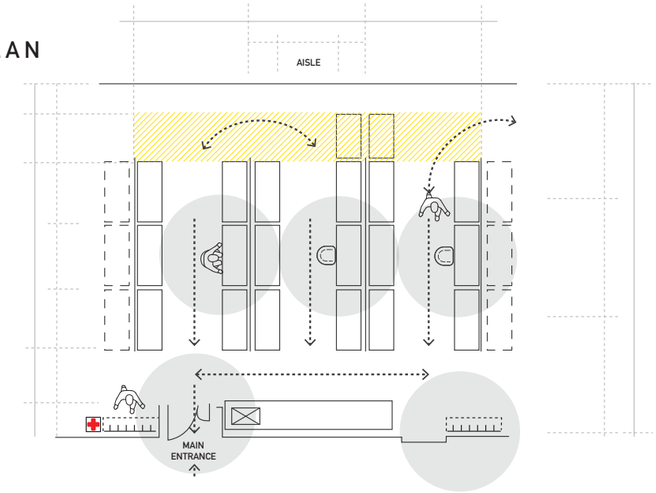
LABS

SPECIFIC ADJUSTMENTS

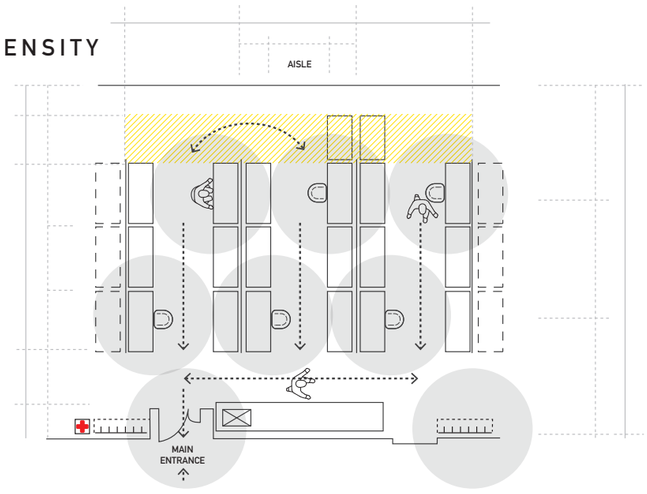
The typical capacity of lab benching will be reduced, providing increased personal space for employees. The program, use of specific equipment, and layout of each lab typology must be considered unique to its respective uses, needs, and flexibility.

The diagrams to the right show a phased approach and provide guidance on density, directional flow, egress, and locations for lab coats and PPE to limit contact of employees and maintain a safe scientific environment.

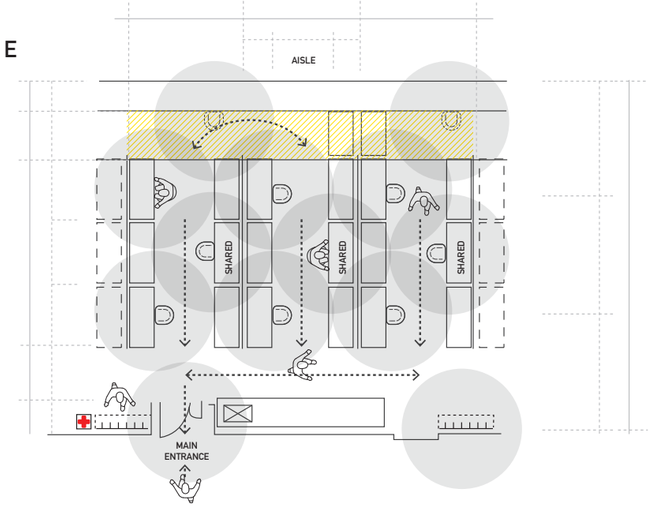
START-UP PLAN



INCREASED DENSITY



FUTURE STATE



Area Analysis:
Module 10.5' x 31.5' = 330.75 nsf
Module 11' x 33' = 363 nsf

32.25 nsf difference (9.7% increase) from corporate to academic

Peninsula Bench:
Module 11' x 26' = 286 nsf
143 nsf / researcher
ELF = 52.5 LF
26.2 ELF / researcher

Island Bench:
Module 11' x 33' = 363 nsf
181.5 nsf / researcher
ELF = 58 LF
29 ELF / researcher
49.5 nsf additional for Island
(8.5% increase in area/researcher)

** circles have 6' radius*

** converting every other island bench to peninsula gains ELF*

START-UP PLAN

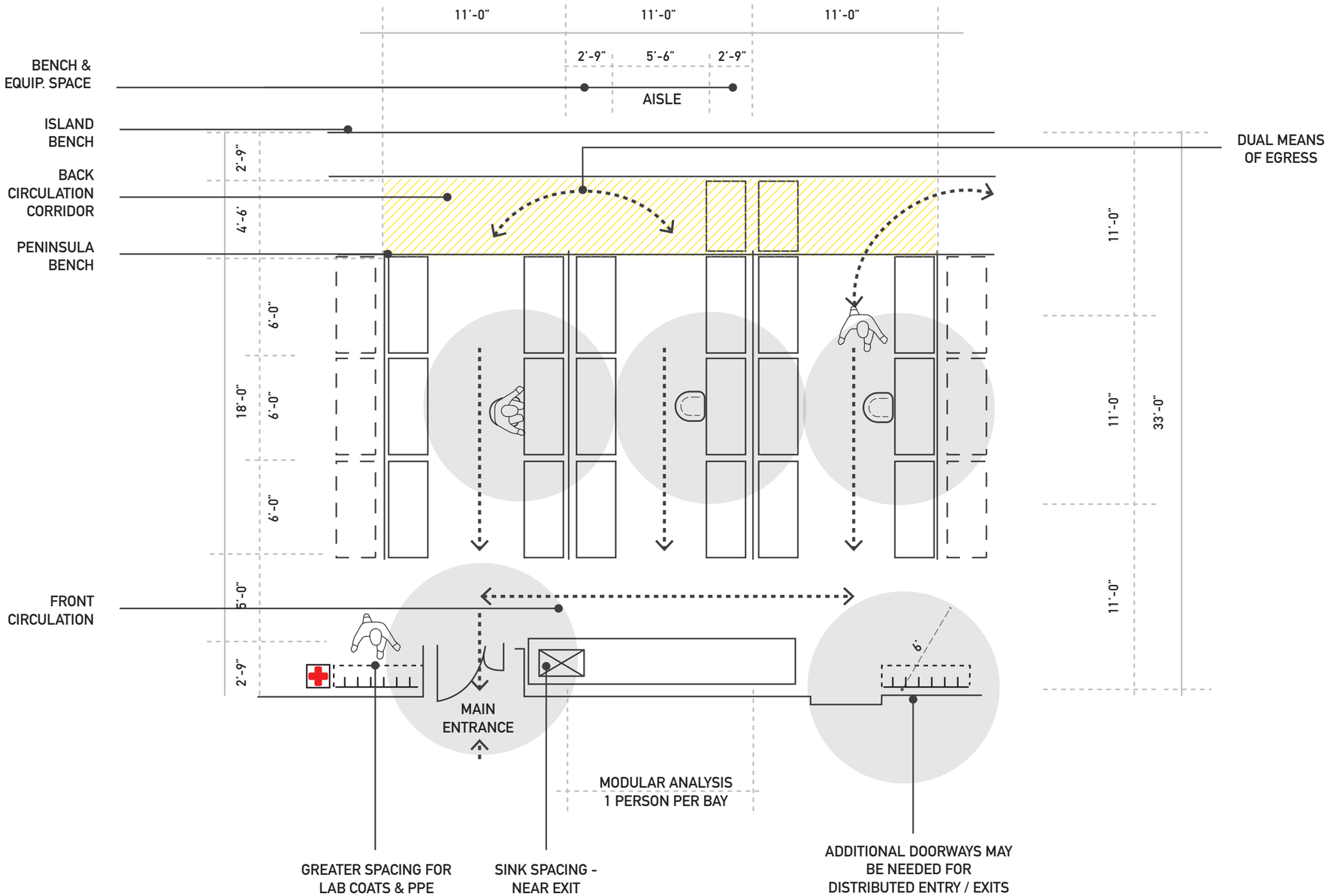
The start-up scenario for initial re-occupancy includes one person per bay.

