1.0 SCOPE

1.1 PURPOSE

The purpose of this document is to provide detailed information in relation to the application of cellulose insulation into Attics & Lofts and Stud Walls of Timber Frame dwellings. The document should be used in conjunction with the Ecocel Technical Data sheet.

1.2 POLICY

The policy of Ecocel is to ensure that all installations are carried out in accordance with current standards. We are also committed to compliance with all standards outlined by the Irish Agrement Board (IAB) with particular emphasis on the methods used by installers of Ecocel

BS 5803 specifies requirements for the application of thermal insulation in pitched roof spaces in new and existing dwellings. It covers both the insulation of an uninsulated roof and the application of additional insulation to increase the existing standard of insulation.

1.3 OBJECTIVE

The objective is to provide the installers with a detailed knowledge of the installation process and regulations relating to cellulose insulation into Stud Walls of Timber Frame dwellings and loft & Attic spaces. The manual consists of data relating to BS5803 standards as well as Ecocel specific procedures that are complimentary to the existing BS and IAB standards and certification criteria.

1.4 THE PRODUCT - BLOWN FIBROUS MATERIALS

The system shall comprise loose-fill material capable of being installed in the Wall/ Attic/Loft space by blowing, and a machine capable of installing the material at the specified thickness and density.

2.0 SITE PREPARATION

2.1 CONDITIONS OF ROOF SPACE

The following recommendations should be followed

- *Ventilation -* Ventilation of the roof and Wall space should be as outlined in section 4.0
- *State of repair -* There should be no obvious rainwater penetration or evidence of such penetration, no evidence of wet or dry rot in the Roof or Wall space
- *Loading of ceiling -* The ceiling should be capable of supporting the weight of the insulation and loads imposed during installation
- *Electrical wiring -* There should be no obvious defects in the electrical wiring. General guidance on the avoidance of overheating of electric cables is given in section 5
- *Metal corrosion -* There should be no obvious corrosion to the structural metal connections in the roof members

2.2 ASSESSMENT OF WORK REQUIRED IN ROOF SPACE & STUD WALLS

The client and the insulation installer shall establish the basis for the contract before starting work *NOTE: Attention is drawn to the requirements of the Unfair Contract Terms Act 1977 and the general common law duty of care to avoid injury to persons or property by negligent act or omission so far as is reasonably practicable.*

The following items should be among those established…

- Any requirements necessary to ensure that the conditions in clause 4 are met
- Areas to be insulated
- Type of insulation to be provided
- R value of the material to be installed, or the different values over the areas concerned where applicable
- That for the purpose of installation there is adequate access to the roof space/walls and adequate lighting. Where temporary access is to be formed, the details and method of reinstatement should be agreed
- The need to reposition or remove objects stored in the roof space, floor area to allow the full area to be insulated
- Storage and expansion tanks that require insulating and those that require lids to be fitted
- Water pipes that will be above the insulation and that require insulating separately
- To prevent inhalation of the dust – a suitable dust mask should be worn.
- Precautions should be taken to ensure the insulation material does not lead to contamination of the water tank
- Before starting – all holes at ceiling drops for pipes and other services shall be sealed.

3.0 APPLICATION - INSTALLATION PROCESS

The application of blown fibrous materials shall be carried out as follows

Ceiling Areas

I. Fill the hopper of the insulation machine with material and route a blowing pipe through the property to the roof space. This shall be done in such a manner as to prevent any damage or soiling of the property or its contents. The contents of the hopper shall be protected from the weather
II. Ensure the fibers are teased and aerated and propelled through a delivery hose at a correct material/air ratio to the furthest points of the roof space along the line of the ceiling joists. To ensure uniformity in thickness, this operation shall be undertaken from within the roof space where access permits
III. Ensure that the insulation does not enter the wall cavity and does not block the eaves ventilation
IV. Apply the material evenly and at a mean thickness such as to provide the R value after allowance for settlement
V. The number of bags of insulation used in the loft space shall be such that the maximum bag coverage indicated on the product label is not exceeded.

