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FireSmart™ IRS Insulating Roof Screed



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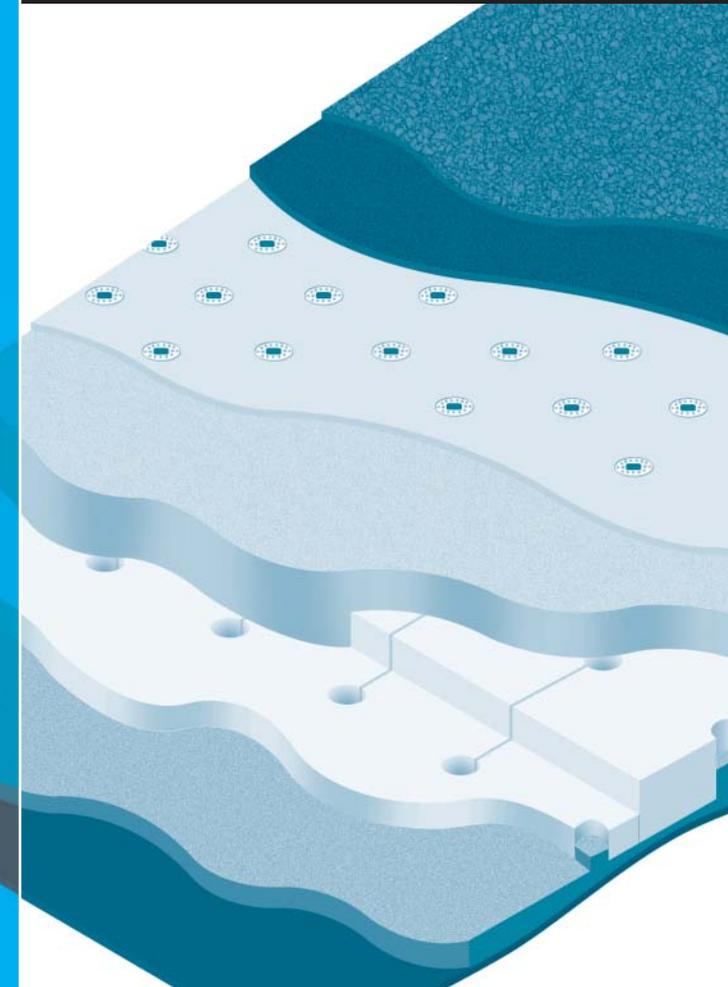
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Your step-by-step
guide to applying
the new lightweight
tapered insulation
system

Application Manual



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Your step-by-step guide to applying FireSmart™ IRS Insulating Roof Screed System.

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Note: To install FireSmart™ IRS you must attend a compulsory training programme at the Icopal Training Centre. Contact the Icopal Technical Services Team on 0161 865 4444 for details.

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For further information contact the Icopal Technical Services Team on 0161 865 4444 or email technical.uk@icopal.com



1. Suitability

1.1. Structural Integrity

Before work begins a suitably qualified structural engineer should have determined the capability of the existing structure to carry the loads imposed by re-roofing with FireSmart™ IRS.

The contractor / client must have provided the structural engineer with the cast weight (kilograms per square metre) and the dry weight (kg/m²) of the new system including relevant membranes and bitumen.

The roof structure must be capable of supporting the combined load of insulation system and membrane system. Using Icopal products the typical combined loads would be:

Pour & Roll	5 kg/m ²	Torch-on	5.33 kg/m ²	Bit. Single-ply	6.14 kg/m ²
Insulation + Screed	25 kg/m ²	Insulation + Screed	25 kg/m ²	Insulation + Screed	25 kg/m ²
Total loading	30kg/m2		30.33 kg/m2		31.14 kg/m2

1.2. Structural Deck Inspection

A detailed roof survey / inspection should always be carried out before the installation of a FireSmart™ IRS System. As part of the inspection it is suggested that the building occupants be questioned as to whether they know of any existing roof leaks.

The following items should be considered during the inspection of existing roof decks:

- **Stramit or Chipboard** - Stramit or Chipboard decks would not be suitable for use with a FireSmart™ IRS System and should be stripped back to the supporting joists and replaced with exterior grade 19mm plywood.
- **Wood / Plywood** - Inspect from the underside where possible for signs of deterioration. Replace sections with excessive deflection, areas of rotten material or obvious loss of structural integrity.

