**1.0 Calculating Water Efficiency Rating Index.** A Water Efficiency Rating Index (or WER Index) shall be calculated as

$$= \frac{indoor\ and\ outdoor\ gpd\ for\ the\ rated\ home}{indoor\ and\ outdoor\ gpd\ for\ the\ reference\ home} * 100$$

Indoor and outdoor gpd values for the reference and rated home shall be determined in accordance with sections 3 and 4.

**2.0 Determining the Indoor Reference Home GPD.** The indoor reference home shall be calculated as

$$ref_{in}gpd = refFgpd + refWgpd + refDWgpd + refCWgpd + refTgpd + refSofgpd + totLeaks$$

Where: refFgpd= daily fixture water use for the reference home
refWgpd= daily fixture water waste for the reference home
refDWgpd= daily dishwasher use for the reference home
refCWgpd= daily clothes washer use for the reference home
refTgpd= daily toilet for the reference home
refSofgpd= daily water softener use for the reference home
totLeaks= total leaks

**2.1 Determining Reference Fixture Water Use.** Reference fixture water use shall be calculated as

$$refFgpd = 14.6 + 10 * Nbr$$

Where: Nbr= number of bedrooms in the rated home

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**2.3 Determining Reference Fixture Water Waste.** Reference fixture water waste shall be calculated as

$$refWgpd = 9.8 * Nbr^{0.43}$$

Where: Nbr= number of bedrooms

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**2.4 Determining Reference Dish Washer Water Use.** Reference dish washer water use shall be calculated as

$$refDWgpd = \frac{(88.4 + 34.9 \; X \; Nbr) * 8.16}{365}$$

Where: Nbr= number of bedrooms

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**2.5 Determining Reference Clothes Washer Water Use.** Reference clothes washer water use shall be calculated as

$$refCWgpd = \frac{4.52 \; X \; (164 + 46.5 * Nbr) * \left[ \left(3 * 2.08 + 1.59\right) \Big/ \left(2.874 * 2.08 + 1.59\right) \right]}{365}$$

Where: Nbr= number of bedrooms

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**2.6 Determining Reference Toilet Water Use.** Reference toilet water use shall be calculated as

$$refTgpd = refFPO * refGPF * Occ$$

Where:

refFPO= the reference flushes per person per day = 5.05
refGPF= the reference gallons per flush for toilets = 1.6
Occ= the number of occupants = 1.09 + 0.54 * Nbr
Nbr= number of bedrooms

**2.7 Determining Reference Water Softener Use.** Reference water softener water use shall be calculated as

$$if$$
$$the \; rated \; home \; has \; a \; water \; softener$$

**and**

$$water \; hardness \; at \; the \; rated \; home \; location \; is \; \geq 180 \; \frac{miligrams}{liter}$$

$$then$$

$$refSofgpd = \frac{grains \; of \; hardness}{gallon \; of \; water} * sum \; of \; indoor \; water \; uses \; in \; the \; reference \; home$$
$$* \frac{5 \; gallons \; used}{1,000 \; grains \; removed}$$

$$Otherwise$$

$$refSofgpd = 0$$

**2.8 Determining total leaks.** Total leaks shall be determined as

$$totLeaks = 5.93 * Nbr$$

Where:

Nbr= the number of bedrooms in the rated home

**3.0 Determining the Outdoor Reference Home GPD.** The reference home outdoor GPD shall be calculated as using the following two equations

Equation 1:

$$\left[\frac{exp(A)}{1 + exp(A)}\right] * 1.18086$$
$$* [2.0341 * netET^{0.7154} * Ref\_Irr\_Area^{0.6227} + 0.5756 * ind\_Pool$$
$$* netET]$$

Equation 2:

$$\left[\frac{exp(B)}{1 + exp(B)}\right] * 1.22257 * [1.4233 + 0.6311 * netET + 0.9376 * Ref\_Irr\_Area]$$

*IF*

*the rated home has an automatic irrigation system*

*AND*

*Rat_Irr_Area < Ref_Irr_Area*

*THEN*

$$Ref\_Out = equation\ 1 \Bigg/ \frac{equation\ 1\ (Using\ \text{Rat\_Irr\_Area}\ and\ both\ indicators=0)}{equation\ 1\ (with\ Ref\_Irr\_Area\ and\ both\ indicators=0)}$$

*IF*

*the rated home has an automatic irrigation system*

*AND*

*Rat_Irr_Area ≥ Ref_Irr_Area*

*THEN*

*Ref_Out= equation 1*

*IF*

*the rated home does not have an automatic irrigation system*

*THEN*

*Ref_Out= equation 2*

*Outdorr Reference Home GPD shall never be lower than equation 2*

Where:

