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Systems

IBM 3270 Information Display System: A Human Factors Study of Work Station Design

IBM

Preface

This document describes, and gives dimensions of, three basic work stations that may be used to support the 3270 CRT terminals. Other general considerations are also briefly discussed.

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Contents

Illustrations

INTRODUCTION

Work station layout and environmental considerations have an effect on work efficiency and employee comfort. This is particularly true when tasks are involved that require the operator to be at the terminal for extended periods.

Three types of work stations are commonly in use: Data Entry, Seated Interactive, and Standing Inquiry/Update. Depending upon customer requirements, standard furniture may be used, some modifications to standard furniture may be warranted, or custom work stations may be designed. When floor space is limited or expensive, customized work stations may be the most economical in the long run.

DATA ENTRY STATIONS

For data entry work stations, the major consideration is the fact that the operator's primary task is to key in large amounts of data from source documents. The operator seldom needs to mark or alter the source documents. Usually they are assembled in batches and handled that way by the operator.

At the data entry work station, the display is secondary in importance to the source document and the keyboard. Visual attention is centered on the source document; the keyboard is operated by touch rather than visual guidance. Occasionally, the operator may want to look at the display to verify an item or to inspect the status indicators.

The data entry work station is shown in Figure 1, and its recommended dimensions are presented in Figure 2. It occupies no more floor space than an IBM 029 Keypunch. Some latitude is provided for adjustments in the positioning of the items. The seated interactive inquiry work station (shown in Figure 3) may also be used for data entry tasks, but it is not as efficient for this purpose as the data entry work station.

SEATED INTERACTIVE OR INQUIRY STATIONS

When a task primarily involves a relationship between the operator, display, and keyboard, the seated interactive or inquiry station shown in Figure 3 is preferred. (Dimensions are given in Figure 4.) In this application, keying rates may be slow and are often visually guided. The operator typically is interested in data that may be called up by a few key strokes. That data may be modified by a few more key strokes, verbally transferred to a requesting party, or responded to by some decision-making process.

Although the other dimensions for this type of work station should not change much from those for data entry, the minimum width depends on the amount of other equipment, reference material, forms, etc., required for performing a specific set of tasks. In any case, the width of this type of work station should not be less than 28 inches, particularly if work stations are to be placed side by side. These work stations usually should not exceed 60 inches in width.

STANDING INTERACTIVE OR INQUIRY STATIONS

A work station designed for a standing operator (as in Figures 5 and 6) is often indicated for shared terminals where the task to be performed at the terminal lasts for, at most, a few minutes. Space for a standard telephone and perhaps one document or clipboard should be considered. A width of 28 inches should be adequate for most applications of this type.

GENERAL CONSIDERATIONS

A more restrictive work station can be tolerated for intermittent tasks than for continuous tasks. For tasks that require the operator to be at the work station for more than a half hour, enough space should be provided to permit the operator to change positions while operating the equipment. Additional knee space and provision for some additional lateral movement would be required.

The orientation of equipment and forms also can be more restrictive for intermittent tasks than for extended tasks. For extended tasks, it is advisable, within limits, to permit the operator to personalize the work station. This might include provision for reorienting the keyboard and display and for some latitude in positioning source documents. For work stations for a full-time operator, storage space for personal items should also be considered.

MULTIPLE WORK STATIONS

If floor space is particularly critical, structures that support more than one work station should be considered. Maximum compactness, with some loss of flexibility, may be obtained by designing a continuous structure that can support several individual work stations. No less than 28 inches of width should be allotted each work position.

The following specifications should be considered if custom work stations are to be built.

Keyboard height (distance from home row of keyboard to floor):
28 to 29 inches for sustained (professional) keying.
28 to 32 inches for other (hunt-and-peck, casual).

Operator spacing (center-to-center distances between work stations):
28 inches minimum.
48 to 60 inches preferred.

Leg room, width:
18 inches minimum at knee height.
24 inches minimum at foot level.

Leg room, depth:
12 inches minimum at knee height.
18 inches or more preferred at knee height.
18 inches minimum at foot level.
24 inches or more preferred at foot level.