- Controlled space and circulation

- Less congestion of people in the lab allows fewer entries into the lab

- Greater spacing for lab coats and PPE

- Easier to manage and supervise procedurally



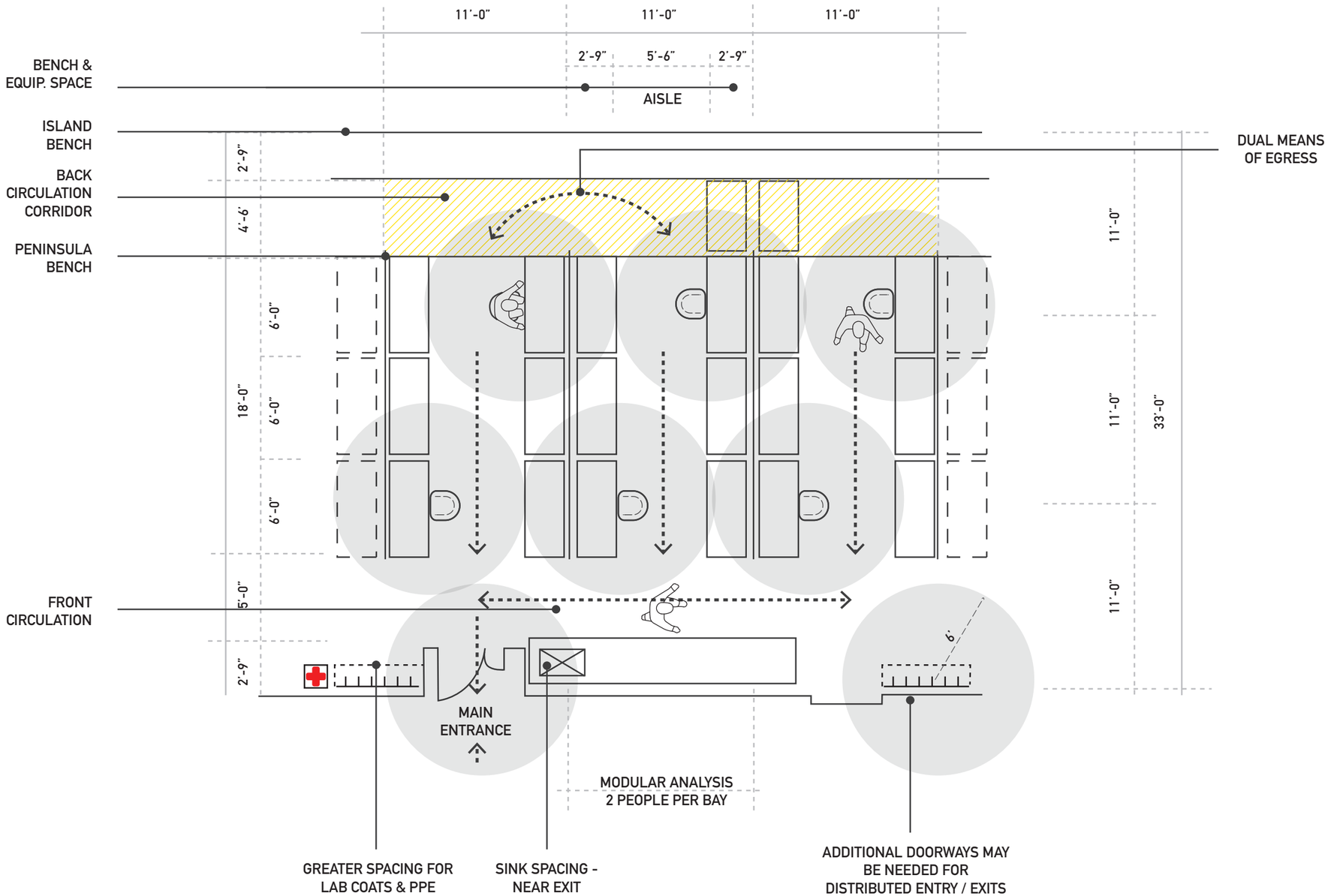
INCREASED DENSITY

The second scenario shows two people per bay, where it is feasible to add a second person if there is proper spacing at their primary workstation.
This scenario is based on the availability of additional testing.

· Less congestion of people in the lab allows fewer entries into the lab

· May require a secondary entrance/exit and additional PPE stations

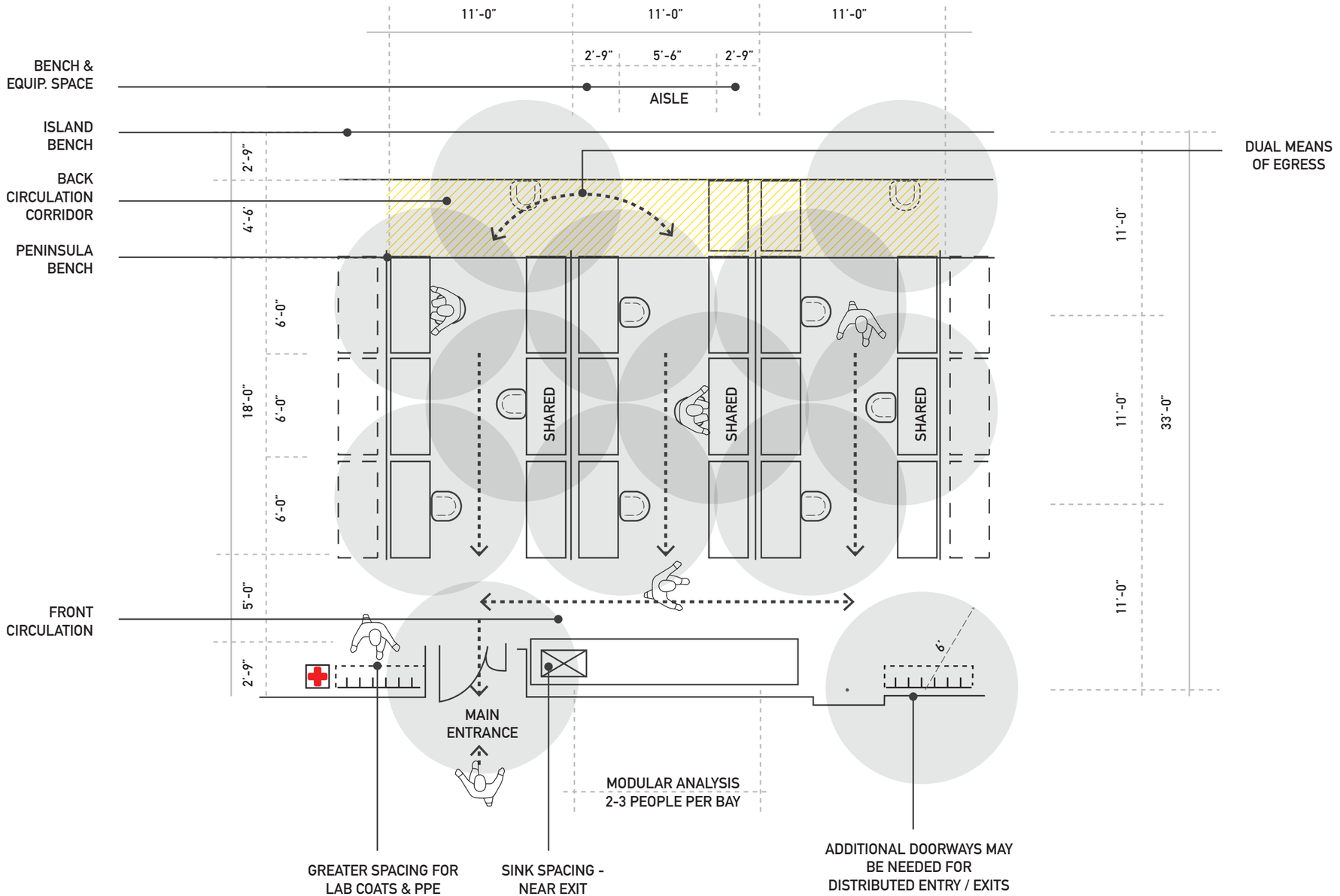
· More challenging to supervise



FUTURE STATE // FULL OCCUPANCY

The future-state scenario shows two to three people per bay as the new normal. This scheme includes a separate corridor for dual egress should other people be in the same bay.

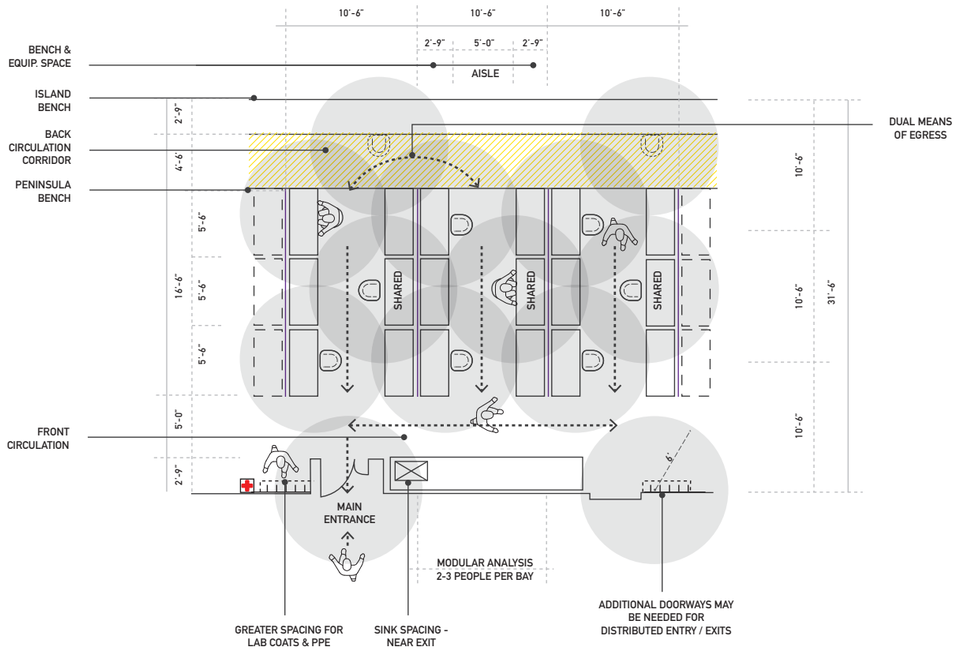
- More congestion of people in the lab, consideration for additional entries/exits and PPE stations
- Strongly suggests dual egress corridor based on higher densification
- More challenging to supervise, requires significant training and additional protocols