Exp(A)= 1.4416 + 0.5069 X IrrArea

Exp(B)= 0.6911 + 0.00301 X netET X IrrArea

Ref_Irr_Area= The size of the irrigated area in the reference home, calculate in accordance with section 3.1

Rat_Irr_Area= The size of the irrigated area in the rated home

netET= The annual historic sum of mean reference evapotranspiration minus the mean precipitation for all months that evapotranspiration exceeds precipitation

ind_Pool= Indicator representing the presence or absence of a swimming pool in the rated home

**3.1 Reference Irrigated Area.** Reference irrigated area shall be calculated as

*If*

*the lot size of the rated home is < 7,000 ft$^2$*

*then*

$$Ref\_Irr\_Area = \ 0.002479 * lot\_area^{0.6157}$$

*If*

*The lot size of the rated home is ≥7,000 ft$^2$*

*Then*

*Ref_Irr_Area = lot_area * 0.577*

Where:

Ref_Irr_Area= The size of the landscape that receives supplemental water in the reference home

Lot_Area= The size of the lot on which the rated home is being constructed

**4.0 Determining Indoor Rated Home GPD.** The rated home's indoor GPD shall be calculated as

$$Indoor_{gpd} = Shower_{gpd} + KitchF_{gpd} + LavF_{gpd} + Waste_{gpd} + CW_{gpd} + DW_{gpd} + Toilets_{gpd} + Soft_{gpd} + Leaks_{gpd}$$

Where:

$Shower_{gpd}$ = daily shower water use for the rated home

$KitchF_{gpd}$ = daily kitchen faucet use for the rated home

$LavF_{gpd}$ = daily lavatory water use for the rated home

$Waste_{gpd}$ = daily fixture water waste for the rated home

$CW_{gpd}$ = daily clothes washer water use for the rated home

$DW_{gpd}$ = daily dishwasher water use for the rated home

$Toilets_{gpd}$ = daily toilet water use for the rated home

$Soft_{gpd}$ = daily water softener water use for the rated home

$Leaks_{gpd}$ = daily water leaks for the rated home

**4.1 Determining Rated Shower Water Use.** Rated home shower water use shall be determined as

$$Shower_{gpd} = \ FixtureTot \ X \ shower_{pc} * SHeff$$

Where:

FixtureTot= Determined in accordance with ANSI/RESNET/ICC 301-2014
Addendum A-2015 Domestic Hot Water Systems

$$= \frac{adjFmix}{Fmix} * refFgpd * VintFact$$

Shower_pc= Percent of fixture water use consumed by showers = 54%
SHeff= the ratio of the average rated flow rate of showerheads to the reference home flow rate

$$= \frac{average\ flow\ rate\ of\ showerheads\ in\ the\ rated\ home}{2.5}$$

This value is derived from ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**4.2 Determining Kitchen Faucet gpd for the rated home.** Kitchen faucet gpd shall be determined as

$$\text{LavF}_{gpd} = FixtureTot * faucet_{pc} * KitchFeff \ X \ kitch$$

Where:

FixtureTot= Determined in accordance with ANSI/RESNET/ICC 301-2014
Addendum A-2015 Domestic Hot Water Systems =
$\frac{adjFmix}{Fmix} * refFgpd * VintFact$

faucet_pc= Percent of fixture water use consumed by faucets = 46%
KitchFeff= the ratio of the average rated flow rate of kitchen faucets to the reference home flow rate =
$\frac{average\ flow\ rate\ of\ kitchen\ faucets\ in\ the\ rated\ home}{2.2}$

Kitch= the percentage of faucet use that is attributed to kitchen faucets= 69%

This value is derived from ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**4.3 Determining Lavatory Faucet gpd for the rated home.** Lavatory faucet use shall be determined as

$$\text{LavF}_{gpd} = FixtureTot * faucet_{pc} * KitchFeff * Lav$$

Where:

Lav= the percentage of faucet use that is attributed to lavatory faucets= 31%
FixtureTot= Determined in accordance with ANSI/RESNET/ICC 301-2014
Addendum A-2015 Domestic Hot Water Systems = $\frac{adjFmix}{Fmix} * refFgpd$

faucet_pc= Percent of fixture water use consumed by faucets = 46%
LavFeff= the ratio of the average rated flow rate of lavatory faucets to the reference home flow rate = 1 for standard faucets and 0.95 for high efficiency faucets

This value is derived from ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**4.4 Determining Daily Fixture Water Wasted gpd in the Rated Home.** Fixture water wasted gpd in the rated home shall be determined as

$$\text{Waste}_{gpd} = F_{eff} * (oWgdp + sWgdp \, X \, WDeff)$$

Where:

  FeffX= Fixture efficiency of showerheads, kitchen faucets, and lavatory faucets weighted by contribution to total fixture use (by volume)

  oWgpd= daily standard operating condition waste hot water quantity as determined by ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems

  sWgpd = daily structural waste hot water quantity as determined by ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems

  WDeff= distribution system water use effectiveness from Table 4.2.2.5.2.11(3) of ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**4.5 Determining clothes washer gpd in the rated home.** Clothes washer gpd in the rated home shall be determined as

$$\text{CW}_{gpd} = CAPw \, X \, CWwf \, X \, ACY/365$$

Where:

  CAPw= washer capacity in cubic feet = the manufacturer's data or the CEC database or the EPA Energy Star website or the default value of 2.874 ft

  CWwf= clothes washer water factor= manufacturer's data

  ACY= Adjusted cycles per year determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**4.6 Determining dish washer gpd in the rated home.** Clothes washer gpd in the rated home shall be determined as

$$DW_{gpd} = ((88.4 + 34.9 \, X \, Nbr) * \frac{12}{dWcap} * \frac{\left[4.6415 \, X \left(\frac{1}{DW\_EF}\right) - 1.9295\right]}{365}$$

Where:

  Nbr= number of bedrooms in the rated home

  dWcap= capacity of the dishwasher in the rated home (in cubic feet) as included in the manufacturer's data

  DW_EF= The energy factor of the dishwasher installed in the rated home

This value is determined in accordance with ANSI/RESNET/ICC 301-2014 Addendum A-2015 Domestic Hot Water Systems.

**4.7 Determining Toilet gpd in the rated home.** Toilet gpd in the rated home shall be determined as

$$Toilet_{gpd} = refFPO * gpf * Oc$$

Where:

refFPO= the reference flushes per person per day = 5.05
gpf= the average gallons per flush of all toilets installed in the rated home
Occ= the number of predicted occupants in the rated home= 1.09 + 0.54*Nbr
Nbr= the number of bedrooms in the rated home

**4.8 Determining Water Softener gpd in the rated home**. Water softener gpd in the rated home shall be determined as

$$Soft_{gpd} = \frac{grains\ of\ hardness}{gallon\ of\ water} * sum\ of\ indoor\ water\ uses\ in\ the\ rated\ home$$
$$* gallons\ used\ per\ 1,000\ grains\ of\ hardness\ removed$$

**4.9 Determining Leaks gpd in the rated home.** Leaks gpd in the rated home shall be determined as

$$Leaks_{gpd} = TotLeaks_{br} * Nb$$

Where:

TotLeaks_br= the average value (in gpd) of leaks per bedroom= 5.93 gpd
Nbr= the number of bedrooms in the rated home

**5.0 Determining Outdoor Rated Home GPD.** The reference home outdoor GPD shall be calculated as

*If the rated home has an automatic irrigation system*

$$\left[\frac{exp(A)}{1 + exp(A)}\right] * 1.18086$$
$$* [2.0341\ X\ netET^{0.7154} * Rat\_Irr\_Area^{0.6227} + 0.5756\ X\ ind_{Pool} * netET]$$

*If the rated home does not have an automatic irrigation system*

$$\left[\frac{exp(B)}{1 + exp(B)}\right] * 1.22257 * [1.4233\ +\ 0.6311 * netET\ +\ 0.9376\ X\ Rat\_Irr\_Area]$$

*Outdoor Rated Home GPD shall never be lower than*

$$\left[\frac{\exp(B)}{1 + \exp(B)}\right] * 1.22257 * [1.4233 + 0.6311 * netET + 0.9376 \text{ X Rat\_Irr\_Area}]$$

Where:
  Exp(A)= 1.4416 + 0.5069 * IrrArea
  Exp(B)= 0.6911 + 0.00301 * netET * IrrArea
  Irr_Area= The size of the landscape that might receive supplemental water in
      the rated home
  netET= The annual historic sum of mean reference evapotranspiration minus
      the mean precipitation for all months that evapotranspiration exceeds
      precipitation
  ind_Pool= Indicator representing the presence or absence of a swimming pool

**5.1 Smart Controllers.** Sensor and weather based irrigation controllers shall decrease the portion of predicted rated home outdoor water use associated with irrigation (less the water use associated with pools) by 15% in homes that have automatic irrigation

**5.2 Residential Irrigation Capacity Index (RICI).** In rated homes where documentation is provided, a RICI may be calculated as

$$RICI\_rat = \frac{sum\ of\ flow\ (gpm)\ of\ all\ irrigation\ valves}{ft^2\ irrigated\ area} \text{ X } 1,000$$

**5.2.1 Applying RICI.** A rated home where documentation for a RICI is provided may adjust the portion of water use associated with irrigation (less the water use associated with pools) in the rated home's outdoor gpd by 10% for every point from a baseline RICI (RICI_ref) of 5.