- **Metal Decks** - Inspect from the underside where possible for signs of deterioration. Areas of rusted decking should either be replaced or evaluated for structural integrity. N.B. If the original waterproofing is removed down to the metal deck, the deck must be overlaid with 19mm plywood and a sacrificial waterproofing layer before the insulated roof screed is applied.
- **Concrete Decks** - Inspect for signs of deterioration / spalling. Check for structural integrity.

1.3. Leaking Roofs

Leaking roofs can often contain substantial areas of wet insulation. Any wet insulation should be identified, removed and replaced with new insulation of equivalent thickness.



2. Existing Roof Inspection and Preparation

If the existing roof system is to be left in place, the condition of the structural deck must be approved by the structural engineer.

Care and planning will be required to ensure the protection of walls, windows, parked cars and other property. Pumps should be located on protective sheeting.

2.1. General Preparation Notes

- A meeting of everyone involved in the re-roofing:- trades, the architect or surveyor, the owner's representative, other relevant personnel should take place before work begins.
- All preparatory work must be completed before the FireSmart™ IRS pour starts.
 - Removal of chippings
 - Blister repair
 - Acceptance of surfaces to be laid upon
 - Carpentry work
 - Mechanical work
 - Electrical work
 - Masonry work
 - Maintaining the existing roof in a watertight condition
- Before carrying out any work to the roof, document and agree any existing water damage and any staining or efflorescence on walls.

2.2. Design Considerations for the FireSmart™ IRS Tapered System

- Determine the height of the finished system relative to waterchecks, DPC's and cavity trays, parapet walls, upstands, equipment supports, pipes, and all roof top equipment.
- In some cases, upstand heights may need to be increased to allow a minimum of 150mm upstand above the finished roof level.
- Remember to allow for any additional crickets at the high side of curbs and roof lights etc.

2.3. Preparation

- Remove dirt, algae, loose chippings, and any other debris. Any large deposits of oil, grease, acid, or unknown contaminants should be removed.
- The roof area should be walked in parallel lines approximately 1.2 metres apart to feel for 'soft' spots (suspected wet insulation).

- Core tests should be done in 'soft' spots and areas of identified leaks to verify deck and insulation condition.
- Remove areas of wet insulation. Replace the insulation and make watertight.
- Cut out any blisters and make watertight.
- Remove non-bonded insulation, replace and make watertight
- If the existing roof structure has suffered excessive water ingress, a thermographic survey is recommended to establish the condition of the existing system.
- If significant areas of the roof insulation are wet or the roof is extensively blistered, the roof and roof insulation should be completely removed. A sacrificial layer may be laid over the VCL to ensure roof is watertight.
- If the deck is concrete, install a suitable felt layer as defined in the written Icopal specification.

2.4. Roof Membrane Adhesion

- Firesmart™ IRS adheres well to mineral surfaced and gritted (loose chippings removed) built-up felt roofs.
- It must be confirmed that the existing waterproofing is adequately attached to the substrate below as well as ensuring an adequate bond strength between the FireSmart™ IRS and the existing waterproofing. If in doubt Icopal Technical Services will assist in measuring bond strengths.
- If the existing surface is an attached single-ply, a sprayed in place urethane roof, or metal-coated roof, the membrane should be bond tested to determine adequate bond strength of the FireSmart™ IRS.
- Loose laid roofs are not suitable surfaces for FireSmart™ IRS.

2. Existing Roof Inspection and Preparation continued

2.5. Rain or Standing Water Removal

Rainwater may collect in low points on the existing roof. Excess water should be removed before installation begins.

2.6. Roof Outlets

- Water test roof outlets before starting roofing operations.
- Maintain integrity of the roof drainage system during re-roofing. Install a tightly fitting circular thickness of fibreglass roof insulation or other suitable filter material into the outlets. The fibreglass will allow water drainage but not the entry of FireSmart™ IRS.
Drains plugged with impervious material to prevent the entry of FireSmart™ IRS must be removed in case of rain and before leaving the job each day.
- It is important that the roof outlets be flush or below the level of the existing roof or new temporary roof. This will allow any rainwater to drain off the roof. In a re-roofing situation it may be necessary to lower the existing outlets.
- When pouring the FireSmart™ IRS System, a temporary dam should be placed around the outlet. After the FireSmart™ IRS has set, the dam can be removed to allow installation of taper material from the dam to the outlet.