FUTURE STATE // FULL OCCUPANCY ANALYSIS

INSTITUTIONAL MODEL

10.5' X 31.5' MODULE



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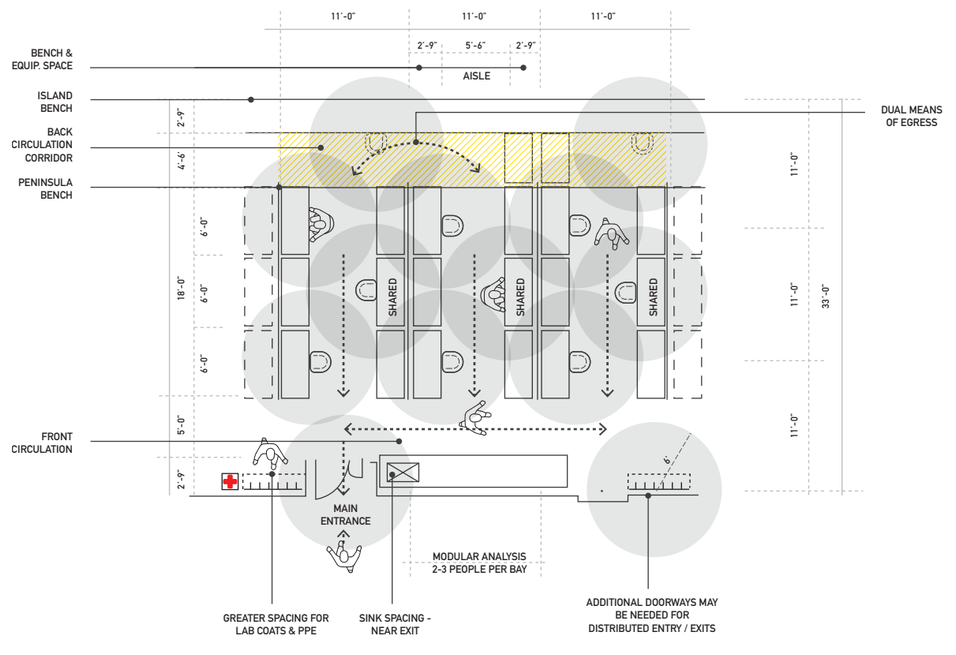
CORPORATE MODEL

11' X 33' MODULE



LAB PLANNING STRATEGIES & IDEAS CHECKLIST

LAB CONFIGURATION:

CURRENT STATE ↓	FUTURE STATE ↓
Large open lab concepts may be less desirable post COVID.	Smaller rooms can support improved contamination control. In each situation, available space, adjacent occupants, and other factors will influence room size and overall layout options for smaller spaces.
The typical corporate Lab Planning module is 11' by 33' with 2-3 staff per module. For academic labs, the norm is 2 researchers per module, with a shallower module depth and typical peninsula bench configurations.	The new norm will require more distance between workstations in the module and less clustered, dense groupings of people in basic research space. Single flow direction traffic and material flow are a new option. Reducing density to one person per lab may be a short-term solution.
The number of researchers assigned per lab has promoted efficient space utilization and equipment sharing.	The number of researchers assigned per lab is likely to adjust to avoid convergence of large groups. Shift scheduling for better overall building utilization is also being considered.
Current lab and lab support net square feet per person is in the range of 200-250 NSF.	Given distancing requirements, we recommend more separation and plan for 250-275 nsf/person. (Primary Lab and Lab Support space). This could add 10-15 percent of space per researcher based upon our research and recent studies.
Assigned prep bench per person or researcher is currently 4-6 lineal feet, with shared equipment between stations.	The new standard could increase to 6 lineal feet for social distancing. If the 6' metric is applied in labs, it could support better spacing in a pandemic condition.
Lab benches are open today, supporting good visibility and work planning concepts.	Plexiglass partitions may become a standard to provide protection between workers.

CURRENT STATE ↓	FUTURE STATE ↓
Peninsula benches are used today in academic and other labs and do not allow for two means of travel around the bench.	The proposed change is island benches planned for directed flow around the benches. This will add approximately 8.5 NSF per researcher. Dead-end bench configurations may be prohibited in the future.
The typical aisle width today is 4.5 to 5 feet.	Aisle widths may widen to 5.0 to 5.5 feet in the future. This change will test the width of the current lab module standard.
ELF studies traditionally have been an important metric for lab right-sizing.	These studies may become the foundation for future planning today to enhance lab safety.
Shared equipment located between stations is now the norm.	New protocols for shared use and routine, intermittent cleaning schedules for shared equipment will become standard.
Lab support zones vary by type of science and other factors.	These zones may increase in size and be compartmentalized to avoid personnel crossover.
Lab technicians are assigned and located outside the lab in cubicles of approximately 24-36 SF, consistent with typical office environments.	Proposed new density recommended is 36-48 SF (6' by 6' and 8' by 6'). There will be a desire to push write-up and non-hazardous work outside the lab environment.
Good Lab Practice today includes safety reviews and proper placements of equipment and circulation in the lab.	Future standards may require new operational flow and life safety protocols.

CURRENT STATE ↓	FUTURE STATE ↓
LAB CONFIGURATION CONTINUED:	
Labs are designed for flexibility and reconfiguration of equipment and workflows.	Future state will result in less flexibility as to where shared equipment is placed and how the floor plate can change, requiring a study into the spacing and social distancing space. That will result in a longer time to reconfigure lab space.
Doors and entrances are now standard manual operation.	Like a clinical healthcare environment, automatic operating doors with touchless actuators may become the norm.
The procedures for entrance, layout, and flow regimens in research space are well documented.	Overall operational protocols require re-study, particularly at re-opening. Additional PPE may be required at lab entries, making that space larger than current standards. Separation of lab coats (spacing), face shields, gloves, eyeglasses with slots dedicated per person and ventilators may come into play. Disposal of over-gowns may be evaluated to avoid re-contamination. Lab budgets will be impacted.
Supervision is achieved through lab visits and direct sight lines through transparency	Future state will result in increased transparency and the potential for security cameras in lab spaces

CURRENT STATE ↓	FUTURE STATE ↓
MAINTENANCE:	
Current maintenance and cleaning protocols are documented.	Protocols will be modified and require frequent, daily cleaning of work surfaces. This will add cost to the lab cleaning budget.
The current frequency of maintenance shutdowns and lab decontamination is annually.	In the future, particulate testing / monitoring may become required. Lab air recirculation will be limited, air change rates re-evaluated for purging air, and more filtration may be required.
Lab space has been carefully managed and maintained for safety and cleanliness as a standard protocol. It is still a high-touch environment by the nature of the work.	We can anticipate a touchless environment. Hands-free devices, foot-operated pedals at sinks, and motion sensors for lights will become standard. These will be included for energy savings and importantly, for transmission sensitivity and less touch. Some academic settings are still paper-dependent as well, impacting potential for contamination in the short term.
Decontamination practices are well standardized today.	These standards are likely to change. They may be by floor or by individual labs, (based on flexibility need). Centralized air and exhaust systems may require greater separation and initial capital costs.
Lab design has focused on sustainable practice and reduction in air flows to conserve energy.	Safety protocols may require revisiting certification initiatives. Carbon-zero initiatives may get extended as new priorities come into play.
HVAC and air flow planning in labs is well monitored by operational protocols and there are existing standards for air changes and circulation of air.	Post COVID, a higher number of Air Changes per Hour (ACPH) on once-through systems for labs and offices may be required, in lieu of recirculated air. This will challenge current sustainability initiatives.

CURRENT STATE ↓	FUTURE STATE ↓
TECHNOLOGY:	
Technology and equipment are present in all lab environments. Electronic lab notebooks are widely used today.	New lab protocols could require dedicated use and regular cleaning of surfaces and technology, similar to a clinical setting.
Technology is widely employed today in the lab environment. As seen in the workplace in general, artificial intelligence use has increased.	In the future, artificial Intelligence may grow as labs become less dependent on the human interface. These technologies may also increase reliability of operations during a pandemic. Complete shut-down may not be acceptable in the future. Our dependence on resilient IT and support will increase and less hazardous work will be done outside of the labs. Virtual research will be conducted outside the lab, as possible.
More communication technologies will be provided in the labs to improve standard communication practices, as work-at-home models accelerate.	Face-to-face learning protocols are evolving rapidly, and there will be an increase in “work-from-home” scenarios, and some groups will work at home temporarily for the foreseeable future, to achieve less density as needed.
The pandemic has dramatically increased the need for rapid testing in labs and accelerated turnaround time.	Post pandemic, core lab automation may become more the norm for specimen handling and distribution, especially for core labs. (Core labs may schedule sample receiving times to spread out the load and slow down cycle times). Clinical testing labs have and will continue to incorporate conveyance and instrument interface automation to provide fewer human touches and less congestion of staff in the labs.

CURRENT STATE ↓	FUTURE STATE ↓
COLLABORATIVE SPACES:	
Public space has traditionally included lobbies, amenities, and multiple functions that require access and visibility in the workplace, clinical, and campus settings.	We will revisit how public space is defined and utilized. New standards and protocols for entrances, waiting, and amenities will be developed to foster safety and less density in some areas.
Multiple spaces for teaming and collaboration are in the current research workplace.	Team space and collaboration areas may be smaller to prevent large group gatherings/congestion. Marker boards may be replaced with touch screen technologies and wipe-down screens for safety.
Conference room planning is driven by institutional need and current workplace norms.	The definition of “conferencing” and interaction will be carefully rethought. Conference rooms will minimize numbers of people and better separations. Plans will include more smaller rooms than larger gathering spaces.

