GLOSSARY

Aerial photography. Aerial photography is the capturing of images of a site or location from an aircraft. It provides an efficient and effective means of quickly documenting the condition of a large site or a number of sites. It documents many relevant matters and, if sufficiently detailed, can be a substitute for conventional mapping and for monitoring purposes. There are two general sources for obtaining aerial photography: archival research and commissioning flights. Archival research is a cost-effective means of acquiring images of a site taken for other reasons such as road engineering or national topographic mapping programs. Aerial images obtained by commissioning flights can be vertical (straight down) or oblique (taken at an angle). Professional companies usually take vertical images by using expensive, extra-large-format film or digital cameras mounted in the belly of a small airplane.

Automated monitoring system. An automated monitoring system contains a large number of different sensors and devices that collect various data measurements. These include but are not limited to inclinometers, to measure the degree of inclination; levelometers, to measure differential settlement; weather stations, to measure wind speed and direction and ambient temperature; and strain gauges, to measure crack propagation. These devices usually are connected to computers to give continuous data to engineers.

Computer-Aided Design and Drafting. Computer-Aided Design and Drafting (CAD) is software into which measurements, data, and images from multiple tools and methods can be combined. CAD is flexible enough to allow the user to produce quick, basic sketches, as well as drawings of great precision and detail. Serving as the common platform for printing and sharing data among specialists, CAD allows images to be imported and data added manually or input directly from survey instruments. Data can be displayed in different ways, including 2-D orthographic projections or 3-D isometric, or perspective, views. Information can be divided using multiple layers, or views, which can then be recombined in various ways.

Database. A database is a collection of various types of data, including photographic images, sketches and measurements, condition assessments, and other pieces of information stored in a systematic way for security and easy retrieval. Individual records, or data, are separated into sets, themes, and fields with unique identifiers that allow the data to be linked together and queried in various ways. The database can connect the separate pieces of information together.

Geographic Information System. A Geographic Information System (GIS) is a geographic database that combines spatial information in graphic form with tabular data. It is an effective descriptive, analytical, and communication tool to map and assess sites and prioritize necessary work.

Global Positioning System. A Global Positioning System (GPS) is a navigation and mapping tool that employs special equipment to receive radio signals transmitted from a network of twenty-four satellites circling the Earth twice a day in precise orbits. It allows the rapid acquisition of detailed and comprehensive data with pinpoint accuracy. Two categories of GPS radio receivers range in accuracy. For these two categories, accuracy can be improved to several centimeters with a differential signal, which is a ground-based radio transmitter. This base station transmits radio signals that supplement the radio signals from the satellites. Amateur or handheld GPS devices are not corrected by a ground-based station and range in accuracy between 5 and 15 meters.

Ground-penetrating radar. Ground-penetrating radar (GPR) is a nondestructive technique that uses electromagnetic waves to investigate the underground or internal structures of natural and human-made objects. It has been used successfully in investigating the characteristics of and damage to walls and masonry structures, such as voids, detachment, cracks, leaks, and deteriorated mortar joints. GPR has a good level of accuracy and is easy to handle and transport. The GPR basic system consists of a data acquisition unit and two transmitting and receiving antennae. The transmitting antenna sends pulses of high-frequency radio waves. When a wave hits the boundary of an object that has different electrical properties, the receiving antenna records these variations, known as anomalies, which are reflected in the return signal.

Infrared reflectography. Infrared reflectography (IRR) is a nondestructive digital or photographic imaging technique that uses a specialized digital detector or heat-sensitive film to capture absorption and emission characteristics of reflected infrared radiation between 750 and 2000 nanometers. IRR is simple, quick, and effective in investigating surface conditions by detecting original faded or hidden drawings, and in penetrating through upper layers of overpainted surfaces.

Laser scanning. Laser scanning uses various scanning technologies to provide a 3-D record of a surface. In general, these technologies are based on one of three methods: (1) time of flight, in which a laser pulse is emitted and the time of light travel is measured; (2) phase comparison, in which the instrument emits a known frequency of light and

compares the returning phases; and (3) triangulation, in which an emitter and receiver are separated by a known distance and the angle of the reflected laser is used to determine distance. With these technologies, XYZ coordinates are recorded as millions of individual points. Close together, these individual points form a point cloud from which a "mesh" can be generated to create a 3-D model.