3. Equipment

3.1. Pumps

A Hydraulic Worm Pump such as the Turbosol T20 Hydroplus specification:

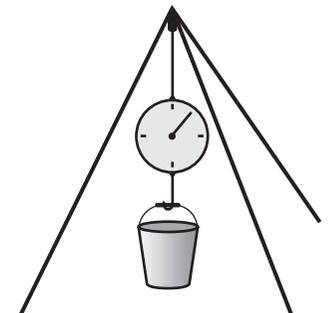
- Output Variable: 0 - 60 litres/min
- Max Pump Pressure: 30 bar
- Delivery Distance: 100m, 40m high
- Air Compressor: 350 l/min @ 4 bar
- 19 kw Twin Cylinder Diesel Engine
- Size: 3000mm long, 1300mm wide, 1300 high
- Weight: 750 kgs

3.2. Other Equipment

- Metal screed bars
- 'Darby' or 'Bull' floats
- Magnetic fixing rod
- A calibrated ten-litre bucket
- A reliable hanging spring scale
(ie a scale where the object is suspended beneath)
which measures in fractions of kilograms
- A calculator
- Icopal FireSmart™ IRS Pouring Audit forms to record results



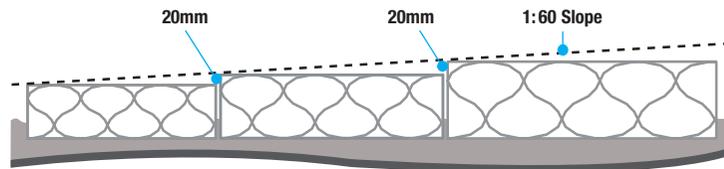
For advice on hire outlets for pumps contact the Icopal Technical Services Team on 0161 865 4444.



4. Installation Procedure

4.1. Falls

- Falls should be introduced by stair-stepping the IRS Insulation Boards in increments of approximately 20mm, rather than thickening the FireSmart™ IRS pour.
- The IRS Insulation Board should be of single thickness for each increment and not layered.

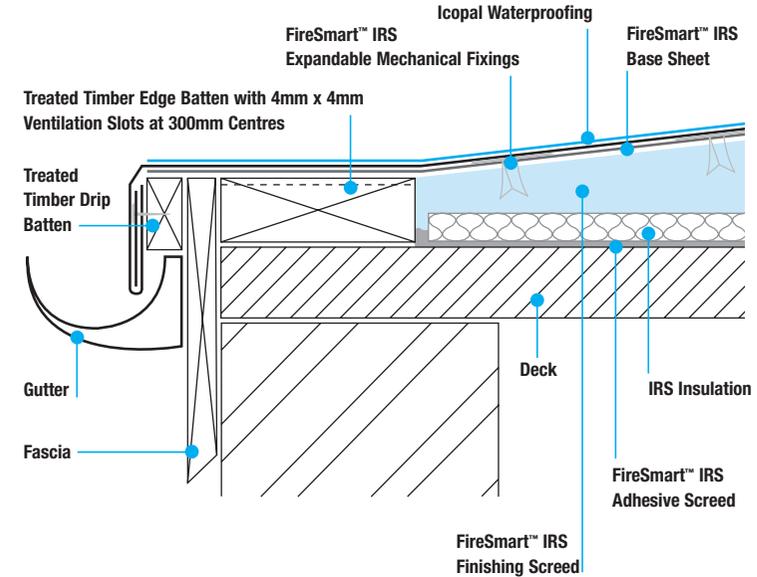


4.2. Cast Density

The cast density should be checked every 30 minutes, and the results recorded. Refer to Quality Control' on pages 17 and 18 for the method of checking cast density.

4.3. Preparing to Install

- Check sufficient materials are on site to allow completion of your selected work area. Allow approximately 0.75m² per 25kg bag of FireSmart™ IRS dry mix.
- The substrate should be clean before installation of the FireSmart™ IRS. All curbs, roof outlets, slotted edge timbers, etc. should be in place. (See illustration opposite)
- Concrete surfaces may be dampened to avoid premature drying of the slurry coat.
- All surfaces should be free of standing water, ice and snow.



