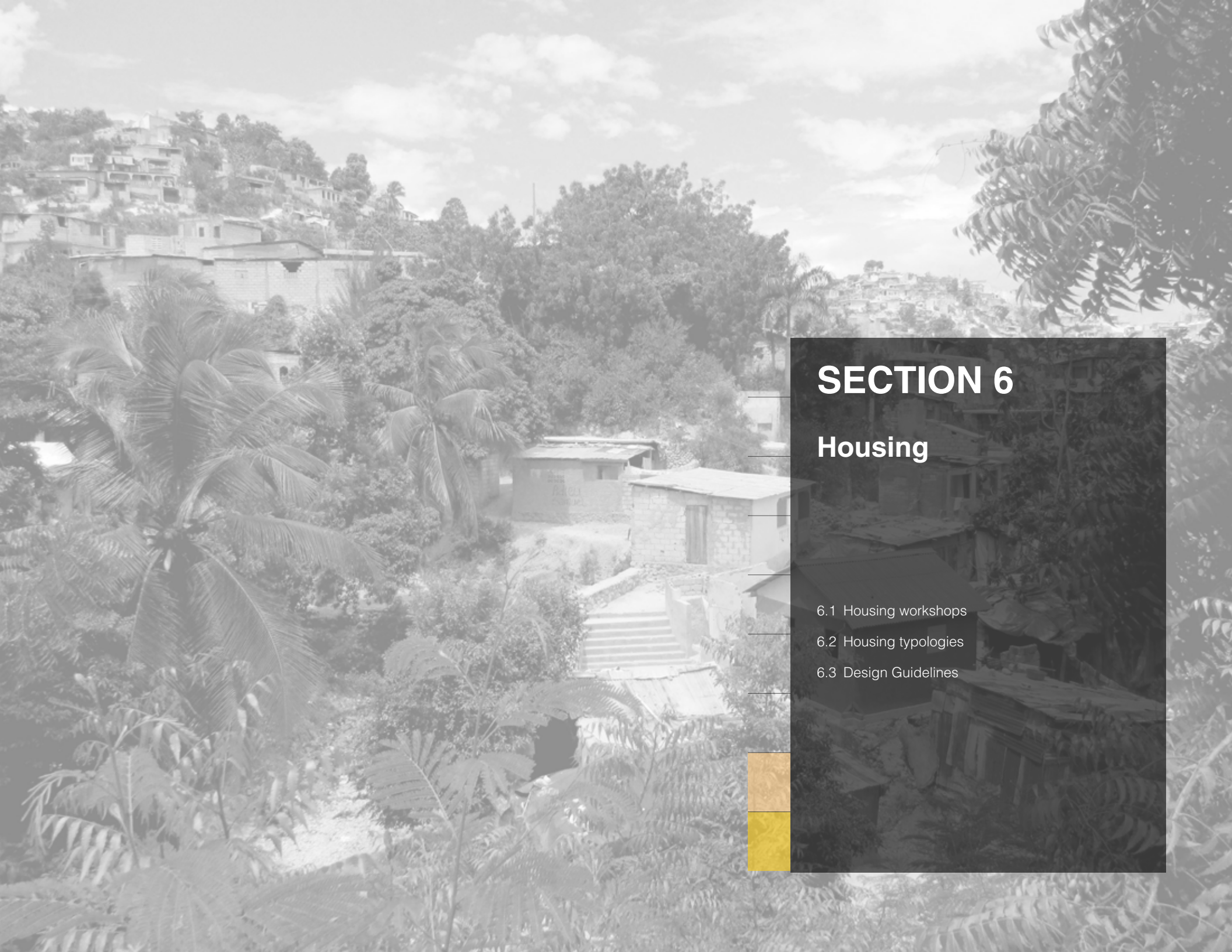


SECTION 6

Housing

6.1
Housing workshops

Membres de la communauté présentent leur vision du quartier

Architecture for Humanity a organisé deux ateliers sur le logement avec la communauté de Grand Ravine, les ateliers ont eu lieu le jeudi 9 et le vendredi 10 Janvier 2014 dans les locaux de la FOKAL au Parc de Martissant. L'objectif de ces rencontres est de comprendre les modes de vie des résidents de cette communauté et la façon dont ils perçoivent l'espace habité afin de pouvoir préparer des typologies de logement qui vont mieux s'adapter aux us et coutumes de la population et qui vont refléter leur vision pour le quartier.

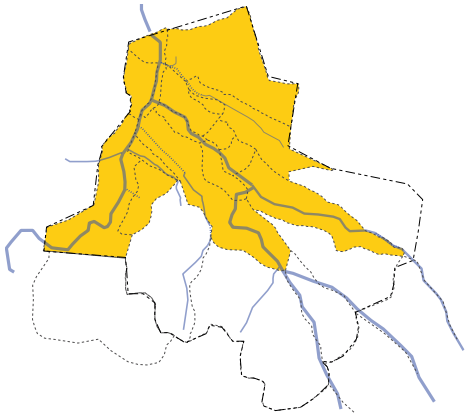
Plus de 40 résidents de Grand Ravine ont participé dans les activités. Le premier jour l'atelier a été réalisé avec des personnes venant des sous-quartiers les plus denses comme: Morne Jean Pierre, Jasmin, Ismaëlie, Cité des Artistes 1 et 2, Corridor Raoul, Entrée Vasquez, Impasse Vasquez, Nan Mazonbèl, Orphelinat, Cité Coicou, Kokiba et Anba Mapou.

Le deuxième jour les memes exercices ont été réalisé avec les résidents des sous-quartiers moins denses tels que: Bellevue 1 et 2, Montagne de la paix et Morne de Lalue. Le but de cette division était de recueuillir les impressions de résidents venant des quartiers avec de caractéristiques différentes.

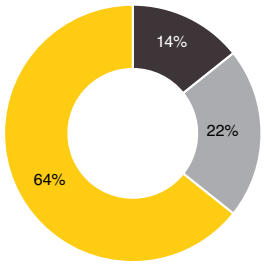
Première activité - Questionnaire

Une série des questions ont été posés aux participants, pour faciliter la comprenssion le tout était rédigé en créole et sous forme d'un questionnaire à choix multiples. Les différentes questions abordent des sujets tels que:

- Les différentes pièces de la maison et leur disposition par rapport aux autres pièces et dans la parcelle.
- L'assainissement et l'approvisionnement d'autres services de base.
- Les rapports public/privé et intérieur/extérieure des pièces de la maison.
- L'évolution des maisons, la durée et les couts des constructions.
- Le foncier.
- Le cas échéant, le cout des loyers.

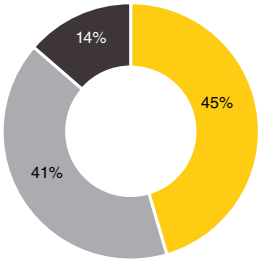


Quartier à forte densité: Morne Jean Pierre, Jasmin, Ismaëlie, Cité des Artistes 1 et 2, Corridor Raoul, Entrée Vasquez, Impasse Vasquez, Nan Mazonbèl, Orphelinat, Cité Coicou, Kokiba et Anba Mapou.



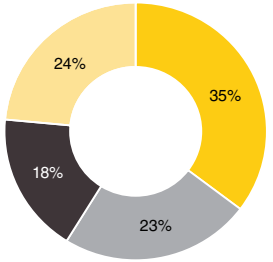
Où pendant la journée la famille passe plus de temps?

- Galerie
- Rue
- Cour



Pourquoi utilisez-vous une galerie?

- Cuisine
- Se réposer
- Se baigner



Etes vous propietaire de la maison que vous habitez?

- Propietietaires du terrain et de la maison
- Propietaires de la maison seulement
- Affermage du terrain sur prix d'achat
- Locataires

70%

Des ménages sont composés seulement par la famille nucléaire, contre 30% dont les ménages partagent la maison avec la famille élargie.

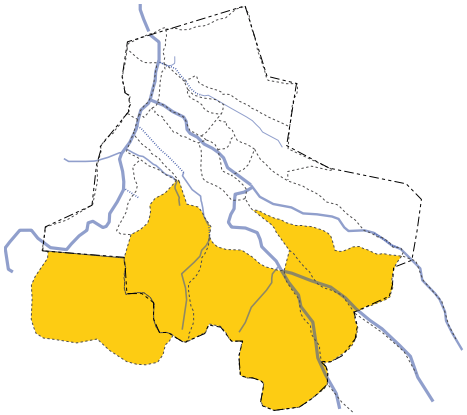
78%

Des enquêtés préfèrent avoir une citerne souterraine pour stocker de l'eau contre 22% qui affirment préférer un réservoir en plastique.

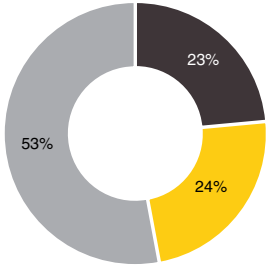
61%

Des enquêtés préfèrent avoir les latrines à l'intérieur de la maison, 22% près de la maison et seulment 17% eloignées de la maison.

Remplissage des questionnaires lors du premier jour

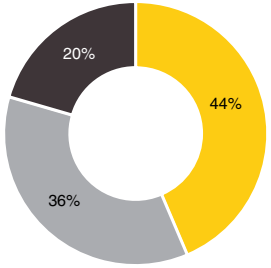


Quartier à faible densité: Bellevue 1 et 2, Montagne de la paix et Morne de Lalue



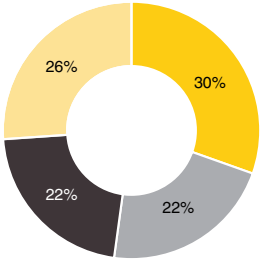
Où pendant la journée la famille passe plus de temps?