Manual recording techniques. Manual recording techniques use tools such as plumb bobs, measuring tapes, and paper and pencil to record buildings or sites. Although often labor intensive, these techniques are readily available and allow the study of buildings or sites in great detail. Usually this method of recording provides sufficient information and accuracy with which to begin conservation.

Photogrammetry. Photogrammetry is a survey technique in which a 2-D or 3-D object may be measured from photographs taken from slightly different positions. These stereographs provide two different views of the same object that mimic the perspective of human binocular vision. Measurements are extracted from the stereographs, and 3-D information is reconstructed using computer software and hardware.

Rectified photography. Rectified photography is based on the concept of bringing the surface of an object, say a building facade, and the plane of the image (photograph) into parallel. Rectification removes perspective, angle, and camera lens distortion, and creates a measurable image that is on the same plane as the building. It is inexpensive and quick to carry out, requires minimal training, and does not require high-tech equipment. Image rectification can be carried out with or without measurement control points on the object. Control points can be measured using a tape measure or survey instruments (total station). These measured distances correct the angle or tilt in the original image while retaining the correct proportions of the building.

Sketch diagram. A sketch diagram is an investigative and interpretative drawing tool that combines various methods of recording to understand a site, building, or object. The diagram represents the relationships between elements in order to understand how they interact. It also facilitates communication about these key elements.

Three-dimensional computer modeling. 3-D computer modeling is software that processes XYZ coordinate points and builds meshes that can be formed into different shapes to represent architectural elements. Images of the actual architectural elements can then be draped or projected over the surface of these meshes. The resulting images can be displayed and rotated on the computer to be viewed from different places.

Total station theodolite. A total station theodolite is a standard survey device consisting of a powerful telescope mounted on a base that rotates both horizontally and vertically. An operator can locate points by measuring distances through an electronic distance measurement (EDM) device as well as horizontal and vertical angles. Trigonometric calculations are performed by an onboard computer, combining the horizontal and vertical angles with the EDM to determine an XYZ coordinate. A series of points can be combined to form lines and planes, thus representing the object being recorded.

Transparencies. Transparencies are clear plastic sheets used as overlays on which conditions can be recorded. They provide a simple but systematic method of recording conditions manually over a printed and scaled image base map. Conditions are then digitally scanned and incorporated back into the base map.

Urban study. An urban study is a detailed survey of a historic urban environment. It provides answers to important questions related to problems, deficiencies, and economy, and identifies general planning measures and specific actions required. Reconnaissance of the historic area focuses on six key issues. The first two, buildings and open spaces—the solids and voids that constitute the urban fabric—are the essence of the historic city and embody its character. The remaining four—people, land use, traffic, and infrastructure—determine the function of the historic core and have a direct impact on its long-term survival and well-being.

Video technology. Video technology is an electronic tool used to capture and process a large number of images and sound in sequence. It is therefore the ideal tool to record motion and processes. Video is also referred to as the technology used to edit and transmit images and sound.

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ABOUT THE EDITORS

Rand Eppich is a licensed architect and senior project manager at the Getty Conservation Institute (GCI). As manager of the institute's Digital Recording Lab, he has been involved in numerous GCI projects in Los Angeles, China, and Europe. He has lectured on a variety of documentation tools, including photography, photogrammetry, GIS, and GPS, at the University of California, Los Angeles (UCLA), Katholieke Universiteit Leuven, and ICCROM. He holds advanced degrees in architecture and management from UCLA.

Amel Chabbi received a master of science in historic preservation from the University of Pennsylvania and also holds degrees in both chemistry and archaeology. At the GCI, she assisted in the Conservation of Mosaics In Situ Initiative in Tunisia. She is currently a conservator at Superstructures Engineers + Architects, as well as a Kress Architectural Conservation Fellow working on the Texaco Road Map project for the New York State Pavilion with the Architectural Conservation Laboratory at the University of Pennsylvania.

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Detail of Renaissance fresco, Cathedral of Valencia, Spain. Photo: © José Luis Lerma.

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ISBN 978-0-89236-946-1