SPECIAL PROVISIONS FOR PREVENTION OF
CORROSION IN ROOFS OF STEEL WATER STORAGE TANKS

There are frequently asked questions concerning the provisions of the present AWWA D100-84 Standard for treatment of the underside of roofs in steel water storage tanks. The need for the additional protection appears to be a function of the chemistry of the water contained in the tank, particularly its chlorine content and pH. Other variables affecting the corrosion rates above the high water line are the temperature of the water, the temperature of the steel, the fluctuating rate of the water, and the amount and location of ventilation within the "free board" area of the tank.

Past experience has indicated that in most cases, the AWWA D100-84 Standard has provided acceptable corrosion protection. That standard provides that roof seams may be lapped and welded top side only as long as those areas are above the overflow level. The roof plates and the rafters may or may not be painted with the prime coat prior to tank erection. The staining from these uncoated areas which appears at the first anniversary inspection is usually not indicative of structural damage.

Penetrating corrosion or structurally detrimental corrosion of roofs has occurred in rare occasions (less than 0.5%) in tanks ranging from 20 to over 100 years in age. This detrimental corrosion has invariably been correlated with extreme operating conditions (heat, chlorination, sulfide gases), improper specification of construction and coatings, and improper control of the initial construction -- all coupled with "zero" maintenance.

Corrosion at the unwelded bottom side of the lapped seams on the interior of low pitched rafter supported roofs (usually 3/4 :12 slope) has very rarely been a structural problem. The critical corrosion has, with only rare exceptions, been in the center of the plates or immediately above the rafters, and more prevalently, on the rafters themselves.

Higher pitched roofs with open lapped joints may have a somewhat higher incidence of detrimental corrosion at the lapped joints due to their tendency to more readily trap condensation.

Where corrosion above the water level is anticipated to cause a serious structural problem, several alternatives can be specified:

1. Prior to erecting the tank, approximately 1/2 to 2/3 of the coats of the coating system can be applied to the roof plates, including the edges which will not be welded, the roof rafters and their associated support clips. Damaged paint areas can be touched up after erection, and an additional full finish coat of paint applied. The most important area to consider being painted before erection appears to be the roof rafters, which are usually the first members to show heavy corrosion and when not observed and maintained can fail structurally.

2. Seal welding of all contact surfaces and interfaces may be specified; however, the interior welding of low pitched (3/4 :12) flat rafter supported roof plates to the rafters is not advised. Solid epoxy sealants are also not effective on roofs with a great deal of flexure.

3. For small diameter tanks (normally 50' diameter or less), more expensive, self-supporting dome or umbrella roofs (without structural stiffeners) may be specified. Dome and umbrella roofs may be lap welded top side only, lap welded both sides, or butt welded. On large diameter tanks where structural framing is required to stiffen the dome, the additional pre-erection paint treatment or seal welding may be specified.

The specifier should consult tank contractors to determine the cost of these exceptions to the AWWA standard and make an economic analysis concerning the value of including this extra cost item in the specifications.

If additional protection against corrosion is desired, the purchaser is reminded to include very definitively these additional coating and/or welding requirements in the specifications. If special design considerations are not included in the bidding specifications, the standard AWWA roof treatment will be bid and constructed by the contractor.