- Galerie
- Rue
- Cour



Pourquoi utilisez-vous une galerie?

- Cuisine
- Se réposer
- Se baigner



Etes vous propietaire de la maison que vous habitez?

- Propietietaires du terrain et de la maison
- Propietaires de la maison seulement
- Affermage du terrain sur prix d'achat
- Locataires

80%

Des ménages sont composés seulement par la famille nucléaire, contre 20% dont les ménages partagent la maison avec la famille élargie.

65%

Des enquêtés préfèrent avoir une citerne souterraine pour stocker de l'eau contre 35% qui affirment préférer un réservoir en plastique.

39%

Des enquêtés préfèrent avoir les latrines à l'intérieur de la maison, 52% près de la maison et seulment 9% eloignées de la maison.

Remarques sur le premier exercice

Globalement, l'exercice avec le questionnaire a été très utile pour démarrer l'atelier sur le logement car il a introduit des idées qui ont ensuite été pris en considération lors de l'élaboration des exercices suivants avec des maquettes. Le format, avec réponses à choix multiples a facilité la compréhension des questions et, dans certains cas, a guidé les participants.

Bien que le questionnaire a été rédigé en créole la plus grande difficulté a été le fait que plusieurs des participants ne savaient ni lire ni écrire ce qui a impliqué une participation plus active des facilitateurs communautaires. Pour les prochaines questionnaires il faudrait prendre en compte cette éventualité et prévoir des activités accessibles a tous ou sous forme de dessins.

Des questions sur le prix des loyers ont été également ...

Deuxième activité - L'aménagement de la parcelle

L'objectif de la deuxième activité était de réfléchir sur la répartition des différentes composantes de la maison à l'échelle de la parcelle, à cet effet les participants ont été divisés en cinq groupes de quatre à cinq personnes. Chaque groupe a reçu les maquettes suivantes: la parcelle, une pièce représentant la structure principale de la maison, cuisine, latrine, réservoir d'eau et une pièce représentant une possible extension future, ainsi que des éléments paysagers comme un jardin et des arbres et du mobilier urbain tels que la rue et de l'éclairage public.

Cet exercice a permis de remarquer les préférences quant à la disposition de la parcelle par rapport à la rue, l'aménagement des différentes pièces de la maison et leur évolution, soit horizontalement ou verticalement.

Les remarques suivantes ont été faites

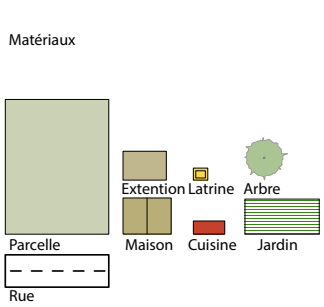
le premier jour:

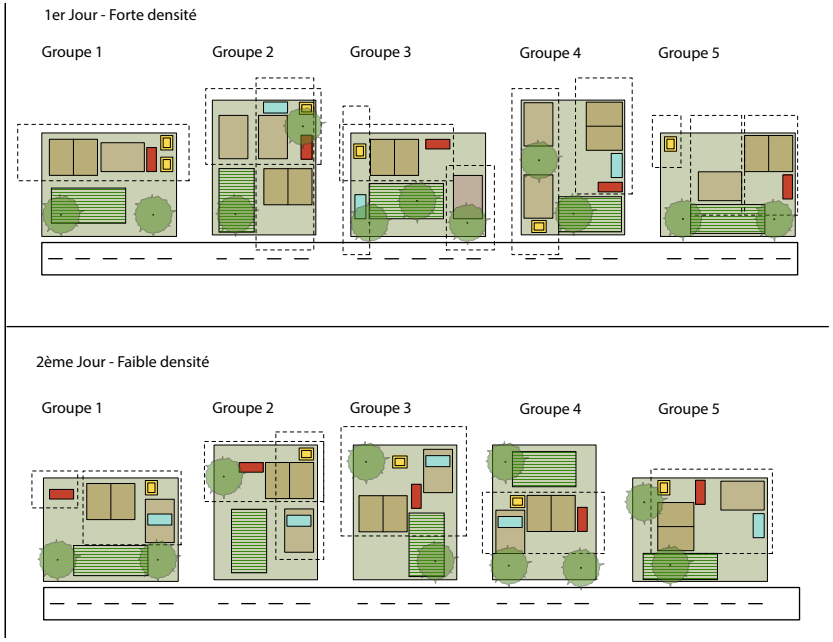
- Position de la parcelle par rapport à la rue: trois groupes ont orienté la largeur de la parcelle du coté de la rue.
- Pour les extensions futures quatre groupes sur cinq ont carrement detaché les nouvelles constructions aux maisons existantes. Seulement deux groupes ont prévu une extension à l'étage.
- Il y a une tendence à regrouper la cuisine avec le reservoir et les mettre à coté de la maison et détacher les Toilettes et les placer généralement à l'arrière de la parcelle.

Le deuxième jour:

- La parcelle et la route : la majorité des groupes ont mis la longueur de la parcelle de coté de la route soit, trois groupes sur cinq.
- Lampadaires: quatre groupes sur cinq ont mis les lampadaires à l'intérieur de la parcelle.
- Réservoir ou citerne d'eau : quatre des cinq groupes ont mis les réservoirs d'eau au dessus des maisons en dalle béton.
- Aménagement général de la parcelle: la majorité des groupes ont regroupés les pièces ayant comme résultat une optimisation de l'espace, laissant en meme temps plus de place pour le paysage ou pour l'agriculture urbaine.

Parcelles regroupées lors du deuxième jour





Troisième exercice

L'objectif de cet exercice était d'introduire des concepts de différents types de logement qu'Architecture for Humanity a identifié comme potentiels pour Grand Ravine. Les participants ont eu à developper les différentes typologies à l'échelle du quartier.

Les typologies sont:

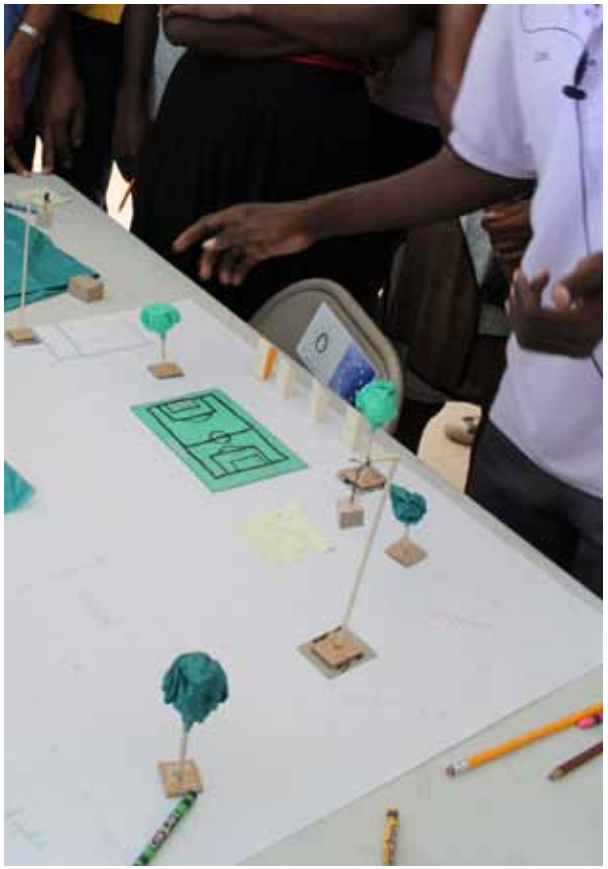
- Reinforcement des structures existantes (Retrofit)
- Sites et services.
- Usage mixte (Commerce/logement).
- Copropriété.
- Expansion verticale.

Un tirage au sort a été effectué pour répartir les thèmes parmis les cinq groupes. Étant donné que plusieurs de ces concepts étaient neufs pour les participants il a fallu que le facilitateurs expliquent et guident les groupes dans le developpement de chaque thème.

Les remarques suivantes ont été faites, selon chaque thème:

Reinforcement des structures existantes (retrofit)
Les participants de ce groupe ont imaginé un site sévèrement touché par le séisme. Pour cette approche ils ont proposé la réparation des maisons endommagées, le reinforcement de la structure existante et meme la reconstruction des maisons detruites, ainsi que la réparations des fisures dans les murs. L'équipement communautaire devrait aussi etre réparé, comme les citernes et les routes.

Ils ont particulièrement déclaré que dans cette logique le plan du quartier ne serait pas modifié.



Site et services
Une fois les principes de cette approche ont été expliqués, les participants ont aménagé un site avec des différents services de base et d'infrastructure: électricité, routes, école, centre de santé, citerne d'eau avec des tuyaux d'alimentation pour toutes les maisons, toilettes communautaires, poubelles, terrain de jeu et espaces publiques.

Le site était traversé par des routes principales et des routes secondaires et un zonage sommaire regroupant les maisons d'un coté et les services d'un autre ont été remarqué.

Copropriété
Ce thème a été développé dans deux dimensions différentes. Premièrement, sous la forme des parcelles partagées par deux familles et sous forme d'immeubles de plusieurs appartements et à plusieurs étages.

Dans les deux cas certains espaces deviennent semi-privés, et des pièces tels que les toilettes ou les cuisines peuvent etre partagées.

Usage mixte
Les participants ont remarqué que cette typologie serait développé près du marché ou le long d'un corridor commercial. Ils ont aménagé un quartier avec plusieurs magasins au rez de chaussée et des maisons ou immeubles d'habitation à l'étage. Les magasins incluent une boulangerie, une pharmacie, une boutique, un atelier de couture, un cybercafé, etc.

