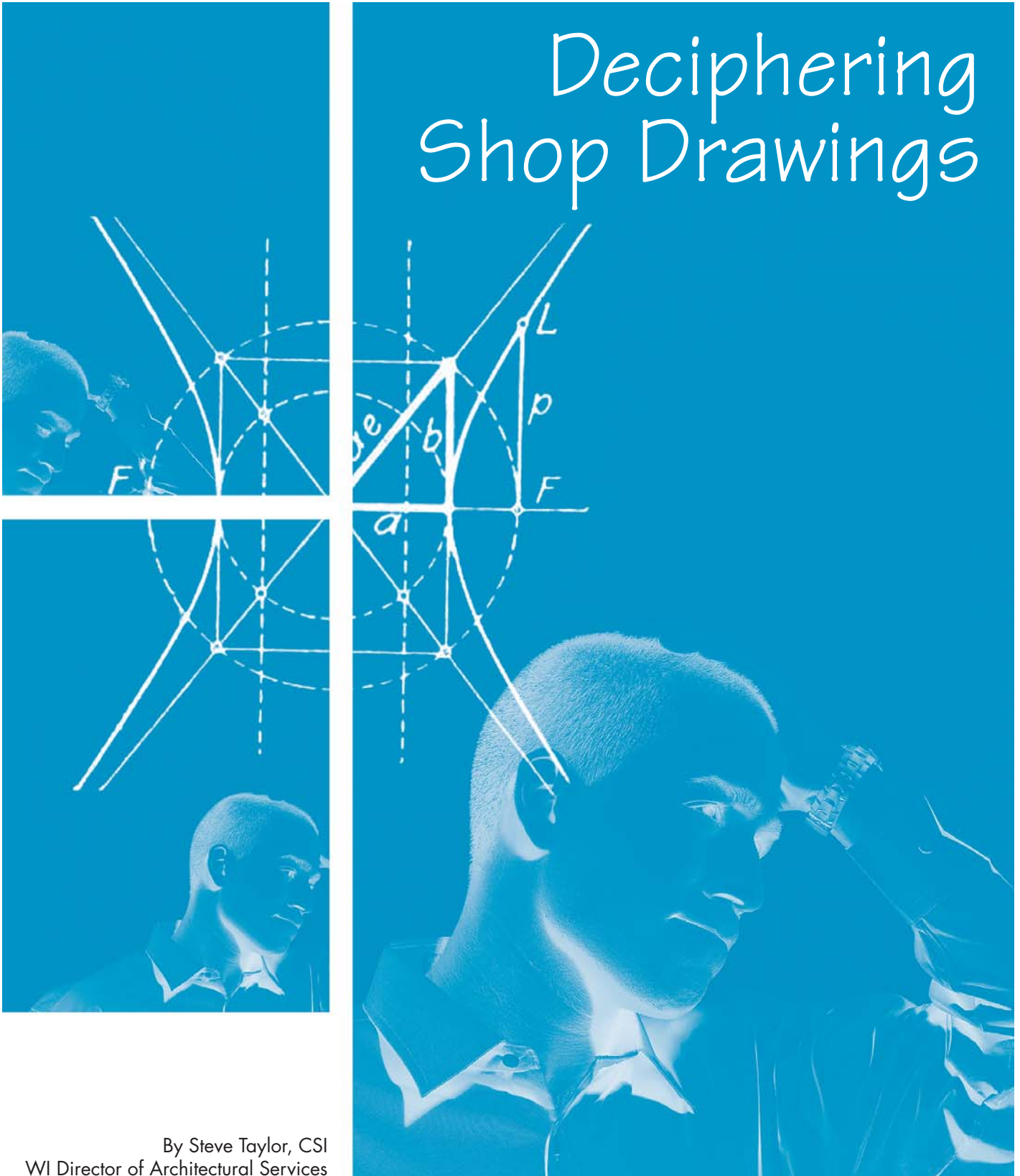


Deciphering Shop Drawings



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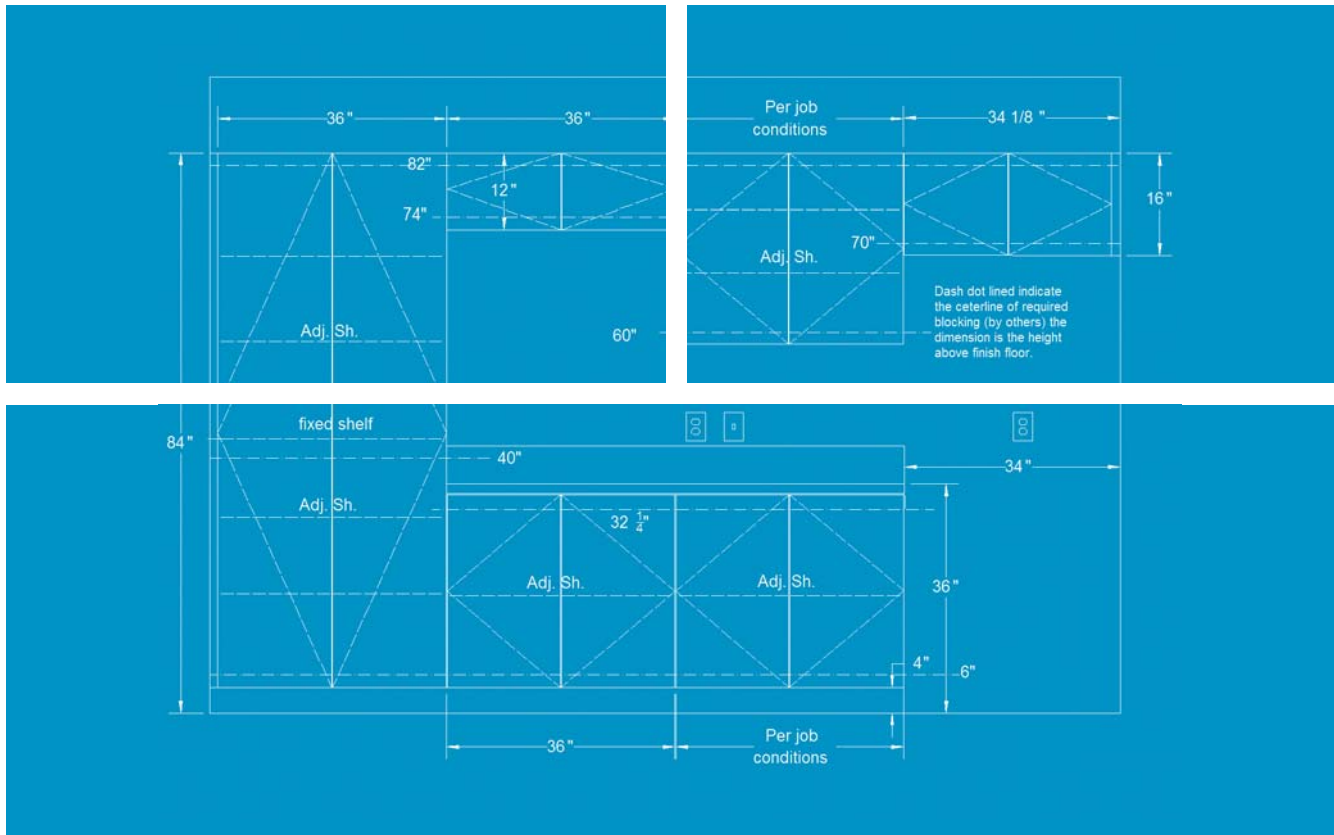


Figure 1



There is no industry that is more collaborative than construction. It's common for hundreds of people from dozens of trades to work on a project, with the work of each trade requiring coordination with all the others. Considering the amount of information that has to be communicated among the architects, engineers, and spec writers, then to the contractor and subcontractors, it is amazing that anything gets built at all.

When a millwork estimator prepares a bid, he may feel that he's solving a puzzle. He goes through stacks of plans and books of specs looking for the tidbits of information that apply to his part of the project. Some aspects of the design may not be clear, or there may be conflicts among the documents. It may not be possible to get answers to every question. Once the contract is awarded, the project is passed to a project manager, who must now resolve all outstanding issues. The object of the submittal process is communication between the design team and the fabricator. The fabricator asks questions about issues that are unclear to him by way of requests for information. He may make suggestions by submitting requests for substitution, or change requests. The woodworker often submits shop drawings, which represent his understanding of the design.

