(Online) ISSN 2712-0554
Heritage and Sustainable Development *Original Research*
Vol. 7, No. 2, 2025, pp.453-466
https://doi.org/10.37868/hsd.v7i2.971

Open centers for irregular migrants in Malta: A case of substandard habitable shelters

Samuel Borg[1*], Lino Bianco[1,2]
[1] Department of Architecture and Urban Design, Faculty for the Built Environment, University of Malta, Malta
[2] Faculty of Architecture, University of Architecture, Civil Engineering and Geodesy, Bulgaria

*Corresponding author: sam4borg@gmail.com

Received Dec. 11, 2024
Revised Mar. 2, 2025
Accepted Mar. 13, 2025
Online May 9, 2025

Abstract

An increase in irregular migration crossing from North Africa to Europe via the Mediterranean Sea has had an impact on Malta. Open centers can handle the influx, but due to the strongly negative rhetoric around immigration in the Maltese public sphere, investment in shelters for such migrants is meager. The research question this article attempts to address is whether these centers are substandard. The methodology employed includes consulting architectural drawings and interviews with professionals and other members of non-governmental organizations working with migrants. The findings establish that the basic infrastructure and general living conditions of such centers are indeed substandard, but with minimal interventions, they can be rendered livable. The article concludes with a set of recommendations that will improve their overall design. Although the number of migrants has dropped considerably in recent times, the country should be prepared for any humanitarian crisis, be it terrestrial or occurring at sea.

Keywords: Migrants, Open centers, Substandard accommodation, Malta

1. Introduction

The authoritative contract database and resource center for nearly a third of a million lawyers and business owners, the *Law Insider*, includes the following definition of substandard housing:

"Substandard housing means that one or more of the … conditions or defects are present in a dwelling unit, guest room, suite of rooms or the premises on which the same are located, which are ordinarily and customarily used for human habitation, to the extent that the life, limb, health, safety or property of the occupants or the public are in danger" [1].

In terms of this simplified definition, substandard living refers to any housing lacking the appropriate plumbing or sanitary facilities or even any property construction that infringes health and sanitary policies and codes. Other characteristics that render a habitable building substandard for living include structural issues, safety hazards, inadequate living spaces, and a lack of accessibility. Structural issues refer to instances where structural components such as walls, roofs, or foundations are damaged and are at risk of collapse. Safety hazards include a lack of appropriate fire safety equipment, faulty electrical systems, and exposed wiring. Inadequate living spaces, in turn, result in overcrowding and associated health issues. Lack of accessibility for people with various types of disabilities can render a building unfit for access.

Over the past few years, migrants have crossed the Mediterranean Sea to flee violence and insecurity in their homelands. According to the United Nations Refugee Agency (UNHCR), Malta lists six types of migrants [2: 17]: (i) refugees, (ii) persons requesting subsidiary protection, (iii) persons requesting temporary humanitarian protection (in need of humanitarian aid such as medicine, having children, and being old), (iv) persons requesting temporary humanitarian protection 'N' (due to being integrated into Maltese society), (v) asylum seekers, and (vi) rejected cases (sent back to the original country if there is no fear of war or a serious breach of their fundamental rights). Those in the last two categories are not provided with any formal residence. Asylum seekers – whose cases typically take months to determine – are housed in detention centers; irregular migrants whose case was rejected are placed in open centers [2: 22-23]. This article is based on research undertaken at the University of Malta [3]. It addresses the research question of whether the premises utilized as open centers in Malta – the main and most populated of the three islands of the Maltese archipelago, which is situated south of Sicily and north of Libya – are substandard with respect to ventilation and thermal capacity. This was assessed by computing the current air change and thermal capacity of such accommodations and comparing them to accepted current standards. Other parameters used to assess whether premises were substandard include their energy performance, sanitation and hygiene, privacy and safety, local transport links, and other contextual aspects relating to social spaces and places of worship. Dimensions such as security, legal and administrative support, and available health services – which are more systematic and administrative issues – were not tackled. Nor were there places for Internet access and educational programs, which promote integration and create a sense of community. Another aspect not addressed in this article, although reference is made to it in the general planning design, is the materials from which a given open center was constructed. The article concludes by proposing prototypes for upgrading the current layout of these centers with minimal effort.

2. Research method

2.1 General considerations

Information regarding (i) target residents, (ii) current capacity as of February 2022, (iii) the inauguration year, and (iv) previous use of open centers and other migrant residences in Malta is given in Table 1. The category 'target residents' signifies which of the following are dominant in the residence (listed in order of vulnerability, from lowest to highest): men, couples, women, families, and unaccompanied minors. The inauguration year indicates whether the building is recent, and 'previous use' indicates the original use from which it was adapted.

Table 1. Open centers and other migrant residences in Malta

Residence	Target residents [4: 30]	Capacity [5: 82]	Inauguration year [6]	Previous use [6]
Dar il-Liedna	Families and unaccompanied minors	56	2006	Not applicable
Dar is-Sliem	Unaccompanied minors	28*	2003	Not applicable
Dar il-Qawsalla	Families	40*	2004	Not applicable
Ħal Far Tent Village	Single men, single women, and unaccompanied minors	1248	2006	Royal Air Force (RAF) base
Ħal Far Family Open Center	Families	128	2007	RAF base
Ħal Far Hangar Open Center	Single men and couples	746	2007	RAF base
Marsa Open Center	Single men	460	2005	Marsa Trade School

* No longer operating.