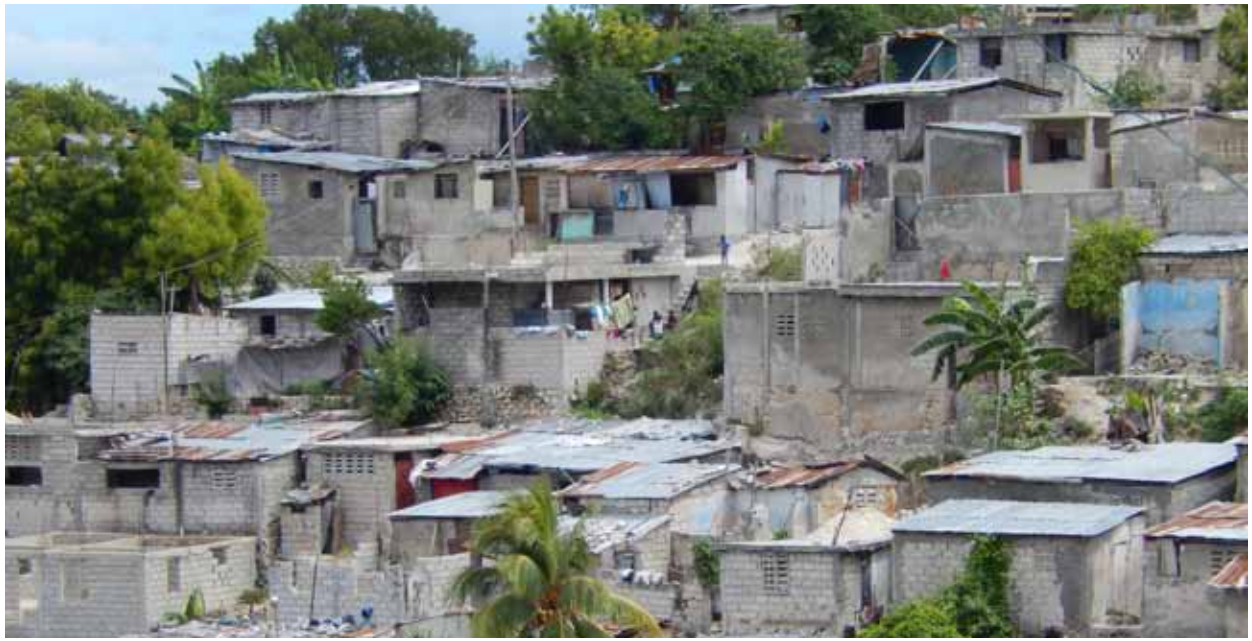
Notamment dans le deuxième jour l'agriculture urbaine a aussi été tenu en compte.

Expansion verticale
Des maisons regroupées de deux ou trois étages ont été proposées, soit avec le renforcément des structures existantes ou par la création de nouveaux immeubles qui pourront etre habités par plusieures familles.

Les participants ont compris que l'expansion en étage permet l'optimisation de l'espace et l'utilisation des espaces vides pour l'équipement ou les aménagements paysagers car ils ont inclut des espaces publics et des routes à double voie.

Le regroupement des maisons facilite aussi le partage des services de base comme les citernes.

6.2
Housing Typologies



This section deals with a variety of housing typologies appropriate to the neighborhood's expressed needs. The housing Atelier was an informative session, working with the community helped to understand the challeges of housing in Grand Ravine.

Information and ideas from these workshops will contribute drawings of house typologies adapted to the environmental reality and vision of this community .

The different housing typologies that will be explored in this section are :

- Sites and services
- Retrofit
- Mixed use
- New development

These housing strategies are all different from one another and will complement each other in the development schemes of Grand Ravine. The mixed use units will help define the important roads by formalizing the commercial activities, while the new development schemes will provide better quality shelter for the people in those zones.

For each typology the following aspects will be discussed:

- Benefits
- Site selection criteria
- Project description
- Cost analysis

Sites and Services

Sites and services programs are an alternative to solve the problem of housing shortage in informal settlements, particularly for low-income people who cannot afford the rising cost of building houses and the high standards established by the governments. The reality is that most houses, even in urban areas, produced in developing economies are informal and self-built gradually. Low-income homeowner-builders usually start with an improvised basic shelter that is expanded, when small savings are available. Over a period of several years (sometimes generations) rudimentary house turns into a good quality, even middle income standard home.

The sites and services scheme relies on this capacity of low-income homeowners to build their own houses incrementally. In the first stage of the approach, plots are furnished with access roads, drainage, water, sewage, electricity and a variety of other individual as well as community services, the community is then encouraged to erect their own buildings.

To be effective these programs need design and engineering standards appropriate for low-income housing and subdivisions to enable the incremental development process. Specialized standards will:

- Allow building incrementally.
- Reduce up-front and future costs
- Make building affordable (for homeowners, local governments and service providers)
- Fit the evolving needs of low-income communities
- Increase density and use land more efficiently
- Provide flexibility

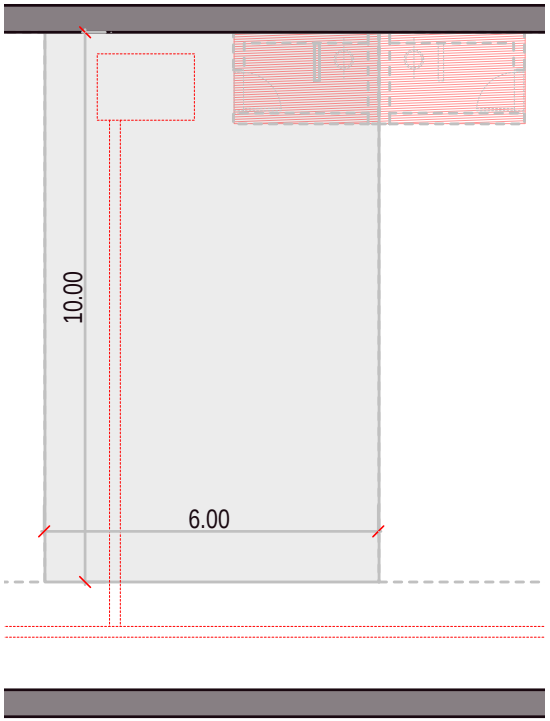
Appropriate standards can facilitate the incremental process by providing a framework for monitoring and controlling development. Additionally, the strategy will organize and improve coordination among infrastructure, utilities and service provision agencies.

Site selection criteria

One of the areas with potential for the development of Sites and Services scheme in Grand Ravine are areas of numerous ruins and shacks. The building damage survey carried out by the MTPTC revealed a wide area of houses listed as red, where development would have a big impact on the community.

Social clusters also are a criteria for site selection, the reinforcement of these existing social and spatial organizations will allow future shared facilities and open spaces, priority should be given to clusters organized around green or yellow houses.

The Sites and Services strategy will benefit people who lived in the area before the earthquake of 2010. The yellow houses should follow the retrofit scheme developed in this chapter.



Project description

This program provide only what the households cannot easily get or afford themselves: a plot of land with basic, essential utilities (clean water, sanitation, flood protection, security lighting, etc.), municipal services (refuse collection, playfields and open spaces, schools, etc.) and, importantly, tenure security. Project subdivisions are developed with small (affordable) plots. Infrastructure is designed so it can be upgraded and expanded over time.

An optional 'sanitary core" could be provided to speed up the owner built incremental development processes.

The idea is to overcome the major constraints keeping the residents from participating in "formal" housing and land markets: lack of credit (and subsidies), scarcity of low-cost, affordable land.

This often calls for reformulating development regulations, for example to increase allowable densities, reduce lot sizes, and introduce stages over time to update and expand infrastructure, and add public services. Building codes can be made flexible to accommodate future addition of rental apartments on a plot, or to provide for small-scale businesses. Land use patterns may need to change and adapt to new needs over time.

Cost break down

The cost associated with the sites and services scheme for the development of grand ravine includes several interventions such as: Site preparation retaining walls and stairs.

Retaining walls - $435 per linear meter

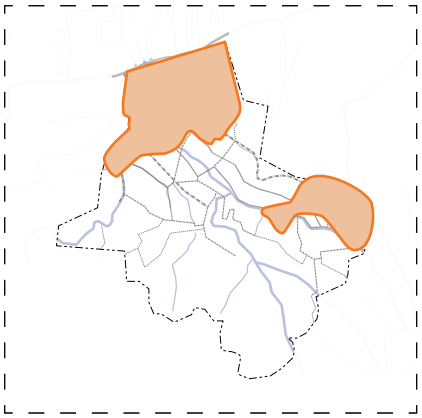
Stairs - $435 per linear meter.

The site preparation - $25 m2

the typical site for this scheme is 60 m2

	Environmental Risk	Access	Drainage	Water Supply	Sanitation	Energy	Waste Management	Community Infrastructure
Initial phase 0 - 2 years	Terracing and retaining walls are built. Reforestation program starts along the ravine.	Main access connecting to Route de Jasmin allowing water trucks or emergency vehicles to the site is paved. Stairology to allow vertical circulation between terraces.	Storm water across the site is canalized according to street and pathway sections.	A water tower or reservoir to be built in selected location. Pipes along utility corridors.	A Service Core may be built in several plots with shared septic tanks. Identified social clusters may share a community toilet. No less than 1 toilet per 4 families.	Solar lamps are installed along the main pathways.	A waste collection kiosk is created in the area, preferably in a central location.	A new public playfield or open space is created for public meetings or recreational uses.
Medium Term 2 - 10 years	Ecological corridor to be created according to the framework plan.	Secondary pathways are paved or planned to be upgraded and expanded over time.	Houses to collect storm water to reduce runoff.	Each house connects to the utility corridors.	Every plot should have a toilet, preferably with septic tanks that can be shared with neighbors or social clusters.	Additional security lighting, maximum distance between each street lamp should be 25 meter.		Community center or other public building to be built. Network of public recreational spaces and community gardens.
Long Term 10 - 30 years	Consolidation of the Ecological corridor and green fingers.	Service corridors are created with dry and wet compartiments.			Existing septic tanks are connected to a public sewage system or a centralized sanitation system.	All houses are connected to EDH.		