See-over height (if operators are required to look over work stations):
Seated work stations:
42 inches or less for women.
54 inches or less for men.
Standing work station:
54 inches or less for women.
58 inches or less for men.

Writing shelf:
12 inches minimum depth.
Minimum width dependent upon number of documents. (Allow 1-inch spacing between documents.)

Source document orientation:
To left of keyboard for data entry tasks.
To right of keyboard for tasks that require notations or written entries on the source document.

Telephone equipment orientation:
Usually to the left of keyboard.

CABLING

Cabling may be handled in several ways, depending upon the configuration of work stations and whether overhead, on-the-floor, or subfloor routes are used. If clustered work stations are considered, the cables might be routed to them using a common point. This would not only help keep the work surface clear but also would protect the cables. On-the-floor cabling should be checked for possible safety hazards before implementation.

VISUAL PARAMETERS

Visual Distance

IBM 3270 displays were designed for comfortable viewing at about 16 to 18 inches. That represents an anfular character height of about 30 minutes of arc for the Mod I and 24 minutes of arc for the Mod II.

A character height of 16 minutes of arc should be considered a minimum. Work stations that have a display-to-operator viewing distance of over 33 inches for the Mod I or over 26 inches for the Mod II should not be used without careful consideration.

Eye Fatigue

Any prolonged visual task may produce noticeable eye-strain if the internal or external eye muscles are overtaxed. If the task requires frequent looking back and forth from the display to a source document, for example, it would help if the two were about the same distance from the eye. Balanced lighting between the various areas of the work station will reduce strain on the muscles that control the pupil of the eye.

Artificial Lighting

Moderate lighting of only 50 to 75 footcandles is indicated for most tasks associated with display use. It is usually helpful if the lighting is reasonably balanced.

Natural Lighting

Although there are positive aspects to having windows in the display area, natural lighting may pose problems with almost any display. The fundamental problem is the variability of natural lighting (from less than "room ambient" to well over 10,000 footcandles). It is often helpful to orient the display units at right angles to the windows so that sunlight will not shine directly on the surface of the display or be in the operator's field of view when working at the display.