Based on the availability of data and ease of access to the sites, the following three open centers were studied:

i. Ħal Far Tent Village (Figure 1 and Figure 2),
ii. Ħal Far Hangar Open Centre (Figure 3 and Figure 4), and
iii. Marsa Open Center (Figure 5 and Figure 6).

They are all managed by the Agency for the Welfare of Asylum Seekers (AWAS). The sites at Ħal Far are made up of mobile units, essentially metal containers (Figure 7). The official abbreviations of the names of these premises are HTV, HOC, and MOC, respectively (see, for example, [5, 7]).

Figure 1. Satellite image of Ħal Far Tent Village (© Google Earth)

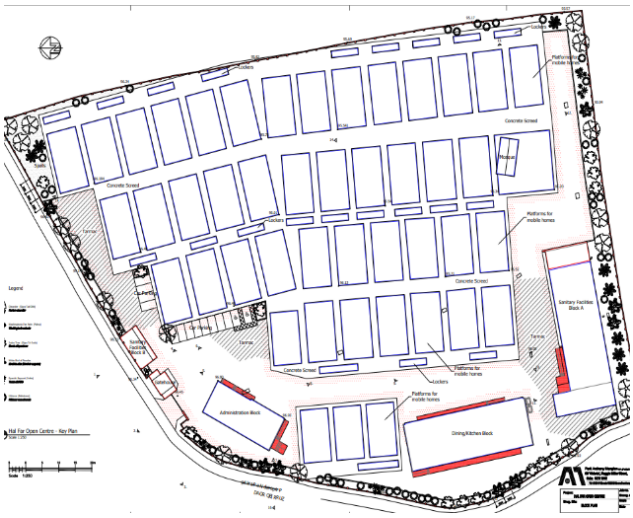


Figure 2. Layout of Ħal Far Tent Village [8]

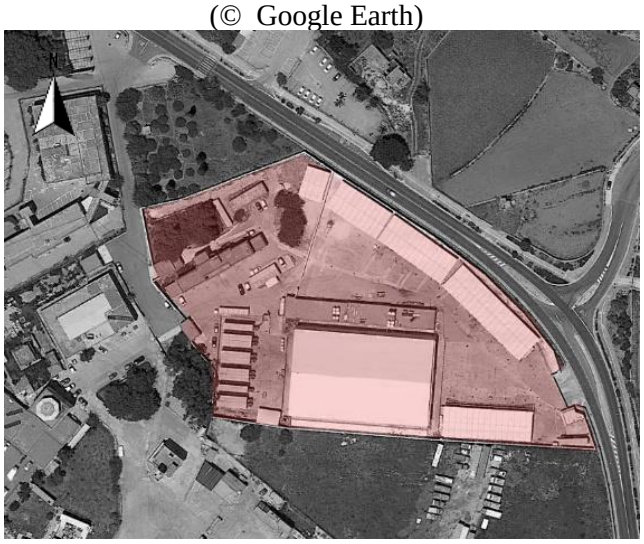


Figure 3. Satellite image of Ħal Far Hangar Open Center (© Google Earth)

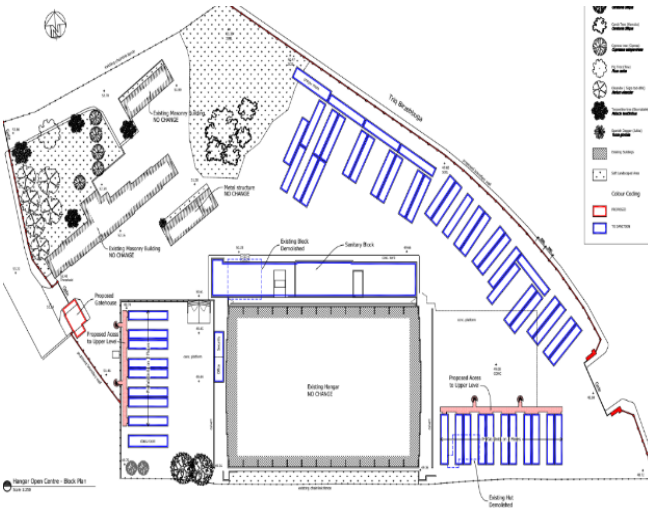


Figure 4. Layout of Ħal Far Hangar Open Center [9]

Figure 5. Satellite image of Marsa Open Center (© Google Earth)

Figure 6. Layout of Marsa Open Center (© PA Map Server, Malta)

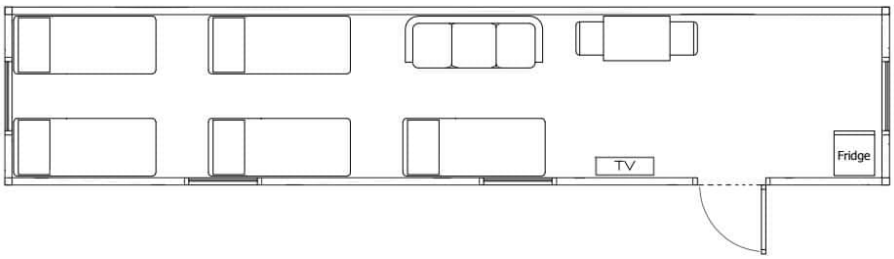


Figure 7. Typical mobile metal container unit (12.0x2.4m) (based on [10])