Phasing Strategy



Retrofit

Retrofitting is the process of modifying an element after it has been manufactured. For buildings, this means making changes to the structure at some point after its initial construction and occupation.

Given that Haiti is in an area at high risk of earthquake and cyclones it is of great importance to think about the repair and reconstruction in affected areas but also to propose measures of reinforcement of existing buildings. As part of the housing strategies retrofits are a typology that this document will address.

Typically this is done with the expectation of improving the performance of the building for the building's occupants. The development of new retrofit typologies means that buildings in Grand Ravine will be stronger and better resist future earthquakes and could even allow for vertical expansion.

The retrofit scheme has many positive aspects for the Housing scheme of gran ravine.

- Allow residents to keep their existing home.
- Provide opportunity for strengthening structures
- Making it safe to be able to build a second story
- Continue curent tenure situation

Site selection criteria

Retrofits will mostly be directed at houses that have been tagged yellow by the MTPTC, those houses represent 3% of the Grand ravine housing stock approximately 110 household (***view Housing chapter***).Further more cluster areas of yellow houses next to main roads represent opportunities for the creation of mixed use units.

The areas with the most yellow tagged houses are the dense areas of Morne Jean Pierre Anba Mapou and Belvue 1. There are some yellow tagged houses in the southern areas of grand ravine Morne de Lalue and Morne de la Paix but because of the densification aspect of the project they will not be focused on for retrofitting.

Some retrofitting will also occur in the areas highlighted for new development so as to compliment the new development schemes in those zones. This approach will present the most opportunity for development.

Recommendations for repairs and retrofits to existing house must be based on structural evaluations that are building specific backed up by geotechnical information. The recommendations presented here are meant to be broader in scope, based on the existing conditions and relevant risks of the area (***view risk chapter***).

The retrofitting typology will focus mainly on parasysmic and paracyclonic reinforcements. These guidelines are to be applied to small existing buildings that meet the MTPTC requirements. Buildings that do not meet the guidelines will have to undergo a detailed evaluation by a qualified engineer.

Project description

The recommendations for retrofitting are based on the MTPTC guidelines developed by Build Change and Degenkolb Engineering (***view annex for more detail***). The design criteria used is based on a life-safety performance level approach to design and construction, where life safety is defined as:

Building performance includes damages to the structural components during the earthquake, such that:

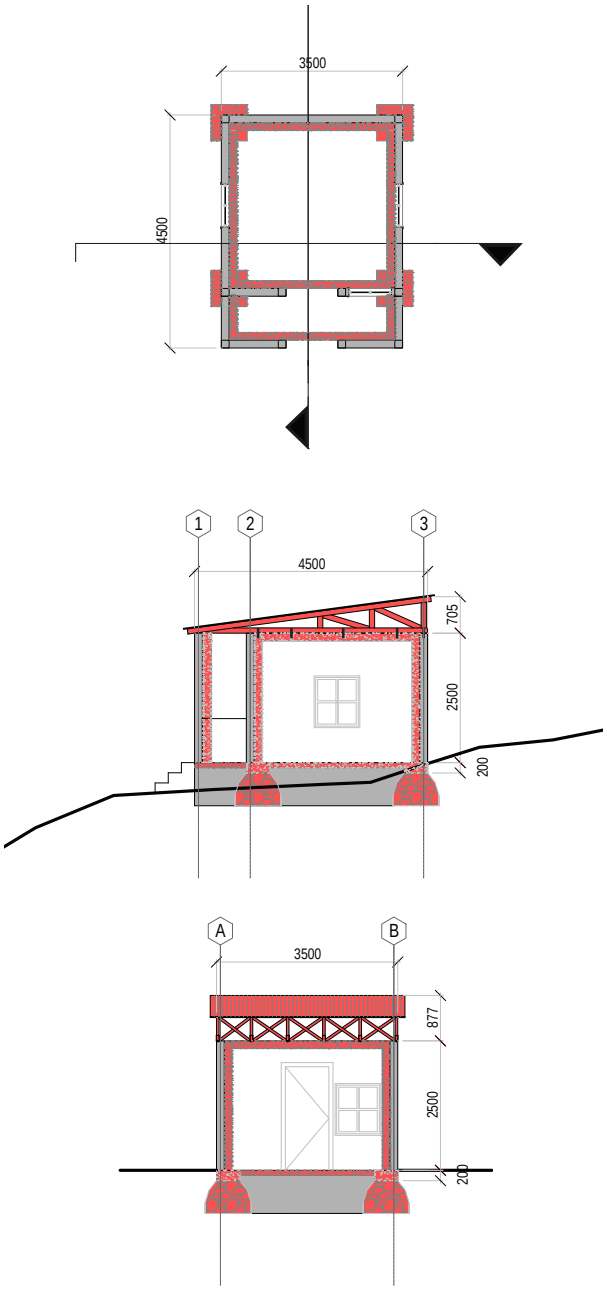
- At least some margin against either partial or total collapse remains,
- Injuries may occur, but the overall risk of life-threatening injury as a result of structural damage is expected to be low.

Life safety performance is generally reserved for seismic retrofits only, while new construction is assumed to be designed under relevant design guidelines, i.e. IBC 2009 or others.

Essentially a full retrofitting of any housing unit refers to the construction of a frame around the existing building that will absorb the environmental loads. This frame is also important as it is the base of all future construction. However each building is affected differently and might not all need a full retrofit.

The focus for retrofits is put on supporting the building from the following aspects:

- Foundations and walls
- Confined masonry conversion (columns)
- Ring beams
- Single slopped roof



The base case consists of a typical 3.5m x 3.5m single room, single story house, stone masonry foundation cut into hillside, unreinforced masonry wall, no columns or ring beam, wood truss with metal roof undergoing a full retrofit.

All referenced details are taken from the Seismic Evaluation and Retrofit Manual, MTPTC Training by Build Change and Degenkolb Engineers.

Retrofit:

- Foundations and walls: Foundation expanded under retrofit work. Plinth beam added underneath wall work. 75mm plastering on interior face of wall reinforced with #3 economic @ 30cm o.c. horizontally and vertically, with #3 dowels @ 30cm on center. Tie reinforcements need to be tied into the new slab on grade.
- Confined masonry conversion: New columns necessary at all four corners and at sides of windows and doors. Confined masonry column at the corner intersection of two existing walls. New column extended into the foundation as well as door and window tie columns are essential elements.
- Ring beam: Typical ring beam (cab beam) replacements.
- Single Slope Shed Roof: The roof frame should be replaced in kind with new structurally graded lumber and painted to protect from rot. The frame should be designed to resist uplift in the event of a hurricane, with hurricane straps connecting the frame to the ring beam, and sufficient roof nailing to ensure the sheet metal roofing stays attached. One nail every three troughs, three rows per sheet is recommended.

Cost break down

According to the build change cost estimate the breakdown of a full retrofit for a house must include labor and materials cost (40%) as well as techinical assistance costs (35%) and program costs (25%).

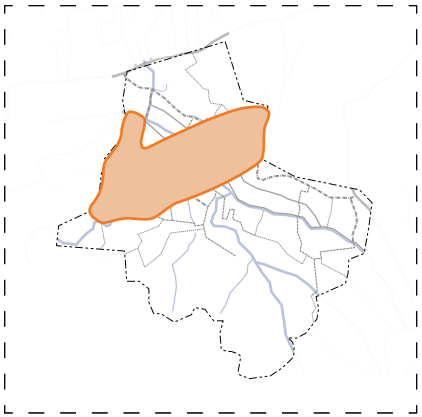
how ever the cost value that is most representative of this typology is only the labor and materials cost .

According to build change documentation a retrofit costs 105$/m2.

the average size of a house in grand ravine is about 26.3m2.

	breakdown	normalized	rounded up
labor / Materials	40%	$ 2761.5	$ 2800
Tech assistance	35%	$ 2147	$ 2150
Program cost	25%	$ 1534	$ 1550
Total		$ 6442	$ 6500

A full retrofit for an average house in the grand ravine neighborhood is estimated to cost $2800. However the cost will not be the same for every house, as each house undergoes a structural evaluation each will need specific work not likely to amount to a full retrofit.



New development

New development is the act of building new structures in some area of land making it more productive or useful for the population it is meant to service.

This scheme is the biggest part of any development plan as they provide better and safer housing solutions.

With the densification aspect of the plan, new construction gives the opportunity to provide housing for the people living in areas at risk of erosion, land slides and floods. Also creating more rental units to house the people in the southern areas (*see environmental protection plan*).

The new development scheme is also an opportunity to build in an incremental process by which housing is to progress according to the population growth of the neighborhood. This will allow each new build to have a rental unit which can be an income generator for the owner.

Also this scheme will give a chance to promote vertical expansion while building safer and better buildings.

The new development typology was designed In accordance with the "code national de bâtiments d'Haïti" (CNBH) and the "Guide de Renforcement parasismique et para cyclonique des bâtiments" of MTPTC to comply with national standards of construction in a post-earthquake Haiti.