Drawings, with their supporting documents, are the common language between design professionals and woodworkers. They are essential to proper shop production. The drawings show the relationship of millwork products to the work of other trades, allowing for proper field coordination. They also

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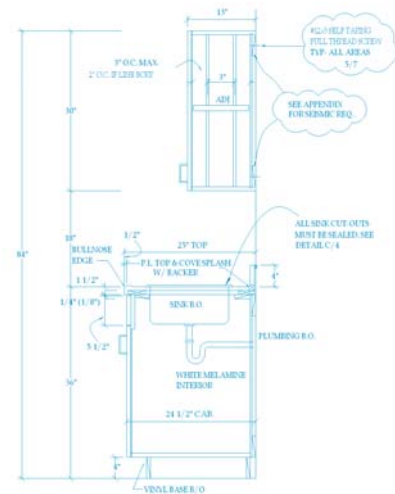


Figure 2

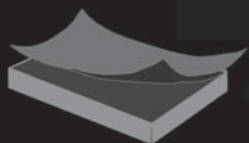
confirm the specified grades and manufacturing standards will be maintained.

Shop drawings are not an appropriate media for making changes in the design. A shop may suggest changes and substitutions so long as quality is maintained. Such changes or substitutions must be submitted and approved in separate documents before being incorporated into shop drawings. By the same token, shop drawings are not a second chance for the design team. Changes in design, materials or quality should not be disguised as "corrections" to the drawings.

The most important quality of a shop drawing, and the most difficult to quantify, is clarity. It should be easy for an architect or inspector to see what's being provided, where it goes, how it's put together and how it's attached to the building. As important as the information is the clarity with which the various drawings are related to each other. Many millwork project managers and draftsmen have come up through the shop and have no formal drafting education. While most shop drawings I see are well drawn and may have all the required information, lack of organization may make the set incomprehensible. There is a set of conventions in architectural drawings which is nearly universal. Circles with the drawing number/page number, pointers that indicate elevations, and lines that indicate sections are all devices used to index properly organized shop drawings. Shop drawings also need to be to scale, and properly

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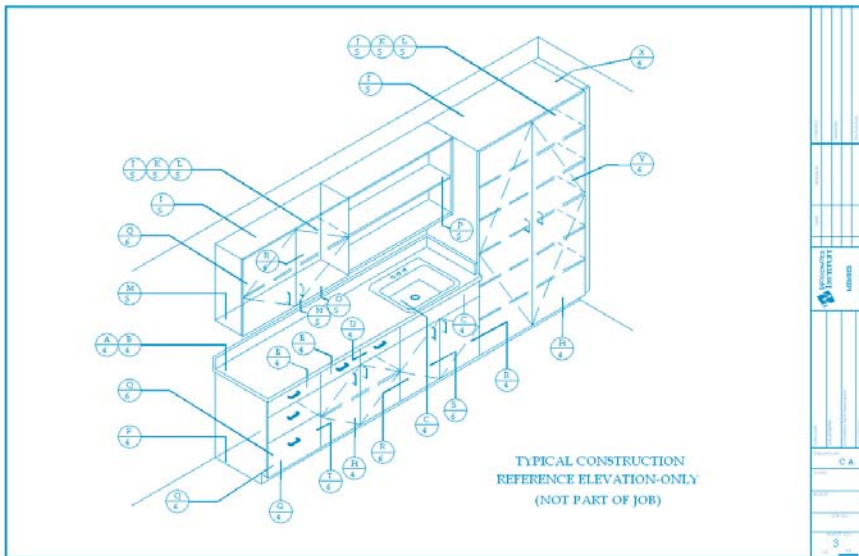


Figure 3

labeled as to the scale that's used.

Except for the smallest projects, a reference plan of the building showing the location of each millwork item should be provided. This is the only drawing which may be a copy from the architectural plans. Each millwork item should be indicated on the reference

plan and tagged with the number of the drawing where that item may be found.

A plan view of each millwork item at an enlarged scale should be provided. The plan must show adjacent walls, columns, and other features which may affect the millwork. The plan must also indicate the location in the drawing

set of the elevations and sections of that item. Depending on the size of the items involved, it may be convenient to put the plan and elevation for each item on the same page. Sections should be indicated on the plan and elevation, and clearly labeled as to their location in the drawing set.

For most millwork items the elevation is the most important view. In the millwork industry, we commonly speak of an "elevation of casework." Millwork is designed for appearance as well as utility, and the elevation shows what it will look like. It should also give an idea of how it fits in the building. Adjacent walls and ceilings should be shown well enough to make clear the location of the work. In addition, the work of other trades should be shown if it will affect the millwork, and it is included in the architectural elevations. Electrical switches and outlets, for example, should be illustrated if their approximate location is known so the electrician can put them in the right place. Plumbing fixtures, or any other item that could affect the

