INSTRUCTIONS FOR THE RECONSTITUTION OF HISTORICAL SMOG

INTERNATIONAL HOUSE OF ARCHITECTURE

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ATMOSPHERIC REPORT — WEDNESDAY, SEPTEMBER 14, 1955
HIGH: 93°F
OZONE PEAK: 0.64 PARTS PER MILLION (PPM)
INVERSION LID AT 1000 FEET
FIRST STAGE SMOG ALERT

The instruction diagram describes stages and procedures for the reconstitution or construction of historical smog. This process appropriates archival records compiled by several air quality agencies beginning in the late 1940s. Incorporating years of air monitoring measurements, these archives form a vast databank of atmospheric signals that demonstrate a peculiar reversibility. Interpreted not as test results or output but rather as detailed lists of materials and measurements, the archives provide specific ingredients for smog recovery. Guided by this reversibility, the instruction diagram is divided into two categories: Record, in which the air is sampled and its contents analyzed, and Replay, in which an atmospheric chamber is used to reconstruct photochemical smog from this analysis.

Following these instructions we reproduce air sampled by the Los Angeles Air Pollution Control District (APCD) Central Station in downtown Los Angeles on September 14, 1955. Record, the first sequence of steps, depicts APCD sampling equipment (ca. 1955) and the pollutant information this technology delivered. A first key component of smog, microscopic dust suspended in the air, was measured by rooftop devices that trapped these particulates against a rotating filter; a second component, the day's combination of pollutant gases, was captured for later analysis in the APCD laboratory, where the agency's personnel recorded levels of ozone, carbon monoxide, nitrogen oxides, sulphur dioxide and hydrocarbons. As the APCD expanded in the years after the Second World War it multiplied sampling locations into a regional network of fixed and mobile air testing stations. The agency's ongoing measurements resulted in a data record of pollutants whose combination was specific to the date, season, and meteorological conditions of a precise location within the city.

Replay, the diagram's second category, shows particulates and gases being constructed and injected into an atmospheric "reactor" alongside a stream of purified air. The chamber and ancillary equipment follow a common design of atmospheric modeling facilities built for the study of aerosol pollutants and photochemical reactions. The primary purpose of the reactor is to hold this mixture aloft while it is lit by an array of fluorescent black lights. In this final phase of smog construction, the chamber's contents are irradiated with ultraviolet light of approximately the same spectrum as sunlight, replicating photochemical reactions that occurred on the day the pollutants were originally recorded. Once the black lights complete their irradiation cycle, the net product of this sequence is 2,880 cubic feet of historical smog.

REMARKS ON MOLECULAR HISTORY

Photochemical smog forms a fluctuating and indistinct body of volatile ingredients that varies by toxicity and visual intensity as well as by composition. Reconstituting Los Angeles smog from its historical components, we discover that the proportions and volumes of aerosol chemicals depend on the specific particulates and gas mixtures injected into the air, as well as on sunlight exposure, wind currents and other weather conditions. As a projection of meteorological and industrial activity, smog emerges as an articulate medium of historical and location-specific atmospheric expression: not only is the city's smog different from that found in Cairo or Mexico City, the smog produced in L.A. in 1955 bears a different chemical signature from that produced five, ten, or fifteen years afterward.

The difference among these smogs is linked to technological, economic, and political conditions in the city below. APCD sampling stations, for example, captured numerous species of particulate material flung into the air during the city's explosive postwar expansion: dust from San Gabriel Valley farming, fluctuations in carbon levels from shipping at the city's port, ash from backyard garbage incinerators, rubber from nylon-belted tires, and concrete dust from freeway construction. Via the records produced by the APCD air monitoring network, Los Angeles smog delivers a material history of the city at the molecular level.

REMARKS ON AIR AGENCY

While the archival record of L.A. smog traces the molecular detritus and material emanation from the city below, it is also evidence of smog's transformative effects. Photochemical smog is both an aerial recipient of surface matter and a reactive force that produces ever more particulates as it attacks rubber, nylon and other ubiquitous materials. In this dynamic interaction with the material of the city, photochemical smog differs from 19th-century aerial accumulations of soot or dust. Through its internal chemical reactions it becomes a potent manifestation of a distinct postwar air ecology. The molecular history of smog records an atmosphere saturated by supplements and pollutants that in turn became an active protoganist in the city.