The New development typology will benefit the community of grand ravine in the following ways:

- Greater housing variety
- Creating more rental units
- Engaging social clusters
- Creating more semi-private open spaces
- Promote safer vertical expansion
- Promoting co-ownership

Site selection criteria

For the development of new housing units, site criteria's have been identified as areas that have been destroyed by the earthquake. Since the neighborhood is already dense empty lots are not always easy to find.

Large Areas of housing clusters tagged red by MTPTC provide an opportunity to find free space in order to develop the zone. Since the MTPTC identified 28 % (1023) of the houses in grand ravine as red buildings mostly concentrated in the areas of Jasmine and Sion those neighborhoods will be the focus of the New development typology (*see Vision documents 1 &2*)

Areas with many ruins and shacks are also part of the site selection for new development as they are temporary structures that can leave room for new builds to be developed. The areas favored for new development must be areas where the new builds can make the most impact. Route de jasmine and route de sion are the two major access routes where new development schemes would make the biggest impact.

Our partners have identified Creating 350 new developments in total for Grand ravine

Project description:

The New development typology was designed as a response to the community's vision from the atelier. They have identified that vertical expansion provides an opportunity to have more green space and to group services. Also this typology is a great way to promote coownership and creating rental units.

The new development typology is to be built in an incremental fashion, the initial unit is to be built on a 60m2 site where the main building is in the front of the site and the bathroom in the back.

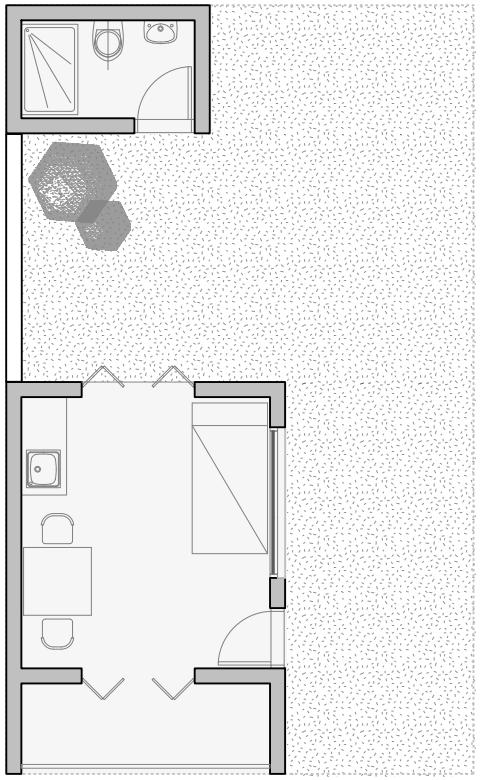
The main building will have a gallery area (***identified by the participants in the community atelier)*** as a multi-purpose space, and a room for a total of 19.23m2 which is in accordance with the the "code national de bâtiments d'Haïti" (CNBH). According to the CNBH the minimum size of a house should be 18m2, preferred is 24 m2.

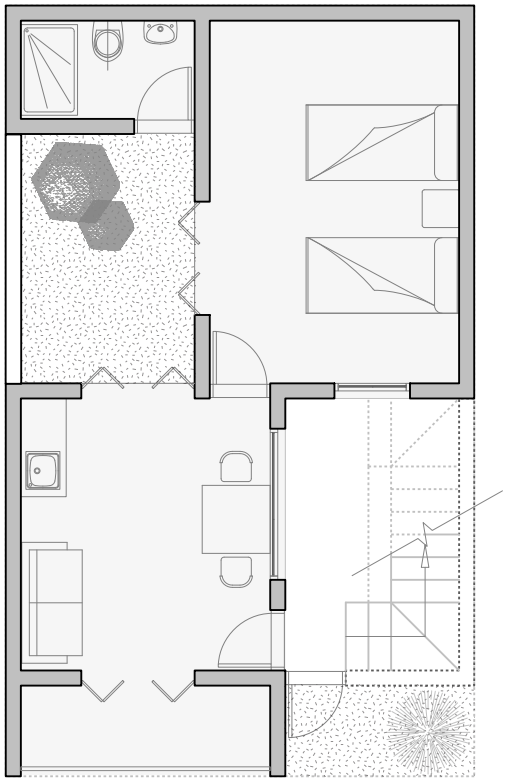
The bathroom has been strategically placed to work with the incremental aspect of the design, so that future renter's also can have access to the bathroom.

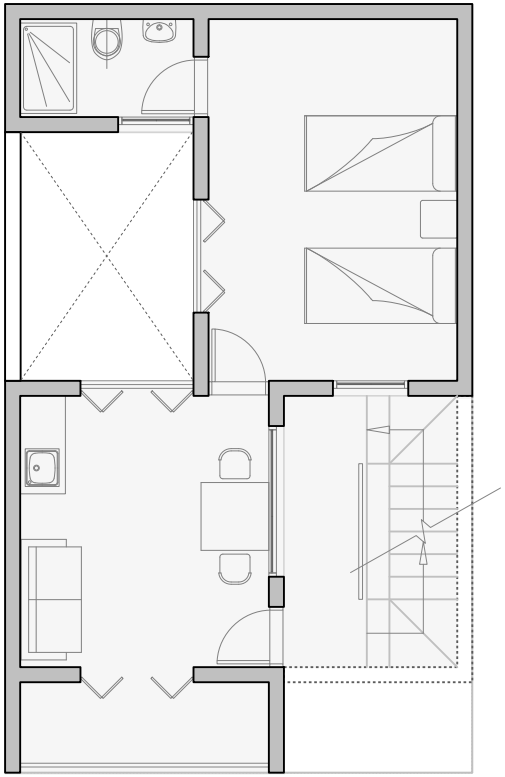
Passive design strategies have also been applied to the design for better ventilation and exposure to natural light in order to promote a better standard of living.

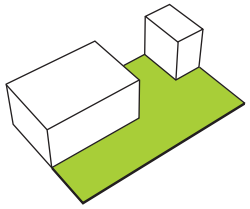
The first expansion of the unit (18m2) allows for a front yard as well as an internal semi private courtyard. The semi-private courtyard is an outdoor space one can use for multi-purpose activities as well as provide bathroom access without disturbing other units.

The front yard becomes a space to accommodate stairs for another level, making it independent from the rest of the building in case of a rental possibility. The vertical expansion unit (41.9m2) covers the entire surface of the first floor, it has a balcony space in the front, a living/ cooking space, a bedroom space and a individual bathroom.





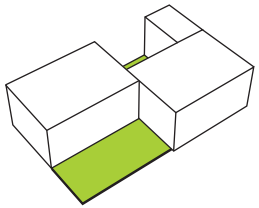




Initial unit
25.00 m2

Living area:	18.20 m2
Bathroom:	4.60 m2

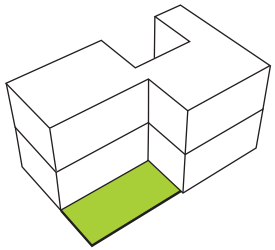
F.A.R.:



Optional expansion
42.00 m2

Living area:	18.20 m2
Bedroom	18.50 m2
Private courtyard	8.20 m2
Bathroom:	4.60 m2

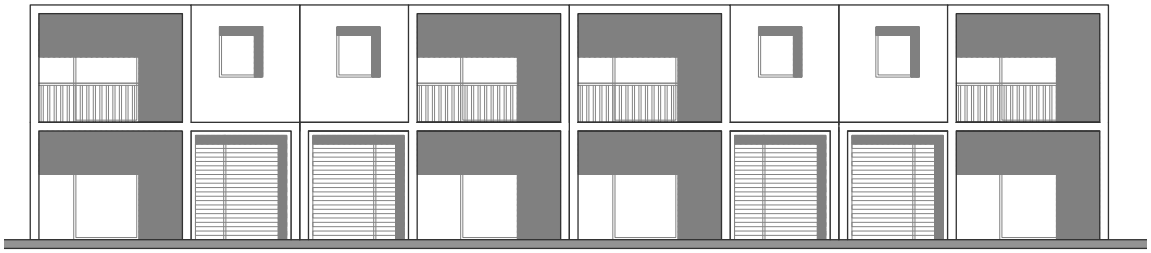
F.A.R.:

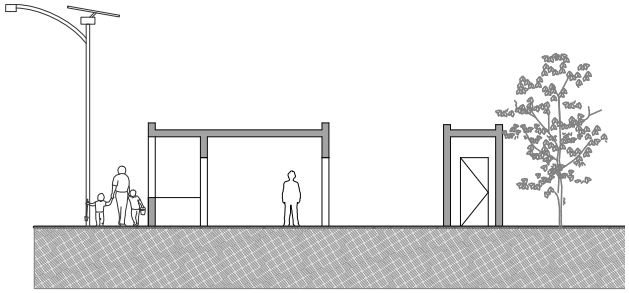


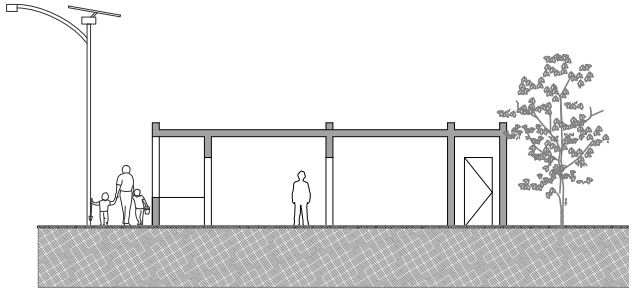
Vertical expansion
42.00 m2

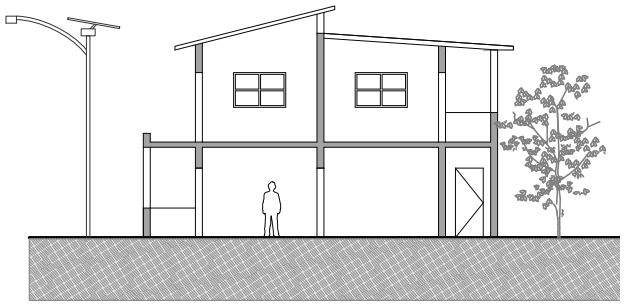
Living area:	18.20 m2
Bedroom	18.50 m2
Bathroom:	4.60 m2

F.A.R.:









Cost break down

The cost associated with building the units have been calculated based on the experience of our technical consultants “Sisul engineering” and reflect only the materials and labor cost associated with building the project the technical assistance, and program costs are not reflected in this document.