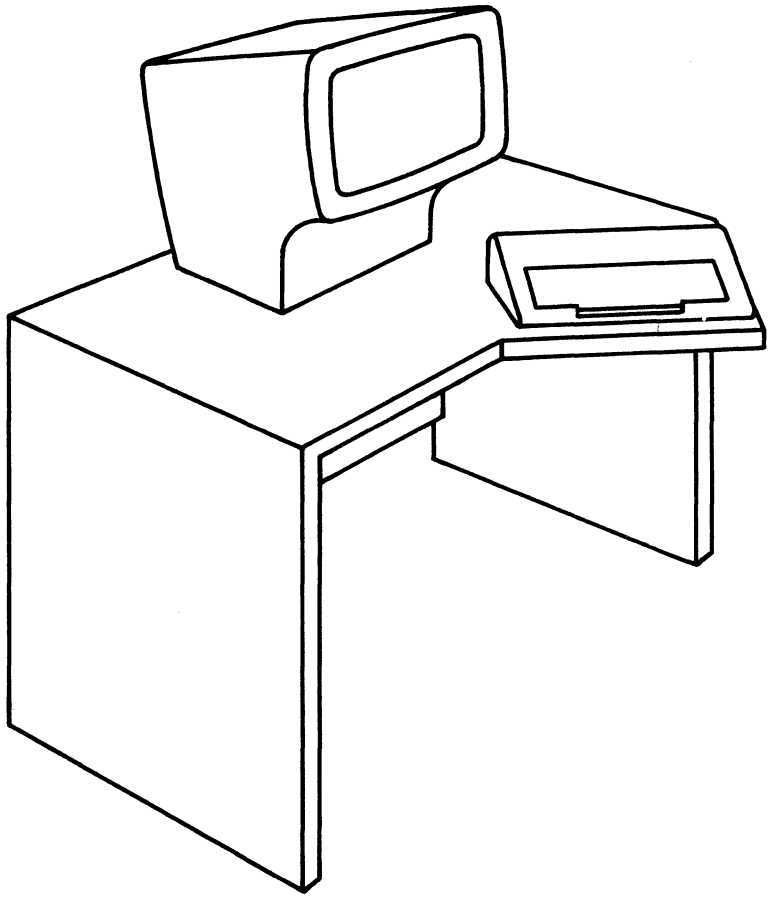

Figure 1. Data Entry Work Station

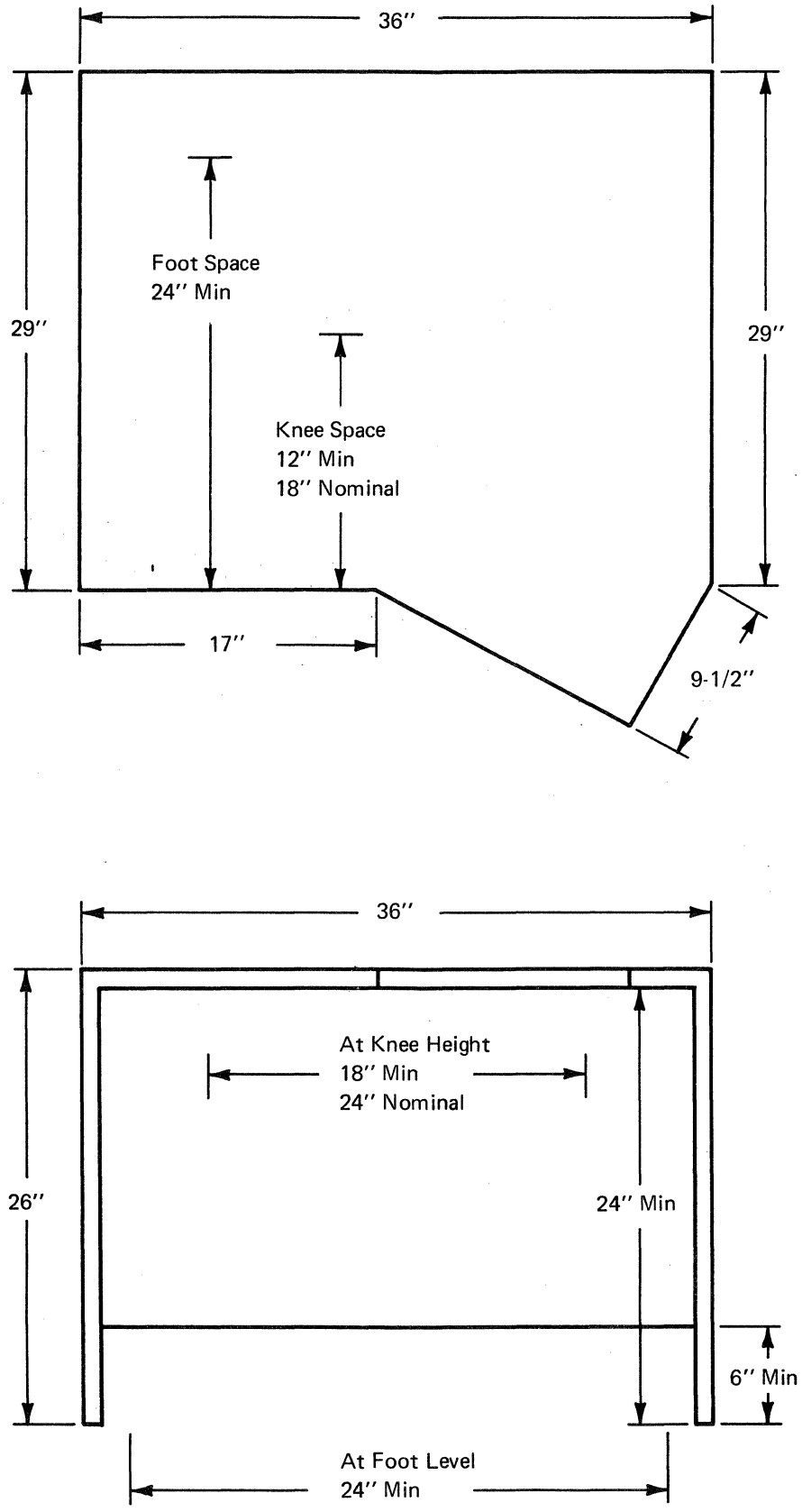

Figure 2. Data Entry Work Station Dimensions

