POTENTIAL FOR EXPANSION OF THE WELS SCHEME TO INCLUDE DOMESTIC IRRIGATION CONTROLLERS

FOR

Australian Government

Department of the Environment, Water, Heritage and the Arts

BY

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AND

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1. EXECUTIVE SUMMARY

The need for water efficiency has never been greater. It is appropriate to search for new ways to reduce consumptive water use, and to consider expansion of existing successful schemes such as the Water Efficiency Labelling and Standards (WELS) Scheme.

The objective of irrigation is to sustain plants by supplementing rainfall. The random acts of humans who operate manufactured equipment like dishwashers, toilets and irrigation controllers can be influenced by a number of means. One successful method is the WELS star rating system which assists buyers to include the water consumption of the product in their decision making process. As a general rule, a device with a low star rating uses more water to do the same job as a device with a high star rating.

The amount of water required to do the job of sustaining plants in a complex natural environment is much more difficult to define and measure than the job of say, flushing a toilet. In the time it took the irrigation industry to debate the definition of irrigation water use efficiency, the plumbing industry developed detailed standards on which the WELS legislation could draw.

Whilst the water flow through many domestic irrigation systems is controlled manually by a tap, many have controllers to assist the operator. These domestic irrigation flow controllers are the subject of this report.

The irrigation industry has welcomed the opportunity to discuss ways to improve water use efficiency. With improved understanding by regulators and the public, water restrictions which focus on consumption can be replaced with those which focus on efficiency.

“Wednesday” is not a good reason to irrigate. But the public are being encouraged by some water restrictions to buy low cost controllers which can water according to fixed schedules. Meantime sophisticated controllers which have sensors to interact with the local environment, and an ability to schedule efficient irrigation events, are prevented by law from irrigating according to optimum schedules.

Even the most sophisticated controllers are just components of an irrigation system. Hence their ability to deliver water efficiently is dependent on all components being well designed, installed and maintained.

The industry recognises that sophisticated controllers are a key part of the potential solution. Like other low cost electronic products, there is a lot of innovation and diversity. It is not feasible for the industry to develop best practice guidelines, let alone standards, as quickly as the industry can innovate, therefore leaders will tend to be penalised by regulations which are designed to enforce standards.

The aim of the consultancy is to review the technical and other issues relating to expanding the WELS scheme to include domestic irrigation event controllers. There are doubts that rating the event controller would actually achieve the aims of the WELS scheme with regard to domestic water consumption because it is only one part of the total irrigation system. The controller is a starting point. Overall the industry appears to be quite supportive of the concept of domestic irrigation event controllers being included in the WELS scheme, however, there is significant work to be done before it could eventuate.

2. BACKGROUND

The Water Efficiency Labelling and Standards (WELS) Scheme helps Australians choose more water efficient products and so save water, energy and greenhouse gas emissions. The WELS Scheme is legislated by the WELS Act 2005 and is administered by the Australian Government Department of the Environment, Water, Heritage and the Arts (DEWHA), in partnership with State and Territory Governments.

DEWHA is reviewing the possibility of expanding the Scheme to include domestic irrigation flow controllers and has commissioned Irrigation Australia Limited (IAL) to prepare this research paper to identify and review the issues relating to expanding the Scheme to cover such equipment.

IAL's team is headed by John Gransbury of HydroPlan and includes Jeremy Cape of Capeability. A workshop in Canberra between the consultants and DEWHA set the project objectives and led to a workshop in Sydney where industry representatives from across Australia were invited to participate.

3. CHALLENGES

3.1 Complex systems in a complex natural environment

In many respects, irrigation systems have to be as complex and flexible as the natural environment they are designed and built to cohabitate with.

Not only can irrigation systems be surprisingly sophisticated, but consumers can access a very large array of inexpensive components which can easily be assembled and/or operated in a variety of ways that can waste water or save water.

The plant-soil-water relationship is also complex. It is surprisingly difficult to quantify efficient water use when irrigation equates to topping up a leaky bucketful of soil & roots – without knowing how big the bucket is or how full it is - because it is hidden below ground.

3.2 Components of a whole system

The question as to whether the WELS Scheme could be expanded to provide a rating system for water use efficiency is relevant to both whole irrigation systems and to the individual components of these systems. The scope of this paper is limited to the components that control domestic irrigation systems.

In this context this research paper discusses these questions:

- what are these components and how could they be rated?
- how could they be tested to provide the rating?
- what standards currently exist and do they form the basis of a rating system?
- what improved water use efficiency and other benefits might follow from the introduction of a rating system?
- is an expansion of the WELS Scheme the most effective way to achieve the potential benefits?

3.3 Flow control versus water efficiency

The regulation impact statement in 2004 which preceded the mandatory WELS Scheme defined flow control as “any method of controlling the rate of water flow in an appliance (other than by adjustment of the taps supplying the appliance)”. Despite the initial focus on flow rate and flow control, the star rating system is now aligned more with water volume consumed per defined event such as a toilet flush or a dish washing cycle. We draw a parallel here with the potential to define an irrigation event, and to rate water efficient irrigation systems depending on the volume consumed during that event. If eating habits and weather are considered to be beyond regulation, then there is another parallel to be drawn between how often a plate needs to be washed and how often a lawn needs to be watered.

3.4 Domestic irrigation flow controllers

The specific focus of this study is the potential for WELS expansion to include domestic irrigation flow controllers. The term flow controllers in this context refers to the logic devices which control water flow in domestic irrigation systems.

Water efficiency labels are applied to packages and extend to the advertising of the product, so the focus of this study includes only devices sold as an integral part of the controller (i.e. it does not include separate items such as valves, sensors, cables and accessories sold separately).

Hence the definition of domestic irrigation flow controllers is a device which can initiate and end domestic irrigation events. They may do this with or without complementary equipment. The devices are differentiated by their capacity to control water application in a temporal and spatial sense, and by the extent to which they can interact with their environment and users.

3.5 Terminology – Flow controller

There is potential for confusion amongst stakeholders because the term flow controller in the irrigation industry can mean a specialty valve, a component of a sprinkler or emitter, and a manual throttle to assist closure on an electrically actuated hydraulic valve.

The plumbing industry uses devices called flow controllers to control the rate of flow at taps and showers. Under the WELS Act, the star rating for flow controllers is determined by their flow rate, but rating of flow controllers is not compulsory.

These same devices are used as an integral part of some irrigation sprinklers. This style of sprinkler is said to be 'regulated'. They are not common in the irrigation industry. Instead, proper performance is achieved using regulation (either manually or automatically) of pressure at the valve which controls the operating time of a group of sprinklers. In irrigation systems, reduction of water volume (water saving) is more likely to be associated with control of pressure and time, than it is with rate of flow. Flow controllers are used to control rate of flow, and are likely to negatively impact on the volume of water used by domestic irrigation systems.

3.6 Terminology – Existing definitions

This paper utilises existing definitions where available, and particularly from Working Group 1 "Pressurized irrigation equipment – Definitions" of the International Standards Organisation Technical Committee 23 Subcommittee 18 (ISO TC23/SC18). The mandate of ISO/TC23/SC18 is to develop and maintain International Standards for irrigation and drainage equipment under the auspices of the International Standards Organization. Australia does not have its own equivalent standards, but it continues to actively collaborate in development of these world-leading ISO standards to ensure they are appropriate to adopt as our own.

We also draw from the reference work by Land & Water Australia titled *Gaining Acceptance of Water Use Efficiency Framework, Terms and Definitions* which was published in May 2003 through the National Program for Sustainable Irrigation.

4. INTRODUCTION TO WELS

The following information has been sourced from the WELS website and summarises the key characteristics of the current WELS scheme. These products are currently covered by the Scheme:

- plumbing products (showers, tap equipment, flow controllers (optional))
- sanitary ware (toilet (lavatory) equipment, urinal equipment)
- white goods (clothes washing machines, dishwashers).

The WELS Scheme requires products to be labelled at point of supply according to their water efficiency, allowing consumers to purchase water efficient products, reduce their water consumption, and save money on water and energy bills.

The *Water Efficiency Labelling and Standards Act 2005* provides the legal framework for the WELS Scheme. The Australian Standard AS/NZS 6400:2005 *Water efficient products-Rating and labelling* contains most of the Scheme's details. Further information on the Scheme can be found at www.waterrating.gov.au

The Scheme also allows industry to showcase their most water-efficient products. The WELS Scheme excludes second-hand products and products imported into Australia for personal use.

The WELS Standard generally requires the following:

- the label, or the details on the label, must appear in any product specifications such as brochures, magazines, advertisements, web sites etc promoting a registered product.
- if the product is packaged, the labelling should appear on the package.
- if the product is supplied without a package, the labelling should be fixed to the product or have a double-sided swing tag attached to it.