The different elements associated with this cost are as follows:

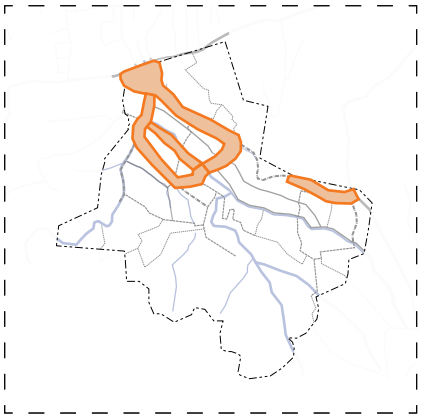
- Foundations
- Walls
- Confining elements
- Roof

The calculations for the core unit refers to the initial build (***minimum requirement***) (19.23m2) and the bathroom (4.6m2) this core unit will be the core of all the new development units. It will be built with the intention of continuing construction to expand the building. The core unit will cost $5,401.

The expansion 1 (18.5m2) calculations refers to the second room that is to be added next to the semi-private courtyard space this space is the second room of the incremental process. The extension 1 will cost $3,183

The vertical expansion unit (41.9m2) calculations refer to the third part of the incremental process,This part is to be built in the future if more housing units are necessary this unit does not need additional foundation and that is reflected in the cost. It will build up from the initial unti’s footprint making it more affordable to build once the initial unit is erected. The only cost not reflected in the table below is the cost of the stairs going to the second floor. The extension 2 unit will cost $8,051

New Development		Core		Ext1		Vertical expansion		Unit Cost	Core	Ext 1	Vert Ext
Foundation											
	Strip Footing	25	m	14.1	m	6.1	m	$20.00	$500	$282	$122
	Plinth	25	m	14.1	m	6.1	m	$16.65	$416	$235	$102
	Slab on Grade	20.61	m2	17.5	m2	9	m2	$22.87	$471	$400	$206
Wall											
	Walls	18.2	m	12.6	m	38.1	m	$75.93	$1,382	$957	$2,893
	Ring Beam	28.3	m	14.1	m	52.5	m	$20.04	$567	$283	$1,052
Confining elements											
	int wall col	8		2		11		$75.00	$600	$150	$825
	int door col	8		2		13		$75.00	$600	$150	$975
	int window col	2		2		4		$75.00	$150	$150	$300
Roof											
	CMU infill slab	23.83	m2	19.24	m2	52.57	m2	$30.00	$715	$577	$1,577
Total									$5,401	$3,183	$8,051



Mixed use

Mixed-use development in the broad sense is a single building that blends a combination of residential, commercial, cultural, institutional, or industrial uses, where those functions are physically and functionally integrated.

Traditionally, human settlements have developed in mixed-use patterns. However zoning regulations were introduced to separate different functions. But since the 1990s, mixed-use zoning has once again become desirable as the benefits are recognized.

For the case of Grand Ravine only a commercial space and a residential space constitute a mixed use unit.

Consistent with the national landscape in Haiti all commerce is done next to the roads leading to residential sub neighborhoods. Mixed use units will allow residents of these neighborhoods to formalize these commercial activities, all the while creating housing units for the population in grand ravine.

Accessibility to these zones is of great importance for mixed use units as these developments will be focused on areas near the roads.

The mixed use typology will benefit the community of grand ravine in the following ways:

- Greater housing variety
- Creating more formal commercial spaces
- Engaging the street fronts
- Creating more semi private open spaces
- Stronger neighborhood character

Site selection criteria

Mixed use units will mostly be directed at areas next to the main pathways that have exhibited signs of informal commercial activity.

The areas of Jasmin and Sion will include mixed use units as part of their development.

Following the new development patterns and schemes mixed use units will be built in areas of major earthquake damage, where red tagged buildings and ruins have been identified. The MTPTC identified 28 % (1023) of the houses in grand ravine as red buildings mostly concentrated in the areas of Jasmine and Sion.

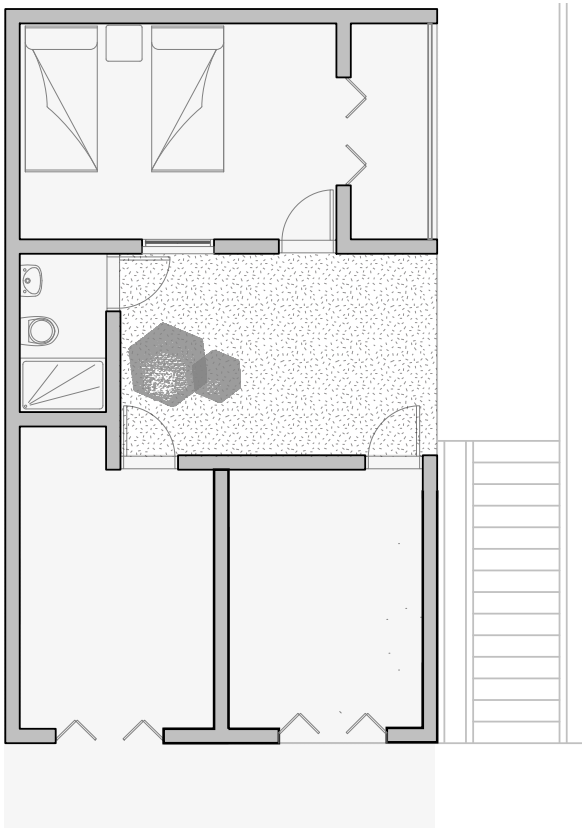
Our partners have identified Creating 50 mixed in total for Grand ravine

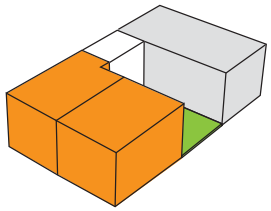
Project description

The mixed use typology was designed to respond to the need of the grand ravine population who identified in the community atelier that mixed use units should have the commercial part on the bottom and the residential part on top or for single story units the commercial space in the front and the residential space in the back.

This layout allows the unit to better engage the street fronts for commercial activity. The mixed use typology was designed for future expansion to also accommodate for future rental units.

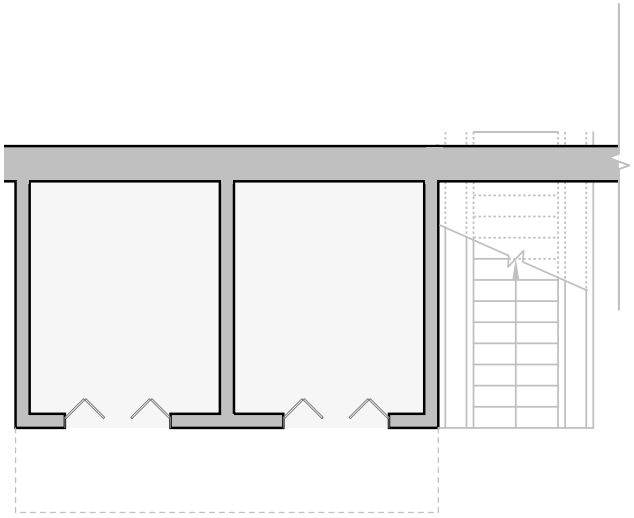
The plot is based on an 60 m2 parcel where two commercial spaces sit side by side at 9 m2.The stair to the side leads up to a semi private courtyard (12m2) which leads to the entrance to the residential space and the bathroom.

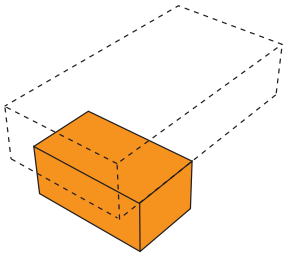




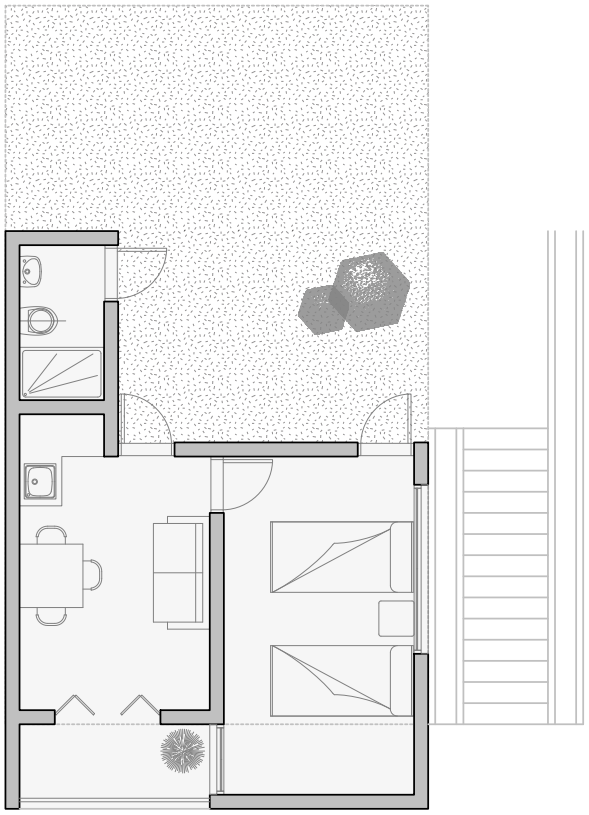
Mixed use unit (A)
25.00 m2

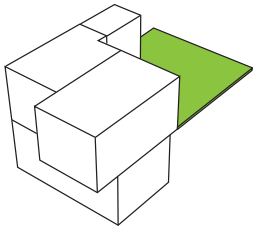
Living area	m2
Bedroom	m2
Bathroom	m2
Balcony	
Private courtyard	m2