The *Development Control Design Policy, Guidance and Standards 2015*, commonly known as DC 15 [10], regulates development planning in Malta. Furthermore, the subsidiary legislation 552.22 addresses health and sanitation [11]. Neither refers to open centers, and thus they are not relevant to the theme under study. Instead, the *Metric Handbook: Planning and Design Data* [12] was used. The following parameters were addressed: natural lighting, ventilation, privacy and personal space, sanitation and hygiene, religious space and basic amenities, recreational and social space, materiality, infrastructural amenities, walkability, and landscaping. Apertures relate to the degree of natural light allowed within the building, whilst those for ventilation relate to the number of air changes required for the user/s of a given space. Privacy relates to residents' belongings as well as personal space; sanitation and hygiene are associated with good bathroom/shower facilities, toilets, and gender segregation. Religious spaces include prayer rooms provided for the various religions and religious denominations. Basic amenities include heating, cooling, electricity, and water. The infrastructural amenities – buses and pedestrian walkways – which serve the areas are an important dimension, as is walkability between the open centers and other localities.

The following publicly available architectural drawings of the development planning applications were consulted: PA/00347/13 [8], PA/05085/08 [9], and PA/01051/08 [13]. Furthermore, meetings and interviews with professionals from entities and non-governmental organizations involved with irregular migrants – UNHCR and religious entities such as the Justice and Peace Commission of the Archdiocese of Malta and the Peace Lab – were held. Although the drawings are in the public domain and available online on the website of the Planning Authority, Malta, they could not be reproduced in this article due to copyright restrictions.

2.2 Case studies

The HTV site, designated to cater for temporary accommodation up to a maximum of six calendar months, includes an administration block, a gatehouse, parking spaces, lockers on the outside, a dining–kitchen block, two sanitary facilities (Block A and Block B), rows of containers totaling circa 90 (double stacked), and landscape vegetation. Originally composed of rows of military tents, hence its name, HTV is the largest reception center consisting of mobile containers. It has different sections: the main one is for single men, and there are smaller ones for single women and unaccompanied minor asylum seekers (UMAs). There is also a section for those pending the Administrative Appeals Tribunal procedure [14]. The UMAs section is not accessible to adults without prior authorization and includes a zone for unaccompanied minor asylum seekers who have been confirmed as minors. In 2021, AWAS completed the refurbishment of part of the minors' section to be used as a classroom and for other activities; a library and a PlayStation were installed. NGOs also carry out activities in this space.

The mobile containers at HTV are situated on elevated concrete platforms; these platforms can double as a semi-private space – sort of a patio – for the occupants. Given that the HTV site is overcrowded, there is potential for problems relating to cleanliness, hygiene, and the spread of disease to arise. When the COVID-19 pandemic broke out, strict and lengthy isolation regulations were implemented [15].

Various agencies have noted that the residents need more access to necessities, including food, water, and medical attention, including for mental health. The last is significant as most have gone through traumatic experiences on their way to Malta [16], a dimension that is not administratively addressed [14]. Based on her

October 2021 visit, the Commissioner for Human Rights noted that accommodation was supplied in containers that "appeared overcrowded and lacked air conditioning and heating" for both HTV and HOC [14]. Despite the clean surroundings, there was inadequate sanitation and water access for the residents. However, construction efforts are underway to add more restrooms and showers to the hangar. Although playrooms were set up for small children in the hangar center, the surrounding area is barren, with no flora or furniture in place for kids to engage in outside activities [17].

HOC – which includes a clinic, classrooms, a gatehouse, a prayer room, containers, offices, security blocks, multifunctional hangers, vegetation, sanitary rooms, and a kitchen – provides residents with social and recreational pursuits, including sporting and cultural events [18]. At this center, minors go through a primary age assessment and medical clearance before being referred to a specific open center or home, depending on the outcome of the individual case. Although official procedures dictate that no one can be detained beyond a maximum of seven days unless health considerations warrant otherwise, the length of stay usually ranges between a few days to a few weeks. Previously forming part of the Royal Air Force base, the hangar lacks a comfortable living environment during the hot summer and cold winter months. As in tent villages, migrants sleep on bunk beds. Privacy is created by putting up blankets and sheets around beds.

Key features within the MOC site – AWAS's initial reception center for men and women – include a guards' room, a football ground, an administration block, the old trade school, offices, parking, dormitories, sanitation blocks, storage facilities, family quarters, a doctor's clinic, a family room, a kitchen and a laundry room. Some migrant accounts portray the accommodation at MOC as overcrowded and state that the site lacks running water and power. "The CPT [European Committee for the Prevention of Torture and Inhuman or Degrading Treatment or Punishment] considers that the situation found at Marsa I[nitial] R[eception] C[enter] on Floors 1 (fl. 1) and 2 (fl. 2) shows an establishment in disarray, which has allowed a dangerous, and potentially fatal, environment for detained migrants and its staff to develop and is symptomatic of […] institutional neglect" [19: 12]. MOC has an on-site clinic for basic medical care [18], but it is unclear what mental health services are offered. MOC provides its inhabitants with some educational and job opportunities.