4.4. Mixing

- A consistent water supply is vital to the application process. Check supply before mixing commences.
- Ensure that suitable dry storage is available for bagged material.

4.5. Mix Information

- One 25kg bag FireSmart™ IRS requires approximately 28 litres of water and should be mixed thoroughly until a uniform consistency is achieved. Adjust the water quantity to control the fluidity of the mixed product. Adding more water will make the product more fluid and adding less water will make the product less fluid. Sufficient water within the cast density tolerances (see page 16) should be added to make a smooth surfaced product finish.



4. Installation Procedure continued

Protection of Property

Care and planning will be required to ensure the protection of walls, windows, parked cars and other property. Pumps should be located on protective sheeting.

Health & Safety

The screed can be an irritant. Always wear suitable eye protection and gloves. Suitable face masks should be worn when handling dry material.

When moving the hose always observe basic roof safety procedures.

4.6. Pouring Guidelines

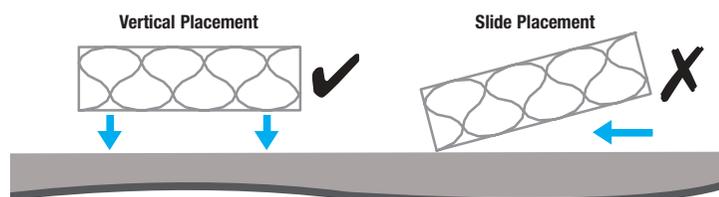
- The roof should be completed in workable sections (screed bays). The size of each screed bay is limited by the size of the screed bars you are using.
- Plan your pouring carefully. Work from the furthest point of the deck back towards your pump set-up. Minimum hose lengths are desirable.
- The person on the hose end should control placement of the pour, directing the stream of screed without excessive movement. Keep the hose end on the deck surface while pouring to minimise splattering and excessive air entrapment.
- After pouring the screed should be finished promptly to achieve the best result.

4.7. Adhesive Screed Layer Placement

Place the required thickness of adhesive screed coat to achieve good thickness in which to place the IRS Insulation Board - a minimum of 4mm and a maximum of 15mm.

4.8. IRS Insulation Placement

- Adhesive Screed placement over the substrate should be followed immediately by IRS Insulation Board placement.
- IRS Insulation Boards should be tightly butted together and placed in a manner that provides full contact of Adhesive Screed to board, causing the Adhesive Screed to enter the locking/keying openings of the IRS Insulation Board. Never slide the insulation into the Adhesive Screed.



- The IRS Insulation Boards must be walked-in to firmly and completely seat them in the Adhesive Screed.
- IMPORTANT. Pay very close attention to the system drawing so that the correct thicknesses of IRS Insulation Boards are placed in the correct locations. The proper use of different thickness boards is paramount to the optimum construction of the FireSmart™ IRS System.

4.9. Finishing Screed Top Coat Placement

- Final pouring of the top coat of FireSmart™ IRS screed must follow insulation placement within 4 hours.
- The minimum thickness of Finishing Screed that should be placed over the IRS Insulation Board and screeded to an even surface is 25mm.

4.10. Finishing Procedure

The method used for placing and controlling the specified thickness of FireSmart™ IRS has been developed to avoid 'bird baths' often created when float finishing to strings or timber battens:

- Place 25mm round metal pipe or square metal tube screed bars on top of the insulation boards. The screed bars must make 80% contact with the top of the IRS Insulation Board stairsteps. If the screed bars are unsupported for excessive lengths they must be packed using off cuts of IRS Insulation Boards to avoid deflection.
- The pipes or tubes support a straight edge pulled to create a finished surface and to give the hose man a target thickness when placing the top coat.
- Areas between screed bays should be touched up as soon as possible after the screed bars are pulled out.

On sunny days, sunglasses may be needed to protect eyes from the glare of the white IRS Insulation.

4. Installation Procedure continued

4.11. Day joints

- Always pour to a vertical form at the end of a working day.
- Day joints should be full-depth of the FireSmart™ IRS and square-edged. Leaving screed bars in place overnight at the edge of the day's last pour is a good method of accomplishing this.
- Avoid feather edging the insulating screed, as feathered edges can create spalled material.
- Day joints between completed sections (screed bays) should be finished smooth.
- Day joints must not be placed where rainwater is prevented from reaching an outlet.