This atmospheric feedback cycle enveloped the L.A. Basin's administrative apparatus. Newly established and increasingly powerful agencies such as the APCD marked a novel involvement between regional administration and city air. Bronchial irritation and chest pain, increasingly described as "smog syndrome," combined with persistent low-visibility conditions and crop damage to cause an escalating atmospheric anxiety. September 14, 1955, our reconstruction date, demarcates one of the initial large-scale encounters between a sudden increase in photochemical smog and the city's new air bureaucracy. With its observation codes, lab analysis procedures, and growing archive of air measurements, the administration of polluted air in Los Angeles expanded older notions of the pathogenic city by positioning municipal government between the population and techniques of atmospheric management. Through the governmental action it compelled, smog, which was initially produced by the city, now participated in the regulation of city life.

Consonant with having been a recent center of war production, the initial engagements between the city administration and smog reprised a theme of militarized airspace; Los Angeles was accustomed to similar wartime deployments of city authority through the civil defense apparatus. "Air emergency" procedures and the terminology of "smog attacks" helped compel the inflation of an ever-differentiating air sampling network that attempted to track an inscrutable enemy. These airborne threats ultimately became the basis for a new formulation of the city environment that required correspondingly novel forms of information, administration, and defense.

REMARKS ON SMOG THREAT AND PRESERVATION

The reconstitution of historical smog extends preservation to include the corrosive air that infiltrated postwar architecture as well as the toxins, chemicals, ingredients and supplements that have conditioned the spatial and environmental ecology of postwar Los Angeles. It is precisely this caustic agent that would be excluded from any preservation project that would seek to isolate, secure, and rescue architectural objects from L.A.'s smog effects. Yet, L.A.'s spaces, populations, and forms of perception have been colored and historically altered by their relation to this constant backdrop of iridescent or murky toxicity. L.A.'s atmosphere is not only a protean body of polluted air that hovers in the distance; it is a cultural artifact that also permeates the city, its population, and its architecture. Smog's gases and particulates were produced by the same manufacturing practices that made building materials available; its ingredients were produced and aerosolized by suburban construction and by the widespread car ownership that fostered suburban life. Smog became not only the by-product of urban expansion in Southern California but also its inseparable complement.

