TECHNICAL ORIENTATIONS
FOR BUILDING BACK SAFER INTERVENTIONS
Draft 24th April 2019
### Types of Walls

<table>
<thead>
<tr>
<th>Type</th>
<th>Beira (%)</th>
<th>Sofala (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adobe bricks</td>
<td>48%</td>
<td>16%</td>
</tr>
<tr>
<td>Sticks/Adobe</td>
<td>33%</td>
<td>46%</td>
</tr>
<tr>
<td>Reed/straw</td>
<td>18%</td>
<td>32%</td>
</tr>
<tr>
<td>Concrete Blocks</td>
<td>1%</td>
<td>6%</td>
</tr>
<tr>
<td>Others</td>
<td>3%</td>
<td>46%</td>
</tr>
</tbody>
</table>

**Adobe bricks**
- Beira: 1% (Sundried earth bricks, *bloco de adobe*)
- Sofala: 6% (Sticks + adobe, *paus maticados/pau a pique*)

**Reed/straw**
- Beira: 8% (Canes / sticks / bamboo / palm, *canico/paus/bambu/palmeira*)
- Sofala: 27%

**Concrete Blocks**
- Beira: 49% (Cement / rebars, *bloco de cimento/ferro*)
- Sofala: 17%
Lusalite (Asbestos) roof present specific environmental concerns.

A consultant seconded by MSB / Swedish Red Cross to the Shelter Cluster will be deployed by the first week of May (final date to confirm) for approx. 1 – 2 months.

ToR:
- Guidance on asbestos risks and possible interventions
- Capacity building training

**Types of Roof**

- **Sofala**
  - Thatched/Straw (straw/palm leaves) 62%
  - CGI (iron sheet) 26%
  - Lusalite 8%

- **Beira**
  - Thatched/Straw (capim/colmo/palmeira) 10%
  - CGI 60%
  - Lusalite 20%
### Levels of Damage Per Type

The objective of the matrix (at the moment an initial draft) is to define types of damages (expanding the GoM categories). Standard interventions packages could be defined taking as a reference the damage categories.

<table>
<thead>
<tr>
<th>PART</th>
<th>DETAILS</th>
<th>MINOR / NO DAMAGES</th>
<th>LIGHT DAMAGES</th>
<th>HEAVY DAMAGES</th>
<th>COMPLETELY DESTROYED</th>
</tr>
</thead>
<tbody>
<tr>
<td>ROOF + CONNECTIONS</td>
<td>CGI</td>
<td>Roof Structure in good conditions</td>
<td>Roof Structure in good conditions</td>
<td>Roof Structure in bad conditions</td>
<td>Roof and structure are destroyed</td>
</tr>
<tr>
<td></td>
<td>THATCHED ROOF</td>
<td>CGIs / lusalite / thatch still on the roof (need extra anchoring)</td>
<td>Some CGIs / lusalite / thatch flown away or broken</td>
<td>Roof cover (CGI, Thatched, lusalite) is partially/totally destroyed</td>
<td></td>
</tr>
<tr>
<td></td>
<td>LUSA LITE</td>
<td>Connections walls/roof in acceptable conditions</td>
<td>Majority of the connections walls/roof in acceptable conditions. Some connections are weak or to replace</td>
<td>Walls/roof connections need improvement</td>
<td></td>
</tr>
<tr>
<td>WALLS + STRUCTURE + FOUNDATIONS</td>
<td>CEMENT BLOCKS</td>
<td>Structure standing Walls with no or minor damages</td>
<td>WALLS / FOUNDATIONS - Structure still standing and in acceptable conditions (need some reinforcement) - Walls with few damages, broken parts &lt;20%</td>
<td>Structure partially destroyed, but possible to repair Walls with damages &gt; 40%</td>
<td>Walls and structure are destroyed</td>
</tr>
<tr>
<td></td>
<td>STICKS / ADOBE</td>
<td>Structure standing Walls with some damages</td>
<td>Structure standing Walls with some damages</td>
<td>Structure partially destroyed, but possible to repair Walls with damages &gt; 40%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ADOBE BRICKS</td>
<td>Structure standing Walls with some damages</td>
<td>Structure standing Walls with some damages</td>
<td>Structure partially destroyed, but possible to repair Walls with damages &gt; 40%</td>
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<td>PART</td>
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<td>------</td>
<td>---------</td>
<td>--------------------</td>
<td>---------------</td>
<td>---------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>CGI</td>
<td>Roof Structure in good conditions</td>
<td>Roof Structure in good conditions</td>
<td>Roof Structure in bad conditions</td>
<td>Roof cover (CGI, thatched) is partially/totally destroyed</td>
<td>Walls and structure are destroyed</td>
</tr>
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<td>THATCHED ROOF</td>
<td>CGIs / lusalite / thatch still on the roof (need extra anchoring)</td>
<td>Majority of the connections walls/roof in acceptable conditions. Some connections are weak or to replace</td>
<td>Majority of the connections walls/roof in acceptable conditions. Some connections are weak or to replace</td>
<td>Walls/roof connections need improvement</td>
<td>Walls and structure are destroyed</td>
</tr>
<tr>
<td>LUSALITE</td>
<td>Connections walls/roof in acceptable conditions</td>
<td>Connections walls/roof in acceptable conditions</td>
<td>Connections walls/roof in acceptable conditions</td>
<td>Connections walls/roof in acceptable conditions</td>
<td>Walls and structure are destroyed</td>
</tr>
<tr>
<td>WALLS + STRUCTURE + FOUNDATIONS</td>
<td>CEMENT BLOCKS</td>
<td>Structure standing Walls with no or minor damages</td>
<td>Structure standing Walls with some damages</td>
<td>Structure standing Walls with some damages</td>
<td>Structure partially destroyed, but possible to repair Walls with damages &lt; 30%</td>
</tr>
<tr>
<td></td>
<td>STICKS / ADOBE</td>
<td>Structure standing Walls with no or minor damages</td>
<td>Structure standing Walls with some damages</td>
<td>Structure standing Walls with some damages</td>
<td>Structure partially destroyed, but possible to repair Walls with damages &gt; 40%</td>
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</tbody>
</table>
THE REALITY IN THE FIELD IS......