3. Results and discussion

3.1 General findings

Information collected through the architectural drawings and the interviews is given in Table 2. The checklist follows the parameters listed in the methodology. Each parameter was assigned one of three categories:

- Inadequate: The parameter fails to satisfy the minimum standards of safety and basic needs.
- Fair: The parameter satisfies the bare minimum of safety and basic needs
- Satisfactory: The parameter matches the relevant standard and provides an adequate level of safety and basic needs

With respect to natural lighting, electricity, water, religious spaces, and locker facilities on site, the main findings were as follows.

1. All open centers have a reasonable degree of sun exposure. This may be a disadvantage in terms of thermal comfort. The outside potential for daylight is fair to adequate in all three cases; with respect to orientation, there is room for improvement.
2. Electricity is not an issue in the open centers as it is provided by the national grid. This is not the case with water; hot water is not available for showering in the winter months. Although there are three solar water heaters in Block (Bl.) A and one in Block (Bl.) B of HTV and five in HOC, their output is insufficient to meet residents' needs. The solution is to install more such heaters to meet the demand. Hot water for showering is not an issue at MOC.

3. HTV and HOC offer a prayer room unit; no such space is present at MOC as the residents there prefer to use nearby churches and the mosque. Migrants are mainly Christians or Muslims. Given that the prayer room is 36 m^2 at HOC, this only caters to a very small fraction of the population at any given time.
4. At HTV, there are units outside the sleeping quarters that house 1,056 lockers – an insufficient quantity for the total number of residents when the center is full. Each locker has a volume of 0.38 m^3, which is the bare minimum for storing clothes, hygienic products, documents, and other possessions. HOC does not have such units: personal storage is integrated within the interior of the residential container in the family section; the other sections have no locker units within the dormitories. This is often the cause of arguments and fights relating to theft of possessions.

Table 2. Open centers: General findings

Parameter	HTV	HOC	MOC
Natural light openings	fair	fair	satisfactory
	Orientation can be improved	Orientation can be improved	Unobstructed and properly oriented
Ventilation openings	satisfactory	satisfactory	inadequate*
	Good ventilation	Good ventilation	No cross ventilation seems to be present at the first-floor level
Privacy and personal space	fair	inadequate	inadequate
	Storage for clothes, hygienic products, documents, and food exists but not enough for every resident when facility is full.	Fine for families as generally they have a container to themselves; for others, it is not present. Storage for clothes, hygienic products, documents, and some food is not adequate	No personal storage
Sanitation and hygiene	inadequate	inadequate	fair
	Not enough	Not enough	Close to standard
Religious space	satisfactory	satisfactory	inadequate
	Prayer room available	Prayer room available	Residents use places of worship in the vicinity
Amenities – heating	inadequate	inadequate	inadequate
			Better than other centers
Amenities – cooling	inadequate	inadequate	inadequate
			Better than other centers
Amenities – electricity	satisfactory	satisfactory	satisfactory
	Grid provision	Grid provision	Grid provision
Amenities – water	inadequate	inadequate	Satisfactory
	Insufficient hot water	Insufficient hot water	Hot water available
Recreational and social space	inadequate	satisfactory	satisfactory
	Poor	Dining space/ TV available for families only	Football ground available; cafeterias removed years earlier
Materiality	inadequate	inadequate	satisfactory

Parameter	HTV	HOC	MOC
	Prefabricated container housing units	Prefabricated container housing units	Stone masonry building
Infrastructural amenities	inadequate	inadequate	satisfactory
	Frequency of route buses: 2 per day	Frequency of route buses: 2 per day	Frequency of route buses: 26 per day
Walkability	satisfactory	satisfactory	satisfactory
	30-minute walk to Birżebbuġġia	23-minute walk to Birżebbuġġia	30-minute walk to Valletta, Malta's capital city
Landscaping	inadequate	inadequate	satisfactory
	Although Ħal Far has arable land, there is no vegetation on site except for planted oleander, which is insufficient to meet residents' needs for green space	Although Ħal Far has arable land, there is no vegetation on site except for planted oleander, which is insufficient to meet residents' needs for green space	Good screening and a fair amount of vegetation

* There are no openings on the rear side of the building as the street is at a higher level.

3.2 Ventilation, heating and cooling, and materiality

The performance of each open center was assessed through the number of air changes per hour and the thermal capacity of the individual containers. The typical container unit has two windows on its shorter sides. These generate cross-ventilation, whether the container is used as accommodation, a classroom, or a prayer room. This is the case for both the open centers at Ħal Far; the rooms at MOC also have cross-ventilation. The respective computations for air changes per hour (ACH) within a given space are given in Table 3. For all spaces, the actual air changes per hour were above the minimum requirements. With respect to the first floor of MOC, the value was computed for openings opposite one another, which is not true to fact as no openings are present on the rear side of the building, as the street is at a higher level.

Air changes are crucial in cooling a building. At the Ħal Far sites, it is "unbearably hot in the summer months and extremely cold in winter due to Malta's high humidity levels" [14]. This is not present in MOC as the structure is in load-bearing masonry.

