Insulating A Shipping Container As A Soup Kitchen: The Case of Masazane Soup Kitchen in Mbekweni Township

Shanon Lusinga, assisted by Jeremiah Pietersen

A "Rapid Research" Report facilitated by the UCT Knowledge Co-op [1]

July 2014

UCT KNOWLEDGE CO-OP

Table of Contents

1. Introduction

This report will provide a brief description of Masazane Soup Kitchen a feeding and social support initiative in Mbekweni Township. It will highlight the challenges faced by children living in this community. It will point out the challenges faced by Masazane Soup Kitchen emphasizing the need to transform the shipping container from which they operate. The report will provide a discussion on shipping containers, outline standard methods of insulation and provide suggestions on structures that can be used to add a shade area to the container.

a) Community Profile and need

Mbekweni 'place of respect' is a township that is located within the Paarl area in the Western Cape (HopeThroughAction, 2011). With an estimated population of 30,000 people (Tremendous Hearts, 2014), 40% of the population is estimated to be below the age of 15 and more than 50% of the population is unemployed (HopeThroughAction, 2011). Mbekweni is challenged by high levels of poverty, food insecurity, high levels of crime and HIV/AIDS (Tremendous Hearts, 2014). The high levels of food insecurity in this community are also related to the fact that the most common forms of employment are part-time and seasonal work (Tremendous Hearts, 2014). Unfortunately these challenges tend to directly affect children who are a vulnerable population and are in need of care and nurture. The children in this community are confronted by poor access to education, nutritious meals, and are exposed to several forms of abuse and neglect.

b) Masazane Soup Kitchen

Masazane soup kitchen is a feeding and social support initiative that is located in Mbekweni (Tremendous Hearts, 2014). The initiative was started by a group of six elderly women wanting to help the children in their community and in surrounding communities. Initially the programme started with 150 children for which the women provided meals and support services. However, since 2011 after collaborating with Tremendous Hearts and Rondebosch United Church, this group of women are currently providing healthy meals to 350 children five days a week.

To gain better understanding of their clientele Tremendous Hearts carried out a small study of the beneficiaries of Masazane soup kitchen. The study revealed that just under 50% of the children live in single parent households, about 20% are orphans, 30% are living with HIV positive adults and that a similar percentage of the children are believed to be HIV positive themselves. These findings highlight the need for improved services provision in Mbekweni.

c) Problem statement

Masazane Soup kitchen is currently operating from a shipping container that was converted into a kitchen. The shipping container, however, is not insulated. As a result the inside temperatures are reported to be extremely hot in summer and extremely cold in winter. Furthermore, the shipping container does not provide a veranda-like structure to provide people standing close to the structure with protection from unpleasant weather elements while waiting to be served or eating. There is a need to insulate the shipping container to provide an improved working environment. There is also a need to attach a shade or shelter to the container to protect the children from the weather while they wait outside.

2. Shipping containers

The reuse of shipping containers in today's society has not only become a means of providing commercial spaces but it is increasingly becoming a means of improving the living conditions for people (Chamber, 2012). Shipping containers have become a source of affordable and innovative space solutions as they are being used to provide housing for those in need, for example the New Jerusalem Children's Home that was created out of shipping container (New Jerusalem Children's Home, 2014). They are also being used to improve social service provision for example soup kitchens housed in shipping containers (Imbasa Educare, 2011).

Shipping container: characteristics

A model shipping container is a steel structure that has 'five closed sides and an opening at one end with a double leaf door' (Brandt, 2011: 3). Shipping containers come in several sizes depending on their use. Bearing in mind that shipping containers are originally intended to store and move cargo across the world, one has to think about the advantages and disadvantages of using them as living and working spaces (Brandt, 2011). Advantages include 'strength and durability, modularity, transportability, availability and cost' and disadvantage 'temperature, labour and difficulties with contraction sites' (Brandt, 2011: 10).