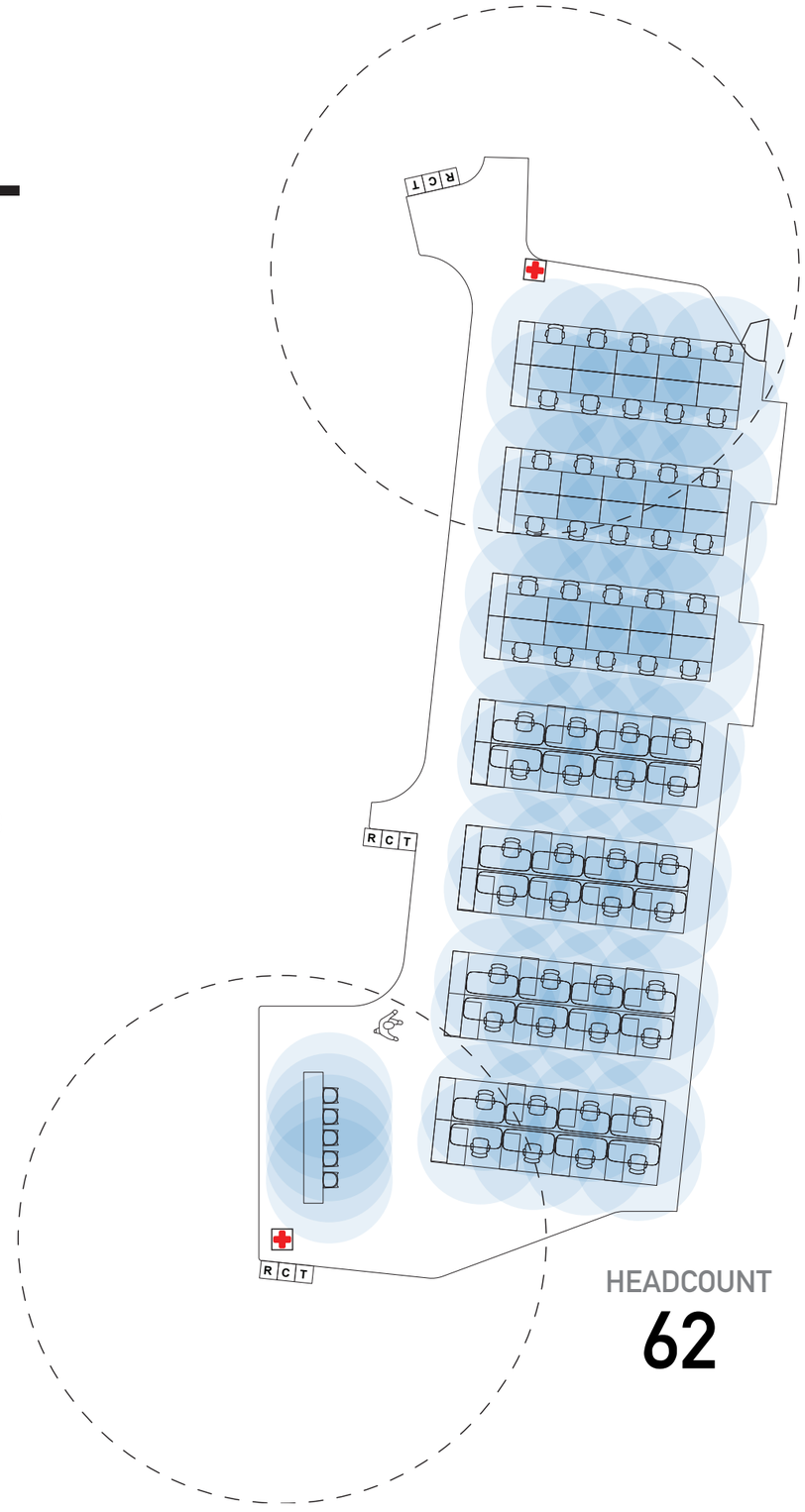
CURRENT STATE ↓	FUTURE STATE ↓
RESEARCH & EDUCATION:	
Technical write-up space today is typically 40-50 NSF per person and varies in corporate and academic settings.	For greater distancing, we recommend considering 50-75 NSF. In academic settings, graduate students are still typically officed in the lab, though the recent trend for biology, physics, and engineering is to move offices outside the labs, into less expensive office space. These workstations can be back-to-back and will require social distancing.
Labs are important and vital teaching spaces. Teaching and training lab use will need to be re-evaluated and re-thought on a detailed level.	In a corporate environment, new protocols and SOPs may be enforced due to insurance risk and owner liability. In academic settings, teaching and collaboration models will be rethought as part of overall curriculum changes.
The educational research model has been relatively standardized over time.	Reinvention will occur and education leaders will provide more virtual learning options, teaching approaches, and technologies. New methods of teaching are already being tested in the midst of the COVID pandemic.

WORKPLACE & COLLABORATION SPACES

OPEN OFFICE

WORKSTATION DENSITY

The typical layout of benching in an open office will be adjusted under social distancing to provide ample space. The density of 4' and 5' workstations creates an intense amount of connection in typical set-up.



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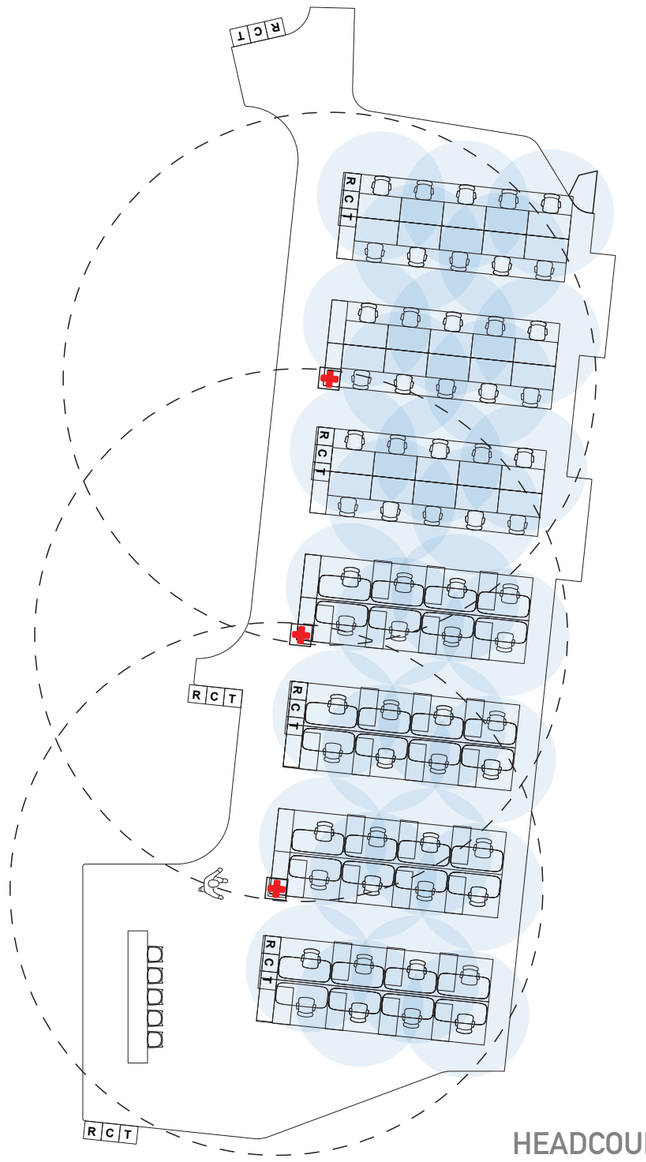

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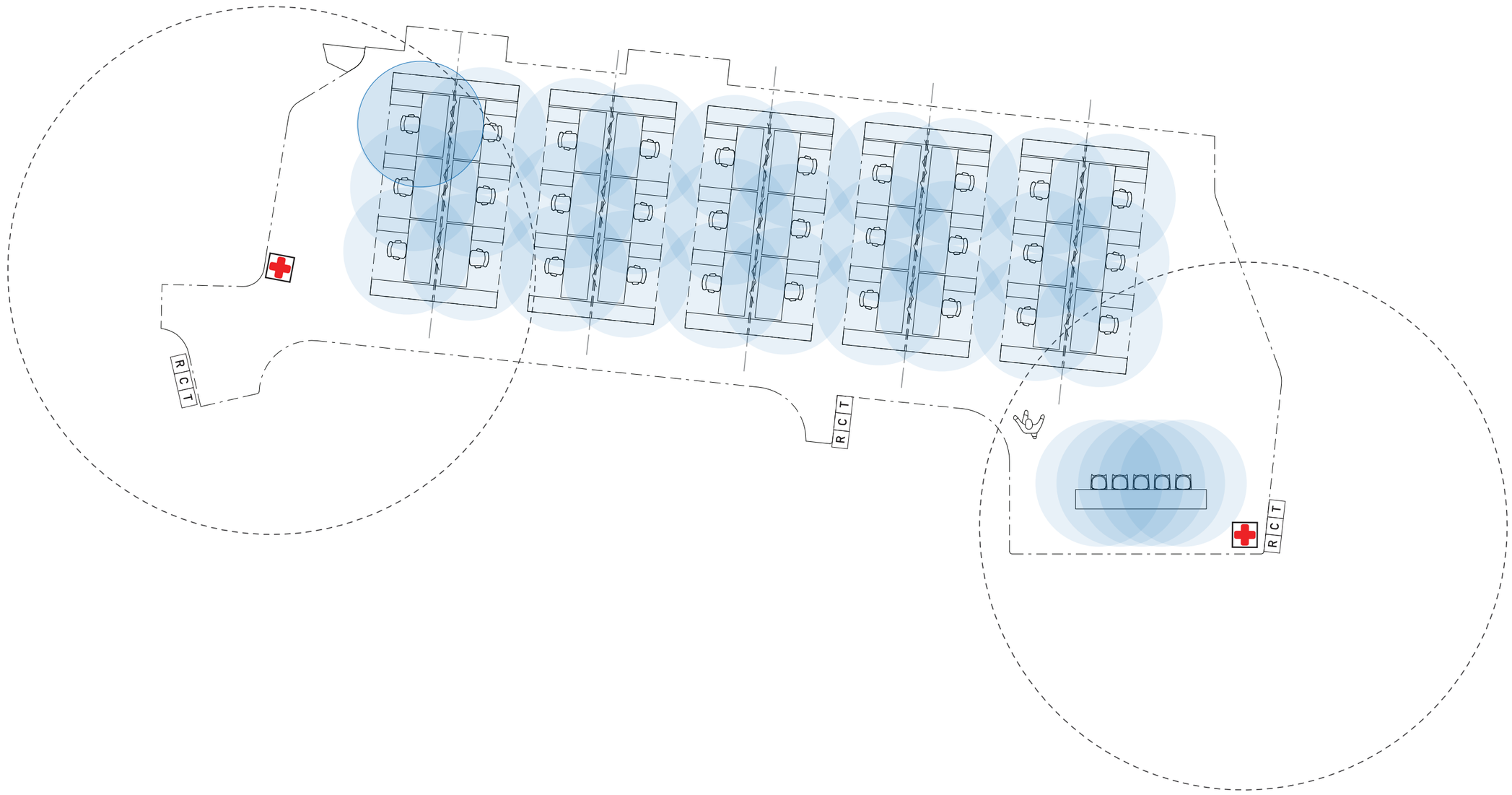
OPEN OFFICE