Sidewalls (Existing Buildings)

Installation into sidewall cavities must be made by pneumatic means. The air setting on the machine should be set as recommended by the machine manufacturer according to the size of the nozzle being used. After fill holes are drilled, all cavities should be checked for fire blocks or other obstructions with an electrician's fish tape of similar tool. A mathematical check should be made in the first few stud space to assure that the proper amount of insulation is being

Installed. (See Manufacturer's Coverage Chart).

Filling through external siding in applications of this type, the following procedure is recommended. Drill holes 5/8 inch to 2 inches (1.59 to 5.08 cm) in diameter, depending on the siding, in each wall cavity. Vertical distance between the holes and top or bottom plate should not exceed 2 feet (.62 m) and the vertical distance between holes should not exceed 5 feet (1.52 m). Homes with shingle or lapped siding should have the holes drilled as near the shadow line as possible. All holes should be filled with suitable plugs.

Filling with a fill tube in some applications is desirable When using this method, the fill tube should be inserted far enough to reach within 18 inches (45.72 cm) of the plate farthest from the point of entry. Fill tube size will depend upon the size of hole which can be drilled.
The insulation is sprayed into the wall cavities from inside the building. Many application systems are proprietary and are designed for use with specific products.

Sidewalls (New Construction)
The same installation techniques used with existing walls are occasionally employed in new construction, however insulation is usually installed in new walls before the walls are closed using spray-on or dry application techniques.

Cellulose insulation for spray-on application in new walls is classified as Type II Material . These materials may contain adhesive to produce cohesion necessary to make the insulation self-supporting. The adhesive may be liquid added during the spraying process, or it may be dry adhesive contained in the insulation and activated by moisture during application.
The insulation is sprayed into the wall cavities from inside the building. Many application systems are proprietary and are designed for use with specific products.
The manufacturer's instructions with regard to application equipment and its use should be followed explicitly, as should the manufacturer's instructions on the amount of liquid to be added during application. All pipes, ducts, conduits, wiring, and outlets should be installed in the wall before the insulation is applied. Windows and areas from which insulation is to be excluded, such as electrical boxes, should be masked.
After application the insulation is made even with the stud faces by a "stud scrubber." The wall can be closed shortly after installation of the insulation, however vapor retardant material, such as some types of paint and vinyl wall coverings, should not be applied to the inner surface of the wall until the insulation has reached moisture equilibrium. Most authorities agree that vapor retarders of any type should not be used with spray-applied cellulose. This recommendation may conflict with some building codes, but knowledgeable code officials under- stand the special nature of spray-on cellulose and normally grant exceptions when the material is used.

Various types of permanent retainer systems are used to install dry cellulose insulation in new walls. All systems are proprietary, and the manufacturers provide detailed instructions, and often special training programs, for their use.
All systems require pneumatic installation and compression of the material to sufficient density to prevent settlement. The Insulation Contractors Association of America recommends a density of 1.5 times nominal settled density for side wall installations. Some manufacturers recommend an installed density of at least 3.5 p.c.f. in side walls.

Dry cellulose insulation can be installed in new walls using temporary retainers that are clamped

in place to create a closed cavity. Insulation is blown into the temporary cavity at sufficient density to keep it in place when the retainer is removed. An installed density of 3.5 to 4.0 p.c.f. may be necessary

VAPOR RETARDERS

New Construction

Many building scientists question prescriptive use of vapor retarders, however some building codes con- tinue to require a vapor retarder on the warm side of insulated walls. Most cellulose manufacturers recommend against use of vapor retarders in walls insulated with spray-applied cellulose. CIMA is not aware of any endemic problems resulting from this practice.

A vapor retarder is not required under attic insulation when the attic is adequately ventilated. A vapor retarder must be used when the cold side of a ceiling cannot be ventilated (See Section 4 for Ventilation)

A ground surface vapor retarder such as plastic film is recommended when there is a crawl space beneath the floor. (See Section 4 for Ventilation)

Existing Construction

Most cellulose producers regard vapor retarders as unnecessary with dense-pack cellulose under most conditions. If design temperatures are below -15 degrees F. (-26 degrees C.), the interior surfaces of exterior walls and ceilings where the cold side cannot be ventilated can be painted with a vapor barrier forming paint.