Assuming for cross ventilation cases that air inlet is equal to air outlet,

i. air flow rate into a given space Q (l/s),
ii. wind velocity at datum level (that is, height of a building or opening) v (m/s),
iii. effective area A_{eff} (m^2),
iv. minimum area of opening A_{min} (m^2),
v. effective area for actual openings $A_{eff\ actual}$ (m^2),
vi. interior volume of the space V (m^3), and
vii. number of air changes per hour N_{ACH}

are computed through equations 1 to 7, respectively. Factors a and c determine mean wind speed at different heights and for different types of terrain. As per BS 5925: 1980 [20], for terrain with scattered wind breaks, a = 0.20 and c = 0.52; for urban terrain, a = 0.25 and c = 0.35.

$$Q = R_pN_p + R_aA \quad (1)$$

where, assuming the required minimum ventilation rates for a dayroom in correctional facility applies to open centres, R_p = people outdoor air rate (2.5 l/s per person, as per ASHRAE [21]), N_p = number of persons, R_a = area outdoor air rate (0.3 l/sm², as per ASHRAE [21]), and A = area (m^2).

$$v = v_{10}cH^a \quad (2)$$

where v_{10} = average yearly wind speed (m/s), and H = height from ground to floor.

$$A_{eff} = Q/C_d v\sqrt{\Delta C_p} \quad (3)$$

where Q = air flow rate (l/s), C_d = discharge coefficient (a function of the geometry of the aperture and the turbulence of the flow for most applications) (C_d = 0.65), v = wind velocity (m/s), and ΔC_p = change in pressure coefficient (assumed as +0.5, inlet and -0.5, outlet).

$$A_{min} = A_{eff}\sqrt{2} \quad (4)$$

$$A_{eff\ actual} = N_a A_a \sqrt{2} \quad (5)$$

where N_a = number of actual apertures perpendicular to the wind and A_a = Area of apertures (taken as half for sliding windows).

$$V = AH_{int} \quad (6)$$

where V = volume and H_{int} = internal height.

$$N = 3.6Q/V \quad (7)$$

Equation 7 was used to compute the last two Q values.

Table 3. Open centers: Air changes

	HTV/HOC (mobile)			Prayer room		HTV			HOC	MOC			
							bathrooms			dormitory		bathrooms	
	1st fl.	2nd fl.	class unit	HTV	HOC	dining/ kitchen	Bl. A	Bl. B		1st fl.	2nd fl.	1st fl.	2nd fl.
R_p	02.50	02.50	05.00	02.50	02.50	03.80	02.50	02.50	02.50	02.50	02.50	02.50	02.50
N_p	10.00	10.00	25.00	43.00	72.00	40.00	36.00	12.00	40.00	25.00	25.00	24.00	24.00
R_a	00.30	00.30	00.60	00.30	00.30	00.90	00.30	00.30	00.30	00.30	00.30	00.30	00.30
A	28.80	28.80	36.00	58.00	36.00	508.6	698.9	51.51	519.4	32.40	32.40	32.40	32.40
Q	33.64	33.64	146.6	124.9	190.8	609.7	299.7	45.45	255.8	72.22	72.22	69.72	69.72
v_{10} [22]	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20
c*	00.52	00.52	00.52	00.52	00.52	00.52	00.52	00.52	00.52	00.52	00.52	00.52	00.52
a*	00.20	00.20	00.20	00.20	00.20	00.20	00.20	00.20	00.20	00.20	00.20	00.20	00.20
H	02.40	04.80	2.40	02.20	02.40	02.50	02.50	02.25	02.70	02.50	09.50	02.50	09.50
v	03.22	03.70	03.22	03.17	03.22	03.25	03.25	03.18	03.30	03.25	04.24	03.25	04.24
Q	0.034	0.034	0.147	0.125	0.191	0.610	0.300	0.045	0.256	0.072	0.072	0.070	0.070
C_d	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65
v	03.22	03.70	03.22	03.17	03.22	03.25	03.25	03.18	03.30	03.25	04.24	03.25	04.24
ΔC_p	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00
A_{eff}	0.016	0.014	0.070	0.061	0.091	0.289	0.142	0.022	0.119	0.034	0.026	0.033	0.025
A_{min}	0.023	0.020	0.099	0.086	0.129	0.408	0.201	0.031	0.169	0.048	0.037	0.047	0.036
N_a	01.00	01.00	02.00	01.00	01.00	06.00	12.00	01.00	35.00	01.00	02.00	01.00	01.00
A_a	00.80	01.80	00.90	00.72	00.90	01.44	00.56	00.54	00.35	00.5	01.68	01.26	02.10
$A_{eff\ actual}$	0.566	1.273	1.273	0.509	0.636	6.109	4.752	0.382	8.662	0.354	2.376	0.891	1.485
v_{10}	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20	05.20
c**	00.35	00.35	00.35	00.35	00.35	00.35	00.35	00.35	00.35	00.35	00.35	00.35	00.35
a**	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25	00.25
H	00.50	03.50	00.50	00.50	00.50	00.50	00.50	00.50	00.50	00.50	09.00	00.50	09.00
v	01.53	02.49	01.53	01.53	01.53	01.53	01.53	01.53	01.53	01.53	03.15	01.53	03.15
A_{eff}	0.566	1.273	1.273	0.509	0.636	6.109	4.752	0.382	8.662	0.354	2.376	0.891	1.485