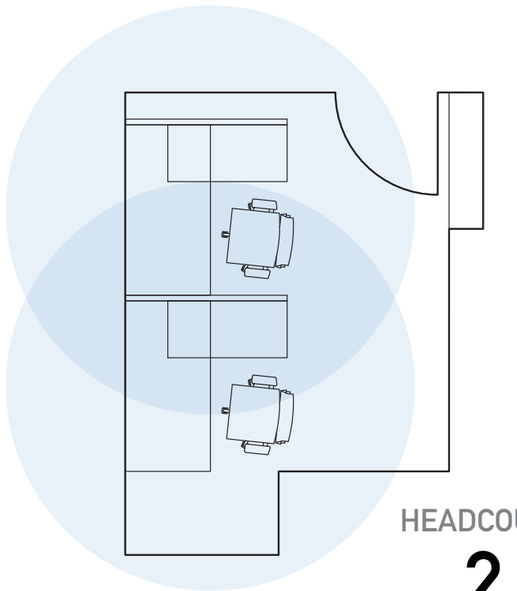
LONG-TERM CHANGE



SHARED OFFICE

OFFICE LAYOUTS

TYPICAL SET-UP



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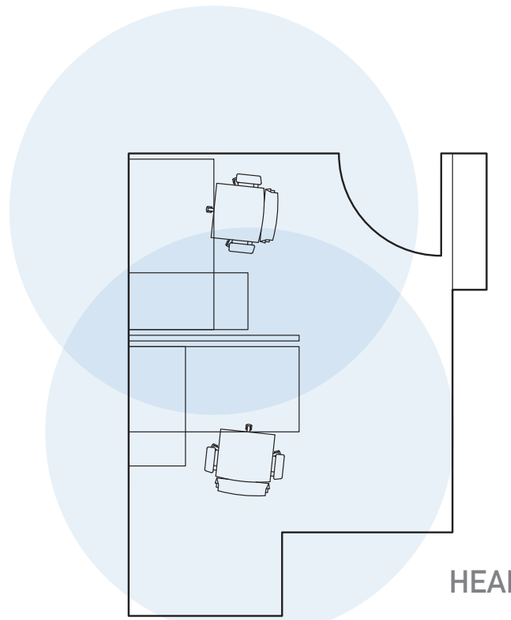
SOCIAL DISTANCING



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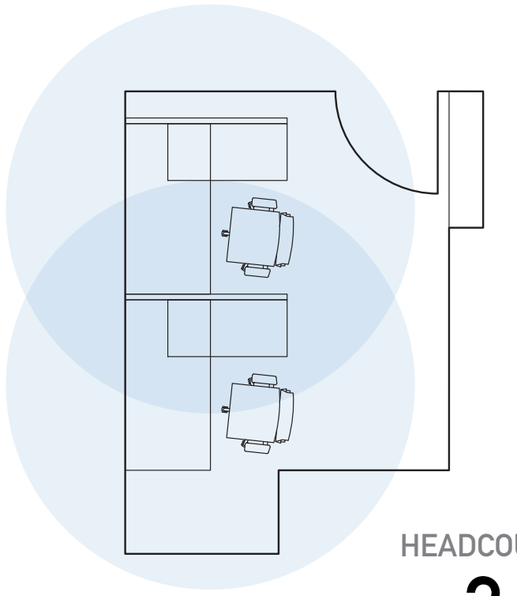

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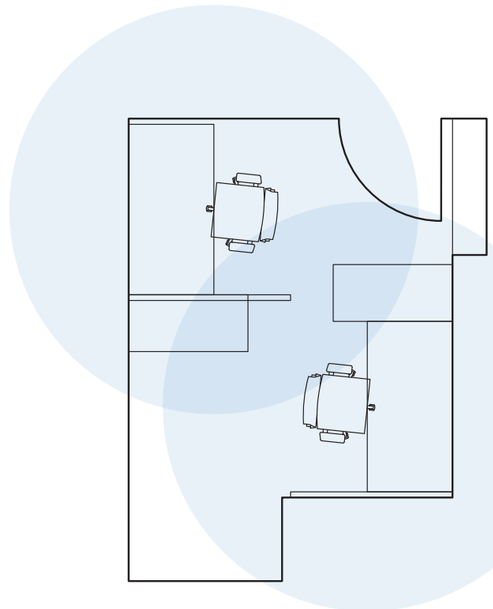


