March 2014

Irrigation ASSOCIATION CERTIFICATION PROGRAM

Certified Irrigation Contractor Examination Equations

Basic and non-irrigation equations and conversions are assumed to be known by candidates. All citations refer to Landscape Irrigation Contractor Workbook, Irrigation Association. Feb. 2014. The equations are presented in the latest IA format and may appear different from those presented in the reference material.

1 cubic foot of water = 7.48 gallons 1 acre-inch = 27,154 gallons 1 acre-foot = 325,848 gallons

$H_v = \frac{V^2}{2 \times g}$	Eq. 3-1	$Bhp = \frac{Whp}{(E_p / 100)} = \frac{Q \times H}{3{,}960 \times (E_p / 100)}$	Eq. 3-3
$NPSHA = H_a - H_s - H_f - H_{vp}$	Eq. 3-2	$AR\ \{in./h\} = \frac{231 \times \text{emitter flow rate } \{gph\}}{\text{emitter spacing } \{ft\} \times \text{row spacing } \{ft\}}$	Eq. 4-7
$RT\ \{h\} = \frac{\text{Daily water need } \{in.\}}{AR\ \{in./h\}}$	Eq. 4-8	$ET_c = ET_o \times K_c$	Eq. 3-5
$ET_L = ET_o \times K_L$	Eq. 7-12	$PR = \frac{1.605 \times gph}{Area}$	Eq. 7-14
$RT = \frac{IR_{gross}}{PR} \times 60$	Eq. 7-15	Left blank intentionally.	
$psi = \text{feet of head} \times 0.433$	Eq. 4-1	$\text{feet of head} = psi \times 2.31$	Eq. 4-2
$H_f = 0.09019 \times \left(\frac{100}{C}\right)^{1.852} \times \frac{Q^{1.852}}{d^{4.866}}$	Eq. 4-3	$F_f = P \times \frac{\Delta p}{L}$	Eq. 4-4
$Q = A \times V$	Eq. 4-5a	$Q = \frac{\left[\left(ET_o \times K_L\right) - R_E\right] \times A \times 0.623}{E_a}$	Eq. 4-6
$CU = 100 \times \left(1 - \frac{\text{mean deviation}}{\text{mean}}\right)$	4-7	Left blank intentionally	

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$V = I \times R$	Eq. 5-1a	Left blank intentionally	
Left blank intentionally		$W = V \times I$	Eq. 5-4
$R = \frac{1{,}000 \times AVL}{2 \times L \times I}$	Eq. 5-5	$L = \frac{1{,}000 \times AVL}{2 \times I \times R}$	Eq. 5-6
$WC = \frac{WW - DW}{DW} \times 100$	Eq. 6-1	$AW_D = \frac{AW}{100} \times \frac{BD_{soil}}{BD_{water}} \times D$	Eq. 6-2
$RAW = AW \times \frac{MAD}{100}$	Eq. 6-3	$K_L = K_T \times K_d \times K_{mc}$	Eq. 6-4a
$K_L = K_P \times K_d \times K_{mc}$	Eq. 6-4b	Left blank intentionally	
$\frac{\text{Upwind distance}}{\text{Downwind distance}} =< 0.65,$ then the wind is over 5 mph	Eq. 7-1	$PR_{net} = \frac{3.66 \times V_{avg}}{t_R \times A_{CD}}$	Eq. 7-2
$DU_{lq} = \frac{LQ_{avg}}{V_{avg}}$	Eq. 7-3	$SM = \frac{1}{0.4 + (0.6 \times DU_{lq})}$	Eq. 7-4
$RT_{lower} = 60 \times \frac{\text{Water need}}{PR}$	Eq. 7-5	$RT_{upper} = RT_{lower} \times SM$	Eq. 7-6
$PR = \frac{96.3 \times Q}{A}$	Eq. 7-7	$PR = \frac{96.3 \times Q}{A};\ A = S_r \times S_s$	Eq. 7-8
$PR = \frac{96.3 \times Q}{0.866 \times S_s^2}$	Eq. 7-9	$PR = \frac{96.3 \times Q}{0.8 \times D_t \times S_s}$	Eq. 7-10
$d_{net} = AW \times Z_r \times p$	Eq. 7-10	$d_{max} = AW \times Z_r \times MAD$	Eq. 7-11
$ET_L = ET_o \times K_L$	Eq. 7-12	$RT = \frac{ET_L \times 60}{PR}$	Eq. 7-13
$SM = \frac{1}{0.4 + (0.6 \times DQ_{lq})}$	Eq. 7-14	$\text{Selling price} = \frac{\text{Cost}}{1 - \text{Desired profit}}$	