	HTV/HOC (mobile)			Prayer room		HTV			HOC	MOC			
	1st fl.	2nd fl.	class unit	HTV	HOC	dining/ kitchen	bathrooms Bl. A	bathrooms Bl. B		dormitory 1st fl.	dormitory 2nd fl.	bathrooms 1st fl.	bathrooms 2nd fl.
C_d	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65	00.65
v	01.53	02.49	01.53	01.53	01.53	01.53	01.53	01.53	01.53	01.53	03.15	01.53	03.15
ΔC_p	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00	01.00
Q	00.56	02.06	01.27	00.51	00.63	06.08	04.73	00.38	08.62	00.35	04.87	00.89	03.04
A	28.80	28.80	36.00	58.00	36.00	508.6	698.9	51.51	519.4	32.40	32.40	32.40	32.40
H_{int}	02.46	02.46	02.46	02.49	02.46	03.00	03.08	02.95	03.60	03.00	03.00	03.00	03.00
V	70.85	70.85	88.56	144.5	88.56	1526	2153	152.0	1870	97.20	97.20	97.20	97.20
Q	33.64	02.06	01.27	00.51	00.63	06.08	04.73	00.38	08.62	00.35	04.87	00.89	03.04
V	70.85	70.85	88.56	144.5	88.56	1526	2153	152.0	1870	97.20	97.20	97.20	97.20
$N_{ACH\ min}$	1.709	0.105	0.052	0.013	0.026	0.014	0.008	0.009	0.017	0.013	0.180	0.033	0.113
Q	562.7	2059	1266	506.7	633.1	6078	4727	379.8	8617	351.7	4868	886.3	3043
V	70.85	70.85	88.56	144.5	88.56	1526	2153	152.0	1870	97.20	97.20	97.20	97.20
$N_{ACH\ act}$	28.59	104.6	51.47	12.62	25.74	14.34	07.91	09.00	16.59	13.03	180.3	32.83	112.7

* terrain with scattered windbreaks; ** urban terrain

3.2 Heating, cooling, and materiality

The building material has a bearing on the thermal capacity. The maximum thermal transmittance (U-value) for dwellings undergoing major renovation is given in Table 4; "the maximum U-value is the cumulative U-value calculation of the thermal properties of the unconditioned space and the exposed building element" [23: 12]. These values apply to MOC.

Table 4. Dwellings: Maximum U-values (based on [23])

Building elements	Maximum U-value (W/m²K)
Exposed walls	1.57
Exposed floors	0.59
Non-exposed floors	1.97
Roofs	0.59

With respect to the Ħal Far sites, feedback from interviews and on-site observations indicate that life is unbearable in the container units, both during the summer months and on cold winter days. The U-values for a typical container unit are given by:

$$U = \frac{1}{R_T} \qquad (8)$$

$$R_T = R_{so} + \sum\frac{x}{k} + R_{si} \qquad (9)$$

where x = thickness of material (m), k = thermal conductivity of element (W/mk), R_{so} = fixed external resistance (m² K/W), R_{si} = fixed internal resistance (m² K/W), and R_T = total thermal resistance (m² K/W).

With respect to an exposed 2.5 mm metal wall panel, k = 45 W/mk, R_{so} = 0.04 W/m²K, and R_{si} = 0.13 W/m²K. Thus:

$R_T = 0.04 + 009/45 + 0.13 = 0.17$ W/m²K and

U = 1/0.17 = 5.88 W/m²K > 1.57 W/m²K

Similarly, in the case of an exposed 2.5 mm metal roof panel, the U-value is 5.88 W/m²K > 0.59 W/m²K. Thus, insulation is recommended for the well-being of residents.

3.3 Sanitary facilities

The current number of sanitary facilities in each respective open center – in the case of HTV, broken down into Block A and Block B – is given in Table 5.

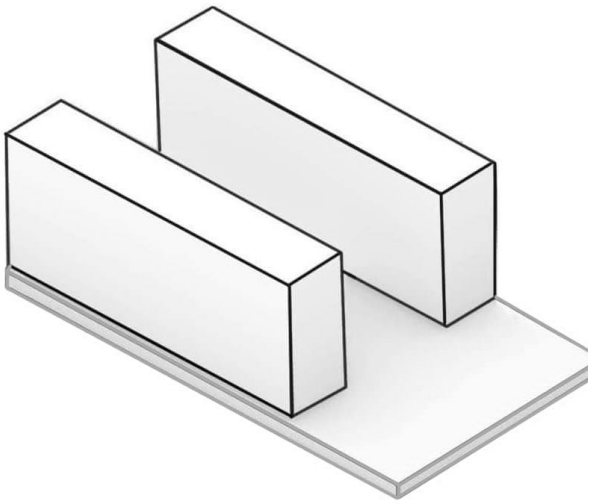
Table 5. Number of sanitary facilities in open centers (based on drawings included in [8, 9, 13])

	HTV Bl. A		HTV Bl. B		HOC		MOC	
	male	female	male	female	male	female	male	female
Toilets	35	7	3	3	20	4	32	n.a.
Showers	35	7	3	3	20	4	42	n.a.