In order to arrive at a favourable working or living space, the shipping container has to be transformed by addressing the abovementioned factors.

Taking into consideration that shipping containers are made of steel, achieving suitable optimum living or working temperatures is cited to be one major challenge (Brandt, 2011). The interior temperatures of a shipping container maximise exterior temperature such that in summer the container has extremely high temperatures and in winter the container has extremely low temperatures (Brandt, 2011).Thus it is important to create barriers that control heat loss and heat gain in order to provide a comfortable working or living space (Brandt, 2011). Insulating the shipping container is one method that is used to achieve such conditions

Insulation

Insulation involves the use of a material or a combination of materials to reduce heat loss and/or heat gain (Thermal Insulation Association of South Africa [TIASA], 2010). In so doing it keeps a structure cooler in summer and warmer in winter (TIASA, 2010). It also serves the purpose of controlling 'surface temperatures for personnel protection and comfort'; it reduces damage in the event of fire or exposure to corrosive atmospheres and increases operating efficiency of heating/cooling (Thermal Insulation Association of Canada [TIAC], 2013). Insulation therefore aims to 'improve the energy efficiency of a home or a building' (Tiasa, 2010: 23).

3. Energy poverty and development

The City of Cape Town Smart Building Handbook (2012: 20) states that insulation is one of 'most important components of energy efficiency in any building'. Bearing in mind that South Africa is largely affected by energy poverty, it is therefore important that building structures use innovative and renewable resources to improve access to energy and to reduce energy costs (International Energy Agency, 2010).

4. Factors to consider when choosing insulating material

When considering the type of insulation to use, one must first consider the R-value of the insulation materials (Brodaski, Campanelli & Zabinski, 2010: 31). The term R-value refers to the rate at which a material can resist heat flow, 'the higher the value the greater the resistance to heat flow' (Brodaski et al., 2010: 31). To find out the R-value that is needed the following factors must be considered: (i) the specific needs of the room and (ii) the type of

systems used for heating and cooling (Brodaski et al., 2010, TIASA, 2010). One should also consider the total life span performance of the insulation material, the materials ability to protect against fire and absorb moisture (Tiasa, 2010).

According to the City of Cape Town Smart Building Handbook (2012) it is also important to consider the environmental impact insulation materials have, hence recycled materials and ozone friendly materials are advocated for.

5. Types and forms of insulation

Insulation material should be in compliance with appropriate national standards and regulations including fire safety requirements given in SANS 10400-T and SANS 428 and the recommended R values for the relevant climatic zones in accordance with SANS 204 (TIASA, 2010). The types of thermal insulation are bulk insulation, reflective foil laminate insulation (RFL) and composite bulk insulation (combined bulk and reflective material) (TIASA, 2010).

a) Bulk Insulation

Bulk insulation mainly retards the movement of heat by trapping air within space of the insulating materials (TIAC, 2013; TIASA, 2010). It includes materials such as polyisocynaurate, stag wool, polyurethane, rock fiber, polystyrene, cellulose fiber and glass fiber (TIASA, 2010).

b) Reflective Foil Laminate Insulation (RFL)

These materials are made of aluminium foil laminates. They buffer against heat flow when ‘applied in combination with air space’ hence RFL ‘are valuable when used in combination with bulk insulation’ (TIASA, 2010:29). The materials should positioned with the brighter side facing downwards to reduce the level of conduct heat transfer and level of emitted radiant heat (TIASA, 2010). The material has excellent thermal performance, protect against dust, water and sun U.V rays, however performance is affected by damages such as openings, creasing and holes (TIASA, 2010).

This form of insulation is ‘more effective at reducing summer heat gain than reducing winter heat losses (TIASA, 2010).

