



GOOD PLACEMENT KEEPS STAIRWAYS clear of the working areas around a boiler as shown here; boiler corner at left



WATER TENDER'S GAGE BOARD is justified if main board can not be seen from his station. Board, right center, faces view

Consider the Operator's Viewpoint When Designing Generating Stations

Because power-plant designers are primarily concerned with the main equipment in a station they often overlook the needs of the men who operate the machinery. Here's a review of many factors to consider while a plant is still on the drawing board

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► DURING THE PLANNING STAGES, designers sometimes slight seemingly minor items that prove important when initial plant operation starts. They may also greatly affect operating and maintenance ease later. Not all the following conditions apply to every plant; some are purely convenience items. Station size usually controls the decision on some of these factors.

Initial Operation. Let's look first at needs during the starting period when many items are more important than they are later. Amount of automatic-control equipment largely determines the ultimate size of the operating force. This means that the force available is usually too small to operate on hand control safely. Hence, every effort should be made to have all control equipment and indicating and recording

instruments ready at the same time as the main units.

Main offices and equipment should be ready several weeks or months before startup. Also essential is an office with a desk for operating personnel. Filing facilities should be available well in advance for construction prints, flow diagrams and instruction pamphlets, which are most valuable during shake-down.

To prevent many delays, smooth-working tool room, storeroom and spare-part systems should be provided early. It is important to have tools, supplies and spare parts at hand during night watches to cope with emergency conditions. Cooperating with these functions, a man on the job during the construction period can often save materials that equal many times his salary.

Several minor items, which may be time losers or contribute to potential hazards if not provided, are (1) ladder storage and control (2) key control systems (3) systems for waste, oily-rag and rubbish disposal (4) hose-storage arrangements.

Facilities that prove invaluable in plant's early days are (1) completely equipped machine shop (2) oil and grease room (3) locker rooms (4) toilet facilities (5) janitors' rooms.

Chemical storage and handling systems as well as a chemical laboratory are more essential during the starting period than at any other time. Instrument-maintenance facilities and the efficiency office should follow closely the initial operation. Portable instruments, which are almost always needed during initial operation, include: orsat analyzer, test gage, dead-weight tester, 300 and 950-F thermometers, 1-in. inclined draft gage, 12-in. draft gage, tachometer, potentiometer and thermocouples.

Accidents and fires are especially liable to occur during the first days. This requires that first-aid arrangements and fire-protection systems be completed in advance. Fires caused by uncovered steam piping and heating salamanders are a particular hazard. Falls and injuries are likely to occur often because of confusion from handling

unfamiliar equipment. Consideration should be given protection systems for safeguarding operators, construction men and others from hazards of rotating machinery, steam, hot or poisonous gas, water, electricity. Padlocking systems may be desirable at first, but a card protection system with responsible firemen signing on and off is probably a better arrangement.

If operators are allowed to have coffee, soda drinks and between-meal snacks, provision should be made to control these activities and eliminate untidy makeshift facilities.

System Capacity. For adequacy the firm power (system capacity less than that of the largest unit) should be greater than the system peak demand. As system size increases there will be a point, at about the 6th unit, where two reserve units should be provided. Even before a second reserve unit is needed it may be advisable to supply it as a rolling spare to eliminate storage space for large spare parts. If units are of equal size and of the standard type promoted by manufacturers this may become particularly desirable.

Where system size warrants, a unit of one turbine-generator and one boiler becomes advantageous. This gives one or more power plants under a common roof controlled by the same operators. Operating trouble on one unit does not

ordinarily affect the other units, which makes for greater ease of operation and reliability of service.

Auxiliary Equipment. It is important not to overlook providing means for starting up a system in a complete shutdown. Recent developments, for supplying reliable sources of current to electrically driven auxiliaries, indicate that steam-driven equipment is seldom necessary except for small or isolated plants. Transformers, instead of house alternators, are being accepted more and more.

Heat-saving apparatus should be carefully evaluated, especially for small sizes. Proper weight should be given to convenience, space use, maintenance, operator's time and eye seal before a decision is made to put in an item on a heat and cost-saving basis alone.

Steam-Generator Control. Placing the water tender's control valves at a point where he can see the boiler-board instruments assures safe and reliable operation during emergencies. If this cannot be done an auxiliary gage board for the water tender is usually justified. An ideal layout groups auxiliary feed valve, automatic feed valve, one mud-drum blowdown valve and the superheater outlet-drain valves at a point where all instruments can be seen.

After a few years' operation superheaters in many plants resemble spa-

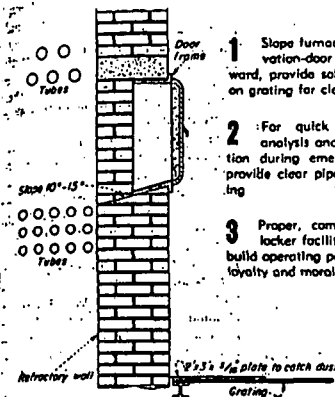
ghetti. This is often caused by the operator's failure or inability to open outlet drain valves in time when flow from the nonreturn valve approaches zero. Whenever possible, these valves should be brought to a point near the water tender's station or the boiler board.

Boiler-control board centralization is still debated. There are not yet satisfactory substitutes for constant direct furnace and water-level supervision. Centralization tends to make a congregating area for operators who should be giving attention to furnace and boiler drum. It is high in first cost and maintenance needs and seldom cuts down the number of operators needed.

Piping Systems. Loop systems are often preferable to straight-line-and-takeoff systems for piping of all sorts. Loops permit isolating any piece of equipment and provide alternative feed during trouble. They cut down number of equipment outages, and permit easier maintenance. From the operator's viewpoint they are worth the extra cost and pay for themselves many times. Where the law permits, a single boiler-feed loop system can often be substituted profitably for a main and auxiliary feed system.

Boiler blowdown and drain valves often discharge into a common header. This creates a difficult situation when there are men working in drums of

THESE THREE ITEMS NEED ATTENTION



1 Slope furnace observation-door sills inward, provide solid plate on grating for cleanliness

2 For quick trouble analysis and correction during emergencies provide clear pipe marking

3 Proper, comfortable locker facilities help build operating personnel loyalty and morale