A ground surface vapor retarder, such as plastic film, is recommended when there is a crawl space beneath the floor. (See Section 4 for Ventilation)

4.0 VENTILATION

Attics/Lofts

It is essential to ventilate every roof void above the roof insulation if condensation problems are to be avoided. Any evidence of condensation or mustiness in the loft means that ventilation is inadequate. If a sarking felt is fitted beneath the roof tiles, and there is no evidence of significant daylight penetration on each of the two opposing sides of the roof, ventilation may be inadequate and the following checks should be made:

i. Check that any existing insulation material is not blocking the eaves
ii. Check soffits externally, gaps on one or either side of the soffit will indicate access to the roof space for ventilating air flow.

A tiled or slated roof without sarking felt and substantially without parging will provide adequate ventilation. This will be obvious within the roof space if a light wind or greater is blowing outside. In all cases ventilation openings to each roof void should be provided at low levels at two opposite sides of the building wherever possible, usually at the eaves. Eaves ventilation for roofs above 15° pitch should be provided with openings equivalent to a continuous opening of not less than 10mm on each side. For roofs of 15° pitch or less, the ventilation openings should be equivalent to a continuous opening of not less than 25mm on each side.

Lean-to roofs not having two opposite eaves require ventilation at high level equal to a continuous opening of 5mm in addition to the low level eave provision. Mono-pitch roofs require openings at high level equivalent to a continuous opening of 5mm. Eaves ventilation openings are also to be provided at the steep side of mono-pitch roofs. Where habitable rooms are located in roof spaces, or whenever insulation is provided at rafter level, eaves ventilation and minimum

free air space clearances of the recommended sizes, should be provided above the insulation. In addition it is essential that high level ventilation openings are provided at or near the ridge equivalent in size to a continuous opening of 3mm.

The ventilation openings recommended are minimum provisions. There are advantages with certain constructions of increasing the ventilation provision in order to achieve air movement throughout the roof void. This is particularly true in duo pitched roofs with pitches of more than 20°, or in roofs with spans in excess of 10m. To reduce the risk of condensation in these cases, consideration should be given to the provision of roof void ventilation at high level, at or near the ridge. Ventilation at ridge level in such cases should be equivalent to a continuous opening of 3mm.

Ventilation openings may be located at irregular intervals provided they are of equivalent area to the continuous openings recommended and avoid the risk of local stagnant pockets of air in the roof void.

It is essential that eaves ventilation openings are not blocked by thermal insulation at ceiling level. Ventilation openings should be designed to prevent the ingress of rain and snow, birds and large insects such as wasps and bees and to provide a continuous weatherproof path from the roof void to the outside of the roof without impairing the weatherproofing function of the underlay and the roof covering.

If it is possible to provide the ventilation openings recommended then ventilating tiles may be used on the roof or suitably protected openings may be inserted in gable ends above the ceiling insulation. In order to provide air movement, it is necessary to locate ventilating openings of equivalent area to those recommended in this clause at both high and low level.

Proprietary eaves, tile, ridge or cowl ventilators should be fitted in accordance with the manufacturers instructions whilst ensuring that cross ventilation in the roof space is achieved by fitting tile or cowl vents as near as possible to the eaves. The Provision of high level ventilation is in all cases additional to the low level requirements stated and high level ventilators should never be used on their own as the suction effect created will otherwise increase the transfer of moisture from the dwelling below into the roof space. Where roofs are covered with slates or tiles, some fortuitous ventilation will occur but this is to be ignored when calculating ventilation openings. Fortuitous ventilation of this nature helps to disperse any moisture vapour which might otherwise be trapped above underlining materials; Materials in this position should be permeable to water vapour when located on the weather side of the insulation.

Sufficient thermal insulation should be included in or immediately above ceilings to ensure that the ceiling temperature is maintained above dew point and this should cover the external wall head to avoid cold bridges. The minimum free air space above the insulation should preferably be not less than 50mm, but in no case less than 25mm at any point.

Note:
See appendices 2a, 2b, 2c and 2d for illustration of required ventilation systems as outlined above.