Refer to Appendix 1 for a tabulated summary of several forms of insulation material. These materials were taken from the TIASA (2011) handbook.

c) Other forms of insulation

Several other materials can be used for insulation. Examples include egg cartons (Barnes, 2012), bubble wraps, blankets, duvets and rags hang of stretch wire (Chamber, 2014). The most commonly used and best form of insulation however, is spray type insulation (yourshippingcontainerhome). One could also use light and bright colours on the container either for painting the container or materials inside the room (Chamber, 2014).

It is recommended that a professional be consulted before attempting any technique.

6. Protecting the children from the weather elements

In order to protect people outside a building or housing structure from unpleasant weather elements, the roof is designed in such a way that it provides such protection (Brandt, 2011). Shipping container homes/offices take this architectural consideration when redesigning the container (Chambers, 2014). Although the shipping container for Masazane soup is not being remodelled, several strategies can be used to provide the needed shade area to protect the children from unpleasant weather.

The following strategies can be used such as awnings, attaching an unused container door to the outside wall of the container, shade sails, portable carports and fabric shade. Refer to Appendix 2 for details.

7. Service Options and recommendatio0ns

The following have been selected from the available options as most suitable for Masazane:

For insulation

1. ***Isolite***

    a. They provide 40mm thick polystyrene panels (Isolam panel) @ R60.00 per m^2 plus VAT.

    b. 5 m long H split section (framework) @ 108.00 each plus VAT.

Quotation for total cost for a standard 20’ container: **R4, 537.00**.

(This amount excludes labour.)

2. ***Thermoshield*** provides white thermoshield paints.

   Quotation for total cost for a standard 20' container: **R5,000. 00**.

   (This amount includes paints/preparation/VAT.)

3. ***Sondor*** suggested they might donate the material and other costs. Please refer to attached email correspondence.

For shade structure

4. ***Covertech*** provides water resistant fabric.
   Quotation for total cost for a 6.5 m x 3.0 m structure: **R 8,500.00.**

5. ***Alnet*** provide
   a. 100% waterproof 25m long x 3m wide @ R115.00 per meter excluding VAT.
   b. 95% extra block 32m long x 3m wide @ R 71.00 per meter exclusing VAT.
   c. 86% sunblock 50m long x 3m wide @ R52.00 per meter excluding VAT.
   d. Off cut A-grade material @ R20.00 per kg.

   Application is do it yourself.

Recommendations

- For insulation it is recommended that the Tremendous Hearts and Masazane Soup Kitchen follow up with Sondor on their offer to donate insulation material.
- For a shade structure it is recommended that Tremendous Heart and Masazane Soup kitchen purchase suitable off-cuts from Alnet.

8. References

Awnings: Clever Cover Solutions. Retrieved July 5, 2014, from http://www.awnmaster.co.za/Awnings/tabid/64/Default.aspx

Barnes, C. (2012). Repurposing Ideas: 5 surprising new uses for egg cartoons. Retrieved July, 5, 2014, from http://www.huffingtonpost.com/chris-barnes/repurposing-ideas-egg-cartons-uses_b_1446539.html

Brandt, N. (2011). Plugging In: Reinterpreting the Traditional Housing Archetype Within a Community Using Shipping Containers. (Master's thesis, University of North Carolina). Retrieved from http://libres.uncg.edu/ir/uncg/f/Brandt_uncg_0154M_10849.pdf

Chamber, P. (2014). Shipping container house. [Video file]. Retrieved from July 3, 2014, from https://www.youtube.com/watch?v=wJSNH9Svjmg#t=12

City of Cape Town Smart Building Handbook. (2012). A guide to green building in Cape Town. Retrieved from http://www.capetown.gov.za/en/EnvironmentalResourceManagement/Documents/Smart-Building-Handbook_2012-06.pdf

Hope Through Action. (2011). Changing lives bringing hope. Retrieved July 4, 2014 from http://www.hopethroughaction.com/our-work/mbekweni-community-sports-centre/.

