



READING BLUEPRINTS

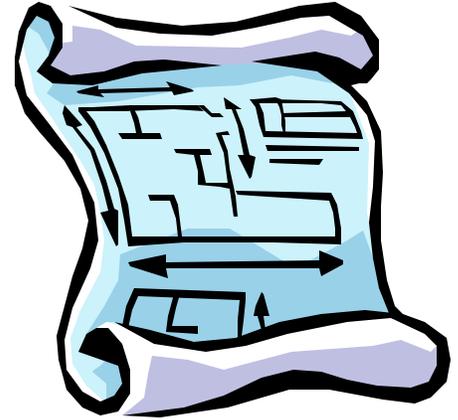
BY STEVE KELLER, CPP

Sooner or later, every security manager will be faced with the problem of having to review and comment on blueprints or some other form of architectural or electrical construction drawing. Surprisingly, many do not have the slightest idea of how to read a blueprint and most, due to lack of day-to-day use of blueprints, do not have the proficiency needed to work closely with architects, engineers, designers, and consultants.

Security is a dynamic industry. It is changing as quickly as the technology associated with it changes, and it is now necessary for every security manager at or aspiring to achieve the corporate director level to be able to comprehend that technology. One skill which must be mastered is the ability to read blueprints.

Most security managers incorrectly assume that architects and engineers employed by them possess a working knowledge of security and always include security requirements in their plans and designs. Architects rarely consider security unless the requirement for security is included in the "program" provided by the building owner. And that is rare.

The blueprint is the means by which the architect commits to paper the design and non-verbal specifications for the building design



and construction. If the security manager does not review blueprints carefully, he or she may find that the final building does not include the designs and devices required for adequate security. Often the security manager must mark up prints so that the Architect can include those changes in design updates.

There are three documents which express the designs proposed for the new building or existing space to be modified. First, a "program" is written, which gives a brief verbal statement as to how the building will be used and possibly what restrictions, limitations, etc. are to be considered. After a program is developed, "blueprints" are prepared. Blueprints, or more specifically, architectural working drawings, show graphically what the architect intends to have built or what renovations are to be made.

Finally, "specifications" are written by a skilled architect, engineer, or consultant. Specifications spell out in detailed English what work is to be done. Since most security managers

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are quite capable of reading and digesting the detailed specifications, they provide something with which the security manager can work. Unfortunately, by this time it is often too late to make sufficient changes to provide the security that the new facility needs.

To be really specific, the word "blueprint" is a misnomer. A blueprint is just one process used in producing architectural working drawings. A blueprint has white lines on a blue background. Today, we more frequently encounter prints which are made by other processes, including Diazo Prints. You may also hear the term vellums or sepias. These refer to architectural drawings which are on a translucent paper, enabling them to be easily reproduced. Prints with blue lines on a white background are more common because they can be written on and read more easily. Nevertheless, the symbols used and the knowledge required in reading prints are the same, regardless of the process used to make the copies.

The term "architectural working drawings" refers to the complete set of drawings necessary for construction or renovation. "Preliminary drawings" are the initial drawings the architect prepares in order to promote the project. These drawings include much of the information needed by the security manager in planning for building security. "Presentation drawings" are those drawings prepared by the architect which show elevations and other perspective views of a building or area to be renovated. They

are most helpful to those people who are unable to interpret blueprints to see how the project will look when completed.

Finally, "working drawings" are prepared and are used by trades in carrying out their construction assignments. A final review of these drawings by the security manager may be critical. "Shop drawings" are drawings which are prepared by a sub-contractor for his own use. They are submitted to the architect, engineer, or consultant to insure that the sub-contractor properly interprets the work he is doing. These drawings show in detail what the sub-contractor intends to do, and how he intends to do it. If your security consultant designs an alarm system for your building, he will usually prepare blueprints which graphically define the written specifications. But he will require that the contractor who wins the bid prepare shop drawings for his review. This occurs because the consultant's drawings are somewhat less specific to allow flexibility in bidding by manufacturers of several models of alarm system. To insure that the system that has been accepted by the owner is correct, the consultant reviews the shop drawings which contain more detail.