The label shows:

- a star rating between one and six that allows a quick comparative assessment of the model's water efficiency. The more stars on the label the more water efficient the product.
- a figure showing water consumption or water flow (expressed in litres per minute) based on laboratory tests.

Examples of consumption or flow are given for various product types in Table 1 below.

The water ratings and consumption/flow figures are determined through laboratory testing. Testing must be done either at a National Association of Testing Authorities (NATA) accredited laboratory, at a laboratory approved by the WELS Regulator, or in accordance with the National Appliance and Equipment Energy Efficiency Program.

Table 1: Examples of consumption or flow for 3-star ratings

Product type	Specific Example	Maximum consumption or flow for a rating of 3 stars
Taps	All	9.0 Litres per minute
Showers	All	9.0 Litres per minute
Toilets	Full flush	6.5 Litres
Urinals	Single stall	2.0 Litres per minute
Dishwashers	10 place settings	12.59 Litres per minute
Washing machines	Load of 7 kilograms	102.9 Litres
Flow controllers	All	9.0 Litres per minute

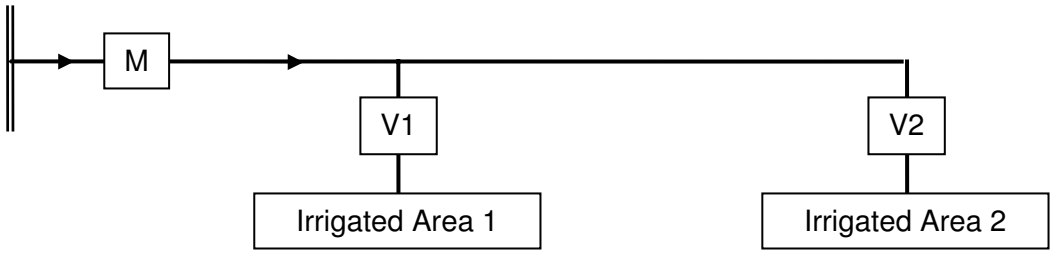
5. IRRIGATION EFFICIENCY

Efficiency is often expressed as the ratio or percentage of output divided by input. For example, if 100 L was put into a canal/pipe and only 90 L arrived at the destination, the efficiency of the conveyance/conduit system would be 0.9 or 90%.

In the context of domestic irrigation systems (refer schematic below) there are two relevant efficiencies:

$$\text{Conduit Efficiency (Eb)} = \frac{\text{Water received at the valve “V1” controlling flow}}{\text{Water received at the point of supply “M”}}$$

$$\text{Application Efficiency (Ea)} = \frac{\text{Water available to the plants in the Irrigated Area 1}}{\text{Water received at the valve “V1” controlling flow}}$$



These terms and definitions are drawn from a comprehensive water use efficiency framework developed between 1999 and 2003 under Land & Water Australia’s National Program for Sustainable Irrigation. These terms are further illustrated in Figure 1 in Section 11.1 below.

Conduit Efficiency will be less than 100% if the pipes and fittings are leaking. The 2005 review of the potential expansion of WELS quoted Sydney Water’s weighted average for water end use analysis at six types of commercial buildings. Leakage accounted for 23.6% (outdoor use accounted for 6.7%). Hence WELS is concerned for potential efficiency of domestic irrigation systems.

Application Efficiency will be impacted by many factors including off-targeting, run-off, evaporation, deep percolation and leakage.

The objective of an irrigation event is to apply water so that it is held in the soil where it will be available to plants. Application efficiency is a volumetric measure of the success of this event. For example, if the objective of the event is to apply 500 L on an area of 50 m^2 (the equivalent of a 10 mm rainfall event) application efficiency would be 80% if 400 L is stored in the soil and made available to the plants.

Agronomic factors determine the depth (volume per area) and timing of optimum irrigation events. These factors include weather, soils, plant type/health, water quality and management objectives. They should be considered separately to application efficiency.

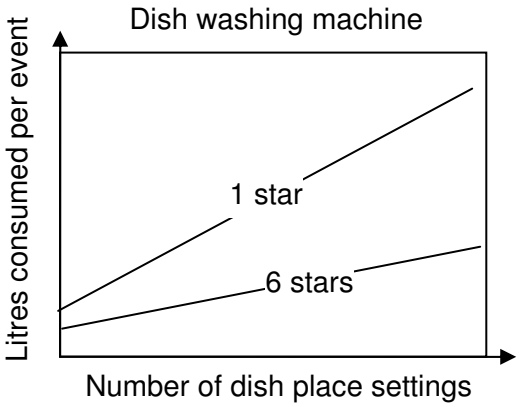
Uniformity of distribution and application efficiency are linked but they should be considered separately. For example, application efficiency could be high even though some areas are under-irrigated and some are over-irrigated due to poor uniformity of distribution. Conversely, the uniformity of distribution for a drip system could be high (when measured to ignore localised precipitation rates) even though deep percolation causes a low application efficiency.

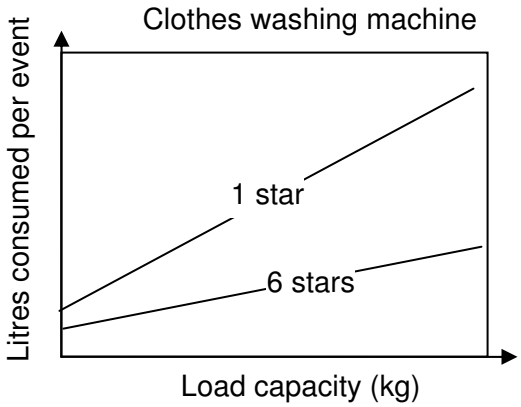
Leaks occurring downstream from control valves(refer V1 and V2 in the schematic above) such as through leaky seals on sprinklers will also decrease application efficiency by reducing the amount of water reaching the target area compared with the amount of water supplied.

6. EFFICIENCY AND WELS

Efficiency has not been defined in either the WELS Act or the WELS Standard (AS/NZS 6400). Australian Standards for whitegoods and lavatory equipment define functional events and the conditions for laboratory testing. Examples include; the weight of a small and large load for a clothes washing machine, and the solids to clear with a half-flush and full flush for a toilet. AS/NZS 6400 refers to these standards and sets out the star rating scheme which gives a higher rating for a device which consumes less water to perform the same event.

The specific examples of star ratings given in Table 1 are drawn from star rating algorithms defined in AS/NZS 6400. These algorithms are stylised in the schematic illustrations below.





Hence a toilet which uses less than 4.7 litres per full flush can have 4, 5 or 6 stars whereas a toilet which uses between 4.7 and 6.5 litres per full flush can only achieve a rating of 3 stars. However, for a toilet to "use water efficiently", it must have low consumptive use and also be effective as a toilet. The matter of effectiveness is addressed by Australian Standards. For example, AS 1172 *Water Closet - Pans* includes eight tests for paper and solid discharge, wetting/splashing, leakage, and load safety.

AS/NZS 6400 has been modified many times since first release in 2003 because better product designs with lower water consumption have caused a need to review the tests which confirm efficiency and effectiveness. For example, the latest amendment to AS/NZS 6400 refers to the need to finalise a "force of spray test" within AS/NZS 3662 *Performance of showers for bathing*. This standard was first released in 1986, and it is anticipated that the new test will allow differentiation between low water consumption and poor effectiveness as a shower.

7. STANDARDS

One of the challenges for extending the WELS Scheme to include domestic irrigation controllers will be the lack of supporting standards like AS 1172 and AS 3662 which set minimum levels of acceptable performance. These standards have taken decades to develop to their current level.

Some domestic irrigation controllers are powered by 240 volts and therefore subject to electrical safety standards including AS/NZS 61558.2.6:2001 *Safety of power transformers, power supply units and similar - Particular requirements for safety isolating transformers for general use*. This standard is reported by the Standards Australia Committee EL-002 to be equivalent to the International Electrotechnical Committee standard IEC 61558-2-6:1997. A related standard requires that products sold after 3 April 2005 must be fitted with a plug incorporating insulated live pins as specified in AS/NZS 3112:2004 *Approval and test specification - Plugs and socket-outlets*. Prior to selling products, manufacturers and importers of 240 volt powered irrigation

controllers must obtain approval from the authorities in that State by having compliance testing conducted at NATA approved facilities.

Whilst these electrical safety standards apply to some controllers, our research concluded there are no Australian standards which are applicable to all domestic irrigation controllers. Further, we could find no standards from any country which were close enough to even consider as a vehicle for development towards a supporting standard for the extension of WELS Scheme.