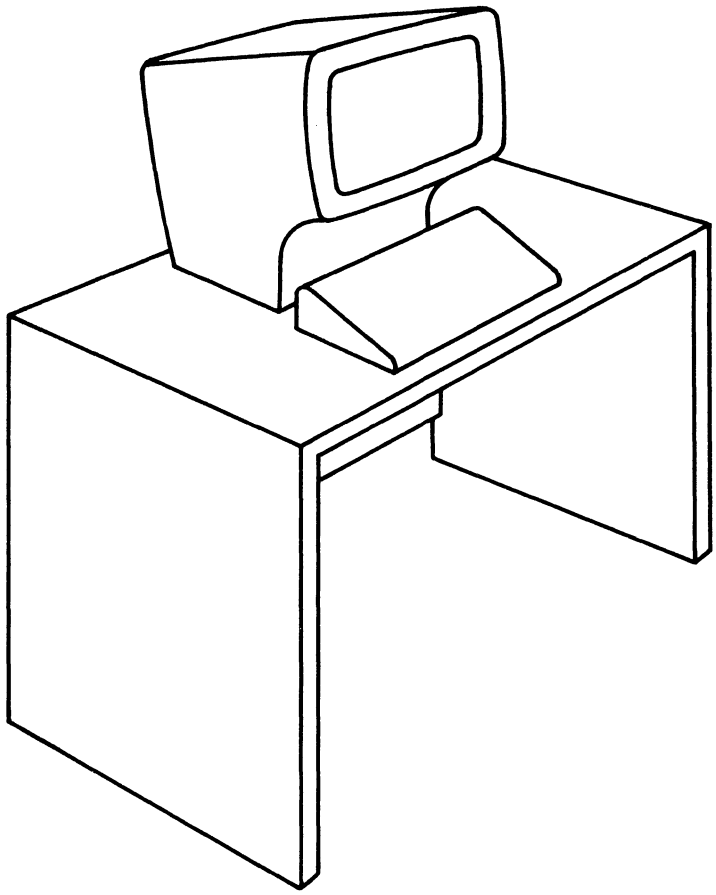

Figure 3. Seated Interactive Work Station

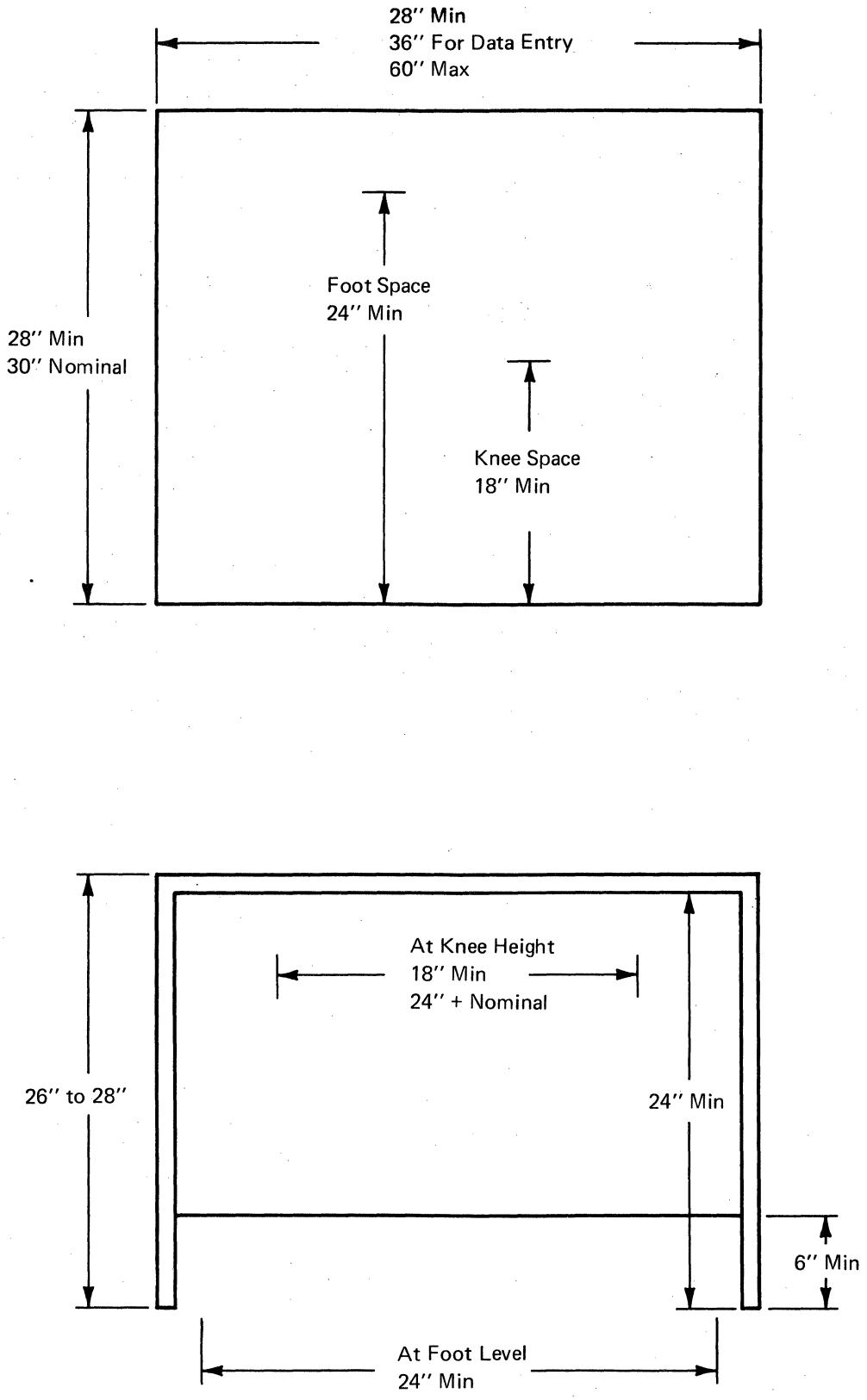