HEADCOUNT
2

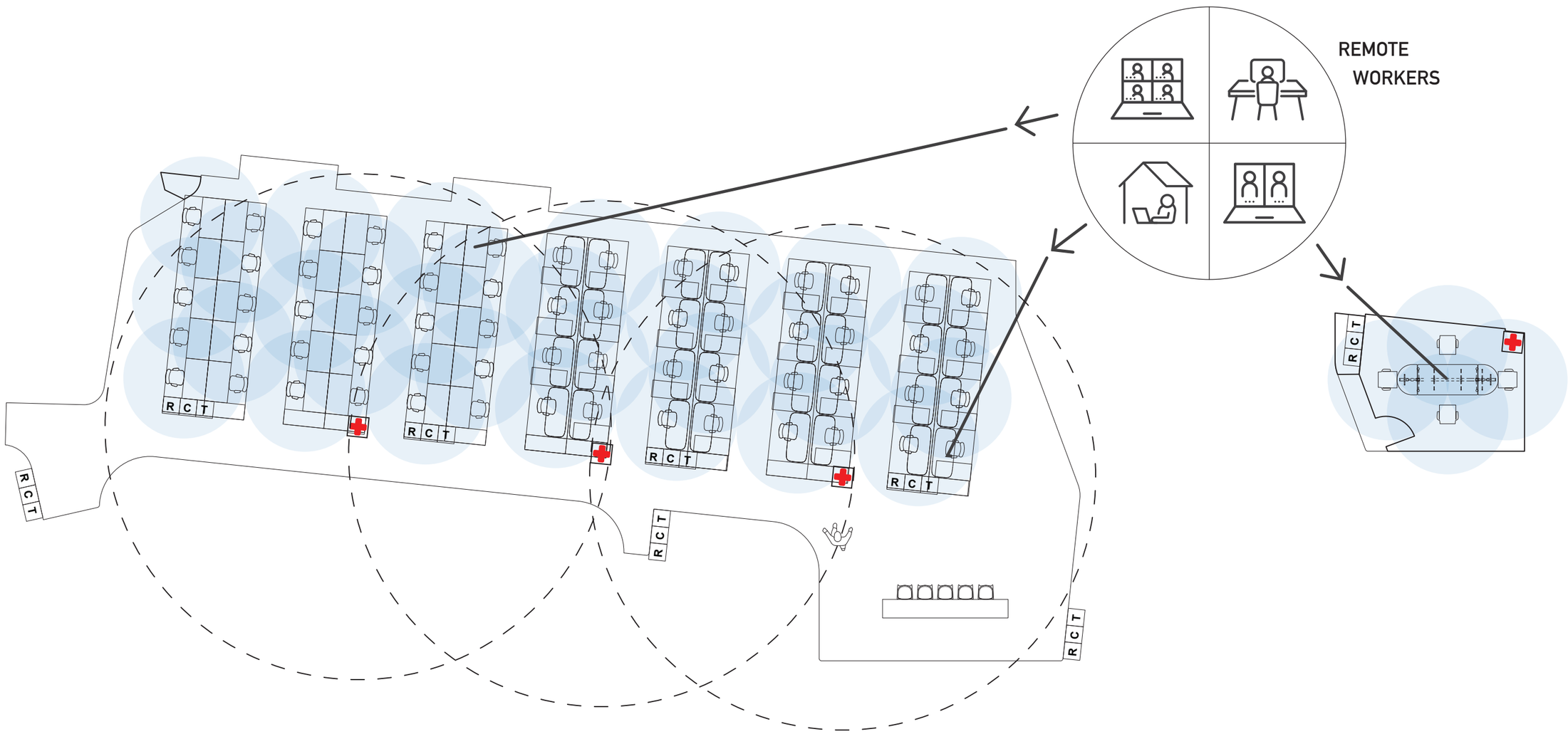
TOTAL HEADCOUNT

	TYPICAL		*SOCIAL DISTANCING*
WORKSTATIONS & TOUCHDOWN	302	→	150
PRIVATE OFFICE	34	→	34

VIRTUAL MEETINGS

WORKING OFF-SITE

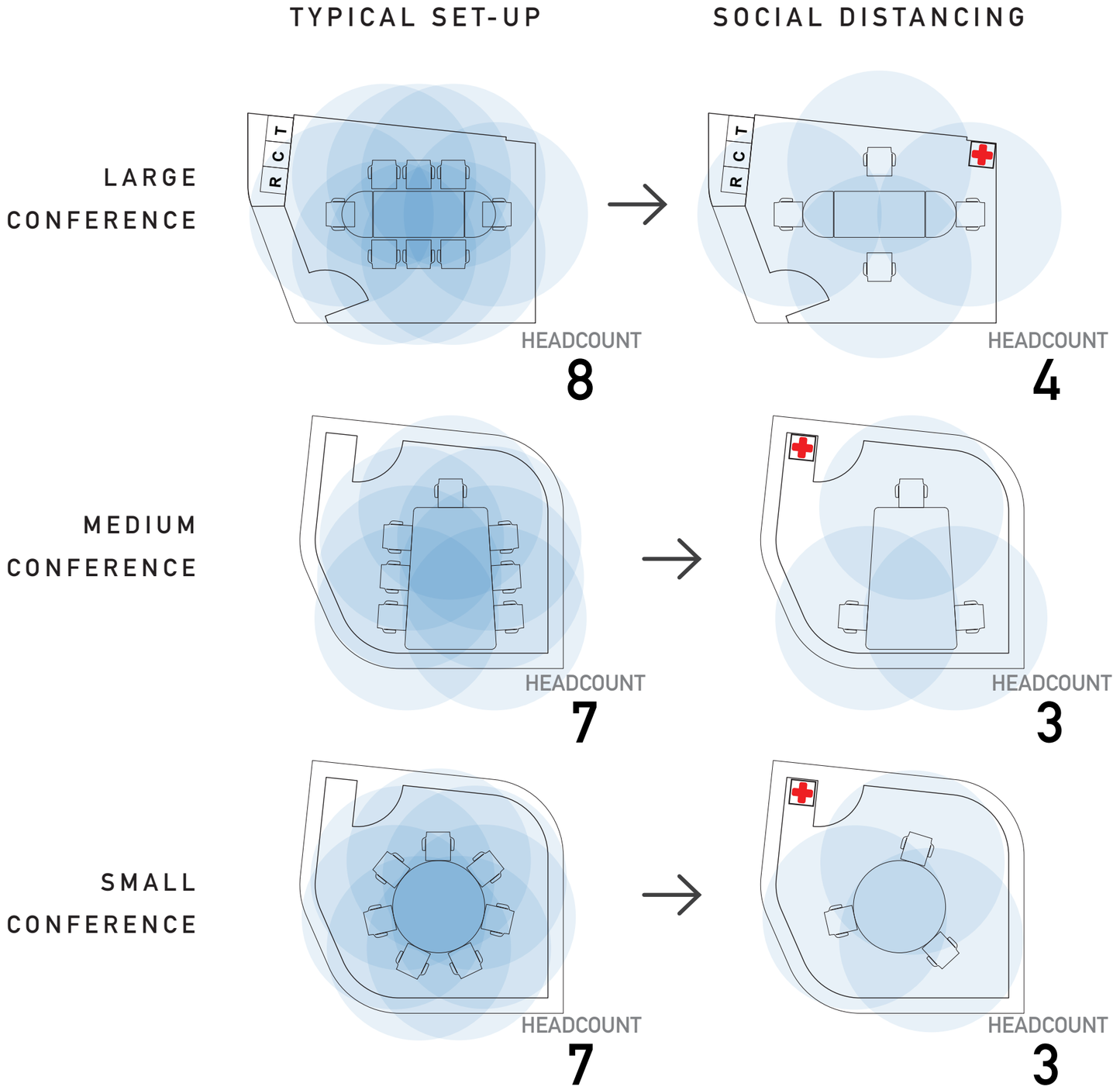
Working remotely limits person-to-person contact and will need to be embraced in most industries in the coming years. With increased technology and capabilities of virtual collaboration, working from home will become easier and a sought-after commodity for employees. The physical workplace needs to reflect these changes and adjust accordingly.



CONFERENCE ROOMS

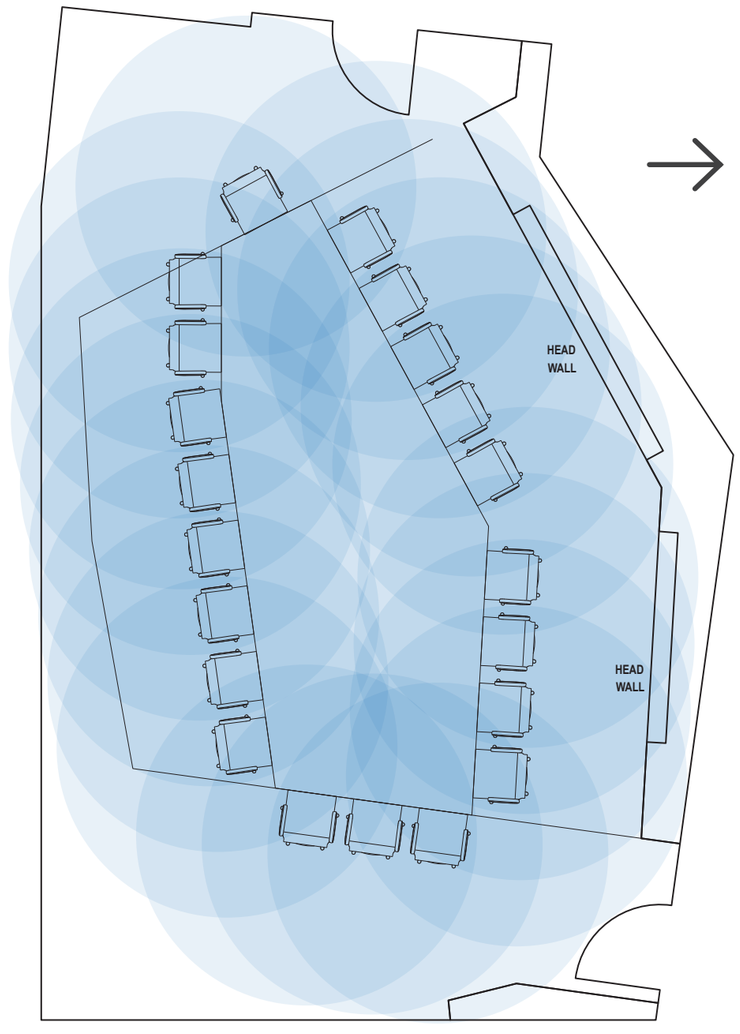
MEETINGS

The limited enclosed space in most meeting rooms will require reduction in headcount.



BOARDROOM

TYPICAL SET-UP



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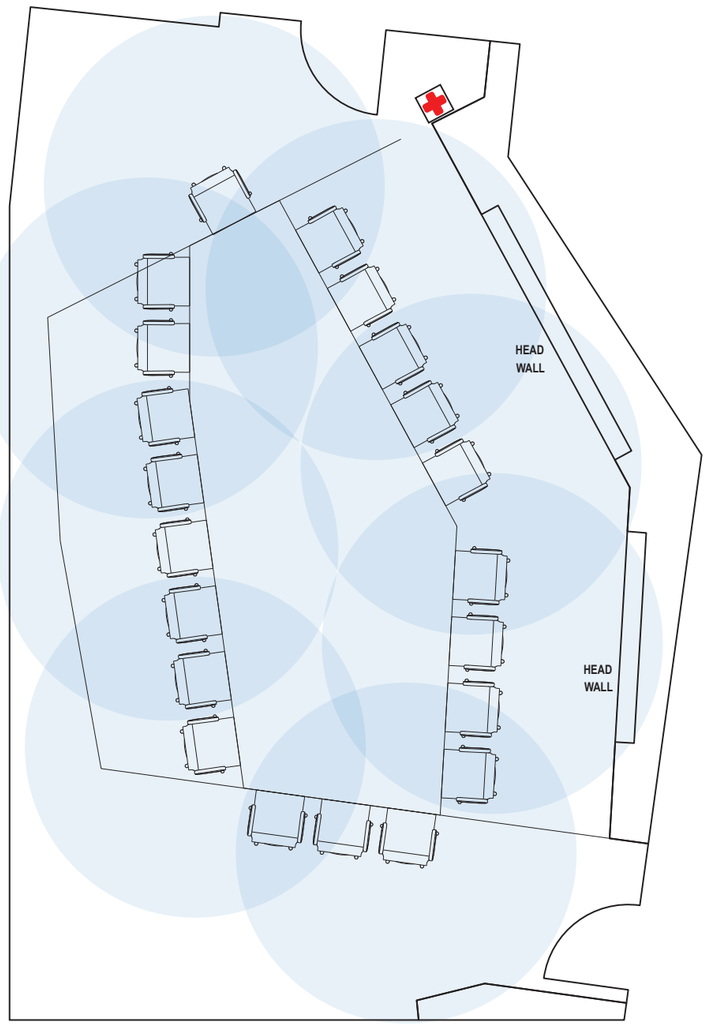
22