The nearest related standards are being developed by the International Standards Organisation. As one of many participating countries, Standards Australia has a delegate to Technical Committee 23 Subcommittee 18 (ISO/TC23/SC18) “Irrigation and drainage equipment and systems” which is responsible for drafting and reviewing standards for irrigation equipment. There are currently 32 published standards but none are relevant for supporting extension of the WELS Scheme to include domestic controllers. However, some have relevance to other elements of domestic irrigation systems, so it is reasonable to expect that this family of standards could one day grow to include domestic controllers.

To exemplify the technical challenge of developing standards, consider the synopses of the following two ISO standards:

- ISO 15886-1:2004 “Agricultural irrigation equipment -- Sprinklers -- Part 1: Definition of terms and classification” defines terms used in relation to sprinklers intended for agricultural irrigation and provides a means of classifying those sprinklers according to physical factors, characteristics of water spray, mechanism for operation and water distribution, approach to sealing, intended use, and additional functions incorporated into the sprinkler.

- ISO 15886-3:2004 “Agricultural irrigation equipment -- Sprinklers -- Part 3: Characterization of distribution and test methods” specifies the conditions and methods used for testing and characterizing the water distribution patterns of sprinklers intended for agricultural irrigation. It deals both with indoor and outdoor, radial and full grid, tests and is organized so as to deal first with conditions common to all the tests and then with those unique to indoor and outdoor testing, respectively.

Consider the similarity to the following Australian Standards and refer to Appendix B for further information:

- AS 2118.1-2006: “Automatic fire sprinkler systems - General systems” specifies general requirements for the design, installation and commissioning of automatic fire sprinkler systems in buildings and structures. This includes land-based buildings, mines, tunnels, bridges, wharves, jetties and mobile structures like rail cars and drag lines.

- AS 4118.1.1-1996: “Fire sprinkler systems - Components - Sprinklers and sprayers”

- HB 147 “Sprinklers Simplified” is a handbook for Automatic Fire Sprinkler Installations produced in response to the need for “down-to-earth” publications by The Fire Team within Standards Australia. This has been added to publications on bushfires (HB 36), Fire safety in the home (HB 46) and the Fire test series (HB 37).

The table of contents for AS 2118 is nine pages long and the document has 390 pages. This standard refers to other standards including the ten component standards of AS 4118. The first of these ten component standards is AS 4118.1.1-1996. It has a table of contents which is four pages long and the document has 44 pages. The handbooks are also substantial documents because they express these technical subjects in user-friendly explanation style to address the requirements of industry and the wider community.

We conclude that a lot of work has been done to develop standards for irrigation, and that there is much more to do before domestic irrigation controllers will be included!

8. TYPES OF TECHNOLOGIES AVAILABLE

Domestic irrigation controllers have a very large range of technologies and features. Like other electronic goods, these technologies and features are usually developed for commercial products but then they migrate down quickly to the retail range of goods. Manufacturers are continually reviewing the trade-off between features, price, and consumer attitudes.

Table 2: Summary of technologies available

Feature	Description	Variations
Integral valve	Controller and valve are an integral unit, or sold as one.	Tap timers. Driven by springs, batteries, water. Volume or time based.
Outputs	Multiple outputs control different plant-soil-water requirements, and irrigate larger areas with the same source flow capacity. Besides valve on-off control, outputs can have monitoring features.	Single or multiple stations (outputs) Master valve or pump start Slave valves, slave controllers Surge protection, for inputs & outputs Voltage; 24VAC, DC, latching Wiring & solenoid coil fault detection Outputs for lighting, fountains, etc.
Inputs	Inputs enable controllers to respond automatically to the environment around them.	External triggers to skip, pause, reset. Digital (on-off), pulse (counter), analogue (continuous range). Sensors – wind, rain, sunshine, soil moisture, evapotranspiration (ET).
Communication	Remote access for user interface, and/or inputs & outputs.	Phone, radio, internet, GSM, wireless. Compatibility with BMS, C-Bus, etc.
Programs	Multiple programs are needed to manage variations in the weather, and multiple plant-soil types.	Calendar cycle (7 to 365 day, more) Multi-programs, multi-starts, repeats. Run-times, intervals, delays, skips. Override, %adjust, semi-manual. Defaults after power failure.
Data acquisition	It is becoming cost effective to capture and retrieve data which is a useful management tool.	Logging, channels, formats, limits. Frequency, processing, memory. Storage and retrieval.
User interface	The interface must be powerful, yet simple and user-friendly.	Keypad, dials, display Logic, steps, user-friendliness Help, manuals, guides Default programs.
Physical	The controller must be robust and built to “fail” in an appropriate manner.	Wall mount, outdoor, splash proof Transformer capacity, fuse. Safety features Time and program retention.

To meet market opportunities, it is possible that products include any number of the features listed above. Some broad groups are given in Table 3 below.

Table 3: Summary of controller groups available

Domestic controller group	Incremental advantages, generally for perceived incremental disadvantages of additional cost and complexity
Tap timers – mechanical	Can be fitted to a garden tap to automatically turn off the flow on completion of the manually initiated irrigation event.
Tap timers – battery operated	Can be programmed to automatically start as well as stop.
Powered, stand alone controllers	Controllers can be mounted more conveniently, and valves can be concealed from view and powered reliably.
Multi-purpose, integrated	Controllers can control lighting and fountains, be integrated with security and a building management system, or be operated from a personal computer and the internet.
Multiple stations	Ability to irrigate different areas in a sequence, each area for a different duration. For example: • drippers for 3 hours then sprinklers for 20 minutes, • back lawn then front lawn.
Multiple programs	Ability to irrigate different plants/soils/microclimates with different frequency. For example: • flowers every day versus lawn twice per week, • sandy soils in one cycle of 15 minutes versus clay soils in three cycles of 5 minutes every hour, • shaded lawn once per week versus exposed lawn twice per week.
Sensor inputs	Ability to react intelligently when the status of one or more external inputs (eg rain, soil, flow sensors) indicate that it is appropriate to start/stop/override/reset according to pre-determined schedules.

9. OPTIONS FOR WELS

At a workshop in Canberra, WELS advised that there are a number of possible outcomes resulting from this investigation into expanding the WELS scheme to cover domestic irrigation controllers. The alternatives are:

- include and regulate domestic controllers within the scope of WELS
- domestic irrigation controllers could be made subject to “minimum performance standards”, as an example water tightness at a specified minimum hydrostatic pressure resistance when closed
- the Smart Approved Water Mark could be considered to meet some of the WELS objectives with respect to domestic irrigation controllers
- exclude domestic irrigation controllers from any regulatory framework at present (the status quo is maintained).

WELS made it clear that any decision about expanding the scheme to cover domestic irrigation flow controllers will be based on the merits of the technical case for doing so and that no in principle decision has been made to expand the scheme to include these products.

10. ISSUES FOR INDUSTRY

The key points about the scheme which would affect any expansion of the scheme are:

- The WELS scheme is a rating scheme which the public equates to water efficiency
- WELS is a mandatory program and places an obligation on suppliers of water-using products to have a sample of each model tested to a specified standard in an approved laboratory and to register the products on the WELS database which will incur a fee, currently $1500
- The appropriate label will need to be fixed to every unit offered for sale

The Secretary of the Department of the Environment, Water, Heritage and the Arts has extensive powers to inspect and test samples of the products covered by WELS, and to institute legal proceedings in the event of evidence of breaches. There are substantial fines for proven non-compliance, as well as powers to order products to be removed from the market.

There are technical, commercial and policy issues to be reviewed. The technical issues concern the testing and evaluation of domestic controllers. The commercial issues concern the costs, availability and administration of the Scheme. The policy issues are focussed on the overall costs and benefits of rating domestic controllers.

The policy issue is basically whether the total costs of expanding the Scheme, with the consequent changes to regulations, are worth the potential benefits arising from covering domestic irrigation flow controllers. Since the potential benefits are primarily determined by the potential water savings this issue can be resolved by estimating the potential water savings.

The commercial issues will be determined by the resolution of the technical issues which in turn will affect what kind of testing regime is required, what type of labelling and what “rating” might be applied to this category of product.

The current WELS scheme is based upon testing products in accordance with published Australian standards, and rating the products in accordance with the test results. Since no published standards exist for domestic controllers or the events they control, such a procedure cannot be used for rating domestic controllers.

In Section 7 we identified that the process of developing standards is well established and that it involves extensive input by the industry and stakeholders. We also established that Australia has actively participated in the development of ISO standards for irrigation for many years. While it would be possible to develop a standards for domestic irrigation controllers outside the Standards Australia processes, this would still require a significant investment of time and resources, including for stakeholder engagement.