Figure 4. Seated Interactive Work Station Dimensions

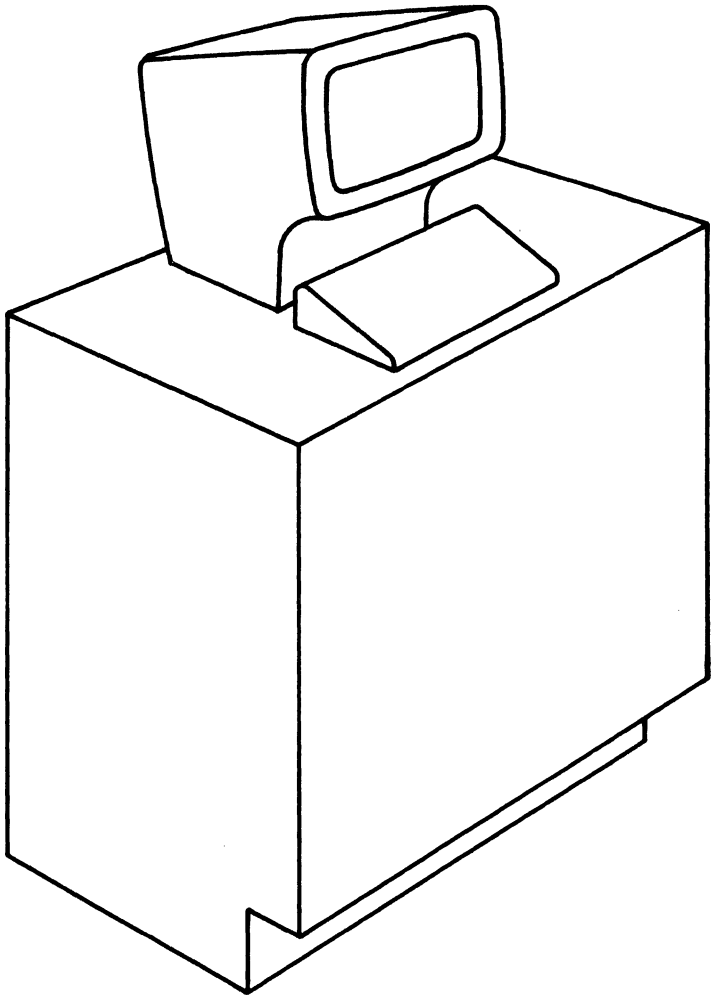

Figure 5. Standing Inquiry Work Station

