

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

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

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

The WER Index can be used for single family dwellings or multiple dwelling units. This is adjusted through the number of dwelling units, Ndu.

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

$$\text{ref}_{in}gpd = \text{ref}Fgpd + \text{ref}Wgpd + \text{ref}DWgpd + \text{ref}CWgpd + \text{ref}Tgpd + \text{ref}Sofgpd + \text{totLeaks}$$

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

$$\text{ref}Fgpd = 14.6 + 10 * \text{Nbr}$$

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

$$\text{ref}Wgpd = 9.8 * \text{Nbr}^{0.43}$$

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

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

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

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

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

$$\text{refTgpd} = \text{refFPO} * \text{refGPF} * \text{Occ}$$

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 $\geq 180 \frac{\text{milligrams}}{\text{liter}}$

then

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

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:

$$\left[\frac{\exp(A)}{1 + \exp(A)} \right] * 1.18086$$
$$* [2.0341 * netET^{0.7154} * IrrArea^{0.6227} + 0.5756 * ind_Pool * netET]$$

Equation 2:

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

IF

the rated home has an automatic irrigation system

AND

$Rat_Irr_Area < Ref_Irr_Area$

THEN

$$Ref_Out = \frac{\text{equation 1}}{\frac{\text{equation 1 (with } Irr_Area = Rat_Irr_Area \text{ and both indicators} = 0)}{\text{equation 1 (with } Irr_Area = Ref_Irr_Area \text{ and both indicators} = 0)}}$$

IF

the rated home has an automatic irrigation system

AND

$Rat_Irr_Area \geq Ref_Irr_Area$

THEN

$Ref_Out = \text{equation 1}$

IF

the rated home does not have an automatic irrigation system

THEN

$Ref_Out = \text{equation 2}$

Where:

$Exp(A) = 1.4416 + 0.5069 * IrrArea$

$Exp(B) = 0.6911 + 0.00301 * netET * IrrArea$

IrrArea= The size of the landscape that will receive supplemental water

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 ft²
then
$$Ref_{Irr_{Area}} = 0.002479 * lot_area^{0.6157}$$

If
The lot size of the rated home is ≥7,000 ft²
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

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

Where:

FixtureTot= Determined in accordance with ANSI/RESNET/ICC 301-2014
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$$= \frac{adjFmix}{Fmix} * refFgpd * VintFact$$

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

$$LavF_{gpd} = FixtureTot * faucet_{pc} * KitchFeff * Kitch$$

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

$$LavF_{gpd} = FixtureTot * faucet_{pc} * KitchFeff * Lav$$

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

$$\text{Waste}_{\text{gpd}} = F_{\text{eff}} * (\text{oWgdp} + \text{sWgdp} \times \text{WDef})$$

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

WDef= 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

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

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

$$\text{DW}_{\text{gpd}} = ((88.4 + 34.9 \times \text{Nbr}) * \frac{12}{\text{dWcap}} * \frac{[4.6415 \times (\frac{1}{\text{DW_EF}}) - 1.9295]}{365})$$

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

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

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

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

If the rated home does not have an automatic irrigation system

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

Where:

$$\text{Exp}(A) = 1.4416 + 0.5069 * IrrArea$$

$$\text{Exp(B)} = 0.6911 + 0.00301 * \text{netET} * \text{IrrArea}$$

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

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

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.