11. WORKSHOP

A workshop was held in Sydney on February 26 2008 to get an irrigation industry perspective on the issues surrounding the possible expansion of the WELS scheme to include domestic irrigation controllers. Before the workshop an options paper was distributed to participants to provide background to the workshop and information on the aims of the project.

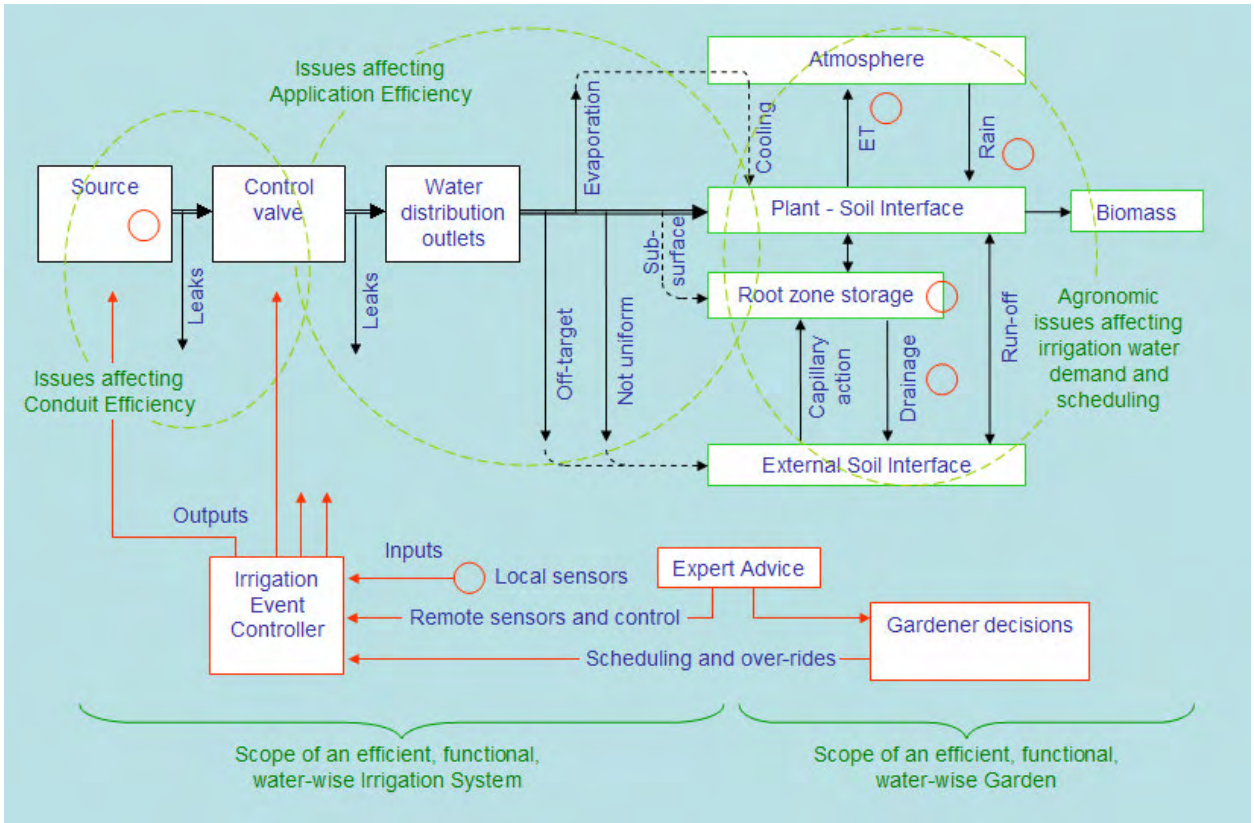
The aims of the workshop were as follows:

- agree on a working definition for domestic irrigation controllers
- confirm understanding of WELS by the irrigation industry members
- identify issues in expanding WELS to include domestic irrigation controllers
- identify issues related to alternatives to WELS, e.g. minimum performance standards and Smart Approved Water Mark
- make recommendations on the key elements in a system of rating domestic irrigation controllers.

11.1 Irrigation systems and issues affecting efficiency
To provide a framework for the workshop, a presentation was made detailing key concepts of irrigation efficiency and irrigation system function so that a definition for a domestic irrigation controller could be agreed.

The full presentation is included as Appendix 1 to this report. Figure 1 describes the way flow is controlled in a domestic irrigation system, and the role played by an irrigation event controller in the total system. The whole irrigation system and the issues that affect its efficiency are represented in the figure.

Figure 1: Role of an Irrigation Event Controller



11.1 Definition of domestic controllers

A definition of an irrigation event controller was developed on the basis of this figure. It was agreed that an irrigation event controller:

- commands the start, end and sequence of irrigation events in both a temporal and spatial sense
- controls water flow through one or more valves
- can command a program (frequency and duration of irrigation events)

Although a domestic irrigation controller controls flow, it is not usually called a flow controller because of potential confusion with dumb plumbing devices which hydraulically control the rate of water flow. The workshop agreed with this definition and functional description of an irrigation event controller.

It was agreed that tap timers are irrigation event controllers. The device must have some means of operating one or more valves whilst unattended. The valve could be integral with (part of) or external to the controller.

11.2 Presentations and discussions

The presentation reproduced in Appendix 1 was halted at this stage and a presentation was given on the WELS scheme, detailing how it works, the products currently covered by the scheme and the legislative framework supporting the scheme.

12. ADVANTAGES AND DISADVANTAGES

Participants listed advantages and disadvantages of expanding WELS to include domestic irrigation event controllers. These are arranged in themes below, with each theme interlinked with at least one other theme.

12.1 Product quality

Participants felt that if irrigation event controllers were included in a government backed scheme such as WELS then the general standard of product on the market would be lifted. This would result as consumers would have a way of differentiating between good and not so good product. It was felt that it could also lead to product innovation and development.
The advantages and disadvantages were that WELS labelling could:

- increase reliability of products — Advantage
- encourage expansion and innovation — Advantage
- rationalise number of products — Advantage
- increase the standard of products — Advantage
- Extinguish some products (maybe some current high volume products may no longer be sold) — Disadvantage
- stifle innovation through standardisation — Disadvantage

These advantages and disadvantages are all from an industry perspective. Some of these perceived disadvantages (such as the removal of high-volume, yet inefficient controllers) could be seen as an advantage from a water conservation or consumer perspective.

12.2 Water restrictions

Water restrictions have had a major impact on the domestic irrigation industry and it was thought that rating of event controllers by WELS might lead to water conservation measures which are “more rational”.
The advantages and disadvantages of rating of event controllers with WELS labelling were:

- government owned and run labelling and standards are more likely to be integrated with water restriction regimes — Advantage
- possibility of changing current illogical water restrictions — Advantage
- industry can build credibility with government and end users — Advantage
- possibility of including in rebate schemes — Advantage
- consumer is only using a single start time controller so water restrictions have reduced consumer demand for better controllers. — Disadvantage

12.3 Commercial

Participants representing manufacturers and retailers recognised the potential for both positive and negative commercial impacts on their businesses.
The advantages and disadvantages upon businesses through WELS labelling were:

- price premium for higher rated equipment — Advantage
- help expand markets — Advantage
- cost of implementing testing, registration, compliance, labelling etc — Disadvantage
- is the value from the labelling system (WELS) per se or from what it might lead to? — Disadvantage

12.4 Need for and lack of standards

Participants felt that the existence of standards which would be required if a WELS approach was adopted, could lead to the greater use of standards for other equipment and possibly for whole systems. This would lead to higher standards generally. It is related to the quality issue.
The advantages and disadvantages of the lack of and need for the development of standards were:

- entry into developing Australian standards for other features — Advantage
- could be equitable; everyone in or out — Advantage
- empirical and measurable as a rating scheme — Advantage
- national scheme would get consistency across the country — Advantage
- ability to differentiate products on quality — Advantage
- testing capacity currently limited — Disadvantage
- not enough research on garden watering. Data is very old, so developing water efficiency labelling based on poor data is questionable — Disadvantage
- development of a standard to define a controller or an event is a large task. — Disadvantage

12.5 Public awareness

Using standards for evaluating event controllers would help demonstrate the credentials of the industry and in the opinion of participants raise its image in the eyes of government and customers.
The advantages and disadvantages of evaluating event controllers were:

- means of informing community — Advantage
- opportunity to indicate what is efficient domestically — Advantage
- differentiation of product on function as well as quality — Advantage
- depends on how well WELS is promoted and marketed — Disadvantage
- will a star rating system for controllers potentially mislead consumers? — Disadvantage