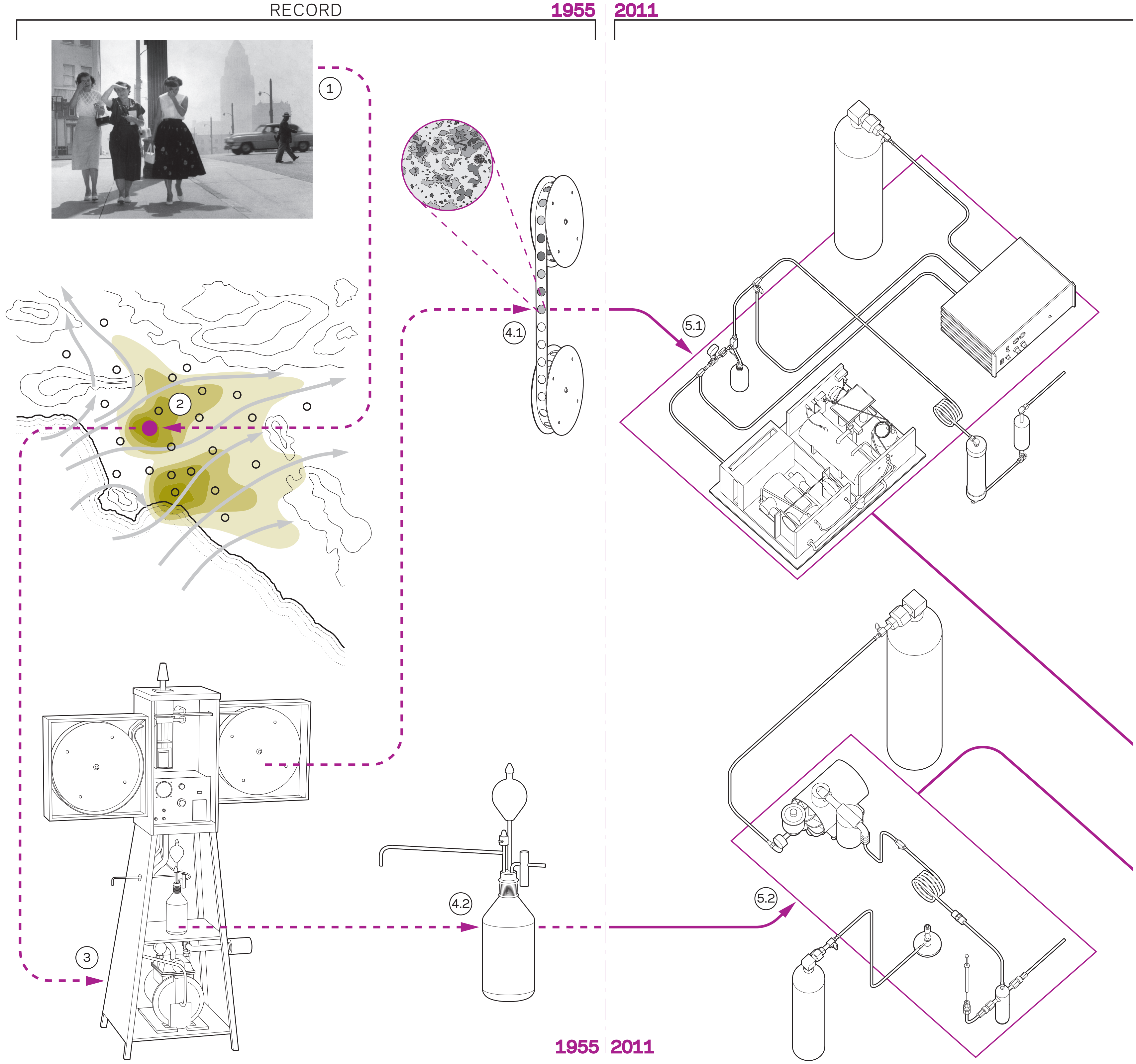
UNESCO's photochemical smog studies in Europe have consistently focused on the deleterious effects of smog measured through acid rain and the surface degradation of historical monuments. In contrast, Los Angeles is a city largely free of both rain and stone monuments. The city seals itself from smog in conditioned interiors of automobiles and architecture, both of which incorporate their own defensive air systems. The most invasive corrosion associated with L.A. smog is not on architectural surfaces but within the filtering apparatuses, sealants, gaskets, and other barriers and technologies of atmospheric isolation. The architecture and filtered environments of Los Angeles are under threat at their edges, seams, and hinges.

REMARKS ON SMOG VISIBILITY

While demonstrating the corrosive potency of photochemical smog, the resulting volume of reconstituted historical air does not exhibit the characteristic hydrocarbonate color range associated with the vistas of late Los Angeles summer. Although pollutant concentrations in the air chamber equal those found in archival smog data, aerial refraction does not successfully scale or compress. The dominant visual effect in the atmospheric laboratory, outside of the short-lived violet glow of the black lights, is what Reyner Banham called the "environmental provisions," the equipment that constructs and supplies the pollutant-air mixture.

The relative visibility or invisibility of smog pervades the project of historical reconstitution. Although historical patterns of toxic intensity and visual density correspond only approximately, visual perception is critical to smog's urban identity. Despite its potential visual imperceptibility, the secondary attributes of haze and color are generally L.A. smog's most obvious phenomena.

Where the instruction diagram uses color-coding as a graphic surrogate for the absent smog chroma, the assembly compensates for the elusive visual features with the attached smog helmet. While the bag's contents are not visible from outside the reactor, they are immediately perceptible from within the breathing apparatus. By exposing the naked eye to the chemical contents, the reconstructed smog's visual evasion is arrested, irradiated, and exposed into an acute optical condition, triggering a form of historic vision. Immersed in smog, the subject registers the aerosol mixture through respiratory distress, chest pain, ocular discharge, and tears, symptoms of the "smog syndrome" first described in the 1950s. Less optical illusion than occlusion, the apparatus ultimately induces the perception of blurs, hazes, and the indistinct boundaries of the smog horizon.



1. AIR CONDITION

Photograph from September 14, 1955. Image shows air conditions during a smog alert in downtown Los Angeles near Air Pollution Control District Station 1. Temperature high of 93 degrees Fahrenheit, inversion lid at 1,000 feet.