SOCIAL DISTANCING



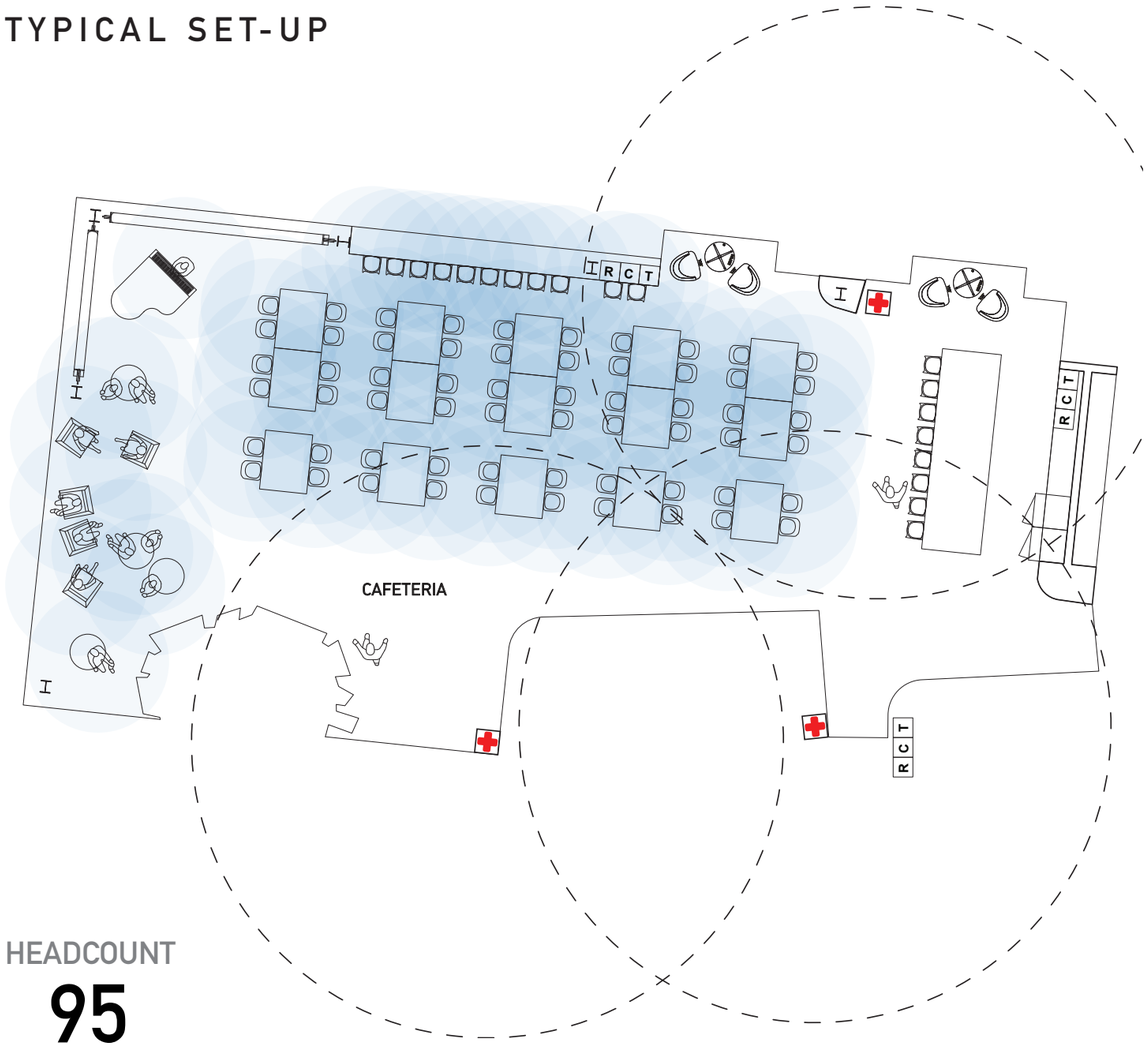
HEADCOUNT

8

ALL-HANDS ROOM

COMMON SPACES Limiting interaction at communal spaces will be an integral part of social-distancing measures.

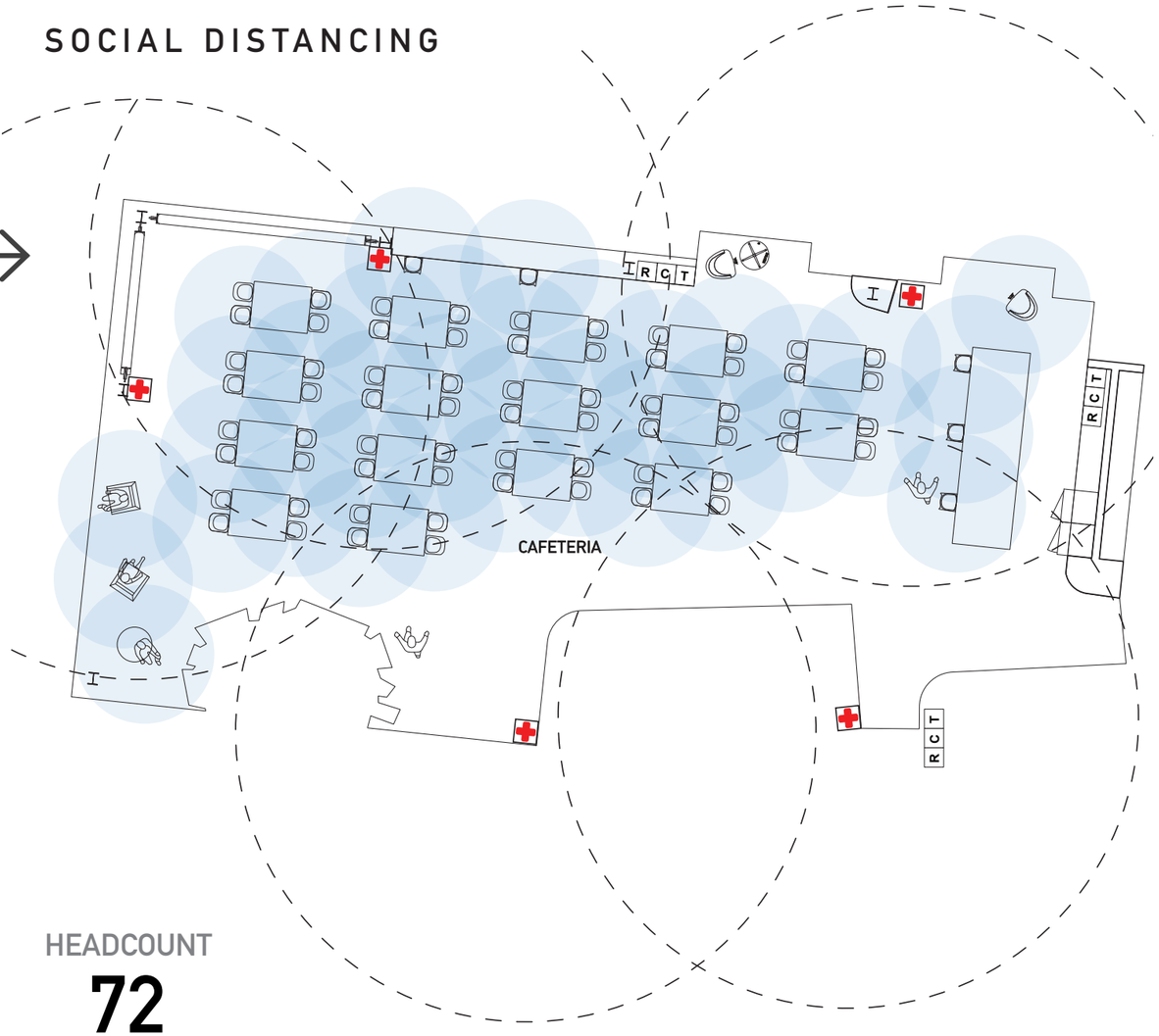
TYPICAL SET-UP



HEADCOUNT

95

SOCIAL DISTANCING



HEADCOUNT

72

MEETING HEADCOUNT

	TYPICAL		*SOCIAL DISTANCING*
MEETING HEADCOUNT	200	→	100
TOTAL HEADCOUNT	336	→	184
MEETING:HEADCOUNT	1:2	→	1:2

APPENDIX

GLOSSARY

TERMINOLOGY:

SOCIAL DISTANCING (SD):

The recommended interventions and practice to prevent the spread of contagious diseases including maintaining distance between others and avoiding large gatherings.

WORKING REMOTE:

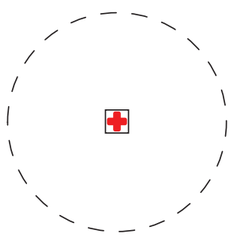
Working in a satellite location outside of the main offices; this includes working from home, a work share space, cafés, other independent spaces.

DIAGRAMS:

PERSONAL SPACE:

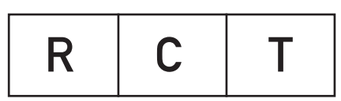
6' RADIUS

HEALTH KIOSK



WASTE:

RECYCLE/COMPOST/TRASH



IMPLEMENTING SAFETY MEASURES

Supporting hygienic procedures such as disinfecting surfaces routinely, washing hands, and having supplies on hand can be greatly beneficial toward reducing the spread of disease.