12.6 System issues

Participants identified a number of issues which would need resolving before WELS could be applied to event controllers. These included development of standards and rating systems, availability of testing facilities and administration of the scheme. Some of these issues will take

some time to resolve while others can be answered more quickly by comparison to current WELS activities.
The disadvantages raised by these issues were:

- to achieve the end result, an event controller is only part of an irrigation system (may have great controller but lousy system downstream) and may take attention away from wider issue — Disadvantage
- definition of efficiency is a key issue — Disadvantage
- sensors are an important part of efficiency and hard to draw line between controller and sensors — Disadvantage
- what are the limits to the definition of the event controller? Does it control all outdoor events, music, lights? — Disadvantage

12.7 Overall feasibility

The overall feasibility of rating domestic controllers as a means of improving water use efficiency was questioned. Given that the main goal of rating event controllers is to improve water conservation in the domestic garden context, participants were concerned that rating the event controller could have little impact on water use overall. Figure 1 defines the role of the irrigation event controller and it is clear that it is only one part of the total irrigation complex. It was argued that rating controllers would do little to improve water use for this reason. The challenge of defining water use efficiency, and the best vehicles for education and awareness were at the centre of discussions.
The advantages and disadvantages overall were:

- possibly lead to irrigation systems being audited — Advantage
- is WELS the best vehicle to achieve what the industry wants? — Disadvantage
- who is accountable for the label; manufacturer, government, testing authority? — Disadvantage
- will it achieve what is required on its own? — Disadvantage
- don't see any value in rating event controllers without broader education — Disadvantage
- is there enough education about irrigation efficiency? — Disadvantage
- will a star rating system improve the lack of awareness of irrigation efficiency — Disadvantage

13. OTHER RATING SYSTEMS

The workshop then heard presentations on the Smart Approved Water Mark (SAWM) and on other rating schemes that might be used as an alternative to the WELS scheme.

An issue that arose during the presentation of the SAWM scheme is that because it is not based on standards it is not perceived by some government authorities as being rigorous enough. From their perspective the WELS scheme is more rigorous because it is based on standards. It was noted that the SAWM has developed and used guidelines for assessing products which are based on standards. It would be possible to introduce further guidelines for other product categories.

Table 4 details some other ratings schemes which have been developed for assessing the quality of products and services. It is clear from the details in the table that rating schemes have been developed for many different purposes, use different measurement techniques and operate in a variety of ways from regulated and backed by legislation schemes such as the WELS scheme to other schemes that are voluntary systems operated by industry associations.

Table 4: Summary of Rating Systems

Rating scheme	Measures	Managed by
The Australian STAR Rating Scheme (accommodation)	500 criteria, 10 categories property rating 1-5 stars.	AAA Tourism - owned by motoring associations.
Car Wash Water Saver Rating	Volume/wash. Self assessment, followed by an audit. 1-5 stars.	Australian Car Wash Association.
Energy Efficiency Ratings for Plasma and LCD TV's	Power (watts) per square centimetre of screen space.	Comparison net. Private plasma TV specialist.
WERS Windows Energy Rating Scheme	Heating and cooling, compared to a standard 3mm clear window.	Australian Window Association.
NABERS National Australian Built Environment Rating Scheme	HOME voluntary performance-based rating system for existing buildings.	NSW Dept Environment and Climate Change. Online tools.
Plant Selector Water Drops Rating Scheme	1-3 drops, low-medium-high water use, x Suburb, x Plant.	Sydney Water.
WELS Water Efficiency Labelling and Standards Scheme	1-6 stars, water volume per load, place setting, flow.	DEWHA (WELS Act, State legislation)
Other schemes	Measures	Managed by
SWAT Smart water application technologies	Certified if sensor based.	Irrigation Association (USA).
SAWM Smart approved water mark	Labelling scheme if best practice is demonstrated.	Expert panel; AWA, IAL, NGIA, WSAA.
Waterwise Garden Irrigator program	Certification of products and services eligible for rebates.	IAL, Dept of Water WA.
MEPS Minimum Energy Performance Standards	Australian Standards; new or upgraded from pre-existing; motors, heaters, whitegoods.	Standards Australia; Federal & State legislation.

A synopsis of these is provided below. Further information is available at the websites listed.

13.1 The Australian STAR Rating Scheme

http://www.aaatourism.com.au/AAATDefault.aspx?sit=1&pid=146

This well known scheme for rating accommodation is operated by AAA Tourism and is owned by motoring associations of Australia. A minimum standard is required before rating can be applied in over 10 categories from resorts to hostels. Over 500 criteria are applied by assessors who regularly inspect the properties.

13.2 Car Wash Water Saver Rating scheme

http://www.carwashwater.com.au

Initially developed in response to water restrictions in Victoria, this scheme had been supported by water authorities in other states as a basis for water conservation through rating the water efficiency of car wash facilities. A detailed check list for best practice has been developed by members of the Australian Car Wash Association.

13.3 Energy Efficiency Ratings for Plasma and LCD TV's

http://www.comparison.com.au/articles/8-energy-efficiency-ratings-for-plasma-and-lcd-tv-s

An example of how consumers benefit when industry simplifies complex technical differences by developing a rating system.

13.4 WERS Window Energy Rating Scheme

http://www.wers.net/about/about-wers

The Window Energy Rating Scheme enables windows to be rated and labelled for their annual energy impact (heating and cooling) on a whole house, in any climate of Australia. This rigorous software based rating system is administered by the Australian Windows Association. Commercial-in-confidence information is provided by manufacturers and independently audited in order to create ratings which architects and building owners can use to model building energy performance in advance of purchasing the windows.

13.5 National Australian Built Environment Rating System

http://www.nabers.com.au

NABERS is a performance-based rating system for existing buildings. NABERS rates a building on the basis of its measured operational impacts on the environment, and provides a simple indication of how well these environmental impacts are being managed compared with peers and neighbours. This is a national, voluntary scheme which is administered by the NSW Department of Environment and Climate Change. Accredited Assessors rate office buildings, but self-assessment is done for homes. A third scheme has recently been added for 0-5 star rating of hotels using 12 month's of energy and water bills, as well as postcode to adjust for climate zone.

13.6 Plant Selector Water Drops Rating Scheme

http://www.sydneywater.com.au/SavingWater/InYourGarden/PlantSelector/WaterRatings.cfm

The Plant Selector Water Drop Rating Scheme allows you to make informed decisions about the amount of water your plants need. The rating system is 1, 2 or 3 water drops. The less water

drops a plant has the less water it needs. This simple and effective scheme allows the user to input the region and hence determine the plant's suitability for the prevailing climate.

13.7 SWAT Smart Water Application Technologies

http://www.irrigation.org/SWAT/Industry

This Irrigation Association (USA) sponsored certification scheme uses the term Smart Water Application Technologies to include any irrigation product and/or practice that delivers proven, exceptional landscape water use efficiency. For example, unlike traditional irrigation controllers, which are really just timers, smart irrigation controllers work by monitoring and using information about site conditions (such as soil moisture, rain, wind, slope, soil, plant type, and more), and applying the right amount of water to the landscape based on those factors. Once the smart controller is installed and set up, the smart controller automatically takes care of seasonal weather/site specific adjustments, and does not require ongoing monitoring.

13.8 Smart Approved WaterMark

http://www.smartwatermark.info/home/default.asp

The Smart Approved WaterMark is a water-saving labelling program for products, services and also organisations. It is a not-for-profit scheme established by four associations, the Australian Water Association, Irrigation Australia Ltd, the Nursery and Garden Industry, Australia and the Water Services Association of Australia. An independent Technical Expert Panel assesses all applications against multiple sets of criteria.

13.9 Waterwise Garden Irrigator Program

http://portal.water.wa.gov.au/portal/page/portal/WiseWaterUse/WhatProductsCanIGetARebateFor/WaterwiseGardenIrrigation

The Waterwise Garden Irrigator Program was developed in conjunction with the IAL and is administered by WA's Department of Water. Irrigators endorsed under the program are qualified to design and install water efficient garden watering systems to an industry standard. To qualify for the program, irrigators must have two years experience in the industry and pass a written test. Consumers can also claim a rebate for approved Waterwise products such as subsurface irrigation and rain sensors along with their claim for installation costs.

13.10 Minimum energy performance standards

http://www.energyrating.gov.au/meps1.html

By specifying minimum performance standards (MEPS), energy consumption of products from water heaters to electric motors has been reduced over the last decade. MEPS programs are made mandatory in Australia by state government legislation and regulations which give force to the relevant Australian Standards. The standards are continually reviewed and the performance bar is lifted higher following appropriate phase-in periods. State based legislation is necessary because the Australian constitution gives Australian States clear responsibility for resource management issues, including energy.