5.0 ADVOIDANCE OF OVERHEATING OF ELECTRIC CABLES

5.1 General

All electric cables carrying current produce heat. The heat will dissipate into the atmosphere if the installation is exposed to air and the cable is carrying current within its nominal capacity. This capacity is known as the "full thermal current rating" of the cable. However if the cable is prevented from losing heat by surrounding it with thermal insulation, the temperature of the cable will rise unless the current being carried is reduced. This could cause softening of the cable insulation increasing the risk of a short circuit or fire. The cable may be selected to have a rating high enough to carry the full circuit load when de-rated by the recommended factor to allow it to be covered with thermal insulation without overheating. An appropriate over-current protective device, eg. A fuse, suitable for the de-rated cable should be incorporated into the circuit.

5.2 Prevention of overheating in cables

Where possible, before installing the insulation material between the joists – the cables should be suitably located away from the insulation so that they continue to be exposed to air. However there may be insufficient slack in the cables to allow this, in which case the insulation should be placed on top of the cables but pushed back by at least 75mm in both directions from bunched and heavy loading cables serving appliances such as heaters, cookers and showers. In the case of loose full insulation a physical restraint should be used, for example rigid boarding or non-magnetic metal rings take due care to protect the cables from any physical damage that may occur where they pass over such restraints. Alternatively the cables may be replaced with those to which an appropriate de-rating factor has been applied, and the circuits should be fitted with appropriate over-current protective devices, e.g. a fuse, in accordance with 5.1.

5.3 Other electrical apparatus

Bi thermal insulating material of any kind should not be placed over electrical apparatus which penetrates a ceiling, recessed luminaries, or their heat resisting final cable connections. Such luminaries and cables should be left exposed to the air for a minimum clearance distance of 75mm.

5.4 Junction Boxes

In the case of loose insulation a permanent physical restraint, as referred to in 5.2, should be employed. Entries to junction boxes should be protected if possible when using any loose-fill type of insulation that may be hygroscopic.

Precautions and Limitations

1. This insulation is not recommended for use in sidewalls below grade.
2. This insulation is not recommended for filling the cavities of masonry walls.
3. This insulation is to be used in the temperatures range of -50 degrees F. to 180 degrees F. (-45.6 degrees C to 82.2 degrees C.)

6.0 ECOCEL RECOMMENDED STAFFING ROLES & RESPONSIBILITIES

The installation is generally done by two people, one in the House and one in the Van.

Steps to install – Operator No 1 Van Operator
Operator No 2 House Operator

6.1 THE ROLE OF OPERATOR NO. 1

- 1st Operator is responsible for filling the blowing machine, and adjusting controls as requested by the 2nd Operator in the House.
- Hopper must be kept at least half full at all times. Ensure nothing potentially damaging falls into the machine.
- Installer must avoid letting material build up around the motor and fans of the blowing machine.
- Keep the area clean and tidy.
- Be attentive to the needs of the operator in the House.

6.2 THE ROLE OF OPERATOR NO. 2

- 2nd Operator is responsible for installing Ecocel to the depth required for the desired U Value. See detailed specification sheet.
- Adjust machine settings so that the blowers deliver the product without creating too much dust.
- Start at the furthest corners of Attic/Loft and work towards hatch.
- If no eaves vents are fitted, use temporary stop end to ensure a clean edge.
- Level the surface of the Ecocel Insulation with the swisher stick or stud scrubber as you go to give an even finish.
- Check bag rate at appropriate intervals and also at the end of the job to ensure correct levels are achieved.
- Where appropriate, lift electrical cables clear of insulation.
- Where appropriate, fill and install hatch-bag and draught sealer.
- Carefully blow fiber from tanks, stored items etc.
- Trim and fix hatch guard – and leave area clean and tidy.

6.3 PREPARATION CHECKLIST

I. Protect the dwelling with dust sheets, padding on corners etc.
II. Check that the attic/ floor area is clear of stored items or that they have been placed on a raised platform or removed.
III. Check that any existing insulation is correctly laid.
IV. Seal any plumbing or electrical cable holes in the ceilings and walls.
V. Fit guards around flues or recessed lights.
VI. Ensure any water tanks are covered and insulated
VII. Fit hatch guard if necessary.
VIII. Ensure that first fixings are complete, and the loft is clear.
IX. Check that insulation will not interfere with other trades (important on new buildings).
X. Where individual vents are used in the soffit, the rafter space immediately in front of and on either side of the vent should be provided with an air chute . Other spaces should be totally blocked.
XI. Where a continuous strip vent is used in the soffit, an air chute should be provided every third rafter space with the other spaces completely blocked.
XII. Small cavities around door and window frames should be insulated prior to the installation of the interior

covering. The material should not be forced into the cavity so tightly that frames are distorted.
XIII.