Many families are already rebuilding with very limited resources. To disseminate Build Back Safer messages, good construction practices and to provide technical support to improve the resistance of the houses is a priority.
1- Roof
2- Walls / Roof connections
3- Walls / Corners / Foundations
4- Doors / Windows
PROPOSED INTERVENTIONS
Governmental Agencies   INGC   UN Habitat

1. Compactar a base do cabuco!

2. Profundidade mínimo do cabuco = 60 cm
   Largura do cabuco = 70 cm

3. AMARRAR UM PAU CRUZADO COM O POSTE VERTICAL PARA REFORÇAR A FUNDAÇÃO!!
   Comprimento: 50 cm
   Posição: 40 cm desde a funda do cabuco

Como podemos reconstruir melhor?
A BASE DA CASA

Como podemos reconstruir melhor?
O LOCAL PARA CONSTRUIR

1. Construir a casa afastada das árvores, já que podem cair durante o ciclone!!

2. Construir fundações profundas e elevar a casa para proteger a casa da água!!

3. Construir a casa longe das águas do rio ou do mar para evitar ficar danificada pela cheia e as ondas!!

A FORMA DA CASA

Como podemos reconstruir melhor?
A COBERTURA DA CASA

1. Colocar diagonais na cobertura como reforço!!

2. Prolongar a cobertura nos laterais com uma estrutura de barrotes e capim!!

3. Assegurar o capim com fitas vegetais!!

Como podemos reconstruir melhor?
O TECTO DA CASA

1. Coberturas de quatro águas e inclinação maior de 30° resistem melhor aos ventos fortes!!

2. Uma varanda prolongada protege melhor as paredes da chuva!!

3. Uma varanda separada da cobertura resiste melhor aos ventos fortes!!

A VARANDA PROTEGE MELHOR AS PAREDES DA CHUVAA!!

AS JANÍEUS PROTEGIDAS COM TAMPA DE MADEIRA RESISTEM MELHOR A PRESSÃO DO VENTO!!

AS JANÍEUS PROTEGIDAS COM TAMPA DE MADEIRA RESISTEM MELHOR A PRESSÃO DO VENTO!!

Uma planta compacta e simétrica é mais resistente

Utilizar reforços diagonais nas paredes

Beira (Mozambique) - 24/04/2019
Como Podemos Reconstruir Melhor?