14. RATING OF IRRIGATION EVENT CONTROLLERS

14.1 Minimum criteria

Minimum criteria which should be applied to event controllers were identified during the workshop as follows:

Multiple Programming (A, B, C – D)
Multiple programs are necessary to enable a proper response to the variety of soils, plants, weather and precipitation rates that pre-programmed events must cater for.

- minimum 3 programs
- each program to have: 2 starts, active days (day/ week or odd/even)
- run time (1-100 min)

Sensor Capability
Potential to save water is enhanced if the controller can respond to sensor inputs.

- minimum 1 sensor input (rain or soil)
- option - One program not affected by sensor.

Calendar compatible with all possible restrictions
Controllers should be able to abide by watering day restrictions.

- allow any day of week or odd/even days

Default settings
Water can be wasted by inappropriate default actions following power outage. Controllers must have either rechargeable battery or non volatile memory so that current time is retained for a minimum time. Also should retain programming for a determined length of time. Default programs on initial start-up are also an issue.

14.2 Potential rating schemes

Once functionality and minimum criteria for event controllers were agreed, the workshop then discussed ways in which these criteria should be rated.

Two suggestions were made, with the first stating that controllers should be rated according to:

POSSIBLE RATING SCHEME A:

Reliability/ Quality

- check testing/cycle testing/weatherproof.

Ease of use

- large screen/ Easy to understand instructions (durable!)
- minimal programming steps.

Water efficiency features (e.g. Sensors, etc)

- rain, moisture, frost, wind, temperature, evapotranspriation (minimum of 2)
- 14-day calendar/scheduling capacity/seasonal adjustments.

However, no process for implementing this rating scheme was proposed at this stage.

POSSIBLE RATING SCHEME B:

One group in the workshop proposed the following rating scheme to evaluate the criteria identified. For the three major functional criteria:

For each criteria present the controller "scores" a point

- the criteria will be weighted
- as a result of this scoring system a controller would be allocated to a rating category, so if a controller scored 50 points it might be awarded 3 stars, a controller scoring 80 points might be a six star and a controller scoring 20 points might be a 1 star controller.

Programmable – ease of use

- user interface testing
- has ET data specific to location
- documented testing procedure
- system scaleable (townhouse 1 acre block)
- can use different sources (tank, potable)

Environmental sensing

- quality of algorithms
- real time monitoring
- frequency of integration
- number of Zones/outputs controlled
- number of inputs sensed – Rain, ET, Soil moisture

Default Limits Calendar/volume

- internal flow meter
- time limit flexible
- volume limit within 5% accuracy
- time x volume capability

There was some discussion as to whether this method of rating could be applied but it was agreed that it demonstrated that it would be possible to develop a rating system for ranking domestic irrigation event controllers.

15. CONCLUSION

The industry workshop agreed four major points:

1) Domestic irrigation event controllers can be rated. The proposed rating scheme outlined at B demonstrated the possibility of developing a rating system for domestic irrigation event controllers.

2) The controller is only one part of an irrigation system. The workshop doubted that rating the event controller would actually achieve the aims of the WELS scheme with regard to domestic water consumption because it is only one part of the total irrigation system. The controller is a starting point. While the industry participants recognised the limitations of rating event controllers it was agreed that it was important for the irrigation industry to begin the process of rating and introducing more quality control into products.

3) Build on existing initiatives. The final conclusion of the workshop was that the irrigation industry, through Irrigation Australia Limited, should work with existing initiatives such as WELS and SAWM rather than try to develop some other rating scheme.

4) It was noted that a rating scheme might work well with the more professional end of the market but that it might be irrelevant to the DIY market. Participants identified that it would require a substantial marketing effort to make any star rating scheme clear to the DIY market.

The aim of the consultancy is to review the technical and other issues relating to expanding the WELS scheme to include domestic irrigation event controllers. While the industry appears to be quite supportive of the concept there is significant work to be done before it could eventuate.

However, before considering the work that needs to be done, a key fundamental question needs to be answered: would rating event controllers contribute a lot to improving domestic water efficiency? The answer to this question is probably not, given the current water restrictions in place around Australia and the fact that the controller is only a small part of an irrigation system.

The desire of the irrigation industry to be seen as more professional and selling quality products includes some attraction towards being able to sell systems that are currently banned. The industry noted that one of the advantages of controllers being included under WELS was the possibility that rated equipment is more likely to be exempt from restrictions.

The industry will have to be involved in developing rating protocols, testing regimes and standards for any irrigation equipment that is rated. Given the resources available in the industry to carry out this type of work it seems better to apply this effort to rating whole systems, and perhaps at least to defining what constitutes an efficient system and efficient irrigation practices rather than trying to rate individual components. A holistic approach is more likely to have the effect on reducing domestic water use that governments are looking for.

If it were decided to proceed with a system of rating controllers we believe it would be quicker to develop guidelines to apply to controllers and have them assessed under the Smart Approved WaterMark scheme to indicate to consumers which controllers are more likely to help them save water.

“In any climate, over-irrigated cacti are as water wise as under-irrigated rainforests”

“Wednesday is not a good reason to irrigate”