2. AIR NETWORK

Map of the Los Angeles Basin showing typical onshore air movement. By 1955, the APCD network included dozens of sampling stations distributed throughout the basin measuring contaminants, eye irritation, and plant damage. Map indicates APCD Station 1 and other main sampling locations.

3. AIR SAMPLING STATION

APCD air sampler used until the early 1960s to collect particulate matter. Over one hour air was drawn through 2 inch filter disks mounted in a "reel-to-reel" belt. At the end of the hour, the belt would advance and the cycle would repeat to produce a continuous material recording. Motors and other equipment were housed within the base of the station, where ambient air samples were drawn into a glass and metal canister for later lab analysis.

4.1. PARTICULATE SAMPLING

After the filtration phase the disks carried data on pollutant ratios and particulate density, measured in micrograms per cubic meter.

4.2. HYDROCARBON SAMPLING

Air samples collected at network stations were analyzed using gas chromatographs; this equipment measured hydrocarbons in units of parts per million (PPM).

5.1. PARTICULATE INJECTION

A graphite aerosol generator is used to produce carbon particles, which are mixed with purified air and injected into the reactor bag. The resulting suspended particulate density follows the 1955 measurements.

5.2 HYDROCARBON INJECTION

Xylene, a hydrocarbon present in solvents and fuels, was registered across the Los Angeles basin from the 1950s onward. Here, it is vaporized into a stream of molecular nitrogen (N_2). The resulting vapor is then injected into the reactor bag. A similar apparatus used for each hydrocarbon results in hydrocarbon concentrations equal to those of the target date.

6. CHAMBER SYSTEM DIAGRAM

(A) Components for supplying a continuous flow of purified air to the enclosure around the reactor bag. This prevents outside pollutants from migrating into the bag.

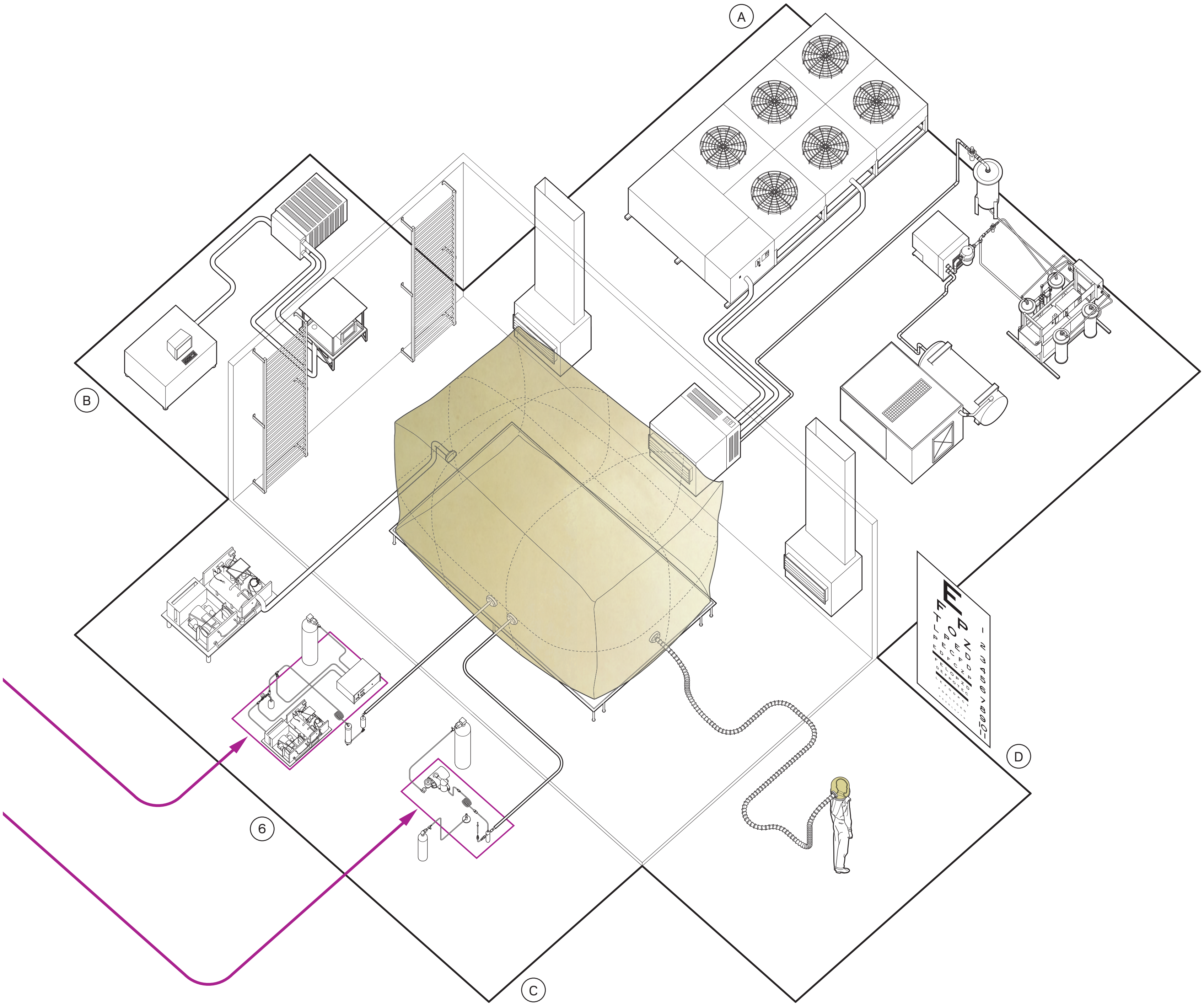
(B) Equipment used to supply UV radiation to the bag. The two banks of black lights match the emission spectrum of sunlight between 300 and 450nm.