In order to read architectural drawings, the security manager must learn the language of construction as well as security trades. Terminology used in electronics is especially important for work with alarm systems. A knowledge of definitions of construction terms is important in



reviewing construction project materials. The architecture and engineering sections of major public or college bookstores contain a number of good reference books, which will help you with this. Begin by obtaining a good glossary of security terms. I recommend *Butterworth's Security Dictionary: Terms and Concepts* by John J. Fay, available from Butterworth's Publishing Company, Stoneham, Massachusetts.

The security manager must learn the symbols, abbreviations, and meaning of lines on drawings. *Reading Architectural Drawings* by Edward Muller Prentice-Hall, Inc., second edition, 1981, is an excellent text on the subject of architectural drawings and includes everything a security manager needs to know about symbols and lines used on prints. This, too, should be part of every security manager's bookshelf. Somewhat standardized symbols exist for various building materials such as brick, wood, concrete, etc. Symbols are also used to show types of electrical fixtures and outlets such as ceiling outlets, bells, buzzers, switches, etc. Plumbing, wiring, and HVAC components all can be shown with symbols. Currently, no standardized symbols exist within the security industry to show components of alarm systems, but many vendors and system designers and consultants use their own symbols, which are all keyed to a list of symbols somewhere on the prints. The Fay book contains as good a list as any of the architectural symbols typically used for security equipment.

Of equal importance to symbols on prints are "schedules." Hardware schedules, for example, often list everything you or your locksmith will need to know about doors, locks, cylinders, electric strikes, and other locking and non-locking hardware used to secure your facility. Your consultant may provide a detailed schedule of security devices, including each detector or contact and explaining how each is to be installed. This is critical in facilities like museums or historic restorations so that no questions remain about the appearance or coverage provided for each device.

The Muller text also discusses the principles of technical projection, i.e., orthographic projection, the standardized method of showing graphically the various dimensions of a three-dimensional structure. Muller, in this excellent text, explains the application of these principles to architectural drawings.

The security manager should learn the various scales used on architectural drawings. In order to reduce the building being designed to fit on a piece of paper, the drawing is made to "scale" with one quarter, one eighth, or other fraction of an inch equaling one foot. An understanding of "scale" and the tools used to read prints reduced in scale such as the architect's triangular rule, should be part of the working knowledge of every security manager.

The security manager should learn the basic construction techniques



used in modern buildings, specifically those relating to the physical security design and electronic security systems. It is not necessary for you to be an engineer, but common sense knowledge will go a long way to guiding you in analyzing drawings. After all, if you find that your storage "vault" has drywall walls, you may wish to consider alternatives due to the obvious security and fire ramifications.

There are a number of reasons the security manager might want to review architectural drawings. First, a review of the drawings will determine whether cost estimates and estimates for labor, materials, and other items are accurate. In a plan for a new building or a new wing of a building, the security manager might want to analyze the costs for a security alarm system and other physical and electronic security equipment. He or she may also wish to analyze future guard manpower costs, and a review of the drawings insures that a sound understanding of use of space is the basis for the cost estimate. The drawings also may serve as an instrument of competitive bidding for everything from initial construction to future contract guard service coverage.

The blueprints do something else for you. It is a good bet that in a museum setting, walls will change frequently over the years. By reviewing the prints prior to construction, you can learn which walls are "temporary" and which are load bearing. You should over design your alarm system during construction so that any movement of walls in the gallery can be accommodated without

diminished protection due to blockage of motion detectors. By marking up possible detector locations, you can develop a protection strategy to meet any situation. Even if you don't provide motion detectors in every corner of the space, you can possibly run conduit so it is ready for any eventuality.

There also may be other times when the security manager may want to convey instructions to contractors regarding the facility's security requirements. These can be incorporated into the blueprints and should be incorporated into the building "program" and written specifications.

If the security manager doubles as a risk or safety manager, the building drawings will serve as a means of obtaining a building permit. It is necessary to read drawings to ascertain whether exiting and other safety and fire requirements are met. If your facility requires an alarm system for insurance, the prints may be used to show the security, fire, and other protection to the insurer before the building is built.

Written specifications are as important to the security manager, architect, and contractor as architectural drawings. The best way to convey the requirements of a project is to prepare detailed written specifications, which spell out each and every detail of the project. Few specifications can be complete without referencing them to a complete set of drawings. Some things simply cannot be said effectively in words.