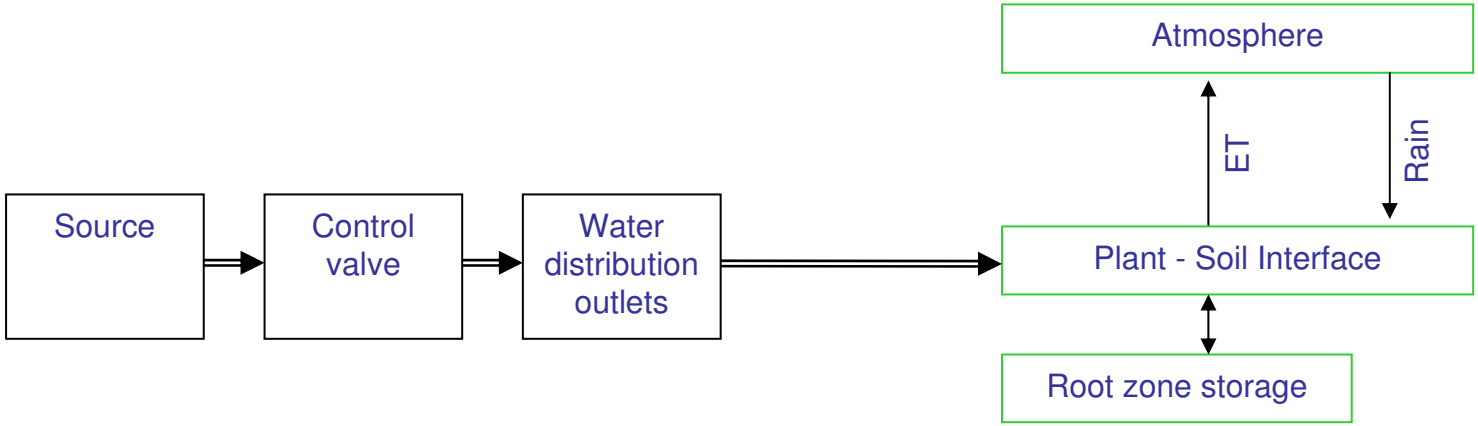
16. APPENDICES

A: Powerpoint presentation to Industry Workshop

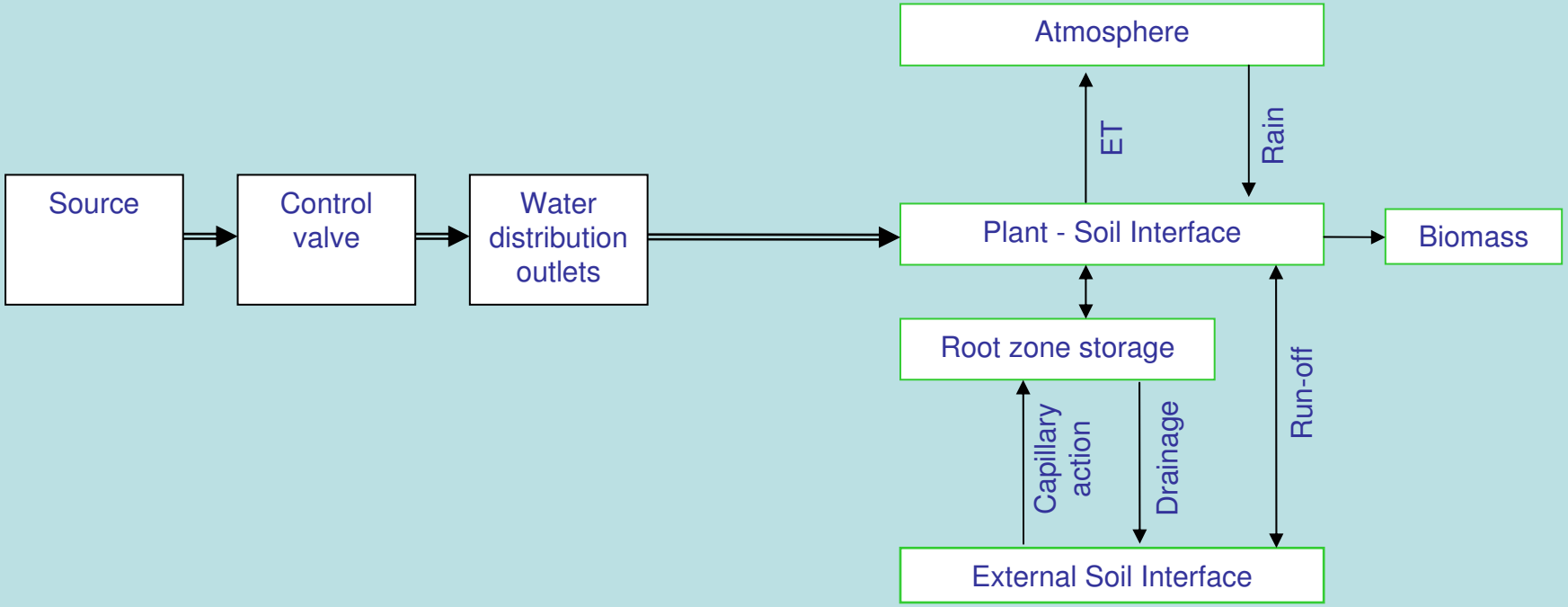
B: Extent of Australian Standards coverage relating to Automatic Fire Sprinkler Systems