Imbasa Educare. (2011). Container Kitchen. [Video file]. Retrieved March 2, 2014, from https://www.youtube.com/watch?v=AR0xR9sY-1A

International Energy Agency. (2010). How to make modern energy access universal. Special early excerpt of the World Energy Outlook 2010 for the Un General Assembly on the Millennium Development Goals. Retrieved from http://www.se4all.org/wp-content/uploads/2013/09/Special_Excerpt_of_WEO_2010.pdf

Michna, P. (2014) Shipping container home. [Blog post]. Retrieved July 3, 2014 from http://earthsci.org/education/fieldsk/container/container.html

New Jerusalem Children's home. (2014). Championing the rights of children. Retrieved July 5 from http://newjerusalemchildrenshome.org/

O' Reily, N. (2014). Shipping container living. [Blog post]. Retrieved July 2, 2014 from http://www.shippingcontainerliving.com/small-modular-homes.html#.U7fYipSSwuc.

Palmer. G. D. 2014. What types of material are outdoor awnings made of? [Web log post]. Retrieved July 4, 2014, from http://homeguides.sfgate.com/types-material-outdoor-awnings-made-of-48987.html

RHI: Strecth Tent Manufacturer. Retrived July 5, 2014, from http://www.rhitents.com/

Taylor, L. H. (2014). What is an Awing? [Web log post]. Retrieved July 5, 2014, from http://poolandpatio.about.com/od/poolremodeling/a/What-Is-An-Awning.htm

Thermal Insulation Association of Canada. (2013). Mechanical Insulation Best Practices Guide. Retrieved from http://www.tiac.ca/downloads/best-practices-guide/BestPracticesGuide_E.pdf

Thermal Insulation Association of South Africa. (2010).The Guide to Energy Efficient Thermal Insulation in Buildings. Retrieved from http://www.aaamsa.co.za/images/Technical%20Publications/TIASA/TIASA%20GUIDE%202010%20Low%20Res.pdf

Your shipping container home. Insulating your shipping container home. [Blog post] Retrieved July 3, 2014 from http://www.yourshippingcontainerhome.com/insulating-your-shipping-container-home/

Other Videos for further reference

Bulk and Foil insulation:

Chamber. P. (2014). Shipping Container House-insulating the shipping container living room. [Video file]. Retrieved July 5, 2014, https://www.youtube.com/watch?v=zo05BBmaWqs

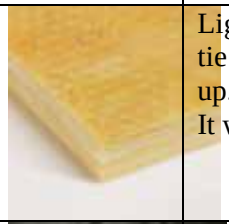
Spray foam:

Gregori, R. (2014). Closed Cell Spray Foam-40 Shipping Container. [Video file]. Retrieved July 5, 2014, from https://www.youtube.com/watch?v=UVGkR415ZXQ

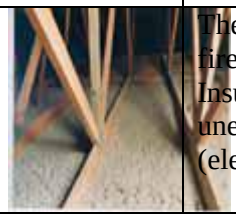
Appendix 1: Insulation Materials:

Table adapted from TIASA (2010)

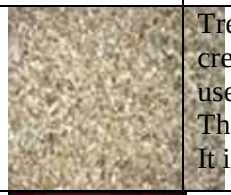
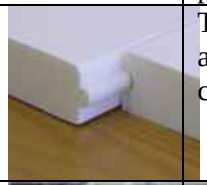
Batt Blanket and Matt Insulation

Material		Characteristics	Challenges
Glass Fiber (Glasswool) - made from molten glass and resin and formed into blankets, mats or rolls Max operating temperature 350°C.		Light weight material that is suitable for standard tie beams and stud spaces. It easy to cut and set up. It will not slump if installed correctly.	Glass fiber can cause irritation to the, skin, respiratory system and eyes. Manufacturers manual to be followed strictly if done yourself. Performance affected by moisture
Mineral Wool (Slag/Rock Wool/Stonewool) -made from molten industrial slag, limiting maximum operating temperature 850°C		The appearance and texture of mineral wood is similar to that of glass fiber. It is heavier/thicker than glasswool and therefore has a higher R-Value per unit. The materials can resist high temperatures. (fire resistance)	These materials can cause irritation to the, skin, respiratory system and eyes. Manufacturers manual to be followed strictly if done personally. Rock wool is more costly than glasswool.
Polyester Fiber - made from recycled polyester fibers including (PET plastic bottles) Maximum limited operating temperature 150°C.		It is easy to cut and set up	The materials melt and shrivel when exposed to fire.
Polyester Fiber batts - combination of polyester fiber and kenaf (renewable plant)		It is has no known physical or health side effect including irritability. Product comes in 24-100kg/m³ batts or a 50-300kg/m³ boards	