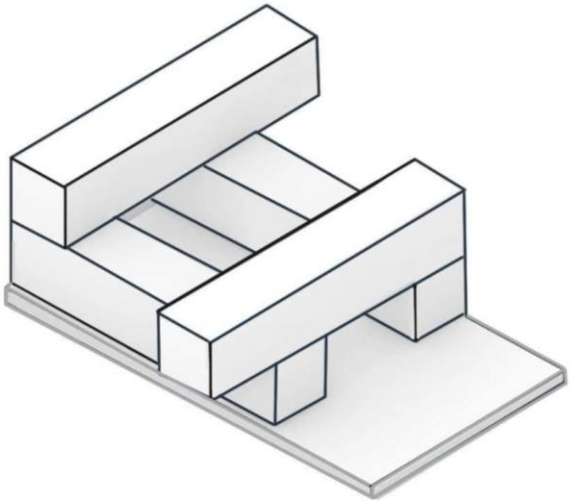
To assess the suitability of the number of facilities at the open centers, it is reasonable to consider them guesthouses without en-suite sanitary facilities. In open centers, the primary objective is a safe and hygienic environment rather than comfortable amenities. Given the residential capacities of such centers (Table 1: HTV = 1,248, HOC = 746, and MOC = 460) and applying the requirements for such guest houses – which require 1 toilet and bathroom per 9 persons [14: 3-5] – all three open centers studied are substandard.

4. Final comments

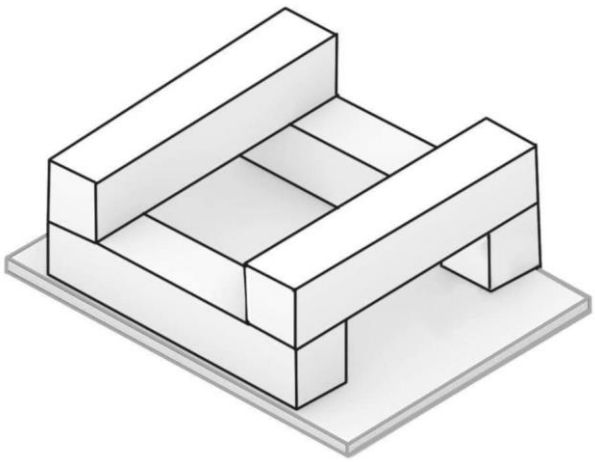
Following the assessment of the case studies, it transpires that the existing open centers have adequate ventilation but are substandard in terms of insulation and number of sanitary facilities. Recommendations for further upgrades relate to ventilation, daylighting, heating and cooling, sanitary facilities, spiritual needs, infrastructural amenities, landscaping, and social spaces. Keeping apertures in sanitary facilities open all the time, including the winter months, is advisable. With respect to the remaining indoor spaces, it is imperative to leave the windows open in the summer months. At HTV, for instance, the daylighting of the interiors can be significantly improved by modifying the position of the containers. The resultant effects not only involve a reduction in daily energy consumption and the corresponding costs but also healthier interiors. There are various ways to position units; uniformly stacked units can be repositioned and assembled in several configurations (Figure 8). The objectives are to illustrate (1) how to optimize the space generated between the containers and (2) how they can be redesigned. The external spaces generated by this repositioning provide opportunities for landscaping. Integrating prefabricated sanitary units within the stacked containers – as an add-on to each container unit – is an option.