A BASE DA CASA

1. PROFUNDIDADE DO CABOUÇO = 70 CM
   COMPACTAR A BASE
   DUPLICAR OS BLOCOS DA FUNDAÇÃO

2. CONSTRUIR UMA PLATAFORMA
   DE 30 CM DE ALTURA!

3. COMPACTAR BEM AS CAMADAS
   DA PLATAFORMA!

AS PAREDES DA CASA

1. REFORÇAR OS CANTOS COM
   CONTRAFORTES DE BLOCOS!!

2. COLOCAR CONTRAFORTES
   NA JUNÇÃO DAS PAREDES!!

3. FAZER UM BOM REBOCO
   PARA PROTEGER AS PAREDES!

A COBERTURA DA CASA

1. ROLONGAR A VARANDA
   PARA PROTEGER AS PAREDES
   DA CHUVA!!

2. MINIMIZAR O ESPAÇO ENTRE
   AS LONGARINAS!!

3. COBERTURA
   BEM AMARRADA E REFORÇADA
   COM CORDAS VEGETAIS

AGREGAR PILARES
PARA ASSEGURAR A COBERTURA
CONTRA OS VENTOS FORTEs!!
Possible interventions on existing houses:
- Reinforcement and bracing of the walls
- Reinforcement of the corners and connections of the walls
OTHER POSSIBLE INTERVENTIONS

FOUNDATIONS REINFORCEMENT
OTHER POSSIBLE INTERVENTIONS

REINFORCEMENT OF ROOF / STRUCTURE CONNECTIONS

ROOF BRACING AND CONNECTIONS OF THE COVER (CGI, THATCH) TO THE ROOF STRUCTURE
TOOLBOX:
Some basic tools and construction materials (total cost approx 100 USD), together with Build Back Safer trainings, will allow the HHs to improve the shelters they’re already rebuilding.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>UNIT</th>
<th>QTY</th>
<th>UNIT PRICE</th>
<th>TOTAL PRICE</th>
<th>TOTAL PRICE</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hammer (Martelhão)</td>
<td>pes</td>
<td>1</td>
<td>100</td>
<td>6,67</td>
<td>480</td>
<td>6,67</td>
</tr>
<tr>
<td>Machete (Catana)</td>
<td>pes</td>
<td>1</td>
<td>150</td>
<td>2,52</td>
<td>150</td>
<td>2,50</td>
</tr>
<tr>
<td>Hoe (Finauda)</td>
<td>pes</td>
<td>1</td>
<td>300</td>
<td>6,01</td>
<td>300</td>
<td>6,00</td>
</tr>
<tr>
<td>Pliers (Camadas)</td>
<td>pes</td>
<td>1</td>
<td>300</td>
<td>5,00</td>
<td>300</td>
<td>5,00</td>
</tr>
<tr>
<td>Saw (Serrote)</td>
<td>pes</td>
<td>1</td>
<td>250</td>
<td>4,17</td>
<td>250</td>
<td>4,17</td>
</tr>
<tr>
<td>Shovel (Pala)</td>
<td>pes</td>
<td>1</td>
<td>320</td>
<td>5,33</td>
<td>320</td>
<td>5,33</td>
</tr>
<tr>
<td>Nails (Pregos) 10 cm - 4&quot; galvanized</td>
<td>kg</td>
<td>2</td>
<td>250</td>
<td>4,17</td>
<td>500</td>
<td>8,33</td>
</tr>
<tr>
<td>Nails (Pregos) 5 cm - 2&quot; galvanized</td>
<td>kg</td>
<td>2</td>
<td>250</td>
<td>4,17</td>
<td>500</td>
<td>8,33</td>
</tr>
<tr>
<td>Umbrella Nails (Pregos de chape)</td>
<td>kg</td>
<td>2</td>
<td>300</td>
<td>5,00</td>
<td>600</td>
<td>10,00</td>
</tr>
<tr>
<td>Rope (Corda) 6 mm, nylon, roll 100 mts</td>
<td>roll</td>
<td>1</td>
<td>160</td>
<td>9,33</td>
<td>160</td>
<td>9,33</td>
</tr>
<tr>
<td>Binding wire (Acomo) roll 5 kgs (approx 200 mts)</td>
<td>roll</td>
<td>1</td>
<td>350</td>
<td>5,83</td>
<td>350</td>
<td>5,83</td>
</tr>
<tr>
<td>Rebar (Varao) 6 mm, length 5 mts</td>
<td>pes</td>
<td>4</td>
<td>160</td>
<td>6,67</td>
<td>660</td>
<td>26,67</td>
</tr>
</tbody>
</table>