HEALTH KIOSK

provides medical and sanitation supplies, dispersed around the building

RECYCLE/TRASH/COMPOST

waste receptacles placed in centralized locations

POWER UMBILICAL

increased flexibility to relocate workstation rows as spatial requirements fluctuate

VIRTUAL MEETING

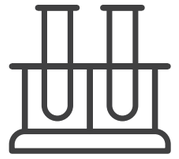
digital virtual collaboration needs to be met through equipment and program needs

OFFICE

workstations must be separated to maintain recommended distance

MEETING

collaboration must be adjusted as the headcount of groups in conference rooms is limited



LAB

as in the open office, workbenches in the labs will also be given more sufficient spatial separation

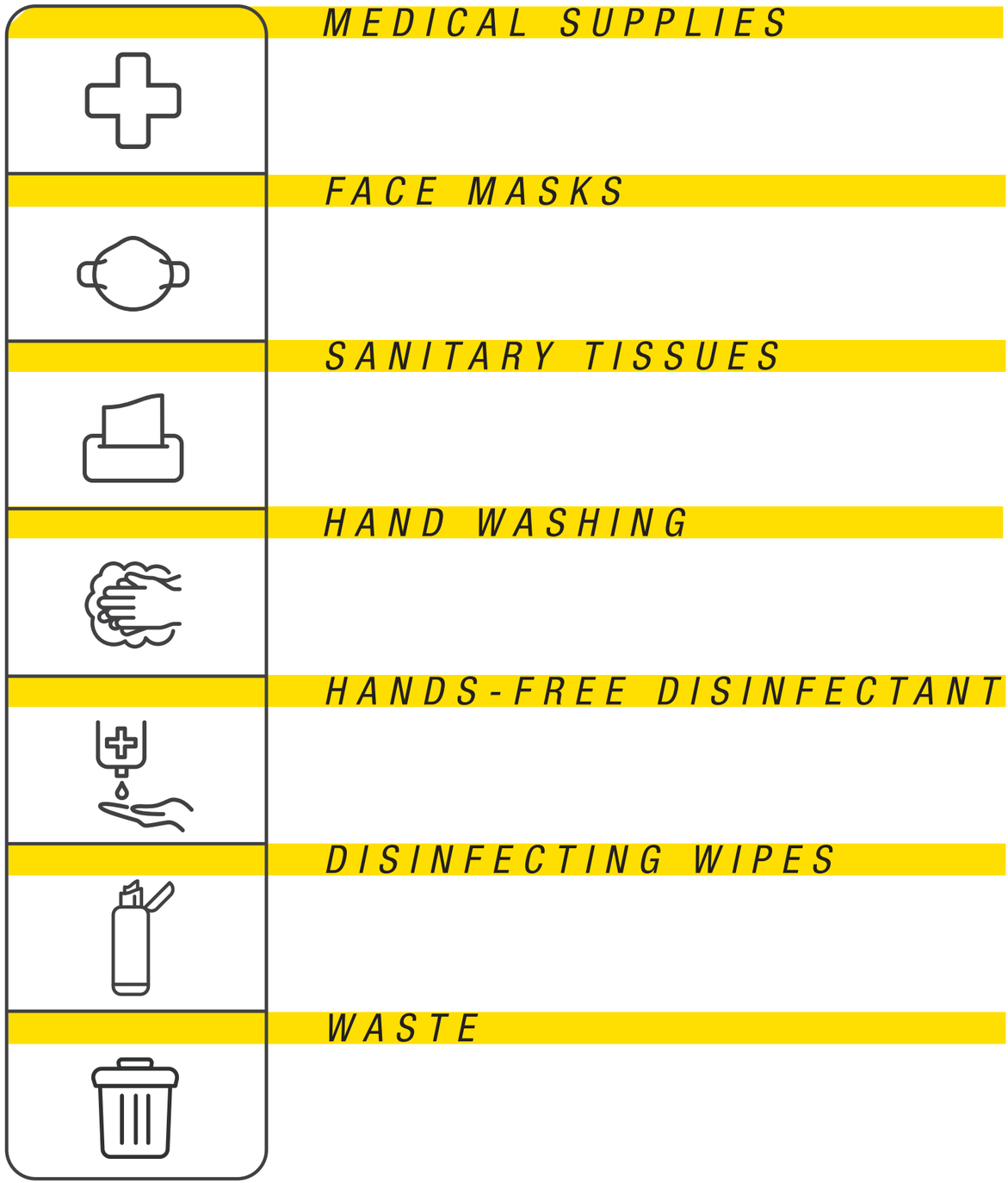
AMENITIES

social distancing protocol will ensure the cleanliness and reduced utilization of amenity spaces

HEALTH KIOSK // SANITATION STATION

These stations help minimize the potential for spreading contagious diseases by providing a location for sanitation and disposal.

The kiosks are to be located at major entrances, common spaces, and meeting rooms; always within a reasonable distance for employees and visitors.

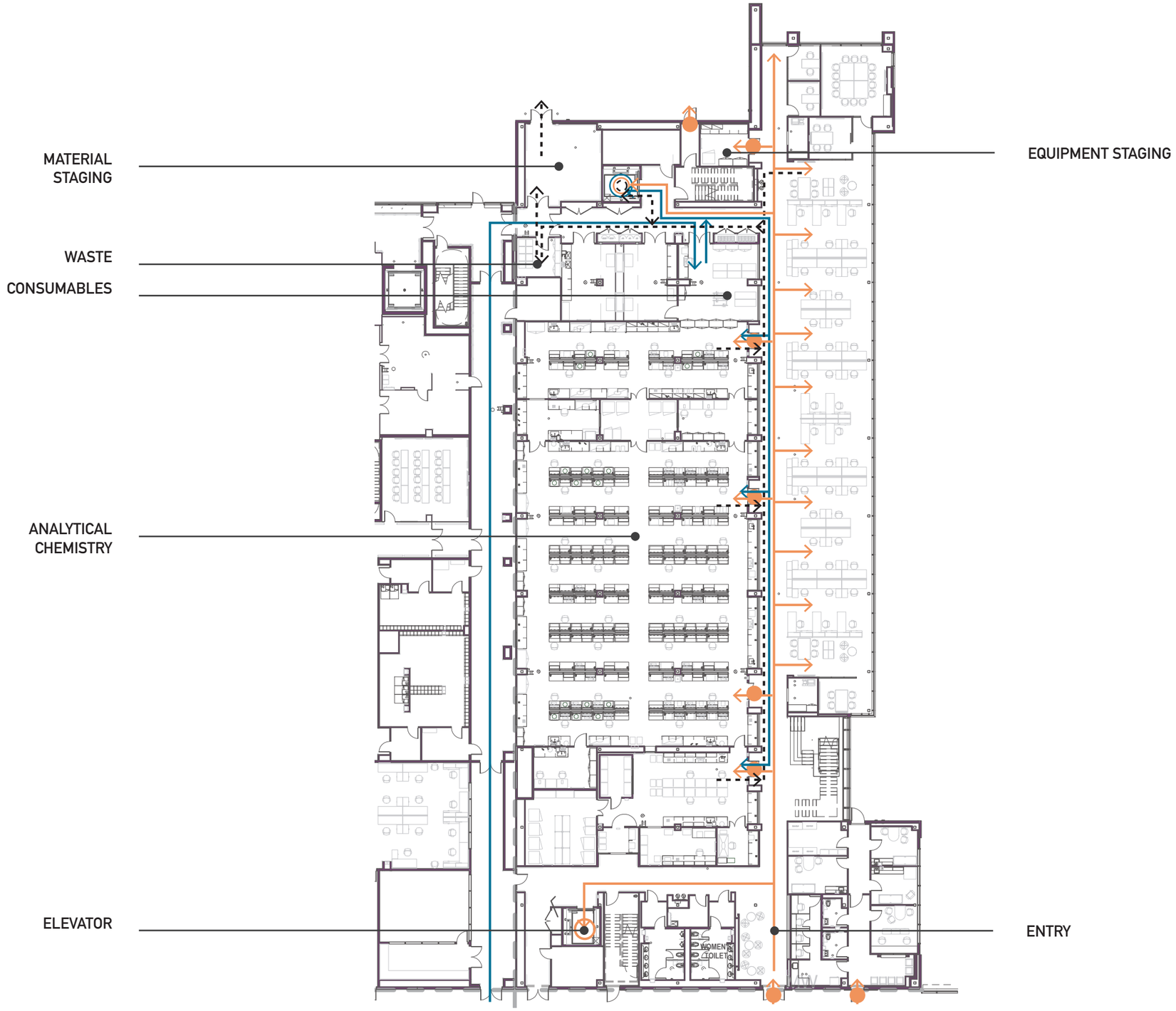


BUILDING FLOWS

This plan represents overall building flow studies. Vertical transportation and circulation corridors are key factors in planning a safe working environment.

LEGEND

- waste
- material
- personnel
- vertical transportation - waste
- vertical transportation - materials
- vertical transportation - personnel
- PPE change



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THE CHALLENGE IS TO SUPPORT OUR ESSENTIAL SCIENTIFIC ENTERPRISE NOW, AT A TIME WHEN NEW DISCOVERIES ARE VITALLY NEEDED, WHILE STILL PROTECTING THE SAFETY OF OUR SCIENTIFIC STAFF AND STUDENTS AS THEY RETURN TO WORK.

For more information, please contact:

Jodi Mulcahy
Principal, National Director of Marketing and Strategy
Flad Architects

jmulcahy@flad.com
o: 608.232.1284
c: 513.604.0232

Flad.com

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