Loose Fill Insulation

Material		Characteristics	Challenges
Cellulose Fiber - manufactured from shredded recycled paper		The material is treated to resist fungal growth and fire. Insulation suitable for giving uniformity to unevenly shaped areas and around obstructions (electrical wires and nails etc).	If the insulation is not blown to manufacturer's recommended density and thickness it can settle over time, and the intended R-Value will not be achieved and maintained.

Rigid Board Insulation

Material		Characteristics	Challenges
Vermiculite - closely related to mica and it comes in two forms		Treated vermiculite when coated with asphalt creates a material that is water repellent and can be used in areas with high moisture. The material is has no irritation properties. It is odourless and non-combustible.	Untreated vermiculite acts in the opposite manner as it absorbs water. The material dries up very slowly. Despite having a high density is it rarely used when seeking high R-values.
Expanded Polystyrene (EPS) - made from pentane gas Limited surface operating temperature 100˚C		It is a lightweight, plastic foam insulation that is easy to install. It is fire retardant, moisture resistant and recyclable. It has no toxic properties and has good thermal properties.	
Extruded Polystyrene (XPS) - made from polystyrene foam and comes in two forms Limited surface operating temperature 100˚C		The high density material is suitable for insulating areas that are exposed to high temperature such as cavities in brick wall and slab-edges.	When exposed to excessive sunlight the material will break down and lose it use. It must be protected from substances that will breakdown the material.
Polyurethane and Polyisocyanurate - made from poly-alcohols and isocyanurates		When used on the inside of a structure, the material should be protected with a fire resistant material for example dry wall.	The material should be protected from excessive sunlight and water. It is relatively expensive and therefore used in limited spaces that require high R values.
Phenolic Foam - made from phenol formaldehyde resin, and is available as either an open or closed cell product		It is suitable for wall sheathing, and for use on the interior, both above and below grade. Use is generally limited to areas which require a high R-Value, but where space is very limited.	The material should be protected from excessive sunlight and water.

Spray Foam Insulations

Material		Characteristics	Challenges
Polyurethane Foam - mixed onsite for large application - also come in small cans for small applications (doors, windows)		The foam acts as a barrier to sound but not a barrier to moisture. When is it used in the interior of the structure, it should be protected with fire resistant material, for example dry wall.	The material should be protected from excessive sunlight and water.

Appendix 2: Strategies for shade area

Awnings-this is an overhanging structure that is attached to the outside wall of a building to protective extra ceiling or shade (Taylor, L. H. 2014). They can be made of metal, natural fibers, vinyl, fibreglass or acrylic (Palmer, G.D. 2014).


Picture from awnmaster (2014).

Container doors as cantilever- unused doors of a container can be attached to the outside wall as an overhang to provide protection from the weather (O'Reilly, 2014).


Picture from O'Reilly, 2014.

Portable carport- carport material can be used to protect the container and provide extra shade area **(Michna, 2014).**

Shade sail-this is sails cloth sold in rolls that can be secured to the container to provide the container and immediate surrounding areas with weather protection (Chambers, 2014).


Picture from Chamber (2014).

Fabric shade-there is stretch tent material that provides excellent outdoor protection from weather elements (RHI stretch tent manufacturers, 2014).


Picture from RHI stretch tent manufactures (2014)