4.12. Finishing Equipment

- FireSmart™ IRS should be placed to the required thickness and fall with an adequate finish to receive the specified roofing system.
- A darby or bull float is a finishing tool with a blade approximately 1.2 metres long. Either the entire surface or footprints and screed bar marks only can be finished with these tools.
- A trowel approximately 600mm long can be used in tight spots and to finish off footprints or screed bar tracks.

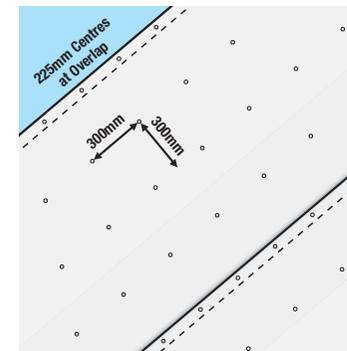
4.13. Cold Weather Working

FireSmart™ IRS must not be laid in temperatures below 5°C. The Portland cement in the FireSmart™ IRS mix requires a minimum temperature of 5°C to set.

4.14. Attachment of Waterproofing

- Roof must be checked for IRS Insulation Boards showing through the screed (floaters). This can be done within 24 hours of finishing.
- 'Floaters' must be removed by cutting the insulation out, fitting a replacement section of IRS Insulation Board and re-screeding.
- Finished screed must be cured for a minimum of 72 hours before attaching waterproofing.
- Mechanically fix base waterproofing layer. See drawing below for typical fixing centres.

On highly exposed roofs consult Icopal Technical Services.



Fixing Centres. Fixings must be staggered.

4.15. Cleaning

In addition to cleaning up any excess material from pipes, outlets and upstands, the area around the pump and grounds surrounding the building should be cleared daily of all debris.



5. Quality Control

Quality Control is vital to the finished job. It is the only way to ensure maximum performance from a quality product.

5.1. Checking the Operation

- Frequent performance checks are necessary to assure a uniform screed.
- Due to the fast installation, quality control must be based on measuring and controlling the wet density of the insulating screed on-site.
- Wet density checks ensure that the finished product will have the dry density and strength specified. They also confirm the amount of material used to create the FireSmart™ IRS.

5.2. FireSmart™ IRS Pouring Audit Form

- Copies of audit reports must be returned to Icopal Technical Services as part of the system guarantee conditions.



FireSmart™ IRS POURING AUDIT REPORT

PROJECT NAME: _____

DATE: _____ FOREMAN/CHARGEHAND: _____

CONTRACTOR: _____

DRY MIX (No. of Bags): _____ WATER RATIO (Litres): _____

TIME	CALIBRATED CONTAINER NET WT	DENSITY
_____	_____	_____
_____	_____	_____
_____	_____	_____

he cast density is the best control for the material to meet the required specification.

5.3. FireSmart™ IRS Density Specification

- Wet Density (kg/m³) - 961 – 1090
- Dry Density (kg/m³) - 561 minimum

5.4. Cast Density of FireSmart™ IRS

a. Frequency of Determining Cast Density

Cast density measurements should be made once every 30 minutes during placement and more often if cast density fluctuates widely.

Should the cast density measurement vary by more than +/- 2 kg/m³ from the specification, the frequency of measurements should be increased to once every 15 minutes.

The increased frequency must continue until the cause of the cast density variance is corrected. Adjustments are made by varying the quantity of water.

b. Cast Density Measurement Procedure

This requires using a weigh scale and a container that has had its accuracy determined in accordance with Section 7. The steps are as follows:

- Weigh an empty calibrated cast density container (minimum 10 litre) and record the weight.
- Using a calibrated cast density container, fill the container with FireSmart™ IRS directly from the hose until it overflows the container.
- Scrape the container top using a straight edge to remove excess FireSmart™ IRS from the filling operation.
- Wipe the outside of the container clean.
- Weigh the full container using a scale calibrated by the procedure in Section 7.
- Subtract the empty container weight from the full container weight.
- Multiply the net weight of FireSmart™ IRS by the container calibration factor determined by procedure in Section 6. The resulting calculation is the FireSmart™ IRS cast density in kg/m³.

$$\left(\begin{array}{c} \text{Full Bucket} \\ \text{kg} \end{array} - \begin{array}{c} \text{Empty Bucket} \\ \text{kg} \end{array} \right) \times \text{Calibration Factor} = \text{Cast Density kg/m}^3$$

5. Quality Control continued

c. Example of Cast Density Measurement

A 10 litre container has an empty weight of 0.9 kg and a calibration factor of 102.2.