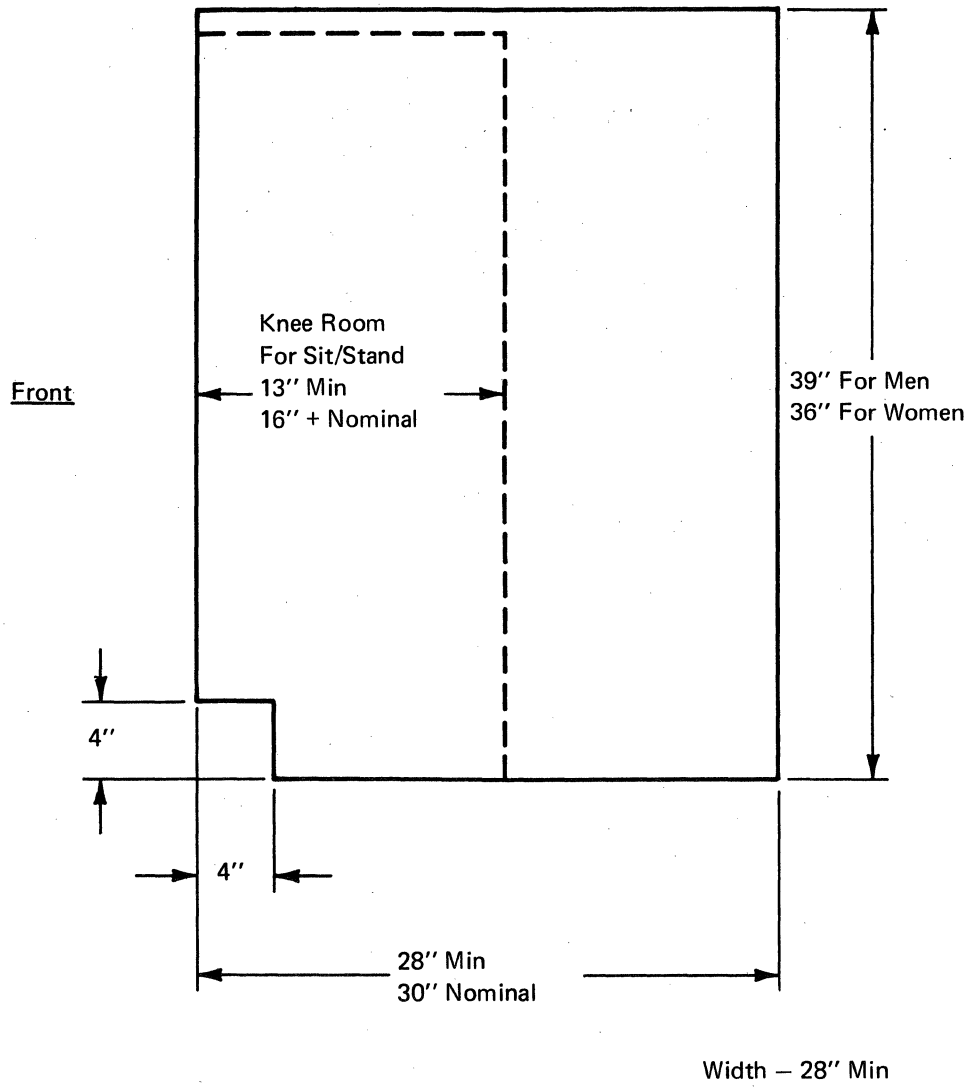

Figure 6. Standing Inquiry Work Station Dimensions (Side View)

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