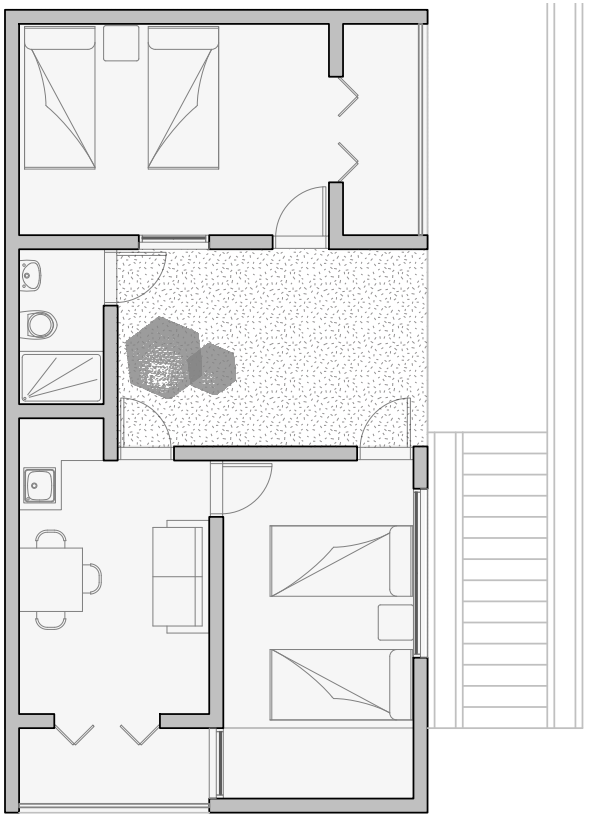
Commercial spaces (B1)
25.00 m2

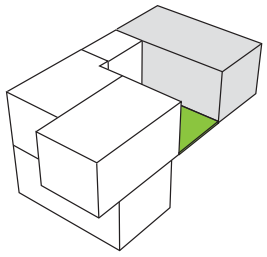




Single family unit (B2)
25.00 m2

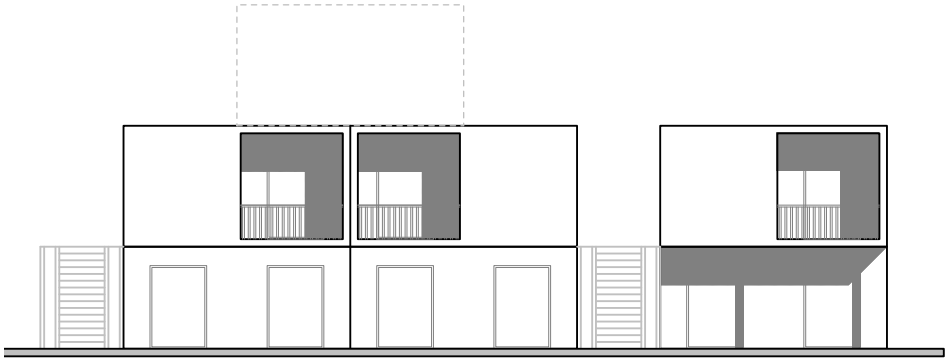
Living area	m2
Bedroom	m2
Bathroom	m2
Balcony	
Private courtyard	m2

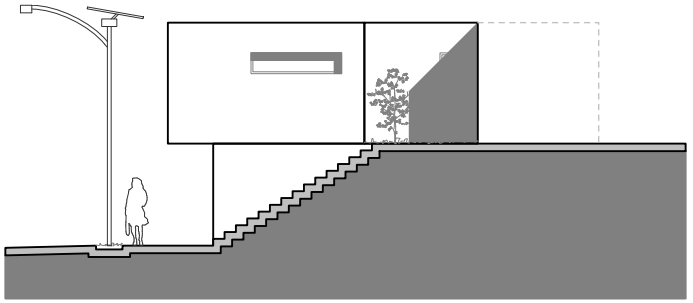


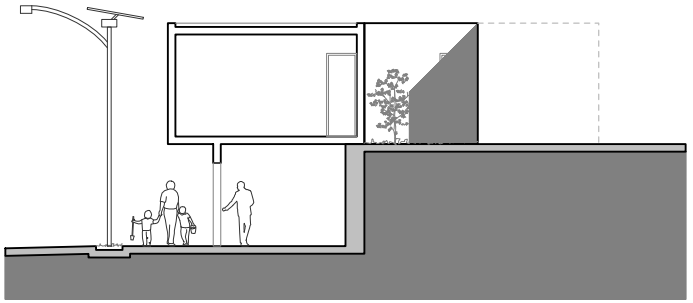


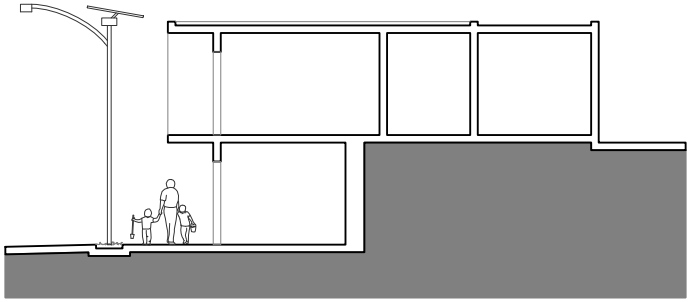
Extension (C)
25.00 m2

Living area	m2
Bedroom	m2
Bathroom	m2
Balcony	
Private courtyard	m2









The residential space is composed of a living area/kitchen (9.62m2) with a gallery space for better ventilation. The bedroom (12.96m2) has its own entrance from the semi-private courtyard and also connects to the living space for ease of access. The bathroom (2.6m2) was designed with an exterior entrance although attached to the unit so that it can be accessible to both sections of the mixed use unit (commercial and residential).

Space was also left for a future extension (17.4 m2) that could serve as a rental unit accommodating future renters from the de-densified zones or additional family members. This extension also opens up to the semi-private courtyard which makes this space very important for the development of the unit.

Cost break down

The cost associated with building the units have been calculated based on the experience of our technical consultants “Sisul engineering” This table reflects only the materials and labor cost associated with building the project the technical assistance, and program costs are not reflected in this document.

The different elements associated with this cost are as follows:

- Foundations
- Retaining walls
- Walls
- Confining elements
- Roof

The initial build A calculations refers to the one story mixed use units that would be built on level ground. The total cost of the unit is $7866.46

the initial build B calculations refers to the mixed use unit where the commercial space is built on the bottom and the single family unit on top. This model requires a retaining wall to support the above construction. The breakdown of this unit is calculated in 2 parts the commercial unit B1 and the single family unit B2. The total cost of this unit is 15,774.36.

The extension unit C was also calculated separately as it is a projected build for future expansion. Because it will be

Mixed Use		initial build (A)		Initial build (B)				Extention (C)		Unit Cost	A Cost	B1 Cost	B2 Cost	C Cost
		Mixed use unit		commercial (B1)		single fam unit (B2)		Extension (C)						
Foundation														
	Strip Footing	38.3	m	26.1	m	11.6	m	12.2	m	$20.00	$766.00	$522.00	$232	$244
	Plinth	28.1	m	15.9	m	11.6	m	12.2	m	$16.65	$467.79	$264.69	$193	$203
	Slab on Grade	46.2	m2	28.2	m2	30.68	m2	18	m2	$22.87	$1,056.70	$645.00	$702	$412
Retaining Wall														
	Retaining Wall	0	m	6	m	0	m2	0	m2	$650.00	$-	$3,900.00	$-	$-
Wall														
	Walls	23.4	m	12.9	m	29.9	m	10.5	m	$75.93	1,776.81	$979.52	$2,270	$797
	Ring Beam	31.8	m	31.8	m	38	m		m	$20.04	$637.16	$637.16	$761	$-
Confining elements														
	Columns	3		3		0		0		$75.00	$225.00	$225.00	$-	$-
	Retaining wall col	3		3		0		0		$75.00	$225.00	$225.00	$-	$-
	int wall col	6		3		8		3		$75.00	$450.00	$225.00	$600	$225
	int door col	8		4		10		4		$75.00	$600.00	$300.00	$750	$300
	int window col	2		0		4		2		$75.00	$150.00	$-	$300	$150
Roof														
	CMU infill slab	50.4	m2	31.2	m2	36.88	m2	19.2	m2	$30.00	1,512.00	$936.00	$1,106	$576
Total											7,866.46	$8,859.37	$6,915	$2,907
											7,866.46	$15,774.36		$2,907

built on the same base as the initial build B it utilizes the same base and foundation thus making it less expensive than the initial builds. The total cost associated with this construction is $2,907.

Refer to the table below for more detail on the construction cost of the mixed use units.

6.3
Design Guidelines

The strategy for the housing stock in Grand Ravine must be in line with the guidelines and laws in force in Haiti.