(C) Components used to inflate the reactor bag with purified air, and later, to inject a flow of pollutants into the bag. A separate system (not shown) samples the bag contents to achieve and maintain the required balance of ingredients.

(D) Wearing a sealed transparent helmet, a subject is exposed to the bag contents. Viewing a Snellen eye chart, the retinal irritation and obscuring of vision associated with the 1955 smog syndrome are manifest.

7. SMOG CONSTRUCTION SEQUENCE

A clean air generator fills the FEP-Teflon reactor bag with purified air; pollutants are then injected through the bag's side ports. Black light arrays irradiate the bag's aerosol contents with UV light, producing controlled and specific photochemical reactions. After irradiation, the reactor's contents match air samples taken on September 14, 1955, resulting in a volume of historical air.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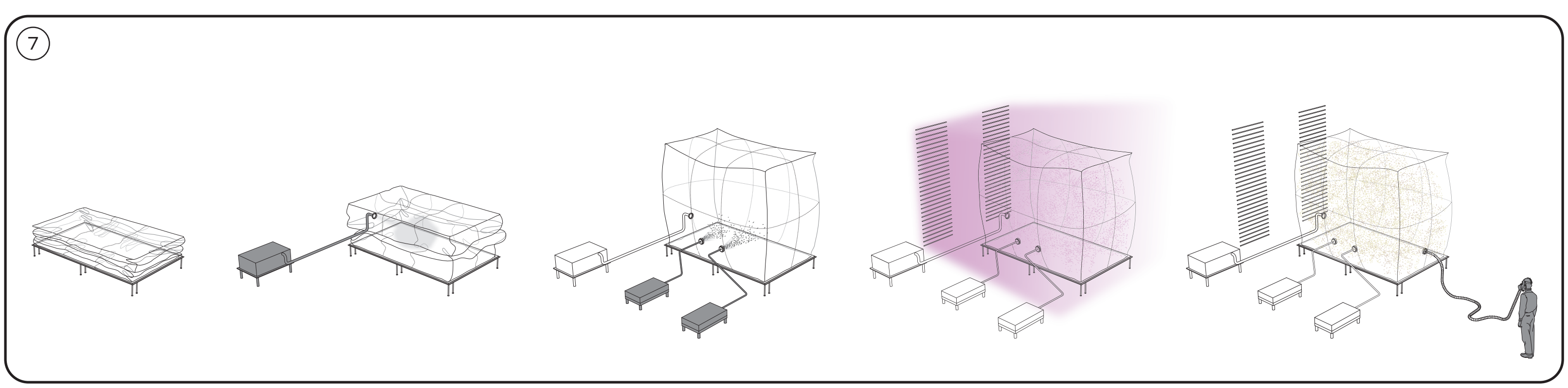
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