Primary irrigation system function

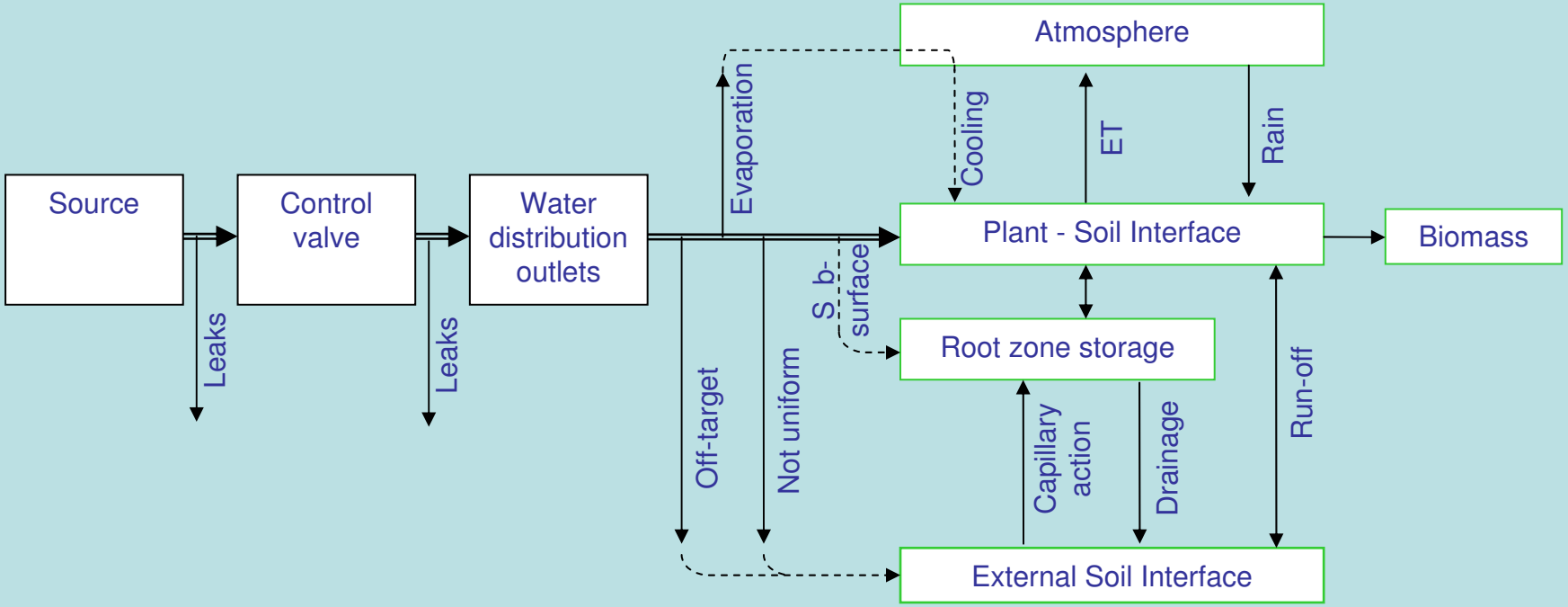
Primary water use transfers



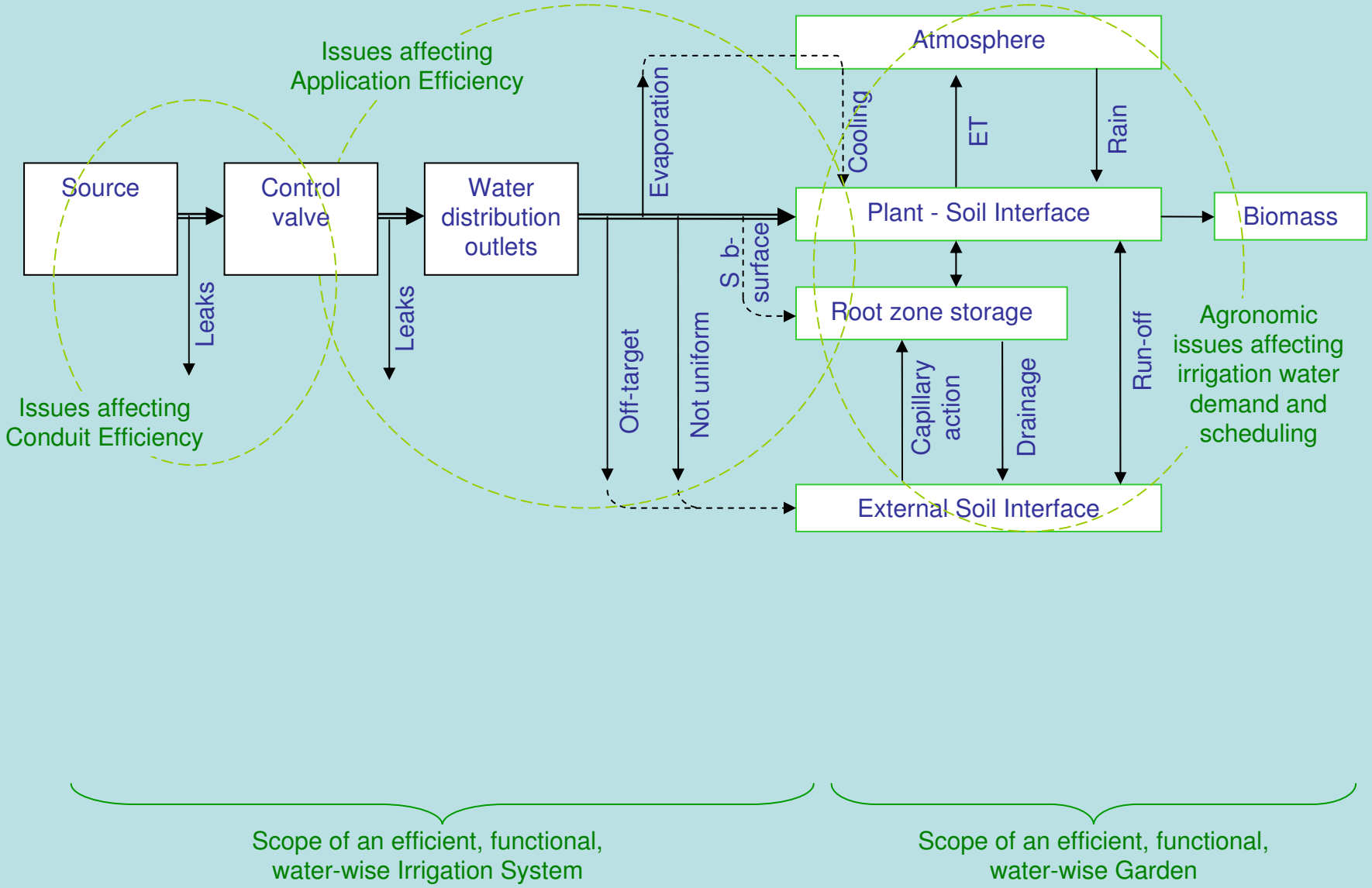
Other plant-soil-water transfers



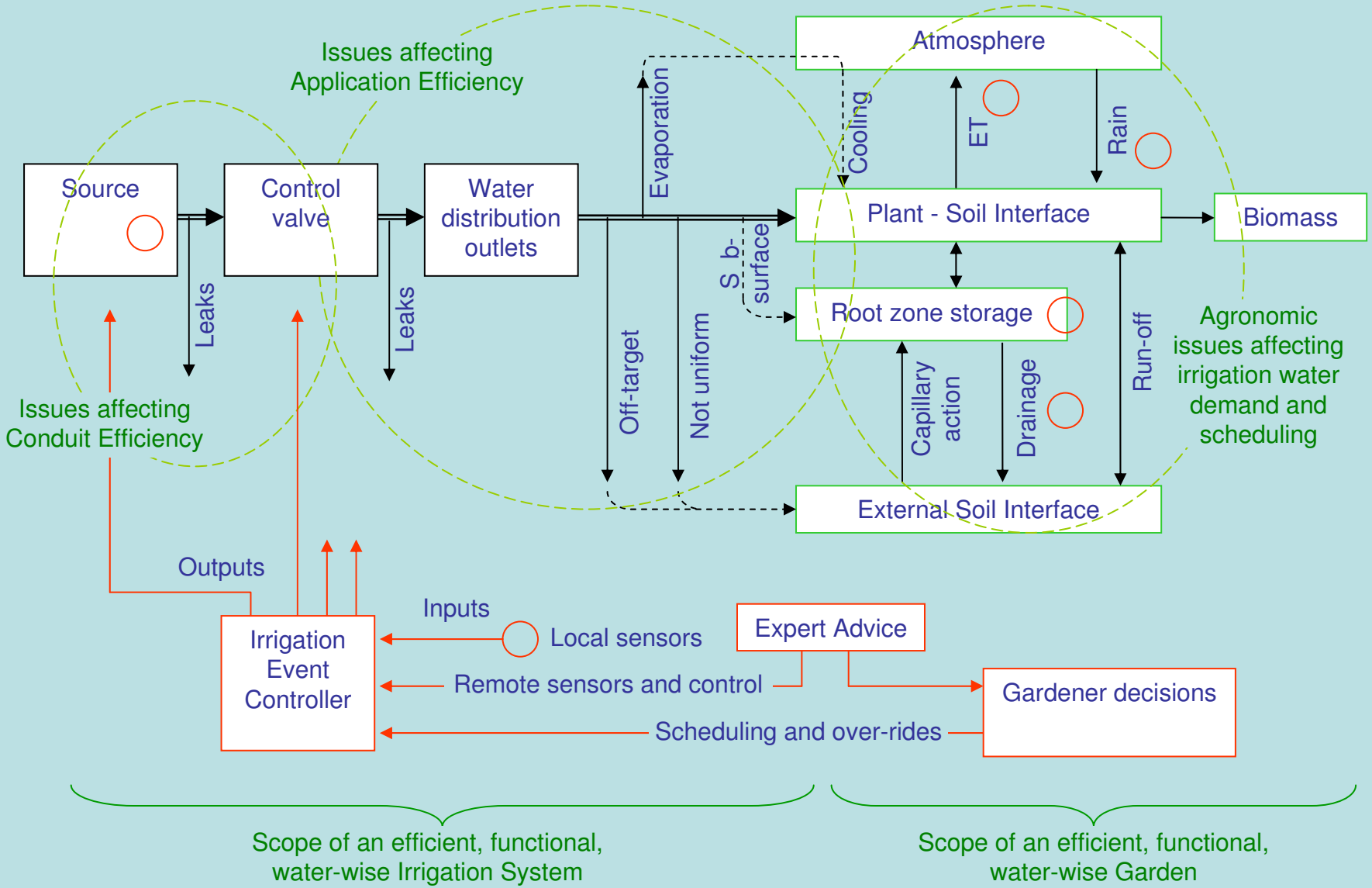
Irrigation system water losses



Issues affecting water efficiency and water use



Role of an Irrigation Event Controller



Rating Schemes

Rating scheme	Measures	Managed by
WERS Windows Energy Rating Scheme	Heating and cooling, compared to a standard 3mm clear window	Australian Window Association
NABERS National Australian Built Environment Rating Scheme	OFFICE voluntary performance-based rating system for existing buildings	NSW Dept Environment and Climate Change. Accredited Assessors
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Energy Efficiency Ratings for Plasma and LCD TV's	Power (watts) per square centimetre of screen space	Comparison net. Private plasma TV specialist.
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Car Wash Water Saver Rating	Volume/wash. Self assessment, followed by an audit. 1-5 stars	Australian Car Wash Association
Star Rating Scheme (Registered Training Org's)	1-3 stars, Independent assessors, industry feedback	The Institute for Trade Skills Excellence, SkillsOne
Plant Selector Water Drops Rating Scheme	1-3 drops, low-medium-high water use, x Suburb, x Plant	Sydney Water
WELS Water Efficiency Labelling Scheme	Water volume per load, place setting,	WELS Act, State legislation, WES

Preview

AS 2118.1-2006 (A4) :
Automatic fire sprinkler systems - General systems

Buy PDF File Buy Hardcopy

This Standard specifies general requirements for the design, installation and commissioning of automatic fire sprinkler systems in buildings and structures. This includes land-based buildings, mines, tunnels, bridges, wharves, jetties and mobile structures like rail cars and drag lines.

The 2006 edition brings you the latest in simplified and economical design, reflecting rapid changes in technologies as a result of testing in the US, UK and Australia.

What's different about the 2006* edition?

- Extended tables for sprinkler clearances

- Simplified design processes for ordinary hazards, including the number of sprinklers in operation

- Additional information and summary tables on high hazard class systems

- Clearer determination of design area with hydraulic calculations

- Concealed space protection now considers a building's life cycle

- New single town main supply

- New 'dual' water concept where higher supply reliability is required

*The 1999 edition is still available for sale and continues to be referenced in the current Building Code of Australia (BCA). However, in situations where the authority having jurisdiction does not require the BCA referenced version, the 2006 edition may be applied. Since it is predicated on advanced technology, the application of AS 2118.1-2006 may provide a more cost-effective and water efficient sprinkler design.

Also available in A5 format, AS 2118.1-2006 (A5)

Product Information

Status:	Current	**ISBN:**	0-7337-7916-6
Published:	29 Dec 2006	**Committee:**	FP-004
Pages:	390		

Supersedes:

DR 02568	Automatic fire sprinkler systems - Part 1: General requirements
AS 2118.1-1999	Automatic fire sprinkler systems - General requirements

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Our Suggestions

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AS 2941-2002
Fixed fire protection installations - Pumpset systems

AS 2118.1-1999
Automatic fire sprinkler systems - General requirements

AS 3786-1993
Smoke alarms

AS 2665-2001
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First published as part of AS CA16-1939 (endorsement of Seventh Edition of FOC Rules).
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Revised and redesignated in part as AS 2118-1978.
Second edition 1982.
Revised and redesignated in part as AS 2118.1-1995.
Second edition 1999.
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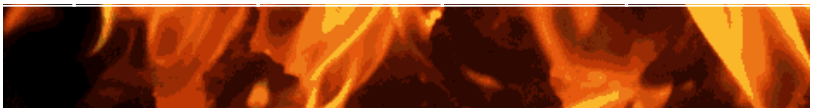

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Committee: FP-004

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DR 92183	Fire sprinkler systems Part 1.1: Components - Sprinklers
AS 2118-1982	Automatic fire sprinkler systems (known as the SAA Code for Automatic Fire Sprinkler Systems)

Equivalent Standard(s)	Relationship
ISO 6182-1:1993	Not Equivalent

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AS 2118.1-2006 (A4)
Automatic fire sprinkler systems - General systems

AS 2118.1-1999
Automatic fire sprinkler systems - General requirements

AS 3786-1993
Smoke alarms

AS 2665-2001
Smoke/heat venting systems - Design, installation and commissioning

AS/NZS 1841.1:2007
Portable fire extinguishers - General requirements

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Scope

This Standard specifies the performance and testing of metallic element and frangible glass bulb sprinklers and sprayers, as listed in Table 1.1.
NOTE: Sprinklers and sprayers will be referred to throughout this text as sprinklers.
Whilst this Standard recognizes that there are sprinklers other than those listed in Table 1.1, the acceptance of these sprinklers is dependent on their documented approval and listing by a recognized authority. Full testing procedures for sprinklers not listed in Table 1.1 are not necessarily included in this Standard.

Abstract

Specifies the performance and testing of metallic element and frangible glass bulb sprinklers and sprayers.

History

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