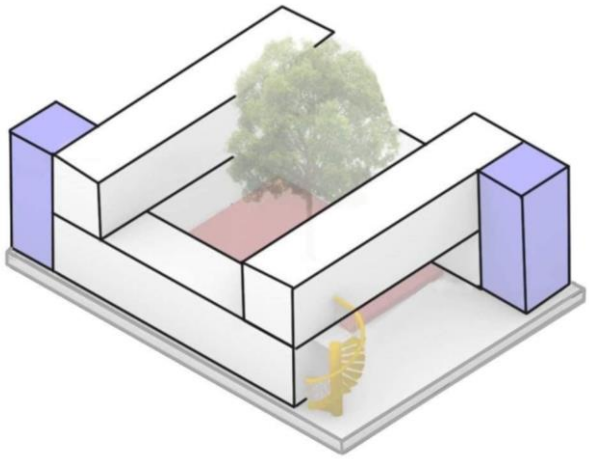
a. Existing layout



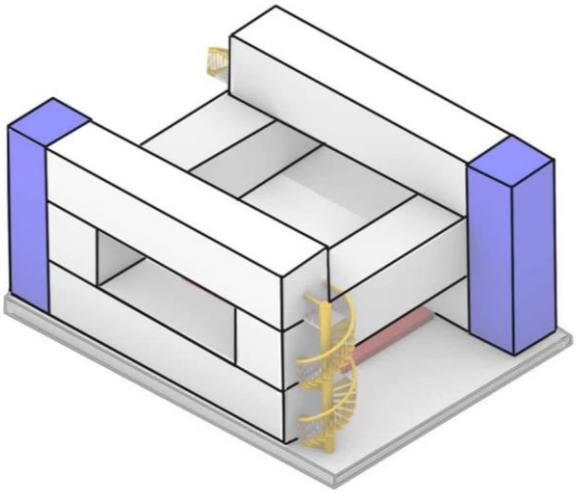
b. Layout generating communal space



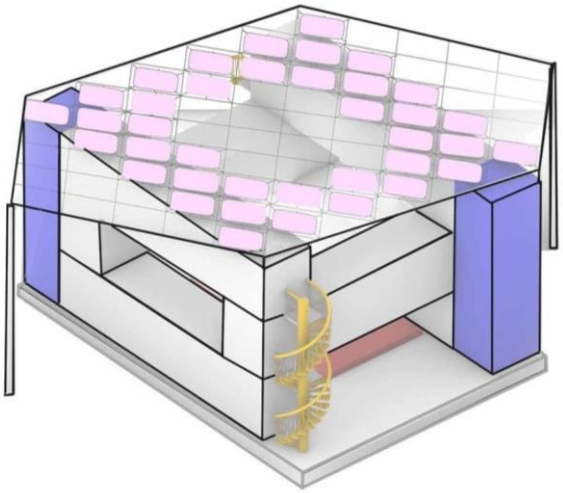
c. Widened platform



d. Modified access and pre-fab sanitary units



e. Possibility of additional level



f. Steel spaceframe providing shading

Figure 8. Re-optimization of placing container units (based on [3]); purple blocks indicate sanitary facilities

The grounding philosophy underlying this proposed optimized design for open centers has several foci, notably:

1. providing open/landscaped spaces without extending the site into adjacent land;
2. keeping the (re)construction time minimal;
3. keeping financial expenditure minimal; and
4. allowing for a greater number of container units within the open centre's existing footprint.

Repositioning the units in this way brings a further benefit in that the resulting construction is more resilient to wind loads, a genuine hazard in open sites such as Ħal Far, as illustrated by an incident in 2019 when strong winds knocked over containers [23]. With respect to ventilation and referring to the computations included in Table 3, although there is room for improvement, especially at MOC, the current apertures are sufficient.

Regarding heating and cooling, shading devices are proposed to reduce natural heating on the roofs of the containers. The recommended solution is a steel space frame covered in heat-reflecting canvas shading the exterior spaces generated between the units. This would be anchored to the roofs of the uppermost containers. Overheating can be tackled by insulating all sides of the units exposed to the elements. This is a cheap and effective solution both in the hot summer months and the winter months, which are mild, humid, and wet, with temperatures rarely dropping below 10°C.

With respect to meeting migrants' religious needs, a prayer room sufficed, but an adjacent ablution space is needed for Muslims. Improving transport connections, notably at the Ħal Far sites, is imperative. The present

number of buses (two per day) is insufficient. Furthermore, the bus stops should be equipped with suitable shelters for all seasons.

With respect to personal privacy, it is recommended that storage units be provided for each migrant. Ideally, these units should be integrated into the interiors of residential containers.

5. Limitations

1. The assessment of whether the ventilation of a given space is adequate was based on the optimal possible situation rather than on the worst-case scenario. Furthermore, the model calculations are elementary because the amount of air through an open window depends on more parameters than wind velocity alone: temperature inside and outside, wind direction, and wind gusts are also relevant. These parameters are unsteady, so it is hard to calculate them with accuracy. CFD programs are the best option to compute ventilation, but these are complicated due to the variables involved. Moreover, ASHRAE is less stringent vis-à-vis category 1 than ISO 17772 and EN 16798.
2. The following three limitations are worth noting: (i) the standards referred to in this study serve as guidelines only; (ii) greater accessibility to the sites would facilitate a more accurate assessment which could lead to improved design solutions and better layout plans; and (iii) the ability to interview irregular migrants residing in these units would have provided feedback from the users.

Authorship and contribution

Although this article is based on a research dissertation undertaken by the first author, substantial contributions to conceptualization, design, and result integration were made by the second author, the academic supervisor. This article was drafted by the latter author; the final version was approved by the former.

Institutional review board statement

The Faculty Research Ethics Committee of the Faculty for the Built Environment, University of Malta, approved the questionnaire on 6 June 2023 and requested that professionals identified in the research provide consent. The unique form ID is BEN-2023-00011. Irregular migrants were not interviewed as they were considered vulnerable; further to their individual privacy, irregular migration is a delicate and sensitive issue for migrants, the general public, and the authorities. All collected data will be deleted within four years of the completion of the research.

Informed consent statement

An information sheet about the purpose of the informal interviews and the overall schematic approach to the interview questions was handed to every participant. Prior to this, participants signed the relative consent form.

Declaration of competing interest

The authors declare that they have no financial or non-financial competing interests in any material discussed in this paper.

Funding information

No funding was received from any organisation to conduct this research.

Acknowledgements

Samuel Borg would like to thank Fr Dionysius Mintoff OFM, founder of John XIII Peace Lab (which houses migrants: single men and families), who helped him develop focus on the research theme of his dissertation. He would like to thank the participants from the Migrants Commission – namely, Perit Etienne Fenech, Rev. Anton

D'Amato, and a professional who wishes to remain anonymous – for their participation and engagement, and Prof. Simon Paul Borg for his guidance and support in the environmental analytical assessments.

Lino Bianco is grateful to Dr Sorin Bolocan (Department of Installations for Civil Engineering, Faculty of Civil Engineering, Transylvania University of Brașov, Romania) for his comments and critical remarks on an earlier draft of this article.

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