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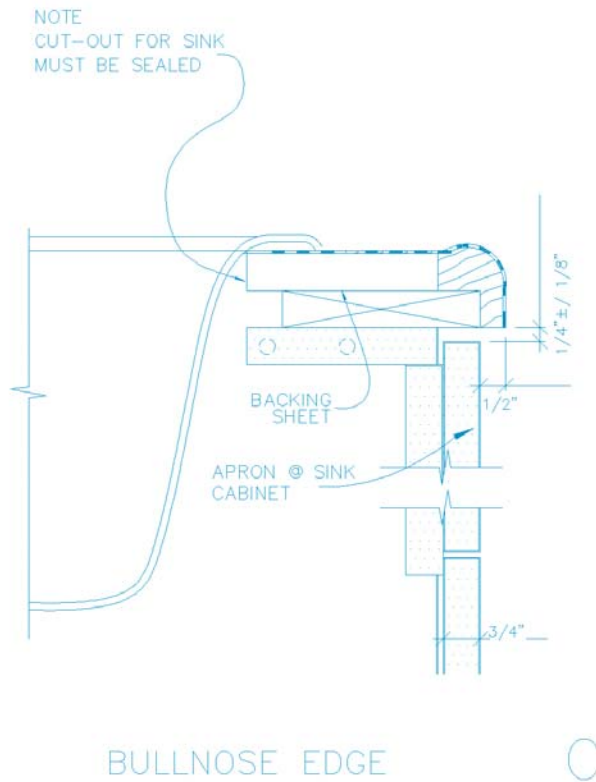


Figure 4

millwork, should be shown and dimensioned if the location is known.

A perennial problem in the architectural millwork industry is backing. The Title 24 seismic requirements are impossible to meet if proper backing isn't provided in the walls. I believe this problem would be mitigated if casework shop drawings showed the location of required blocking on the elevations. A dashed or dash-dot line indicating the centerline of the blocking, marked with the height above finish floor, would suffice. Such a convention would make it much easier for the framer to place the blocking where it belongs. (Fig 1)

The elevation drawing is the key drawing for sections and details. Locations of sections and details should be indicated on the elevation. Casework sections may be keyed to a control elevation such as that in Supplement 1 of the *Manual of Millwork* if the manufacturer prefers. Sections should be provided for every item of millwork, and complex items may require multiple sections to indicate clearly their construction. Sectional draw-

ings should also show how the work is attached to the building, as well as any backing the contractor needs to provide. If attachment details are not provided by the architect, casework attachment details may be found in the Appendix of the *Manual of Millwork*. (Fig 2)

As noted above, standard construction details may be indexed to a control elevation, so long as the location of such is clearly indicated. (Fig 3) There is a potential problem with this practice, however. Control elevations show typical situations — they are not intended to be all inclusive. It's important the draftsman look for unusual situations as he prepares his drawings, and provide details appropriately. I was recently on a job where two elevations of cabinets met at an acute angle. Each had drawn elevations of both sets of cabinets, but neither the cabinet manufacturer nor the architect had given enough thought to what this meant for the drawers in the corner units. While typical layouts are generally well understood, it's the unusual that can provide an unpleasant surprise.

The Woodwork Institute recommends that architects and designers not give a lot of construction detail in their drawings. Technology and materials are changing quickly, even in the wood-working business. For most types of millwork there is more than one good way to put it together. For example, the *Manual of Millwork* recognizes four methods of cabinet construction. Since many modern cabinet shops are highly automated, they are committed to one system of construction. If the design team limits the choice of assembly methods, they will inadvertently eliminate some bidders. However, we do suggest that the design team provide as much detail as possible regarding those aspects of the project that affect appearance and utility.

It's the responsibility of the millwork shop to provide construction details of every item of millwork to be provided. Details of moldings, frame members, and other shaped items should be full size if possible. Other details may be half size or 3" = 1' 0". Details should show materials, spatial relationships, and attachment methods. (Fig 4) Details illustrated in Supplement 1 of the *Manual of Millwork* need not be drawn on the shop drawings if referenced by detail number or letter. I would recommend, however, that those details be included with the drawings.

The Woodwork Institute's requirements for shop drawings can be found in Section 1 of the *Manual of Millwork*. A shop drawing checklist is included in the Appendix of the *Manual* on pages 359 and 360. Shop drawings that comply with those requirements will have all the necessary information. Good organization and cross-referencing will make that information accessible to all those who need to use the drawings.

The opinions expressed are not necessarily the policies of the Woodwork Institute. Woodwork Institute sample shop drawings are available from the administrative office by calling (916) 372-9943 or from your local Director of Architectural Services, listed on page 6 of this issue of Archetype. 