Documents considered are:

- Politique Nationale de Logement.
- Plan Stratégique de développement d'Haiti.
- Directives de l'UCLBP pour la mise en œuvre des projets de logements et d'habitat financés par les bailleurs de fond.
- Code National du Bâtiment d'Haïti (CNBH).
- Lois et Règlements d'Urbanisme. Carried out by CIAT, UCLBP and MTPTC.
- Guide de Reinforcement parasismique et paracyclonique des batiments du MTPTC.

Site and Context

The site characteristics and the context must be taken into account. The slope and the location of the building on the hill will also influence the design, the requirements of the MTPTC state a compliant location is one where the slope is less than 10%. When the slope is between 10% and 25%, detailed evaluation should be performed. No matter the slope, the building should be built on level ground. Retaining walls, if necessary to allow for setbacks, should be of a height no greater than the setbacks, and should posses steel reinforcement and weep holes for drainage. Unreinforced rock retaining walls which directly support the structure shall be no greater than 1.0m tall.

Zones to avoid: ravines and steep slopes (more than 36%, or 20 ° tilt); the landslide areas or unstable slopes where landslides can be caused by an earthquake or heavy rain; flood zones (less than 25m. from the center of ravines or less than 10m. from the edge of non channeled ravines) [1]

The relationship with neighboring buildings or boundary walls (collapsing danger) and the pre-existence of latrines, septic tanks or reservoirs should also be considered.

Runoff volume on the site should be reduced by infiltrating rainfall water through different low-impact micro-managed interventions and finding beneficial uses for water rather than directing it to the ravines. *Houses will be provided with means of stormwater drainage* [2], rain water collection

from roof surfaces is an integral part of this strategy greatly reducing the quantity of storm water reaching the ground surfaces.

[1] CNBH Art. 1.4.2

[2] Law of mai 29th,1963 Art. 22

Technical resistance

Repairs and retrofits to an exisiting house must be based on structural evaluations that are building specific backed up by site specific geotechnical information. Every retrofit should be strong enough to withstand a seismic event while achieving a life safety performance level.

New constructions on the other hand should be design under relevant design guidelines, i.e. IBC 2009, CNBH 2012 or others and recomendations by MTPTC.

Retrofits and new single-story constructions must be expandable upward with two stories.

A hurricane-resistant construction must be designed to withstand the direct effects of wind, airborne debris and rain.

Configuration

The minimum size of a house should be 18m2, preferred is 24 m2. The room size should be at least 2.1m in either direction (bed size). *Each residential building shall have at least one piece of living space above 11 m2. The minimum area is 5 m2 for the kitchen, 3 m2 to that of the bath, shower 1.5 m2 and 1 m2 for the toilet. The minimum width of corridors and stairs is 1 m.* [3]

Pasive design strategies should be considered to provide a maximum of natural light and ventilation.

Every habitable room shall have a window allowing natural light which is at least 8% of the floor area. [4]

Minimum internal heigh is 2.2m. [5] (Preferred is over 2.4m). *Ceiling height of an uninhabited basement, corridor, bathroom or toilet should never be less than 2m.* [6]

Each room must have cross ventilation (min. two ventilation openingsin opposite walls) *The surface of the openings that can be controlled for the purpose of ventilation should not be less than 4% of the floor surface of the room to be ventilated.* [7]

The house should have two doors (for functional and scape reasons). All doors should open in the direction of the scape route i.e. external doors opening to outside. *The exit door must have a clear opening of 0.9m width and 2m in height and capable of being opened without effort or key from the inside.* [8]

Whenever possible, a new house should have some private or semi-private outdooor space (lakou), when shared, they should be shared among a social cluster (defined as a group of families/friends or extended family living together or in close proximity to each other).

[3] CNBH Art. 1.5.7

[4] CNBH Art. 1.5.5.1

[5] CNBH Art. 1.5.8.1

[6] CNBH Art. 1.5.8.2

[7] CNBH Art. 1.5.6

[8] CNBH Art. 1.5.11.2

Construction Meterials

The materials used should be as high quality as is feasible given budget constraints. Local CMU production should be regulated to ensure proper sand/cement ratio and shaded curing time. Steel should be grade 60, with exception for grade 40 #3 bar (economic) when producing stirrups. All steel should be deformed.

For the preparation of concrete river sand is the preferred sand. *It must be clean, free from organic or deleterious materials and shall contain a maximum of 5% of dust. River sand must be washed to remove dust. Grain size does not exceed 5 mm. White calcium sand, very common in Haiti, can not, under any circumstances, be used for the manufacture of concrete and should only be used for non-structural applications.*[9]

Due to low strength of local produced cement blocks it is highly recommended to plaster the walls to enhance the integrity of the structure and increase earthquake resistance.

[9] CNBH Art. 1.6.1.2

Building system

Following MTPTC recomendations the building system for managing horizontal and vertical loads in Grand Ravine should be confined masonry construction tied to an appropriately designed foundation based on site and geotechnical characteristics. The preferred roof would be a light wood frame roof with roof steel. If the building is multi-story or will expand to multi-story in the future, the foundations and walls should be designed to support the additional loads coming later. However, for confined masonry, total building height should be less than three times the narrowest lateral system dimensions.

Foundations

Foundations should be stone masonry or concrete continuous under all walls and around the perimeter, with a plinth beam at the base of the walls, all columns should be doweled into the foundation and the footings embedded at least 50 cm below grade. For all sloped sites (>10% grade) or for soft sites, the foundation elements shall be interconnected by a reinforced concrete slab and footings and reinforced concrete plinth beams shall be continuous underneath all walls.

Minimum dimensions [10]*:*

Depth: Not less than 0.6m.

Width:	*1 story:*	*0.45m hard ground*
		0.6m average ground
		0.8m soft ground
	2 stories:	*0.6m hard ground*
		0.75m average ground
		0.90m soft ground
Thickness		*0.225m hard ground*
		0.275m average ground
		0.325m soft ground

[10] CNBH Art 1.7.6.2

Walls

Each perimeter wall of a residential building must have at least one shear wall able to resist lateral loads from wind or earthquake. The internal walls of a building can, as required, contain shearwalls.

Shear walls should be continuous over the entire height of the building or the foundation to the low part of the roof and shall have no openings or penetration.

Shear walls in hollow concrete blocks are reinforced masonry wall type or confined masonry wall. [11]

A shear wall must have a minimum horizontal length, measured in the direction of the wall, of 1.80 m. If the shear wall must be made of two wall portions, the total minimum horizontal length must be increased to 2.80 m. and the length of the shorter wall must not be less than 1m. [12]

The shear walls must be anchored to the foundation in the lower part of the wall and the ring beam in the upper part of the wall. [13]

Slab on grade
Concrete slab resting directly on the ground shall have a minimum thickness of 100 mm.

The site area located within the foundation walls must be cleaned of all vegetation, topsoil and unsuitable soil.[14]

Dalles suspendues
Pleine : L'épaisseur (h) de la dalle varie en fonction de la portée (L), mais ne doit jamais être inférieure à 100 mm. Pour les petits bâtiments résidentiels, la portée est limitée à 4,5 m et le rapport longueur/largeur doit varier entre 0,8 et 1,25.

Suspended slabs
Pleine: The thickness (h) of the slab varies depending on the span (L), but should never be less than 100 mm. For small residential buildings, the span is limited to 4.5 m and the length / width ratio should be between 0.8 and 1.25.

Hollow core slab: A cellular slab should be made of reinforced concrete parallel beams, spaced 500 mm o.c. and aligned in the direction of the shorter span measured between two opposite walls.

Standard hollow concrete blocks 390 mm and 100 mm long and 150mm thick, called "hourdis"(hollow), must be placed between the beams to create voids. The slab must be perfectly aligned and leveled. A concrete layer 50 mm minimum thickness should cover everything.[15]

Roof
It is recommended that when CGI roofing sheets are used, to apply the factory painted type, not only for esthetic reasons but as protection agains corrosion and to increase the life span in a sea climate.

[11] CNBH Art. 1.8.1

[12] CNBH Art. 1.8.2

[13] CBNH Art. 1.8.2.4

[14] CBNH Art. 1.9.1

[15] CBNH Art. 1.9.3

Construction Methods

The UCLBP advocates assisted owner driven reconstruction, which means helping Haitian families in the construction of their home in the context of a development project designed in co-production with the community. (Re)construction of housing project becomes the project of a family or a group of families that are accompanied by field operators through a grant or any prime, but especially also by regular inspections.[16]

Construction oversight is necessary to ensure that construction standards are met such as proper placement of reinforcement, proper development lengths in the ties and connections, proper spacing, concrete placement, with proper mix ratios and limited use of water clean of impurities.

[16] Directives de l'UCLBP pour la mise en œuvre des projets de logements et d'habitat financés par les bailleurs de fond

Basic Services

Basic wiring and outlets in each room should be provided for a future connection to EDH.

The fewer families sharing a toilet, the better maintained this facility is likely to be in the long-term. The technology/ choice of system needs to be appropriate to the context.

In order to improve access to sanitation in Grand Ravine, all newly installed sanitation systems must adhere to the following minimum standards:

No less than 1 toilet per 4 families.

Toilet must be within 50 meters from the furthest user;

No less than 1 shower per 4 families;

1 hand washing station per 4 families or 1 station per household toilet;

1 toilet out of 10 for elderly/disabled persons;

Excreta storage, treatment, storage and disposal must be at least 30 meters from any surface water source;

The bottom of the pit must be at least 1.5 meters above the maximum height of the water table. [17]

[17] DINEPA standards

Infrastructure

Any new road width must be at least 13 meters and the lane shall not be less than 7 m. [18]

Maximum slope of 5% for the main artery. 8% for all local roads and 12% for all collector roads. [19]

[18] Décret du 1er Juin 2005

[19] Décret du 6 janvier 1982