A complete set of drawings often consists of a series of drawings, each dealing with various aspects of the project. One set may show building exterior landscaping. Another set will show floor plans while others will show structural, mechanical, and electrical designs. Still others will show elevations and details. Generally, pages of drawings are numbered and the numbers are preceded by a letter referring to the series. "A-1" refers to architectural print (floor plan) page one, "S-3" refers to structural drawing page 3, "M-6" refers to mechanical system design page 6, etc. (This is a general rule, not a standard. For example, S-1 may refer to "security system page 1" on your system).

Generally, it is not sufficient for a security manager to study only the architectural prints or floor plans. Much important data involving security equipment may appear on or be referenced to the electrical prints. Design of the fire system will relate to the mechanical or heating, ventilating and air conditioning prints. For example, placement of smoke detectors and infrared motion detectors may depend upon location of heat and air supply vents, etc. As a consultant, I have great difficulty making architects understand that I need to review the mechanical prints before preparing security or fire prints. I need to make sure that I don't place a smoke detector where it will be covered by a duct. Often, the mechanical, electrical, security and other prints are all being prepared simultaneously, so it is important that you do a review of prints as they change--and they will change.

Of considerable importance on a blueprint are the various lines and leaders, all of which have specific meaning. Heavy lines have more important meaning than thin lines. A good book such as the Muller text, already referenced, will provide great detail on the meaning of various lines used on blueprints. Space does not permit a discussion of them at this time.

The security manager should never overlook the importance of having the architect, engineer, or security consultant prepare a separate set of drawings depicting the security system components, particularly the electrical supply and components to any alarm, card access, CCTV, and other security equipment. The security manager will have to play an important role in the development of these drawings and will generally guide the architect through the process. A facility with high or medium security requirements should always avoid placing security system components on general electrical drawings. They are often put out for cost estimating to as many as five or six contractors and then put out to bid to many more. By the time a large project is finished, thousands of unauthorized people may have seen--and even kept copies of--your new security system design. By isolating security system drawings from general electrical drawings, you can control the distribution of your prints to those few contractors who will submit bids.

The progressive security manager must be familiar with one final type of drawing. The written specifications you prepare for installation of a



security alarm system or other high tech equipment should always require that the contractor mark up a set of architectural or electrical drawings and submit them to you as "as-builts." As-built drawings show in detail exactly where all security, fire, and other related equipment are located. Notes on the prints provide verbal details as to locations of conduit and other out-of-view equipment, which may have been placed in slightly different locations from the design drawings due to field conditions. "As-builts" serve as important documents when changes are later required or service is needed. The more detailed the as-built drawing, the better. When you run wires behind walls for future use, such as when you over-design security for a gallery, as mentioned above, the as-built drawings are the only map you will have to guide you to them later.

Whether your future projects involve simple layout prints or complex architectural, electrical, structural, and mechanical working drawings, you should know what they mean. The best way to learn to read and understand architectural drawings is to practice reading them. Undoubtedly, your company or institution has many prints on file. Spending a day or two studying them and referencing your questions to a good text on the subject will greatly improve your skills in this regard and make you a more valuable employee.

This text was provided to the Smithsonian Institution by the author for one time use in the Proceedings Manual of the 1992 National Conference on Museum Security.

HORIZON INSTITUTE'S

HOW TO READ BLUEPRINTS: AN ESSENTIAL MANAGEMENT SKILL

(Video, 52 min.) ◆ ◆ ◆ ◆

Sooner or later, your employer will build a new building, a new wing, or undertake a renovation project. You will have to review the project blueprints and be conversant in their interpretation. Whether you are reviewing prints for the purpose of understanding the building layout, or to understand detailed systems like fire and security designs, you will need to master the blueprint reading skill. Don't wait to show your ignorance at the first staff meeting!

This program, featuring Mike Johnson, a construction professional, and Steve Keller, a well-known consultant, is presented in an easy to understand format. It will tell you everything a typical, non-technical manager will have to know to work with architectural drawings, details, schedules, and related schematics.

Video--M113 (see catalog and price list)