What is the cast density of the FireSmart™ IRS ?

■ Fill the calibrated container with FireSmart™ IRS. The filled container weighs = 8.85 kg

■ The net weight of FireSmart™ IRS is $(8.85 - 0.9) = 7.95$ kg

■ Multiply the net weight by the calibration factor to obtain an estimate of the FireSmart™ IRS cast density in kilograms per cubic metre

$(7.95 \text{ kg} \times 102.2 \text{ pails / cubic metre}) = \mathbf{813 \text{ kg/m}^3}$

Conclusion: Cast density too low adjust mix ratio and re-measure.

6. The Cast Density Calibrated Container



6.1. General

- A galvanised steel bucket is recommended minimum 10 litre.
- The volume of the cast density measurement container is critical to determining the cast density of the FireSmart™ IRS being placed.
- The cast density measurement container must be of solid construction in order to maintain its volume characteristics.
- Should the volume change because it is flexible when loaded with FireSmart™ IRS, the cast density measurement will not be accurate.

6.2. Frequency of Determining Accuracy and Accuracy Limits

- The container calibration factor should be measured once a month.
- If the bucket volume changes due to bending of the container or leaving dried FireSmart™ IRS inside the container, re-calibrate the container or use a new container that has been calibrated.
- Should the container calibration factor change by more than 3%, the container must be replaced with a new container that has been calibrated.

6.3. Accuracy Procedure

This procedure requires a scale with a minimum weighing capacity of 25 kilograms and a cast density container:

- Weigh the empty container in kilograms
- Fill the container to the top with water
- Weigh the water filled container
- Subtract the empty container weight from the water filled container weight



6. The Cast Density Calibrated Container continued

- Divide 999.6 kg/m³ (weight of 1m³ of water) by the weight of water determined above.
- The resulting number is the calibration factor used in determining the FireSmart™ IRS cast density

$$999.6 \text{ kg/m}^3 \div \left(\begin{array}{c} \text{Full Bucket} \text{ kg} \\ - \\ \text{Empty Bucket} \text{ kg} \end{array} \right) = \text{Calibration Factor}$$

6.4. Example of Determining Calibration Factor

A 10 litre metal container will be used in measuring the cast density of FireSmart™ IRS.
What is the container calibration factor?

- Using a calibrated scale, the container empty weight = 0.9 kg
- The weight of the water filled container is = 10.7 kg
- The net weight of water is (10.7 – 0.9) = 9.8 kg
- The container calibration Factor is (999.6 ÷ 9.8) = 102 pails / m³

7. The Cast Density Scale

7.1. General

The kilogram scale used to measure the cast density of FireSmart™ IRS should be a hanging spring scale with a minimum weight capacity of 25 kilograms or a capacity practical for the calibrated container.

7.2. Frequency of Determining Accuracy and Accuracy Limits

The scale must be checked weekly. Repair and re-calibrate it should the scale accuracy measurements be greater than +/- 5.0%.

7.3. Accuracy Procedure

Use a known calibrated weight of at least 10 kg to calibrate the scale:

- The calibrated weight must be attached to the scale or placed on the scale a minimum of three times. Record the scale reading for each weighing.
- Calculate an average of the three scale readings. Subtract the average of the scale readings from the calibration weight. Calculate the percent difference between the two numbers. If the difference is greater than 5.0%, replace the scale or have it repaired before continuing to make cast density measurements.

$$\begin{array}{c} \text{10kg} \\ \text{Calibrated} \\ \text{Weight} \end{array} - \left(\begin{array}{c} \text{Reading 1} \\ 99\text{kg} \end{array} + \begin{array}{c} \text{Reading 2} \\ 10.2\text{kg} \end{array} + \begin{array}{c} \text{Reading 3} \\ 10.3\text{kg} \end{array} \right) \div 3 = 0.13\text{kg}$$

Conclusion: Spring balance within calibration tolerance.