7.0 ASSESSMENT OF ROOF SPACE AFTER COMPLETION OF WORK

After insulation has been installed in the roof space, it shall be established that the following conditions are fulfilled.

I. That the roof space is adequately ventilated
II. All water tanks have been completely enclosed including lids and insulated unless they are located on the joists – in which case the insulation has not been laid underneath them
III. Exposed pipe work above the insulation has been insulated in accordance with BS 5422 to minimize the risk of freezing
IV. The access hatch has been permanently and independently insulated.
V. The insulation has not been laid directly over recessed luminaires. Combustible material is not in contact with flues or metal chimneys
VI. All loose electrical wires have been lifted and re-laid over the insulation where practicable
VII. The installer has removed his debris, packages etc from the site.

8.0 CERTIFICATION

The work must be carried out by an approved Installer of Ecocel loft insulation who shall, on completion of the work, provide the client with a signed and stamped certificate, containing the following

i. Installer's name and registered address
ii. Address at which the insulation was installed
iii. The date on which the work was carried out
iv. Whether the whole of the roof space was insulated, if not, the area insulated
v. The material used, the name of the manufacturer and the IAB Certificate Number.
vi. The R value at the installed thickness of roll material (or settled thickness of blown material) for each area concerned
vii. The thickness of the insulation (settled thickness for blown material) installed for each area concerned

NOTE

Labels should be pinned up in the roof space adjacent to the point of access

i. Details of any cold water tanks insulated
ii. Details of any water pipes insulated
iii. Advice on the action to be taken in the insulation material becomes damaged or wet
iv. Advice on whether the roof space is adequately ventilated or on additional ventilation required.

8.1 AUDITING PROCESS (Appendix No 1 audit report.)

As part of our ongoing business and in accordance with the IAB certification we are committed to supporting the installer by providing ongoing support in the form of

- Training course – Theory and Practical
- Documentation relating to regulations and certification
- Ongoing sites visits to assess installation methods in accordance with this manual and other legislative requirements.

Application to become an Ecocel Approved Installer must be made through Ecocel who will counter-sign it.

9.0 BUILDING REGULATIONS DATA AND INFORMATION

To achieve the current regulation standard of 0.16 in the attic – a depth of 220mm of cellulose is required.

Note: Lower U-value demonstrates best efficiency performance.

Current Standard

220mm = U of 0.16

Low Energy Standard

250mm = U of 0.14
275mm = U of 0.12

Passive House Standard

300mm = U of 0.11
350mm = U of 0.10

10.00 COVERAGE REQUIREMENTS – DIMENSIONS at installed density of 30kg/m^3

		Bag Yield
Standard Rate	220mm = 6.6 kg/m^2	2.2m^2 per bag
	275mm = 8.3 kg/m^2	1.8m^2 per bag
	300mm = 9.0 kg/m^2	1.6m^2 per bag
	350mm = 10.00 kg/m^2	1.5m^2 per bag

11.00 ISTALLATION EQUIPMENT – CHECK LIST

- A Krendle 250 or similar - mounted in a high roof van or trailer
- 50 meters of hose and remote control.
- An appropriate tool kit
- Plastic Sheeting / Dust sheets / Draught excluder
- Two way radio or some form of communication with other installer.
- Eaves stop.
- Boards for working platform

12.00 SUMMARY

Ecocel cellulose material is considered to be highly energy efficient and provides the home owner with tremendous opportunity to save money and create an environmentally friendly home insulation solution. To achieve optimum performance an effective installation is critical. Compliance with the steps outlined in this manual will facilitate you, the installer, to achieve best results.

See appendices and Ecocel Data Sheet for additional information.

APPENDIX 1 ECOCEL AUDIT REPORT

APPENDIX 2 INSTALLATION PHOTOS

APPENDIX 3 TRAINING COURSE CONTENTS